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Final

Screening and Baseline Ecological Risk Assessment Steps 1, 2, and 3 SWMUs 2B, 11,16,16GC, 21, 22, and 26 Naval Air Station Oceana Virginia Beach, Virginia

Prepared for

Department of the Navy
Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia

Contract No. N62470-93-D-6007
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August 2001

Prepared by

CH2MHILL

Baker
Environmental, Inc.

CDM
Federal Programs Corp.

03.15/8/01/01-00558

FINAL

Screening and Baseline Ecological Risk Assessment (Steps 1, 2, and 3)

SWMUs 2B, 11, 16, 16GC, 21, 22, and 26

Naval Air Station, Oceana
Virginia Beach, Virginia

Contract Task Order 0105

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Department of the Navy
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Under the

LANTDIV Clean II Program
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SIGNATURE PAGE

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Naval Air Station Oceana
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Contract Task Order Number 0105
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Navy CLEAN II Program

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August 2001

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Acronyms and Abbreviations

AOC	Area of Concern
AUF	Area Use Factor
BAF	Bioaccumulation Factor
BCF	Bioconcentration Factor
BGS	Below Ground Surface
BTAG	Biological Technical Assistance Group
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CLEAN	Comprehensive Long-Term Environmental Action
CMP	Corrective Measures Plan
CMS	Corrective Measures Study
COPC	Chemical of Potential Concern
CTO	Contract Task Order
1,1-DCA	1,1-Dichloroethane
1,2-DCE	1,2-Dichloroethene
DD	Decision Document
EE/CA	Engineering Evaluation/Cost Analysis
ERA	Ecological Risk Assessment
FFA	Federal Facilities Agreement
FS	Feasibility Study
HQ	Hazard Quotient
HRS	Hazard Ranking System
IAS	Initial Assessment Study
IR	Installation Restoration
IRI	Interim Remedial Investigation
MCL	Maximum Concentration Limit
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
mph	Miles per hour
MSL	Mean Sea Level
NACIP	Navy Assessment and Control of Installation Pollutants
NAS	Naval Air Station
NFRAP	No Further Response Action Planned
NPL	National Priorities List
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PCE	Tetrachloroethene

Acronyms and Abbreviations (Continued)

PCP	Pentachlorophenol
POL	Petroleum Oil Lubricant
PRAP	Proposed Remedial Action Plan
PSI	Preliminary Site Inspection/Site Investigation
PWC	Public Works Center
RA	Remedial Action
RBCs	Risk Based Concentrations
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RGH	Rodgers, Golden, and Halpern
RI	Remedial Investigation
RVS	Round 1 Verification Step
SARA	Superfund Amendments and Reauthorization Act
SERA	Screening Ecological Risk Assessment
SI	Site Inspection/ Site Investigation
SMP	Site Management Plan
SRI	Supplemental Remedial Investigation
SVOC	Semivolatile Organic Compound
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TCE	Trichloroethene
TCL	Target Compound List
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VDEQ	Virginia Department of Environmental Quality
VOC	Volatile Organic Compound
μg/kg	Micrograms per kilogram
μg/L	Micrograms per liter

Executive Summary

This final report presents a screening ecological risk assessment (SERA; Steps 1 and 2) and the first step (Step 3) of a baseline ecological risk assessment (BERA) for seven Solid Waste Management Units (SWMUs 2B, 11, 16, 16GC, 21, 22, and 26) on Naval Air Station (NAS) Oceana, Virginia Beach, Virginia. This ERA was conducted in accordance with the Navy Policy for Conducting Ecological Risk Assessments (CNO, 1999) and the Navy/Tier II ERA approach developed for Region 3. The CNO policy, which describes a process consisting of eight steps organized into three tiers, is a clarification and interpretation of the eight-step process outlined in U.S. Environmental Protection Agency (USEPA) ERA guidance for the Superfund program (USEPA, 1997).

The objectives of the SERA were to:

- Screen individual sites to determine if potential risks to ecological receptors warrant either: (1) additional assessment beyond the conservative screening steps of the ERA process (unacceptable ecological risks possible), or (2) the removal of specific sites from further ecological consideration (no unacceptable ecological risks).
- Identify any data gaps or areas of unacceptable uncertainty that may require the collection of additional data to support ERA evaluations beyond the screening level.

Sites not screened out in the SERA continue on to Step 3. The general objectives of the Step 3 ERA were to:

- Refine the risk estimates from the SERA to determine if risks to ecological receptors from site-related chemicals are likely to occur based on realistic exposure scenarios.
- Focus subsequent data collection activities if potential risks are indicated, uncertainties are unacceptably high, and/or data gaps are identified.

SWMU 2B is located southeast of the main MATWING Hangar 122. The site includes Line Shacks 130 through 134 and the five aircraft cleaning stations northeast of Line Shack 130. Potential site related risk to terrestrial organisms exist at SWMU 2B. It is recommended that additional data will be collected and evaluated in a Feasibility Study in order to verify and delineate the metal concentrations in the soils.

SWMU 11 consists of two fire-fighting training rings and their immediate surroundings. The site is on the west side of NAS Oceana at the intersection of two abandoned runways. Potential risks to terrestrial organisms utilizing SWMU 11 are expected to be low to negligible based upon lines of evidence provided in Section 6.8. In conclusion, there is little potential for ecological risk at SWMU 11 as based upon the evidence. Therefore, further evaluation is not warranted and the ERA process is concluded.

SWMU 16 consists of a pesticide storage area adjacent to the pesticide shop at Building 821 in the Public Works Compound. Potential risks to terrestrial organisms or aquatic invertebrates utilizing SWMU 16 are expected be low to negligible based upon lines of evidence provided in Section 6.8. In conclusion, there is little potential for ecological risk at SWMU 16 as based upon the evidence. Therefore, further evaluation is not warranted and the ERA process is concluded.

SWMU 16GC consists of the pesticide storage area at the Golf Course Maintenance Shop. Potential risks to terrestrial organisms at SWMU 16GC are expected to be low to negligible based upon lines of evidence provided in Section 7.8. In conclusion, there is little potential for ecological risk at SWMU 16GC as based upon the evidence. Therefore, further evaluation is not warranted and the ERA process is concluded.

SWMU 21 is located in the southwestern corner of the Public Works Transportation Yard, approximately 400 feet southeast of Building 830 where transformers were stored in two gravel areas between the sand loaders and the yard's chain-link fence. Potential risks to terrestrial organisms utilizing the limited habitats present on SWMU 21 are expected to be negligible based upon lines of evidence provided in Section 8.8. In conclusion, there is little potential for ecological risk at SWMU 21 as based upon the evidence. Therefore, further evaluation is not warranted and the ERA process is concluded.

SWMU 22 is approximately 600 to 1,000 feet west of Oceana Boulevard and 1,500 feet north of the VACAPES complex. The construction debris landfill is an approximately 0.5-acre unlined facility. Potential risks to terrestrial organisms at SWMU 22 are expected to be negligible based upon lines of evidence provided in Section 9.8. In conclusion, there is little potential for ecological risk at SWMU 22 as based upon the evidence. Therefore, further evaluation is not warranted and the ERA process is concluded.

SWMU 26 consisted of partially buried drum or small tank with the top removed that measured 3-feet wide by 4-feet high and was inset approximately 3 feet below grade. The tank formed a burn pit that was used for fire extinguisher training. The tank has since been removed. Potential risks to terrestrial organisms at SWMU 26 are expected to be low to negligible based upon lines of evidence provided in Section 10.8. In conclusion, there is little potential for ecological risk at SWMU 26 as based upon the evidence. Therefore, further evaluation is not warranted and the ERA process is concluded.

Based upon the results and the certainty associated with the results, the relative size of these SWMUs, and the proximity of these SWMUs to an active military runway/airfield, site specific toxicity testing or additional sampling on which to base remedial action decisions is not warranted. Therefore, no further study in the risk assessment is recommended at this time. The identified potential for risks to ecological receptors at SWMU 2B will be further addressed in the remedial alternatives in the feasibility study being drafted for SWMU 2B. All remaining SWMUs (11, 16, 16GC, 21, 22, and 26) require no further action.

1.0 Introduction

This final report presents a screening ecological risk assessment (SERA; Steps 1 and 2) and the first step (Step 3) of a baseline ecological risk assessment (BERA) for seven Solid Waste Management Units (SWMUs) on Naval Air Station (NAS) Oceana, Virginia Beach, Virginia. The SWMUs addressed in this ERA include:

- SWMU 2B – Line Shack 130-131 Disposal Area
- SWMU 11 – Fire-Fighting Training Area
- SWMU 16 – Pesticide Storage Area
- SWMU 16GC – Golf Course Pesticide Storage Area
- SWMU 21 – Transformer Storage Yard
- SWMU 22 – Construction Debris Landfill
- SWMU 26 – Fire-Fighting Training Area, Building 220

Figure 1-1 shows the locations of the seven SWMUs addressed in this ecological risk assessment (ERA).

A total of 60 SWMUs were recommended for study in the draft RCRA Consent Order issued by the U.S. Environmental Protection Agency (USEPA). After reviewing the results of the Interim RFI, the Navy and EPA determined that only 19 SWMUs required investigation under the RCRA consent order; the remainder of the RFA identified SWMUs are regulated under other federal and/or state programs.

Because of the proximity of four of the RFA SWMUs, they were consolidated into two; therefore, 17 SWMUs were in the RCRA Facility Investigation (RFI) under the consent order.

The Consent Order specified four RCRA corrective action steps that would be required for the SWMUs. These were:

- Interim Measures, including the preparation of a community relations plan and other plans for future work
- The RFI
- A corrective measures study (CMS) to identify appropriate remediation technologies and approaches to remediate SWMUs that require cleanup
- A corrective measures implementation of the selected remedies

NAS Oceana is now regulated under a Federal Facilities Agreement (established under CERCLA) which supercedes the RCRA Consent Order. ERAs are therefore being performed at NAS Oceana SWMUs 2B, 11, 16, 16GC, 21, 22, and 26, as required for SWMU closeout under CERCLA.

Following the development a technical approach defining how to proceed and conduct ecological risk assessments for the remaining SWMUs in November 1999, the partnering team scoped ecological data gaps at SWMUs 2B, 11, 16/16GC, 21, 22, and 26. During this scoping the team reviewed the conceptual models developed of each specific SWMU to determine potential routes of exposure; the team considered the use of existing data from the RCRA investigations and its limitations. The team developed a sampling plan for those SWMUs identified as having significant data gaps warranting new sampling data. The sampling plan included the number of samples, sampling locations, and the analytical parameters for each set of samples for each site. This sampling plan the Work Plan Addendum, Sediment, Surface Water, and Surface Soil Sampling at Multiple SWMUs to Support Ecological Risk Assessment and Direct Push Technology Investigation to Support MNA at SWMU 15; Naval Air Station, Oceana, Virginia Beach, Virginia was approved by the Partnering Team in December 1999.

This ERA is conducted in accordance with the Navy Policy for Conducting Ecological Risk Assessments (CNO, 1999) and the Navy/Tier II ERA approach developed for Region 3. The CNO policy, which describes a process consisting of eight steps organized into three tiers, is a clarification and interpretation of the eight-step process outlined in USEPA ERA guidance for the Superfund program (USEPA, 1997). The major differences between the Navy ERA policy and the USEPA ERA guidance are: (1) the Navy policy provides clearly defined criteria for exiting the ERA process at specific points, (2) the Navy policy divides Step 3 (the first step of the baseline ERA) into two distinct sub-steps (Steps 3A and 3B), with a potential exit point after Step 3A, and (3) the Navy policy incorporates risk management considerations throughout all tiers of the ERA process.

Steps 1 and 2 of the ERA process constitutes the screening ERA, which is conducted using intentionally conservative assumptions. If complete exposure pathways exist on a site and the results of the SERA indicate that risks are possible, the site normally continues on to Step 3, the first step in the baseline ERA. As indicated above, Step 3 is divided into two distinct sub-steps in Navy ERA guidance.

In Step 3A, a refined evaluation of media concentrations and exposure estimates is conducted using more realistic assumptions and additional methodologies relative to those used in the SERA, which is intended to be a very conservative assessment. Examples of more realistic exposure assumptions include using central tendency estimates (rather than maximums) for media concentrations, bioaccumulation factors, and exposure parameters. Examples of additional methodologies, where applicable, include consideration of background concentrations, detection frequency, and bioavailability (CNO, 1999).

If risk estimates (and their associated uncertainty) are acceptable following Step 3A, the site will meet the conditions of the exit criterion specified in the Navy guidance and the ERA process will terminate. If the Step 3A evaluation does not support an acceptable risk determination, the site continues to Step 3B.

In Step 3B, the preliminary conceptual model presented in the SERA is refined based on the results of Step 3A to develop a revised list of receptors, Chemicals of Potential Concern (COPCs), assessment endpoints, measurement endpoints, and risk hypotheses. Based upon the revised conceptual model, the lines of evidence to be used in characterizing risk are determined.

1.1 Objectives

The objectives of the SERA are to:

- Screen individual sites to determine if potential risks to ecological receptors warrant either: (1) additional assessment beyond the conservative screening steps of the ERA process (unacceptable ecological risks possible), or (2) the removal of specific sites from further ecological consideration (no unacceptable ecological risks)
- To identify any data gaps or areas of unacceptable uncertainty that may require the collection of additional data to support ERA evaluations beyond the screening level

Sites not screened out in the SERA continue on to Step 3. The general objectives of the Step 3 ERA are to:

- Refine the risk estimates from the SERA to determine if risks to ecological receptors from site-related chemicals are likely to occur based on realistic exposure scenarios
- Focus subsequent data collection activities if potential risks are indicated, uncertainties are unacceptably high, and/or data gaps are identified

At the conclusion of Step 3, there are three possible decision points:

- **No further action is warranted.** This decision is appropriate if the evaluation indicates that sufficient data are available on which to base a conclusion of no risk.
- **Further data are required.** This decision is appropriate if the evaluation indicates that the potential for risk exists and additional data to refine these estimates (e.g., additional analytical data, measures of bioavailability) are needed. In this case, the site continues to Step 4 of the ERA process.
- **Take remedial action.** This decision may be appropriate for circumstances in which the potential for risks was identified but these potential risks could best be addressed through remedial action (e.g., presumptive remedy, soil removal) rather than additional study.

1.2 Report Organization

This report is divided into the following sections:

- **Section 1.0 - Introduction.** Describes the purpose and scope of the risk assessment and outlines the report organization.
- **Section 2.0 - Facility Background.** Describes the environmental setting of NAS Oceana and the sources of analytical data available for use in the risk assessment.
- **Section 3.0 - General Approach and Methodology.** Outlines and describes the specific technical approaches, methodologies, models, and parameter values that are used in the ERA for conducting problem formulation, exposure estimation, effects evaluation, and risk calculation. This section includes those items that are common to all of the SWMUs

evaluated in this ERA; site-specific approaches or parameter values are described in the sections (4 through 10) addressing the individual sites.

- **Section 4.0 – SWMU 2B (Line Shack Disposal Area).** Describes the results and conclusions of the risk evaluation for SWMU 2B.
- **Section 5.0 – SWMU 11 (Fire-Fighting Training Area).** Describes the results and conclusions of the risk evaluation for SWMU 11.
- **Section 6.0 – SWMU 16 (Pesticide Storage Area).** Describes the results and conclusions of the risk evaluation for SWMU 16.
- **Section 7.0 – SWMU 16GC (Golf Course Pesticide Storage Area).** Describes the results and conclusions of the risk evaluation for SWMU 16GC.
- **Section 8.0 – SWMU 21 (Transformer Storage Yard).** Describes the results and conclusions of the risk evaluation for SWMU 21.
- **Section 9.0 – SWMU 22 (Construction Debris Landfill).** Describes the results and conclusions of the risk evaluation for SWMU 22.
- **Section 10.0 – SWMU 26 (Fire-Fighting Training Area, Building 220).** Describes the results and conclusions of the risk evaluation for SWMU 26.
- **Section 11.0 – Uncertainties.** Identifies and discusses the sources of uncertainty in the ERA and evaluates their potential impacts on the risk conclusions.
- **Section 12.0 – Conclusions.** Summarizes the results of the ERA and presents the conclusions for each SWMU.
- **Section 13.0 – References.** Lists the citations for all references cited in the ERA.

Supporting technical data for the ERA are provided in appendices.

2.0 Facility Background

This section describes the environmental setting (e.g., habitats and biota) of NAS Oceana as well as the analytical data available for use in the ERA. NAS Oceana is located in the Tidewater region of Virginia and lies southeast of the city of Norfolk, immediately west of the Atlantic Ocean, and just south of the Chesapeake Bay. NAS Oceana consists of approximately 6,000 acres within the city of Virginia Beach.

More than 40 percent of the air station is urbanized including commercial, residential, and operations buildings and runways, hangars and similar structures. The undeveloped areas of the air station consist of farmland, open land, forest, and wetlands. Farmland comprises approximately 925 acres. The land is farmed by private producers under the Navy's agricultural outlease program (Nair, 1988). Major crops grown within the boundaries of the air station are corn, soybeans, and winter wheat. Approximately 200 acres of open fields and meadows, and 600 acres of forest occur on NAS Oceana (RGH, 1984). The forested areas on the air station are dominated by pine, mixed pine-hardwood, and hardwood stands.

Wetlands comprise approximately 660 acres of the undeveloped areas (CH2M HILL, 1993). The U.S. Fish and Wildlife Service's (USFWS) National Wetland Inventory (NWI) maps classify the wetlands as palustrine emergent (PEM), palustrine scrub/shrub (PSS), and palustrine forested (PFO) (USFWS, 1991). In addition to relying on the NWI mapping of wetlands, field observations by CH2M HILL ecologists and Army Corps of Engineers wetlands biologists were used to verify the existence of wetlands on NAS Oceana and each specific SWMU.

2.1 Environmental Setting

2.1.1 Physiographic Features

2.1.1.1 Climate

NAS Oceana is located near the Atlantic Ocean, which accounts for the mild year-round temperatures. The Virginia Beach area climate is characterized by hot, humid summers and mild winters. The annual temperature is 68.2°F with an average annual precipitation of 44.62 inches. Seasonal snowfall is approximately 7 inches annually. Average wind speed at the station is approximately 10 miles per hour (mph). Coastal storms, in the form of severe thunderstorms, northeasters, and hurricanes frequently impact the station.

2.1.1.2 Topography

The elevation of the station ranges from approximately 5 feet above mean sea level (MSL) in the drainage ditches to approximately 25 feet above MSL in the open fields. Elevations in the developed area of the station range from 10 to 25 feet above MSL. The topography of the station is generally flat with a general easterly slope to the land surface.

2.1.1.3 Soils

NAS Oceana is on the outer edge of the Atlantic Coastal Plain physiographic province. The Atlantic Coastal Plain is a broad wedge of unconsolidated sediments that dip and thicken to the east. In the area of NAS Oceana, the sediments consist of several thousand feet of unconsolidated sand, clay, silt, and gravel, and are underlain by granite basement rock.

The geologic units of concern in the environmental investigations at NAS Oceana are the Yorktown Formation and the Columbia Group. The Yorktown Formation consists of interbedded layers of shelly, very fine to coarse sands, clayey sands and sandy clay. Shelly layers are common in the Yorktown (Meng and Harsh, 1984). Siudyla et al. (1981) divided the Yorktown into three sand units each overlain by a confining layer of silt and clay.

Regionally, the uppermost of these silt and clay beds, which is referred to as the Yorktown confining unit, separates the Yorktown Formation from the sediments of the Columbia Group that overlie it. This uppermost bed consists of massive, well-bedded yellow-gray to greenish-gray clays and silty clays, which commonly contain shells, fine sand, and mica. The clay layers within the confining bed are generally extensive but are a series of coalescing clay beds rather than a single deposited unit. This unit was deposited in a shallow open-marine environment of broad lagoons and quiet bays (Meng and Harsh, 1984).

2.1.1.4 Surface Water Resources

Surface runoff from the station is facilitated by a system of drainage ditches and surface canals that flow south and west to West Neck Creek, north to London Bridge and Great Neck Creek, and east to Owls Creek and Lake Rudee (Figure 1-1). These drainage ditches are engineered, maintained structures and are periodically cleaned. Surface water bodies on the station are limited to these drainage ditches and a number of man-made ponds.

2.1.1.5 Groundwater Resources

Groundwater at NAS Oceana is generally within 4 to 10 feet of the land surface. Aquifer conditions are unconfined in the Columbia Group and unconfined to semi-confined within the upper Yorktown Formation (Siudyla et al., 1981). When the clay confining unit overlying the Yorktown is absent, the upper Yorktown is generally unconfined. Natural groundwater flow directions are generally south to southeast, but flow direction is controlled locally by drainage ditches. The flow direction in the Virginia Beach area is therefore highly variable because of the complexity of the drainage patterns.

2.1.2 Habitats and Biota

2.1.2.1 Flora

- A wide variety of vegetation types occur at NAS Oceana. Table 2-1 lists the plant species known or expected to occur on the station. Approximately 600 acres of forest and 200 acres of open land comprise the undeveloped areas at NAS Oceana (RGH, 1984). Approximately 660 acres (11 percent) of the land area at NAS Oceana are wetlands.

Most of the forested areas on the station are dominated by pine, mixed pine-hardwood, and hardwood stands. Areas with poorly drained, saturated soils are dominated by sweetgum, red maple, and, sometimes, loblolly pine. Most forested stands with unsaturated or moist soil conditions are dominated by loblolly pine or mixed pine-hardwoods. Upland forested areas usually have more oaks and cherry. Other overstory species likely to occur with these species are water oak, southern red oak, swamp chestnut oak, willow oak, tulip poplar, and black gum. Understory vegetation in the hardwood stands is dominated by switch cane. Other species occurring in the hardwood understory include greenbrier, pawpaw, Japanese honeysuckle, and bayberry. Understory plants that commonly occur in loblolly forests include sparse stands of switch cane, greenbrier, and Japanese honeysuckle.

2.1.2.2 Fauna

Observations of mammals, birds, reptiles, and amphibians, or their signs, were recorded during a 1992 on-site survey of the NAS (CH2M HILL, 1993). Only six mammalian species were observed during the survey: white-tailed deer, raccoon, chipmunk, squirrel, field mouse, and red fox. These species were observed in the forested areas around the station or in over-grown areas in the developed portion of the station. Table 2-2 lists mammals known or expected to inhabit NAS Oceana.

Many species of birds use the station as seasonal and year-round habitat. The on-site survey was conducted during early winter when many of the resident birds have migrated to their wintering grounds. Therefore, only a few species were observed during the survey. The yellow-rumped warbler, which occurred in large numbers on the edges of forested areas throughout the station, was observed more than any other species of bird. Other species observed during the survey include starlings, crows, gulls, song sparrows, ovenbirds, blue jays, cardinals, and common flickers. A list of birds known or expected to occur on the station is included in Table 2-3.

Habitat exists on the station for a wide variety of reptiles and amphibians. However, because the on-site survey was conducted in early winter, only two species of reptiles, eastern painted turtle and a slider turtle, were observed. Green frogs and bullfrog tadpoles were prevalent in some of the small shallow ponds throughout the station. Lists of reptiles and amphibians known or expected to occur on the station are shown in Tables 2-4 and 2-5, respectively.

Fishery resources are largely limited to the ponds at the inactive landfill/sand pit, and the borrow pond on the outskirts of the station. Largemouth bass and bluegill are known to exist in these ponds. Some of the ditches and creeks on the station had low numbers of mosquito fish and mud minnows. Mosquito fish were once stocked in several ditches on the station to control mosquito populations (CH2M HILL, 1993). Table 2-6 lists fish species known or expected to occur on the station.

Because the sediment was not sampled during the 1992 on-site ecological survey, no benthic organisms were observed in any of the water bodies on the station. Benthic organisms probably exist in all of the water bodies on and adjacent to the station.

2.1.2.3 Rare, Threatened, and Endangered Species

An inventory of rare, threatened, and endangered vertebrate and plant species was conducted on NAS Oceana in 1989 by the Virginia Department of Conservation and Recreation, Division of Natural Heritage (DNH), and was published in a Natural Heritage Technical Report (DNH, 1990). These results were updated and verified by checking the DNH, VA Department of Game and Inland Fisheries, and USFWS web sites for rare and endangered species (http://www.dcr.state.va.us/dnh/rare.htm, http://www.dgif.state.va.us/wildlife/index.cfm, and http://endangered.fws.gov/). The updated information, in conjunction with the earlier DNH report (DNH, 1990) suggests that no rare, threatened, or endangered wildlife species are known to occur at NAS Oceana, with the possible exception of occasional transient species (CH2M HILL 1993). These species are discussed below. Several rare plant species have been found on the station (see below).

Wildlife. The following three listed species reside or migrate through southeastern Virginia and could be found at the station:

- Peregrine falcon (*Falco peregrinus*). Listed as endangered in the commonwealth of Virginia, the peregrine falcon can be found in coastal areas during migration, particularly in September and October. In addition, hacking stations (release areas) have been established for the peregrine falcon on the Eastern Shore and in Back Bay National Wildlife Refuge (RGH, 1984).
- Bald eagle (*Haliaeetus leucocephalus*). This species is listed as endangered in the commonwealth of Virginia and threatened in portions of the lower 48 United States. The bald eagle was proposed for removal from the federal list in July 1999. Virginia provides prime habitat for the bald eagle. In 1978, 37 active nests were located in the state (RGH, 1984). There are currently no known bald eagles nesting in the immediate area of NAS Oceana. Some birds, however, do winter along area beaches or pass through the region during migration.
- Swainson's warbler (*Limnothlypis swainsonii*). This species is known to inhabit areas with abundant giant cane. This habitat was once common in Virginia Beach and is found on NAS Oceana. The findings of the DNH technical report (DNH, 1990) are that only marginally suitable habitat was found at the station for this species.

A list of rare wildlife species that may occur in the vicinity of NAS Oceana was generated from the natural heritage database and is presented in Table 2-7 (DNH, 1990).

Other rare, threatened, or endangered wildlife species that historically were likely to occur on the station are the following:

- Red-cockaded woodpecker (*Picoides borealis*)
- Many-lined salamander (*Stereochilus marginatus*)
- Greater siren (*Siren lacertina*)

The red-cockaded woodpecker was sighted in Suffolk, approximately 30 miles away from NAS Oceana, during the summer of 1984 (Nair, 1988). No sightings have occurred since. The many-lined salamander was found in a sandy-bottomed stream within a few miles of NAS Oceana, but the exact location of this sighting or the date could not be determined (DNH, 1990). The greater siren was recorded early in this century and in the 1950s at Dam Neck Lake and Indian Creek (DNH, 1990). No recent specimens of either of these salamanders are known.

Plants. A list of rare plant species that may occur in the vicinity of NAS Oceana was generated from the natural heritage database and is presented in Table 2-8 (DNH, 1990). One state-listed rare plant species was observed during the on-site survey of the station.

This species was the long-leaf pine (*Pinus palustris*), which is listed as extremely rare in Virginia. A grove of long-leaf pine was planted in the early 1980s near the sandpit area near SWMU 22 as an experiment to determine if the species could be successfully grown at NAS Oceana for commercial harvesting (CH2M HILL, 1993). Commercial use of long-leaf pine at NAS Oceana was determined to be infeasible; however, the stand that exists on the site serves aesthetic purposes. The sandpits are approximately 500 to 600 feet east of the SWMU 22 boundary (CH2M HILL, 1993). This area will likely not be impacted by SWMU 22 because surface water is flowing northeast and groundwater is flowing north.

The southern twayblade (*Listera australis*) also is known to occur on the station. This species is listed as very rare in Virginia. Eighteen individuals were located during the species inventory conducted by DNH in 1989. The plants were found in the area referred to as the Northwest Woods Special Interest Area. *Listera australis* was recommended for special concern status in 1989 (DNR, 1990).

2.2 Sources of Available Analytical Data

The sources of analytical data are described in detail in Sections 4.1.2, 5.1.2, 6.1.2, 7.1.2, 8.1.2, 9.1.2, and 10.1.2. The rationale for selecting which data to use at each SWMU is provided in Section 3.3.1 as well as in each site-specific section.

3.0 General Approach and Methodology

This section describes the specific technical approaches, methodologies, models, and parameter values that are used in the ERA for conducting problem formulation, exposure estimation, effects evaluation, and risk calculation. This section includes those items that are common to each of the SWMUs evaluated in this ERA. Site-specific parameter values are described in Sections 4 through 10, which address the individual SWMUs.

3.1 Screening-Level Problem Formulation

Problem formulation establishes the goals, scope, and focus of the risk assessment. As part of problem formulation, the environmental setting of each SWMU is characterized in terms of the habitats and biota known or likely to be present, and the types and concentrations of chemicals that are present in ecologically relevant media. Conceptual models are developed for each SWMU that describe potential sources, potential transport pathways, potential exposure pathways and routes, and potential receptors. Assessment endpoints, measurement endpoints, and risk hypotheses are then selected to evaluate those receptors for which complete and potentially significant exposure pathways are likely to exist. The fate, transport, and toxicological properties of the chemicals present at each SWMU are also considered during this process.

Since environmental setting and the types and concentrations of chemicals are site-specific issues, they are not addressed in this section. They are, however, included in each of the site-specific sections (4 through 10). The following subsections describe the other components of problem formulation.

3.1.1 Preliminary Conceptual Model

Figure 3-1 illustrates a preliminary, generic diagrammatic conceptual model for SWMUs 2B, 11, 16, 16GC, 21, 22, and 26. Important components of the preliminary conceptual model are the identification of potential sources of contaminants, transport pathways, exposure media, potential exposure routes, and potential receptor groups. This preliminary, generic conceptual model is modified in Sections 4 through 10 to focus on the specific conditions at each individual SWMU.

3.1.1.1 Transport Pathways

A transport pathway describes the mechanisms whereby chemicals may be transported from a source of contamination to ecologically relevant media. These transport pathways are shown on Figure 3-1 for each SWMU. Incomplete pathways are shown as dashed lines, potentially complete but insignificant pathways are shown as dotted lines, and complete and potentially significant pathways are shown as solid lines. Only the latter pathways are evaluated in the ERA. The rationale for assigning these pathways to the three categories is detailed in the discussion of each site-specific model (Sections 4 through 10).

Site-related chemicals discharged to soils may be transported via surface runoff to downgradient surface water bodies. Site-related chemicals in soils may also leach to groundwater and then discharge to downgradient water bodies. Site-related chemicals in soil, sediment, and surface water may be taken up and accumulated in the tissue of biota, and thus be transported to upper trophic level receptors via food webs.

3.1.1.2 Exposure Pathways and Routes

An exposure pathway links a source of contamination with one or more receptors via exposure to one or more media. Exposure, and thus potential for risk, can only occur if complete exposure pathways exist. As shown in Figure 3-1, each SWMU has potentially complete exposure pathways to ecological receptors (solid lines). These exposure pathways are discussed in greater detail in Sections 4 through 10.

An exposure route describes the specific mechanism(s) by which a receptor is exposed to a chemical present in an environmental medium. Terrestrial plants may be exposed through their root surfaces during water and nutrient uptake to chemicals present in surface soils. Unrooted, floating aquatic plants, and rooted submerged vascular aquatic plants and algae, may be exposed to chemicals directly from the water or (for rooted plants) from sediments.

Animals may be exposed to chemicals through: (1) direct inhalation of gaseous chemicals or of chemicals adhered to particulate matter; (2) incidental ingestion of contaminated abiotic media (e.g., soil or sediment) during feeding activities; (3) the ingestion of contaminated water; (4) the ingestion of contaminated plant and/or animal tissues for chemicals which have entered the food webs; and/or (5) dermal contact with contaminated abiotic media. These routes, where applicable, are depicted in Figure 3-1.

Based on the general fate properties (e.g., relatively high adsorption to solids) of the chemicals commonly present on these SWMUs (generally metals and PAHs) and the protection offered by hair or feathers, dermal and inhalation exposures for upper trophic level receptor species are not considered significant relative to ingestion exposures and are therefore not evaluated in the ERA. Upper trophic-level receptors considered in this ecological risk assessment would not likely be exposed to significant airborne sources of chemicals because the sites are vegetated and little wind erosion of topsoil would be expected. Furthermore, the primary chemicals on the sites, metals and PAHs, typically adsorb to soil suggesting the potential for volatilization and thus exposure via inhalation is limited. Incidental ingestion of soil or sediment during feeding, preening, or grooming activities is, however, considered in the risk estimates. Direct contact is considered for lower trophic level receptors (e.g., invertebrates).

3.1.1.3 Endpoints and Risk Hypotheses

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). 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 (1997) and discussed in detail in Suter (1989, 1990, 1993). Risk hypotheses are testable hypotheses about the relationship among the assessment endpoints and their predicted responses when exposed to contaminants.

Endpoints in the risk assessment 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., raccoon population) 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. Effects on individuals are important for some receptors, such as rare and endangered species; 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., Ambient Water Quality Criteria for the Protection of Aquatic Life) can be useful in evaluating potential community- and/or population-level effects.

Table 3-1 summarizes the assessment endpoints, risk hypotheses, and measurement endpoints selected for Steps 1 and 2 of the risk assessment. Not all of these endpoints will be applied to all of the SWMUs. The relevant endpoints for each SWMU, based on the site-specific conceptual models, are identified in Sections 4 through 10.

3.2 Screening-Level Effects Evaluation

The purpose of the screening-level effects evaluation is to establish chemical exposure levels (screening values) that represent conservative thresholds for adverse ecological effects. One set of screening values is typically developed for each selected assessment endpoint. The screening values used in this ERA are the same as the values used in the SERA. Medium-specific screening values for surface water, sediment, and surface soil are summarized in Table 3-2.

3.2.1 Medium-Specific Screening Values

Medium-specific screening values are established for ecologically relevant media, including fresh surface water, freshwater sediment, and surface soil. Although ecological receptors are not typically directly exposed to groundwater, surface water screening values are also applied to groundwater to provide a conservative evaluation of potential screening-level risks associated with potential groundwater discharge to surface water bodies (for sites where this exposure pathway is complete). Based on the preliminary conceptual model (Figure 3-1), exposure via surface water, sediment, and surface soil are complete pathways at SWMUs 2B, 11, and 22. Exposure pathways at SWMUs 16, 16GC, 21, and 26 exist only for surface soils.

The screening values used in the risk assessment are based on either Region 3 BTAG screening values (USEPA, 1995a) or on alternate screening values previously used at NAS Oceana (CH2M HILL, 2000a). It was determined, based upon available information, that these screening values are appropriate for the SWMUs considered in this risk assessment. Where more than one screening value was available for a specific medium (e.g., soil fauna and soil flora), the lowest value was selected for use in the SERA portion of the risk assessment. Screening values were adjusted based on modifying factors such as hardness or total organic carbon (TOC) as follows:

- Fresh surface water screening values for several divalent metals at SWMUs 11 and 22 were adjusted using mean water hardness values of 24.9 mg/L and 44.0 mg/L, respectively. The values for hardness were calculated using the following formula (Franson, 1992):

$$Hardness = 2.497\ (Ca) + 4.118\ (Mg)$$

where: Ca = Measured calcium surface water concentration (mg/L)
Mg = Measured magnesium surface water concentration (mg/L)

- Surface soil screening values based on Dutch soil standards for certain organic chemicals were adjusted based on a TOC value of two percent. This two percent value represents the default minimum adjustment value.

The screening values used in this risk assessment are summarized, by medium, in Table 3-2.

3.2.2 Ingestion Screening Values

Ingestion screening values for dietary exposures were derived for each avian/mammalian receptor species and chemical evaluated in the ERA. Toxicological information from the literature for wildlife species most closely related to the receptor species was used, where available, but was supplemented by laboratory studies of non-wildlife species (e.g., laboratory mice) where necessary. The ingestion screening values are expressed as milligrams of the chemical per kilogram body weight of the receptor per day (mg/kg-BW/day).

Growth and reproduction were emphasized as assessment endpoints since they are the most relevant, ecologically, to maintaining viable populations and because they are generally the most studied chronic toxicological endpoints for ecological receptors. If several chronic toxicity studies were available from the literature, the most appropriate study was selected for each receptor species based on study design, study methodology, study duration, study endpoint, and test species. No Observed Adverse Effect Levels (NOAELs) based on growth and reproduction were utilized, where available, as the primary screening values. The same practice of applying uncertainty factors used in the SERA (CH2M HILL 2000a) was used in this ERA. When chronic NOAEL values were unavailable, estimates were derived or extrapolated from chronic Lowest Observed Adverse Effect Levels (LOAELs) or acute values as follows:

- When values for chronic toxicity were not available, the median lethal dose (LD_{50}) was used. An uncertainty factor of 100 was used to convert the acute LD_{50} to a chronic NOAEL (i.e., the LD_{50} was multiplied by 0.01 to obtain the chronic NOAEL).
- An uncertainty factor of 10 was used to convert a reported LOAEL to a NOAEL.

Ingestion screening values for mammals and birds are summarized in Tables 3-3 and 3-4, respectively.

3.3 Screening-Level Exposure Estimate

Maximum concentrations in surface water, sediment, groundwater, and/or surface soil (as appropriate to each SWMU) were used in the screening-level portion of the ERA to conservatively estimate potential chemical exposures for the ecological receptors selected to represent the assessment endpoints at each SWMU. For conservatism, the maximum detection limit for chemicals that were analyzed for but not detected was also compared to medium-specific screening values and (where applicable) used for food web exposure modeling. This was done to ensure that detection 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 (i.e., 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. In no case was there a non-detected value with a greater concentration than a detected value.

Exposures for upper trophic level receptor species via the food web were determined by estimating the chemical-specific concentrations in each dietary component using uptake and food web models. Incidental ingestion of soil or sediment and ingestion of water were also included when calculating the total level of exposure. As indicated previously, maximum surface soil, sediment, and surface water concentrations were used in all screening-level calculations to provide a conservative assessment.

3.3.1 Selection Criteria for Analytical Data

Available analytical data were selected for use in the risk assessment based on a set of selection criteria that included:

- Data must have been validated by a qualified data validator using acceptable data validation methods. Data with rejected (R) values were not used in the risk assessment. Unqualified data and data qualified as J, L, or K were treated as detected. Data qualified as U or B were treated as non-detected.
- For groundwater and surface water, only samples from the most recent one-year period were considered since these represent the best estimate of current exposures. Data from Geoprobe® sampling and from temporary groundwater wells were not considered.

- Surface soil or sediment data collected prior to any major physical disturbance (such as capping or paving) that would result in the elimination of realistic exposure pathways were not used in the risk assessment. In addition, surface soil samples that were collected under paved surfaces were also not used in the risk assessment.
- For surface soil, samples collected from depths of 0 to 6 inches were used since this depth range represents the most realistic potential exposures for most of the ecological receptors evaluated in terrestrial habitats. Although some ecological receptors may be exposed to deeper soils (e.g., down to 2 feet below the ground surface), no useable data are available for soils in the 6- to 24-inch depth range at these SWMUs.
- For sediment, samples from depths of 0 to 6 inches were also used preferentially since this depth range represents the most realistic exposures for sediment-dwelling species.
- For surface water and groundwater, total (unfiltered) chemical concentrations were used in the risk assessment for conservatism. Dissolved metals data were not collected and therefore are not reported or used in exposure estimation.

3.3.2 Selection of Receptor Species

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 or species groups (e.g., American kestrel) are often selected as surrogates to evaluate potential risks to larger portions of the ecological community (guilds; e.g., carnivorous birds) used to represent the assessment endpoints (e.g., survival and reproduction of carnivorous birds). Selection criteria typically include those species that:

- Are known to occur, or are likely to occur, at the site
- Have a particular 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
- Have sufficient ecotoxicological information available on which to base an evaluation

Amphibians will be selected as a receptor group when freshwater habitats are present on the site or in the contaminant migration pathways as defined in the conceptual site model. Freshwater is defined as surface water salinity less than or equal to 1.0 part per thousand. Reptiles will be evaluated using other fauna as surrogates.

Lower trophic level receptor species are evaluated in the risk assessment based on those taxonomic groupings for which screening values have been developed; these groupings and screening values are used in most ecological risk assessments. As such, specific species of aquatic biota (e.g., fish and macroinvertebrates) are not chosen as receptor species because of the limited information available for specific species and because aquatic biota are dealt with on a community level via a comparison to surface water and sediment screening values. Similarly, terrestrial plants and soil invertebrates (earthworms are the standard surrogate) are evaluated using soil screening values developed specifically for these groups.

The following upper trophic level receptor species have been chosen for exposure modeling based on the criteria listed above and the assessment endpoints in Table 3-1:

- Short-tailed shrew (*Blarina brevicauda*) - terrestrial mammalian insectivore
- Meadow vole (*Microtus pennsylvanicus*) - terrestrial mammalian herbivore
- Deer mouse (*Peromyscus maniculatus*) - terrestrial mammalian omnivore
- Raccoon (*Procyon lotor*) - semi-aquatic mammalian omnivore
- Mink (*Mustela vison*) - semi-aquatic mammalian piscivore
- Red fox (*Vulpes vulpes*) - terrestrial mammalian carnivore
- American robin (*Turdus migratorius*) - terrestrial avian insectivore/omnivore
- American kestrel (*Falco sparverius*) - terrestrial avian insectivore/carnivore
- Killdeer (*Charadrius vociferus*) - terrestrial avian insectivore
- Great blue heron (*Ardea herodias*) - wetland/aquatic avian piscivore/omnivore
- Mallard (*Anas platyrhynchos*) - wetland/aquatic avian herbivore/omnivore
- Marsh wren (*Cistothorus palustris*) - wetland avian insectivore

Not all of these receptors are evaluated at all SWMUs. Sections 4 through 10 discuss which of these receptor species are selected for evaluation at each SWMU based on the site-specific conceptual models. Life history information and exposure parameters used in the screening-level (Steps 1 and 2) portion of the ERA for these receptors are summarized in Table 3-5 and discussed in detail in Appendix B.

3.3.3 Exposure Estimation

Upper trophic level receptor exposures to chemicals in surface soil, surface water, and/or sediment were determined by estimating the concentration of each chemical in each relevant dietary component. Incidental ingestion of soil or sediment was included when calculating the total exposure. Exposure via drinking water was also included at each SWMU that had a potential freshwater drinking source from which analytical chemistry data were collected. Since receptors (and their prey) are not exposed directly to groundwater, food web exposures were not calculated based on groundwater concentrations.

Only those chemicals that were identified as bioaccumulative COPCs are evaluated for food web exposures. This list of bioaccumulating chemicals is provided in Table 3-6 and is based on the selection process and approved list documented in CH2M HILL (2000d). This list includes all of the chemicals contained in Region III USEPA BTAG current list of bioaccumulative chemicals (USEPA 2000). In general, bioaccumulating organic chemicals were defined as those with a maximum reported log K_{ow} value of ≥ 3.0. All of the inorganic chemicals on the Target Analyte List (TAL) were also retained except for the essential macro-nutrients calcium, magnesium, sodium, and potassium, and cyanide, which is readily metabolized and does not bioaccumulate (Eisler, 1991).

Dietary items for which tissue concentrations were modeled included terrestrial plants, soil invertebrates (earthworms), small mammals, aquatic plants, aquatic invertebrates, fish, and amphibians. The methodologies used for these tissue calculations are outlined in the following subsection. For the screening-level portion of the ERA, the uptake of chemicals from the abiotic media into these food items was based on conservative (e.g., maximum or 90th percentile) bioconcentration factors (BCFs) or bioaccumulation factors (BAFs) from the literature. Default factors of 1.0 were used only where data were unavailable for a chemical in the literature.

3.3.3.1 Screening-Level Exposure Point Concentrations

Maximum media concentrations are used as exposure point concentrations for exposure estimation and food web modeling in the screening-level portion of the ERA. Exposure point concentrations (concentrations in plant, soil invertebrate, small mammal, amphibians, fish, and aquatic invertebrate prey items) for terrestrial and aquatic predators are estimated using bioaccumulation models and maximum measured media concentrations. The methodology and models used to derive these estimates are described below.

Terrestrial Plants. Tissue concentrations in terrestrial plants were estimated by multiplying the maximum 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).

For inorganic chemicals without literature based BCFs, a soil-to-plant BCF of 1.0 was assumed. For organic chemicals without literature based BCFs, soil-to-plant BCFs were estimated using the algorithm provided in Travis and Arms (1988):

$$\log B_v = 1.588 - (0.578)\ (\log K_{ow})$$

where: B_v = Soil-to-plant BCF (unitless; dry weight basis)
K_{ow} = Octanol-water partitioning coefficient (unitless)

The log K_{ow} values used in the calculations were obtained mostly from USEPA (1995b, 1996a) and are listed in Table 3-6. The soil-to-plant BCFs used in the screening-level portion of the ERA are shown in Table 3-7.

Earthworms. Tissue concentrations in soil invertebrates (earthworms) were estimated by multiplying the maximum surface soil concentration for each chemical by chemical-specific BCFs or BAFs obtained from the literature. BCFs are calculated by dividing the concentration of a chemical in the tissues of an organism by the concentration of that same chemical in the surrounding environmental medium (in this case, soil) without accounting for uptake via the diet. BAFs consider both direct exposure to soil and exposure via the diet. Since earthworms consume soil, BAFs are more appropriate values and are used in the food web models when available. BAFs based on depurated analyses (soil was purged from the gut of the earthworm prior to analysis) are given preference over undepurated analyses when selecting BAF values since direct ingestion of soil is accounted for separately in the food web model.

The BCF/BAF values used were based on the ratio between dry-weight soil and dry-weight earthworm tissue. Literature values based on the ratio between dry-weight soil and wet-weight earthworm tissue were converted to a dry-weight basis by dividing the wet-weight

BCF/BAF by the estimated solids content for earthworms (16 percent [0.16]; USEPA, 1993). For chemicals without available measured BAFs or BCFs, an earthworm BAF of 1.0 was assumed. The soil-to-earthworm BCFs/BAFs used in the screening-level portion of the ERA are shown in Table 3-7.

Small Mammals. Whole-body tissue concentrations in small mammals (shrews, voles, and/or mice) were estimated using one of two methodologies. For chemicals with literature-based soil-to-small mammal BCFs, the small mammal tissue concentration was obtained by multiplying the maximum surface soil concentration for each chemical by a chemical-specific soil-to-small mammal BCF obtained from the literature. The BCF values used were based on the ratio between dry-weight soil and whole-body dry-weight tissue. Literature values based on the ratio between dry-weight soil and wet-weight tissue were converted to a dry-weight basis by dividing the wet-weight BCF by the estimated solids content for small mammals (32 percent [0.32]; USEPA, 1993). BCFs for shrews were those reported in Sample et al. (1998b) for insectivores (or for general small mammals if insectivore values were unavailable), for voles were those reported for herbivores, and for mice were those reported for omnivores.

For chemicals without soil-to-small mammal BCF values, an alternate approach was used to estimate whole-body tissue concentrations. Because most chemical exposure for these small mammal species is via the diet, it was assumed that the concentration of each chemical in the small mammal's tissues was equal to the chemical concentration in its diet, that is, a diet to whole-body BAF (wet-weight basis) of one was assumed. The 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 know 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 were only slightly above one (1.4) for the deer mouse (USEPA, 1990). Resulting tissue concentrations (wet-weight) were then converted to dry weight using an estimated solids content of 32 percent (see above). The soil-to-small mammal BAFs used in the screening-level portion of the ERA are shown in Table 3-8.

Aquatic Plants. Tissue concentrations in aquatic and wetland plants were estimated using the same methodologies as described above for terrestrial plants except that maximum sediment (not soil) concentrations were used in the calculation.

Aquatic Invertebrates. Tissue concentrations in aquatic invertebrates were estimated by multiplying the maximum sediment concentration for each chemical by chemical-specific sediment-to-invertebrate BCFs obtained from the literature. The BCF values used were based on the ratio between dry-weight sediment and dry-weight invertebrate tissue. BCFs based on depurated analyses (sediment was purged from the gut of the organism prior to analysis) were given preference over undepurated analyses when selecting BCF values since direct ingestion of sediment is accounted for separately in the food web model.

Literature values based on the ratio between dry-weight sediment and wet-weight invertebrate tissue were converted to a dry-weight basis by dividing the wet-weight BCF by the estimated solids content for aquatic invertebrates (21 percent [0.21]; USEPA, 1993). For chemicals without literature-based sediment-to-invertebrate BCFs, a BCF of 1.0 was assumed. The sediment-to-invertebrate BCFs used in the screening-level portion of the ERA are shown in Table 3-9.

Fish and Amphibians. Tissue concentrations in whole-body fish and amphibians were estimated by multiplying the maximum sediment concentration for each chemical by chemical-specific sediment-to-fish/amphibian BCFs obtained from the literature. The BCF values used were based on the ratio between dry-weight sediment and dry-weight fish or amphibian tissue. Literature values based on the ratio between dry-weight sediment and wet-weight fish or amphibian tissue were converted to a dry-weight basis by dividing the wet-weight BCF by the estimated solids content for fish/amphibians (25 percent [0.25]; USEPA, 1993). For chemicals without literature based sediment-to-fish/amphibian BCFs, a BCF of 1.0 was assumed. The sediment-to-fish/amphibian BCFs used in the screening-level portion of the ERA are shown in Table 3-9.

3.3.3.2 Dietary Intakes

Dietary intakes for each receptor species were calculated using the following formula (modified from USEPA [1993]):

$$DI_x = \frac{[[\sum_i (FIR)(FC_{xi})(PDF_i)] + [(FIR)(SC_x)(PDS)] + [(WIR)(WC_x)]]}{BW}$$

where:

	DI_x	=	Dietary intake for chemical x (mg chemical/kg body weight/day)
	FIR	=	Food ingestion rate (kg/day, dry-weight)
	FC_{xi}	=	Concentration of chemical x in food item i (mg/kg, dry weight)
	PDF_i	=	Proportion of diet composed of food item i (dry weight basis)
	SC_x	=	Concentration of chemical x in soil/sediment (mg/kg, dry weight)
	PDS	=	Proportion of diet composed of soil/sediment (dry weight basis)
	WIR	=	Water ingestion rate (L/day)
	WC_x	=	Concentration of chemical x in water (mg/L)
	BW	=	Body weight (kg, wet weight)

Receptor-specific values used as inputs to this equation were obtained from Table 3-5. We used averages of values presented in USEPA, 1993 when appropriate.

3.4 Screening-Level Risk Calculation

The screening-level risk calculation is the final step in a SERA. In this step, the maximum exposure concentrations (abiotic media) or exposure doses (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 Chemicals of Potential Concern (COPCs) for each media-pathway-receptor combination evaluated or a conclusion of acceptable risk.

3.4.1 Selection of Chemicals of Potential Concern (COPCs)

COPCs are selected using the hazard quotient (HQ) method. HQs are calculated by dividing the chemical concentration in the medium being evaluated by the corresponding medium-specific screening value or by dividing the exposure dose by the corresponding ingestion screening value. Chemicals with HQs greater than or equal to 1.0 are considered COPCs in the SERA.

HQs exceeding one indicate the potential for risk since the chemical concentration or dose (exposure) exceeds the screening value (effect). However, screening values and exposure estimates are derived using intentionally conservative assumptions such that HQs greater than or equal to one do not necessarily indicate that risks are present or impacts are occurring. Rather, it identifies chemical-pathway-receptor combinations requiring further evaluation. Following the same reasoning, HQs that are less than one indicate that risks are very unlikely, enabling a conclusion of no unacceptable risk to be reached with high confidence. Synergistic and antagonistic affects of chemicals were not evaluated in this ERA. Uncertainty associated with evaluating risk on the sole toxicity of a chemical is discussed further in Section 11.

3.4.1.1 Abiotic Media

The following conservative methodology was used when selecting COPCs for abiotic media in the screening-level portion of the ERA:

- The maximum detected chemical concentration in each media (surface soil, sediment, surface water, and groundwater) was used to calculate HQs
- For chemicals not detected in any samples of a particular medium, the maximum reporting limit was used to calculate the HQ
- Chemicals without medium-specific screening values for a particular chemical were retained as COPCs for that medium

3.4.1.2 Food Web Exposures

The following conservative methodology was used when selecting COPCs for food web exposures in the screening-level portion of the ERA:

- The maximum detected chemical concentration in each media (surface soil, sediment, and/or surface water) was used to estimate dietary doses for each receptor
- For bioaccumulating chemicals not detected in any samples of a particular medium, the maximum reporting limit was used to estimate dietary doses for each receptor
- Exposures were based on maximum ingestion rates and minimum body weights for each receptor
- It was assumed that chemicals were 100 percent bioavailable to the receptor and it was also assumed that each receptor spent 100 percent of its time on the site (i.e., an area use factor of 1.0 was assumed).
- Chemicals without screening values for any receptor were retained as COPCs

3.4.2 Fate and Transport Mechanisms of the COPCs

Measured surface water, sediment, and surface soil concentrations reflect the acting fate and transport mechanisms of the COPCs at each SWMU and provide a direct means to characterize exposure to the abiotic media. The ultimate fate of chemicals in environmental compartments can be estimated from physico-chemical characteristics in the absence of measured values. The physico-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. A synthesis of general, non site-specific fate and toxicity information is presented in Appendix C. The information in Appendix C is presented regardless of whether or not it was applicable to the site-specific situations for each SWMU.

The water solubility of a compound influences its partitioning to aqueous media. Highly water soluble constituents, such as some polar volatile organics, have a tendency to remain dissolved in the water column rather than partitioning to soil or sediment (Howard, 1991). Compounds with high water solubilities also generally exhibit a lower tendency to bioconcentrate in aquatic organisms and a greater likelihood of biodegradation (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, either K_d (adsorption coefficient; a unitless expression of the equilibrium concentration in the solid phase versus the water phase) or as K_{oc} (K_d normalized to the organic carbon content of the solid phase; again unitless) (Howard, 1991). The higher the K_{oc} or K_d value, the greater the tendency for the constituent 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. K_{ow} has been shown to correlate well with bioconcentration factors in aquatic organisms, 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 three (3.0) or less generally indicates that the constituent will not bioconcentrate to a significant degree (Maki and Duthie, 1978). A log K_{ow} of three equates to an aquatic species bioconcentration factor (BCF) of about 100, using the equation (Lyman et al., 1990):

$$\log BCF = (0.76)\,(\log K_{ow}) - 0.23$$

Degradability is an important factor in determining whether there will be significant loss of mass or change in the form of a constituent 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.

As depicted on Figure 3-1, the primary mechanisms for contaminant transport from the source areas at these SWMUs are believed to include:

- Leaching of chemicals from the soil and/or waste materials by precipitation and transport by surface runoff to surface water bodies
- Leaching of chemicals from the soil and/or waste materials by infiltrating precipitation and transport to surface water bodies via groundwater
- Uptake by biota from soil, sediment, and/or surface water and trophic transfer to upper trophic level receptors

3.4.3 Mechanisms of Toxicity for the COPCs

The mechanisms of toxicity for the COPCs are discussed in the chemical profiles contained in Appendix C.

3.5 Refinement of Conservative Screening Assumptions

According to Superfund guidance (USEPA, 1997), Step 3 initiates the problem formulation phase of the baseline ERA. Under Navy guidance (CNO, 1999), the baseline ERA begins with a preliminary step (Step 3A) in which the conservative assumptions employed in the screening ERA are refined and risk estimates are recalculated using the same conceptual model for the site. The re-evaluation may also include consideration of background data, bioavailability of analytes in the media, and the frequency at which chemicals were detected (CNO, 1999). This reevaluation would only be used when there is adequate spatial sampling intensity.

The assumptions, parameter values, and methods that were modified for the Step 3A re-evaluation included:

- Evaluations of risk based on the maximum chemical concentration used in the screening ERA were supplemented by the use of average (arithmetic mean) chemical concentrations. For upper trophic level receptors, mean chemical concentrations provide a more refined estimate of the likely level of chemical exposure because their populations (as documented in the SERA, there are no threatened or endangered species present that could be exposed, thus the population level assessment endpoint) would be expected to utilize the entire site rather than concentrating use in one area. In cases where adequate spatial sampling coverage exists, the mean concentrations are also appropriate for evaluating potential risks to populations of lower trophic level terrestrial and aquatic receptors because the members of the population are also expected to be found throughout the site where habitat is present, rather than concentrated in one particular area. This method is used in addition to other lines of evidence (comparison to background values, bioavailability of chemicals in soils, and spatial extent of exceedences of chronic and acute screening values) to determine potential risk at each SWMU.
- Bioaccumulation factors (BAFs) and bioconcentration factors (BCFs) were based on, or modeled from, central tendency estimates (e.g., median or mean) from the literature as opposed to the maximum or "high-end" (e.g., 90th percentile) estimates used in the screening ERA for many chemicals. Revised BAF/BCF values used in Step 3 are

provided in Tables 3-10 (plants and soil invertebrates), 3-11 (small mammals), and 3-12 (aquatic invertebrates and fish/amphibians).

- Central tendency estimates (e.g., mean, median, midpoint) for body weight and ingestion rate (Table 3-13) were used to develop exposure estimates for upper trophic level receptors, rather than the minimum body weights and maximum ingestion rates used in the screening ERA. The use of central tendency exposure parameter estimates is more relevant because they represent the characteristics of a greater proportion of the individuals in the population.
- In addition to the No Observed Adverse Effect Levels (NOAELs) used in the screening ERA, consideration is also given to risk estimates based on Lowest Observed Adverse Effect Levels (LOAELs).
- All COPCs from the SERA were carried through into the BERA. Chemicals which were undetected and had no screening values were not retained as COPCs at the completion of the BERA. The potential for these chemicals to be present at concentrations that could adversely affect ecological receptors is unknown and is not able to be evaluated due to the lack of screening values. Chemicals which were detected but did not have screening values were retained as COPCs at the completion of the BERA in order to incorporate possible risk into the overall site conclusions.
- The bioavailability of COPCs is described in the ERA in order to show how these chemicals behave in the media being evaluated and to show whether or not it is expected that the chemical will be available for uptake for receptors at the site.
- Background concentrations were also considered in the re-evaluation and were obtained, for surface soil, from the SWMU 15 Biopile ecological evaluation (CH2M HILL 2000d).

Only complete and significant pathways identified in the screening ERA were re-evaluated in Step 3A of the ERA. Similarly, only COPCs and receptors identified in the screening ERA as requiring further evaluation are addressed in Step 3A. Although many aspects of the estimation of exposure are modified in Step 3 (see above), the screening values (effects) used in Step 3A are the same as the values used in the screening ERA. Although the same basic conceptual model from the screening ERA is used in Step 3A, the endpoints and risk hypotheses from the screening ERA have been modified slightly to better reflect the Step 3A analysis (Table 3-14).

3.6 Uncertainties

Uncertainties are present in all risk assessments because of the limitations of the available data and the need to make certain assumptions and extrapolations based on incomplete information. Since conservative assumptions were used in the exposure and effects assessments, these uncertainties are more likely to result in an overestimation rather than an underestimation of the likelihood and magnitude of risks to ecological receptors. The uncertainties associated with this risk assessment are discussed in Section 11.

4.0 SWMU 2B – Line Shack Disposal Area

SWMU 2B is located southeast of the main MATWING Hangar 122 (Figure 1-1). The site includes Line Shacks 130 through 134 and the five aircraft cleaning stations northeast of Line Shack 130. The Initial Assessment Study (IAS) states that potential contaminants at SWMU 2B may include oil, hydraulic fluid, turco (paint remover used in aircraft maintenance), paint stripper and thinners, PD 680 (degreaser), and aromatic hydrocarbons (naphtha, benzene, toluene and derivatives), all of which were used in aircraft maintenance activities (RGH, 1984). These waste oils and aircraft-maintenance chemicals were disposed of adjacent to the line shacks in unknown amounts beginning in 1963 when the line shacks were constructed, until the early 1980s (RGH, 1984). A hazardous waste collection and recycling program has been in force throughout the air station since 1981. During the 1980s, an oil-water separator system was installed in the aircraft cleaning area northeast of Line Shack 130 to separate oil from wash water flowing from the aircraft cleaning area.

4.1 Screening-Level Problem Formulation

As described in Section 3.1, in the screening-level problem formulation: (1) the environmental setting of a site is characterized in terms of the habitats and biota known or likely to be present; (2) the types and concentrations of chemicals that are present in ecologically relevant media are characterized; (3) a conceptual model is developed for the site that describes potential sources, potential transport pathways, potential exposure pathways and routes, and potential receptors; and (4) assessment endpoints, measurement endpoints, and risk hypotheses are selected to evaluate those receptors for which complete and potentially significant exposure pathways are likely to exist. These components of the problem formulation are developed for SWMU 2B in this section. In addition, the fate, transport, and toxicological properties of the chemicals present at a site are also considered during the problem formulation process (see Sections 4.4.2 and 4.4.3).

4.1.1 Environmental Setting

Much of the ground surface in the immediate area of the Line Shacks is covered with concrete or asphalt (Figure 4-1), and the ground surface that is not covered has been heavily disturbed as a result of the on-going construction of the Aircraft Maintenance Hangar and the extension of the flight line. After construction is completed, the limited exposed ground surface between the buildings, parking areas, and tarmac will be graded. Grass will be planted and it will be maintained as mowed lawn. A fence surrounds the impervious surfaces and separates the developed portion of the area from the undeveloped portion. Most of the site is within the flight line. The flat terrain is interrupted only by a storm water drainage ditch and a few berms left from previous disturbances.

SWMU 2B contains a storm water drainage ditch that is used to convey surface runoff from the site to the southeast. Groundwater discharges to the ditch, which maintains a perennial base flow. Data show that shallow groundwater flow is to the southeast over most of the area from Line Shacks 138 to 134, but it is to the southwest northwest of Line Shacks 132, 133, and 134 (CH2M HILL, 1993). No submerged aquatic vegetation was observed in the ditch. A band of vegetation approximately 10 feet wide runs along either side of the ditch. Vegetation includes bamboo, sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*) and some shrubs. This drainage ditch originates at the end of a pipe which collects storm water runoff from parking lots, roads, and other impervious surfaces in this section the base.

Construction of the Aircraft Maintenance Hangar and extension of the flight-line are underway in the immediate vicinity of this SWMU. With the exception of a short reach (between samples OW2B-SD01 and OW2B-SD04) near the construction, in late 2000 the ditch was cleaned out to a depth of 6 to 18 inches downgradient, all the way to the golf course. The sediments that were removed were disposed of at an approved landfill.

Drains within the aircraft cleaning area of SWMU 2B direct runoff to oil-water separators before discharging to sanitary sewers. Thus, this area of SWMU 2B does not currently contribute to the potential occurrence of contamination in the drainage ditches.

4.1.2 Summary of Available Analytical Data

As stated in Section 1.0, SWMU 2B was identified as requiring no further action for ecological consideration under the previous RCRA investigations. However, as part of an agreement between the Navy and the EPA, this ERA at SWMU 2B has been conducted utilizing as much of the previous RCRA investigation data as feasible. Therefore, there may be differences in the classes of chemicals analyzed for in the various site media. These differences were considered in the development of a sampling plan to collect new data for significant data gaps and the effects of which are addressed in the uncertainties section.

The data used in this ERA were obtained from multiple sources as described below. Data that were used are summarized in Tables 4-1 through 4-4 and are contained in Appendix A.

The Phase I RCRA Facility Investigation (RFI; CH2M HILL, 1993) determined that the groundwater is contaminated with chlorinated hydrocarbons in one area near Line Shack 134 (western source area) and in another area near Line Shack 131 (eastern source area). Fuel-related benzene, toluene, ethylbenzene, and xylene (BTEX) contamination was also detected east of Line Shack 130. No chlorinated volatile organic compounds (VOCs) were detected in the soils. Surface water from the northern-most ditch was shown to contain VOCs in some areas, however, no polycyclic aromatic hydrocarbons (PAHs) were detected. Chlorinated VOCs were not detected in any sediment samples, but 15 PAH compounds were detected in two sediment samples. The Corrective Measures Study (CMS; CH2M HILL, 1995a) confirmed that chlorinated VOCs were not present in the soils, however, trace amounts of BTEX compounds were found in several samples. Results from groundwater sampling confirmed the presence of chlorinated VOCs. The CMS also confirmed the presence of low concentrations of chlorinated VOCs in surface water in the ditch. Ditch sediments were found to contain PAHs, which were not found in the groundwater.

As part of the Phase III RFI (CH2M HILL, 1999b), two groundwater samples were taken from monitoring wells on either side of the perennially flowing drainage ditch at points where the groundwater discharges to the ditch. The samples were analyzed for semivolatile organic compounds (SVOCs) and PAHs. These chemicals were not detected in either of the samples. Confirmatory sediment samples were taken at the same points within the ditch as in the Phase I RFI. These samples confirmed the presence of PAHs in the sediments.

In 2001, additional soil samples were collected at SWMU 2B in order to further investigate potential inorganic contamination in the soils. These samples were not evaluated in this ERA, but will instead be evaluated in conjunction with soil sampling which is part of the Feasibility Study being conducted at SWMU 2B. Figure 4-1 shows the locations of the samples used in the ERA as well as the soil samples collected in 2001.

4.1.3 Preliminary Conceptual Model

The preliminary conceptual model for SWMU 2B is illustrated on Figure 4-2.

4.1.3.1 Exposure Pathways

At SWMU 2B, waste oils and aircraft-maintenance chemicals were disposed of adjacent to the line shacks in unknown amounts contaminating the surface and subsurface soils. Contaminants leached from the soils into the groundwater as evidenced by the detection of chlorinated VOCs in the groundwater. Groundwater feeds the perennial flowing ditch, which contains contaminated surface water and sediment. The contamination in the groundwater may have been caused by persistent releases of chemicals close to the fence line near Line Shack 131. The source of the surface water contamination is believed to be centered around the concrete area northwest of Line Shacks 132, 133, and 134. The source of PAHs is probably a storm water pipe, which outlets into the drainage ditch and brings water from parking lots, road, and flight line areas located west and northwest of the SWMU. Since oils and PAHs are common constituents found near aircraft operations areas, the PAHs found in the sediment may not be related to past disposal practices at SWMU 2B. The sediments in the section of the ditch east of OW2B-SD04 have been removed. Habitat at SWMU 2B consists of impervious surfaces, a storm water drainage ditch, and a small mowed lawn.

Ecological receptors at SWMU 2B can be exposed to chemicals in surface water, sediment, and surface soils via direct exposure pathways (including ingestion and direct contact) or via food-chain transfer of chemicals that bioaccumulate.

4.1.3.2 Endpoints and Risk Hypotheses

Preliminary assessment endpoints, risk hypotheses, and measurement endpoints (Table 4-5) are developed for SWMU 2B based on the preliminary conceptual model (Figure 4-2) and the complete exposure pathways identified therein. These endpoints/hypotheses were selected from the generic set developed in Section 3.1.1.2. Table 4-5 also identifies specific receptor species or groups associated with each endpoint. These receptors are discussed in more detail in Section 4.3.1.

4.2 Screening-Level Effects Evaluation

The purpose of the screening-level effects evaluation is to establish chemical exposure levels (screening values) that represent conservative thresholds for adverse ecological effects. The medium-specific screening values developed in Section 3.2.1 and Table 3-2 for fresh surface water (also applied to groundwater), freshwater sediment, and surface soil are used in this section to evaluate the maximum concentrations in these media at SWMU 2B. The relevant chemical-specific screening values are shown in Tables 4-6 (groundwater), 4-7 (surface water), 4-8 (sediment), and 4-9 (surface soil). Ingestion screening values for dietary exposures to upper trophic level receptors via the food web are discussed in Section 4.3.3.

4.3 Screening-Level Exposure Estimate

Maximum concentrations in groundwater, surface water, sediment, and surface soil were used to conservatively estimate potential chemical exposures for ecological receptors at SWMU 2B. For conservatism, the maximum detection limit for chemicals that were analyzed for, but not detected, was also compared to medium-specific screening values (see Section 3.3). Also for conservatism, no dilution factors were applied to the maximum groundwater concentrations.

Exposures for upper trophic level receptor species via the food web were determined by estimating the chemical-specific concentrations in each dietary component using uptake and food web models (see Section 3.3.3). Incidental ingestion of soil or sediment was also included when calculating the total level of exposure, as was direct ingestion of surface water. Maximum surface soil, sediment, and/or surface water concentrations were used in all calculations to provide a conservative assessment.

4.3.1 Selection of Receptor Species

Receptor species used in the SWMU 2B evaluation are identified in Table 4-5. These species or species groups were selected based on the complete exposure pathways identified in the conceptual model, the specific habitats present on the site, the biota known or likely to occur on the site (see Section 2), and the selected assessment endpoints. The general criteria for receptor selection were identified in Section 3.3.2. Receptor profiles are provided in Appendix B.

4.3.2 Exposure Estimation

Upper trophic level receptor exposures to chemicals in surface soil, surface water, and sediment were determined by estimating the concentration of each chemical in each relevant dietary component. Incidental ingestion of soil or sediment was included when calculating the total exposure. Exposure via drinking water was included in the food web model since SWMU 2B contains a potential freshwater drinking source. Since receptors (and their prey) are not exposed directly to groundwater, food web exposures were not calculated using groundwater data.

4.3.2.1 Exposure Point Concentrations

Maximum measured media concentrations are used as exposure point concentrations for exposure estimation and food web modeling. Dietary concentrations (concentrations in plants, soil invertebrates, small mammals, and aquatic invertebrates that are eaten) for terrestrial and aquatic consumers were estimated using bioaccumulation models and maximum measured media concentrations. The methodology and models used to derive these estimates are described in Section 3.3.3.1.

4.3.2.2 Dietary Intakes

Dietary intakes were calculated for each upper trophic level receptor species using the methods discussed in Section 3.3.3.2.

4.3.3 Ingestion Screening Values

Ingestion screening values for mammals and birds were developed in Section 3.3.4 and are summarized in Tables 3-3 and 3-4, respectively.

4.4 Screening-Level Risk Calculation

The screening-level risk calculation for SWMU 2B compares the maximum exposure concentrations in site groundwater, surface water, sediment, and surface soil with the corresponding screening values to derive screening risk estimates using the hazard quotient (HQ) method (see Section 3.4). Chemicals with HQs greater than or equal to 1.0 are retained as Chemicals of Potential Concern (COPCs) in the SERA.

4.4.1 Selection of Chemicals of Potential Concern (COPCs)

4.4.1.1 Groundwater

Maximum undiluted groundwater concentrations are compared to screening values for fresh surface water in Table 4-6. Based on this comparison, two inorganic chemicals (manganese and iron) exceeded their screening values based on detected concentrations and four undetected inorganic chemicals (copper, cyanide, lead, and silver) have exceedences based on the maximum reporting limit (Table 4-6). These six chemicals were retained as COPCs.

Six undetected PCBs and twelve undetected pesticides exceeded their screening values based on the maximum reporting limit (Table 4-6). These 18 chemicals were retained as COPCs. No detected PCBs or pesticides were retained as COPCs.

Ten undetected SVOCs exceeded screening values based on maximum reporting limits and were retained as COPCs. Nineteen additional undetected SVOCs were retained as COPCs because screening values were not available (Table 4-6). No detected SVOCs were retained as COPCs.

One undetected VOC exceeded its screening value based on the maximum reporting limit and was retained as a COPC. Twelve additional VOCs were retained as COPCs because screening values were not available (Table 4-6). Of those twelve VOCs, four (chloroethane, ethane, ethene, and methane) were detected.

4.4.1.2 Surface Water

Maximum surface water concentrations are compared to screening values for fresh surface water in Table 4-7. Based on this comparison, two undetected VOCs (acrolein and carbon disulfide) have HQs exceeding one based on the maximum reporting limit and are identified as COPCs. Eight undetected VOCs were retained as COPCs because screening values were not available (Table 4-7). No detected VOCs were retained as COPCs.

4.4.1.3 Sediment

Maximum sediment concentrations are compared to screening values for fresh sediments in Table 4-8. Based on this comparison, 15 detected SVOCs had HQs exceeding one and were identified as a COPCs. Fourteen undetected SVOCs were retained as COPCs based on maximum reporting limits. Thirty SVOCs were retained as COPCs because screening values were not available (Table 4-8). Of these 30 SVOCs, only two (1-methylnaphthalene and carbazole) were detected.

Five undetected VOCs exceeded their screening values based on maximum reporting limits (Table 4-8) and were retained as COPCs. Twenty-four undetected VOCs were retained as COPCs because screening values were not available (Table 4-8). No detected VOCs were retained as COPCs.

4.4.1.4 Surface Soil

Maximum surface soil concentrations are compared to screening values in Table 4-9. Based on this comparison, eight detected inorganics (aluminum, antimony, chromium, iron, lead, mercury, vanadium, and zinc) have HQs exceeding one and are identified as COPCs. Cyanide and thallium (undetected) had exceedences based on maximum reporting limits.

No PCBs or pesticides were detected at levels above their screening values. Five undetected pesticides were retained as COPCs because screening values were not available.

Four SVOCs (benzo(a)anthracene, benzo(k)fluoranthene, chrysene, and pyrene) exceeded their screening values based on detected concentrations and were retained as COPCs; maximum HQs were less than two for these four chemicals. The HQ for benzo(a)pyrene was 1.0 and this chemical was also retained. Eleven undetected SVOCs exceeded screening values based on maximum reporting limits. Twenty-eight additional SVOCs were retained as COPCs because screening values were not available (Table 4-9). Of these 28 SVOCs, three (butylbenzylphthalate, di-n-octylphthalate, and bis(2-ethylhexyl)phthalate) were detected.

Ten VOCs were retained as COPCs because screening values were not available (Table 4-9). Of these ten VOCs, only one (acetone) was detected.

4.4.1.5 Food Web Exposures

Maximum exposure doses for each receptor species are compared to ingestion screening values in Table 4-10. Based on a comparison to NOAELs, ten inorganic chemicals have NOAEL HQs exceeding one for one or more receptors based on maximum detected values. These metals included aluminum, antimony, arsenic, cadmium, chromium, iron, lead, mercury, vanadium, and zinc. Two inorganic chemicals have NOAEL HQs exceeding one for one or more receptors based on maximum reporting limits.

One PCB (Aroclor –1254) has a NOAEL HQ exceeding one based on a maximum detected value. Four PCBs (Aroclor-1221, 1232, 1242, and 1260) have NOAEL HQs exceeding one based on maximum reporting limits.

Hexachlorobenzene has an HQ exceeding one for one or more receptors based on a maximum reporting limit. Ingestion screening values were not available for six SVOCs.

4.4.2 Fate and Transport Mechanisms of the COPCs

The fate and transport mechanisms of the COPCs are discussed in Section 3.4.2 and described in Appendix C.

4.4.3 Mechanisms of Toxicity for the COPCs

The mechanisms of toxicity for the COPCs are described in Appendix C.

4.5 Screening-Level Risk Conclusions

COPCs were identified in each media evaluated. These COPCs are summarized in Table 4-11. In groundwater, only two metals (iron and manganese) exceeded their screening values based on detected concentrations. Their HQs were 111 and 4.17, respectively. No organic chemicals exceeded their screening values based on detected concentrations. Buchman (1999) recommends the use of a dilution factor of 10 in a SERA to account for the dilution expected during migration and upon discharge of groundwater to surface water in the absence of site-specific dilution factors. If such a dilution factor was applied, only iron would be retained as a COPC. Similarly, only nine of the 33 non-detected COPCs that were retained based on maximum reporting limits would be retained if a dilution factor of 10 was applied. Of the 31 COPCs retained based on a lack of a screening value, only four were actually detected in groundwater samples (Table 4-1).

In surface water, no chemicals were retained as COPCs based on maximum detected concentrations and only two chemicals (carbon disulfide and acrolein) were retained as COPCs based on maximum reporting limits (HQs of 2.5 and 4.76, respectively). None of the eight chemicals that were retained because screening levels were not available were detected in the surface water. In surface sediments, SVOC HQs ranged from 2.41 to 30.8 with six of the 15 chemicals having HQs below 15. Five VOCs had HQs greater than or equal to one but all were below three. In surface soils, eight inorganic chemicals and five organic chemicals were retained as COPCs based on detected concentrations. All of the organic HQs were below two.

Maximum HQs from food web exposures for metals were relatively low (only aluminum, antimony, chromium, lead, and mercury had NOAEL HQs greater than 10). Five PCBs and one SVOC had NOAEL HQs greater than or equal to 1.0 (all were below 3.0). No NOAEL HQs were greater than or equal to one for the raccoon or the mallard so evaluation of these receptors is not recommended in Step 3.

In summary, potential ecological risks based on observed groundwater, surface water, surface sediment, and surface soil concentrations exist at SWMU 2B. Since one or more COPCs were identified in each medium evaluated during the screening process, additional evaluation in Step 3 is recommended for this SWMU.

4.6 Refined (Step 3A) Risk Characterization

Based on the results of the SERA, the assessment endpoints, measurement endpoints, and risk hypotheses have been modified for the Step 3A evaluation (Table 4-12). Modifications include dropping assessment endpoints for which no unacceptable risk (as defined by no

HQs equal to or greater than or equal to 1.0) was found during the SERA and modifying the measurement endpoints to reflect the assumptions and methods used in the Step 3A evaluation (see Section 3.5).

Refined medium-specific screenings for groundwater, surface water, sediment, and surface soil are presented in Tables 4-13, 4-14, 4-15, and 4-16, respectively. Receptor species HQs associated with Step 3A food chain modeling are provided in Table 4-17. Results of the recalculation of risk estimates are discussed by media type below.

4.6.1 Groundwater

Mean chemical concentrations in groundwater are compared to surface water screening values in Table 4-13 (maximum concentrations are used if the mean concentration exceeded the maximum). Only iron (HQ of 48.4) and manganese (HQ of 2.93) exceeded screening values based upon detected concentrations. Four detected VOCs were retained as COPCs because no screening values were available.

4.6.2 Surface Water

Mean chemical concentrations in surface water are compared to surface water screening values in Table 4-14 (maximum concentrations are used if the mean concentration exceeded the maximum). No chemicals were retained as COPCs for surface water at SWMU 2B.

4.6.3 Sediment

Mean chemical concentrations in sediment are compared to screening values in Table 4-15 (maximum concentrations are used if the mean concentration exceeded the maximum). Fourteen chemicals (13 PAHs and one phthalate) exceeded screening values based upon detected concentrations. Mean HQs ranged from 1.23 to 21.9. Two detected SVOCs were retained as COPCs because no screening values were available.

4.6.4 Surface Soil

Mean chemical concentrations in surface soil are compared to screening values in Table 4-16 (maximum concentrations are used if the mean concentration exceeded the maximum). Six inorganic compounds (aluminum, chromium, iron, lead, mercury, and vanadium) exceeded screening values based on detected concentrations. Mean HQs were 215, 674, 21.5, 18.7, 2.28, and 7.62, respectively. Mercury and vanadium were detected at levels slightly above the detection limits. Four detected organic chemicals were retained as COPCs because no screening values were available.

4.6.5 Food Web Exposures

Mean exposure doses for each receptor species are compared to ingestion screening values in Table 4-17. HQs for the short-tailed shrew (based on NOAELs) exceeded one for aluminum (8.58), iron (1.23), lead (3.98), and vanadium (1.04). HQs based on LOAELs were less than one. HQs for the American robin (based on NOAELs) exceeded one for chromium (3.68) and lead (11.89). The HQ based on the LOAEL for chromium was less than one. The HQ based on the LOAEL for lead was 1.19. HQs for the American kestrel (based on NOAELs) exceeded one for chromium (4.25) and lead (3.48). The HQ based on the LOAELs were less than one. The remaining receptors all had NOAEL and LOAEL HQs less than one.

4.7 Risk Evaluation

The potential for adverse effects associated with the COPCs identified in Section 4.6 and Table 4-18 are evaluated in this section.

4.7.1 Aquatic Habitats

Aquatic habitat at SMWU 2B consists of a drainage ditch which conveys surface runoff from the site. The ditch also receives water from other sites at NASO. Groundwater discharges to the ditch, which maintains a perennial base flow.

At SWMU 2B, not all media were sampled for the same analytes. The following table shows which media were analyzed for which groups of chemicals.

Sampling Analyses Conducted in Media at SWMU 2B

Media	Groundwater	Surface Water	Sediment	Surface Soil
VOCs	X	X	X	X
SVOCs	X		X	X
Pesticides	X			X
PCBs	X			X
Inorganics (metals)	X			X

Due to limited available analytical information for surface water and sediments, it was not possible to draw concrete conclusions as to possible risk in surface water and sediments. However, based on the information that is available, the following conclusions have been drawn.

There is no significant transport of VOCs via groundwater to surface water or sediment at SWMU 2B. The four VOCs that were detected in groundwater were not detected in surface water or sediment samples.

Surface water was not analyzed for SVOCs, pesticides, or PCBs. However, there were no exceedences based on detected concentrations for these analytes in either groundwater or surface soils. Therefore, possible migration of these analytes from these media to surface water is not expected to occur.

Two metals exceeded screening values in groundwater. Surface water was not analyzed for metals, so possible migration from groundwater to surface water is unknown. Additional soil sampling that is planned as part of the Feasibility Study will address possible metal contamination in soils. This data may be used in order to extrapolate information as to whether or not metals in soils are migrating to surface water and sediments through surface runoff. Possible contamination to sediments and surface water from pesticides and PCBs is unknown.

Fourteen detected chemicals (13 were PAHs) exceeded screening values in the sediment. All of these chemicals had HQs under ten except fluorene, whose HQ was 16.84. However, total

PAHs from the three most recent sediment samples (taken in 1999) did not exceed sediment screening values for total PAHs (SD-01 and SD-02) or were only marginally over one (HQ of 1.06, SD-04) (Table 4-19). Although two of the three older samples (collected from the same locations as the 1999 samples) exceeded sediment screening values based on total PAHs, PAHs were not detected in one of these samples (SD-1) and were not detected in the duplicate of the second (SD-30). The HQ for the third sample (SD-4) was 3.38 (Table 4-19).

Based on the most recently collected samples (1999), the area of concern for PAH exceedences is limited to sediments in the vicinity of sample SD-01, where four PAHs exceeded the screening values, acenaphthene (HQ of 4.6), butlybenzylphthalate (HQ of 1.01), fluorene (HQ of 3.2), and phenanthrene (HQ of 2.0). There were no exceedences at location SD-02 and only one exceedence at location SD-04 (for butylbenzylphthalate, HQ of 2.4). Therefore, there is a small section of the ditch located between samples OW2B-SD01 and OW2B-SD02 and the immediate area near SD-04 where there may be some risk to aquatic invertebrates. In addition, no chemicals exceeded ingestion-based screening values for the aquatic upper trophic level receptors evaluated.

Risks to aquatic receptors at SWMU 2B are low to negligible for VOCs. Risks to aquatic receptors for SVOCs (other than PAHs), PCBs, pesticides, and metals are unknown. Risk is present in the sediments for PAHs.

4.7.2 Terrestrial Habitats

Six inorganic compounds (aluminum, chromium, iron, lead, mercury, and vanadium) exceeded screening values based on detected concentrations in surface soils. Four of these metals (aluminum, chromium, iron, and vanadium) exceeded the screening values in each sample collected, thus indicating a potential risk to soil invertebrates and plants throughout the site. However, the other two metals (lead and mercury) were present at concentrations exceeding their screening levels in only one sample (SS-02), thus indicating a localized potential risk to soil invertebrates and plants in the vicinity of this sampling location.

To evaluate the potential significance of these exceedences, on-site soil concentrations are compared to background surface soil concentrations developed as part of the SWMU 15 Biopile ecological evaluation (CH2M HILL 2000d). Maximum and mean background concentrations were compared to on-site concentrations. Based on this evaluation (Table 4-20), only on-site concentrations of chromium, lead, and mercury exceeded background soil concentrations for both maximum and mean values.

Aluminum, iron, lead, and vanadium exceeded ingestion-based screening values based on NOAELs for the short-tailed shrew. Chromium and lead exceeded ingestion-based screening values based on NOAELs for the American robin and the American kestrel. Only the lead HQ for the robin exceeded one (1.2) based on the LOAEL.

4.8 Risk Conclusions

Conclusions drawn from the above analyses are:

Groundwater

- Mean concentrations of two metals (iron and manganese) were detected at levels above the screening values; however, these are likely not site-related chemicals.
- Both metals exceeded the screening values in each sample, thus indicating their presence at similar concentrations throughout the site.
- No VOCs exceeded screening values.
- Four VOCs were detected (chloroethane, ethane, ethene, and methane) for which no screening values were available.

Based upon the above lines of evidence, it is unlikely that COPC concentrations in groundwater pose a site-related ecological risk for VOCs when discharging into surface water. Potential for metals in groundwater to discharge to surface water is unknown because surface water was not sampled for metals.

This conclusion is qualified for the site-related COPCs for which no screening values were available. The potential for these chemicals to be present at concentrations that could adversely affect ecological receptors is unknown and is not able to be evaluated due to the lack of screening values.

Surface Water

- No VOCs were detected at mean concentrations above the screening values.
- Surface water was not analyzed for SVOCs, pesticides, or PCBs. However, there were no exceedences based on detected concentrations for these analytes in either groundwater or surface soils. Therefore, possible migration of these analytes from these media to surface water is not expected to occur.
- Metals were not analyzed for in the surface water samples, therefore some metals COPCs may be present in the surface water, however they are likely not site-related since the only metal that exceeded screening values in the groundwater were non site-related iron and manganese.

Based upon the above lines of evidence, it is unlikely that COPC concentrations in surface water pose a site-related ecological risk. Since metals were not analyzed for in the surface water, some uncertainty exists in this conclusion. However, based on the results of the groundwater screening, any metals present in the surface water are likely not-site related.

Sediment

- No VOCs were detected in any of the sediment samples.
- The mean concentrations of 14 detected chemicals (13 PAHs and butylbenzylphthalate) exceeded screening values in the sediment.

- The spatial distribution of exceedences (based on the most recently collected data) indicated that the presence of all but one chemical (butylbenzylphthalate) was limited to the upper part of the ditch (near location SD-01).
- Two SVOCs were detected (1-methylnaphthalene and carbozole) for which no screening values were available.
- Although PAHs were detected in the sediment samples, levels were below the screening value for Total PAHs.
- Based upon the above lines of evidence, there is a small section of the ditch located between samples OW2B-SD01 and OW2B-SD02 and the immediate area near SD-04 where there may be some risk to aquatic invertebrates. If a removal action for sediments was conducted, there is a high probability of the ditch being recontaminated from the storm water draining from non-point sources (parking lots, roads, and other impervious surfaces). In addition, removing sediments may do more harm to ecological receptors and the surrounding habitat than will be gained from the removal, particularly when storm water runoff from the surrounding area will likely recontaminate the ditch following any removal action.
- This conclusion is qualified for the two COPCs for which no screening values were available. The potential for these chemicals to be present at concentrations that could adversely affect ecological receptors is unknown and is not able to be evaluated due to the lack of screening values.

Soil

- Six metals (aluminum, chromium, iron, lead, mercury, and vanadium) exceeded screening values based on detected concentrations in surface soils. Three of these metals (aluminum, iron, and vanadium) were measured at concentrations similar to background.
- Lead and mercury were present at concentrations exceeding their screening levels in only one sample (SS-02), thus indicating a localized potential risk to soil invertebrates and plants in the vicinity of this sampling location.
- Three SVOCs (butylbenzylphthalate, di-n-octylphthalate, and bis(2-thylhexyl)phthalate) and one VOC (acetone) were detected for which no screening values were available.
- Based upon the above lines of evidence, it is likely that concentrations of chromium, lead, and mercury in soil pose a site-related ecological risk. It is unlikely that any of the other chemicals detected in the soil pose an ecological risk. This conclusion is qualified for the four COPCs for which no screening values were available. The potential for these chemicals to be present at concentrations that could adversely affect ecological receptors is unknown and is not able to be evaluated due to the lack of screening values.

Food Web

- Aluminum, chromium, iron, lead, and vanadium exceeded ingestion-based screening values for terrestrial receptors based on the NOAEL. Only the estimated dosage of lead for robin exceeded the LOAEL dosage.

Based upon the lines of evidence above, potential site related risk to terrestrial organisms exist at SWMU 2B. It is recommended that additional data be collected and evaluated in a Feasibility Study in order to verify and delineate the metal concentrations in the soils.

5.0 SWMU 11 – Fire-Fighting Training Area

SWMU 11 consists of two fire-fighting training rings and their immediate surroundings. The site is on the west side of NAS Oceana at the intersection of two abandoned runways (Figure 1-1). From the early 1960s until the mid-1970s, two fire-fighting practice sessions were conducted each weekend as part of training exercises (RGH, 1984). Waste oil, fuel, chlorinated and aromatic hydrocarbons, and hydraulic fluid were poured into the center of the abandoned runway, ignited, and extinguished. This burning was believed to have taken place between the two rings due to burn marks and scarring on the runway that show up on historical aerial photographs.

In the mid-1970s, a fire pit with an earthen outer berm was built (RGH, 1984). Discussions with officials from the Public Works Department indicated that the waste fuels and water would occasionally flow over the earthen berm onto surrounding soils (R.E. Wright Associates, 1983).

A second fire ring with a concrete outer berm was constructed approximately 100 feet north of the old ring where jet fuel was burned for fire-fighting training. This ring had an oil-water separator system (RGH, 1984). Waste oils flowed from the oil-water separator into two adjacent USTs (1,000 gallon fiberglass and 10,000 gallon steel). When the USTs became full, the waste oils were transferred to an adjacent 15,000 gallon AST.

Ignitable materials used in the training fires, in addition to the wastes listed above, included paint, paint thinners and strippers, naptha, and PD 680 (degreaser) (RGH, 1984).

In January and February 1995, the two rings, berms, and adjacent soils were removed to a depth of approximately one foot (Figure 5-1). Confirmatory samples were collected to ensure TPH remediation goals were met. Soils were transferred to an approved landfill.

Both USTs, the oil-water separator, and the AST were removed in June of 1995 (Figure 5-1). Approximately 230 tons of soil were excavated during the removal of the two USTs. Contaminated soils were separated from uncontaminated soils using an organic vapor analyzer. Contaminated soils (170 tons) were transferred to and disposed of at an approved landfill. There are no known occurrences of leaks or spills or stained soils or stressed vegetation associated with the AST.

The tarmac between the two fire rings was broken up and crushed as part of the overall tarmac restoration project at Oceana. The area was then covered with soils from the SWMU 15 biopiles (Figure 5-1).

The IAS reported that an area directly west of the fire training pits on the west side of the abandoned runway was used for the disposal of waste fuels and lubricants by land farming (R.E. Wright Associates, 1983). Land farming entailed spreading hydrocarbon products over a large area, followed by tilling the soil to enhance volatilization and biodegradation. However, it could not be confirmed that the land farming occurred from a review of aerial photographs, however, it is believed that the wetland is site of this land farming.

5.1 Screening-Level Problem Formulation

As described in Section 3.1, in the screening-level problem formulation: (1) the environmental setting of a site is characterized in terms of the habitats and biota known or likely to be present; (2) the types and concentrations of chemicals that are present in ecologically relevant media are characterized; (3) a conceptual model is developed for the site that describes potential sources, potential transport pathways, potential exposure pathways and routes, and potential receptors; and (4) assessment endpoints, measurement endpoints, and risk hypotheses are selected to evaluate those receptors for which complete and potentially significant exposure pathways are likely to exist. These components of the problem formulation are developed for SWMU 11 in this section. In addition, the fate, transport, and toxicological properties of the chemicals present at a site are also considered during the problem formulation process (see Sections 5.4.2 and 5.4.3).

5.1.1 Environmental Setting

Portions of the immediate area around SWMU 11 (Figure 5-1) consist of impervious concrete; however, this concrete was crushed in place to allow for infiltration. Following the concrete crushing operation, soils from the SWMU 15 biopiles were spread over the areas to promote the growth of vegetation. Grasses dominate the surrounding area to the east. A wetland is located west of the training rings and the former AST (Figure 5-1). During a site visit in November 1999, no standing water was present. In December 1999, there was an area of standing water approximately 8 to 10 feet in diameter with the deepest portion being 3 to 5 inches deep. There were several rainstorms in the area prior to that sampling event and the ponded water at the site remained from the rain events. Water from storm events percolates into the ground and does not remain on the site long after a rain event. At the time of sampling, it was only possible to collect one surface water sample. Soft rush (*Juncus effusus*), wool grass (*Scirpus cyperinus*), spike rush (*Eleocharis* sp.), and water purslane (*Ludwigia palustris*) dominate the wetland. The remaining area west of the site is comprised of old field and mowed grass. Groundwater level measurements taken during the Phase I RFI show that groundwater flow is to the southwest. Groundwater does not discharge to the wetland. The near-surface geology consists of a 5- to 10-foot thick layer of sandy clays with silty sands and clays. This layer is underlain by 10- to 12-foot thick layer clean sand with coarse grains.

5.1.2 Summary of Available Analytical Data

As stated in Section 1.0, SWMU 11 was identified as requiring no further action for ecological consideration under the previous RCRA investigations. However, as part of an agreement between the Navy and the EPA, this ERA at SWMU 11 has been conducted utilizing as much of the previous RCRA investigation data as feasible. Therefore, there may be differences in the classes of chemicals analyzed for in the various site media. These differences were considered in the development of a sampling plan to collect new data for significant data gaps and the effects of which are addressed in the uncertainties section.

The data used in this ERA was obtained from multiple sources as described below. Data that were used are presented in Tables 5-1 through 5-3 and are contained in Appendix A.

The Phase I RFI (CH2M HILL, 1993) investigated the extent of groundwater and soil contamination at SWMU 11. No VOCs or SVOCs were detected in groundwater. All of the trace metals detected in groundwater were at or near the detection limit. Total petroleum hydrocarbons (TPH), VOCs, and metals were detected in the surface and subsurface soil samples, however, VOC and metal concentrations were present at or near the detection limit.

Additional groundwater and soil samples were collected during the CMS (CH2M HILL, 1994). Benzene and PAHs were detected at one shallow groundwater well. The soil data showed that there is no apparent contamination in the former fuel farm area but there are high TPH levels northeast of the northern training ring and southeast of the southern training ring.

One surface water and three surface sediment samples were collected from the wetland in December 1999 to be used in the ERA. The two additional proposed surface water samples were not collected due to the small amount of surface water present at these locations at the time of sample collection. Figure 5-1 shows the locations of the samples used in the ERA at SWMU 11.

5.1.3 Preliminary Conceptual Model

The preliminary conceptual model for SWMU 11 is shown on Figure 5-2.

5.1.3.1 Exposure Pathways

At SWMU 11, waste fuel and other liquid wastes were burned as part of fire-fighting training activities. Overflow from the training rings contaminated surface and subsurface soils. Precipitation leaching through the soils to the water table may have transported the contaminants to the groundwater as indicated by the contaminants detected (benzene and PAHs) in one shallow groundwater well during the CMS. Groundwater level measurements show that groundwater flow is southwest in the direction of an emergent wetland. Groundwater level measurements show that groundwater is 6 feet below ground. Therefore, groundwater is not discharging to the wetland. Water is only present in the wetland area for a few days after significant storm events. During the sampling efforts in December 1999, it was only possible to collect one surface water sample after several storms had recently moved through the area. Therefore, the wetland is not considered to be a significant exposure pathway because exposure to aquatic habitats via surface water is minimal. However, surface water was evaluated in both direct exposure and ingestion-based exposure calculations.

Groundwater at SWMU 11 flows towards SWMU 1. Because groundwater does not discharge at SWMU 11 and groundwater contamination has already been evaluated at SWMU 1 (13 samples analyzed for volatiles and semivolatiles), groundwater was not evaluated at this site. Five of the monitoring wells at SWMU 1 receive groundwater flow from the direction of SWMU 11 (CH2M HILL 2000b). Therefore the long-term monitoring of groundwater from these wells will also address chemicals in the groundwater from SWMU 11.

The wetland may also receive contaminants via surface water runoff from exposed or eroding surface soils during heavy precipitation. Habitats at SWMU 11 include old field, mowed grass, and the emergent wetland to the west of the site. Ecological receptors utilizing these habitats can be exposed to chemicals in surface soil, surface sediment, and surface water via direct exposure pathways (including ingestion and direct contact) or via food-chain transfer of chemicals that bioaccumulate.

5.1.3.2 Endpoints and Risk Hypotheses

Preliminary assessment endpoints, risk hypotheses, and measurement endpoints (Table 5-4) are developed for SWMU 11 based on the preliminary conceptual model (Figure 5-2) and the complete exposure pathways identified therein. These endpoints/hypotheses were selected from the generic set developed in Section 3.1.1.2. Table 5-4 also identifies specific receptor species or groups associated with each endpoint. These receptors are discussed in more detail in Section 5.3.1.

5.2 Screening-Level Effects Evaluation

The purpose of the screening-level effects evaluation is to establish chemical exposure levels (screening values) that represent conservative thresholds for adverse ecological effects. The medium-specific screening values developed in Section 3.2.1 and Table 3-2 for fresh surface water, freshwater sediment, and surface soil are used in this section to evaluate the maximum concentrations in these media at SWMU 11. The relevant chemical-specific screening values are shown in Tables 5-5 (surface water), 5-6 (sediment), and 5-7 (surface soil). Ingestion screening values for dietary exposures to upper trophic level receptors via the food web are discussed in Section 5.3.3.

5.3 Screening-Level Exposure Estimate

Maximum concentrations in surface water, sediment, and surface soil were used to conservatively estimate potential chemical exposures for ecological receptors at SWMU 11. For conservatism, the maximum measured value for chemicals that were analyzed for, but not detected, was also compared to medium-specific screening values (see Section 3.3).

Exposures for upper trophic level receptor species via the food web were determined by estimating the chemical-specific concentrations in each dietary component using uptake and food web models (see Section 3.3.3). Incidental ingestion of soil or sediment was also included when calculating the total level of exposure, as was direct ingestion of surface water. Maximum surface soil, sediment, and/or surface water concentrations were used in all calculations to provide a conservative assessment.

5.3.1 Selection of Receptor Species

Receptor species used in the SWMU 11 evaluation are identified in Table 5-4. These species or species groups were selected based on complete exposure pathways identified in the conceptual model, the specific habitats present on the site, the biota known or likely to occur on the site (see Section 2), and the selected assessment endpoints. The general criteria for receptor selection were identified in Section 3.3.2. Receptor profiles are provided in Appendix B.

5.3.2 Exposure Estimation

Upper trophic level receptor exposures to chemicals in surface soil, surface water, and sediment were determined by estimating the concentration of each chemical in each relevant dietary component. Incidental ingestion of soil or sediment was included when calculating the total exposure. Exposure via drinking water was included in the food web model since SWMU 11 contains a potential freshwater drinking source.

5.3.2.1 Exposure Point Concentrations

Maximum measured media concentrations are used as exposure point concentrations for exposure estimation and food web modeling. Dietary concentrations (concentrations in plants, soil invertebrates, small mammals, and aquatic invertebrates that are eaten) for terrestrial and aquatic consumers were estimated using bioaccumulation models and maximum measured media concentrations. The methodology and models used to derive these estimates are described in Section 3.3.3.1.

5.3.2.2 Dietary Intakes

Dietary intakes were calculated for each upper trophic level receptor species using the methods discussed in Section 3.3.3.2.

5.3.3 Ingestion Screening Values

Ingestion screening values for mammals and birds were developed in Section 3.3.4 and are summarized in Tables 3-3 and 3-4, respectively.

5.4 Screening-Level Risk Calculation

The screening-level risk calculation for SWMU 11 compares the maximum exposure concentrations in site surface water, sediment, and surface soil, and the maximum exposure doses for the upper trophic level receptor species, with the corresponding screening values to derive screening risk estimates using the hazard quotient (HQ) method (see Section 3.4). Chemicals with HQs greater than or equal to 1.0 are retained as Chemicals of Potential Concern (COPCs) in the SERA.

5.4.1 Selection of Chemicals of Potential Concern (COPCs)

5.4.1.1 Surface Water

Maximum surface water concentrations are compared to screening values for fresh surface water in Table 5-5. Based on this comparison, 13 inorganic chemicals had HQs exceeding one based on detected concentrations and were identified as COPCs.

Six undetected PCBs and twelve undetected pesticides had HQs exceeding one based on maximum reporting limits. These 18 chemicals were retained as COPCs (Table 5-5). No PCBs or pesticides were detected in surface water.

Nine undetected SVOCs had HQs exceeding one based on maximum reporting limits. Twenty undetected SVOCs were retained as COPCs because screening values were not available (Table 5-5). No detected SVOCs were retained as COPCs.

One undetected VOC had a HQ exceeding one based on its maximum reporting limit and was retained as a COPC. Three undetected VOCs were retained as COPCs because screening values were not available (Table 5-5). No detected VOCs were retained as COPCs.

5.4.1.2 Sediment

Maximum sediment concentrations are compared to screening values for freshwater sediments in Table 5-6. Based on this comparison, one inorganic chemical (lead) had a HQ exceeding one based on a detected concentration and three undetected inorganic chemicals had HQs exceeding one based on maximum reporting limits. These four chemicals were retained as COPCs. Two detected inorganic chemicals were retained as COPCs because screening values were not available.

Seven undetected PCBs and six undetected pesticides had HQs exceeding one based on maximum reporting limits. These 13 chemicals were retained as COPCs (Table 5-6). No PCBs or pesticides were detected in sediments.

Fourteen undetected SVOCs had HQs exceeding one based on maximum reporting limits. Thirty undetected SVOCs were retained as COPCs because screening values were not available. All 44 chemicals were retained as COPCs (Table 5-6). No detected SVOCs were retained as COPCs.

One undetected VOC (ethylbenzene) had a HQ exceeding one based on its maximum reporting limit and was retained as a COPC. Thirty-one VOCs were retained as COPCs because screening values were not available (Table 5-6). Of these 31 VOCs, only one (bromochloromethane) was actually detected.

5.4.1.3 Surface Soil

Maximum surface soil concentrations are compared to screening values for surface soil in Table 5-7. Based on this comparison, 14 undetected SVOCs had HQs exceeding one based on maximum reporting limits. Two undetected SVOCs lacked screening values. These 16 chemicals are retained as COPCs (Table 5-7). No SVOCs were detected in SWMU 11 surface soils.

Nineteen VOCs were retained as COPCs because screening values were not available (Table 5-7). Of these 19 VOCs, only one (acetone) was actually detected. Other than acetone, no detected VOCs were retained as COPCs.

5.4.1.4 Food Web Exposures

Maximum exposure doses for each receptor species are compared to ingestion screening values in Table 5-8. HQs for the raccoon (based on NOAELs) exceeded one for antimony (2.89), iron (1.14), and vanadium (1.35). HQs based on LOAELs were less than one. HQs for the mallard (based on NOAELs) exceeded one for lead (4.09), mercury (6.74), and selenium (1.30). HQs based on LOAELs were less than one. HQs for the marsh wren (based on NOAELs) exceeded one for aluminum (3.15), cobalt (2.87), iron (9.61), lead (7.05), aroclor-1221 (1.67), aroclor-1248 (1.87), aroclor-1254 (1.87), aroclor-1260 (1.87), di-n-butylphthalate (1.51) and hexachlorobenzene (2.07). HQs based on LOAELs were less than one.

5.4.2 Fate and Transport Mechanisms of the COPCs

The fate and transport mechanisms of the COPCs are discussed in Section 3.4.2 and described in Appendix C.

5.4.3 Mechanisms of Toxicity for the COPCs

The mechanisms of toxicity for the COPCs are described in Appendix C.

5.5 Screening-Level Risk Conclusions

COPCs were identified in each media evaluated. These COPCs are summarized in Table 5-9. In surface water, 13 inorganic chemicals were retained as COPCs based on maximum detected concentrations although half of these have HQs of less than ten. Nine SVOCs, one VOC, six PCBs, and twelve pesticides were retained as COPCs based on maximum reporting limits. None of the 20 chemicals that were retained because screening levels were not available were detected in surface water samples.

In surface sediments, only one inorganic (lead) was retained as a COPC based on a detected concentration and its HQ was below two. The three inorganic chemicals that were retained based on maximum reporting limits all have HQs below three. None of the PCBs that were retained as COPCs were detected and all had HQs of less than five. Undetected pesticide HQs (based on maximum reporting limits) ranged from 1.36 to 9.03. No VOCs or SVOCs were retained as COPCs based on detected concentrations. Undetected HQs (based on maximum reporting limits) ranged from 1.2 to 48.2.

Maximum HQs from food web exposures for metals all had NOAEL HQs less than 10. Four PCBs and two SVOCs had NOAEL HQs greater than or equal to 1.0 (all were below 3.0).

In summary, potential ecological risks based on observed surface water, surface sediment, and surface soil concentrations exist at SWMU 11. Since one or more COPCs were identified in each media evaluated during the screening process, additional evaluation in Step 3 is recommended for this SWMU.

5.6 Refined (Step 3A) Risk Characterization

Based on the results of the SERA, the assessment endpoints, measurement endpoints, and risk hypotheses have been modified for the Step 3A evaluation (Table 5-10). Modifications include dropping assessment endpoints for which no unacceptable risk (as defined by no HQs equal to or greater than 1.0) was found during the SERA and modifying the measurement endpoints to reflect the assumptions and methods used in the Step 3A evaluation (see Section 3.5).

Refined medium-specific screenings for surface water, sediment, and surface soil are presented in Tables 5-11, 5-12, and 5-13, respectively. Receptor species HQs associated with Step 3A food chain modeling are provided in Table 5-14. Results of the recalculation of risk estimates are discussed by media type below.

5.6.1 Surface Water

Mean chemical concentrations in surface water are compared to surface water screening values in Table 5-11 (maximum concentrations are used if the mean concentration exceeded the maximum). Thirteen inorganic compounds exceeded screening values. HQs ranged from 2.37 to 53.6.

5.6.2 Sediment

Mean chemical concentrations in sediment are compared to screening values in Table 5-12 (maximum concentrations are used if the mean concentration exceeded the maximum). No chemicals exceeded screening values based on detected concentrations. Two detected metals were retained as COPCs because no screening values were available.

5.6.3 Surface Soil

Mean chemical concentrations in surface soil are compared to screening values in Table 5-13. No chemicals exceeded screening values based on detected concentrations. TPH and acetone were detected and were retained as COPCs because no screening values were available.

5.6.4 Food Web Exposures

Mean exposure doses for each receptor species are compared to ingestion screening values in Table 5-14. HQs for the marsh wren (based on NOAELs) exceeded one for iron (4.41) and lead (2.36). HQs based on LOAELs were less than one. The remaining receptors all had NOAEL and LOAEL HQs less than one.

5.7 Risk Evaluation

The potential for adverse effects associated with the COPCs identified in Section 5.6 and Table 5-15 are evaluated in this section.

5.7.1 Aquatic Habitats

Aquatic habitats at SWMU 11 consist of one small emergent wetland. The wetland only holds water after storm events. At the time of sampling, only enough water was available to take one sample.

Thirteen inorganic compounds exceeded screening values in surface water but no detected chemicals exceeded sediment screening values. It is likely that the exceedences in surface water were due to high levels of suspended solids in the samples given the shallow depths of water present during sampling. Although filtered surface water data for these metals were not available to test this hypothesis, visual observation of the water suggested high suspended solids were present. Only two inorganic compounds (iron and lead) exceeded ingestion based screening values for the marsh wren. Both NOAEL HQs were under five, and LOAEL HQs were less than one.

5.7.2 Terrestrial Habitats

No chemicals exceed surface soil screening values or ingestion based screening values at SWMU 11. Therefore, risks to terrestrial receptors at SWMU 11 are considered negligible.

5.8 Risk Conclusions

Conclusions drawn from the above analyses are:

Surface Water

- Thirteen inorganic compounds exceeded screening values in the surface water sample, however, inorganic compounds in the corresponding sediment samples did not exceed screening values.
- No other chemicals exceeded the screening values.
- The presence of considerable suspended solids in the unfiltered sample likely contributed to the inorganic exceedences.
- Surface water is only present in the wetland after significant storm events. Therefore, any potential risk associated with surface water in the wetland is expected to be low because of this insignificant exposure pathway to aquatic organisms.

Based upon the above lines of evidence, it is unlikely that COPC concentrations in surface water pose a site-related ecological risk.

Sediment

- The mean concentrations of none of the chemicals detected in the sediment exceeded the screening values.
- Lead was the only chemical detected for which the maximum concentration exceeded its screening value in sediments. It was detected in three samples, however, only one of the three samples exceeded the screening value. The maximum concentration (SD-03) was 72.3 mg/kg. This was the only sample which exceeded the sediments screening value, thus indicating a localized potential risk in the vicinity of this sample. Mean concentrations of lead in the wetland did not exceed screening values.
- As the wetland does not hold water for significant amounts of time, the site likely provides suitable habitat for terrestrial invertebrates. In order to investigate this risk, the maximum concentration of lead at sample SD-03 was compared to the ORNL values of 50 mg/kg (plants) and 500 mg/kg (earthworms). Lead concentrations were below the earthworm screening values showing that risk to invertebrates is not expected to occur at this site. Limited risk to terrestrial plants (HQ of 1.4 in this sample) may be present.
- Three chemicals were detected (beryllium, thallium, and bromochloromethane) for which no screening values were available.
- Beryllium was detected in 2 of the three samples (SD-02 and SD-03) at 0.2 mg/kg.
- Thallium was detected in 1 of the three samples at 0.8 mg/kg.

- Bromochloromethane was detected in each sample at 50 μg/kg.
- Based upon the above lines of evidence, it is unlikely that COPC concentrations in sediment pose a site-related ecological risk. This conclusion is qualified for the COPCs for which no screening values were available. The potential for these chemicals to be present at concentrations that could adversely affect ecological receptors is unknown and is not able to be evaluated due to the lack of screening values.

Soil

- No chemicals exceeded screening values based on detected concentrations.
- TPH and acetone were detected, but did not have screening values available.
- Acetone was detected in only one sample (SS-10) and is a common laboratory contaminant.
- TPH was detected in each sample, with a range of 14 to 607 μg/kg.
- Based upon the above lines of evidence, it is unlikely that any of the chemicals detected in the soil pose an ecological risk. This conclusion is qualified for the COPCs for which no screening values were available. The potential for these chemicals to be present at concentrations that could adversely affect ecological receptors is unknown and is not able to be evaluated due to the lack of screening values.

Food Web

- HQs for the marsh wren (based on NOAELs) exceeded one for iron (4.41) and lead (2.36). HQs for the marsh wren (based on LOAELs) were less than one for iron (0.4) and lead (0.2).

HQs based on NOAELs exceeded 1.0 for lead across an area of about 20,000 square feet, representing less than one-half acre of wren habitat.

In consideration of the lines of evidence, potential risks to terrestrial organisms utilizing SWMU 11 are expected to be low to negligible based on the lack of screening value exceedences. Potential risks to aquatic organisms utilizing SWMU 11 are expected to be low to negligible. Although though there were exceedences based on metals, it is likely that the exceedences in surface water were due to high levels of suspended solids in the samples given the shallow depths of water present during sampling. In addition, any potential risk associated with surface water in the wetland is expected to be low, because of this insignificant exposure pathway to aquatic organisms. No COPCs exceeded ingestion-based screening values based on LOAELs for the wetland/aquatic receptors evaluated.

In conclusion, further evaluation of SWMU 11 is not recommended and there is adequate information to conclude no need for remediation.

6.0 SWMU 16 – Pesticide Storage Area

SWMU 16 consists of a pesticide storage area adjacent to the pesticide shop at Building 821 in the Public Works Compound (Figure 1-1). The IAS stated that rinse water from the pesticide mixing tank was discharged directly onto the ground near Building 821 between 1968 and 1982 (RGH, 1984). The pesticides and herbicides used at this site included 2,4-D, 2,4,5-T, baygon heptachlor, malathion, dursban, nibaryl, aldrin, chlordane, bromacil, warfarin, and DDT. Releases may have resulted from washing out pesticide containers and equipment during the 15-year life of the pesticide shop.

6.1 Screening-Level Problem Formulation

As described in Section 3.1, in the screening-level problem formulation: (1) the environmental setting of a site is characterized in terms of the habitats and biota known or likely to be present; (2) the types and concentrations of chemicals that are present in ecologically relevant media are characterized; (3) a conceptual model is developed for the site that describes potential sources, potential transport pathways, potential exposure pathways and routes, and potential receptors; and (4) assessment endpoints, measurement endpoints, and risk hypotheses are selected to evaluate those receptors for which complete and potentially significant exposure pathways are likely to exist. These components of the problem formulation are developed for SWMU 16 in this section. In addition, the fate, transport, and toxicological properties of the chemicals present at a site are also considered during the problem formulation process (see Sections 6.4.2 and 6.4.3).

6.1.1 Environmental Setting

The pesticide storage area adjacent to Building 821 was located within a fenced, undeveloped, gravel lot (Figure 6-1). This area is currently paved. The area immediately adjacent to the storage area is composed of hard packed dirt and gravel and was used as a parking lot. This area is now fenced. Beyond the lot (south of the fenced area) is a small area of trees (red maple (*Acer rubrum*), tuliptree (*Liriodendron tulipfera*), American beech (*Fagus grandifolia*), sweet gum (*Liquidamber styraciflua*), bamboo, and southern red oak (*Quercus falcata*)) which surrounds a low-lying area. The lot slopes downward approximately 50 feet towards this low-lying area (Figure 6-1). Surface flow from the site flows into this low-lying area, which is approximately 20 feet wide by 60 feet long, and ponds for varying periods of time. No vegetation is present in the ditch itself. Although the water depth was approximately one foot at the time of the ecological study conducted in 1992, and approximately 6 to 8 inches during a site visit conducted in 1999, this area does not meet the criteria for classification as a wetland due to the lack of wetland vegetation in the ditch. At the time of the site visit in 1999, leaves were covering the bottom of the ditch and were floating on the water and the water appeared stagnant. No outlet from this area was observed. The closest surface stream is about 1,000 feet southwest of Building 821. Shallow soils on the site are silts, and sandy, lean clays.

6.1.2 Summary of Available Analytical Data

As stated in Section 1.0, SWMU 16 was identified as requiring no further action for ecological consideration under the previous RCRA investigations. However, as part of an agreement between the Navy and the EPA, this ERA at SWMU 16 has been conducted utilizing as much of the previous RCRA investigation data as feasible. Therefore, there may be differences in the classes of chemicals analyzed for in the various site media. These differences were considered in the development of a sampling plan to collect new data for significant data gaps and the effects of which are addressed in the uncertainties section.

Surface soil data (four samples) were collected from the gravel lot just northeast of Building 821 during the 1993 Phase I RFI. The Phase I RFI soil investigation determined that surface soil at Building 821 contained pesticides and metals. Organo-phosphorous pesticide and herbicide compounds were not detected in surface soil samples. The Phase I RFI recommended that no future RFI or CMS activities be conducted based on human health concerns because the concentrations detected were low and did not pose a risk to human health. Due to the fact that the area in which these samples were collected is now paved and there is no exposure pathway or migration to downgradient habitats, these samples were not used in this ERA.

Two surface soil samples and one surface water sample were collected in December 1999 from the low-lying area located southwest of Building 821 (Figure 6-1). These samples were analyzed for pesticides and metals. Although the soil sample collected from the intermittent ponded area was labeled a sediment sample, it is treated as a surface soil sample in the ERA since this area is not a wetland, is only periodically wet, and does not support aquatic-type receptors. Pesticides and metals were detected in the soil samples while only metals were detected in the surface water sample.

Figure 6-1 shows the location of the samples used in the ERA. Data that were used in the ERA are summarized in Tables 6-1 and 6-2, and are contained in Appendix A.

6.1.3 Preliminary Conceptual Model

The preliminary conceptual model for SWMU 16 is shown on Figure 6-2.

6.1.3.1 Exposure Pathways

At SWMU 16, pesticides were historically stored at Building 821. Rinse water from pesticide storage containers was discharged directly onto the ground near Building 821. A small low-lying area is located southwest of Building 821 and may have received surface water runoff from SWMU 16 during periods of heavy precipitation. The habitats present at SWMU 16 include a small deciduous woodlot that contains a small low-lying area that periodically collects standing water. Soils in the parking lot immediately adjacent to Building 821 are not evaluated since potential exposures in this unvegetated area composed of hard-packed dirt and gravel are considered negligible. Although birds could use this area of the site infrequently, they would not use the area for feeding or any other significant life activity that would result in ecologically important exposure. Since water is not present in the low-lying area long enough for the soils to be considered sediments (they showed no evidence of hydric reduction), initially the "sediment" sample taken from the low-lying area in 1999 was treated as a surface soil sample in this ERA. However, because the water is sometimes present, this sample was also screened against sediment screening values in Step 3 in order to determine any possible risk to aquatic invertebrates. In addition, in Step 3 the two surface water samples will be screened against water screening values in order to determine any possible risk to aquatic invertebrates. Since it is present at least intermittently, surface water is used as a drinking water input to the ingestion-based food web model. Ecological receptors utilizing these habitats can be exposed to chemicals in surface soil and surface water via direct exposure pathways (including ingestion and direct contact) or via food-chain transfer of chemicals that bioaccumulate.

6.1.3.2 Endpoints and Risk Hypotheses

Preliminary assessment endpoints, risk hypotheses, and measurement endpoints (Table 6-3) are developed for SWMU 16 based on the preliminary conceptual model (Figure 6-2) and the complete exposure pathways identified therein. These endpoints/hypotheses were selected from the generic set developed in Section 3.1.1.2. Table 6-3 also identifies specific receptor species or groups associated with each endpoint. These receptors are discussed in more detail in Section 6.3.1.

6.2 Screening-Level Effects Evaluation

The purpose of the screening-level effects evaluation is to establish chemical exposure levels (screening values) that represent conservative thresholds for adverse ecological effects. The medium-specific screening values developed in Section 3.2.1 and Table 3-2 for surface soil are used in this section to evaluate the maximum concentrations in soils at SWMU 16. The relevant chemical-specific screening values for surface soils are shown in Table 6-4. Ingestion screening values for dietary exposures to upper trophic level receptors via the food web are discussed in Section 6.3.3.

6.3 Screening-Level Exposure Estimate

Maximum concentrations in surface soil were used to conservatively estimate potential chemical exposures for ecological receptors at SWMU 16. For conservatism, the maximum measured value for chemicals that were analyzed for, but not detected, was also compared to medium-specific screening values (see Section 3.3).

Exposures for upper trophic level receptor species via the food web were determined by estimating the chemical-specific concentrations in each dietary component using uptake and food web models (see Section 3.3.3). Incidental ingestion of soil, and direct ingestion of surface water, was also included when calculating the total level of exposure. Maximum surface soil and surface water concentrations were used in all calculations to provide a conservative assessment.

6.3.1 Selection of Receptor Species

Receptor species used in the SWMU 16 evaluation are identified in Table 6-3. These species or species groups were selected based on complete exposure pathways identified in the conceptual model, the specific habitats present on the site, the biota known or likely to occur on the site (see Section 2), and the selected assessment endpoints. The general criteria for receptor selection were identified in Section 3.3.2. Receptor profiles are provided in Appendix B.

6.3.2 Exposure Estimation

Upper trophic level receptor exposures to chemicals in surface soil and surface water were determined by estimating the concentration of each chemical in each relevant dietary component. Incidental ingestion of soil was included when calculating the total exposure. Exposure via drinking water was included in the food web model since SWMU 16 contains a potential freshwater drinking source, at least intermittently.

6.3.2.1 Exposure Point Concentrations

Maximum measured media concentrations are used as exposure point concentrations for exposure estimation and food web modeling. Dietary concentrations (concentrations in plants, soil invertebrates, and small mammals that are eaten) for terrestrial consumers were estimated using bioaccumulation models and maximum measured media concentrations. The methodology and models used to derive these estimates are described in Section 3.3.3.1.

6.3.2.2 Dietary Intakes

Dietary intakes were calculated for each upper trophic level receptor species using the methods discussed in Section 3.3.3.2.

6.3.3 Ingestion Screening Values

Ingestion screening values for mammals and birds were developed in Section 3.3.4 and are summarized in Tables 3-3 and 3-4, respectively.

6.4 Screening-Level Risk Calculation

The screening-level risk calculation for SWMU 16 compares the maximum exposure concentrations in site surface soil, and the maximum exposure doses for the upper trophic level receptor species, with the corresponding screening values to derive screening risk estimates using the hazard quotient (HQ) method (see Section 3.4). Chemicals with HQs greater than or equal to 1.0 are retained as Chemicals of Potential Concern (COPCs) in the SERA.

6.4.1 Selection of Chemicals of Potential Concern (COPCs)

6.4.1.1 Surface Soil

Maximum surface soil concentrations are compared to screening values for surface soil in Table 6-4. Based on this comparison, ten inorganic chemicals have HQs exceeding one based on detected concentrations and two undetected inorganic chemicals have HQs exceeding one based on maximum reporting limits. These twelve chemicals are retained as COPCs.

One pesticide (DDT) is retained as a COPC based on a detected concentration; its HQ is 1.10. Five additional undetected pesticides are retained as COPCs because screening values are not available (Table 6-4).

6.4.1.2 Food Web Exposures

Maximum exposure doses for each receptor species are compared to ingestion screening values in Table 6-5. HQs for the short-tailed shrew (based on NOAELs) exceeded one for 14 inorganic chemicals and one pesticide (dieldrin). HQs for the meadow vole (based on NOAELs) exceeded one for aluminum (2.73), arsenic (79.96), iron (1.81, mercury (2.53), and selenium (3.49). HQs for the red fox (based on NOAELs) exceeded one for barium (4.41), iron (1.29), and zinc (1.26). HQs for the American robin (based on NOAELs) exceeded one for eight inorganic chemicals. HQs for the American kestrel (based on NOAELs) exceeded one for aluminum (2.68), arsenic (2.68), cadmium (1.86), chromium (10.56), iron (2.9), and zinc (12.78).

6.4.2 Fate and Transport Mechanisms of the COPCs

The fate and transport mechanisms of the COPCs are discussed in Section 3.4.2 and described in Appendix C.

6.4.3 Mechanisms of Toxicity for the COPCs

The mechanisms of toxicity for the COPCs are described in Appendix C.

6.5 Screening-Level Risk Conclusions

COPCs were identified in the surface soils and in the food web modeling. These COPCs are summarized in Table 6-6.

In surface soils, ten inorganic chemicals were retained as COPCs based on detected concentrations. HQs ranged from just over 1.0 to 320. One pesticide (DDT) was retained as a COPC based on a detected value, although its HQ was 1.10, and five additional pesticides were retained as COPCs because screening values were not available.

Aluminum, arsenic, chromium, iron, mercury, and zinc all had NOAEL HQs greater than 10). Dieldrin (2.14) was the only pesticide with a NOAEL HQ greater than or equal to one.

In summary, potential ecological risks based on observed surface soil concentrations exist at SWMU 16. Since one or more COPCs were identified in this medium during the screening process, additional evaluation in Step 3 is recommended for this site.

6.6 Refined (Step 3A) Risk Characterization

Based on the results of the SERA, the assessment endpoints, measurement endpoints, and risk hypotheses have been modified for the Step 3A evaluation (Table 6-7). Modifications include dropping assessment endpoints for which no unacceptable risk (as defined by no HQs equal to or greater than 1.0) was found during the SERA and modifying the measurement endpoints to reflect the assumptions and methods used in the Step 3A evaluation (see Section 3.5).

Refined medium-specific screenings for surface soils are presented in Table 6-8. Receptor species HQs associated with Step 3A food chain modeling are provided in Table 6-9. The results of the recalculation of risk estimates are discussed below.

6.6.1 Surface Soil

Mean chemical concentrations in surface soil are compared to screening values in Table 6-8. Seven inorganic compounds (aluminum, chromium, copper, iron, silver, vanadium, and zinc) exceeded screening values based on detected concentrations. Mean HQs were 281, 98, 1.14, 94.2, 1.93, 16.8, and 3.67, respectively. No pesticides were retained as COPCs, however 4,4′-DDT was detected in both soil samples, but at concentrations below the screening value.

6.6.2 Food Web Exposures

Mean exposure doses for each receptor species are compared to ingestion screening values in Table 6-9. HQs for the short-tailed shrew (based on NOAELs) exceeded one for aluminum (11.20), arsenic (11.30), iron (5.39), and vanadium (2.31); HQs based on LOAELs were greater than or equal to one for aluminum (1.12) and arsenic (1.13). HQs for the meadow vole (based on NOAELs) exceeded one for aluminum (1.03) and arsenic (1.17); HQs based on LOAELs were all less than one. HQs for the American robin (based on NOAELs) exceeded one for zinc (1.19); HQs based on LOAELs were all less than one. HQs for the American kestrel (based on NOAELs) exceeded one for zinc (1.27); HQs based on LOAELs were all less than one.

6.7 Risk Evaluation

The potential for adverse effects associated with the COPCs identified in Section 6.6 and Table 6-10 are evaluated in this section.

6.7.1 Terrestrial Habitats

Seven inorganic compounds (aluminum, chromium, copper, iron, silver, vanadium, and zinc) exceeded screening values based on detected concentrations in surface soils. Aluminum, arsenic, iron, vanadium and zinc also exceeded ingestion-based screening values for terrestrial receptors based on the NOAEL. To evaluate the potential significance of these exceedences, on-site soil concentrations are compared to background surface soil concentrations developed as part of the SWMU 15 Biopile ecological evaluation (CH2M HILL, 2000d). Maximum and mean background concentrations were compared to on-site concentrations.

Based on this evaluation (Table 6-11), only chromium exceeds background for both the maximum and mean concentrations. However, chromium-containing compounds are not known to have been stored at this site (see Section 6.0) so this chemical is not likely to be site-related. Chromium concentrations in the sample collected in the low-lying were compared to both sediment and soil screening values in order to pinpoint risk to chromium. Concentrations of chromium in this sample fall below the sediment screening value of 81 mg/kg showing no risk to aquatic invertebrates or plants. The screening value for soil invertebrates is 0.4 mg/kg. The screening values for terrestrial plants is 1.0 mg/kg. Both samples exceed the soil screening values. Therefore, there is potential for risk to terrestrial invertebrates and plants at both samples. However, there is no vegetation in the low-lying area where the samples were collected and the habitat for soil invertebrates in the low-lying area is poor due to the fact that there is water present part of the time. Due to the small size of the ditch compared to the size available surrounding habitat, soil invertebrates would most likely be utilizing other areas. In addition, chromium has low bioavailability in soils.

Silver was not compared to background data because background data were not available. However, the mean HQ from soil screening was less than two and HQs for silver from ingestion-based exposures were all substantially less than one. The silver concentration in the swale exceeded the soil screening value with an HQ of 3.4 showing a potential risk to soil invertebrates and plants in the swale. However, this swale is about 50 linear feet in a hard packed dirt area with limited vegetation and is not of exceptional habitat quality. Silver was not detected in the low-lying area. HQs from ingestion-based exposure were all below one for mammalian and avian receptors. In soils, silver tends to form complexes with inorganic chemicals and humic substances. As pH increases, silver solubility increases and subsequently mobility increases. However, because silver toxicity to microbial communities inhibits bacterial enzymes, biotransformation is not expected to be significant (ATSDR, 1990). Silver can bioconcentrate in aquatic biota and bioaccumulate in plants and animals, but is not expected to biomagnify and food chain transfer is not expected to be significant (Luoma and Jenne, 1977)."

Because surface water in the low-lying area is present intermittently, the sample collected in the low-lying area was also screened against sediment screening values in order to determine possible risk to aquatic invertebrates. Two metals (mercury and zinc) exceeded sediment screening values based upon detected concentrations. HQs were 1.0 and 1.1, respectively. Four pesticides (DDD, DDE, DDT, and alpha-chlordane) exceeded screening values based upon detected concentrations. HQs were 2.9, 7.3, 16.5, and 1.6, respectively. Therefore, there is a potential risk to aquatic invertebrates in the sediments at SWMU 16 for these analytes. (There is no aquatic vegetation present in the low-lying area; therefore risks to aquatic plants are not present.) This area is limited in size (approximately 1,200 square feet or 0.03 acres). In addition, water is not present at all times, limiting the number and variety of aquatic invertebrates that may use the site.

Because surface water in the low-lying area is present intermittently, surface water samples were be screened in order to determine risks to aquatic invertebrates. Two analytes (iron HQ of 5.38 and manganese HQ of1.97) have HQs greater than or equal to one based on detected concentrations for the surface water sample collected in the low-lying area. All other analytes were undetected. Therefore, there is a potential risk to aquatic invertebrates in the water at SWMU 16 for these two metals. (There is no aquatic vegetation present in the low-lying area; therefore risks to aquatic plants are not present.) This area is limited in size (approximately 1,200 square feet or 0.03 acres).

Thus, risks to ecological receptors at SWMU 16 are not likely to be significant.

6.8 Risk Conclusions

Conclusions drawn from the above analyses are:

Soil

- The maximum concentrations of ten metals exceeded screening values, with five of the metals exceeding screening in only one sample (SS-01). Of the metals that exceeded the screening values in both samples, aluminum and chromium had the greatest exceedences (HQs of 320 and 130, respectively).

- Seven metals (aluminum, chromium, copper, iron, mercury, silver, and vanadium) exceeded screening values based on mean detected concentrations in surface soils.
- Arsenic HQ for maximum concentration was 1.5, but its HQ for the mean concentration was below one.
- Only one of the metals (chromium) that exceeded the screening values was present at concentrations above maximum background concentrations. (Comparison to the maximum value versus the mean value is more appropriate because of a sample size of two samples.) Chromium exceeded the screening value in both samples, thus indicating a potential risk to soil invertebrates and plants throughout the site. However, since the other metals were present at concentrations similar to background, it is unlikely that they are posing a site-related threat to flora and invertebrates at the site.
- Background data were not available for silver to allow a comparison with concentrations at the site. Silver was detected in only one location (SS-01). The mean HQ was 1.9. The silver concentration in the swale (SS-01) exceeded the soil screening value with an HQ of 3.4 showing a potential risk to soil invertebrates and plants. However, this swale is about 50 linear feet in a hard packed dirt area with limited vegetation and is not of exceptional habitat quality. Silver was not detected in the low-lying area. HQs from ingestion-based exposure were all below one for mammalian and avian receptors. In soils, silver tends to form complexes with inorganic chemicals and humic substances. As pH increases, silver solubility increases and subsequently mobility increases. However, because silver toxicity to microbial communities inhibits bacterial enzymes, biotransformation is not expected to be significant (ATSDR, 1990). Silver can bioconcentrate in aquatic biota and bioaccumulate in plants and animals, but is not expected to biomagnify and food chain transfer is not expected to be significant (Luoma and Jenne, 1977).
- There were no exceedences for pesticides in any of the soil samples, indicating that there is little potential for risk from pesticides to soil invertebrate and plant communities.
- Based upon the lines of evidence above, it is unlikely that any of the chemicals detected in the soil pose a site-related risk to soil invertebrate or terrestrial plant communities.

Aquatic Invertebrates

- Concentrations of chromium fall below the sediment screening value of 81 mg/kg showing no risk to aquatic invertebrates.
- Two metals (mercury and zinc) exceeded sediment screening values based upon detected concentrations. HQs were 1.0 and 1.1, respectively.
- Four pesticides (DDD, DDE, DDT, and alpha-chlordane) exceeded screening values based upon detected concentrations. HQs were 2.9, 7.3, 16.5, and 1.6, respectively.
- Therefore, there is a potential risk to aquatic invertebrates in the water at SWMU 16 for these analytes. (There is no aquatic vegetation present in the low-lying area; therefore

risks to aquatic plants are not present.) However, this area is limited in size (approximately 1,200 square feet or 0.03 acres). In addition, water is not present at all times, limiting the number and variety of aquatic invertebrates that may use the site.

- Two analytes (iron HQ of 5.38 and manganese HQ of1.97) have HQs greater than or equal to one based on detected concentrations for the surface water sample collected in the low-lying area. All other analytes were undetected.
- Therefore, there is a potential risk to aquatic invertebrates in the water at SWMU 16 for these two metals. (There is no aquatic vegetation present in the low-lying area; therefore risks to aquatic plants are not present.) However, this area is limited in size (approximately 1,200 square feet or 0.03 acres). In addition, water is not present at all times, limiting the number and variety of aquatic invertebrates that may use the site.
- Based upon the lines of evidence above, it is unlikely that any of the chemicals detected in the sediments or surface water pose a site-related risk to invertebrate communities.

Food Web

- Aluminum, arsenic, iron, vanadium, and zinc exceeded ingestion-based screening values for terrestrial receptors based on the NOAEL.
- Aluminum (HQ of 1.1) and arsenic (HQ of 1.1) exceeded the ingestion-based screening values for short-tailed shrew based on LOAELs.
- Aluminum, iron, vanadium are likely not site-related based upon comparisons to background concentrations. It is unclear whether zinc is a site-related chemical. Zinc maximum concentrations were below background maximum concentrations, but its mean concentration was above mean background concentration. However, based on past use, as documented in the Phase I and III RFIs (CH2M HILL 1993, 1999b), there is no evidence that zinc was disposed of at the site.
- Arsenic could pose a potential risk in the swale that leads to the low-lying area to mammalian terrestrial insectivores based upon the LOAEL HQ of 1.1 for the short-tailed shrew. However, this swale is about 50 linear feet in a hard packed dirt area with limited vegetation and is not of exceptional habitat quality. In addition, any exposure to the shrew is through the ingestion of invertebrates. As this is an area of hard-packed dirt, it is unlikely that it is exceptional habitat to invertebrates. It is expected that both shrews and invertebrates would more likely be expected to forage in other areas which provide better habitat. Potential use of this area by the shrew is expected to be low.

Based on the lines of evidence presented above, potential risks to terrestrial organisms at SWMU 16 are expected to be low.

In conclusion, further evaluation of SWMU 16 is not recommended and there is adequate information to conclude no need for remediation.

7.0 SWMU 16GC – Golf Course Pesticide Storage Area

SWMU 16GC consists of the pesticide storage area at the Golf Course Maintenance Shop (Figure 1-1). The pesticide storage area at the NAS Oceana Golf Course has existed since 1956 (RGH, 1984). Since 1956, pesticides were stored in the Golf Course Barn – Building 798 (RGH, 1984). Materials stored in the barn included fungicides, such as Daconil, Chipco 26019, and dursban; herbicides, including Daconte 6; and Oursban, an insecticide (RGH, 1984). Since 1982, pesticides drained from the spray tank into 55 gallon drums have been removed by Public Works as part of the hazardous waste pickup program (RGH, 1984). Before 1982, residual pesticides were rinsed over a concrete rinsing pad in the shack outside Building 798 (RGH, 1984). This rinse water flowed into a shallow drainage ditch adjacent to Building 798.

7.1 Screening-Level Problem Formulation

As described in Section 3.1, in the screening-level problem formulation: (1) the environmental setting of a site is characterized in terms of the habitats and biota known or likely to be present; (2) the types and concentrations of chemicals that are present in ecologically relevant media are characterized; (3) a conceptual model is developed for the site that describes potential sources, potential transport pathways, potential exposure pathways and routes, and potential receptors; and (4) assessment endpoints, measurement endpoints, and risk hypotheses are selected to evaluate those receptors for which complete and potentially significant exposure pathways are likely to exist. These components of the problem formulation are developed for SWMU 16GC in this section. In addition, the fate, transport, and toxicological properties of the chemicals present at a site are also considered during the problem formulation process (see Sections 7.4.2 and 7.4.3).

7.1.1 Environmental Setting

The pesticide storage shack at SWMU 16GC is located adjacent to the Golf Course on the western side, and Buildings 798 and 799 on the southeastern side (Figure 7-1). Most of the interior of the three-sided, open front shack has a cement floor where pesticides were historically rinsed. A small portion of the shack interior has an exposed dirt floor. The area in front of the shack consists of hard-packed dirt. To the north of Building 798 is an open field with a small, shallow swale running through it. The swale begins about 20 feet north of the shack and drains northward into the Oceana NAS surface water drainage system ditches. Water is present in the swale only intermittently and no aquatic habitats or communities are present. The field consists mostly of mowed grass. There is a line of loblolly pine (*Pinus taeda*) between the golf course green and the field. There is also a small clump of sweetgum (*Liquidambar styraciflua*) next to the swale.

7.1.2 Summary of Available Analytical Data

As stated in Section 1.0, SWMU 16GC was identified as requiring no further action for ecological consideration under the previous RCRA investigations. However, as part of an agreement between the Navy and the EPA, this ERA at SWMU 16GC has been conducted utilizing as much of the previous RCRA investigation data as feasible. Therefore, there may be differences in the classes of chemicals analyzed for in the various site media. These differences were considered in the development of a sampling plan to collect new data for significant data gaps and the effects of which are addressed in the uncertainties section.

Available data for SWMU 16GC include historical surface soil data collected during the Phase I RFI, and surface water and surface soil samples collected from the drainage swale in December 1999 for use in the ERA. Figure 7-1 shows the locations of the samples used in the ERA. Data that were used are summarized in Tables 7-1 and 7-2 and are contained in Appendix A.

Four surface soil samples were collected during the Phase I RFI near the shack and in the beginning portion of the drainage swale. These samples were analyzed for pesticides. 4,4'-DDD, 4,4'-DDE, 4,4'-DDT and chlordane were detected in these soil samples. These samples were not analyzed in this ERA because they are located in an area of hard-packed dirt that is enclosed on three sides and adjacent to the concrete pad. Therefore, this was not seen as a significant exposure pathway.

Two surface soil and two surface water samples were collected in December 1999 from the drainage swale and were analyzed for pesticides and metals. Pesticides and metals were detected in the soil samples. Only metals were detected in the surface water samples.

7.1.3 Preliminary Conceptual Model

The preliminary conceptual model for SWMU 16GC is shown on Figure 7-2.

7.1.3.1 Exposure Pathways

At SWMU 16GC, pesticides have been, and currently are, stored at the Golf Course Maintenance Shop. At the Maintenance Shop, residual pesticides were historically (1956 - 1982) rinsed over a concrete rinsing pad that drains into a shallow swale to the north. Since 1982, this rinsate has been collected and shipped off-site as part of the air station's hazardous waste collection program. Water runoff from the concrete pad potentially transported contaminants to soils adjacent to the pad, and to surface water and soils in the drainage swale.

Terrestrial habitats present at SWMU 16GC include mowed lawn, the drainage swale, and a few trees. Surrounding habitats consist on the golf course. Since water is not present in the swale area long enough for the soils to be considered true sediments, (they showed no evidence of hydric reduction), the "sediment" samples taken from the swale in 1999 will be treated as surface soil samples in this ERA. The swale width varies from about two inches to twelve inches and is about three to four inches deep. Any water that remains in this swale after a storm event either percolates into the groundwater or evaporates within a few days. Flowing water is only present in this swale during or immediately after a storm event. No aquatic plants are located in the swale. It is a maintained and mowed grassy swale along the edge of a golf course. Aquatic habitats are not present at this SWMU. Since water is present at least intermittently, surface water is used as a drinking water input to the ingestion-based food web model but chemical concentrations in surface water are not compared to surface water screening values since aquatic habitats are not present at this SWMU. Ecological receptors utilizing these habitats can be exposed to chemicals in surface soil and surface water via direct exposure pathways (including ingestion and direct contact) or via food-chain transfer of chemicals that bioaccumulate.

7.1.3.2 Endpoints and Risk Hypotheses

Preliminary assessment endpoints, risk hypotheses, and measurement endpoints (Table 7-3) are developed for SWMU 16GC based on the preliminary conceptual model (Figure 7-2) and the complete exposure pathways identified therein. These endpoints/hypotheses were selected from the generic set developed in Section 3.1.1.2. Table 7-3 also identifies specific receptor species or groups associated with each endpoint. These receptors are discussed in more detail in Section 7.3.1.

7.2 Screening-Level Effects Evaluation

The purpose of the screening-level effects evaluation is to establish chemical exposure levels (screening values) that represent conservative thresholds for adverse ecological effects. The medium-specific screening values developed in Section 3.2.1 and Table 3-2 surface soil are used in this section to evaluate the maximum concentrations in these media at SWMU 16GC. The relevant chemical-specific screening values are shown in Table 7-4 (surface soil). Ingestion screening values for dietary exposures to upper trophic level receptors via the food web are discussed in Section 7.3.3.

7.3 Screening-Level Exposure Estimate

Maximum concentrations in surface soil were used to conservatively estimate potential chemical exposures for ecological receptors at SWMU 16GC. For conservatism, the maximum measured value for chemicals that were analyzed for, but not detected, was also compared to medium-specific screening values (see Section 3.3).

Exposures for upper trophic level receptor species via the food web were determined by estimating the chemical-specific concentrations in each dietary component using uptake and food web models (see Section 3.3.3). Incidental ingestion of soil, and ingestion of drinking water, were also included when calculating the total level of exposure. Maximum surface soil and surface water concentrations were used in all calculations to provide a conservative assessment.

7.3.1 Selection of Receptor Species

Receptor species used in the SWMU 16GC evaluation are identified in Table 7-3. These species or species groups were selected based on complete exposure pathways identified in the conceptual model, the specific habitats present on the site, the biota known or likely to occur on the site (see Section 2), and the selected assessment endpoints. The general criteria for receptor selection were identified in Section 3.3.2. Receptor profiles are provided in Appendix B.

7.3.2 Exposure Estimation

Upper trophic level receptor exposures to chemicals in surface soil were determined by estimating the concentration of each chemical in each relevant dietary component. Incidental ingestion of soil was included when calculating the total exposure. Exposure via drinking water was included in the food web model since SWMU 16GC contains a potential freshwater drinking source (the drainage swale), at least intermittently.

7.3.2.1 Exposure Point Concentrations

Maximum measured media concentrations are used as exposure point concentrations for exposure estimation and food web modeling. Dietary concentrations (concentrations in plants, soil invertebrates, and small mammals that are eaten) for terrestrial consumers were estimated using bioaccumulation models and maximum measured media concentrations. The methodology and models used to derive these estimates are described in Section 3.3.3.1.

7.3.2.2 Dietary Intakes

Dietary intakes were calculated for each upper trophic level receptor species using the methods discussed in Section 3.3.3.2.

7.3.3 Ingestion Screening Values

Ingestion screening values for mammals and birds were developed in Section 3.3.4 and are summarized in Tables 3-3 and 3-4, respectively.

7.4 Screening-Level Risk Calculation

The screening-level risk calculation for SWMU 16GC compares the maximum exposure concentrations in site surface soil, and the maximum exposure doses for the upper trophic level receptor species, with the corresponding screening values to derive screening risk estimates using the hazard quotient (HQ) method (see Section 3.4). Chemicals with HQs greater than or equal to 1.0 are retained as Chemicals of Potential Concern (COPCs) in the SERA.

7.4.1 Selection of Chemicals of Potential Concern (COPCs)

7.4.1.1 Surface Soil

Maximum surface soil concentrations are compared to soil screening values in Table 7-4. Six inorganic chemicals exceeded screening values based on detected concentrations. Three undetected inorganic chemicals exceeded screening values based on maximum reporting limits. One undetected pesticide (methoxychlor) was retained as a COPC based on a maximum reporting limit. Five additional undetected pesticides were retained as COPCs because screening values were not available. No detected pesticides were retained as COPCs since none of these chemicals exceeded soil screening values (Table 7-4).

7.4.1.2 Food Web Exposures

Maximum exposure doses for each receptor species are compared to ingestion screening values in Table 7-5. HQs for the short-tailed shrew (based on NOAELs) exceeded one for aluminum (23.60), antimony (1.37), arsenic (6.54), cadmium (8.61), iron (2.93), mercury (8.45), thallium (6.62), vanadium (2.14), and dieldrin (2.24); HQs based on LOAELs were less than one except for aluminum (2.36) and mercury (1.69). HQs for the meadow vole (based on NOAELs) exceeded one for aluminum (1.87), arsenic (8.48), mercury (1.86), and selenium (1.27); HQs based on LOAELs were less than one. HQs for the American robin (based on NOAELs) exceeded one for aluminum (1.58), cadmium (2.80), chromium (2.64), lead (1.62), and zinc (5.33); HQs based on LOAELs were less than one. HQs for the American kestrel (based on NOAELs) exceeded one for aluminum (1.83), cadmium (3.04), chromium (3.24), and zinc (6.52); HQs based on LOAELs were less than one.

7.4.2 Fate and Transport Mechanisms of the COPCs

The fate and transport mechanisms of the COPCs are discussed in Section 3.4.2 and described in Appendix C.

7.4.3 Mechanisms of Toxicity for the COPCs

The mechanisms of toxicity for the COPCs are described in Appendix C.

7.5 Screening-Level Risk Conclusions

COPCs were identified in each media evaluated. These COPCs are summarized in Table 7-6. In surface soils, six inorganic chemicals were retained as a COPCs based on maximum detected concentrations. Three inorganic compounds and one pesticide were retained as COPCs based on maximum reporting limits. Five pesticides were retained as COPCs because no screening values were available.

Maximum NOAEL HQs from food web exposures for metals were all less than ten except for aluminum which had an HQ of 23.60). Only one pesticide (dieldrin; HQ of 2.24) had a NOAEL HQ greater than or equal to 1.0. No NOAEL or LOAEL HQs were greater than or equal to 1.0 for the red fox. Therefore, further evaluation of the red fox is not recommended in Step 3A.

In summary, potential ecological risks based on surface soil concentrations exist at SWMU 16GC. Since COPCs were identified in surface soils evaluated during the screening process, additional evaluation in Step 3 is recommended for this site.

7.6 Refined (Step 3A) Risk Characterization

Based on the results of the SERA, the assessment endpoints, measurement endpoints, and risk hypotheses have been modified for the Step 3A evaluation (Table 7-7). Modifications include dropping assessment endpoints for which no unacceptable risk (as defined by no HQs equal to or greater than one) was found during the SERA and modifying the measurement endpoints to reflect the assumptions and methods used in the Step 3A evaluation (see Section 3.5).

Refined medium-specific screenings for surface soil are presented in Table 7-8. Receptor species HQs associated with Step 3A food chain modeling are provided in Table 7-9. Results of the recalculation of risk estimates are discussed below.

7.6.1 Surface Soil

Mean chemical concentrations in surface soil are compared to screening values in Table 7-8. Five inorganic compounds (aluminum, chromium, iron, vanadium, and zinc) exceeded screening values based on detected concentrations. Mean HQs were 202, 37.8, 22.9, 7.08, and 1.83, respectively.

7.6.2 Food Web Exposures

HQs for the short-tailed shrew (based on NOAELs) exceeded one for aluminum (8.05) and iron (1.31); HQs based on LOAELs were less than one (Table 7-9). HQs for all other receptors based on NOAELs and LOAELs were below one.

7.7 Risk Evaluation

The potential for adverse effects associated with the COPCs identified in Section 7.6 and Table 7-6 are evaluated in this section.

7.7.1 Terrestrial Habitats

Five inorganic compounds (aluminum, chromium, iron, vanadium, and zinc) exceeded soil screening values based on detected concentrations. Aluminum and iron also exceeded ingestion-based screening values for the short-tailed shrew based on the NOAEL (but not the LOAEL). To evaluate the potential significance of these exceedences, on-site soil concentrations are compared to background surface soil concentrations developed as part of the SWMU 15 Biopile ecological evaluation (CH2M HILL 2000d). Maximum and mean background concentrations were compared to on-site concentrations. Based on this evaluation (Table 7-11), none of the five metals exceeded background surface soil concentrations based on both the maximum. Only the mean concentration for zinc exceeded its background mean concentration.

7.8 Risk Conclusions

Conclusions drawn from the above analyses are:

Surface Soils

- Five metals (aluminum, chromium, iron, vanadium, and zinc) exceeded screening values in both samples. However, none of the five metals exceeded maximum background soil concentrations and only zinc exceeded the mean background concentration, thus indicating that these four metals likely do not pose a significant risk to soil invertebrate and plant communities at the site relative to background concentrations.
- Mercury exceeded the screening value in one of the soil samples, but only slightly with an HQ of 1.1. Mercury bioaccumulates in the food chain, however, HQs from ingestion-based exposure models were all below one for mammalian and avian receptors. Therefore, mercury is not a concern at the site.
- The mean concentration of zinc exceeded background; however, the maximum concentration did not exceed the background maximum. Thus, indicating that a

potential site-related risk to soil invertebrate and plant communities might exit, but it is likely isolated.

- No pesticides were detected at concentrations exceeding the screening values in any of the samples.

Food Web

- HQs for the short-tailed shrew (based on NOAELs) exceeded one for aluminum (8.05) and iron (1.31); however, HQs based on LOAELs were less than one. Concentrations of aluminum are not likely site-related.
- HQs for all other receptors based on NOAELs and LOAELs were below one.

Based upon the lines of evidence, potential site-related risks to terrestrial organisms at SWMU 16GC are expected to be negligible. The few inorganic chemicals which exceeded soil screening values were consistent with background soil concentrations, suggesting they are not site related. In addition, no chemical exceeded a LOAEL-based ingestion screening value for an upper trophic level receptor. Finally the site's small size would limit potential exposure on a population scale.

In conclusion, further evaluation of SWMU 16GC is not recommended and there is adequate information to conclude no need for remediation.

8.0 SWMU 21 – Transformer Storage Area

SWMU 21 is located in the southwestern corner of the Public Works Transportation Yard, approximately 400 feet southeast of Building 830 (Figure 1-1). Transformers were stored in two gravel areas between the sand loaders and the yard's chain-link fence. The sand loaders are on the edge of a large asphalt parking lot. In the past, old electrical transformers, which were known to contain PCBs, were stored on pallets over bare ground at this site until they could be disposed of (RGH, 1984). The Public Works Transportation Yard has been in use since the early 1950s; however, it is unclear how long this area has been used for transformer storage (RGH, 1984). Transformers have been stored in the yard since as early as 1982, when a transformer leaked oil, and the Navy hired a contractor to clean up the spill (RGH, 1984). Two transformers without release controls were seen leaking oil onto the ground during the Visual Site Inspection (VSI) (USEPA, 1988).

Navy personnel inspected the transformers stored at SWMU 21 on a regular basis, and a contractor was retained by the Navy to respond to any identified release. In recent years, the NAS Oceana PCB program was subjected to a "multi-media" EPA inspection in the summer of 1998, which included a review of inspection records. No PCB program discrepancies, or findings, were noted by the EPA inspectors.

8.1 Screening-Level Problem Formulation

As described in Section 3.1, in the screening-level problem formulation: (1) the environmental setting of a site is characterized in terms of the habitats and biota known or likely to be present; (2) the types and concentrations of chemicals that are present in ecologically relevant media are characterized; (3) a conceptual model is developed for the site that describes potential sources, potential transport pathways, potential exposure pathways and routes, and potential receptors; and (4) assessment endpoints, measurement endpoints, and risk hypotheses are selected to evaluate those receptors for which complete and potentially significant exposure pathways are likely to exist. These components of the problem formulation are developed for SWMU 21 in this section. In addition, the fate, transport, and toxicological properties of the chemicals present at a site are also considered during the problem formulation process (see Sections 8.4.2 and 8.4.3).

8.1.1 Environmental Setting

The Transformer Storage Yard consists of a fenced asphalt parking lot, two gravel storage areas, and an area of hard-packed dirt with some herbaceous vegetation (Figure 8-1). Some Japanese honeysuckle (*Lonicera japonica*) grows along the fence line. Immediately to the east of the chain-link fence is a recreational picnic area with a maintained lawn and a few loblolly pines. Beyond the site, to the southeast, is the golf course. A forested area is located southwest of the site and is dominated by sweetgum, tulip tree, and loblolly pine. The understory consists of Japanese honeysuckle, greenbriar (*Smilax* sp.), and giant cane (*Arundinaria gigantea*). There are no transport pathways to the forested area.

Drainage across the storage yard generally flows southeast. In the southeastern corner of the yard, an exposed storm sewer pipe extends from the asphalt, goes under the fence and underground into a manhole cover observed just inside the forested area southeast of the site. This storm sewer discharges to a twelve inch corrugated metal pipe which runs into a 60 x 30 inch concrete pipe. This pipe discharges to a 71 x 47 inch corrugated metal pipe which in turn discharges to a drainage ditch which flows behind the closed landfill. This drainage ditch was significantly cleaned out (scraped and widened) in the summer of 1999 in order to retain more water during storm events. The length of concrete and metal piping is all underground and is only accessible via manhole covers. The total distance between SWMU 21 and the outlet to the ditch is approximately 1500 feet (based on storm sewer maps provided to CH2M HILL). Sediments that were removed from the ditch were either disposed of off site at a landfill or were spread in low areas in other sites at NAS Oceana. However, based on the fact that all PCBs were undetected in the eleven soil samples and mean concentrations (based upon reporting limits) were all below screening values, it is not believed that any PCBs that may have traveled from these soils through the 1500 feet of piping to the ditch would be at levels that would be a concern. Surface runoff from the site is directed into this storm sewer pipe. Shallow soils are silts and sandy silts.

8.1.2 Summary of Available Analytical Data

As stated in Section 1.0, SWMU 21 was identified as requiring no further action for ecological consideration under the previous RCRA investigations. However, as part of an agreement between the Navy and the EPA, this ERA at SWMU 21 has been conducted utilizing as much of the previous RCRA investigation data as feasible. Therefore, there may be differences in the classes of chemicals analyzed for in the various site media. These differences were considered in the development of a sampling plan to collect new data for significant data gaps and the effects of which are addressed in the uncertainties section.

The data used in this ERA were obtained from the Phase I and Phase III RFIs. Data that were used are summarized in Table 8-1 and are contained in Appendix A. Figure 8-1 shows the locations of all samples used in the ERA.

The Phase I RFI soil investigation determined that PCBs were not detected in the ten shallow (0.5 to 1 foot) soil samples collected in the two gravel areas. Six samples were taken from the soils in the gravel area near the parking lot and four samples were taken from the soils in the gravel area near the fence. Detection limits for PCBs range from 21 to 460 μg/kg. The two soil samples that were analyzed for TPH (both from the gravel area near the parking lot) did contain petroleum hydrocarbons (91,000 and 242,000 μg/kg). No groundwater sampling was performed.

The Phase III RFI field activities involved the collection of two shallow soil samples (0.5 to 1 feet) taken to confirm the results of the Phase I RFI soil sampling. A third sample (0.0 to 0.5 feet) was collected from the drainage feature located in the southern corner of the SWMU. All samples were analyzed for SVOCs. In addition, the third sample was analyzed for PCBs. Some PAHs were detected in all three samples (50 to 1,200 μg/kg). No PCBs were detected in the third sample at a detection limit of 42 μg/kg.

At the time that the samples were collected, there was a layer of gravel across the sampling area. It determined that a more representative analytical result could be attained if the soils under the gravel layer were collected. Therefore, rather than collect from the top 6 inches of substrate which was primarily gravel, the second 6 inches of substrate which consists of the surface soils were collected.

8.1.3 Preliminary Conceptual Model

The preliminary conceptual model for SWMU 21 is shown on Figure 8-2.

8.1.3.1 Exposure Pathways

At SWMU 21, transformers containing PCBs were stored and potentially leaked, thereby contaminating surface soils. Surface drainage across the SWMU is towards the southeast into a storm sewer pipe. There are no known areas of groundwater discharge to surface water within the vicinity of this SWMU. The only habitat at SWMU 21 consists of a small area of bare, hard packed dirt and gravel with a small amount of vegetation. The vegetation consists of some low, sparse groundcover , grass, and Japanese honeysuckle. Ecological receptors utilizing this habitat can potentially be exposed to chemicals in the surface soil via direct exposure pathways (including ingestion and direct contact) or via food-chain transfer of chemicals that bioaccumulate.

8.1.3.2 Endpoints and Risk Hypotheses

Preliminary assessment endpoints, risk hypotheses, and measurement endpoints (Table 8-2) are developed for SWMU 21 based on the preliminary conceptual model (Figure 8-2) and the complete exposure pathways identified therein. These endpoints/hypotheses were selected from the generic set developed in Section 3.1.1.2. Table 8-2 also identifies specific receptor species or groups associated with each endpoint. These receptors are discussed in more detail in Section 8.3.1.

8.2 Screening-Level Effects Evaluation

The purpose of the screening-level effects evaluation is to establish chemical exposure levels (screening values) that represent conservative thresholds for adverse ecological effects. The medium-specific screening values developed in Section 3.2.1 and Table 3-2 for surface soil are used in this section to evaluate the maximum concentrations in surface soils at SWMU 21. The relevant chemical-specific screening values are shown in Table 8-3 (surface soil). Ingestion screening values for dietary exposures to upper trophic level receptors via the food web are discussed in Section 8.3.3.

8.3 Screening-Level Exposure Estimate

Maximum concentrations in surface soil were used to conservatively estimate potential chemical exposures for ecological receptors at SWMU 21. For conservatism, the maximum measured value for chemicals that were analyzed for, but not detected, was also compared to medium-specific screening values (see Section 3.3).

Exposures for upper trophic level receptor species via the food web were determined by estimating the chemical-specific concentrations in each dietary component using uptake and food web models (see Section 3.3.3). Incidental ingestion of soil was also included when calculating the total level of exposure. Maximum surface soil concentrations were used in all calculations to provide a conservative assessment.

8.3.1 Selection of Receptor Species

Receptor species used in the SWMU 21 evaluation are identified in Table 8-2. These species or species groups were selected based on complete exposure pathways identified in the conceptual model, the specific habitats present on the site, the biota known or likely to occur on the site (see Section 2), and the selected assessment endpoints. The general criteria for receptor selection were identified in Section 3.3.2. Receptor profiles are provided in Appendix B.

8.3.2 Exposure Estimation

Upper trophic level receptor exposures to chemicals in surface soil were determined by estimating the concentration of each chemical in each relevant dietary component. Incidental ingestion of soil was included when calculating the total exposure. Exposure via drinking water was not included in the food web model since the SWMU does not contain a drinking source.

8.3.2.1 Exposure Point Concentrations

Maximum measured media concentrations are used as exposure point concentrations for exposure estimation and food web modeling. Dietary concentrations (concentrations in plants and soil invertebrates that are eaten) for terrestrial consumers were estimated using bioaccumulation models and maximum measured media concentrations. The methodology and models used to derive these estimates are described in Section 3.3.3.1.

8.3.2.2 Dietary Intakes

Dietary intakes were calculated for each upper trophic level receptor species using the methods discussed in Section 3.3.3.2.

8.3.3 Ingestion Screening Values

Ingestion screening values for birds were developed in Section 3.3.4 and are summarized in Table 3-4.

8.4 Screening-Level Risk Calculation

The screening-level risk calculation for SWMU 21 compares the maximum exposure concentrations in site surface soil, and the maximum exposure doses for the upper trophic level receptor species, with the corresponding screening values to derive screening risk estimates using the hazard quotient (HQ) method (see Section 3.4). Chemicals with HQs greater than or equal to 1.0 are retained as Chemicals of Potential Concern (COPCs) in the SERA.

8.4.1 Selection of Chemicals of Potential Concern (COPCs)

8.4.1.1 Surface Soil

Maximum surface soil concentrations are compared to screening values in Table 8-3. Based on this comparison, seven undetected PCBs have HQs exceeding one based on maximum reporting limits and are identified as COPCs.

Sixteen undetected SVOCs exceeded their screening values based on maximum detection limits and were retained as COPCs. Twenty-seven additional SVOCs (plus TPH) were retained as COPCs because screening values were not available (Table 8-3). Of these 28 SVOCS, only bis(2-ethylhexyl)phthalate and TPH was actually detected. No SVOC was retained as a COPC based on a detected concentration.

8.4.1.2 Food Web Exposures

Maximum exposure doses for each receptor species are compared to ingestion screening values in Table 8-4. Based on a comparison to NOAELs, seven PCB Aroclors and one SVOC (hexachlorobenzene) had HQs exceeding one for one or more receptors.

8.4.2 Fate and Transport Mechanisms of the COPCs

The fate and transport mechanisms of the COPCs are discussed in Section 3.4.2 and described in Appendix C.

8.4.3 Mechanisms of Toxicity for the COPCs

The mechanisms of toxicity for the COPCs are described in Appendix C.

8.5 Screening-Level Risk Conclusions

COPCs were identified in the preliminary screening of surface soils at SWMU 21. These COPCs are summarized in Table 8-5. In surface soils, no chemicals had HQs exceeding one based on detected values. Of the 23 chemicals that had HQs exceeding one based on maximum reporting limits, none were greater than five.

Maximum NOAEL HQs from food web exposures for pesticides were all less than five. All seven chemicals were undetected in the soils and HQs are based on maximum reporting limits.

In summary, potential ecological risks based on observed surface soil concentrations are very low at SWMU 21. However, since one or more COPCs were identified in this media during the screening process, additional evaluation in Step 3 is recommended for this site for surface soils.

8.6 Refined (Step 3A) Risk Characterization

Based on the results of the SERA, the assessment endpoints, measurement endpoints, and risk hypotheses have been modified for the Step 3A evaluation (Table 8-6). Modifications include dropping assessment endpoints for which no unacceptable risk (as defined by no HQs equal to or greater than one) was found during the SERA and modifying the measurement endpoints to reflect the assumptions and methods used in the Step 3A evaluation (see Section 3.5).

Refined medium-specific screenings for surface soil are presented in Table 8-7. Receptor species HQs associated with Step 3A food chain modeling are provided in Table 8-8. Results of the recalculation of risk estimates are discussed below.

8.6.1 Surface Soil

Mean concentrations of surface soil COPCs identified in the SERA are compared to screening values in Table 8-7. No PCBs were detected in site surface soil samples. The mean concentration of the all PCB Aroclors (based on reporting limits) are below screening values. Only one SVOC, bis(2-ethylhexyl)phthalate, was detected. However, there is no screening value for this chemical. Bis(2-ethylhexyl)phthalate is a common laboratory contaminant and is not considered to be a COPC at SWMU 21. All other SVOCs were not detected and are therefore not considered to be COPCs.

8.6.2 Food Web Exposures

All NOAEL and LOAEL HQs for the killdeer were below one for all chemicals modeled.

8.7 Risk Evaluation

Based on the results of the refined medium-specific screenings, no detected chemicals exceeded soil screening values. The only chemical that was detected at SWMU 21 is a common laboratory contaminant and is not considered to be a COPC. In addition, all NOAEL and LOAEL values were below one for the killdeer, which is the only receptor expected to utilize the habitat at SWMU 21.

8.8 Risk Conclusions

Conclusions drawn from the above analyses are:

Surface Soil

- No PCBs were detected in the surface soil samples. Mean concentrations of the PCB Aroclors (based on reporting limits) were below the screening values.
- Only one SVOC, bis(2-ethylhexyl)phthalate, was detected. However, there is no screening value for this chemical.

Based upon the above lines of evidence, it is unlikely that COPC concentrations in surface soil pose a site-related ecological risk. This conclusion is qualified for bis(2-ethylhexyl)phthalate for which no screening values were available. The potential for risk for this chemical remains unknown. However, it is not considered a site-related chemical.

Food Web

- All NOAEL and LOAEL HQs for the killdeer were below one for all chemicals modeled.

Based upon the lines of evidence, potential risks to terrestrial organisms utilizing the limited habitats present on SWMU 21 are expected to be negligible. In conclusion, further evaluation of SWMU 21 is not recommended and there is adequate information to conclude no need for remediation.

9.0 SWMU 22 – Construction Debris Landfill

SWMU 22 is approximately 600 to 1,000 feet west of Oceana Boulevard and 1,500 feet north of the VACAPES complex (Figure 1-1). The landfill is an approximately 0.5-acre unlined facility that was in use at the time of the VSI. No release controls were observed (USEPA, 1988). The age of the landfill is unknown, but it was first discovered in 1986 (USEPA, 1988). The former permit status of this landfill is not known. Although the Navy designated and permitted this landfill for construction debris, controls on the landfill's waste stream did not prevent the disposal of other types of waste. Essentially only surface dumping occurred at this SWMU and was confined to inert objects such as major appliances, furniture, and aircraft components. These objects have been removed and the area replanted as part of ecological restoration activities being conducted on the base. There have been no documented releases from this site.

9.1 Screening-Level Problem Formulation

As described in Section 3.1, in the screening-level problem formulation: (1) the environmental setting of a site is characterized in terms of the habitats and biota known or likely to be present; (2) the types and concentrations of chemicals that are present in ecologically relevant media are characterized; (3) a conceptual model is developed for the site that describes potential sources, potential transport pathways, potential exposure pathways and routes, and potential receptors; and (4) assessment endpoints, measurement endpoints, and risk hypotheses are selected to evaluate those receptors for which complete and potentially significant exposure pathways are likely to exist. These components of the problem formulation are developed for SWMU 22 in this section. In addition, the fate, transport, and toxicological properties of the chemicals present at a site are also considered during the problem formulation process (see Sections 9.4.2 and 9.4.3).

9.1.1 Environmental Setting

SWMU 22 is bounded by Oceana Boulevard to the east, a drainage ditch to the north, and an access road to the southwest (Figure 9-1). The plant community in this area is dominated by scrubby vegetation adapted to sandy, nutrient poor soils, including loblolly pine, glasswort species (*Salicornia* sp.), grasses, waxmyrtle (*Myrica cerifera*), and long-leaf pine (*Pinus palustris*). The ditch which runs along the northern boundary of the SWMU flows northeast and is not tidally influenced. Bottom sediments in the ditch were sandy. The deep depressional area in the main terminal loop of the road contains disturbed clayey soils, and little vegetation has become established. Vegetation includes path rush (*Juncus tenuis*), bluestem (*Andropogon* sp.), and stunted specimens of waxmyrtle, pine, and several weedy species. The site provides potential habitat for a variety of wildlife and aquatic species due to its proximity to water and cover. Near-surface geology consists of a 5- to 10-foot thick layer of sandy silts and clay that is underlain by a 12- to 17-foot thick layer of clean sands with fine to coarse grains.

9.1.2 Summary of Available Analytical Data

As stated in Section 1.0, SWMU 22 was identified as requiring no further action for ecological consideration under the previous RCRA investigations. However, as part of an agreement between the Navy and the EPA, this ERA at SWMU 22 has been conducted utilizing as much of the previous RCRA investigation data as feasible. Therefore, there may be differences in the classes of chemicals analyzed for in the various site media. These differences were considered in the development of a sampling plan to collect new data for significant data gaps and the effects of which are addressed in the uncertainties section.

Available data for SWMU 22 include historical groundwater, surface water, and sediment data collected during the Phase I RFI, and surface soil samples collected in December 1999 for use in the ERA. Figure 9-1 shows the locations of the samples used in the ERA. Data that were used are summarized in Tables 9-1 through 9-4 and are contained in Appendix A. Total organic carbon and grain size measurements were not collected for the sediment samples.

The Phase I RFI (CH2M HILL, 1993) investigated potential groundwater, surface water, and sediment contamination. Groundwater samples contained no pesticides, PCBs, herbicides, or dioxins/furans. Four common organic laboratory contaminants and some metals were found in the groundwater at low concentrations. A duplicate sediment sample contained low levels of VOCs, and four pesticide compounds were detected at low concentrations in all of the sediment samples. No pesticides were detected in the surface water. Metals were detected in the sediment and surface water, with concentrations generally higher in the downstream sediment sample relative to the upstream sediment sample. No further investigation for human health concerns was recommended because significant contamination was not found. Three surface soil samples were collected in December 1999. Metals, pesticides, PCBs, SVOCs, and two VOCs were detected in the surface soil samples.

9.1.3 Preliminary Conceptual Model

The preliminary conceptual model for SWMU 22 is shown on Figure 9-2.

9.1.3.1 Exposure Pathways

SWMU 22 is an unlined landfill where construction debris and unknown wastes were disposed of. Precipitation leaching through the wastes to the water table may have transported contaminants to the groundwater. Groundwater level measurements show that groundwater flow is north or northwest towards a large drainage ditch. Groundwater discharge to the ditch may be contributing to surface water and sediment contamination. Surface water runoff from the exposed waste during periods of heavy precipitation may transport contaminants to downgradient surface soils, surface water, and sediment. Ecological receptors utilizing these habitats can be exposed to chemicals in surface soil, surface sediment, and surface water via direct exposure pathways (including ingestion and direct contact) or via food-chain transfer of chemicals that bioaccumulate.

9.1.3.2 Endpoints and Risk Hypotheses

Preliminary assessment endpoints, risk hypotheses, and measurement endpoints (Table 9-5) are developed for SWMU 22 based on the preliminary conceptual model (Figure 9-2) and the complete exposure pathways identified therein. These endpoints/hypotheses were selected from the generic set developed in Section 3.1.1.2. Table 9-5 also identifies specific receptor species or groups associated with each endpoint. These receptors are discussed in more detail in Section 9.3.1.

9.2 Screening-Level Effects Evaluation

The purpose of the screening-level effects evaluation is to establish chemical exposure levels (screening values) that represent conservative thresholds for adverse ecological effects. The medium-specific screening values developed in Section 3.2.1 and Table 3-2 for fresh surface water (also applied to groundwater), freshwater sediment, and surface soil are used in this section to evaluate the maximum concentrations in these media at SWMU 22. The relevant chemical-specific screening values are shown in Tables 9-6 (groundwater), 9-7 (surface water), 9-8 (sediment), and 9-9 (surface soil). Ingestion screening values for dietary exposures to upper trophic level receptors via the food web are discussed in Section 9.3.3.

9.3 Screening-Level Exposure Estimate

Maximum concentrations in groundwater, surface water, sediment, and surface soil were used to conservatively estimate potential chemical exposures for ecological receptors at SWMU 22. For conservatism, the maximum measured value for chemicals that were analyzed for, but not detected, was also compared to medium-specific screening values (see Section 3.3). Also for conservatism, no dilution factors were applied to the maximum groundwater concentrations.

Exposures for upper trophic level receptor species via the food web were determined by estimating the chemical-specific concentrations in each dietary component using uptake and food web models (see Section 3.3.3). Incidental ingestion of soil or sediment was also included when calculating the total level of exposure, as was direct ingestion of surface water. Maximum surface soil, sediment, and/or surface water concentrations were used in all calculations to provide a conservative assessment.

9.3.1 Selection of Receptor Species

Receptor species used in the SWMU 22 evaluation are identified in Table 9-5. These species or species groups were selected based on complete exposure pathways identified in the conceptual model, the specific habitats present on the site, the biota known or likely to occur on the site (see Section 2), and the selected assessment endpoints. The general criteria for receptor selection were identified in Section 3.3.2. Receptor profiles are provided in Appendix B.

9.3.2 Exposure Estimation

Upper trophic level receptor exposures to chemicals in surface soil, surface water, and sediment were determined by estimating the concentration of each chemical in each relevant dietary component. Incidental ingestion of soil or sediment was included when calculating the total exposure. Exposure via drinking water was included in the food web model since SWMU 22 contains a potential freshwater drinking source. Since receptors (and their prey) are not exposed directly to groundwater, food web exposures were not calculated using groundwater data.

9.3.2.1 Exposure Point Concentrations

Maximum measured media concentrations are used as exposure point concentrations for exposure estimation and food web modeling. Dietary concentrations (concentrations in plants, soil invertebrates, small mammals, fish, and aquatic invertebrates that are eaten) for terrestrial and aquatic consumers were estimated using bioaccumulation models and maximum measured media concentrations. The methodology and models used to derive these estimates are described in Section 3.3.3.1.

9.3.2.2 Dietary Intakes

Dietary intakes were calculated for each upper trophic level receptor species using the methods discussed in Section 3.3.3.2.

9.3.3 Ingestion Screening Values

Ingestion screening values for mammals and birds were developed in Section 3.3.4 and are summarized in Tables 3-3 and 3-4, respectively.

9.4 Screening-Level Risk Calculation

The screening-level risk calculation for SWMU 22 compares the maximum exposure concentrations in site groundwater, surface water, sediment, and surface soil, and the maximum exposure doses for the upper trophic level receptor species, with the corresponding screening values to derive screening risk estimates using the hazard quotient (HQ) method (see Section 3.4). Chemicals with HQs greater than or equal to 1.0 are retained as Chemicals of Potential Concern (COPCs) in the SERA.

9.4.1 Selection of Chemicals of Potential Concern (COPCs)

9.4.1.1 Groundwater

Maximum groundwater concentrations are compared to screening values for groundwater in Table 9-6. Based on this comparison, three metals had HQs exceeding one based on detected concentrations, three undetected metals had HQs that exceed one based on the maximum reporting limit, and barium was not detected but lacked a reporting limit. These seven chemicals were retained as COPCs.

No PCBs or pesticides were detected in groundwater. Six undetected PCBs and eight undetected pesticides had HQs exceeding one based on maximum reporting limits and were retained as COPCs (Table 9-6).

No SVOCs were detected in groundwater. Thirteen undetected SVOCs had HQs exceeding one based on maximum reporting limits and were retained as COPCs. Twenty-two undetected SVOCs were retained as COPCs because screening values were not available (Table 9-6).

One undetected VOC (carbon disulfide) had a HQ exceeding one based on the maximum reporting limit and one undetected VOC (methylene chloride) lacked a reporting limit. These two VOCs were retained as COPCs. Six undetected VOCs are retained as COPCs because screening values were not available (Table 9-6). No detected VOCs were retained as COPCs.

9.4.1.2 Surface Water

Maximum surface water concentrations are compared to screening values for fresh surface water in Table 9-7. Based on this comparison, one inorganic chemical (iron) had a HQ exceeding one (3.91) based on a maximum detected value. Six undetected inorganic chemicals (aluminum, barium, cadmium, lead, silver, and zinc) have HQs exceeding one based on maximum reporting limits or lacked reporting limits. These seven metals were retained as COPCs (Table 9-7).

PCBs and pesticides were not detected in surface water samples (Table 9-7). Six undetected PCBs and eight undetected pesticides had HQs exceeding one based on maximum reporting limits. These 14 chemicals were retained as COPCs (Table 9-7).

Except for acetone, VOCs were also not detected in surface water samples. One undetected VOC (carbon disulfide) had a HQ exceeding one based on maximum reporting limits and was retained as a COPC. Six additional undetected VOCs are retained as COPCs because screening values or reporting limits were not available (Table 9-7).

9.4.1.3 Sediment

Maximum sediment concentrations are compared to screening values for sediment in Table 9-8. Based on this comparison, two undetected inorganic chemicals (thallium and beryllium) were retained as COPCs because screening values are not available. Four undetected inorganic chemicals (arsenic, barium, mercury, and vanadium) were retained as COPCs because no reporting limits were available to compare with screening values. No inorganic was retained as a COPC based on a detected concentration.

Two undetected pesticides and five undetected PCBs had HQs exceeding one based on maximum reporting limits and were retained as COPCs. Seven additional undetected pesticides were retained as COPCs because screening values were not available (Table 9-8). No detected PCBs or pesticides were retained as COPCs.

9.4.1.4 Surface Soil

Maximum surface soil concentrations are compared to soil screening values in Table 9-9. Based on this comparison, five inorganic chemicals (aluminum, chromium, cyanide, iron, and vanadium) had HQs that exceeded one based on detected concentrations. Two undetected inorganic chemicals (antimony and thallium) had HQs that exceeded one based on maximum reporting limits. These seven chemicals are retained as COPCs (Table 9-9).

Five undetected pesticides (endosulfan I, endosulfan II, endosulfan sulfate, heptachlor, and toxaphene) and ten VOCs were retained as COPCs because screening values were not available (Table 9-9). No detected PCBs, pesticides, or VOCs were retained as COPCs.

One SVOC (fluoranthene) had a HQ that exceeded one based on a detected concentration; the HQ was 1.20 (Table 9-9). Seven SVOCs had HQs that exceeded one based on maximum reporting limits. These eight chemicals were retained as COPCs. Twenty-eight additional SVOCs (27 of which were not detected) were retained as COPCs because screening values were not available (Table 9-9).

9.4.1.5 Food Web Exposures

Maximum exposure doses for each receptor species are compared to ingestion screening values in Table 9-10. Based on a comparison to NOAELs, eight inorganic chemicals have HQs exceeding one based on maximum detected concentrations, and four inorganic chemicals have HQs exceeding one based on maximum reporting limit ranges. These twelve chemicals are being retained as COPCs (Table 9-10).

Five PCBs (Aroclor-1221, 1232, 1242, 1248, and 1254) have HQs exceeding one based on maximum reporting limits and are retained as COPCs. Five organic chemicals are retained as COPCs because no ingestion screening values are available (Table 9-10).

9.4.2 Fate and Transport Mechanisms of the COPCs

The fate and transport mechanisms of the COPCs are discussed in Section 3.4.2 and described in Appendix C.

9.4.3 Mechanisms of Toxicity for the COPCs

The mechanisms of toxicity for the COPCs are described in Appendix C.

9.5 Screening-Level Risk Conclusions

COPCs were identified in each medium evaluated. These COPCs are summarized in Table 9-11. In groundwater, only three inorganic chemicals (aluminum, iron, and manganese) exceeded their screening values based on detected concentrations. Their HQs were 8.64, 29.2, and 2.53, respectively. Buchman (1999) recommends the use of a dilution factor of 10 in a SERA to account for the dilution expected during migration and upon discharge of groundwater to surface water in the absence of site-specific dilution factors. If such a dilution factor were to be applied, only iron would be retained. Similarly, of the thirty-three non-detected COPCs that were retained based on maximum reporting limits, only ten would be retained if a dilution factor of 10 were to be applied.

In surface water, only iron (HQ of 3.34) was retained as a COPC based on the maximum detected concentration. In surface sediments, no chemicals were retained as COPCs based on detected concentrations. In surface soils, five inorganic chemicals and one organic chemical were retained as COPCs based on detected concentrations. Only aluminum and antimony had a NOAEL HQ greater than 10. Only five PCBs NOAEL HQs were greater than or equal to 1.0 (1.12 to 2.28).

In summary, potential ecological risks based on observed groundwater, surface water, surface sediment, and surface soil concentrations may exist at SWMU 22. Since one or more COPCs were identified in each medium evaluated during the screening process, additional evaluation in Step 3 is recommended for this site.

9.6 Refined (Step 3A) Risk Characterization

Based on the results of the SERA, the assessment endpoints, measurement endpoints, and risk hypotheses have been modified for the Step 3A evaluation (Table 9-12). Modifications include dropping assessment endpoints for which no unacceptable risk (as defined by no HQs equal to or greater than one) was found during the SERA and modifying the measurement endpoints to reflect the assumptions and methods used in the Step 3A evaluation (see Section 3.5).

Refined medium-specific screenings for groundwater, surface water, sediment, and surface soil are presented in Tables 9-13 through 9-16, respectively. Receptor species HQs associated with Step 3A food chain modeling are provided in Table 9-17. Results of the recalculation of risk estimates are discussed by media type below.

9.6.1 Groundwater

Mean concentrations of the groundwater COPCs identified in the SERA are compared to screening values in Table 9-13. Three inorganic compounds (aluminum, iron, and manganese) exceeded screening values based on mean concentrations. Mean hazard quotients were 4.80 19.9, and 1.76, respectively. No organic compounds exceeded screening values based on mean detected concentrations.

9.6.2 Surface Water

Mean concentrations of the surface water COPCs identified in the SERA are compared to screening values in Table 9-14. One inorganic compound (iron; HQ of 3.63) exceeded its screening value based on a mean concentration. None of the PCB, pesticide, or VOC COPCs from the SERA were detected in surface water.

9.6.3 Sediment

Mean concentrations of the sediment COPCs identified in the SERA are compared to screening values in Table 9-15. All inorganic COPCs (none of which were detected) were below screening values based on mean concentrations (reporting limits). Similarly, none of the PCB or pesticide COPCs from the SERA were detected.

9.6.4 Surface Soil

Mean concentrations of the surface soil COPCs identified in the SERA are compared to screening values in Table 9-16. Four inorganic compounds (aluminum, chromium, iron, and vanadium) exceeded screening values based on mean detected concentrations. Mean HQs were 273, 42.5, 28.0, and 9.17, respectively. One organic compound (fluoranthene; HQ of 1.14) exceeded its screening value based on a mean detected concentration. Potential for risk is unknown for two detected SVOCs because no screening values were available.

9.6.5 Food Web Exposures

Mean exposure doses for each receptor species are compared to ingestion screening values in Table 9-17. HQs for the short-tailed shrew (based on NOAELs) exceeded one for aluminum (10.87), iron (1.60), and vanadium (1.26); HQs based on LOAELs were less than one except for aluminum (1.09). HQs for the meadow vole (based on NOAELs) was 1.0 for aluminum; HQs based on LOAELs were less than one. HQs for the mink (based on NOAELs) exceeded one for iron (1.22); HQs based on LOAELs were less than one. HQs for the marsh wren (based on NOAELs) exceeded one for iron (4.11); HQs based on LOAELs were less than one. HQs for the great blue heron (based on NOAELs) exceeded one for aluminum (2.24), iron 3.27), and mercury (2.24); HQs based on LOAELs were less than one.

9.7 Risk Evaluation

The potential for adverse effects associated with the COPCs identified in Section 9.6 and Table 9-18 are evaluated in this section.

9.7.1 Groundwater

Three metals exceeded screening values based upon a detected concentration in undiluted and unfiltered groundwater samples. HQs for aluminum, iron, and manganese were 4.80 19.9, and 1.76, respectively. Based on contours, groundwater near SWMU 22 appears to flow directly into the drainage ditch at numerous points. Only iron exceeded screening values in surface water samples taken in the drainage ditch based on detected concentrations and the HQ was 3.34.

9.7.2 Aquatic Habitats

Aquatic habitats present within SWMU 22 consist of a small drainage ditch. Iron was the only chemical detected in ditch surface water that exceeded a screening value; the HQ was 3.63. When compared to the freshwater AWQC for iron, the HQ drops to 1.16. Given that this comparison is based on total (not the more bioavailable dissolved) iron, this marginal exceedence is not likely to be ecologically important.

No chemicals that were detected in sediment samples exceeded screening values based on mean concentrations. No chemicals exceeded ingestion-based screening values based on the LOAEL for aquatic upper trophic level receptors.

9.7.3 Terrestrial Habitats

Based on the results of the refined medium-specific screenings, four inorganic compounds and one organic compound exceeded screening values in surface soils. The short-tailed shrew has one LOAEL HQ that exceeds one (1.09) for aluminum. To evaluate the potential significance of these exceedences, on-site soil concentrations are compared to background surface soil concentrations developed as part of the SWMU 15 Biopile ecological evaluation (CH2M HILL, 2000d). Based on this evaluation (Table 9-19), only chromium exceeded background surface soil concentrations based on maximum concentrations. However, chromium did not have any ingestion-based exceedences based on NOAEL or LOAEL HQs. In addition, chromium has low bioavailability in soils. Thus, risks to terrestrial receptors are considered negligible.

9.8 Risk Conclusions

Conclusions drawn from the above analyses are:

Groundwater

- Three metals (aluminum, iron, and manganese) exceeded screening values (mean HQs were 4.80 19.9, and 1.76, respectively).
- Based on contours, groundwater near SWMU 22 appears to flow directly into the drainage ditch at numerous points, where iron was the only detected chemical in the surface water that exceeded the screening values.
- Based upon the above lines of evidence, it is unlikely that COPC concentrations in groundwater, with the exception of iron, pose a site-related ecological risk when discharging into surface water. Discharges of iron, as discussed below, are not likely result in ecological risk in the surface water or sediments, where the point of ecological exposure exists.

Surface Water

- Only iron exceeded screening values, with a mean HQ of 3.34 (exceeded in each sample).
- The surface water samples were unfiltered and thus the HQ is based on total (not the more bioavailable dissolved) iron.

Based upon the above lines of evidence, it is unlikely that COPC concentrations in surface water pose a site-related ecological risk.

Sediment

- No chemicals that were detected in the sediment samples exceeded the screening values.
- Sediment samples were collected in the ditch. This section of the ditch has sandy sediments. It is possible that depositional areas exist downstream that were not sampled. However, because minimal contamination was found in surface soil at the site, the chance of significant contamination in any portion of the ditch (even downgradient) is expected to be low.

Based upon the above lines of evidence, it is unlikely that COPC concentrations in sediment pose a site-related ecological risk.

Surface Soils

- Based on mean concentrations, four inorganic compounds (aluminum, chromium, iron, and vanadium) exceeded screening values in surface soils. The concentration of each metal exceeded the screening value in each sample. However, only chromium exceeded the maximum background concentration, suggesting that the concentrations of the remaining three metals cannot be differentiated from background. Chromium did not have any ingestion-based exceedences based on NOAEL or LOAEL HQs. In addition, chromium has low bioavailability in soils. Therefore, it is expected that it is unlikely that metals pose a site-related risk to soil invertebrate and plant communities. It is also unlikely that any contamination from soils migrated to surface water or sediments in the ditch due to these low concentrations present in the soils.

- One other inorganic chemical (cyanide) exceeded its screening value in one of the soil samples (SS-03), thus indicating a potential isolated risk to soil invertebrate and plant communities in the vicinity of this sampling location.
- The mean concentration of one VOC, fluoranthene, exceeded its screening value (HQ of 1.1).
- Two SVOCs were detected (1-methylnaphthalene and 2-methylnaphthalene) for which no screening values were available.
- Based upon the above lines of evidence, it is unlikely that COPC concentrations in surface soils pose a site-related ecological risk across the site. There are a few isolated locations where limited numbers of individual organisms could be affected. This conclusion is qualified for the two COPCs for which no screening values were available. The potential for these chemicals to be present at concentrations that could adversely affect ecological receptors is unknown and is not able to be evaluated due to the lack of screening values.

Food Web

- No chemicals exceeded ingestion-based screening values based on the LOAEL for aquatic upper trophic level receptors.
- The short-tailed shrew has one LOAEL HQ that exceeds one (1.09) for aluminum.

Based upon the lines of evidence above, there is little potential for site-related ecological risk to upper trophic level receptors. In conclusion, further evaluation of SWMU 22 is not recommended and there is adequate information to conclude no need for remediation.

10.0 SWMU 26 – Fire Extinguisher Training Area, Building 220

SWMU 26 consisted of partially buried drum or small tank with the top removed that measured 3-feet wide by 4-feet high and was inset approximately 3 feet below grade (Figure 1-1). The tank formed a burn pit that was used for fire extinguisher training. The tank was located southeast of Building 220, the air station's fire station. Petroleum oil lubricant (POL) and fuel-soaked objects were placed in the pit and were ignited. Burn residue and water were periodically pumped out of the tank to the adjacent mowed depression or swale. This swale is a low, graded, mowed area between two parking lots where storm water collects and percolates into the groundwater, but does not connect to a drainage system or a surface water body. During the VSI, inspectors observed soil staining that extended to the adjacent swale. The burn pit had no release controls at the time of the VSI (USEPA, 1988). The tank has been removed and the area has been returned to grade in or before 1990.

10.1 Screening-Level Problem Formulation

As described in Section 3.1, in the screening-level problem formulation: (1) the environmental setting of a site is characterized in terms of the habitats and biota known or likely to be present; (2) the types and concentrations of chemicals that are present in ecologically relevant media are characterized; (3) a conceptual model is developed for the site that describes potential sources, potential transport pathways, potential exposure pathways and routes, and potential receptors; and (4) assessment endpoints, measurement endpoints, and risk hypotheses are selected to evaluate those receptors for which complete and potentially significant exposure pathways are likely to exist. These components of the problem formulation are developed for SWMU 26 in this section. In addition, the fate, transport, and toxicological properties of the chemicals present at a site are also considered during the problem formulation process (see Sections 10.4.2 and 10.4.3).

10.1.1 Environmental Setting

SWMU 26 includes the former burn pit area and a small grassy mowed swale (Figure 10-1). There is no vegetation other than mowed grass. A steam pipeline traverses the southern corner of the SWMU. Aside from the slight southeasterly slope from the former pit to the swale, the site is flat. The surface soils are sandy silts underlain by silty sands.

10.1.2 Summary of Available Analytical Data

As stated in Section 1.0, SWMU 26 was identified as requiring no further action for ecological consideration under the previous RCRA investigations. However, as part of an agreement between the Navy and the EPA, this ERA at SWMU 26 has been conducted utilizing as much of the previous RCRA investigation data as feasible. Therefore, there may be differences in the classes of chemicals analyzed for in the various site media. These differences were considered in the development of a sampling plan to collect new data for significant data gaps and the effects of which are addressed in the uncertainties section.

Phase I RFI (CH2M HILL, 1993) studies of subsurface soils revealed that soils contained TPH, PAHs, VOCs, and metals. No groundwater samples were taken. No further action for protection of human health at the site was recommended in the Phase I RFI. Only TPH was detected at levels which (slightly) exceeded human health guidelines and there was no transport to surface water bodies via surface runoff.

Phase III RFI (CH2M HILL, 1999b) studies included subsurface soil sampling in order to identify any subsurface petroleum contamination which may have resulted from the spillage of flammable liquids used during fire-fighting training activities. Three subsurface soil samples were taken around the tank and in the base of the ditch, and analyzed for BTEX and PAHs. Only acetone and methylene chloride were detected in the subsurface soils.

Three surface soil samples were taken during December 1999 in the swale and analyzed for VOCs, SVOCs, pesticides, PCBs, and metals. Metals, pesticides, SVOCs, and VOCs were detected in these soil samples, while PCBs were not.

Only data from the December 1999 sampling were used in the ERA since these data are more recent and focus on the surface strata. These data are summarized in Table 10-1 and are contained in Appendix A. Figure 10-1 shows the locations of the samples used in the ERA.

10.1.3 Preliminary Conceptual Model

The preliminary conceptual model for SWMU 26 is shown on Figure 10-2.

10.1.3.1 Exposure Pathways

At SWMU 26, firefighters were trained to extinguish fires by putting POL and fuel-soaked objects in a buried tank in the ground and igniting them. Habitat at this SWMU is limited to a mowed grassy swale. There are no outlets from the swale to any other areas. The grassy swale is surrounded by pavement. Burn residue and water from the tank were occasionally pumped from the tank into the adjacent mowed swale where it was allowed to seep into the ground. There are no known areas of groundwater discharge to surface water on or near this SWMU. Ecological receptors can be exposed to chemicals in surface soils within this swale via direct exposure pathways (such as ingestion and direct contact) or via food-chain transfer of chemicals that bioaccumulate.

10.1.3.2 Endpoints and Risk Hypotheses

Preliminary assessment endpoints, risk hypotheses, and measurement endpoints (Table 10-2) are developed for SWMU 26 based on the preliminary conceptual model (Figure 10-2) and the complete exposure pathways identified therein. These endpoints/ hypotheses were selected from the generic set developed in Section 3.1.1.2. Table 10-2 also identifies specific receptor species or groups associated with each endpoint. These receptors are discussed in more detail in Section 10.3.1.

10.2 Screening-Level Effects Evaluation

The purpose of the screening-level effects evaluation is to establish chemical exposure levels (screening values) that represent conservative thresholds for adverse ecological effects. The medium-specific screening values developed in Section 3.2.1 and Table 3-2 for surface soil are used in this section to evaluate the maximum concentrations in these media at SWMU 26. The chemical-specific screening values for soils are shown in Table 10-3. Ingestion screening values for dietary exposures to upper trophic level receptors via the food web are discussed in Section 10.3.3.

10.3 Screening-Level Exposure Estimate

Maximum concentrations in surface soil were used to conservatively estimate potential chemical exposures for ecological receptors at SWMU 26. For conservatism, the maximum measured value for chemicals that were analyzed for, but not detected, was also compared to medium-specific screening values (see Section 3.3).

Exposures for upper trophic level receptor species via the food web were determined by estimating the chemical-specific concentrations in each dietary component using uptake and food web models (see Section 3.3.3). Incidental ingestion of soil was also included when calculating the total level of exposure. Direct ingestion of surface water was not included in the exposure estimates since the site lacks a drinking water source. Maximum surface soil concentrations were used in all calculations to provide a conservative assessment.

10.3.1 Selection of Receptor Species

Receptor species used in the SWMU 26 evaluation are identified in Table 10-2. These species or species groups were selected based on complete exposure pathways identified in the conceptual model, the specific habitats present on the site, the biota known or likely to occur on the site (see Section 2), and the selected assessment endpoints. The general criteria for receptor selection were identified in Section 3.3.2. Receptor profiles are provided in Appendix B.

10.3.2 Exposure Estimation

Upper trophic level receptor exposures to chemicals in surface soil were determined by estimating the concentration of each chemical in each relevant dietary component. Incidental ingestion of soil was included when calculating the total exposure. Exposure via drinking water was not included in the food web model since SWMU 26 does not contain a potential freshwater drinking source.

10.3.2.1 Exposure Point Concentrations

Maximum measured media concentrations are used as exposure point concentrations for exposure estimation and food web modeling. Dietary concentrations (concentrations in plants and soil invertebrates that are eaten) for terrestrial consumers were estimated using bioaccumulation models and maximum measured media concentrations. The methodology and models used to derive these estimates are described in Section 3.3.3.1.

10.3.2.2 Dietary Intakes

Dietary intakes were calculated for each upper trophic level receptor species using the methods discussed in Section 3.3.3.2.

10.3.3 Ingestion Screening Values

Ingestion screening values for birds were developed in Section 3.3.4 and are summarized in Table 3-4.

10.4 Screening-Level Risk Calculation

The screening-level risk calculation for SWMU 26 compares the maximum exposure concentrations in site surface soil, and the maximum exposure doses for the upper trophic level receptor species, with the corresponding screening values to derive screening risk estimates using the hazard quotient (HQ) method (see Section 3.4). Chemicals with HQs greater than or equal to 1.0 are retained as Chemicals of Potential Concern (COPCs) in the SERA.

10.4.1 Selection of Chemicals of Potential Concern (COPCs)

10.4.1.1 Surface Soil

Maximum surface soil concentrations are compared to screening values in Table 10-3. Based on this comparison, five inorganic chemicals (aluminum, chromium, iron, vanadium, and zinc) had HQs equal to or exceeding one based on detected values and were identified as COPCs. Two undetected inorganic chemicals (cyanide and thallium) exceeded screening values based on maximum reporting limits and were also retained as COPCs (Table 10-3).

Five SVOCs (all were PAHs) had HQs equal to or exceeding one based on detected values and were identified as COPCs. Sixteen undetected SVOCs exceeded screening values based on maximum reporting limits and were also retained as COPCs. Twenty-eight SVOCs (25 of which were undetected) were retained as COPCs because screening values were not available (Table 10-3).

Five pesticides and ten VOCs were retained as COPCs because screening values were not available. None of these 15 chemicals were detected. No detected PCBs, pesticides, or VOCs were retained as COPCs.

10.4.1.2 Food Web Exposures

Maximum exposure doses for each receptor species are compared to ingestion screening values in Table 10-4. Based on a comparison to NOAELs, five inorganic chemicals had HQs equal to or exceeding one for one or more receptors. These inorganic chemicals included aluminum, cadmium, chromium, lead, and zinc.

Among organic chemicals, HQs were equal to or exceeded one for one or more receptors for di-n-butylphthalate (1.33) and hexachlorobenzene (2.75). Twenty-five organic chemicals are included as COPCs because screening levels are not available.

10.4.2 Fate and Transport Mechanisms of the COPCs

The fate and transport mechanisms of the COPCs are discussed in Section 3.4.2 and described in Appendix C.

10.4.3 Mechanisms of Toxicity for the COPCs

The mechanisms of toxicity for the COPCs are described in Appendix C.

10.5 Screening-Level Risk Conclusions

COPCs were identified in each medium evaluated at SWMU 26. These COPCs are summarized in Table 10-5. In surface soils, five inorganic chemicals and five organic chemicals were retained as COPCs based on detected concentrations. Only three chemicals (aluminum, chromium, and iron) had HQs greater than 10. Maximum HQs from food web exposures for metals all had NOAEL HQs less than 10. Only two organic chemicals (di-n-butylphthalate and hexachlorobenzene) had NOAEL HQs greater than or equal to one and both were less than three.

In summary, potential ecological risks based on observed surface soil concentrations may exist at SWMU 22. Since one or more COPCs were identified in surface soils during the screening process, additional evaluation in Step 3 is recommended for this site.

10.6 Refined (Step 3A) Risk Characterization

Based on the results of the SERA, the assessment endpoints, measurement endpoints, and risk hypotheses have been modified for the Step 3A evaluation (Table 10-6). Modifications include dropping assessment endpoints for which no unacceptable risk (as defined by no HQs equal to or greater than one) was found during the SERA and modifying the measurement endpoints to reflect the assumptions and methods used in the Step 3A evaluation (see Section 3.5).

A refined medium-specific screening for surface soil is presented in Table 10-7. Receptor species HQs associated with Step 3A food chain modeling are provided in Table 10-8. Results of the recalculation of risk estimates are discussed below.

10.6.1 Surface Soil

Mean concentrations of the surface soil COPCs identified in the SERA are compared to screening values in Table 10-7. Four inorganic compounds (aluminum, chromium, iron, and vanadium) exceeded screening values based on mean concentrations. Mean hazard quotients were 397, 52.7, 27.6, and 12.3, respectively. Three PAHs (benzo(b)fluoranthene, fluoranthene, and pyrene) also exceeded screening values based on mean concentrations. Mean hazard quotients were 1.73, 2.51, and 2.10, respectively.

10.6.2 Food Web Exposures

All NOAEL and LOAEL HQs for the American robin were below one for all chemicals modeled.

10.7 Risk Evaluation

The potential for adverse effects associated with the COPCs identified in Section 10.6 and Table 10-9 are evaluated in this section.

10.7.1 Terrestrial Habitats

Terrestrial habitats at SWMU 26 are limited and consist of a mowed grassy swale, which was the past site of fire extinguisher training. Based on the results of the refined medium-specific screenings, four inorganic and three organic compounds exceeded screening values in surface soils. To evaluate the potential significance of these exceedences, on-site soil concentrations are compared to background surface soil concentrations developed as part of the SWMU 15 Biopile ecological evaluation (CH2M HILL 2000d). Based on this evaluation (Table 10-10), only chromium exceeded background surface soil concentrations based on maximum concentrations. However, chromium did not have any ingestion-based exceedences based on NOAEL or LOAEL HQs. In addition, chromium has low bioavailability in soils. All three PAHs exceeded background levels based on maximum concentrations. The mean HQs for the PAHs range from 1.7 to 2.5. Given the limited habitat present on this SWMU, this exceedence is not likely to be significant. In addition, total PAHs were summed for each surface soil sample and compared to the soil screening value (4,100 μg/kg) for total PAHs. In this comparison, each sample had a HQ below 1.0 (Table 10-11).

10.8 Risk Conclusions

Conclusions drawn from the above analyses are:

Surface Soils

- The mean concentrations of four metals (aluminum, chromium, iron, and vanadium) exceeded screening values (HQs of 397, 52.7, 27.6, and 12.3, respectively). Each of these metals was detected in all three of the soil samples. However, only chromium exceeded background surface soil concentrations, suggesting that the remaining three metals are not site related. Chromium did not have any ingestion-based exceedences based on NOAEL or LOAEL HQs. In addition, chromium has low bioavailability in soils. Therefore, it is expected that it is unlikely that metals pose a site-related risk to soil invertebrate and plant communities.

- One other metals (zinc) slightly exceeded the screening value (HQ of 1.3) in one of the three soil samples (SS-03). This exceedence suggests that a potential isolated risk to soil invertebrate and plant communities may exist in the vicinity of this sampling location.

- The mean concentrations of three PAHs (benzo(b)fluoranthene, fluoranthene, and pyrene) exceeded screening values (HQs of 1.73, 2.51, and 2.10, respectively). However, each was detected in only one of the three soil samples (SS-03) and two of the three PAHs (fluoranthene and pyrene) did not exceed background soil concentrations.

- Benzo(b)fluoranthene exceeded background levels (HQ of 1.73). Given the limited habitat present on this SWMU, this exceedence is not likely to pose a substantial risk to soil invertebrate or plant communities.

- Two other PAHs (benzo(g,h,i) perylene and chrysene) were detected in one sample (SS-03) at concentrations exceeding the screening values, but their mean concentrations did not exceed the screening values.
- There were three SVOCs detected (butylbenzylphthalate, carbazole, and bis(2-ethylhexyl)phthalate) for which screening values were not available.

Based upon the above lines of evidence, it is unlikely that COPC concentrations in surface soils pose a site-related ecological risk over the site. However, there may exist a slight risk to soil invertebrate and plant communities in the portion of the site near the vicinity of sampling location SS-03. This conclusion is qualified for the three COPCs for which no screening values were available. The potential for these chemicals to be present at concentrations that could adversely affect ecological receptors is unknown and is not able to be evaluated due to the lack of screening values.

Food Web

- There were no exceedences of NOAEL or LOAEL dosages for ingestion-based exposure to the American robin.

Based upon the lines of evidence, potential risks to terrestrial organisms at SWMU 26 are expected to be low to negligible. Except for one PAH, the few inorganic and organic chemicals which exceeded soil screening values were consistent with background soil concentrations. Total PAHs did not exceed screening values. In addition, no chemical exceeded a LOAEL-based ingestion screening value for an upper trophic level receptor. In conclusion, further evaluation of SWMU 11 is not recommended and there is adequate information to conclude no need for remediation.

11.0 Uncertainties

Uncertainties are present in all risk assessments because of the limitations of the available data and the need to make certain assumptions and extrapolations based on incomplete information. Since conservative assumptions were used in the exposure and effects assessments, especially in the screening portion of the ERA, these uncertainties are more likely to result in an overestimation rather than an underestimation of the likelihood and magnitude of risks to ecological receptors. The uncertainty in this ERA is mainly attributable to the following factors:

- Detection Limits - Detection limits for some analytes exceeded applicable screening values in some media; these COPCs were not further evaluated in Step 3 unless they were detected on the site. The potential for risks associated with these chemicals is unknown and represents an uncertainty in the risk assessment.
- No Screening Values - For some chemicals there were no screening values available for some of the media. This resulted in the chemical being retained as a COPC in the SERA for both detected and undetected chemicals. The potential for risks associated with the detected and undetected chemicals is unknown for the following reasons. A non-detected result shows that the analytical methods could not detect the presence of a compound above a certain detection limit. The compound could be present at concentrations up to the detection limit for that compound or the compound may be absent. This adds an uncertainty to the risk assessment process. The non-detected value may or may not be toxic depending on screening values. If a screening value is not available for that compound, additional uncertainty is introduced into the process. In order to carry this possible risk through the risk assessment process, all COPCs from the SERA were carried through into the BERA. Chemicals which were undetected and had no screening values were not retained as COPCs at the completion of the BERA because the potential for these chemicals to be present at concentrations that could adversely affect ecological receptors is unknown. However, chemicals which were detected but did not have screening values were retained as COPCs at the completion of the BERA in order to incorporate possible risk into the overall site conclusions.
- Total Versus Dissolved Metals - Current USEPA guidance (USEPA, 1996b) indicates that the dissolved metal fraction should be preferentially used to the total metal fraction in surface water screening. Total concentrations were used in the ERA for surface water and groundwater screenings since dissolved data were not available. High levels of suspended solids and sediment-adsorbed metals would result in overstating bioavailable surface water and groundwater concentrations and thus potential exposures and risks.
- Evaluation of Groundwater - Although ecological receptors are not directly exposed to groundwater, groundwater concentrations were compared directly to surface water screening values without the application of any dilution factors. Since significant dilution is likely to occur prior to discharge to a surface water body, this procedure results in a very conservative assessment. For illustrative purposes, the implications of

applying a dilution factor of 10 (recommended in Buchman [1999]) to the groundwater concentrations were provided in each applicable section.

- Evaluation of Soils - The evaluation of chemical contamination in soils was restricted to surface soils from the 0 to 6 inch depth range. Although some ecological receptors may be exposed to deeper soils (e.g., in the 6 to 24 inch depth range), no useable existing soil data were available from this deeper depth range. However, the evaluation of surface soils in the 0 to 6 inch depth range is likely to result in a conservative assessment since releases were at the surface (and thus higher chemical concentrations would be expected in the surface strata except possibly for volatile organic compounds).

- Sediment Screening Values - Most of the sediment screening values used in the ERA do not consider site-specific bioavailability to ecological receptors and are typically based on correlational studies (termed the Screening Level Concentration [SLC] approach). These factors tend to make the resulting screening values very conservative and likely overestimate potential risk.

- Plant Tissue Concentrations - Due to the fact that above-ground tissue concentrations (and not root/tuber concentrations) are estimated for aquatic plants, a degree of uncertainty is introduced into the risk assessment. Plant tissue concentrations were calculated for the above ground portions of the plant. Soil-plant BCFs are extrapolated to sediment and aquatic plants. Herbivores rarely drive risks in aquatic systems as is shown by the fact that risk estimates are typically much greater for piscivores for bioaccumulative chemicals. In addition, risks to herbivores are usually driven more by sediment consumption than plant consumption (since plant BCFs are typically well below one for most chemicals).

- Ingestion Screening Values - 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 and extrapolation 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 considered in selecting a test species to represent a receptor species included taxonomic relatedness, trophic level, foraging method, and similarity of diet.

  A second uncertainty related to the derivation of ingestion screening values applies to metals. Most of the toxicological studies on which the ingestion 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, 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 associated with the derivation of ingestion screening values concerns the use of uncertainty factors. For example, NOAELs were extrapolated to LOAELs using an uncertainty factor of ten. This approach is likely to be conservative since Dourson and Stara (1983 *cited in* USEPA, 1997) determined that 96 percent of the chemicals included in a data review had LOAEL/NOAEL ratios of five or less. The use of an uncertainty factor of 10, although potentially conservative, also serves to counter some of the uncertainty associated with interspecies extrapolations, for which a specific uncertainty factor was not used.

There are different methods available for converting lab endpoints to actual wildlife endpoints using safety factors. The typical conversion and what was used in this risk assessment is to multiply a NOAEL by ten or an LD50 by 100. Studies have shown that 95% of the cases fall below these conversions (Dourson and Stara, 1983). There are other methods that are not necessarily well documented. For example, The TriServices Guidline (Wentzel, et al., 1996) proposes a graded scale for laboratory endpoints as well as multipliers of 2 for intraspecific and interspecific applications. However, there is no scientific basis for these multipliers. Use of the latter scheme, would result in HQ's in this risk assessment being increased by a multiple of two to 16. It is unknown whether this increase in robustness of HQs would be better predictors of the actual potential for risk. Using this extra safety factor method could result in having different analytes being retained as COPCs, however, the HQs would be low in general relative to other chemicals that were COPCs using the scheme used in this risk assessment and would not likely be risk drivers. Using the TriServices scheme would typically result in HQs that are presently between 0.125 and 0.999 being increased to HQs equal to or greater than one (1.0 to 8.0). This would result in those chemicals becoming COPCs. For example, based upon a review of Table 4-17 for SWMU 2B, this change would increase the list of COPCs for mammals at SWMU 2B from five COPCs to seventeen COPCs.

- 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 value. This could result in an underestimation of risk (if there are additive or synergistic effects among chemicals) or an overestimation of risks (if there are antagonistic effects among chemicals).

- Receptor Species Selection - Reptile and amphibian species were selected as receptors in the ERA, but were not evaluated quantitatively even when exposure pathways to these organisms were likely to be complete for a number of reasons. Reptiles were evaluated using other fauna (birds and mammals) as surrogates due to the general lack of reptile-specific toxicological data. This represents an uncertainty in the risk assessment.

- The ERA evaluates amphibians at a critical life stage (tadpole) by screening against ambient water quality criteria or other comparable screening values. After a search of toxicological databases, no dietary toxicological information was found for amphibians. Thus, food web exposures for amphibians were not directly, quantitatively evaluated. However, the ERA analyzed ingestion exposures for other upper trophic level receptors that eat one hundred percent aquatic food items (e.g., raccoon, great blue heron) as well as for receptors that eat one hundred percent terrestrial food items (e.g., short-tailed shrew, meadow vole). By analyzing tadpoles at a sensitive stage and evaluating other (non-amphibian) upper trophic level aquatic and terrestrial receptors, the ERA is likely to adequately bound potential risks to amphibian species, even though they were not quantitatively evaluated.

- It was also assumed that any reptiles and amphibians present at the SWMUs were not exposed to significantly higher concentrations of COPCs and were not more sensitive to COPCs than other terrestrial receptor species evaluated in the risk assessment. This assumption was a source of uncertainty in the ERA.

- SWMUs 2B, 11, and 22 contain potential habitat that could support amphibians at all life stages. Therefore, based on habitat, amphibians were qualitatively evaluated at these SWMUs. In addition, there is some uncertainty associated with the use of specific receptor species to represent larger groups of organisms (e.g., guilds).

- Food Web Exposure Modeling - Chemical concentrations in terrestrial and aquatic food items (plants, earthworms, small mammals, aquatic invertebrates, and fish) were modeled from measured media concentrations and were not directly measured. The use of generic, literature-derived exposure models and bioaccumulation factors introduces some uncertainty into the resulting estimates. The values selected and methodology employed were intended to provide a conservative (SERA) or reasonable (Step 3A) estimate of potential food web exposure concentrations.

  Another source of uncertainty is the use of default assumptions for exposure parameters such as bioconcentration and bioaccumulation factors (BCFs/BAFs). Although BCFs or BAFs for many bioaccumulative chemicals were readily available from the literature and were used in the ERA, the use of a default factor of 1.0 to estimate the concentration of some chemicals in receptor prey items is a source of uncertainty. However, for most chemicals, the assumption that the chemical body burden in the prey item is at the same concentration as in soil or sediment is conservative, particularly when many of the chemicals are known not to accumulate to any significant degree.

- Mean Versus Maximum Media Concentrations - As is typical in a ERA, a finite number of samples of environmental media are used to develop the exposure estimates. 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 ERA, the use of maximum chemical concentrations (rather than mean concentrations) in the SERA to estimate the exposure via food webs is very conservative. This conservatism was reduced to more realistic levels in the values selected for use in the Step 3A evaluation.

- Bioavailability – The bioavailability of chromium is described in the ERA in order to show how chromium behaves and to show whether or not it is expected that chromium will be available for uptake for receptors at the site. Different bioavailability and toxicities exist between different oxidation states. For example, chromium III is insoluble and would not be in the dissolved fraction of surface water. Because samples were analyzed for total chromium in this ERA, the exact behavior of the different states present at the site cannot be known which introduced a degree of uncertainty into this ERA.

- Data Gaps – At SWMU 2B, not all media were sampled for the same analytes. Groundwater and surface soils were analyzed for volatile organics, semi-volatile organics, pesticides, PCBs, and inorganics. Surface water was sampled for volatile organics and sediments were sampled for volatile organics and semi-volatile organics. This introduces a data gap for surface water and sediment for pesticides, PCBs, and metals. Additional soil sampling that is planned as part of the Feasibility Study will address possible metal contamination in soils. This data may be used in order to extrapolate information as to whether or not metals in soils are migrating to surface water and sediments through surface runoff. Possible contamination to sediments and surface water from pesticides and PCBs is unknown. This introduces uncertainty into the risk assessment.

  At SWMU 16, one sample was collected in the low-lying area. The use of a single sample to evaluate risk in this area introduces some uncertainty into the risk assessment.

  At SWMU 22 sediment samples were collected in the ditch. This section of the ditch has sandy sediments. It is possible that depositional areas exist downstream that were not sampled. However, because minimal contamination was found in surface soil at the site, the chance of significant contamination in any portion of the ditch (even downgradient) is expected to be low.

  TOC is not available for these SWMUs. Therefore, the default minimum of 2 percent was used. Use of this minimum value will be conservative, since the calculated screening value decreases as TOC decreases.

- Comparisons to Background - Background levels of chemicals were used to judge where it was likely or not chemicals were site related. If site chemical concentrations were consistent with background levels, it was assumed that the concentrations were not site related. There exists the possibility that concentrations below background were indeed site-related, rendering the assumption false. However the impact of this possibility is minimal since chemicals at levels consistent with background should exhibit no different ecological effects than commonly occurring at areas not affected by releases, regardless of their source.

12.0 Conclusions

Potential site related risk to terrestrial organisms exist at SWMU 2B due to exceedences of metals in the soils. Therefore, it is recommended that additional data will be collected and evaluated in a Feasibility Study in order to verify and delineate the metal concentrations in the soils.

Potential risks to terrestrial organisms utilizing SWMU 11 are expected to be low to negligible based upon lines of evidence provided in Section 6.8. Although there were exceedences based on metals, it is likely that the exceedences in surface water were due to high levels of suspended solids in the samples given the shallow depths of water present during sampling. Surface water is only present in the wetland after significant storm events. Therefore, any potential risk associated with surface water in the wetland is expected to be low because of this insignificant exposure pathway to aquatic organisms. In order to investigate risk to terrestrial invertebrates in the wetland, the maximum concentration of lead at sample SD-03 was compared to the ORNL values for plants and earthworms. Lead concentrations were below the earthworm screening values showing that risk to invertebrates is not expected to occur at this site. Limited risk to terrestrial plants from lead may be present in a localized area around one sample. Only two metals exceeded ingestion screening values for the marsh wren and both had NOAEL HQs under five. In conclusion, there is little potential for ecological risk at SWMU 11 as based upon the evidence. Therefore, further evaluation is not warranted and the ERA process is concluded.

Potential risks to terrestrial organisms or aquatic invertebrates utilizing SWMU 16 are expected be low to negligible based upon lines of evidence provided in Section 6.8. Aluminum exceeded soil screening values at SWMU 16; however, aluminum concentrations in SWMU 16 surface soils were below background soil concentrations. Chromium exceeded soil screening values and background soil concentrations, but was not a COPC in ingestion-based models and is not likely to be site-related based on site history. Copper exceeded soil screening values, although on-site surface soil concentrations were below background soil concentrations and copper was not a COPC in ingestion-based models. Iron, vanadium, and zinc exceeded soil and ingestion-based screening values but did not exceed background soil concentrations. The HQ for silver based on a comparison with soil screening values was less than two and HQs for ingestion-based exposures were substantially less than one.

Two metals exceeded sediment screening values based upon detected concentrations. Four pesticides exceeded sediment screening values based upon detected concentrations. Two metals exceeded screening values based upon detected concentrations for the surface water. There is no aquatic vegetation present in the low-lying area; therefore risks to aquatic plants are not present. This area is limited in size and water is not present at all times, limiting the number and variety of aquatic invertebrates that may use the site. Based upon the lines of evidence above, it is unlikely that any of the chemicals detected in the sediments or surface water pose a site-related risk to invertebrate communities. In conclusion, there is little potential for ecological risk at SWMU 16 as based upon the evidence. Therefore, further evaluation is not warranted and the ERA process is concluded.

Potential risks to terrestrial organisms at SWMU 16GC are expected to be low to negligible based upon lines of evidence provided in Section 7.8. The few inorganic chemicals which exceeded soil screening values were consistent with background soil concentrations. In addition, no chemical exceeded a LOAEL-based ingestion screening value for an upper trophic level receptor. In conclusion, there is little potential for ecological risk at SWMU 16GC as based upon the evidence. Therefore, further evaluation is not warranted and the ERA process is concluded.

Potential risks to terrestrial organisms utilizing the limited habitats present on SWMU 21 are expected to be negligible based upon the lack of screening value exceedences. In conclusion, there is little potential for ecological risk at SWMU 21 as based upon the evidence. Therefore, further evaluation is not warranted and the ERA process is concluded.

Potential risks to terrestrial organisms at SWMU 22 are expected to be negligible based upon lines of evidence provided in Section 9.8. The few inorganic and organic chemicals which exceeded soil screening values were consistent with background soil concentrations. In addition, only aluminum (1.09) exceeded a LOAEL-based ingestion screening value for a terrestrial upper trophic level receptor and no chemicals exceeded a LOAEL-based ingestion screening value for terrestrial upper trophic level receptors.

Aquatic habitats present within SWMU 22 consist of a stormwater drainage ditch. Iron was the only chemical detected in ditch surface water that exceeded a surface water screening value. This exceedence was marginal relative to the chronic AWQC for iron, especially given that the comparison was based on total (not dissolved) iron. No chemicals that were detected in sediment samples exceeded screening values based on mean concentrations. No chemicals exceeded ingestion-based screening values based on the LOAEL for aquatic upper trophic level receptors. Sediment samples were collected in the ditch. This section of the ditch has sandy sediments. It is possible that depositional areas exist downstream that were not sampled. However, because minimal contamination was found in surface soil at the site, the chance of significant contamination in any portion of the ditch (even downgradient) is expected to be low. In conclusion, there is little potential for ecological risk at SWMU 22 as based upon the evidence. Therefore, further evaluation is not warranted and the ERA process is concluded.

Potential risks to terrestrial organisms at SWMU 26 are expected to be low to negligible based upon lines of evidence provided in Section 10.8. . Except for one PAH, the few inorganic and organic chemicals which exceeded soil screening values were consistent with background soil concentrations. Total PAHs did not exceed screening values. In addition, no chemical exceeded a LOAEL-based ingestion screening value for an upper trophic level receptor. In conclusion, there is little potential for ecological risk at SWMU 22 as based upon the evidence. Therefore, further evaluation is not warranted and the ERA process is concluded.

Based upon the results and the certainty associated with the results, the relative size of these SWMUs, and the proximity of these SWMUs to an active military runway/airfield, site specific toxicity testing or additional sampling on which to base remedial action decisions is not warranted. Therefore, no further study in the risk assessment is recommended at this time. The identified potential for risks to ecological receptors at SWMU 2B will be further addressed in the remedial alternatives in the feasibility study being drafted for SWMU 2B. All remaining SWMUs (11, 16, 16GC, 21, 22, and 26) require no further action.

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Table 2-1 Plant Species Known or Expected to Occur *NAS Oceana, Virginia Beach, VA*	
Species	**Common Name**
Trees	
Pinus taeda	Loblolly Pine
Pinus serotina	Pond Pine
Taxodium distichum	Bald Cypress
Chamaecyparis thyoides	Atlantic White Cedar
Juniperus virginiana	Red Cedar
Salix nigra	Black Willow
Populus heterophylla	Swamp Cottonwood
Ostrva virginiana	Hop Hornbeam
Carpinus caroliniana	Musclewood
Fagus grandifolia	American Beech
Quercus alba	White Oak
Quercus lyrata	Overcup Oak
Quercus michauxii	Swamp Chestnut Oak
Quercus fatcata	Southern Red Oak
Quercus falcata var. pagodaefloia	Cherrybark Oak
Quercus nigra	Water Oak
Quercus phellos	Willow Oak
Quercus laurifolia	Laurel Oak
Quercus stellata	Post Oak
Quercus velutina	Black Oak
Liriodendron tulipifera	Yellow Poplar
Magnolia virginiana	Sweetbay
Asimina triloba	Pawpaw
Persea borbonia	Redbay
Sassafras albidum	Sassafras
Liquidambar styraciflua	Sweetgum
Platanus occidentalis	American Sycamore
Crataegus phaenopyrum	Washington Thorn
Amelanchier canadensis	Shadbush
Ilex opaca	American Holly
Acer negundo	Box Elder
Acer rubrum	Red Maple
Scewartia malacodendron	Silky Camellia
Nyssa svlvatica	Black Gum
Nyssa aquatica	Tupelo Gum
Cornus florida	Dogwood
Oxydendrum arboreum	Sourwood
Diospyros virginiana	Persimmon
Symplocos tinctoria	Horse Sugar
Fraxinus caroliniana	Carolina Ash
Fraxinus pennsylvanica	Green Ash
Fraxinus tomentosa	Pumpkin Ash
Prunus serotina	Black Cherry
Shrubs	
Myrica cerifera	Wax Myrtle
Alnus serrulata	Tag Alder
Itea virginica	Virginia Willow
Rosa palustris	Swamp Rose

Table 2-1 **Plant Species Known or Expected to Occur** ***NAS Oceana, Virginia Beach, VA***	
Species	**Common Name**
Sorbus arbutifolia	Red Chokeberry
Rhododendron nudiflorum	Wild Azalea
Rhododendron viscosum	Swamp Azalea
Kalmia angustifolia	Sheep Laurel
Lyonia lingustrina	Male-Berry
Lyonia lucida	Fetter-Bush
Leucothoe axillaris	Dog-Hobble
Leucothoe racemosa	Fetter-Bush
Toxicodenron vernix	Poison Sumac
Rhus copallina	Winged Sumac
Ilex verticillata	Winterberry
Ilex glabra	Inkberry
Ilex coriacea	Sweet Gallberry
Euonymus americanus	Strawberry Bush
Aralia spinosa	Devil's Walking Stick
Clethra alnifolia	Sweet Pepperbush
Vaccinium corymbosum	Righbush Blueberry
Callicarpa americana	French Mulberry
Viburnum nudum	Possumhaw Virburnum
Sambucus canadensis	Elderberry
Cyrilla racemiflora	Titi
Baccharis halmifolia	Groundsel-Tree
Vines	
Smilax hispida	Greenbrier
Smilax rotundifolia	Greenbrier
Sawbrier - Smilax glauca	Greenbrier
Coral Greenbrier - Smilax walteri	Greenbrier
Smilax laurifolia	Greenbrier
Dioscorea villosa	Wild Yac
Clematis crispa	Leather-Flower
Decumaria barbara	Climbing Hydrangea
Toxicodendron radicans	Poison Ivy
Berchemia scandens	Rattan Vine
Parthenocissus quinquefolia	Virginia Creeper
Vitis rotundifolia	Muscadine Grape
Vitis labrusca	Fox Grape
Vitis aestivalis	Summer Grape
Passiflora incarnata	Maypop
Gelsemium sempervirens	Yellow Jessamine
Anisostichus capreolata	Cross Vine
Campsis radicans	Trumpet Vine
Lonicera japonica	Japanese Honeysuckle
Lonicera sempervirens	Coral Honeysuckle
Mikania scandens	Climbing Hempweed

Table 2-1 **Plant Species Known or Expected to Occur** ***NAS Oceana, Virginia Beach, VA***	
Species	**Common Name**
Ferns and Fern Allies	
Lycopodium obscurum	Groundpine
Lycopodium flabelliforme	Running-Pine
Osmunda regalis	Royal Fern
Osmunda cinnamomea	Cinnamon Fern
Lygodium palmatum	Climbing Fern
Dennstaedtia punctilobula	May-scented Fern
Pteridium aquilinum	Bracken Fern
Athyrium asplenioides	Southern Lady Fern
Dryopteris celsa	Log Fern
Dryopteris intermedia	Fancy Fern
Thelypteris noveboracensis	New York Fern
Thelvpteris palustris	Marsh Fern
Onoclea sensibilis	Sensitive Fern
Woodwardia areolata	Netted-Chain Fern
Woodwardia virginica	Virginia Chain Fern
Aeplenium platyneuron	Ebony Spleenwort
Polypodium polypodioides	Resurrection Fern
Herbaceous plants	
Lena valdiviana	Duckweeds
Spirodela oligorrhiza	Duckweeds
Comelina virginica	Dayflower
Trillium pusillum	Dwarf Trillium
Medeola virginiana	Indian Cucumber
Sisyrinchium angustifolium	Blue Eyed Grass
Cypripedium acaule	Pink Lady's Slipper
Listera australis	Southern Twayblade
Goodyera pubescens	Downy Rattlesnake Plantain
Tipularia discolor	Crane Fly Orchid
Saururus cernuus	Lizard's Tail
Boehmeria cylindrica	False Nettle
Phoradendron serotinum	Mistletoe
Tovara virginiana	Jumpseed
Polygonum hydropiperoides	Smartweed
Polygonum pensylvanicum	Knotweed
Phytolacca americana	Pokeweed
Stellaria media	Chickweed
Nuphar luteum	Yellow Pond-Lilly
Clematis viorna	Leather-Flower
Ranunculus species	Buttercups
Cardamine hirsuta	Bitter Cress
Duchesnea indica	Mock Strawberry
Cassia fasciculata	Partridge Pea
Lespedeza cuneata	Lespedeza
Oxalis dillenii	Lady's Sorrel
Geranium carolinianum	Wild Geranium
Impatiens capensis	Jewel-Weed
Hypericum hypericoides	St. John's Wort
Hypericum multilum	St. John's Wort

Table 2-1 **Plant Species Known or Expected to Occur** ***NAS Oceana, Virginia Beach, VA***	
Species	**Common Name**
Hypericum virginicum	St. John's Wort
Viola primulifolia	Violet
Decodon verticillatus	Water Loosestrife
Rhexia mariana	Meadow-Beauty
Ludwigia alternifolia	Water Primrose
Ludwigia palustris	Water Primrose
Proserpinaca palustris	Mermaid-Weed
Daucus carota	Queen Anne's Lace
Hydrocotyle umbellata	Marsh Pennywork
Prunella vulgaris	Heal-All
Scutellaria integrifolia	Skullcap
Solanum carolienense	Nightshade
Agalinis purpurea	Gerardia
Conapholis americana	Squaw-Root
Epifagus virginiana	Beech-Drops
Utricularia gibba	Bladderwort
Utricularia purpurea	Purple Bladderwort
Utricularia inflata	Great Bladderwort
Diodia virginiana	Diodia
Mitchella repens	Partridge Berry
Lobelia cardinalis	Cardinal Flower
Achillea millefolium	Yarrow
Ericeron annuus	Daisey Fleabane
Eupatorium capillifolium	Dog-Fennel
Eupatorium coelestinum	Mistflower
Eupatorium maculatum	Joe-Pye-Weed
Solidago erecta	Goldenrod
Taraxacum officinale	Dandelion
Vernonia noveboracensis	Ironweed
Grasses-Sedges-Rushes	
Eriphorum virginicum	Cotton Grass
Scripus cyperinus	Wool Grass
Setaria - species	Foxtail Grasses
Panicum - species	Panic Grasses
Cyperus - species	Sedges
Carex - species	Sedges
Arundinaria gigantea	Switch Cane
Juncus bufonius	Rushes
Juncus repens	Rushes
Source: VA Department of Game and Inland Fisheries - Fish and Wildlife Information System, 1992.	

Table 2-2 **Mammal Species Known or Expected to Occur** ***NAS Oceana, Virginia Beach, VA***	
Species	**Common Name**
Eptesicus fuscus	Bat, big brown
Lasiurus intermedius floridanus	Bat, northern yellow
Lasiurus seminolus	Bat, seminole
Castor canadensis	Beaver
Sylvilagus floridanus mallurus	Cottontail, eastern
Odocoileus virginianus	Deer, white-tailed
Urocyon cineroeargenteus	Fox, gray
Synaptomys cooperi helaletes	Lemming, southern bog
Mustela vison mink	Mink, common
Scalopus aquaticus aquaticus	Mole, eastern
Peromyscus leucopus easti	Mouse, Pungo white-footed
Ochrotomys nuttalli nuttalli	Mouse, common golden
Peromyscus leucopus leucopus	Mouse, common white-footed
Peromyscus gossypinus gossypinus	Mouse, cotton
Reithrodontomys humulus humulus	Mouse, eastern harvest
Mus musculus	Mouse, house
Ondatra zibethica	Muskrat
Myocastor coypus	Nutria
Didelphis virginianus	Oppossum
Lutra canadensis lataxina	Otter, river
Sylvilagus palustris palustris	Rabbit, marsh
Procyon lotor lotor	Raccoon
Rattus norvegicus	Rat, Norway
Oryzomys palustris palustris	Rat, marsh rice
Sorex longirostris fisheri	Shrew, Dismal Swamp southeastern
Cryptotis parva parva	Shrew, least
Blarina carolinensis	Shrew, short-tailed
Sorex longirostris longirostris	Shrew, southeastern
Sciurus niger niger	Squirrel, black fox
Scurius carolinensis	Squirrel, eastern gray
Glaucomys volans volans	Squirrel, southern flying
Microtus pinetorum pinetorum	Vole, common pine
Microtus pennsylvanicus	Vole, meadow
Mustela frenata noveboracensis	Weasel, long-tailed
Source: VA Department of Game and Inland Fisheries - Fish and Wildlife Information System, 1992.	

Table 2-3
Bird Species Known or Expected to Occur
NAS Oceana, Virginia Beach, VA

Species	Common Name
Botaurus lentiginosus	Bittern, American
Ixobrychus exilis exilis	Bittern, least
Agelaius phoeniceus	Blackbird, red-winged
Sialia sialis	Bluebird, eastern
Colinus virginianus	Bobwhite, northern
Bucephala albeola	Bufflehead
Passerina cyanea	Bunting, indigo
Calamospiza melanocorys	Bunting, lark
Aythya valisineria	Canvasback
Cardinalis cardinalis	Cardinal, northern
Dumetella carolinensis	Catbird, gray
Icteria virens virens	Chat, yellow-breasted
Parus carolinensis	Chickadee, Carolina
Phalacropcorax auritus floridanus	Cormorant, double-crested
Phalacrocorax carbo	Cormorant, great
Molothrus ater	Cowbird, brown-headed
Corvus brachyrhynchos	Crow, American
Corvus ossifragus	Crow, fish
Coccyzus americanus	Cuckoo, yellow-billed
Zenaida macroura carolinensis	Dove, mourning
Columba livia	Dove, rock
Limnodromus scolopaceus	Dowitcher, long-billed
Limnodromus griseus	Dowitcher, short-billed
Anas rubripes	Duck, American black
Oxyura jamaicensis	Duck, ruddy
Aix sponea	Duck, wood
Bubulcus ibis	Egret, cattle
Casmerodius albus egretta	Egret, great
Egretta thula	Egret, snowy
Carpodacus mexicanus	Finch, house
Colaptes auratus	Flicker, northern
Empidonax virescens	Flycatcher, Acadian
Myiarchus crinitus	Flycatcher, great crested
Anas strepera	Gadwall
Polioptila caerulea	Gnatcatcher, blue-gray
Limosa fedoa	Godwit, marbled
Carduelis tristis	Goldfinch, American
Branta canadensis	Goose, Canada
Chen caerulescens atlanticus	Goose, greater snow
Chen caerulescens caerulescens	Goose, lesser snow
Quiscalus major	Grackle, boat-tailed
Quiscalus quiscula	Grackle, common
Podiceps auritus	Grebe, horned
Podilymbus podiceps	Grebe, pied-billed
Podiceps grisegena	Grebe, red-necked
Guiraca caerulea caerulea	Grosbeak, blue
Larus marinus	Gull, great black-backed
Larus argentatus	Gull, herring
Larus atricilla	Gull, laughing

Table 2-3 Bird Species Known or Expected to Occur *NAS Oceana, Virginia Beach, VA*	
Species	**Common Name**
Larus delawarensis	Gull, ring-billed
Buteo lineatus lineatus	Hawk, red-shouldered
Buteo jamaicensis	Hawk, red-tailed
Accipiter striatus velox	Hawk, sharp-shinned
Ardea herodias herodias	Heron, great blue
Butorides striatus verescens	Heron, green-backed
Egretta caerulea caerulea	Heron, little blue
Egretta tricolor	Heron, tricolored
Archilochus colubris	Hummingbird, ruby-throated
Plegadis falcinellus	Ibis, glossy
Cyanocitta cristata	Jay, blue
Junco hyamalis	Junco, dark-eyed
Falco sparverius sparverius	Kestrel, American
Charadrius vociferus	Killdeer
Tyrannus tyrannus	Kingbird, eastern
Ceryle alcyon	Kingfisher, belted
Elanoides forficatus forficatus	Kite, American swallow-tailed
Ictinia mississippiensis	Kite, Mississippi
Calidris canutus rufus	Knot, red
Gavia stellata	Loon, red-throated
Anas platyrhynchos	Mallard
Progne subis	Martin, purple
Sturnella magna	Meadowlark, eastern
Lophodytes cucullatus	Merganser, hooded
Falco columbarius	Merlin
Mimus polyglottos	Mockingbird, northern
Gallinula chloropus cachinnans	Moorhen, common
Nycticorax nycticorax hoactii	Night-heron, black-crowned
Nyctanassa violaceus violaceus	Night-heron, yellow-crowned
Chordeiles minor	Nighthawk, common
Sitta pusilla	Nuthatch, brown-headed
Icterus spurius	Oriole, orchard
Pandion haliaetus carolinensis	Osprey
Seiurus aurocapillus	Ovenbird
Bubo virginianus	Owl, great horned
Contopus virens	Pewee, eastern wood
Sayornis phoebe	Phoebe, eastern
Rallus limicola	Rail, Virginia
Rallus longirostris crepitans	Rail, clapper
Rallus elegans	Rail, king
Turdus migratorius	Robin, American
Calidris alba	Sanderling
Calidris minutilla	Sandpiper, least
Calidris maritima	Sandpiper, purple
Actitis macularia	Sandpiper, spotted
Calidris mauri	Sandpiper, western
Aythya affinis	Scaup, lesser
Melanitta nigra americana	Scoter, black
Melanitta perspicillata	Scoter, surf

Table 2-3
Bird Species Known or Expected to Occur
NAS Oceana, Virginia Beach, VA

Species	Common Name
Melanitta fusca deglandi	Scoter, white-winged
Otus asio	Screech-owl, eastern
Anas clypeata	Shoveler, northern
Rynchops niger	Skimmer, black
Gallinago gallinago	Snipe, common
Spizella passerina	Sparrow, chipping
Spizella pusilla	Sparrow, field
Ammodramus sabannarum pratensis	Sparrow, grasshopper
Passer domesticus	Sparrow, house
Melospiza melodia	Sparrow, song
Sturnus vulgaris	Starling, European
Hirundo rustica	Swallow, barn
Tachycineta bicolor	Swallow, tree
Chaetura pelagica	Swift, chimney
Piranga olivacea	Tanager, scarlet
Piranga rubra	Tanager, summer
Anas discors orphna	Teal, blue-winged
Anas crecca carolinensis	Teal, green-winged
Sterna forsteri	Tern, Forster's
Sterna sandvicensis acuflavidus	Tern, sandwich
Sterna hirundo	Tern, common
Sterna nilotica aranea	Tern, gull-billed
Sterna maxima maximus	Tern, royal
Toxostoma rufum	Thrasher, brown
Hylocichla mustelina	Thrush, wood
Parus bicolor	Titmouse, tufted
Pipilo erythrophthalmus	Towhee, rufous-sided
Arenaria interpres morinella	Turnstone, ruddy
Vireo olivaceus	Vireo, red-eyed
Vireo solitarius	Vireo, solitary
Vireo griseus	Vireo, white-eyed
Vireo flavifrons	Vireo, yellow-throated
Coragyps atratus	Vulture, black
Cathartes aura	Vulture, turkey
Mniotilta varia	Warbler, black-and-white
Wilsonia citrina	Warbler, hooded
Parula americana	Warbler, northern parula
Dendroica palmarum	Warbler, palm
Dendroica pinus	Warbler, pine
Dendroica discolor	Warbler, prairie
Protonotaria citrea	Warbler, prothonotary
Dendroica petechia	Warbler, yellow
Dendroica coronata cornata	Warbler, yellow-rumped
Dendroica dominica	Warbler, yellow-throated
Seiurus motacilla	Waterthrush, Louisiana
Bombycilla cedrorum	Waxwing, cedar
Anas americana	Wigeon, American
Catoptrophorus semipalmatus semipalmatus	Willet
Scolopax minor	Woodcock, American

Table 2-3
Bird Species Known or Expected to Occur
NAS Oceana, Virginia Beach, VA

Species	Common Name
Picoides pubescans medianus	Woodpecker, downy
Picoides villosus	Woodpecker, hairy
Dryocopus pileatus	Woodpecker, pileated
Melanerpes carolinus	Woodpecker, red-bellied
Melanerpes erythrocephalus	Woodpecker, red-headed
Thryothorus ludovicianus	Wren, Carolina
Troglodytes aedon	Wren, house
Geothlypis trichas brachidactylus	Yellowthroat, common

Source: VA Department of Game and Inland Fisheries - Fish and Wildlife Information System, 1992.

Table 2-4
Reptile Species Known or Expected to Occur
NAS Oceana, Virginia Beach, VA

Species	Common Name
Chrysemya floridana floridana	Cooter, Florida
Agkistrodon contortrix mokason	Copperhead, northern
Agkistrodon piscivorus piscivorus	Cottonmouth, eastern
Lampropeltis getulus getulus	Kingsnake, eastern
Lampropeltis triangulum elapsoides	Kingsnake, scarlet
Ophisaurus ventralis	Lizard, eastern glass
Ophisaurus attenuatus longicaudus	Lizard, eastern slender glass
Sceloporus undulatus hyacinthinus	Lizard, northern fence
Coluber constrictor constrictor	Racer, northern black
Cnemidophorous sexlineatus	Racerunner, six-lined
Crotalus horridus atricaudatus	Rattlesnake, canebrake
Eumeces laticeps	Skink, broadhead
Eumeces fasciatus	Skink, five-lined
Scincella lateralis	Skink, ground
Eumeces inexpectatus	Skink, southeastern five-lined
Tachemys scripta	Slider, yellowbellied
Elaphe obsoleta obsoleta	Snake, black rat
Nerodia taxispilota	Snake, brown water
Elaphe guttata guttata	Snake, corn
Virginia valeriae	Snake, eastern earth
Thamnophis sirtalis sirtalis	Snake, eastern garter
Heterodon platyrhinos	Snake, eastern hognose
Farancia abacura abacura	Snake, eastern mud
Thamnophis sauritus sauritus	Snake, eastern ribbon
Carphophis amoenus amoenus	Snake, eastern worm
Storeria dekayi dekayi	Snake, northern brown
Storeria occipitomaculata	Snake, northern red-belly
Diadophis punctatus edwardsii	Snake, northern ringneck
Nerodia sipedon sipedon	Snake, northern water
Farancia erytrogramma erytrogramma	Snake, rainbow
Nerodia erythrogaster erythrogaster	Snake, red-belly water
Opheodrys aestivus	Snake, rough green
Cemophora coccinea	Snake, scarlet
Diadophis punctatus punctatus	Snake, southern ringneck
Sternotherus odoratus	Stinkpot
Malaclemys terrapin terrapin	Terrapin, northern diamondback
Chelonia mydas mydas	Turtle, Atlantic green sea
Lepidochelys kempi	Turtle, Kemp's Ridley sea
Chelydra serpentina serpentina	Turtle, common snapping
Terrapene carolina carolina	Turtle, eastern box
Deirochelys reticularia reticularia	Turtle, eastern chicken
Kinosternon subrubrum subrubrum	Turtle, eastern mud
Chrysemys picta picta	Turtle, eastern painted
Eretmochelys imbricata	Turtle, hawksbill sea
Dermochelys coriacea coriacea	Turtle, leatherback sea
Caretta caretta caretta	Turtle, loggerhead sea
Pseudemys rubriventris	Turtle, red-bellied
Clemmys guttata	Turtle, spotted

Source: VA Department of Game and Inland Fisheries - Fish and Wildlife Information System, 1992.

Table 2-5
Amphibian Species Known or Expected to Occur
NAS Oceana, Virginia Beach, VA

Species	Common Name
Amphiuma means	Amphiuma, two-toed
Rana catesbeiana	Bullfrog
Pseudacris brimleyi	Frog, Brimley's chorus
Rana virgatipes	Frog, carpenter
Rana clamitans	Frog, green
Limnaoedus ocularis	Frog, little grass
Rana palustris	Frog, pickeral
Acris gryllus gryllus	Frog, southern cricket
Rana utricularia	Frog, southern leopard
Pseudacris triseriata feriarum	Frog, upland chorus
Notophthalmus viridescens viridescens	Newt, red-spotted
Hyla crucifer crucifer	Peeper, northern spring
Plethodon chlorobryonous	Salamander, Coastal Plain slimy
Pseudotriton montanus montanus	Salamander, eastern mud
Hemidactylium scutatum	Salamander, four-toed
Stereochilus marginatus	Salamander, many-lined
Ambystoma opacum	Salamander, marbled
Desmognathus fuscus fuscus	Salamander, northern dusky
Eurycea bislineata bislineata	Salamander, northern two-lined
Plethodon cinereus	Salamander, redback
Plethodon glutinosus glutinosus	Salamander, slimy
Desmognathus auriculatus	Salamander, southern dusky
Eurycea bislineata cirrigera	Salamander, southern two-lined
Ambystoma maculatum	Salamander, spotted
Eurycea longicauda guttolineata	Salamander, three-lined
Siran lacertina	Siren, greater
Scaphiopus holbrooki holbrooki	Spadefoot, eastern
Bufo woodhousii fowleri	Toad, Fowler's
Gastrophryne carolinensis	Toad, eastern narrowmouth
Bufo terrestris	Toad, southern
Hyla chrysoscelis	Treefrog, Cope's gray
Hyla versicolor	Treefrog, gray
Hyla cinerea	Treefrog, green
Hyla femoralis	Treefrog, pine woods
Hyla squirrela	Treefrog, squirrel
Necturus punctatus	Waterdog, dwarf

Source: VA Department of Game and Inland Fisheries - Fish and Wildlife Information System, 1992.

Table 2-6
Fish Species Known or Expected to Occur
NAS Oceana, Virginia Beach, VA

Species	Common Name
Alosa pseudohazengus	Alewife
Micropterus salmoides	Bass, largemouth
Micropterus dolomieui	Bass, smallmouth
Morono saxatilis	Bass, striped
Morone chrysops	Bass, white
Lepomis macrochirus	Bluegill
Amia calva	Bowfin
Ameiurus nebulosus	Bullhead, brown
Ameiurus natalis	Bullhead, yellow
Cyprinus carpio	Carp, common
Ictalurus punctatus	Catfish, channel
Americus catus	Catfish, white
Pomoxis nigromaculatus	Crappie, black
Clinostomus funduloides	Dace, rosyside
Lepisosteus osseus	Gar, longnose
Fundulus diaphanus	Killifish, banded
Fundulus confluentus	Killifish, marsh
Hybognathus regius	Minnow, eastern silvery
Gambusia affinis	Mosquitofish
Umbra pygmaea	Mudminnow, eastern
Morone americana	Perch, white
Perca flavescens	Perch, yellow
Esox niger	Pickerel, chain
Esox americanus americanus	Pickerel, redfin
Lepomis gibbosus	Pumpkinseed
Dorosoma cepedianum	Shad, gizzard
Dorosoma petenense	Shad, threadfin
Notemigonus crysoleucas	Shiner, golden
Enneacanthus obesus	Sunfish, banded
Enneacanthus gloriosus	Sunfish, bluespotted
Acantharchus pomotis	Sunfish, mud
Lepomis microlophus	Sunfish, redear
Stizostedion vitreum vitreum	Walleye
Lepomis gulosus	Warmouth

Source: VA Department of Game and Inland Fisheries - Fish and Wildlife Information System, 1992.

Table 2-7
Rare Wildlife Known From Virginia Beach and Chesapeake
NAS Oceana, Virginia Beach, VA

Species	Common Name
Stereochilus marginatus	Many-lined salamander
Siren lacertina	Greater Siren
Limnaoedus ocularis	Little Grass Frog
Rana virgatipes	Carpenter Frog
Crotalus horridus atricaudatus	Canebrake rattlesnake
Deirochelys reticularis	Chicken turtle
Ophisaurus ventralis	Eastern glass lizard
Ixobrychus exilis	Least Bittern
Haliaeetus leucocephalus	Bald Eagle
Nycticorax nycticorax	Black-crowned Night Heron
Ardea herodias	Great Blue Heron
Ardea alba	Great Egret
Lophodytes cucullatus	Hooded Merganser
Podilymbus podiceps	Pied-billed Grebe
Picoides borealis	Red-cockaded woodpecker
Actitus macularia	Spotted sandpiper
Limnothlypis swainsonii	Swainson's Warbler
Condylura cristata parva	Star-nosed mole
Blarina brevicauda telmalestes	Dismal Swamp short-tailed shrew
Sorex longirostris fisheri	Dismal Swamp shrew
Synaptomys cooperi helaletes	Southern bog lemming
Plecotus rafinesquii	Rafineque's big-eared bat
Lasiurus seminolis	Seminole bat
Sylvilagus palustris	Marsh rabbit

Source: VA Department of Game and Inland Fisheries - Fish and Wildlife Information System, 1992.

Table 2-8 Rare Plants Known From Virginia Beach and Chesapeake *NAS Oceana, Virginia Beach, VA*
Species
Aster elliotti
Bacopa monnieri
Boltonia caroliniana
Bulbostylis ciliatifolia
Cardamine longii
Carex reniformis
Carex walteriana
Cassia fasciculata
Chamaecyparis thyoides
Cladium jamaicense
Cladium mariscoides
Cuscuta cephalanthii
Cyperus haspan
Desmodium strictum
Dichromena colorata
Drosera intermedia
Eleocharis baldwinii
Eleocharis halophila
Eleocharis radicans
Eleocharis rostellata
Eleocharis vivipara
Erigeron vernus
Eupatorium recurvans
Euphorbia ammannioides
Fimbristylis caroliniana
Galium hispidulum
Heliotropium curassavicum
Hydrocotyle bonariensis
Hypoxis longii
Iresine rhizomatosa
Iva imbricatas
Juncus crassifolius
Juncus elliottii
Juncus megacephalus
Juniperus communis
Kalmia angustifolia
Lechea maritima
Lilaeopsis carolinensis
Limnobium spongia
Lippia nodiflora
Listera australis
Lobelia elongata
Ludwigia alata
Ludwigia Brevipes
Lycopodium inundatum
Nothoscordum bivalve
Nymphoides aquatica
Osmanthus americanus
Physalis viscosa

Table 2-8 Rare Plants Known From Virginia Beach and Chesapeake *NAS Oceana, Virginia Beach, VA*
Species
Physostegia leptophylla
Quercus hemisphaerica
Quercus incana
Quercus laevis
Quercus margarettae
Rhynchospora fascicularis
Scirpus acutus
Scirpus etuberculatus
Spiranthes odorata
Stewartia malacodendron
Stipulicida setacea
Tillandsia usneoides
Triglochin striatum
Typha domingensis
Utricularia fibrosa
Utricularia pupurea
Vaccinium macrocarpon
Verbena scabra
Xyris caroliniana
Source: DNH, Technical Report 90-6, 1990.

Table 3-1
Preliminary Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - Screening ERA
NAS Oceana, Virginia Beach, VA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint
Terrestrial Habitats		
Survival, growth, and reproduction of terrestrial soil invertebrate communities.	Are site-retated surface soil concentrations sufficient to adversely effect soil invertebrate communities based on conservative screening values?	Comparison of maximum chemical concentrations in surface soil with soil screening values.
Survival, growth, and reproduction of terrestrial plant communities.	Are site-related surface soil concentrations sufficient to adversely effect terrestrial plant communities based on conservative screening values?	Comparison of maximum chemical concentrations in surface soil with soil screening values.
Survival, growth, and reproduction of avian terrestrial insectivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume 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 soil concentrations.
Survival, growth, and reproduction of avian terrestrial carnivores.	Are site-related chemical concentrations in surface soils 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 soil concentrations.
Survival, growth, and reproduction of mammalian terrestrial insectivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume 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 soil concentrations.
Survival, growth, and reproduction of mammalian terrestrial herbivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian 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 soil concentrations.
Survival, growth, and reproduction of mammalian terrestrial omnivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume plants and 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 soil concentrations.
Survival, growth, and reproduction of mammalian terrestrial carnivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian 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 soil concentrations.

Table 3-1
Preliminary Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - Screening ERA
NAS Oceana, Virginia Beach, VA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint
Survival, growth, and reproduction of terrestrial reptiles.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to terrestrial reptilian species?	Evidence of potential risk to other upper trophic level terrestrial receptors evaluated in the ERA.
Wetland and Aquatic Habitats		
Survival, growth, and reproduction of benthic invertebrate communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect benthic invertebrate communities?	Comparison of maximum chemical concentrations in surface water and/or sediment with medium-specific screening values.
Survival, growth, and reproduction of aquatic and wetland plant communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect aquatic or wetland plant communities?	Comparison of maximum chemical concentrations in surface water and/or sediment with medium-specific screening values.
Survival, growth, and reproduction of fish communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect fish communities?	Comparison of maximum chemical concentrations in surface water and/or sediment with medium-specific screening values.
Survival, growth, and reproduction of amphibian communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect amphibian communities?	Comparison of maximum chemical concentrations in surface water and/or sediment with medium-specific screening values.
Survival, growth, and reproduction of amphibians.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to amphibian species that may consume aquatic invertebrates from the site?	Evidence of potential risk to other upper trophic level aquatic receptors evaluated in the ERA.
Survival, growth, and reproduction of aquatic/wetland reptiles.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to aquatic/wetland reptile species?	Evidence of potential risk to other upper trophic level aquatic receptors evaluated in the ERA.
Survival, growth, and reproduction of avian aquatic/wetland insectivores.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume aquatic 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 surface water and sediment concentrations.
Survival, growth, and reproduction of avian aquatic/wetland omnivores.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume aquatic plants and 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 surface water and sediment concentrations.

Table 3-1 **Preliminary Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - Screening ERA** ***NAS Oceana, Virginia Beach, VA***		
Assessment Endpoint	**Risk Hypothesis**	**Measurement Endpoint**
Survival, growth, and reproduction of avian aquatic/wetland piscivores.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume fish 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 surface water and sediment concentrations.
Survival, growth, and reproduction of mammalian aquatic/wetland piscivores	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume fish 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 surface water and sediment concentrations.
Survival, growth, and reproduction of mammalian aquatic/wetland omnivores.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume aquatic/wetland prey 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 surface water and sediment concentrations.

Table 3-2
Medium-Specific Screening Values Used in the ERA
NAS Oceana, Virginia Beach, VA

Chemical	Screening Value	Units	Reference	Hardness (mg/L)
Surface Water/Groundwater (Fresh)				
1,1,1,2-Tetrachloroethane	2400	ug/L	USEPA 1995a	
1,1,1-Trichloroethane	9400	ug/L	USEPA 1995a	
1,1,2,2-Tetrachloroethane	2400	ug/L	USEPA 1995a	
1,1,2-Trichloroethane	9400	ug/L	USEPA 1995a	
1,1-Dichloroethane	1600	ug/L	USEPA 1995a (with safety factor of 100)	
1,1-Dichloroethene	1160	ug/L	USEPA 1995a (with safety factor of 10)	
1,2,4,5-Tetrachlorobenzene	50	ug/L	USEPA 1995a	
1,2,4-Trichlorobenzene	50	ug/L	USEPA 1995a	
1,2-Dibromoethane	180	ug/L	USEPA 1995a (with safety factor of 100)	
1,2-Dichlorobenzene	763	ug/L	USEPA 1995a	
1,2-Dichloroethane	20000	ug/L	USEPA 1995a	
1,2-Dichloroethene (total)	1160	ug/L	USEPA 1995a (with safety factor of 10)	
1,2-Dichloropropane	5700	ug/L	USEPA 1995a	
1,3-Dichlorobenzene	763	ug/L	USEPA 1995a	
1,3-Dichloropropene	244	ug/L	USEPA 1995a	
1,4-Dichlorobenzene	763	ug/L	USEPA 1995a	
2,4,5-Trichlorophenol	63	ug/L	USEPA 1995a	
2,4,6-Trichlorophenol	970	ug/L	USEPA 1995a	
2,4-Dichlorophenol	365	ug/L	USEPA 1995a	
2,4-Dimethylphenol	530	ug/L	Federal Register 59:3762 (1994)	
2,4-Dinitrophenol	150	ug/L	USEPA 1995a	
2,4-Dinitrotoluene	230	ug/L	USEPA 1995a	
2-Butanone	14000	ug/L	Suter and Tsao 1996	
2-Chloronaphthalene	620	ug/L	USEPA 1995a	
2-Chlorophenol	97	ug/L	USEPA 1995a (with safety factor of 10)	
2-Hexanone	4280	ug/L	USEPA 1995a (with safety factor of 100)	
2-Methylphenol	13	ug/L	Suter and Tsao 1996	
2-Nitrophenol	150	ug/L	USEPA 1994	
4,4'-DDD	0.06	ug/L	USEPA 1995a (with safety factor of 10)	
4,4'-DDE	105	ug/L	USEPA 1995a (with safety factor of 10)	
4,4'-DDT	0.001	ug/L	USEPA 1995a	
4,6-Dinitro-2-methylphenol	2.3	ug/L	USEPA 1999a	

Table 3-2
Medium-Specific Screening Values Used in the ERA
NAS Oceana, Virginia Beach, VA

Chemical	Screening Value	Units	Reference	Hardness (mg/L)
4-Bromophenyl-phenylether	1.5	ug/L	USEPA 1996b	
4-Chloro-3-methylphenol	0.3	ug/L	USEPA 1999a	
4-Chloroaniline	50	ug/L	Buchman 1999	
4-Methyl-2-pentanone	4600	ug/L	USEPA 1995a (with safety factor of 100)	
4-Nitrophenol	150	ug/L	USEPA 1995a	
Acenaphthene	520	ug/L	USEPA 1995a	
Acetone	90000	ug/L	USEPA 1995a (with safety factor of 100)	
Aldrin	0.3	ug/L	USEPA 1995a (with safety factor of 10)	
alpha-BHC	2.2	ug/L	Suter and Tsao 1996	
alpha-Chlordane	0.17	ug/L	Suter and Tsao 1996	
Aluminum	87	ug/L	USEPA 1999b	
Anthracene	0.73	ug/L	Suter and Tsao 1996	
Antimony	30	ug/L	USEPA 1995a	
Aroclor-1016	0.014	ug/L	USEPA 1995a	
Aroclor-1221	0.28	ug/L	Suter and Tsao 1996	
Aroclor-1232	0.58	ug/L	Suter and Tsao 1996	
Aroclor-1242	0.053	ug/L	Suter and Tsao 1996	
Aroclor-1248	0.081	ug/L	Suter and Tsao 1996	
Aroclor-1254	0.033	ug/L	Suter and Tsao 1996	
Aroclor-1260	94	ug/L	Suter and Tsao 1996	
Arsenic	150	ug/L	USEPA 1999b	
Barium	1000	ug/L	USEPA 1995a (with safety factor of 10)	
Benzene	530	ug/L	USEPA 1995a (with safety factor of 10)	
Benzo(a)anthracene	6.3	ug/L	USEPA 1995a	
Benzo(a)pyrene	0.014	ug/L	Suter and Tsao 1996	
Beryllium	5.3	ug/L	USEPA 1995a	
beta-BHC	2.2	ug/L	Suter and Tsao 1996	
bis(2-Chloroethoxy)methane	1100	ug/L	USEPA 1995a (with safety factor of 10)	
bis(2-Chloroethyl)ether	2380	ug/L	USEPA 1999a	
bis(2-Ethylhexyl)phthalate	30	ug/L	USEPA 1995a	
Bromochloromethane	1100	ug/L	USEPA 1995a (with safety factor of 10)	
Bromodichloromethane	1100	ug/L	USEPA 1995a (with safety factor of 10)	
Butylbenzylphthalate	22	ug/L	USEPA 1999a	

Table 3-2 Medium-Specific Screening Values Used in the ERA *NAS Oceana, Virginia Beach, VA*				
Chemical	**Screening Value**	**Units**	**Reference**	**Hardness (mg/L)**
Cadmium (SWMU 11)	0.83	ug/L	USEPA 1999b	24.9
Cadmium (SWMU 22)	1.29	ug/L	USEPA 1999b	44.0
Carbon disulfide	2	ug/L	USEPA 1995a	
Carbon tetrachloride	3520	ug/L	USEPA 1995a (with safety factor of 10)	
Chlordane	0.17	ug/L	Suter and Tsao 1996	
Chlorobenzene	130	ug/L	USEPA 1996b	
Chloroform	1240	ug/L	USEPA 1995a	
Chloromethane	5500	ug/L	USEPA 1999a	
Chromium	11.4	ug/L	USEPA 1999b	
cis-1,2-Dichloroethene	1160	ug/L	USEPA 1995a (with safety factor of 10)	
cis-1,3-Dichloropropene	244	ug/L	USEPA 1995a	
Cobalt	23	ug/L	Suter and Tsao 1996	
Copper (SWMU 11)	2.84	ug/L	USEPA 1999b	24.9
Copper (SWMU 22)	4.6	ug/L	USEPA 1999b	44.0
Cyanide	5.2	ug/L	USEPA 1995a	
delta-BHC	2.2	ug/L	Suter and Tsao 1996	
Dibenzofuran	20	ug/L	USEPA 1996b	
Dibromochloromethane	1100	ug/L	USEPA 1995a (with safety factor of 10)	
Dibromomethane	1100	ug/L	USEPA 1995a (with safety factor of 10)	
Dichlorodifluoromethane	1100	ug/L	USEPA 1995a (with safety factor of 10)	
Dieldrin	0.056	ug/L	USEPA 1999b	
Diethylphthalate	220	ug/L	USEPA 1996b	
Dimethyl phthalate	330	ug/L	USEPA 1999a	
Di-n-butylphthalate	33	ug/L	USEPA 1996b	
Dinitrophenol	150	ug/L	USEPA 1995a	
Di-n-octyl phthalate	3	ug/L	Buchman 1999	
Endosulfan	0.056	ug/L	USEPA 1995a	
Endosulfan I	0.056	ug/L	USEPA 1995a	
Endosulfan II	0.056	ug/L	USEPA 1995a	
Endosulfan sulfate	0.056	ug/L	USEPA 1995a	
Endrin	0.036	ug/L	USEPA 1999b	
Endrin aldehyde	0.036	ug/L	USEPA 1996b	
Endrin ketone	0.036	ug/L	USEPA 1996b	

Table 3-2
Medium-Specific Screening Values Used in the ERA
NAS Oceana, Virginia Beach, VA

Chemical	Screening Value	Units	Reference	Hardness (mg/L)
Ethylbenzene	3200	ug/L	USEPA 1995a (with safety factor of 10)	
Fluoranthene	398	ug/L	USEPA 1995a (with safety factor of 10)	
Fluorene	430	ug/L	USEPA 1995a	
Fluoride	2000	ug/L	USEPA 1995a	
gamma-BHC (Lindane)	0.08	ug/L	USEPA 1995a	
gamma-Chlordane	0.17	ug/L	Suter and Tsao 1996	
Heptachlor	0.0069	ug/L	USEPA 1996b	
Heptachlor epoxide	0.0069	ug/L	Suter and Tsao 1996	
Hexachlorobenzene	3.68	ug/L	USEPA 1995a	
Hexachlorobutadiene	9.3	ug/L	USEPA 1995a	
Hexachlorocyclopentadiene	5.2	ug/L	USEPA 1995a	
Hexachloroethane	540	ug/L	USEPA 1995a	
Iron	320	ug/L	USEPA 1995a	
Isophorone	11700	ug/L	USEPA 1995a (with safety factor of 10)	
Lead (SWMU 11)	0.54	ug/L	USEPA 1999b	24.9
Lead (SWMU 22)	1.1	ug/L	USEPA 1999b	44.0
Manganese	120	ug/L	Suter and Tsao 1996	
Mercury	0.91	ug/L	USEPA 1999b	
Methoxychlor	0.03	ug/L	USEPA 1995a	
Methyl bromide	110	ug/L	USEPA 1999a	
Methylene chloride	2200	ug/L	Suter and Tsao 1996	
Naphthalene	100	ug/L	USEPA 1995a	
Nickel	25.2	ug/L	USEPA 1999b	
Nitrobenzene	2700	ug/L	USEPA 1995a (with safety factor of 10)	
n-Nitrosodiphenylamine	585	ug/L	USEPA 1995a (with safety factor of 10)	
Pentachlorobenzene	50	ug/L	USEPA 1995a	
Pentachloroethane	1100	ug/L	USEPA 1995a	
Pentachlorophenol	15.0	ug/L	USEPA 1999b	
Phenanthrene	6.3	ug/L	USEPA 1995a	
Phenol	256	ug/L	USEPA 1999a	
Polychlorinated biphenyls (PCBs)	0.14	ug/L	Suter and Tsao 1996	
Selenium	5	ug/L	USEPA 1995a	
Silver	0.36	ug/L	Suter and Tsao 1996	

Table 3-2 **Medium-Specific Screening Values Used in the ERA** *NAS Oceana, Virginia Beach, VA*				
Chemical	**Screening Value**	**Units**	**Reference**	**Hardness (mg/L)**
Tetrachloroethene	840	ug/L	USEPA 1995a	
Thallium	40	ug/L	USEPA 1995a	
Toluene	1700	ug/L	USEPA 1995a (with safety factor of 10)	
Toxaphene	0.011	ug/L	USEPA 1996b	
trans-1,2-Dichloroethene	1160	ug/L	USEPA 1995a (with safety factor of 10)	
trans-1,3-Dichloropropene	244	ug/L	USEPA 1995a	
Tribromomethane	320	ug/L	USEPA 1996b	
Trichlorobenzene	50	ug/L	USEPA 1995a	
Trichloroethene	21900	ug/L	USEPA 1995a	
Trichlorofluoromethane	1100	ug/L	USEPA 1995a (with safety factor of 10)	
Vanadium	10000	ug/L	USEPA 1995a	
Vinyl chloride	1160	ug/L	USEPA 1995a (with safety factor of 10)	
Xylene, total	130	ug/L	USEPA 1995a	
Zinc (SWMU 11)	37	ug/L	USEPA 1999b	24.9
Zinc (SWMU 22)	60	ug/L	USEPA 1999b	44.0
Sediment				
1,1,1-Trichloroethane	31	ug/kg	USEPA 1995a	
1,1,2-Trichloroethane	31	ug/kg	USEPA 1995a	
1,2,4-Trichlorobenzene	40	ug/kg	USEPA 1995a	
1,2-Dichlorobenzene	35	ug/kg	USEPA 1995a	
1,4-Dichlorobenzene	110	ug/kg	USEPA 1995a	
2,4-Dimethylphenol	29	ug/kg	USEPA 1995a	
2-Methylnaphthalene	70	ug/kg	USEPA 1995a	
2-Methylphenol	63	ug/kg	USEPA 1995a	
4,4'-DDD	16	ug/kg	USEPA 1995a	
4,4'-DDE	2.2	ug/kg	USEPA 1995a	
4,4'-DDT	1.58	ug/kg	USEPA 1995a	
4-Methylphenol	670	ug/kg	USEPA 1995a	
Acenaphthene	16	ug/kg	USEPA 1995a	
Acenaphthylene	44	ug/kg	USEPA 1995a	
Aldrin	2	ug/kg	Ontario Ministry of the Environment 1993	
alpha-BHC	6	ug/kg	Ontario Ministry of the Environment 1993	
alpha-Chlordane	7	ug/kg	Ontario Ministry of the Environment 1993	

Table 3-2
Medium-Specific Screening Values Used in the ERA
NAS Oceana, Virginia Beach, VA

Chemical	Screening Value	Units	Reference	Hardness (mg/L)
Aluminum	25500	mg/kg	Buchman 1999	
Anthracene	85.3	ug/kg	USEPA 1995a	
Antimony	150	mg/kg	USEPA 1995a	
Aroclor-1016	22.7	ug/kg	USEPA 1995a	
Aroclor-1221	22.7	ug/kg	USEPA 1995a	
Aroclor-1232	22.7	ug/kg	USEPA 1995a	
Aroclor-1242	22.7	ug/kg	USEPA 1995a	
Aroclor-1248	22.7	ug/kg	USEPA 1995a	
Aroclor-1254	22.7	ug/kg	USEPA 1995a	
Aroclor-1260	22.7	ug/kg	USEPA 1995a	
Arsenic	8.2	mg/kg	USEPA 1995a	
Barium	500	mg/kg	Beyer 1990	
Benzo(a)anthracene	261	ug/kg	USEPA 1995a	
Benzo(a)pyrene	430	ug/kg	USEPA 1995a	
Benzo(b)fluoranthene	3200	ug/kg	USEPA 1995a	
Benzo(g,h,i)perylene	670	ug/kg	USEPA 1995a	
Benzo(k)fluoranthene	240	ug/kg	Ontario Ministry of the Environment 1993	
beta-BHC	5	ug/kg	Ontario Ministry of the Environment 1993	
bis(2-Ethylhexyl)phthalate	1300	ug/kg	USEPA 1995a	
Butylbenzylphthalate	63	ug/kg	USEPA 1995a	
Cadmium	1.2	mg/kg	USEPA 1995a	
Chlordane	7	ug/kg	Ontario Ministry of the Environment 1993	
Chromium	81	mg/kg	Long et al. 1995	
Chrysene	384	ug/kg	USEPA 1995a	
Cobalt	50	mg/kg	Ontario Ministry of the Environment 1993	
Copper	34	mg/kg	USEPA 1995a	
Cyanide	0.1	mg/kg	Ontario Ministry of the Environment 1993	
Dibenz(a,h)anthracene	63.4	ug/kg	USEPA 1995a	
Dibenzofuran	540	ug/kg	USEPA 1995a	
Dieldrin	2	ug/kg	Ontario Ministry of the Environment 1993	
Diethylphthalate	200	ug/kg	USEPA 1995a	
Dimethyl phthalate	71	ug/kg	USEPA 1995a	
Di-n-butylphthalate	1400	ug/kg	USEPA 1995a	

Table 3-2
Medium-Specific Screening Values Used in the ERA
NAS Oceana, Virginia Beach, VA

Chemical	Screening Value	Units	Reference	Hardness (mg/L)
Di-n-octyl phthalate	6200	ug/kg	USEPA 1995a	
Endrin	3	ug/kg	Ontario Ministry of the Environment 1993	
Ethylbenzene	10	ug/kg	USEPA 1995a	
Fluoranthene	600	ug/kg	USEPA 1995a	
Fluorene	19	ug/kg	USEPA 1995a	
gamma-BHC (Lindane)	3	ug/kg	Ontario Ministry of the Environment 1993	
gamma-Chlordane	7	ug/kg	Ontario Ministry of the Environment 1993	
Heptachlor	0.3	ug/kg	Buchman 1999	
Heptachlor epoxide	5	ug/kg	Ontario Ministry of the Environment 1993	
Hexachlorobenzene	22	ug/kg	USEPA 1995a	
Hexachlorobutadiene	11	ug/kg	USEPA 1995a	
Indeno(1,2,3-cd)pyrene	600	ug/kg	USEPA 1995a	
Iron	188400	mg/kg	Buchman 1999	
Lead	46.7	mg/kg	USEPA 1995a	
Manganese	460	mg/kg	Ontario Ministry of the Environment 1993	
Mercury	0.15	mg/kg	USEPA 1995a	
Naphthalene	160	ug/kg	USEPA 1995a	
Nickel	20.9	mg/kg	USEPA 1995a	
n-Nitrosodiphenylamine	28	ug/kg	USEPA 1995a	
PAH (total)	4022	ug/kg	Long et al. 1995	
Pentachlorophenol	360	ug/kg	USEPA 1995a	
Phenanthrene	240	ug/kg	USEPA 1995a	
Phenol	420	ug/kg	USEPA 1995a	
Polychlorinated biphenyls (PCBs)	22.7	ug/kg	USEPA 1995a	
Pyrene	665	ug/kg	USEPA 1995a	
Selenium	1	mg/kg	Buchman 1999	
Silver	1	mg/kg	USEPA 1995a	
Tetrachloroethene	57	ug/kg	USEPA 1995a	
Trichlorobenzene	40	ug/kg	USEPA 1995a	
Trichloroethene	41	ug/kg	Buchman 1999	
Vanadium	57	mg/kg	Buchman 1999	
Xylene, total	40	ug/kg	USEPA 1995a	
Zinc	150	mg/kg	USEPA 1995a	

Table 3-2
Medium-Specific Screening Values Used in the ERA
NAS Oceana, Virginia Beach, VA

Chemical	Screening Value	Units	Reference	Hardness (mg/L)
Surface Soil				
1,1,1,2-Tetrachloroethane	300	ug/kg	USEPA 1995a	
1,1,1-Trichloroethane	300	ug/kg	USEPA 1995a	
1,1,2,2-Tetrachloroethane	300	ug/kg	USEPA 1995a	
1,1,2-Trichloroethane	300	ug/kg	USEPA 1995a	
1,1-Dichloroethane	300	ug/kg	USEPA 1995a	
1,2,4,5-Tetrachlorobenzene	100	ug/kg	USEPA 1995a	
1,2,4-Trichlorobenzene	1270	ug/kg	Efroymson et al. 1997b	
1,2-Dibromoethane	5000	ug/kg	USEPA 1995a	
1,2-Dichlorobenzene	100	ug/kg	USEPA 1995a	
1,2-Dichloroethane	401	ug/kg	MHSPE 1994	
1,2-Dichloroethene (total)	300	ug/kg	USEPA 1995a	
1,2-Dichloropropane	38800	ug/kg	Efroymson et al. 1997b	
1,3-Dichloropropene	300	ug/kg	USEPA 1995a	
1,4-Dichlorobenzene	1280	ug/kg	Efroymson et al. 1997b	
2,3,4,6-Tetrachlorophenol	100	ug/kg	USEPA 1995a	
2,4,5-Trichlorophenol	430	ug/kg	Efroymson et al. 1997a	
2,4,6-Trichlorophenol	580	ug/kg	Efroymson et al. 1997b	
2,4-Dichlorophenol	13400	ug/kg	Efroymson et al. 1997b	
2,4-Dimethylphenol	100	ug/kg	USEPA 1995a	
2,4-Dinitrophenol	20000	ug/kg	Efroymson et al. 1997a	
2,6-Dichlorophenol	100	ug/kg	USEPA 1995a	
2-Chloronaphthalene	1033	ug/kg	MHSPE 1994	
2-Chlorophenol	100	ug/kg	USEPA 1995a	
2-Methylphenol	100	ug/kg	USEPA 1995a	
4,4'-DDD	100	ug/kg	USEPA 1995a	
4,4'-DDE	100	ug/kg	USEPA 1995a	
4,4'-DDT	100	ug/kg	USEPA 1995a	
4-Methyl-2-pentanone	10000	ug/kg	USEPA 1995a (with safety factor of 10)	
4-Methylphenol	100	ug/kg	USEPA 1995a	
4-Nitrophenol	380	ug/kg	Efroymson et al. 1997b	
Acenaphthene	2500	ug/kg	Efroymson et al. 1997a	
Acenaphthylene	100	ug/kg	USEPA 1995a	

Table 3-2
Medium-Specific Screening Values Used in the ERA
NAS Oceana, Virginia Beach, VA

Chemical	Screening Value	Units	Reference	Hardness (mg/L)
Aldrin	100	ug/kg	USEPA 1995a	
alpha-BHC	100000	ug/kg	USEPA 1995a	
alpha-Chlordane	100	ug/kg	USEPA 1995a	
Aluminum	50	mg/kg	Efroymson et al. 1997a	
Anthracene	see PAH, total; 100	ug/kg	MHSPE 1994; USEPA 1995a	
Antimony	5	mg/kg	Efroymson et al. 1997a	
Aroclor-1016	100	ug/kg	USEPA 1995a	
Aroclor-1221	100	ug/kg	USEPA 1995a	
Aroclor-1232	100	ug/kg	USEPA 1995a	
Aroclor-1242	100	ug/kg	USEPA 1995a	
Aroclor-1248	100	ug/kg	USEPA 1995a	
Aroclor-1254	100	ug/kg	USEPA 1995a	
Aroclor-1260	100	ug/kg	USEPA 1995a	
Arsenic	60	mg/kg	Efroymson et al. 1997b	
Barium	500	mg/kg	Efroymson et al. 1997a	
Benzene	105	ug/kg	MHSPE 1994	
Benzo(a)anthracene	see PAH, total; 100	ug/kg	MHSPE 1994; USEPA 1995a	
Benzo(a)pyrene	see PAH, total; 100	ug/kg	MHSPE 1994; USEPA 1995a	
Benzo(b)fluoranthene	100	ug/kg	USEPA 1995a	
Benzo(g,h,i)perylene	see PAH, total; 100	ug/kg	MHSPE 1994; USEPA 1995a	
Benzo(k)fluoranthene	see PAH, total; 100	ug/kg	MHSPE 1994; USEPA 1995a	
Beryllium	10	mg/kg	Efroymson et al. 1997a	
beta-BHC	100000	ug/kg	USEPA 1995a	
Bromochloromethane	300000	ug/kg	USEPA 1995a (with safety factor of 10)	
Bromodichloromethane	45000	ug/kg	USEPA 1995a (with safety factor of 10)	
Cadmium	4	mg/kg	Efroymson et al. 1997a	
Carbon tetrachloride	1000000	ug/kg	Efroymson et al. 1997b	
Chlordane	100	ug/kg	USEPA 1995a	
Chlorobenzene	2400	ug/kg	Efroymson et al. 1997b	
Chloroform	1000	ug/kg	MHSPE 1994	
Chromium	0.4	mg/kg	Efroymson et al. 1997b	
Chrysene	see PAH, total; 100	ug/kg	MHSPE 1994; USEPA 1995a	
cis-1,2-Dichloroethene	300	ug/kg	USEPA 1995a	

Table 3-2
Medium-Specific Screening Values Used in the ERA
NAS Oceana, Virginia Beach, VA

Chemical	Screening Value	Units	Reference	Hardness (mg/L)
cis-1,3-Dichloropropene	300	ug/kg	USEPA 1995a	
Cobalt	100	mg/kg	USEPA 1995a	
Copper	50	mg/kg	Efroymson et al. 1997b	
Cyanide	0.06	mg/kg	Eisler 1991	
delta-BHC	100000	ug/kg	USEPA 1995a	
Dibenz(a,h)anthracene	100	ug/kg	USEPA 1995a	
Dieldrin	100	ug/kg	USEPA 1995a	
Diethylphthalate	13400	ug/kg	Efroymson et al. 1997a	
Dimethyl phthalate	10640	ug/kg	Efroymson et al. 1997b	
Di-n-butylphthalate	200000	ug/kg	Efroymson et al. 1997a	
Dinitrophenol	100	ug/kg	USEPA 1995a	
Endrin	100	ug/kg	USEPA 1995a	
Endrin aldehyde	100	ug/kg	USEPA 1995a	
Endrin ketone	100	ug/kg	USEPA 1995a	
Ethylbenzene	5005	ug/kg	MHSPE 1994	
Fluoranthene	see PAH, total; 100	ug/kg	MHSPE 1994; USEPA 1995a	
Fluorene	1700	ug/kg	Efroymson et al. 1997b	
Fluoride	1	mg/kg	USEPA 1995a	
gamma-BHC (Lindane)	100	ug/kg	USEPA 1995a	
gamma-Chlordane	100	ug/kg	USEPA 1995a	
HCH-technical	100000	ug/kg	USEPA 1995a	
Heptachlor epoxide	100	ug/kg	USEPA 1995a	
Hexachlorocyclopentadiene	1000	ug/kg	Efroymson et al. 1997a	
Indeno(1,2,3-cd)pyrene	see PAH, total; 100	ug/kg	MHSPE 1994; USEPA 1995a	
Iron	200	mg/kg	Efroymson et al. 1997b	
Lead	50	mg/kg	Efroymson et al. 1997a	
Magnesium	4400	mg/kg	USEPA 1995a	
Manganese	500	mg/kg	Efroymson et al. 1997a	
Mercury	0.1	mg/kg	Efroymson et al. 1997b	
Methoxychlor	100	ug/kg	USEPA 1995a	
Methylene chloride	1001	ug/kg	MHSPE 1994	
Naphthalene	see PAH, total; 100	ug/kg	MHSPE 1994; USEPA 1995a	
Nickel	30	mg/kg	Efroymson et al. 1997a	

Table 3-2
Medium-Specific Screening Values Used in the ERA
NAS Oceana, Virginia Beach, VA

Chemical	Screening Value	Units	Reference	Hardness (mg/L)
Nitrobenzene	2260	ug/kg	Efroymson et al. 1997b	
n-Nitrosodiphenylamine	1090	ug/kg	Efroymson et al. 1997b	
PAH (total)	4100	ug/kg	MHSPE 1994	
Pentachlorobenzene	1150	ug/kg	Efroymson et al. 1997b	
Pentachlorophenol	3000	ug/kg	Efroymson et al. 1997a	
Phenanthrene	see PAH, total; 100	ug/kg	MHSPE 1994; USEPA 1995a	
Phenol	1880	ug/kg	Efroymson et al. 1997b	
Pyrene	100	ug/kg	USEPA 1995a	
Selenium	1.8	mg/kg	USEPA 1995a	
Silver	2	mg/kg	Efroymson et al. 1997a	
Styrene	10010	ug/kg	MHSPE 1994	
Tetrachloroethene	401	ug/kg	MHSPE 1994	
Thallium	1	mg/kg	Efroymson et al. 1997a	
Toluene	13005	ug/kg	MHSPE 1994	
trans-1,2-Dichloroethene	300	ug/kg	USEPA 1995a	
trans-1,3-Dichloropropene	300	ug/kg	USEPA 1995a	
Tribromomethane	114700	ug/kg	USEPA 1995a (with safety factor of 10)	
Trichlorobenzene	100	ug/kg	USEPA 1995a	
Trichloroethene	6000	ug/kg	MHSPE 1994	
Vanadium	2	mg/kg	Efroymson et al. 1997a	
Vinyl chloride	300	ug/kg	USEPA 1995a	
Xylene, total	2505	ug/kg	MHSPE 1994	
Zinc	50	mg/kg	Efroymson et al. 1997a	

Table 3-3
Ingestion Screening Values for Mammals
NAS Oceana, Virginia Beach, VA

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Inorganics								
Aluminum	mouse	0.03	390 days	oral in water	reproduction	193	19.3	ATSDR 1990a
Aluminum	dog	10	6 months	oral	reproduction	600	60	ATSDR 1990a
Antimony	mouse	0.03	lifetime	oral in water	lifespan/longevity	1.25	0.125	Sample et al. 1996
Arsenic	mouse	0.03	3 generations	oral in water	reproduction	1.26	0.126	Sample et al. 1996
Barium	rat	0.435	16 months	oral in water	growth/hypertension	19.8	5.1	Sample et al. 1996
Beryllium	rat	0.35	lifetime	oral in water	longevity/weight loss	6.6	0.66	Sample et al. 1996
Cadmium	rat	0.303	6 weeks	oral (gavage)	reproduction	10	1	Sample et al. 1996
Cadmium	dog	10	3 months	oral	reproduction	7.5	0.75	ATSDR 1993
Chromium	rat	0.35	3 months	oral in water	mortality	131.4	13.14	Sample et al. 1996
Cobalt	rat	0.35	69 days	oral in diet	reproduction	50	5	ATSDR 1992a
Copper	mink	1	357 days	oral in diet	reproduction	15.14	11.7	Sample et al. 1996
Iron	rabbit	3.8	?	oral in diet	tolerance level	500	50	NAS 1980
Lead	rat	0.35	3 generations	oral in diet	reproduction	80	8	Sample et al. 1996
Manganese	rat	0.35	224 days	oral in diet	reproduction	284	88	Sample et al. 1996
Mercury	rat	0.35	3 generations	oral in diet	reproduction	0.16	0.032	Sample et al. 1996
Mercury	mink	1	93 days	oral in diet	mortality/weight loss	0.25	0.15	Sample et al. 1996
Nickel	rat	0.35	3 generations	oral in diet	reproduction	80	40	Sample et al. 1996
Selenium	rat	0.35	1 year	oral in water	reproduction	0.33	0.2	Sample et al. 1996
Silver	rat	0.35	2 weeks	oral in water	mortality	181	18.1	ATSDR 1990b
Thallium	rat	0.365	60 days	oral in water	reproduction	0.74	0.074	Sample et al. 1996
Vanadium	rat	0.26	60 days +	oral intubation	reproduction	2.1	0.21	Sample et al. 1996
Zinc	rat	0.35	GD 1-16	oral in diet	reproduction	320	160	Sample et al. 1996
Zinc	mink	1	25 weeks	oral	reproduction	208	20.8	ATSDR 1992b
Pesticides/PCBs								
4,4'-DDD	rat	0.35	2 years	oral in diet	reproduction	4	0.8	Sample et al. 1996
4,4'-DDD	dog	10	2 generations	oral	reproduction	5	1	ATSDR 1992c
4,4'-DDE	rat	0.35	2 years	oral in diet	reproduction	4	0.8	Sample et al. 1996
4,4'-DDE	dog	10	2 generations	oral	reproduction	5	1	ATSDR 1992c
4,4'-DDT	rat	0.35	2 years	oral in diet	reproduction	4	0.8	Sample et al. 1996
4,4'-DDT	dog	10	2 generations	oral	reproduction	5	1	ATSDR 1992c
Aldrin	rat	0.35	3 generations	oral in diet	reproduction	1	0.2	Sample et al. 1996
alpha-BHC	rat	0.35	4 generations	oral in diet	reproduction	3.2	1.6	Sample et al. 1996
alpha-Chlordane	mouse	0.03	6 generations	oral in diet	reproduction	9.16	4.58	Sample et al. 1996
Aroclor-1016	mink	1	18 months	oral in diet	reproduction	3.43	1.37	Sample et al. 1996
Aroclor-1221	mink	1	7 months	oral in diet	reproduction	0.69	0.069	Sample et al. 1996
Aroclor-1232	mink	1	7 months	oral in diet	reproduction	0.69	0.069	Sample et al. 1996
Aroclor-1242	mink	1	7 months	oral in diet	reproduction	0.69	0.069	Sample et al. 1996

Table 3-3
Ingestion Screening Values for Mammals
NAS Oceana, Virginia Beach, VA

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Aroclor-1248	mouse	0.03	5 weeks	oral in diet	immunological	13	1.3	ATSDR 1995a
Aroclor-1248	rhesus monkey	5	14 months	oral in diet	reproduction	0.1	0.01	Sample et al. 1996
Aroclor-1254	oldfield mouse	0.014	12 months	oral in diet	reproduction	0.68	0.068	Sample et al. 1996
Aroclor-1254	mink	1	4.5 months	oral in diet	reproduction	0.69	0.14	Sample et al. 1996
Aroclor-1260	oldfield mouse	0.014	12 months	oral in diet	reproduction	0.68	0.068	Sample et al. 1996
Aroclor-1260	mink	1	4.5 months	oral in diet	reproduction	0.69	0.14	Sample et al. 1996
beta-BHC	rat	0.35	13 weeks	oral in diet	growth/systemic	20	4	Sample et al. 1996
delta-BHC	rat	0.35	4 generations	oral in diet	reproduction	3.2	1.6	Sample et al. 1996
Dieldrin	rat	0.35	3 generations	oral in diet	reproduction	0.2	0.02	Sample et al. 1996
Endosulfan I	rat	0.35	30 days	oral (intubation)	reproduction	15	1.5	Sample et al. 1996
Endosulfan II	rat	0.35	30 days	oral (intubation)	reproduction	15	1.5	Sample et al. 1996
Endosulfan Sulfate	rat	0.35	30 days	oral (intubation)	reproduction	15	1.5	Sample et al. 1996
Endrin	mouse	0.03	120 days	oral in diet	reproduction	0.92	0.092	Sample et al. 1996
Endrin Aldehyde	mouse	0.03	120 days	oral in diet	reproduction	0.92	0.092	Sample et al. 1996
Endrin Ketone	mouse	0.03	120 days	oral in diet	reproduction	0.92	0.092	Sample et al. 1996
Gamma-BHC (Lindane)	rat	0.35	3 generations	oral in diet	reproduction	80	8	Sample et al. 1996
Gamma-Chlordane	mouse	0.03	6 generations	oral in diet	reproduction	9.16	4.58	Sample et al. 1996
Heptachlor	mink	1	181 days	oral in diet	reproduction	1	0.1	Sample et al. 1996
Heptachlor Epoxide	mink	1	181 days	oral in diet	reproduction	1	0.1	Sample et al. 1996
Methoxychlor	rat	0.35	11 months	oral in diet	reproduction	8	4	Sample et al. 1996
Toxaphene	rat	0.35	3 generations	oral in diet	reproduction	80	8	Sample et al. 1996
Semivolatile Organic Compounds								
1,2,4-Trichlorobenzene	rat	0.35	3 generations	oral in water	reproduction	106	53	Coulston and Kolbye 1994
1,2-Dichlorobenzene	rat	0.35	chronic	oral (gavage)	liver/kidney	857	85.7	Coulston and Kolbye 1994
1,3-Dichlorobenzene	rat	0.35	chronic	oral (gavage)	liver/kidney	857	85.7	Coulston and Kolbye 1994
1,4-Dichlorobenzene	rat	0.35	GD 6-15	oral (gavage)	reproduction	500	250	Coulston and Kolbye 1994
2,4,5-Trichlorophenol	rat	0.35	98 days	oral in diet	hepatic/renal	800	80	McCollister et al. 1961
2,4,6-Trichlorophenol	rat	0.35	98 days	oral in diet	hepatic/renal	800	80	McCollister et al. 1961
2,4-Dichlorophenol	rat	0.35	103 weeks	oral in diet	reproduction	4400	440	NTP 1989
2-Chloronaphthalene	--	--	--	--	--	NA	NA	--
2-Methylnaphthalene	mouse	0.03	81 weeks	oral in diet	systemic	1437	143.7	ATSDR 1995b
3,3'-Dichlorobenzidine	--	--	--	--	--	NA	NA	--
4-Bromophenyl-Phenylether	--	--	--	--	--	NA	NA	--
4-Chloro-3-Methylphenol	--	--	--	--	--	NA	NA	--
4-Chlorophenyl-Phenylether	--	--	--	--	--	NA	NA	--
Acenaphthene	mouse	0.03	13 weeks	oral (gavage)	reproduction	3500	350	ATSDR 1995b
Acenaphthylene	mouse	0.03	13 weeks	oral (gavage)	reproduction	2500	350	ATSDR 1995b
Anthracene	mouse	0.03	13 weeks	oral (gavage)	reproduction	10000	1000	ATSDR 1995b

Table 3-3
Ingestion Screening Values for Mammals
NAS Oceana, Virginia Beach, VA

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Benzo(a)anthracene	mouse	0.03	GD 7-16	oral (intubation)	reproduction	10	1	Sample et al. 1996
Benzo(a)pyrene	mouse	0.03	GD 7-16	oral (intubation)	reproduction	10	1	Sample et al. 1996
Benzo(b)fluoranthene	mouse	0.03	GD 7-16	oral (intubation)	reproduction	10	1	Sample et al. 1996
Benzo(g,h,i)perylene	mouse	0.03	19 to 29 days	oral in diet	reproduction	1330	133	ATSDR 1995b
Benzo(k)fluoranthene	mouse	0.03	GD 7-16	oral (intubation)	reproduction	10	1	Sample et al. 1996
Bis-(2-Ethylhexyl)phthalate	mouse	0.03	105 days	oral in diet	reproduction	183.3	18.3	Sample et al. 1996
Butylbenzylphthalate	rat	0.35	2 years	oral in diet	hepatic	2400	240	NTP 1997
Carbazole	mouse	0.03	19 to 29 days	oral in diet	reproduction	1330	133	ATSDR 1995b
Chrysene	mouse	0.03	GD 7-16	oral (intubation)	reproduction	10	1	Sample et al. 1996
Dibenz(a,h)anthracene	mouse	0.03	GD 7-16	oral (intubation)	reproduction	10	1	Sample et al. 1996
Dibenzofuran	mouse	0.03	19 to 29 days	oral in diet	reproduction	1330	133	ATSDR 1995b
Diethylphthalate	mouse	0.03	105 days	oral in diet	reproduction	45830	4583	Sample et al. 1996
Di-n-butylphthalate	mouse	0.03	105 days	oral in diet	reproduction	1833	550	Sample et al. 1996
Di-n-octylphthalate	mouse	0.03	105 days	oral in diet	reproduction	550	55	Sample et al. 1996
Fluoranthene	mouse	0.03	13 weeks	oral (gavage)	hepatic	1250	125	ATSDR 1995b
Fluorene	mouse	0.03	13 weeks	oral (gavage)	hematological	1250	125	ATSDR 1995b
Hexachlorobutadiene	rat	0.35	90 days +	oral	reproduction	20	2	IPCS 1994
Hexachlorobenzene	rat	0.35	2 years	oral	reproduction	16	1.6	ATSDR 1989
Hexachlorocyclopentadiene	rat	0.35	GD 6-15	oral	reproduction	30	10	USEPA 1984
Hexachloroethane	--	--	--	--	--	NA	NA	--
Indeno(1,2,3-cd)pyrene	mouse	0.03	GD 7-16	oral (intubation)	reproduction	10	1	Sample et al. 1996
Naphthalene	mouse	0.03	13 weeks	oral (gavage)	reproduction	1400	140	ATSDR 1995
N-Nitrosodiphenylamine	rat	0.35	8 to 11 weeks	oral in diet	systemic	1500	150	ATSDR 1993
Pentachlorophenol	rat	0.35	up to 24 months	oral in diet	reproduction	30	3	Coulston and Kolbye 1994
Phenanthrene	mouse	0.03	19 to 29 days	oral in diet	reproduction	1330	133	ATSDR 1995
Pyrene	mouse	0.03	19 to 29 days	oral in diet	reproduction	1330	133	ATSDR 1995
Volatile Organic Compounds								
Carbon Tetrachloride	rat	0.35	2 years	oral in diet	reproduction	160	16	Sample et al. 1996
Chlorobenzene	dog	12.7	chronic	?	liver	273	27.3	IRIS 1998
Chloroform	rat	0.35	13 weeks	oral (intubation)	systemic	410	150	Sample et al. 1996
Ethylbenzene	rat	0.35	chronic	?	liver/kidney	971	97.1	Wolf et al. 1956
Styrene	rat	0.35	90 days	oral	reproduction	350	35	Beliles et al. 1985
Styrene	dog	12.7	560 days	oral (gavage)	blood/liver	400	200	IRIS 1998
Tetrachloroethene	mouse	0.03	6 weeks	oral (gavage)	hepatotoxicity	70	14	Sample et al. 1996
Toluene	mouse	0.03	GD 6-12	oral (gavage)	reproduction	260	26	Sample et al. 1996
Trichloroethene	rat	0.35	?	oral	reproduction	10000	1000	Coulston and Kolbye 1994
Trichloroethene	mouse	0.03	6 weeks	oral (gavage)	hepatotoxicity	7	0.7	Sample et al. 1996
Xylenes (total)	mouse	0.03	GD 6-15	oral (gavage)	reproduction	2.6	2.1	Sample et al. 1996

Table 3-4
Ingestion Screening Values for Birds
NAS Oceana, Virginia Beach, VA

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Inorganics								
Aluminum	ringed dove	0.155	4 months	oral in diet	reproduction	1097	109.7	Sample et al. 1996
Antimony	northern bobwhite	0.19	6 weeks	oral	?	47400	4740	Opresko et al. 1993
Arsenic	brown-headed cowbird	0.049	7 months	oral in diet	mortality	7.38	2.46	Sample et al. 1996
Arsenic	mallard	1	128 days	oral in diet	mortality	12.84	5.14	Sample et al. 1996
Barium	chicks	0.121	4 weeks	oral in diet	mortality	417	208	Sample et al. 1996
Beryllium	--	--	--	--	--	NA	NA	--
Cadmium	mallard	1.153	90 days	oral in diet	reproduction	20	1.45	Sample et al. 1996
Chromium	American black duck	1.25	10 months	oral in diet	reproduction	5	1	Sample et al. 1996
Cobalt	chicken	1.8	14 days	oral in diet	growth	14.7	1.47	Diaz et al. 1994
Copper	chicks	0.534	10 weeks	oral in diet	growth/mortality	61.7	47	Sample et al. 1996
Iron	chicken	1.6	?	oral	maximum tolerance level	1000	100	NAS 1980
Lead	Japanese quail	0.15	12 weeks	oral in diet	reproduction	11.3	1.13	Sample et al. 1996
Lead	American kestrel	0.13	7 months	oral in diet	reproduction	38.5	3.85	Sample et al. 1996
Manganese	Japanese quail	0.072	75 days	oral in diet	growth/behavior	9770	977	Sample et al. 1996
Mercury	Japanese quail	0.15	1 year	oral in diet	reproduction	0.9	0.45	Sample et al. 1996
Mercury	mallard	1	3 generations	oral in diet	reproduction	0.064	0.0064	Sample et al. 1996
Nickel	mallard	0.782	90 days	oral in diet	growth/mortality	107	77.4	Sample et al. 1996
Selenium	mallard	1	100 days	oral in diet	reproduction	0.8	0.4	Sample et al. 1996
Selenium	screech owl	0.2	13.7 weeks	oral in diet	reproduction	1.5	0.44	Sample et al. 1996
Silver	mallard	?	14 days	oral	?	1780	178	USEPA 1999
Thallium	European starling	?	acute	oral	?	3.5	0.35	USEPA 1999
Vanadium	mallard	1.17	12 weeks	oral in diet	growth/mortality	114	11.4	Sample et al. 1996
Zinc	chicken	1.935	44 weeks	oral in diet	reproduction	131	14.5	Sample et al. 1996
Pesticides/PCBs								
4,4'-DDD	mallard	1.134	chronic	oral	reproduction	5.2	0.52	Stickel 1973
4,4'-DDD	American kestrel	0.115	2 years	oral	reproduction	0.5	0.05	McLane and Hall 1972
4,4'-DDE	brown pelican	3.5	chronic	oral	reproduction	1.31	0.131	Beyer et al. 1996
4,4'-DDE	American kestrel	0.115	2 years	oral	reproduction	0.5	0.05	McLane and Hall 1972
4,4'-DDT	mallard	1.134	chronic	oral	reproduction	1.04	0.104	Davison and Sell 1974
4,4'-DDT	American kestrel	0.115	2 years	oral	reproduction	0.5	0.05	McLane and Hall 1972
Aldrin	mallard	1.134	chronic	oral	mortality	5	0.5	Tucker and Crabtree 1970
alpha-BHC	Japanese quail	0.15	90 days	oral in diet	reproduction	2.25	0.56	Sample et al. 1996
alpha-Chlordane	red-winged blackbird	0.064	84 days	oral in diet	mortality	10.7	2.14	Sample et al. 1996
Aroclor-1016	screech owl	0.181	2 generations	oral in diet	reproduction	4.1	0.41	Sample et al. 1996
Aroclor-1221	screech owl	0.181	2 generations	oral in diet	reproduction	4.1	0.41	Sample et al. 1996
Aroclor-1232	screech owl	0.181	2 generations	oral in diet	reproduction	4.1	0.41	Sample et al. 1996
Aroclor-1242	screech owl	0.181	2 generations	oral in diet	reproduction	4.1	0.41	Sample et al. 1996
Aroclor-1248	ring-necked pheasant	1	17 weeks	oral	reproduction	1.8	0.18	Sample et al. 1996
Aroclor-1254	ring-necked pheasant	1	17 weeks	oral	reproduction	1.8	0.18	Sample et al. 1996

Table 3-4
Ingestion Screening Values for Birds
NAS Oceana, Virginia Beach, VA

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Aroclor-1260	ring-necked pheasant	1	17 weeks	oral	reproduction	1.8	0.18	Sample et al. 1996
beta-BHC	Japanese quail	0.15	90 days	oral in diet	reproduction	2.25	0.56	Sample et al. 1996
delta-BHC	Japanese quail	0.15	90 days	oral in diet	reproduction	2.25	0.56	Sample et al. 1996
Dieldrin	barn owl	0.466	2 years	oral in diet	reproduction	0.77	0.077	Sample et al. 1996
Endosulfan I	gray partridge	0.4	4 weeks	oral in diet	reproduction	100	10	Sample et al. 1996
Endosulfan II	gray partridge	0.4	4 weeks	oral in diet	reproduction	100	10	Sample et al. 1996
Endosulfan Sulfate	gray partridge	0.4	4 weeks	oral in diet	reproduction	100	10	Sample et al. 1996
Endrin	mallard	1.15	>200 days	oral in diet	reproduction	3	0.3	Sample et al. 1996
Endrin	screech owl	0.181	>83 days	oral in diet	reproduction	0.1	0.01	Sample et al. 1996
Endrin Aldehyde	mallard	1.15	>200 days	oral in diet	reproduction	3	0.3	Sample et al. 1996
Endrin Aldehyde	screech owl	0.181	>83 days	oral in diet	reproduction	0.1	0.01	Sample et al. 1996
Endrin Ketone	mallard	1.15	>200 days	oral in diet	reproduction	3	0.3	Sample et al. 1996
Endrin Ketone	screech owl	0.181	>83 days	oral in diet	reproduction	0.1	0.01	Sample et al. 1996
Gamma-BHC (Lindane)	mallard	1	8 weeks	oral (intubation)	reproduction	20	2	Sample et al. 1996
Gamma-Chlordane	red-winged blackbird	0.064	84 days	oral in diet	mortality	10.7	2.14	Sample et al. 1996
Heptachlor	quail	0.191	5 days	oral in diet	mortality	4.05	0.405	Hill et al. 1975
Heptachlor Epoxide	quail	0.191	5 days	oral in diet	mortality	4.05	0.405	Hill et al. 1975
Methoxychlor	quail	0.191	5 days	oral in diet	mortality	4050	405	Hill and Camardese 1986
Toxaphene	mallard	1.043	5 days	oral in diet	mortality	3.07	0.307	Hill and Camardese 1986
Semivolatile Organic Compounds								
1,2,4-Trichlorobenzene	--	--	--	--	--	NA	NA	--
1,2-Dichlorobenzene	northern bobwhite	0.157	14 days	oral (gavage)	growth/mortality	2500	250	Grimes and Jaber 1989
1,3-Dichlorobenzene	northern bobwhite	0.157	14 days	oral (gavage)	growth/mortality	2500	250	Grimes and Jaber 1989
1,4-Dichlorobenzene	northern bobwhite	0.157	14 days	oral (gavage)	growth/mortality	2500	250	Grimes and Jaber 1989
2,4,5-Trichlorophenol	--	--	--	--	--	NA	NA	--
2,4,6-Trichlorophenol	--	--	--	--	--	NA	NA	--
2,4-Dichlorophenol	--	--	--	--	--	NA	NA	--
2-Chloronaphthalene	--	--	--	--	--	NA	NA	--
2-Methylnaphthalene	--	--	--	--	--	NA	NA	--
3,3'-Dichlorobenzidine	--	--	--	--	--	NA	NA	--
4-Bromophenyl-Phenylether	--	--	--	--	--	NA	NA	--
4-Chloro-3-Methylphenol	--	--	--	--	--	NA	NA	--
4-Chlorophenyl-Phenylether	--	--	--	--	--	NA	NA	--
Acenaphthene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Acenaphthylene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Anthracene	mallard	1.043	7 months	oral in diet	hepatic	228	22.8	Patton and Dieter 1980
Benzo(a)anthracene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Benzo(a)pyrene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Benzo(b)fluoranthene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Benzo(g,h,i)perylene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963

Table 3-4
Ingestion Screening Values for Birds
NAS Oceana, Virginia Beach, VA

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Benzo(k)fluoranthene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Bis-(2-Ethylhexyl)phthalate	ringed dove	0.155	4 weeks	oral in diet	reproduction	11	1.1	Sample et al. 1996
Butylbenzylphthalate	--	--	--	--	--	NA	NA	--
Carbazole	--	--	--	--	--	NA	NA	--
Chrysene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Dibenz(a,h)anthracene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Dibenzofuran	--	--	--	--	--	NA	NA	--
Diethylphthalate	--	--	--	--	--	NA	NA	--
Di-n-butylphthalate	ringed dove	0.155	4 weeks	oral in diet	reproduction	1.1	0.11	Sample et al. 1996
Di-n-octylphthalate	ring-necked pheasant	1	?	?	mortality	500	50	TERRETOX 1998
Fluoranthene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Fluorene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Hexachlorobutadiene	Japanese quail	0.19	90 days	oral	reproduction	8	2.5	Coulston and Kolbye 1994; IPCS 1994
Hexachlorobenzene	Japanese quail	0.19	?	oral	reproduction	0.8	0.08	Coulston and Kolbye 1994
Hexachlorocyclopentadiene	--	--	--	--	--	NA	NA	--
Hexachloroethane	--	--	--	--	--	NA	NA	--
Indeno(1,2,3-cd)pyrene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Naphthalene	mallard	1.04	7 months	oral in diet	hepatic	228	22.8	Patton and Dieter 1980
N-Nitrosodiphenylamine	--	--	--	--	--	NA	NA	--
Pentachlorophenol	chicken	1.5	8 weeks	oral	growth	200	100	Eisler 1989
Phenanthrene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Pyrene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Volatile Organic Compounds								
Carbon Tetrachloride	--	--	--	--	--	NA	NA	--
Chlorobenzene	--	--	--	--	--	NA	NA	--
Chloroform	--	--	--	--	--	NA	NA	--
Ethylbenzene	--	--	--	--	--	NA	NA	--
Styrene	--	--	--	--	--	NA	NA	--
Tetrachloroethene	--	--	--	--	--	NA	NA	--
Toluene	--	--	--	--	--	NA	NA	--
Trichloroethene	--	--	--	--	--	NA	NA	--
Xylenes (total)	quail	0.191	subacute	?	"toxicity"	405	40.5	Hill and Camardese 1986

Table 3-5
Screening-Level Exposure Parameters for Upper Trophic Level Ecological Receptors
NAS Oceana, Virginia Beach, VA

Receptor	Body Weight (kg)		Water Ingestion Rate (L/day)		Food Ingestion Rate (kg/day - dry)	
	Value	Reference	Value	Reference	Value	Reference
Birds						
American kestrel	0.083	Palmer 1988	0.01685	allometric equation	0.01192	USEPA 1993
American robin	0.0635	USEPA 1993	0.01287	allometric equation	0.00735	Levey and Karasov 1989
Great blue heron	2.1	Butler 1992	0.10901	allometric equation	0.43894	allometric equation
Killdeer	0.0858	Dunning 1993	0.01385	allometric equation	0.01424	allometric equation
Mallard	0.612	Bellrose 1980	0.08498	allometric equation	0.08297	allometric equation
Marsh wren	0.00975	Dunning 1993	0.00330	allometric equation	0.00298	USEPA 1993
Mammals						
Deer mouse	0.0122	Silva and Downing 1995	0.00398	USEPA 1993	0.00067	USEPA 1993
Meadow vole	0.03	Silva and Downing 1995	0.01334	USEPA 1993	0.00310	USEPA 1993
Mink	0.726	Silva and Downing 1995	0.02856	USEPA 1993	0.03396	USEPA 1993
Raccoon	4.23	Silva and Downing 1995	0.60919	allometric equation	0.12681	Conover 1989
Red fox	3.17	Silva and Downing 1995	0.41154	allometric equation	0.14763	Sample and Suter 1994
Short-tailed shrew	0.01331	USEPA 1993	0.00475	USEPA 1993	0.00189	USEPA 1993

Table 3-5
Screening-Level Exposure Parameters for Upper Trophic Level Ecological Receptors
NAS Oceana, Virginia Beach, VA

Receptor	Dietary Composition (percent)							Soil/ Sediment Ingestion (percent)	
	Terr. Plants	Soil Invert.	Small Mammals	Fish/ Frogs	Aquatic Plants	Aquatic Invert.	Reference	Value	Reference
Birds									
American kestrel	0	38	60	0	0	0	USEPA 1993	2	Assumed based on diet
American robin	51.6	43.6	0	0	0	0	Martin et al. 1951	4.8	Sample and Suter 1994
Great blue heron	0	0	0	100	0	0	USEPA 1993; Quinney and Smith 1980	0	Sample and Suter 1994
Killdeer	2	93	0	0	0	0	Robbins and Blom 1996	5	Assumed based on diet
Mallard	0	0	0	0	86.7	10	Palmer 1976	3.3	Beyer et al. 1994
Marsh wren	0	0	0	0	0	95	USEPA 1993	5	Assumed based on diet
Mammals									
Deer mouse	53	45	0	0	0	0	Martin et al. 1951	2	Beyer et al. 1994
Meadow vole	95.6	2	0	0	0	0	USEPA 1993	2.4	Beyer et al. 1994
Mink	0	0	0	94	1	5	USEPA 1993	0	Sample and Suter 1994
Raccoon	0	0	0	7	40	43.6	USEPA 1993	9.4	Beyer et al. 1994
Red fox	7	2.8	87.4	0	0	0	USEPA 1993	2.8	Beyer et al. 1994
Short-tailed shrew	4.7	82.3	0	0	0	0	USEPA 1993; Sample and Suter 1994	13	Sample and Suter 1994

Table 3-6
Bioaccumulative Chemicals List and Log K_{ow} Values
NAS Oceana, Virginia Beach, VA

Chemical	Log K_{ow} Range	Selected log K_{ow}	Reference	Evaluate for Food Web Exposures?
Volatile Organics				
1,1,1-Trichloroethane	2.47 to 2.51	2.48	USEPA 1995b	NO
1,1,2,2-Tetrachloroethane	2.31 to 2.64	2.39	USEPA 1995b	NO
1,1,2-Trichloroethane	2.03 to 2.07	2.05	USEPA 1995b	NO
1,1-Dichloroethane	1.78 to 1.85	1.79	USEPA 1995b	NO
1,1-Dichloroethene	2.13 to 2.37	2.13	USEPA 1995b	NO
1,2-Dibromo-3-Chloropropane	2.26 to 2.41	2.34	USEPA 1995b	NO
1,2-Dibromoethane	Not reported	2.00	USEPA 1996a	NO
1,2-Dichloroethane	1.40 to 1.48	1.47	USEPA 1995b	NO
1,2-Dichloropropane	1.94 to 1.99	1.97	USEPA 1995b	NO
2-Butanone	0.26 to 0.69	0.28	USEPA 1995b	NO
2-Hexanone	Not reported	1.40	USEPA 1996a	NO
4-Methyl-2-Pentanone	1.17 to 1.25	1.19	USEPA 1995b	NO
Acetone	-0.21 to -0.24	-0.24	USEPA 1995b	NO
Benzene	1.83 to 2.50	2.13	USEPA 1995b	NO
Bromochloromethane	Not reported	1.41	SRC 1998	NO
Bromodichloromethane	1.88 to 2.14	2.10	USEPA 1995b	NO
Bromoform	2.30 to 2.38	2.35	USEPA 1995b	NO
Bromomethane	1.08 to 1.19	1.19	USEPA 1995b	NO
Carbon disulfide	1.84 to 2.16	2.00	USEPA 1995b	NO
Carbon tetrachloride	2.03 to 3.10	2.73	USEPA 1995b	YES
Chlorobenzene	2.46 to 3.79	2.86	USEPA 1995b	YES
Chloroethane	Not reported	1.43	USEPA 1996a	NO
Chloroform	1.81 to 3.04	1.92	USEPA 1995b	YES
Chloromethane	0.90 to 0.94	0.91	USEPA 1995b	NO
Cis-1,2-Dichloroethene	1.77 to 2.10	1.86	USEPA 1995b	NO
Cis-1,3-Dichloropropene	1.76 to 2.10	2.00	USEPA 1995b	NO
Dibromochloromethane	2.13 to 2.24	2.17	USEPA 1995b	NO
Ethylbenzene	3.07 to 3.57	3.14	USEPA 1995b	YES
Methylene chloride	1.22 to 1.40	1.25	USEPA 1995b	NO
Styrene	2.76 to 3.16	2.94	USEPA 1995b	YES
Tetrachloroethene	2.53 to 3.70	2.67	USEPA 1995b	YES

Table 3-6
Bioaccumulative Chemicals List and Log K_{ow} Values
NAS Oceana, Virginia Beach, VA

Chemical	Log K_{ow} Range	Selected log K_{ow}	Reference	Evaluate for Food Web Exposures?
Toluene	2.21 to 3.13	2.75	USEPA 1995b	YES
Trans-1,2-Dichloroethene	1.77 to 2.10	2.07	USEPA 1995b	NO
Trans-1,3-Dichloropropene	1.76 to 2.10	2.00	USEPA 1995b	NO
Trichloroethene	2.53 to 3.14	2.71	USEPA 1995b	YES
Vinyl chloride	1.23 to 1.52	1.50	USEPA 1995b	NO
Xylenes (total)	2.77 to 3.68	3.20	USEPA 1995b	YES
Semivolatile Organics				
1,2,4-Trichlorobenzene	3.89 to 4.23	4.01	USEPA 1995b	YES
1,2-Dichlorobenzene	3.20 to 3.61	3.43	USEPA 1995b	YES
1,3-Dichlorobenzene	Not reported	3.50	USEPA 1996a	YES
1,4-Dichlorobenzene	3.26 to 3.78	3.42	USEPA 1995b	YES
2,2'-Oxybis(1-Chloropropane)	Not reported	2.50	USEPA 1996a	NO
2,4,5-Trichlorophenol	2.39 to 4.19	3.90	USEPA 1995b	YES
2,4,6-Trichlorophenol	3.29 to 4.05	3.70	USEPA 1995b	YES
2,4-Dichlorophenol	2.80 to 3.30	3.08	USEPA 1995b	YES
2,4-Dimethylphenol	1.99 to 2.49	2.36	USEPA 1995b	NO
2,4-Dinitrophenol	1.40 to 1.79	1.55	USEPA 1995b	NO
2,4-Dinitrotoluene	1.98 to 2.05	2.01	USEPA 1995b	NO
2,6-Dinitrotoluene	1.72 to 2.03	1.87	USEPA 1995b	NO
2-Chloronaphthalene	Not reported	4.10	USEPA 1996a	YES
2-Chlorophenol	0.83 to 2.32	2.15	USEPA 1995b	NO
2-Methylnaphthalene	Not reported	3.90	USEPA 1996a	YES
2-Methylphenol	1.90 to 2.04	1.99	USEPA 1995b	NO
2-Nitroaniline	Not reported	1.90	USEPA 1996a	NO
2-Nitrophenol	Not reported	1.80	USEPA 1996a	NO
3,3'-Dichlorobenzidine	3.51 to 3.95	3.51	USEPA 1995b	YES
3-Nitroaniline	Not reported	1.40	USEPA 1996a	NO
4,6-Dinitro-2-Methylphenol	Not reported	2.10	USEPA 1996a	NO
4-Bromophenyl-Phenylether	4.89 to 5.24	5.00	USEPA 1995b	YES
4-Chloro-3-Methylphenol	Not reported	3.10	USEPA 1996a	YES
4-Chloroaniline	1.57 to 2.02	1.85	USEPA 1995b	NO
4-Chlorophenyl-Phenylether	4.08 to 5.09	4.95	USEPA 1995b	YES

Table 3-6 Bioaccumulative Chemicals List and Log K_{ow} Values *NAS Oceana, Virginia Beach, VA*				
Chemical	**Log K_{ow} Range**	**Selected log K_{ow}**	**Reference**	**Evaluate for Food Web Exposures?**
4-Methylphenol	1.38 to 2.04	1.95	USEPA 1995b	NO
4-Nitroanaline	Not reported	1.40	USEPA 1996a	NO
4-Nitrophenol	Not reported	1.90	USEPA 1996a	NO
Acenaphthene	3.77 to 4.49	3.92	USEPA 1995b	YES
Acenaphthylene	Not reported	4.10	USEPA 1996a	YES
Anthracene	3.45 to 4.80	4.55	USEPA 1995b	YES
Benzo(a)anthracene	4.00 to 5.79	5.70	USEPA 1995b	YES
Benzo(a)pyrene	5.98 to 6.42	6.11	USEPA 1995b	YES
Benzo(b)fluoranthene	5.79 to 6.40	6.20	USEPA 1995b	YES
Benzo(g,h,i)perylene	6.63 to 7.05	6.70	USEPA 1995b	YES
Benzo(k)fluoranthene	6.12 to 6.27	6.20	USEPA 1995b	YES
Bis-(2-Chloroethoxy)methane	Not reported	0.75	USEPA 1996a	NO
Bis-(2-Chloroethyl)ether	1.00 to 1.29	1.21	USEPA 1995b	NO
Bis-(2-Ethylhexyl)phthalate	4.20 to 8.61	7.30	USEPA 1995b	YES
Butylbenzylphthalate	3.57 to 5.02	4.84	USEPA 1995b	YES
Carbazole	3.01 to 3.76	3.59	USEPA 1995b	YES
Chrysene	5.41 to 5.79	5.70	USEPA 1995b	YES
Dibenz(a,h)anthracene	6.50 to 6.88	6.69	USEPA 1995b	YES
Dibenzofuran	Not reported	4.20	USEPA 1996a	YES
Diethylphthalate	1.40 to 3.00	2.50	USEPA 1995b	YES
Dimethylphthalate	1.34 to 1.90	1.57	USEPA 1995b	NO
Di-n-butylphthalate	3.74 to 4.79	4.61	USEPA 1995b	YES
Di-n-octylphthalate	8.03 to 9.49	8.06	USEPA 1995b	YES
Fluoranthene	4.31 to 5.39	5.12	USEPA 1995b	YES
Fluorene	4.04 to 4.40	4.21	USEPA 1995b	YES
Hexachlorobutadiene	4.74 to 5.16	4.81	USEPA 1995b	YES
Hexachlorobenzene	5.00 to 7.42	5.89	USEPA 1995b	YES
Hexachlorocyclopentadiene	5.04 to 5.51	5.39	USEPA 1995b	YES
Hexachloroethane	3.82 to 4.14	4.00	USEPA 1995b	YES
Indeno(1,2,3-cd)pyrene	6.58 to 6.72	6.65	USEPA 1995b	YES
Isophorone	1.67 to 1.90	1.70	USEPA 1995b	NO
Naphthalene	3.01 to 4.70	3.36	USEPA 1995b	YES

Table 3-6
Bioaccumulative Chemicals List and Log K_{ow} Values
NAS Oceana, Virginia Beach, VA

Chemical	Log K_{ow} Range	Selected log K_{ow}	Reference	Evaluate for Food Web Exposures?
Nitrobenzene	1.70 to 2.93	1.84	USEPA 1995b	NO
N-Nitrosodi-n-propylamine	1.31 to 1.49	1.40	USEPA 1995b	NO
N-Nitrosodiphenylamine	3.13 to 3.45	3.16	USEPA 1995b	YES
Pentachlorophenol	3.29 to 5.24	5.09	USEPA 1995b	YES
Phenanthrene	4.28 to 4.57	4.55	USEPA 1995b	YES
Phenol	0.79 to 1.55	1.48	USEPA 1995b	NO
Pyrene	4.76 to 5.52	5.11	USEPA 1995b	YES
Pesticides/PCBs				
4,4'-DDD	4.73 to 6.65	6.10	USEPA 1995b	YES
4,4'-DDE	5.63 to 6.96	6.76	USEPA 1995b	YES
4,4'-DDT	3.98 to 7.01	6.53	USEPA 1995b	YES
Aldrin	5.11 to 7.50	6.50	USEPA 1995b	YES
Alpha-BHC	3.75 to 3.81	3.80	USEPA 1995b	YES
Alpha-Chlordane	5.80 to 6.41	6.32	USEPA 1995b	YES
Aroclor-1016	Not reported	5.60	Sample et al. 1996	YES
Aroclor-1221	Not reported	4.70	Jones et al. 1997	YES
Aroclor-1232	Not reported	5.10	Jones et al. 1997	YES
Aroclor-1242	Not reported	5.60	Jones et al. 1997	YES
Aroclor-1248	Not reported	6.20	Jones et al. 1997	YES
Aroclor-1254	Not reported	6.50	Jones et al. 1997	YES
Aroclor-1260	Not reported	6.80	Jones et al. 1997	YES
Beta-BHC	3.75 to 3.84	3.81	USEPA 1995b	YES
Delta-BHC	Not reported	4.10	USEPA 1996a	YES
Dieldrin	3.63 to 6.20	5.37	USEPA 1995b	YES
Endosulfan I	3.83 to 3.85	3.83	USEPA 1995b	YES
Endosulfan II	4.45 to 4.52	4.52	USEPA 1995b	YES
Endosulfan sulfate	Not reported	3.70	USEPA 1996a	YES
Endrin	2.92 to 5.20	5.06	USEPA 1995b	YES
Endrin aldehyde	--	4.00	USEPA 1995b	YES
Endrin ketone	--	4.00	Endrin aldehyde	YES
Gamma-BHC (Lindane)	3.00 to 4.95	3.73	USEPA 1995b	YES
Gamma-Chlordane	5.80 to 6.41	6.32	USEPA 1995b	YES

Table 3-6 Bioaccumulative Chemicals List and Log K_{ow} Values *NAS Oceana, Virginia Beach, VA*				
Chemical	**Log K_{ow} Range**	**Selected log K_{ow}**	**Reference**	**Evaluate for Food Web Exposures?**
Heptachlor	4.93 to 6.26	6.26	USEPA 1995b	YES
Heptachlor epoxide	3.50 to 5.40	5.00	USEPA 1995b	YES
Methoxychlor	3.31 to 5.60	5.08	USEPA 1995b	YES
Toxaphene	3.23 to 5.56	5.50	USEPA 1995b	YES
PCBs (total)	Not reported	6.00	USEPA 1996a	YES
Inorganics				
Aluminum	--	--	--	YES
Antimony	--	--	--	YES
Arsenic	--	--	--	YES
Barium	--	--	--	YES
Beryllium	--	--	--	YES
Cadmium	--	--	--	YES
Calcium	--	--	--	NO
Chromium	--	--	--	YES
Cobalt	--	--	--	YES
Copper	--	--	--	YES
Cyanide	--	--	--	NO
Iron	--	--	--	YES
Lead	--	--	--	YES
Magnesium	--	--	--	NO
Manganese	--	--	--	YES
Mercury	--	--	--	YES
Nickel	--	--	--	YES
Potassium	--	--	--	NO
Selenium	--	--	--	YES
Silver	--	--	--	YES
Sodium	--	--	--	NO
Thallium	--	--	--	YES
Vanadium	--	--	--	YES
Zinc	--	--	--	YES

Table 3-7
Screening-Level Soil Bioconcentration Factors Used For Plants and Soil Invertebrates
NAS Oceana, Virginia Beach, VA

Chemical	Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)	
	Value	Reference	Value	Reference
Inorganics				
Aluminum	0.004	Baes et al. 1984	0.2	Sample et al. 1998a
Antimony	0.2	Baes et al. 1984	1	--
Arsenic	1.103	Bechtel Jacobs 1998a	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	--
Cadmium	3.25	Bechtel Jacobs 1998a	40.69	Sample et al. 1998a
Chromium	0.0075	Baes et al. 1984	3.162	Sample et al. 1998a
Cobalt	0.02	Baes et al. 1984	1	--
Copper	0.625	Bechtel Jacobs 1998a	1.531	Sample et al. 1998a
Iron	0.004	Baes et al. 1984	0.1	Sample et al. 1998a
Lead	0.468	Bechtel Jacobs 1998a	1.522	Sample et al. 1998a
Manganese	0.25	Baes et al. 1984	0.124	Sample et al. 1998a
Mercury	5	Bechtel Jacobs 1998a	20.63	Sample et al. 1998a
Nickel	1.411	Bechtel Jacobs 1998a	4.73	Sample et al. 1998a
Selenium	3.012	Bechtel Jacobs 1998a	1.34	Sample et al. 1998a
Silver	0.4	Baes et al. 1984	1	--
Thallium	0.004	Baes et al. 1984	1	--
Vanadium	0.0055	Baes et al. 1984	0.088	Sample et al. 1998a
Zinc	1.82	Bechtel Jacobs 1998a	12.89	Sample et al. 1998a
Pesticides/PCBs				
4,4'-DDD	0.0115	Travis and Arms 1988	2	Menzie et al. 1992
4,4'-DDE	0.0048	Travis and Arms 1988	10.6	Menzie et al. 1992
4,4'-DDT	0.0065	Travis and Arms 1988	0.7	Menzie et al. 1992
Aldrin	0.0068	Travis and Arms 1988	1	--
alpha-BHC	0.2464	Travis and Arms 1988	1	--
alpha-Chlordane	0.0086	Travis and Arms 1988	3	Menzie et al. 1992
Aroclor-1016	0.0224	Travis and Arms 1988	15.91	Sample et al. 1998a
Aroclor-1221	0.0744	Travis and Arms 1988	15.91	Sample et al. 1998a
Aroclor-1232	0.0437	Travis and Arms 1988	15.91	Sample et al. 1998a
Aroclor-1242	0.0224	Travis and Arms 1988	15.91	Sample et al. 1998a
Aroclor-1248	0.0101	Travis and Arms 1988	15.91	Sample et al. 1998a

Table 3-7
Screening-Level Soil Bioconcentration Factors Used For Plants and Soil Invertebrates
NAS Oceana, Virginia Beach, VA

Chemical	Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)	
	Value	Reference	Value	Reference
Aroclor-1254	0.0068	Travis and Arms 1988	15.91	Sample et al. 1998a
Aroclor-1260	0.0045	Travis and Arms 1988	15.91	Sample et al. 1998a
beta-BHC	0.2431	Travis and Arms 1988	1	--
delta-BHC	0.1653	Travis and Arms 1988	1	--
Dieldrin	0.0305	Travis and Arms 1988	8	Beyer and Gish 1980
Endosulfan I	0.2367	Travis and Arms 1988	1	--
Endosulfan II	0.0945	Travis and Arms 1988	1	--
Endosulfan Sulfate	0.2814	Travis and Arms 1988	1	--
Endrin	0.0461	Travis and Arms 1988	1	--
Endrin Aldehyde	0.1888	Travis and Arms 1988	1	--
Endrin Ketone	0.1888	Travis and Arms 1988	1	--
Gamma-BHC (Lindane)	0.2704	Travis and Arms 1988	1	--
Gamma-Chlordane	0.0086	Travis and Arms 1988	3	Menzie et al. 1992
Heptachlor	0.0093	Travis and Arms 1988	10	Roberts and Dorough 1985
Heptachlor Epoxide	0.0499	Travis and Arms 1988	10	Roberts and Dorough 1985
Methoxychlor	0.0448	Travis and Arms 1988	1	--
Toxaphene	0.0256	Travis and Arms 1988	1	--
Semivolatile Organics				
1,2,4-Trichlorobenzene	0.1863	Travis and Arms 1988	0.56	Beyer 1996
1,2-Dichlorobenzene	0.4031	Travis and Arms 1988	1	--
1,3-Dichlorobenzene	0.3673	Travis and Arms 1988	1	--
1,4-Dichlorobenzene	0.4085	Travis and Arms 1988	1	--
2,4,5-Trichlorophenol	0.2157	Travis and Arms 1988	8.4	van Gestel and Ma 1988
2,4,6-Trichlorophenol	0.2814	Travis and Arms 1988	1	--
2,4-Dichlorophenol	0.6423	Travis and Arms 1988	1	--
2-Chloronaphthalene	0.1653	Travis and Arms 1988	1	--
2-Methylnaphthalene	0.2157	Travis and Arms 1988	0.2	Beyer and Stafford 1993
3,3'-Dichlorobenzidine	0.3624	Travis and Arms 1988	1	--
4-Bromophenyl-Phenylether	0.0499	Travis and Arms 1988	1	--
4-Chloro-3-Methylphenol	0.6255	Travis and Arms 1988	1	--
4-Chlorophenyl-Phenylether	0.0533	Travis and Arms 1988	1	--
Acenaphthene	0.21	Travis and Arms 1988	0.3	Beyer and Stafford 1993

Table 3-7
Screening-Level Soil Bioconcentration Factors Used For Plants and Soil Invertebrates
NAS Oceana, Virginia Beach, VA

Chemical	Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)	
	Value	Reference	Value	Reference
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
Bis-(2-Ethylhexyl)phthalate	0.0023	Travis and Arms 1988	1	--
Butylbenzylphthalate	0.0617	Travis and Arms 1988	1	--
Carbazole	0.3258	Travis and Arms 1988	1	--
Chrysene	0.0197	Travis and Arms 1988	0.44	Beyer and Stafford 1993
Dibenz(a,h)anthracene	0.0053	Travis and Arms 1988	0.49	Beyer and Stafford 1993
Dibenzofuran	0.1447	Travis and Arms 1988	1	--
Diethylphthalate	1.39	Travis and Arms 1988	1	--
Di-n-butylphthalate	0.0838	Travis and Arms 1988	1	--
Di-n-octylphthalate	0.0008	Travis and Arms 1988	1	--
Fluoranthene	0.0425	Travis and Arms 1988	0.37	Beyer and Stafford 1993
Fluorene	0.1428	Travis and Arms 1988	0.2	Beyer and Stafford 1993
Hexachlorobutadiene	0.0642	Travis and Arms 1988	1	--
Hexachlorobenzene	0.0153	Travis and Arms 1988	1.69	Beyer 1996
Hexachlorocyclopentadiene	0.0297	Travis and Arms 1988	1	--
Hexachloroethane	0.1888	Travis and Arms 1988	1	--
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
N-Nitrosodiphenylamine	0.5775	Travis and Arms 1988	1	--
Pentachlorophenol	0.0443	Travis and Arms 1988	8	van Gestel and Ma 1988
Phenanthrene	0.0908	Travis and Arms 1988	0.28	Beyer and Stafford 1993
Pyrene	0.0431	Travis and Arms 1988	0.39	Beyer and Stafford 1993
Volatile Organics				
Carbon Tetrachloride	1.0234	Travis and Arms 1988	1	--
Chlorobenzene	0.8608	Travis and Arms 1988	1	--
Chloroform	3.0077	Travis and Arms 1988	1	--

Table 3-7
Screening-Level Soil Bioconcentration Factors Used For Plants and Soil Invertebrates
NAS Oceana, Virginia Beach, VA

Chemical	Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)	
	Value	Reference	Value	Reference
Ethylbenzene	0.593	Travis and Arms 1988	1	--
Styrene	0.7739	Travis and Arms 1988	1	--
Tetrachloroethene	1.1085	Travis and Arms 1988	1	--
Toluene	0.9966	Travis and Arms 1988	1	--
Trichloroethene	1.051	Travis and Arms 1988	1	--
Xylenes (total)	0.5475	Travis and Arms 1988	1	--

Table 3-8
Screening-Level Soil Bioaccumulation Factors Used For Small Mammals
NAS Oceana, Virginia Beach, VA

Chemical	Soil-Mouse BAF (dry weight)		Soil-Vole BAF (dry weight)		Soil-Shrew BAF (dry weight)	
	Value	Reference	Value	Reference	Value	Reference
Inorganics						
Aluminum	--	see text	--	see text	--	see text
Antimony	--	see text	--	see text	--	see text
Arsenic	0.014	Sample et al. 1998b	0.016	Sample et al. 1998b	0.0149	Sample et al. 1998b
Barium	0.069	Sample et al. 1998b	0.253	Sample et al. 1998b	0.1121	Sample et al. 1998b
Beryllium	0.41	SWDIV 1996	0.41	SWDIV 1996	0.41	SWDIV 1996
Cadmium	0.462	Sample et al. 1998b	0.448	Sample et al. 1998b	7.017	Sample et al. 1998b
Chromium	0.349	Sample et al. 1998b	0.309	Sample et al. 1998b	0.3333	Sample et al. 1998b
Cobalt	0.025	Sample et al. 1998b	0.14	Sample et al. 1998b	0.1	Sample et al. 1998b
Copper	0.554	Sample et al. 1998b	1.29	Sample et al. 1998b	1.117	Sample et al. 1998b
Iron	0.015	Sample et al. 1998b	0.024	Sample et al. 1998b	0.0171	Sample et al. 1998b
Lead	0.286	Sample et al. 1998b	0.187	Sample et al. 1998b	0.339	Sample et al. 1998b
Manganese	--	see text	--	see text	--	see text
Mercury	0.13	Sample et al. 1998b	0.192	Sample et al. 1998b	0.192	Sample et al. 1998b
Nickel	0.589	Sample et al. 1998b	0.898	Sample et al. 1998b	0.578	Sample et al. 1998b
Selenium	1.263	Sample et al. 1998b	0.155	Sample et al. 1998b	1.1867	Sample et al. 1998b
Silver	--	see text	--	see text	--	see text
Thallium	0.1227	Sample et al. 1998b	0.1227	Sample et al. 1998b	0.1227	Sample et al. 1998b
Vanadium	--	see text	--	see text	--	see text
Zinc	2.7822	Sample et al. 1998b	2.3168	Sample et al. 1998b	2.9011	Sample et al. 1998b
Pesticides/PCBs						
4,4'-DDD	--	see text	--	see text	--	see text
4,4'-DDE	--	see text	--	see text	--	see text
4,4'-DDT	--	see text	--	see text	--	see text
Aldrin	--	see text	--	see text	--	see text
alpha-BHC	--	see text	--	see text	--	see text
alpha-Chlordane	--	see text	--	see text	--	see text
Aroclor-1016	--	see text	--	see text	--	see text
Aroclor-1221	--	see text	--	see text	--	see text
Aroclor-1232	--	see text	--	see text	--	see text
Aroclor-1242	--	see text	--	see text	--	see text
Aroclor-1248	--	see text	--	see text	--	see text

Table 3-8 Screening-Level Soil Bioaccumulation Factors Used For Small Mammals *NAS Oceana, Virginia Beach, VA*						
Chemical	Soil-Mouse BAF (dry weight)		Soil-Vole BAF (dry weight)		Soil-Shrew BAF (dry weight)	
	Value	Reference	Value	Reference	Value	Reference
Aroclor-1254	--	see text	--	see text	--	see text
Aroclor-1260	--	see text	--	see text	--	see text
beta-BHC	--	see text	--	see text	--	see text
delta-BHC	--	see text	--	see text	--	see text
Dieldrin	--	see text	--	see text	--	see text
Endosulfan I	--	see text	--	see text	--	see text
Endosulfan II	--	see text	--	see text	--	see text
Endosulfan Sulfate	--	see text	--	see text	--	see text
Endrin	--	see text	--	see text	--	see text
Endrin Aldehyde	--	see text	--	see text	--	see text
Endrin Ketone	--	see text	--	see text	--	see text
Gamma-BHC (Lindane)	--	see text	--	see text	--	see text
Gamma-Chlordane	--	see text	--	see text	--	see text
Heptachlor	--	see text	--	see text	--	see text
Heptachlor Epoxide	--	see text	--	see text	--	see text
Methoxychlor	--	see text	--	see text	--	see text
Toxaphene	--	see text	--	see text	--	see text
Semivolatile Organics						
1,2,4-Trichlorobenzene	--	see text	--	see text	--	see text
1,2-Dichlorobenzene	--	see text	--	see text	--	see text
1,3-Dichlorobenzene	--	see text	--	see text	--	see text
1,4-Dichlorobenzene	--	see text	--	see text	--	see text
2,4,5-Trichlorophenol	--	see text	--	see text	--	see text
2,4,6-Trichlorophenol	--	see text	--	see text	--	see text
2,4-Dichlorophenol	--	see text	--	see text	--	see text
2-Chloronaphthalene	--	see text	--	see text	--	see text
2-Methylnaphthalene	--	see text	--	see text	--	see text
3,3'-Dichlorobenzidine	--	see text	--	see text	--	see text
4-Bromophenyl-Phenylether	--	see text	--	see text	--	see text
4-Chloro-3-Methylphenol	--	see text	--	see text	--	see text
4-Chlorophenyl-Phenylether	--	see text	--	see text	--	see text
Acenaphthene	--	see text	--	see text	--	see text

Table 3-8
Screening-Level Soil Bioaccumulation Factors Used For Small Mammals
NAS Oceana, Virginia Beach, VA

Chemical	Soil-Mouse BAF (dry weight)		Soil-Vole BAF (dry weight)		Soil-Shrew BAF (dry weight)	
	Value	Reference	Value	Reference	Value	Reference
Acenaphthylene	--	see text	--	see text	--	see text
Anthracene	--	see text	--	see text	--	see text
Benzo(a)anthracene	--	see text	--	see text	--	see text
Benzo(a)pyrene	--	see text	--	see text	--	see text
Benzo(b)fluoranthene	--	see text	--	see text	--	see text
Benzo(g,h,i)perylene	--	see text	--	see text	--	see text
Benzo(k)fluoranthene	--	see text	--	see text	--	see text
Bis-(2-Ethylhexyl)phthalate	--	see text	--	see text	--	see text
Butylbenzylphthalate	--	see text	--	see text	--	see text
Carbazole	--	see text	--	see text	--	see text
Chrysene	--	see text	--	see text	--	see text
Dibenz(a,h)anthracene	--	see text	--	see text	--	see text
Dibenzofuran	--	see text	--	see text	--	see text
Diethylphthalate	--	see text	--	see text	--	see text
Di-n-butylphthalate	--	see text	--	see text	--	see text
Di-n-octylphthalate	--	see text	--	see text	--	see text
Fluoranthene	--	see text	--	see text	--	see text
Fluorene	--	see text	--	see text	--	see text
Hexachlorobutadiene	--	see text	--	see text	--	see text
Hexachlorobenzene	--	see text	--	see text	--	see text
Hexachlorocyclopentadiene	--	see text	--	see text	--	see text
Hexachloroethane	--	see text	--	see text	--	see text
Indeno(1,2,3-cd)pyrene	--	see text	--	see text	--	see text
Naphthalene	--	see text	--	see text	--	see text
N-Nitrosodiphenylamine	--	see text	--	see text	--	see text
Pentachlorophenol	--	see text	--	see text	--	see text
Phenanthrene	--	see text	--	see text	--	see text
Pyrene	--	see text	--	see text	--	see text
Volatile Organics						
Carbon Tetrachloride	--	see text	--	see text	--	see text
Chlorobenzene	--	see text	--	see text	--	see text
Chloroform	--	see text	--	see text	--	see text

Table 3-8 Screening-Level Soil Bioaccumulation Factors Used For Small Mammals *NAS Oceana, Virginia Beach, VA*						
	Soil-Mouse BAF (dry weight)		Soil-Vole BAF (dry weight)		Soil-Shrew BAF (dry weight)	
Chemical	**Value**	**Reference**	**Value**	**Reference**	**Value**	**Reference**
Ethylbenzene	--	see text	--	see text	--	see text
Styrene	--	see text	--	see text	--	see text
Tetrachloroethene	--	see text	--	see text	--	see text
Toluene	--	see text	--	see text	--	see text
Trichloroethene	--	see text	--	see text	--	see text
Xylenes (total)	--	see text	--	see text	--	see text

Table 3-9
Screening-Level Sediment Bioaccumulation Factors Used For Aquatic Invertebrates and Fish/Amphibians
NAS Oceana, Virginia Beach, VA

Chemical	Sediment-Invertebrate BAF (dry weight)		Sediment-Fish BAF (dry weight)	
	Value	Reference	Value	Reference
Inorganics				
Aluminum	0.069	Brumbaugh et al. 1994; Ingersoll et al. 1994	1	--
Antimony	1	--	1	--
Arsenic	0.675	Bechtel Jacobs 1998b	0.126	Pascoe et al. 1996
Barium	1	--	1	--
Beryllium	1	--	1	--
Cadmium	3.073	Bechtel Jacobs 1998b	0.164	Pascoe et al. 1996
Chromium	0.186	Bechtel Jacobs 1998b	0.038	Krantzberg and Boyd 1992
Cobalt	1	--	1	--
Copper	7.957	Bechtel Jacobs 1998b	0.1	Krantzberg and Boyd 1992
Iron	1	--	1	--
Lead	0.326	Bechtel Jacobs 1998b	0.07	Krantzberg and Boyd 1992
Manganese	1	--	1	--
Mercury	1.735	Bechtel Jacobs 1998b	4.58	Cope et al. 1990
Nickel	0.214	Bechtel Jacobs 1998b	1	--
Selenium	1	--	1	--
Silver	0.18	Hirsch 1998	1	--
Thallium	1	--	1	--
Vanadium	1	--	1	--
Zinc	4.759	Bechtel Jacobs 1998b	0.147	Pascoe et al. 1996
Pesticides/PCBs				
4,4'-DDD	0.5	Oliver 1987	2.61	Oliver and Niimi 1988
4,4'-DDE	4.3	Oliver 1987	20.39	Oliver and Niimi 1988
4,4'-DDT	0.5	Oliver 1987	9.11	Oliver and Niimi 1988
Aldrin	1	--	1	--
alpha-BHC	1	--	1	--
alpha-Chlordane	1	--	1	--
Aroclor-1016	21.89	Bechtel Jacobs 1998b	11.24	Oliver and Niimi 1988
Aroclor-1221	21.89	Bechtel Jacobs 1998b	11.24	Oliver and Niimi 1988
Aroclor-1232	21.89	Bechtel Jacobs 1998b	11.24	Oliver and Niimi 1988
Aroclor-1242	21.89	Bechtel Jacobs 1998b	11.24	Oliver and Niimi 1988
Aroclor-1248	21.89	Bechtel Jacobs 1998b	11.24	Oliver and Niimi 1988

Table 3-9
Screening-Level Sediment Bioaccumulation Factors Used For Aquatic Invertebrates and Fish/Amphibians
NAS Oceana, Virginia Beach, VA

Chemical	Sediment-Invertebrate BAF (dry weight)		Sediment-Fish BAF (dry weight)	
	Value	Reference	Value	Reference
Aroclor-1254	21.89	Bechtel Jacobs 1998b	11.24	Oliver and Niimi 1988
Aroclor-1260	21.89	Bechtel Jacobs 1998b	11.24	Oliver and Niimi 1988
beta-BHC	1	--	1	--
delta-BHC	1	--	1	--
Dieldrin	1	--	1	--
Endosulfan I	1	--	1	--
Endosulfan II	1	--	1	--
Endosulfan Sulfate	1	--	1	--
Endrin	1	--	1	--
Endrin Aldehyde	1	--	1	--
Endrin Ketone	1	--	1	--
Gamma-BHC (Lindane)	1	--	1	--
Gamma-Chlordane	1	--	1	--
Heptachlor	1	--	1	--
Heptachlor Epoxide	1	--	1	--
Methoxychlor	1	--	1	--
Toxaphene	1	--	1	--
Semivolatile Organics				
1,2,4-Trichlorobenzene	1	--	1	--
1,2-Dichlorobenzene	1	--	1	--
1,3-Dichlorobenzene	1	--	1	--
1,4-Dichlorobenzene	1	--	1	--
2,4,5-Trichlorophenol	1	--	1	--
2,4,6-Trichlorophenol	1	--	1	--
2,4-Dichlorophenol	1	--	1	--
2-Chloronaphthalene	1	--	1	--
2-Methylnaphthalene	1	--	1	--
3,3'-Dichlorobenzidine	1	--	1	--
4-Bromophenyl-Phenylether	1	--	1	--
4-Chloro-3-Methylphenol	1	--	1	--
4-Chlorophenyl-Phenylether	1	--	1	--
Acenaphthene	2.04	Maruya et al. 1997	1	--

Table 3-9
Screening-Level Sediment Bioaccumulation Factors Used For Aquatic Invertebrates and Fish/Amphibians
NAS Oceana, Virginia Beach, VA

Chemical	Sediment-Invertebrate BAF (dry weight)		Sediment-Fish BAF (dry weight)	
	Value	Reference	Value	Reference
Acenaphthylene	1	--	1	--
Anthracene	0.271	Maruya et al. 1997	1	--
Benzo(a)anthracene	1.4	Maruya et al. 1997	1	--
Benzo(a)pyrene	0.191	Maruya et al. 1997	1	--
Benzo(b)fluoranthene	0.16	Maruya et al. 1997	1	--
Benzo(g,h,i)perylene	0.295	Maruya et al. 1997	1	--
Benzo(k)fluoranthene	0.421	Maruya et al. 1997	1	--
Bis-(2-Ethylhexyl)phthalate	1	--	1	--
Butylbenzylphthalate	1	--	1	--
Carbazole	1	--	1	--
Chrysene	0.335	Maruya et al. 1997	1	--
Dibenz(a,h)anthracene	1	--	1	--
Dibenzofuran	1	--	1	--
Diethylphthalate	1	--	1	--
Di-n-butylphthalate	1	--	1	--
Di-n-octylphthalate	1	--	1	--
Fluoranthene	0.312	Maruya et al. 1997	1	--
Fluorene	1.13	Maruya et al. 1997	1	--
Hexachlorobutadiene	1	--	1	--
Hexachlorobenzene	1	--	1	--
Hexachlorocyclopentadiene	1	--	1	--
Hexachloroethane	1	--	1	--
Indeno(1,2,3-cd)pyrene	0.355	Maruya et al. 1997	1	--
Naphthalene	1	--	1	--
N-Nitrosodiphenylamine	1	--	1	--
Pentachlorophenol	1	--	1	--
Phenanthrene	0.652	Maruya et al. 1997	1	--
Pyrene	0.803	Maruya et al. 1997	1	--
Volatile Organics				
Carbon Tetrachloride	1	--	1	--
Chlorobenzene	1	--	1	--
Chloroform	1	--	1	--

Table 3-9
Screening-Level Sediment Bioaccumulation Factors Used For Aquatic Invertebrates and Fish/Amphibians
NAS Oceana, Virginia Beach, VA

Chemical	Sediment-Invertebrate BAF (dry weight)		Sediment-Fish BAF (dry weight)	
	Value	Reference	Value	Reference
Ethylbenzene	1	--	1	--
Styrene	1	--	1	--
Tetrachloroethene	1	--	1	--
Toluene	1	--	1	--
Trichloroethene	1	--	1	--
Xylenes (total)	1	--	1	--

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TABLE 3-10 BaseLINE (Step 3A) Soil Bioconcentration Factors Used For Plants And Soil Invertebrates

Table 3-11
Baseline (Step 3A) Soil Bioaccumulation Factors Used For Small Mammals
NAS Oceana, Virginia Beach, VA

Chemical	Soil-Mouse BAF (dry weight)		Soil-Vole BAF (dry weight)		Soil-Shrew BAF (dry weight)	
	Value	Reference	Value	Reference	Value	Reference
Inorganics						
Aluminum	--	see text	--	see text	--	see text
Antimony	--	see text	--	see text	--	see text
Arsenic	0.0033	Sample et al. 1998b	0.0054	Sample et al. 1998b	0.0039	Sample et al. 1998b
Barium	0.0451	Sample et al. 1998b	0.0689	Sample et al. 1998b	0.0548	Sample et al. 1998b
Cadmium	0.144	Sample et al. 1998b	0.134	Sample et al. 1998b	2.212	Sample et al. 1998b
Chromium	0.092	Sample et al. 1998b	0.1249	Sample et al. 1998b	0.0939	Sample et al. 1998b
Copper	0.1107	Sample et al. 1998b	0.109	Sample et al. 1998b	0.5017	Sample et al. 1998b
Iron	0.0121	Sample et al. 1998b	0.0137	Sample et al. 1998b	0.013	Sample et al. 1998b
Lead	0.0548	Sample et al. 1998b	0.0406	Sample et al. 1998b	0.1478	Sample et al. 1998b
Mercury	0.0731	Sample et al. 1998b	0.0672	Sample et al. 1998b	0.0672	Sample et al. 1998b
Selenium	0.2579	Sample et al. 1998b	0.0221	Sample et al. 1998b	0.273	Sample et al. 1998b
Thallium	0.1124	Sample et al. 1998b	0.1124	Sample et al. 1998b	0.1124	Sample et al. 1998b
Vanadium	--	see text	--	see text	--	see text
Zinc	0.5092	Sample et al. 1998b	0.2929	Sample et al. 1998b	0.862	Sample et al. 1998b
Pesticides/PCBs						
Aroclor-1016	--	see text	--	see text	--	see text
Aroclor-1221	--	see text	--	see text	--	see text
Aroclor-1232	--	see text	--	see text	--	see text
Aroclor-1242	--	see text	--	see text	--	see text
Aroclor-1248	--	see text	--	see text	--	see text
Aroclor-1254	--	see text	--	see text	--	see text
Aroclor-1260	--	see text	--	see text	--	see text
Dieldrin	--	see text	--	see text	--	see text
Semivolatile Organic Compounds						
Di-n-butylphthalate	--	see text	--	see text	--	see text
Hexachlorobenzene	--	see text	--	see text	--	see text

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was/were not found.

TABLE 3-12 Baseline (Step 3A)
Sediment BioAccumulation
Factors Used For Aquatic
Invertebrates And Fish/
Amphibians

Table 3-13
Baseline (Step 3A) Exposure Parameters for Upper Trophic Level Ecological Receptors
NAS Oceana, Virginia Beach, VA

Receptor	Body Weight (kg)		Water Ingestion Rate (L/day)		Food Ingestion Rate (kg/day - dry)	
	Value	Reference	Value	Reference	Value	Reference
Birds						
American kestrel	0.114	USEPA 1993	0.01377	allometric equation	0.00882	USEPA 1993
American robin	0.0773	USEPA 1993	0.01062	allometric equation	0.00552	Levey and Karasov 1989
Great blue heron	2.23	Quinney 1982	0.10098	allometric equation	0.39306	allometric equation
Killdeer	0.0966	Dunning 1993	0.01232	allometric equation	0.01271	allometric equation
Mallard	1.177	Bellrose 1980	0.06581	allometric equation	0.06471	allometric equation
Marsh wren	0.01125	Dunning 1993	0.00292	allometric equation	0.00249	USEPA 1993
Mammals						
Deer mouse	0.0168	Silva and Downing 1995	0.00302	USEPA 1993	0.00051	USEPA 1993
Meadow vole	0.0428	Silva and Downing 1995	0.00899	USEPA 1993	0.00209	USEPA 1993
Mink	0.777	Silva and Downing 1995	0.02176	USEPA 1993	0.02587	USEPA 1993
Raccoon	5.94	Silva and Downing 1995	0.49209	allometric equation	0.10003	Conover 1989
Red fox	4.06	Silva and Downing 1995	0.34939	allometric equation	0.12308	Sample and Suter 1994
Short-tailed shrew	0.01687	USEPA 1993	0.00376	USEPA 1993	0.00149	USEPA 1993

Table 3-13
Baseline (Step 3A) Exposure Parameters for Upper Trophic Level Ecological Receptors
NAS Oceana, Virginia Beach, VA

Receptor	Dietary Composition (percent)							Soil/ Sediment Ingestion (percent)	
	Terr. Plants	Soil Invert.	Small Mammals	Fish/ Frogs	Aquatic Plants	Aquatic Invert.	Reference	Value	Reference
Birds									
American kestrel	0	38	60	0	0	0	USEPA 1993	2	Assumed based on diet
American robin	51.6	43.6	0	0	0	0	Martin et al. 1951	4.8	Sample and Suter 1994
Great blue heron	0	0	0	100	0	0	USEPA 1993; Quinney and Smith 1980	0	Sample and Suter 1994
Killdeer	2	93	0	0	0	0	Robbins and Blom 1996	5	Assumed based on diet
Mallard	0	0	0	0	86.7	10	Palmer 1976	3.3	Beyer et al. 1994
Marsh wren	0	0	0	0	0	95	USEPA 1993	5	Assumed based on diet
Mammals									
Deer mouse	53	45	0	0	0	0	Martin et al. 1951	2	Beyer et al. 1994
Meadow vole	95.6	2	0	0	0	0	USEPA 1993	2.4	Beyer et al. 1994
Mink	0	0	0	94	1	5	USEPA 1993	0	Sample and Suter 1994
Raccoon	0	0	0	7	40	43.6	USEPA 1993	9.4	Beyer et al. 1994
Red fox	7	2.8	87.4	0	0	0	USEPA 1993	2.8	Beyer et al. 1994
Short-tailed shrew	4.7	82.3	0	0	0	0	USEPA 1993; Sample and Suter 1994	13	Sample and Suter 1994

Table 3-14 **Refined Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints** *NAS Oceana, Virginia Beach, VA*		
Assessment Endpoint	**Risk Hypothesis**	**Measurement Endpoint**
Terrestrial Habitats		
Survival, growth, and reproduction of terrestrial soil invertebrate communities.	Are site-retated surface soil concentrations sufficient to adversely effect soil invertebrate communities based on conservative screening values?	Comparison of mean chemical concentrations in surface soil with soil screening values.
Survival, growth, and reproduction of terrestrial plant communities.	Are site-related surface soil concentrations sufficient to adversely effect terrestrial plant communities based on conservative screening values?	Comparison of mean chemical concentrations in surface soil with soil screening values.
Survival, growth, and reproduction of avian terrestrial insectivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume soil invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean soil concentrations.
Survival, growth, and reproduction of avian terrestrial carnivores.	Are site-related chemical concentrations in surface soils 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) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean soil concentrations.
Survival, growth, and reproduction of mammalian terrestrial insectivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume soil invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean soil concentrations.
Survival, growth, and reproduction of mammalian terrestrial herbivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume terrestrial plants from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean soil concentrations.
Survival, growth, and reproduction of mammalian terrestrial omnivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume plants and invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean soil concentrations.
Survival, growth, and reproduction of mammalian terrestrial carnivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume small mammals from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean soil concentrations.

Table 3-14
Refined Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints
NAS Oceana, Virginia Beach, VA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint
Survival, growth, and reproduction of terrestrial reptiles.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to terrestrial reptilian species?	Evidence of potential risk to other upper trophic level terrestrial receptors evaluated in the ERA.
Wetland and Aquatic Habitats		
Survival, growth, and reproduction of benthic invertebrate communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect benthic invertebrate communities?	Comparison of mean chemical concentrations in surface water and/or sediment with medium-specific screening values.
Survival, growth, and reproduction of aquatic and wetland plant communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect aquatic or wetland plant communities?	Comparison of mean chemical concentrations in surface water and/or sediment with medium-specific screening values.
Survival, growth, and reproduction of fish communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect fish communities?	Comparison of mean chemical concentrations in surface water and/or sediment with medium-specific screening values.
Survival, growth, and reproduction of amphibian communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect amphibian communities?	Comparison of mean chemical concentrations in surface water and/or sediment with medium-specific screening values.
Survival, growth, and reproduction of amphibians.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to amphibian species that may consume aquatic invertebrates from the site?	Evidence of potential risk to other upper trophic level aquatic receptors evaluated in the ERA.
Survival, growth, and reproduction of aquatic/wetland reptiles.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to aquatic/wetland reptile species?	Evidence of potential risk to other upper trophic level aquatic receptors evaluated in the ERA.
Survival, growth, and reproduction of avian aquatic/wetland insectivores.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume aquatic invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean surface water and sediment concentrations.

Table 3-14 Refined Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints *NAS Oceana, Virginia Beach, VA*		
Assessment Endpoint	**Risk Hypothesis**	**Measurement Endpoint**
Survival, growth, and reproduction of avian aquatic/wetland omnivores.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume aquatic plants and invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean surface water and sediment concentrations.
Survival, growth, and reproduction of avian aquatic/wetland piscivores.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume fish from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean surface water and sediment concentrations.
Survival, growth, and reproduction of mammalian aquatic/wetland piscivores	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume fish from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean surface water and sediment concentrations.
Survival, growth, and reproduction of mammalian aquatic/wetland omnivores.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume aquatic/wetland prey from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean surface water and sediment concentrations.

Table 4-1
Summary Statistics - SWMU 2B - Groundwater
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Inorganics (UG/L)						
Aluminum	15.5 - 15.5	0 / 4	--	--	28.5	11.3
Antimony	1.60 - 1.60	0 / 4	--	--	0.95	0.30
Arsenic	2.50 - 2.50	2 / 4	29.7	OW2B-MW17-R01	11.2	13.4
Barium	0.60 - 0.60	4 / 4	65.6	OW2B-MW20-R01	49.7	12.8
Beryllium	0.20 - 0.20	0 / 4	--	--	0.1	0
Cadmium	0.70 - 0.70	0 / 4	--	--	0.35	0
Calcium	13.4 - 13.4	4 / 4	40,800	OW2B-MW20-R01	21100	13331
Chromium	2.60 - 2.60	1 / 4	4.80	OW2B-MW20-R01	2.18	1.75
Cobalt	1.50 - 1.50	1 / 4	1.60	OW2B-MW18-R01	0.96	0.43
Copper	2.90 - 2.90	0 / 4	--	--	1.45	0
Cyanide	10.0 - 10.0	0 / 2	--	--	5	0
Ferric iron	500 - 500	1 / 4	1,100	OW2B-MW17-R01	463	425
Ferrous iron	500 - 5,000	4 / 4	18,000	OW2B-MW17-R01	8250	6550
Iron	43.7 - 43.7	4 / 4	35,500	OW2B-MW17-R01	15500	13489
Lead	1.40 - 1.40	0 / 4	--	--	0.70	0
Magnesium	19.7 - 19.7	4 / 4	13,500	OW2B-MW17-R01	9600	3600
Manganese	0.40 - 0.40	4 / 4	500	OW2B-MW20-R01	351	170
Mercury	0.03 - 0.03	0 / 4	--	--	0.02	0
Nickel	1.70 - 1.70	0 / 4	--	--	0.85	0
Potassium	103 - 103	4 / 4	2,190	OW2B-MW20-R01	1638	483
Selenium	3.10 - 3.10	0 / 4	--	--	1.55	0
Silver	1.90 - 1.90	0 / 4	--	--	0.95	0
Sodium	686 - 686	4 / 4	28,800	OW2B-MW20-R01	18000	7421
Thallium	9.40 - 9.40	0 / 4	--	--	4.70	0
Vanadium	2.10 - 2.10	0 / 4	--	--	1.05	0
Zinc	1.40 - 1.40	0 / 4	--	--	4.25	1.70
Pesticide/Polychlorinated Biphenyls (UG/L)						
4,4'-DDD	0.10 - 0.10	0 / 4	--	--	0.05	0
4,4'-DDE	0.10 - 0.10	0 / 4	--	--	0.05	0

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 4-1 Summary Statistics - SWMU 2B - Groundwater *NAS Oceana, Virginia Beach, VA*						
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Arithmetic Mean[1]**	**Standard Deviation of Mean**
4,4'-DDT	0.10 - 0.10	0 / 4	--	--	0.05	0
Aldrin	0.05 - 0.05	0 / 4	--	--	0.03	0
Aroclor-1016	1.00 - 1.00	0 / 4	--	--	0.5	0
Aroclor-1221	2.00 - 2.00	0 / 4	--	--	1	0
Aroclor-1232	1.00 - 1.00	0 / 4	--	--	0.5	0
Aroclor-1242	1.00 - 1.00	0 / 4	--	--	0.5	0
Aroclor-1248	1.00 - 1.00	0 / 4	--	--	0.5	0
Aroclor-1254	1.00 - 1.00	0 / 4	--	--	0.5	0
Aroclor-1260	1.00 - 1.00	0 / 4	--	--	0.5	0
Dieldrin	0.10 - 0.10	0 / 4	--	--	0.05	0
Endosulfan I	0.05 - 0.05	0 / 4	--	--	0.03	0
Endosulfan II	0.10 - 0.10	0 / 4	--	--	0.05	0
Endosulfan sulfate	0.10 - 0.10	0 / 4	--	--	0.05	0
Endrin	0.10 - 0.10	0 / 4	--	--	0.05	0
Endrin aldehyde	0.10 - 0.10	0 / 4	--	--	0.05	0
Endrin ketone	0.10 - 0.10	0 / 4	--	--	0.05	0
Heptachlor	0.05 - 0.05	0 / 4	--	--	0.03	0
Heptachlor epoxide	0.05 - 0.05	0 / 4	--	--	0.03	0
Methoxychlor	0.50 - 0.50	0 / 4	--	--	0.25	0
Toxaphene	5.00 - 5.00	0 / 4	--	--	2.50	0
alpha-BHC	0.05 - 0.05	0 / 4	--	--	0.03	0
alpha-Chlordane	0.05 - 0.05	0 / 4	--	--	0.03	0
beta-BHC	0.05 - 0.05	0 / 4	--	--	0.03	0
delta-BHC	0.05 - 0.05	0 / 4	--	--	0.03	0
gamma-BHC (Lindane)	0.05 - 0.05	0 / 4	--	--	0.03	0
gamma-Chlordane	0.05 - 0.05	0 / 4	--	--	0.03	0
Semi-volatile Organic Compounds (UG/L)						
1,2,4-Trichlorobenzene	10.0 - 10.0	0 / 4	--	--	5	0
1,2-Dichlorobenzene	10.0 - 10.0	0 / 4	--	--	5	0
1,3-Dichlorobenzene	10.0 - 10.0	0 / 4	--	--	5	0

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 4-1
Summary Statistics - SWMU 2B - Groundwater
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
1,4-Dichlorobenzene	10.0 - 10.0	0 / 4	--	--	5	0
2,2'-Oxybis(1-chloropropane)	10.0 - 10.0	0 / 4	--	--	5	0
2,4,5-Trichlorophenol	25.0 - 25.0	0 / 4	--	--	12.5	0
2,4,6-Trichlorophenol	10.0 - 10.0	0 / 4	--	--	5	0
2,4-Dichlorophenol	10.0 - 10.0	0 / 4	--	--	5	0
2,4-Dimethylphenol	10.0 - 10.0	0 / 4	--	--	5	0
2,4-Dinitrophenol	25.0 - 25.0	0 / 4	--	--	12.5	0
2,4-Dinitrotoluene	10.0 - 10.0	0 / 4	--	--	5	0
2,6-Dinitrotoluene	10.0 - 10.0	0 / 4	--	--	5	0
2-Chloronaphthalene	10.0 - 10.0	0 / 4	--	--	5	0
2-Chlorophenol	10.0 - 10.0	0 / 4	--	--	5	0
2-Methylnaphthalene	10.0 - 10.0	0 / 4	--	--	5	0
2-Methylphenol	10.0 - 10.0	0 / 4	--	--	5	0
2-Nitroaniline	25.0 - 25.0	0 / 4	--	--	12.5	0
2-Nitrophenol	10.0 - 10.0	0 / 4	--	--	5	0
3,3'-Dichlorobenzidine	10.0 - 10.0	0 / 4	--	--	5	0
3-Nitroaniline	25.0 - 25.0	0 / 4	--	--	12.5	0
4,6-Dinitro-2-methylphenol	25.0 - 25.0	0 / 4	--	--	12.5	0
4-Bromophenyl-phenylether	10.0 - 10.0	0 / 4	--	--	5	0
4-Chloro-3-methylphenol	10.0 - 10.0	0 / 4	--	--	5	0
4-Chloroaniline	10.0 - 10.0	0 / 4	--	--	5	0
4-Chlorophenyl-phenylether	10.0 - 10.0	0 / 4	--	--	5	0
4-Methylphenol	10.0 - 10.0	0 / 4	--	--	5	0
4-Nitroaniline	25.0 - 25.0	0 / 4	--	--	12.5	0
4-Nitrophenol	25.0 - 25.0	0 / 4	--	--	12.5	0
Acenaphthene	1.00 - 1.00	0 / 4	--	--	0.50	0
Acenaphthylene	1.00 - 1.00	0 / 4	--	--	0.50	0
Anthracene	2.00 - 2.00	0 / 4	--	--	1	0
Benzo(a)anthracene	0.10 - 0.10	0 / 4	--	--	0.05	0
Benzo(a)pyrene	0.10 - 0.10	0 / 4	--	--	0.05	0

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 4-1
Summary Statistics - SWMU 2B - Groundwater
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Benzo(b)fluoranthene	0.10 - 0.10	0 / 4	--	--	0.05	0
Benzo(g,h,i)perylene	0.10 - 0.10	0 / 4	--	--	0.05	0
Benzo(k)fluoranthene	0.10 - 0.10	0 / 4	--	--	0.05	0
Butylbenzylphthalate	10.0 - 10.0	0 / 4	--	--	5	0
Carbazole	10.0 - 10.0	0 / 4	--	--	5	0
Chrysene	0.10 - 0.10	0 / 4	--	--	0.05	0
Di-n-butylphthalate	10.0 - 10.0	0 / 4	--	--	5	0
Di-n-octylphthalate	10.0 - 10.0	0 / 4	--	--	5	0
Dibenz(a,h)anthracene	0.10 - 0.10	0 / 4	--	--	0.05	0
Dibenzofuran	10.0 - 10.0	0 / 4	--	--	5	0
Diethylphthalate	10.0 - 10.0	0 / 4	--	--	5	0
Dimethyl phthalate	10.0 - 10.0	0 / 4	--	--	5	0
Fluoranthene	0.10 - 0.10	0 / 4	--	--	0.05	0
Fluorene	1.00 - 1.00	1 / 4	0.10	OW2B-MW18-R01	0.40	0.20
Hexachlorobenzene	10.0 - 10.0	0 / 4	--	--	5	0
Hexachlorobutadiene	10.0 - 10.0	0 / 4	--	--	5	0
Hexachlorocyclopentadiene	10.0 - 10.0	0 / 4	--	--	5	0
Hexachloroethane	10.0 - 10.0	0 / 4	--	--	5	0
Indeno(1,2,3-cd)pyrene	0.10 - 0.10	0 / 4	--	--	0.05	0
Isophorone	10.0 - 10.0	0 / 4	--	--	5	0
Naphthalene	2.00 - 2.00	0 / 4	--	--	1	0
Nitrobenzene	10.0 - 10.0	0 / 4	--	--	5	0
Pentachlorophenol	25.0 - 25.0	0 / 4	--	--	12.5	0
Phenanthrene	1.00 - 1.00	0 / 4	--	--	0.50	0
Phenol	10.0 - 10.0	0 / 4	--	--	5	0
Pyrene	0.10 - 0.10	0 / 4	--	--	0.05	0
bis(2-Chloroethoxy)methane	10.0 - 10.0	0 / 4	--	--	5	0
bis(2-Chloroethyl)ether	10.0 - 10.0	0 / 4	--	--	5	0
bis(2-Ethylhexyl)phthalate	10.0 - 10.0	0 / 4	--	--	5	0
n-Nitroso-di-n-propylamine	10.0 - 10.0	0 / 4	--	--	5	0

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 4-1
Summary Statistics - SWMU 2B - Groundwater
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
n-Nitrosodiphenylamine	10.0 - 10.0	0 / 4	--	--	5	0
Volatile Organic Compounds (UG/L)						
1,1,1-Trichloroethane	1.00 - 5.00	0 / 8	--	--	1.50	1.07
1,1,2,2-Tetrachloroethane	1.00 - 5.00	0 / 8	--	--	1.50	1.07
1,1,2-Trichloroethane	1.00 - 5.00	0 / 8	--	--	1.50	1.07
1,1-Dichloroethane	1.00 - 5.00	6 / 8	71.0	OW2B-MW18-94A	14.1	24.5
1,1-Dichloroethene	1.00 - 5.00	3 / 8	11.0	OW2B-MW17-94A	2.51	3.55
1,2,3-Trichloropropane	5.00 - 5.00	0 / 4	--	--	2.50	0
1,2,4-Trichlorobenzene	1.00 - 1.00	0 / 4	--	--	0.50	0
1,2-Dibromo-3-chloropropane	1.00 - 1.00	0 / 4	--	--	0.50	0
1,2-Dibromoethane	1.00 - 1.00	0 / 4	--	--	0.50	0
1,2-Dichlorobenzene	1.00 - 5.00	0 / 8	--	--	1.50	1.07
1,2-Dichloroethane	1.00 - 5.00	1 / 8	1.00	OW2B-MW18-94A	1.31	1.00
1,2-Dichloroethene (total)	5.00 - 5.00	2 / 4	48.0	OW2B-MW17-94A	14.5	22.4
1,2-Dichloropropane	1.00 - 5.00	0 / 8	--	--	1.50	1.07
1,3-Dichlorobenzene	1.00 - 5.00	0 / 8	--	--	1.50	1.07
1,4-Dichlorobenzene	1.00 - 5.00	0 / 8	--	--	1.50	1.07
2-Butanone	10.0 - 10.0	0 / 4	--	--	5	0
2-Chloroethyl vinyl ether	10.0 - 10.0	0 / 4	--	--	5	0
2-Hexanone	5.00 - 10.0	0 / 8	--	--	3.75	1.34
4-Methyl-2-pentanone	5.00 - 10.0	0 / 8	--	--	3.75	1.34
Acetone	10.0 - 10.0	0 / 4	--	--	4	1.22
Acrolein	100 - 100	0 / 4	--	--	50	0
Acrylonitrile	100 - 100	0 / 4	--	--	50	0
Benzene	1.00 - 5.00	3 / 8	6.00	OW2B-MW17-94A	2	1.95
Bromochloromethane	1.00 - 1.00	0 / 4	--	--	0.50	0
Bromodichloromethane	1.00 - 5.00	0 / 8	--	--	1.50	1.07
Bromoform	1.00 - 5.00	0 / 8	--	--	1.50	1.07
Bromomethane	1.00 - 10.0	0 / 8	--	--	2.75	2.41
Carbon disulfide	1.00 - 5.00	3 / 8	0.80	OW2B-MW20-R01	1.55	1.02

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 4-1
Summary Statistics - SWMU 2B - Groundwater
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Carbon tetrachloride	1.00 - 5.00	0 / 8	--	--	1.50	1.07
Chlorobenzene	1.00 - 5.00	0 / 8	--	--	1.50	1.07
Chloroethane	1.00 - 10.0	2 / 8	20.0	OW2B-MW18-94A	4.69	6.56
Chloroform	1.00 - 5.00	0 / 8	--	--	1.50	1.07
Chloromethane	1.00 - 10.0	0 / 8	--	--	2.75	2.41
Dibromochloromethane	1.00 - 5.00	0 / 8	--	--	1.50	1.07
Dibromomethane	5.00 - 5.00	0 / 4	--	--	2.50	0
Dichlorodifluoromethane	10.0 - 10.0	0 / 4	--	--	5	0
Ethane	0.005 - 0.005	2 / 4	0.11	OW2B-MW20-R01	0.03	0.05
Ethene	0.005 - 0.005	2 / 4	0.06	OW2B-MW17-R01	0.03	0.03
Ethyl methacrylate	5.00 - 5.00	0 / 4	--	--	2.50	0
Ethylbenzene	1.00 - 5.00	0 / 8	--	--	1.50	1.07
Iodomethane	10.0 - 10.0	0 / 4	--	--	5	0
Methane	0.02 - 0.02	4 / 4	2,150	OW2B-MW17-R01	1257	869
Methylene chloride	2.00 - 5.00	4 / 8	1.00	OW2B-MW17-94A	0.81	0.78
Styrene	1.00 - 5.00	0 / 8	--	--	1.50	1.07
Tetrachloroethene	1.00 - 5.00	0 / 8	--	--	1.50	1.07
Toluene	1.00 - 5.00	3 / 8	0.20	OW2B-MW17-R01	1.38	1.21
Trichloroethene	1.00 - 5.00	2 / 8	4.00	OW2B-MW18-94A	1.66	1.39
Trichlorofluoromethane	5.00 - 5.00	0 / 4	--	--	2.50	0
Vinyl acetate	10.0 - 10.0	0 / 4	--	--	5	0
Vinyl chloride	1.00 - 10.0	4 / 8	15.0	OW2B-MW18-94A	3.44	4.99
Xylene, total	1.00 - 5.00	0 / 8	--	--	1.50	1.07
cis-1,2-Dichloroethene	1.00 - 1.00	3 / 4	3.00	OW2B-MW17-R01	0.95	1.38
cis-1,3-Dichloropropene	1.00 - 5.00	0 / 8	--	--	1.56	1.15
trans-1,2-Dichloroethene	1.00 - 1.00	1 / 4	0.30	OW2B-MW17-R01	0.45	0.10
trans-1,3-Dichloropropene	1.00 - 5.00	0 / 8	--	--	1.50	1.07
trans-1,4-Dichloro-2-butene	5.00 - 5.00	0 / 4	--	--	2.50	0
Other Parameters (MG/L)						
Alkalinity	10.0 - 10.0	4 / 4	110	OW2B-MW20-R01-P	77.0	30.9

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 4-1
Summary Statistics - SWMU 2B - Groundwater
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Chloride	0.50 - 0.50	4 / 4	23.0	OW2B-MW20-R01	14.1	6.51
Cyanide	0.01 - 0.01	0 / 2	--	--	0.003	0.003
Dissolved oxygen	0.01 - 0.01	4 / 4	0.17	OW2B-MW18-R01	0.09	0.06
Nitrate	0.50 - 0.50	0 / 4	--	--	0.25	0
Nitrite	0.50 - 0.50	0 / 4	--	--	0.25	0
Redox	-- - --	4 / 4	--	OW2B-MW17-R01	--	0
Specific conductance	-- - --	4 / 4	--	OW2B-MW17-R01	--	0
Sulfate	0.50 - 0.50	4 / 4	19.0	OW2B-MW17-R01	13.4	8.01
Sulfide	0.06 - 0.06	4 / 4	0.16	OW2B-MW20-R01-P	0.12	0.03
Temperature	-- - --	4 / 4	--	OW2B-MW17-R01	--	0
Total organic carbon (TOC)	2.00 - 2.00	4 / 4	9.40	OW2B-MW17-R01	5.85	2.56
Turbidity	-- - --	4 / 4	--	OW2B-MW17-R01	--	0
pH	-- - --	4 / 4	--	OW2B-MW17-R01	--	0

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 4-2
Summary Statistics - SWMU 2B - Surface Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Volatile Organic Compounds (UG/L)						
1,1,1-Trichloroethane	5.00 - 5.00	0 / 4	--	--	2.50	0
1,1,2,2-Tetrachloroethane	5.00 - 5.00	0 / 4	--	--	2.50	0
1,1,2-Trichloroethane	5.00 - 5.00	0 / 4	--	--	2.50	0
1,1-Dichloroethane	5.00 - 5.00	1 / 4	1.00	OW2B-SW4-94	2.13	0.75
1,1-Dichloroethene	5.00 - 5.00	0 / 4	--	--	2.50	0
1,2,3-Trichloropropane	5.00 - 5.00	0 / 4	--	--	2.50	0
1,2-Dichlorobenzene	5.00 - 5.00	0 / 4	--	--	2.50	0
1,2-Dichloroethane	5.00 - 10.0	0 / 4	--	--	3.13	1.25
1,2-Dichloroethene (total)	5.00 - 5.00	2 / 4	2.00	OW2B-SW5-94A	2.25	0.29
1,2-Dichloropropane	5.00 - 5.00	0 / 4	--	--	2.50	0
1,3-Dichlorobenzene	5.00 - 5.00	0 / 4	--	--	2.50	0
1,4-Dichlorobenzene	5.00 - 5.00	0 / 4	--	--	2.50	0
2-Butanone	5.00 - 10.0	0 / 4	--	--	4.38	1.25
2-Chloroethyl vinyl ether	10.0 - 10.0	0 / 4	--	--	5	0
2-Hexanone	10.0 - 10.0	0 / 4	--	--	5	0
4-Methyl-2-pentanone	10.0 - 10.0	0 / 4	--	--	5	0
Acetone	-- - --	0 / 4	--	--	5	0
Acrolein	100 - 100	0 / 4	--	--	50	0
Acrylonitrile	100 - 100	0 / 4	--	--	50	0
Benzene	5.00 - 5.00	0 / 4	--	--	2.50	0
Bromodichloromethane	5.00 - 5.00	0 / 4	--	--	2.50	0
Bromoform	5.00 - 5.00	0 / 4	--	--	2.50	0
Bromomethane	10.0 - 10.0	0 / 4	--	--	5	0
Carbon disulfide	5.00 - 5.00	0 / 4	--	--	2.50	0
Carbon tetrachloride	5.00 - 5.00	0 / 4	--	--	2.50	0
Chlorobenzene	5.00 - 5.00	0 / 4	--	--	2.50	0
Chloroethane	10.0 - 10.0	0 / 4	--	--	5	0
Chloroform	5.00 - 5.00	0 / 4	--	--	2.50	0
Chloromethane	10.0 - 10.0	1 / 4	5.00	OW2B-SW2-94A	5	0

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 4-2
Summary Statistics - SWMU 2B - Surface Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Dibromochloromethane	5.00 - 5.00	0 / 4	--	--	2.50	0
Dibromomethane	5.00 - 5.00	0 / 4	--	--	2.50	0
Dichlorodifluoromethane	10.0 - 10.0	0 / 4	--	--	5	0
Ethyl methacrylate	5.00 - 5.00	0 / 4	--	--	2.50	0
Ethylbenzene	5.00 - 5.00	0 / 4	--	--	2.50	0
Iodomethane	10.0 - 10.0	0 / 4	--	--	5	0
Methylene chloride	5.00 - 5.00	0 / 4	--	--	2.50	0
Styrene	5.00 - 5.00	0 / 4	--	--	2.50	0
Tetrachloroethene	5.00 - 5.00	0 / 4	--	--	2.50	0
Toluene	5.00 - 5.00	1 / 4	1.00	OW2B-SW4-94	2.13	0.75
Trichloroethene	5.00 - 5.00	2 / 4	1.00	OW2B-SW5-94A	1.75	0.87
Trichlorofluoromethane	5.00 - 5.00	0 / 4	--	--	2.50	0
Vinyl acetate	10.0 - 10.0	0 / 4	--	--	5	0
Vinyl chloride	2.00 - 2.00	3 / 4	1.00	OW2B-SW4-94	1	0
Xylene, total	5.00 - 5.00	1 / 4	1.00	OW2B-SW6-94A	2.13	0.75
cis-1,3-Dichloropropene	5.00 - 5.00	0 / 4	--	--	2.50	0
trans-1,3-Dichloropropene	5.00 - 5.00	0 / 4	--	--	2.50	0
trans-1,4-Dichloro-2-butene	5.00 - 5.00	0 / 4	--	--	2.50	0

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 4-3 Summary Statistics - SWMU 2B - Sediment *NAS Oceana, Virginia Beach, VA*						
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Arithmetic Mean[1]**	**Standard Deviation of Mean**
Semi-volatile Organic Compounds (UG/KG)						
1,2,4-Trichlorobenzene	390 - 420	0 / 3	--	--	205	8.66
1,2-Dichlorobenzene	390 - 420	0 / 3	--	--	205	8.66
1,3-Dichlorobenzene	390 - 420	0 / 3	--	--	205	8.66
1,4-Dichlorobenzene	390 - 420	0 / 3	--	--	205	8.66
1-Methylnaphthalene	310 - 3,700	1 / 3	430	OW2B-SD4-94A	743	271
2,2'-Oxybis(1-chloropropane)	390 - 420	0 / 3	--	--	205	8.66
2,4,5-Trichlorophenol	390 - 420	0 / 3	--	--	205	8.66
2,4,6-Trichlorophenol	390 - 420	0 / 3	--	--	205	8.66
2,4-Dichlorophenol	390 - 420	0 / 3	--	--	205	8.66
2,4-Dimethylphenol	390 - 420	0 / 3	--	--	205	8.66
2,4-Dinitrophenol	950 - 1,000	0 / 3	--	--	492	14.4
2,4-Dinitrotoluene	390 - 420	0 / 3	--	--	205	8.66
2,6-Dinitrotoluene	390 - 420	0 / 3	--	--	205	8.66
2-Chloronaphthalene	390 - 420	0 / 3	--	--	205	8.66
2-Chlorophenol	390 - 420	0 / 3	--	--	205	8.66
2-Methylnaphthalene	310 - 3,700	2 / 6	420	OW2B-SD4-94A	450	368
2-Methylphenol	390 - 420	0 / 3	--	--	205	8.66
2-Nitroaniline	950 - 1,000	0 / 3	--	--	492	14.4
2-Nitrophenol	390 - 420	0 / 3	--	--	205	8.66
3,3'-Dichlorobenzidine	390 - 420	0 / 3	--	--	205	8.66
3-Nitroaniline	950 - 1,000	0 / 3	--	--	492	14.4
4,6-Dinitro-2-methylphenol	950 - 1,000	0 / 3	--	--	492	14.4
4-Bromophenyl-phenylether	390 - 420	0 / 3	--	--	205	8.66
4-Chloro-3-methylphenol	390 - 420	0 / 3	--	--	205	8.66
4-Chloroaniline	390 - 420	0 / 3	--	--	205	8.66
4-Chlorophenyl-phenylether	390 - 420	0 / 3	--	--	205	8.66
4-Methylphenol	390 - 420	0 / 3	--	--	205	8.66
4-Nitroaniline	950 - 1,000	0 / 3	--	--	492	14.4
4-Nitrophenol	950 - 1,000	0 / 3	--	--	492	14.4

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 4-3
Summary Statistics - SWMU 2B - Sediment
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Acenaphthene	310 - 3,700	2 / 6	350	OW2B-SD4-94A	441	367
Acenaphthylene	310 - 3,700	0 / 6	--	--	428	366
Anthracene	310 - 3,700	3 / 6	2,200	OW2B-SD2-94A	656	810
Benzo(a)anthracene	310 - 3,700	5 / 6	6,000	OW2B-SD2-94A	1392	2287
Benzo(a)pyrene	310 - 3,700	5 / 6	6,400	OW2B-SD2-94A	1448	2452
Benzo(b)fluoranthene	310 - 3,700	5 / 6	7,700	OW2B-SD2-94A	1668	2970
Benzo(g,h,i)perylene	310 - 3,700	5 / 6	3,200	OW2B-SD2-94A	822	1203
Benzo(k)fluoranthene	310 - 3,700	5 / 6	6,500	OW2B-SD2-94A	1359	2540
Butylbenzylphthalate	390 - 420	2 / 3	150	OW2B-SD04	141	73.4
Carbazole	390 - 420	1 / 3	54.0	OW2B-SD01	158	90.1
Chrysene	310 - 3,700	5 / 6	7,900	OW2B-SD2-94A	1758	3029
Di-n-butylphthalate	390 - 420	1 / 3	170	OW2B-SD04	192	20.2
Di-n-octylphthalate	390 - 420	0 / 3	--	--	205	8.66
Dibenz(a,h)anthracene	310 - 3,700	0 / 6	--	--	428	366
Dibenzofuran	390 - 420	1 / 3	46.0	OW2B-SD01	155	94.7
Diethylphthalate	390 - 420	0 / 3	--	--	205	8.66
Dimethyl phthalate	390 - 420	0 / 3	--	--	205	8.66
Fluoranthene	310 - 3,700	5 / 6	13,000	OW2B-SD2-94A	2893	5008
Fluorene	310 - 3,700	2 / 6	320	OW2B-SD4-94A	433	371
Hexachlorobenzene	390 - 420	0 / 3	--	--	205	8.66
Hexachlorobutadiene	390 - 420	0 / 3	--	--	205	8.66
Hexachlorocyclopentadiene	390 - 420	0 / 3	--	--	205	8.66
Hexachloroethane	390 - 420	0 / 3	--	--	205	8.66
Indeno(1,2,3-cd)pyrene	310 - 3,700	5 / 6	5,100	OW2B-SD2-94A	1140	1965
Isophorone	390 - 420	0 / 3	--	--	205	8.66
Naphthalene	310 - 3,700	0 / 6	--	--	428	366
Nitrobenzene	390 - 420	0 / 3	--	--	205	8.66
Pentachlorophenol	950 - 1,000	0 / 3	--	--	492	14.4
Phenanthrene	310 - 3,700	5 / 6	7,400	OW2B-SD2-94A	1867	2806
Phenol	390 - 420	0 / 3	--	--	205	8.66

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 4-3
Summary Statistics - SWMU 2B - Sediment
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Pyrene	310 - 3,700	5 / 6	11,000	OW2B-SD2-94A	2533	4188
bis(2-Chloroethoxy)methane	390 - 420	0 / 3	--	--	205	8.66
bis(2-Chloroethyl)ether	390 - 420	0 / 3	--	--	205	8.66
bis(2-Ethylhexyl)phthalate	390 - 420	3 / 3	680	OW2B-SD02	543	220
n-Nitroso-di-n-propylamine	390 - 420	0 / 3	--	--	205	8.66
n-Nitrosodiphenylamine	390 - 420	0 / 3	--	--	205	8.66
Volatile Organic Compounds (UG/KG)						
1,1,1-Trichloroethane	1.30 - 63.0	0 / 3	--	--	20.6	17.2
1,1,2,2-Tetrachloroethane	1.30 - 63.0	0 / 3	--	--	20.6	17.2
1,1,2-Trichloroethane	1.30 - 63.0	0 / 3	--	--	20.6	17.2
1,1-Dichloroethane	1.30 - 63.0	0 / 3	--	--	20.6	17.2
1,1-Dichloroethene	1.30 - 63.0	0 / 3	--	--	20.6	17.2
1,2-Dichlorobenzene	1.30 - 63.0	0 / 3	--	--	20.6	17.2
1,2-Dichloroethane	1.30 - 63.0	0 / 3	--	--	20.6	17.2
1,2-Dichloropropane	1.30 - 63.0	0 / 3	--	--	20.6	17.2
1,3-Dichlorobenzene	1.30 - 63.0	0 / 3	--	--	20.6	17.2
1,4-Dichlorobenzene	1.30 - 63.0	0 / 3	--	--	20.6	17.2
2-Chloroethyl vinyl ether	1.30 - 63.0	0 / 3	--	--	20.6	17.2
Bromodichloromethane	1.30 - 63.0	0 / 3	--	--	20.6	17.2
Bromoform	1.30 - 63.0	0 / 3	--	--	20.6	17.2
Bromomethane	1.30 - 63.0	0 / 3	--	--	20.6	17.2
Carbon tetrachloride	1.30 - 63.0	0 / 3	--	--	20.6	17.2
Chlorobenzene	1.30 - 63.0	0 / 3	--	--	20.6	17.2
Chloroethane	1.30 - 63.0	0 / 3	--	--	20.6	17.2
Chloroform	1.30 - 63.0	0 / 3	--	--	20.6	17.2
Chloromethane	1.30 - 63.0	0 / 3	--	--	20.6	17.2
Dibromochloromethane	1.30 - 63.0	0 / 3	--	--	20.6	17.2
Dichlorodifluoromethane	1.30 - 63.0	0 / 3	--	--	20.6	17.2
Methylene chloride	1.30 - 63.0	0 / 3	--	--	20.6	17.2
Tetrachloroethene	1.30 - 63.0	0 / 3	--	--	20.6	17.2

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 4-3 Summary Statistics - SWMU 2B - Sediment *NAS Oceana, Virginia Beach, VA*						
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Arithmetic Mean[1]**	**Standard Deviation of Mean**
Trichloroethene	1.30 - 63.0	0 / 3	--	--	20.6	17.2
Trichlorofluoromethane	1.30 - 63.0	0 / 3	--	--	20.6	17.2
Vinyl chloride	62.0 - 63.0	0 / 2	--	--	30.5	0.71
cis-1,2-Dichloroethene	1.30 - 63.0	0 / 3	--	--	20.6	17.2
cis-1,3-Dichloropropene	1.30 - 63.0	0 / 3	--	--	20.6	17.2
trans-1,2-Dichloroethene	1.30 - 63.0	0 / 3	--	--	20.6	17.2
trans-1,3-Dichloropropene	1.30 - 63.0	0 / 3	--	--	20.6	17.2
Other Parameters (MG/KG)						
Total Organic Carbon	120 - 130	1 / 3	290	OW2B-SD04	138	131

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 4-4
Summary Statistics - SWMU 2B - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Inorganics (MG/KG)						
Aluminum	40.1 - 45.8	3 / 3	11,000	OW2B-SS01-00	10767	208
Antimony	12.0 - 13.7	1 / 3	10.0	OW2B-SS02-00	3.48	5.65
Arsenic	2.00 - 2.30	3 / 3	2.60	OW2B-SS01-00	2.27	0.58
Barium	40.1 - 45.8	3 / 3	45.4	OW2B-SS03-00	44.4	1.06
Beryllium	1.00 - 1.10	2 / 3	0.31	OW2B-SS02-00	0.22	0.13
Cadmium	1.00 - 1.10	2 / 3	1.20	OW2B-SS02-00	0.57	0.55
Calcium	1,003 - 1,145	3 / 3	1,380	OW2B-SS02-00	1065	275
Chromium	2.00 - 2.30	3 / 3	782	OW2B-SS02-00	270	444
Cobalt	10.0 - 11.4	3 / 3	2.00	OW2B-SS02-00	1.87	0.15
Copper	5.00 - 5.70	3 / 3	9.20	OW2B-SS03-00	7.2	1.95
Cyanide	0.60 - 0.60	0 / 3	--	--	0.01	0.003
Iron	20.1 - 22.9	3 / 3	4,800	OW2B-SS03-00	4293	439
Lead	0.60 - 6.00	3 / 3	2,760	OW2B-SS02-00	935	1580
Magnesium	1,003 - 1,145	3 / 3	872	OW2B-SS02-00	739	129
Manganese	3.00 - 3.40	3 / 3	36.5	OW2B-SS03-00	28.9	6.85
Mercury	0.10 - 0.10	2 / 3	0.61	OW2B-SS02-00	0.23	0.33
Nickel	8.00 - 9.20	3 / 3	8.10	OW2B-SS01-00	6.43	1.46
Potassium	1,003 - 1,145	3 / 3	426	OW2B-SS03-00	381	39.7
Selenium	1.00 - 1.10	0 / 3	--	--	0.30	0.01
Silver	2.00 - 2.30	1 / 3	1.00	OW2B-SS01-00	0.60	0.35
Sodium	1,003 - 1,145	0 / 3	--	--	38.3	4.75
Thallium	2.00 - 2.30	0 / 3	--	--	0.28	0.07
Vanadium	10.0 - 11.4	3 / 3	15.3	OW2B-SS01-00	15.2	0.12
Zinc	4.00 - 4.60	2 / 3	69.1	OW2B-SS02-00	38.8	28.4
Pesticide/Polychlorinated Biphenyls (UG/KG)						
4,4'-DDD	4.05 - 4.22	1 / 3	8.10	OW2B-SS02-00	4.06	3.50
4,4'-DDE	4.05 - 4.22	2 / 3	13.0	OW2B-SS03-00	6.67	5.69
4,4'-DDT	4.05 - 4.22	1 / 3	30.0	OW2B-SS03-00	11.4	16.1
Aldrin	2.08 - 2.17	0 / 3	--	--	1.06	0.03

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 4-4
Summary Statistics - SWMU 2B - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Aroclor-1016	40.5 - 42.2	0 / 3	--	--	20.6	0.56
Aroclor-1221	82.2 - 85.6	0 / 3	--	--	41.8	1.14
Aroclor-1232	40.5 - 42.2	0 / 3	--	--	20.6	0.56
Aroclor-1242	40.5 - 42.2	0 / 3	--	--	20.6	0.56
Aroclor-1248	40.5 - 42.2	0 / 3	--	--	20.6	0.56
Aroclor-1254	40.5 - 42.2	1 / 3	53.0	OW2B-SS02-00	31.2	18.8
Aroclor-1260	40.5 - 42.2	0 / 3	--	--	20.6	0.56
Dieldrin	4.05 - 4.22	1 / 3	6.60	OW2B-SS02-00	3.56	2.63
Endosulfan I	2.08 - 2.17	0 / 3	--	--	1.06	0.03
Endosulfan II	4.05 - 4.22	0 / 3	--	--	2.06	0.06
Endosulfan sulfate	4.05 - 4.22	0 / 3	--	--	2.06	0.06
Endrin	4.05 - 4.22	0 / 3	--	--	2.06	0.06
Endrin aldehyde	4.05 - 4.22	0 / 3	--	--	2.06	0.06
Endrin ketone	4.05 - 4.22	0 / 3	--	--	2.06	0.06
Heptachlor	2.08 - 2.17	0 / 3	--	--	1.06	0.03
Heptachlor epoxide	2.08 - 2.17	2 / 3	5.00	OW2B-SS01-00	3.32	2.03
Methoxychlor	20.9 - 21.7	0 / 3	--	--	10.6	0.29
Toxaphene	208 - 217	0 / 3	--	--	106	2.89
alpha-BHC	2.08 - 2.17	0 / 3	--	--	1.06	0.03
alpha-Chlordane	2.08 - 2.17	1 / 3	3.10	OW2B-SS01-00	1.75	1.17
beta-BHC	2.08 - 2.17	0 / 3	--	--	1.06	0.03
delta-BHC	2.08 - 2.17	0 / 3	--	--	1.06	0.03
gamma-BHC (Lindane)	2.08 - 2.17	0 / 3	--	--	1.06	0.03
gamma-Chlordane	2.08 - 2.17	2 / 3	3.40	OW2B-SS01-00	2.36	1.18
Semi-volatile Organic Compounds (UG/KG)						
1,2,4-Trichlorobenzene	370 - 420	0 / 3	--	--	198	12.6
1,2-Dichlorobenzene	370 - 420	0 / 3	--	--	198	12.6
1,3-Dichlorobenzene	370 - 420	0 / 3	--	--	198	12.6
1,4-Dichlorobenzene	370 - 420	0 / 3	--	--	198	12.6
1-Methylnaphthalene	21.0 - 21.0	0 / 2	--	--	10.5	0

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 4-4
Summary Statistics - SWMU 2B - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
2,2'-Oxybis(1-chloropropane)	370 - 420	0 / 3	--	--	198	12.6
2,4,5-Trichlorophenol	930 - 1,000	0 / 3	--	--	488	20.2
2,4,6-Trichlorophenol	370 - 420	0 / 3	--	--	198	12.6
2,4-Dichlorophenol	370 - 420	0 / 3	--	--	198	12.6
2,4-Dimethylphenol	370 - 420	0 / 3	--	--	198	12.6
2,4-Dinitrophenol	930 - 1,000	0 / 3	--	--	488	20.2
2,4-Dinitrotoluene	370 - 420	0 / 3	--	--	198	12.6
2,6-Dinitrotoluene	370 - 420	0 / 3	--	--	198	12.6
2-Chloronaphthalene	370 - 420	0 / 3	--	--	198	12.6
2-Chlorophenol	370 - 420	0 / 3	--	--	198	12.6
2-Methylnaphthalene	21.0 - 420	0 / 3	--	--	77	115
2-Methylphenol	370 - 420	0 / 3	--	--	198	12.6
2-Nitroaniline	930 - 1,000	0 / 3	--	--	488	20.2
2-Nitrophenol	370 - 420	0 / 3	--	--	198	12.6
3,3'-Dichlorobenzidine	370 - 420	0 / 3	--	--	198	12.6
3-Nitroaniline	930 - 1,000	0 / 3	--	--	488	20.2
4,6-Dinitro-2-methylphenol	930 - 1,000	0 / 3	--	--	488	20.2
4-Bromophenyl-phenylether	370 - 420	0 / 3	--	--	198	12.6
4-Chloro-3-methylphenol	370 - 420	0 / 3	--	--	198	12.6
4-Chloroaniline	370 - 420	0 / 3	--	--	198	12.6
4-Chlorophenyl-phenylether	370 - 420	0 / 3	--	--	198	12.6
4-Methylphenol	370 - 420	0 / 3	--	--	198	12.6
4-Nitroaniline	930 - 1,000	0 / 3	--	--	488	20.2
4-Nitrophenol	930 - 1,000	0 / 3	--	--	488	20.2
Acenaphthene	21.0 - 420	0 / 3	--	--	77	115
Acenaphthylene	41.0 - 420	0 / 3	--	--	83.8	109
Anthracene	2.00 - 420	0 / 3	--	--	70.7	121
Benzo(a)anthracene	2.00 - 420	3 / 3	140	OW2B-SS03-00	61.3	68.2
Benzo(a)pyrene	2.00 - 2.00	3 / 3	100	OW2B-SS03-00	50	43.4
Benzo(b)fluoranthene	4.10 - 4.20	3 / 3	57.0	OW2B-SS03-00	37.3	17.9

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 4-4
Summary Statistics - SWMU 2B - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Benzo(g,h,i)perylene	4.10 - 4.20	3 / 3	89.0	OW2B-SS03-00	41.3	41.5
Benzo(k)fluoranthene	2.00 - 420	3 / 3	170	OW2B-SS03-00	72.3	84.7
Butylbenzylphthalate	380 - 420	1 / 3	52.0	OW2B-SS02-00	154	88.5
Carbazole	370 - 420	0 / 3	--	--	198	12.6
Chrysene	2.00 - 2.00	3 / 3	180	OW2B-SS03-00	78.3	88.1
Di-n-butylphthalate	380 - 420	0 / 3	--	--	45.7	4.04
Di-n-octylphthalate	370 - 420	1 / 3	210	OW2B-SS01-00	202	14.4
Dibenz(a,h)anthracene	4.10 - 420	0 / 3	--	--	71.4	120
Dibenzofuran	370 - 420	0 / 3	--	--	198	12.6
Diethylphthalate	370 - 420	1 / 3	390	OW2B-SS01-00	262	112
Dimethyl phthalate	370 - 420	0 / 3	--	--	198	12.6
Fluoranthene	4.10 - 4.20	3 / 3	86.0	OW2B-SS03-00	60.7	24.1
Fluorene	4.10 - 420	0 / 3	--	--	71.4	120
Hexachlorobenzene	370 - 420	0 / 3	--	--	198	12.6
Hexachlorobutadiene	370 - 420	0 / 3	--	--	198	12.6
Hexachlorocyclopentadiene	370 - 420	0 / 3	--	--	198	12.6
Hexachloroethane	370 - 420	0 / 3	--	--	198	12.6
Indeno(1,2,3-cd)pyrene	2.00 - 2.00	3 / 3	35.0	OW2B-SS03-00	21.7	11.9
Isophorone	370 - 420	0 / 3	--	--	198	12.6
Naphthalene	21.0 - 420	0 / 3	--	--	77	115
Nitrobenzene	370 - 420	0 / 3	--	--	198	12.6
Pentachlorophenol	930 - 1,000	0 / 3	--	--	488	20.2
Phenanthrene	2.00 - 2.00	2 / 3	36.0	OW2B-SS03-00	20.7	17.9
Phenol	370 - 420	0 / 3	--	--	198	12.6
Pyrene	2.00 - 2.00	3 / 3	160	OW2B-SS03-00	76.3	73.1
bis(2-Chloroethoxy)methane	370 - 420	0 / 3	--	--	198	12.6
bis(2-Chloroethyl)ether	370 - 420	0 / 3	--	--	198	12.6
bis(2-Ethylhexyl)phthalate	380 - 420	3 / 3	690	OW2B-SS03-00	293	346
n-Nitroso-di-n-propylamine	370 - 420	0 / 3	--	--	198	12.6
n-Nitrosodiphenylamine	370 - 420	0 / 3	--	--	198	12.6

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 4-4
Summary Statistics - SWMU 2B - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Volatile Organic Compounds (UG/KG)						
1,1,1-Trichloroethane	10.0 - 12.3	0 / 3	--	--	5.39	0.68
1,1,2,2-Tetrachloroethane	10.0 - 12.3	0 / 3	--	--	5.39	0.68
1,1,2-Trichloroethane	10.0 - 12.3	0 / 3	--	--	5.39	0.68
1,1-Dichloroethane	10.0 - 12.3	0 / 3	--	--	5.39	0.68
1,1-Dichloroethene	10.0 - 12.3	0 / 3	--	--	5.39	0.68
1,2-Dichloroethane	10.0 - 12.3	0 / 3	--	--	5.39	0.68
1,2-Dichloroethene (total)	10.0 - 12.3	0 / 3	--	--	5.39	0.68
1,2-Dichloropropane	10.0 - 12.3	0 / 3	--	--	5.39	0.68
2-Butanone	10.0 - 12.3	0 / 3	--	--	4	1.73
2-Hexanone	10.0 - 12.3	0 / 3	--	--	5.39	0.68
4-Methyl-2-pentanone	10.0 - 12.3	0 / 3	--	--	5.39	0.68
Acetone	10.0 - 12.3	1 / 3	6.00	OW2B-SS02-00	4.83	1.04
Benzene	10.0 - 12.3	0 / 3	--	--	5.39	0.68
Bromochloromethane	10.0 - 12.3	3 / 3	50.0	OW2B-SS01-00	50	0
Bromodichloromethane	10.0 - 12.3	0 / 3	--	--	5.39	0.68
Bromoform	10.0 - 12.3	0 / 3	--	--	5.39	0.68
Bromomethane	10.0 - 12.3	0 / 3	--	--	5.39	0.68
Carbon disulfide	10.0 - 12.3	0 / 3	--	--	5.39	0.68
Carbon tetrachloride	10.0 - 12.3	0 / 3	--	--	5.39	0.68
Chlorobenzene	10.0 - 12.3	0 / 3	--	--	5.39	0.68
Chloroethane	10.0 - 12.3	0 / 3	--	--	5.39	0.68
Chloroform	10.0 - 12.3	0 / 3	--	--	5.39	0.68
Chloromethane	10.0 - 12.3	0 / 3	--	--	5.39	0.68
Dibromochloromethane	10.0 - 12.3	0 / 3	--	--	5.39	0.68
Ethylbenzene	10.0 - 12.3	0 / 3	--	--	5.39	0.68
Methylene chloride	10.0 - 12.3	0 / 3	--	--	12.2	0.76
Styrene	10.0 - 12.3	0 / 3	--	--	5.39	0.68
Tetrachloroethene	10.0 - 12.3	0 / 3	--	--	5.39	0.68
Toluene	10.0 - 12.3	0 / 3	--	--	5.39	0.68

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 4-4
Summary Statistics - SWMU 2B - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Trichloroethene	10.0 - 12.3	0 / 3	--	--	5.39	0.68
Vinyl chloride	10.0 - 12.3	0 / 3	--	--	5.39	0.68
Xylene, total	10.0 - 12.3	0 / 3	--	--	5.39	0.68
cis-1,2-Dichloroethene	10.0 - 12.3	0 / 3	--	--	5.39	0.68
cis-1,3-Dichloropropene	10.0 - 12.3	0 / 3	--	--	5.39	0.68
o-Xylene	10.0 - 12.3	0 / 3	--	--	5.39	0.68
trans-1,2-Dichloroethene	10.0 - 12.3	0 / 3	--	--	5.39	0.68
trans-1,3-Dichloropropene	10.0 - 12.3	0 / 3	--	--	5.39	0.68

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 4-5
Preliminary Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - SWMU 2B
NAS Oceana, Virginia Beach, VA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor
Terrestrial Habitats			
Survival, growth, and reproduction of terrestrial soil invertebrate communities.	Are site-related surface soil concentrations sufficient to adversely effect soil invertebrate communities based on conservative screening values?	Comparison of maximum chemical concentrations in surface soil with soil screening values.	Soil Invertebrates (earthworms)
Survival, growth, and reproduction of terrestrial plant communities.	Are site-related surface soil concentrations sufficient to adversely effect terrestrial plant communities based on conservative screening values?	Comparison of maximum chemical concentrations in surface soil with soil screening values.	Terrestrial plants
Survival, growth, and reproduction of avian terrestrial insectivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume 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 soil concentrations.	American robin
Survival, growth, and reproduction of avian terrestrial carnivores.	Are site-related chemical concentrations in surface soils 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 soil concentrations.	American kestrel
Survival, growth, and reproduction of mammalian terrestrial insectivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume 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 soil concentrations.	Short-tailed shrew
Survival, growth, and reproduction of mammalian terrestrial omnivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume plants and 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 soil concentrations.	Deer mouse
Survival, growth, and reproduction of mammalian terrestrial herbivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume 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 soil concentrations.	Meadow vole

Table 4-5
Preliminary Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - SWMU 2B
NAS Oceana, Virginia Beach, VA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor
Survival, growth, and reproduction of mammalian terrestrial carnivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian 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 soil concentrations.	Red fox
Survival, growth, and reproduction of terrestrial reptiles.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to terrestrial reptilian species?	Evidence of potential risk to other upper trophic level terrestrial receptors evaluated in the screening ERA.	--
Wetland and Aquatic Habitats			
Survival, growth, and reproduction of benthic invertebrate communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect benthic invertebrate communities?	Comparison of maximum chemical concentrations in surface water and/or sediment with medium-specific screening values.	Benthic invertebrates
Survival, growth, and reproduction of aquatic and wetland plant communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect aquatic or wetland plant communities?	Comparison of maximum chemical concentrations in surface water and/or sediment with medium-specific screening values.	Aquatic/wetland plants
Survival, growth, and reproduction of fish communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect fish communities?	Comparison of maximum chemical concentrations in surface water and/or sediment with medium-specific screening values.	Freshwater fish
Survival, growth, and reproduction of amphibian communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect amphibian communities?	Comparison of maximum chemical concentrations in surface water and/or sediment with medium-specific screening values.	Amphibians
Survival, growth, and reproduction of amphibians.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to amphibian species that may consume aquatic invertebrates from the site?	Evidence of potential risk to other upper trophic level aquatic and wetland receptors evaluated in the screening ERA.	--

Table 4-5
Preliminary Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - SWMU 2B
NAS Oceana, Virginia Beach, VA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor
Survival, growth, and reproduction of wetland reptiles.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to aquatic/wetland reptile species?	Evidence of potential risk to other upper trophic level aquatic and wetland receptors evaluated in the screening ERA.	--
Survival, growth, and reproduction of avian aquatic/wetland insectivores.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume aquatic 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 surface water and/or sediment concentrations.	Marsh wren
Survival, growth, and reproduction of avian aquatic/wetland omnivores.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume aquatic plants and 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 surface water and/or sediment concentrations.	Mallard
Survival, growth, and reproduction of avian aquatic/wetland piscivores.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume fish 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 surface water and/or sediment concentrations.	Great blue heron
Survival, growth, and reproduction of mammalian aquatic/wetland omnivores.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume aquatic plants and 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 surface water and/or sediment concentrations.	Raccoon

Table 4-6
Preliminary Screening Statistics - SWMU 2B - Groundwater
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient [1]	COPC ?
Inorganics (UG/L)								
Aluminum	15.5 - 15.5	0 / 4	--	--	87.0	-- / --	0.18	NO
Antimony	1.60 - 1.60	0 / 4	--	--	30.0	-- / --	0.05	NO
Arsenic	2.50 - 2.50	2 / 4	29.7	OW2B-MW17-R01	150	0 / 4	0.20	NO
Barium	0.60 - 0.60	4 / 4	65.6	OW2B-MW20-R01	1,000	0 / 4	0.07	NO
Beryllium	0.20 - 0.20	0 / 4	--	--	5.30	-- / --	0.04	NO
Cadmium	0.70 - 0.70	0 / 4	--	--	0.83	-- / --	0.84	NO
Calcium [2]	13.4 - 13.4	4 / 4	40,800	OW2B-MW20-R01	NSV	-- / --	NSV	NO
Chromium	2.60 - 2.60	1 / 4	4.80	OW2B-MW20-R01	11.4	0 / 4	0.42	NO
Cobalt	1.50 - 1.50	1 / 4	1.60	OW2B-MW18-R01	23.0	0 / 4	0.07	NO
Copper	2.90 - 2.90	0 / 4	--	--	2.85	-- / --	1.02	**YES**
Cyanide	10.0 - 10.0	0 / 2	--	--	5.20	-- / --	1.92	**YES**
Iron	43.7 - 43.7	4 / 4	35,500	OW2B-MW17-R01	320	4 / 4	111	**YES**
Lead	1.40 - 1.40	0 / 4	--	--	0.54	-- / --	2.57	**YES**
Magnesium [2]	19.7 - 19.7	4 / 4	13,500	OW2B-MW17-R01	NSV	-- / --	NSV	NO
Manganese	0.40 - 0.40	4 / 4	500	OW2B-MW20-R01	120	4 / 4	4.17	**YES**
Mercury	0.03 - 0.03	0 / 4	--	--	0.91	-- / --	0.03	NO
Nickel	1.70 - 1.70	0 / 4	--	--	16.1	-- / --	0.11	NO
Potassium [2]	103 - 103	4 / 4	2,190	OW2B-MW20-R01	NSV	-- / --	NSV	NO
Selenium	3.10 - 3.10	0 / 4	--	--	5.00	-- / --	0.62	NO
Silver	1.90 - 1.90	0 / 4	--	--	0.36	-- / --	5.28	**YES**
Sodium [2]	686 - 686	4 / 4	28,800	OW2B-MW20-R01	NSV	-- / --	NSV	NO
Thallium	9.40 - 9.40	0 / 4	--	--	40.0	-- / --	0.24	NO
Vanadium	2.10 - 2.10	0 / 4	--	--	10,000	-- / --	0.0002	NO
Zinc	1.40 - 1.40	0 / 4	--	--	37.0	-- / --	0.04	NO
Pesticide/Polychlorinated Biphenyls (UG/L)								
4,4'-DDD	0.10 - 0.10	0 / 4	--	--	0.06	-- / --	1.67	**YES**
4,4'-DDE	0.10 - 0.10	0 / 4	--	--	105	-- / --	0.0010	NO
4,4'-DDT	0.10 - 0.10	0 / 4	--	--	0.001	-- / --	100	**YES**

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 4-6 Preliminary Screening Statistics - SWMU 2B - Groundwater *NAS Oceana, Virginia Beach, VA*								
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Screening Value**	**Frequency of Exceedance**	**Maximum Hazard Quotient [1]**	**COPC ?**
Aldrin	0.05 - 0.05	0 / 4	--	--	0.30	-- / --	0.17	NO
Aroclor-1016	1.00 - 1.00	0 / 4	--	--	0.01	-- / --	71.4	**YES**
Aroclor-1221	2.00 - 2.00	0 / 4	--	--	0.28	-- / --	7.14	**YES**
Aroclor-1232	1.00 - 1.00	0 / 4	--	--	0.58	-- / --	1.72	**YES**
Aroclor-1242	1.00 - 1.00	0 / 4	--	--	0.05	-- / --	18.9	**YES**
Aroclor-1248	1.00 - 1.00	0 / 4	--	--	0.08	-- / --	12.3	**YES**
Aroclor-1254	1.00 - 1.00	0 / 4	--	--	0.03	-- / --	30.3	**YES**
Aroclor-1260	1.00 - 1.00	0 / 4	--	--	94.0	-- / --	0.01	NO
Dieldrin	0.10 - 0.10	0 / 4	--	--	0.06	-- / --	1.79	**YES**
Endosulfan I	0.05 - 0.05	0 / 4	--	--	0.06	-- / --	0.89	NO
Endosulfan II	0.10 - 0.10	0 / 4	--	--	0.06	-- / --	1.79	**YES**
Endosulfan sulfate	0.10 - 0.10	0 / 4	--	--	0.06	-- / --	1.79	**YES**
Endrin	0.10 - 0.10	0 / 4	--	--	0.04	-- / --	2.78	**YES**
Endrin aldehyde	0.10 - 0.10	0 / 4	--	--	0.04	-- / --	2.78	**YES**
Endrin ketone	0.10 - 0.10	0 / 4	--	--	0.04	-- / --	2.78	**YES**
Heptachlor	0.05 - 0.05	0 / 4	--	--	0.007	-- / --	7.25	**YES**
Heptachlor epoxide	0.05 - 0.05	0 / 4	--	--	0.007	-- / --	7.25	**YES**
Methoxychlor	0.50 - 0.50	0 / 4	--	--	0.03	-- / --	16.7	**YES**
Toxaphene	5.00 - 5.00	0 / 4	--	--	0.01	-- / --	455	**YES**
alpha-BHC	0.05 - 0.05	0 / 4	--	--	2.20	-- / --	0.02	NO
alpha-Chlordane	0.05 - 0.05	0 / 4	--	--	0.17	-- / --	0.29	NO
beta-BHC	0.05 - 0.05	0 / 4	--	--	2.20	-- / --	0.02	NO
delta-BHC	0.05 - 0.05	0 / 4	--	--	2.20	-- / --	0.02	NO
gamma-BHC (Lindane)	0.05 - 0.05	0 / 4	--	--	0.08	-- / --	0.63	NO
gamma-Chlordane	0.05 - 0.05	0 / 4	--	--	0.17	-- / --	0.29	NO
Semi-volatile Organic Compounds (UG/L)								
1,2,4-Trichlorobenzene	10.0 - 10.0	0 / 4	--	--	50.0	-- / --	0.20	NO
1,2-Dichlorobenzene	10.0 - 10.0	0 / 4	--	--	763	-- / --	0.01	NO
1,3-Dichlorobenzene	10.0 - 10.0	0 / 4	--	--	763	-- / --	0.01	NO
1,4-Dichlorobenzene	10.0 - 10.0	0 / 4	--	--	763	-- / --	0.01	NO

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 4-6
Preliminary Screening Statistics - SWMU 2B - Groundwater
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient [1]	COPC ?
2,2'-Oxybis(1-chloropropane)	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
2,4,5-Trichlorophenol	25.0 - 25.0	0 / 4	--	--	63.0	-- / --	0.40	NO
2,4,6-Trichlorophenol	10.0 - 10.0	0 / 4	--	--	970	-- / --	0.01	NO
2,4-Dichlorophenol	10.0 - 10.0	0 / 4	--	--	365	-- / --	0.03	NO
2,4-Dimethylphenol	10.0 - 10.0	0 / 4	--	--	530	-- / --	0.02	NO
2,4-Dinitrophenol	25.0 - 25.0	0 / 4	--	--	150	-- / --	0.17	NO
2,4-Dinitrotoluene	10.0 - 10.0	0 / 4	--	--	230	-- / --	0.04	NO
2,6-Dinitrotoluene	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
2-Chloronaphthalene	10.0 - 10.0	0 / 4	--	--	620	-- / --	0.02	NO
2-Chlorophenol	10.0 - 10.0	0 / 4	--	--	97.0	-- / --	0.10	NO
2-Methylnaphthalene	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
2-Methylphenol	10.0 - 10.0	0 / 4	--	--	13.0	-- / --	0.77	NO
2-Nitroaniline	25.0 - 25.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
2-Nitrophenol	10.0 - 10.0	0 / 4	--	--	150	-- / --	0.07	NO
3,3'-Dichlorobenzidine	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
3-Nitroaniline	25.0 - 25.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
4,6-Dinitro-2-methylphenol	25.0 - 25.0	0 / 4	--	--	2.30	-- / --	10.9	**YES**
4-Bromophenyl-phenylether	10.0 - 10.0	0 / 4	--	--	1.50	-- / --	6.67	**YES**
4-Chloro-3-methylphenol	10.0 - 10.0	0 / 4	--	--	0.30	-- / --	33.3	**YES**
4-Chloroaniline	10.0 - 10.0	0 / 4	--	--	50.0	-- / --	0.20	NO
4-Chlorophenyl-phenylether	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
4-Methylphenol	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
4-Nitroaniline	25.0 - 25.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
4-Nitrophenol	25.0 - 25.0	0 / 4	--	--	150	-- / --	0.17	NO
Acenaphthene	1.00 - 1.00	0 / 4	--	--	520	-- / --	0.002	NO
Acenaphthylene	1.00 - 1.00	0 / 4	--	--	NSV	-- / --	NSV	**YES**
Anthracene	2.00 - 2.00	0 / 4	--	--	0.73	-- / --	2.74	**YES**
Benzo(a)anthracene	0.10 - 0.10	0 / 4	--	--	6.30	-- / --	0.02	NO
Benzo(a)pyrene	0.10 - 0.10	0 / 4	--	--	0.01	-- / --	7.14	**YES**
Benzo(b)fluoranthene	0.10 - 0.10	0 / 4	--	--	NSV	-- / --	NSV	**YES**

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
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Table 4-6
Preliminary Screening Statistics - SWMU 2B - Groundwater
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient [1]	COPC ?
Benzo(g,h,i)perylene	0.10 - 0.10	0 / 4	--	--	NSV	-- / --	NSV	**YES**
Benzo(k)fluoranthene	0.10 - 0.10	0 / 4	--	--	NSV	-- / --	NSV	**YES**
Butylbenzylphthalate	10.0 - 10.0	0 / 4	--	--	22.0	-- / --	0.45	NO
Carbazole	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
Chrysene	0.10 - 0.10	0 / 4	--	--	NSV	-- / --	NSV	**YES**
Di-n-butylphthalate	10.0 - 10.0	0 / 4	--	--	33.0	-- / --	0.30	NO
Di-n-octylphthalate	10.0 - 10.0	0 / 4	--	--	3.00	-- / --	3.33	**YES**
Dibenz(a,h)anthracene	0.10 - 0.10	0 / 4	--	--	NSV	-- / --	NSV	**YES**
Dibenzofuran	10.0 - 10.0	0 / 4	--	--	20.0	-- / --	0.50	NO
Diethylphthalate	10.0 - 10.0	0 / 4	--	--	220	-- / --	0.05	NO
Dimethyl phthalate	10.0 - 10.0	0 / 4	--	--	330	-- / --	0.03	NO
Fluoranthene	0.10 - 0.10	0 / 4	--	--	398	-- / --	0.0003	NO
Fluorene	1.00 - 1.00	1 / 4	0.10	OW2B-MW18-R01	430	0 / 4	0.0002	NO
Hexachlorobenzene	10.0 - 10.0	0 / 4	--	--	3.68	-- / --	2.72	**YES**
Hexachlorobutadiene	10.0 - 10.0	0 / 4	--	--	9.30	-- / --	1.08	**YES**
Hexachlorocyclopentadiene	10.0 - 10.0	0 / 4	--	--	5.20	-- / --	1.92	**YES**
Hexachloroethane	10.0 - 10.0	0 / 4	--	--	540	-- / --	0.02	NO
Indeno(1,2,3-cd)pyrene	0.10 - 0.10	0 / 4	--	--	NSV	-- / --	NSV	**YES**
Isophorone	10.0 - 10.0	0 / 4	--	--	11,700	-- / --	0.0009	NO
Naphthalene	2.00 - 2.00	0 / 4	--	--	100	-- / --	0.02	NO
Nitrobenzene	10.0 - 10.0	0 / 4	--	--	2,700	-- / --	0.004	NO
Pentachlorophenol	25.0 - 25.0	0 / 4	--	--	6.69	-- / --	3.74	**YES**
Phenanthrene	1.00 - 1.00	0 / 4	--	--	6.30	-- / --	0.16	NO
Phenol	10.0 - 10.0	0 / 4	--	--	256	-- / --	0.04	NO
Pyrene	0.10 - 0.10	0 / 4	--	--	NSV	-- / --	NSV	**YES**
bis(2-Chloroethoxy)methane	10.0 - 10.0	0 / 4	--	--	1,100	-- / --	0.009	NO
bis(2-Chloroethyl)ether	10.0 - 10.0	0 / 4	--	--	2,380	-- / --	0.004	NO
bis(2-Ethylhexyl)phthalate	10.0 - 10.0	0 / 4	--	--	30.0	-- / --	0.33	NO
n-Nitroso-di-n-propylamine	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
n-Nitrosodiphenylamine	10.0 - 10.0	0 / 4	--	--	585	-- / --	0.02	NO

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 4-6
Preliminary Screening Statistics - SWMU 2B - Groundwater
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient [1]	COPC ?
Volatile Organic Compounds (UG/L)								
1,1,1-Trichloroethane	1.00 - 5.00	0 / 8	--	--	9,400	-- / --	0.0005	NO
1,1,2,2-Tetrachloroethane	1.00 - 5.00	0 / 8	--	--	2,400	-- / --	0.002	NO
1,1,2-Trichloroethane	1.00 - 5.00	0 / 8	--	--	9,400	-- / --	0.0005	NO
1,1-Dichloroethane	1.00 - 5.00	6 / 8	71.0	OW2B-MW18-94A	1,600	0 / 8	0.04	NO
1,1-Dichloroethene	1.00 - 5.00	3 / 8	11.0	OW2B-MW17-94A	1,160	0 / 8	0.009	NO
1,2,3-Trichloropropane	5.00 - 5.00	0 / 4	--	--	NSV	-- / --	NSV	**YES**
1,2,4-Trichlorobenzene	1.00 - 1.00	0 / 4	--	--	50.0	-- / --	0.02	NO
1,2-Dibromo-3-chloropropane	1.00 - 1.00	0 / 4	--	--	NSV	-- / --	NSV	**YES**
1,2-Dibromoethane	1.00 - 1.00	0 / 4	--	--	180	-- / --	0.006	NO
1,2-Dichlorobenzene	1.00 - 5.00	0 / 8	--	--	763	-- / --	0.007	NO
1,2-Dichloroethane	1.00 - 5.00	1 / 8	1.00	OW2B-MW18-94A	20,000	0 / 8	0.00005	NO
1,2-Dichloroethene (total)	5.00 - 5.00	2 / 4	48.0	OW2B-MW17-94A	1,160	0 / 4	0.04	NO
1,2-Dichloropropane	1.00 - 5.00	0 / 8	--	--	5,700	-- / --	0.0009	NO
1,3-Dichlorobenzene	1.00 - 5.00	0 / 8	--	--	763	-- / --	0.007	NO
1,4-Dichlorobenzene	1.00 - 5.00	0 / 8	--	--	763	-- / --	0.007	NO
2-Butanone	10.0 - 10.0	0 / 4	--	--	14,000	-- / --	0.0007	NO
2-Chloroethyl vinyl ether	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
2-Hexanone	5.00 - 10.0	0 / 8	--	--	4,280	-- / --	0.002	NO
4-Methyl-2-pentanone	5.00 - 10.0	0 / 8	--	--	4,600	-- / --	0.002	NO
Acetone	10.0 - 10.0	0 / 4	--	--	90,000	-- / --	0.0001	NO
Acrolein	100 - 100	0 / 4	--	--	21.0	-- / --	4.76	**YES**
Acrylonitrile	100 - 100	0 / 4	--	--	2,600	-- / --	0.04	NO
Benzene	1.00 - 5.00	3 / 8	6.00	OW2B-MW17-94A	530	0 / 8	0.01	NO
Bromochloromethane	1.00 - 1.00	0 / 4	--	--	1,100	-- / --	0.0009	NO
Bromodichloromethane	1.00 - 5.00	0 / 8	--	--	1,100	-- / --	0.005	NO
Bromoform	1.00 - 5.00	0 / 8	--	--	320	-- / --	0.02	NO
Bromomethane	1.00 - 10.0	0 / 8	--	--	110	-- / --	0.09	NO
Carbon disulfide	1.00 - 5.00	3 / 8	0.80	OW2B-MW20-R01	2.00	0 / 8	0.40	NO
Carbon tetrachloride	1.00 - 5.00	0 / 8	--	--	3,520	-- / --	0.001	NO

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 4-6
Preliminary Screening Statistics - SWMU 2B - Groundwater
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient [1]	COPC ?
Chlorobenzene	1.00 - 5.00	0 / 8	--	--	130	-- / --	0.04	NO
Chloroethane	1.00 - 10.0	2 / 8	20.0	OW2B-MW18-94A	NSV	-- / --	NSV	**YES**
Chloroform	1.00 - 5.00	0 / 8	--	--	1,240	-- / --	0.004	NO
Chloromethane	1.00 - 10.0	0 / 8	--	--	5,500	-- / --	0.002	NO
Dibromochloromethane	1.00 - 5.00	0 / 8	--	--	1,100	-- / --	0.005	NO
Dibromomethane	5.00 - 5.00	0 / 4	--	--	1,100	-- / --	0.005	NO
Dichlorodifluoromethane	10.0 - 10.0	0 / 4	--	--	1,100	-- / --	0.009	NO
Ethane	0.005 - 0.005	2 / 4	0.11	OW2B-MW20-R01	NSV	-- / --	NSV	**YES**
Ethene	0.005 - 0.005	2 / 4	0.06	OW2B-MW17-R01	NSV	-- / --	NSV	**YES**
Ethyl methacrylate	5.00 - 5.00	0 / 4	--	--	NSV	-- / --	NSV	**YES**
Ethylbenzene	1.00 - 5.00	0 / 8	--	--	3,200	-- / --	0.002	NO
Iodomethane	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
Methane	0.02 - 0.02	4 / 4	2,150	OW2B-MW17-R01	NSV	-- / --	NSV	**YES**
Methylene chloride	2.00 - 5.00	4 / 8	1.00	OW2B-MW17-94A	2,200	0 / 8	0.0005	NO
Styrene	1.00 - 5.00	0 / 8	--	--	NSV	-- / --	NSV	**YES**
Tetrachloroethene	1.00 - 5.00	0 / 8	--	--	840	-- / --	0.006	NO
Toluene	1.00 - 5.00	3 / 8	0.20	OW2B-MW17-R01	1,700	0 / 8	0.0001	NO
Trichloroethene	1.00 - 5.00	2 / 8	4.00	OW2B-MW18-94A	21,900	0 / 8	0.0002	NO
Trichlorofluoromethane	5.00 - 5.00	0 / 4	--	--	1,100	-- / --	0.005	NO
Vinyl acetate	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
Vinyl chloride	1.00 - 10.0	4 / 8	15.0	OW2B-MW18-94A	1,160	0 / 8	0.01	NO
Xylene, total	1.00 - 5.00	0 / 8	--	--	130	-- / --	0.04	NO
cis-1,2-Dichloroethene	1.00 - 1.00	3 / 4	3.00	OW2B-MW17-R01	1,160	0 / 4	0.003	NO
cis-1,3-Dichloropropene	1.00 - 5.00	0 / 8	--	--	244	-- / --	0.02	NO
trans-1,2-Dichloroethene	1.00 - 1.00	1 / 4	0.30	OW2B-MW17-R01	1,160	0 / 4	0.0003	NO
trans-1,3-Dichloropropene	1.00 - 5.00	0 / 8	--	--	244	-- / --	0.02	NO
trans-1,4-Dichloro-2-butene	5.00 - 5.00	0 / 4	--	--	NSV	-- / --	NSV	**YES**

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 4-7
Preliminary Screening Statistics - SWMU 2B - Surface Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Volatile Organic Compounds (UG/L)								
1,1,1-Trichloroethane	5.00 - 5.00	0 / 4	--	--	9,400	-- / --	0.0005	NO
1,1,2,2-Tetrachloroethane	5.00 - 5.00	0 / 4	--	--	2,400	-- / --	0.002	NO
1,1,2-Trichloroethane	5.00 - 5.00	0 / 4	--	--	9,400	-- / --	0.0005	NO
1,1-Dichloroethane	5.00 - 5.00	1 / 4	1.00	OW2B-SW4-94	1,600	0 / 4	0.0006	NO
1,1-Dichloroethene	5.00 - 5.00	0 / 4	--	--	1,160	-- / --	0.004	NO
1,2,3-Trichloropropane	5.00 - 5.00	0 / 4	--	--	NSV	-- / --	NSV	**YES**
1,2-Dichlorobenzene	5.00 - 5.00	0 / 4	--	--	763	-- / --	0.007	NO
1,2-Dichloroethane	5.00 - 10.0	0 / 4	--	--	20,000	-- / --	0.0005	NO
1,2-Dichloroethene (total)	5.00 - 5.00	2 / 4	2.00	OW2B-SW5-94A	1,160	0 / 4	0.002	NO
1,2-Dichloropropane	5.00 - 5.00	0 / 4	--	--	5,700	-- / --	0.0009	NO
1,3-Dichlorobenzene	5.00 - 5.00	0 / 4	--	--	763	-- / --	0.007	NO
1,4-Dichlorobenzene	5.00 - 5.00	0 / 4	--	--	763	-- / --	0.007	NO
2-Butanone	5.00 - 10.0	0 / 4	--	--	14,000	-- / --	0.0007	NO
2-Chloroethyl vinyl ether	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
2-Hexanone	10.0 - 10.0	0 / 4	--	--	4,280	-- / --	0.002	NO
4-Methyl-2-pentanone	10.0 - 10.0	0 / 4	--	--	4,600	-- / --	0.002	NO
Acetone	-- - --	0 / 4	--	--	90,000	-- / --	--	**YES**
Acrolein	100 - 100	0 / 4	--	--	21.0	-- / --	4.76	**YES**
Acrylonitrile	100 - 100	0 / 4	--	--	2,600	-- / --	0.04	NO
Benzene	5.00 - 5.00	0 / 4	--	--	530	-- / --	0.009	NO
Bromodichloromethane	5.00 - 5.00	0 / 4	--	--	1,100	-- / --	0.005	NO
Bromoform	5.00 - 5.00	0 / 4	--	--	320	-- / --	0.02	NO
Bromomethane	10.0 - 10.0	0 / 4	--	--	110	-- / --	0.09	NO
Carbon disulfide	5.00 - 5.00	0 / 4	--	--	2.00	-- / --	2.50	**YES**
Carbon tetrachloride	5.00 - 5.00	0 / 4	--	--	3,520	-- / --	0.001	NO
Chlorobenzene	5.00 - 5.00	0 / 4	--	--	130	-- / --	0.04	NO
Chloroethane	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
Chloroform	5.00 - 5.00	0 / 4	--	--	1,240	-- / --	0.004	NO
Chloromethane	10.0 - 10.0	1 / 4	5.00	OW2B-SW2-94A	5,500	0 / 4	0.0009	NO

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 4-7
Preliminary Screening Statistics - SWMU 2B - Surface Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Dibromochloromethane	5.00 - 5.00	0 / 4	--	--	1,100	-- / --	0.005	NO
Dibromomethane	5.00 - 5.00	0 / 4	--	--	1,100	-- / --	0.005	NO
Dichlorodifluoromethane	10.0 - 10.0	0 / 4	--	--	1,100	-- / --	0.009	NO
Ethyl methacrylate	5.00 - 5.00	0 / 4	--	--	NSV	-- / --	NSV	**YES**
Ethylbenzene	5.00 - 5.00	0 / 4	--	--	3,200	-- / --	0.002	NO
Iodomethane	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
Methylene chloride	5.00 - 5.00	0 / 4	--	--	2,200	-- / --	0.002	NO
Styrene	5.00 - 5.00	0 / 4	--	--	NSV	-- / --	NSV	**YES**
Tetrachloroethene	5.00 - 5.00	0 / 4	--	--	840	-- / --	0.006	NO
Toluene	5.00 - 5.00	1 / 4	1.00	OW2B-SW4-94	1,700	0 / 4	0.0006	NO
Trichloroethene	5.00 - 5.00	2 / 4	1.00	OW2B-SW5-94A	21,900	0 / 4	0.00005	NO
Trichlorofluoromethane	5.00 - 5.00	0 / 4	--	--	1,100	-- / --	0.005	NO
Vinyl acetate	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
Vinyl chloride	2.00 - 2.00	3 / 4	1.00	OW2B-SW4-94	1,160	0 / 4	0.0009	NO
Xylene, total	5.00 - 5.00	1 / 4	1.00	OW2B-SW6-94A	130	0 / 4	0.008	NO
cis-1,3-Dichloropropene	5.00 - 5.00	0 / 4	--	--	244	-- / --	0.02	NO
trans-1,3-Dichloropropene	5.00 - 5.00	0 / 4	--	--	244	-- / --	0.02	NO
trans-1,4-Dichloro-2-butene	5.00 - 5.00	0 / 4	--	--	NSV	-- / --	NSV	**YES**

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 4-8 Preliminary Screening Statistics - SWMU 2B - Sediment *NAS Oceana, Virginia Beach, VA*								
Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Semi-volatile Organic Compounds (UG/KG)								
1,2,4-Trichlorobenzene	390 - 420	0 / 3	--	--	40.0	-- / --	10.5	**YES**
1,2-Dichlorobenzene	390 - 420	0 / 3	--	--	35.0	-- / --	12.0	**YES**
1,3-Dichlorobenzene	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
1,4-Dichlorobenzene	390 - 420	0 / 3	--	--	110	-- / --	3.82	**YES**
1-Methylnaphthalene	310 - 3,700	1 / 3	430	OW2B-SD4-94A	NSV	-- / --	NSV	**YES**
2,2'-Oxybis(1-chloropropane)	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2,4,5-Trichlorophenol	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2,4,6-Trichlorophenol	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2,4-Dichlorophenol	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2,4-Dimethylphenol	390 - 420	0 / 3	--	--	29.0	-- / --	14.5	**YES**
2,4-Dinitrophenol	950 - 1,000	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2,4-Dinitrotoluene	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2,6-Dinitrotoluene	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2-Chloronaphthalene	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2-Chlorophenol	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2-Methylnaphthalene	310 - 3,700	2 / 6	420	OW2B-SD4-94A	70.0	1 / 6	6.00	**YES**
2-Methylphenol	390 - 420	0 / 3	--	--	63.0	-- / --	6.67	**YES**
2-Nitroaniline	950 - 1,000	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2-Nitrophenol	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
3,3'-Dichlorobenzidine	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
3-Nitroaniline	950 - 1,000	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4,6-Dinitro-2-methylphenol	950 - 1,000	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Bromophenyl-phenylether	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Chloro-3-methylphenol	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Chloroaniline	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Chlorophenyl-phenylether	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Methylphenol	390 - 420	0 / 3	--	--	670	-- / --	0.63	NO
4-Nitroaniline	950 - 1,000	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Nitrophenol	950 - 1,000	0 / 3	--	--	NSV	-- / --	NSV	**YES**

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 4-8
Preliminary Screening Statistics - SWMU 2B - Sediment
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Acenaphthene	310 - 3,700	2 / 6	350	OW2B-SD4-94A	16.0	2 / 6	21.9	**YES**
Acenaphthylene	310 - 3,700	0 / 6	--	--	44.0	-- / --	84.1	**YES**
Anthracene	310 - 3,700	3 / 6	2,200	OW2B-SD2-94A	85.3	2 / 6	25.8	**YES**
Benzo(a)anthracene	310 - 3,700	5 / 6	6,000	OW2B-SD2-94A	261	2 / 6	23.0	**YES**
Benzo(a)pyrene	310 - 3,700	5 / 6	6,400	OW2B-SD2-94A	430	2 / 6	14.9	**YES**
Benzo(b)fluoranthene	310 - 3,700	5 / 6	7,700	OW2B-SD2-94A	3,200	1 / 6	2.41	**YES**
Benzo(g,h,i)perylene	310 - 3,700	5 / 6	3,200	OW2B-SD2-94A	670	1 / 6	4.78	**YES**
Benzo(k)fluoranthene	310 - 3,700	5 / 6	6,500	OW2B-SD2-94A	240	2 / 6	27.1	**YES**
Butylbenzylphthalate	390 - 420	2 / 3	150	OW2B-SD04	63.0	2 / 3	2.38	**YES**
Carbazole	390 - 420	1 / 3	54.0	OW2B-SD01	NSV	-- / --	NSV	**YES**
Chrysene	310 - 3,700	5 / 6	7,900	OW2B-SD2-94A	384	2 / 6	20.6	**YES**
Di-n-butylphthalate	390 - 420	1 / 3	170	OW2B-SD04	1,400	0 / 3	0.12	NO
Di-n-octylphthalate	390 - 420	0 / 3	--	--	6,200	-- / --	0.07	NO
Dibenz(a,h)anthracene	310 - 3,700	0 / 6	--	--	63.4	-- / --	58.4	**YES**
Dibenzofuran	390 - 420	1 / 3	46.0	OW2B-SD01	540	0 / 3	0.09	NO
Diethylphthalate	390 - 420	0 / 3	--	--	200	-- / --	2.10	**YES**
Dimethyl phthalate	390 - 420	0 / 3	--	--	71.0	-- / --	5.92	**YES**
Fluoranthene	310 - 3,700	5 / 6	13,000	OW2B-SD2-94A	600	2 / 6	21.7	**YES**
Fluorene	310 - 3,700	2 / 6	320	OW2B-SD4-94A	19.0	2 / 6	16.8	**YES**
Hexachlorobenzene	390 - 420	0 / 3	--	--	22.0	-- / --	19.1	**YES**
Hexachlorobutadiene	390 - 420	0 / 3	--	--	11.0	-- / --	38.2	**YES**
Hexachlorocyclopentadiene	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Hexachloroethane	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Indeno(1,2,3-cd)pyrene	310 - 3,700	5 / 6	5,100	OW2B-SD2-94A	600	1 / 6	8.50	**YES**
Isophorone	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Naphthalene	310 - 3,700	0 / 6	--	--	160	-- / --	23.1	**YES**
Nitrobenzene	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Pentachlorophenol	950 - 1,000	0 / 3	--	--	360	-- / --	2.78	**YES**
Phenanthrene	310 - 3,700	5 / 6	7,400	OW2B-SD2-94A	240	3 / 6	30.8	**YES**
Phenol	390 - 420	0 / 3	--	--	420	-- / --	1.00	**YES**

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 4-8
Preliminary Screening Statistics - SWMU 2B - Sediment
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Pyrene	310 - 3,700	5 / 6	11,000	OW2B-SD2-94A	665	2 / 6	16.5	YES
bis(2-Chloroethoxy)methane	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	YES
bis(2-Chloroethyl)ether	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	YES
bis(2-Ethylhexyl)phthalate	390 - 420	3 / 3	680	OW2B-SD02	1,300	0 / 3	0.52	NO
n-Nitroso-di-n-propylamine	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	YES
n-Nitrosodiphenylamine	390 - 420	0 / 3	--	--	28.0	-- / --	15.0	YES
Volatile Organic Compounds (UG/KG)								
1,1,1-Trichloroethane	1.30 - 63.0	0 / 3	--	--	31.0	-- / --	2.03	YES
1,1,2,2-Tetrachloroethane	1.30 - 63.0	0 / 3	--	--	NSV	-- / --	NSV	YES
1,1,2-Trichloroethane	1.30 - 63.0	0 / 3	--	--	31.0	-- / --	2.03	YES
1,1-Dichloroethane	1.30 - 63.0	0 / 3	--	--	NSV	-- / --	NSV	YES
1,1-Dichloroethene	1.30 - 63.0	0 / 3	--	--	NSV	-- / --	NSV	YES
1,2-Dichlorobenzene	1.30 - 63.0	0 / 3	--	--	35.0	-- / --	1.80	YES
1,2-Dichloroethane	1.30 - 63.0	0 / 3	--	--	NSV	-- / --	NSV	YES
1,2-Dichloropropane	1.30 - 63.0	0 / 3	--	--	NSV	-- / --	NSV	YES
1,3-Dichlorobenzene	1.30 - 63.0	0 / 3	--	--	NSV	-- / --	NSV	YES
1,4-Dichlorobenzene	1.30 - 63.0	0 / 3	--	--	110	-- / --	0.57	NO
2-Chloroethyl vinyl ether	1.30 - 63.0	0 / 3	--	--	NSV	-- / --	NSV	YES
Bromodichloromethane	1.30 - 63.0	0 / 3	--	--	NSV	-- / --	NSV	YES
Bromoform	1.30 - 63.0	0 / 3	--	--	NSV	-- / --	NSV	YES
Bromomethane	1.30 - 63.0	0 / 3	--	--	NSV	-- / --	NSV	YES
Carbon tetrachloride	1.30 - 63.0	0 / 3	--	--	NSV	-- / --	NSV	YES
Chlorobenzene	1.30 - 63.0	0 / 3	--	--	NSV	-- / --	NSV	YES
Chloroethane	1.30 - 63.0	0 / 3	--	--	NSV	-- / --	NSV	YES
Chloroform	1.30 - 63.0	0 / 3	--	--	NSV	-- / --	NSV	YES
Chloromethane	1.30 - 63.0	0 / 3	--	--	NSV	-- / --	NSV	YES
Dibromochloromethane	1.30 - 63.0	0 / 3	--	--	NSV	-- / --	NSV	YES
Dichlorodifluoromethane	1.30 - 63.0	0 / 3	--	--	NSV	-- / --	NSV	YES
Methylene chloride	1.30 - 63.0	0 / 3	--	--	NSV	-- / --	NSV	YES
Tetrachloroethene	1.30 - 63.0	0 / 3	--	--	57.0	-- / --	1.11	YES

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 4-8
Preliminary Screening Statistics - SWMU 2B - Sediment
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Trichloroethene	1.30 - 63.0	0 / 3	--	--	41.0	-- / --	1.54	YES
Trichlorofluoromethane	1.30 - 63.0	0 / 3	--	--	NSV	-- / --	NSV	YES
Vinyl chloride	62.0 - 63.0	0 / 2	--	--	NSV	-- / --	NSV	YES
cis-1,2-Dichloroethene	1.30 - 63.0	0 / 3	--	--	NSV	-- / --	NSV	YES
cis-1,3-Dichloropropene	1.30 - 63.0	0 / 3	--	--	NSV	-- / --	NSV	YES
trans-1,2-Dichloroethene	1.30 - 63.0	0 / 3	--	--	NSV	-- / --	NSV	YES
trans-1,3-Dichloropropene	1.30 - 63.0	0 / 3	--	--	NSV	-- / --	NSV	YES

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 4-9
Preliminary Screening Statistics - SWMU 2B - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Inorganics (MG/KG)								
Aluminum	40.1 - 45.8	3 / 3	11,000	OW2B-SS01-00	50.0	3 / 3	220	**YES**
Antimony	12.0 - 13.7	1 / 3	10.0	OW2B-SS02-00	5.00	1 / 3	2.00	**YES**
Arsenic	2.00 - 2.30	3 / 3	2.60	OW2B-SS01-00	60.0	0 / 3	0.04	NO
Barium	40.1 - 45.8	3 / 3	45.4	OW2B-SS03-00	500	0 / 3	0.09	NO
Beryllium	1.00 - 1.10	2 / 3	0.31	OW2B-SS02-00	10.0	0 / 3	0.03	NO
Cadmium	1.00 - 1.10	2 / 3	1.20	OW2B-SS02-00	4.00	0 / 3	0.30	NO
Calcium [2]	1,003 - 1,145	3 / 3	1,380	OW2B-SS02-00	NSV	-- / --	NSV	NO
Chromium	2.00 - 2.30	3 / 3	782	OW2B-SS02-00	0.40	3 / 3	1,955	**YES**
Cobalt	10.0 - 11.4	3 / 3	2.00	OW2B-SS02-00	100	0 / 3	0.02	NO
Copper	5.00 - 5.70	3 / 3	9.20	OW2B-SS03-00	50.0	0 / 3	0.18	NO
Cyanide	0.60 - 0.60	0 / 3	--	--	0.06	-- / --	10.0	**YES**
Iron	20.1 - 22.9	3 / 3	4,800	OW2B-SS03-00	200	3 / 3	24.0	**YES**
Lead	0.60 - 6.00	3 / 3	2,760	OW2B-SS02-00	50.0	1 / 3	55.2	**YES**
Magnesium [2]	1,003 - 1,145	3 / 3	872	OW2B-SS02-00	4,400	0 / 3	0.20	NO
Manganese	3.00 - 3.40	3 / 3	36.5	OW2B-SS03-00	330	0 / 3	0.11	NO
Mercury	0.10 - 0.10	2 / 3	0.61	OW2B-SS02-00	0.10	1 / 3	6.10	**YES**
Nickel	8.00 - 9.20	3 / 3	8.10	OW2B-SS01-00	30.0	0 / 3	0.27	NO
Potassium [2]	1,003 - 1,145	3 / 3	426	OW2B-SS03-00	NSV	-- / --	NSV	NO
Selenium	1.00 - 1.10	0 / 3	--	--	1.80	-- / --	0.61	NO
Silver	2.00 - 2.30	1 / 3	1.00	OW2B-SS01-00	2.00	0 / 3	0.50	NO
Sodium [2]	1,003 - 1,145	0 / 3	--	--	NSV	-- / --	NSV	NO
Thallium	2.00 - 2.30	0 / 3	--	--	1.00	-- / --	2.30	**YES**
Vanadium	10.0 - 11.4	3 / 3	15.3	OW2B-SS01-00	2.00	3 / 3	7.65	**YES**
Zinc	4.00 - 4.60	2 / 3	69.1	OW2B-SS02-00	50.0	1 / 3	1.38	**YES**
Pesticide/Polychlorinated Biphenyls (UG/KG)								
4,4'-DDD	4.05 - 4.22	1 / 3	8.10	OW2B-SS02-00	100	0 / 3	0.08	NO
4,4'-DDE	4.05 - 4.22	2 / 3	13.0	OW2B-SS03-00	100	0 / 3	0.13	NO
4,4'-DDT	4.05 - 4.22	1 / 3	30.0	OW2B-SS03-00	100	0 / 3	0.30	NO

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 4-9
Preliminary Screening Statistics - SWMU 2B - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Aldrin	2.08 - 2.17	0 / 3	--	--	100	-- / --	0.02	NO
Aroclor-1016	40.5 - 42.2	0 / 3	--	--	100	-- / --	0.42	NO
Aroclor-1221	82.2 - 85.6	0 / 3	--	--	100	-- / --	0.86	NO
Aroclor-1232	40.5 - 42.2	0 / 3	--	--	100	-- / --	0.42	NO
Aroclor-1242	40.5 - 42.2	0 / 3	--	--	100	-- / --	0.42	NO
Aroclor-1248	40.5 - 42.2	0 / 3	--	--	100	-- / --	0.42	NO
Aroclor-1254	40.5 - 42.2	1 / 3	53.0	OW2B-SS02-00	100	0 / 3	0.53	NO
Aroclor-1260	40.5 - 42.2	0 / 3	--	--	100	-- / --	0.42	NO
Dieldrin	4.05 - 4.22	1 / 3	6.60	OW2B-SS02-00	100	0 / 3	0.07	NO
Endosulfan I	2.08 - 2.17	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Endosulfan II	4.05 - 4.22	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Endosulfan sulfate	4.05 - 4.22	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Endrin	4.05 - 4.22	0 / 3	--	--	100	-- / --	0.04	NO
Endrin aldehyde	4.05 - 4.22	0 / 3	--	--	100	-- / --	0.04	NO
Endrin ketone	4.05 - 4.22	0 / 3	--	--	100	-- / --	0.04	NO
Heptachlor	2.08 - 2.17	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Heptachlor epoxide	2.08 - 2.17	2 / 3	5.00	OW2B-SS01-00	100	0 / 3	0.05	NO
Methoxychlor	20.9 - 21.7	0 / 3	--	--	100	-- / --	0.22	NO
Toxaphene	208 - 217	0 / 3	--	--	NSV	-- / --	NSV	**YES**
alpha-BHC	2.08 - 2.17	0 / 3	--	--	100,000	-- / --	0.0000217	NO
alpha-Chlordane	2.08 - 2.17	1 / 3	3.10	OW2B-SS01-00	100	0 / 3	0.03	NO
beta-BHC	2.08 - 2.17	0 / 3	--	--	100,000	-- / --	0.0000217	NO
delta-BHC	2.08 - 2.17	0 / 3	--	--	100,000	-- / --	0.0000217	NO
gamma-BHC (Lindane)	2.08 - 2.17	0 / 3	--	--	100	-- / --	0.02	NO
gamma-Chlordane	2.08 - 2.17	2 / 3	3.40	OW2B-SS01-00	100	0 / 3	0.03	NO
Semi-volatile Organic Compounds (UG/KG)								
1,2,4-Trichlorobenzene	370 - 420	0 / 3	--	--	1,270	-- / --	0.33	NO
1,2-Dichlorobenzene	370 - 420	0 / 3	--	--	100	-- / --	4.20	**YES**
1,3-Dichlorobenzene	370 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
1,4-Dichlorobenzene	370 - 420	0 / 3	--	--	1,280	-- / --	0.33	NO

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 4-9
Preliminary Screening Statistics - SWMU 2B - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
1-Methylnaphthalene	21.0 - 21.0	0 / 2	--	--	NSV	-- / --	NSV	**YES**
2,2'-Oxybis(1-chloropropane)	370 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2,4,5-Trichlorophenol	930 - 1,000	0 / 3	--	--	430	-- / --	2.33	**YES**
2,4,6-Trichlorophenol	370 - 420	0 / 3	--	--	580	-- / --	0.72	NO
2,4-Dichlorophenol	370 - 420	0 / 3	--	--	13,400	-- / --	0.03	NO
2,4-Dimethylphenol	370 - 420	0 / 3	--	--	100	-- / --	4.20	**YES**
2,4-Dinitrophenol	930 - 1,000	0 / 3	--	--	20,000	-- / --	0.05	NO
2,4-Dinitrotoluene	370 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2,6-Dinitrotoluene	370 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2-Chloronaphthalene	370 - 420	0 / 3	--	--	1,033	-- / --	0.41	NO
2-Chlorophenol	370 - 420	0 / 3	--	--	100	-- / --	4.20	**YES**
2-Methylnaphthalene	21.0 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2-Methylphenol	370 - 420	0 / 3	--	--	100	-- / --	4.20	**YES**
2-Nitroaniline	930 - 1,000	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2-Nitrophenol	370 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
3,3'-Dichlorobenzidine	370 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
3-Nitroaniline	930 - 1,000	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4,6-Dinitro-2-methylphenol	930 - 1,000	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Bromophenyl-phenylether	370 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Chloro-3-methylphenol	370 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Chloroaniline	370 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Chlorophenyl-phenylether	370 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Methylphenol	370 - 420	0 / 3	--	--	100	-- / --	4.20	**YES**
4-Nitroaniline	930 - 1,000	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Nitrophenol	930 - 1,000	0 / 3	--	--	380	-- / --	2.63	**YES**
Acenaphthene	21.0 - 420	0 / 3	--	--	2,500	-- / --	0.17	NO
Acenaphthylene	41.0 - 420	0 / 3	--	--	100	-- / --	4.20	**YES**
Anthracene	2.00 - 420	0 / 3	--	--	100	-- / --	4.20	**YES**
Benzo(a)anthracene	2.00 - 420	3 / 3	140	OW2B-SS03-00	100	1 / 3	1.40	**YES**
Benzo(a)pyrene	2.00 - 2.00	3 / 3	100	OW2B-SS03-00	100	0 / 3	1.00	**YES**

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 4-9
Preliminary Screening Statistics - SWMU 2B - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Benzo(b)fluoranthene	4.10 - 4.20	3 / 3	57.0	OW2B-SS03-00	100	0 / 3	0.57	NO
Benzo(g,h,i)perylene	4.10 - 4.20	3 / 3	89.0	OW2B-SS03-00	100	0 / 3	0.89	NO
Benzo(k)fluoranthene	2.00 - 420	3 / 3	170	OW2B-SS03-00	100	1 / 3	1.70	**YES**
Butylbenzylphthalate	380 - 420	1 / 3	52.0	OW2B-SS02-00	NSV	-- / --	NSV	**YES**
Carbazole	370 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Chrysene	2.00 - 2.00	3 / 3	180	OW2B-SS03-00	100	1 / 3	1.80	**YES**
Di-n-butylphthalate	380 - 420	0 / 3	--	--	200,000	-- / --	0.002	NO
Di-n-octylphthalate	370 - 420	1 / 3	210	OW2B-SS01-00	NSV	-- / --	NSV	**YES**
Dibenz(a,h)anthracene	4.10 - 420	0 / 3	--	--	100	-- / --	4.20	**YES**
Dibenzofuran	370 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Diethylphthalate	370 - 420	1 / 3	390	OW2B-SS01-00	13,400	0 / 3	0.03	NO
Dimethyl phthalate	370 - 420	0 / 3	--	--	10,640	-- / --	0.04	NO
Fluoranthene	4.10 - 4.20	3 / 3	86.0	OW2B-SS03-00	100	0 / 3	0.86	NO
Fluorene	4.10 - 420	0 / 3	--	--	1,700	-- / --	0.25	NO
Hexachlorobenzene	370 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Hexachlorobutadiene	370 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Hexachlorocyclopentadiene	370 - 420	0 / 3	--	--	1,000	-- / --	0.42	NO
Hexachloroethane	370 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Indeno(1,2,3-cd)pyrene	2.00 - 2.00	3 / 3	35.0	OW2B-SS03-00	100	0 / 3	0.35	NO
Isophorone	370 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Naphthalene	21.0 - 420	0 / 3	--	--	100	-- / --	4.20	**YES**
Nitrobenzene	370 - 420	0 / 3	--	--	2,260	-- / --	0.19	NO
Pentachlorophenol	930 - 1,000	0 / 3	--	--	3,000	-- / --	0.33	NO
Phenanthrene	2.00 - 2.00	2 / 3	36.0	OW2B-SS03-00	100	0 / 3	0.36	NO
Phenol	370 - 420	0 / 3	--	--	1,880	-- / --	0.22	NO
Pyrene	2.00 - 2.00	3 / 3	160	OW2B-SS03-00	100	1 / 3	1.60	**YES**
bis(2-Chloroethoxy)methane	370 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
bis(2-Chloroethyl)ether	370 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
bis(2-Ethylhexyl)phthalate	380 - 420	3 / 3	690	OW2B-SS03-00	NSV	-- / --	NSV	**YES**
n-Nitroso-di-n-propylamine	370 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 4-9 Preliminary Screening Statistics - SWMU 2B - Surface Soil *NAS Oceana, Virginia Beach, VA*								
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Screening Value**	**Frequency of Exceedance**	**Maximum Hazard Quotient[1]**	**COPC?**
n-Nitrosodiphenylamine	370 - 420	0 / 3	--	--	1,090	-- / --	0.39	NO
Volatile Organic Compounds (UG/KG)								
1,1,1-Trichloroethane	10.0 - 12.3	0 / 3	--	--	300	-- / --	0.04	NO
1,1,2,2-Tetrachloroethane	10.0 - 12.3	0 / 3	--	--	300	-- / --	0.04	NO
1,1,2-Trichloroethane	10.0 - 12.3	0 / 3	--	--	300	-- / --	0.04	NO
1,1-Dichloroethane	10.0 - 12.3	0 / 3	--	--	300	-- / --	0.04	NO
1,1-Dichloroethene	10.0 - 12.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
1,2-Dichloroethane	10.0 - 12.3	0 / 3	--	--	401	-- / --	0.03	NO
1,2-Dichloroethene (total)	10.0 - 12.3	0 / 3	--	--	300	-- / --	0.04	NO
1,2-Dichloropropane	10.0 - 12.3	0 / 3	--	--	38,800	-- / --	0.0003	NO
2-Butanone	10.0 - 12.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2-Hexanone	10.0 - 12.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Methyl-2-pentanone	10.0 - 12.3	0 / 3	--	--	10,000	-- / --	0.001	NO
Acetone	10.0 - 12.3	1 / 3	6.00	OW2B-SS02-00	NSV	-- / --	NSV	**YES**
Benzene	10.0 - 12.3	0 / 3	--	--	105	-- / --	0.12	NO
Bromochloromethane	10.0 - 12.3	3 / 3	50.0	OW2B-SS01-00	300,000	0 / 3	0.0002	NO
Bromodichloromethane	10.0 - 12.3	0 / 3	--	--	45,000	-- / --	0.0003	NO
Bromoform	10.0 - 12.3	0 / 3	--	--	114,700	-- / --	0.0001	NO
Bromomethane	10.0 - 12.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Carbon disulfide	10.0 - 12.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Carbon tetrachloride	10.0 - 12.3	0 / 3	--	--	1,000,000	-- / --	0.00001234	NO
Chlorobenzene	10.0 - 12.3	0 / 3	--	--	2,400	-- / --	0.005	NO
Chloroethane	10.0 - 12.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Chloroform	10.0 - 12.3	0 / 3	--	--	1,000	-- / --	0.01	NO
Chloromethane	10.0 - 12.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Dibromochloromethane	10.0 - 12.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Ethylbenzene	10.0 - 12.3	0 / 3	--	--	5,005	-- / --	0.002	NO
Methylene chloride	10.0 - 12.3	0 / 3	--	--	1,001	-- / --	0.01	NO
Styrene	10.0 - 12.3	0 / 3	--	--	10,010	-- / --	0.001	NO
Tetrachloroethene	10.0 - 12.3	0 / 3	--	--	401	-- / --	0.03	NO

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 4-9
Preliminary Screening Statistics - SWMU 2B - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Toluene	10.0 - 12.3	0 / 3	--	--	13,005	-- / --	0.0009	NO
Trichloroethene	10.0 - 12.3	0 / 3	--	--	6,000	-- / --	0.002	NO
Vinyl chloride	10.0 - 12.3	0 / 3	--	--	300	-- / --	0.04	NO
Xylene, total	10.0 - 12.3	0 / 3	--	--	2,505	-- / --	0.005	NO
cis-1,2-Dichloroethene	10.0 - 12.3	0 / 3	--	--	300	-- / --	0.04	NO
cis-1,3-Dichloropropene	10.0 - 12.3	0 / 3	--	--	300	-- / --	0.04	NO
o-Xylene	10.0 - 12.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
trans-1,2-Dichloroethene	10.0 - 12.3	0 / 3	--	--	300	-- / --	0.04	NO
trans-1,3-Dichloropropene	10.0 - 12.3	0 / 3	--	--	300	-- / --	0.04	NO

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 4-10
Summary of Maximum Hazard Quotients for Food Web Exposures - SWMU 2B
NAS Oceana, Virginia Beach, VA

Chemical	Short-tailed shrew		Deer mouse		Meadow vole		Raccoon		Red fox		American robin	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics												
Aluminum	23.81	2.38	3.53	0.35	1.87	0.19	NA	NA	0.67	0.07	1.59	0.16
Antimony	10.91	1.09	2.54	0.25	1.94	0.19	NA	NA	0.89	0.09	<0.01	<0.01
Arsenic	1.79	0.18	0.96	0.10	2.32	0.23	NA	NA	0.13	0.01	0.10	0.03
Barium	0.55	0.14	0.13	0.03	0.16	0.04	NA	NA	0.07	0.02	<0.01	<0.01
Beryllium	0.06	<0.01	0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Cadmium	5.74	0.57	1.33	0.13	0.49	0.05	NA	NA	0.27	0.03	1.87	0.14
Chromium	23.04	2.30	4.75	0.48	0.58	0.06	NA	NA	1.12	0.11	129.52	25.90
Cobalt	0.05	<0.01	0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	0.08	<0.01
Copper	0.16	0.12	0.05	0.03	0.05	0.04	NA	NA	0.04	0.03	0.02	0.02
Iron	2.89	0.29	0.36	0.04	0.30	0.03	NA	NA	0.21	0.02	0.52	0.05
Lead	68.66	6.87	18.14	1.81	17.89	1.79	NA	NA	5.43	0.54	269.52	26.95
Manganese	0.01	<0.01	<0.01	<0.01	0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01
Mercury	46.85	9.37	12.57	2.51	10.28	2.06	NA	NA	0.21	0.13	1.82	0.91
Nickel	0.12	0.06	0.03	0.02	0.03	0.02	NA	NA	<0.01	<0.01	0.03	0.02
Selenium	1.07	0.65	0.67	0.41	1.67	1.01	NA	NA	0.26	0.16	0.63	0.19
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01
Thallium	4.20	0.42	0.81	0.08	0.15	0.02	NA	NA	0.24	0.02	0.37	0.04
Vanadium	2.09	0.21	0.25	0.03	0.23	0.02	NA	NA	0.21	0.02	0.01	<0.01
Zinc	0.66	0.33	0.16	0.08	0.09	0.05	NA	NA	0.44	0.04	3.65	0.40
Pesticides/PCBs												
4,4'-DDD	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	0.02	<0.01
4,4'-DDE	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	0.14	0.01
4,4'-DDT	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	0.02	<0.01
Aldrin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01
alpha-BHC	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01
alpha-Chlordane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01
Aroclor-1016	0.06	0.02	0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	0.08	<0.01
Aroclor-1221	2.33	0.23	0.49	0.05	0.05	<0.01	NA	NA	0.14	0.01	0.17	0.02
Aroclor-1232	1.15	0.11	0.24	0.02	0.02	<0.01	NA	NA	0.07	<0.01	0.08	<0.01
Aroclor-1242	1.15	0.11	0.24	0.02	0.02	<0.01	NA	NA	0.07	<0.01	0.08	<0.01
Aroclor-1248	0.06	<0.01	0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	0.19	0.02
Aroclor-1254	1.46	0.15	0.31	0.03	0.03	<0.01	NA	NA	0.04	<0.01	0.24	0.02
Aroclor-1260	1.16	0.12	0.25	0.02	0.02	<0.01	NA	NA	0.03	<0.01	0.19	0.02
beta-BHC	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01

Table 4-10
Summary of Maximum Hazard Quotients for Food Web Exposures - SWMU 2B
NAS Oceana, Virginia Beach, VA

Chemical	Short-tailed shrew		Deer mouse		Meadow vole		Raccoon		Red fox		American robin	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
delta-BHC	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01
Dieldrin	0.31	0.03	0.07	<0.01	<0.01	<0.01	NA	NA	0.02	<0.01	0.04	<0.01
Endosulfan I	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01
Endosulfan II	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01
Endosulfan Sulfate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01
Endrin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	0.02	<0.01
Endrin Aldehyde	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	0.03	<0.01
Endrin Ketone	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	0.03	<0.01
Gamma-BHC (Lindane)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01
Gamma-Chlordane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01
Heptachlor	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01
Heptachlor Epoxide	0.06	<0.01	0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01
Methoxychlor	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01
Toxaphene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	0.04	<0.01
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01
2,4,5-Trichlorophenol	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
2,4,6-Trichlorophenol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
2,4-Dichlorophenol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.14	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	0.05	NA	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	NA	<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	NA	NA	<0.01	<0.01	<0.01	<0.01

Table 4-10
Summary of Maximum Hazard Quotients for Food Web Exposures - SWMU 2B
NAS Oceana, Virginia Beach, VA

Chemical	Short-tailed shrew		Deer mouse		Meadow vole		Raccoon		Red fox		American robin	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.07	NA	<0.01	<0.01	<0.01	<0.01
Bis-(2-Ethylhexyl)phthalate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	0.04	<0.01
Butylbenzylphthalate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Carbazole	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Chrysene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.08	NA	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	0.07	NA	<0.01	<0.01	<0.01	<0.01
Dibenzofuran	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Diethylphthalate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Di-n-butylphthalate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	0.23	0.02
Di-n-octylphthalate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01
Fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01
Hexachlorobutadiene	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	0.01	<0.01
Hexachlorobenzene	0.06	<0.01	0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	0.48	0.05
Hexachlorocyclopentadiene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	NA	<0.01	<0.01	<0.01	<0.01
Naphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01
N-Nitrosodiphenylamine	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Pentachlorophenol	0.32	0.03	0.07	<0.01	<0.01	<0.01	NA	NA	0.02	<0.01	<0.01	<0.01
Phenanthrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01
Pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01
Volatile Organic Compounds												
Carbon Tetrachloride	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Chlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Chloroform	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Ethylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Styrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Tetrachloroethene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Toluene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Trichloroethene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Xylenes (total)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01

Table 4-10
Summary of Maximum Hazard Quotients for Food Web Exposures - SWMU 2B
NAS Oceana, Virginia Beach, VA

Chemical	Marsh wren		American kestrel		Great blue heron		Mallard	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics								
Aluminum	NA	NA	1.84	0.18	NA	NA	NA	NA
Antimony	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Arsenic	NA	NA	0.03	0.01	NA	NA	NA	NA
Barium	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	2.03	0.15	NA	NA	NA	NA
Chromium	NA	NA	159.42	31.88	NA	NA	NA	NA
Cobalt	NA	NA	0.09	<0.01	NA	NA	NA	NA
Copper	NA	NA	0.03	0.03	NA	NA	NA	NA
Iron	NA	NA	0.48	0.05	NA	NA	NA	NA
Lead	NA	NA	78.31	7.83	NA	NA	NA	NA
Manganese	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Mercury	NA	NA	1.55	0.77	NA	NA	NA	NA
Nickel	NA	NA	0.03	0.02	NA	NA	NA	NA
Selenium	NA	NA	0.38	0.11	NA	NA	NA	NA
Silver	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Thallium	NA	NA	0.45	0.04	NA	NA	NA	NA
Vanadium	NA	NA	0.01	<0.01	NA	NA	NA	NA
Zinc	NA	NA	4.46	0.49	NA	NA	NA	NA
Pesticides/PCBs								
4,4'-DDD	NA	NA	0.02	<0.01	NA	NA	NA	NA
4,4'-DDE	NA	NA	0.19	0.02	NA	NA	NA	NA
4,4'-DDT	NA	NA	0.03	<0.01	NA	NA	NA	NA
Aldrin	NA	NA	<0.01	<0.01	NA	NA	NA	NA
alpha-BHC	NA	NA	<0.01	<0.01	NA	NA	NA	NA
alpha-Chlordane	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Aroclor-1016	NA	NA	0.11	0.01	NA	NA	NA	NA
Aroclor-1221	NA	NA	0.23	0.02	NA	NA	NA	NA
Aroclor-1232	NA	NA	0.11	0.01	NA	NA	NA	NA
Aroclor-1242	NA	NA	0.11	0.01	NA	NA	NA	NA
Aroclor-1248	NA	NA	0.25	0.03	NA	NA	NA	NA
Aroclor-1254	NA	NA	0.32	0.03	NA	NA	NA	NA
Aroclor-1260	NA	NA	0.25	0.03	NA	NA	NA	NA
beta-BHC	NA	NA	<0.01	<0.01	NA	NA	NA	NA

Table 4-10
Summary of Maximum Hazard Quotients for Food Web Exposures - SWMU 2B
NAS Oceana, Virginia Beach, VA

Chemical	Marsh wren		American kestrel		Great blue heron		Mallard	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
delta-BHC	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Dieldrin	NA	NA	0.05	<0.01	NA	NA	NA	NA
Endosulfan I	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Endosulfan II	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Endosulfan Sulfate	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Endrin	NA	NA	0.03	<0.01	NA	NA	NA	NA
Endrin Aldehyde	NA	NA	0.03	<0.01	NA	NA	NA	NA
Endrin Ketone	NA	NA	0.03	<0.01	NA	NA	NA	NA
Gamma-BHC (Lindane)	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Gamma-Chlordane	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Heptachlor	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Heptachlor Epoxide	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Methoxychlor	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Toxaphene	NA	NA	0.05	<0.01	NA	NA	NA	NA
Semivolatile Organic Compounds								
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	<0.01	<0.01	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	<0.01	<0.01	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	<0.01	<0.01	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Acenaphthylene	0.03	NA	<0.01	<0.01	0.02	NA	NA	NA
Anthracene	NA	NA	<0.01	<0.01	0.02	NA	NA	NA
Benzo(a)anthracene	0.06	NA	<0.01	<0.01	0.03	NA	NA	NA
Benzo(a)pyrene	0.01	NA	<0.01	<0.01	0.03	NA	NA	NA
Benzo(b)fluoranthene	0.01	NA	<0.01	<0.01	0.04	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	<0.01	<0.01	0.02	NA	NA	NA

Table 4-10
Summary of Maximum Hazard Quotients for Food Web Exposures - SWMU 2B
NAS Oceana, Virginia Beach, VA

Chemical	Marsh wren		American kestrel		Great blue heron		Mallard	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Benzo(k)fluoranthene	0.02	NA	<0.01	<0.01	0.03	NA	NA	NA
Bis-(2-Ethylhexyl)phthalate	0.19	0.02	0.05	<0.01	0.13	0.01	0.01	NA
Butylbenzylphthalate	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	0.02	NA	<0.01	<0.01	0.04	NA	NA	NA
Dibenz(a,h)anthracene	0.03	NA	<0.01	<0.01	0.02	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	0.47	0.05	0.28	0.03	0.32	0.03	0.04	NA
Di-n-octylphthalate	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Fluoranthene	0.03	NA	<0.01	<0.01	0.07	NA	NA	NA
Fluorene	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Hexachlorobutadiene	0.05	0.02	0.01	<0.01	0.04	0.01	NA	NA
Hexachlorobenzene	1.61	0.16	0.62	0.06	1.10	0.11	0.10	0.01
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.02	NA	<0.01	<0.01	0.03	NA	NA	NA
Naphthalene	0.05	NA	<0.01	<0.01	0.03	NA	0.01	NA
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Phenanthrene	0.04	NA	<0.01	<0.01	0.04	NA	NA	NA
Pyrene	0.07	NA	<0.01	<0.01	0.06	NA	NA	NA
Volatile Organic Compounds								
Carbon Tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	NA	NA	<0.01	<0.01	NA	NA	NA	NA

Table 4-11
Summary of COPCs - SWMU 2B - Screening ERA
NAS Oceana, Virginia Beach, VA

Chemical	Groundwater			Surface Water			Sediment			Surface Soil			Food web		
	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV
Inorganics															
Aluminum										X			X		
Antimony										X			X		
Arsenic													X		
Cadmium													X		
Chromium										X			X		
Copper		X													
Cyanide		X									X				
Iron	X									X			X		
Lead		X								X			X		
Manganese	X														
Mercury										X			X		
Selenium														X	
Silver		X													
Thallium											X			X	
Vanadium										X			X		
Zinc										X			X		
Pesticide/Polychlorinated Biphenyls															
4,4'-DDD		X													
4,4'-DDT		X													
Aroclor-1016		X													
Aroclor-1221		X												X	
Aroclor-1232		X												X	
Aroclor-1242		X												X	
Aroclor-1248		X													
Aroclor-1254		X											X		
Aroclor-1260														X	
Dieldrin		X													
Endosulfan I												X			
Endosulfan II		X										X			
Endosulfan sulfate		X										X			
Endrin		X													

MD - Maximum detect exceeds screening value
MRL - Not detected; maximum reporting limit exceeds screening value
NSV - No screening value

Table 4-11
Summary of COPCs - SWMU 2B - Screening ERA
NAS Oceana, Virginia Beach, VA

Chemical	Groundwater			Surface Water			Sediment			Surface Soil			Food web		
	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV
Endrin aldehyde		X													
Endrin ketone		X													
Heptachlor		X										X			
Heptachlor epoxide		X													
Methoxychlor		X													
Toxaphene		X										X			
Semi-volatile Organic Compounds															
1,2,4-Trichlorobenzene								X							
1,2-Dichlorobenzene								X			X				
1,3-Dichlorobenzene									X			X			
1,4-Dichlorobenzene								X							
1-Methylnaphthalene									X			X			
2,2'-Oxybis(1-chloropropane)			X						X			X			
2,4,5-Trichlorophenol									X		X				
2,4,6-Trichlorophenol									X						
2,4-Dichlorophenol									X						
2,4-Dimethylphenol								X			X				
2,4-Dinitrophenol									X						
2,4-Dinitrotoluene									X			X			
2,6-Dinitrotoluene			X						X			X			
2-Chloronaphthalene									X						X
2-Chlorophenol									X		X				
2-Methylnaphthalene			X				X					X			
2-Methylphenol								X			X				
2-Nitroaniline			X						X			X			
2-Nitrophenol									X			X			
3,3'-Dichlorobenzidine			X						X			X			X
3-Nitroaniline			X						X			X			
4,6-Dinitro-2-methylphenol		X							X			X			
4-Bromophenyl-phenylether		X							X			X			X
4-Chloro-3-methylphenol		X							X			X			X
4-Chloroaniline									X			X			

MD - Maximum detect exceeds screening value
MRL - Not detected; maximum reporting limit exceeds screening value
NSV - No screening value

Table 4-11
Summary of COPCs - SWMU 2B - Screening ERA
NAS Oceana, Virginia Beach, VA

Chemical	Groundwater			Surface Water			Sediment			Surface Soil			Food web		
	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV
4-Chlorophenyl-phenylether			X						X			X			X
4-Methylphenol			X								X				
4-Nitroaniline			X						X			X			
4-Nitrophenol									X		X				
Acenaphthene							X								
Acenaphthylene			X					X			X				
Anthracene		X					X				X				
Benzo(a)anthracene							X			X					
Benzo(a)pyrene		X					X			X					
Benzo(b)fluoranthene			X				X								
Benzo(g,h,i)perylene			X				X								
Benzo(k)fluoranthene			X				X			X					
Butylbenzylphthalate							X					X			
Carbazole			X						X			X			
Chrysene			X				X			X					
Di-n-octylphthalate		X										X			
Dibenz(a,h)anthracene			X					X			X				
Dibenzofuran												X			
Diethylphthalate								X							
Dimethyl phthalate								X							
Fluoranthene							X								
Fluorene							X								
Hexachlorobenzene		X						X				X		X	
Hexachlorobutadiene		X						X				X			
Hexachlorocyclopentadiene		X							X						
Hexachloroethane									X			X			X
Indeno(1,2,3-cd)pyrene			X				X								
Isophorone									X			X			
Naphthalene								X			X				
Nitrobenzene									X						
Pentachlorophenol		X						X							
Phenanthrene							X								

MD - Maximum detect exceeds screening value
MRL - Not detected; maximum reporting limit exceeds screening value
NSV - No screening value

Table 4-11
Summary of COPCs - SWMU 2B - Screening ERA
NAS Oceana, Virginia Beach, VA

Chemical	Groundwater			Surface Water			Sediment			Surface Soil			Food web		
	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV
Phenol								X							
Pyrene			X				X			X					
bis(2-Chloroethoxy)methane									X			X			
bis(2-Chloroethyl)ether									X			X			
bis(2-Ethylhexyl)phthalate												X			
n-Nitroso-di-n-propylamine			X						X			X			
n-Nitrosodiphenylamine								X							
Volatile Organic Compounds															
1,1,1-Trichloroethane								X							
1,1,2,2-Tetrachloroethane									X						
1,1,2-Trichloroethane								X							
1,1-Dichloroethane									X						
1,1-Dichloroethene									X			X			
1,2,3-Trichloropropane			X			X									
1,2-Dibromo-3-chloropropane			X												
1,2-Dichlorobenzene								X							
1,2-Dichloroethane									X						
1,2-Dichloropropane									X						
1,3-Dichlorobenzene									X						
2-Butanone												X			
2-Chloroethyl vinyl ether			X			X			X						
2-Hexanone												X			
Acetone					*							X			
Acrolein		X			X										
Bromodichloromethane									X						
Bromoform									X						
Bromomethane									X			X			
Carbon disulfide					X							X			
Carbon tetrachloride									X						
Chlorobenzene									X						
Chloroethane			X			X			X			X			
Chloroform									X						

MD - Maximum detect exceeds screening value
MRL - Not detected; maximum reporting limit exceeds screening value
NSV - No screening value

Table 4-11
Summary of COPCs - SWMU 2B - Screening ERA
NAS Oceana, Virginia Beach, VA

Chemical	Groundwater			Surface Water			Sediment			Surface Soil			Food web		
	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV
Chloromethane									X			X			
Dibromochloromethane									X			X			
Dichlorodifluoromethane									X						
Ethane			X												
Ethene			X												
Ethyl methacrylate			X			X									
Iodomethane			X			X									
Methane			X												
Methylene chloride									X						
Styrene			X			X									
Tetrachloroethene								X							
Trichloroethene								X							
Trichlorofluoromethane									X						
Vinyl acetate			X			X									
Vinyl chloride									X						
o-Xylene												X			
cis-1,2-Dichloroethene									X						
cis-1,3-Dichloropropene									X						
trans-1,2-Dichloroethene									X						
trans-1,3-Dichloropropene									X						
trans-1,4-Dichloro-2-butene			X			X									

MD - Maximum detect exceeds screening value
MRL - Not detected; maximum reporting limit exceeds screening value
NSV - *No screening value*

Table 4-12
Refined Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - SWMU 2B
NAS Oceana, Virginia Beach, VA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor
Terrestrial Habitats			
Survival, growth, and reproduction of terrestrial soil invertebrate communities.	Are site-related surface soil concentrations sufficient to adversely effect soil invertebrate communities based on conservative screening values?	Comparison of mean chemical concentrations in surface soil with soil screening values.	Soil Invertebrates (earthworms)
Survival, growth, and reproduction of terrestrial plant communities.	Are site-related surface soil concentrations sufficient to adversely effect terrestrial plant communities based on conservative screening values?	Comparison of mean chemical concentrations in surface soil with soil screening values.	Terrestrial plants
Survival, growth, and reproduction of avian terrestrial insectivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume soil invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean soil concentrations.	American robin
Survival, growth, and reproduction of avian terrestrial carnivores.	Are site-related chemical concentrations in surface soils 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) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean soil concentrations.	American kestrel
Survival, growth, and reproduction of mammalian terrestrial insectivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume soil invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean soil concentrations.	Short-tailed shrew
Survival, growth, and reproduction of mammalian terrestrial omnivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume plants and invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean soil concentrations.	Deer Mouse
Survival, growth, and reproduction of mammalian terrestrial herbivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume plants from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean soil concentrations.	Meadow vole

Table 4-12
Refined Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - SWMU 2B
NAS Oceana, Virginia Beach, VA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor
Survival, growth, and reproduction of mammalian terrestrial carnivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume small mammals from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean soil concentrations.	Red fox
Survival, growth, and reproduction of terrestrial reptiles.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to terrestrial reptilian species?	Evidence of potential risk to other upper trophic level terrestrial receptors evaluated in the baseline ERA.	--
Wetland and Aquatic Habitats			
Survival, growth, and reproduction of benthic invertebrate communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect benthic invertebrate communities?	Comparison of mean chemical concentrations in surface water and/or sediment with medium-specific screening values.	Benthic invertebrates
Survival, growth, and reproduction of aquatic and wetland plant communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect aquatic or wetland plant communities?	Comparison of mean chemical concentrations in surface water and/or sediment with medium-specific screening values.	Aquatic/wetland plants
Survival, growth, and reproduction of fish communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect fish communities?	Comparison of mean chemical concentrations in surface water and/or sediment with medium-specific screening values.	Freshwater fish
Survival, growth, and reproduction of amphibian communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect amphibian communities?	Comparison of mean chemical concentrations in surface water and/or sediment with medium-specific screening values.	Amphibians
Survival, growth, and reproduction of amphibians.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to amphibian species that may consume aquatic invertebrates from the site?	Evidence of potential risk to other upper trophic level aquatic and wetland receptors evaluated in the baseline ERA.	--

Table 4-12
Refined Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - SWMU 2B
NAS Oceana, Virginia Beach, VA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor
Survival, growth, and reproduction of wetland reptiles.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to aquatic/wetland reptile species?	Evidence of potential risk to other upper trophic level aquatic and wetland receptors evaluated in the baseline ERA.	--
Survival, growth, and reproduction of avian aquatic/wetland insectivores.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume aquatic invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean sediment concentrations.	Marsh wren
Survival, growth, and reproduction of mammalian aquatic/wetland omnivores.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume aquatic plants and invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean sediment concentrations.	Raccoon

Table 4-13
Refined Screening Statistics - SWMU 2B - Groundwater
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COPC?
Inorganics (UG/L)									
Copper	2.90 - 2.90	0 / 4	--	--	1.45	2.85	-- / --	0.51	NO
Cyanide	10.0 - 10.0	0 / 2	--	--	5.00	5.20	-- / --	0.96	NO
Iron	43.7 - 43.7	4 / 4	35,500	OW2B-MW17-R01	15,500	320	4 / 4	48.4	**YES**
Lead	1.40 - 1.40	0 / 4	--	--	0.70	0.54	-- / --	1.28	NO
Manganese	0.40 - 0.40	4 / 4	500	OW2B-MW20-R01	351	120	4 / 4	2.93	**YES**
Silver	1.90 - 1.90	0 / 4	--	--	0.95	0.36	-- / --	2.64	NO
Pesticide/Polychlorinated Biphenyls (UG/L)									
4,4'-DDD	0.10 - 0.10	0 / 4	--	--	0.05	0.06	-- / --	0.83	NO
4,4'-DDT	0.10 - 0.10	0 / 4	--	--	0.05	0.001	-- / --	50.0	NO
Aldrin	0.05 - 0.05	0 / 4	--	--	0.03	0.30	-- / --	0.08	NO
Aroclor-1016	1.00 - 1.00	0 / 4	--	--	0.5	0.01	-- / --	35.7	NO
Aroclor-1221	2.00 - 2.00	0 / 4	--	--	1.0	0.28	-- / --	3.57	NO
Aroclor-1232	1.00 - 1.00	0 / 4	--	--	0.5	0.58	-- / --	0.86	NO
Aroclor-1242	1.00 - 1.00	0 / 4	--	--	0.5	0.05	-- / --	9.43	NO
Aroclor-1248	1.00 - 1.00	0 / 4	--	--	0.5	0.08	-- / --	6.17	NO
Aroclor-1254	1.00 - 1.00	0 / 4	--	--	0.5	0.03	-- / --	15.2	NO
Dieldrin	0.10 - 0.10	0 / 4	--	--	0.05	0.06	-- / --	0.89	NO
Endosulfan II	0.10 - 0.10	0 / 4	--	--	0.05	0.06	-- / --	0.89	NO
Endosulfan sulfate	0.10 - 0.10	0 / 4	--	--	0.05	0.06	-- / --	0.89	NO
Endrin	0.10 - 0.10	0 / 4	--	--	0.05	0.04	-- / --	1.39	NO
Endrin aldehyde	0.10 - 0.10	0 / 4	--	--	0.05	0.04	-- / --	1.39	NO
Endrin ketone	0.10 - 0.10	0 / 4	--	--	0.05	0.04	-- / --	1.39	NO
Heptachlor	0.05 - 0.05	0 / 4	--	--	0.03	0.007	-- / --	3.62	NO
Heptachlor epoxide	0.05 - 0.05	0 / 4	--	--	0.03	0.007	-- / --	3.62	NO
Methoxychlor	0.50 - 0.50	0 / 4	--	--	0.25	0.03	-- / --	8.33	NO
Toxaphene	5.00 - 5.00	0 / 4	--	--	2.50	0.01	-- / --	227	NO
Semi-volatile Organic Compounds (UG/L)									
2,2'-Oxybis(1-chloropropane)	10.0 - 10.0	0 / 4	--	--	5	NSV	-- / --	NSV	NO
2,6-Dinitrotoluene	10.0 - 10.0	0 / 4	--	--	5	NSV	-- / --	NSV	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 4-13 Refined Screening Statistics - SWMU 2B - Groundwater *NAS Oceana, Virginia Beach, VA*									
Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COPC?
2-Methylnaphthalene	10.0 - 10.0	0 / 4	--	--	5	NSV	-- / --	NSV	NO
2-Nitroaniline	25.0 - 25.0	0 / 4	--	--	12.5	NSV	-- / --	NSV	NO
3,3'-Dichlorobenzidine	10.0 - 10.0	0 / 4	--	--	5	NSV	-- / --	NSV	NO
3-Nitroaniline	25.0 - 25.0	0 / 4	--	--	12.5	NSV	-- / --	NSV	NO
4,6-Dinitro-2-methylphenol	25.0 - 25.0	0 / 4	--	--	12.5	2.30	-- / --	5.43	NO
4-Bromophenyl-phenylether	10.0 - 10.0	0 / 4	--	--	5	1.50	-- / --	3.33	NO
4-Chloro-3-methylphenol	10.0 - 10.0	0 / 4	--	--	5	0.30	-- / --	16.7	NO
4-Chlorophenyl-phenylether	10.0 - 10.0	0 / 4	--	--	5	NSV	-- / --	NSV	NO
4-Methylphenol	10.0 - 10.0	0 / 4	--	--	5	NSV	-- / --	NSV	NO
4-Nitroaniline	25.0 - 25.0	0 / 4	--	--	12.5	NSV	-- / --	NSV	NO
Acenaphthylene	1.00 - 1.00	0 / 4	--	--	0.50	NSV	-- / --	NSV	NO
Anthracene	2.00 - 2.00	0 / 4	--	--	1	0.73	-- / --	1.37	NO
Benzo(a)pyrene	0.10 - 0.10	0 / 4	--	--	0.05	0.01	-- / --	3.57	NO
Benzo(b)fluoranthene	0.10 - 0.10	0 / 4	--	--	0.05	NSV	-- / --	NSV	NO
Benzo(g,h,i)perylene	0.10 - 0.10	0 / 4	--	--	0.05	NSV	-- / --	NSV	NO
Benzo(k)fluoranthene	0.10 - 0.10	0 / 4	--	--	0.05	NSV	-- / --	NSV	NO
Carbazole	10.0 - 10.0	0 / 4	--	--	5	NSV	-- / --	NSV	NO
Chrysene	0.10 - 0.10	0 / 4	--	--	0.05	NSV	-- / --	NSV	NO
Di-n-octylphthalate	10.0 - 10.0	0 / 4	--	--	5	3.00	-- / --	1.67	NO
Dibenz(a,h)anthracene	0.10 - 0.10	0 / 4	--	--	0.05	NSV	-- / --	NSV	NO
Hexachlorobenzene	10.0 - 10.0	0 / 4	--	--	5	3.68	-- / --	1.36	NO
Hexachlorobutadiene	10.0 - 10.0	0 / 4	--	--	5	9.30	-- / --	0.54	NO
Hexachlorocyclopentadiene	10.0 - 10.0	0 / 4	--	--	5	5.20	-- / --	0.96	NO
Indeno(1,2,3-cd)pyrene	0.10 - 0.10	0 / 4	--	--	0.05	NSV	-- / --	NSV	NO
Pentachlorophenol	25.0 - 25.0	0 / 4	--	--	12.5	6.69	-- / --	1.87	NO
Pyrene	0.10 - 0.10	0 / 4	--	--	0.05	NSV	-- / --	NSV	NO
n-Nitroso-di-n-propylamine	10.0 - 10.0	0 / 4	--	--	5	NSV	-- / --	NSV	NO
Volatile Organic Compounds (UG/L)									
1,2,3-Trichloropropane	5.00 - 5.00	0 / 4	--	--	2.50	NSV	-- / --	NSV	NO
1,2-Dibromo-3-chloropropane	1.00 - 1.00	0 / 4	--	--	0.50	NSV	-- / --	NSV	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 4-13
Refined Screening Statistics - SWMU 2B - Groundwater
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COPC?
2-Chloroethyl vinyl ether	10.0 - 10.0	0 / 4	--	--	5	NSV	-- / --	NSV	NO
Bromodichloromethane	1.00 - 5.00	0 / 8	--	--	1.50	1,100	-- / --	0.001	NO
Chloroethane	1.00 - 10.0	2 / 8	20.0	OW2B-MW18-94A	4.69	NSV	-- / --	NSV	**YES**
Ethane	0.005 - 0.005	2 / 4	0.11	OW2B-MW20-R01	0.03	NSV	-- / --	NSV	**YES**
Ethene	0.005 - 0.005	2 / 4	0.06	OW2B-MW17-R01	0.03	NSV	-- / --	NSV	**YES**
Ethyl methacrylate	5.00 - 5.00	0 / 4	--	--	2.50	NSV	-- / --	NSV	NO
Ethylbenzene	1.00 - 5.00	0 / 8	--	--	1.50	3,200	-- / --	0.0005	NO
Iodomethane	10.0 - 10.0	0 / 4	--	--	5	NSV	-- / --	NSV	NO
Methane	0.02 - 0.02	4 / 4	2,150	OW2B-MW17-R01	1257	NSV	-- / --	NSV	**YES**
Styrene	1.00 - 5.00	0 / 8	--	--	1.50	NSV	-- / --	NSV	NO
Vinyl acetate	10.0 - 10.0	0 / 4	--	--	5	NSV	-- / --	NSV	NO
trans-1,4-Dichloro-2-butene	5.00 - 5.00	0 / 4	--	--	2.50	NSV	-- / --	NSV	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 4-14
Refined Screening Statistics - SWMU 2B - Surface Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COPC?
Volatile Organic Compounds (UG/L)									
1,2,3-Trichloropropane	5.00 - 5.00	0 / 4	--	--	2.50	NSV	-- / --	NSV	NO
2-Chloroethyl vinyl ether	10.0 - 10.0	0 / 4	--	--	5.00	NSV	-- / --	NSV	NO
Acetone	-- - --	0 / 4	--	--	5.00	90,000	-- / --	0.0001	NO
Acrolein	100 - 100	0 / 4	--	--	50.0	21.0	-- / --	2.38	NO
Carbon disulfide	5.00 - 5.00	0 / 4	--	--	2.50	2.00	-- / --	1.25	NO
Chloroethane	10.0 - 10.0	0 / 4	--	--	5.00	NSV	-- / --	NSV	NO
Ethyl methacrylate	5.00 - 5.00	0 / 4	--	--	2.50	NSV	-- / --	NSV	NO
Iodomethane	10.0 - 10.0	0 / 4	--	--	5.00	NSV	-- / --	NSV	NO
Styrene	5.00 - 5.00	0 / 4	--	--	2.50	NSV	-- / --	NSV	NO
Vinyl acetate	10.0 - 10.0	0 / 4	--	--	5.00	NSV	-- / --	NSV	NO
trans-1,4-Dichloro-2-butene	5.00 - 5.00	0 / 4	--	--	2.50	NSV	-- / --	NSV	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 4-15
Refined Screening Statistics - SWMU 2B - Sediment
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COPC?
Semi-volatile Organic Compounds (UG/KG)									
1,2,4-Trichlorobenzene	390 - 420	0 / 3	--	--	205	40.0	-- / --	5.13	NO
1,2-Dichlorobenzene	390 - 420	0 / 3	--	--	205	35.0	-- / --	5.86	NO
1,3-Dichlorobenzene	390 - 420	0 / 3	--	--	205	NSV	-- / --	NSV	NO
1,4-Dichlorobenzene	390 - 420	0 / 3	--	--	205	110	-- / --	1.86	NO
1-Methylnaphthalene	310 - 3,700	1 / 3	430	OW2B-SD4-94A	743	NSV	-- / --	NSV	**YES**
2,2'-Oxybis(1-chloropropane)	390 - 420	0 / 3	--	--	205	NSV	-- / --	NSV	NO
2,4,5-Trichlorophenol	390 - 420	0 / 3	--	--	205	NSV	-- / --	NSV	NO
2,4,6-Trichlorophenol	390 - 420	0 / 3	--	--	205	NSV	-- / --	NSV	NO
2,4-Dichlorophenol	390 - 420	0 / 3	--	--	205	NSV	-- / --	NSV	NO
2,4-Dimethylphenol	390 - 420	0 / 3	--	--	205	29.0	-- / --	7.07	NO
2,4-Dinitrophenol	950 - 1,000	0 / 3	--	--	492	NSV	-- / --	NSV	NO
2,4-Dinitrotoluene	390 - 420	0 / 3	--	--	205	NSV	-- / --	NSV	NO
2,6-Dinitrotoluene	390 - 420	0 / 3	--	--	205	NSV	-- / --	NSV	NO
2-Chloronaphthalene	390 - 420	0 / 3	--	--	205	NSV	-- / --	NSV	NO
2-Chlorophenol	390 - 420	0 / 3	--	--	205	NSV	-- / --	NSV	NO
2-Methylnaphthalene	310 - 3,700	2 / 6	420	OW2B-SD4-94A	450	70.0	1 / 6	6.00	**YES**
2-Methylphenol	390 - 420	0 / 3	--	--	205	63.0	-- / --	3.25	NO
2-Nitroaniline	950 - 1,000	0 / 3	--	--	492	NSV	-- / --	NSV	NO
2-Nitrophenol	390 - 420	0 / 3	--	--	205	NSV	-- / --	NSV	NO
3,3'-Dichlorobenzidine	390 - 420	0 / 3	--	--	205	NSV	-- / --	NSV	NO
3-Nitroaniline	950 - 1,000	0 / 3	--	--	492	NSV	-- / --	NSV	NO
4,6-Dinitro-2-methylphenol	950 - 1,000	0 / 3	--	--	492	NSV	-- / --	NSV	NO
4-Bromophenyl-phenylether	390 - 420	0 / 3	--	--	205	NSV	-- / --	NSV	NO
4-Chloro-3-methylphenol	390 - 420	0 / 3	--	--	205	NSV	-- / --	NSV	NO
4-Chloroaniline	390 - 420	0 / 3	--	--	205	NSV	-- / --	NSV	NO
4-Chlorophenyl-phenylether	390 - 420	0 / 3	--	--	205	NSV	-- / --	NSV	NO
4-Nitroaniline	950 - 1,000	0 / 3	--	--	492	NSV	-- / --	NSV	NO
4-Nitrophenol	950 - 1,000	0 / 3	--	--	492	NSV	-- / --	NSV	NO
Acenaphthene	310 - 3,700	2 / 6	350	OW2B-SD4-94A	441	16.0	2 / 6	21.9	**YES**
Acenaphthylene	310 - 3,700	0 / 6	--	--	428	44.0	-- / --	9.73	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 4-15
Refined Screening Statistics - SWMU 2B - Sediment
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COPC?
Anthracene	310 - 3,700	3 / 6	2,200	OW2B-SD2-94A	656	85.3	2 / 6	7.69	**YES**
Benzo(a)anthracene	310 - 3,700	5 / 6	6,000	OW2B-SD2-94A	1392	261	2 / 6	5.33	**YES**
Benzo(a)pyrene	310 - 3,700	5 / 6	6,400	OW2B-SD2-94A	1448	430	2 / 6	3.37	**YES**
Benzo(b)fluoranthene	310 - 3,700	5 / 6	7,700	OW2B-SD2-94A	1668	3,200	1 / 6	0.52	NO
Benzo(g,h,i)perylene	310 - 3,700	5 / 6	3,200	OW2B-SD2-94A	822	670	1 / 6	1.23	**YES**
Benzo(k)fluoranthene	310 - 3,700	5 / 6	6,500	OW2B-SD2-94A	1359	240	2 / 6	5.66	**YES**
Butylbenzylphthalate	390 - 420	2 / 3	150	OW2B-SD04	141	63.0	2 / 3	2.24	**YES**
Carbazole	390 - 420	1 / 3	54.0	OW2B-SD01	158	NSV	-- / --	NSV	**YES**
Chrysene	310 - 3,700	5 / 6	7,900	OW2B-SD2-94A	1758	384	2 / 6	4.58	**YES**
Dibenz(a,h)anthracene	310 - 3,700	0 / 6	--	--	428	63.4	-- / --	6.76	NO
Diethylphthalate	390 - 420	0 / 3	--	--	205	200	-- / --	1.03	NO
Dimethyl phthalate	390 - 420	0 / 3	--	--	205	71.0	-- / --	2.89	NO
Fluoranthene	310 - 3,700	5 / 6	13,000	OW2B-SD2-94A	2893	600	2 / 6	4.82	**YES**
Fluorene	310 - 3,700	2 / 6	320	OW2B-SD4-94A	433	19.0	2 / 6	16.84	**YES**
Hexachlorobenzene	390 - 420	0 / 3	--	--	205	22.0	-- / --	9.32	NO
Hexachlorobutadiene	390 - 420	0 / 3	--	--	205	11.0	-- / --	18.6	NO
Hexachlorocyclopentadiene	390 - 420	0 / 3	--	--	205	NSV	-- / --	NSV	NO
Hexachloroethane	390 - 420	0 / 3	--	--	205	NSV	-- / --	NSV	NO
Indeno(1,2,3-cd)pyrene	310 - 3,700	5 / 6	5,100	OW2B-SD2-94A	1140	600	1 / 6	1.90	**YES**
Isophorone	390 - 420	0 / 3	--	--	205	NSV	-- / --	NSV	NO
Naphthalene	310 - 3,700	0 / 6	--	--	428	160	-- / --	2.68	NO
Nitrobenzene	390 - 420	0 / 3	--	--	205	NSV	-- / --	NSV	NO
Pentachlorophenol	950 - 1,000	0 / 3	--	--	492	360	-- / --	1.37	NO
Phenanthrene	310 - 3,700	5 / 6	7,400	OW2B-SD2-94A	1867	240	3 / 6	7.78	**YES**
Phenol	390 - 420	0 / 3	--	--	205	420	-- / --	0.49	NO
Pyrene	310 - 3,700	5 / 6	11,000	OW2B-SD2-94A	2533	665	2 / 6	3.81	**YES**
bis(2-Chloroethoxy)methane	390 - 420	0 / 3	--	--	205	NSV	-- / --	NSV	NO
bis(2-Chloroethyl)ether	390 - 420	0 / 3	--	--	205	NSV	-- / --	NSV	NO
n-Nitroso-di-n-propylamine	390 - 420	0 / 3	--	--	205	NSV	-- / --	NSV	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 4-15 Refined Screening Statistics - SWMU 2B - Sediment *NAS Oceana, Virginia Beach, VA*									
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Arithmetic Mean**	**Screening Value**	**Frequency of Exceedance**	**Mean Hazard Quotient**	**COPC?**
n-Nitrosodiphenylamine	390 - 420	0 / 3	--	--	205	28.0	-- / --	7.32	NO
Volatile Organic Compounds (UG/KG)									
1,1,1-Trichloroethane	1.30 - 63.0	0 / 3	--	--	20.6	31.0	-- / --	0.66	NO
1,1,2,2-Tetrachloroethane	1.30 - 63.0	0 / 3	--	--	20.6	NSV	-- / --	NSV	NO
1,1,2-Trichloroethane	1.30 - 63.0	0 / 3	--	--	20.6	31.0	-- / --	0.66	NO
1,1-Dichloroethane	1.30 - 63.0	0 / 3	--	--	20.6	NSV	-- / --	NSV	NO
1,1-Dichloroethene	1.30 - 63.0	0 / 3	--	--	20.6	NSV	-- / --	NSV	NO
1,2-Dichlorobenzene	1.30 - 63.0	0 / 3	--	--	20.6	35.0	-- / --	0.59	NO
1,2-Dichloroethane	1.30 - 63.0	0 / 3	--	--	20.6	NSV	-- / --	NSV	NO
1,2-Dichloropropane	1.30 - 63.0	0 / 3	--	--	20.6	NSV	-- / --	NSV	NO
1,3-Dichlorobenzene	1.30 - 63.0	0 / 3	--	--	20.6	NSV	-- / --	NSV	NO
2-Chloroethyl vinyl ether	1.30 - 63.0	0 / 3	--	--	20.6	NSV	-- / --	NSV	NO
Bromodichloromethane	1.30 - 63.0	0 / 3	--	--	20.6	NSV	-- / --	NSV	NO
Bromoform	1.30 - 63.0	0 / 3	--	--	20.6	NSV	-- / --	NSV	NO
Bromomethane	1.30 - 63.0	0 / 3	--	--	20.6	NSV	-- / --	NSV	NO
Carbon tetrachloride	1.30 - 63.0	0 / 3	--	--	20.6	NSV	-- / --	NSV	NO
Chlorobenzene	1.30 - 63.0	0 / 3	--	--	20.6	NSV	-- / --	NSV	NO
Chloroethane	1.30 - 63.0	0 / 3	--	--	20.6	NSV	-- / --	NSV	NO
Chloroform	1.30 - 63.0	0 / 3	--	--	20.6	NSV	-- / --	NSV	NO
Chloromethane	1.30 - 63.0	0 / 3	--	--	20.6	NSV	-- / --	NSV	NO
Dibromochloromethane	1.30 - 63.0	0 / 3	--	--	20.6	NSV	-- / --	NSV	NO
Dichlorodifluoromethane	1.30 - 63.0	0 / 3	--	--	20.6	NSV	-- / --	NSV	NO
Methylene chloride	1.30 - 63.0	0 / 3	--	--	20.6	NSV	-- / --	NSV	NO
Tetrachloroethene	1.30 - 63.0	0 / 3	--	--	20.6	57.0	-- / --	0.36	NO
Trichloroethene	1.30 - 63.0	0 / 3	--	--	20.6	41.0	-- / --	0.50	NO
Trichlorofluoromethane	1.30 - 63.0	0 / 3	--	--	20.6	NSV	-- / --	NSV	NO
Vinyl chloride	62.0 - 63.0	0 / 2	--	--	30.5	NSV	-- / --	NSV	NO
cis-1,2-Dichloroethene	1.30 - 63.0	0 / 3	--	--	20.6	NSV	-- / --	NSV	NO
cis-1,3-Dichloropropene	1.30 - 63.0	0 / 3	--	--	20.6	NSV	-- / --	NSV	NO
trans-1,2-Dichloroethene	1.30 - 63.0	0 / 3	--	--	20.6	NSV	-- / --	NSV	NO
trans-1,3-Dichloropropene	1.30 - 63.0	0 / 3	--	--	20.6	NSV	-- / --	NSV	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 4-16
Refined Screening Statistics - SWMU 2B - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COPC?
Inorganics (MG/KG)									
Aluminum	40.1 - 45.8	3 / 3	11,000	OW2B-SS01-00	10,767	50.0	3 / 3	215	**YES**
Antimony	12.0 - 13.7	1 / 3	10.0	OW2B-SS02-00	3.48	5.00	1 / 3	0.70	NO
Chromium	2.00 - 2.30	3 / 3	782	OW2B-SS02-00	270	0.40	3 / 3	674	**YES**
Cyanide	0.60 - 0.60	0 / 3	--	--	0.01	0.06	-- / --	0.22	NO
Iron	20.1 - 22.9	3 / 3	4,800	OW2B-SS03-00	4,293	200	3 / 3	21.5	**YES**
Lead	0.60 - 6.00	3 / 3	2,760	OW2B-SS02-00	935	50.0	1 / 3	18.7	**YES**
Mercury	0.10 - 0.10	2 / 3	0.61	OW2B-SS02-00	0.23	0.10	1 / 3	2.28	**YES**
Thallium	2.00 - 2.30	0 / 3	--	--	0.28	1.00	-- / --	0.28	NO
Vanadium	10.0 - 11.4	3 / 3	15.3	OW2B-SS01-00	15.2	2.00	3 / 3	7.62	**YES**
Zinc	4.00 - 4.60	2 / 3	69.1	OW2B-SS02-00	38.8	50.0	1 / 3	0.78	NO
Pesticide/Polychlorinated Biphenyls (UG/KG)									
Endosulfan I	2.08 - 2.17	0 / 3	--	--	1.06	NSV	-- / --	NSV	NO
Endosulfan II	4.05 - 4.22	0 / 3	--	--	2.06	NSV	-- / --	NSV	NO
Endosulfan sulfate	4.05 - 4.22	0 / 3	--	--	2.06	NSV	-- / --	NSV	NO
Heptachlor	2.08 - 2.17	0 / 3	--	--	1.06	NSV	-- / --	NSV	NO
Toxaphene	208 - 217	0 / 3	--	--	106	NSV	-- / --	NSV	NO
Semi-volatile Organic Compounds (UG/KG)									
1,2-Dichlorobenzene	370 - 420	0 / 3	--	--	198	100	-- / --	1.98	NO
1,3-Dichlorobenzene	370 - 420	0 / 3	--	--	198	NSV	-- / --	NSV	NO
1-Methylnaphthalene	21.0 - 21.0	0 / 2	--	--	10.5	NSV	-- / --	NSV	NO
2,2'-Oxybis(1-chloropropane)	370 - 420	0 / 3	--	--	198	NSV	-- / --	NSV	NO
2,4,5-Trichlorophenol	930 - 1,000	0 / 3	--	--	488	430	-- / --	1.14	NO
2,4-Dimethylphenol	370 - 420	0 / 3	--	--	198	100	-- / --	1.98	NO
2,4-Dinitrophenol	930 - 1,000	0 / 3	--	--	488	20,000	-- / --	0.02	NO
2,4-Dinitrotoluene	370 - 420	0 / 3	--	--	198	NSV	-- / --	NSV	NO
2,6-Dinitrotoluene	370 - 420	0 / 3	--	--	198	NSV	-- / --	NSV	NO
2-Chlorophenol	370 - 420	0 / 3	--	--	198	100	-- / --	1.98	NO
2-Methylnaphthalene	21.0 - 420	0 / 3	--	--	77	NSV	-- / --	NSV	NO
2-Methylphenol	370 - 420	0 / 3	--	--	198	100	-- / --	1.98	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 4-16
Refined Screening Statistics - SWMU 2B - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COPC?
2-Nitroaniline	930 - 1,000	0 / 3	--	--	488	NSV	-- / --	NSV	NO
2-Nitrophenol	370 - 420	0 / 3	--	--	198	NSV	-- / --	NSV	NO
3,3'-Dichlorobenzidine	370 - 420	0 / 3	--	--	198	NSV	-- / --	NSV	NO
3-Nitroaniline	930 - 1,000	0 / 3	--	--	488	NSV	-- / --	NSV	NO
4,6-Dinitro-2-methylphenol	930 - 1,000	0 / 3	--	--	488	NSV	-- / --	NSV	NO
4-Bromophenyl-phenylether	370 - 420	0 / 3	--	--	198	NSV	-- / --	NSV	NO
4-Chloro-3-methylphenol	370 - 420	0 / 3	--	--	198	NSV	-- / --	NSV	NO
4-Chloroaniline	370 - 420	0 / 3	--	--	198	NSV	-- / --	NSV	NO
4-Chlorophenyl-phenylether	370 - 420	0 / 3	--	--	198	NSV	-- / --	NSV	NO
4-Methylphenol	370 - 420	0 / 3	--	--	198	100	-- / --	1.98	NO
4-Nitroaniline	930 - 1,000	0 / 3	--	--	488	NSV	-- / --	NSV	NO
4-Nitrophenol	930 - 1,000	0 / 3	--	--	488	380	-- / --	1.29	NO
Acenaphthylene	41.0 - 420	0 / 3	--	--	83.8	100	-- / --	0.84	NO
Anthracene	2.00 - 420	0 / 3	--	--	70.7	100	-- / --	0.71	NO
Benzo(a)anthracene	2.00 - 420	3 / 3	140	OW2B-SS03-00	61.3	100	1 / 3	0.61	NO
Benzo(k)fluoranthene	2.00 - 420	3 / 3	170	OW2B-SS03-00	72.3	100	1 / 3	0.72	NO
Butylbenzylphthalate	380 - 420	1 / 3	52.0	OW2B-SS02-00	154	NSV	-- / --	NSV	**YES**
Carbazole	370 - 420	0 / 3	--	--	198	NSV	-- / --	NSV	NO
Chrysene	2.00 - 2.00	3 / 3	180	OW2B-SS03-00	78.3	100	1 / 3	0.78	NO
Di-n-octylphthalate	370 - 420	1 / 3	210	OW2B-SS01-00	202	NSV	-- / --	NSV	**YES**
Dibenz(a,h)anthracene	4.10 - 420	0 / 3	--	--	71.4	100	-- / --	0.71	NO
Dibenzofuran	370 - 420	0 / 3	--	--	198	NSV	-- / --	NSV	NO
Hexachlorobenzene	370 - 420	0 / 3	--	--	198	NSV	-- / --	NSV	NO
Hexachlorobutadiene	370 - 420	0 / 3	--	--	198	NSV	-- / --	NSV	NO
Hexachloroethane	370 - 420	0 / 3	--	--	198	NSV	-- / --	NSV	NO
Isophorone	370 - 420	0 / 3	--	--	198	NSV	-- / --	NSV	NO
Naphthalene	21.0 - 420	0 / 3	--	--	77	100	-- / --	0.77	NO
Pyrene	2.00 - 2.00	3 / 3	160	OW2B-SS03-00	76.3	100	1 / 3	0.76	NO
bis(2-Chloroethoxy)methane	370 - 420	0 / 3	--	--	198	NSV	-- / --	NSV	NO
bis(2-Chloroethyl)ether	370 - 420	0 / 3	--	--	198	NSV	-- / --	NSV	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 4-16
Refined Screening Statistics - SWMU 2B - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COPC?
bis(2-Ethylhexyl)phthalate	380 - 420	3 / 3	690	OW2B-SS03-00	293	NSV	-- / --	NSV	**YES**
n-Nitroso-di-n-propylamine	370 - 420	0 / 3	--	--	198	NSV	-- / --	NSV	NO
Volatile Organic Compounds (UG/KG)									
1,1-Dichloroethene	10.0 - 12.3	0 / 3	--	--	5.39	NSV	-- / --	NSV	NO
2-Butanone	10.0 - 12.3	0 / 3	--	--	4.00	NSV	-- / --	NSV	NO
2-Hexanone	10.0 - 12.3	0 / 3	--	--	5.39	NSV	-- / --	NSV	NO
Acetone	10.0 - 12.3	1 / 3	6.00	OW2B-SS02-00	4.83	NSV	-- / --	NSV	**YES**
Bromomethane	10.0 - 12.3	0 / 3	--	--	5.39	NSV	-- / --	NSV	NO
Carbon disulfide	10.0 - 12.3	0 / 3	--	--	5.39	NSV	-- / --	NSV	NO
Chloroethane	10.0 - 12.3	0 / 3	--	--	5.39	NSV	-- / --	NSV	NO
Chloromethane	10.0 - 12.3	0 / 3	--	--	5.39	NSV	-- / --	NSV	NO
Dibromochloromethane	10.0 - 12.3	0 / 3	--	--	5.39	NSV	-- / --	NSV	NO
o-Xylene	10.0 - 12.3	0 / 3	--	--	5.39	NSV	-- / --	NSV	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 4-17
Summary of Mean Hazard Quotients for Food Web Exposures - SWMU 2B
NAS Oceana, Virginia Beach, VA

Chemical	Short-tailed shrew		Deer mouse		Meadow vole		Red fox		American robin		Marsh wren		American kestrel	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics														
Aluminum	8.58	0.86	0.78	0.08	0.79	0.08	0.25	0.02	0.51	0.05	NA	NA	0.39	0.04
Antimony	0.47	0.05	0.13	0.01	0.29	0.03	0.06	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Arsenic	0.55	0.05	0.09	<0.01	0.06	<0.01	0.02	<0.01	0.01	<0.01	NA	NA	<0.01	<0.01
Cadmium	0.32	0.03	0.06	<0.01	0.02	<0.01	0.02	<0.01	0.10	<0.01	NA	NA	0.10	<0.01
Chromium	0.71	0.07	0.10	0.01	0.04	<0.01	0.08	<0.01	3.68	0.74	NA	NA	4.25	0.85
Iron	1.23	0.12	0.10	0.01	0.12	0.01	0.11	0.01	0.20	0.02	NA	NA	0.14	0.01
Lead	3.98	0.40	0.63	0.06	0.38	0.04	0.38	0.04	11.89	1.19	NA	NA	3.48	0.35
Mercury	0.71	0.14	0.16	0.03	0.13	0.03	<0.01	<0.01	0.03	0.01	NA	NA	0.02	0.01
Selenium	0.13	0.08	0.03	0.02	0.04	0.03	0.01	<0.01	0.04	0.01	NA	NA	0.03	<0.01
Thallium	0.32	0.03	0.05	<0.01	<0.01	<0.01	0.02	<0.01	0.03	<0.01	NA	NA	0.03	<0.01
Vanadium	1.04	0.10	0.09	<0.01	0.11	0.01	0.10	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Zinc	0.05	0.02	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	0.25	0.03	NA	NA	0.27	0.03
Pesticides/PCBs														
Aroclor-1221	0.20	0.02	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	NA	NA	0.01	<0.01
Aroclor-1232	0.10	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Aroclor-1242	0.10	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Aroclor-1254	0.15	0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	NA	NA	0.03	<0.01
Aroclor-1260	0.10	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	NA	NA	0.02	<0.01

Table 4-18
Refined Summary of COPCs - SWMU 2B
NAS Oceana, Virginia Beach, VA

Chemical	Groundwater	Surface Water	Sediment	Surface Soil	Food web
Inorganics					
Aluminum				X	X
Chromium				X	X
Iron	X			X	X
Lead				X	X
Manganese	X				
Mercury				X	
Vanadium				X	X
Semi-volatile Organic Compounds					
2-Methylnaphthalene			X		
Acenaphthene			X		
Anthracene			X		
Benzo(a)anthracene			X		
Benzo(a)pyrene			X		
Benzo(g,h,i)perylene			X		
Benzo(k)fluoranthene			X		
Butylbenzylphthalate			X		
Chrysene			X		
Fluoranthene			X		
Fluorene			X		
Indeno(1,2,3-cd)pyrene			X		
Phenanthrene			X		
Pyrene			X		

Table 4-19

Sediment Screening - Total PAHs - SWMU 2B

NAS Oceana, Virginia Beach, VA

Sample	PAHs Detected/Total PAHs	Total PAH (ug/kg)	Screening Value (ug/kg)	Hazard Quotient
OW2B-SD01	14 / 17	3,798	4,022	0.94
OW2B-SD02	10 / 17	2,533	4,022	0.63
OW2B-SD04	10 / 17	4,270	4,022	1.06
OW2B-SD1-94A	0 / 18	33,300	4,022	8.28
OW2B-SD2-94A	11 / 18	82,700	4,022	20.6
OW2B-SD30-94A	0 / 18	16,200	4,022	4.03
OW2B-SD4-94A	15 / 18	13,595	4,022	3.38

One-half of the detection limit was used for non-detected compounds when calculating total PAH.

Table 4-20
Comparison of SWMU 2B Surface Soil COPC Concentrations to Background Concentrations
NAS Oceana, Virginia Beach, VA

Chemical	On-Site			Background [1]		On-site Comparison to Background	
	Frequency of Detection	Maximum	Arithmetic Mean	Maximum	Arithmetic Mean	On-site Maximum Exceeds Background Maximum?	On-site Mean Exceeds Background Mean?
Inorganics (mg/kg)							
Aluminum	3 / 3	11,000	10,767	100,000	66,000	NO	NO
Chromium	3 / 3	782	270	19.5	15.7	YES	YES
Iron	3 / 3	4,800	4,293	100,000	25,000	NO	NO
Lead	3 / 3	2,760	935	8.9	6.8	YES	YES
Mercury	2 / 3	0.61	0.23	0.12	0.115	YES	YES
Vanadium	3 / 3	15.3	15.2	500	76	NO	NO

[1] Background obtained from (CH2M HILL, 2000c).

Table 5-1 Summary Statistics - SWMU 11 - Surface Water *NAS Oceana, Virginia Beach, VA*						
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Sample Value[1]**	**Standard Deviation of Mean**
Inorganics (UG/L)						
Aluminum	200 - 200	1 / 1	3,070	OW11-SW01	3,070	--
Antimony	60.0 - 60.0	1 / 1	184	OW11-SW01	184	--
Arsenic	10.0 - 10.0	1 / 1	14.3	OW11-SW01	14.3	--
Barium	200 - 200	1 / 1	798	OW11-SW01	798	--
Beryllium	5.00 - 5.00	1 / 1	20.1	OW11-SW01	20.1	--
Cadmium	5.00 - 5.00	1 / 1	20.7	OW11-SW01	20.7	--
Calcium	5,000 - 5,000	1 / 1	6,320	OW11-SW01	6,320	--
Chromium	10.0 - 10.0	1 / 1	80.3	OW11-SW01	80.3	--
Cobalt	50.0 - 50.0	1 / 1	187	OW11-SW01	187	--
Copper	25.0 - 25.0	1 / 1	101	OW11-SW01	101	--
Cyanide	5.00 - 5.00	0 / 1	--	--	0.10	--
Iron	100 - 100	1 / 1	1,600	OW11-SW01	1,600	--
Lead	3.00 - 3.00	1 / 1	12.4	OW11-SW01	12.4	--
Magnesium	5,000 - 5,000	1 / 1	2,220	OW11-SW01	2,220	--
Manganese	15.0 - 15.0	1 / 1	284	OW11-SW01	284	--
Mercury	0.30 - 0.30	0 / 1	--	--	0.03	--
Nickel	40.0 - 40.0	1 / 1	188	OW11-SW01	188	--
Potassium	5,000 - 5,000	1 / 1	4,830	OW11-SW01	4,830	--
Selenium	5.00 - 5.00	1 / 1	4.90	OW11-SW01	4.90	--
Silver	10.0 - 10.0	1 / 1	19.3	OW11-SW01	19.3	--
Sodium	5,000 - 5,000	1 / 1	7,130	OW11-SW01	7,130	--
Thallium	10.0 - 10.0	1 / 1	18.8	OW11-SW01	18.8	--
Vanadium	50.0 - 50.0	1 / 1	196	OW11-SW01	196	--
Zinc	20.0 - 20.0	1 / 1	220	OW11-SW01	220	--
Pesticide/Polychlorinated Biphenyls (UG/L)						
4,4'-DDD	0.10 - 0.10	0 / 1	--	--	0.05	--
4,4'-DDE	0.10 - 0.10	0 / 1	--	--	0.05	--
4,4'-DDT	0.10 - 0.10	0 / 1	--	--	0.05	--
Aldrin	0.05 - 0.05	0 / 1	--	--	0.03	--

1 - One-half of the reporting limit was used for non-detected samples.

Table 5-1 Summary Statistics - SWMU 11 - Surface Water *NAS Oceana, Virginia Beach, VA*						
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Sample Value[1]**	**Standard Deviation of Mean**
Aroclor-1016	1.00 - 1.00	0 / 1	--	--	0.50	--
Aroclor-1221	2.00 - 2.00	0 / 1	--	--	1.0	--
Aroclor-1232	1.00 - 1.00	0 / 1	--	--	0.50	--
Aroclor-1242	1.00 - 1.00	0 / 1	--	--	0.50	--
Aroclor-1248	1.00 - 1.00	0 / 1	--	--	0.50	--
Aroclor-1254	1.00 - 1.00	0 / 1	--	--	0.50	--
Aroclor-1260	1.00 - 1.00	0 / 1	--	--	0.50	--
Dieldrin	0.10 - 0.10	0 / 1	--	--	0.05	--
Endosulfan I	0.05 - 0.05	0 / 1	--	--	0.03	--
Endosulfan II	0.10 - 0.10	0 / 1	--	--	0.05	--
Endosulfan sulfate	0.10 - 0.10	0 / 1	--	--	0.05	--
Endrin	0.10 - 0.10	0 / 1	--	--	0.05	--
Endrin aldehyde	0.10 - 0.10	0 / 1	--	--	0.05	--
Endrin ketone	0.10 - 0.10	0 / 1	--	--	0.05	--
Heptachlor	0.05 - 0.05	0 / 1	--	--	0.03	--
Heptachlor epoxide	0.05 - 0.05	0 / 1	--	--	0.03	--
Methoxychlor	0.50 - 0.50	0 / 1	--	--	0.25	--
Toxaphene	5.00 - 5.00	0 / 1	--	--	2.50	--
alpha-BHC	0.05 - 0.05	0 / 1	--	--	0.03	--
alpha-Chlordane	0.05 - 0.05	0 / 1	--	--	0.03	--
beta-BHC	0.05 - 0.05	0 / 1	--	--	0.03	--
delta-BHC	0.05 - 0.05	0 / 1	--	--	0.03	--
gamma-BHC (Lindane)	0.05 - 0.05	0 / 1	--	--	0.03	--
gamma-Chlordane	0.05 - 0.05	0 / 1	--	--	0.03	--
Semi-volatile Organic Compounds (UG/L)						
1,2,4-Trichlorobenzene	10.0 - 10.0	0 / 1	--	--	5.00	--
1,2-Dichlorobenzene	10.0 - 10.0	0 / 1	--	--	5.00	--
1,3-Dichlorobenzene	10.0 - 10.0	0 / 1	--	--	5.00	--
1,4-Dichlorobenzene	10.0 - 10.0	0 / 1	--	--	5.00	--
1-Methylnaphthalene	0.50 - 0.50	0 / 1	--	--	0.25	--

1 - One-half of the reporting limit was used for non-detected samples.

Table 5-1
Summary Statistics - SWMU 11 - Surface Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Sample Value[1]	Standard Deviation of Mean
2,2'-Oxybis(1-chloropropane)	10.0 - 10.0	0 / 1	--	--	5.00	--
2,4,5-Trichlorophenol	25.0 - 25.0	0 / 1	--	--	12.5	--
2,4,6-Trichlorophenol	10.0 - 10.0	0 / 1	--	--	5.00	--
2,4-Dichlorophenol	10.0 - 10.0	0 / 1	--	--	5.00	--
2,4-Dimethylphenol	10.0 - 10.0	0 / 1	--	--	5.00	--
2,4-Dinitrophenol	25.0 - 25.0	0 / 1	--	--	12.5	--
2,4-Dinitrotoluene	10.0 - 10.0	0 / 1	--	--	5.00	--
2,6-Dinitrotoluene	10.0 - 10.0	0 / 1	--	--	5.00	--
2-Chloronaphthalene	10.0 - 10.0	0 / 1	--	--	5.00	--
2-Chlorophenol	10.0 - 10.0	0 / 1	--	--	5.00	--
2-Methylnaphthalene	0.50 - 0.50	0 / 1	--	--	0.25	--
2-Methylphenol	10.0 - 10.0	0 / 1	--	--	5.00	--
2-Nitroaniline	25.0 - 25.0	0 / 1	--	--	12.5	--
2-Nitrophenol	10.0 - 10.0	0 / 1	--	--	5.00	--
3,3'-Dichlorobenzidine	10.0 - 10.0	0 / 1	--	--	5.00	--
3-Nitroaniline	25.0 - 25.0	0 / 1	--	--	12.5	--
4,6-Dinitro-2-methylphenol	25.0 - 25.0	0 / 1	--	--	12.5	--
4-Bromophenyl-phenylether	10.0 - 10.0	0 / 1	--	--	5.00	--
4-Chloro-3-methylphenol	10.0 - 10.0	0 / 1	--	--	5.00	--
4-Chloroaniline	10.0 - 10.0	0 / 1	--	--	5.00	--
4-Chlorophenyl-phenylether	10.0 - 10.0	0 / 1	--	--	5.00	--
4-Methylphenol	10.0 - 10.0	0 / 1	--	--	5.00	--
4-Nitroaniline	25.0 - 25.0	0 / 1	--	--	12.5	--
4-Nitrophenol	25.0 - 25.0	0 / 1	--	--	12.5	--
Acenaphthene	0.50 - 0.50	0 / 1	--	--	0.25	--
Acenaphthylene	1.00 - 1.00	0 / 1	--	--	0.50	--
Anthracene	0.05 - 0.05	0 / 1	--	--	0.03	--
Benzo(a)anthracene	0.05 - 0.05	0 / 1	--	--	0.03	--
Benzo(a)pyrene	0.05 - 0.05	0 / 1	--	--	0.03	--
Benzo(b)fluoranthene	0.10 - 0.10	0 / 1	--	--	0.05	--

1 - One-half of the reporting limit was used for non-detected samples.

Table 5-1
Summary Statistics - SWMU 11 - Surface Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Sample Value[1]	Standard Deviation of Mean
Benzo(g,h,i)perylene	0.10 - 0.10	0 / 1	--	--	0.05	--
Benzo(k)fluoranthene	0.05 - 0.05	0 / 1	--	--	0.03	--
Butylbenzylphthalate	10.0 - 10.0	0 / 1	--	--	5.00	--
Carbazole	10.0 - 10.0	0 / 1	--	--	5.00	--
Chrysene	0.05 - 0.05	0 / 1	--	--	0.03	--
Di-n-butylphthalate	10.0 - 10.0	0 / 1	--	--	5.00	--
Di-n-octylphthalate	10.0 - 10.0	0 / 1	--	--	5.00	--
Dibenz(a,h)anthracene	0.10 - 0.10	0 / 1	--	--	0.05	--
Dibenzofuran	10.0 - 10.0	0 / 1	--	--	5.00	--
Diethylphthalate	10.0 - 10.0	0 / 1	--	--	5.00	--
Dimethyl phthalate	10.0 - 10.0	0 / 1	--	--	5.00	--
Fluoranthene	0.10 - 0.10	1 / 1	0.04	OW11-SW01	0.04	--
Fluorene	0.10 - 0.10	0 / 1	--	--	0.05	--
Hexachlorobenzene	10.0 - 10.0	0 / 1	--	--	5.00	--
Hexachlorobutadiene	10.0 - 10.0	0 / 1	--	--	5.00	--
Hexachlorocyclopentadiene	10.0 - 10.0	0 / 1	--	--	5.00	--
Hexachloroethane	10.0 - 10.0	0 / 1	--	--	5.00	--
Indeno(1,2,3-cd)pyrene	0.05 - 0.05	0 / 1	--	--	0.03	--
Isophorone	10.0 - 10.0	0 / 1	--	--	5.00	--
Naphthalene	0.50 - 0.50	0 / 1	--	--	0.25	--
Nitrobenzene	10.0 - 10.0	0 / 1	--	--	5.00	--
Pentachlorophenol	25.0 - 25.0	0 / 1	--	--	12.5	--
Phenanthrene	0.05 - 0.05	1 / 1	0.03	OW11-SW01	0.03	--
Phenol	10.0 - 10.0	0 / 1	--	--	5.00	--
Pyrene	0.05 - 0.05	0 / 1	--	--	0.03	--
bis(2-Chloroethoxy)methane	10.0 - 10.0	0 / 1	--	--	5.00	--
bis(2-Chloroethyl)ether	10.0 - 10.0	0 / 1	--	--	5.00	--
bis(2-Ethylhexyl)phthalate	10.0 - 10.0	0 / 1	--	--	5.00	--
n-Nitroso-di-n-propylamine	10.0 - 10.0	0 / 1	--	--	5.00	--
n-Nitrosodiphenylamine	10.0 - 10.0	0 / 1	--	--	5.00	--

1 - One-half of the reporting limit was used for non-detected samples.

Table 5-1 Summary Statistics - SWMU 11 - Surface Water *NAS Oceana, Virginia Beach, VA*						
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Sample Value[1]**	**Standard Deviation of Mean**
Volatile Organic Compounds (UG/L)						
1,1,1-Trichloroethane	10.0 - 10.0	0 / 1	--	--	5.00	--
1,1,2,2-Tetrachloroethane	10.0 - 10.0	0 / 1	--	--	5.00	--
1,1,2-Trichloroethane	10.0 - 10.0	0 / 1	--	--	5.00	--
1,1-Dichloroethane	10.0 - 10.0	0 / 1	--	--	5.00	--
1,1-Dichloroethene	10.0 - 10.0	0 / 1	--	--	5.00	--
1,2-Dichloroethane	10.0 - 10.0	0 / 1	--	--	5.00	--
1,2-Dichloroethene (total)	10.0 - 10.0	0 / 1	--	--	5.00	--
1,2-Dichloropropane	10.0 - 10.0	0 / 1	--	--	5.00	--
2-Butanone	10.0 - 10.0	0 / 1	--	--	5.00	--
2-Hexanone	10.0 - 10.0	0 / 1	--	--	5.00	--
4-Methyl-2-pentanone	10.0 - 10.0	0 / 1	--	--	5.00	--
Acetone	10.0 - 10.0	0 / 1	--	--	5.00	--
Benzene	10.0 - 10.0	0 / 1	--	--	5.00	--
Bromochloromethane	10.0 - 10.0	1 / 1	50.0	OW11-SW01	50.0	--
Bromodichloromethane	10.0 - 10.0	0 / 1	--	--	5.00	--
Bromoform	10.0 - 10.0	0 / 1	--	--	5.00	--
Bromomethane	10.0 - 10.0	0 / 1	--	--	5.00	--
Carbon disulfide	10.0 - 10.0	0 / 1	--	--	5.00	--
Carbon tetrachloride	10.0 - 10.0	0 / 1	--	--	5.00	--
Chlorobenzene	10.0 - 10.0	0 / 1	--	--	5.00	--
Chloroethane	10.0 - 10.0	0 / 1	--	--	5.00	--
Chloroform	10.0 - 10.0	0 / 1	--	--	5.00	--
Chloromethane	10.0 - 10.0	0 / 1	--	--	5.00	--
Dibromochloromethane	10.0 - 10.0	0 / 1	--	--	5.00	--
Ethylbenzene	10.0 - 10.0	0 / 1	--	--	5.00	--
Methylene chloride	10.0 - 10.0	0 / 1	--	--	1.50	--
Styrene	10.0 - 10.0	0 / 1	--	--	5.00	--
Tetrachloroethene	10.0 - 10.0	0 / 1	--	--	5.00	--
Toluene	10.0 - 10.0	0 / 1	--	--	5.00	--

1 - One-half of the reporting limit was used for non-detected samples.

Table 5-1 Summary Statistics - SWMU 11 - Surface Water *NAS Oceana, Virginia Beach, VA*						
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Sample Value[1]**	**Standard Deviation of Mean**
Trichloroethene	10.0 - 10.0	0 / 1	--	--	5.00	--
Vinyl chloride	10.0 - 10.0	0 / 1	--	--	5.00	--
Xylene, total	10.0 - 10.0	0 / 1	--	--	5.00	--
cis-1,2-Dichloroethene	10.0 - 10.0	0 / 1	--	--	5.00	--
cis-1,3-Dichloropropene	10.0 - 10.0	0 / 1	--	--	5.00	--
o-Xylene	10.0 - 10.0	0 / 1	--	--	5.00	--
trans-1,2-Dichloroethene	10.0 - 10.0	0 / 1	--	--	5.00	--
trans-1,3-Dichloropropene	10.0 - 10.0	0 / 1	--	--	5.00	--

1 - One-half of the reporting limit was used for non-detected samples.

Table 5-2 Summary Statistics - SWMU 11 - Sediment *NAS Oceana, Virginia Beach, VA*						
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Arithmetic Mean[1]**	**Standard Deviation of Mean**
Inorganics (MG/KG)						
Aluminum	40.1 - 54.6	3 / 3	9,750	OW11-SD02	5,977	4,096
Antimony	12.0 - 16.4	0 / 3	--	--	0.25	0.05
Arsenic	2.00 - 2.70	2 / 3	1.50	OW11-SD02	1.08	0.64
Barium	40.1 - 54.6	2 / 3	51.7	OW11-SD02	29.2	24.3
Beryllium	1.00 - 1.40	2 / 3	0.23	OW11-SD03	0.17	0.09
Cadmium	1.00 - 1.40	0 / 3	--	--	0.12	0.09
Calcium	1,003 - 1,364	1 / 3	1,160	OW11-SD02	457	609
Chromium	2.00 - 2.70	3 / 3	12.5	OW11-SD02	7.73	4.85
Cobalt	10.0 - 13.6	0 / 3	--	--	0.70	0.13
Copper	5.00 - 6.80	3 / 3	6.60	OW11-SD02	4.07	2.41
Cyanide	0.60 - 0.90	1 / 3	0.02	OW11-SD03	0.02	0.005
Iron	20.1 - 27.3	3 / 3	3,140	OW11-SD02	1,992	1,241
Lead	0.60 - 0.80	3 / 3	72.3	OW11-SD03	32.4	35.8
Magnesium	1,003 - 1,364	3 / 3	625	OW11-SD02	340	260
Manganese	3.00 - 4.10	3 / 3	39.5	OW11-SD02	17.7	18.9
Mercury	0.10 - 0.10	3 / 3	0.07	OW11-SD02	0.05	0.02
Nickel	8.00 - 10.9	3 / 3	6.20	OW11-SD02	3.83	2.40
Potassium	1,003 - 1,364	1 / 3	527	OW11-SD02	219	267
Selenium	1.00 - 1.40	0 / 3	--	--	0.34	0.06
Silver	2.00 - 2.70	0 / 3	--	--	0.45	0.09
Sodium	1,003 - 1,364	0 / 3	--	--	26.2	5.61
Thallium	2.00 - 2.70	1 / 3	0.79	OW11-SD02	0.42	0.32
Vanadium	10.0 - 13.6	3 / 3	14.1	OW11-SD02	8.20	6.06
Zinc	4.00 - 5.50	0 / 3	--	--	7.98	7.17
Pesticide/Polychlorinated Biphenyls (UG/KG)						
4,4'-DDD	3.90 - 5.27	0 / 3	--	--	2.20	0.38
4,4'-DDE	3.90 - 5.27	0 / 3	--	--	2.20	0.38
4,4'-DDT	3.90 - 5.27	0 / 3	--	--	2.20	0.38
Aldrin	2.01 - 2.71	0 / 3	--	--	1.13	0.20

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 5-2
Summary Statistics - SWMU 11 - Sediment
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Aroclor-1016	39.0 - 52.7	0 / 3	--	--	22.0	3.82
Aroclor-1221	79.2 - 107	0 / 3	--	--	44.6	7.75
Aroclor-1232	39.0 - 52.7	0 / 3	--	--	22.0	3.82
Aroclor-1242	39.0 - 52.7	0 / 3	--	--	22.0	3.82
Aroclor-1248	39.0 - 52.7	0 / 3	--	--	22.0	3.82
Aroclor-1254	39.0 - 52.7	0 / 3	--	--	22.0	3.82
Aroclor-1260	39.0 - 52.7	0 / 3	--	--	22.0	3.82
Dieldrin	3.90 - 5.27	0 / 3	--	--	2.20	0.38
Endosulfan I	2.01 - 2.71	0 / 3	--	--	1.13	0.20
Endosulfan II	3.90 - 5.27	0 / 3	--	--	2.20	0.38
Endosulfan sulfate	3.90 - 5.27	0 / 3	--	--	2.20	0.38
Endrin	3.90 - 5.27	0 / 3	--	--	2.20	0.38
Endrin aldehyde	3.90 - 5.27	0 / 3	--	--	2.20	0.38
Endrin ketone	3.90 - 5.27	0 / 3	--	--	2.20	0.38
Heptachlor	2.01 - 2.71	0 / 3	--	--	1.13	0.20
Heptachlor epoxide	2.01 - 2.71	0 / 3	--	--	1.13	0.20
Methoxychlor	20.1 - 27.2	0 / 3	--	--	11.3	1.97
Toxaphene	201 - 271	0 / 3	--	--	113	19.7
alpha-BHC	2.01 - 2.71	0 / 3	--	--	1.13	19.7
alpha-Chlordane	2.01 - 2.71	0 / 3	--	--	1.13	19.7
beta-BHC	2.01 - 2.71	0 / 3	--	--	1.13	19.7
delta-BHC	2.01 - 2.71	0 / 3	--	--	1.13	19.7
gamma-BHC (Lindane)	2.01 - 2.71	0 / 3	--	--	1.13	19.7
gamma-Chlordane	2.01 - 2.71	0 / 3	--	--	1.13	19.7
Semi-volatile Organic Compounds (UG/KG)						
1,2,4-Trichlorobenzene	390 - 530	0 / 3	--	--	220	39.1
1,2-Dichlorobenzene	390 - 530	0 / 3	--	--	220	39.1
1,3-Dichlorobenzene	390 - 530	0 / 3	--	--	220	39.1
1,4-Dichlorobenzene	390 - 530	0 / 3	--	--	220	39.1
1-Methylnaphthalene	20.0 - 27.0	0 / 3	--	--	11.2	2.02

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 5-2 Summary Statistics - SWMU 11 - Sediment *NAS Oceana, Virginia Beach, VA*						
Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
2,2'-Oxybis(1-chloropropane)	390 - 530	0 / 3	--	--	220	39.1
2,4,5-Trichlorophenol	980 - 1,300	0 / 3	--	--	547	89.6
2,4,6-Trichlorophenol	390 - 530	0 / 3	--	--	220	39.1
2,4-Dichlorophenol	390 - 530	0 / 3	--	--	220	39.1
2,4-Dimethylphenol	390 - 530	0 / 3	--	--	220	39.1
2,4-Dinitrophenol	980 - 1,300	0 / 3	--	--	547	89.6
2,4-Dinitrotoluene	390 - 530	0 / 3	--	--	220	39.1
2,6-Dinitrotoluene	390 - 530	0 / 3	--	--	220	39.1
2-Chloronaphthalene	390 - 530	0 / 3	--	--	220	39.1
2-Chlorophenol	390 - 530	0 / 3	--	--	220	39.1
2-Methylnaphthalene	20.0 - 27.0	0 / 3	--	--	11.2	2.02
2-Methylphenol	390 - 530	0 / 3	--	--	220	39.1
2-Nitroaniline	980 - 1,300	0 / 3	--	--	547	89.6
2-Nitrophenol	390 - 530	0 / 3	--	--	220	39.1
3,3'-Dichlorobenzidine	390 - 530	0 / 3	--	--	220	39.1
3-Nitroaniline	980 - 1,300	0 / 3	--	--	547	89.6
4,6-Dinitro-2-methylphenol	980 - 1,300	0 / 3	--	--	547	89.6
4-Bromophenyl-phenylether	390 - 530	0 / 3	--	--	220	39.1
4-Chloro-3-methylphenol	390 - 530	0 / 3	--	--	220	39.1
4-Chloroaniline	390 - 530	0 / 3	--	--	220	39.1
4-Chlorophenyl-phenylether	390 - 530	0 / 3	--	--	220	39.1
4-Methylphenol	390 - 530	0 / 3	--	--	220	39.1
4-Nitroaniline	980 - 1,300	0 / 3	--	--	547	89.6
4-Nitrophenol	980 - 1,300	0 / 3	--	--	547	89.6
Acenaphthene	20.0 - 27.0	0 / 3	--	--	11.2	2.02
Acenaphthylene	39.0 - 53.0	0 / 3	--	--	22	3.91
Anthracene	2.00 - 3.00	0 / 3	--	--	1.17	0.29
Benzo(a)anthracene	2.00 - 3.00	0 / 3	--	--	1.17	0.29
Benzo(a)pyrene	2.00 - 3.00	1 / 3	1.50	OW11-SD01	1.33	0.29
Benzo(b)fluoranthene	3.90 - 5.30	0 / 3	--	--	2.2	0.39

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 5-2
Summary Statistics - SWMU 11 - Sediment
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Benzo(g,h,i)perylene	3.90 - 5.30	1 / 3	5.40	OW11-SD01	3.33	1.82
Benzo(k)fluoranthene	2.00 - 3.00	1 / 3	1.00	OW11-SD01	1.17	0.29
Butylbenzylphthalate	390 - 530	0 / 3	--	--	220	39.1
Carbazole	390 - 530	0 / 3	--	--	220	39.1
Chrysene	2.00 - 3.00	0 / 3	--	--	1.17	0.29
Di-n-butylphthalate	390 - 530	0 / 3	--	--	45.8	22.1
Di-n-octylphthalate	390 - 530	0 / 3	--	--	220	39.1
Dibenz(a,h)anthracene	3.90 - 5.30	0 / 3	--	--	2.20	0.39
Dibenzofuran	390 - 530	0 / 3	--	--	220	39.1
Diethylphthalate	390 - 530	0 / 3	--	--	220	39.1
Dimethyl phthalate	390 - 530	0 / 3	--	--	220	39.1
Fluoranthene	3.90 - 5.30	1 / 3	8.80	OW11-SD02	4.25	3.94
Fluorene	3.90 - 5.30	3 / 3	14.0	OW11-SD02	8.73	5.02
Hexachlorobenzene	390 - 530	0 / 3	--	--	220	39.1
Hexachlorobutadiene	390 - 530	0 / 3	--	--	220	39.1
Hexachlorocyclopentadiene	390 - 530	0 / 3	--	--	220	39.1
Hexachloroethane	390 - 530	0 / 3	--	--	220	39.1
Indeno(1,2,3-cd)pyrene	2.00 - 3.00	2 / 3	4.00	OW11-SD02	2.27	1.55
Isophorone	390 - 530	0 / 3	--	--	220	39.1
Naphthalene	20.0 - 27.0	0 / 3	--	--	11.2	2.02
Nitrobenzene	390 - 530	0 / 3	--	--	220	39.1
Pentachlorophenol	980 - 1,300	0 / 3	--	--	547	89.6
Phenanthrene	2.00 - 3.00	0 / 3	--	--	1.17	0.29
Phenol	390 - 530	0 / 3	--	--	220	39.1
Pyrene	2.00 - 3.00	0 / 3	--	--	1.17	0.29
bis(2-Chloroethoxy)methane	390 - 530	0 / 3	--	--	220	39.1
bis(2-Chloroethyl)ether	390 - 530	0 / 3	--	--	220	39.1
bis(2-Ethylhexyl)phthalate	390 - 530	1 / 3	58.0	OW11-SD02	151	80.6
n-Nitroso-di-n-propylamine	390 - 530	0 / 3	--	--	220	39.1
n-Nitrosodiphenylamine	390 - 530	0 / 3	--	--	220	39.1

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 5-2 Summary Statistics - SWMU 11 - Sediment *NAS Oceana, Virginia Beach, VA*						
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Arithmetic Mean[1]**	**Standard Deviation of Mean**
Volatile Organic Compounds (UG/KG)						
1,1,1-Trichloroethane	11.7 - 15.3	0 / 3	--	--	6.37	1.10
1,1,2,2-Tetrachloroethane	11.7 - 15.3	0 / 3	--	--	6.37	1.10
1,1,2-Trichloroethane	11.7 - 15.3	0 / 3	--	--	6.37	1.10
1,1-Dichloroethane	11.7 - 15.3	0 / 3	--	--	6.37	1.10
1,1-Dichloroethene	11.7 - 15.3	0 / 3	--	--	6.37	1.10
1,2-Dichloroethane	11.7 - 15.3	0 / 3	--	--	6.37	1.10
1,2-Dichloroethene (total)	11.7 - 15.3	0 / 3	--	--	6.37	1.10
1,2-Dichloropropane	11.7 - 15.3	0 / 3	--	--	6.37	1.10
2-Butanone	11.7 - 15.3	0 / 3	--	--	1.83	0.58
2-Hexanone	11.7 - 15.3	0 / 3	--	--	6.37	1.10
4-Methyl-2-pentanone	11.7 - 15.3	0 / 3	--	--	6.37	1.10
Acetone	11.7 - 15.3	0 / 3	--	--	7.5	7.09
Benzene	11.7 - 15.3	0 / 3	--	--	6.37	1.10
Bromochloromethane	11.7 - 15.3	3 / 3	50.0	OW11-SD01	50.0	0
Bromodichloromethane	11.7 - 15.3	0 / 3	--	--	6.37	1.10
Bromoform	11.7 - 15.3	0 / 3	--	--	6.37	1.10
Bromomethane	11.7 - 15.3	0 / 3	--	--	6.37	1.10
Carbon disulfide	11.7 - 15.3	0 / 3	--	--	6.37	1.10
Carbon tetrachloride	11.7 - 15.3	0 / 3	--	--	6.37	1.10
Chlorobenzene	11.7 - 15.3	0 / 3	--	--	6.37	1.10
Chloroethane	11.7 - 15.3	0 / 3	--	--	6.37	1.10
Chloroform	11.7 - 15.3	0 / 3	--	--	6.37	1.10
Chloromethane	11.7 - 15.3	0 / 3	--	--	6.37	1.10
Dibromochloromethane	11.7 - 15.3	0 / 3	--	--	6.37	1.10
Ethylbenzene	11.7 - 15.3	0 / 3	--	--	6.37	1.10
Methylene chloride	11.7 - 15.3	0 / 3	--	--	12.7	5.48
Styrene	11.7 - 15.3	0 / 3	--	--	6.37	1.10
Tetrachloroethene	11.7 - 15.3	0 / 3	--	--	6.37	1.10
Toluene	11.7 - 15.3	0 / 3	--	--	6.37	1.10

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 5-2
Summary Statistics - SWMU 11 - Sediment
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Trichloroethene	11.7 - 15.3	0 / 3	--	--	6.37	1.10
Vinyl chloride	11.7 - 15.3	0 / 3	--	--	6.37	1.10
Xylene, total	11.7 - 15.3	0 / 3	--	--	6.37	1.10
cis-1,2-Dichloroethene	11.7 - 15.3	0 / 3	--	--	6.37	1.10
cis-1,3-Dichloropropene	11.7 - 15.3	0 / 3	--	--	6.37	1.10
o-Xylene	11.7 - 15.3	0 / 3	--	--	6.37	1.10
trans-1,2-Dichloroethene	11.7 - 15.3	0 / 3	--	--	6.37	1.10
trans-1,3-Dichloropropene	11.7 - 15.3	0 / 3	--	--	6.37	1.10

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 5-3
Summary Statistics - SWMU 11 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Sample Value[1]	Standard Deviation of Mean
Semi-volatile Organic Compounds (UG/KG)						
1-Methylnaphthalene	110 - 110	0 / 1	--	--	55.0	--
2-Methylnaphthalene	110 - 110	0 / 1	--	--	55.0	--
Acenaphthene	110 - 110	0 / 1	--	--	55.0	--
Acenaphthylene	110 - 110	0 / 1	--	--	55.0	--
Anthracene	110 - 110	0 / 1	--	--	55.0	--
Benzo(a)anthracene	110 - 110	0 / 1	--	--	55.0	--
Benzo(a)pyrene	110 - 110	0 / 1	--	--	55.0	--
Benzo(b)fluoranthene	110 - 110	0 / 1	--	--	55.0	--
Benzo(g,h,i)perylene	110 - 110	0 / 1	--	--	55.0	--
Benzo(k)fluoranthene	110 - 110	0 / 1	--	--	55.0	--
Chrysene	110 - 110	0 / 1	--	--	55.0	--
Dibenz(a,h)anthracene	110 - 110	0 / 1	--	--	55.0	--
Fluoranthene	110 - 110	0 / 1	--	--	55.0	--
Fluorene	110 - 110	0 / 1	--	--	55.0	--
Indeno(1,2,3-cd)pyrene	110 - 110	0 / 1	--	--	55.0	--
Naphthalene	110 - 110	0 / 1	--	--	55.0	--
Phenanthrene	110 - 110	0 / 1	--	--	55.0	--
Pyrene	110 - 110	0 / 1	--	--	55.0	--
Volatile Organic Compounds (UG/KG)						
1,1,1-Trichloroethane	6.00 - 6.00	0 / 1	--	--	3.00	--
1,1,2,2-Tetrachloroethane	6.00 - 6.00	0 / 1	--	--	3.00	--
1,1,2-Trichloroethane	6.00 - 6.00	0 / 1	--	--	3.00	--
1,1-Dichloroethane	6.00 - 6.00	0 / 1	--	--	3.00	--
1,1-Dichloroethene	6.00 - 6.00	0 / 1	--	--	3.00	--
1,2,3-Trichloropropane	6.00 - 6.00	0 / 1	--	--	3.00	--
1,2-Dichlorobenzene	6.00 - 6.00	0 / 1	--	--	3.00	--
1,2-Dichloroethane	6.00 - 6.00	0 / 1	--	--	3.00	--
1,2-Dichloroethene (total)	6.00 - 6.00	0 / 1	--	--	3.00	--
1,2-Dichloropropane	6.00 - 6.00	0 / 1	--	--	3.00	--

1 - One-half of the reporting limit was used for non-detected samples.

Table 5-3
Summary Statistics - SWMU 11 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Sample Value[1]	Standard Deviation of Mean
1,3-Dichlorobenzene	6.00 - 6.00	0 / 1	--	--	3.00	--
1,4-Dichlorobenzene	6.00 - 6.00	0 / 1	--	--	3.00	--
2-Butanone	11.0 - 11.0	0 / 1	--	--	5.50	--
2-Chloroethyl vinyl ether	11.0 - 11.0	0 / 1	--	--	5.50	--
2-Hexanone	11.0 - 11.0	0 / 1	--	--	5.50	--
4-Methyl-2-pentanone	11.0 - 11.0	0 / 1	--	--	5.50	--
Acetone	-- - --	1 / 1	65.0	OW11-SS10-1-94A	65.0	--
Acrolein	110 - 110	0 / 1	--	--	55.0	--
Acrylonitrile	110 - 110	0 / 1	--	--	55.0	--
Benzene	6.00 - 6.00	0 / 1	--	--	3.00	--
Bromodichloromethane	6.00 - 6.00	0 / 1	--	--	3.00	--
Bromoform	6.00 - 6.00	0 / 1	--	--	3.00	--
Bromomethane	11.0 - 11.0	0 / 1	--	--	5.50	--
Carbon disulfide	6.00 - 6.00	0 / 1	--	--	3.00	--
Carbon tetrachloride	6.00 - 6.00	0 / 1	--	--	3.00	--
Chlorobenzene	6.00 - 6.00	0 / 1	--	--	3.00	--
Chloroethane	11.0 - 11.0	0 / 1	--	--	5.50	--
Chloroform	6.00 - 6.00	0 / 1	--	--	3.00	--
Chloromethane	11.0 - 11.0	0 / 1	--	--	5.50	--
Dibromochloromethane	6.00 - 6.00	0 / 1	--	--	3.00	--
Dibromomethane	6.00 - 6.00	0 / 1	--	--	3.00	--
Ethyl methacrylate	6.00 - 6.00	0 / 1	--	--	3.00	--
Ethylbenzene	6.00 - 6.00	0 / 1	--	--	3.00	--
Iodomethane	11.0 - 11.0	0 / 1	--	--	5.50	--
Methylene chloride	-- - --	0 / 1	--	--	7.50	--
Styrene	6.00 - 6.00	0 / 1	--	--	3.00	--
Tetrachloroethene	6.00 - 6.00	0 / 1	--	--	3.00	--
Toluene	-- - --	1 / 1	2.00	OW11-SS10-1-94A	2.00	--
Trichloroethene	6.00 - 6.00	0 / 1	--	--	3.00	--
Trichlorofluoromethane	6.00 - 6.00	0 / 1	--	--	3.00	--

1 - One-half of the reporting limit was used for non-detected samples.

Table 5-3 Summary Statistics - SWMU 11 - Surface Soil *NAS Oceana, Virginia Beach, VA*						
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Sample Value[1]**	**Standard Deviation of Mean**
Vinyl acetate	11.0 - 11.0	0 / 1	--	--	5.50	--
Vinyl chloride	2.00 - 2.00	0 / 1	--	--	1.00	--
Xylene, total	-- - --	1 / 1	2.00	OW11-SS10-1-94A	2.00	--
cis-1,3-Dichloropropene	6.00 - 6.00	0 / 1	--	--	3.00	--
trans-1,3-Dichloropropene	6.00 - 6.00	0 / 1	--	--	3.00	--
Total Petroleum Hydrocarbons (MG/KG)						
Total petroleum hydrocarbons (TPH)	-- - --	5 / 5	607	OW11-SS12-94A	281	215

1 - One-half of the reporting limit was used for non-detected samples.

Table 5-4
Preliminary Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - SWMU 11
NAS Oceana, Virginia Beach, VA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor
Terrestrial Habitats			
Survival, growth, and reproduction of terrestrial soil invertebrate communities.	Are site-related surface soil concentrations sufficient to adversely effect soil invertebrate communities based on conservative screening values?	Comparison of maximum chemical concentrations in surface soil with soil screening values.	Soil Invertebrates (earthworms)
Survival, growth, and reproduction of terrestrial plant communities.	Are site-related surface soil concentrations sufficient to adversely effect terrestrial plant communities based on conservative screening values?	Comparison of maximum chemical concentrations in surface soil with soil screening values.	Terrestrial plants
Survival, growth, and reproduction of avian terrestrial insectivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume 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 soil concentrations.	American robin
Survival, growth, and reproduction of avian terrestrial carnivores.	Are site-related chemical concentrations in surface soils 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 soil concentrations.	American kestrel
Survival, growth, and reproduction of mammalian terrestrial insectivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume 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 soil concentrations.	Short-tailed shrew
Survival, growth, and reproduction of mammalian terrestrial omnivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume plants and 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 soil concentrations.	Deer Mouse
Survival, growth, and reproduction of mammalian terrestrial herbivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume 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 soil concentrations.	Meadow vole

Table 5-4
Preliminary Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - SWMU 11
NAS Oceana, Virginia Beach, VA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor
Survival, growth, and reproduction of mammalian terrestrial carnivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian 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 soil concentrations.	Red fox
Survival, growth, and reproduction of terrestrial reptiles.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to terrestrial reptilian species?	Evidence of potential risk to other upper trophic level terrestrial receptors evaluated in the baseline ERA.	--
Wetland and Aquatic Habitats			
Survival, growth, and reproduction of benthic invertebrate communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect benthic invertebrate communities?	Comparison of maximum chemical concentrations in surface water and/or sediment with medium-specific screening values.	Benthic invertebrates
Survival, growth, and reproduction of aquatic and wetland plant communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect aquatic or wetland plant communities?	Comparison of maximum chemical concentrations in surface water and/or sediment with medium-specific screening values.	Aquatic/wetland plants
Survival, growth, and reproduction of amphibian communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect amphibian communities?	Comparison of maximum chemical concentrations in surface water and/or sediment with medium-specific screening values.	Amphibians
Survival, growth, and reproduction of amphibians.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to amphibian species that may consume aquatic invertebrates from the site?	Evidence of potential risk to other upper trophic level aquatic and wetland receptors evaluated in the baseline ERA.	--
Survival, growth, and reproduction of wetland reptiles.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to aquatic/wetland reptile species?	Evidence of potential risk to other upper trophic level aquatic and wetland receptors evaluated in the baseline ERA.	--

Table 5-4
Preliminary Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - SWMU 11
NAS Oceana, Virginia Beach, VA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor
Survival, growth, and reproduction of avian aquatic/wetland insectivores.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume aquatic 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 surface water and/or sediment concentrations.	Marsh wren
Survival, growth, and reproduction of avian aquatic/wetland omnivores.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume aquatic plants and 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 surface water and/or sediment concentrations.	Mallard
Survival, growth, and reproduction of mammalian aquatic/wetland omnivores.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume aquatic plants and 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 surface water and/or sediment concentrations.	Raccoon

Table 5-5
Preliminary Screening Statistics - SWMU 11 - Surface Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Inorganics (UG/L)								
Aluminum	200 - 200	1 / 1	3,070	OW11-SW01	87.0	1 / 1	35.3	**YES**
Antimony	60.0 - 60.0	1 / 1	184	OW11-SW01	30.0	1 / 1	6.13	**YES**
Arsenic	10.0 - 10.0	1 / 1	14.3	OW11-SW01	150	0 / 1	0.10	NO
Barium	200 - 200	1 / 1	798	OW11-SW01	1,000	0 / 1	0.80	NO
Beryllium	5.00 - 5.00	1 / 1	20.1	OW11-SW01	5.30	1 / 1	3.79	**YES**
Cadmium	5.00 - 5.00	1 / 1	20.7	OW11-SW01	0.83	1 / 1	25.0	**YES**
Calcium [2]	5,000 - 5,000	1 / 1	6,320	OW11-SW01	NSV	-- / --	NSV	NO
Chromium	10.0 - 10.0	1 / 1	80.3	OW11-SW01	11.4	1 / 1	7.04	**YES**
Cobalt	50.0 - 50.0	1 / 1	187	OW11-SW01	23.0	1 / 1	8.13	**YES**
Copper	25.0 - 25.0	1 / 1	101	OW11-SW01	2.84	1 / 1	35.6	**YES**
Cyanide	5.00 - 5.00	0 / 1	--	--	5.20	-- / --	0.96	NO
Iron	100 - 100	1 / 1	1,600	OW11-SW01	320	1 / 1	5.00	**YES**
Lead	3.00 - 3.00	1 / 1	12.4	OW11-SW01	0.54	1 / 1	22.8	**YES**
Magnesium [2]	5,000 - 5,000	1 / 1	2,220	OW11-SW01	NSV	-- / --	NSV	NO
Manganese	15.0 - 15.0	1 / 1	284	OW11-SW01	120	1 / 1	2.37	**YES**
Mercury	0.30 - 0.30	0 / 1	--	--	0.91	-- / --	0.33	NO
Nickel	40.0 - 40.0	1 / 1	188	OW11-SW01	16.1	1 / 1	11.6	**YES**
Potassium [2]	5,000 - 5,000	1 / 1	4,830	OW11-SW01	NSV	-- / --	NSV	NO
Selenium	5.00 - 5.00	1 / 1	4.90	OW11-SW01	5.00	0 / 1	0.98	NO
Silver	10.0 - 10.0	1 / 1	19.3	OW11-SW01	0.36	1 / 1	53.6	**YES**
Sodium [2]	5,000 - 5,000	1 / 1	7,130	OW11-SW01	NSV	-- / --	NSV	NO
Thallium	10.0 - 10.0	1 / 1	18.8	OW11-SW01	40.0	0 / 1	0.47	NO
Vanadium	50.0 - 50.0	1 / 1	196	OW11-SW01	10,000	0 / 1	0.02	NO
Zinc	20.0 - 20.0	1 / 1	220	OW11-SW01	37.0	1 / 1	5.94	**YES**
Pesticide/Polychlorinated Biphenyls (UG/L)								
4,4'-DDD	0.10 - 0.10	0 / 1	--	--	0.06	-- / --	1.67	**YES**
4,4'-DDE	0.10 - 0.10	0 / 1	--	--	105	-- / --	0.0010	NO
4,4'-DDT	0.10 - 0.10	0 / 1	--	--	0.001	-- / --	100	**YES**

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 5-5
Preliminary Screening Statistics - SWMU 11 - Surface Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Aldrin	0.05 - 0.05	0 / 1	--	--	0.30	-- / --	0.17	NO
Aroclor-1016	1.00 - 1.00	0 / 1	--	--	0.01	-- / --	71.4	**YES**
Aroclor-1221	2.00 - 2.00	0 / 1	--	--	0.28	-- / --	7.14	**YES**
Aroclor-1232	1.00 - 1.00	0 / 1	--	--	0.58	-- / --	1.72	**YES**
Aroclor-1242	1.00 - 1.00	0 / 1	--	--	0.05	-- / --	18.9	**YES**
Aroclor-1248	1.00 - 1.00	0 / 1	--	--	0.08	-- / --	12.3	**YES**
Aroclor-1254	1.00 - 1.00	0 / 1	--	--	0.03	-- / --	30.3	**YES**
Aroclor-1260	1.00 - 1.00	0 / 1	--	--	94.0	-- / --	0.01	NO
Dieldrin	0.10 - 0.10	0 / 1	--	--	0.06	-- / --	1.79	**YES**
Endosulfan I	0.05 - 0.05	0 / 1	--	--	0.06	-- / --	0.89	NO
Endosulfan II	0.10 - 0.10	0 / 1	--	--	0.06	-- / --	1.79	**YES**
Endosulfan sulfate	0.10 - 0.10	0 / 1	--	--	0.06	-- / --	1.79	**YES**
Endrin	0.10 - 0.10	0 / 1	--	--	0.04	-- / --	2.78	**YES**
Endrin aldehyde	0.10 - 0.10	0 / 1	--	--	0.04	-- / --	2.78	**YES**
Endrin ketone	0.10 - 0.10	0 / 1	--	--	0.04	-- / --	2.78	**YES**
Heptachlor	0.05 - 0.05	0 / 1	--	--	0.007	-- / --	7.25	**YES**
Heptachlor epoxide	0.05 - 0.05	0 / 1	--	--	0.007	-- / --	7.25	**YES**
Methoxychlor	0.50 - 0.50	0 / 1	--	--	0.03	-- / --	16.7	**YES**
Toxaphene	5.00 - 5.00	0 / 1	--	--	0.01	-- / --	455	**YES**
alpha-BHC	0.05 - 0.05	0 / 1	--	--	2.20	-- / --	0.02	NO
alpha-Chlordane	0.05 - 0.05	0 / 1	--	--	0.17	-- / --	0.29	NO
beta-BHC	0.05 - 0.05	0 / 1	--	--	2.20	-- / --	0.02	NO
delta-BHC	0.05 - 0.05	0 / 1	--	--	2.20	-- / --	0.02	NO
gamma-BHC (Lindane)	0.05 - 0.05	0 / 1	--	--	0.08	-- / --	0.63	NO
gamma-Chlordane	0.05 - 0.05	0 / 1	--	--	0.17	-- / --	0.29	NO
Semi-volatile Organic Compounds (UG/L)								
1,2,4-Trichlorobenzene	10.0 - 10.0	0 / 1	--	--	50.0	-- / --	0.20	NO
1,2-Dichlorobenzene	10.0 - 10.0	0 / 1	--	--	763	-- / --	0.01	NO
1,3-Dichlorobenzene	10.0 - 10.0	0 / 1	--	--	763	-- / --	0.01	NO
1,4-Dichlorobenzene	10.0 - 10.0	0 / 1	--	--	763	-- / --	0.01	NO

NSV - *No Screening Value*
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 5-5 Preliminary Screening Statistics - SWMU 11 - Surface Water *NAS Oceana, Virginia Beach, VA*								
Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
1-Methylnaphthalene	0.50 - 0.50	0 / 1	--	--	NSV	-- / --	NSV	**YES**
2,2'-Oxybis(1-chloropropane)	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	**YES**
2,4,5-Trichlorophenol	25.0 - 25.0	0 / 1	--	--	63.0	-- / --	0.40	NO
2,4,6-Trichlorophenol	10.0 - 10.0	0 / 1	--	--	970	-- / --	0.01	NO
2,4-Dichlorophenol	10.0 - 10.0	0 / 1	--	--	365	-- / --	0.03	NO
2,4-Dimethylphenol	10.0 - 10.0	0 / 1	--	--	530	-- / --	0.02	NO
2,4-Dinitrophenol	25.0 - 25.0	0 / 1	--	--	150	-- / --	0.17	NO
2,4-Dinitrotoluene	10.0 - 10.0	0 / 1	--	--	230	-- / --	0.04	NO
2,6-Dinitrotoluene	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	**YES**
2-Chloronaphthalene	10.0 - 10.0	0 / 1	--	--	620	-- / --	0.02	NO
2-Chlorophenol	10.0 - 10.0	0 / 1	--	--	97.0	-- / --	0.10	NO
2-Methylnaphthalene	0.50 - 0.50	0 / 1	--	--	NSV	-- / --	NSV	**YES**
2-Methylphenol	10.0 - 10.0	0 / 1	--	--	13.0	-- / --	0.77	NO
2-Nitroaniline	25.0 - 25.0	0 / 1	--	--	NSV	-- / --	NSV	**YES**
2-Nitrophenol	10.0 - 10.0	0 / 1	--	--	150	-- / --	0.07	NO
3,3'-Dichlorobenzidine	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	**YES**
3-Nitroaniline	25.0 - 25.0	0 / 1	--	--	NSV	-- / --	NSV	**YES**
4,6-Dinitro-2-methylphenol	25.0 - 25.0	0 / 1	--	--	2.30	-- / --	10.9	**YES**
4-Bromophenyl-phenylether	10.0 - 10.0	0 / 1	--	--	1.50	-- / --	6.67	**YES**
4-Chloro-3-methylphenol	10.0 - 10.0	0 / 1	--	--	0.30	-- / --	33.3	**YES**
4-Chloroaniline	10.0 - 10.0	0 / 1	--	--	50.0	-- / --	0.20	NO
4-Chlorophenyl-phenylether	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	**YES**
4-Methylphenol	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	**YES**
4-Nitroaniline	25.0 - 25.0	0 / 1	--	--	NSV	-- / --	NSV	**YES**
4-Nitrophenol	25.0 - 25.0	0 / 1	--	--	150	-- / --	0.17	NO
Acenaphthene	0.50 - 0.50	0 / 1	--	--	520	-- / --	0.0010	NO
Acenaphthylene	1.00 - 1.00	0 / 1	--	--	NSV	-- / --	NSV	**YES**
Anthracene	0.05 - 0.05	0 / 1	--	--	0.73	-- / --	0.07	NO
Benzo(a)anthracene	0.05 - 0.05	0 / 1	--	--	6.30	-- / --	0.008	NO
Benzo(a)pyrene	0.05 - 0.05	0 / 1	--	--	0.01	-- / --	3.57	**YES**

NSV - No Screening Value
Shaded Cells Indicate Hazard Quotient based on Reporting Limit

Table 5-5
Preliminary Screening Statistics - SWMU 11 - Surface Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Benzo(b)fluoranthene	0.10 - 0.10	0 / 1	--	--	NSV	-- / --	NSV	**YES**
Benzo(g,h,i)perylene	0.10 - 0.10	0 / 1	--	--	NSV	-- / --	NSV	**YES**
Benzo(k)fluoranthene	0.05 - 0.05	0 / 1	--	--	NSV	-- / --	NSV	**YES**
Butylbenzylphthalate	10.0 - 10.0	0 / 1	--	--	22.0	-- / --	0.45	NO
Carbazole	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	**YES**
Chrysene	0.05 - 0.05	0 / 1	--	--	NSV	-- / --	NSV	**YES**
Di-n-butylphthalate	10.0 - 10.0	0 / 1	--	--	33.0	-- / --	0.30	NO
Di-n-octylphthalate	10.0 - 10.0	0 / 1	--	--	3.00	-- / --	3.33	**YES**
Dibenz(a,h)anthracene	0.10 - 0.10	0 / 1	--	--	NSV	-- / --	NSV	**YES**
Dibenzofuran	10.0 - 10.0	0 / 1	--	--	20.0	-- / --	0.50	NO
Diethylphthalate	10.0 - 10.0	0 / 1	--	--	220	-- / --	0.05	NO
Dimethyl phthalate	10.0 - 10.0	0 / 1	--	--	330	-- / --	0.03	NO
Fluoranthene	0.10 - 0.10	1 / 1	0.04	OW11-SW01	398	0 / 1	0.0001	NO
Fluorene	0.10 - 0.10	0 / 1	--	--	430	-- / --	0.0002	NO
Hexachlorobenzene	10.0 - 10.0	0 / 1	--	--	3.68	-- / --	2.72	**YES**
Hexachlorobutadiene	10.0 - 10.0	0 / 1	--	--	9.30	-- / --	1.08	**YES**
Hexachlorocyclopentadiene	10.0 - 10.0	0 / 1	--	--	5.20	-- / --	1.92	**YES**
Hexachloroethane	10.0 - 10.0	0 / 1	--	--	540	-- / --	0.02	NO
Indeno(1,2,3-cd)pyrene	0.05 - 0.05	0 / 1	--	--	NSV	-- / --	NSV	**YES**
Isophorone	10.0 - 10.0	0 / 1	--	--	11,700	-- / --	0.0009	NO
Naphthalene	0.50 - 0.50	0 / 1	--	--	100	-- / --	0.005	NO
Nitrobenzene	10.0 - 10.0	0 / 1	--	--	2,700	-- / --	0.004	NO
Pentachlorophenol	25.0 - 25.0	0 / 1	--	--	6.69	-- / --	3.74	**YES**
Phenanthrene	0.05 - 0.05	1 / 1	0.03	OW11-SW01	6.30	0 / 1	0.005	NO
Phenol	10.0 - 10.0	0 / 1	--	--	256	-- / --	0.04	NO
Pyrene	0.05 - 0.05	0 / 1	--	--	NSV	-- / --	NSV	**YES**
bis(2-Chloroethoxy)methane	10.0 - 10.0	0 / 1	--	--	1,100	-- / --	0.009	NO
bis(2-Chloroethyl)ether	10.0 - 10.0	0 / 1	--	--	2,380	-- / --	0.004	NO
bis(2-Ethylhexyl)phthalate	10.0 - 10.0	0 / 1	--	--	30.0	-- / --	0.33	NO
n-Nitroso-di-n-propylamine	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	**YES**

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Table 5-5
Preliminary Screening Statistics - SWMU 11 - Surface Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
n-Nitrosodiphenylamine	10.0 - 10.0	0 / 1	--	--	585	-- / --	0.02	NO
Volatile Organic Compounds (UG/L)								
1,1,1-Trichloroethane	10.0 - 10.0	0 / 1	--	--	9,400	-- / --	0.001	NO
1,1,2,2-Tetrachloroethane	10.0 - 10.0	0 / 1	--	--	2,400	-- / --	0.004	NO
1,1,2-Trichloroethane	10.0 - 10.0	0 / 1	--	--	9,400	-- / --	0.001	NO
1,1-Dichloroethane	10.0 - 10.0	0 / 1	--	--	1,600	-- / --	0.006	NO
1,1-Dichloroethene	10.0 - 10.0	0 / 1	--	--	1,160	-- / --	0.009	NO
1,2-Dichloroethane	10.0 - 10.0	0 / 1	--	--	20,000	-- / --	0.0005	NO
1,2-Dichloroethene (total)	10.0 - 10.0	0 / 1	--	--	1,160	-- / --	0.009	NO
1,2-Dichloropropane	10.0 - 10.0	0 / 1	--	--	5,700	-- / --	0.002	NO
2-Butanone	10.0 - 10.0	0 / 1	--	--	14,000	-- / --	0.0007	NO
2-Hexanone	10.0 - 10.0	0 / 1	--	--	4,280	-- / --	0.002	NO
4-Methyl-2-pentanone	10.0 - 10.0	0 / 1	--	--	4,600	-- / --	0.002	NO
Acetone	10.0 - 10.0	0 / 1	--	--	90,000	-- / --	0.0001	NO
Benzene	10.0 - 10.0	0 / 1	--	--	530	-- / --	0.02	NO
Bromochloromethane	10.0 - 10.0	1 / 1	50.0	OW11-SW01	1,100	0 / 1	0.05	NO
Bromodichloromethane	10.0 - 10.0	0 / 1	--	--	1,100	-- / --	0.009	NO
Bromoform	10.0 - 10.0	0 / 1	--	--	320	-- / --	0.03	NO
Bromomethane	10.0 - 10.0	0 / 1	--	--	110	-- / --	0.09	NO
Carbon disulfide	10.0 - 10.0	0 / 1	--	--	2.00	-- / --	5.00	**YES**
Carbon tetrachloride	10.0 - 10.0	0 / 1	--	--	3,520	-- / --	0.003	NO
Chlorobenzene	10.0 - 10.0	0 / 1	--	--	130	-- / --	0.08	NO
Chloroethane	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	**YES**
Chloroform	10.0 - 10.0	0 / 1	--	--	1,240	-- / --	0.008	NO
Chloromethane	10.0 - 10.0	0 / 1	--	--	5,500	-- / --	0.002	NO
Dibromochloromethane	10.0 - 10.0	0 / 1	--	--	1,100	-- / --	0.009	NO
Ethylbenzene	10.0 - 10.0	0 / 1	--	--	3,200	-- / --	0.003	NO
Methylene chloride	10.0 - 10.0	0 / 1	--	--	2,200	-- / --	0.005	NO
Styrene	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	**YES**
Tetrachloroethene	10.0 - 10.0	0 / 1	--	--	840	-- / --	0.01	NO

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Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 5-5
Preliminary Screening Statistics - SWMU 11 - Surface Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Toluene	10.0 - 10.0	0 / 1	--	--	1,700	-- / --	0.006	NO
Trichloroethene	10.0 - 10.0	0 / 1	--	--	21,900	-- / --	0.0005	NO
Vinyl chloride	10.0 - 10.0	0 / 1	--	--	1,160	-- / --	0.009	NO
Xylene, total	10.0 - 10.0	0 / 1	--	--	130	-- / --	0.08	NO
cis-1,2-Dichloroethene	10.0 - 10.0	0 / 1	--	--	1,160	-- / --	0.009	NO
cis-1,3-Dichloropropene	10.0 - 10.0	0 / 1	--	--	244	-- / --	0.04	NO
o-Xylene	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	**YES**
trans-1,2-Dichloroethene	10.0 - 10.0	0 / 1	--	--	1,160	-- / --	0.009	NO
trans-1,3-Dichloropropene	10.0 - 10.0	0 / 1	--	--	244	-- / --	0.04	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 5-6
Preliminary Screening Statistics - SWMU 11 - Sediment
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Inorganics (MG/KG)								
Aluminum	40.1 - 54.6	3 / 3	9,750	OW11-SD02	25,500	0 / 3	0.38	NO
Antimony	12.0 - 16.4	0 / 3	--	--	150	-- / --	0.11	NO
Arsenic	2.00 - 2.70	2 / 3	1.50	OW11-SD02	8.20	0 / 3	0.18	NO
Barium	40.1 - 54.6	2 / 3	51.7	OW11-SD02	500	0 / 3	0.10	NO
Beryllium	1.00 - 1.40	2 / 3	0.23	OW11-SD03	NSV	-- / --	NSV	**YES**
Cadmium	1.00 - 1.40	0 / 3	--	--	1.20	-- / --	1.17	**YES**
Calcium [2]	1,003 - 1,364	1 / 3	1,160	OW11-SD02	NSV	-- / --	NSV	NO
Chromium	2.00 - 2.70	3 / 3	12.5	OW11-SD02	81.0	0 / 3	0.15	NO
Cobalt	10.0 - 13.6	0 / 3	--	--	50.0	-- / --	0.27	NO
Copper	5.00 - 6.80	3 / 3	6.60	OW11-SD02	34.0	0 / 3	0.19	NO
Cyanide	0.60 - 0.90	1 / 3	0.02	OW11-SD03	0.10	0 / 3	0.20	NO
Iron	20.1 - 27.3	3 / 3	3,140	OW11-SD02	188,400	0 / 3	0.02	NO
Lead	0.60 - 0.80	3 / 3	72.3	OW11-SD03	46.7	1 / 3	1.55	**YES**
Magnesium [2]	1,003 - 1,364	3 / 3	625	OW11-SD02	NSV	-- / --	NSV	NO
Manganese	3.00 - 4.10	3 / 3	39.5	OW11-SD02	460	0 / 3	0.09	NO
Mercury	0.10 - 0.10	3 / 3	0.07	OW11-SD02	0.15	0 / 3	0.47	NO
Nickel	8.00 - 10.9	3 / 3	6.20	OW11-SD02	20.9	0 / 3	0.30	NO
Potassium [2]	1,003 - 1,364	1 / 3	527	OW11-SD02	NSV	-- / --	NSV	NO
Selenium	1.00 - 1.40	0 / 3	--	--	1.00	-- / --	1.40	**YES**
Silver	2.00 - 2.70	0 / 3	--	--	1.00	-- / --	2.70	**YES**
Sodium [2]	1,003 - 1,364	0 / 3	--	--	NSV	-- / --	NSV	NO
Thallium	2.00 - 2.70	1 / 3	0.79	OW11-SD02	NSV	-- / --	NSV	**YES**
Vanadium	10.0 - 13.6	3 / 3	14.1	OW11-SD02	57.0	0 / 3	0.25	NO
Zinc	4.00 - 5.50	0 / 3	--	--	150	-- / --	0.04	NO
Pesticide/Polychlorinated Biphenyls (UG/KG)								
4,4'-DDD	3.90 - 5.27	0 / 3	--	--	16.0	-- / --	0.33	NO
4,4'-DDE	3.90 - 5.27	0 / 3	--	--	2.20	-- / --	2.40	**YES**
4,4'-DDT	3.90 - 5.27	0 / 3	--	--	1.58	-- / --	3.34	**YES**

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Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 5-6
Preliminary Screening Statistics - SWMU 11 - Sediment
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Aldrin	2.01 - 2.71	0 / 3	--	--	2.00	-- / --	1.36	YES
Aroclor-1016	39.0 - 52.7	0 / 3	--	--	22.7	-- / --	2.32	YES
Aroclor-1221	79.2 - 107	0 / 3	--	--	22.7	-- / --	4.71	YES
Aroclor-1232	39.0 - 52.7	0 / 3	--	--	22.7	-- / --	2.32	YES
Aroclor-1242	39.0 - 52.7	0 / 3	--	--	22.7	-- / --	2.32	YES
Aroclor-1248	39.0 - 52.7	0 / 3	--	--	22.7	-- / --	2.32	YES
Aroclor-1254	39.0 - 52.7	0 / 3	--	--	22.7	-- / --	2.32	YES
Aroclor-1260	39.0 - 52.7	0 / 3	--	--	22.7	-- / --	2.32	YES
Dieldrin	3.90 - 5.27	0 / 3	--	--	2.00	-- / --	2.64	YES
Endosulfan I	2.01 - 2.71	0 / 3	--	--	NSV	-- / --	NSV	YES
Endosulfan II	3.90 - 5.27	0 / 3	--	--	NSV	-- / --	NSV	YES
Endosulfan sulfate	3.90 - 5.27	0 / 3	--	--	NSV	-- / --	NSV	YES
Endrin	3.90 - 5.27	0 / 3	--	--	3.00	-- / --	1.76	YES
Endrin aldehyde	3.90 - 5.27	0 / 3	--	--	NSV	-- / --	NSV	YES
Endrin ketone	3.90 - 5.27	0 / 3	--	--	NSV	-- / --	NSV	YES
Heptachlor	2.01 - 2.71	0 / 3	--	--	0.30	-- / --	9.03	YES
Heptachlor epoxide	2.01 - 2.71	0 / 3	--	--	5.00	-- / --	0.54	NO
Methoxychlor	20.1 - 27.2	0 / 3	--	--	NSV	-- / --	NSV	YES
Toxaphene	201 - 271	0 / 3	--	--	NSV	-- / --	NSV	YES
alpha-BHC	2.01 - 2.71	0 / 3	--	--	6.00	-- / --	0.45	NO
alpha-Chlordane	2.01 - 2.71	0 / 3	--	--	7.00	-- / --	0.39	NO
beta-BHC	2.01 - 2.71	0 / 3	--	--	5.00	-- / --	0.54	NO
delta-BHC	2.01 - 2.71	0 / 3	--	--	NSV	-- / --	NSV	YES
gamma-BHC (Lindane)	2.01 - 2.71	0 / 3	--	--	3.00	-- / --	0.90	NO
gamma-Chlordane	2.01 - 2.71	0 / 3	--	--	7.00	-- / --	0.39	NO
Semi-volatile Organic Compounds (UG/KG)								
1,2,4-Trichlorobenzene	390 - 530	0 / 3	--	--	40.0	-- / --	13.25	YES
1,2-Dichlorobenzene	390 - 530	0 / 3	--	--	35.0	-- / --	15.14	YES
1,3-Dichlorobenzene	390 - 530	0 / 3	--	--	NSV	-- / --	NSV	YES
1,4-Dichlorobenzene	390 - 530	0 / 3	--	--	110	-- / --	4.82	YES

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Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 5-6
Preliminary Screening Statistics - SWMU 11 - Sediment
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
1-Methylnaphthalene	20.0 - 27.0	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2,2'-Oxybis(1-chloropropane)	390 - 530	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2,4,5-Trichlorophenol	980 - 1,300	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2,4,6-Trichlorophenol	390 - 530	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2,4-Dichlorophenol	390 - 530	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2,4-Dimethylphenol	390 - 530	0 / 3	--	--	29.0	-- / --	18.28	**YES**
2,4-Dinitrophenol	980 - 1,300	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2,4-Dinitrotoluene	390 - 530	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2,6-Dinitrotoluene	390 - 530	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2-Chloronaphthalene	390 - 530	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2-Chlorophenol	390 - 530	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2-Methylnaphthalene	20.0 - 27.0	0 / 3	--	--	70.0	-- / --	0.39	NO
2-Methylphenol	390 - 530	0 / 3	--	--	63.0	-- / --	8.41	**YES**
2-Nitroaniline	980 - 1,300	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2-Nitrophenol	390 - 530	0 / 3	--	--	NSV	-- / --	NSV	**YES**
3,3'-Dichlorobenzidine	390 - 530	0 / 3	--	--	NSV	-- / --	NSV	**YES**
3-Nitroaniline	980 - 1,300	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4,6-Dinitro-2-methylphenol	980 - 1,300	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Bromophenyl-phenylether	390 - 530	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Chloro-3-methylphenol	390 - 530	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Chloroaniline	390 - 530	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Chlorophenyl-phenylether	390 - 530	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Methylphenol	390 - 530	0 / 3	--	--	670	-- / --	0.79	NO
4-Nitroaniline	980 - 1,300	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Nitrophenol	980 - 1,300	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Acenaphthene	20.0 - 27.0	0 / 3	--	--	16.0	-- / --	1.69	**YES**
Acenaphthylene	39.0 - 53.0	0 / 3	--	--	44.0	-- / --	1.20	**YES**
Anthracene	2.00 - 3.00	0 / 3	--	--	85.3	-- / --	0.04	NO
Benzo(a)anthracene	2.00 - 3.00	0 / 3	--	--	261	-- / --	0.01	NO
Benzo(a)pyrene	2.00 - 3.00	1 / 3	1.50	OW11-SD01	430	0 / 3	0.003	NO

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NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Benzo(b)fluoranthene	3.90 - 5.30	0 / 3	--	--	3,200	-- / --	0.002	NO
Benzo(g,h,i)perylene	3.90 - 5.30	1 / 3	5.40	OW11-SD01	670	0 / 3	0.01	NO
Benzo(k)fluoranthene	2.00 - 3.00	1 / 3	1.00	OW11-SD01	240	0 / 3	0.004	NO
Butylbenzylphthalate	390 - 530	0 / 3	--	--	63.0	-- / --	8.41	**YES**
Carbazole	390 - 530	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Chrysene	2.00 - 3.00	0 / 3	--	--	384	-- / --	0.01	NO
Di-n-butylphthalate	390 - 530	0 / 3	--	--	1,400	-- / --	0.38	NO
Di-n-octylphthalate	390 - 530	0 / 3	--	--	6,200	-- / --	0.09	NO
Dibenz(a,h)anthracene	3.90 - 5.30	0 / 3	--	--	63.4	-- / --	0.08	NO
Dibenzofuran	390 - 530	0 / 3	--	--	540	-- / --	0.98	NO
Diethylphthalate	390 - 530	0 / 3	--	--	200	-- / --	2.65	**YES**
Dimethyl phthalate	390 - 530	0 / 3	--	--	71.0	-- / --	7.46	**YES**
Fluoranthene	3.90 - 5.30	1 / 3	8.80	OW11-SD02	600	0 / 3	0.01	NO
Fluorene	3.90 - 5.30	3 / 3	14.0	OW11-SD02	19.0	0 / 3	0.74	NO
Hexachlorobenzene	390 - 530	0 / 3	--	--	22.0	-- / --	24.1	**YES**
Hexachlorobutadiene	390 - 530	0 / 3	--	--	11.0	-- / --	48.2	**YES**
Hexachlorocyclopentadiene	390 - 530	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Hexachloroethane	390 - 530	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Indeno(1,2,3-cd)pyrene	2.00 - 3.00	2 / 3	4.00	OW11-SD02	600	0 / 3	0.01	NO
Isophorone	390 - 530	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Naphthalene	20.0 - 27.0	0 / 3	--	--	160	-- / --	0.17	NO
Nitrobenzene	390 - 530	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Pentachlorophenol	980 - 1,300	0 / 3	--	--	360	-- / --	3.61	**YES**
Phenanthrene	2.00 - 3.00	0 / 3	--	--	240	-- / --	0.01	NO
Phenol	390 - 530	0 / 3	--	--	420	-- / --	1.26	**YES**
Pyrene	2.00 - 3.00	0 / 3	--	--	665	-- / --	0.005	NO
bis(2-Chloroethoxy)methane	390 - 530	0 / 3	--	--	NSV	-- / --	NSV	**YES**
bis(2-Chloroethyl)ether	390 - 530	0 / 3	--	--	NSV	-- / --	NSV	**YES**
bis(2-Ethylhexyl)phthalate	390 - 530	1 / 3	58.0	OW11-SD02	1,300	0 / 3	0.04	NO
n-Nitroso-di-n-propylamine	390 - 530	0 / 3	--	--	NSV	-- / --	NSV	**YES**

NSV - No *Screening* Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 5-6
Preliminary Screening Statistics - SWMU 11 - Sediment
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
n-Nitrosodiphenylamine	390 - 530	0 / 3	--	--	28.0	-- / --	18.93	**YES**
Volatile Organic Compounds (UG/KG)								
1,1,1-Trichloroethane	11.7 - 15.3	0 / 3	--	--	31.0	-- / --	0.49	NO
1,1,2,2-Tetrachloroethane	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
1,1,2-Trichloroethane	11.7 - 15.3	0 / 3	--	--	31.0	-- / --	0.49	NO
1,1-Dichloroethane	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
1,1-Dichloroethene	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
1,2-Dichloroethane	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
1,2-Dichloroethene (total)	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
1,2-Dichloropropane	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2-Butanone	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2-Hexanone	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Methyl-2-pentanone	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Acetone	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Benzene	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Bromochloromethane	11.7 - 15.3	3 / 3	50.0	OW11-SD01	NSV	-- / --	NSV	**YES**
Bromodichloromethane	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Bromoform	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Bromomethane	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Carbon disulfide	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Carbon tetrachloride	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Chlorobenzene	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Chloroethane	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Chloroform	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Chloromethane	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Dibromochloromethane	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Ethylbenzene	11.7 - 15.3	0 / 3	--	--	10.0	-- / --	1.53	**YES**
Methylene chloride	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Styrene	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Tetrachloroethene	11.7 - 15.3	0 / 3	--	--	57.0	-- / --	0.27	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 5-6
Preliminary Screening Statistics - SWMU 11 - Sediment
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Toluene	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Trichloroethene	11.7 - 15.3	0 / 3	--	--	41.0	-- / --	0.37	NO
Vinyl chloride	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Xylene, total	11.7 - 15.3	0 / 3	--	--	40.0	-- / --	0.38	NO
cis-1,2-Dichloroethene	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
cis-1,3-Dichloropropene	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
o-Xylene	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
trans-1,2-Dichloroethene	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**
trans-1,3-Dichloropropene	11.7 - 15.3	0 / 3	--	--	NSV	-- / --	NSV	**YES**

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 5-7
Preliminary Screening Statistics - SWMU 11 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Semi-volatile Organic Compounds (UG/KG)								
1-Methylnaphthalene	110 - 110	0 / 1	--	--	NSV	-- / --	NSV	**YES**
2-Methylnaphthalene	110 - 110	0 / 1	--	--	NSV	-- / --	NSV	**YES**
Acenaphthene	110 - 110	0 / 1	--	--	2,500	-- / --	0.04	NO
Acenaphthylene	110 - 110	0 / 1	--	--	100	-- / --	1.10	**YES**
Anthracene	110 - 110	0 / 1	--	--	100	-- / --	1.10	**YES**
Benzo(a)anthracene	110 - 110	0 / 1	--	--	100	-- / --	1.10	**YES**
Benzo(a)pyrene	110 - 110	0 / 1	--	--	100	-- / --	1.10	**YES**
Benzo(b)fluoranthene	110 - 110	0 / 1	--	--	100	-- / --	1.10	**YES**
Benzo(g,h,i)perylene	110 - 110	0 / 1	--	--	100	-- / --	1.10	**YES**
Benzo(k)fluoranthene	110 - 110	0 / 1	--	--	100	-- / --	1.10	**YES**
Chrysene	110 - 110	0 / 1	--	--	100	-- / --	1.10	**YES**
Dibenz(a,h)anthracene	110 - 110	0 / 1	--	--	100	-- / --	1.10	**YES**
Fluoranthene	110 - 110	0 / 1	--	--	100	-- / --	1.10	**YES**
Fluorene	110 - 110	0 / 1	--	--	1,700	-- / --	0.06	NO
Indeno(1,2,3-cd)pyrene	110 - 110	0 / 1	--	--	100	-- / --	1.10	**YES**
Naphthalene	110 - 110	0 / 1	--	--	100	-- / --	1.10	**YES**
Phenanthrene	110 - 110	0 / 1	--	--	100	-- / --	1.10	**YES**
Pyrene	110 - 110	0 / 1	--	--	100	-- / --	1.10	**YES**
Volatile Organic Compounds (UG/KG)								
1,1,1-Trichloroethane	6.00 - 6.00	0 / 1	--	--	300	-- / --	0.02	NO
1,1,2,2-Tetrachloroethane	6.00 - 6.00	0 / 1	--	--	300	-- / --	0.02	NO
1,1,2-Trichloroethane	6.00 - 6.00	0 / 1	--	--	300	-- / --	0.02	NO
1,1-Dichloroethane	6.00 - 6.00	0 / 1	--	--	300	-- / --	0.02	NO
1,1-Dichloroethene	6.00 - 6.00	0 / 1	--	--	NSV	-- / --	NSV	**YES**
1,2,3-Trichloropropane	6.00 - 6.00	0 / 1	--	--	NSV	-- / --	NSV	**YES**
1,2-Dichlorobenzene	6.00 - 6.00	0 / 1	--	--	100	-- / --	0.06	NO
1,2-Dichloroethane	6.00 - 6.00	0 / 1	--	--	401	-- / --	0.01	NO
1,2-Dichloroethene (total)	6.00 - 6.00	0 / 1	--	--	300	-- / --	0.02	NO
1,2-Dichloropropane	6.00 - 6.00	0 / 1	--	--	38,800	-- / --	0.0002	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 5-7
Preliminary Screening Statistics - SWMU 11 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
1,3-Dichlorobenzene	6.00 - 6.00	0 / 1	--	--	NSV	-- / --	NSV	**YES**
1,4-Dichlorobenzene	6.00 - 6.00	0 / 1	--	--	1,280	-- / --	0.005	NO
2-Butanone	11.0 - 11.0	0 / 1	--	--	NSV	-- / --	NSV	**YES**
2-Chloroethyl vinyl ether	11.0 - 11.0	0 / 1	--	--	NSV	-- / --	NSV	**YES**
2-Hexanone	11.0 - 11.0	0 / 1	--	--	NSV	-- / --	NSV	**YES**
4-Methyl-2-pentanone	11.0 - 11.0	0 / 1	--	--	10,000	-- / --	0.001	NO
Acetone	-- - --	1 / 1	65.0	OW11-SS10-1-94A	NSV	-- / --	NSV	**YES**
Acrolein	110 - 110	0 / 1	--	--	NSV	-- / --	NSV	**YES**
Acrylonitrile	110 - 110	0 / 1	--	--	NSV	-- / --	NSV	**YES**
Benzene	6.00 - 6.00	0 / 1	--	--	105	-- / --	0.06	NO
Bromodichloromethane	6.00 - 6.00	0 / 1	--	--	45,000	-- / --	0.0001	NO
Bromoform	6.00 - 6.00	0 / 1	--	--	114,700	-- / --	5.23E-05	NO
Bromomethane	11.0 - 11.0	0 / 1	--	--	NSV	-- / --	NSV	**YES**
Carbon disulfide	6.00 - 6.00	0 / 1	--	--	NSV	-- / --	NSV	**YES**
Carbon tetrachloride	6.00 - 6.00	0 / 1	--	--	1,000,000	-- / --	0.000006	NO
Chlorobenzene	6.00 - 6.00	0 / 1	--	--	2,400	-- / --	0.003	NO
Chloroethane	11.0 - 11.0	0 / 1	--	--	NSV	-- / --	NSV	**YES**
Chloroform	6.00 - 6.00	0 / 1	--	--	1,000	-- / --	0.006	NO
Chloromethane	11.0 - 11.0	0 / 1	--	--	NSV	-- / --	NSV	**YES**
Dibromochloromethane	6.00 - 6.00	0 / 1	--	--	NSV	-- / --	NSV	**YES**
Dibromomethane	6.00 - 6.00	0 / 1	--	--	NSV	-- / --	NSV	**YES**
Ethyl methacrylate	6.00 - 6.00	0 / 1	--	--	NSV	-- / --	NSV	**YES**
Ethylbenzene	6.00 - 6.00	0 / 1	--	--	5,005	-- / --	0.001	NO
Iodomethane	11.0 - 11.0	0 / 1	--	--	NSV	-- / --	NSV	**YES**
Methylene chloride	-- - --	0 / 1	--	--	1,001	-- / --	--	**YES**
Styrene	6.00 - 6.00	0 / 1	--	--	10,010	-- / --	0.0006	NO
Tetrachloroethene	6.00 - 6.00	0 / 1	--	--	401	-- / --	0.01	NO
Toluene	-- - --	1 / 1	2.00	OW11-SS10-1-94A	13,005	0 / 1	0.0002	NO
Trichloroethene	6.00 - 6.00	0 / 1	--	--	6,000	-- / --	0.0010	NO
Trichlorofluoromethane	6.00 - 6.00	0 / 1	--	--	NSV	-- / --	NSV	**YES**

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 5-7 **Preliminary Screening Statistics - SWMU 11 - Surface Soil** ***NAS Oceana, Virginia Beach, VA***								
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Screening Value**	**Frequency of Exceedance**	**Maximum Hazard Quotient[1]**	**COPC?**
Vinyl acetate	11.0 - 11.0	0 / 1	--	--	NSV	-- / --	NSV	**YES**
Vinyl chloride	2.00 - 2.00	0 / 1	--	--	300	-- / --	0.007	NO
Xylene, total	-- - --	1 / 1	2.00	OW11-SS10-1-94A	2,505	0 / 1	0.0008	NO
cis-1,3-Dichloropropene	6.00 - 6.00	0 / 1	--	--	300	-- / --	0.02	NO
trans-1,3-Dichloropropene	6.00 - 6.00	0 / 1	--	--	300	-- / --	0.02	NO
Total Petroleum Hydrocarbons (MG/KG)								
Total petroleum hydrocarbons (TPH)	-- - --	5 / 5	607	OW11-SS12-94A	NSV	-- / --	NSV	**YES**

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 5-8
Summary of Maximum Hazard Quotients for Food Web Exposures - SWMU 11
NAS Oceana, Virginia Beach, VA

Chemical	Short-tailed shrew		Deer mouse		Meadow vole		Raccoon		Red fox	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Aluminum	0.06	<0.01	0.05	<0.01	0.07	<0.01	0.96	0.10	<0.01	<0.01
Antimony	0.53	0.05	0.48	0.05	0.65	0.07	2.89	0.29	0.28	0.03
Arsenic	0.04	<0.01	0.04	<0.01	0.05	<0.01	0.32	0.03	0.01	<0.01
Barium	0.06	0.01	0.05	0.01	0.07	0.02	0.22	0.06	0.02	<0.01
Beryllium	0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.01	NA	<0.01	<0.01
Cadmium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.16	0.02	<0.01	<0.01
Chromium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Cobalt	0.01	<0.01	0.01	<0.01	0.02	<0.01	0.05	NA	<0.01	<0.01
Copper	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.07	0.05	<0.01	<0.01
Iron	0.01	<0.01	0.01	<0.01	0.01	<0.01	1.14	0.11	<0.01	<0.01
Lead	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.12	0.01	<0.01	<0.01
Manganese	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Mercury	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	0.03	<0.01	<0.01
Nickel	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Selenium	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.38	0.23	<0.01	<0.01
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Thallium	0.09	<0.01	0.08	<0.01	0.11	0.01	0.23	0.02	0.03	<0.01
Vanadium	0.33	0.03	0.30	0.03	0.41	0.04	1.35	0.13	0.18	0.02
Zinc	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	NA	<0.01	<0.01
4,4'-DDD	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
4,4'-DDE	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
4,4'-DDT	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Aldrin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
alpha-BHC	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
alpha-Chlordane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Aroclor-1016	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	NA	<0.01	<0.01
Aroclor-1221	0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.49	0.05	<0.01	<0.01
Aroclor-1232	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.24	0.02	<0.01	<0.01
Aroclor-1242	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.24	0.02	<0.01	<0.01
Aroclor-1248	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	NA	<0.01	<0.01
Aroclor-1254	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.12	0.02	<0.01	<0.01
Aroclor-1260	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.12	0.02	<0.01	<0.01
beta-BHC	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
delta-BHC	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Dieldrin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01

Table 5-8
Summary of Maximum Hazard Quotients for Food Web Exposures - SWMU 11
NAS Oceana, Virginia Beach, VA

Chemical	Short-tailed shrew		Deer mouse		Meadow vole		Raccoon		Red fox	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Endosulfan I	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Endosulfan II	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Endosulfan Sulfate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Endrin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Endrin Aldehyde	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Endrin Ketone	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Gamma-BHC (Lindane)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Gamma-Chlordane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Heptachlor	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Heptachlor Epoxide	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Methoxychlor	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Toxaphene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
1,2,4-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
2,4,5-Trichlorophenol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
2,4,6-Trichlorophenol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
2,4-Dichlorophenol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Benzo(a)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01

Table 5-8
Summary of Maximum Hazard Quotients for Food Web Exposures - SWMU 11
NAS Oceana, Virginia Beach, VA

Chemical	Short-tailed shrew		Deer mouse		Meadow vole		Raccoon		Red fox	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Benzo(a)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Bis-(2-Ethylhexyl)phthalate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Butylbenzylphthalate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Carbazole	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Chrysene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Dibenz(a,h)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Dibenzofuran	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Diethylphthalate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Di-n-butylphthalate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Di-n-octylphthalate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Hexachloro-1,3-butadiene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Hexachlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Hexachlorocyclopentadiene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Naphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
N-Nitrosodiphenylamine	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Pentachlorophenol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Phenanthrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Carbon Tetrachloride	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Chlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Chloroform	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Ethylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Styrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Tetrachloroethene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Toluene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Trichloroethene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01
Xylenes (total)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	<0.01	<0.01

Table 5-8
Summary of Maximum Hazard Quotients for Food Web Exposures - SWMU 11
NAS Oceana, Virginia Beach, VA

Chemical	American robin		Marsh wren		American kestrel		Mallard	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Aluminum	<0.01	<0.01	3.15	0.32	<0.01	<0.01	0.53	0.05
Antimony	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Arsenic	<0.01	<0.01	0.13	0.04	<0.01	<0.01	0.04	0.02
Barium	<0.01	<0.01	0.08	0.04	<0.01	<0.01	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	<0.01	<0.01	0.88	0.06	<0.01	<0.01	0.42	0.03
Chromium	0.02	<0.01	0.89	0.18	0.02	<0.01	0.11	0.02
Cobalt	0.03	<0.01	2.87	0.29	0.03	<0.01	0.21	0.02
Copper	<0.01	<0.01	0.33	0.25	<0.01	<0.01	0.03	0.02
Iron	<0.01	<0.01	9.61	0.96	<0.01	<0.01	0.58	0.06
Lead	<0.01	<0.01	7.05	0.70	<0.01	<0.01	4.09	0.41
Manganese	<0.01	<0.01	0.01	NA	<0.01	<0.01	NA	NA
Mercury	<0.01	<0.01	0.08	0.04	<0.01	<0.01	6.74	0.67
Nickel	<0.01	<0.01	NA	NA	<0.01	<0.01	0.01	0.01
Selenium	<0.01	<0.01	1.08	0.54	<0.01	<0.01	1.30	0.65
Silver	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Thallium	0.01	<0.01	0.71	0.07	0.01	<0.01	0.05	NA
Vanadium	<0.01	<0.01	0.38	0.04	<0.01	<0.01	0.03	NA
Zinc	<0.01	<0.01	0.54	0.06	<0.01	<0.01	0.11	0.01
4,4'-DDD	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
4,4'-DDE	<0.01	<0.01	0.05	NA	<0.01	<0.01	NA	NA
4,4'-DDT	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Aldrin	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
alpha-BHC	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
alpha-Chlordane	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Aroclor-1016	<0.01	<0.01	0.82	0.08	<0.01	<0.01	0.04	NA
Aroclor-1221	<0.01	<0.01	1.67	0.17	<0.01	<0.01	0.08	NA
Aroclor-1232	<0.01	<0.01	0.82	0.08	<0.01	<0.01	0.04	NA
Aroclor-1242	<0.01	<0.01	0.82	0.08	<0.01	<0.01	0.04	NA
Aroclor-1248	<0.01	<0.01	1.87	0.19	<0.01	<0.01	0.09	NA
Aroclor-1254	<0.01	<0.01	1.87	0.19	<0.01	<0.01	0.09	NA
Aroclor-1260	<0.01	<0.01	1.87	0.19	<0.01	<0.01	0.09	NA
beta-BHC	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
delta-BHC	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Dieldrin	<0.01	<0.01	0.02	NA	<0.01	<0.01	NA	NA

Table 5-8
Summary of Maximum Hazard Quotients for Food Web Exposures - SWMU 11
NAS Oceana, Virginia Beach, VA

Chemical	American robin		Marsh wren		American kestrel		Mallard	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Endosulfan I	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Endosulfan II	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Endosulfan Sulfate	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Endrin	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Endrin Aldehyde	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Endrin Ketone	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Gamma-BHC (Lindane)	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Gamma-Chlordane	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Heptachlor	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Heptachlor Epoxide	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Methoxychlor	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Toxaphene	<0.01	<0.01	0.28	0.03	<0.01	<0.01	0.02	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
1,3-Dichlorobenzene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
1,4-Dichlorobenzene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Acenaphthylene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Anthracene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Benzo(a)anthracene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA

Table 5-8
Summary of Maximum Hazard Quotients for Food Web Exposures - SWMU 11
NAS Oceana, Virginia Beach, VA

Chemical	American robin		Marsh wren		American kestrel		Mallard	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Benzo(a)pyrene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Benzo(b)fluoranthene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Benzo(g,h,i)perylene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Benzo(k)fluoranthene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Bis-(2-Ethylhexyl)phthalate	<0.01	<0.01	0.02	NA	<0.01	<0.01	NA	NA
Butylbenzylphthalate	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Dibenz(a,h)anthracene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	0.02	<0.01	1.51	0.15	0.03	<0.01	0.15	0.01
Di-n-octylphthalate	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Fluoranthene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Fluorene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Hexachloro-1,3-butadiene	<0.01	<0.01	0.07	0.02	<0.01	<0.01	NA	NA
Hexachlorobenzene	0.03	<0.01	2.07	0.21	0.04	<0.01	0.15	0.01
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Naphthalene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Phenanthrene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Pyrene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Carbon Tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA

Table 5-9
Summary of COPCs - SWMU 11 - Screening ERA
NAS Oceana, Virginia Beach, VA

Chemical	Surface Water			Sediment			Surface Soil			Food web		
	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV
Inorganics												
Aluminum	X									X		
Antimony	X										X	
Beryllium	X					X						
Cadmium	X				X							
Chromium	X											
Cobalt	X										X	
Copper	X											
Iron	X									X		
Lead	X			X						X		
Manganese	X											
Mercury										X		
Nickel	X											
Selenium					X						X	
Silver	X				X							
Thallium						X						
Vanadium										X		
Zinc	X											
Pesticide/Polychlorinated Biphenyls												
4,4'-DDD		X										
4,4'-DDE					X							
4,4'-DDT		X			X							
Aldrin					X							
Aroclor-1016		X			X							
Aroclor-1221		X			X						X	
Aroclor-1232		X			X							
Aroclor-1242		X			X							
Aroclor-1248		X			X						X	
Aroclor-1254		X			X						X	
Aroclor-1260					X						X	
Dieldrin		X			X							

MD - Maximum detect exceeds screening value
MRL - Not detected; maximum reporting limit exceeds screening value
NSV - No screening value
* - Non-detected value - No reporting limit available

Table 5-9
Summary of COPCs - SWMU 11 - Screening ERA
NAS Oceana, Virginia Beach, VA

Chemical	Surface Water			Sediment			Surface Soil			Food web		
	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV
Endosulfan I						X						
Endosulfan II		X				X						
Endosulfan sulfate		X				X						
Endrin		X			X							
Endrin aldehyde		X				X						
Endrin ketone		X				X						
Heptachlor		X			X							
Heptachlor epoxide		X										
Methoxychlor		X				X						
Toxaphene		X				X						
delta-BHC						X						
Semi-volatile Organic Compounds												
1,2,4-Trichlorobenzene					X							
1,2-Dichlorobenzene					X							
1,3-Dichlorobenzene						X						
1,4-Dichlorobenzene					X							
1-Methylnaphthalene			X			X			X			
2,2'-Oxybis(1-chloropropane)			X			X						
2,4,5-Trichlorophenol						X						
2,4,6-Trichlorophenol						X						
2,4-Dichlorophenol						X						
2,4-Dimethylphenol					X							
2,4-Dinitrophenol						X						
2,4-Dinitrotoluene						X						
2,6-Dinitrotoluene			X			X						
2-Chloronaphthalene						X						
2-Chlorophenol						X						
2-Methylnaphthalene			X						X			
2-Methylphenol					X							
2-Nitroaniline			X			X						
2-Nitrophenol						X						

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Table 5-9
Summary of COPCs - SWMU 11 - Screening ERA
NAS Oceana, Virginia Beach, VA

Chemical	Surface Water			Sediment			Surface Soil			Food web		
	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV
3,3'-Dichlorobenzidine			X			X						
3-Nitroaniline			X			X						
4,6-Dinitro-2-methylphenol		X				X						
4-Bromophenyl-phenylether		X				X						
4-Chloro-3-methylphenol		X				X						
4-Chloroaniline						X						
4-Chlorophenyl-phenylether			X			X						
4-Methylphenol			X									
4-Nitroaniline			X			X						
4-Nitrophenol						X						
Acenaphthene					X							
Acenaphthylene			X		X			X				
Anthracene								X				
Benzo(a)anthracene								X				
Benzo(a)pyrene		X						X				
Benzo(b)fluoranthene			X					X				
Benzo(g,h,i)perylene			X					X				
Benzo(k)fluoranthene			X					X				
Butylbenzylphthalate					X							
Carbazole			X			X						
Chrysene			X					X				
Di-n-butylphthalate											X	
Di-n-octylphthalate		X										
Dibenz(a,h)anthracene			X					X				
Diethylphthalate					X							
Dimethyl phthalate					X							
Fluoranthene								X				
Hexachlorobenzene		X									X	
Hexachlorobutadiene		X			X							
Hexachlorocyclopentadiene		X				X						
Hexachloroethane						X						

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Table 5-9
Summary of COPCs - SWMU 11 - Screening ERA
NAS Oceana, Virginia Beach, VA

Chemical	Surface Water			Sediment			Surface Soil			Food web		
	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV
Indeno(1,2,3-cd)pyrene			X					X				
Isophorone						X						
Naphthalene								X				
Nitrobenzene						X						
Pentachlorophenol		X			X							
Phenanthrene								X				
Phenol					X							
Pyrene			X					X				
bis(2-Chloroethoxy)methane						X						
bis(2-Chloroethyl)ether						X						
n-Nitroso-di-n-propylamine			X			X						
n-Nitrosodiphenylamine					X							
Volatile Organic Compounds												
1,1,2,2-Tetrachloroethane						X						
1,1-Dichloroethane						X						
1,1-Dichloroethene						X			X			
1,2,3-Trichloropropane									X			
1,2-Dichloroethane						X						
1,2-Dichloroethene (total)						X						
1,2-Dichloropropane						X						
1,3-Dichlorobenzene									X			
2-Butanone						X			X			
2-Chloroethyl vinyl ether									X			
2-Hexanone						X			X			
4-Methyl-2-pentanone						X						
Acetone						X			X			
Acrolein									X			
Acrylonitrile									X			
Benzene						X						
Bromochloromethane						X						
Bromodichloromethane						X						

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NSV - No screening value
* - Non-detected value - No reporting limit available

Table 5-9
Summary of COPCs - SWMU 11 - Screening ERA
NAS Oceana, Virginia Beach, VA

Chemical	Surface Water			Sediment			Surface Soil			Food web		
	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV
Bromoform						X						
Bromomethane						X			X			
Carbon disulfide		X				X			X			
Carbon tetrachloride						X						
Chlorobenzene						X						
Chloroethane			X			X			X			
Chloroform						X						
Chloromethane						X			X			
Dibromochloromethane						X			X			
Dibromomethane									X			
Ethyl methacrylate									X			
Ethylbenzene					X							
Idomethane									X			
Methylene chloride						X		*				
Styrene			X			X						
Trichlorofluoromethane									X			
Vinyl acetate									X			
Toluene						X						
Vinyl chloride						X						
cis-1,2-Dichloroethene						X						
cis-1,3-Dichloropropene						X						
o-Xylene			X			X						
trans-1,2-Dichloroethene						X						
trans-1,3-Dichloropropene						X						
Total Petroleum Hydrocarbons												
Total petroleum hydrocarbons (TPH)									X			

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MRL - Not detected; maximum reporting limit exceeds screening value
NSV - No screening value
* - Non-detected value - No reporting limit available

Table 5-10
Refined Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - SWMU 11
NAS Oceana, Virginia Beach, VA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor
Terrestrial Habitats			
Survival, growth, and reproduction of terrestrial soil invertebrate communities.	Are site-related surface soil concentrations sufficient to adversely effect soil invertebrate communities based on conservative screening values?	Comparison of mean chemical concentrations in surface soil with soil screening values.	Soil Invertebrates (earthworms)
Survival, growth, and reproduction of terrestrial plant communities.	Are site-related surface soil concentrations sufficient to adversely effect terrestrial plant communities based on conservative screening values?	Comparison of mean chemical concentrations in surface soil with soil screening values.	Terrestrial plants
Wetland and Aquatic Habitats			
Survival, growth, and reproduction of benthic invertebrate communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect benthic invertebrate communities?	Comparison of mean chemical concentrations in surface water and/or sediment with medium-specific screening values.	Benthic invertebrates
Survival, growth, and reproduction of aquatic and wetland plant communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect aquatic or wetland plant communities?	Comparison of mean chemical concentrations in surface water and/or sediment with medium-specific screening values.	Aquatic/wetland plants
Survival, growth, and reproduction of amphibian communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect amphibian communities?	Comparison of mean chemical concentrations in surface water and/or sediment with medium-specific screening values.	Amphibians
Survival, growth, and reproduction of amphibians.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to amphibian species that may consume aquatic invertebrates from the site?	Evidence of potential risk to other upper trophic level aquatic and wetland receptors evaluated in the baseline ERA.	--
Survival, growth, and reproduction of wetland reptiles.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to aquatic/wetland reptile species?	Evidence of potential risk to other upper trophic level aquatic and wetland receptors evaluated in the baseline ERA.	--
Survival, growth, and reproduction of avian aquatic/wetland insectivores.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume aquatic invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean sediment concentrations.	Marsh wren

Table 5-10
Refined Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - SWMU 11
NAS Oceana, Virginia Beach, VA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor
Survival, growth, and reproduction of avian aquatic/wetland omnivores.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume aquatic plants and invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean sediment concentrations.	Mallard
Survival, growth, and reproduction of mammalian aquatic/wetland omnivores.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume aquatic plants and invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean sediment concentrations.	Raccoon

Table 5-11
Refined Screening Statistics - SWMU 11 - Surface Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Sample Value	Screening Value	Frequency of Exceedance	Hazard Quotient	COPC?
Inorganics (UG/L)									
Aluminum	200 - 200	1 / 1	3,070	OW11-SW01	3070	87.0	1 / 1	35.3	**YES**
Antimony	60.0 - 60.0	1 / 1	184	OW11-SW01	184	30.0	1 / 1	6.13	**YES**
Beryllium	5.00 - 5.00	1 / 1	20.1	OW11-SW01	20.1	5.30	1 / 1	3.79	**YES**
Cadmium	5.00 - 5.00	1 / 1	20.7	OW11-SW01	20.7	0.83	1 / 1	25.0	**YES**
Chromium	10.0 - 10.0	1 / 1	80.3	OW11-SW01	80.3	11.4	1 / 1	7.04	**YES**
Cobalt	50.0 - 50.0	1 / 1	187	OW11-SW01	187	23.0	1 / 1	8.13	**YES**
Copper	25.0 - 25.0	1 / 1	101	OW11-SW01	101	2.84	1 / 1	35.6	**YES**
Iron	100 - 100	1 / 1	1,600	OW11-SW01	1600	320	1 / 1	5.00	**YES**
Lead	3.00 - 3.00	1 / 1	12.4	OW11-SW01	12.4	0.54	1 / 1	22.8	**YES**
Manganese	15.0 - 15.0	1 / 1	284	OW11-SW01	284	120	1 / 1	2.37	**YES**
Nickel	40.0 - 40.0	1 / 1	188	OW11-SW01	188	16.1	1 / 1	11.6	**YES**
Silver	10.0 - 10.0	1 / 1	19.3	OW11-SW01	19.3	0.36	1 / 1	53.6	**YES**
Zinc	20.0 - 20.0	1 / 1	220	OW11-SW01	220	37.0	1 / 1	5.94	**YES**
Pesticide/Polychlorinated Biphenyls (UG/L)									
4,4'-DDD	0.10 - 0.10	0 / 1	--	--	0.05	0.06	-- / --	0.83	NO
4,4'-DDT	0.10 - 0.10	0 / 1	--	--	0.05	0.001	-- / --	50.0	NO
Aroclor-1016	1.00 - 1.00	0 / 1	--	--	0.50	0.01	-- / --	35.7	NO
Aroclor-1221	2.00 - 2.00	0 / 1	--	--	1.0	0.28	-- / --	3.57	NO
Aroclor-1232	1.00 - 1.00	0 / 1	--	--	0.50	0.58	-- / --	0.86	NO
Aroclor-1242	1.00 - 1.00	0 / 1	--	--	0.50	0.05	-- / --	9.43	NO
Aroclor-1248	1.00 - 1.00	0 / 1	--	--	0.50	0.08	-- / --	6.17	NO
Aroclor-1254	1.00 - 1.00	0 / 1	--	--	0.50	0.03	-- / --	15.2	NO
Dieldrin	0.10 - 0.10	0 / 1	--	--	0.05	0.06	-- / --	0.89	NO
Endosulfan II	0.10 - 0.10	0 / 1	--	--	0.05	0.06	-- / --	0.89	NO
Endosulfan sulfate	0.10 - 0.10	0 / 1	--	--	0.05	0.06	-- / --	0.89	NO
Endrin	0.10 - 0.10	0 / 1	--	--	0.05	0.04	-- / --	1.39	NO
Endrin aldehyde	0.10 - 0.10	0 / 1	--	--	0.05	0.04	-- / --	1.39	NO
Endrin ketone	0.10 - 0.10	0 / 1	--	--	0.05	0.04	-- / --	1.39	NO
Heptachlor	0.05 - 0.05	0 / 1	--	--	0.03	0.007	-- / --	3.62	NO
Heptachlor epoxide	0.05 - 0.05	0 / 1	--	--	0.03	0.007	-- / --	3.62	NO
Methoxychlor	0.50 - 0.50	0 / 1	--	--	0.25	0.03	-- / --	8.33	NO
Toxaphene	5.00 - 5.00	0 / 1	--	--	2.50	0.01	-- / --	227	NO
Semi-volatile Organic Compounds (UG/L)									
1-Methylnaphthalene	0.50 - 0.50	0 / 1	--	--	0.25	NSV	-- / --	NSV	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 5-11 Refined Screening Statistics - SWMU 11 - Surface Water *NAS Oceana, Virginia Beach, VA*									
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Sample Value**	**Screening Value**	**Frequency of Exceedance**	**Hazard Quotient**	**COPC?**
2,2'-Oxybis(1-chloropropane)	10.0 - 10.0	0 / 1	--	--	5.00	NSV	-- / --	NSV	NO
2,6-Dinitrotoluene	10.0 - 10.0	0 / 1	--	--	5.00	NSV	-- / --	NSV	NO
2-Methylnaphthalene	0.50 - 0.50	0 / 1	--	--	0.25	NSV	-- / --	NSV	NO
2-Nitroaniline	25.0 - 25.0	0 / 1	--	--	12.5	NSV	-- / --	NSV	NO
3,3'-Dichlorobenzidine	10.0 - 10.0	0 / 1	--	--	5.00	NSV	-- / --	NSV	NO
3-Nitroaniline	25.0 - 25.0	0 / 1	--	--	12.5	NSV	-- / --	NSV	NO
4,6-Dinitro-2-methylphenol	25.0 - 25.0	0 / 1	--	--	12.5	2.30	-- / --	5.43	NO
4-Bromophenyl-phenylether	10.0 - 10.0	0 / 1	--	--	5.00	1.50	-- / --	3.33	NO
4-Chloro-3-methylphenol	10.0 - 10.0	0 / 1	--	--	5.00	0.30	-- / --	16.7	NO
4-Chlorophenyl-phenylether	10.0 - 10.0	0 / 1	--	--	5.00	NSV	-- / --	NSV	NO
4-Methylphenol	10.0 - 10.0	0 / 1	--	--	5.00	NSV	-- / --	NSV	NO
4-Nitroaniline	25.0 - 25.0	0 / 1	--	--	12.5	NSV	-- / --	NSV	NO
Acenaphthylene	1.00 - 1.00	0 / 1	--	--	0.50	NSV	-- / --	NSV	NO
Benzo(a)pyrene	0.05 - 0.05	0 / 1	--	--	0.03	0.01	-- / --	1.79	NO
Benzo(b)fluoranthene	0.10 - 0.10	0 / 1	--	--	0.05	NSV	-- / --	NSV	NO
Benzo(g,h,i)perylene	0.10 - 0.10	0 / 1	--	--	0.05	NSV	-- / --	NSV	NO
Benzo(k)fluoranthene	0.05 - 0.05	0 / 1	--	--	0.03	NSV	-- / --	NSV	NO
Carbazole	10.0 - 10.0	0 / 1	--	--	5.00	NSV	-- / --	NSV	NO
Chrysene	0.05 - 0.05	0 / 1	--	--	0.03	NSV	-- / --	NSV	NO
Di-n-octylphthalate	10.0 - 10.0	0 / 1	--	--	5.00	3.00	-- / --	1.67	NO
Dibenz(a,h)anthracene	0.10 - 0.10	0 / 1	--	--	0.05	NSV	-- / --	NSV	NO
Hexachlorobenzene	10.0 - 10.0	0 / 1	--	--	5.00	3.68	-- / --	1.36	NO
Hexachlorobutadiene	10.0 - 10.0	0 / 1	--	--	5.00	9.30	-- / --	0.54	NO
Hexachlorocyclopentadiene	10.0 - 10.0	0 / 1	--	--	5.00	5.20	-- / --	0.96	NO
Indeno(1,2,3-cd)pyrene	0.05 - 0.05	0 / 1	--	--	0.03	NSV	-- / --	NSV	NO
Pentachlorophenol	25.0 - 25.0	0 / 1	--	--	12.5	6.69	-- / --	1.87	NO
Pyrene	0.05 - 0.05	0 / 1	--	--	0.03	NSV	-- / --	NSV	NO
n-Nitroso-di-n-propylamine	10.0 - 10.0	0 / 1	--	--	5.00	NSV	-- / --	NSV	NO
Volatile Organic Compounds (UG/L)									
Carbon disulfide	10.0 - 10.0	0 / 1	--	--	5.00	2.00	-- / --	2.50	NO
Chloroethane	10.0 - 10.0	0 / 1	--	--	5.00	NSV	-- / --	NSV	NO
Chloroform	10.0 - 10.0	0 / 1	--	--	5.00	1,240	-- / --	0.004	NO
Styrene	10.0 - 10.0	0 / 1	--	--	5.00	NSV	-- / --	NSV	NO
o-Xylene	10.0 - 10.0	0 / 1	--	--	5.00	NSV	-- / --	NSV	NO

NSV - No Screening Value
Shaded Cells Indicate Hazard Quotient based on Reporting Limit

Table 5-12
Refined Screening Statistics - SWMU 11 - Sediment
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COPC?
Inorganics (MG/KG)									
Beryllium	1.00 - 1.40	2 / 3	0.23	OW11-SD03	0.17	NSV	-- / --	NSV	**YES**
Cadmium	1.00 - 1.40	0 / 3	--	--	0.12	1.20	-- / --	0.10	NO
Lead	0.60 - 0.80	3 / 3	72.3	OW11-SD03	32.4	46.7	0 / 3	0.69	NO
Selenium	1.00 - 1.40	0 / 3	--	--	0.34	1.00	-- / --	NSV	NO
Silver	2.00 - 2.70	0 / 3	--	--	0.45	1.00	-- / --	NSV	NO
Thallium	2.00 - 2.70	1 / 3	0.79	OW11-SD02	0.42	NSV	-- / --	NSV	**YES**
Pesticide/Polychlorinated Biphenyls (UG/KG)									
4,4'-DDE	3.90 - 5.27	0 / 3	--	--	2.20	2.20	-- / --	1.00	NO
4,4'-DDT	3.90 - 5.27	0 / 3	--	--	2.20	1.58	-- / --	1.39	NO
Aldrin	2.01 - 2.71	0 / 3	--	--	1.13	2.00	-- / --	0.57	NO
Aroclor-1016	39.0 - 52.7	0 / 3	--	--	22.0	22.7	-- / --	0.97	NO
Aroclor-1221	79.2 - 107	0 / 3	--	--	44.6	22.7	-- / --	1.96	NO
Aroclor-1232	39.0 - 52.7	0 / 3	--	--	22.0	22.7	-- / --	0.97	NO
Aroclor-1242	39.0 - 52.7	0 / 3	--	--	22.0	22.7	-- / --	0.97	NO
Aroclor-1248	39.0 - 52.7	0 / 3	--	--	22.0	22.7	-- / --	0.97	NO
Aroclor-1254	39.0 - 52.7	0 / 3	--	--	22.0	22.7	-- / --	0.97	NO
Aroclor-1260	39.0 - 52.7	0 / 3	--	--	22.0	22.7	-- / --	0.97	NO
Dieldrin	3.90 - 5.27	0 / 3	--	--	2.20	2.00	-- / --	1.10	NO
Endosulfan I	2.01 - 2.71	0 / 3	--	--	1.13	NSV	-- / --	NSV	NO
Endosulfan II	3.90 - 5.27	0 / 3	--	--	2.20	NSV	-- / --	NSV	NO
Endosulfan sulfate	3.90 - 5.27	0 / 3	--	--	2.20	NSV	-- / --	NSV	NO
Endrin	3.90 - 5.27	0 / 3	--	--	2.20	3.00	-- / --	0.73	NO
Endrin aldehyde	3.90 - 5.27	0 / 3	--	--	2.20	NSV	-- / --	NSV	NO
Endrin ketone	3.90 - 5.27	0 / 3	--	--	2.20	NSV	-- / --	NSV	NO
Heptachlor	2.01 - 2.71	0 / 3	--	--	1.13	0.30	-- / --	3.77	NO
Methoxychlor	20.1 - 27.2	0 / 3	--	--	11.3	NSV	-- / --	NSV	NO
Toxaphene	201 - 271	0 / 3	--	--	113	NSV	-- / --	NSV	NO
delta-BHC	2.01 - 2.71	0 / 3	--	--	1.13	NSV	-- / --	NSV	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 5-12
Refined Screening Statistics - SWMU 11 - Sediment
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COPC?
Semi-volatile Organic Compounds (UG/KG)									
1,2,4-Trichlorobenzene	390 - 530	0 / 3	--	--	220	40.0	-- / --	5.50	NO
1,2-Dichlorobenzene	390 - 530	0 / 3	--	--	220	35.0	-- / --	6.29	NO
1,3-Dichlorobenzene	390 - 530	0 / 3	--	--	220	NSV	-- / --	NSV	NO
1,4-Dichlorobenzene	390 - 530	0 / 3	--	--	220	110	-- / --	2.00	NO
1-Methylnaphthalene	20.0 - 27.0	0 / 3	--	--	11.2	NSV	-- / --	NSV	NO
2,2'-Oxybis(1-chloropropane)	390 - 530	0 / 3	--	--	220	NSV	-- / --	NSV	NO
2,4,5-Trichlorophenol	980 - 1,300	0 / 3	--	--	547	NSV	-- / --	NSV	NO
2,4,6-Trichlorophenol	390 - 530	0 / 3	--	--	220	NSV	-- / --	NSV	NO
2,4-Dichlorophenol	390 - 530	0 / 3	--	--	220	NSV	-- / --	NSV	NO
2,4-Dimethylphenol	390 - 530	0 / 3	--	--	220	29.0	-- / --	7.59	NO
2,4-Dinitrophenol	980 - 1,300	0 / 3	--	--	547	NSV	-- / --	NSV	NO
2,4-Dinitrotoluene	390 - 530	0 / 3	--	--	220	NSV	-- / --	NSV	NO
2,6-Dinitrotoluene	390 - 530	0 / 3	--	--	220	NSV	-- / --	NSV	NO
2-Chloronaphthalene	390 - 530	0 / 3	--	--	220	NSV	-- / --	NSV	NO
2-Chlorophenol	390 - 530	0 / 3	--	--	220	NSV	-- / --	NSV	NO
2-Methylphenol	390 - 530	0 / 3	--	--	220	63.0	-- / --	3.49	NO
2-Nitroaniline	980 - 1,300	0 / 3	--	--	547	NSV	-- / --	NSV	NO
2-Nitrophenol	390 - 530	0 / 3	--	--	220	NSV	-- / --	NSV	NO
3,3'-Dichlorobenzidine	390 - 530	0 / 3	--	--	220	NSV	-- / --	NSV	NO
3-Nitroaniline	980 - 1,300	0 / 3	--	--	547	NSV	-- / --	NSV	NO
4,6-Dinitro-2-methylphenol	980 - 1,300	0 / 3	--	--	547	NSV	-- / --	NSV	NO
4-Bromophenyl-phenylether	390 - 530	0 / 3	--	--	220	NSV	-- / --	NSV	NO
4-Chloro-3-methylphenol	390 - 530	0 / 3	--	--	220	NSV	-- / --	NSV	NO
4-Chloroaniline	390 - 530	0 / 3	--	--	220	NSV	-- / --	NSV	NO
4-Chlorophenyl-phenylether	390 - 530	0 / 3	--	--	220	NSV	-- / --	NSV	NO
4-Nitroaniline	980 - 1,300	0 / 3	--	--	547	NSV	-- / --	NSV	NO
4-Nitrophenol	980 - 1,300	0 / 3	--	--	547	NSV	-- / --	NSV	NO
Acenaphthene	20.0 - 27.0	0 / 3	--	--	11.2	16.0	-- / --	0.70	NO
Acenaphthylene	39.0 - 53.0	0 / 3	--	--	22	44.0	-- / --	0.50	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 5-12
Refined Screening Statistics - SWMU 11 - Sediment
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COPC?
Butylbenzylphthalate	390 - 530	0 / 3	--	--	220	63.0	-- / --	3.49	NO
Carbazole	390 - 530	0 / 3	--	--	220	NSV	-- / --	NSV	NO
Diethylphthalate	390 - 530	0 / 3	--	--	220	200	-- / --	1.10	NO
Dimethyl phthalate	390 - 530	0 / 3	--	--	220	71.0	-- / --	3.10	NO
Hexachlorobutadiene	390 - 530	0 / 3	--	--	220	11.0	-- / --	20.0	NO
Hexachlorocyclopentadiene	390 - 530	0 / 3	--	--	220	NSV	-- / --	NSV	NO
Hexachloroethane	390 - 530	0 / 3	--	--	220	NSV	-- / --	NSV	NO
Isophorone	390 - 530	0 / 3	--	--	220	NSV	-- / --	NSV	NO
Nitrobenzene	390 - 530	0 / 3	--	--	220	NSV	-- / --	NSV	NO
Pentachlorophenol	980 - 1,300	0 / 3	--	--	547	360	-- / --	1.52	NO
Phenol	390 - 530	0 / 3	--	--	220	420	-- / --	0.52	NO
bis(2-Chloroethoxy)methane	390 - 530	0 / 3	--	--	220	NSV	-- / --	NSV	NO
bis(2-Chloroethyl)ether	390 - 530	0 / 3	--	--	220	NSV	-- / --	NSV	NO
n-Nitroso-di-n-propylamine	390 - 530	0 / 3	--	--	220	NSV	-- / --	NSV	NO
n-Nitrosodiphenylamine	390 - 530	0 / 3	--	--	220	28.0	-- / --	7.86	NO
Volatile Organic Compounds (UG/KG)									
1,1,2,2-Tetrachloroethane	11.7 - 15.3	0 / 3	--	--	6.37	NSV	-- / --	NSV	NO
1,1-Dichloroethane	11.7 - 15.3	0 / 3	--	--	6.37	NSV	-- / --	NSV	NO
1,1-Dichloroethene	11.7 - 15.3	0 / 3	--	--	6.37	NSV	-- / --	NSV	NO
1,2-Dichloroethane	11.7 - 15.3	0 / 3	--	--	6.37	NSV	-- / --	NSV	NO
1,2-Dichloroethene (total)	11.7 - 15.3	0 / 3	--	--	6.37	NSV	-- / --	NSV	NO
1,2-Dichloropropane	11.7 - 15.3	0 / 3	--	--	6.37	NSV	-- / --	NSV	NO
2-Butanone	11.7 - 15.3	0 / 3	--	--	1.83	NSV	-- / --	NSV	NO
2-Hexanone	11.7 - 15.3	0 / 3	--	--	6.37	NSV	-- / --	NSV	NO
4-Methyl-2-pentanone	11.7 - 15.3	0 / 3	--	--	6.37	NSV	-- / --	NSV	NO
Acetone	11.7 - 15.3	0 / 3	--	--	7.5	NSV	-- / --	NSV	NO
Benzene	11.7 - 15.3	0 / 3	--	--	6.37	NSV	-- / --	NSV	NO
Bromochloromethane	11.7 - 15.3	3 / 3	50.0	OW11-SD01	50.0	NSV	-- / --	NSV	**YES**
Bromodichloromethane	11.7 - 15.3	0 / 3	--	--	6.37	NSV	-- / --	NSV	NO
Bromoform	11.7 - 15.3	0 / 3	--	--	6.37	NSV	-- / --	NSV	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 5-12 Refined Screening Statistics - SWMU 11 - Sediment *NAS Oceana, Virginia Beach, VA*									
Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COPC?
Bromomethane	11.7 - 15.3	0 / 3	--	--	6.37	NSV	-- / --	NSV	NO
Carbon disulfide	11.7 - 15.3	0 / 3	--	--	6.37	NSV	-- / --	NSV	NO
Carbon tetrachloride	11.7 - 15.3	0 / 3	--	--	6.37	NSV	-- / --	NSV	NO
Chlorobenzene	11.7 - 15.3	0 / 3	--	--	6.37	NSV	-- / --	NSV	NO
Chloroethane	11.7 - 15.3	0 / 3	--	--	6.37	NSV	-- / --	NSV	NO
Chloroform	11.7 - 15.3	0 / 3	--	--	6.37	NSV	-- / --	NSV	NO
Chloromethane	11.7 - 15.3	0 / 3	--	--	6.37	NSV	-- / --	NSV	NO
Dibromochloromethane	11.7 - 15.3	0 / 3	--	--	6.37	NSV	-- / --	NSV	NO
Ethylbenzene	11.7 - 15.3	0 / 3	--	--	6.37	10.0	-- / --	0.64	NO
Methylene chloride	11.7 - 15.3	0 / 3	--	--	12.7	NSV	-- / --	NSV	NO
Styrene	11.7 - 15.3	0 / 3	--	--	6.37	NSV	-- / --	NSV	NO
Toluene	11.7 - 15.3	0 / 3	--	--	6.37	NSV	-- / --	NSV	NO
Vinyl chloride	11.7 - 15.3	0 / 3	--	--	6.37	NSV	-- / --	NSV	NO
cis-1,2-Dichloroethene	11.7 - 15.3	0 / 3	--	--	6.37	NSV	-- / --	NSV	NO
cis-1,3-Dichloropropene	11.7 - 15.3	0 / 3	--	--	6.37	NSV	-- / --	NSV	NO
o-Xylene	11.7 - 15.3	0 / 3	--	--	6.37	NSV	-- / --	NSV	NO
trans-1,2-Dichloroethene	11.7 - 15.3	0 / 3	--	--	6.37	NSV	-- / --	NSV	NO
trans-1,3-Dichloropropene	11.7 - 15.3	0 / 3	--	--	6.37	NSV	-- / --	NSV	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 5-13 Refined Screening Statistics - SWMU 11 - Surface Soil *NAS Oceana, Virginia Beach, VA*									
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Sample Value**	**Screening Value**	**Frequency of Exceedance**	**Hazard Quotient**	**COPC?**
Semi-volatile Organic Compounds (UG/KG)									
1-Methylnaphthalene	110 - 110	0 / 1	--	--	55.0	NSV	-- / --	NSV	NO
2-Methylnaphthalene	110 - 110	0 / 1	--	--	55.0	NSV	-- / --	NSV	NO
Acenaphthylene	110 - 110	0 / 1	--	--	55.0	100	-- / --	0.55	NO
Anthracene	110 - 110	0 / 1	--	--	55.0	100	-- / --	0.55	NO
Benzo(a)anthracene	110 - 110	0 / 1	--	--	55.0	100	-- / --	0.55	NO
Benzo(a)pyrene	110 - 110	0 / 1	--	--	55.0	100	-- / --	0.55	NO
Benzo(b)fluoranthene	110 - 110	0 / 1	--	--	55.0	100	-- / --	0.55	NO
Benzo(g,h,i)perylene	110 - 110	0 / 1	--	--	55.0	100	-- / --	0.55	NO
Benzo(k)fluoranthene	110 - 110	0 / 1	--	--	55.0	100	-- / --	0.55	NO
Chrysene	110 - 110	0 / 1	--	--	55.0	100	-- / --	0.55	NO
Dibenz(a,h)anthracene	110 - 110	0 / 1	--	--	55.0	100	-- / --	0.55	NO
Fluoranthene	110 - 110	0 / 1	--	--	55.0	100	-- / --	0.55	NO
Indeno(1,2,3-cd)pyrene	110 - 110	0 / 1	--	--	55.0	100	-- / --	0.55	NO
Naphthalene	110 - 110	0 / 1	--	--	55.0	100	-- / --	0.55	NO
Phenanthrene	110 - 110	0 / 1	--	--	55.0	100	-- / --	0.55	NO
Pyrene	110 - 110	0 / 1	--	--	55.0	100	-- / --	0.55	NO
Volatile Organic Compounds (UG/KG)									
1,1-Dichloroethene	6.00 - 6.00	0 / 1	--	--	3.00	NSV	-- / --	NSV	NO
1,2,3-Trichloropropane	6.00 - 6.00	0 / 1	--	--	3.00	NSV	-- / --	NSV	NO
1,3-Dichlorobenzene	6.00 - 6.00	0 / 1	--	--	3.00	NSV	-- / --	NSV	NO
2-Butanone	11.0 - 11.0	0 / 1	--	--	5.50	NSV	-- / --	NSV	NO
2-Chloroethyl vinyl ether	11.0 - 11.0	0 / 1	--	--	5.50	NSV	-- / --	NSV	NO
2-Hexanone	11.0 - 11.0	0 / 1	--	--	5.50	NSV	-- / --	NSV	NO
Acetone	-- - --	1 / 1	65.0	OW11-SS10-1-94A	65.0	NSV	-- / --	NSV	**YES**
Acrolein	110 - 110	0 / 1	--	--	55.0	NSV	-- / --	NSV	NO
Acrylonitrile	110 - 110	0 / 1	--	--	55.0	NSV	-- / --	NSV	NO
Bromomethane	11.0 - 11.0	0 / 1	--	--	5.50	NSV	-- / --	NSV	NO
Carbon disulfide	6.00 - 6.00	0 / 1	--	--	3.00	NSV	-- / --	NSV	NO
Chloroethane	11.0 - 11.0	0 / 1	--	--	5.50	NSV	-- / --	NSV	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 5-13
Refined Screening Statistics - SWMU 11 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Sample Value	Screening Value	Frequency of Exceedance	Hazard Quotient	COPC?
Chloromethane	11.0 - 11.0	0 / 1	--	--	5.50	NSV	-- / --	NSV	NO
Dibromochloromethane	6.00 - 6.00	0 / 1	--	--	3.00	NSV	-- / --	NSV	NO
Dibromomethane	6.00 - 6.00	0 / 1	--	--	3.00	NSV	-- / --	NSV	NO
Ethyl methacrylate	6.00 - 6.00	0 / 1	--	--	3.00	NSV	-- / --	NSV	NO
Iodomethane	11.0 - 11.0	0 / 1	--	--	5.50	NSV	-- / --	NSV	NO
Methylene chloride	-- - --	0 / 1	--	--	7.50	1,001	-- / --	0.007	NO
Trichlorofluoromethane	6.00 - 6.00	0 / 1	--	--	3.00	NSV	-- / --	NSV	NO
Vinyl acetate	11.0 - 11.0	0 / 1	--	--	5.50	NSV	-- / --	NSV	NO
Total Petroleum Hydrocarbons (MG/KG)									
Total petroleum hydrocarbons (TPH)	-- - --	5 / 5	607	OW11-SS12-94A	281	NSV	-- / --	NSV	**YES**

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 5-14
Summary of Mean Hazard Quotients for Food Web Exposures - SWMU 11
NAS Oceana, Virginia Beach, VA

Chemical	Raccoon		Marsh wren		Mallard	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Aluminum	0.30	0.03	0.92	0.09	0.12	0.01
Antimony	0.14	0.01	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	0.02	NA	NA	NA
Chromium	NA	NA	0.25	0.05	0.03	NA
Cobalt	NA	NA	0.14	0.01	0.01	NA
Copper	NA	NA	0.02	0.01	NA	NA
Iron	0.41	0.04	4.41	0.44	0.15	0.02
Lead	0.02	NA	2.36	0.24	0.16	0.02
Manganese	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	0.02	0.01	0.17	0.02
Nickel	NA	NA	NA	NA	NA	NA
Selenium	0.03	0.02	0.19	0.09	0.03	0.01
Silver	NA	NA	NA	NA	NA	NA
Thallium	0.08	NA	0.28	0.03	0.01	NA
Vanadium	0.47	0.05	0.16	0.02	NA	NA
Zinc	NA	NA	0.12	0.01	0.01	NA
4,4'-DDD	NA	NA	NA	NA	NA	NA
4,4'-DDE	NA	NA	0.02	NA	NA	NA
4,4'-DDT	NA	NA	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA	NA	NA
Aroclor-1016	NA	NA	0.02	NA	NA	NA
Aroclor-1221	0.02	NA	0.05	NA	NA	NA
Aroclor-1232	NA	NA	0.02	NA	NA	NA
Aroclor-1242	NA	NA	0.02	NA	NA	NA
Aroclor-1248	NA	NA	0.05	NA	NA	NA
Aroclor-1254	NA	NA	0.05	NA	NA	NA
Aroclor-1260	NA	NA	0.05	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA
Endosulfan I	NA	NA	NA	NA	NA	NA
Endosulfan II	NA	NA	NA	NA	NA	NA
Endosulfan Sulfate	NA	NA	NA	NA	NA	NA
Endrin	NA	NA	NA	NA	NA	NA

Table 5-14
Summary of Mean Hazard Quotients for Food Web Exposures - SWMU 11
NAS Oceana, Virginia Beach, VA

Chemical	Raccoon		Marsh wren		Mallard	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Endrin Aldehyde	NA	NA	NA	NA	NA	NA
Endrin Ketone	NA	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	NA	NA	NA	NA	NA	NA
Methoxychlor	NA	NA	NA	NA	NA	NA
Toxaphene	NA	NA	0.08	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA
4-Bromophenyl-Phenylether	NA	NA	NA	NA	NA	NA
4-Chloro-3-Methylphenol	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-Phenylether	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA
Butylbenzylphthalate	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA
Diethylphthalate	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA

Table 5-14
Summary of Mean Hazard Quotients for Food Web Exposures - SWMU 11
NAS Oceana, Virginia Beach, VA

Chemical	Raccoon		Marsh wren		Mallard	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Hexachlorobutadiene	NA	NA	0.02	NA	NA	NA
Hexachlorobenzene	NA	NA	0.62	0.06	0.03	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA
Carbon Tetrachloride	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA
Styrene	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA

Table 5-15
Refined Summary of COPCs - SWMU 11
NAS Oceana, Virginia Beach, VA

Chemical	Surface Water	Sediment	Surface Soil	Food web
Inorganics				
Aluminum	X			
Antimony	X			
Beryllium	X			
Cadmium	X			
Chromium	X			
Cobalt	X			
Copper	X			
Iron	X			X
Lead	X			X
Manganese	X			
Nickel	X			
Silver	X			
Zinc	X			

Table 6-1
Summary Statistics - SWMU 16 - Surface Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Sample Value[1]	Standard Deviation of Mean
Inorganics (UG/L)						
Aluminum	200 - 200	0 / 1	--	--	98.0	--
Antimony	60.0 - 60.0	0 / 1	--	--	1.10	--
Arsenic	10.0 - 10.0	0 / 1	--	--	1.70	--
Barium	200 - 200	1 / 1	37.0	OW16-SW01	37.0	--
Beryllium	5.00 - 5.00	0 / 1	--	--	0.33	--
Cadmium	5.00 - 5.00	0 / 1	--	--	0.17	--
Calcium	5,000 - 5,000	1 / 1	12,200	OW16-SW01	12,200	--
Chromium	10.0 - 10.0	0 / 1	--	--	3.10	--
Cobalt	50.0 - 50.0	0 / 1	--	--	3.10	--
Copper	25.0 - 25.0	0 / 1	--	--	2.70	--
Cyanide	5.00 - 5.00	0 / 1	--	--	0.10	--
Iron	100 - 100	1 / 1	1,720	OW16-SW01	1,720	--
Lead	3.00 - 3.00	0 / 1	--	--	0.70	--
Magnesium	5,000 - 5,000	1 / 1	3,420	OW16-SW01	3,420	--
Manganese	15.0 - 15.0	1 / 1	236	OW16-SW01	236	--
Mercury	0.20 - 0.20	0 / 1	--	--	0.03	--
Nickel	40.0 - 40.0	0 / 1	--	--	3.00	--
Potassium	5,000 - 5,000	1 / 1	4,650	OW16-SW01	4,650	--
Selenium	5.00 - 5.00	0 / 1	--	--	1.50	--
Silver	10.0 - 10.0	0 / 1	--	--	1.95	--
Sodium	5,000 - 5,000	1 / 1	11,100	OW16-SW01	11,100	--
Thallium	10.0 - 10.0	0 / 1	--	--	1.20	--
Vanadium	50.0 - 50.0	0 / 1	--	--	2.85	--
Zinc	20.0 - 20.0	0 / 1	--	--	18.4	--
Pesticide/Polychlorinated Biphenyls (UG/L)						
4,4'-DDD	0.10 - 0.10	0 / 1	--	--	0.05	--
4,4'-DDE	0.10 - 0.10	0 / 1	--	--	0.05	--
4,4'-DDT	0.10 - 0.10	0 / 1	--	--	0.05	--
Aldrin	0.05 - 0.05	0 / 1	--	--	0.03	--

1 - One-half of the reporting limit was used for non-detected samples.

Table 6-1 Summary Statistics - SWMU 16 - Surface Water *NAS Oceana, Virginia Beach, VA*						
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Sample Value[1]**	**Standard Deviation of Mean**
Dieldrin	0.10 - 0.10	0 / 1	--	--	0.05	--
Endosulfan I	0.05 - 0.05	0 / 1	--	--	0.03	--
Endosulfan II	0.10 - 0.10	0 / 1	--	--	0.05	--
Endosulfan sulfate	0.10 - 0.10	0 / 1	--	--	0.05	--
Endrin	0.10 - 0.10	0 / 1	--	--	0.05	--
Endrin aldehyde	0.10 - 0.10	0 / 1	--	--	0.05	--
Endrin ketone	0.10 - 0.10	0 / 1	--	--	0.05	--
Heptachlor	0.05 - 0.05	0 / 1	--	--	0.03	--
Heptachlor epoxide	0.05 - 0.05	0 / 1	--	--	0.03	--
Methoxychlor	0.50 - 0.50	0 / 1	--	--	0.25	--
Toxaphene	5.00 - 5.00	0 / 1	--	--	2.50	--
alpha-BHC	0.05 - 0.05	0 / 1	--	--	0.03	--
alpha-Chlordane	0.05 - 0.05	0 / 1	--	--	0.03	--
beta-BHC	0.05 - 0.05	0 / 1	--	--	0.03	--
delta-BHC	0.05 - 0.05	0 / 1	--	--	0.03	--
gamma-BHC (Lindane)	0.05 - 0.05	0 / 1	--	--	0.03	--

1 - One-half of the reporting limit was used for non-detected samples.

Table 6-2
Summary Statistics - SWMU 16 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Inorganics (MG/KG)						
Aluminum	42.3 - 93.4	2 / 2	16,000	OW16-SD01	14,050	2,758
Antimony	12.7 - 28.0	1 / 2	1.40	OW16-SS01-00	0.95	0.64
Arsenic	2.10 - 4.70	2 / 2	89.5	OW16-SS01-00	46.8	60.5
Barium	42.3 - 93.4	2 / 2	111	OW16-SS01-00	110	2.12
Beryllium	1.10 - 2.30	2 / 2	0.44	OW16-SD01	0.36	0.11
Cadmium	1.10 - 2.30	1 / 2	1.10	OW16-SD01	0.57	0.75
Calcium	1,057 - 2,335	2 / 2	4,200	OW16-SD01	3,075	1,591
Chromium	2.10 - 4.70	2 / 2	51.8	OW16-SS01-00	39.2	17.8
Cobalt	10.6 - 23.3	2 / 2	9.60	OW16-SS01-00	7.10	3.54
Copper	5.30 - 11.7	2 / 2	86.9	OW16-SS01-00	56.9	42.4
Cyanide	0.60 - 1.30	0 / 2	--	--	0.02	0.01
Iron	21.1 - 46.7	2 / 2	29,100	OW16-SS01-00	18,845	14,503
Lead	0.60 - 1.40	2 / 2	27.2	OW16-SD01	18.7	12.0
Magnesium	1,057 - 2,335	2 / 2	4,430	OW16-SS01-00	3,570	1,216
Manganese	3.20 - 7.00	2 / 2	339	OW16-SS01-00	239	142
Mercury	0.10 - 0.30	2 / 2	0.15	OW16-SD01	0.10	0.08
Nickel	8.50 - 18.7	2 / 2	27.0	OW16-SS01-00	20.3	9.55
Potassium	1,057 - 2,335	2 / 2	4,770	OW16-SS01-00	3,070	2,404
Selenium	1.10 - 2.30	0 / 2	--	--	0.51	0.27
Silver	2.10 - 4.70	1 / 2	6.80	OW16-SS01-00	3.85	4.17
Sodium	1,057 - 2,335	1 / 2	218	OW16-SD01	139	112
Thallium	2.10 - 4.70	1 / 2	0.57	OW16-SS01-00	0.56	0.01
Vanadium	10.6 - 23.3	2 / 2	36.7	OW16-SS01-00	33.7	4.31
Zinc	4.20 - 9.30	2 / 2	198	OW16-SS01-00	184	20.5
Pesticide/Polychlorinated Biphenyls (UG/KG)						
4,4'-DDD	4.14 - 13.6	2 / 2	46.0	OW16-SD01	29.0	24.0
4,4'-DDE	4.14 - 13.6	2 / 2	23.0	OW16-SS01-00	19.5	4.95
4,4'-DDT	13.6 - 41.4	2 / 2	110	OW16-SS01-00	68.0	59.4
Aldrin	2.13 - 6.99	0 / 2	--	--	2.28	1.72

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 6-2 Summary Statistics - SWMU 16 - Surface Soil *NAS Oceana, Virginia Beach, VA*						
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Arithmetic Mean[1]**	**Standard Deviation of Mean**
Dieldrin	4.14 - 13.6	1 / 2	45.0	OW16-SS01-00	25.9	27.0
Endosulfan I	2.13 - 6.99	0 / 2	--	--	2.28	1.72
Endosulfan II	4.14 - 13.6	0 / 2	--	--	4.43	3.33
Endosulfan sulfate	4.14 - 13.6	0 / 2	--	--	4.43	3.33
Endrin	4.14 - 13.6	0 / 2	--	--	4.43	3.33
Endrin aldehyde	4.14 - 13.6	0 / 2	--	--	4.43	3.33
Endrin ketone	4.14 - 13.6	0 / 2	--	--	4.43	3.33
Heptachlor	2.13 - 6.99	0 / 2	--	--	2.28	1.72
Heptachlor epoxide	2.13 - 6.99	1 / 2	3.80	OW16-SS01-00	3.65	0.22
Methoxychlor	21.3 - 69.9	0 / 2	--	--	22.8	17.2
Toxaphene	213 - 699	0 / 2	--	--	228	172
alpha-BHC	2.13 - 6.99	0 / 2	--	--	2.28	1.72
alpha-Chlordane	2.13 - 6.99	2 / 2	11.0	OW16-SD01	11.0	0
beta-BHC	2.13 - 6.99	0 / 2	--	--	2.28	1.72
delta-BHC	2.13 - 6.99	0 / 2	--	--	2.28	1.72
gamma-BHC (Lindane)	2.13 - 6.99	0 / 2	--	--	2.28	1.72
gamma-Chlordane	2.13 - 6.99	2 / 2	10.0	OW16-SD01	10.0	0

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 6-3
Preliminary Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - SWMU 16
NAS Oceana, Virginia Beach, VA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor
Terrestrial Habitats			
Survival, growth, and reproduction of terrestrial soil invertebrate communities.	Are site-related surface soil concentrations sufficient to adversely effect soil invertebrate communities based on conservative screening values?	Comparison of maximum chemical concentrations in surface soil with soil screening values.	Soil Invertebrates (earthworms)
Survival, growth, and reproduction of terrestrial plant communities.	Are site-related surface soil concentrations sufficient to adversely effect terrestrial plant communities based on conservative screening values?	Comparison of maximum chemical concentrations in surface soil with soil screening values.	Terrestrial plants
Survival, growth, and reproduction of avian terrestrial insectivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume 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 soil concentrations.	American robin
Survival, growth, and reproduction of avian terrestrial carnivores.	Are site-related chemical concentrations in surface soils 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 soil concentrations.	American kestrel
Survival, growth, and reproduction of mammalian terrestrial insectivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume 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 soil concentrations.	Short-tailed shrew
Survival, growth, and reproduction of mammalian terrestrial herbivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume 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 soil concentrations.	Meadow vole
Survival, growth, and reproduction of mammalian terrestrial carnivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian 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 soil concentrations.	Red fox
Survival, growth, and reproduction of terrestrial reptiles.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to terrestrial reptilian species?	Evidence of potential risk to other upper trophic level terrestrial receptors evaluated in the screening ERA.	--

Table 6-4
Preliminary Screening Statistics - SWMU 16 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Inorganics (MG/KG)								
Aluminum	42.3 - 93.4	2 / 2	16,000	OW16-SD01	50.0	2 / 2	320	**YES**
Antimony	12.7 - 28.0	1 / 2	1.40	OW16-SS01-00	5.00	0 / 2	0.28	NO
Arsenic	2.10 - 4.70	2 / 2	89.5	OW16-SS01-00	60.0	1 / 2	1.49	**YES**
Barium	42.3 - 93.4	2 / 2	111	OW16-SS01-00	500	0 / 2	0.22	NO
Beryllium	1.10 - 2.30	2 / 2	0.44	OW16-SD01	10.0	0 / 2	0.04	NO
Cadmium	1.10 - 2.30	1 / 2	1.10	OW16-SD01	4.00	0 / 2	0.28	NO
Calcium [2]	1,057 - 2,335	2 / 2	4,200	OW16-SD01	NSV	-- / --	NSV	NO
Chromium	2.10 - 4.70	2 / 2	51.8	OW16-SS01-00	0.40	2 / 2	130	**YES**
Cobalt	10.6 - 23.3	2 / 2	9.60	OW16-SS01-00	100	0 / 2	0.10	NO
Copper	5.30 - 11.7	2 / 2	86.9	OW16-SS01-00	50.0	1 / 2	1.74	**YES**
Cyanide	0.60 - 1.30	0 / 2	--	--	0.06	-- / --	21.7	**YES**
Iron	21.1 - 46.7	2 / 2	29,100	OW16-SS01-00	200	2 / 2	146	**YES**
Lead	0.60 - 1.40	2 / 2	27.2	OW16-SD01	50.0	0 / 2	0.54	NO
Magnesium [2]	1,057 - 2,335	2 / 2	4,430	OW16-SS01-00	4,400	1 / 2	1.01	NO
Manganese	3.20 - 7.00	2 / 2	339	OW16-SS01-00	330	1 / 2	1.03	**YES**
Mercury	0.10 - 0.30	2 / 2	0.15	OW16-SD01	0.10	1 / 2	1.50	**YES**
Nickel	8.50 - 18.7	2 / 2	27.0	OW16-SS01-00	30.0	0 / 2	0.90	NO
Potassium [2]	1,057 - 2,335	2 / 2	4,770	OW16-SS01-00	NSV	-- / --	NSV	NO
Selenium	1.10 - 2.30	0 / 2	--	--	1.80	-- / --	1.28	**YES**
Silver	2.10 - 4.70	1 / 2	6.80	OW16-SS01-00	2.00	1 / 2	3.40	**YES**
Sodium [2]	1,057 - 2,335	1 / 2	218	OW16-SD01	NSV	-- / --	NSV	NO
Thallium	2.10 - 4.70	1 / 2	0.57	OW16-SS01-00	1.00	0 / 2	0.57	NO
Vanadium	10.6 - 23.3	2 / 2	36.7	OW16-SS01-00	2.00	2 / 2	18.4	**YES**
Zinc	4.20 - 9.30	2 / 2	198	OW16-SS01-00	50.0	2 / 2	3.96	**YES**
Pesticide/Polychlorinated Biphenyls (UG/KG)								
4,4'-DDD	4.14 - 13.6	2 / 2	46.0	OW16-SD01	100	0 / 2	0.46	NO
4,4'-DDE	4.14 - 13.6	2 / 2	23.0	OW16-SS01-00	100	0 / 2	0.23	NO
4,4'-DDT	13.6 - 41.4	2 / 2	110	OW16-SS01-00	100	1 / 2	1.10	**YES**

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 6-4
Preliminary Screening Statistics - SWMU 16 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Aldrin	2.13 - 6.99	0 / 2	--	--	100	-- / --	0.07	NO
Dieldrin	4.14 - 13.6	1 / 2	45.0	OW16-SS01-00	100	0 / 2	0.45	NO
Endosulfan I	2.13 - 6.99	0 / 2	--	--	NSV	-- / --	NSV	**YES**
Endosulfan II	4.14 - 13.6	0 / 2	--	--	NSV	-- / --	NSV	**YES**
Endosulfan sulfate	4.14 - 13.6	0 / 2	--	--	NSV	-- / --	NSV	**YES**
Endrin	4.14 - 13.6	0 / 2	--	--	100	-- / --	0.14	NO
Endrin aldehyde	4.14 - 13.6	0 / 2	--	--	100	-- / --	0.14	NO
Endrin ketone	4.14 - 13.6	0 / 2	--	--	100	-- / --	0.14	NO
Heptachlor	2.13 - 6.99	0 / 2	--	--	NSV	-- / --	NSV	**YES**
Heptachlor epoxide	2.13 - 6.99	1 / 2	3.80	OW16-SS01-00	100	0 / 2	0.04	NO
Methoxychlor	21.3 - 69.9	0 / 2	--	--	100	-- / --	0.70	NO
Toxaphene	213 - 699	0 / 2	--	--	NSV	-- / --	NSV	**YES**
alpha-BHC	2.13 - 6.99	0 / 2	--	--	100,000	-- / --	0.0001	NO
alpha-Chlordane	2.13 - 6.99	2 / 2	11.0	OW16-SD01	100	0 / 2	0.11	NO
beta-BHC	2.13 - 6.99	0 / 2	--	--	100,000	-- / --	0.0001	NO
delta-BHC	2.13 - 6.99	0 / 2	--	--	100,000	-- / --	0.0001	NO
gamma-BHC (Lindane)	2.13 - 6.99	0 / 2	--	--	100	-- / --	0.07	NO
gamma-Chlordane	2.13 - 6.99	2 / 2	10.0	OW16-SD01	100	0 / 2	0.10	NO

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 6-5
Summary of Maximum Hazard Quotients for Food Web Exposures - SWMU 16
NAS Oceana, Virginia Beach, VA

Chemical	Short-tailed shrew		Meadow vole		Red fox		American robin		American kestrel	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Aluminum	34.63	3.46	2.73	0.27	0.97	0.10	2.32	0.23	2.68	0.27
Antimony	1.70	0.17	0.49	0.05	0.22	0.02	<0.01	<0.01	<0.01	<0.01
Arsenic	61.65	6.17	79.98	8.00	4.41	0.44	3.56	1.19	1.19	0.40
Barium	1.34	0.34	0.40	0.10	0.18	0.05	0.02	<0.01	0.02	<0.01
Beryllium	0.09	<0.01	<0.01	<0.01	0.01	<0.01	NA	NA	NA	NA
Cadmium	5.27	0.53	0.45	0.05	0.25	0.02	1.71	0.12	1.86	0.13
Chromium	1.53	0.15	0.04	<0.01	0.07	<0.01	8.58	1.72	10.56	2.11
Cobalt	0.26	0.03	0.02	<0.01	0.01	<0.01	0.38	0.04	0.43	0.04
Copper	1.49	1.15	0.50	0.39	0.34	0.26	0.22	0.17	0.32	0.24
Iron	17.54	1.75	1.81	0.18	1.29	0.13	3.16	0.32	2.90	0.29
Lead	0.68	0.07	0.18	0.02	0.05	<0.01	2.66	0.27	0.77	0.08
Manganese	0.13	0.04	0.11	0.03	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Mercury	11.52	2.30	2.53	0.51	0.05	0.03	0.45	0.22	0.38	0.19
Nickel	0.39	0.20	0.10	0.05	0.03	0.01	0.11	0.08	0.11	0.08
Selenium	2.25	1.36	3.49	2.12	0.55	0.34	1.33	0.39	0.79	0.23
Silver	0.05	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thallium	1.09	0.11	0.10	<0.01	0.08	<0.01	0.10	<0.01	0.12	0.01
Vanadium	5.10	0.51	0.67	0.07	0.55	0.05	0.03	<0.01	0.04	<0.01
Zinc	1.90	0.95	0.26	0.13	1.26	0.13	10.45	1.16	12.78	1.41
4,4'-DDD	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.10	<0.01	0.13	0.01
4,4'-DDE	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	0.25	0.02	0.33	0.03
4,4'-DDT	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.09	<0.01	0.12	0.01
Aldrin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
alpha-BHC	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
alpha-Chlordane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
beta-BHC	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
delta-BHC	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dieldrin	2.14	0.21	0.05	<0.01	0.13	0.01	0.24	0.02	0.32	0.03
Endosulfan I	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endosulfan II	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endosulfan Sulfate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Table 6-5
Summary of Maximum Hazard Quotients for Food Web Exposures - SWMU 16
NAS Oceana, Virginia Beach, VA

Chemical	Short-tailed shrew		Meadow vole		Red fox		American robin		American kestrel	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Endrin	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.08	<0.01	0.10	0.01
Endrin Aldehyde	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.09	<0.01	0.10	0.01
Endrin Ketone	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.09	<0.01	0.10	0.01
Gamma-BHC (Lindane)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Gamma-Chlordane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Heptachlor	0.08	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01
Heptachlor Epoxide	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Methoxychlor	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Toxaphene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.13	0.01	0.17	0.02

Table 6-6
Summary of COPCs - SWMU 16 - Screening ERA
NAS Oceana, Virginia Beach, VA

Chemical	Surface Soil			Food web		
	MD	MRL	NSV	MD	MRL	NSV
Inorganics						
Aluminum	X			X		
Antimony				X		
Arsenic	X			X		
Barium				X		
Cadmium				X		
Chromium	X			X		
Copper	X			X		
Cyanide		X				
Iron	X			X		
Lead				X		
Manganese	X					
Mercury	X			X		
Selenium		X			X	
Silver	X					
Thallium				X		
Vanadium	X			X		
Zinc	X			X		
Pesticide/Polychlorinated Biphenyls						
4,4'-DDT	X					
Dieldrin				X		
Endosulfan I			X			
Endosulfan II			X			
Endosulfan sulfate			X			
Heptachlor			X			
Toxaphene			X			

MD - Maximum detect exceeds screening value
MRL - Not detected; maximum reporting limit exceeds screening value
NSV - No screening value

Table 6-7
Refined Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - SWMU 16
NAS Oceana, Virginia Beach, VA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor
Terrestrial Habitats			
Survival, growth, and reproduction of terrestrial soil invertebrate communities.	Are site-related surface soil concentrations sufficient to adversely effect soil invertebrate communities based on conservative screening values?	Comparison of mean chemical concentrations in surface soil with soil screening values.	Soil Invertebrates (earthworms)
Survival, growth, and reproduction of terrestrial plant communities.	Are site-related surface soil concentrations sufficient to adversely effect terrestrial plant communities based on conservative screening values?	Comparison of mean chemical concentrations in surface soil with soil screening values.	Terrestrial plants
Survival, growth, and reproduction of avian terrestrial insectivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume soil invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean soil concentrations.	American robin
Survival, growth, and reproduction of avian terrestrial carnivores.	Are site-related chemical concentrations in surface soils 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) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean soil concentrations.	American kestrel
Survival, growth, and reproduction of mammalian terrestrial insectivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume soil invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean soil concentrations.	Short-tailed shrew
Survival, growth, and reproduction of mammalian terrestrial herbivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume plants from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean soil concentrations.	Meadow vole
Survival, growth, and reproduction of mammalian terrestrial carnivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume small mammals from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean soil concentrations.	Red fox
Survival, growth, and reproduction of terrestrial reptiles.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to terrestrial reptilian species?	Evidence of potential risk to other upper trophic level terrestrial receptors evaluated in the baseline ERA.	--

Table 6-8
Refined Screening Statistics - SWMU 16 - Surface Soils
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COPC?
Inorganics (MG/KG)									
Aluminum	42.3 - 93.4	2 / 2	16,000	OW16-SD01	14,050	50.0	2 / 2	281	**YES**
Arsenic	2.10 - 4.70	2 / 2	89.5	OW16-SS01-00	46.8	60.0	1 / 2	0.78	NO
Chromium	2.10 - 4.70	2 / 2	51.8	OW16-SS01-00	39.2	0.40	2 / 2	98.0	**YES**
Copper	5.30 - 11.7	2 / 2	86.9	OW16-SS01-00	56.9	50.0	1 / 2	1.14	**YES**
Cyanide	0.60 - 1.30	0 / 2	--	--	0.02	0.06	-- / --	0.29	NO
Iron	21.1 - 46.7	2 / 2	29,100	OW16-SS01-00	18,845	200	2 / 2	94.2	**YES**
Manganese	3.20 - 7.00	2 / 2	339	OW16-SS01-00	239	330	1 / 2	0.72	NO
Mercury	0.10 - 0.30	2 / 2	0.15	OW16-SD01	0.10	0.10	1 / 2	0.95	NO
Selenium	1.10 - 2.30	0 / 2	--	--	0.51	1.80	-- / --	0.28	NO
Silver	2.10 - 4.70	1 / 2	6.80	OW16-SS01-00	3.85	2.00	1 / 2	1.93	**YES**
Vanadium	10.6 - 23.3	2 / 2	36.7	OW16-SS01-00	33.7	2.00	2 / 2	16.8	**YES**
Zinc	4.20 - 9.30	2 / 2	198	OW16-SS01-00	184	50.0	2 / 2	3.67	**YES**
Pesticide/Polychlorinated Biphenyls (UG/KG)									
4,4'-DDT	13.6 - 41.4	2 / 2	110	OW16-SS01-00	68.0	100	1 / 2	0.68	NO
Endosulfan I	2.13 - 6.99	0 / 2	--	--	2.28	NSV	-- / --	NSV	NO
Endosulfan II	4.14 - 13.6	0 / 2	--	--	4.43	NSV	-- / --	NSV	NO
Endosulfan sulfate	4.14 - 13.6	0 / 2	--	--	4.43	NSV	-- / --	NSV	NO
Heptachlor	2.13 - 6.99	0 / 2	--	--	2.28	NSV	-- / --	NSV	NO
Toxaphene	213 - 699	0 / 2	--	--	228	NSV	-- / --	NSV	NO

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 6-9
Summary of Mean Hazard Quotients for Food Web Exposures - SWMU 16
NAS Oceana, Virginia Beach, VA

Chemical	Short-tailed shrew		Meadow vole		Red fox		American robin		American kestrel	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Aluminum	11.20	1.12	1.03	0.10	0.32	0.03	0.67	0.07	0.51	0.05
Antimony	0.13	0.01	0.08	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic	11.30	1.13	1.17	0.12	0.47	0.05	0.24	0.08	0.18	0.06
Barium	0.83	0.21	0.18	0.05	0.06	0.02	0.01	<0.01	<0.01	<0.01
Cadmium	0.32	0.03	0.02	<0.01	0.02	<0.01	0.10	<0.01	0.10	<0.01
Chromium	0.10	0.01	<0.01	<0.01	0.01	<0.01	0.54	0.11	0.62	0.12
Copper	0.22	0.17	0.04	0.03	0.04	0.03	0.03	0.02	0.03	0.02
Iron	5.39	0.54	0.53	0.05	0.47	0.05	0.90	0.09	0.62	0.06
Lead	0.08	<0.01	<0.01	<0.01	<0.01	<0.01	0.24	0.02	0.07	<0.01
Manganese	0.04	0.01	0.04	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Mercury	0.30	0.06	0.05	0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Selenium	0.22	0.13	0.07	0.04	0.02	0.01	0.06	0.02	0.05	0.01
Silver	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thallium	0.64	0.06	0.02	<0.01	0.04	<0.01	0.06	<0.01	0.06	<0.01
Vanadium	2.31	0.23	0.24	0.02	0.22	0.02	0.01	<0.01	0.01	<0.01
Zinc	0.22	0.11	0.02	0.01	0.16	0.02	1.19	0.13	1.27	0.14
4,4'-DDT	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	0.04	<0.01
Dieldrin	0.77	0.08	0.01	<0.01	0.03	<0.01	0.09	<0.01	0.09	<0.01
Endosulfan I	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endosulfan II	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endosulfan Sulfate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Heptachlor	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Toxaphene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	0.03	<0.01

Table 6-10
Refined Summary of COPCs - SWMU 16
NAS Oceana, Virginia Beach, VA

Chemical	Surface Soil	Food web
Inorganics		
Aluminum	X	X
Arsenic		X
Chromium	X	
Copper	X	
Iron	X	X
Silver	X	
Vanadium	X	X
Zinc	X	X

MD - Maximum detect exceeds screening value
MRL - Not detected; maximum reporting limit exceeds screening value
NSV - No screening value

Table 6-11
Comparison of SWMU 16 Surface Soil COPC Concentrations to Background Concentrations
NAS Oceana, Virginia Beach, VA

Chemical	On-Site			Background [1]		On-site Comparison to Background	
	Frequency of Detection	Maximum	Arithmetic Mean	Maximum	Arithmetic Mean	On-site Maximum Exceeds Background Maximum?	On-site Mean Exceeds Background Mean?
Inorganics (mg/kg)							
Aluminum	2 / 2	16,000	14,050	100,000	66,000	NO	NO
Chromium	2 / 2	51.8	39.2	19.5	15.7	YES	YES
Copper	2 / 2	86.9	56.9	300.0	25.0	NO	YES
Iron	2 / 2	29,100	18,845	100,000	25,000	NO	NO
Vanadium	2 / 2	36.7	33.7	500	76	NO	NO
Zinc	2 / 2	198.0	184.0	2,000	54	NO	YES

[1] Background obtained from (CH2M HILL, 2000c).

Table 7-1
Summary Statistics - SWMU 16GC - Surface Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Inorganics (UG/L)						
Aluminum	200 - 200	2 / 2	544	OW16GC-SW02	529	21.2
Antimony	60.0 - 60.0	0 / 2	--	--	1.10	0
Arsenic	10.0 - 10.0	2 / 2	23.7	OW16GC-SW01	19.1	6.58
Barium	200 - 200	0 / 2	--	--	8.78	3.43
Beryllium	5.00 - 5.00	0 / 2	--	--	0.33	0
Cadmium	5.00 - 5.00	0 / 2	--	--	0.27	0.02
Calcium	5,000 - 5,000	2 / 2	13,100	OW16GC-SW02	11,750	1,909
Chromium	10.0 - 10.0	0 / 2	--	--	3.10	0
Cobalt	50.0 - 50.0	0 / 2	--	--	3.10	0
Copper	25.0 - 25.0	2 / 2	11.4	OW16GC-SW01	9.50	2.69
Cyanide	5.00 - 5.00	1 / 2	3.10	OW16GC-SW01	1.60	2.12
Iron	100 - 100	2 / 2	552	OW16GC-SW02	466	122
Lead	3.00 - 3.00	1 / 2	1.50	OW16GC-SW01	1.10	0.57
Magnesium	5,000 - 5,000	2 / 2	3,170	OW16GC-SW02	2,835	474
Manganese	15.0 - 15.0	2 / 2	106	OW16GC-SW02	70.2	50.6
Mercury	0.30 - 0.30	0 / 2	--	--	0.03	0
Nickel	40.0 - 40.0	1 / 2	8.30	OW16GC-SW01	5.65	3.75
Potassium	5,000 - 5,000	2 / 2	11,900	OW16GC-SW01	11,400	707
Selenium	5.00 - 5.00	0 / 2	--	--	1.50	0
Silver	10.0 - 10.0	0 / 2	--	--	1.95	0
Sodium	5,000 - 5,000	2 / 2	6,110	OW16GC-SW02	5,695	587
Thallium	10.0 - 10.0	0 / 2	--	--	1.20	0
Vanadium	50.0 - 50.0	0 / 2	--	--	2.85	0
Zinc	20.0 - 20.0	1 / 2	265	OW16GC-SW01	162	145
Pesticide/Polychlorinated Biphenyls (UG/L)						
4,4'-DDD	0.10 - 0.10	0 / 2	--	--	0.05	0
4,4'-DDE	0.10 - 0.10	0 / 2	--	--	0.05	0
4,4'-DDT	0.10 - 0.10	0 / 2	--	--	0.05	0
Aldrin	0.05 - 0.05	0 / 2	--	--	0.03	0

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 7-1 Summary Statistics - SWMU 16GC - Surface Water *NAS Oceana, Virginia Beach, VA*						
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Arithmetic Mean[1]**	**Standard Deviation of Mean**
Dieldrin	0.10 - 0.10	0 / 2	--	--	0.05	0
Endosulfan I	0.05 - 0.05	0 / 2	--	--	0.03	0
Endosulfan II	0.10 - 0.10	0 / 2	--	--	0.05	0
Endosulfan sulfate	0.10 - 0.10	0 / 2	--	--	0.05	0
Endrin	0.10 - 0.10	0 / 2	--	--	0.05	0
Endrin aldehyde	0.10 - 0.10	0 / 2	--	--	0.05	0
Endrin ketone	0.10 - 0.10	0 / 2	--	--	0.05	0
Heptachlor	0.05 - 0.05	0 / 2	--	--	0.03	0
Heptachlor epoxide	0.05 - 0.05	0 / 2	--	--	0.03	0
Methoxychlor	0.50 - 0.50	0 / 2	--	--	0.25	0
Toxaphene	5.00 - 5.00	0 / 2	--	--	2.50	0
alpha-BHC	0.05 - 0.05	0 / 2	--	--	0.03	0
alpha-Chlordane	0.05 - 0.05	0 / 2	--	--	0.03	0
beta-BHC	0.05 - 0.05	0 / 2	--	--	0.03	0
delta-BHC	0.05 - 0.05	0 / 2	--	--	0.03	0
gamma-BHC (Lindane)	0.05 - 0.05	0 / 2	--	--	0.03	0
gamma-Chlordane	0.05 - 0.05	0 / 2	--	--	0.03	0

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 7-2
Summary Statistics - SWMU 16GC - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Inorganics (MG/KG)						
Aluminum	55.4 - 71.1	2 / 2	10,900	OW16GC-SD01	10,095	1,138
Antimony	16.6 - 21.3	1 / 2	1.10	OW16GC-SD01	0.75	0.50
Arsenic	2.80 - 3.60	2 / 2	9.40	OW16GC-SD01	7.80	2.26
Barium	55.4 - 71.1	2 / 2	45.1	OW16GC-SD01	42.4	3.89
Beryllium	1.40 - 1.80	0 / 2	--	--	0.10	0.02
Cadmium	1.40 - 1.80	0 / 2	--	--	0.30	0.02
Calcium	1,385 - 1,777	2 / 2	1,690	OW16GC-SD02	1,455	332
Chromium	2.80 - 3.60	2 / 2	15.9	OW16GC-SD01	15.1	1.13
Cobalt	13.8 - 17.8	0 / 2	--	--	0.98	0.18
Copper	6.90 - 8.90	2 / 2	15.1	OW16GC-SD02	12.7	3.46
Cyanide	0.80 - 0.90	0 / 2	--	--	0.02	0.004
Iron	27.7 - 35.5	2 / 2	4,860	OW16GC-SD01	4,585	389
Lead	0.80 - 1.10	2 / 2	16.6	OW16GC-SD01	14.6	2.83
Magnesium	1,385 - 1,777	1 / 2	847	OW16GC-SD02	650	279
Manganese	4.20 - 5.30	2 / 2	47.5	OW16GC-SD01	45.9	2.26
Mercury	0.10 - 0.20	1 / 2	0.11	OW16GC-SD02	0.09	0.04
Nickel	11.1 - 14.2	2 / 2	5.80	OW16GC-SD01	5.05	1.06
Potassium	1,385 - 1,777	2 / 2	793	OW16GC-SD01	724	98.3
Selenium	1.40 - 1.80	1 / 2	0.83	OW16GC-SD01	0.69	0.20
Silver	2.80 - 3.60	0 / 2	--	--	0.63	0.11
Sodium	1,385 - 1,777	0 / 2	--	--	54.7	10.3
Thallium	2.80 - 3.60	0 / 2	--	--	0.38	0.07
Vanadium	13.8 - 17.8	2 / 2	15.0	OW16GC-SD01	14.2	1.20
Zinc	5.50 - 7.10	2 / 2	101	OW16GC-SD01	91.4	13.6
Pesticide/Polychlorinated Biphenyls (UG/KG)						
4,4'-DDD	3.30 - 92.0	2 / 6	15.0	OW16GC-SS3-93A	13.7	16.9
4,4'-DDE	1.70 - 47.0	2 / 6	26.0	OW16GC-SS4-93A	13.1	12.1
4,4'-DDT	3.30 - 92.0	3 / 6	12.0	OW16GC-SS4-93A	13.2	16.6
Aldrin	1.70 - 47.0	0 / 6	--	--	5.57	8.86

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 7-2 Summary Statistics - SWMU 16GC - Surface Soil *NAS Oceana, Virginia Beach, VA*						
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Arithmetic Mean[1]**	**Standard Deviation of Mean**
Chlordane	17.0 - 470	1 / 4	40.0	OW16GC-SS4-93A	81.3	104
Dieldrin	1.70 - 47.0	0 / 6	--	--	6.02	8.63
Endosulfan I	1.70 - 47.0	0 / 6	--	--	5.57	8.86
Endosulfan II	3.30 - 92.0	0 / 6	--	--	10.9	17.4
Endosulfan sulfate	3.30 - 92.0	0 / 6	--	--	10.9	17.4
Endrin	3.30 - 92.0	0 / 6	--	--	10.9	17.4
Endrin aldehyde	3.30 - 92.0	0 / 6	--	--	10.9	17.4
Endrin ketone	5.43 - 5.61	0 / 2	--	--	2.76	0.06
Heptachlor	1.70 - 47.0	0 / 6	--	--	5.57	8.86
Heptachlor epoxide	1.70 - 47.0	0 / 6	--	--	5.57	8.86
Methoxychlor	6.90 - 190	0 / 6	--	--	25.3	34.5
Toxaphene	85.0 - 2,300	0 / 6	--	--	298	421
alpha-BHC	1.70 - 47.0	0 / 6	--	--	5.57	8.86
alpha-Chlordane	2.80 - 2.89	1 / 2	6.00	OW16GC-SD02	3.72	3.22
beta-BHC	2.80 - 92.0	0 / 6	--	--	10.4	17.6
delta-BHC	1.70 - 47.0	0 / 6	--	--	5.57	8.86
gamma-BHC (Lindane)	1.70 - 47.0	0 / 6	--	--	5.57	8.86
gamma-Chlordane	2.80 - 2.89	0 / 2	--	--	1.42	0.03

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 7-3
Preliminary Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - SWMU 16GC
NAS Oceana, Virginia Beach, VA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor
Terrestrial Habitats			
Survival, growth, and reproduction of terrestrial soil invertebrate communities.	Are site-related surface soil concentrations sufficient to adversely effect soil invertebrate communities based on conservative screening values?	Comparison of maximum chemical concentrations in surface soil with soil screening values.	Soil Invertebrates (earthworms)
Survival, growth, and reproduction of terrestrial plant communities.	Are site-related surface soil concentrations sufficient to adversely effect terrestrial plant communities based on conservative screening values?	Comparison of maximum chemical concentrations in surface soil with soil screening values.	Terrestrial plants
Survival, growth, and reproduction of avian terrestrial insectivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume 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 soil concentrations.	American robin
Survival, growth, and reproduction of avian terrestrial carnivores.	Are site-related chemical concentrations in surface soils 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 soil concentrations.	American kestrel
Survival, growth, and reproduction of mammalian terrestrial insectivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume 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 soil concentrations.	Short-tailed shrew
Survival, growth, and reproduction of mammalian terrestrial herbivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume 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 soil concentrations.	Meadow vole
Survival, growth, and reproduction of mammalian terrestrial carnivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian 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 soil concentrations.	Red fox
Survival, growth, and reproduction of terrestrial reptiles.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to terrestrial reptilian species?	Evidence of potential risk to other upper trophic level terrestrial receptors evaluated in the screening ERA.	--

Table 7-4
Preliminary Screening Statistics - SWMU 16GC - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Inorganics (MG/KG)								
Aluminum	55.4 - 71.1	2 / 2	10,900	OW16GC-SD01	50.0	2 / 2	218	**YES**
Antimony	16.6 - 21.3	1 / 2	1.10	OW16GC-SD01	5.00	0 / 2	0.22	NO
Arsenic	2.80 - 3.60	2 / 2	9.40	OW16GC-SD01	60.0	0 / 2	0.16	NO
Barium	55.4 - 71.1	2 / 2	45.1	OW16GC-SD01	500	0 / 2	0.09	NO
Beryllium	1.40 - 1.80	0 / 2	--	--	10.0	-- / --	0.18	NO
Cadmium	1.40 - 1.80	0 / 2	--	--	4.00	-- / --	0.45	NO
Calcium [2]	1,385 - 1,777	2 / 2	1,690	OW16GC-SD02	NSV	-- / --	NSV	NO
Chromium	2.80 - 3.60	2 / 2	15.9	OW16GC-SD01	0.40	2 / 2	39.8	**YES**
Cobalt	13.8 - 17.8	0 / 2	--	--	100	-- / --	0.18	NO
Copper	6.90 - 8.90	2 / 2	15.1	OW16GC-SD02	50.0	0 / 2	0.30	NO
Cyanide	0.80 - 0.90	0 / 2	--	--	0.06	-- / --	15.0	**YES**
Iron	27.7 - 35.5	2 / 2	4,860	OW16GC-SD01	200	2 / 2	24.3	**YES**
Lead	0.80 - 1.10	2 / 2	16.6	OW16GC-SD01	50.0	0 / 2	0.33	NO
Magnesium [2]	1,385 - 1,777	1 / 2	847	OW16GC-SD02	4,400	0 / 2	0.19	NO
Manganese	4.20 - 5.30	2 / 2	47.5	OW16GC-SD01	330	0 / 2	0.14	NO
Mercury	0.10 - 0.20	1 / 2	0.11	OW16GC-SD02	0.10	1 / 2	1.10	**YES**
Nickel	11.1 - 14.2	2 / 2	5.80	OW16GC-SD01	30.0	0 / 2	0.19	NO
Potassium [2]	1,385 - 1,777	2 / 2	793	OW16GC-SD01	NSV	-- /	NSV	NO
Selenium	1.40 - 1.80	1 / 2	0.83	OW16GC-SD01	1.80	0 / 2	0.46	NO
Silver	2.80 - 3.60	0 / 2	--	--	2.00	-- / --	1.80	**YES**
Sodium [2]	1,385 - 1,777	0 / 2	--	--	NSV	-- / --	NSV	NO
Thallium	2.80 - 3.60	0 / 2	--	--	1.00	-- / --	3.60	**YES**
Vanadium	13.8 - 17.8	2 / 2	15.0	OW16GC-SD01	2.00	2 / 2	7.50	**YES**
Zinc	5.50 - 7.10	2 / 2	101	OW16GC-SD01	50.0	2 / 2	2.02	**YES**
Pesticide/Polychlorinated Biphenyls (UG/KG)								
4,4'-DDD	3.30 - 92.0	2 / 6	15.0	OW16GC-SS3-93A	100	0 / 6	0.15	NO
4,4'-DDE	1.70 - 47.0	2 / 6	26.0	OW16GC-SS4-93A	100	0 / 6	0.26	NO
4,4'-DDT	3.30 - 92.0	3 / 6	12.0	OW16GC-SS4-93A	100	0 / 6	0.12	NO

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 7-4 Preliminary Screening Statistics - SWMU 16GC - Surface Soil *NAS Oceana, Virginia Beach, VA*								
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Screening Value**	**Frequency of Exceedance**	**Maximum Hazard Quotient[1]**	**COPC?**
Aldrin	1.70 - 47.0	0 / 6	--	--	100	-- / --	0.47	NO
Chlordane	17.0 - 470	1 / 4	40.0	OW16GC-SS4-93A	100	0 / 4	0.40	NO
Dieldrin	1.70 - 47.0	0 / 6	--	--	100	-- / --	0.47	NO
Endosulfan I	1.70 - 47.0	0 / 6	--	--	NSV	-- / --	NSV	**YES**
Endosulfan II	3.30 - 92.0	0 / 6	--	--	NSV	-- / --	NSV	**YES**
Endosulfan sulfate	3.30 - 92.0	0 / 6	--	--	NSV	-- / --	NSV	**YES**
Endrin	3.30 - 92.0	0 / 6	--	--	100	-- / --	0.92	NO
Endrin aldehyde	3.30 - 92.0	0 / 6	--	--	100	-- / --	0.92	NO
Endrin ketone	5.43 - 5.61	0 / 2	--	--	100	-- / --	0.06	NO
Heptachlor	1.70 - 47.0	0 / 6	--	--	NSV	-- / --	NSV	**YES**
Heptachlor epoxide	1.70 - 47.0	0 / 6	--	--	100	-- / --	0.47	NO
Methoxychlor	6.90 - 190	0 / 6	--	--	100	-- / --	1.90	**YES**
Toxaphene	85.0 - 2,300	0 / 6	--	--	NSV	-- / --	NSV	**YES**
alpha-BHC	1.70 - 47.0	0 / 6	--	--	100,000	-- / --	0.0005	NO
alpha-Chlordane	2.80 - 2.89	1 / 2	6.00	OW16GC-SD02	100	0 / 2	0.06	NO
beta-BHC	2.80 - 92.0	0 / 6	--	--	100,000	-- / --	0.0009	NO
delta-BHC	1.70 - 47.0	0 / 6	--	--	100,000	-- / --	0.0005	NO
gamma-BHC (Lindane)	1.70 - 47.0	0 / 6	--	--	100	-- / --	0.47	NO
gamma-Chlordane	2.80 - 2.89	0 / 2	--	--	100	-- / --	0.03	NO

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 7-5
Summary of Maximum Hazard Quotients for Food Web Exposures - SWMU 16GC
NAS Oceana, Virginia Beach, VA

Chemical	Short-tailed shrew		Meadow vole		Red fox		American robin		American kestrel	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Aluminum	23.60	2.36	1.87	0.19	0.66	0.07	1.58	0.16	1.83	0.18
Antimony	1.37	0.14	0.43	0.04	0.19	0.02	<0.01	<0.01	<0.01	<0.01
Arsenic	6.54	0.65	8.48	0.85	0.49	0.05	0.38	0.13	0.13	0.04
Barium	0.56	0.14	0.18	0.05	0.08	0.02	<0.01	<0.01	<0.01	<0.01
Beryllium	0.37	0.04	0.02	<0.01	0.05	<0.01	NA	NA	NA	NA
Cadmium	8.61	0.86	0.74	0.07	0.40	0.04	2.80	0.20	3.04	0.22
Chromium	0.47	0.05	0.01	<0.01	0.02	<0.01	2.64	0.53	3.24	0.65
Cobalt	0.48	0.05	0.03	<0.01	0.02	<0.01	0.70	0.07	0.79	0.08
Copper	0.26	0.20	0.09	0.07	0.06	0.05	0.04	0.03	0.06	0.04
Iron	2.93	0.29	0.30	0.03	0.22	0.02	0.53	0.05	0.48	0.05
Lead	0.41	0.04	0.11	0.01	0.03	<0.01	1.62	0.16	0.47	0.05
Manganese	0.02	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Mercury	8.45	1.69	1.86	0.37	0.04	0.02	0.33	0.16	0.28	0.14
Nickel	0.08	0.04	0.02	0.01	<0.01	<0.01	0.02	0.02	0.02	0.02
Selenium	0.82	0.50	1.27	0.77	0.20	0.12	0.48	0.14	0.29	0.08
Silver	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thallium	6.62	0.66	0.30	0.03	0.39	0.04	0.58	0.06	0.71	0.07
Vanadium	2.14	0.21	0.33	0.03	0.25	0.03	0.01	<0.01	0.02	<0.01
Zinc	0.97	0.48	0.13	0.07	0.64	0.06	5.33	0.59	6.52	0.72
4,4'-DDD	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	0.04	<0.01
4,4'-DDE	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	0.28	0.03	0.37	0.04
4,4'-DDT	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.01	<0.01
Aldrin	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
alpha-BHC	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
alpha-Chlordane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
beta-BHC	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.01	<0.01
delta-BHC	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dieldrin	2.24	0.22	0.05	<0.01	0.14	0.01	0.25	0.03	0.33	0.03
Endosulfan I	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endosulfan II	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endosulfan Sulfate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Table 7-5
Summary of Maximum Hazard Quotients for Food Web Exposures - SWMU 16GC
NAS Oceana, Virginia Beach, VA

Chemical	Short-tailed shrew		Meadow vole		Red fox		American robin		American kestrel	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Endrin	0.14	0.01	<0.01	<0.01	<0.01	<0.01	0.54	0.05	0.67	0.07
Endrin Aldehyde	0.14	0.01	0.02	<0.01	0.01	<0.01	0.62	0.06	0.69	0.07
Endrin Ketone	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	<0.01	0.05	<0.01
Gamma-BHC (Lindane)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Gamma-Chlordane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Heptachlor	0.56	0.06	0.01	<0.01	0.03	<0.01	0.06	<0.01	0.08	<0.01
Heptachlor Epoxide	0.56	0.06	0.01	<0.01	0.03	<0.01	0.06	<0.01	0.08	<0.01
Methoxychlor	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Toxaphene	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	0.43	0.04	0.55	0.05

Table 7-6 Preliminary Summary of COPCs - SWMU 16GC *NAS Oceana, Virginia Beach, VA*						
Chemical	Surface Soil			Food web		
	MD	MRL	NSV	MD	MRL	NSV
Inorganics						
Aluminum	X			X		
Antimony				X		
Arsenic				X		
Cadmium					X	
Chromium	X			X		
Cyanide		X				
Iron	X			X		
Lead				X		
Mercury	X			X		
Selenium				X		
Silver		X				
Thallium		X			X	
Vanadium	X			X		
Zinc	X			X		
Pesticide/Polychlorinated Biphenyls						
Dieldrin					X	
Endosulfan I			X			
Endosulfan II			X			
Endosulfan sulfate			X			
Heptachlor			X			
Methoxychlor		X				
Toxaphene			X			

MD - Maximum detect exceeds screening value
MRL - Not detected; maximum reporting limit exceeds screening value
NSV - No screening value

Table 7-7
Refined Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - SWMU 16GC
NAS Oceana, Virginia Beach, VA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor
Terrestrial Habitats			
Survival, growth, and reproduction of terrestrial soil invertebrate communities.	Are site-related surface soil concentrations sufficient to adversely effect soil invertebrate communities based on conservative screening values?	Comparison of mean chemical concentrations in surface soil with soil screening values.	Soil Invertebrates (earthworms)
Survival, growth, and reproduction of terrestrial plant communities.	Are site-related surface soil concentrations sufficient to adversely effect terrestrial plant communities based on conservative screening values?	Comparison of mean chemical concentrations in surface soil with soil screening values.	Terrestrial plants
Survival, growth, and reproduction of avian terrestrial insectivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume soil invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean soil concentrations.	American robin
Survival, growth, and reproduction of avian terrestrial carnivores.	Are site-related chemical concentrations in surface soils 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) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean soil concentrations.	American kestrel
Survival, growth, and reproduction of mammalian terrestrial insectivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume soil invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean soil concentrations.	Short-tailed shrew
Survival, growth, and reproduction of mammalian terrestrial herbivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume plants from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean soil concentrations.	Meadow vole
Survival, growth, and reproduction of terrestrial reptiles.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to terrestrial reptilian species?	Evidence of potential risk to other upper trophic level terrestrial receptors evaluated in the baseline ERA.	--

Table 7-8
Refined Screening Statistics - SWMU 16GC - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COPC?
Inorganics (MG/KG)									
Aluminum	55.4 - 71.1	2 / 2	10,900	OW16GC-SD01	10,095	50.0	2 / 2	202	**YES**
Chromium	2.80 - 3.60	2 / 2	15.9	OW16GC-SD01	15.1	0.40	2 / 2	37.8	**YES**
Cyanide	0.80 - 0.90	0 / 2	--	--	0.02	0.06	-- / --	0.29	NO
Iron	27.7 - 35.5	2 / 2	4,860	OW16GC-SD01	4,585	200	2 / 2	22.9	**YES**
Mercury	0.10 - 0.20	1 / 2	0.11	OW16GC-SD02	0.09	0.10	1 / 2	0.85	NO
Silver	2.80 - 3.60	0 / 2	--	--	0.63	2.00	-- / --	0.31	NO
Thallium	2.80 - 3.60	0 / 2	--	--	0.38	1.00	-- / --	0.38	NO
Vanadium	13.8 - 17.8	2 / 2	15.0	OW16GC-SD01	14.2	2.00	2 / 2	7.08	**YES**
Zinc	5.50 - 7.10	2 / 2	101	OW16GC-SD01	91.4	50.0	2 / 2	1.83	**YES**
Pesticide/Polychlorinated Biphenyls (UG/KG)									
Endosulfan I	1.70 - 47.0	0 / 6	--	--	5.57	NSV	-- / --	NSV	NO
Endosulfan II	3.30 - 92.0	0 / 6	--	--	10.9	NSV	-- / --	NSV	NO
Endosulfan sulfate	3.30 - 92.0	0 / 6	--	--	10.9	NSV	-- / --	NSV	NO
Heptachlor	1.70 - 47.0	0 / 6	--	--	5.57	NSV	-- / --	NSV	NO
Methoxychlor	6.90 - 190	0 / 6	--	--	25.3	100	-- / --	0.25	NO
Toxaphene	85.0 - 2,300	0 / 6	--	--	298	NSV	-- / --	NSV	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 7-9
Summary of Mean Hazard Quotients for Food Web Exposures - SWMU 16GC
NAS Oceana, Virginia Beach, VA

Chemical	Short-tailed shrew		Meadow vole		American robin		American kestrel	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Aluminum	8.05	0.81	0.74	0.07	0.48	0.05	0.37	0.04
Antimony	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic	0.03	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium	0.04	<0.01	<0.01	<0.01	0.21	0.04	0.24	0.05
Iron	1.31	0.13	0.13	0.01	0.22	0.02	0.15	0.02
Lead	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Mercury	0.26	0.05	0.05	<0.01	0.01	<0.01	<0.01	<0.01
Selenium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thallium	0.43	0.04	0.02	<0.01	0.04	<0.01	0.04	<0.01
Vanadium	0.97	0.10	0.10	0.01	<0.01	<0.01	<0.01	<0.01
Zinc	0.11	0.06	0.01	<0.01	0.59	0.07	0.63	0.07
Dieldrin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endosulfan I	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endosulfan II	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endosulfan Sulfate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Heptachlor	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Methoxychlor	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Toxaphene	<0.01	<0.01	<0.01	<0.01	0.04	<0.01	0.04	<0.01

Table 7-10 Refined Summary of COPCs - SWMU 16GC *NAS Oceana, Virginia Beach, VA*		
Chemical	**Surface Soil**	**Food web**
Inorganics		
Aluminum	X	X
Chromium	X	
Iron	X	X
Vanadium	X	
Zinc	X	

Table 7-11

Comparison of SWMU 16GC Surface Soil COPC Concentrations to Background Concentrations

NAS Oceana, Virginia Beach, VA

Chemical	On-Site			Background [1]		On-site Comparison to Background	
	Frequency of Detection	Maximum	Arithmetic Mean	Maximum	Arithmetic Mean	On-site Maximum Exceeds Background Maximum?	On-site Mean Exceeds Background Mean?
Inorganics (mg/kg)							
Aluminum	2 / 2	10,900	10,095	100,000	66,000	NO	NO
Chromium	2 / 2	15.9	15.1	19.5	15.7	NO	NO
Iron	2 / 2	4,860	4,585	100,000	25,000	NO	NO
Vanadium	2 / 2	15.0	14.2	500	76	NO	NO
Zinc	2 / 2	101.0	91.4	2,000	54	NO	YES

[1] Background obtained from (CH2M HILL, 2000c).

Table 8-1 Summary Statistics - SWMU 21 - Surface Soil *NAS Oceana, Virginia Beach, VA*						
Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Polychlorinated Biphenyls (UG/KG)						
Aroclor-1016	41.0 - 230	0 / 11	--	--	30.1	28.2
Aroclor-1221	42.0 - 460	0 / 11	--	--	59.1	57.1
Aroclor-1232	42.0 - 460	0 / 11	--	--	59.1	57.1
Aroclor-1242	41.0 - 230	0 / 11	--	--	30.1	28.2
Aroclor-1248	41.0 - 230	0 / 11	--	--	30.1	28.2
Aroclor-1254	21.0 - 120	0 / 11	--	--	16.5	14.7
Aroclor-1260	21.0 - 120	0 / 11	--	--	16.5	14.7
Semi-volatile Organic Compounds (UG/KG)						
1,2,4-Trichlorobenzene	420 - 460	0 / 3	--	--	215	10.0
1,2-Dichlorobenzene	420 - 460	0 / 3	--	--	215	10.0
1,3-Dichlorobenzene	420 - 460	0 / 3	--	--	215	10.0
1,4-Dichlorobenzene	420 - 460	0 / 3	--	--	215	10.0
2,2'-Oxybis(1-chloropropane)	420 - 460	0 / 3	--	--	215	10.0
2,4,5-Trichlorophenol	420 - 460	0 / 3	--	--	215	10.0
2,4,6-Trichlorophenol	420 - 460	0 / 3	--	--	215	10.0
2,4-Dichlorophenol	420 - 460	0 / 3	--	--	215	10.0
2,4-Dimethylphenol	420 - 460	0 / 3	--	--	215	10.0
2,4-Dinitrophenol	1,000 - 1,100	0 / 3	--	--	517	28.9
2,4-Dinitrotoluene	420 - 460	0 / 3	--	--	215	10.0
2,6-Dinitrotoluene	420 - 460	0 / 3	--	--	215	10.0
2-Chloronaphthalene	420 - 460	0 / 3	--	--	215	10.0
2-Chlorophenol	420 - 460	0 / 3	--	--	215	10.0
2-Methylnaphthalene	420 - 460	0 / 3	--	--	215	10.0
2-Methylphenol	420 - 460	0 / 3	--	--	215	10.0
2-Nitroaniline	1,000 - 1,100	0 / 3	--	--	517	28.9
2-Nitrophenol	420 - 460	0 / 3	--	--	215	10.0
3,3'-Dichlorobenzidine	420 - 460	0 / 3	--	--	215	10.0
3-Nitroaniline	1,000 - 1,100	0 / 3	--	--	517	28.9
4,6-Dinitro-2-methylphenol	1,000 - 1,100	0 / 3	--	--	517	28.9

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 8-1
Summary Statistics - SWMU 21 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
4-Bromophenyl-phenylether	420 - 460	0 / 3	--	--	215	10.0
4-Chloro-3-methylphenol	420 - 460	0 / 3	--	--	215	10.0
4-Chloroaniline	420 - 460	0 / 3	--	--	215	10.0
4-Chlorophenyl-phenylether	420 - 460	0 / 3	--	--	215	10.0
4-Methylphenol	420 - 460	0 / 3	--	--	215	10.0
4-Nitroaniline	1,000 - 1,100	0 / 3	--	--	517	28.9
4-Nitrophenol	1,000 - 1,100	0 / 3	--	--	517	28.9
Acenaphthene	420 - 460	0 / 3	--	--	215	10.0
Acenaphthylene	420 - 460	0 / 3	--	--	215	10.0
Anthracene	420 - 460	0 / 3	--	--	215	10.0
Benzo(a)anthracene	420 - 460	1 / 3	50.0	OW21-SS13	163	98.3
Benzo(a)pyrene	420 - 460	0 / 3	--	--	215	10.0
Benzo(b)fluoranthene	420 - 460	1 / 3	57.0	OW21-SS13	166	94.2
Benzo(g,h,i)perylene	420 - 460	0 / 3	--	--	215	10.0
Benzo(k)fluoranthene	420 - 460	0 / 3	--	--	215	10.0
Butylbenzylphthalate	420 - 460	0 / 3	--	--	215	10.0
Carbazole	420 - 460	0 / 3	--	--	215	10.0
Chrysene	420 - 460	1 / 3	67.0	OW21-SS13	169	88.5
Di-n-butylphthalate	420 - 460	0 / 3	--	--	215	10.0
Di-n-octylphthalate	420 - 460	0 / 3	--	--	215	10.0
Dibenz(a,h)anthracene	420 - 460	0 / 3	--	--	215	10.0
Dibenzofuran	420 - 460	0 / 3	--	--	215	10.0
Diethylphthalate	420 - 460	0 / 3	--	--	215	10.0
Dimethyl phthalate	420 - 460	0 / 3	--	--	215	10.0
Fluoranthene	420 - 460	1 / 3	74.0	OW21-SS13	171	84.4
Fluorene	420 - 460	0 / 3	--	--	215	10.0
Hexachlorobenzene	420 - 460	0 / 3	--	--	215	10.0
Hexachlorobutadiene	420 - 460	0 / 3	--	--	215	10.0
Hexachlorocyclopentadiene	420 - 460	0 / 3	--	--	215	10.0
Hexachloroethane	420 - 460	0 / 3	--	--	215	10.0

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 8-1
Summary Statistics - SWMU 21 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Indeno(1,2,3-cd)pyrene	420 - 460	0 / 3	--	--	215	10.0
Isophorone	420 - 460	0 / 3	--	--	215	10.0
Naphthalene	420 - 460	0 / 3	--	--	215	10.0
Nitrobenzene	420 - 460	0 / 3	--	--	215	10.0
Pentachlorophenol	1,000 - 1,100	0 / 3	--	--	517	28.9
Phenanthrene	420 - 460	0 / 3	--	--	215	10.0
Phenol	420 - 460	0 / 3	--	--	215	10.0
Pyrene	420 - 460	1 / 3	87.0	OW21-SS13	176	77.0
bis(2-Chloroethoxy)methane	420 - 460	0 / 3	--	--	215	10.0
bis(2-Chloroethyl)ether	420 - 460	0 / 3	--	--	215	10.0
bis(2-Ethylhexyl)phthalate	420 - 460	3 / 3	1,200	OW21-SS11	743	460
n-Nitroso-di-n-propylamine	420 - 460	0 / 3	--	--	215	10.0
n-Nitrosodiphenylamine	420 - 460	0 / 3	--	--	215	10.0
Total Petroleum Hydrocarbons (MG/KG)						
Total petroleum hydrocarbons (TPH)	-- - --	2 / 2	242	OW21-SS6-93A	126	165

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 8-2
Preliminary Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - SWMU 21
NAS Oceana, Virginia Beach, VA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor
Terrestrial Habitats			
Survival, growth, and reproduction of terrestrial soil invertebrate communities.	Are site-related surface soil concentrations sufficient to adversely effect soil invertebrate communities based on conservative screening values?	Comparison of maximum chemical concentrations in surface soil with soil screening values.	Soil Invertebrates (earthworms)
Survival, growth, and reproduction of terrestrial plant communities.	Are site-related surface soil concentrations sufficient to adversely effect terrestrial plant communities based on conservative screening values?	Comparison of maximum chemical concentrations in surface soil with soil screening values.	Terrestrial plants
Survival, growth, and reproduction of avian terrestrial insectivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume 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 soil concentrations.	Killdeer

Table 8-3
Preliminary Screening Statistics - SWMU 21 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Polychlorinated Biphenyls (UG/KG)								
Aroclor-1016	41.0 - 230	0 / 11	--	--	100	-- / --	2.30	**YES**
Aroclor-1221	42.0 - 460	0 / 11	--	--	100	-- / --	4.60	**YES**
Aroclor-1232	42.0 - 460	0 / 11	--	--	100	-- / --	4.60	**YES**
Aroclor-1242	41.0 - 230	0 / 11	--	--	100	-- / --	2.30	**YES**
Aroclor-1248	41.0 - 230	0 / 11	--	--	100	-- / --	2.30	**YES**
Aroclor-1254	21.0 - 120	0 / 11	--	--	100	-- / --	1.20	**YES**
Aroclor-1260	21.0 - 120	0 / 11	--	--	100	-- / --	1.20	**YES**
Semi-volatile Organic Compounds (UG/KG)								
1,2,4-Trichlorobenzene	420 - 460	0 / 3	--	--	1,270	-- / --	0.36	NO
1,2-Dichlorobenzene	420 - 460	0 / 3	--	--	100	-- / --	4.60	**YES**
1,3-Dichlorobenzene	420 - 460	0 / 3	--	--	NSV	-- / --	NSV	**YES**
1,4-Dichlorobenzene	420 - 460	0 / 3	--	--	1,280	-- / --	0.36	NO
2,2'-Oxybis(1-chloropropane)	420 - 460	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2,4,5-Trichlorophenol	420 - 460	0 / 3	--	--	430	-- / --	1.07	**YES**
2,4,6-Trichlorophenol	420 - 460	0 / 3	--	--	580	-- / --	0.79	NO
2,4-Dichlorophenol	420 - 460	0 / 3	--	--	13,400	-- / --	0.03	NO
2,4-Dimethylphenol	420 - 460	0 / 3	--	--	100	-- / --	4.60	**YES**
2,4-Dinitrophenol	1,000 - 1,100	0 / 3	--	--	20,000	-- / --	0.06	NO
2,4-Dinitrotoluene	420 - 460	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2,6-Dinitrotoluene	420 - 460	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2-Chloronaphthalene	420 - 460	0 / 3	--	--	1,033	-- / --	0.45	NO
2-Chlorophenol	420 - 460	0 / 3	--	--	100	-- / --	4.60	**YES**
2-Methylnaphthalene	420 - 460	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2-Methylphenol	420 - 460	0 / 3	--	--	100	-- / --	4.60	**YES**
2-Nitroaniline	1,000 - 1,100	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2-Nitrophenol	420 - 460	0 / 3	--	--	NSV	-- / --	NSV	**YES**
3,3'-Dichlorobenzidine	420 - 460	0 / 3	--	--	NSV	-- / --	NSV	**YES**
3-Nitroaniline	1,000 - 1,100	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4,6-Dinitro-2-methylphenol	1,000 - 1,100	0 / 3	--	--	NSV	-- / --	NSV	**YES**

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit

Table 8-3
Preliminary Screening Statistics - SWMU 21 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
4-Bromophenyl-phenylether	420 - 460	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Chloro-3-methylphenol	420 - 460	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Chloroaniline	420 - 460	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Chlorophenyl-phenylether	420 - 460	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Methylphenol	420 - 460	0 / 3	--	--	100	-- / --	4.60	**YES**
4-Nitroaniline	1,000 - 1,100	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Nitrophenol	1,000 - 1,100	0 / 3	--	--	380	-- / --	2.89	**YES**
Acenaphthene	420 - 460	0 / 3	--	--	2,500	-- / --	0.18	NO
Acenaphthylene	420 - 460	0 / 3	--	--	100	-- / --	4.60	**YES**
Anthracene	420 - 460	0 / 3	--	--	100	-- / --	4.60	**YES**
Benzo(a)anthracene	420 - 460	1 / 3	50.0	OW21-SS13	100	0 / 3	0.50	NO
Benzo(a)pyrene	420 - 460	0 / 3	--	--	100	-- / --	4.60	**YES**
Benzo(b)fluoranthene	420 - 460	1 / 3	57.0	OW21-SS13	100	0 / 3	0.57	NO
Benzo(g,h,i)perylene	420 - 460	0 / 3	--	--	100	-- / --	4.60	**YES**
Benzo(k)fluoranthene	420 - 460	0 / 3	--	--	100	-- / --	4.60	**YES**
Butylbenzylphthalate	420 - 460	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Carbazole	420 - 460	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Chrysene	420 - 460	1 / 3	67.0	OW21-SS13	100	0 / 3	0.67	NO
Di-n-butylphthalate	420 - 460	0 / 3	--	--	200,000	-- / --	0.002	NO
Di-n-octylphthalate	420 - 460	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Dibenz(a,h)anthracene	420 - 460	0 / 3	--	--	100	-- / --	4.60	**YES**
Dibenzofuran	420 - 460	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Diethylphthalate	420 - 460	0 / 3	--	--	13,400	-- / --	0.03	NO
Dimethyl phthalate	420 - 460	0 / 3	--	--	10,640	-- / --	0.04	NO
Fluoranthene	420 - 460	1 / 3	74.0	OW21-SS13	100	0 / 3	0.74	NO
Fluorene	420 - 460	0 / 3	--	--	1,700	-- / --	0.27	NO
Hexachlorobenzene	420 - 460	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Hexachlorobutadiene	420 - 460	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Hexachlorocyclopentadiene	420 - 460	0 / 3	--	--	1,000	-- / --	0.46	NO
Hexachloroethane	420 - 460	0 / 3	--	--	NSV	-- / --	NSV	**YES**

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit

Table 8-3
Preliminary Screening Statistics - SWMU 21 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Indeno(1,2,3-cd)pyrene	420 - 460	0 / 3	--	--	100	-- / --	4.60	**YES**
Isophorone	420 - 460	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Naphthalene	420 - 460	0 / 3	--	--	100	-- / --	4.60	**YES**
Nitrobenzene	420 - 460	0 / 3	--	--	2,260	-- / --	0.20	NO
Pentachlorophenol	1,000 - 1,100	0 / 3	--	--	3,000	-- / --	0.37	NO
Phenanthrene	420 - 460	0 / 3	--	--	100	-- / --	4.60	**YES**
Phenol	420 - 460	0 / 3	--	--	1,880	-- / --	0.24	NO
Pyrene	420 - 460	1 / 3	87.0	OW21-SS13	100	0 / 3	0.87	NO
bis(2-Chloroethoxy)methane	420 - 460	0 / 3	--	--	NSV	-- / --	NSV	**YES**
bis(2-Chloroethyl)ether	420 - 460	0 / 3	--	--	NSV	-- / --	NSV	**YES**
bis(2-Ethylhexyl)phthalate	420 - 460	3 / 3	1,200	OW21-SS11	NSV	-- / --	NSV	**YES**
n-Nitroso-di-n-propylamine	420 - 460	0 / 3	--	--	NSV	-- / --	NSV	**YES**
n-Nitrosodiphenylamine	420 - 460	0 / 3	--	--	1,090	-- / --	0.42	NO
Total Petroleum Hydrocarbons (MG/KG)								
Total petroleum hydrocarbons (TPH)	-- - --	2 / 2	242	OW21-SS6-93A	NSV	-- / --	NSV	**YES**

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit

Table 8-4
Summary of Maximum Hazard Quotients for Food Web Exposures - SWMU 21
NAS Oceana, Virginia Beach, VA

Chemical	Killdeer	
	NOAEL	LOAEL
4,4'-DDD	<0.01	<0.01
4,4'-DDE	<0.01	<0.01
4,4'-DDT	<0.01	<0.01
Aldrin	<0.01	<0.01
alpha-BHC	<0.01	<0.01
alpha-Chlordane	<0.01	<0.01
Aroclor-1016	1.38	0.14
Aroclor-1221	2.76	0.28
Aroclor-1232	2.76	0.28
Aroclor-1242	1.38	0.14
Aroclor-1248	3.15	0.31
Aroclor-1254	1.64	0.16
Aroclor-1260	1.64	0.16
beta-BHC	<0.01	<0.01
delta-BHC	<0.01	<0.01
Dieldrin	<0.01	<0.01
Endosulfan I	<0.01	<0.01
Endosulfan II	<0.01	<0.01
Endosulfan Sulfate	<0.01	<0.01
Endrin	<0.01	<0.01
Endrin Aldehyde	<0.01	<0.01
Endrin Ketone	<0.01	<0.01
Gamma-BHC (Lindane)	<0.01	<0.01
Gamma-Chlordane	<0.01	<0.01
Heptachlor	<0.01	<0.01
Heptachlor Epoxide	<0.01	<0.01
Methoxychlor	<0.01	<0.01
Toxaphene	<0.01	<0.01
1,2,4-Trichlorobenzene	NA	NA
1,2-Dichlorobenzene	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01
2,4,5-Trichlorophenol	NA	NA
2,4,6-Trichlorophenol	NA	NA
2,4-Dichlorophenol	NA	NA
2-Chloronaphthalene	NA	NA
2-Methylnaphthalene	NA	NA
3,3'-Dichlorobenzidine	NA	NA
4-Bromophenyl-Phenylether	NA	NA
4-Chloro-3-Methylphenol	NA	NA
4-Chlorophenyl-Phenylether	NA	NA
Acenaphthene	<0.01	<0.01
Acenaphthylene	<0.01	<0.01
Anthracene	<0.01	<0.01
Benzo(a)anthracene	<0.01	<0.01
Benzo(a)pyrene	<0.01	<0.01
Benzo(b)fluoranthene	<0.01	<0.01

Table 8-4
Summary of Maximum Hazard Quotients for Food Web Exposures - SWMU 21
NAS Oceana, Virginia Beach, VA

Chemical	Killdeer	
	NOAEL	LOAEL
Benzo(g,h,i)perylene	<0.01	<0.01
Benzo(k)fluoranthene	<0.01	<0.01
Bis-(2-Ethylhexyl)phthalate	0.18	0.02
Butylbenzylphthalate	NA	NA
Carbazole	NA	NA
Chrysene	<0.01	<0.01
Dibenz(a,h)anthracene	<0.01	<0.01
Dibenzofuran	NA	NA
Diethylphthalate	NA	NA
Di-n-butylphthalate	0.68	0.07
Di-n-octylphthalate	<0.01	<0.01
Fluoranthene	<0.01	<0.01
Fluorene	<0.01	<0.01
Hexachloro-1,3-butadiene	0.03	<0.01
Hexachlorobenzene	1.55	0.15
Hexachlorocyclopentadiene	NA	NA
Hexachloroethane	NA	NA
Indeno(1,2,3-cd)pyrene	<0.01	<0.01
Naphthalene	<0.01	<0.01
N-Nitrosodiphenylamine	NA	NA
Pentachlorophenol	0.01	<0.01
Phenanthrene	<0.01	<0.01
Pyrene	<0.01	<0.01

Table 8-5
Preliminary Summary of COPCs - SWMU 21
NAS Oceana, Virginia Beach, VA

Chemical	Surface Soil			Food web		
	MD	MRL	NSV	MD	MRL	NSV
Polychlorinated Biphenyls						
Aroclor-1016		X			X	
Aroclor-1221		X			X	
Aroclor-1232		X			X	
Aroclor-1242		X			X	
Aroclor-1248		X			X	
Aroclor-1254		X			X	
Aroclor-1260		X			X	
Semi-volatile Organic Compounds						
1,2-Dichlorobenzene		X				
1,3-Dichlorobenzene			X			
2,2'-Oxybis(1-chloropropane)			X			
2,4,5-Trichlorophenol		X				
2,4-Dimethylphenol		X				
2,4-Dinitrotoluene			X			
2,6-Dinitrotoluene			X			
2-Chlorophenol		X				
2-Methylnaphthalene			X			
2-Methylphenol		X				
2-Nitroaniline			X			
2-Nitrophenol			X			
3,3'-Dichlorobenzidine			X			
3-Nitroaniline			X			
4,6-Dinitro-2-methylphenol			X			
4-Bromophenyl-phenylether			X			
4-Chloro-3-methylphenol			X			
4-Chloroaniline			X			
4-Chlorophenyl-phenylether			X			
4-Methylphenol		X				
4-Nitroaniline			X			
4-Nitrophenol		X				
Acenaphthylene		X				
Anthracene		X				
Benzo(a)pyrene		X				
Benzo(g,h,i)perylene		X				
Benzo(k)fluoranthene		X				
Butylbenzylphthalate			X			
Carbazole			X			
Di-n-octylphthalate			X			
Dibenz(a,h)anthracene		X				
Dibenzofuran			X			
Hexachlorobenzene			X		X	
Hexachlorobutadiene			X			
Hexachloroethane			X			
Indeno(1,2,3-cd)pyrene		X				

MD - Maximum detect exceeds screening value
MRL - Not detected; maximum reporting limit exceeds screening value
NSV - No screening value

Table 8-5 Preliminary Summary of COPCs - SWMU 21 *NAS Oceana, Virginia Beach, VA*						
Chemical	**Surface Soil**			**Food web**		
Isophorone			X			
Naphthalene		X				
Phenanthrene		X				
bis(2-Chloroethoxy)methane			X			
bis(2-Chloroethyl)ether			X			
bis(2-Ethylhexyl)phthalate			X			
n-Nitroso-di-n-propylamine			X			
Total Petroleum Hydrocarbons						
Total petroleum hydrocarbons (TPH)			X			

MD - Maximum detect exceeds screening value
MRL - Not detected; maximum reporting limit exceeds screening value
NSV - No screening value

Table 8-6
Refined Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - SWMU 21
NAS Oceana, Virginia Beach, VA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor
Terrestrial Habitats			
Survival, growth, and reproduction of terrestrial soil invertebrate communities.	Are site-related surface soil concentrations sufficient to adversely effect soil invertebrate communities based on conservative screening values?	Comparison of mean chemical concentrations in surface soil with soil screening values.	Soil Invertebrates (earthworms)
Survival, growth, and reproduction of terrestrial plant communities.	Are site-related surface soil concentrations sufficient to adversely effect terrestrial plant communities based on conservative screening values?	Comparison of mean chemical concentrations in surface soil with soil screening values.	Terrestrial plants
Survival, growth, and reproduction of avian terrestrial insectivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume soil invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean soil concentrations.	Killdeer

Table 8-7
Refined Screening Statistics - SWMU 21 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient[1]	COPC?
Polychlorinated Biphenyls (UG/KG)									
Aroclor-1016	41.0 - 230	0 / 11	--	--	30.1	100	-- / --	0.30	NO
Aroclor-1221	42.0 - 460	0 / 11	--	--	59.1	100	-- / --	0.59	NO
Aroclor-1232	42.0 - 460	0 / 11	--	--	59.1	100	-- / --	0.59	NO
Aroclor-1242	41.0 - 230	0 / 11	--	--	30.1	100	-- / --	0.30	NO
Aroclor-1248	41.0 - 230	0 / 11	--	--	30.1	100	-- / --	0.30	NO
Aroclor-1254	21.0 - 120	0 / 11	--	--	16.5	100	-- / --	0.17	NO
Aroclor-1260	21.0 - 120	0 / 11	--	--	16.5	100	-- / --	0.17	NO
Semi-volatile Organic Compounds (UG/KG)									
1,2-Dichlorobenzene	420 - 460	0 / 3	--	--	215	100	-- / --	2.15	NO
1,3-Dichlorobenzene	420 - 460	0 / 3	--	--	215	NSV	-- / --	NSV	NO
2,2'-Oxybis(1-chloropropane)	420 - 460	0 / 3	--	--	215	NSV	-- / --	NSV	NO
2,4,5-Trichlorophenol	420 - 460	0 / 3	--	--	215	430	-- / --	0.50	NO
2,4-Dimethylphenol	420 - 460	0 / 3	--	--	215	100	-- / --	2.15	NO
2,4-Dinitrotoluene	420 - 460	0 / 3	--	--	215	NSV	-- / --	NSV	NO
2,6-Dinitrotoluene	420 - 460	0 / 3	--	--	215	NSV	-- / --	NSV	NO
2-Chlorophenol	420 - 460	0 / 3	--	--	215	100	-- / --	2.15	NO
2-Methylnaphthalene	420 - 460	0 / 3	--	--	215	NSV	-- / --	NSV	NO
2-Methylphenol	420 - 460	0 / 3	--	--	215	100	-- / --	2.15	NO
2-Nitroaniline	1,000 - 1,100	0 / 3	--	--	517	NSV	-- / --	NSV	NO
2-Nitrophenol	420 - 460	0 / 3	--	--	215	NSV	-- / --	NSV	NO
3,3'-Dichlorobenzidine	420 - 460	0 / 3	--	--	215	NSV	-- / --	NSV	NO
3-Nitroaniline	1,000 - 1,100	0 / 3	--	--	517	NSV	-- / --	NSV	NO
4,6-Dinitro-2-methylphenol	1,000 - 1,100	0 / 3	--	--	517	NSV	-- / --	NSV	NO
4-Bromophenyl-phenylether	420 - 460	0 / 3	--	--	215	NSV	-- / --	NSV	NO
4-Chloro-3-methylphenol	420 - 460	0 / 3	--	--	215	NSV	-- / --	NSV	NO
4-Chloroaniline	420 - 460	0 / 3	--	--	215	NSV	-- / --	NSV	NO
4-Chlorophenyl-phenylether	420 - 460	0 / 3	--	--	215	NSV	-- / --	NSV	NO
4-Methylphenol	420 - 460	0 / 3	--	--	215	100	-- / --	2.15	NO
4-Nitroaniline	1,000 - 1,100	0 / 3	--	--	517	NSV	-- / --	NSV	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 8-7 Refined Screening Statistics - SWMU 21 - Surface Soil *NAS Oceana, Virginia Beach, VA*									
Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient[1]	COPC?
4-Nitrophenol	1,000 - 1,100	0 / 3	--	--	517	380	-- / --	1.36	NO
Acenaphthylene	420 - 460	0 / 3	--	--	215	100	-- / --	2.15	NO
Anthracene	420 - 460	0 / 3	--	--	215	100	-- / --	2.15	NO
Benzo(a)pyrene	420 - 460	0 / 3	--	--	215	100	-- / --	2.15	NO
Benzo(g,h,i)perylene	420 - 460	0 / 3	--	--	215	100	-- / --	2.15	NO
Benzo(k)fluoranthene	420 - 460	0 / 3	--	--	215	100	-- / --	2.15	NO
Butylbenzylphthalate	420 - 460	0 / 3	--	--	215	NSV	-- / --	NSV	NO
Carbazole	420 - 460	0 / 3	--	--	215	NSV	-- / --	NSV	NO
Di-n-octylphthalate	420 - 460	0 / 3	--	--	215	NSV	-- / --	NSV	NO
Dibenz(a,h)anthracene	420 - 460	0 / 3	--	--	215	100	-- / --	2.15	NO
Dibenzofuran	420 - 460	0 / 3	--	--	215	NSV	-- / --	NSV	NO
Hexachlorobenzene	420 - 460	0 / 3	--	--	215	NSV	-- / --	NSV	NO
Hexachlorobutadiene	420 - 460	0 / 3	--	--	215	NSV	-- / --	NSV	NO
Hexachloroethane	420 - 460	0 / 3	--	--	215	NSV	-- / --	NSV	NO
Indeno(1,2,3-cd)pyrene	420 - 460	0 / 3	--	--	215	100	-- / --	2.15	NO
Isophorone	420 - 460	0 / 3	--	--	215	NSV	-- / --	NSV	NO
Naphthalene	420 - 460	0 / 3	--	--	215	100	-- / --	2.15	NO
Phenanthrene	420 - 460	0 / 3	--	--	215	100	-- / --	2.15	NO
bis(2-Chloroethoxy)methane	420 - 460	0 / 3	--	--	215	NSV	-- / --	NSV	NO
bis(2-Chloroethyl)ether	420 - 460	0 / 3	--	--	215	NSV	-- / --	NSV	NO
bis(2-Ethylhexyl)phthalate	420 - 460	3 / 3	1,200	OW21-SS11	743	NSV	-- / --	NSV	NO
n-Nitroso-di-n-propylamine	420 - 460	0 / 3	--	--	215	NSV	-- / --	NSV	NO
Total Petroleum Hydrocarbons (MG/KG)									
Total petroleum hydrocarbons (TPH)	-- - --	2 / 2	242	OW21-SS6-93A	126	NSV	-- / --	NSV	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 8-8
Summary of Mean Hazard Quotients for Food Web Exposures - SWMU 21
NAS Oceana, Virginia Beach, VA

Chemical	Killdeer	
	NOAEL	LOAEL
Aroclor-1016	0.04	<0.01
Aroclor-1221	0.08	<0.01
Aroclor-1232	0.08	<0.01
Aroclor-1242	0.04	<0.01
Aroclor-1248	0.09	<0.01
Aroclor-1254	0.05	<0.01
Aroclor-1260	0.05	<0.01
1,2-Dichlorobenzene	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01
2,4,5-Trichlorophenol	NA	NA
2-Methylnaphthalene	NA	NA
3,3'-Dichlorobenzidine	NA	NA
4-Bromophenyl-Phenylether	NA	NA
4-Chloro-3-Methylphenol	NA	NA
4-Chlorophenyl-Phenylether	NA	NA
Acenaphthylene	<0.01	<0.01
Anthracene	<0.01	<0.01
Benzo(a)pyrene	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01
Benzo(k)fluoranthene	<0.01	<0.01
Butylbenzylphthalate	NA	NA
Carbazole	NA	NA
Dibenz(a,h)anthracene	<0.01	<0.01
Dibenzofuran	NA	NA
Hexachlorobutadiene	0.01	<0.01
Hexachlorobenzene	0.57	0.06
Hexachloroethane	NA	NA
Indeno(1,2,3-cd)pyrene	<0.01	<0.01
Naphthalene	<0.01	<0.01
Phenanthrene	<0.01	<0.01

Table 9-1
Summary Statistics - SWMU 22 - Groundwater
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Inorganics (UG/L)						
Aluminum	-- - --	2 / 3	752	OW22-MW4-93A	417	346
Antimony	16.4 - 16.4	0 / 4	--	--	8.20	0
Arsenic	0.68 - 0.68	0 / 4	--	--	0.34	0
Barium	-- - --	0 / 4	--	--	18.4	4.37
Beryllium	0.26 - 0.26	1 / 4	0.43	OW22-MW1-93A	0.21	0.15
Cadmium	2.80 - 2.80	0 / 4	--	--	1.40	0
Calcium	13,500 - 13,500	2 / 3	14,500	OW22-MW3-93A	11,683	4,287
Chromium	2.80 - 2.80	0 / 4	--	--	1.54	0.21
Cobalt	2.60 - 2.60	0 / 4	--	--	1.60	0.48
Copper	1.20 - 1.20	0 / 4	--	--	1.26	0.95
Cyanide	1.40 - 1.40	0 / 1	--	--	0.70	--
Iron	-- - --	3 / 3	9,340	OW22-MW3-93A	6,355	4,972
Lead	1.70 - 1.70	0 / 4	--	--	0.88	0.05
Magnesium	-- - --	2 / 3	9,630	OW22-MW4-93A	6,283	3,927
Manganese	-- - --	3 / 3	303	OW22-MW4-93A	211	138
Mercury	0.07 - 0.07	0 / 4	--	--	0.04	0.007
Nickel	9.40 - 9.40	0 / 4	--	--	4.70	0
Potassium	-- - --	0 / 3	--	--	1,155	487
Selenium	1.80 - 1.80	0 / 4	--	--	0.90	0
Silver	2.00 - 2.00	0 / 4	--	--	1.06	0.13
Sodium	-- - --	3 / 3	14,300	OW22-MW1-93A	13,300	866
Thallium	2.30 - 2.30	0 / 4	--	--	1.15	0
Vanadium	2.60 - 2.60	0 / 4	--	--	1.30	0
Zinc	9.00 - 9.00	0 / 4	--	--	4.55	0.10
Pesticide/Polychlorinated Biphenyls (UG/L)						
4,4'-DDD	0.04 - 0.04	0 / 4	--	--	0.02	0
4,4'-DDE	0.02 - 0.02	0 / 4	--	--	0.01	0
4,4'-DDT	0.04 - 0.04	0 / 4	--	--	0.02	0
Aldrin	0.02 - 0.02	0 / 4	--	--	0.01	0

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 9-1 Summary Statistics - SWMU 22 - Groundwater *NAS Oceana, Virginia Beach, VA*						
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Arithmetic Mean[1]**	**Standard Deviation of Mean**
Aroclor-1016	1.00 - 2.00	0 / 4	--	--	0.50	0
Aroclor-1221	2.00 - 2.00	0 / 4	--	--	1.00	0
Aroclor-1232	1.00 - 2.00	0 / 4	--	--	1.00	0
Aroclor-1242	1.00 - 1.00	0 / 4	--	--	0.50	0
Aroclor-1248	1.00 - 1.00	0 / 4	--	--	0.50	0
Aroclor-1254	0.50 - 0.50	0 / 4	--	--	0.25	0
Aroclor-1260	0.50 - 0.50	0 / 4	--	--	0.25	0
Chlordane	0.20 - 1.00	0 / 4	--	--	0.10	0
Chlorobenzilate	0.50 - 0.50	0 / 1	--	--	0.25	--
Diallate	1.00 - 1.00	0 / 1	--	--	0.50	--
Dieldrin	0.02 - 0.02	0 / 4	--	--	0.01	0
Endosulfan I	0.02 - 0.02	0 / 4	--	--	0.01	0
Endosulfan II	0.04 - 0.04	0 / 4	--	--	0.02	0
Endosulfan sulfate	0.04 - 0.04	0 / 4	--	--	0.02	0
Endrin	0.04 - 0.04	0 / 4	--	--	0.02	0
Endrin aldehyde	0.04 - 0.04	0 / 4	--	--	0.02	0
Endrin ketone	0.02 - 0.02	0 / 1	--	--	0.01	--
Heptachlor	0.02 - 0.02	0 / 4	--	--	0.01	0
Heptachlor epoxide	0.02 - 0.02	0 / 4	--	--	0.01	0
Isodrin	0.02 - 0.02	0 / 1	--	--	0.01	--
Methoxychlor	0.08 - 0.08	0 / 4	--	--	0.04	0
Toxaphene	1.00 - 1.00	0 / 4	--	--	0.50	0
alpha-BHC	0.02 - 0.02	0 / 4	--	--	0.01	0
beta-BHC	0.04 - 0.04	0 / 4	--	--	0.02	0
delta-BHC	0.02 - 0.02	0 / 4	--	--	0.01	0
gamma-BHC (Lindane)	0.02 - 0.02	0 / 4	--	--	0.01	0
Semi-volatile Organic Compounds (UG/L)						
1,2,4-Trichlorobenzene	10.0 - 10.0	0 / 4	--	--	5.00	0
1,2-Dichlorobenzene	10.0 - 10.0	0 / 4	--	--	5.00	0
1,3-Dichlorobenzene	10.0 - 10.0	0 / 4	--	--	5.00	0

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 9-1
Summary Statistics - SWMU 22 - Groundwater
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
1,4-Dichlorobenzene	10.0 - 10.0	0 / 4	--	--	5.00	0
2,2'-Oxybis(1-chloropropane)	10.0 - 10.0	0 / 4	--	--	5.00	0
2,4,5-Trichlorophenol	50.0 - 50.0	0 / 4	--	--	25.0	0
2,4,6-Trichlorophenol	10.0 - 10.0	0 / 4	--	--	5.00	0
2,4-Dichlorophenol	10.0 - 10.0	0 / 4	--	--	5.00	0
2,4-Dimethylphenol	10.0 - 10.0	0 / 4	--	--	5.00	0
2,4-Dinitrophenol	50.0 - 50.0	0 / 4	--	--	25.0	0
2,4-Dinitrotoluene	10.0 - 10.0	0 / 4	--	--	5.00	0
2,6-Dinitrotoluene	10.0 - 10.0	0 / 4	--	--	5.00	0
2-Chloronaphthalene	10.0 - 10.0	0 / 4	--	--	5.00	0
2-Chlorophenol	10.0 - 10.0	0 / 4	--	--	5.00	0
2-Methylaniline	10.0 - 10.0	0 / 1	--	--	5.00	--
2-Methylnaphthalene	10.0 - 10.0	0 / 4	--	--	5.00	0
2-Methylphenol	10.0 - 10.0	0 / 4	--	--	5.00	0
2-Nitroaniline	50.0 - 50.0	0 / 4	--	--	25.0	0
2-Nitrophenol	10.0 - 10.0	0 / 4	--	--	5.00	0
3,3'-Dichlorobenzidine	20.0 - 20.0	0 / 4	--	--	10.0	0
3-Nitroaniline	50.0 - 50.0	0 / 4	--	--	25.0	0
4,6-Dinitro-2-methylphenol	50.0 - 50.0	0 / 4	--	--	25.0	0
4-Bromophenyl-phenylether	10.0 - 10.0	0 / 4	--	--	5.00	0
4-Chloro-3-methylphenol	10.0 - 10.0	0 / 4	--	--	5.00	0
4-Chloroaniline	10.0 - 10.0	0 / 4	--	--	5.00	0
4-Methylphenol	10.0 - 10.0	0 / 3	--	--	5.00	0
4-Nitroaniline	50.0 - 50.0	0 / 4	--	--	25.0	0
4-Nitrophenol	50.0 - 50.0	0 / 4	--	--	25.0	0
Acenaphthene	10.0 - 10.0	0 / 4	--	--	5.00	0
Acenaphthylene	10.0 - 10.0	0 / 4	--	--	5.00	0
Aniline	10.0 - 10.0	0 / 4	--	--	5.00	0
Anthracene	10.0 - 10.0	0 / 4	--	--	5.00	0
Benzidine	50.0 - 50.0	0 / 4	--	--	25.0	0

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 9-1
Summary Statistics - SWMU 22 - Groundwater
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Benzo(a)anthracene	10.0 - 10.0	0 / 4	--	--	5.00	0
Benzo(a)pyrene	10.0 - 10.0	0 / 4	--	--	5.00	0
Benzo(b)fluoranthene	10.0 - 10.0	0 / 4	--	--	5.00	0
Benzo(g,h,i)perylene	10.0 - 10.0	0 / 4	--	--	5.00	0
Benzo(k)fluoranthene	10.0 - 10.0	0 / 4	--	--	5.00	0
Benzoic acid	50.0 - 50.0	0 / 4	--	--	25.0	0
Benzyl alcohol	10.0 - 10.0	0 / 4	--	--	5.00	0
Butylbenzylphthalate	10.0 - 10.0	0 / 4	--	--	5.00	0
Chrysene	10.0 - 10.0	0 / 4	--	--	5.00	0
Di-n-butylphthalate	2.00 - 10.0	0 / 4	--	--	4.00	2.00
Di-n-octylphthalate	10.0 - 10.0	0 / 4	--	--	5.00	0
Dibenz(a,h)anthracene	10.0 - 10.0	0 / 4	--	--	5.00	0
Dibenzofuran	10.0 - 10.0	0 / 4	--	--	5.00	0
Diethylphthalate	10.0 - 10.0	0 / 4	--	--	5.00	0
Dimethyl phthalate	10.0 - 10.0	0 / 4	--	--	5.00	0
Fluoranthene	10.0 - 10.0	0 / 4	--	--	5.00	0
Fluorene	10.0 - 10.0	0 / 4	--	--	5.00	0
Hexachlorobenzene	10.0 - 10.0	0 / 4	--	--	5.00	0
Hexachlorobutadiene	10.0 - 10.0	0 / 4	--	--	5.00	0
Hexachlorocyclopentadiene	10.0 - 10.0	0 / 4	--	--	5.00	0
Hexachloroethane	10.0 - 10.0	0 / 4	--	--	5.00	0
Indeno(1,2,3-cd)pyrene	10.0 - 10.0	0 / 4	--	--	5.00	0
Isophorone	10.0 - 10.0	0 / 4	--	--	5.00	0
Naphthalene	10.0 - 10.0	0 / 4	--	--	5.00	0
Nitrobenzene	10.0 - 10.0	0 / 4	--	--	5.00	0
Pentachlorophenol	50.0 - 50.0	0 / 4	--	--	25.0	0
Phenanthrene	10.0 - 10.0	0 / 4	--	--	5.00	0
Phenol	10.0 - 10.0	0 / 4	--	--	5.00	0
Pyrene	10.0 - 10.0	0 / 4	--	--	5.00	0
bis(2-Chloroethoxy)methane	10.0 - 10.0	0 / 4	--	--	5.00	0

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 9-1
Summary Statistics - SWMU 22 - Groundwater
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
bis(2-Chloroethyl)ether	10.0 - 10.0	0 / 4	--	--	5.00	0
bis(2-Ethylhexyl)phthalate	10.0 - 10.0	0 / 4	--	--	4.63	0.75
n-Nitroso-di-n-propylamine	10.0 - 10.0	0 / 4	--	--	5.00	0
n-Nitrosodimethylamine	10.0 - 10.0	0 / 4	--	--	5.00	0
n-Nitrosodiphenylamine	10.0 - 10.0	0 / 4	--	--	5.00	0
Volatile Organic Compounds (UG/L)						
1,1,1,2-Tetrachloroethane	5.00 - 5.00	0 / 1	--	--	2.50	--
1,1,1-Trichloroethane	5.00 - 5.00	0 / 4	--	--	2.50	0
1,1,2,2-Tetrachloroethane	5.00 - 5.00	0 / 4	--	--	2.50	0
1,1,2-Trichloroethane	5.00 - 5.00	0 / 4	--	--	2.50	0
1,1-Dichloroethane	5.00 - 5.00	0 / 4	--	--	2.50	0
1,1-Dichloroethene	5.00 - 5.00	0 / 4	--	--	2.50	0
1,2,3-Trichloropropane	5.00 - 5.00	0 / 4	--	--	2.50	0
1,2-Dibromo-3-chloropropane	10.0 - 10.0	0 / 1	--	--	5.00	--
1,2-Dibromoethane	5.00 - 5.00	0 / 1	--	--	2.50	--
1,2-Dichlorobenzene	5.00 - 5.00	0 / 4	--	--	2.50	0
1,2-Dichloroethane	5.00 - 5.00	0 / 4	--	--	2.50	0
1,2-Dichloroethene (total)	5.00 - 5.00	0 / 4	--	--	2.50	0
1,2-Dichloropropane	5.00 - 5.00	0 / 4	--	--	2.50	0
1,3-Dichlorobenzene	5.00 - 5.00	0 / 4	--	--	2.50	0
1,4-Dichlorobenzene	5.00 - 5.00	0 / 4	--	--	2.50	0
2-Butanone	10.0 - 10.0	0 / 4	--	--	5.00	0
2-Chloroethyl vinyl ether	10.0 - 10.0	0 / 4	--	--	5.00	0
2-Hexanone	10.0 - 10.0	0 / 4	--	--	5.00	0
4-Methyl-2-pentanone	10.0 - 10.0	0 / 4	--	--	5.00	0
Acetone	-- - --	4 / 4	6.00	OW22-MW1-93A	5.75	0.50
Benzene	5.00 - 5.00	0 / 4	--	--	2.50	0
Bromodichloromethane	5.00 - 5.00	0 / 4	--	--	2.50	0
Bromomethane	10.0 - 10.0	0 / 4	--	--	5.00	0
Carbon disulfide	5.00 - 5.00	0 / 4	--	--	2.50	0

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 9-1 Summary Statistics - SWMU 22 - Groundwater *NAS Oceana, Virginia Beach, VA*						
Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Carbon tetrachloride	5.00 - 5.00	0 / 4	--	--	2.50	0
Chlorobenzene	5.00 - 5.00	0 / 4	--	--	2.50	0
Chloroethane	10.0 - 10.0	0 / 4	--	--	5.00	0
Chloroform	5.00 - 5.00	0 / 4	--	--	2.50	0
Chloromethane	10.0 - 10.0	0 / 4	--	--	5.00	0
Dibromochloromethane	5.00 - 5.00	0 / 4	--	--	2.50	0
Dibromomethane	5.00 - 5.00	0 / 4	--	--	2.50	0
Dichlorodifluoromethane	10.0 - 10.0	0 / 1	--	--	5.00	--
Ethylbenzene	5.00 - 5.00	0 / 4	--	--	2.50	0
Methylene chloride	-- - --	0 / 4	--	--	1.38	0.25
Styrene	5.00 - 5.00	0 / 4	--	--	2.50	0
Toluene	5.00 - 5.00	0 / 4	--	--	2.50	0
Trichlorofluoromethane	5.00 - 5.00	0 / 4	--	--	2.50	0
Vinyl acetate	10.0 - 10.0	0 / 4	--	--	5.00	0
Vinyl chloride	2.00 - 2.00	0 / 4	--	--	1.00	0
Xylene, total	5.00 - 5.00	0 / 4	--	--	2.50	0
cis-1,3-Dichloropropene	5.00 - 5.00	0 / 4	--	--	2.50	0
trans-1,3-Dichloropropene	5.00 - 5.00	0 / 4	--	--	2.50	0

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 9-2
Summary Statistics - SWMU 22 - Surface Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Inorganics (UG/L)						
Aluminum	-- - --	0 / 2	--	--	79.8	15.2
Antimony	16.4 - 16.4	0 / 2	--	--	8.20	0
Arsenic	0.68 - 0.68	0 / 2	--	--	0.45	0.15
Barium	-- - --	0 / 2	--	--	17.6	0
Beryllium	0.26 - 0.26	0 / 2	--	--	0.13	0
Cadmium	2.80 - 2.80	0 / 2	--	--	1.40	0
Calcium	-- - --	2 / 2	9,170	OW22-SW2-93A	8,965	290
Chromium	2.80 - 2.80	0 / 2	--	--	1.40	0
Cobalt	2.60 - 2.60	0 / 2	--	--	1.50	0
Copper	1.20 - 1.20	0 / 2	--	--	0.60	0
Iron	-- - --	2 / 2	1,070	OW22-SW1-93A	1,160	0
Lead	1.70 - 1.70	0 / 2	--	--	0.85	0
Magnesium	-- - --	2 / 2	5,260	OW22-SW1-93A	5,390	0
Manganese	-- - --	2 / 2	73.9	OW22-SW1-93A	88.0	0
Mercury	0.07 - 0.07	0 / 2	--	--	0.04	0
Nickel	9.40 - 9.40	0 / 2	--	--	4.70	0
Potassium	-- - --	0 / 2	--	--	805	219
Selenium	1.80 - 1.80	0 / 2	--	--	0.90	0
Silver	2.00 - 2.00	0 / 2	--	--	1.00	0
Sodium	-- - --	2 / 2	9,200	OW22-SW1-93A	9,085	163
Thallium	2.30 - 2.30	0 / 2	--	--	1.15	0
Vanadium	2.60 - 2.60	0 / 2	--	--	1.30	0
Zinc	-- - --	0 / 2	--	--	7.50	0
Pesticide/Polychlorinated Biphenyls (UG/L)						
4,4'-DDD	0.04 - 0.04	0 / 2	--	--	0.02	0
4,4'-DDE	0.02 - 0.02	0 / 2	--	--	0.01	0
4,4'-DDT	0.04 - 0.04	0 / 2	--	--	0.02	0
Aldrin	0.02 - 0.02	0 / 2	--	--	0.01	0
Aroclor-1016	1.00 - 1.00	0 / 2	--	--	0.50	0

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 9-2
Summary Statistics - SWMU 22 - Surface Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Aroclor-1221	2.00 - 2.00	0 / 2	--	--	1.00	0
Aroclor-1232	2.00 - 2.00	0 / 2	--	--	1.00	0
Aroclor-1242	1.00 - 1.00	0 / 2	--	--	0.50	0
Aroclor-1248	1.00 - 1.00	0 / 2	--	--	0.50	0
Aroclor-1254	0.50 - 0.50	0 / 2	--	--	0.25	0
Aroclor-1260	0.50 - 0.50	0 / 2	--	--	0.25	0
Chlordane	0.20 - 0.20	0 / 2	--	--	0.10	0
Dieldrin	0.02 - 0.02	0 / 2	--	--	0.01	0
Endosulfan I	0.02 - 0.02	0 / 2	--	--	0.01	0
Endosulfan II	0.04 - 0.04	0 / 2	--	--	0.02	0
Endosulfan sulfate	0.04 - 0.04	0 / 2	--	--	0.02	0
Endrin	0.04 - 0.04	0 / 2	--	--	0.02	0
Endrin aldehyde	0.04 - 0.04	0 / 2	--	--	0.02	0
Heptachlor	0.02 - 0.02	0 / 2	--	--	0.01	0
Heptachlor epoxide	0.02 - 0.02	0 / 2	--	--	0.01	0
Methoxychlor	0.08 - 0.08	0 / 2	--	--	0.04	0
Toxaphene	1.00 - 1.00	0 / 2	--	--	0.50	0
alpha-BHC	0.02 - 0.02	0 / 2	--	--	0.01	0
beta-BHC	0.04 - 0.04	0 / 2	--	--	0.02	0
delta-BHC	0.02 - 0.02	0 / 2	--	--	0.01	0
gamma-BHC (Lindane)	0.02 - 0.02	0 / 2	--	--	0.01	0
Volatile Organic Compounds (UG/L)						
1,1,1-Trichloroethane	5.00 - 5.00	0 / 2	--	--	2.50	0
1,1,2,2-Tetrachloroethane	5.00 - 5.00	0 / 2	--	--	2.50	0
1,1,2-Trichloroethane	5.00 - 5.00	0 / 2	--	--	2.50	0
1,1-Dichloroethane	5.00 - 5.00	0 / 2	--	--	2.50	0
1,1-Dichloroethene	5.00 - 5.00	0 / 2	--	--	2.50	0
1,2,3-Trichloropropane	5.00 - 5.00	0 / 2	--	--	2.50	0
1,2-Dichlorobenzene	5.00 - 5.00	0 / 2	--	--	2.50	0
1,2-Dichloroethane	5.00 - 5.00	0 / 2	--	--	2.50	0

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 9-2 Summary Statistics - SWMU 22 - Surface Water *NAS Oceana, Virginia Beach, VA*						
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Arithmetic Mean[1]**	**Standard Deviation of Mean**
1,2-Dichloroethene (total)	5.00 - 5.00	0 / 2	--	--	2.50	0
1,2-Dichloropropane	5.00 - 5.00	0 / 2	--	--	2.50	0
1,3-Dichlorobenzene	5.00 - 5.00	0 / 2	--	--	2.50	0
1,4-Dichlorobenzene	5.00 - 5.00	0 / 2	--	--	2.50	0
2-Butanone	10.0 - 10.0	0 / 2	--	--	5.00	0
2-Chloroethyl vinyl ether	10.0 - 10.0	0 / 2	--	--	5.00	0
2-Hexanone	10.0 - 10.0	0 / 2	--	--	5.00	0
4-Methyl-2-pentanone	10.0 - 10.0	0 / 2	--	--	5.00	0
Acetone	5.00 - 5.00	2 / 2	5.00	OW22-SW1-93A	5.00	0
Acrolein	100 - 100	0 / 2	--	--	50.0	0
Acrylonitrile	100 - 100	0 / 2	--	--	50.0	0
Benzene	5.00 - 5.00	0 / 2	--	--	2.50	0
Bromodichloromethane	5.00 - 5.00	0 / 2	--	--	2.50	0
Bromoform	5.00 - 5.00	0 / 2	--	--	2.50	0
Bromomethane	10.0 - 10.0	0 / 2	--	--	5.00	0
Carbon disulfide	5.00 - 5.00	0 / 2	--	--	2.50	0
Carbon tetrachloride	5.00 - 5.00	0 / 2	--	--	2.50	0
Chlorobenzene	5.00 - 5.00	0 / 2	--	--	2.50	0
Chloroethane	10.0 - 10.0	0 / 2	--	--	5.00	0
Chloroform	5.00 - 5.00	0 / 2	--	--	2.50	0
Chloromethane	10.0 - 10.0	0 / 2	--	--	5.00	0
Dibromochloromethane	5.00 - 5.00	0 / 2	--	--	2.50	0
Dibromomethane	5.00 - 5.00	0 / 2	--	--	2.50	0
Ethyl methacrylate	5.00 - 5.00	0 / 2	--	--	2.50	0
Ethylbenzene	5.00 - 5.00	0 / 2	--	--	2.50	0
Iodomethane	10.0 - 10.0	0 / 2	--	--	5.00	0
Methylene chloride	-- - --	0 / 2	--	--	1.25	1.06
Styrene	5.00 - 5.00	0 / 2	--	--	2.50	0
Tetrachloroethene	5.00 - 5.00	0 / 2	--	--	2.50	0
Toluene	5.00 - 5.00	0 / 2	--	--	2.50	0

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 9-2 Summary Statistics - SWMU 22 - Surface Water *NAS Oceana, Virginia Beach, VA*						
Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Trichloroethene	5.00 - 5.00	0 / 2	--	--	2.50	0
Trichlorofluoromethane	5.00 - 5.00	0 / 2	--	--	2.50	0
Vinyl acetate	10.0 - 10.0	0 / 2	--	--	5.00	0
Vinyl chloride	2.00 - 2.00	0 / 2	--	--	1.00	0
Xylene, total	5.00 - 5.00	0 / 2	--	--	2.50	0
cis-1,3-Dichloropropene	5.00 - 5.00	0 / 2	--	--	2.50	0
trans-1,3-Dichloropropene	5.00 - 5.00	0 / 2	--	--	2.50	0
trans-1,4-Dichloro-2-butene	5.00 - 5.00	0 / 2	--	--	2.50	0

1 - *One-half of the reporting limit was used for non-detected samples when calculating the mean.*

Table 9-3
Summary Statistics - SWMU 22 - Sediment
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Inorganics (MG/KG)						
Aluminum	-- - --	2 / 2	2,400	OW22-SD1-93A	1,392	1,426
Antimony	3.90 - 4.00	0 / 2	--	--	1.98	0.04
Arsenic	-- - --	0 / 2	--	--	0.61	0.41
Barium	-- - --	0 / 2	--	--	3.03	1.73
Beryllium	0.06 - 0.06	0 / 2	--	--	0.04	0.007
Cadmium	0.66 - 0.67	0 / 2	--	--	0.33	0.004
Calcium	-- - --	0 / 2	--	--	72.5	32.6
Chromium	-- - --	1 / 2	6.20	OW22-SD1-93A	3.43	3.92
Cobalt	0.65 - 0.65	0 / 2	--	--	0.35	0.04
Copper	0.29 - 0.29	0 / 2	--	--	0.52	0.53
Iron	-- - --	2 / 2	3,000	OW22-SD1-93A	1,857	1,616
Lead	-- - --	2 / 2	5.50	OW22-SD2-93A	4.50	1.41
Magnesium	-- - --	0 / 2	--	--	100	111
Manganese	-- - --	1 / 2	12.4	OW22-SD1-93A	6.58	8.24
Mercury	-- - --	0 / 2	--	--	0.03	0
Nickel	2.30 - 2.30	0 / 2	--	--	1.15	0
Potassium	228 - 228	0 / 2	--	--	117	3.54
Selenium	0.44 - 0.45	0 / 2	--	--	0.22	0.004
Silver	0.47 - 0.48	0 / 2	--	--	0.24	0.004
Sodium	-- - --	0 / 2	--	--	121	1.06
Thallium	0.55 - 0.57	0 / 2	--	--	0.28	0.007
Vanadium	-- - --	0 / 2	--	--	2.23	2.30
Zinc	-- - --	1 / 2	6.80	OW22-SD1-93A	4.48	3.29
Pesticide/Polychlorinated Biphenyls (UG/KG)						
4,4'-DDD	1.50 - 1.50	1 / 2	1.10	OW22-SD1-93A	0.93	0.25
4,4'-DDE	-- - --	2 / 2	1.60	OW22-SD1-93A	1.14	0.65
4,4'-DDT	-- - --	2 / 2	1.10	OW22-SD1-93A	0.89	0.30
Aldrin	0.79 - 0.83	0 / 2	--	--	0.41	0.01
Aroclor-1016	39.0 - 41.0	0 / 2	--	--	20.0	0.71

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 9-3
Summary Statistics - SWMU 22 - Sediment
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Aroclor-1221	39.0 - 83.0	0 / 2	--	--	30.5	15.6
Aroclor-1232	39.0 - 83.0	0 / 2	--	--	30.5	15.6
Aroclor-1242	39.0 - 41.0	0 / 2	--	--	20.0	0.71
Aroclor-1248	39.0 - 41.0	0 / 2	--	--	20.0	0.71
Aroclor-1254	20.0 - 21.0	0 / 2	--	--	10.3	0.35
Aroclor-1260	20.0 - 21.0	0 / 2	--	--	10.3	0.35
Chlordane	7.90 - 8.30	0 / 2	--	--	4.05	0.14
Dieldrin	0.79 - 0.79	1 / 2	0.56	OW22-SD1-93A	0.48	0.12
Endosulfan I	0.79 - 0.83	0 / 2	--	--	0.41	0.01
Endosulfan II	1.50 - 1.60	0 / 2	--	--	0.78	0.04
Endosulfan sulfate	1.50 - 1.60	0 / 2	--	--	0.78	0.04
Endrin	1.50 - 1.60	0 / 2	--	--	0.78	0.04
Endrin aldehyde	1.50 - 1.60	0 / 2	--	--	0.78	0.04
Heptachlor	0.79 - 0.83	0 / 2	--	--	0.41	0.01
Heptachlor epoxide	0.79 - 0.83	0 / 2	--	--	0.41	0.01
Methoxychlor	3.20 - 3.30	0 / 2	--	--	1.63	0.04
Toxaphene	39.0 - 41.0	0 / 2	--	--	20.0	0.71
alpha-BHC	0.79 - 0.83	0 / 2	--	--	0.41	0.01
beta-BHC	1.50 - 1.60	0 / 2	--	--	0.78	0.04
delta-BHC	0.79 - 0.83	0 / 2	--	--	0.41	0.01
gamma-BHC (Lindane)	0.79 - 0.83	0 / 2	--	--	0.41	0.01

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 9-4
Summary Statistics - SWMU 22 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Inorganics (MG/KG)						
Aluminum	38.1 - 43.8	3 / 3	15,400	OW22-SS02-00	13,633	1,750
Antimony	11.4 - 13.1	0 / 3	--	--	0.23	0.01
Arsenic	1.90 - 2.20	3 / 3	2.70	OW22-SS02-00	2.30	0.40
Barium	38.1 - 43.8	3 / 3	64.6	OW22-SS02-00	58.3	9.89
Beryllium	1.00 - 1.10	3 / 3	0.42	OW22-SS02-00	0.34	0.07
Cadmium	1.00 - 1.10	3 / 3	0.37	OW22-SS01-00	0.24	0.12
Calcium	954 - 1,094	3 / 3	1,350	OW22-SS01-00	845	467
Chromium	1.90 - 2.20	3 / 3	19.7	OW22-SS02-00	17.0	2.75
Cobalt	9.50 - 10.9	3 / 3	2.30	OW22-SS02-00	1.93	0.32
Copper	4.80 - 5.50	3 / 3	9.50	OW22-SS01-00	9.07	0.45
Cyanide	0.60 - 0.60	1 / 3	0.12	OW22-SS03-00	0.05	0.06
Iron	19.1 - 21.9	3 / 3	6,270	OW22-SS02-00	5,590	592
Lead	0.60 - 0.70	3 / 3	25.0	OW22-SS01-00	21.0	3.82
Magnesium	954 - 1,094	3 / 3	795	OW22-SS02-00	715	96.2
Manganese	2.90 - 3.30	3 / 3	37.0	OW22-SS01-00	33.1	4.06
Mercury	0.10 - 0.10	0 / 3	--	--	0.04	0.008
Nickel	7.60 - 8.80	3 / 3	8.00	OW22-SS03-00	7.80	0.20
Potassium	954 - 1,094	3 / 3	603	OW22-SS03-00	533	63.1
Selenium	1.00 - 1.10	0 / 3	--	--	0.31	0.02
Silver	1.90 - 2.20	3 / 3	1.60	OW22-SS01-00	1.43	0.29
Sodium	954 - 1,094	3 / 3	60.4	OW22-SS02-00	50.4	8.64
Thallium	1.90 - 2.20	0 / 3	--	--	0.29	0.03
Vanadium	9.50 - 10.9	3 / 3	20.1	OW22-SS02-00	18.3	2.04
Zinc	3.80 - 4.40	1 / 3	28.6	OW22-SS01-00	17.0	10.1
Pesticide/Polychlorinated Biphenyls (UG/KG)						
4,4'-DDD	3.92 - 4.12	1 / 3	5.30	OW22-SS01-00	3.11	1.90
4,4'-DDE	3.92 - 4.12	3 / 3	23.0	OW22-SS03-00	15.7	10.1
4,4'-DDT	3.92 - 4.12	3 / 3	9.40	OW22-SS01-00	8.43	1.42
Aldrin	2.02 - 2.12	0 / 3	--	--	1.03	0.03

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Table 9-4
Summary Statistics - SWMU 22 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Aroclor-1016	39.2 - 41.2	0 / 3	--	--	20.0	0.56
Aroclor-1221	79.7 - 83.7	0 / 3	--	--	40.5	1.15
Aroclor-1232	39.2 - 41.2	0 / 3	--	--	20.0	0.56
Aroclor-1242	39.2 - 41.2	0 / 3	--	--	20.0	0.56
Aroclor-1248	39.2 - 41.2	0 / 3	--	--	20.0	0.56
Aroclor-1254	39.2 - 41.2	0 / 3	--	--	20.0	0.56
Aroclor-1260	39.2 - 41.2	1 / 3	26.0	OW22-SS01-00	22.1	3.42
Dieldrin	3.92 - 4.12	3 / 3	20.0	OW22-SS02-00	15.0	5.00
Endosulfan I	2.02 - 2.12	0 / 3	--	--	1.03	0.03
Endosulfan II	3.92 - 4.12	0 / 3	--	--	2.00	0.06
Endosulfan sulfate	3.92 - 4.12	0 / 3	--	--	2.00	0.06
Endrin	3.92 - 4.12	0 / 3	--	--	2.00	0.06
Endrin aldehyde	3.92 - 4.12	0 / 3	--	--	2.00	0.06
Endrin ketone	3.92 - 4.12	0 / 3	--	--	2.00	0.06
Heptachlor	2.02 - 2.12	0 / 3	--	--	1.03	0.03
Heptachlor epoxide	2.02 - 2.12	0 / 3	--	--	1.03	0.03
Methoxychlor	20.2 - 21.2	0 / 3	--	--	10.3	0.29
Toxaphene	202 - 212	0 / 3	--	--	103	2.92
alpha-BHC	2.02 - 2.12	0 / 3	--	--	1.03	0.03
alpha-Chlordane	2.02 - 2.12	1 / 3	3.20	OW22-SS03-00	1.74	1.26
beta-BHC	2.02 - 2.12	0 / 3	--	--	1.03	0.03
delta-BHC	2.02 - 2.12	0 / 3	--	--	1.03	0.03
gamma-BHC (Lindane)	2.02 - 2.12	0 / 3	--	--	1.03	0.03
gamma-Chlordane	2.02 - 2.12	1 / 3	2.40	OW22-SS03-00	1.47	0.80
Semi-volatile Organic Compounds (UG/KG)						
1,2,4-Trichlorobenzene	390 - 420	0 / 3	--	--	202	7.64
1,2-Dichlorobenzene	390 - 420	0 / 3	--	--	202	7.64
1,3-Dichlorobenzene	390 - 420	0 / 3	--	--	202	7.64
1,4-Dichlorobenzene	390 - 420	0 / 3	--	--	202	7.64
1-Methylnaphthalene	20.0 - 20.0	1 / 2	40.0	OW22-SS01-00	25.0	21.2

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Table 9-4
Summary Statistics - SWMU 22 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
2,2'-Oxybis(1-chloropropane)	390 - 420	0 / 3	--	--	202	7.64
2,4,5-Trichlorophenol	980 - 1,000	0 / 3	--	--	495	5.00
2,4,6-Trichlorophenol	390 - 420	0 / 3	--	--	202	7.64
2,4-Dichlorophenol	390 - 420	0 / 3	--	--	202	7.64
2,4-Dimethylphenol	390 - 420	0 / 3	--	--	202	7.64
2,4-Dinitrophenol	980 - 1,000	0 / 3	--	--	495	5.00
2,4-Dinitrotoluene	390 - 420	0 / 3	--	--	202	7.64
2,6-Dinitrotoluene	390 - 420	0 / 3	--	--	202	7.64
2-Chloronaphthalene	390 - 420	0 / 3	--	--	202	7.64
2-Chlorophenol	390 - 420	0 / 3	--	--	202	7.64
2-Methylnaphthalene	20.0 - 420	1 / 3	40.0	OW22-SS01-00	86.7	108
2-Methylphenol	390 - 420	0 / 3	--	--	202	7.64
2-Nitroaniline	980 - 1,000	0 / 3	--	--	495	5.00
2-Nitrophenol	390 - 420	0 / 3	--	--	202	7.64
3,3'-Dichlorobenzidine	390 - 420	0 / 3	--	--	202	7.64
3-Nitroaniline	980 - 1,000	0 / 3	--	--	495	5.00
4,6-Dinitro-2-methylphenol	980 - 1,000	0 / 3	--	--	495	5.00
4-Bromophenyl-phenylether	390 - 420	0 / 3	--	--	202	7.64
4-Chloro-3-methylphenol	390 - 420	0 / 3	--	--	202	7.64
4-Chloroaniline	390 - 420	0 / 3	--	--	202	7.64
4-Chlorophenyl-phenylether	390 - 420	0 / 3	--	--	202	7.64
4-Methylphenol	390 - 420	0 / 3	--	--	202	7.64
4-Nitroaniline	980 - 1,000	0 / 3	--	--	495	5.00
4-Nitrophenol	980 - 1,000	0 / 3	--	--	495	5.00
Acenaphthene	20.0 - 420	1 / 3	40.0	OW22-SS01-00	86.7	108
Acenaphthylene	39.0 - 420	1 / 3	40.0	OW22-SS01-00	89.8	105
Anthracene	2.00 - 420	1 / 3	7.90	OW22-SS01-00	73.0	119
Benzo(a)anthracene	2.00 - 2.00	3 / 3	59.0	OW22-SS01-00	21.2	32.8
Benzo(a)pyrene	2.00 - 2.00	3 / 3	85.0	OW22-SS01-00	29.7	47.9
Benzo(b)fluoranthene	3.90 - 4.20	3 / 3	68.0	OW22-SS01-00	24.2	37.9

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Table 9-4
Summary Statistics - SWMU 22 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Benzo(g,h,i)perylene	3.90 - 4.20	2 / 3	78.0	OW22-SS01-00	27.2	44.0
Benzo(k)fluoranthene	2.00 - 420	2 / 3	31.0	OW22-SS01-00	81.0	113
Butylbenzylphthalate	390 - 420	0 / 3	--	--	202	7.64
Carbazole	390 - 420	0 / 3	--	--	202	7.64
Chrysene	2.00 - 420	2 / 3	68.0	OW22-SS01-00	93.7	106
Di-n-butylphthalate	390 - 420	0 / 3	--	--	202	7.64
Di-n-octylphthalate	390 - 420	0 / 3	--	--	202	7.64
Dibenz(a,h)anthracene	3.90 - 420	1 / 3	40.0	OW22-SS01-00	84.0	111
Dibenzofuran	390 - 420	0 / 3	--	--	202	7.64
Diethylphthalate	390 - 420	0 / 3	--	--	202	7.64
Dimethyl phthalate	390 - 420	0 / 3	--	--	202	7.64
Fluoranthene	3.90 - 420	2 / 3	120	OW22-SS01-00	114	99.7
Fluorene	3.90 - 4.20	2 / 3	40.0	OW22-SS01-00	15.6	21.2
Hexachlorobenzene	390 - 420	0 / 3	--	--	202	7.64
Hexachlorobutadiene	390 - 420	0 / 3	--	--	202	7.64
Hexachlorocyclopentadiene	390 - 420	0 / 3	--	--	202	7.64
Hexachloroethane	390 - 420	0 / 3	--	--	202	7.64
Indeno(1,2,3-cd)pyrene	2.00 - 2.00	3 / 3	56.0	OW22-SS01-00	20.4	30.8
Isophorone	390 - 420	0 / 3	--	--	202	7.64
Naphthalene	20.0 - 420	1 / 3	40.0	OW22-SS01-00	86.7	108
Nitrobenzene	390 - 420	0 / 3	--	--	202	7.64
Pentachlorophenol	980 - 1,000	0 / 3	--	--	495	5.00
Phenanthrene	2.00 - 2.00	2 / 3	51.0	OW22-SS01-00	18.1	28.5
Phenol	390 - 420	0 / 3	--	--	202	7.64
Pyrene	2.00 - 420	1 / 3	99.0	OW22-SS01-00	103	105
bis(2-Chloroethoxy)methane	390 - 420	0 / 3	--	--	202	7.64
bis(2-Chloroethyl)ether	390 - 420	0 / 3	--	--	202	7.64
bis(2-Ethylhexyl)phthalate	390 - 420	0 / 2	--	--	203	10.6
n-Nitroso-di-n-propylamine	390 - 420	0 / 3	--	--	202	7.64
n-Nitrosodiphenylamine	390 - 420	0 / 3	--	--	202	7.64

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 9-4
Summary Statistics - SWMU 22 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Volatile Organic Compounds (UG/KG)						
1,1,1-Trichloroethane	11.7 - 12.9	0 / 3	--	--	6.08	0.34
1,1,2,2-Tetrachloroethane	11.7 - 12.9	0 / 3	--	--	6.08	0.34
1,1,2-Trichloroethane	11.7 - 12.9	0 / 3	--	--	6.08	0.34
1,1-Dichloroethane	11.7 - 12.9	0 / 3	--	--	6.08	0.34
1,1-Dichloroethene	11.7 - 12.9	0 / 3	--	--	6.08	0.34
1,2-Dichloroethane	11.7 - 12.9	0 / 3	--	--	6.08	0.34
1,2-Dichloroethene (total)	11.7 - 12.9	0 / 3	--	--	6.08	0.34
1,2-Dichloropropane	11.7 - 12.9	0 / 3	--	--	6.08	0.34
2-Butanone	11.7 - 12.9	0 / 3	--	--	6.08	0.34
2-Hexanone	11.7 - 12.9	0 / 3	--	--	6.08	0.34
4-Methyl-2-pentanone	11.7 - 12.9	0 / 3	--	--	6.08	0.34
Acetone	11.7 - 12.9	0 / 3	--	--	7.00	1.73
Benzene	11.7 - 12.9	0 / 3	--	--	6.08	0.34
Bromochloromethane	11.7 - 12.9	3 / 3	50.0	OW22-SS01-00	50.0	0
Bromodichloromethane	11.7 - 12.9	0 / 3	--	--	6.08	0.34
Bromoform	11.7 - 12.9	0 / 3	--	--	6.08	0.34
Bromomethane	11.7 - 12.9	0 / 3	--	--	6.08	0.34
Carbon disulfide	11.7 - 12.9	0 / 3	--	--	6.08	0.34
Carbon tetrachloride	11.7 - 12.9	0 / 3	--	--	6.08	0.34
Chlorobenzene	11.7 - 12.9	0 / 3	--	--	6.08	0.34
Chloroethane	11.7 - 12.9	0 / 3	--	--	6.08	0.34
Chloroform	11.7 - 12.9	0 / 3	--	--	6.08	0.34
Chloromethane	11.7 - 12.9	0 / 3	--	--	6.08	0.34
Dibromochloromethane	11.7 - 12.9	0 / 3	--	--	6.08	0.34
Ethylbenzene	11.7 - 12.9	0 / 3	--	--	6.08	0.34
Methylene chloride	11.7 - 12.9	3 / 3	45.0	OW22-SS03-00	38.0	6.08
Styrene	11.7 - 12.9	0 / 3	--	--	6.08	0.34
Tetrachloroethene	11.7 - 12.9	0 / 3	--	--	6.08	0.34
Toluene	11.7 - 12.9	0 / 3	--	--	6.08	0.34

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 9-4 Summary Statistics - SWMU 22 - Surface Soil *NAS Oceana, Virginia Beach, VA*						
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Arithmetic Mean[1]**	**Standard Deviation of Mean**
Trichloroethene	11.7 - 12.9	0 / 3	--	--	6.08	0.34
Vinyl chloride	11.7 - 12.9	0 / 3	--	--	6.08	0.34
Xylene, total	11.7 - 12.9	0 / 3	--	--	6.08	0.34
cis-1,2-Dichloroethene	11.7 - 12.9	0 / 3	--	--	6.08	0.34
cis-1,3-Dichloropropene	11.7 - 12.9	0 / 3	--	--	6.08	0.34
o-Xylene	11.7 - 12.9	0 / 3	--	--	6.08	0.34
trans-1,2-Dichloroethene	11.7 - 12.9	0 / 3	--	--	6.08	0.34
trans-1,3-Dichloropropene	11.7 - 12.9	0 / 3	--	--	6.08	0.34

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 9-5
Preliminary Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - SWMU 22
NAS Oceana, Virginia Beach, VA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor
Terrestrial Habitats			
Survival, growth, and reproduction of terrestrial soil invertebrate communities.	Are site-related surface soil concentrations sufficient to adversely effect soil invertebrate communities based on conservative screening values?	Comparison of maximum chemical concentrations in surface soil with soil screening values.	Soil Invertebrates (earthworms)
Survival, growth, and reproduction of terrestrial plant communities.	Are site-related surface soil concentrations sufficient to adversely effect terrestrial plant communities based on conservative screening values?	Comparison of maximum chemical concentrations in surface soil with soil screening values.	Terrestrial plants
Survival, growth, and reproduction of avian terrestrial insectivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume 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 soil concentrations.	American robin
Survival, growth, and reproduction of avian terrestrial carnivores.	Are site-related chemical concentrations in surface soils 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 soil concentrations.	American kestrel
Survival, growth, and reproduction of mammalian terrestrial insectivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume 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 soil concentrations.	Short-tailed shrew
Survival, growth, and reproduction of mammalian terrestrial omnivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume plants and 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 soil concentrations.	Deer Mouse
Survival, growth, and reproduction of mammalian terrestrial herbivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume 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 soil concentrations.	Meadow vole

Table 9-5
Preliminary Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - SWMU 22
NAS Oceana, Virginia Beach, VA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor
Survival, growth, and reproduction of mammalian terrestrial carnivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian 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 soil concentrations.	Red fox
Survival, growth, and reproduction of terrestrial reptiles.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to terrestrial reptilian species?	Evidence of potential risk to other upper trophic level terrestrial receptors evaluated in the screening ERA.	--
Wetland and Aquatic Habitats			
Survival, growth, and reproduction of benthic invertebrate communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect benthic invertebrate communities?	Comparison of maximum chemical concentrations in surface water and/or sediment with medium-specific screening values.	Benthic invertebrates
Survival, growth, and reproduction of aquatic and wetland plant communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect aquatic or wetland plant communities?	Comparison of maximum chemical concentrations in surface water and/or sediment with medium-specific screening values.	Aquatic/wetland plants
Survival, growth, and reproduction of fish communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect fish communities?	Comparison of maximum chemical concentrations in surface water and/or sediment with medium-specific screening values.	Freshwater fish
Survival, growth, and reproduction of amphibian communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect amphibian communities?	Comparison of maximum chemical concentrations in surface water and/or sediment with medium-specific screening values.	Amphibians
Survival, growth, and reproduction of amphibians.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to amphibian species that may consume aquatic invertebrates from the site?	Evidence of potential risk to other upper trophic level aquatic and wetland receptors evaluated in the screening ERA.	--

Table 9-5
Preliminary Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - SWMU 22
NAS Oceana, Virginia Beach, VA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor
Survival, growth, and reproduction of aquatic/wetland reptiles.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to aquatic/wetland reptile species?	Evidence of potential risk to other upper trophic level aquatic and wetland receptors evaluated in the screening ERA.	--
Survival, growth, and reproduction of avian aquatic/wetland insectivores.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume aquatic 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 surface water and/or sediment concentrations.	Marsh wren
Survival, growth, and reproduction of avian aquatic/wetland omnivores.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume aquatic plants and 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 surface water and/or sediment concentrations.	Mallard
Survival, growth, and reproduction of avian aquatic/wetland piscivores.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume fish 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 surface water and/or sediment concentrations.	Great blue heron
Survival, growth, and reproduction of mammalian aquatic/wetland piscivores	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume fish 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 surface water and/or sediment concentrations.	Mink
Survival, growth, and reproduction of mammalian aquatic/wetland omnivores.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume aquatic plants and 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 surface water and/or sediment concentrations.	Raccoon

Table 9-6
Preliminary Screening Statistics - SWMU 22 - Ground Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Inorganics (UG/L)								
Aluminum	-- - --	2 / 3	752	OW22-MW4-93A	87.0	2 / 3	8.64	**YES**
Antimony	16.4 - 16.4	0 / 4	--	--	30.0	-- / --	0.55	NO
Arsenic	0.68 - 0.68	0 / 4	--	--	150	-- / --	0.005	NO
Barium	-- - --	0 / 4	--	--	1,000	-- / --	--	**YES**
Beryllium	0.26 - 0.26	1 / 4	0.43	OW22-MW1-93A	5.30	0 / 4	0.08	NO
Cadmium	2.80 - 2.80	0 / 4	--	--	0.83	-- / --	3.38	**YES**
Calcium [2]	13,500 - 13,500	2 / 3	14,500	OW22-MW3-93A	NSV	-- / --	NSV	NO
Chromium	2.80 - 2.80	0 / 4	--	--	11.4	-- / --	0.25	NO
Cobalt	2.60 - 2.60	0 / 4	--	--	23.0	-- / --	0.11	NO
Copper	1.20 - 1.20	0 / 4	--	--	2.85	-- / --	0.42	NO
Cyanide	1.40 - 1.40	0 / 1	--	--	5.20	-- / --	0.27	NO
Iron	-- - --	3 / 3	9,340	OW22-MW3-93A	320	3 / 3	29.2	**YES**
Lead	1.70 - 1.70	0 / 4	--	--	0.54	-- / --	3.12	**YES**
Magnesium [2]	-- - --	2 / 3	9,630	OW22-MW4-93A	NSV	-- / --	NSV	NO
Manganese	-- - --	3 / 3	303	OW22-MW4-93A	120	2 / 3	2.53	**YES**
Mercury	0.07 - 0.07	0 / 4	--	--	0.91	-- / --	0.08	NO
Nickel	9.40 - 9.40	0 / 4	--	--	16.1	-- / --	0.58	NO
Potassium [2]	-- - --	0 / 3	--	--	NSV	-- / --	NSV	NO
Selenium	1.80 - 1.80	0 / 4	--	--	5.00	-- / --	0.36	NO
Silver	2.00 - 2.00	0 / 4	--	--	0.36	-- / --	5.56	**YES**
Sodium [2]	-- - --	3 / 3	14,300	OW22-MW1-93A	NSV	-- / --	NSV	NO
Thallium	2.30 - 2.30	0 / 4	--	--	40.0	-- / --	0.06	NO
Vanadium	2.60 - 2.60	0 / 4	--	--	10,000	-- / --	0.0003	NO
Zinc	9.00 - 9.00	0 / 4	--	--	37.0	-- / --	0.24	NO
Pesticide/Polychlorinated Biphenyls (UG/L)								
4,4'-DDD	0.04 - 0.04	0 / 4	--	--	0.06	-- / --	0.67	NO
4,4'-DDE	0.02 - 0.02	0 / 4	--	--	105	-- / --	0.0002	NO
4,4'-DDT	0.04 - 0.04	0 / 4	--	--	0.001	-- / --	40.0	**YES**

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 9-6
Preliminary Screening Statistics - SWMU 22 - Ground Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Aldrin	0.02 - 0.02	0 / 4	--	--	0.30	-- / --	0.07	NO
Aroclor-1016	1.00 - 2.00	0 / 4	--	--	0.01	-- / --	143	**YES**
Aroclor-1221	2.00 - 2.00	0 / 4	--	--	0.28	-- / --	7.14	**YES**
Aroclor-1232	1.00 - 2.00	0 / 4	--	--	0.58	-- / --	3.45	**YES**
Aroclor-1242	1.00 - 1.00	0 / 4	--	--	0.05	-- / --	18.9	**YES**
Aroclor-1248	1.00 - 1.00	0 / 4	--	--	0.08	-- / --	12.3	**YES**
Aroclor-1254	0.50 - 0.50	0 / 4	--	--	0.03	-- / --	15.2	**YES**
Aroclor-1260	0.50 - 0.50	0 / 4	--	--	94.0	-- / --	0.01	NO
Chlordane	0.20 - 1.00	0 / 4	--	--	0.17	-- / --	5.88	**YES**
Dieldrin	0.02 - 0.02	0 / 4	--	--	0.06	-- / --	0.36	NO
Endosulfan I	0.02 - 0.02	0 / 4	--	--	0.06	-- / --	0.36	NO
Endosulfan II	0.04 - 0.04	0 / 4	--	--	0.06	-- / --	0.71	NO
Endosulfan sulfate	0.04 - 0.04	0 / 4	--	--	0.06	-- / --	0.71	NO
Endrin	0.04 - 0.04	0 / 4	--	--	0.04	-- / --	1.11	**YES**
Endrin aldehyde	0.04 - 0.04	0 / 4	--	--	0.04	-- / --	1.11	**YES**
Endrin ketone	0.02 - 0.02	0 / 1	--	--	0.04	-- / --	0.56	NO
Heptachlor	0.02 - 0.02	0 / 4	--	--	0.007	-- / --	2.90	**YES**
Heptachlor epoxide	0.02 - 0.02	0 / 4	--	--	0.007	-- / --	2.90	**YES**
Methoxychlor	0.08 - 0.08	0 / 4	--	--	0.03	-- / --	2.67	**YES**
Toxaphene	1.00 - 1.00	0 / 4	--	--	0.01	-- / --	90.9	**YES**
alpha-BHC	0.02 - 0.02	0 / 4	--	--	2.20	-- / --	0.01	NO
beta-BHC	0.04 - 0.04	0 / 4	--	--	2.20	-- / --	0.02	NO
delta-BHC	0.02 - 0.02	0 / 4	--	--	2.20	-- / --	0.01	NO
gamma-BHC (Lindane)	0.02 - 0.02	0 / 4	--	--	0.08	-- / --	0.25	NO
Semi-volatile Organic Compounds (UG/L)								
1,2,4-Trichlorobenzene	10.0 - 10.0	0 / 4	--	--	50.0	-- / --	0.20	NO
1,2-Dichlorobenzene	10.0 - 10.0	0 / 4	--	--	763	-- / --	0.01	NO
1,3-Dichlorobenzene	10.0 - 10.0	0 / 4	--	--	763	-- / --	0.01	NO
1,4-Dichlorobenzene	10.0 - 10.0	0 / 4	--	--	763	-- / --	0.01	NO
2,2'-Oxybis(1-chloropropane)	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**

NSV - No Screening Value
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2 - Macronutrient - Not considered to be a COPC

Table 9-6
Preliminary Screening Statistics - SWMU 22 - Ground Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
2,4,5-Trichlorophenol	50.0 - 50.0	0 / 4	--	--	63.0	-- / --	0.79	NO
2,4,6-Trichlorophenol	10.0 - 10.0	0 / 4	--	--	970	-- / --	0.01	NO
2,4-Dichlorophenol	10.0 - 10.0	0 / 4	--	--	365	-- / --	0.03	NO
2,4-Dimethylphenol	10.0 - 10.0	0 / 4	--	--	530	-- / --	0.02	NO
2,4-Dinitrophenol	50.0 - 50.0	0 / 4	--	--	150	-- / --	0.33	NO
2,4-Dinitrotoluene	10.0 - 10.0	0 / 4	--	--	230	-- / --	0.04	NO
2,6-Dinitrotoluene	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
2-Chloronaphthalene	10.0 - 10.0	0 / 4	--	--	620	-- / --	0.02	NO
2-Chlorophenol	10.0 - 10.0	0 / 4	--	--	97.0	-- / --	0.10	NO
2-Methylaniline	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	**YES**
2-Methylnaphthalene	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
2-Methylphenol	10.0 - 10.0	0 / 4	--	--	13.0	-- / --	0.77	NO
2-Nitroaniline	50.0 - 50.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
2-Nitrophenol	10.0 - 10.0	0 / 4	--	--	150	-- / --	0.07	NO
3,3'-Dichlorobenzidine	20.0 - 20.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
3-Nitroaniline	50.0 - 50.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
4,6-Dinitro-2-methylphenol	50.0 - 50.0	0 / 4	--	--	2.30	-- / --	21.7	**YES**
4-Bromophenyl-phenylether	10.0 - 10.0	0 / 4	--	--	1.50	-- / --	6.67	**YES**
4-Chloro-3-methylphenol	10.0 - 10.0	0 / 4	--	--	0.30	-- / --	33.3	**YES**
4-Chloroaniline	10.0 - 10.0	0 / 4	--	--	50.0	-- / --	0.20	NO
4-Methylphenol	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Nitroaniline	50.0 - 50.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
4-Nitrophenol	50.0 - 50.0	0 / 4	--	--	150	-- / --	0.33	NO
Acenaphthene	10.0 - 10.0	0 / 4	--	--	520	-- / --	0.02	NO
Acenaphthylene	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
Aniline	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
Anthracene	10.0 - 10.0	0 / 4	--	--	0.73	-- / --	13.7	**YES**
Benzidine	50.0 - 50.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
Benzo(a)anthracene	10.0 - 10.0	0 / 4	--	--	6.30	-- / --	1.59	**YES**
Benzo(a)pyrene	10.0 - 10.0	0 / 4	--	--	0.01	-- / --	714	**YES**

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Table 9-6
Preliminary Screening Statistics - SWMU 22 - Ground Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Benzo(b)fluoranthene	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
Benzo(g,h,i)perylene	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
Benzo(k)fluoranthene	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
Benzoic acid	50.0 - 50.0	0 / 4	--	--	42.0	-- / --	1.19	**YES**
Benzyl alcohol	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
Butylbenzylphthalate	10.0 - 10.0	0 / 4	--	--	22.0	-- / --	0.45	NO
Chrysene	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
Di-n-butylphthalate	2.00 - 10.0	0 / 4	--	--	33.0	-- / --	0.30	NO
Di-n-octylphthalate	10.0 - 10.0	0 / 4	--	--	3.00	-- / --	3.33	**YES**
Dibenz(a,h)anthracene	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
Dibenzofuran	10.0 - 10.0	0 / 4	--	--	20.0	-- / --	0.50	NO
Diethylphthalate	10.0 - 10.0	0 / 4	--	--	220	-- / --	0.05	NO
Dimethyl phthalate	10.0 - 10.0	0 / 4	--	--	330	-- / --	0.03	NO
Fluoranthene	10.0 - 10.0	0 / 4	--	--	398	-- / --	0.03	NO
Fluorene	10.0 - 10.0	0 / 4	--	--	430	-- / --	0.02	NO
Hexachlorobenzene	10.0 - 10.0	0 / 4	--	--	3.68	-- / --	2.72	**YES**
Hexachlorobutadiene	10.0 - 10.0	0 / 4	--	--	9.30	-- / --	1.08	**YES**
Hexachlorocyclopentadiene	10.0 - 10.0	0 / 4	--	--	5.20	-- / --	1.92	**YES**
Hexachloroethane	10.0 - 10.0	0 / 4	--	--	540	-- / --	0.02	NO
Indeno(1,2,3-cd)pyrene	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
Isophorone	10.0 - 10.0	0 / 4	--	--	11,700	-- / --	0.001	NO
Naphthalene	10.0 - 10.0	0 / 4	--	--	100	-- / --	0.10	NO
Nitrobenzene	10.0 - 10.0	0 / 4	--	--	2,700	-- / --	0.004	NO
Pentachlorophenol	50.0 - 50.0	0 / 4	--	--	6.69	-- / --	7.47	**YES**
Phenanthrene	10.0 - 10.0	0 / 4	--	--	6.30	-- / --	1.59	**YES**
Phenol	10.0 - 10.0	0 / 4	--	--	256	-- / --	0.04	NO
Pyrene	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
bis(2-Chloroethoxy)methane	10.0 - 10.0	0 / 4	--	--	1,100	-- / --	0.01	NO
bis(2-Chloroethyl)ether	10.0 - 10.0	0 / 4	--	--	2,380	-- / --	0.004	NO
bis(2-Ethylhexyl)phthalate	10.0 - 10.0	0 / 4	--	--	30.0	-- / --	0.33	NO

NSV - No Screening Value
1 - *Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit*
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Table 9-6
Preliminary Screening Statistics - SWMU 22 - Ground Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
n-Nitroso-di-n-propylamine	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
n-Nitrosodimethylamine	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
n-Nitrosodiphenylamine	10.0 - 10.0	0 / 4	--	--	585	-- / --	0.02	NO
Volatile Organic Compounds (UG/L)								
1,1,1,2-Tetrachloroethane	5.00 - 5.00	0 / 1	--	--	2,400	-- / --	0.002	NO
1,1,1-Trichloroethane	5.00 - 5.00	0 / 4	--	--	9,400	-- / --	0.001	NO
1,1,2,2-Tetrachloroethane	5.00 - 5.00	0 / 4	--	--	2,400	-- / --	0.002	NO
1,1,2-Trichloroethane	5.00 - 5.00	0 / 4	--	--	9,400	-- / --	0.001	NO
1,1-Dichloroethane	5.00 - 5.00	0 / 4	--	--	1,600	-- / --	0.003	NO
1,1-Dichloroethene	5.00 - 5.00	0 / 4	--	--	1,160	-- / --	0.004	NO
1,2,3-Trichloropropane	5.00 - 5.00	0 / 4	--	--	NSV	-- / --	NSV	**YES**
1,2-Dibromo-3-chloropropane	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	**YES**
1,2-Dibromoethane	5.00 - 5.00	0 / 1	--	--	180	-- / --	0.03	NO
1,2-Dichlorobenzene	5.00 - 5.00	0 / 4	--	--	763	-- / --	0.01	NO
1,2-Dichloroethane	5.00 - 5.00	0 / 4	--	--	20,000	-- / --	0.0003	NO
1,2-Dichloroethene (total)	5.00 - 5.00	0 / 4	--	--	1,160	-- / --	0.004	NO
1,2-Dichloropropane	5.00 - 5.00	0 / 4	--	--	5,700	-- / --	0.001	NO
1,3-Dichlorobenzene	5.00 - 5.00	0 / 4	--	--	763	-- / --	0.01	NO
1,4-Dichlorobenzene	5.00 - 5.00	0 / 4	--	--	763	-- / --	0.01	NO
2-Butanone	10.0 - 10.0	0 / 4	--	--	14,000	-- / --	0.001	NO
2-Chloroethyl vinyl ether	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
2-Hexanone	10.0 - 10.0	0 / 4	--	--	4,280	-- / --	0.002	NO
4-Methyl-2-pentanone	10.0 - 10.0	0 / 4	--	--	4,600	-- / --	0.002	NO
Acetone	-- - --	4 / 4	6.00	OW22-MW1-93A	90,000	0 / 4	0.0001	NO
Benzene	5.00 - 5.00	0 / 4	--	--	530	-- / --	0.009	NO
Bromodichloromethane	5.00 - 5.00	0 / 4	--	--	1,100	-- / --	0.005	NO
Bromomethane	10.0 - 10.0	0 / 4	--	--	110	-- / --	0.09	NO
Carbon disulfide	5.00 - 5.00	0 / 4	--	--	2.00	-- / --	2.50	**YES**
Carbon tetrachloride	5.00 - 5.00	0 / 4	--	--	3,520	-- / --	0.001	NO
Chlorobenzene	5.00 - 5.00	0 / 4	--	--	130	-- / --	0.04	NO

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Table 9-6
Preliminary Screening Statistics - SWMU 22 - Ground Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Chloroethane	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
Chloroform	5.00 - 5.00	0 / 4	--	--	1,240	-- / --	0.004	NO
Chloromethane	10.0 - 10.0	0 / 4	--	--	5,500	-- / --	0.002	NO
Dibromochloromethane	5.00 - 5.00	0 / 4	--	--	1,100	-- / --	0.005	NO
Dibromomethane	5.00 - 5.00	0 / 4	--	--	1,100	-- / --	0.005	NO
Dichlorodifluoromethane	10.0 - 10.0	0 / 1	--	--	1,100	-- / --	0.009	NO
Ethylbenzene	5.00 - 5.00	0 / 4	--	--	3,200	-- / --	0.002	NO
Methylene chloride	-- - --	0 / 4	--	--	2,200	-- / --	--	**YES**
Styrene	5.00 - 5.00	0 / 4	--	--	NSV	-- / --	NSV	**YES**
Toluene	5.00 - 5.00	0 / 4	--	--	1,700	-- / --	0.003	NO
Trichlorofluoromethane	5.00 - 5.00	0 / 4	--	--	1,100	-- / --	0.005	NO
Vinyl acetate	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	**YES**
Vinyl chloride	2.00 - 2.00	0 / 4	--	--	1,160	-- / --	0.002	NO
Xylene, total	5.00 - 5.00	0 / 4	--	--	130	-- / --	0.04	NO
cis-1,3-Dichloropropene	5.00 - 5.00	0 / 4	--	--	244	-- / --	0.02	NO
trans-1,3-Dichloropropene	5.00 - 5.00	0 / 4	--	--	244	-- / --	0.02	NO

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 9-7
Preliminary Screening Statistics - SWMU 22 - Surface Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Inorganics (UG/L)								
Aluminum	-- - --	0 / 2	--	--	87.0	-- / --	--	**YES**
Antimony	16.4 - 16.4	0 / 2	--	--	30.0	-- / --	0.55	NO
Arsenic	0.68 - 0.68	0 / 2	--	--	150	-- / --	0.005	NO
Barium	-- - --	0 / 2	--	--	1,000	-- / --	--	**YES**
Beryllium	0.26 - 0.26	0 / 2	--	--	5.30	-- / --	0.05	NO
Cadmium	2.80 - 2.80	0 / 2	--	--	1.29	-- / --	2.17	**YES**
Calcium [2]	-- - --	2 / 2	9,170	OW22-SW2-93A	NSV	-- / --	NSV	NO
Chromium	2.80 - 2.80	0 / 2	--	--	11.4	-- / --	0.25	NO
Cobalt	2.60 - 2.60	0 / 2	--	--	23.0	-- / --	0.11	NO
Copper	1.20 - 1.20	0 / 2	--	--	4.60	-- / --	0.26	NO
Iron	-- - --	2 / 2	1,250	OW22-SW1-93A	320	2 / 2	3.91	**YES**
Lead	1.70 - 1.70	0 / 2	--	--	1.10	-- / --	1.55	**YES**
Magnesium [2]	-- - --	2 / 2	5,520	OW22-SW1-93A	NSV	-- / --	NSV	NO
Manganese	-- - --	2 / 2	102.0	OW22-SW1-93A	120	0 / 2	0.62	NO
Mercury	0.07 - 0.07	0 / 2	--	--	0.91	-- / --	0.08	NO
Nickel	9.40 - 9.40	0 / 2	--	--	16.1	-- / --	0.58	NO
Potassium [2]	-- - --	0 / 2	--	--	NSV	-- / --	NSV	NO
Selenium	1.80 - 1.80	0 / 2	--	--	5.00	-- / --	0.36	NO
Silver	2.00 - 2.00	0 / 2	--	--	0.36	-- / --	5.56	**YES**
Sodium [2]	-- - --	2 / 2	9,200	OW22-SW1-93A	NSV	-- / --	NSV	NO
Thallium	2.30 - 2.30	0 / 2	--	--	40.0	-- / --	0.06	NO
Vanadium	2.60 - 2.60	0 / 2	--	--	10,000	-- / --	0.0003	NO
Zinc	-- - --	0 / 2	--	--	60.0	-- / --	--	**YES**
Pesticide/Polychlorinated Biphenyls (UG/L)								
4,4'-DDD	0.04 - 0.04	0 / 2	--	--	0.06	-- / --	0.67	NO
4,4'-DDE	0.02 - 0.02	0 / 2	--	--	105	-- / --	0.0002	NO
4,4'-DDT	0.04 - 0.04	0 / 2	--	--	0.001	-- / --	40.0	**YES**
Aldrin	0.02 - 0.02	0 / 2	--	--	0.30	-- / --	0.07	NO

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 9-7 Preliminary Screening Statistics - SWMU 22 - Surface Water *NAS Oceana, Virginia Beach, VA*								
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Screening Value**	**Frequency of Exceedance**	**Maximum Hazard Quotient[1]**	**COPC?**
Aroclor-1016	1.00 - 1.00	0 / 2	--	--	0.01	-- / --	71.4	**YES**
Aroclor-1221	2.00 - 2.00	0 / 2	--	--	0.28	-- / --	7.14	**YES**
Aroclor-1232	2.00 - 2.00	0 / 2	--	--	0.58	-- / --	3.45	**YES**
Aroclor-1242	1.00 - 1.00	0 / 2	--	--	0.05	-- / --	18.9	**YES**
Aroclor-1248	1.00 - 1.00	0 / 2	--	--	0.08	-- / --	12.3	**YES**
Aroclor-1254	0.50 - 0.50	0 / 2	--	--	0.03	-- / --	15.2	**YES**
Aroclor-1260	0.50 - 0.50	0 / 2	--	--	94.0	-- / --	0.01	NO
Chlordane	0.20 - 0.20	0 / 2	--	--	0.17	-- / --	1.18	**YES**
Dieldrin	0.02 - 0.02	0 / 2	--	--	0.06	-- / --	0.36	NO
Endosulfan I	0.02 - 0.02	0 / 2	--	--	0.06	-- / --	0.36	NO
Endosulfan II	0.04 - 0.04	0 / 2	--	--	0.06	-- / --	0.71	NO
Endosulfan sulfate	0.04 - 0.04	0 / 2	--	--	0.06	-- / --	0.71	NO
Endrin	0.04 - 0.04	0 / 2	--	--	0.04	-- / --	1.11	**YES**
Endrin aldehyde	0.04 - 0.04	0 / 2	--	--	0.04	-- / --	1.11	**YES**
Heptachlor	0.02 - 0.02	0 / 2	--	--	0.007	-- / --	2.90	**YES**
Heptachlor epoxide	0.02 - 0.02	0 / 2	--	--	0.007	-- / --	2.90	**YES**
Methoxychlor	0.08 - 0.08	0 / 2	--	--	0.03	-- / --	2.67	**YES**
Toxaphene	1.00 - 1.00	0 / 2	--	--	0.01	-- / --	90.9	**YES**
alpha-BHC	0.02 - 0.02	0 / 2	--	--	2.20	-- / --	0.01	NO
beta-BHC	0.04 - 0.04	0 / 2	--	--	2.20	-- / --	0.02	NO
delta-BHC	0.02 - 0.02	0 / 2	--	--	2.20	-- / --	0.01	NO
gamma-BHC (Lindane)	0.02 - 0.02	0 / 2	--	--	0.08	-- / --	0.25	NO
Volatile Organic Compounds (UG/L)								
1,1,1-Trichloroethane	5.00 - 5.00	0 / 2	--	--	9,400	-- / --	0.001	NO
1,1,2,2-Tetrachloroethane	5.00 - 5.00	0 / 2	--	--	2,400	-- / --	0.002	NO
1,1,2-Trichloroethane	5.00 - 5.00	0 / 2	--	--	9,400	-- / --	0.001	NO
1,1-Dichloroethane	5.00 - 5.00	0 / 2	--	--	1,600	-- / --	0.003	NO
1,1-Dichloroethene	5.00 - 5.00	0 / 2	--	--	1,160	-- / --	0.004	NO
1,2,3-Trichloropropane	5.00 - 5.00	0 / 2	--	--	NSV	-- / --	NSV	**YES**
1,2-Dichlorobenzene	5.00 - 5.00	0 / 2	--	--	763	-- / --	0.01	NO

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 9-7
Preliminary Screening Statistics - SWMU 22 - Surface Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
1,2-Dichloroethane	5.00 - 5.00	0 / 2	--	--	20,000	-- / --	0.0003	NO
1,2-Dichloroethene (total)	5.00 - 5.00	0 / 2	--	--	1,160	-- / --	0.004	NO
1,2-Dichloropropane	5.00 - 5.00	0 / 2	--	--	5,700	-- / --	0.001	NO
1,3-Dichlorobenzene	5.00 - 5.00	0 / 2	--	--	763	-- / --	0.01	NO
1,4-Dichlorobenzene	5.00 - 5.00	0 / 2	--	--	763	-- / --	0.01	NO
2-Butanone	10.0 - 10.0	0 / 2	--	--	14,000	-- / --	0.001	NO
2-Chloroethyl vinyl ether	10.0 - 10.0	0 / 2	--	--	NSV	-- / --	NSV	**YES**
2-Hexanone	10.0 - 10.0	0 / 2	--	--	4,280	-- / --	0.002	NO
4-Methyl-2-pentanone	10.0 - 10.0	0 / 2	--	--	4,600	-- / --	0.002	NO
Acetone	5.00 - 5.00	2 / 2	5.00	OW22-SW1-93A	90,000	0 / 2	0.0001	NO
Acrylonitrile	100 - 100	0 / 2	--	--	2,600	-- / --	0.04	NO
Benzene	5.00 - 5.00	0 / 2	--	--	530	-- / --	0.01	NO
Bromodichloromethane	5.00 - 5.00	0 / 2	--	--	1,100	-- / --	0.005	NO
Bromoform	5.00 - 5.00	0 / 2	--	--	320	-- / --	0.02	NO
Bromomethane	10.0 - 10.0	0 / 2	--	--	110	-- / --	0.09	NO
Carbon disulfide	5.00 - 5.00	0 / 2	--	--	2.00	-- / --	2.50	**YES**
Carbon tetrachloride	5.00 - 5.00	0 / 2	--	--	3,520	-- / --	0.001	NO
Chlorobenzene	5.00 - 5.00	0 / 2	--	--	130	-- / --	0.04	NO
Chloroethane	10.0 - 10.0	0 / 2	--	--	NSV	-- / --	NSV	**YES**
Chloroform	5.00 - 5.00	0 / 2	--	--	1,240	-- / --	0.004	NO
Chloromethane	10.0 - 10.0	0 / 2	--	--	5,500	-- / --	0.002	NO
Dibromochloromethane	5.00 - 5.00	0 / 2	--	--	1,100	-- / --	0.005	NO
Dibromomethane	5.00 - 5.00	0 / 2	--	--	1,100	-- / --	0.005	NO
Ethylbenzene	5.00 - 5.00	0 / 2	--	--	3,200	-- / --	0.002	NO
Methylene chloride	-- - --	0 / 2	--	--	2,200	-- / --	--	**YES**
Styrene	5.00 - 5.00	0 / 2	--	--	NSV	-- / --	NSV	**YES**
Tetrachloroethene	5.00 - 5.00	0 / 2	--	--	840	-- / --	0.01	NO
Toluene	5.00 - 5.00	0 / 2	--	--	1,700	-- / --	0.003	NO
Trichloroethene	5.00 - 5.00	0 / 2	--	--	21,900	-- / --	0.0002	NO
Trichlorofluoromethane	5.00 - 5.00	0 / 2	--	--	1,100	-- / --	0.005	NO

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
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Table 9-7
Preliminary Screening Statistics - SWMU 22 - Surface Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Vinyl acetate	10.0 - 10.0	0 / 2	--	--	NSV	-- / --	NSV	**YES**
Vinyl chloride	2.00 - 2.00	0 / 2	--	--	1,160	-- / --	0.002	NO
Xylene, total	5.00 - 5.00	0 / 2	--	--	130	-- / --	0.04	NO
cis-1,3-Dichloropropene	5.00 - 5.00	0 / 2	--	--	244	-- / --	0.02	NO
trans-1,3-Dichloropropene	5.00 - 5.00	0 / 2	--	--	244	-- / --	0.02	NO

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 9-8
Preliminary Screening Statistics - SWMU 22 - Sediment
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Inorganics (MG/KG)								
Aluminum	-- - --	2 / 2	2,400	OW22-SD1-93A	25,500	0 / 2	0.09	NO
Antimony	3.90 - 4.00	0 / 2	--	--	150	-- / --	0.03	NO
Arsenic	-- - --	0 / 2	--	--	8.20	-- / --	--	**YES**
Barium	-- - --	0 / 2	--	--	500	-- / --	--	**YES**
Beryllium	0.06 - 0.06	0 / 2	--	--	NSV	-- / --	NSV	**YES**
Cadmium	0.66 - 0.67	0 / 2	--	--	1.20	-- / --	0.56	NO
Calcium [2]	-- - --	0 / 2	--	--	NSV	-- / --	NSV	NO
Chromium	-- - --	1 / 2	6.20	OW22-SD1-93A	81.0	0 / 2	0.08	NO
Cobalt	0.65 - 0.65	0 / 2	--	--	50.0	-- / --	0.01	NO
Copper	0.29 - 0.29	0 / 2	--	--	34.0	-- / --	0.01	NO
Iron	-- - --	2 / 2	3,000	OW22-SD1-93A	188,400	0 / 2	0.02	NO
Lead	-- - --	2 / 2	5.50	OW22-SD2-93A	46.7	0 / 2	0.12	NO
Magnesium [2]	-- - --	0 / 2	--	--	NSV	-- / --	NSV	NO
Manganese	-- - --	1 / 2	12.4	OW22-SD1-93A	460	0 / 2	0.03	NO
Mercury	-- - --	0 / 2	--	--	0.15	-- / --	--	**YES**
Nickel	2.30 - 2.30	0 / 2	--	--	20.9	-- / --	0.11	NO
Potassium [2]	228 - 228	0 / 2	--	--	NSV	-- / --	NSV	NO
Selenium	0.44 - 0.45	0 / 2	--	--	1.00	-- / --	0.45	NO
Silver	0.47 - 0.48	0 / 2	--	--	1.00	-- / --	0.48	NO
Sodium [2]	-- - --	0 / 2	--	--	NSV	-- / --	NSV	NO
Thallium	0.55 - 0.57	0 / 2	--	--	NSV	-- / --	NSV	**YES**
Vanadium	-- - --	0 / 2	--	--	57.0	-- / --	--	**YES**
Zinc	-- - --	1 / 2	6.80	OW22-SD1-93A	150	0 / 2	0.05	NO
Pesticide/Polychlorinated Biphenyls (UG/KG)								
4,4'-DDD	1.50 - 1.50	1 / 2	1.10	OW22-SD1-93A	16.0	0 / 2	0.07	NO
4,4'-DDE	-- - --	2 / 2	1.60	OW22-SD1-93A	2.20	0 / 2	0.73	NO
4,4'-DDT	-- - --	2 / 2	1.10	OW22-SD1-93A	1.58	0 / 2	0.70	NO
Aldrin	0.79 - 0.83	0 / 2	--	--	2.00	-- / --	0.42	NO

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 9-8
Preliminary Screening Statistics - SWMU 22 - Sediment
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Aroclor-1016	39.0 - 41.0	0 / 2	--	--	22.7	-- / --	1.81	**YES**
Aroclor-1221	39.0 - 83.0	0 / 2	--	--	22.7	-- / --	3.66	**YES**
Aroclor-1232	39.0 - 83.0	0 / 2	--	--	22.7	-- / --	3.66	**YES**
Aroclor-1242	39.0 - 41.0	0 / 2	--	--	22.7	-- / --	1.81	**YES**
Aroclor-1248	39.0 - 41.0	0 / 2	--	--	22.7	-- / --	1.81	**YES**
Aroclor-1254	20.0 - 21.0	0 / 2	--	--	22.7	-- / --	0.93	NO
Aroclor-1260	20.0 - 21.0	0 / 2	--	--	22.7	-- / --	0.93	NO
Chlordane	7.90 - 8.30	0 / 2	--	--	7.00	-- / --	1.19	**YES**
Dieldrin	0.79 - 0.79	1 / 2	0.56	OW22-SD1-93A	2.00	0 / 2	0.28	NO
Endosulfan I	0.79 - 0.83	0 / 2	--	--	NSV	-- / --	NSV	**YES**
Endosulfan II	1.50 - 1.60	0 / 2	--	--	NSV	-- / --	NSV	**YES**
Endosulfan sulfate	1.50 - 1.60	0 / 2	--	--	NSV	-- / --	NSV	**YES**
Endrin	1.50 - 1.60	0 / 2	--	--	3.00	-- / --	0.53	NO
Endrin aldehyde	1.50 - 1.60	0 / 2	--	--	NSV	-- / --	NSV	**YES**
Heptachlor	0.79 - 0.83	0 / 2	--	--	0.30	-- / --	2.77	**YES**
Heptachlor epoxide	0.79 - 0.83	0 / 2	--	--	5.00	-- / --	0.17	NO
Methoxychlor	3.20 - 3.30	0 / 2	--	--	NSV	-- / --	NSV	**YES**
Toxaphene	39.0 - 41.0	0 / 2	--	--	NSV	-- / --	NSV	**YES**
alpha-BHC	0.79 - 0.83	0 / 2	--	--	6.00	-- / --	0.14	NO
beta-BHC	1.50 - 1.60	0 / 2	--	--	5.00	-- / --	0.32	NO
delta-BHC	0.79 - 0.83	0 / 2	--	--	NSV	-- / --	NSV	**YES**
gamma-BHC (Lindane)	0.79 - 0.83	0 / 2	--	--	3.00	-- / --	0.28	NO

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 9-9
Preliminary Screening Statistics - SWMU 22 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Inorganics (MG/KG)								
Aluminum	38.1 - 43.8	3 / 3	15,400	OW22-SS02-00	50.0	3 / 3	308	**YES**
Antimony	11.4 - 13.1	0 / 3	--	--	5.00	-- / --	2.62	**YES**
Arsenic	1.90 - 2.20	3 / 3	2.70	OW22-SS02-00	60.0	0 / 3	0.05	NO
Barium	38.1 - 43.8	3 / 3	64.6	OW22-SS02-00	500	0 / 3	0.13	NO
Beryllium	1.00 - 1.10	3 / 3	0.42	OW22-SS02-00	10.0	0 / 3	0.04	NO
Cadmium	1.00 - 1.10	3 / 3	0.37	OW22-SS01-00	4.00	0 / 3	0.09	NO
Calcium [2]	954 - 1,094	3 / 3	1,350	OW22-SS01-00	NSV	-- / --	NSV	NO
Chromium	1.90 - 2.20	3 / 3	19.7	OW22-SS02-00	0.40	3 / 3	49.3	**YES**
Cobalt	9.50 - 10.9	3 / 3	2.30	OW22-SS02-00	100	0 / 3	0.02	NO
Copper	4.80 - 5.50	3 / 3	9.50	OW22-SS01-00	50.0	0 / 3	0.19	NO
Cyanide	0.60 - 0.60	1 / 3	0.12	OW22-SS03-00	0.06	1 / 3	2.00	**YES**
Iron	19.1 - 21.9	3 / 3	6,270	OW22-SS02-00	200	3 / 3	31.4	**YES**
Lead	0.60 - 0.70	3 / 3	25.0	OW22-SS01-00	50.0	0 / 3	0.50	NO
Magnesium [2]	954 - 1,094	3 / 3	795	OW22-SS02-00	4,400	0 / 3	0.18	NO
Manganese	2.90 - 3.30	3 / 3	37.0	OW22-SS01-00	330	0 / 3	0.11	NO
Mercury	0.10 - 0.10	0 / 3	--	--	0.10	-- / --	1.00	NO
Nickel	7.60 - 8.80	3 / 3	8.00	OW22-SS03-00	30.0	0 / 3	0.27	NO
Potassium [2]	954 - 1,094	3 / 3	603	OW22-SS03-00	NSV	-- / --	NSV	NO
Selenium	1.00 - 1.10	0 / 3	--	--	1.80	-- / --	0.61	NO
Silver	1.90 - 2.20	3 / 3	1.60	OW22-SS01-00	2.00	0 / 3	0.80	NO
Sodium [2]	954 - 1,094	3 / 3	60.4	OW22-SS02-00	NSV	-- / --	NSV	NO
Thallium	1.90 - 2.20	0 / 3	--	--	1.00	-- / --	2.20	**YES**
Vanadium	9.50 - 10.9	3 / 3	20.1	OW22-SS02-00	2.00	3 / 3	10.1	**YES**
Zinc	3.80 - 4.40	1 / 3	28.6	OW22-SS01-00	50.0	0 / 3	0.57	NO
Pesticide/Polychlorinated Biphenyls (UG/KG)								
4,4'-DDD	3.92 - 4.12	1 / 3	5.30	OW22-SS01-00	100	0 / 3	0.05	NO
4,4'-DDE	3.92 - 4.12	3 / 3	23.0	OW22-SS03-00	100	0 / 3	0.23	NO
4,4'-DDT	3.92 - 4.12	3 / 3	9.40	OW22-SS01-00	100	0 / 3	0.09	NO

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
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Table 9-9
Preliminary Screening Statistics - SWMU 22 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Aldrin	2.02 - 2.12	0 / 3	--	--	100	-- / --	0.02	NO
Aroclor-1016	39.2 - 41.2	0 / 3	--	--	100	-- / --	0.41	NO
Aroclor-1221	79.7 - 83.7	0 / 3	--	--	100	-- / --	0.84	NO
Aroclor-1232	39.2 - 41.2	0 / 3	--	--	100	-- / --	0.41	NO
Aroclor-1242	39.2 - 41.2	0 / 3	--	--	100	-- / --	0.41	NO
Aroclor-1248	39.2 - 41.2	0 / 3	--	--	100	-- / --	0.41	NO
Aroclor-1254	39.2 - 41.2	0 / 3	--	--	100	-- / --	0.41	NO
Aroclor-1260	39.2 - 41.2	1 / 3	26.0	OW22-SS01-00	100	0 / 3	0.26	NO
Dieldrin	3.92 - 4.12	3 / 3	20.0	OW22-SS02-00	100	0 / 3	0.20	NO
Endosulfan I	2.02 - 2.12	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Endosulfan II	3.92 - 4.12	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Endosulfan sulfate	3.92 - 4.12	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Endrin	3.92 - 4.12	0 / 3	--	--	100	-- / --	0.04	NO
Endrin aldehyde	3.92 - 4.12	0 / 3	--	--	100	-- / --	0.04	NO
Endrin ketone	3.92 - 4.12	0 / 3	--	--	100	-- / --	0.04	NO
Heptachlor	2.02 - 2.12	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Heptachlor epoxide	2.02 - 2.12	0 / 3	--	--	100	-- / --	0.02	NO
Methoxychlor	20.2 - 21.2	0 / 3	--	--	100	-- / --	0.21	NO
Toxaphene	202 - 212	0 / 3	--	--	NSV	-- / --	NSV	**YES**
alpha-BHC	2.02 - 2.12	0 / 3	--	--	100,000	-- / --	0.00002	NO
alpha-Chlordane	2.02 - 2.12	1 / 3	3.20	OW22-SS03-00	100	0 / 3	0.03	NO
beta-BHC	2.02 - 2.12	0 / 3	--	--	100,000	-- / --	0.00002	NO
delta-BHC	2.02 - 2.12	0 / 3	--	--	100,000	-- / --	0.00002	NO
gamma-BHC (Lindane)	2.02 - 2.12	0 / 3	--	--	100	-- / --	0.02	NO
gamma-Chlordane	2.02 - 2.12	1 / 3	2.40	OW22-SS03-00	100	0 / 3	0.02	NO
Semi-volatile Organic Compounds (UG/KG)								
1,2,4-Trichlorobenzene	390 - 420	0 / 3	--	--	1,270	-- / --	0.33	NO
1,2-Dichlorobenzene	390 - 420	0 / 3	--	--	100	-- / --	4.20	**YES**
1,3-Dichlorobenzene	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
1,4-Dichlorobenzene	390 - 420	0 / 3	--	--	1,280	-- / --	0.33	NO

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
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Table 9-9
Preliminary Screening Statistics - SWMU 22 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
1-Methylnaphthalene	20.0 - 20.0	1 / 2	40.0	OW22-SS01-00	NSV	-- / --	NSV	**YES**
2,2'-Oxybis(1-chloropropane)	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2,4,5-Trichlorophenol	980 - 1,000	0 / 3	--	--	430	-- / --	2.33	**YES**
2,4,6-Trichlorophenol	390 - 420	0 / 3	--	--	580	-- / --	0.72	NO
2,4-Dichlorophenol	390 - 420	0 / 3	--	--	13,400	-- / --	0.03	NO
2,4-Dimethylphenol	390 - 420	0 / 3	--	--	100	-- / --	4.20	**YES**
2,4-Dinitrophenol	980 - 1,000	0 / 3	--	--	20,000	-- / --	0.05	NO
2,4-Dinitrotoluene	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2,6-Dinitrotoluene	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2-Chloronaphthalene	390 - 420	0 / 3	--	--	1,033	-- / --	0.41	NO
2-Chlorophenol	390 - 420	0 / 3	--	--	100	-- / --	4.20	**YES**
2-Methylnaphthalene	20.0 - 420	1 / 3	40.0	OW22-SS01-00	NSV	-- / --	NSV	**YES**
2-Methylphenol	390 - 420	0 / 3	--	--	100	-- / --	4.20	**YES**
2-Nitroaniline	980 - 1,000	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2-Nitrophenol	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
3,3'-Dichlorobenzidine	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
3-Nitroaniline	980 - 1,000	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4,6-Dinitro-2-methylphenol	980 - 1,000	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Bromophenyl-phenylether	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Chloro-3-methylphenol	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Chloroaniline	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Chlorophenyl-phenylether	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Methylphenol	390 - 420	0 / 3	--	--	100	-- / --	4.20	**YES**
4-Nitroaniline	980 - 1,000	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Nitrophenol	980 - 1,000	0 / 3	--	--	380	-- / --	2.63	**YES**
Acenaphthene	20.0 - 420	1 / 3	40.0	OW22-SS01-00	2,500	0 / 3	0.02	NO
Acenaphthylene	39.0 - 420	1 / 3	40.0	OW22-SS01-00	100	0 / 3	0.40	NO
Anthracene	2.00 - 420	1 / 3	7.90	OW22-SS01-00	100	0 / 3	0.08	NO
Benzo(a)anthracene	2.00 - 2.00	3 / 3	59.0	OW22-SS01-00	100	0 / 3	0.59	NO
Benzo(a)pyrene	2.00 - 2.00	3 / 3	85.0	OW22-SS01-00	100	0 / 3	0.85	NO

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 9-9
Preliminary Screening Statistics - SWMU 22 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Benzo(b)fluoranthene	3.90 - 4.20	3 / 3	68.0	OW22-SS01-00	100	0 / 3	0.68	NO
Benzo(g,h,i)perylene	3.90 - 4.20	2 / 3	78.0	OW22-SS01-00	100	0 / 3	0.78	NO
Benzo(k)fluoranthene	2.00 - 420	2 / 3	31.0	OW22-SS01-00	100	0 / 3	0.31	NO
Butylbenzylphthalate	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Carbazole	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Chrysene	2.00 - 420	2 / 3	68.0	OW22-SS01-00	100	0 / 3	0.68	NO
Di-n-butylphthalate	390 - 420	0 / 3	--	--	200,000	-- / --	0.002	NO
Di-n-octylphthalate	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Dibenz(a,h)anthracene	3.90 - 420	1 / 3	40.0	OW22-SS01-00	100	0 / 3	0.40	NO
Dibenzofuran	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Diethylphthalate	390 - 420	0 / 3	--	--	13,400	-- / --	0.03	NO
Dimethyl phthalate	390 - 420	0 / 3	--	--	10,640	-- / --	0.04	NO
Fluoranthene	3.90 - 420	2 / 3	120	OW22-SS01-00	100	1 / 3	1.20	**YES**
Fluorene	3.90 - 4.20	2 / 3	40.0	OW22-SS01-00	1,700	0 / 3	0.02	NO
Hexachlorobenzene	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Hexachlorobutadiene	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Hexachlorocyclopentadiene	390 - 420	0 / 3	--	--	1,000	-- / --	0.42	NO
Hexachloroethane	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Indeno(1,2,3-cd)pyrene	2.00 - 2.00	3 / 3	56.0	OW22-SS01-00	100	0 / 3	0.56	NO
Isophorone	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Naphthalene	20.0 - 420	1 / 3	40.0	OW22-SS01-00	100	0 / 3	0.40	NO
Nitrobenzene	390 - 420	0 / 3	--	--	2,260	-- / --	0.19	NO
Pentachlorophenol	980 - 1,000	0 / 3	--	--	3,000	-- / --	0.33	NO
Phenanthrene	2.00 - 2.00	2 / 3	51.0	OW22-SS01-00	100	0 / 3	0.51	NO
Phenol	390 - 420	0 / 3	--	--	1,880	-- / --	0.22	NO
Pyrene	2.00 - 420	1 / 3	99.0	OW22-SS01-00	100	0 / 3	0.99	NO
bis(2-Chloroethoxy)methane	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
bis(2-Chloroethyl)ether	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**
bis(2-Ethylhexyl)phthalate	390 - 420	0 / 2	--	--	NSV	-- / --	NSV	**YES**
n-Nitroso-di-n-propylamine	390 - 420	0 / 3	--	--	NSV	-- / --	NSV	**YES**

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
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Table 9-9
Preliminary Screening Statistics - SWMU 22 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
n-Nitrosodiphenylamine	390 - 420	0 / 3	--	--	1,090	-- / --	0.39	NO
Volatile Organic Compounds (UG/KG)								
1,1,1-Trichloroethane	11.7 - 12.9	0 / 3	--	--	300	-- / --	0.04	NO
1,1,2,2-Tetrachloroethane	11.7 - 12.9	0 / 3	--	--	300	-- / --	0.04	NO
1,1,2-Trichloroethane	11.7 - 12.9	0 / 3	--	--	300	-- / --	0.04	NO
1,1-Dichloroethane	11.7 - 12.9	0 / 3	--	--	300	-- / --	0.04	NO
1,1-Dichloroethene	11.7 - 12.9	0 / 3	--	--	NSV	-- / --	NSV	**YES**
1,2-Dichloroethane	11.7 - 12.9	0 / 3	--	--	401	-- / --	0.03	NO
1,2-Dichloroethene (total)	11.7 - 12.9	0 / 3	--	--	300	-- / --	0.04	NO
1,2-Dichloropropane	11.7 - 12.9	0 / 3	--	--	38,800	-- / --	0.0003	NO
2-Butanone	11.7 - 12.9	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2-Hexanone	11.7 - 12.9	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Methyl-2-pentanone	11.7 - 12.9	0 / 3	--	--	10,000	-- / --	0.001	NO
Acetone	11.7 - 12.9	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Benzene	11.7 - 12.9	0 / 3	--	--	105	-- / --	0.12	NO
Bromochloromethane	11.7 - 12.9	3 / 3	50.0	OW22-SS01-00	300,000	0 / 3	0.0002	NO
Bromodichloromethane	11.7 - 12.9	0 / 3	--	--	45,000	-- / --	0.0003	NO
Bromoform	11.7 - 12.9	0 / 3	--	--	114,700	-- / --	0.0001	NO
Bromomethane	11.7 - 12.9	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Carbon disulfide	11.7 - 12.9	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Carbon tetrachloride	11.7 - 12.9	0 / 3	--	--	1,000,000	-- / --	0.00001292	NO
Chlorobenzene	11.7 - 12.9	0 / 3	--	--	2,400	-- / --	0.005	NO
Chloroethane	11.7 - 12.9	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Chloroform	11.7 - 12.9	0 / 3	--	--	1,000	-- / --	0.01	NO
Chloromethane	11.7 - 12.9	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Dibromochloromethane	11.7 - 12.9	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Ethylbenzene	11.7 - 12.9	0 / 3	--	--	5,005	-- / --	0.003	NO
Methylene chloride	11.7 - 12.9	3 / 3	45.0	OW22-SS03-00	1,001	0 / 3	0.04	NO
Styrene	11.7 - 12.9	0 / 3	--	--	10,010	-- / --	0.001	NO
Tetrachloroethene	11.7 - 12.9	0 / 3	--	--	401	-- / --	0.03	NO

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
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Table 9-9 Preliminary Screening Statistics - SWMU 22 - Surface Soil *NAS Oceana, Virginia Beach, VA*								
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Screening Value**	**Frequency of Exceedance**	**Maximum Hazard Quotient[1]**	**COPC?**
Toluene	11.7 - 12.9	0 / 3	--	--	13,005	-- / --	0.0010	NO
Trichloroethene	11.7 - 12.9	0 / 3	--	--	6,000	-- / --	0.002	NO
Vinyl chloride	11.7 - 12.9	0 / 3	--	--	300	-- / --	0.04	NO
Xylene, total	11.7 - 12.9	0 / 3	--	--	2,505	-- / --	0.005	NO
cis-1,2-Dichloroethene	11.7 - 12.9	0 / 3	--	--	300	-- / --	0.04	NO
cis-1,3-Dichloropropene	11.7 - 12.9	0 / 3	--	--	300	-- / --	0.04	NO
o-Xylene	11.7 - 12.9	0 / 3	--	--	NSV	-- / --	NSV	**YES**
trans-1,2-Dichloroethene	11.7 - 12.9	0 / 3	--	--	300	-- / --	0.04	NO
trans-1,3-Dichloropropene	11.7 - 12.9	0 / 3	--	--	300	-- / --	0.04	NO

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
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Table 9-10
Summary of Maximum Hazard Quotients for Food Web Exposures - SWMU 22
NAS Oceana, Virginia Beach, VA

Chemical	Short-tailed shrew		Deer mouse		Meadow vole		Raccoon		Mink		Red fox	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Aluminum	33.33	3.33	4.94	0.49	2.62	0.26	0.23	0.02	1.77	0.18	0.94	0.09
Antimony	14.34	1.43	3.37	0.34	2.61	0.26	0.67	0.07	1.49	0.15	1.19	0.12
Arsenic	1.86	0.19	0.99	0.10	2.41	0.24	NA	NA	NA	NA	0.13	0.01
Barium	0.78	0.20	0.18	0.05	0.23	0.06	NA	NA	NA	NA	0.10	0.03
Beryllium	0.09	<0.01	0.02	<0.01	<0.01	<0.01	NA	NA	NA	NA	0.01	<0.01
Cadmium	1.77	0.18	0.41	0.04	0.15	0.02	0.07	NA	0.01	NA	0.08	<0.01
Chromium	0.58	0.06	0.12	0.01	0.01	<0.01	NA	NA	NA	NA	0.03	<0.01
Cobalt	0.06	<0.01	0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Copper	0.16	0.13	0.05	0.04	0.05	0.04	NA	NA	NA	NA	0.04	0.03
Iron	3.78	0.38	0.47	0.05	0.40	0.04	1.09	0.11	2.78	0.28	0.28	0.03
Lead	0.62	0.06	0.16	0.02	0.16	0.02	NA	NA	NA	NA	0.05	<0.01
Manganese	0.01	<0.01	<0.01	<0.01	0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Mercury	7.68	1.54	2.06	0.41	1.69	0.34	NA	NA	NA	NA	0.03	0.02
Nickel	0.12	0.06	0.03	0.02	0.03	0.02	NA	NA	NA	NA	<0.01	<0.01
Selenium	1.07	0.65	0.68	0.41	1.67	1.01	0.12	0.07	0.11	0.07	0.26	0.16
Silver	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Thallium	4.03	0.40	0.78	0.08	0.16	0.02	0.14	0.01	0.36	0.04	0.23	0.02
Vanadium	2.75	0.28	0.33	0.03	0.31	0.03	NA	NA	NA	NA	0.28	0.03
Zinc	0.27	0.14	0.07	0.03	0.04	0.02	0.03	NA	NA	NA	0.18	0.02
4,4'-DDD	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
4,4'-DDE	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
4,4'-DDT	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Aldrin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
alpha-BHC	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
alpha-Chlordane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Aroclor-1016	0.06	0.02	0.01	<0.01	<0.01	<0.01	NA	NA	0.02	NA	<0.01	<0.01
Aroclor-1221	2.28	0.23	0.49	0.05	0.06	<0.01	0.38	0.04	0.66	0.07	0.15	0.01
Aroclor-1232	1.13	0.11	0.25	0.02	0.04	<0.01	0.38	0.04	0.66	0.07	0.07	<0.01
Aroclor-1242	1.12	0.11	0.24	0.02	0.03	<0.01	0.19	0.02	0.32	0.03	0.07	<0.01
Aroclor-1248	0.06	<0.01	0.01	<0.01	<0.01	<0.01	NA	NA	0.02	NA	<0.01	<0.01
Aroclor-1254	1.14	0.11	0.24	0.02	0.03	<0.01	0.05	NA	0.08	0.02	0.03	<0.01
Aroclor-1260	0.72	0.07	0.15	0.02	0.02	<0.01	0.05	NA	0.08	0.02	0.02	<0.01
beta-BHC	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
delta-BHC	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Dieldrin	0.95	0.10	0.20	0.02	0.02	<0.01	NA	NA	NA	NA	0.06	<0.01
Endosulfan I	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01

Table 9-10
Summary of Maximum Hazard Quotients for Food Web Exposures - SWMU 22
NAS Oceana, Virginia Beach, VA

Chemical	Short-tailed shrew		Deer mouse		Meadow vole		Raccoon		Mink		Red fox	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Endosulfan II	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Endosulfan Sulfate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Endrin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Endrin Aldehyde	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Endrin Ketone	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Gamma-BHC (Lindane)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Gamma-Chlordane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Heptachlor	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Heptachlor Epoxide	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Methoxychlor	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Toxaphene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
1,2,4-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
2,4,5-Trichlorophenol	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
2,4,6-Trichlorophenol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
2,4-Dichlorophenol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Benzo(a)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Benzo(a)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Bis-(2-Ethylhexyl)phthalate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Butylbenzylphthalate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Carbazole	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Chrysene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01

Table 9-10
Summary of Maximum Hazard Quotients for Food Web Exposures - SWMU 22
NAS Oceana, Virginia Beach, VA

Chemical	Short-tailed shrew		Deer mouse		Meadow vole		Raccoon		Mink		Red fox	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Dibenz(a,h)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Dibenzofuran	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Diethylphthalate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Di-n-butylphthalate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Di-n-octylphthalate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Hexachloro-1,3-butadiene	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Hexachlorobenzene	0.06	<0.01	0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Hexachlorocyclopentadiene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Naphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
N-Nitrosodiphenylamine	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Pentachlorophenol	0.32	0.03	0.07	<0.01	<0.01	<0.01	NA	NA	NA	NA	0.02	<0.01
Phenanthrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Carbon Tetrachloride	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Chlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Chloroform	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Ethylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Styrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Tetrachloroethene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Toluene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Trichloroethene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Xylenes (total)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01

Table 9-10
Summary of Maximum Hazard Quotients for Food Web Exposures - SWMU 22
NAS Oceana, Virginia Beach, VA

Chemical	American robin		Marsh wren		American kestrel		Great blue heron		Mallard	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Aluminum	2.23	0.22	0.77	0.08	2.58	0.26	4.57	0.46	0.13	0.01
Antimony	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Arsenic	0.11	0.04	NA	NA	0.04	0.01	NA	NA	NA	NA
Barium	0.01	<0.01	NA	NA	0.01	<0.01	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	0.58	0.04	0.42	0.03	0.63	0.05	0.02	NA	0.20	0.01
Chromium	3.26	0.65	0.43	0.09	4.02	0.80	0.05	NA	0.05	NA
Cobalt	0.09	<0.01	0.14	0.01	0.10	0.01	0.09	NA	NA	NA
Copper	0.02	0.02	0.01	0.01	0.03	0.03	NA	NA	NA	NA
Iron	0.68	0.07	9.18	0.92	0.63	0.06	6.27	0.63	0.56	0.06
Lead	2.44	0.24	0.54	0.05	0.71	0.07	0.02	NA	0.31	0.03
Manganese	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Mercury	0.30	0.15	NA	NA	0.25	0.13	NA	NA	NA	NA
Nickel	0.03	0.02	NA	NA	0.03	0.02	NA	NA	NA	NA
Selenium	0.63	0.19	0.35	0.17	0.38	0.11	0.24	0.12	0.42	0.21
Silver	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Thallium	0.36	0.04	0.50	0.05	0.43	0.04	0.34	0.03	0.03	NA
Vanadium	0.02	<0.01	NA	NA	0.02	<0.01	NA	NA	NA	NA
Zinc	1.51	0.17	0.66	0.07	1.85	0.20	0.01	NA	0.13	0.01
4,4'-DDD	0.01	<0.01	NA	NA	0.02	<0.01	NA	NA	NA	NA
4,4'-DDE	0.25	0.02	0.02	NA	0.33	0.03	0.05	NA	NA	NA
4,4'-DDT	<0.01	<0.01	NA	NA	0.01	<0.01	0.02	NA	NA	NA
Aldrin	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
alpha-BHC	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
alpha-Chlordane	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Aroclor-1016	0.08	<0.01	0.64	0.06	0.11	0.01	0.24	0.02	0.03	NA
Aroclor-1221	0.17	0.02	1.29	0.13	0.22	0.02	0.48	0.05	0.06	NA
Aroclor-1232	0.08	<0.01	1.29	0.13	0.11	0.01	0.48	0.05	0.06	NA
Aroclor-1242	0.08	<0.01	0.64	0.06	0.11	0.01	0.24	0.02	0.03	NA
Aroclor-1248	0.19	0.02	1.45	0.15	0.25	0.02	0.54	0.05	0.07	NA
Aroclor-1254	0.19	0.02	0.75	0.07	0.25	0.02	0.27	0.03	0.04	NA
Aroclor-1260	0.12	0.01	0.75	0.07	0.16	0.02	0.27	0.03	0.04	NA
beta-BHC	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
delta-BHC	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Dieldrin	0.11	0.01	NA	NA	0.14	0.01	NA	NA	NA	NA
Endosulfan I	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA

Table 9-10
Summary of Maximum Hazard Quotients for Food Web Exposures - SWMU 22
NAS Oceana, Virginia Beach, VA

Chemical	American robin		Marsh wren		American kestrel		Great blue heron		Mallard	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Endosulfan II	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Endosulfan Sulfate	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Endrin	0.03	<0.01	NA	NA	0.03	<0.01	NA	NA	NA	NA
Endrin Aldehyde	0.03	<0.01	NA	NA	0.03	<0.01	NA	NA	NA	NA
Endrin Ketone	0.03	<0.01	NA	NA	0.03	<0.01	NA	NA	NA	NA
Gamma-BHC (Lindane)	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Gamma-Chlordane	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Heptachlor	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Heptachlor Epoxide	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Methoxychlor	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Toxaphene	0.04	<0.01	0.04	NA	0.05	<0.01	0.03	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
1,3-Dichlorobenzene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
1,4-Dichlorobenzene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Acenaphthylene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Anthracene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Benzo(a)anthracene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Benzo(a)pyrene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Benzo(b)fluoranthene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Benzo(g,h,i)perylene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Benzo(k)fluoranthene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Bis-(2-Ethylhexyl)phthalate	0.02	<0.01	NA	NA	0.03	<0.01	NA	NA	NA	NA
Butylbenzylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA

Table 9-10
Summary of Maximum Hazard Quotients for Food Web Exposures - SWMU 22
NAS Oceana, Virginia Beach, VA

Chemical	American robin		Marsh wren		American kestrel		Great blue heron		Mallard	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Dibenz(a,h)anthracene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	0.23	0.02	NA	NA	0.28	0.03	NA	NA	NA	NA
Di-n-octylphthalate	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Fluoranthene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Fluorene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Hexachloro-1,3-butadiene	0.01	<0.01	NA	NA	0.01	<0.01	NA	NA	NA	NA
Hexachlorobenzene	0.48	0.05	NA	NA	0.62	0.06	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Naphthalene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Phenanthrene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Pyrene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
Carbon Tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA

Table 9-11
Preliminary Summary of COPCs - SWMU 22 - Screening ERA
NAS Oceana, Virginia Beach, VA

Chemical	Groundwater			Surface Water			Sediment			Surface Soil			Food web		
	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV
Inorganics															
Aluminum	X				*					X			X		
Antimony											X			X	
Arsenic								*					X		
Barium		*			*			*							
Beryllium									X						
Cadmium		X			X								X		
Chromium										X			X		
Cyanide										X					
Iron	X			X						X			X		
Lead		X			X								X		
Manganese	X														
Mercury								*						X	
Selenium														X	
Silver		X			X										
Thallium									X		X			X	
Vanadium								*		X			X		
Zinc					*								X		
Pesticide/Polychlorinated Biphenyls															
4,4'-DDT		X			X										
Aroclor-1016		X			X			X							
Aroclor-1221		X			X			X						X	
Aroclor-1232		X			X			X						X	
Aroclor-1242		X			X			X						X	
Aroclor-1248		X			X			X						X	
Aroclor-1254		X			X									X	
Chlordane		X			X			X							
Endosulfan I									X			X			
Endosulfan II									X			X			
Endosulfan sulfate									X			X			
Endrin		X			X										

MD - Maximum detect exceeds screening value
MRL - Not detected; maximum reporting limit exceeds screening value
NSV - No screening value
* - Non-detected value - No reporting limit available

Table 9-11
Preliminary Summary of COPCs - SWMU 22 - Screening ERA
NAS Oceana, Virginia Beach, VA

Chemical	Groundwater			Surface Water			Sediment			Surface Soil			Food web		
	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV
Endrin aldehyde		X			X				X						
Heptachlor		X			X			X				X			
Heptachlor epoxide		X			X										
Methoxychlor		X			X				X						
Toxaphene		X			X				X			X			
delta-BHC									X						
Semi-volatile Organic Compounds															
1,2-Dichlorobenzene											X				
1,3-Dichlorobenzene												X			
1-Methylnaphthalene												X			
2,2'-Oxybis(1-chloropropane)			X									X			
2,4,5-Trichlorophenol											X				
2,4-Dimethylphenol											X				
2,4-Dinitrotoluene												X			
2,6-Dinitrotoluene			X									X			
2-Chlorophenol											X				
2-Methylaniline			X												
2-Methylnaphthalene			X									X			
2-Methylphenol											X				
2-Nitroaniline			X									X			
2-Nitrophenol												X			
3,3'-Dichlorobenzidine			X									X			
3-Nitroaniline			X									X			
4,6-Dinitro-2-methylphenol		X										X			
4-Bromophenyl-phenylether		X										X			
4-Chloro-3-methylphenol		X										X			
4-Chloroaniline												X			
4-Chlorophenyl-phenylether												X			
4-Methylphenol			X								X				
4-Nitroaniline			X									X			
4-Nitrophenol											X				

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Table 9-11
Preliminary Summary of COPCs - SWMU 22 - Screening ERA
NAS Oceana, Virginia Beach, VA

Chemical	Groundwater			Surface Water			Sediment			Surface Soil			Food web		
	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV
Acenaphthylene			X												
Aniline			X												
Anthracene		X													
Benzidine			X												
Benzo(a)anthracene		X													
Benzo(a)pyrene		X													
Benzo(b)fluoranthene			X												
Benzo(g,h,i)perylene			X												
Benzo(k)fluoranthene			X												
Benzoic acid		X													
Benzyl alcohol			X												
Butylbenzylphthalate												X			
Carbazole												X			
Chrysene			X												
Di-n-octylphthalate		X										X			
Dibenz(a,h)anthracene			X												
Dibenzofuran												X			
Fluoranthene										X					
Hexachlorobenzene		X										X			
Hexachlorobutadiene		X										X			
Hexachlorocyclopentadiene		X													
Hexachloroethane												X			
Indeno(1,2,3-cd)pyrene			X												
Isophorone												X			
Pentachlorophenol		X													
Phenanthrene		X													
Pyrene			X												
bis(2-Chloroethoxy)methane												X			
bis(2-Chloroethyl)ether												X			
bis(2-Ethylhexyl)phthalate												X			
n-Nitroso-di-n-propylamine			X									X			

MD - Maximum detect exceeds screening value
MRL - Not detected; maximum reporting limit exceeds screening value
NSV - No screening value
* - Non-detected value - No reporting limit available

Table 9-11
Preliminary Summary of COPCs - SWMU 22 - Screening ERA
NAS Oceana, Virginia Beach, VA

Chemical	Groundwater			Surface Water			Sediment			Surface Soil			Food web		
	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV	MD	MRL	NSV
n-Nitrosodimethylamine			X												
Volatile Organic Compounds															
1,1-Dichloroethene												X			
1,2,3-Trichloropropane			X												
1,2-Dibromo-3-chloropropane			X												
2-Butanone												X			
2-Chloroethyl vinyl ether			X			X									
2-Hexanone												X			
Acetone												X			
Bromomethane												X			
Carbon disulfide		X				X						X			
Chloroethane			X			X						X			
Chloromethane												X			
Dibromochloromethane												X			
Methylene chloride		*			*										
Styrene			X			X									
Vinyl acetate			X			X									
0-Xylene												X			

MD - Maximum detect exceeds screening value
MRL - Not detected; maximum reporting limit exceeds screening value
NSV - No screening value
* - Non-detected value - No reporting limit available

Table 9-12
Refined Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - SWMU 22
NAS Oceana, Virginia Beach, VA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor
Terrestrial Habitats			
Survival, growth, and reproduction of terrestrial soil invertebrate communities.	Are site-related surface soil concentrations sufficient to adversely effect soil invertebrate communities based on conservative screening values?	Comparison of mean chemical concentrations in surface soil with soil screening values.	Soil Invertebrates (earthworms)
Survival, growth, and reproduction of terrestrial plant communities.	Are site-related surface soil concentrations sufficient to adversely effect terrestrial plant communities based on conservative screening values?	Comparison of mean chemical concentrations in surface soil with soil screening values.	Terrestrial plants
Survival, growth, and reproduction of avian terrestrial insectivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume soil invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean soil concentrations.	American robin
Survival, growth, and reproduction of avian terrestrial carnivores.	Are site-related chemical concentrations in surface soils 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) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean soil concentrations.	American kestrel
Survival, growth, and reproduction of mammalian terrestrial insectivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume soil invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean soil concentrations.	Short-tailed shrew
Survival, growth, and reproduction of mammalian terrestrial omnivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume plants and invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean soil concentrations.	Deer mouse
Survival, growth, and reproduction of mammalian terrestrial herbivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume plants from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean soil concentrations.	Meadow vole

Table 9-12
Refined Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - SWMU 22
NAS Oceana, Virginia Beach, VA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor
Survival, growth, and reproduction of mammalian terrestrial carnivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume small mammals from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean soil concentrations.	Red fox
Survival, growth, and reproduction of terrestrial reptiles.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to terrestrial reptilian species?	Evidence of potential risk to other upper trophic level terrestrial receptors evaluated in the baseline ERA.	--
Wetland and Aquatic Habitats			
Survival, growth, and reproduction of benthic invertebrate communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect benthic invertebrate communities?	Comparison of mean chemical concentrations in surface water and/or sediment with medium-specific screening values.	Benthic invertebrates
Survival, growth, and reproduction of aquatic and wetland plant communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect aquatic or wetland plant communities?	Comparison of mean chemical concentrations in surface water and/or sediment with medium-specific screening values.	Aquatic/wetland plants
Survival, growth, and reproduction of fish communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect fish communities?	Comparison of mean chemical concentrations in surface water and/or sediment with medium-specific screening values.	Freshwater fish
Survival, growth, and reproduction of amphibian communities.	Are site-related chemical concentrations in surface water and/or sediment sufficient to adversely effect amphibian communities?	Comparison of mean chemical concentrations in surface water and/or sediment with medium-specific screening values.	Amphibians
Survival, growth, and reproduction of amphibians.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to amphibian species that may consume aquatic invertebrates from the site?	Evidence of potential risk to other upper trophic level aquatic and wetland receptors evaluated in the baseline ERA.	--
Survival, growth, and reproduction of aquatic/wetland reptiles.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to aquatic/wetland reptile species?	Evidence of potential risk to other upper trophic level aquatic and wetland receptors evaluated in the baseline ERA.	--

Table 9-12
Refined Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - SWMU 22
NAS Oceana, Virginia Beach, VA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor
Survival, growth, and reproduction of avian aquatic/wetland insectivores.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume aquatic invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean sediment concentrations.	Marsh wren
Survival, growth, and reproduction of avian aquatic/wetland piscivores.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume fish from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean sediment concentrations.	Great blue heron
Survival, growth, and reproduction of mammalian aquatic/wetland piscivores	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume fish from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean sediment concentrations.	Mink
Survival, growth, and reproduction of mammalian aquatic/wetland omnivores.	Are site-related chemical concentrations in surface water and sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to mammalian species that may consume aquatic plants and invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean sediment concentrations.	Raccoon

Table 9-13
Refined Screening Statistics - SWMU 22 - Ground Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COPC?
Inorganics (UG/L)									
Aluminum	-- - --	2 / 3	752	OW22-MW4-93A	417	87.0	2 / 3	4.80	**YES**
Barium	-- - --	0 / 4	--	--	18.4	1,000	-- / --	0.02	NO
Cadmium	2.80 - 2.80	0 / 4	--	--	1.40	0.83	-- / --	1.69	NO
Iron	-- - --	3 / 3	9,340	OW22-MW3-93A	6,355	320	3 / 3	19.9	**YES**
Lead	1.70 - 1.70	0 / 4	--	--	0.88	0.54	-- / --	1.61	NO
Manganese	-- - --	3 / 3	303	OW22-MW4-93A	211	120	2 / 3	1.76	**YES**
Silver	2.00 - 2.00	0 / 4	--	--	1.06	0.36	-- / --	2.95	NO
Pesticide/Polychlorinated Biphenyls (UG/L)									
4,4'-DDT	0.04 - 0.04	0 / 4	--	--	0.02	0.001	-- / --	20.0	NO
Aroclor-1016	1.00 - 2.00	0 / 4	--	--	0.50	0.01	-- / --	35.7	NO
Aroclor-1221	2.00 - 2.00	0 / 4	--	--	1.00	0.28	-- / --	3.57	NO
Aroclor-1232	1.00 - 2.00	0 / 4	--	--	1.00	0.58	-- / --	1.72	NO
Aroclor-1242	1.00 - 1.00	0 / 4	--	--	0.50	0.05	-- / --	9.43	NO
Aroclor-1248	1.00 - 1.00	0 / 4	--	--	0.50	0.08	-- / --	6.17	NO
Aroclor-1254	0.50 - 0.50	0 / 4	--	--	0.25	0.03	-- / --	7.58	NO
Chlordane	0.20 - 1.00	0 / 4	--	--	0.10	0.17	-- / --	0.59	NO
Endrin	0.04 - 0.04	0 / 4	--	--	0.02	0.04	-- / --	0.56	NO
Endrin aldehyde	0.04 - 0.04	0 / 4	--	--	0.02	0.04	-- / --	0.56	NO
Heptachlor	0.02 - 0.02	0 / 4	--	--	0.01	0.007	-- / --	1.45	NO
Heptachlor epoxide	0.02 - 0.02	0 / 4	--	--	0.01	0.007	-- / --	1.45	NO
Methoxychlor	0.08 - 0.08	0 / 4	--	--	0.04	0.03	-- / --	1.33	NO
Toxaphene	1.00 - 1.00	0 / 4	--	--	0.50	0.01	-- / --	45.5	NO
Semi-volatile Organic Compounds (UG/L)									
2,2'-Oxybis(1-chloropropane)	10.0 - 10.0	0 / 4	--	--	5.00	NSV	-- / --	NSV	NO
2,6-Dinitrotoluene	10.0 - 10.0	0 / 4	--	--	5.00	NSV	-- / --	NSV	NO
2-Methylaniline	10.0 - 10.0	0 / 1	--	--	5.00	NSV	-- / --	NSV	NO
2-Methylnaphthalene	10.0 - 10.0	0 / 4	--	--	5.00	NSV	-- / --	NSV	NO
2-Nitroaniline	50.0 - 50.0	0 / 4	--	--	25.0	NSV	-- / --	NSV	NO
3,3'-Dichlorobenzidine	20.0 - 20.0	0 / 4	--	--	10.0	NSV	-- / --	NSV	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 9-13
Refined Screening Statistics - SWMU 22 - Ground Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COPC?
3-Nitroaniline	50.0 - 50.0	0 / 4	--	--	25.0	NSV	-- / --	NSV	NO
4,6-Dinitro-2-methylphenol	50.0 - 50.0	0 / 4	--	--	25.0	2.30	-- / --	10.9	NO
4-Bromophenyl-phenylether	10.0 - 10.0	0 / 4	--	--	5.00	1.50	-- / --	3.33	NO
4-Chloro-3-methylphenol	10.0 - 10.0	0 / 4	--	--	5.00	0.30	-- / --	16.7	NO
4-Methylphenol	10.0 - 10.0	0 / 3	--	--	5.00	NSV	-- / --	NSV	NO
4-Nitroaniline	50.0 - 50.0	0 / 4	--	--	25.0	NSV	-- / --	NSV	NO
Acenaphthylene	10.0 - 10.0	0 / 4	--	--	5.00	NSV	-- / --	NSV	NO
Aniline	10.0 - 10.0	0 / 4	--	--	5.00	NSV	-- / --	NSV	NO
Anthracene	10.0 - 10.0	0 / 4	--	--	5.00	0.73	-- / --	6.85	NO
Benzidine	50.0 - 50.0	0 / 4	--	--	25.0	NSV	-- / --	NSV	NO
Benzo(a)anthracene	10.0 - 10.0	0 / 4	--	--	5.00	6.30	-- / --	0.79	NO
Benzo(a)pyrene	10.0 - 10.0	0 / 4	--	--	5.00	0.01	-- / --	357	NO
Benzo(b)fluoranthene	10.0 - 10.0	0 / 4	--	--	5.00	NSV	-- / --	NSV	NO
Benzo(g,h,i)perylene	10.0 - 10.0	0 / 4	--	--	5.00	NSV	-- / --	NSV	NO
Benzo(k)fluoranthene	10.0 - 10.0	0 / 4	--	--	5.00	NSV	-- / --	NSV	NO
Benzoic acid	50.0 - 50.0	0 / 4	--	--	25.0	42.0	-- / --	0.60	NO
Benzyl alcohol	10.0 - 10.0	0 / 4	--	--	5.00	NSV	-- / --	NSV	NO
Chrysene	10.0 - 10.0	0 / 4	--	--	5.00	NSV	-- / --	NSV	NO
Di-n-octylphthalate	10.0 - 10.0	0 / 4	--	--	5.00	3.00	-- / --	1.67	NO
Dibenz(a,h)anthracene	10.0 - 10.0	0 / 4	--	--	5.00	NSV	-- / --	NSV	NO
Hexachlorobenzene	10.0 - 10.0	0 / 4	--	--	5.00	3.68	-- / --	1.36	NO
Hexachlorobutadiene	10.0 - 10.0	0 / 4	--	--	5.00	9.30	-- / --	0.54	NO
Hexachlorocyclopentadiene	10.0 - 10.0	0 / 4	--	--	5.00	5.20	-- / --	0.96	NO
Indeno(1,2,3-cd)pyrene	10.0 - 10.0	0 / 4	--	--	5.00	NSV	-- / --	NSV	NO
Pentachlorophenol	50.0 - 50.0	0 / 4	--	--	25.0	6.69	-- / --	3.74	NO
Phenanthrene	10.0 - 10.0	0 / 4	--	--	5.00	6.30	-- / --	0.79	NO
Pyrene	10.0 - 10.0	0 / 4	--	--	5.00	NSV	-- / --	NSV	NO
n-Nitroso-di-n-propylamine	10.0 - 10.0	0 / 4	--	--	5.00	NSV	-- / --	NSV	NO
n-Nitrosodimethylamine	10.0 - 10.0	0 / 4	--	--	5.00	NSV	-- / --	NSV	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 9-13
Refined Screening Statistics - SWMU 22 - Ground Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COPC?
Volatile Organic Compounds (UG/L)									
1,2,3-Trichloropropane	5.00 - 5.00	0 / 4	--	--	2.50	NSV	-- / --	NSV	NO
1,2-Dibromo-3-chloropropane	10.0 - 10.0	0 / 1	--	--	5.00	NSV	-- / --	NSV	NO
2-Chloroethyl vinyl ether	10.0 - 10.0	0 / 4	--	--	5.00	NSV	-- / --	NSV	NO
Carbon disulfide	5.00 - 5.00	0 / 4	--	--	2.50	2.00	-- / --	1.25	NO
Chloroethane	10.0 - 10.0	0 / 4	--	--	5.00	NSV	-- / --	NSV	NO
Methylene chloride	-- - --	0 / 4	--	--	1.38	2,200	-- / --	0.001	NO
Styrene	5.00 - 5.00	0 / 4	--	--	2.50	NSV	-- / --	NSV	NO
Vinyl acetate	10.0 - 10.0	0 / 4	--	--	5.00	NSV	-- / --	NSV	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 9-14
Refined Screening Statistics - SWMU 22 - Surface Water
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COPC?
Inorganics (UG/L)									
Aluminum	-- - --	0 / 2	--	--	79.8	87.0	-- / --	0.92	NO
Barium	-- - --	0 / 2	--	--	17.6	1,000	-- / --	0.02	NO
Cadmium	2.80 - 2.80	0 / 2	--	--	1.40	1.29	-- / --	1.09	NO
Iron	-- - --	2 / 2	1,070	OW22-SW1-93A	1,160	320	2 / 2	3.63	**YES**
Lead	1.70 - 1.70	0 / 2	--	--	0.85	1.10	-- / --	0.77	NO
Silver	2.00 - 2.00	0 / 2	--	--	1.00	0.36	-- / --	2.78	NO
Zinc	-- - --	0 / 2	--	--	7.50	60.0	-- / --	0.13	NO
Pesticide/Polychlorinated Biphenyls (UG/L)									
4,4'-DDT	0.04 - 0.04	0 / 2	--	--	0.02	0.001	-- / --	20.0	NO
Aroclor-1016	1.00 - 1.00	0 / 2	--	--	0.50	0.01	-- / --	35.7	NO
Aroclor-1221	2.00 - 2.00	0 / 2	--	--	1.00	0.28	-- / --	3.57	NO
Aroclor-1232	2.00 - 2.00	0 / 2	--	--	1.00	0.58	-- / --	1.72	NO
Aroclor-1242	1.00 - 1.00	0 / 2	--	--	0.50	0.05	-- / --	9.43	NO
Aroclor-1248	1.00 - 1.00	0 / 2	--	--	0.50	0.08	-- / --	6.17	NO
Aroclor-1254	0.50 - 0.50	0 / 2	--	--	0.25	0.03	-- / --	7.58	NO
Chlordane	0.20 - 0.20	0 / 2	--	--	0.10	0.17	-- / --	0.59	NO
Endrin	0.04 - 0.04	0 / 2	--	--	0.02	0.04	-- / --	0.56	NO
Endrin aldehyde	0.04 - 0.04	0 / 2	--	--	0.02	0.04	-- / --	0.56	NO
Heptachlor	0.02 - 0.02	0 / 2	--	--	0.01	0.007	-- / --	1.45	NO
Heptachlor epoxide	0.02 - 0.02	0 / 2	--	--	0.01	0.007	-- / --	1.45	NO
Methoxychlor	0.08 - 0.08	0 / 2	--	--	0.04	0.03	-- / --	1.33	NO
Toxaphene	1.00 - 1.00	0 / 2	--	--	0.50	0.01	-- / --	45.5	NO
Volatile Organic Compounds (UG/L)									
2-Chloroethyl vinyl ether	10.0 - 10.0	0 / 2	--	--	5.00	NSV	-- / --	NSV	NO
Carbon disulfide	5.00 - 5.00	0 / 2	--	--	2.50	2.00	-- / --	1.25	NO
Chloroethane	10.0 - 10.0	0 / 2	--	--	5.00	NSV	-- / --	NSV	NO
Styrene	5.00 - 5.00	0 / 2	--	--	2.50	NSV	-- / --	NSV	NO
Vinyl acetate	10.0 - 10.0	0 / 2	--	--	5.00	NSV	-- / --	NSV	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 9-15
Refined Screening Statistics - SWMU 22 - Sediment
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COPC?
Inorganics (MG/KG)									
Arsenic	-- - --	0 / 2	--	--	0.61	8.20	-- / --	0.07	NO
Barium	-- - --	0 / 2	--	--	3.03	500	-- / --	0.01	NO
Beryllium	0.06 - 0.06	0 / 2	--	--	0.04	NSV	-- / --	NSV	NO
Mercury	-- - --	0 / 2	--	--	0.03	0.15	-- / --	0.17	NO
Thallium	0.55 - 0.57	0 / 2	--	--	0.28	NSV	-- / --	NSV	NO
Vanadium	-- - --	0 / 2	--	--	2.23	57.0	-- / --	0.04	NO
Pesticide/Polychlorinated Biphenyls (UG/KG)									
Aroclor-1016	39.0 - 41.0	0 / 2	--	--	20.0	22.7	-- / --	0.88	NO
Aroclor-1221	39.0 - 83.0	0 / 2	--	--	30.5	22.7	-- / --	1.34	NO
Aroclor-1232	39.0 - 83.0	0 / 2	--	--	30.5	22.7	-- / --	1.34	NO
Aroclor-1242	39.0 - 41.0	0 / 2	--	--	20.0	22.7	-- / --	0.88	NO
Aroclor-1248	39.0 - 41.0	0 / 2	--	--	20.0	22.7	-- / --	0.88	NO
Chlordane	7.90 - 8.30	0 / 2	--	--	4.05	7.00	-- / --	0.58	NO
Endosulfan I	0.79 - 0.83	0 / 2	--	--	0.41	NSV	-- / --	NSV	NO
Endosulfan II	1.50 - 1.60	0 / 2	--	--	0.78	NSV	-- / --	NSV	NO
Endosulfan sulfate	1.50 - 1.60	0 / 2	--	--	0.78	NSV	-- / --	NSV	NO
Endrin aldehyde	1.50 - 1.60	0 / 2	--	--	0.78	NSV	-- / --	NSV	NO
Heptachlor	0.79 - 0.83	0 / 2	--	--	0.41	0.30	-- / --	1.35	NO
Methoxychlor	3.20 - 3.30	0 / 2	--	--	1.63	NSV	-- / --	NSV	NO
Toxaphene	39.0 - 41.0	0 / 2	--	--	20.0	NSV	-- / --	NSV	NO
delta-BHC	0.79 - 0.83	0 / 2	--	--	0.41	NSV	-- / --	NSV	NO

NSV - No Screening Value
Shaded Cells Indicate Hazard Quotient based on Reporting Limit

Table 9-16
Refined Screening Statistics - SWMU 22 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COPC?
Inorganics (MG/KG)									
Aluminum	38.1 - 43.8	3 / 3	15,400	OW22-SS02-00	13,633	50.0	3 / 3	273	**YES**
Antimony	11.4 - 13.1	0 / 3	--	--	0.23	5.00	-- / --	0.05	NO
Chromium	1.90 - 2.20	3 / 3	19.7	OW22-SS02-00	17.0	0.40	3 / 3	42.5	**YES**
Cyanide	0.60 - 0.60	1 / 3	0.12	OW22-SS03-00	0.05	0.06	1 / 3	0.78	NO
Iron	19.1 - 21.9	3 / 3	6,270	OW22-SS02-00	5,590	200	3 / 3	28.0	**YES**
Thallium	1.90 - 2.20	0 / 3	--	--	0.29	1.00	-- / --	0.29	NO
Vanadium	9.50 - 10.9	3 / 3	20.1	OW22-SS02-00	18.3	2.00	3 / 3	9.17	**YES**
Pesticide/Polychlorinated Biphenyls (UG/KG)									
Endosulfan I	2.02 - 2.12	0 / 3	--	--	1.03	NSV	-- / --	NSV	NO
Endosulfan II	3.92 - 4.12	0 / 3	--	--	2.00	NSV	-- / --	NSV	NO
Endosulfan sulfate	3.92 - 4.12	0 / 3	--	--	2.00	NSV	-- / --	NSV	NO
Heptachlor	2.02 - 2.12	0 / 3	--	--	1.03	NSV	-- / --	NSV	NO
Toxaphene	202 - 212	0 / 3	--	--	103	NSV	-- / --	NSV	NO
Semi-volatile Organic Compounds (UG/KG)									
1,2-Dichlorobenzene	390 - 420	0 / 3	--	--	202	100	-- / --	2.02	NO
1,3-Dichlorobenzene	390 - 420	0 / 3	--	--	202	NSV	-- / --	NSV	NO
1-Methylnaphthalene	20.0 - 20.0	1 / 2	40.0	OW22-SS01-00	25.0	NSV	-- / --	NSV	**YES**
2,2'-Oxybis(1-chloropropane)	390 - 420	0 / 3	--	--	202	NSV	-- / --	NSV	NO
2,4,5-Trichlorophenol	980 - 1,000	0 / 3	--	--	495	430	-- / --	1.15	NO
2,4-Dimethylphenol	390 - 420	0 / 3	--	--	202	100	-- / --	2.02	NO
2,4-Dinitrotoluene	390 - 420	0 / 3	--	--	202	NSV	-- / --	NSV	NO
2,6-Dinitrotoluene	390 - 420	0 / 3	--	--	202	NSV	-- / --	NSV	NO
2-Chlorophenol	390 - 420	0 / 3	--	--	202	100	-- / --	2.02	NO
2-Methylnaphthalene	20.0 - 420	1 / 3	40.0	OW22-SS01-00	86.7	NSV	-- / --	NSV	**YES**
2-Methylphenol	390 - 420	0 / 3	--	--	202	100	-- / --	2.02	NO
2-Nitroaniline	980 - 1,000	0 / 3	--	--	495	NSV	-- / --	NSV	NO
2-Nitrophenol	390 - 420	0 / 3	--	--	202	NSV	-- / --	NSV	NO
3,3'-Dichlorobenzidine	390 - 420	0 / 3	--	--	202	NSV	-- / --	NSV	NO
3-Nitroaniline	980 - 1,000	0 / 3	--	--	495	NSV	-- / --	NSV	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 9-16 Refined Screening Statistics - SWMU 22 - Surface Soil *NAS Oceana, Virginia Beach, VA*									
Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COPC?
4,6-Dinitro-2-methylphenol	980 - 1,000	0 / 3	--	--	495	NSV	-- / --	NSV	NO
4-Bromophenyl-phenylether	390 - 420	0 / 3	--	--	202	NSV	-- / --	NSV	NO
4-Chloro-3-methylphenol	390 - 420	0 / 3	--	--	202	NSV	-- / --	NSV	NO
4-Chloroaniline	390 - 420	0 / 3	--	--	202	NSV	-- / --	NSV	NO
4-Chlorophenyl-phenylether	390 - 420	0 / 3	--	--	202	NSV	-- / --	NSV	NO
4-Methylphenol	390 - 420	0 / 3	--	--	202	100	-- / --	2.02	NO
4-Nitroaniline	980 - 1,000	0 / 3	--	--	495	NSV	-- / --	NSV	NO
4-Nitrophenol	980 - 1,000	0 / 3	--	--	495	380	-- / --	1.30	NO
Butylbenzylphthalate	390 - 420	0 / 3	--	--	202	NSV	-- / --	NSV	NO
Carbazole	390 - 420	0 / 3	--	--	202	NSV	-- / --	NSV	NO
Di-n-octylphthalate	390 - 420	0 / 3	--	--	202	NSV	-- / --	NSV	NO
Dibenzofuran	390 - 420	0 / 3	--	--	202	NSV	-- / --	NSV	NO
Fluoranthene	3.90 - 420	2 / 3	120	OW22-SS01-00	114	100	1 / 3	1.14	**YES**
Hexachlorobenzene	390 - 420	0 / 3	--	--	202	NSV	-- / --	NSV	NO
Hexachlorobutadiene	390 - 420	0 / 3	--	--	202	NSV	-- / --	NSV	NO
Hexachloroethane	390 - 420	0 / 3	--	--	202	NSV	-- / --	NSV	NO
Isophorone	390 - 420	0 / 3	--	--	202	NSV	-- / --	NSV	NO
bis(2-Chloroethoxy)methane	390 - 420	0 / 3	--	--	202	NSV	-- / --	NSV	NO
bis(2-Chloroethyl)ether	390 - 420	0 / 3	--	--	202	NSV	-- / --	NSV	NO
bis(2-Ethylhexyl)phthalate	390 - 420	0 / 2	--	--	203	NSV	-- / --	NSV	NO
n-Nitroso-di-n-propylamine	390 - 420	0 / 3	--	--	202	NSV	-- / --	NSV	NO
Volatile Organic Compounds (UG/KG)									
1,1-Dichloroethene	11.7 - 12.9	0 / 3	--	--	6.08	NSV	-- / --	NSV	NO
2-Butanone	11.7 - 12.9	0 / 3	--	--	6.08	NSV	-- / --	NSV	NO
2-Hexanone	11.7 - 12.9	0 / 3	--	--	6.08	NSV	-- / --	NSV	NO
Acetone	11.7 - 12.9	0 / 3	--	--	7.00	NSV	-- / --	NSV	NO
Bromomethane	11.7 - 12.9	0 / 3	--	--	6.08	NSV	-- / --	NSV	NO
Carbon disulfide	11.7 - 12.9	0 / 3	--	--	6.08	NSV	-- / --	NSV	NO
Chloroethane	11.7 - 12.9	0 / 3	--	--	6.08	NSV	-- / --	NSV	NO
Chloromethane	11.7 - 12.9	0 / 3	--	--	6.08	NSV	-- / --	NSV	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 9-16 Refined Screening Statistics - SWMU 22 - Surface Soil *NAS Oceana, Virginia Beach, VA*									
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Arithmetic Mean**	**Screening Value**	**Frequency of Exceedance**	**Mean Hazard Quotient**	**COPC?**
Dibromochloromethane	11.7 - 12.9	0 / 3	--	--	6.08	NSV	-- / --	NSV	NO
o-Xylene	11.7 - 12.9	0 / 3	--	--	6.08	NSV	-- / --	NSV	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 9-17
Summary of Mean Hazard Quotients for Food Web Exposures - SWMU 22
NAS Oceana, Virginia Beach, VA

Chemical	Short-tailed shrew		Deer mouse		Meadow vole		Raccoon		Mink		Red fox	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Aluminum	10.87	1.09	0.99	0.10	1.00	0.10	0.07	NA	0.73	0.07	0.31	0.03
Antimony	0.05	<0.01	0.02	<0.01	0.03	<0.01	0.19	0.02	0.52	0.05	0.01	<0.01
Arsenic	0.56	0.06	0.09	<0.01	0.06	<0.01	0.03	NA	0.02	NA	0.02	<0.01
Barium	0.44	0.11	0.09	0.02	0.10	0.03	NA	NA	0.02	NA	0.03	<0.01
Beryllium	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Cadmium	0.14	0.01	0.03	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Chromium	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Iron	1.60	0.16	0.14	0.01	0.16	0.02	0.38	0.04	1.22	0.12	0.14	0.01
Lead	0.09	<0.01	0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Manganese	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Mercury	0.11	0.02	0.03	<0.01	0.02	<0.01	NA	NA	0.02	0.01	<0.01	<0.01
Selenium	0.13	0.08	0.04	0.02	0.05	0.03	0.02	NA	0.04	0.02	0.01	<0.01
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Thallium	0.33	0.03	0.06	<0.01	0.01	<0.01	0.04	NA	0.13	0.01	0.02	<0.01
Vanadium	1.26	0.13	0.11	0.01	0.13	0.01	0.11	0.01	0.35	0.03	0.12	0.01
Zinc	0.02	0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	0.01	<0.01
4,4'-DDT	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Aroclor-1016	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Aroclor-1221	0.19	0.02	0.04	<0.01	<0.01	<0.01	0.01	NA	0.12	0.01	0.01	<0.01
Aroclor-1232	0.10	<0.01	0.02	<0.01	<0.01	<0.01	0.01	NA	0.12	0.01	<0.01	<0.01
Aroclor-1242	0.10	<0.01	0.02	<0.01	<0.01	<0.01	NA	NA	0.08	NA	<0.01	<0.01
Aroclor-1248	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Aroclor-1254	0.10	<0.01	0.02	<0.01	<0.01	<0.01	NA	NA	0.02	NA	<0.01	<0.01
Endosulfan I	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Endosulfan II	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Endosulfan Sulfate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Endrin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Endrin Aldehyde	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Heptachlor	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Heptachlor Epoxide	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Methoxychlor	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Toxaphene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01

Table 9-17
Summary of Mean Hazard Quotients for Food Web Exposures - SWMU 22
NAS Oceana, Virginia Beach, VA

Chemical	Short-tailed shrew		Deer mouse		Meadow vole		Raccoon		Mink		Red fox	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
2,4,5-Trichlorophenol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
2-Methylnaphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Benzo(a)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Benzo(a)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Butylbenzylphthalate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Carbazole	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Chrysene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Dibenz(a,h)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Dibenzofuran	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Di-n-octylphthalate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Hexachlorobutadiene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Hexachlorobenzene	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Hexachlorocyclopentadiene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
N-Nitrosodiphenylamine	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Pentachlorophenol	0.06	<0.01	0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Phenanthrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01
Styrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA	<0.01	<0.01

Table 9-17
Summary of Mean Hazard Quotients for Food Web Exposures - SWMU 22
NAS Oceana, Virginia Beach, VA

Chemical	American robin		Marsh wren		American kestrel		Great blue heron	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Aluminum	0.65	0.06	0.21	0.02	0.49	0.05	2.24	0.22
Antimony	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Arsenic	0.01	<0.01	0.03	NA	<0.01	<0.01	NA	NA
Barium	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	0.04	<0.01	0.04	NA	0.04	<0.01	NA	NA
Chromium	0.23	0.05	0.10	0.02	0.27	0.05	0.02	NA
Iron	0.27	0.03	4.11	0.41	0.18	0.02	3.27	0.33
Lead	0.27	0.03	0.33	0.03	0.08	<0.01	0.01	NA
Manganese	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Mercury	<0.01	<0.01	0.01	NA	<0.01	<0.01	2.24	0.22
Selenium	0.04	0.01	0.12	0.06	0.03	<0.01	0.10	0.05
Silver	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Thallium	0.03	<0.01	0.18	0.02	0.03	<0.01	0.14	0.01
Vanadium	<0.01	<0.01	0.04	NA	<0.01	<0.01	0.03	NA
Zinc	0.11	0.01	0.07	NA	0.12	0.01	NA	NA
4,4'-DDT	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Aroclor-1016	<0.01	<0.01	0.02	NA	<0.01	<0.01	0.07	NA
Aroclor-1221	0.01	<0.01	0.03	NA	0.01	<0.01	0.11	0.01
Aroclor-1232	<0.01	<0.01	0.03	NA	<0.01	<0.01	0.11	0.01
Aroclor-1242	<0.01	<0.01	0.02	NA	<0.01	<0.01	0.07	NA
Aroclor-1248	0.02	<0.01	0.05	NA	0.02	<0.01	0.17	0.02
Aroclor-1254	0.02	<0.01	0.02	NA	0.02	<0.01	0.09	NA
Endosulfan I	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Endosulfan II	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Endosulfan Sulfate	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Endrin	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Endrin Aldehyde	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Heptachlor	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Heptachlor Epoxide	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Methoxychlor	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Toxaphene	0.01	<0.01	0.01	NA	0.01	<0.01	0.01	NA

Table 9-17
Summary of Mean Hazard Quotients for Food Web Exposures - SWMU 22
NAS Oceana, Virginia Beach, VA

Chemical	American robin		Marsh wren		American kestrel		Great blue heron	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
1,2-Dichlorobenzene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
1,3-Dichlorobenzene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Benzo(a)anthracene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Benzo(a)pyrene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Benzo(b)fluoranthene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Benzo(g,h,i)perylene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Benzo(k)fluoranthene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Butylbenzylphthalate	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Dibenz(a,h)anthracene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Fluoranthene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Hexachlorobutadiene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Hexachlorobenzene	0.14	0.01	NA	NA	0.15	0.01	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Phenanthrene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Pyrene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA
Styrene	NA	NA	NA	NA	NA	NA	NA	NA

Table 9-18
Refined Summary of COPCs - SWMU 22
NAS Oceana, Virginia Beach, VA

Chemical	Groundwater	Surface Water	Sediment	Surface Soil	Food web
Inorganics					
Aluminum	X			X	X
Chromium				X	
Iron	X	X		X	X
Manganese	X				
Mercury					X
Vanadium				X	X
Semi-volatile Organic Compounds					
Fluoranthene				X	

Table 9-19
Comparison of SWMU 22 Surface Soil COPC Concentrations to Background Concentrations
NAS Oceana, Virginia Beach, VA

Chemical	On-Site			Background [1]		On-site Comparison to Background	
	Frequency of Detection	Maximum	Arithmetic Mean	Maximum	Arithmetic Mean	On-site Maximum Exceeds Background Maximum?	On-site Mean Exceeds Background Mean?
Inorganics (mg/kg)							
Aluminum	3 / 3	15,400	13,633	100,000	66,000	NO	NO
Chromium	3 / 3	19.7	17.0	19.5	15.7	YES	YES
Iron	3 / 3	6,270	5,590	100,000	25,000	NO	NO
Vanadium	3 / 3	20.1	18.3	500	76	NO	NO
Semivolatiles (ug/l)							
Fluoranthene	2 / 3	120	114	580	136	NO	NO

[1] Background obtained from (CH2M HILL, 2000c).

Table 10-1 Summary Statistics - SWMU 26 - Surface Soil *NAS Oceana, Virginia Beach, VA*						
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Arithmetic Mean[1]**	**Standard Deviation of Mean**
Inorganics (MG/KG)						
Aluminum	43.7 - 51.8	3 / 3	21,100	OW26-SS03-00	19,867	1,721
Antimony	13.1 - 15.5	1 / 3	0.53	OW26-SS02-00	0.36	0.15
Arsenic	2.20 - 2.60	3 / 3	3.20	OW26-SS02-00	2.60	0.53
Barium	43.7 - 51.8	3 / 3	85.9	OW26-SS02-00	77.5	7.34
Beryllium	1.10 - 1.30	3 / 3	0.83	OW26-SS02-00	0.77	0.07
Cadmium	1.10 - 1.30	1 / 3	0.86	OW26-SS03-00	0.46	0.34
Calcium	1,091 - 1,294	3 / 3	1,220	OW26-SS01-00	930	372
Chromium	2.20 - 2.60	3 / 3	23.5	OW26-SS03-00	21.1	2.27
Cobalt	10.9 - 12.9	2 / 3	3.10	OW26-SS03-00	2.13	1.19
Copper	5.50 - 6.50	3 / 3	15.7	OW26-SS03-00	12.2	3.50
Cyanide	0.70 - 0.70	0 / 3	--	--	0.02	2.32831E-10
Iron	21.8 - 25.9	3 / 3	6,050	OW26-SS01-00	5,523	904
Lead	0.70 - 0.80	3 / 3	44.5	OW26-SS03-00	29.0	13.5
Magnesium	1,091 - 1,294	3 / 3	1,070	OW26-SS03-00	799	241
Manganese	3.30 - 3.90	3 / 3	33.9	OW26-SS03-00	23.0	9.85
Mercury	0.10 - 0.10	3 / 3	0.10	OW26-SS01-00	0.09	0.006
Nickel	8.70 - 10.4	3 / 3	11.3	OW26-SS03-00	9.87	1.27
Potassium	1,091 - 1,294	3 / 3	1,010	OW26-SS03-00	923	142
Selenium	1.10 - 1.30	1 / 3	1.50	OW26-SS01-00	0.73	0.67
Silver	2.20 - 2.60	1 / 3	1.20	OW26-SS02-00	0.73	0.41
Sodium	1,091 - 1,294	0 / 3	--	--	40.0	6.21
Thallium	2.20 - 2.60	0 / 3	--	--	0.29	0.03
Vanadium	10.9 - 12.9	3 / 3	26.8	OW26-SS03-00	24.7	2.15
Zinc	4.40 - 5.20	1 / 3	66.1	OW26-SS03-00	31.0	30.4
Pesticide/Polychlorinated Biphenyls (UG/KG)						
4,4'-DDD	4.43 - 4.77	0 / 3	--	--	2.32	0.09
4,4'-DDE	4.43 - 4.77	0 / 3	--	--	2.32	0.09

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 10-1
Summary Statistics - SWMU 26 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
4,4'-DDT	4.43 - 4.77	0 / 3	--	--	2.32	0.09
Aldrin	2.28 - 2.46	0 / 3	--	--	1.20	0.05
Aroclor-1016	44.3 - 47.7	0 / 3	--	--	23.2	0.91
Aroclor-1221	89.9 - 96.8	0 / 3	--	--	47.1	1.85
Aroclor-1232	44.3 - 47.7	0 / 3	--	--	23.2	0.91
Aroclor-1242	44.3 - 47.7	0 / 3	--	--	23.2	0.91
Aroclor-1248	44.3 - 47.7	0 / 3	--	--	23.2	0.91
Aroclor-1254	44.3 - 47.7	0 / 3	--	--	23.2	0.91
Aroclor-1260	44.3 - 47.7	0 / 3	--	--	23.2	0.91
Dieldrin	4.43 - 4.77	0 / 3	--	--	2.32	0.09
Endosulfan I	2.28 - 2.46	0 / 3	--	--	1.20	0.05
Endosulfan II	4.43 - 4.77	0 / 3	--	--	2.32	0.09
Endosulfan sulfate	4.43 - 4.77	0 / 3	--	--	2.32	0.09
Endrin	4.43 - 4.77	0 / 3	--	--	2.32	0.09
Endrin aldehyde	4.43 - 4.77	0 / 3	--	--	2.32	0.09
Endrin ketone	4.43 - 4.77	0 / 3	--	--	2.32	0.09
Heptachlor	2.28 - 2.46	0 / 3	--	--	1.20	0.05
Heptachlor epoxide	2.28 - 2.46	3 / 3	8.80	OW26-SS03-00	6.23	2.38
Methoxychlor	22.8 - 24.6	0 / 3	--	--	11.9	0.47
Toxaphene	228 - 246	0 / 3	--	--	119	4.70
alpha-BHC	2.28 - 2.46	0 / 3	--	--	1.20	0.05
alpha-Chlordane	2.28 - 2.46	2 / 3	7.10	OW26-SS03-00	4.18	2.94
beta-BHC	2.28 - 2.46	0 / 3	--	--	1.20	0.05
delta-BHC	2.28 - 2.46	0 / 3	--	--	1.20	0.05
gamma-BHC (Lindane)	2.28 - 2.46	0 / 3	--	--	1.20	0.05
gamma-Chlordane	2.28 - 2.46	3 / 3	9.40	OW26-SS03-00	6.30	2.70
Semi-volatile Organic Compounds (UG/KG)						
1,2,4-Trichlorobenzene	440 - 2,400	0 / 3	--	--	552	562

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 10-1 Summary Statistics - SWMU 26 - Surface Soil *NAS Oceana, Virginia Beach, VA*						
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Arithmetic Mean[1]**	**Standard Deviation of Mean**
1,2-Dichlorobenzene	440 - 2,400	0 / 3	--	--	552	562
1,3-Dichlorobenzene	440 - 2,400	0 / 3	--	--	552	562
1,4-Dichlorobenzene	440 - 2,400	0 / 3	--	--	552	562
1-Methylnaphthalene	21.0 - 24.0	0 / 3	--	--	11.3	0.76
2,2'-Oxybis(1-chloropropane)	440 - 2,400	0 / 3	--	--	552	562
2,4,5-Trichlorophenol	1,100 - 6,000	0 / 3	--	--	1,383	1,400
2,4,6-Trichlorophenol	440 - 2,400	0 / 3	--	--	552	562
2,4-Dichlorophenol	440 - 2,400	0 / 3	--	--	552	562
2,4-Dimethylphenol	440 - 2,400	0 / 3	--	--	552	562
2,4-Dinitrophenol	1,100 - 6,000	0 / 3	--	--	1,383	1,400
2,4-Dinitrotoluene	440 - 2,400	0 / 3	--	--	552	562
2,6-Dinitrotoluene	440 - 2,400	0 / 3	--	--	552	562
2-Chloronaphthalene	440 - 2,400	0 / 3	--	--	552	562
2-Chlorophenol	440 - 2,400	0 / 3	--	--	552	562
2-Methylnaphthalene	21.0 - 24.0	0 / 3	--	--	11.3	0.76
2-Methylphenol	440 - 2,400	0 / 3	--	--	552	562
2-Nitroaniline	1,100 - 6,000	0 / 3	--	--	1,383	1,400
2-Nitrophenol	440 - 2,400	0 / 3	--	--	552	562
3,3'-Dichlorobenzidine	440 - 2,400	0 / 3	--	--	552	562
3-Nitroaniline	1,100 - 6,000	0 / 3	--	--	1,383	1,400
4,6-Dinitro-2-methylphenol	1,100 - 6,000	0 / 3	--	--	1,383	1,400
4-Bromophenyl-phenylether	440 - 2,400	0 / 3	--	--	552	562
4-Chloro-3-methylphenol	440 - 2,400	0 / 3	--	--	552	562
4-Chloroaniline	440 - 2,400	0 / 3	--	--	552	562
4-Chlorophenyl-phenylether	440 - 2,400	0 / 3	--	--	552	562
4-Methylphenol	440 - 2,400	0 / 3	--	--	552	562
4-Nitroaniline	1,100 - 6,000	0 / 3	--	--	1,383	1,400
4-Nitrophenol	1,100 - 6,000	0 / 3	--	--	1,383	1,400

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 10-1 Summary Statistics - SWMU 26 - Surface Soil *NAS Oceana, Virginia Beach, VA*						
Chemical	**Reporting Limit Range**	**Frequency of Detection**	**Maximum Concentration Detected**	**Sample ID of Maximum Concentration**	**Arithmetic Mean[1]**	**Standard Deviation of Mean**
Acenaphthene	21.0 - 24.0	0 / 3	--	--	11.3	0.76
Acenaphthylene	42.0 - 48.0	0 / 3	--	--	22.5	1.50
Anthracene	2.00 - 2.00	1 / 3	18.0	OW26-SS03-00	6.67	9.81
Benzo(a)anthracene	2.00 - 2.00	2 / 3	78.0	OW26-SS03-00	32.7	40.3
Benzo(a)pyrene	2.00 - 2.00	3 / 3	90.0	OW26-SS03-00	39.6	44.1
Benzo(b)fluoranthene	4.50 - 480	3 / 3	480	OW26-SS03-00	173	266
Benzo(g,h,i)perylene	4.20 - 4.80	2 / 3	120	OW26-SS03-00	46.1	64.3
Benzo(k)fluoranthene	2.00 - 2.00	2 / 3	79.0	OW26-SS03-00	31.3	41.8
Butylbenzylphthalate	440 - 2,400	1 / 3	64.0	OW26-SS03-00	495	616
Carbazole	440 - 2,400	1 / 3	61.0	OW26-SS03-00	494	617
Chrysene	2.00 - 2.00	2 / 3	110	OW26-SS03-00	44.0	58.0
Di-n-butylphthalate	440 - 2,400	0 / 3	--	--	445	654
Di-n-octylphthalate	440 - 2,400	0 / 3	--	--	552	562
Dibenz(a,h)anthracene	4.20 - 4.80	0 / 3	--	--	2.25	0.15
Dibenzofuran	440 - 2,400	0 / 3	--	--	552	562
Diethylphthalate	440 - 2,400	0 / 3	--	--	552	562
Dimethyl phthalate	440 - 2,400	0 / 3	--	--	552	562
Fluoranthene	4.50 - 480	3 / 3	660	OW26-SS03-00	251	354
Fluorene	4.20 - 4.80	0 / 3	--	--	2.25	0.15
Hexachlorobenzene	440 - 2,400	0 / 3	--	--	552	562
Hexachlorobutadiene	440 - 2,400	0 / 3	--	--	552	562
Hexachlorocyclopentadiene	440 - 2,400	0 / 3	--	--	552	562
Hexachloroethane	440 - 2,400	0 / 3	--	--	552	562
Indeno(1,2,3-cd)pyrene	2.00 - 2.00	3 / 3	89.0	OW26-SS03-00	39.9	43.0
Isophorone	440 - 2,400	0 / 3	--	--	552	562
Naphthalene	21.0 - 24.0	0 / 3	--	--	11.3	0.76
Nitrobenzene	440 - 2,400	0 / 3	--	--	552	562
Pentachlorophenol	1,100 - 6,000	0 / 3	--	--	1,383	1,400

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 10-1
Summary Statistics - SWMU 26 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Phenanthrene	2.00 - 2.00	3 / 3	83.0	OW26-SS03-00	38.3	38.9
Phenol	440 - 2,400	0 / 3	--	--	552	562
Pyrene	2.00 - 480	3 / 3	560	OW26-SS03-00	210	303
bis(2-Chloroethoxy)methane	440 - 2,400	0 / 3	--	--	552	562
bis(2-Chloroethyl)ether	440 - 2,400	0 / 3	--	--	552	562
bis(2-Ethylhexyl)phthalate	440 - 2,400	2 / 3	360	OW26-SS03-00	590	534
n-Nitroso-di-n-propylamine	440 - 2,400	0 / 3	--	--	552	562
n-Nitrosodiphenylamine	440 - 2,400	0 / 3	--	--	552	562
Volatile Organic Compounds (UG/KG)						
1,1,1-Trichloroethane	13.4 - 14.0	0 / 3	--	--	6.89	0.15
1,1,2,2-Tetrachloroethane	13.4 - 14.0	0 / 3	--	--	6.89	0.15
1,1,2-Trichloroethane	13.4 - 14.0	0 / 3	--	--	6.89	0.15
1,1-Dichloroethane	13.4 - 14.0	0 / 3	--	--	6.89	0.15
1,1-Dichloroethene	13.4 - 14.0	0 / 3	--	--	6.89	0.15
1,2-Dichloroethane	13.4 - 14.0	0 / 3	--	--	6.89	0.15
1,2-Dichloroethene (total)	13.4 - 14.0	0 / 3	--	--	6.89	0.15
1,2-Dichloropropane	13.4 - 14.0	0 / 3	--	--	6.89	0.15
2-Butanone	13.4 - 14.0	0 / 3	--	--	3.32	3.16
2-Hexanone	13.4 - 14.0	0 / 3	--	--	6.89	0.15
4-Methyl-2-pentanone	13.4 - 14.0	0 / 3	--	--	6.89	0.15
Acetone	13.4 - 14.0	0 / 3	--	--	8.67	5.58
Benzene	13.4 - 14.0	0 / 3	--	--	6.89	0.15
Bromochloromethane	13.4 - 14.0	3 / 3	50.0	OW26-SS01-00	50.0	0
Bromodichloromethane	13.4 - 14.0	0 / 3	--	--	6.89	0.15
Bromoform	13.4 - 14.0	0 / 3	--	--	6.89	0.15
Bromomethane	13.4 - 14.0	0 / 3	--	--	6.89	0.15
Carbon disulfide	13.4 - 14.0	0 / 3	--	--	6.89	0.15
Carbon tetrachloride	13.4 - 14.0	0 / 3	--	--	6.89	0.15

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 10-1
Summary Statistics - SWMU 26 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Chlorobenzene	13.4 - 14.0	0 / 3	--	--	6.89	0.15
Chloroethane	13.4 - 14.0	0 / 3	--	--	6.89	0.15
Chloroform	13.4 - 14.0	0 / 3	--	--	6.89	0.15
Chloromethane	13.4 - 14.0	0 / 3	--	--	6.89	0.15
Dibromochloromethane	13.4 - 14.0	0 / 3	--	--	6.89	0.15
Ethylbenzene	13.4 - 14.0	0 / 3	--	--	6.89	0.15
Methylene chloride	13.4 - 14.0	0 / 3	--	--	20.3	6.11
Styrene	13.4 - 14.0	0 / 3	--	--	6.89	0.15
Tetrachloroethene	13.4 - 14.0	0 / 3	--	--	6.89	0.15
Toluene	13.4 - 14.0	0 / 3	--	--	6.89	0.15
Trichloroethene	13.4 - 14.0	0 / 3	--	--	6.89	0.15
Vinyl chloride	13.4 - 14.0	0 / 3	--	--	6.89	0.15
Xylene, total	13.4 - 14.0	1 / 3	2.00	OW26-SS02-00	5.23	2.80
cis-1,2-Dichloroethene	13.4 - 14.0	0 / 3	--	--	6.89	0.15
cis-1,3-Dichloropropene	13.4 - 14.0	0 / 3	--	--	6.89	0.15
o-Xylene	13.4 - 14.0	0 / 3	--	--	6.89	0.15
trans-1,2-Dichloroethene	13.4 - 14.0	0 / 3	--	--	6.89	0.15
trans-1,3-Dichloropropene	13.4 - 14.0	0 / 3	--	--	6.89	0.15

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 10-2
Preliminary Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - SWMU 26
NAS Oceana, Virginia Beach, VA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor
Terrestrial Habitats			
Survival, growth, and reproduction of terrestrial soil invertebrate communities.	Are site-related surface soil concentrations sufficient to adversely effect soil invertebrate communities based on conservative screening values?	Comparison of maximum chemical concentrations in surface soil with soil screening values.	Soil Invertebrates (earthworms)
Survival, growth, and reproduction of terrestrial plant communities.	Are site-related surface soil concentrations sufficient to adversely effect terrestrial plant communities based on conservative screening values?	Comparison of maximum chemical concentrations in surface soil with soil screening values.	Terrestrial plants
Survival, growth, and reproduction of avian terrestrial insectivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume 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 soil concentrations.	American robin

Table 10-3
Preliminary Screening Statistics - SWMU 26 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Inorganics (MG/KG)								
Aluminum	43.7 - 51.8	3 / 3	21,100	OW26-SS03-00	50.0	3 / 3	422	**YES**
Antimony	13.1 - 15.5	1 / 3	0.53	OW26-SS02-00	5.00	0 / 3	0.11	NO
Arsenic	2.20 - 2.60	3 / 3	3.20	OW26-SS02-00	60.0	0 / 3	0.05	NO
Barium	43.7 - 51.8	3 / 3	85.9	OW26-SS02-00	500	0 / 3	0.17	NO
Beryllium	1.10 - 1.30	3 / 3	0.83	OW26-SS02-00	10.0	0 / 3	0.08	NO
Cadmium	1.10 - 1.30	1 / 3	0.86	OW26-SS03-00	4.00	0 / 3	0.22	NO
Calcium [2]	1,091 - 1,294	3 / 3	1,220	OW26-SS01-00	NSV	-- / --	NSV	NO
Chromium	2.20 - 2.60	3 / 3	23.5	OW26-SS03-00	0.40	3 / 3	58.8	**YES**
Cobalt	10.9 - 12.9	2 / 3	3.10	OW26-SS03-00	100	0 / 3	0.03	NO
Copper	5.50 - 6.50	3 / 3	15.7	OW26-SS03-00	50.0	0 / 3	0.31	NO
Cyanide	0.70 - 0.70	0 / 3	--	--	0.06	-- / --	11.7	**YES**
Iron	21.8 - 25.9	3 / 3	6,050	OW26-SS01-00	200	3 / 3	30.3	**YES**
Lead	0.70 - 0.80	3 / 3	44.5	OW26-SS03-00	50.0	0 / 3	0.89	NO
Magnesium [2]	1,091 - 1,294	3 / 3	1,070	OW26-SS03-00	4,400	0 / 3	0.24	NO
Manganese	3.30 - 3.90	3 / 3	33.9	OW26-SS03-00	330	0 / 3	0.10	NO
Mercury	0.10 - 0.10	3 / 3	0.10	OW26-SS01-00	0.10	0 / 3	1.00	NO
Nickel	8.70 - 10.4	3 / 3	11.3	OW26-SS03-00	30.0	0 / 3	0.38	NO
Potassium [2]	1,091 - 1,294	3 / 3	1,010	OW26-SS03-00	NSV	-- / --	NSV	NO
Selenium	1.10 - 1.30	1 / 3	1.50	OW26-SS01-00	1.80	0 / 3	0.83	NO
Silver	2.20 - 2.60	1 / 3	1.20	OW26-SS02-00	2.00	0 / 3	0.60	NO
Sodium [2]	1,091 - 1,294	0 / 3	--	--	NSV	-- / --	NSV	NO
Thallium	2.20 - 2.60	0 / 3	--	--	1.00	-- / --	2.60	**YES**
Vanadium	10.9 - 12.9	3 / 3	26.8	OW26-SS03-00	2.00	3 / 3	13.4	**YES**
Zinc	4.40 - 5.20	1 / 3	66.1	OW26-SS03-00	50.0	1 / 3	1.32	**YES**
Pesticide/Polychlorinated Biphenyls (UG/KG)								
4,4'-DDD	4.43 - 4.77	0 / 3	--	--	100	-- / --	0.05	NO
4,4'-DDE	4.43 - 4.77	0 / 3	--	--	100	-- / --	0.05	NO
4,4'-DDT	4.43 - 4.77	0 / 3	--	--	100	-- / --	0.05	NO

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 10-3
Preliminary Screening Statistics - SWMU 26 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Aldrin	2.28 - 2.46	0 / 3	--	--	100	-- / --	0.02	NO
Aroclor-1016	44.3 - 47.7	0 / 3	--	--	100	-- / --	0.48	NO
Aroclor-1221	89.9 - 96.8	0 / 3	--	--	100	-- / --	0.97	NO
Aroclor-1232	44.3 - 47.7	0 / 3	--	--	100	-- / --	0.48	NO
Aroclor-1242	44.3 - 47.7	0 / 3	--	--	100	-- / --	0.48	NO
Aroclor-1248	44.3 - 47.7	0 / 3	--	--	100	-- / --	0.48	NO
Aroclor-1254	44.3 - 47.7	0 / 3	--	--	100	-- / --	0.48	NO
Aroclor-1260	44.3 - 47.7	0 / 3	--	--	100	-- / --	0.48	NO
Dieldrin	4.43 - 4.77	0 / 3	--	--	100	-- / --	0.05	NO
Endosulfan I	2.28 - 2.46	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Endosulfan II	4.43 - 4.77	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Endosulfan sulfate	4.43 - 4.77	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Endrin	4.43 - 4.77	0 / 3	--	--	100	-- / --	0.05	NO
Endrin aldehyde	4.43 - 4.77	0 / 3	--	--	100	-- / --	0.05	NO
Endrin ketone	4.43 - 4.77	0 / 3	--	--	100	-- / --	0.05	NO
Heptachlor	2.28 - 2.46	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Heptachlor epoxide	2.28 - 2.46	3 / 3	8.80	OW26-SS03-00	100	0 / 3	0.09	NO
Methoxychlor	22.8 - 24.6	0 / 3	--	--	100	-- / --	0.25	NO
Toxaphene	228 - 246	0 / 3	--	--	NSV	-- / --	NSV	**YES**
alpha-BHC	2.28 - 2.46	0 / 3	--	--	100,000	-- / --	0.0000246	NO
alpha-Chlordane	2.28 - 2.46	2 / 3	7.10	OW26-SS03-00	100	0 / 3	0.07	NO
beta-BHC	2.28 - 2.46	0 / 3	--	--	100,000	-- / --	0.0000246	NO
delta-BHC	2.28 - 2.46	0 / 3	--	--	100,000	-- / --	0.0000246	NO
gamma-BHC (Lindane)	2.28 - 2.46	0 / 3	--	--	100	-- / --	0.02	NO
gamma-Chlordane	2.28 - 2.46	3 / 3	9.40	OW26-SS03-00	100	0 / 3	0.09	NO
Semi-volatile Organic Compounds (UG/KG)								
1,2,4-Trichlorobenzene	440 - 2,400	0 / 3	--	--	1,270	-- / --	1.89	**YES**
1,2-Dichlorobenzene	440 - 2,400	0 / 3	--	--	100	-- / --	24.0	**YES**
1,3-Dichlorobenzene	440 - 2,400	0 / 3	--	--	NSV	-- / --	NSV	**YES**
1,4-Dichlorobenzene	440 - 2,400	0 / 3	--	--	1,280	-- / --	1.88	**YES**

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 10-3
Preliminary Screening Statistics - SWMU 26 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
1-Methylnaphthalene	21.0 - 24.0	0 / 3	--	--	NSV	-- / --	NSV	YES
2,2'-Oxybis(1-chloropropane)	440 - 2,400	0 / 3	--	--	NSV	-- / --	NSV	YES
2,4,5-Trichlorophenol	1,100 - 6,000	0 / 3	--	--	430	-- / --	14.0	YES
2,4,6-Trichlorophenol	440 - 2,400	0 / 3	--	--	580	-- / --	4.14	YES
2,4-Dichlorophenol	440 - 2,400	0 / 3	--	--	13,400	-- / --	0.18	NO
2,4-Dimethylphenol	440 - 2,400	0 / 3	--	--	100	-- / --	24.0	YES
2,4-Dinitrophenol	1,100 - 6,000	0 / 3	--	--	20,000	-- / --	0.30	NO
2,4-Dinitrotoluene	440 - 2,400	0 / 3	--	--	NSV	-- / --	NSV	YES
2,6-Dinitrotoluene	440 - 2,400	0 / 3	--	--	NSV	-- / --	NSV	YES
2-Chloronaphthalene	440 - 2,400	0 / 3	--	--	1,033	-- / --	2.32	YES
2-Chlorophenol	440 - 2,400	0 / 3	--	--	100	-- / --	24.0	YES
2-Methylnaphthalene	21.0 - 24.0	0 / 3	--	--	NSV	-- / --	NSV	YES
2-Methylphenol	440 - 2,400	0 / 3	--	--	100	-- / --	24.0	YES
2-Nitroaniline	1,100 - 6,000	0 / 3	--	--	NSV	-- / --	NSV	YES
2-Nitrophenol	440 - 2,400	0 / 3	--	--	NSV	-- / --	NSV	YES
3,3'-Dichlorobenzidine	440 - 2,400	0 / 3	--	--	NSV	-- / --	NSV	YES
3-Nitroaniline	1,100 - 6,000	0 / 3	--	--	NSV	-- / --	NSV	YES
4,6-Dinitro-2-methylphenol	1,100 - 6,000	0 / 3	--	--	NSV	-- / --	NSV	YES
4-Bromophenyl-phenylether	440 - 2,400	0 / 3	--	--	NSV	-- / --	NSV	YES
4-Chloro-3-methylphenol	440 - 2,400	0 / 3	--	--	NSV	-- / --	NSV	YES
4-Chloroaniline	440 - 2,400	0 / 3	--	--	NSV	-- / --	NSV	YES
4-Chlorophenyl-phenylether	440 - 2,400	0 / 3	--	--	NSV	-- / --	NSV	YES
4-Methylphenol	440 - 2,400	0 / 3	--	--	100	-- / --	24.0	YES
4-Nitroaniline	1,100 - 6,000	0 / 3	--	--	NSV	-- / --	NSV	YES
4-Nitrophenol	1,100 - 6,000	0 / 3	--	--	380	-- / --	15.8	YES
Acenaphthene	21.0 - 24.0	0 / 3	--	--	2,500	-- / --	0.010	NO
Acenaphthylene	42.0 - 48.0	0 / 3	--	--	100	-- / --	0.48	NO
Anthracene	2.00 - 2.00	1 / 3	18.0	OW26-SS03-00	100	0 / 3	0.18	NO
Benzo(a)anthracene	2.00 - 2.00	2 / 3	78.0	OW26-SS03-00	100	0 / 3	0.78	NO
Benzo(a)pyrene	2.00 - 2.00	3 / 3	90.0	OW26-SS03-00	100	0 / 3	0.90	NO

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 10-3
Preliminary Screening Statistics - SWMU 26 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Benzo(b)fluoranthene	4.50 - 480	3 / 3	480	OW26-SS03-00	100	1 / 3	4.80	**YES**
Benzo(g,h,i)perylene	4.20 - 4.80	2 / 3	120	OW26-SS03-00	100	1 / 3	1.20	**YES**
Benzo(k)fluoranthene	2.00 - 2.00	2 / 3	79.0	OW26-SS03-00	100	0 / 3	0.79	NO
Butylbenzylphthalate	440 - 2,400	1 / 3	64.0	OW26-SS03-00	NSV	-- / --	NSV	**YES**
Carbazole	440 - 2,400	1 / 3	61.0	OW26-SS03-00	NSV	-- / --	NSV	**YES**
Chrysene	2.00 - 2.00	2 / 3	110	OW26-SS03-00	100	1 / 3	1.10	**YES**
Di-n-butylphthalate	440 - 2,400	0 / 3	--	--	200,000	-- / --	0.01	NO
Di-n-octylphthalate	440 - 2,400	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Dibenz(a,h)anthracene	4.20 - 4.80	0 / 3	--	--	100	-- / --	0.05	NO
Dibenzofuran	440 - 2,400	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Diethylphthalate	440 - 2,400	0 / 3	--	--	13,400	-- / --	0.18	NO
Dimethyl phthalate	440 - 2,400	0 / 3	--	--	10,640	-- / --	0.23	NO
Fluoranthene	4.50 - 480	3 / 3	660	OW26-SS03-00	100	1 / 3	6.60	**YES**
Fluorene	4.20 - 4.80	0 / 3	--	--	1,700	-- / --	0.003	NO
Hexachlorobenzene	440 - 2,400	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Hexachlorobutadiene	440 - 2,400	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Hexachlorocyclopentadiene	440 - 2,400	0 / 3	--	--	1,000	-- / --	2.40	**YES**
Hexachloroethane	440 - 2,400	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Indeno(1,2,3-cd)pyrene	2.00 - 2.00	3 / 3	89.0	OW26-SS03-00	100	0 / 3	0.89	NO
Isophorone	440 - 2,400	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Naphthalene	21.0 - 24.0	0 / 3	--	--	100	-- / --	0.24	NO
Nitrobenzene	440 - 2,400	0 / 3	--	--	2,260	-- / --	1.06	**YES**
Pentachlorophenol	1,100 - 6,000	0 / 3	--	--	3,000	-- / --	2.00	**YES**
Phenanthrene	2.00 - 2.00	3 / 3	83.0	OW26-SS03-00	100	0 / 3	0.83	NO
Phenol	440 - 2,400	0 / 3	--	--	1,880	-- / --	1.28	**YES**
Pyrene	2.00 - 480	3 / 3	560	OW26-SS03-00	100	1 / 3	5.60	**YES**
bis(2-Chloroethoxy)methane	440 - 2,400	0 / 3	--	--	NSV	-- / --	NSV	**YES**
bis(2-Chloroethyl)ether	440 - 2,400	0 / 3	--	--	NSV	-- / --	NSV	**YES**
bis(2-Ethylhexyl)phthalate	440 - 2,400	2 / 3	360	OW26-SS03-00	NSV	-- / --	NSV	**YES**
n-Nitroso-di-n-propylamine	440 - 2,400	0 / 3	--	--	NSV	-- / --	NSV	**YES**

NSV - No Screening Value
1 - *Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit*
2 - Macronutrient - Not considered to be a COPC

Table 10-3
Preliminary Screening Statistics - SWMU 26 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
n-Nitrosodiphenylamine	440 - 2,400	0 / 3	--	--	1,090	-- / --	2.20	**YES**
Volatile Organic Compounds (UG/KG)								
1,1,1-Trichloroethane	13.4 - 14.0	0 / 3	--	--	300	-- / --	0.05	NO
1,1,2,2-Tetrachloroethane	13.4 - 14.0	0 / 3	--	--	300	-- / --	0.05	NO
1,1,2-Trichloroethane	13.4 - 14.0	0 / 3	--	--	300	-- / --	0.05	NO
1,1-Dichloroethane	13.4 - 14.0	0 / 3	--	--	300	-- / --	0.05	NO
1,1-Dichloroethene	13.4 - 14.0	0 / 3	--	--	NSV	-- / --	NSV	**YES**
1,2-Dichloroethane	13.4 - 14.0	0 / 3	--	--	401	-- / --	0.03	NO
1,2-Dichloroethene (total)	13.4 - 14.0	0 / 3	--	--	300	-- / --	0.05	NO
1,2-Dichloropropane	13.4 - 14.0	0 / 3	--	--	38,800	-- / --	0.0004	NO
2-Butanone	13.4 - 14.0	0 / 3	--	--	NSV	-- / --	NSV	**YES**
2-Hexanone	13.4 - 14.0	0 / 3	--	--	NSV	-- / --	NSV	**YES**
4-Methyl-2-pentanone	13.4 - 14.0	0 / 3	--	--	10,000	-- / --	0.001	NO
Acetone	13.4 - 14.0	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Benzene	13.4 - 14.0	0 / 3	--	--	105	-- / --	0.13	NO
Bromochloromethane	13.4 - 14.0	3 / 3	50.0	OW26-SS01-00	300,000	0 / 3	0.0002	NO
Bromodichloromethane	13.4 - 14.0	0 / 3	--	--	45,000	-- / --	0.0003	NO
Bromoform	13.4 - 14.0	0 / 3	--	--	114,700	-- / --	0.0001	NO
Bromomethane	13.4 - 14.0	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Carbon disulfide	13.4 - 14.0	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Carbon tetrachloride	13.4 - 14.0	0 / 3	--	--	1,000,000	-- / --	0.00001	NO
Chlorobenzene	13.4 - 14.0	0 / 3	--	--	2,400	-- / --	0.006	NO
Chloroethane	13.4 - 14.0	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Chloroform	13.4 - 14.0	0 / 3	--	--	1,000	-- / --	0.01	NO
Chloromethane	13.4 - 14.0	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Dibromochloromethane	13.4 - 14.0	0 / 3	--	--	NSV	-- / --	NSV	**YES**
Ethylbenzene	13.4 - 14.0	0 / 3	--	--	5,005	-- / --	0.003	NO
Methylene chloride	13.4 - 14.0	0 / 3	--	--	1,001	-- / --	0.01	NO
Styrene	13.4 - 14.0	0 / 3	--	--	10,010	-- / --	0.001	NO
Tetrachloroethene	13.4 - 14.0	0 / 3	--	--	401	-- / --	0.03	NO

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 10-3
Preliminary Screening Statistics - SWMU 26 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Toluene	13.4 - 14.0	0 / 3	--	--	13,005	-- / --	0.001	NO
Trichloroethene	13.4 - 14.0	0 / 3	--	--	6,000	-- / --	0.002	NO
Vinyl chloride	13.4 - 14.0	0 / 3	--	--	300	-- / --	0.05	NO
Xylene, total	13.4 - 14.0	1 / 3	2.00	OW26-SS02-00	2,505	0 / 3	0.0008	NO
cis-1,2-Dichloroethene	13.4 - 14.0	0 / 3	--	--	300	-- / --	0.05	NO
cis-1,3-Dichloropropene	13.4 - 14.0	0 / 3	--	--	300	-- / --	0.05	NO
o-Xylene	13.4 - 14.0	0 / 3	--	--	NSV	-- / --	NSV	**YES**
trans-1,2-Dichloroethene	13.4 - 14.0	0 / 3	--	--	300	-- / --	0.05	NO
trans-1,3-Dichloropropene	13.4 - 14.0	0 / 3	--	--	300	-- / --	0.05	NO

NSV - No Screening Value
1 - Shaded Cells indicate Maximum Hazard Quotient based on Maximum Reporting Limit
2 - Macronutrient - Not considered to be a COPC

Table 10-4
Summary of Maximum Hazard Quotients for Food Web Exposures - SWMU 26
NAS Oceana, Virginia Beach, VA

Chemical	American robin	
	NOAEL	LOAEL
Aluminum	3.06	0.31
Antimony	<0.01	<0.01
Arsenic	0.13	0.04
Barium	0.01	<0.01
Beryllium	NA	NA
Cadmium	1.34	0.10
Chromium	3.89	0.78
Cobalt	0.12	0.01
Copper	0.04	0.03
Iron	0.66	0.07
Lead	4.35	0.43
Manganese	<0.01	<0.01
Mercury	0.30	0.15
Nickel	0.05	0.03
Selenium	0.86	0.25
Silver	<0.01	<0.01
Thallium	0.42	0.04
Vanadium	0.02	<0.01
Zinc	3.49	0.39
4,4'-DDD	0.01	<0.01
4,4'-DDE	0.05	<0.01
4,4'-DDT	<0.01	<0.01
Aldrin	<0.01	<0.01
alpha-BHC	<0.01	<0.01
alpha-Chlordane	<0.01	<0.01
Aroclor-1016	0.09	<0.01
Aroclor-1221	0.19	0.02
Aroclor-1232	0.09	<0.01
Aroclor-1242	0.09	<0.01
Aroclor-1248	0.21	0.02
Aroclor-1254	0.21	0.02
Aroclor-1260	0.21	0.02
beta-BHC	<0.01	<0.01
delta-BHC	<0.01	<0.01
Dieldrin	0.03	<0.01
Endosulfan I	<0.01	<0.01
Endosulfan II	<0.01	<0.01
Endosulfan Sulfate	<0.01	<0.01
Endrin	0.03	<0.01
Endrin Aldehyde	0.03	<0.01
Endrin Ketone	0.03	<0.01
Gamma-BHC (Lindane)	<0.01	<0.01
Gamma-Chlordane	<0.01	<0.01
Heptachlor	<0.01	<0.01
Heptachlor Epoxide	0.01	<0.01
Methoxychlor	<0.01	<0.01
Toxaphene	0.05	<0.01
1,2,4-Trichlorobenzene	NA	NA
1,2-Dichlorobenzene	<0.01	<0.01

Table 10-4
Summary of Maximum Hazard Quotients for Food Web Exposures - SWMU 26
NAS Oceana, Virginia Beach, VA

Chemical	American robin	
	NOAEL	LOAEL
1,3-Dichlorobenzene	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01
2,4,5-Trichlorophenol	NA	NA
2,4,6-Trichlorophenol	NA	NA
2,4-Dichlorophenol	NA	NA
2-Chloronaphthalene	NA	NA
2-Methylnaphthalene	NA	NA
3,3'-Dichlorobenzidine	NA	NA
4-Bromophenyl-Phenylether	NA	NA
4-Chloro-3-Methylphenol	NA	NA
4-Chlorophenyl-Phenylether	NA	NA
Acenaphthene	<0.01	<0.01
Acenaphthylene	<0.01	<0.01
Anthracene	<0.01	<0.01
Benzo(a)anthracene	<0.01	<0.01
Benzo(a)pyrene	<0.01	<0.01
Benzo(b)fluoranthene	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01
Benzo(k)fluoranthene	<0.01	<0.01
Bis-(2-Ethylhexyl)phthalate	0.02	<0.01
Butylbenzylphthalate	NA	NA
Carbazole	NA	NA
Chrysene	<0.01	<0.01
Dibenz(a,h)anthracene	<0.01	<0.01
Dibenzofuran	NA	NA
Diethylphthalate	NA	NA
Di-n-butylphthalate	1.33	0.13
Di-n-octylphthalate	<0.01	<0.01
Fluoranthene	<0.01	<0.01
Fluorene	<0.01	<0.01
Hexachloro-1,3-butadiene	0.06	0.02
Hexachlorobenzene	2.75	0.28
Hexachlorocyclopentadiene	NA	NA
Hexachloroethane	NA	NA
Indeno(1,2,3-cd)pyrene	<0.01	<0.01
Naphthalene	<0.01	<0.01
N-Nitrosodiphenylamine	NA	NA
Pentachlorophenol	0.02	0.01
Phenanthrene	<0.01	<0.01
Pyrene	<0.01	<0.01
Carbon Tetrachloride	NA	NA
Chlorobenzene	NA	NA
Chloroform	NA	NA
Ethylbenzene	NA	NA
Styrene	NA	NA
Tetrachloroethene	NA	NA
Toluene	NA	NA
Trichloroethene	NA	NA
Xylenes (total)	<0.01	<0.01

Table 10-5
Preliminary Summary of COPCs - SWMU 26 - Screening ERA
NAS Oceana, Virginia Beach, VA

Chemical	Surface Soil			Food web		
	MD	MRL	NSV	MD	MRL	NSV
Inorganics						
Aluminum	X			X		
Cadmium				X		
Chromium	X			X		
Cyanide		X				
Iron	X					
Lead				X		
Thallium		X				
Vanadium	X					
Zinc	X			X		
Pesticide/Polychlorinated Biphenyls						
Endosulfan I			X			
Endosulfan II			X			
Endosulfan sulfate			X			
Heptachlor			X			
Toxaphene			X			
Semi-volatile Organic Compounds						
1,2,4-Trichlorobenzene		X				X
1,2-Dichlorobenzene		X				
1,3-Dichlorobenzene			X			
1,4-Dichlorobenzene		X				
1-Methylnaphthalene			X			
2,2'-Oxybis(1-chloropropane)			X			
2,4,5-Trichlorophenol		X				X
2,4,6-Trichlorophenol		X				X
2,4-Dichlorophenol						X
2,4-Dimethylphenol		X				
2,4-Dinitrotoluene			X			
2,6-Dinitrotoluene			X			
2-Chloronaphthalene		X				X
2-Chlorophenol		X				
2-Methylnaphthalene			X			X
2-Methylphenol		X				
2-Nitroaniline			X			
2-Nitrophenol			X			
3,3'-Dichlorobenzidine			X			X
3-Nitroaniline			X			
4,6-Dinitro-2-methylphenol			X			
4-Bromophenyl-phenylether			X			X
4-Chloro-3-methylphenol			X			X
4-Chloroaniline			X			
4-Chlorophenyl-phenylether			X			X
4-Methylphenol		X				
4-Nitroaniline			X			
4-Nitrophenol		X				
Benzo(b)fluoranthene	X					

MD - Maximum detect exceeds screening value
MRL - Not detected; maximum reporting limit exceeds screening value
NSV - No screening value

Table 10-5
Preliminary Summary of COPCs - SWMU 26 - Screening ERA
NAS Oceana, Virginia Beach, VA

Chemical	Surface Soil			Food web		
	MD	MRL	NSV	MD	MRL	NSV
Benzo(g,h,i)perylene	X					
Butylbenzylphthalate			X			X
Carbazole			X			X
Chrysene	X					
Di-n-butylphthalate					X	
Di-n-octylphthalate			X			
Dibenz(a,h)anthracene						
Dibenzofuran			X			X
Diethylphthalate						X
Fluoranthene	X					
Hexachlorobenzene			X		X	
Hexachlorobutadiene			X			
Hexachlorocyclopentadiene		X				X
Hexachloroethane			X			X
Isophorone			X			
Nitrobenzene		X				
Pentachlorophenol		X				
Phenol		X				
Pyrene	X					
bis(2-Chloroethoxy)methane			X			
bis(2-Chloroethyl)ether			X			
bis(2-Ethylhexyl)phthalate			X			
n-Nitroso-di-n-propylamine			X			
n-Nitrosodiphenylamine		X				X
Volatile Organic Compounds						
1,1-Dichloroethene			X			
2-Butanone			X			
2-Hexanone			X			
Acetone			X			
Bromomethane			X			
Carbon disulfide			X			
Carbon tetrachloride						X
Chlorobenzene						X
Chloroethane			X			
Chloroform						X
Chloromethane			X			
Dibromochloromethane			X			
Ethylbenzene						X
Styrene						X
Tetrachloroethene						X
Toluene						X
Trichloroethene						X
o-Xylene			X			

MD - Maximum detect exceeds screening value
MRL - Not detected; maximum reporting limit exceeds screening value
NSV - No screening value

Table 10-6
Refined Assessment Endpoints, Risk Hypotheses, and Measurement Endpoints - SWMU 26
NAS Oceana, Virginia Beach, VA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor
Terrestrial Habitats			
Survival, growth, and reproduction of terrestrial soil invertebrate communities.	Are site-related surface soil concentrations sufficient to adversely effect soil invertebrate communities based on conservative screening values?	Comparison of mean chemical concentrations in surface soil with soil screening values.	Soil Invertebrates (earthworms)
Survival, growth, and reproduction of terrestrial plant communities.	Are site-related surface soil concentrations sufficient to adversely effect terrestrial plant communities based on conservative screening values?	Comparison of mean chemical concentrations in surface soil with soil screening values.	Terrestrial plants
Survival, growth, and reproduction of avian terrestrial insectivores.	Are site-related chemical concentrations in surface soils sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume soil invertebrates from the site?	Comparison of literature-derived chronic No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on mean soil concentrations.	American robin

Table 10-7
Refined Screening Statistics - SWMU 26 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COPC?
Inorganics (MG/KG)									
Aluminum	43.7 - 51.8	3 / 3	21,100	OW26-SS03-00	19,867	50.0	3 / 3	397	**YES**
Chromium	2.20 - 2.60	3 / 3	23.5	OW26-SS03-00	21.1	0.40	3 / 3	52.7	**YES**
Cyanide	0.70 - 0.70	0 / 3	--	--	0.02	0.06	-- / --	0.25	NO
Iron	21.8 - 25.9	3 / 3	6,050	OW26-SS01-00	5,523	200	3 / 3	27.6	**YES**
Thallium	2.20 - 2.60	0 / 3	--	--	0.29	1.00	-- / --	0.29	NO
Vanadium	10.9 - 12.9	3 / 3	26.8	OW26-SS03-00	24.7	2.00	3 / 3	12.3	**YES**
Zinc	4.40 - 5.20	1 / 3	66.1	OW26-SS03-00	31.0	50.0	1 / 3	0.62	NO
Pesticide/Polychlorinated Biphenyls (UG/KG)									
Endosulfan I	2.28 - 2.46	0 / 3	--	--	1.20	NSV	-- / --	NSV	NO
Endosulfan II	4.43 - 4.77	0 / 3	--	--	2.32	NSV	-- / --	NSV	NO
Endosulfan sulfate	4.43 - 4.77	0 / 3	--	--	2.32	NSV	-- / --	NSV	NO
Heptachlor	2.28 - 2.46	0 / 3	--	--	1.20	NSV	-- / --	NSV	NO
Toxaphene	228 - 246	0 / 3	--	--	119	NSV	-- / --	NSV	NO
Semi-volatile Organic Compounds (UG/KG)									
1,2,4-Trichlorobenzene	440 - 2,400	0 / 3	--	--	552	1,270	-- / --	0.43	NO
1,2-Dichlorobenzene	440 - 2,400	0 / 3	--	--	552	100	-- / --	5.52	NO
1,3-Dichlorobenzene	440 - 2,400	0 / 3	--	--	552	NSV	-- / --	NSV	NO
1,4-Dichlorobenzene	440 - 2,400	0 / 3	--	--	552	1,280	-- / --	0.43	NO
1-Methylnaphthalene	21.0 - 24.0	0 / 3	--	--	11.3	NSV	-- / --	NSV	NO
2,2'-Oxybis(1-chloropropane)	440 - 2,400	0 / 3	--	--	552	NSV	-- / --	NSV	NO
2,4,5-Trichlorophenol	1,100 - 6,000	0 / 3	--	--	1,383	430	-- / --	3.22	NO
2,4,6-Trichlorophenol	440 - 2,400	0 / 3	--	--	552	580	-- / --	0.95	NO
2,4-Dimethylphenol	440 - 2,400	0 / 3	--	--	552	100	-- / --	5.52	NO
2,4-Dinitrotoluene	440 - 2,400	0 / 3	--	--	552	NSV	-- / --	NSV	NO
2,6-Dinitrotoluene	440 - 2,400	0 / 3	--	--	552	NSV	-- / --	NSV	NO
2-Chloronaphthalene	440 - 2,400	0 / 3	--	--	552	1,033	-- / --	0.53	NO
2-Chlorophenol	440 - 2,400	0 / 3	--	--	552	100	-- / --	5.52	NO
2-Methylnaphthalene	21.0 - 24.0	0 / 3	--	--	11.3	NSV	-- / --	NSV	NO
2-Methylphenol	440 - 2,400	0 / 3	--	--	552	100	-- / --	5.52	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 10-7
Refined Screening Statistics - SWMU 26 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COPC?
2-Nitroaniline	1,100 - 6,000	0 / 3	--	--	1,383	NSV	-- / --	NSV	NO
2-Nitrophenol	440 - 2,400	0 / 3	--	--	552	NSV	-- / --	NSV	NO
3,3'-Dichlorobenzidine	440 - 2,400	0 / 3	--	--	552	NSV	-- / --	NSV	NO
3-Nitroaniline	1,100 - 6,000	0 / 3	--	--	1,383	NSV	-- / --	NSV	NO
4,6-Dinitro-2-methylphenol	1,100 - 6,000	0 / 3	--	--	1,383	NSV	-- / --	NSV	NO
4-Bromophenyl-phenylether	440 - 2,400	0 / 3	--	--	552	NSV	-- / --	NSV	NO
4-Chloro-3-methylphenol	440 - 2,400	0 / 3	--	--	552	NSV	-- / --	NSV	NO
4-Chloroaniline	440 - 2,400	0 / 3	--	--	552	NSV	-- / --	NSV	NO
4-Chlorophenyl-phenylether	440 - 2,400	0 / 3	--	--	552	NSV	-- / --	NSV	NO
4-Methylphenol	440 - 2,400	0 / 3	--	--	552	100	-- / --	5.52	NO
4-Nitroaniline	1,100 - 6,000	0 / 3	--	--	1,383	NSV	-- / --	NSV	NO
4-Nitrophenol	1,100 - 6,000	0 / 3	--	--	1,383	380	-- / --	3.64	NO
Benzo(b)fluoranthene	4.50 - 480	3 / 3	480	OW26-SS03-00	173	100	1 / 3	1.73	**YES**
Benzo(g,h,i)perylene	4.20 - 4.80	2 / 3	120	OW26-SS03-00	46.1	100	1 / 3	0.46	NO
Butylbenzylphthalate	440 - 2,400	1 / 3	64.0	OW26-SS03-00	495	NSV	-- / --	NSV	NO
Carbazole	440 - 2,400	1 / 3	61.0	OW26-SS03-00	494	NSV	-- / --	NSV	NO
Chrysene	2.00 - 2.00	2 / 3	110	OW26-SS03-00	44.0	100	1 / 3	0.44	NO
Di-n-octylphthalate	440 - 2,400	0 / 3	--	--	552	NSV	-- / --	NSV	NO
Dibenzofuran	440 - 2,400	0 / 3	--	--	552	NSV	-- / --	NSV	NO
Fluoranthene	4.50 - 480	3 / 3	660	OW26-SS03-00	251	100	1 / 3	2.51	**YES**
Hexachlorobenzene	440 - 2,400	0 / 3	--	--	552	NSV	-- / --	NSV	NO
Hexachlorobutadiene	440 - 2,400	0 / 3	--	--	552	NSV	-- / --	NSV	NO
Hexachlorocyclopentadiene	440 - 2,400	0 / 3	--	--	552	1,000	-- / --	0.55	NO
Hexachloroethane	440 - 2,400	0 / 3	--	--	552	NSV	-- / --	NSV	NO
Isophorone	440 - 2,400	0 / 3	--	--	552	NSV	-- / --	NSV	NO
Nitrobenzene	440 - 2,400	0 / 3	--	--	552	2,260	-- / --	0.24	NO
Pentachlorophenol	1,100 - 6,000	0 / 3	--	--	1,383	3,000	-- / --	0.46	NO
Phenol	440 - 2,400	0 / 3	--	--	552	1,880	-- / --	0.29	NO
Pyrene	2.00 - 480	3 / 3	560	OW26-SS03-00	210	100	1 / 3	2.10	**YES**
bis(2-Chloroethoxy)methane	440 - 2,400	0 / 3	--	--	552	NSV	-- / --	NSV	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 10-7
Refined Screening Statistics - SWMU 26 - Surface Soil
NAS Oceana, Virginia Beach, VA

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient	COPC?
bis(2-Chloroethyl)ether	440 - 2,400	0 / 3	--	--	552	NSV	-- / --	NSV	NO
bis(2-Ethylhexyl)phthalate	440 - 2,400	2 / 3	360	OW26-SS03-00	590	NSV	-- / --	NSV	NO
n-Nitroso-di-n-propylamine	440 - 2,400	0 / 3	--	--	552	NSV	-- / --	NSV	NO
n-Nitrosodiphenylamine	440 - 2,400	0 / 3	--	--	552	1,090	-- / --	0.51	NO
Volatile Organic Compounds (UG/KG)									
1,1-Dichloroethene	13.4 - 14.0	0 / 3	--	--	6.89	NSV	-- / --	NSV	NO
2-Butanone	13.4 - 14.0	0 / 3	--	--	3.32	NSV	-- / --	NSV	NO
2-Hexanone	13.4 - 14.0	0 / 3	--	--	6.89	NSV	-- / --	NSV	NO
Acetone	13.4 - 14.0	0 / 3	--	--	8.67	NSV	-- / --	NSV	NO
Bromomethane	13.4 - 14.0	0 / 3	--	--	6.89	NSV	-- / --	NSV	NO
Carbon disulfide	13.4 - 14.0	0 / 3	--	--	6.89	NSV	-- / --	NSV	NO
Chloroethane	13.4 - 14.0	0 / 3	--	--	6.89	NSV	-- / --	NSV	NO
Chloromethane	13.4 - 14.0	0 / 3	--	--	6.89	NSV	-- / --	NSV	NO
Dibromochloromethane	13.4 - 14.0	0 / 3	--	--	6.89	NSV	-- / --	NSV	NO

NSV - No Screening Value
Shaded Cells indicate Hazard Quotient based on Reporting Limit

Table 10-8
Summary of Mean Hazard Quotients for Food Web Exposures - SWMU 26
NAS Oceana, Virginia Beach, VA

Chemical	American robin	
	NOAEL	LOAEL
Aluminum	0.95	0.09
Cadmium	0.08	<0.01
Chromium	0.29	0.06
Iron	0.26	0.03
Lead	0.37	0.04
Silver	<0.01	<0.01
Thallium	0.03	<0.01
Vanadium	0.01	<0.01
Zinc	0.20	0.02
Endosulfan I	<0.01	<0.01
Endosulfan II	<0.01	<0.01
Endosulfan Sulfate	<0.01	<0.01
Heptachlor	<0.01	<0.01
Toxaphene	0.01	<0.01
1,2,4-Trichlorobenzene	NA	NA
1,2-Dichlorobenzene	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01
2,4,5-Trichlorophenol	NA	NA
2,4,6-Trichlorophenol	NA	NA
2,4-Dichlorophenol	NA	NA
2-Chloronaphthalene	NA	NA
2-Methylnaphthalene	NA	NA
3,3'-Dichlorobenzidine	NA	NA
4-Bromophenyl-Phenylether	NA	NA
4-Chloro-3-Methylphenol	NA	NA
4-Chlorophenyl-Phenylether	NA	NA
Benzo(b)fluoranthene	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01
Bis-(2-Ethylhexyl)phthalate	<0.01	<0.01
Butylbenzylphthalate	NA	NA
Carbazole	NA	NA
Chrysene	<0.01	<0.01
Dibenz(a,h)anthracene	<0.01	<0.01
Dibenzofuran	NA	NA
Diethylphthalate	NA	NA
Di-n-butylphthalate	0.15	0.02
Di-n-octylphthalate	<0.01	<0.01
Fluoranthene	<0.01	<0.01
Hexachloro-1,3-butadiene	<0.01	<0.01
Hexachlorobenzene	0.39	0.04
Hexachlorocyclopentadiene	NA	NA
Hexachloroethane	NA	NA
Naphthalene	<0.01	<0.01
N-Nitrosodiphenylamine	NA	NA
Pentachlorophenol	<0.01	<0.01
Pyrene	<0.01	<0.01
Carbon Tetrachloride	NA	NA
Chlorobenzene	NA	NA

Table 10-8
Summary of Mean Hazard Quotients for Food Web Exposures - SWMU 26
NAS Oceana, Virginia Beach, VA

Chemical	American robin	
	NOAEL	LOAEL
Chloroform	NA	NA
Ethylbenzene	NA	NA
Styrene	NA	NA
Tetrachloroethene	NA	NA
Toluene	NA	NA
Trichloroethene	NA	NA
Xylenes (total)	<0.01	<0.01

Table 10-9
Refined Summary of COPCs - SWMU 26
NAS Oceana, Virginia Beach, VA

Chemical	Surface Soil	Food web
Inorganics		
Aluminum	X	
Chromium	X	
Iron	X	
Vanadium	X	
Semi-volatile Organic Compounds		
Benzo(b)fluoranthene	X	
Fluoranthene	X	
Pyrene	X	

Table 10-10
Comparison of SWMU 26 Surface Soil COPC Concentrations to Background Concentrations
NAS Oceana, Virginia Beach, VA

Chemical	On-Site			Background [1]		On-site Comparison to Background	
	Frequency of Detection	Maximum	Arithmetic Mean	Maximum	Arithmetic Mean	On-site Maximum Exceeds Background Maximum?	On-site Mean Exceeds Background Mean?
Inorganics (mg/kg)							
Aluminum	3 / 3	21,100	19,867	100,000	66,000	NO	NO
Chromium	3 / 3	23.5	21.1	19.5	15.7	YES	YES
Iron	3 / 3	6,050	5,523	100,000	25,000	NO	NO
Vanadium	3 / 3	26.8	24.7	500	76	NO	NO
Organics (ug/kg)							
Benzo(b)fluoranthene	3 / 3	480	173	270	63	YES	YES
Fluoranthene	3 / 3	660	251	580	136	YES	YES
Pyrene	3 / 3	560	210	430	106	YES	YES

[1] Background obtained from (CH2M HILL, 2000c).

Table 10-11
Screening - Total PAHs - SWMU 26
NAS Oceana, Virginia Beach, VA

	Total PAH (ug/kg)	Screening Value	Hazard Quotient
OW26-SS01-00	281	4100	0.069
OW26-SS02-00	396	4100	0.097
OW26-SS03-00	2501.4	4100	0.610

File Path: v:\18gis\oceana\figures\oceana_laura_m.apr

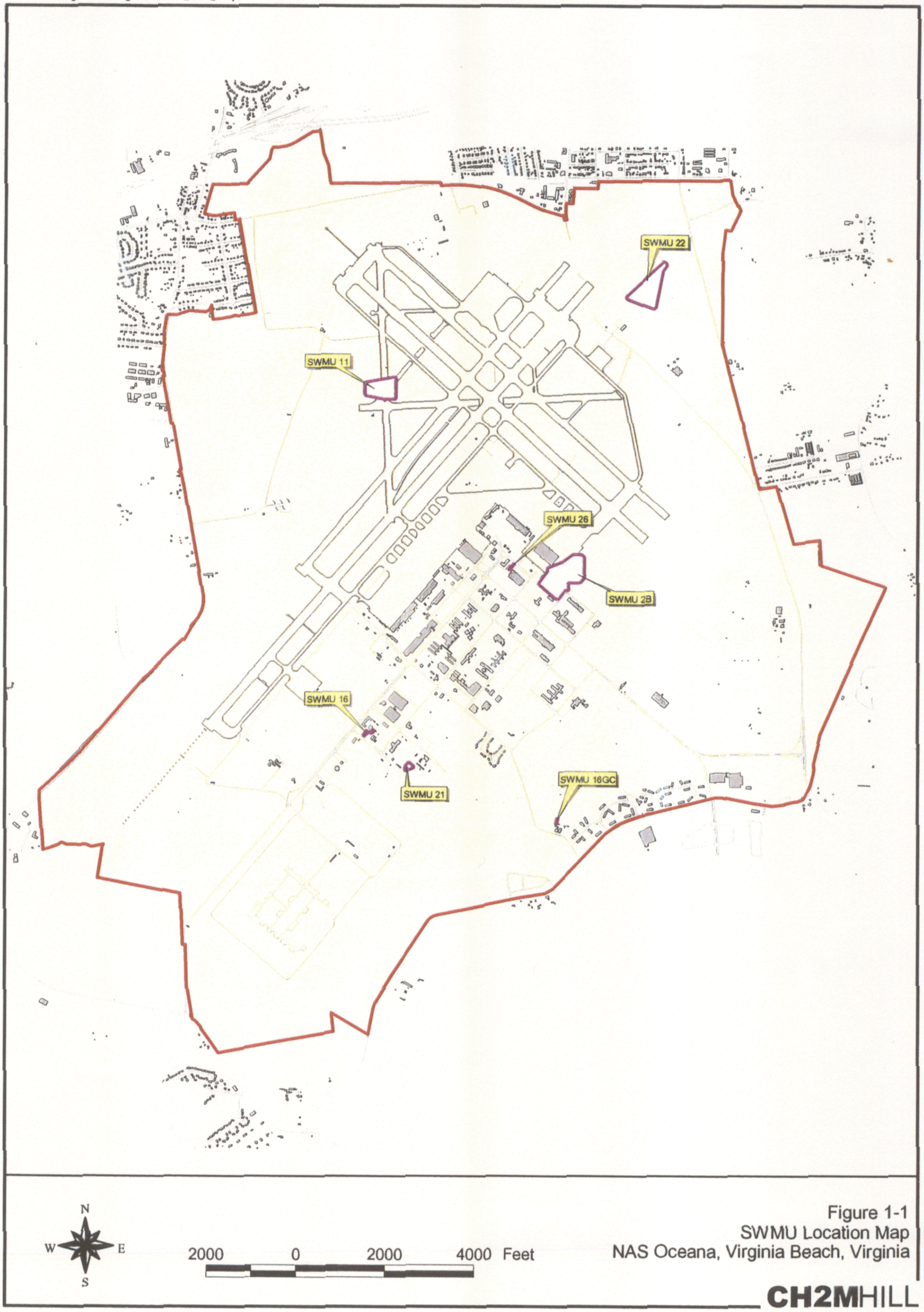
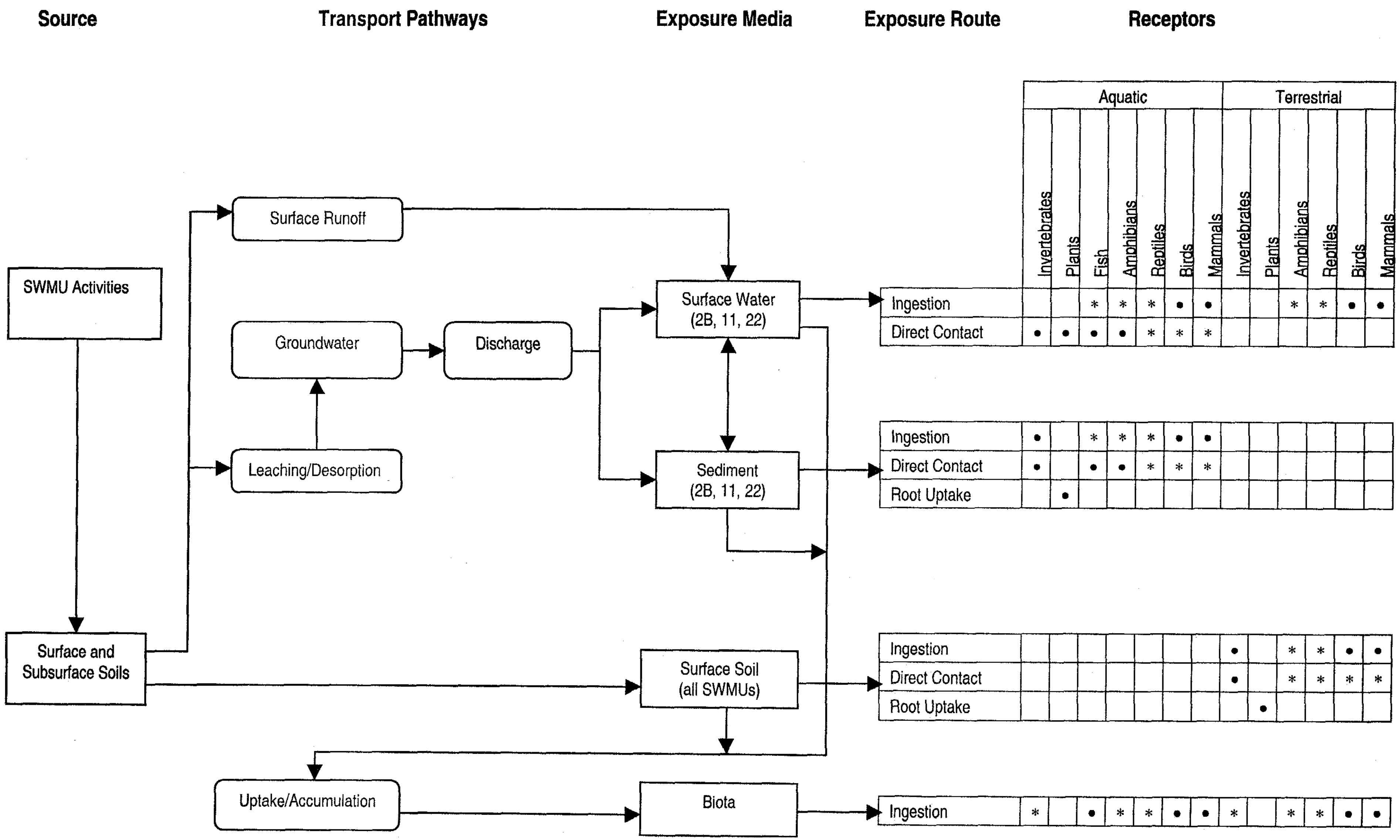


Figure 1-1
SWMU Location Map
NAS Oceana, Virginia Beach, Virginia

CH2MHILL

00558 F014



Exposure Media	Exposure Route	Aquatic Invertebrates	Aquatic Plants	Aquatic Fish	Aquatic Amphibians	Aquatic Reptiles	Aquatic Birds	Aquatic Mammals	Terrestrial Invertebrates	Terrestrial Plants	Terrestrial Amphibians	Terrestrial Reptiles	Terrestrial Birds	Terrestrial Mammals
Surface Water (2B, 11, 22)	Ingestion			*	*	*	•	•			*	*	•	•
	Direct Contact	•	•	•	•	*	*	*						
Sediment (2B, 11, 22)	Ingestion	•		*	*	*	•	•						
	Direct Contact	•		•	•	*	*	*						
	Root Uptake		•											
Surface Soil (all SWMUs)	Ingestion								•		*	*	•	•
	Direct Contact								•		*	*	*	*
	Root Uptake									•				
Biota	Ingestion	*		•	*	*	•	•	*		*	*	•	•

FIGURE 3-1. GENERIC PRELIMINARY CONCEPTUAL MODEL
NAS OCEANA

• - Exposure Route evaluated quantitatively
* - Exposure Route not evaluated quantitatively (see text)

File Path: v:\18gis\oceana\figures\oceana_laura_m.apr

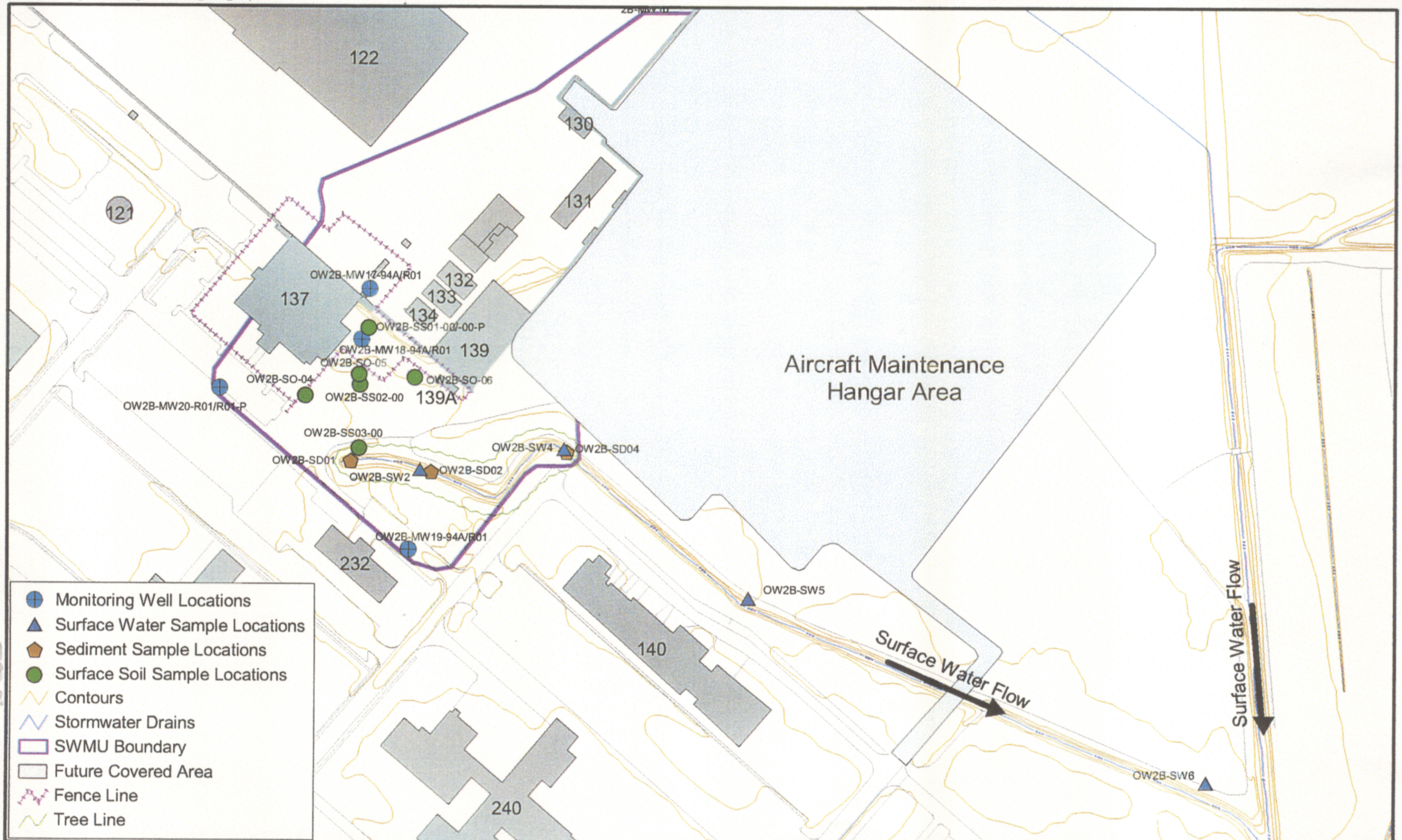
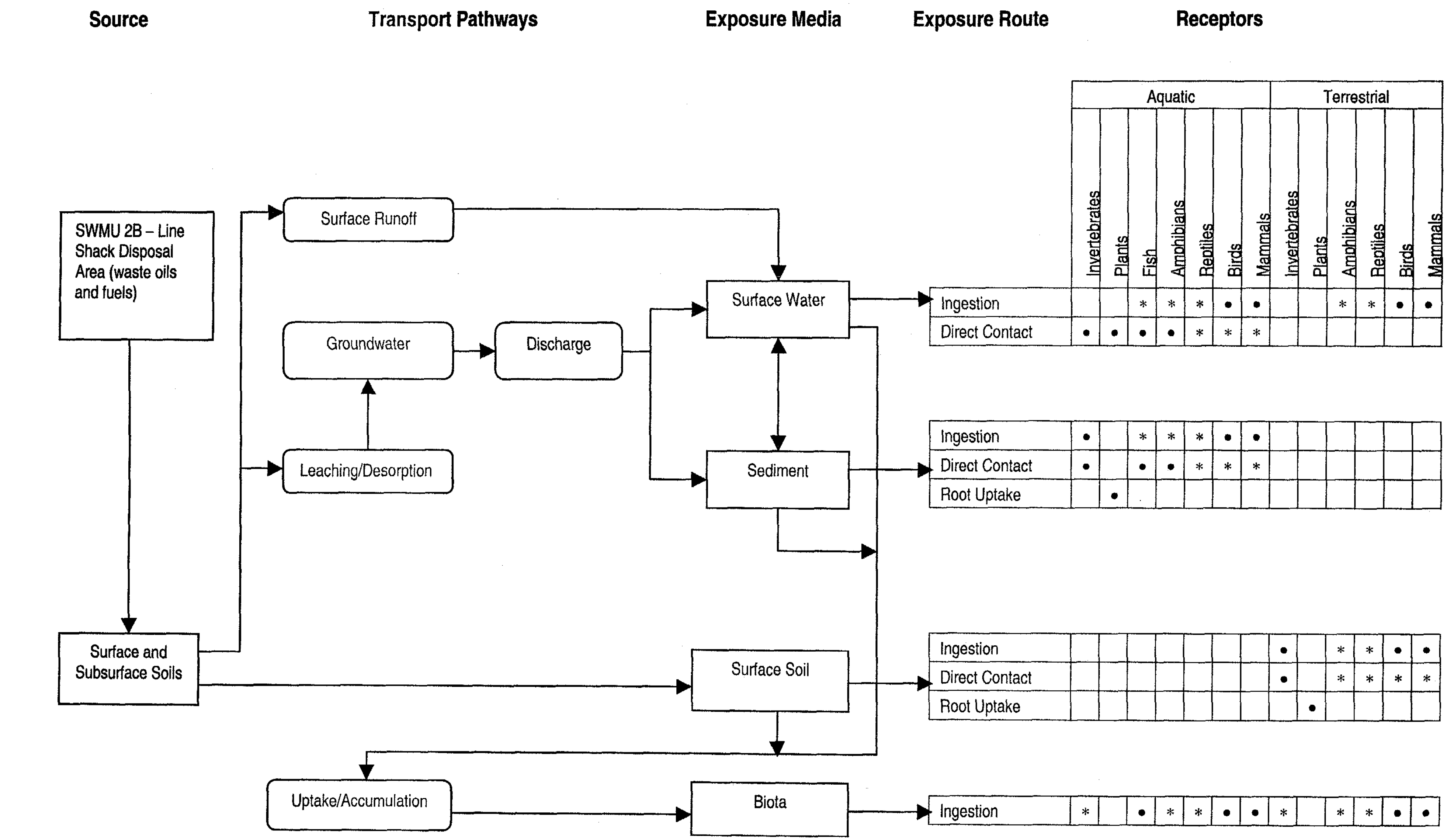


Figure 4-1
SWMU 2B Sample Locations
NAS Oceana, Virginia Beach, Virginia

CH2MHILL

00558F024



Exposure Media	Exposure Route	Aquatic Invertebrates	Aquatic Plants	Aquatic Fish	Aquatic Amphibians	Aquatic Reptiles	Aquatic Birds	Aquatic Mammals	Terrestrial Invertebrates	Terrestrial Plants	Terrestrial Amphibians	Terrestrial Reptiles	Terrestrial Birds	Terrestrial Mammals
Surface Water	Ingestion			*	*	*	•	•			*	*	•	•
	Direct Contact	•	•	•	•	*	*	*						
Sediment	Ingestion	•		*	*	*	•	•						
	Direct Contact	•		•	•	*	*	*						
	Root Uptake		•											
Surface Soil	Ingestion								•		*	*	•	•
	Direct Contact								•		*	*	*	*
	Root Uptake									•				
Biota	Ingestion	*		•	*	*	•	•	*		*	*	•	•

Complete migration pathway - not evaluated (not used)
Complete migration pathway - evaluated
Incomplete migration pathway (not used)

FIGURE 4-2. PRELIMINARY CONCEPTUAL MODEL NAS OCEANA – SWMU 2B

• - Exposure Route evaluated quantitatively
* - Exposure Route not evaluated quantitatively (see text)

File Path: v:\18gis\oceana\figures\oceana_laura_m.apr

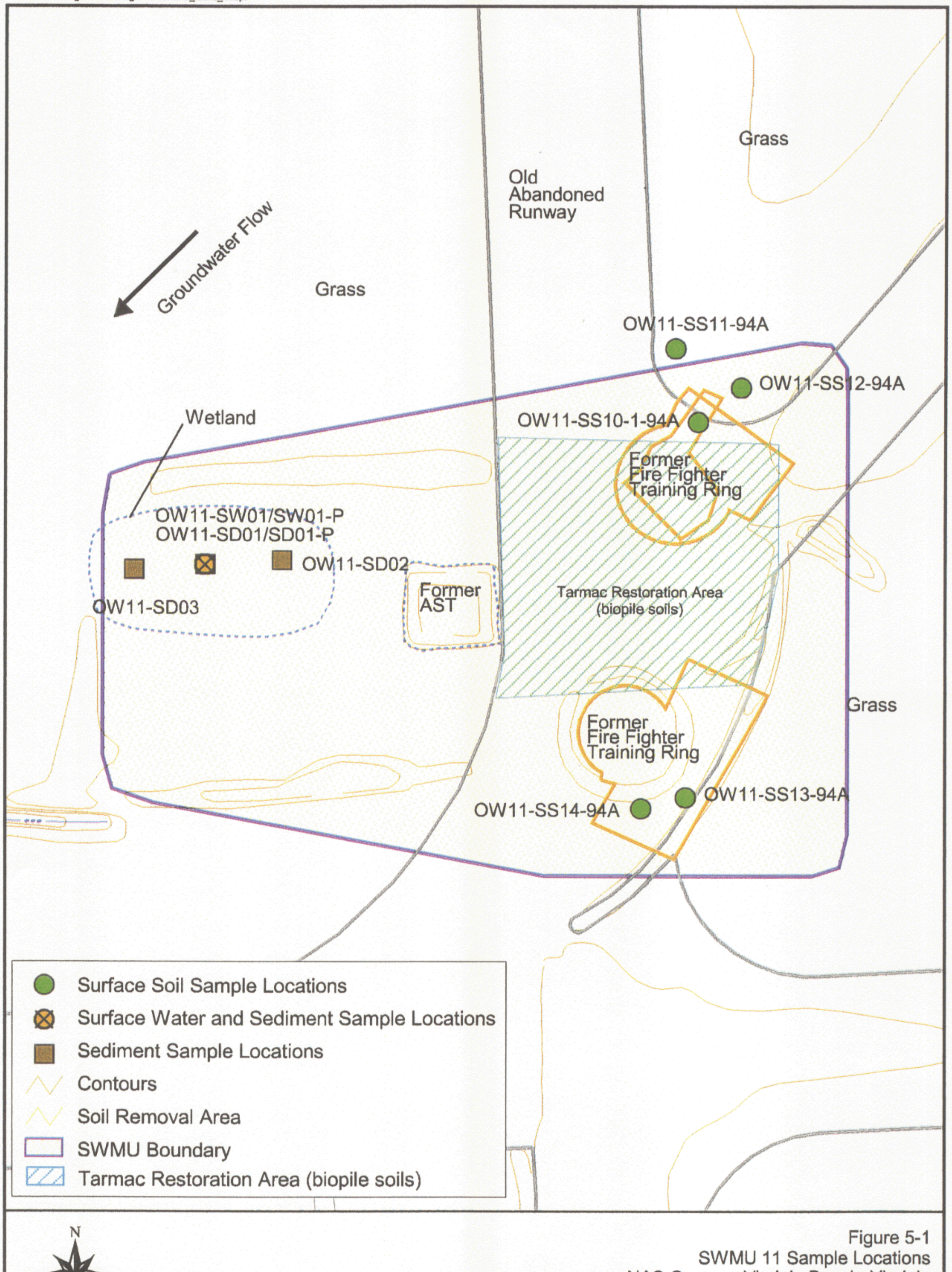
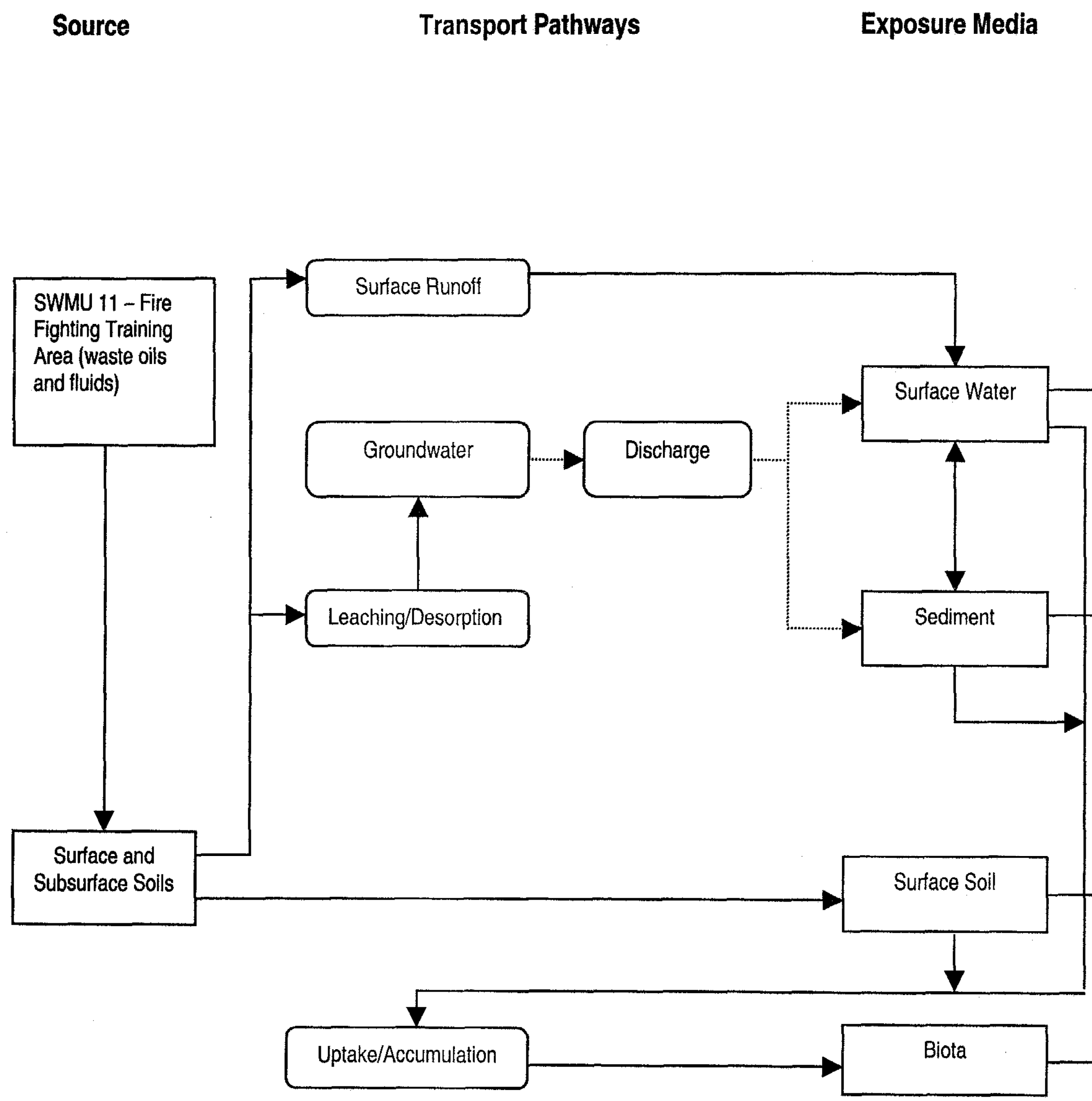


Figure 5-1
SWMU 11 Sample Locations
NAS Oceana, Virginia Beach, Virginia

CH2MHILL

00558 F034



Exposure Media	Exposure Route	Aquatic Invertebrates	Aquatic Plants	Aquatic Fish	Aquatic Amphibians	Aquatic Reptiles	Aquatic Birds	Aquatic Mammals	Terrestrial Invertebrates	Terrestrial Plants	Terrestrial Amphibians	Terrestrial Reptiles	Terrestrial Birds	Terrestrial Mammals
Surface Water	Ingestion				*	*	•	•			*	*	•	•
	Direct Contact	•	•		•	*	*	*						
Sediment	Ingestion	•			*	*	•	•						
	Direct Contact	•			•	*	*	*						
	Root Uptake		•											
Surface Soil	Ingestion								•		*	*	•	•
	Direct Contact								•		*	*	*	*
	Root Uptake									•				
Biota	Ingestion	*			*	*	•	•	*		*	*	•	•

Complete migration pathway - not evaluated (not used)
Complete migration pathway - evaluated
Incomplete migration pathway (not used)

FIGURE 5-2. PRELIMINARY CONCEPTUAL MODEL
NAS OCEANA – SWMU 11

• - Exposure Route evaluated quantitatively
* - Exposure Route not evaluated quantitatively (see text)

File Path: v:\18gis\oceana\figures\oceana_laura_m.apr

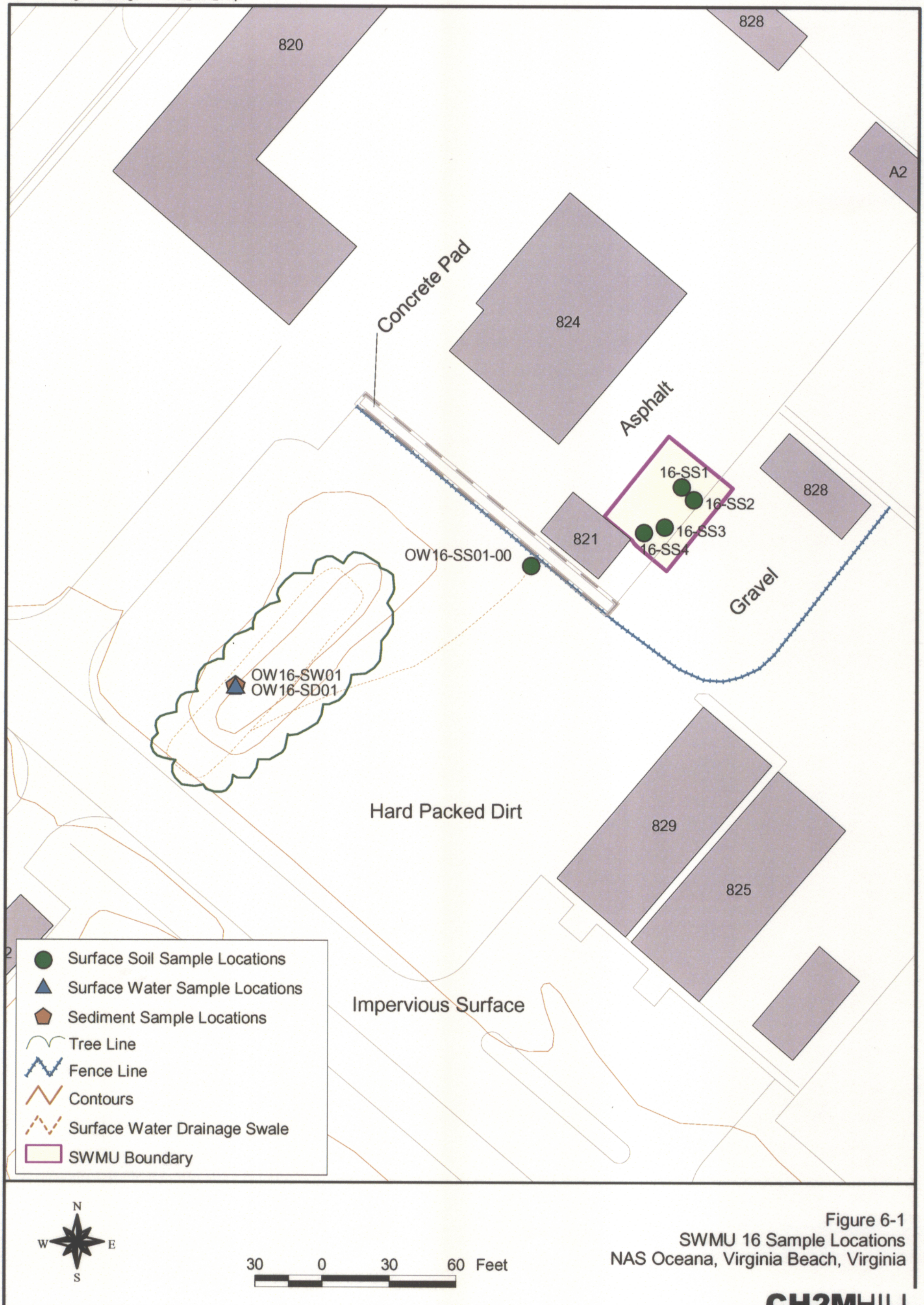
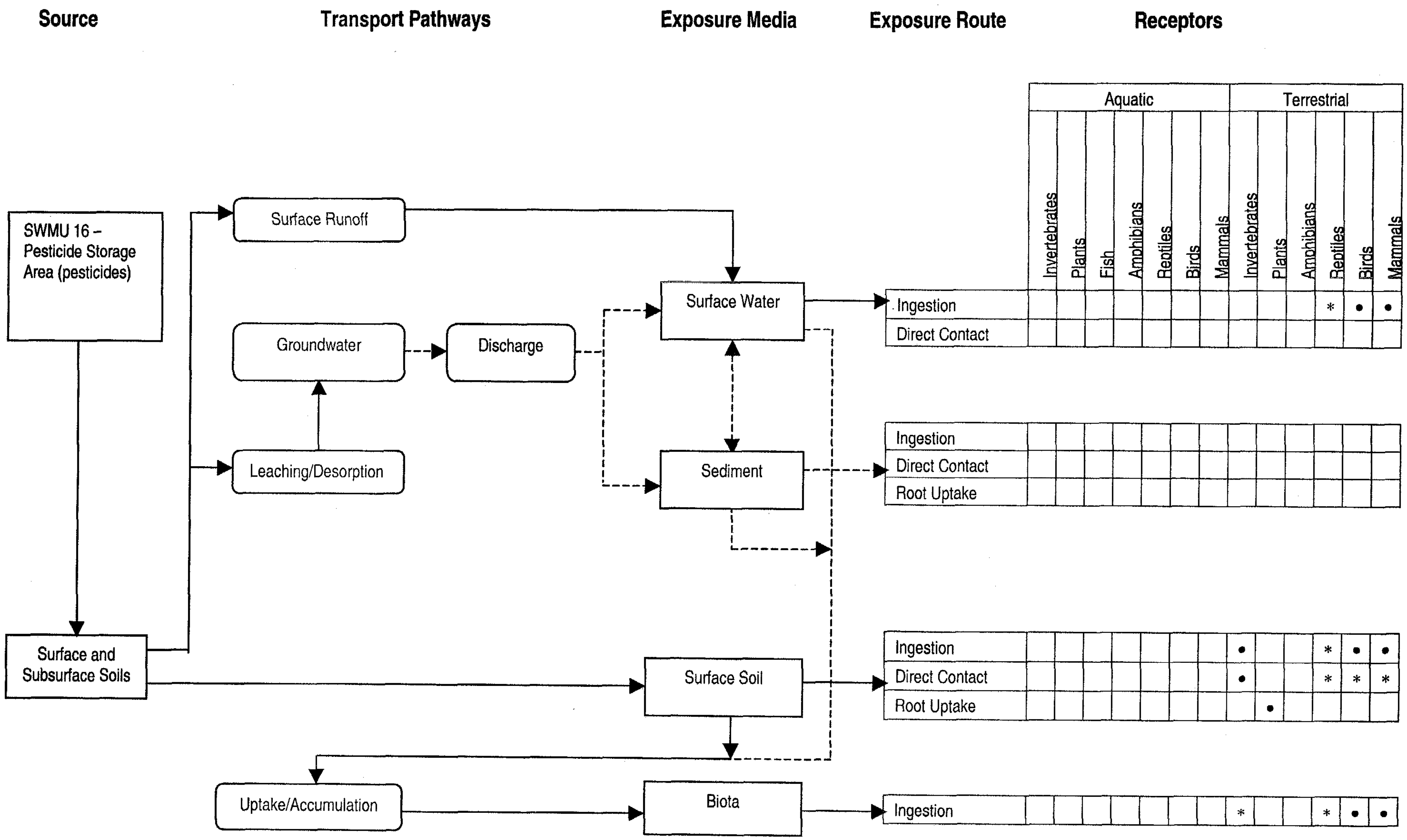


Figure 6-1
SWMU 16 Sample Locations
NAS Oceana, Virginia Beach, Virginia

CH2MHILL

00558 F 04y



······▶ Complete migration pathway - not evaluated (not used)
——▶ Complete migration pathway - evaluated
- - -▶ Incomplete migration pathway (not used)

FIGURE 6-2. PRELIMINARY CONCEPTUAL MODEL
NAS OCEANA – SWMU 16

• - Exposure Route evaluated quantitatively
* - Exposure Route not evaluated quantitatively (see text)

File Path: v:\18gis\oceana\figures\oceana_laura_m.apr

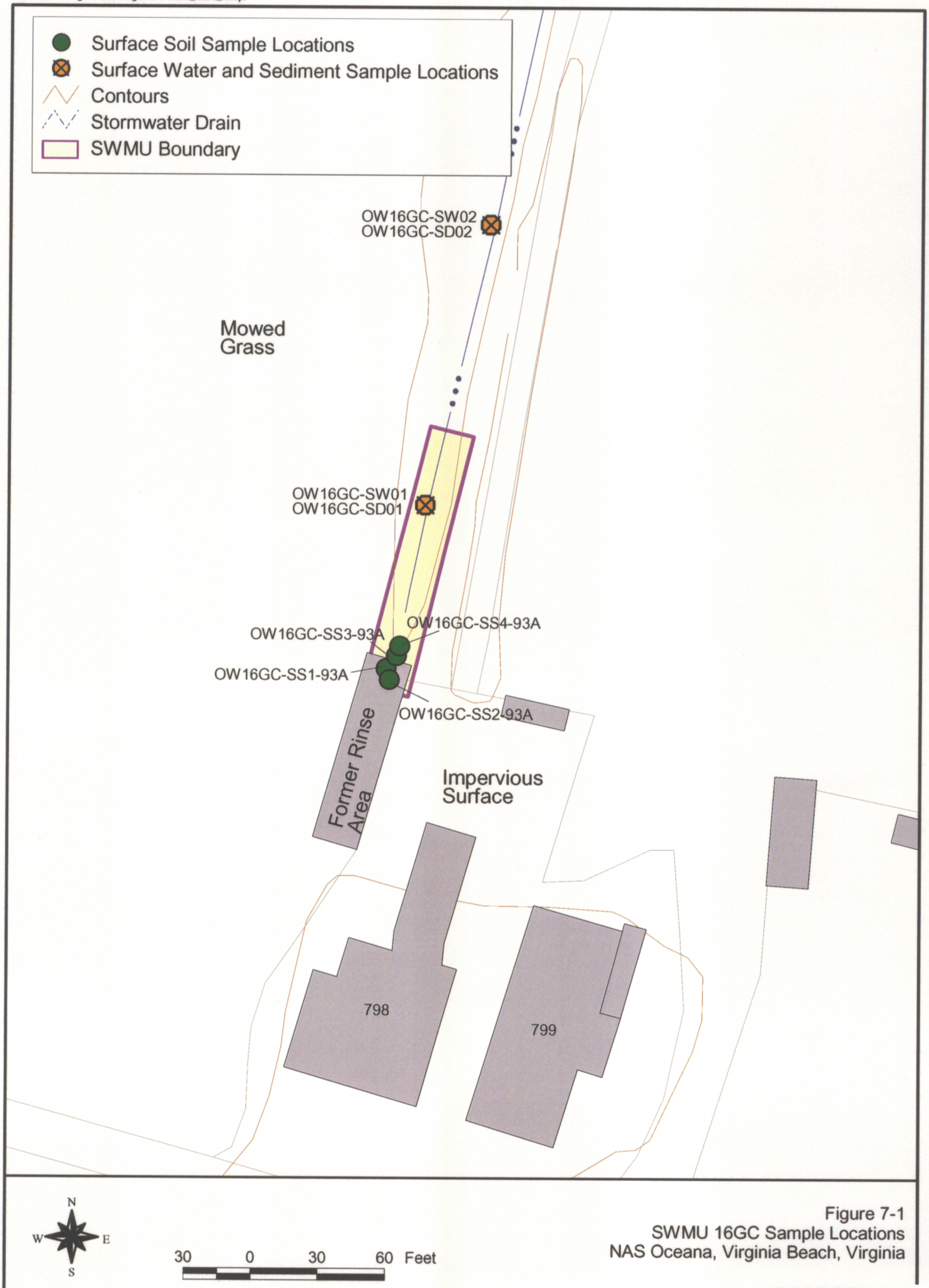
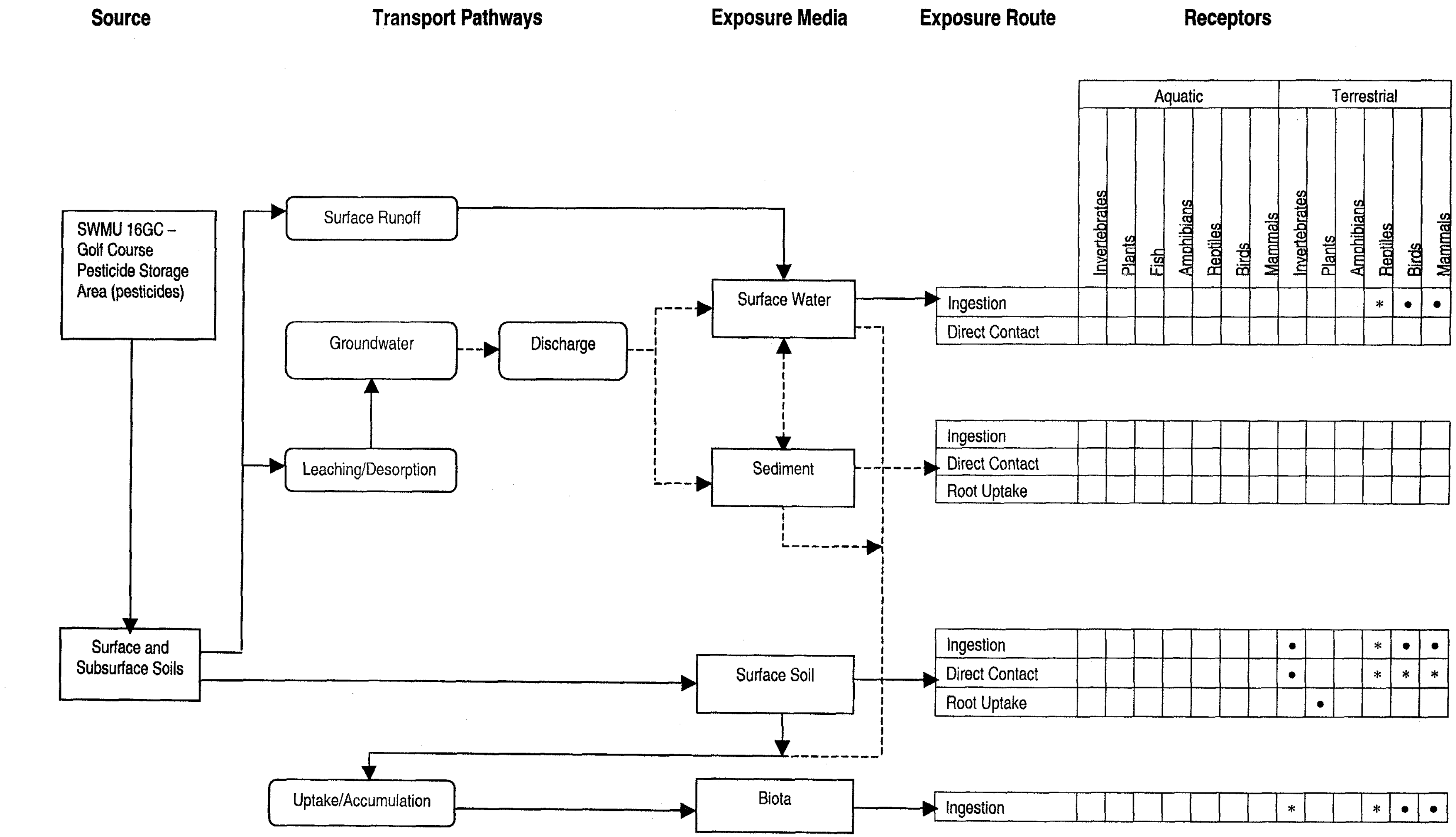


Figure 7-1
SWMU 16GC Sample Locations
NAS Oceana, Virginia Beach, Virginia

CH2MHILL

00558 F 058



Complete migration pathway - not evaluated (not used)
Complete migration pathway - evaluated
Incomplete migration pathway (not used)

FIGURE 7-2. PRELIMINARY CONCEPTUAL MODEL
NAS OCEANA – SWMU 16GC

• - Exposure Route evaluated quantitatively
* - Exposure Route not evaluated quantitatively (see text)

File Path: v:\18gis\oceana\figures\oceana_laura_m.apr

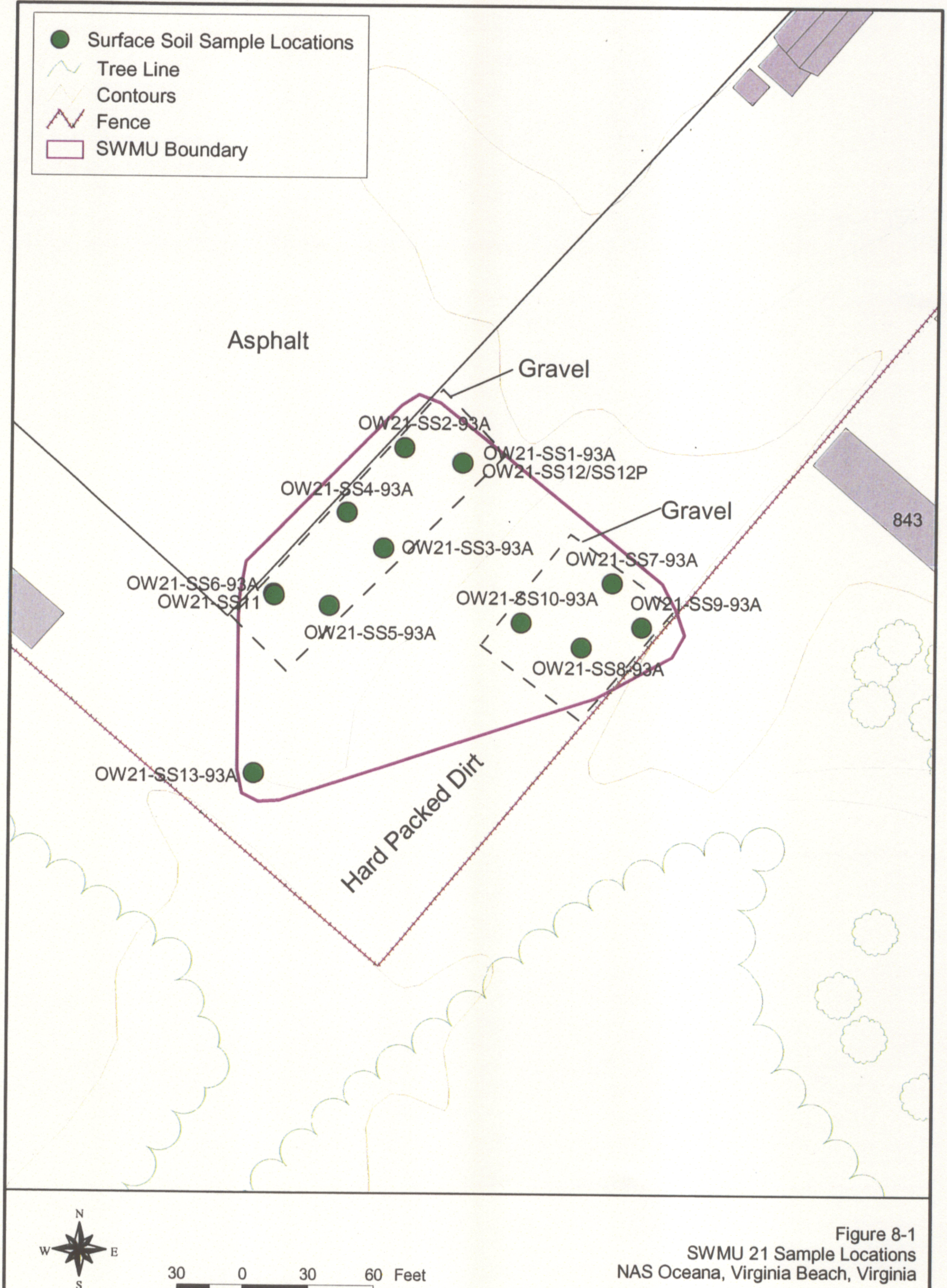
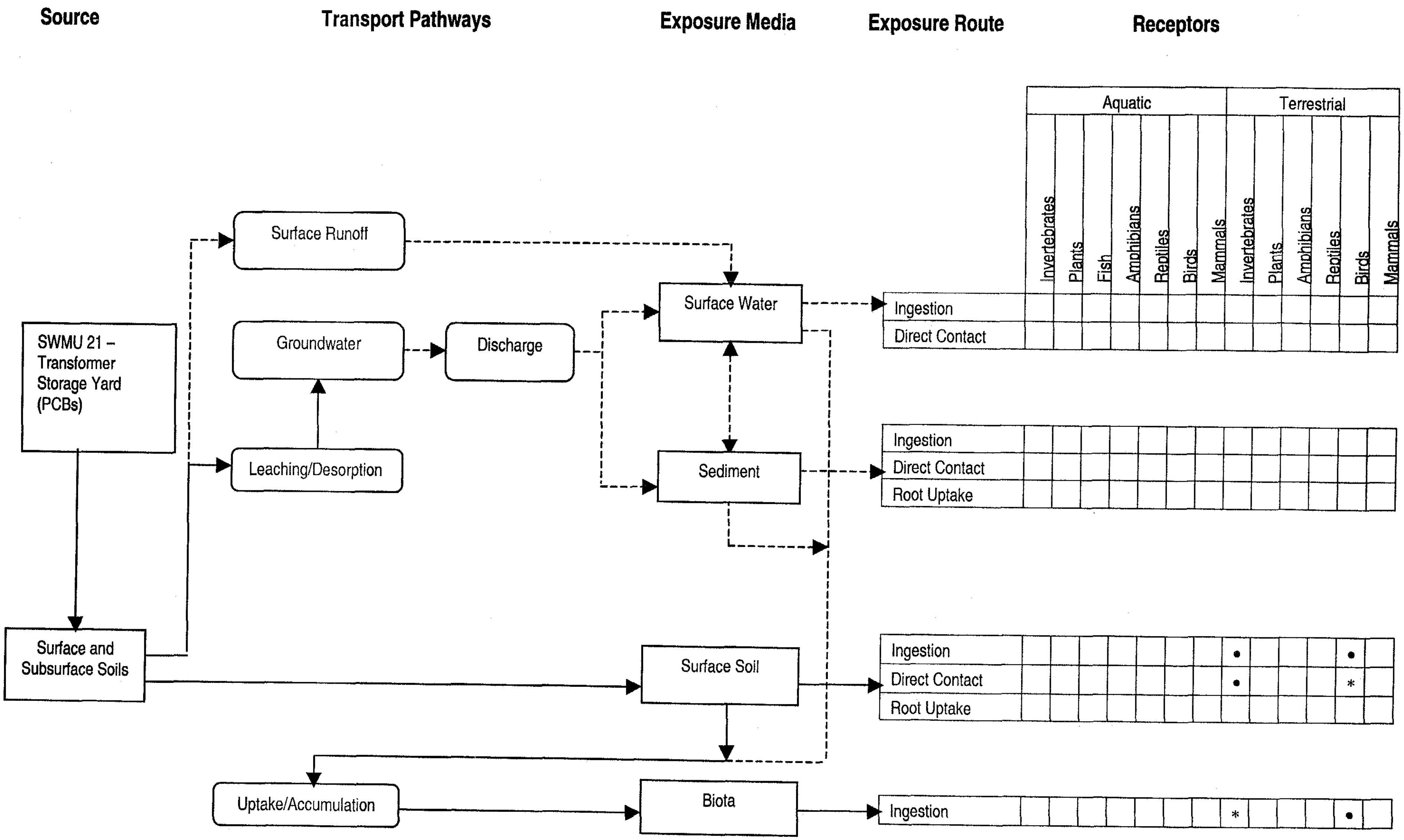


Figure 8-1
SWMU 21 Sample Locations
NAS Oceana, Virginia Beach, Virginia

CH2MHILL

00558 F 069



Complete migration pathway - not evaluated (not used)
Complete migration pathway - evaluated
Incomplete migration pathway

FIGURE 8-2. PRELIMINARY CONCEPTUAL MODEL NAS OCEANA – SWMU 21

• - Exposure Route evaluated quantitatively
* - Exposure Route not evaluated quantitatively (see text)

File Path: v:\18gis\oceana\figures\oceana_laura_m.apr

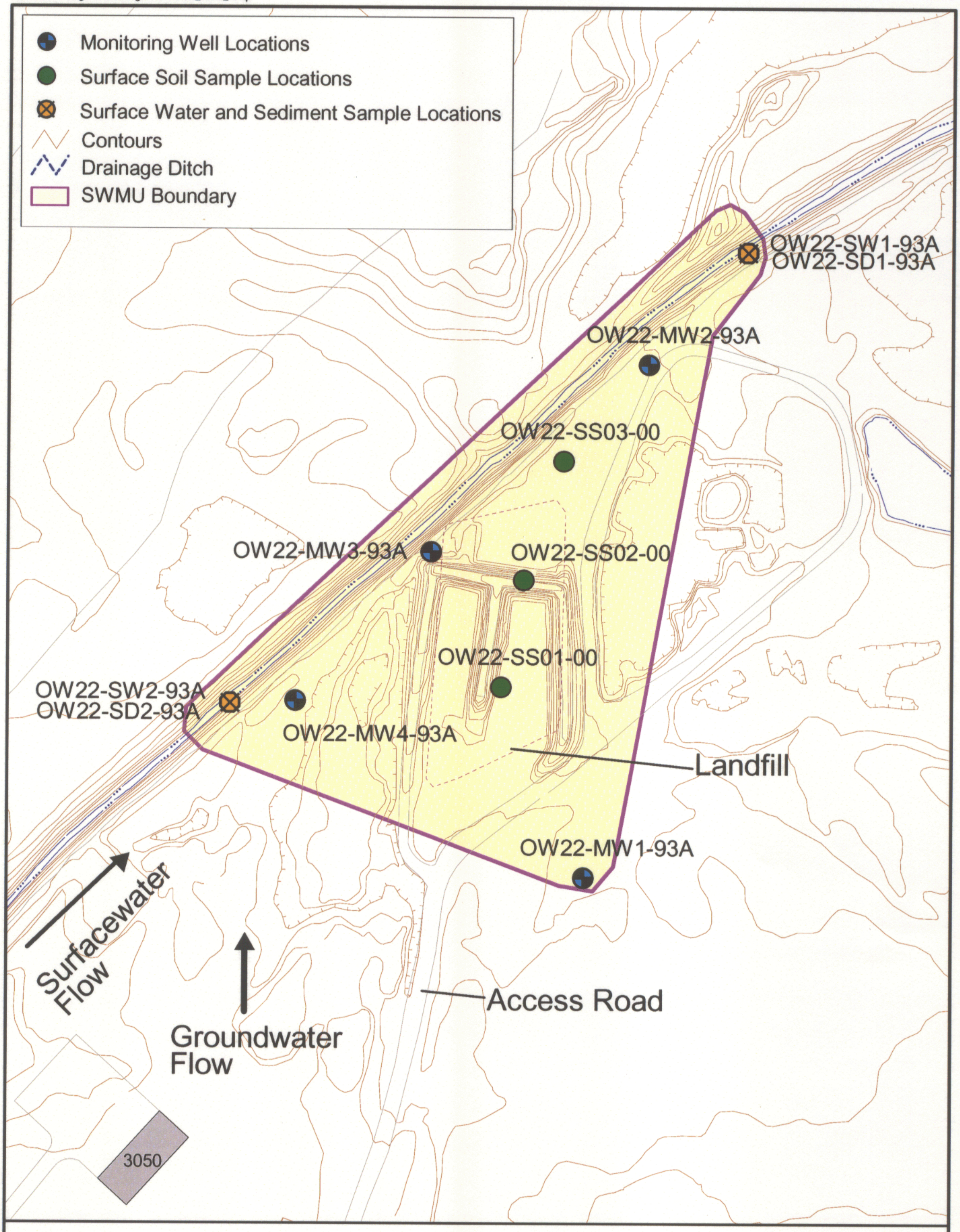
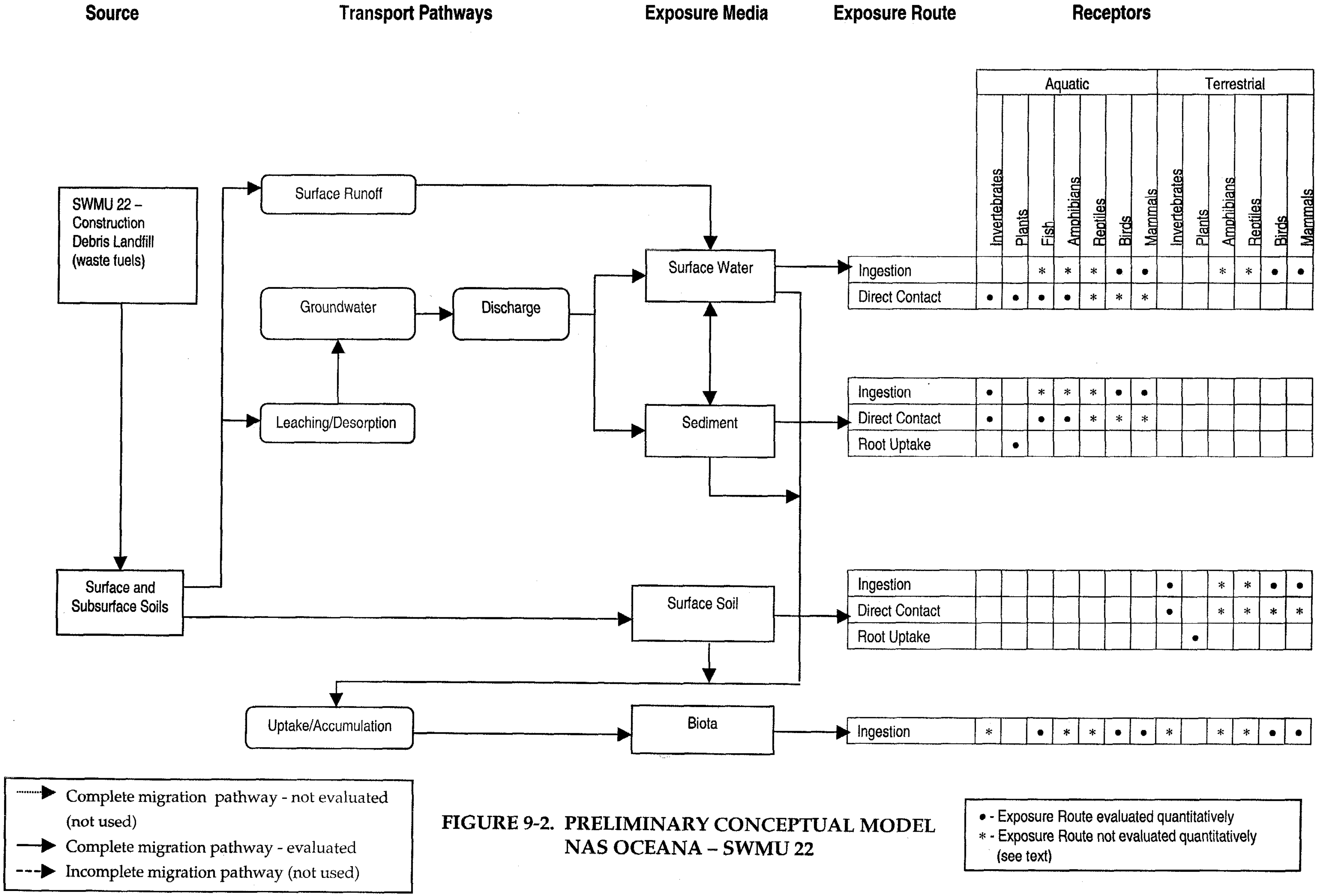


Figure 9-1
SWMU 22 Sample Locations
NAS Oceana, Virginia Beach, Virginia

CH2MHILL

00558F074



Exposure Media	Exposure Route	Aquatic Invertebrates	Aquatic Plants	Aquatic Fish	Aquatic Amphibians	Aquatic Reptiles	Aquatic Birds	Aquatic Mammals	Terrestrial Invertebrates	Terrestrial Plants	Terrestrial Amphibians	Terrestrial Reptiles	Terrestrial Birds	Terrestrial Mammals
Surface Water	Ingestion			∗	∗	∗	•	•			∗	∗	•	•
	Direct Contact	•	•	•	•	∗	∗	∗						
Sediment	Ingestion	•		∗	∗	∗	•	•						
	Direct Contact	•		•	•	∗	∗	∗						
	Root Uptake		•											
Surface Soil	Ingestion								•		∗	∗	•	•
	Direct Contact								•		∗	∗	∗	∗
	Root Uptake									•				
Biota	Ingestion	∗		•	∗	∗	•	•	∗		∗	∗	•	•

FIGURE 9-2. PRELIMINARY CONCEPTUAL MODEL NAS OCEANA – SWMU 22

File Path: v:\18gis\oceana\figures\oceana_laura_m.apr

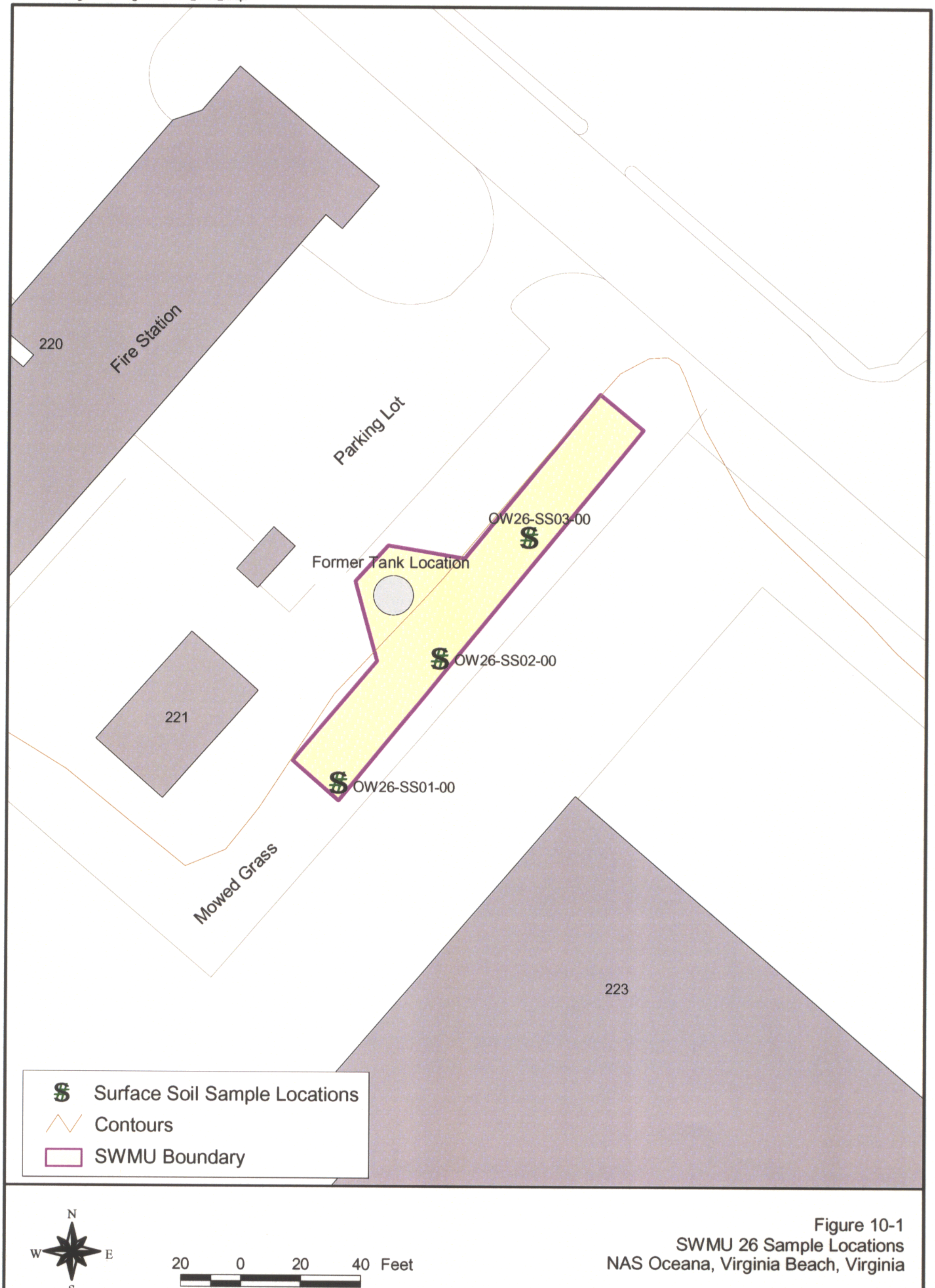
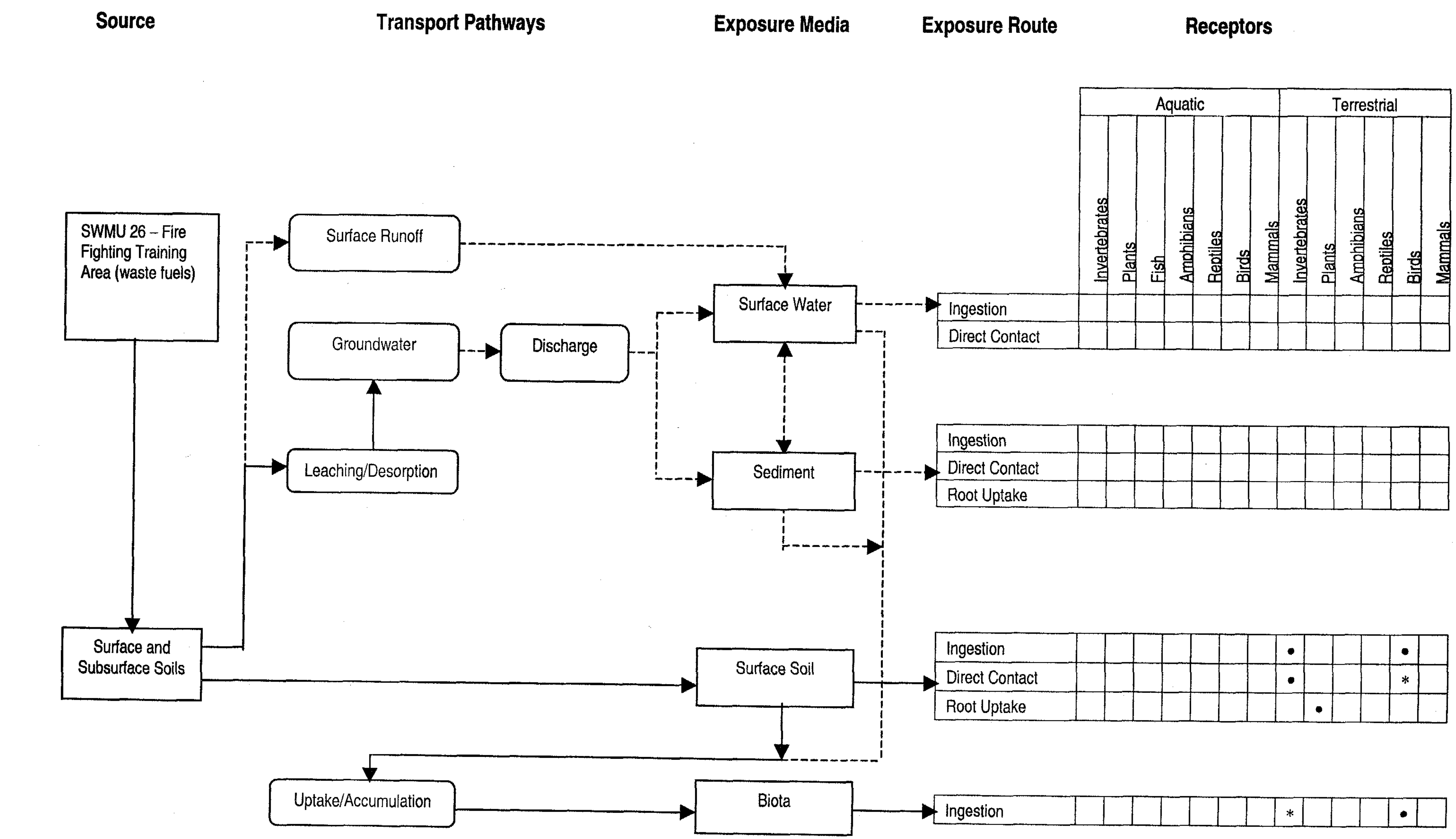


Figure 10-1
SWMU 26 Sample Locations
NAS Oceana, Virginia Beach, Virginia

CH2MHILL

00558 F 084



Complete migration pathway - not evaluated (not used)
Complete migration pathway - evaluated
Incomplete migration pathway

FIGURE 10-2. PRELIMINARY CONCEPTUAL MODEL NAS OCEANA – SWMU 26

• - Exposure Route evaluated quantitatively
* - Exposure Route not evaluated quantitatively (see text)

Appendix A
Analytical Data

SUMMARY OF DATA QUALIFIERS AND OTHER CODES

NS	Not Sampled
B	Analyte not detected above associated blank
J	Reported value is estimated
K	Reported value may be biased high
L	Reported value may be biased low
NJ	Estimated; tentative identification
U	Analyte not detected
UJ	Analyte not detected; quantitation limit is estimated
UL	Analyte not detected; quantitation limit is probably higher

Table [illegible]-1
Raw Data
SWMU 2B - Ground Water
NAS Oceana, Virginia Beach, Virginia

	OW2B-MW17-94A	OW2B-MW17-R01	OW2B-MW18-94A	OW2B-MW18-R01	OW2B-MW19-94A	OW2B-MW19-R01	OW2B-MW20-94B
Sample Date							
Chemical Name							
Volatile Organic Compounds (UG/L)							
1,1,1-Trichloroethane	5 U	1 U	5 U	1 U	5 U	1 U	5 U
1,1,2,2-Tetrachloroethane	5 U	1 U	5 U	1 U	5 U	1 U	5 U
1,1,2-Trichloroethane	5 U	1 U	5 U	1 U	5 U	1 U	5 U
1,1-Dichloroethane	26	2	71	0.1 J	7	4	5 U
1,1-Dichloroethene	11	0.6 J	2 J	1 U	5 U	1 U	5 U
1,2,3-Trichloropropane	5 U	NS	5 U	NS	5 U	NS	5 U
1,2,4-Trichlorobenzene	NS	1 U	NS	1 U	NS	1 U	NS
1,2-Dibromo-3-chloropropane	NS	1 U	NS	1 U	NS	1 U	NS
1,2-Dibromoethane	NS	1 U	NS	1 U	NS	1 U	NS
1,2-Dichlorobenzene	5 U	1 U	5 U	1 U	5 U	1 U	5 U
1,2-Dichloroethane	5 U	1 U	1 J	1 U	5 U	1 U	5 U
1,2-Dichloroethene (total)	48	NS	5	NS	5 U	NS	5 U
1,2-Dichloropropane	5 U	1 U	5 U	1 U	5 U	1 U	5 U
1,3-Dichlorobenzene	5 U	1 U	5 U	1 U	5 U	1 U	5 U
1,4-Dichlorobenzene	5 U	1 U	5 U	1 U	5 U	1 U	5 U
2-Butanone	10 U	5 R	10 U	5 R	10 U	5 R	10 U
2-Chloroethyl vinyl ether	10 U	NS	10 U	NS	10 U	NS	10 U
2-Hexanone	10 U	5 U	10 U	5 U	10 U	5 U	10 U
4-Methyl-2-pentanone	10 U	5 U	10 U	5 U	10 U	5 U	10 U
Acetone	7 JB	5 R	5 JB	5 R	10 U	5 R	10 U
Acrolein	100 U	NS	100 U	NS	100 U	NS	100 U
Acrylonitrile	100 U	NS	100 U	NS	100 U	NS	100 U
Benzene	6	0.5 J	3 J	1 U	5 U	1 U	5 U
Bromochloromethane	NS	1 U	NS	1 U	NS	1 U	NS
Bromodichloromethane	5 U	1 U	5 U	1 U	5 U	1 U	5 U
Bromoform	5 U	1 U	5 U	1 U	5 U	1 U	5 U
Bromomethane	10 U	1 U	10 U	1 U	10 U	1 U	10 U
Carbon disulfide	5 U	0.7 J	5 U	1 U	5 U	0.4 J	5 U
Carbon tetrachloride	5 U	1 U	5 U	1 U	5 U	1 U	5 U
Chlorobenzene	5 U	1 U	5 U	1 U	5 U	1 U	5 U
Chloroethane	10 U	1	20	1 U	10 U	1 U	10 U
Chloroform	5 U	1 U	5 U	1 U	5 U	1 U	5 U
Chloromethane	10 U	1 U	10 U	1 U	10 U	1 U	10 U
Dibromochloromethane	5 U	1 U	5 U	1 U	5 U	1 U	5 U

NS - Not sampled
B - Analyte not detected above associated blank
J - Reported value is estimated
JB
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UL

Table A-1-1
Raw Data
SWMU 2B - Ground Water
NAS Oceana, Virginia Beach, Virginia

	OW2B-MW17-94A	OW2B-MW17-R01	OW2B-MW18-94A	OW2B-MW18-R01	OW2B-MW19-94A	OW2B-MW19-R01	OW2B-MW20-94B
Sample Date							
Chemical Name							
Dibromomethane	5 U	NS	5 U	NS	5 U	NS	5 U
Dichlorodifluoromethane	10 U	NS	10 U	NS	10 U	NS	10 U
Ethane	NS	0.005 U	NS	0.005 U	NS	0.022	NS
Ethene	NS	0.064	NS	0.005 U	NS	0.032	NS
Ethyl methacrylate	5 U	NS	5 U	NS	5 U	NS	5 U
Ethylbenzene	5 U	1 U	5 U	1 U	5 U	1 U	5 U
Iodomethane	10 U	NS	10 U	NS	10 U	NS	10 U
Methane	NS	2,150	NS	1,510	NS	73.15	NS
Methylene chloride	1 J	0.6 B	1 J	0.6 B	5 U	0.2 J	2 JB
Styrene	5 U	1 U	5 U	1 U	5 U	1 U	5 U
Tetrachloroethene	5 U	1 U	5 U	1 U	5 U	1 U	5 U
Toluene	5 U	0.2 J	5 U	0.2 J	5 U	0.1 J	5 U
Trichloroethene	5 U	1 U	4 J	0.3 J	5 U	1 U	5 U
Trichlorofluoromethane	5 U	NS	5 U	NS	5 U	NS	5 U
Vinyl acetate	10 U	NS	10 U	NS	10 U	NS	10 U
Vinyl chloride	4	0.5 J	15	1 U	2 U	1	10 U
Xylene, total	5 U	1 U	5 U	1 U	5 U	1 U	5 U
cis-1,2-Dichloroethene	NS	3	NS	0.2 J	NS	0.1 J	NS
cis-1,3-Dichloropropene	6 U	1 U	5 U	1 U	5 U	1 U	5 U
trans-1,2-Dichloroethene	NS	0.3 J	NS	1 U	NS	1 U	NS
trans-1,3-Dichloropropene	5 U	1 U	5 U	1 U	5 U	1 U	5 U
trans-1,4-Dichloro-2-butene	5 U	NS	5 U	NS	5 U	NS	5 U
Semi-volatile Organic Compounds (UG/L)							
1,2,4-Trichlorobenzene	NS	10 U	NS	10 U	NS	10 U	NS
1,2-Dichlorobenzene	NS	10 U	NS	10 U	NS	10 U	NS
1,3-Dichlorobenzene	NS	10 U	NS	10 U	NS	10 U	NS
1,4-Dichlorobenzene	NS	10 U	NS	10 U	NS	10 U	NS
2,2'-Oxybis(1-chloropropane)	NS	10 U	NS	10 U	NS	10 U	NS
2,4,5-Trichlorophenol	NS	25 U	NS	25 U	NS	25 U	NS
2,4,6-Trichlorophenol	NS	10 U	NS	10 U	NS	10 U	NS
2,4-Dichlorophenol	NS	10 U	NS	10 U	NS	10 U	NS
2,4-Dimethylphenol	NS	10 U	NS	10 U	NS	10 U	NS
2,4-Dinitrophenol	NS	25 UJ	NS	25 UJ	NS	25 UJ	NS
2,4-Dinitrotoluene	NS	10 U	NS	10 U	NS	10 U	NS

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Table ..-1-1
Raw Data
SWMU 2B - Ground Water
NAS Oceana, Virginia Beach, Virginia

	OW2B-MW17-94A		OW2B-MW17-R01		OW2B-MW18-94A		OW2B-MW18-R01		OW2B-MW19-94A		OW2B-MW19-R01		OW2B-MW20-94B	
Sample Date														
Chemical Name														
2,6-Dinitrotoluene	NS		10	U	NS		10	U	NS		10	U	NS	
2-Chloronaphthalene	NS		10	U	NS		10	U	NS		10	U	NS	
2-Chlorophenol	NS		10	U	NS		10	U	NS		10	U	NS	
2-Methylnaphthalene	NS		10	U	NS		10	U	NS		10	U	NS	
2-Methylphenol	NS		10	U	NS		10	U	NS		10	U	NS	
2-Nitroaniline	NS		25	U	NS		25	U	NS		25	U	NS	
2-Nitrophenol	NS		10	U	NS		10	U	NS		10	U	NS	
3,3'-Dichlorobenzidine	NS		10	U	NS		10	U	NS		10	U	NS	
3-Nitroaniline	NS		25	UJ	NS		25	UJ	NS		25	U	NS	
4,6-Dinitro-2-methylphenol	NS		25	U	NS		25	U	NS		25	U	NS	
4-Bromophenyl-phenylether	NS		10	U	NS		10	U	NS		10	U	NS	
4-Chloro-3-methylphenol	NS		10	U	NS		10	U	NS		10	U	NS	
4-Chloroaniline	NS		10	U	NS		10	U	NS		10	U	NS	
4-Chlorophenyl-phenylether	NS		10	U	NS		10	U	NS		10	U	NS	
4-Methylphenol	NS		10	U	NS		10	U	NS		10	U	NS	
4-Nitroaniline	NS		25	UJ	NS		25	UJ	NS		25	U	NS	
4-Nitrophenol	NS		25	UJ	NS		25	UJ	NS		25	U	NS	
Acenaphthene	NS		1	UL	NS		1	U	NS		1	U	NS	
Acenaphthylene	NS		1	UL	NS		1	U	NS		1	U	NS	
Anthracene	NS		2	UL	NS		2	U	NS		2	UJ	NS	
Benzo(a)anthracene	NS		0.1	UL	NS		0.1	U	NS		0.1	U	NS	
Benzo(a)pyrene	NS		0.1	UJ	NS		0.1	UJ	NS		0.1	UJ	NS	
Benzo(b)fluoranthene	NS		0.1	UL	NS		0.1	U	NS		0.1	U	NS	
Benzo(g,h,i)perylene	NS		0.1	UJ	NS		0.1	UJ	NS		0.1	UJ	NS	
Benzo(k)fluoranthene	NS		0.1	UL	NS		0.1	U	NS		0.1	U	NS	
Butylbenzylphthalate	NS		10	UJ	NS		10	UJ	NS		10	U	NS	
Carbazole	NS		10	U	NS		10	U	NS		10	U	NS	
Chrysene	NS		0.1	UL	NS		0.1	U	NS		0.1	U	NS	
Di-n-butylphthalate	NS		10	U	NS		10	U	NS		10	U	NS	
Di-n-octylphthalate	NS		10	UJ	NS		10	UJ	NS		10	U	NS	
Dibenz(a,h)anthracene	NS		0.1	UL	NS		0.1	UJ	NS		0.1	U	NS	
Dibenzofuran	NS		10	U	NS		10	U	NS		10	U	NS	
Diethylphthalate	NS		10	U	NS		10	U	NS		10	U	NS	
Dimethyl phthalate	NS		10	U	NS		10	U	NS		10	U	NS	
Fluoranthene	NS		0.1	UL	NS		0.1	U	NS		0.1	U	NS	

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Table A-1-1
Raw Data
SWMU 2B - Ground Water
NAS Oceana, Virginia Beach, Virginia

	OW2B-MW17-94A		OW2B-MW17-R01		OW2B-MW18-94A		OW2B-MW18-R01		OW2B-MW19-94A		OW2B-MW19-R01		OW2B-MW20-94B	
Sample Date														
Chemical Name														
Fluorene	NS		1	UL	NS		0.098	J	NS		1	U	NS	
Hexachlorobenzene	NS		10	UJ	NS		10	UJ	NS		10	U	NS	
Hexachlorobutadiene	NS		10	UJ	NS		10	UJ	NS		10	U	NS	
Hexachlorocyclopentadiene	NS		10	U	NS		10	U	NS		10	U	NS	
Hexachloroethane	NS		10	U	NS		10	U	NS		10	U	NS	
Indeno(1,2,3-cd)pyrene	NS		0.1	UL	NS		0.1	U	NS		0.1	U	NS	
Isophorone	NS		10	U	NS		10	U	NS		10	U	NS	
Naphthalene	NS		2	UL	NS		2	U	NS		2	U	NS	
Nitrobenzene	NS		10	U	NS		10	U	NS		10	U	NS	
Pentachlorophenol	NS		25	U	NS		25	U	NS		25	U	NS	
Phenanthrene	NS		1	UL	NS		1	U	NS		1	U	NS	
Phenol	NS		10	U	NS		10	U	NS		10	U	NS	
Pyrene	NS		0.1	UJ	NS		0.1	UJ	NS		0.1	U	NS	
bis(2-Chloroethoxy)methane	NS		10	U	NS		10	U	NS		10	U	NS	
bis(2-Chloroethyl)ether	NS		10	UJ	NS		10	UJ	NS		10	U	NS	
bis(2-Ethylhexyl)phthalate	NS		10	U	NS		10	U	NS		10	U	NS	
n-Nitroso-di-n-propylamine	NS		10	U	NS		10	U	NS		10	U	NS	
n-Nitrosodiphenylamine	NS		10	U	NS		10	U	NS		10	U	NS	
Pesticide/Polychlorinated Biphenyls (UG/L)														
4,4'-DDD	NS		0.1	U	NS		0.1	U	NS		0.1	U	NS	
4,4'-DDE	NS		0.1	U	NS		0.1	U	NS		0.1	U	NS	
4,4'-DDT	NS		0.1	U	NS		0.1	U	NS		0.1	U	NS	
Aldrin	NS		0.05	U	NS		0.05	U	NS		0.05	U	NS	
Aroclor-1016	NS		1	U	NS		1	U	NS		1	U	NS	
Aroclor-1221	NS		2	U	NS		2	U	NS		2	U	NS	
Aroclor-1232	NS		1	U	NS		1	U	NS		1	U	NS	
Aroclor-1242	NS		1	U	NS		1	U	NS		1	U	NS	
Aroclor-1248	NS		1	U	NS		1	U	NS		1	U	NS	
Aroclor-1254	NS		1	U	NS		1	U	NS		1	U	NS	
Aroclor-1260	NS		1	U	NS		1	U	NS		1	U	NS	
Dieldrin	NS		0.1	U	NS		0.1	U	NS		0.1	U	NS	
Endosulfan I	NS		0.05	U	NS		0.05	U	NS		0.05	U	NS	
Endosulfan II	NS		0.1	U	NS		0.1	U	NS		0.1	U	NS	
Endosulfan sulfate	NS		0.1	U	NS		0.1	U	NS		0.1	U	NS	

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UL

Table [illegible]-1
Raw Data
SWMU 2B - Ground Water
NAS Oceana, Virginia Beach, Virginia

	OW2B-MW17-94A	OW2B-MW17-R01	OW2B-MW18-94A	OW2B-MW18-R01	OW2B-MW19-94A	OW2B-MW19-R01	OW2B-MW20-94B
Sample Date							
Chemical Name							
Endrin	NS	0.1 U	NS	0.1 U	NS	0.1 U	NS
Endrin aldehyde	NS	0.1 U	NS	0.1 U	NS	0.1 U	NS
Endrin ketone	NS	0.1 U	NS	0.1 U	NS	0.1 U	NS
Heptachlor	NS	0.05 U	NS	0.05 U	NS	0.05 U	NS
Heptachlor epoxide	NS	0.05 U	NS	0.05 U	NS	0.05 U	NS
Methoxychlor	NS	0.5 U	NS	0.5 U	NS	0.5 U	NS
Toxaphene	NS	5 U	NS	5 U	NS	5 U	NS
alpha-BHC	NS	0.05 U	NS	0.05 U	NS	0.05 U	NS
alpha-Chlordane	NS	0.05 U	NS	0.05 U	NS	0.05 U	NS
beta-BHC	NS	0.05 U	NS	0.05 U	NS	0.05 U	NS
delta-BHC	NS	0.05 U	NS	0.05 U	NS	0.05 U	NS
gamma-BHC (Lindane)	NS	0.05 U	NS	0.05 U	NS	0.05 U	NS
gamma-Chlordane	NS	0.05 U	NS	0.05 U	NS	0.05 U	NS
Total Metals (UG/L)							
Aluminum	NS	39.9 B	NS	76.1 B	NS	76.8 B	NS
Antimony	NS	1.6 U	NS	2.8 B	NS	1.6 U	NS
Arsenic	NS	29.7	NS	12.5	NS	2.5 U	NS
Barium	NS	41.2 J	NS	54.1 J	NS	37.7 J	NS
Beryllium	NS	0.2 U	NS	0.2 U	NS	0.2 U	NS
Cadmium	NS	0.7 U	NS	0.7 U	NS	0.7 U	NS
Calcium	NS	17,600	NS	13,900	NS	12,100	NS
Chromium	NS	2.6 U	NS	2.6 U	NS	2.6 U	NS
Cobalt	NS	1.5 U	NS	1.6 J	NS	1.5 U	NS
Copper	NS	2.9 U	NS	2.9 U	NS	2.9 U	NS
Cyanide	NS	10 U	NS	10 U	NS	NS	NS
Ferric iron	NS	1,100	NS	500 U	NS	500 U	NS
Ferrous iron	NS	18,000	NS	6,100	NS	4,200	NS
Iron	NS	35,500	NS	11,700	NS	7,720	NS
Lead	NS	1.4 U	NS	1.4 U	NS	1.4 U	NS
Magnesium	NS	13,500	NS	5,120	NS	8,580	NS
Manganese	NS	494	NS	230	NS	181	NS
Mercury	NS	0.031 U	NS	0.031 U	NS	0.031 UL	NS
Nickel	NS	1.7 U	NS	1.7 U	NS	1.7 U	NS
Potassium	NS	1,870 J	NS	1,370 J	NS	1,120 J	NS

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Table A-1-1
Raw Data
SWMU 2B - Ground Water
NAS Oceana, Virginia Beach, Virginia

	OW2B-MW17-94A		OW2B-MW17-R01		OW2B-MW18-94A		OW2B-MW18-R01		OW2B-MW19-94A		OW2B-MW19-R01		OW2B-MW20-94B	
Sample Date														
Chemical Name														
Selenium	NS		3.1	U	NS		3.1	U	NS		3.1	U	NS	
Silver	NS		1.9	U	NS		1.9	U	NS		1.9	U	NS	
Sodium	NS		16,600		NS		12,200		NS		14,400		NS	
Thallium	NS		9.4	U	NS		9.4	U	NS		9.4	U	NS	
Vanadium	NS		2.1	U	NS		2.1	U	NS		2.1	U	NS	
Zinc	NS		6.5	B	NS		4.9	B	NS		10.3	B	NS	
Wet Chemistry (MG/L)														
Alkalinity	NS		93		NS		40		NS		65		NS	
Chloride	NS		12		NS		14		NS		7.5		NS	
Cyanide	NS		NS		NS		NS		NS		0.0025	B	NS	
Dissolved oxygen	NS		0.08		NS		0.17		NS		0.04		NS	
Nitrate	NS		0.5	U	NS		0.5	U	NS		0.5	U	NS	
Nitrite	NS		0.5	U	NS		0.5	U	NS		0.5	U	NS	
Redox	NS		-1		NS		-1		NS		-1		NS	
Specific conductance	NS		-1		NS		-1		NS		-1		NS	
Sulfate	NS		19		NS		17		NS		16		NS	
Sulfide	NS		0.11		NS		0.08		NS		0.12		NS	
Temperature	NS		-1		NS		-1		NS		-1		NS	
Total organic carbon (TOC)	NS		9.4		NS		5.9		NS		3.5		NS	
Turbidity	NS		-1		NS		-1		NS		-1		NS	
pH	NS		-1		NS		-1		NS		-1		NS	

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Table ...-1-1
Raw Data
SWMU 2B - Ground Water
NAS Oceana, Virginia Beach, Virginia

	OW2B-MW20-R01		OW2B-MW20-R01-P		OW2B-MW20D-94B	
Sample Date						
Chemical Name						
Volatile Organic Compounds (UG/L)						
1,1,1-Trichloroethane	1	U	1	U	5	U
1,1,2,2-Tetrachloroethane	1	U	1	U	5	U
1,1,2-Trichloroethane	1	U	1	U	5	U
1,1-Dichloroethane	1	U	1	U	5	U
1,1-Dichloroethene	1	U	1	U	5	U
1,2,3-Trichloropropane	NS		NS		5	U
1,2,4-Trichlorobenzene	1	U	1	U	NS	
1,2-Dibromo-3-chloropropane	1	U	1	U	NS	
1,2-Dibromoethane	1	U	1	U	NS	
1,2-Dichlorobenzene	1	U	1	U	5	U
1,2-Dichloroethane	1	U	1	U	5	U
1,2-Dichloroethene (total)	NS		NS		5	U
1,2-Dichloropropane	1	U	1	U	5	U
1,3-Dichlorobenzene	1	U	1	U	5	U
1,4-Dichlorobenzene	1	U	1	U	5	U
2-Butanone	5	R	5	R	10	U
2-Chloroethyl vinyl ether	NS		NS		10	U
2-Hexanone	5	U	5	U	10	U
4-Methyl-2-pentanone	5	U	5	U	10	U
Acetone	5	R	5	R	10	U
Acrolein	NS		NS		100	U
Acrylonitrile	NS		NS		100	U
Benzene	1	U	1	U	5	U
Bromochloromethane	1	U	1	U	NS	
Bromodichloromethane	1	U	1	U	5	U
Bromoform	1	U	1	U	5	U
Bromomethane	1	U	1	U	10	U
Carbon disulfide	0.4	J	0.8	J	5	U
Carbon tetrachloride	1	U	1	U	5	U
Chlorobenzene	1	U	1	U	5	U
Chloroethane	1	U	1	U	10	U
Chloroform	1	U	1	U	5	U
Chloromethane	1	U	1	U	10	U
Dibromochloromethane	1	U	1	U	5	U

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Table A-1-1
Raw Data
SWMU 2B - Ground Water
NAS Oceana, Virginia Beach, Virginia

	OW2B-MW20-R01		OW2B-MW20-R01-P		OW2B-MW20D-94B	
Sample Date						
Chemical Name						
Dibromomethane	NS		NS		5	U
Dichlorodifluoromethane	NS		NS		10	U
Ethane	0.109		0.09		NS	
Ethene	0.005	U	0.005	U	NS	
Ethyl methacrylate	NS		NS		5	U
Ethylbenzene	1	U	1	U	5	U
Iodomethane	NS		NS		10	U
Methane	1,295		1,160		NS	
Methylene chloride	0.2	J	0.2	J	2	JB
Styrene	1	U	1	U	5	U
Tetrachloroethene	1	U	1	U	5	U
Toluene	1	U	1	U	5	U
Trichloroethene	1	U	1	U	5	U
Trichlorofluoromethane	NS		NS		5	U
Vinyl acetate	NS		NS		10	U
Vinyl chloride	1	U	1	U	10	U
Xylene, total	1	U	1	U	5	U
cis-1,2-Dichloroethene	1	U	1	U	NS	
cis-1,3-Dichloropropene	1	U	1	U	5	U
trans-1,2-Dichloroethene	1	U	1	U	NS	
trans-1,3-Dichloropropene	1	U	1	U	5	U
trans-1,4-Dichloro-2-butene	NS		NS		5	U
Semi-volatile Organic Compounds (UG/L)						
1,2,4-Trichlorobenzene	10	U	10	U	NS	
1,2-Dichlorobenzene	10	U	10	U	NS	
1,3-Dichlorobenzene	10	U	10	U	NS	
1,4-Dichlorobenzene	10	U	10	U	NS	
2,2'-Oxybis(1-chloropropane)	10	U	10	U	NS	
2,4,5-Trichlorophenol	25	U	25	U	NS	
2,4,6-Trichlorophenol	10	U	10	U	NS	
2,4-Dichlorophenol	10	U	10	U	NS	
2,4-Dimethylphenol	10	U	10	U	NS	
2,4-Dinitrophenol	25	UJ	25	UJ	NS	
2,4-Dinitrotoluene	10	U	10	U	NS	

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Table -1-1
Raw Data
SWMU 2B - Ground Water
NAS Oceana, Virginia Beach, Virginia

	OW2B-MW20-R01		OW2B-MW20-R01-P		OW2B-MW20D-94B	
Sample Date						
Chemical Name						
2,6-Dinitrotoluene	10	U	10	U	NS	
2-Chloronaphthalene	10	U	10	U	NS	
2-Chlorophenol	10	U	10	U	NS	
2-Methylnaphthalene	10	U	10	U	NS	
2-Methylphenol	10	U	10	U	NS	
2-Nitroaniline	25	U	25	U	NS	
2-Nitrophenol	10	U	10	U	NS	
3,3'-Dichlorobenzidine	10	U	10	U	NS	
3-Nitroaniline	25	U	25	U	NS	
4,6-Dinitro-2-methylphenol	25	U	25	U	NS	
4-Bromophenyl-phenylether	10	U	10	U	NS	
4-Chloro-3-methylphenol	10	U	10	U	NS	
4-Chloroaniline	10	U	10	U	NS	
4-Chlorophenyl-phenylether	10	U	10	U	NS	
4-Methylphenol	10	U	10	U	NS	
4-Nitroaniline	25	U	25	U	NS	
4-Nitrophenol	25	U	25	U	NS	
Acenaphthene	1	U	1	U	NS	
Acenaphthylene	1	U	1	U	NS	
Anthracene	2	UJ	2	UJ	NS	
Benzo(a)anthracene	0.1	U	0.1	U	NS	
Benzo(a)pyrene	0.1	UJ	0.1	UJ	NS	
Benzo(b)fluoranthene	0.1	U	0.1	U	NS	
Benzo(g,h,i)perylene	0.1	UJ	0.1	UJ	NS	
Benzo(k)fluoranthene	0.1	U	0.1	U	NS	
Butylbenzylphthalate	10	U	10	U	NS	
Carbazole	10	U	10	U	NS	
Chrysene	0.1	U	0.1	U	NS	
Di-n-butylphthalate	10	U	10	U	NS	
Di-n-octylphthalate	10	U	10	U	NS	
Dibenz(a,h)anthracene	0.1	U	0.1	U	NS	
Dibenzofuran	10	U	10	U	NS	
Diethylphthalate	10	U	10	U	NS	
Dimethyl phthalate	10	U	10	U	NS	
Fluoranthene	0.1	U	0.1	U	NS	

NS - Not sampled
B - Analyte not detected above associated blank
J - Reported value is estimated
JB
R - Unreliable result

U - Analyte not detected
UJ - Not detected, quantitation limit may be inaccurate
UL

Table A-1-1
Raw Data
SWMU 2B - Ground Water
NAS Oceana, Virginia Beach, Virginia

	OW2B-MW20-R01		OW2B-MW20-R01-P		OW2B-MW20D-94B	
Sample Date						
Chemical Name						
Fluorene	1	U	1	U	NS	
Hexachlorobenzene	10	U	10	U	NS	
Hexachlorobutadiene	10	U	10	U	NS	
Hexachlorocyclopentadiene	10	U	10	U	NS	
Hexachloroethane	10	U	10	U	NS	
Indeno(1,2,3-cd)pyrene	0.1	U	0.1	U	NS	
Isophorone	10	U	10	U	NS	
Naphthalene	2	U	2	U	NS	
Nitrobenzene	10	U	10	U	NS	
Pentachlorophenol	25	U	25	U	NS	
Phenanthrene	1	U	1	U	NS	
Phenol	10	U	10	U	NS	
Pyrene	0.1	U	0.1	U	NS	
bis(2-Chloroethoxy)methane	10	U	10	U	NS	
bis(2-Chloroethyl)ether	10	U	10	U	NS	
bis(2-Ethylhexyl)phthalate	10	U	10	U	NS	
n-Nitroso-di-n-propylamine	10	U	10	U	NS	
n-Nitrosodiphenylamine	10	U	10	U	NS	
Pesticide/Polychlorinated Biphenyls (UG/L)						
4,4'-DDD	0.1	U	0.1	U	NS	
4,4'-DDE	0.1	U	0.1	U	NS	
4,4'-DDT	0.1	U	0.1	U	NS	
Aldrin	0.05	U	0.05	U	NS	
Aroclor-1016	1	U	1	U	NS	
Aroclor-1221	2	U	2	U	NS	
Aroclor-1232	1	U	1	U	NS	
Aroclor-1242	1	U	1	U	NS	
Aroclor-1248	1	U	1	U	NS	
Aroclor-1254	1	U	1	U	NS	
Aroclor-1260	1	U	1	U	NS	
Dieldrin	0.1	U	0.1	U	NS	
Endosulfan I	0.05	U	0.05	U	NS	
Endosulfan II	0.1	U	0.1	U	NS	
Endosulfan sulfate	0.1	U	0.1	U	NS	

NS - Not sampled
B - Analyte not detected above associated blank
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JB
R - Unreli[illegible] result

U - Analyte not detected
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UL

Table [illegible]-1
Raw Data
SWMU 2B - Ground Water
NAS Oceana, Virginia Beach, Virginia

	OW2B-MW20-R01		OW2B-MW20-R01-P		OW2B-MW20D-94B	
Sample Date						
Chemical Name						
Endrin	0.1	U	0.1	U	NS	
Endrin aldehyde	0.1	U	0.1	U	NS	
Endrin ketone	0.1	U	0.1	U	NS	
Heptachlor	0.05	U	0.05	U	NS	
Heptachlor epoxide	0.05	U	0.05	U	NS	
Methoxychlor	0.5	U	0.5	U	NS	
Toxaphene	5	U	5	U	NS	
alpha-BHC	0.05	U	0.05	U	NS	
alpha-Chlordane	0.05	U	0.05	U	NS	
beta-BHC	0.05	U	0.05	U	NS	
delta-BHC	0.05	U	0.05	U	NS	
gamma-BHC (Lindane)	0.05	U	0.05	U	NS	
gamma-Chlordane	0.05	U	0.05	U	NS	
Total Metals (UG/L)						
Aluminum	35.2	B	25.9	B	NS	
Antimony	1.6	U	1.6	U	NS	
Arsenic	2.8	B	2.5	B	NS	
Barium	65.6	J	64.1	J	NS	
Beryllium	0.2	U	0.2	U	NS	
Cadmium	0.7	U	0.7	U	NS	
Calcium	40,800		40,100		NS	
Chromium	4.8	J	4.8	J	NS	
Cobalt	1.5	U	1.5	U	NS	
Copper	2.9	U	2.9	U	NS	
Cyanide	NS		NS		NS	
Ferric iron	500	U	500	U	NS	
Ferrous iron	4,700		4,500		NS	
Iron	7,080		6,950		NS	
Lead	1.4	U	1.4	U	NS	
Magnesium	11,200		11,000		NS	
Manganese	500		492		NS	
Mercury	0.031	UL	0.031	UL	NS	
Nickel	1.7	U	1.7	U	NS	
Potassium	2,190	J	2,140	J	NS	

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UL

Table A-1-1
Raw Data
SWMU 2B - Ground Water
NAS Oceana, Virginia Beach, Virginia

	OW2B-MW20-R01		OW2B-MW20-R01-P		OW2B-MW20D-94B	
Sample Date						
Chemical Name						
Selenium	3.1	U	3.1	U	NS	
Silver	1.9	U	1.9	U	NS	
Sodium	28,800		28,100		NS	
Thallium	9.4	U	9.4	U	NS	
Vanadium	2.1	U	2.1	U	NS	
Zinc	9	B	12.3	B	NS	
Wet Chemistry (MG/L)						
Alkalinity	NS		110		NS	
Chloride	22		23		NS	
Cyanide	0.01	U	0.01	U	NS	
Dissolved oxygen	0.08		NS		NS	
Nitrate	0.5	U	0.5	U	NS	
Nitrite	0.5	U	0.5	U	NS	
Redox	-1		NS		NS	
Specific conductance	-1		NS		NS	
Sulfate	1.5		1.5		NS	
Sulfide	NS		0.16		NS	
Temperature	-1		NS		NS	
Total organic carbon (TOC)	4.6		4.6		NS	
Turbidity	-1		NS		NS	
pH	-1		NS		NS	

NS - Not sampled
B - Analyte not detected above associated blank
J - Reported value is estimated
JB
R - Unreli[illegible]esult

U - Analyte not detected
UJ - Not detected, quantitation limit may be inaccurate
UL

Table [illegible]1-2
Raw Data
SWMU 2B - Surface Water
NAS Oceana, Virginia Beach, Virginia

	OW2B-SW2-94A		OW2B-SW4-94		OW2B-SW5-94A		OW2B-SW6-94A		OW2B-SW60-94A	
Sample Date										
Chemical Name										
Volatile Organic Compounds (UG/L)										
1,1,1-Trichloroethane	5	U	5	U	5	U	5	U	5	U
1,1,2,2-Tetrachloroethane	5	U	5	U	5	U	5	U	5	U
1,1,2-Trichloroethane	5	U	5	U	5	U	5	U	5	U
1,1-Dichloroethane	5	U	1	J	5	U	5	U	5	U
1,1-Dichloroethene	5	U	5	U	5	U	5	U	5	U
1,2,3-Trichloropropane	5	U	5	U	5	U	5	U	5	U
1,2-Dichlorobenzene	5	U	5	U	5	U	5	U	5	U
1,2-Dichloroethane	10	U	5	U	5	U	5	U	5	U
1,2-Dichloroethene (total)	5	U	5	U	2	J	5	U	2	J
1,2-Dichloropropane	5	U	5	U	5	U	5	U	5	U
1,3-Dichlorobenzene	5	U	5	U	5	U	5	U	5	U
1,4-Dichlorobenzene	5	U	5	U	5	U	5	U	5	U
2-Butanone	5	U	10	U	10	U	10	U	10	U
2-Chloroethyl vinyl ether	10	U	10	U	10	U	10	U	10	U
2-Hexanone	10	U	10	U	10	U	10	U	10	U
4-Methyl-2-pentanone	10	U	10	U	10	U	10	U	10	U
Acetone	10	U	10	U	10	U	10	U	10	U
Acrolein	100	U	100	U	100	U	100	U	100	U
Acrylonitrile	100	U	100	U	100	U	100	U	100	U
Benzene	5	U	5	U	5	U	5	U	5	U
Bromodichloromethane	5	U	5	U	5	U	5	U	5	U
Bromoform	5	U	5	U	5	U	5	U	5	U
Bromomethane	10	U	10	U	10	U	10	U	10	U
Carbon disulfide	5	U	5	U	5	U	5	U	5	U
Carbon tetrachloride	5	U	5	U	5	U	5	U	5	U
Chlorobenzene	5	U	5	U	5	U	5	U	5	U
Chloroethane	10	U	10	U	10	U	10	U	10	U
Chloroform	5	U	5	U	5	U	5	U	5	U
Chloromethane	5	J	10	U	10	U	10	U	10	U
Dibromochloromethane	5	U	5	U	5	U	5	U	5	U
Dibromomethane	5	U	5	U	5	U	5	U	5	U
Dichlorodifluoromethane	10	U	10	U	10	U	10	U	10	U
Ethyl methacrylate	5	U	5	U	5	U	5	U	5	U
Ethylbenzene	5	U	5	U	5	U	5	U	5	U

NS - Not sampled
J - Reported value is estimated
U - Analyte not detected

Table A-1-2
Raw Data
SWMU 2B - Surface Water
NAS Oceana, Virginia Beach, Virginia

	OW2B-SW2-94A		OW2B-SW4-94		OW2B-SW5-94A		OW2B-SW6-94A		OW2B-SW60-94A	
Sample Date										
Chemical Name										
Iodomethane	10	U	10	U	10	U	10	U	10	U
Methylene chloride	5	U	5	U	5	U	5	U	5	U
Styrene	5	U	5	U	5	U	5	U	5	U
Tetrachloroethene	5	U	5	U	5	U	5	U	5	U
Toluene	5	U	1	J	5	U	5	U	5	U
Trichloroethene	5	U	5	U	1	J	5	U	1	J
Trichlorofluoromethane	5	U	5	U	5	U	5	U	5	U
Vinyl acetate	10	U	10	U	10	U	10	U	10	U
Vinyl chloride	2	U	1	J	1	J	2	U	1	J
Xylene, total	5	U	5	U	5	U	5	U	1	J
cis-1,3-Dichloropropene	5	U	5	U	5	U	5	U	5	U
trans-1,3-Dichloropropene	5	U	5	U	5	U	5	U	5	U
trans-1,4-Dichloro-2-butene	5	U	5	U	5	U	5	U	5	U

NS - Not sampled
J - Reported value is estimated
U - Analyte not detected

Table [illegible]-3
Raw Data
SWMU 2B - Sediment
NAS Oceana, Virginia Beach, Virginia

	OW2B-SD01	OW2B-SD02	OW2B-SD04	OW2B-SD1-94A	OW2B-SD2-94A	OW2B-SD30-94A	OW2B-SD4-94A
Sample Date							
Chemical Name							
Volatile Organic Compounds (UG/KG)							
1,1,1-Trichloroethane	NS	NS	NS	60 U	62 U	63 U	1.3 U
1,1,2,2-Tetrachloroethane	NS	NS	NS	60 U	62 U	63 U	1.3 U
1,1,2-Trichloroethane	NS	NS	NS	60 U	62 U	63 U	1.3 U
1,1-Dichloroethane	NS	NS	NS	60 U	62 U	63 U	1.3 U
1,1-Dichloroethene	NS	NS	NS	60 U	62 U	63 U	1.3 U
1,2-Dichlorobenzene	NS	NS	NS	60 U	62 U	63 U	1.3 U
1,2-Dichloroethane	NS	NS	NS	60 U	62 U	63 U	1.3 U
1,2-Dichloropropane	NS	NS	NS	60 U	62 U	63 U	1.3 U
1,3-Dichlorobenzene	NS	NS	NS	60 U	62 U	63 U	1.3 U
1,4-Dichlorobenzene	NS	NS	NS	60 U	62 U	63 U	1.3 U
2-Chloroethyl vinyl ether	NS	NS	NS	60 U	62 U	63 U	1.3 U
Bromodichloromethane	NS	NS	NS	60 U	62 U	63 U	1.3 U
Bromoform	NS	NS	NS	60 U	62 U	63 U	1.3 U
Bromomethane	NS	NS	NS	60 U	62 U	63 U	1.3 U
Carbon tetrachloride	NS	NS	NS	60 U	62 U	63 U	1.3 U
Chlorobenzene	NS	NS	NS	60 U	62 U	63 U	1.3 U
Chloroethane	NS	NS	NS	60 U	62 U	63 U	1.3 U
Chloroform	NS	NS	NS	60 U	62 U	63 U	1.3 U
Chloromethane	NS	NS	NS	60 U	62 U	63 U	1.3 U
Dibromochloromethane	NS	NS	NS	60 U	62 U	63 U	1.3 U
Dichlorodifluoromethane	NS	NS	NS	60 U	62 U	63 U	1.3 U
Methylene chloride	NS	NS	NS	60 U	62 U	63 U	1.3 U
Tetrachloroethene	NS	NS	NS	60 U	62 U	63 U	1.3 U
Trichloroethene	NS	NS	NS	60 U	62 U	63 U	1.3 U
Trichlorofluoromethane	NS	NS	NS	60 U	62 U	63 U	1.3 U
Vinyl chloride	NS	NS	NS	60 U	62 U	63 U	NS
cis-1,2-Dichloroethene	NS	NS	NS	60 U	62 U	63 U	1.3 U
cis-1,3-Dichloropropene	NS	NS	NS	60 U	62 U	63 U	1.3 U
trans-1,2-Dichloroethene	NS	NS	NS	60 U	62 U	63 U	1.3 U
trans-1,3-Dichloropropene	NS	NS	NS	60 U	62 U	63 U	1.3 U
Semi-volatile Organic Compounds (UG/KG)							
1,2,4-Trichlorobenzene	390 U	420 U	420 U	NS	NS	NS	NS
1,2-Dichlorobenzene	390 U	420 U	420 U	NS	NS	NS	NS

NS - Not sampled
J - Reported value is estimated
U - Analyte not detected

Table A-1-3
Raw Data
SWMU 2B - Sediment
NAS Oceana, Virginia Beach, Virginia

	OW2B-SD01	OW2B-SD02	OW2B-SD04	OW2B-SD1-94A	OW2B-SD2-94A	OW2B-SD30-94A	OW2B-SD4-94A
Sample Date							
Chemical Name							
1,3-Dichlorobenzene	390 U	420 U	420 U	NS	NS	NS	NS
1,4-Dichlorobenzene	390 U	420 U	420 U	NS	NS	NS	NS
1-Methylnaphthalene	NS	NS	NS	3,700 U	1,800 U	1,800 U	430
2,2'-Oxybis(1-chloropropane)	390 U	420 U	420 U	NS	NS	NS	NS
2,4,5-Trichlorophenol	390 U	420 U	420 U	NS	NS	NS	NS
2,4,6-Trichlorophenol	390 U	420 U	420 U	NS	NS	NS	NS
2,4-Dichlorophenol	390 U	420 U	420 U	NS	NS	NS	NS
2,4-Dimethylphenol	390 U	420 U	420 U	NS	NS	NS	NS
2,4-Dinitrophenol	950 U	1,000 U	1,000 U	NS	NS	NS	NS
2,4-Dinitrotoluene	390 U	420 U	420 U	NS	NS	NS	NS
2,6-Dinitrotoluene	390 U	420 U	420 U	NS	NS	NS	NS
2-Chloronaphthalene	390 U	420 U	420 U	NS	NS	NS	NS
2-Chlorophenol	390 U	420 U	420 U	NS	NS	NS	NS
2-Methylnaphthalene	57 J	420 U	420 U	3,700 U	1,800 U	1,800 U	420
2-Methylphenol	390 U	420 U	420 U	NS	NS	NS	NS
2-Nitroaniline	950 U	1,000 U	1,000 U	NS	NS	NS	NS
2-Nitrophenol	390 U	420 U	420 U	NS	NS	NS	NS
3,3'-Dichlorobenzidine	390 U	420 U	420 U	NS	NS	NS	NS
3-Nitroaniline	950 U	1,000 U	1,000 U	NS	NS	NS	NS
4,6-Dinitro-2-methylphenol	950 U	1,000 U	1,000 U	NS	NS	NS	NS
4-Bromophenyl-phenylether	390 U	420 U	420 U	NS	NS	NS	NS
4-Chloro-3-methylphenol	390 U	420 U	420 U	NS	NS	NS	NS
4-Chloroaniline	390 U	420 U	420 U	NS	NS	NS	NS
4-Chlorophenyl-phenylether	390 U	420 U	420 U	NS	NS	NS	NS
4-Methylphenol	390 U	420 U	420 U	NS	NS	NS	NS
4-Nitroaniline	950 U	1,000 U	1,000 U	NS	NS	NS	NS
4-Nitrophenol	950 U	1,000 U	1,000 U	NS	NS	NS	NS
Acenaphthene	73 J	420 U	420 U	3,700 U	1,800 U	1,800 U	350
Acenaphthylene	390 U	420 U	420 U	3,700 U	1,800 U	1,800 U	310 U
Anthracene	66 J	420 U	420 U	3,700 U	2,200	1,800 U	350
Benzo(a)anthracene	220 J	79 J	220 J	3,700 U	6,000	1,800 U	930
Benzo(a)pyrene	200 J	85 J	220 J	3,700 U	6,400	1,800 U	880
Benzo(b)fluoranthene	270 J	130 J	280 J	3,700 U	7,700	1,800 U	730
Benzo(g,h,i)perylene	150 J	69 J	200 J	3,700 U	3,200	1,800 U	410
Benzo(k)fluoranthene	77 J	49 J	120 J	3,700 U	6,500	1,800 U	510

NS - Not sampled
J - Reported value is estimated
U - Analyte not detected

Table [illegible]1-3
Raw Data
SWMU 2B - Sediment
NAS Oceana, Virginia Beach, Virginia

	OW2B-SD01	OW2B-SD02	OW2B-SD04	OW2B-SD1-94A	OW2B-SD2-94A	OW2B-SD30-94A	OW2B-SD4-94A
Sample Date							
Chemical Name							
Butylbenzylphthalate	64 J	420 U	150 J	NS	NS	NS	NS
Carbazole	54 J	420 U	420 U	NS	NS	NS	NS
Chrysene	290 J	140 J	320 J	3,700 U	7,900	1,800 U	1,000
Di-n-butylphthalate	390 U	420 U	170 J	NS	NS	NS	NS
Di-n-octylphthalate	390 U	420 U	420 U	NS	NS	NS	NS
Dibenz(a,h)anthracene	390 U	420 U	420 U	3,700 U	1,800 U	1,800 U	310 U
Dibenzofuran	46 J	420 U	420 U	NS	NS	NS	NS
Diethylphthalate	390 U	420 U	420 U	NS	NS	NS	NS
Dimethyl phthalate	390 U	420 U	420 U	NS	NS	NS	NS
Fluoranthene	520	160 J	480	3,700 U	13,000	1,800 U	2,300
Fluorene	60 J	420 U	420 U	3,700 U	1,800 U	1,800 U	320
Hexachlorobenzene	390 U	420 U	420 U	NS	NS	NS	NS
Hexachlorobutadiene	390 U	420 U	420 U	NS	NS	NS	NS
Hexachlorocyclopentadiene	390 U	420 U	420 U	NS	NS	NS	NS
Hexachloroethane	390 U	420 U	420 U	NS	NS	NS	NS
Indeno(1,2,3-cd)pyrene	130 J	61 J	150 J	3,700 U	5,100	1,800 U	500
Isophorone	390 U	420 U	420 U	NS	NS	NS	NS
Naphthalene	390 U	420 U	420 U	3,700 U	1,800 U	1,800 U	310 U
Nitrobenzene	390 U	420 U	420 U	NS	NS	NS	NS
Pentachlorophenol	950 U	1,000 U	1,000 U	NS	NS	NS	NS
Phenanthrene	490	100 J	210 J	3,700 U	7,400	1,800 U	2,100
Phenol	390 U	420 U	420 U	NS	NS	NS	NS
Pyrene	610	190 J	600	3,700 U	11,000	1,800 U	1,900
bis(2-Chloroethoxy)methane	390 U	420 U	420 U	NS	NS	NS	NS
bis(2-Chloroethyl)ether	390 U	420 U	420 U	NS	NS	NS	NS
bis(2-Ethylhexyl)phthalate	660	680	290 J	NS	NS	NS	NS
n-Nitroso-di-n-propylamine	390 U	420 U	420 U	NS	NS	NS	NS
n-Nitrosodiphenylamine	390 U	420 U	420 U	NS	NS	NS	NS
Wet Chemistry (MG/KG)							
Carbon	120 U	130 U	290	NS	NS	NS	NS

NS - Not sampled
J - Reported value is estimated
U - Analyte not detected

Table A-1-4
Raw Data
SWMU 2B - Surface Soil
NAS Oceana, Virginia Beach, Virginia

Sample Date	OW2B-SS01-00	OW2B-SS01-00-P	OW2B-SS02-00	OW2B-SS03-00
Chemical Name				
Volatile Organic Compounds (UG/KG)				
1,1,1-Trichloroethane	10 U	10 U	10 U	12.34 U
1,1,2,2-Tetrachloroethane	10 U	10 U	10 U	12.34 U
1,1,2-Trichloroethane	10 U	10 U	10 U	12.34 U
1,1-Dichloroethane	10 U	10 U	10 U	12.34 U
1,1-Dichloroethene	10 U	10 U	10 U	12.34 U
1,2-Dichloroethane	10 U	10 U	10 U	12.34 U
1,2-Dichloroethene (total)	10 U	10 U	10 U	12.34 U
1,2-Dichloropropane	10 U	10 U	10 U	12.34 U
2-Butanone	10 U	10 U	10 U	4 B
2-Hexanone	10 U	10 U	10 U	12.34 U
4-Methyl-2-pentanone	10 U	10 U	10 U	12.34 U
Acetone	7 B	8 B	6 J	9 B
Benzene	10 U	10 U	10 U	12.34 U
Bromochloromethane	50	50	50	50
Bromodichloromethane	10 U	10 U	10 U	12.34 U
Bromoform	10 U	10 U	10 U	12.34 U
Bromomethane	10 U	10 U	10 U	12.34 U
Carbon disulfide	10 U	10 U	10 U	12.34 U
Carbon tetrachloride	10 U	10 U	10 U	12.34 U
Chlorobenzene	10 U	10 U	10 U	12.34 U
Chloroethane	10 U	10 U	10 U	12.34 U
Chloroform	10 U	10 U	10 U	12.34 U
Chloromethane	10 U	10 U	10 U	12.34 U
Dibromochloromethane	10 U	10 U	10 U	12.34 U
Ethylbenzene	10 U	10 U	10 U	12.34 U
Methylene chloride	26 B	23 B	23 B	24 B
Styrene	10 U	10 U	10 U	12.34 U
Tetrachloroethene	10 U	10 U	10 U	12.34 U
Toluene	10 U	10 U	10 U	12.34 U
Trichloroethene	10 U	10 U	10 U	12.34 U
Vinyl chloride	10 U	10 U	10 U	12.34 U
Xylene, total	10 U	10 U	10 U	12.34 U
cis-1,2-Dichloroethene	10 U	10 U	10 U	12.34 U
cis-1,3-Dichloropropene	10 U	10 U	10 U	12.34 U

NS - Not sampled
BD
J - Reported value is estimated
L - Reported value may be biased low
U - Analyte not detected

UJ - Not detected, quantitation limit may be inaccurate
UL - Not detected, quantitation limit is probably higher

Table A-1-4
Raw Data
SWMU 2B - Surface Soil
NAS Oceana, Virginia Beach, Virginia

Sample Date	OW2B-SS01-00	OW2B-SS01-00-P	OW2B-SS02-00	OW2B-SS03-00
Chemical Name				
o-Xylene	10 U	10 U	10 U	12.34 U
trans-1,2-Dichloroethene	10 U	10 U	10 U	12.34 U
trans-1,3-Dichloropropene	10 U	10 U	10 U	12.34 U
Semi-volatile Organic Compounds (UG/KG)				
1,2,4-Trichlorobenzene	400 U	400 U	370 U	420 U
1,2-Dichlorobenzene	400 U	400 U	370 U	420 U
1,3-Dichlorobenzene	400 U	400 U	370 U	420 U
1,4-Dichlorobenzene	400 U	400 U	370 U	420 U
1-Methylnaphthalene	21 U	21 U	21 UJ	21 R
2,2'-Oxybis(1-chloropropane)	400 U	400 U	370 U	420 U
2,4,5-Trichlorophenol	1,000 U	1,000 U	930 U	1,000 U
2,4,6-Trichlorophenol	400 U	400 U	370 U	420 U
2,4-Dichlorophenol	400 U	400 U	370 U	420 U
2,4-Dimethylphenol	400 U	400 U	370 U	420 U
2,4-Dinitrophenol	1,000 U	1,000 U	930 U	1,000 U
2,4-Dinitrotoluene	400 U	400 U	370 U	420 U
2,6-Dinitrotoluene	400 U	400 U	370 U	420 U
2-Chloronaphthalene	400 U	400 U	370 U	420 U
2-Chlorophenol	400 U	400 U	370 U	420 U
2-Methylnaphthalene	21 U	21 U	21 UJ	420 U
2-Methylphenol	400 U	400 U	370 U	420 U
2-Nitroaniline	1,000 U	1,000 U	930 U	1,000 U
2-Nitrophenol	400 U	400 U	370 U	420 U
3,3'-Dichlorobenzidine	400 U	400 U	370 U	420 U
3-Nitroaniline	1,000 U	1,000 U	930 U	1,000 U
4,6-Dinitro-2-methylphenol	1,000 U	1,000 U	930 U	1,000 U
4-Bromophenyl-phenylether	400 U	400 U	370 U	420 U
4-Chloro-3-methylphenol	400 U	400 U	370 U	420 U
4-Chloroaniline	400 U	400 U	370 U	420 U
4-Chlorophenyl-phenylether	400 U	400 U	370 U	420 U
4-Methylphenol	400 U	400 U	370 U	420 U
4-Nitroaniline	1,000 U	1,000 U	930 U	1,000 U
4-Nitrophenol	1,000 U	1,000 U	930 U	1,000 U
Acenaphthene	21 U	21 U	21 UJ	420 U

NS - Not sampled
BD
J - Reported value is estimated
L - Reported value may be biased low
U - Analy' detected

UJ - Not detected, quantitation limit may be inaccurate
UL - Not detected, quantitation limit is probably higher

Table [illegible]-4
Raw Data
SWMU 2B - Surface Soil
NAS Oceana, Virginia Beach, Virginia

Sample Date	OW2B-SS01-00	OW2B-SS01-00-P	OW2B-SS02-00	OW2B-SS03-00
Chemical Name				
Acenaphthylene	41 U	41 U	42 UJ	420 U
Anthracene	2 U	2 U	2 UJ	420 U
Benzo(a)anthracene	2.5	19	25 K	140 J
Benzo(a)pyrene	9.9	22	28 K	100 L
Benzo(b)fluoranthene	8.6	22	33 K	57 L
Benzo(g,h,i)perylene	5.7	13	22 K	89 L
Benzo(k)fluoranthene	16	28	19 K	170 J
Butylbenzylphthalate	400 U	400 U	52 J	420 U
Carbazole	400 U	400 U	370 U	420 U
Chrysene	13	25	30 K	180 L
Di-n-butylphthalate	100 B	82 B	84 B	90 B
Di-n-octylphthalate	400 U	210 J	370 U	420 U
Dibenz(a,h)anthracene	4.1 U	4.1 U	4.2 UJ	420 U
Dibenzofuran	400 U	400 U	370 U	420 U
Diethylphthalate	400 U	390 J	370 U	420 U
Dimethyl phthalate	400 U	400 U	370 U	420 U
Fluoranthene	20	38	58 K	86 L
Fluorene	4.1 U	4.1 U	4.2 UJ	420 U
Hexachlorobenzene	400 U	400 U	370 U	420 U
Hexachlorobutadiene	400 U	400 U	370 U	420 U
Hexachlorocyclopentadiene	400 U	400 U	370 U	420 U
Hexachloroethane	400 U	400 U	370 U	420 U
Indeno(1,2,3-cd)pyrene	6	12	18 K	35 L
Isophorone	400 U	400 U	370 U	420 U
Naphthalene	21 U	21 U	21 UJ	420 U
Nitrobenzene	400 U	400 U	370 U	420 U
Pentachlorophenol	1,000 U	1,000 U	930 U	1,000 U
Phenanthrene	2 U	2 U	25 K	36 L
Phenol	400 U	400 U	370 U	420 U
Pyrene	16	25	44 K	160 L
bis(2-Chloroethoxy)methane	400 U	400 U	370 U	420 U
bis(2-Chloroethyl)ether	400 U	400 U	370 U	420 U
bis(2-Ethylhexyl)phthalate	58 J	400 U	130 J	690
n-Nitroso-di-n-propylamine	400 U	400 U	370 U	420 U
n-Nitrosodiphenylamine	400 U	400 U	370 U	420 U

NS - Not sampled
BD
J - Reported value is estimated
L - Reported value may be biased low
U - Analyte not detected

UJ - Not detected, quantitation limit may be inaccurate
UL - Not detected, quantitation limit is probably higher

Table A-1-4
Raw Data
SWMU 2B - Surface Soil
NAS Oceana, Virginia Beach, Virginia

Sample Date	OW2B-SS01-00	OW2B-SS01-00-P	OW2B-SS02-00	OW2B-SS03-00
Chemical Name				
Pesticide/Polychlorinated Biphenyls (UG/KG)				
4,4'-DDD	4 U	4.05 U	8.1 J	4.15 U
4,4'-DDE	4 U	4.05 U	5	13 J
4,4'-DDT	4 U	4.05 U	4.22 U	30 J
Aldrin	2.06 U	2.08 U	2.17 U	2.14 U
Aroclor-1016	39.98 U	40.47 U	42.17 U	41.5 U
Aroclor-1221	81.17 U	82.17 U	85.61 U	84.25 U
Aroclor-1232	39.98 U	40.47 U	42.17 U	41.5 U
Aroclor-1242	39.98 U	40.47 U	42.17 U	41.5 U
Aroclor-1248	39.98 U	40.47 U	42.17 U	41.5 U
Aroclor-1254	39.98 U	40.47 U	53	41.5 U
Aroclor-1260	39.98 U	40.47 U	42.17 U	41.5 U
Dieldrin	4 U	4.05 U	6.6	4.15 U
Endosulfan I	2.06 U	2.08 U	2.17 U	2.14 U
Endosulfan II	4 U	4.05 U	4.22 U	4.15 U
Endosulfan sulfate	4 U	4.05 U	4.22 U	4.15 U
Endrin	4 U	4.05 U	4.22 U	4.15 U
Endrin aldehyde	4 U	4.05 U	4.22 U	4.15 U
Endrin ketone	4 U	4.05 U	4.22 U	4.15 U
Heptachlor	2.06 U	2.08 U	2.17 U	2.14 U
Heptachlor epoxide	4.6 J	5	3.9 J	2.14 U
Methoxychlor	20.59 U	20.85 U	21.72 U	21.38 U
Toxaphene	205.94 U	208.49 U	217.22 U	213.76 U
alpha-BHC	2.06 U	2.08 U	2.17 U	2.14 U
alpha-Chlordane	3.1 J	3.1 J	2.17 U	2.14 U
beta-BHC	2.06 U	2.08 U	2.17 U	2.14 U
delta-BHC	2.06 U	2.08 U	2.17 U	2.14 U
gamma-BHC (Lindane)	2.06 U	2.08 U	2.17 U	2.14 U
gamma-Chlordane	3.4	3.1 J	2.6	2.14 U
Total Metals (MG/KG)				
Aluminum	11,000 J	9,760 J	10,700 J	10,600
Antimony	0.41 UL	0.5 UL	10 J	0.45 U
Arsenic	2.3	2.6	2.6	1.6 L

NS - Not sampled
BD
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L - Reported value may be biased low
U - Analy' \detected

UJ - Not detected, quantitation limit may be inaccurate
UL - Not detected, quantitation limit is probably higher

Table ..1-4
Raw Data
SWMU 2B - Surface Soil
NAS Oceana, Virginia Beach, Virginia

Sample Date	OW2B-SS01-00	OW2B-SS01-00-P	OW2B-SS02-00	OW2B-SS03-00
Chemical Name				
Barium	43.3 J	38.3 J	44.6 J	45.4
Beryllium	0.28 L	0.21 L	0.31 L	0.13 UL
Cadmium	0.27 J	0.25 J	1.2	0.45 B
Calcium	735 L	874 J	1,380 J	941 J
Chromium	13.2 J	11.2 J	782 J	13.7
Cobalt	1.9 J	1.9 J	2 J	1.7 J
Copper	5.3	5.3 J	7.1	9.2
Cyanide	0.02 UL	0.02 UL	0.03 UL	0.03 UL
Iron	4,040 J	3,450 J	4,040 J	4,800 L
Lead	17.5	16.2	2,760	28.2
Magnesium	614 J	559 J	872 J	731 J
Manganese	20.8 J	23.2 J	27 J	36.5
Mercury	0.05 B	0.05 B	0.61 K	0.05 J
Nickel	8.1	6.2 J	5.8 J	5.4 J
Potassium	366 L	343 L	351 L	426 J
Selenium	0.57 UL	0.69 UL	0.6 UL	0.61 UL
Silver	1 J	0.89 U	0.78 U	0.8 U
Sodium	72.1 B	86 B	67 B	77 B
Thallium	0.45 U	0.71 B	0.48 U	0.49 U
Vanadium	15.3	13.7	15.1	15.3
Zinc	34.2 J	32.5 J	69.1 J	25.9 B

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NS - Not sampled
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Table [illegible] 2-1
Raw Data
SWMU 11 - Surfacewater
NAS Oceana, Virginia Beach, Virginia

	OW11-SW01		OW11-SW01-P	
Sample Date				
Chemical Name				
Volatile Organic Compounds (UG/L)				
1,1,1-Trichloroethane	10	U	10	U
1,1,2,2-Tetrachloroethane	10	U	10	U
1,1,2-Trichloroethane	10	U	10	U
1,1-Dichloroethane	10	U	10	U
1,1-Dichloroethene	10	U	10	U
1,2-Dichloroethane	10	U	10	U
1,2-Dichloroethene (total)	10	U	10	U
1,2-Dichloropropane	10	U	10	U
2-Butanone	10	U	10	U
2-Hexanone	10	U	10	U
4-Methyl-2-pentanone	10	U	10	U
Acetone	10	U	10	U
Benzene	10	U	10	U
Bromochloromethane	50		50	
Bromodichloromethane	10	U	10	U
Bromoform	10	U	10	U
Bromomethane	10	U	10	U
Carbon disulfide	10	U	10	U
Carbon tetrachloride	10	U	10	U
Chlorobenzene	10	U	10	U
Chloroethane	10	U	10	U
Chloroform	10	U	10	U
Chloromethane	10	U	10	U
Dibromochloromethane	10	U	10	U
Ethylbenzene	10	U	10	U
Methylene chloride	3	B	2	B
Styrene	10	U	10	U
Tetrachloroethene	10	U	10	U
Toluene	10	U	10	U
Trichloroethene	10	U	10	U
Vinyl chloride	10	U	10	U
Xylene, total	10	U	10	U
cis-1,2-Dichloroethene	10	U	10	U
cis-1,3-Dichloropropene	10	U	10	U
o-Xylene	10	U	10	U

NS - Not sampled
B - Analyte not detected above associated blank
J - Reported value is estimated
L - Reported value may be biased low

Table A-2-1
Raw Data
SWMU 11 - Surfacewater
NAS Oceana, Virginia Beach, Virginia

	OW11-SW01		OW11-SW01-P	
Sample Date				
Chemical Name				
trans-1,2-Dichloroethene	10	U	10	U
trans-1,3-Dichloropropene	10	U	10	U
Semi-volatile Organic Compounds (UG/L)				
1,2,4-Trichlorobenzene	10	U	10	U
1,2-Dichlorobenzene	10	U	10	U
1,3-Dichlorobenzene	10	U	10	U
1,4-Dichlorobenzene	10	U	10	U
1-Methylnaphthalene	0.5	U	0.5	U
2,2'-Oxybis(1-chloropropane)	10	U	10	U
2,4,5-Trichlorophenol	25	U	25	U
2,4,6-Trichlorophenol	10	U	10	U
2,4-Dichlorophenol	10	U	10	U
2,4-Dimethylphenol	10	U	10	U
2,4-Dinitrophenol	25	U	25	U
2,4-Dinitrotoluene	10	U	10	U
2,6-Dinitrotoluene	10	U	10	U
2-Chloronaphthalene	10	U	10	U
2-Chlorophenol	10	U	10	U
2-Methylnaphthalene	0.5	U	0.5	U
2-Methylphenol	10	U	10	U
2-Nitroaniline	25	U	25	U
2-Nitrophenol	10	U	10	U
3,3'-Dichlorobenzidine	10	U	10	U
3-Nitroaniline	25	U	25	U
4,6-Dinitro-2-methylphenol	25	U	25	U
4-Bromophenyl-phenylether	10	U	10	U
4-Chloro-3-methylphenol	10	U	10	U
4-Chloroaniline	10	U	10	U
4-Chlorophenyl-phenylether	10	U	10	U
4-Methylphenol	10	U	10	U
4-Nitroaniline	25	U	25	U
4-Nitrophenol	25	U	25	U
Acenaphthene	0.5	U	0.5	U
Acenaphthylene	1	U	1	U
Anthracene	0.05	U	0.05	U

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Table ...-1
Raw Data
SWMU 11 - Surfacewater
NAS Oceana, Virginia Beach, Virginia

	OW11-SW01		OW11-SW01-P	
Sample Date				
Chemical Name				
Benzo(a)anthracene	0.05	U	0.05	U
Benzo(a)pyrene	0.05	U	0.05	U
Benzo(b)fluoranthene	0.1	U	0.1	U
Benzo(g,h,i)perylene	0.1	U	0.1	U
Benzo(k)fluoranthene	0.05	U	0.05	U
Butylbenzylphthalate	10	U	10	U
Carbazole	10	U	10	U
Chrysene	0.05	U	0.05	U
Di-n-butylphthalate	10	U	10	U
Di-n-octylphthalate	10	U	10	U
Dibenz(a,h)anthracene	0.1	U	0.1	U
Dibenzofuran	10	U	10	U
Diethylphthalate	10	U	10	U
Dimethyl phthalate	10	U	10	U
Fluoranthene	0.1	U	0.04	J
Fluorene	0.1	U	0.1	U
Hexachlorobenzene	10	U	10	U
Hexachlorobutadiene	10	U	10	U
Hexachlorocyclopentadiene	10	U	10	U
Hexachloroethane	10	U	10	U
Indeno(1,2,3-cd)pyrene	0.05	U	0.05	U
Isophorone	10	U	10	U
Naphthalene	0.5	U	0.5	U
Nitrobenzene	10	U	10	U
Pentachlorophenol	25	U	25	U
Phenanthrene	0.05	U	0.03	J
Phenol	10	U	10	U
Pyrene	0.05	U	0.05	U
bis(2-Chloroethoxy)methane	10	U	10	U
bis(2-Chloroethyl)ether	10	U	10	U
bis(2-Ethylhexyl)phthalate	10	U	10	U
n-Nitroso-di-n-propylamine	10	U	10	U
n-Nitrosodiphenylamine	10	U	10	U
Pesticide/Polychlorinated Biphenyls (UG/L)				
4,4'-DDD	0.1	U	0.1	U

NS - Not sampled
B - Analyte not detected above associated blank
J - Reported value is estimated
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Table A-2-1
Raw Data
SWMU 11 - Surfacewater
NAS Oceana, Virginia Beach, Virginia

	OW11-SW01		OW11-SW01-P	
Sample Date				
Chemical Name				
4,4'-DDE	0.1	U	0.1	U
4,4'-DDT	0.1	U	0.1	U
Aldrin	0.05	U	0.05	U
Aroclor-1016	1	U	1	U
Aroclor-1221	2	U	2	U
Aroclor-1232	1	U	1	U
Aroclor-1242	1	U	1	U
Aroclor-1248	1	U	1	U
Aroclor-1254	1	U	1	U
Aroclor-1260	1	U	1	U
Dieldrin	0.1	U	0.1	U
Endosulfan I	0.05	U	0.05	U
Endosulfan II	0.1	U	0.1	U
Endosulfan sulfate	0.1	U	0.1	U
Endrin	0.1	U	0.1	U
Endrin aldehyde	0.1	U	0.1	U
Endrin ketone	0.1	U	0.1	U
Heptachlor	0.05	U	0.05	U
Heptachlor epoxide	0.05	U	0.05	U
Methoxychlor	0.5	U	0.5	U
Toxaphene	5	U	5	U
alpha-BHC	0.05	U	0.05	U
alpha-Chlordane	0.05	U	0.05	U
beta-BHC	0.05	U	0.05	U
delta-BHC	0.05	U	0.05	U
gamma-BHC (Lindane)	0.05	U	0.05	U
gamma-Chlordane	0.05	U	0.05	U
Total Metals (UG/L)				
Aluminum	1,230		3,070	
Antimony	3.7	J	184	
Arsenic	3.4	UL	14.3	L
Barium	30.7	B	798	
Beryllium	0.66	UL	20.1	
Cadmium	0.34	B	20.7	
Calcium	3,820	J	6,320	

NS - Not sampled
B - Analyte not detected above associated blank
J - Reported value is estimated
L - Repor' ue may be biased low

Table . . 2-1
Raw Data
SWMU 11 - Surfacewater
NAS Oceana, Virginia Beach, Virginia

	OW11-SW01		OW11-SW01-P	
Sample Date				
Chemical Name				
Chromium	6.2	U	80.3	
Cobalt	6.2	U	187	
Copper	8.4	J	101	
Cyanide	0.2	UL	0.2	UL
Iron	1,010	J	1,600	J
Lead	3.8		12.4	
Magnesium	1,580		2,220	J
Manganese	88.1	J	284	J
Mercury	0.06	U	0.06	U
Nickel	7.9	J	188	
Potassium	3,900	J	4,830	J
Selenium	3	UL	4.9	J
Silver	3.9	U	19.3	
Sodium	5,970		7,130	
Thallium	2.4	U	18.8	
Vanadium	5.7	U	196	
Zinc	27.6	B	220	J

NS - Not sampled
B - Analyte not detected above associated blank
J - Reported value is estimated
L - Reported value may be biased low

Tabl_ _2-2
Raw Data
SWMU 11 - Sediment
NAS Oceana, Virginia Beach, Virginia

Sample Date	OW11-SD01	OW11-SD01-P	OW11-SD02	OW11-SD03
Chemical Name				
Volatile Organic Compounds (UG/KG)				
1,1,1-Trichloroethane	11.23 U	11.74 U	15.27 U	11.74 U
1,1,2,2-Tetrachloroethane	11.23 U	11.74 U	15.27 U	11.74 U
1,1,2-Trichloroethane	11.23 U	11.74 U	15.27 U	11.74 U
1,1-Dichloroethane	11.23 U	11.74 U	15.27 U	11.74 U
1,1-Dichloroethene	11.23 U	11.74 U	15.27 U	11.74 U
1,2-Dichloroethane	11.23 U	11.74 U	15.27 U	11.74 U
1,2-Dichloroethene (total)	11.23 U	11.74 U	15.27 U	11.74 U
1,2-Dichloropropane	11.23 U	11.74 U	15.27 U	11.74 U
2-Butanone	3 B	3 B	5 B	3 B
2-Hexanone	11.23 U	11.74 U	15.27 U	11.74 U
4-Methyl-2-pentanone	11.23 U	11.74 U	15.27 U	11.74 U
Acetone	12 B	31 B	10 B	4 B
Benzene	11.23 U	11.74 U	15.27 U	11.74 U
Bromochloromethane	50	50	50	50
Bromodichloromethane	11.23 U	11.74 U	15.27 U	11.74 U
Bromoform	11.23 U	11.74 U	15.27 U	11.74 U
Bromomethane	11.23 U	11.74 U	15.27 U	11.74 U
Carbon disulfide	11.23 U	11.74 U	15.27 U	11.74 U
Carbon tetrachloride	11.23 U	11.74 U	15.27 U	11.74 U
Chlorobenzene	11.23 UJ	11.74 UJ	15.27 UJ	11.74 UJ
Chloroethane	11.23 U	11.74 U	15.27 U	11.74 U
Chloroform	11.23 U	11.74 U	15.27 U	11.74 U
Chloromethane	11.23 U	11.74 U	15.27 U	11.74 U
Dibromochloromethane	11.23 U	11.74 U	15.27 U	11.74 U
Ethylbenzene	11.23 U	11.74 U	15.27 U	11.74 U
Methylene chloride	19 B	19 B	38 B	19 B
Styrene	11.23 U	11.74 U	15.27 U	11.74 U
Tetrachloroethene	11.23 U	11.74 U	15.27 U	11.74 U
Toluene	11.23 U	11.74 U	15.27 U	11.74 U
Trichloroethene	11.23 U	11.74 U	15.27 U	11.74 U
Vinyl chloride	11.23 U	11.74 U	15.27 U	11.74 U
Xylene, total	11.23 U	11.74 U	15.27 U	11.74 U
cis-1,2-Dichloroethene	11.23 U	11.74 U	15.27 U	11.74 U
cis-1,3-Dichloropropene	11.23 U	11.74 U	15.27 U	11.74 U
o-Xylene	11.23 U	11.74 U	15.27 U	11.74 U

NS - Not sampled
B - Analyte not detected above associated blank
J - Reported value is estimated
L - Reported value may be biased low
U - Analyte not detected

UJ - Not detected, quantitation limit may be inaccurate
UL

Table A-2-2
Raw Data
SWMU 11 - Sediment
NAS Oceana, Virginia Beach, Virginia

Sample Date	OW11-SD01	OW11-SD01-P	OW11-SD02	OW11-SD03
Chemical Name				
trans-1,2-Dichloroethene	11.23 U	11.74 U	15.27 U	11.74 U
trans-1,3-Dichloropropene	11.23 U	11.74 U	15.27 U	11.74 U
Semi-volatile Organic Compounds (UG/KG)				
1,2,4-Trichlorobenzene	400 U	400 U	530 U	390 U
1,2-Dichlorobenzene	400 U	400 U	530 U	390 U
1,3-Dichlorobenzene	400 U	400 U	530 U	390 U
1,4-Dichlorobenzene	400 U	400 U	530 U	390 U
1-Methylnaphthalene	20 U	20 U	27 U	20 U
2,2'-Oxybis(1-chloropropane)	400 U	400 U	530 U	390 U
2,4,5-Trichlorophenol	1,000 U	1,000 U	1,300 U	980 U
2,4,6-Trichlorophenol	400 U	400 U	530 U	390 U
2,4-Dichlorophenol	400 U	400 U	530 U	390 U
2,4-Dimethylphenol	400 U	400 U	530 U	390 U
2,4-Dinitrophenol	1,000 U	1,000 U	1,300 U	980 U
2,4-Dinitrotoluene	400 U	400 U	530 U	390 U
2,6-Dinitrotoluene	400 U	400 U	530 U	390 U
2-Chloronaphthalene	400 U	400 U	530 U	390 U
2-Chlorophenol	400 U	400 U	530 U	390 U
2-Methylnaphthalene	20 U	20 U	27 U	20 U
2-Methylphenol	400 U	400 U	530 U	390 U
2-Nitroaniline	1,000 U	1,000 U	1,300 U	980 U
2-Nitrophenol	400 U	400 U	530 U	390 U
3,3'-Dichlorobenzidine	400 U	400 U	530 U	390 U
3-Nitroaniline	1,000 U	1,000 U	1,300 U	980 U
4,6-Dinitro-2-methylphenol	1,000 U	1,000 U	1,300 U	980 U
4-Bromophenyl-phenylether	400 U	400 U	530 U	390 U
4-Chloro-3-methylphenol	400 U	400 U	530 U	390 U
4-Chloroaniline	400 U	400 U	530 U	390 U
4-Chlorophenyl-phenylether	400 U	400 U	530 U	390 U
4-Methylphenol	400 U	400 U	530 U	390 U
4-Nitroaniline	1,000 U	1,000 U	1,300 U	980 U
4-Nitrophenol	1,000 U	1,000 U	1,300 U	980 U
Acenaphthene	20 U	20 U	27 U	20 U
Acenaphthylene	40 U	40 U	53 U	39 U
Anthracene	2 U	2 U	3 U	2 U

NS - Not sampled
B - Analyte not detected above associated blank
J - Reported value is estimated
L - Report value may be biased low
U - Analy detected

UJ - Not detected, quantitation limit may be inaccurate
UL

Table ..-2-2
Raw Data
SWMU 11 - Sediment
NAS Oceana, Virginia Beach, Virginia

Sample Date	OW11-SD01	OW11-SD01-P	OW11-SD02	OW11-SD03
Chemical Name				
Benzo(a)anthracene	2 U	2 U	3 U	2 U
Benzo(a)pyrene	1.5 J	2 U	3 U	2 U
Benzo(b)fluoranthene	4 U	4 U	5.3 U	3.9 U
Benzo(g,h,i)perylene	5.4	4 U	5.3 U	3.9 U
Benzo(k)fluoranthene	1 J	2 U	3 U	2 U
Butylbenzylphthalate	400 U	400 U	530 U	390 U
Carbazole	400 U	400 U	530 U	390 U
Chrysene	2 U	2 U	3 U	2 U
Di-n-butylphthalate	82 B	62 B	140 B	53 B
Di-n-octylphthalate	400 U	400 U	530 U	390 U
Dibenz(a,h)anthracene	4 U	4 U	5.3 U	3.9 U
Dibenzofuran	400 U	400 U	530 U	390 U
Diethylphthalate	400 U	400 U	530 U	390 U
Dimethyl phthalate	400 U	400 U	530 U	390 U
Fluoranthene	4 U	4 U	8.8	3.9 U
Fluorene	4 U	4	14	8.2
Hexachlorobenzene	400 U	400 U	530 U	390 U
Hexachlorobutadiene	400 U	400 U	530 U	390 U
Hexachlorocyclopentadiene	400 U	400 U	530 U	390 U
Hexachloroethane	400 U	400 U	530 U	390 U
Indeno(1,2,3-cd)pyrene	1.8 J	2 U	4	2 U
Isophorone	400 U	400 U	530 U	390 U
Naphthalene	20 U	20 U	27 U	20 U
Nitrobenzene	400 U	400 U	530 U	390 U
Pentachlorophenol	1,000 U	1,000 U	1,300 U	980 U
Phenanthrene	2 U	2 U	3 U	2 U
Phenol	400 U	400 U	530 U	390 U
Pyrene	2 U	2 U	3 U	2 U
bis(2-Chloroethoxy)methane	400 U	400 U	530 U	390 U
bis(2-Chloroethyl)ether	400 U	400 U	530 U	390 U
bis(2-Ethylhexyl)phthalate	400 U	400 U	58 J	390 U
n-Nitroso-di-n-propylamine	400 U	400 U	530 U	390 U
n-Nitrosodiphenylamine	400 U	400 U	530 U	390 U
Pesticide/Polychlorinated Biphenyls (UG/KG)				
4,4'-DDD	4 U	4.03 U	5.27 U	3.9 U

NS - Not sampled
B - Analyte not detected above associated blank
J - Reported value is estimated
L - Reported value may be biased low
U - Analyte not detected

UJ - Not detected, quantitation limit may be inaccurate
UL

Table A-2-2
Raw Data
SWMU 11 - Sediment
NAS Oceana, Virginia Beach, Virginia

Sample Date	OW11-SD01	OW11-SD01-P	OW11-SD02	OW11-SD03
Chemical Name				
4,4'-DDE	4 U	4.03 U	5.27 U	3.9 U
4,4'-DDT	4 U	4.03 U	5.27 U	3.9 U
Aldrin	2.06 U	2.08 U	2.71 U	2.01 U
Aroclor-1016	39.98 U	40.34 U	52.7 U	39.03 U
Aroclor-1221	81.17 U	81.9 U	106.99 U	79.23 U
Aroclor-1232	39.98 U	40.34 U	52.7 U	39.03 U
Aroclor-1242	39.98 U	40.34 U	52.7 U	39.03 U
Aroclor-1248	39.98 U	40.34 U	52.7 U	39.03 U
Aroclor-1254	39.98 U	40.34 U	52.7 U	39.03 U
Aroclor-1260	39.98 U	40.34 U	52.7 U	39.03 U
Dieldrin	4 U	4.03 U	5.27 U	3.9 U
Endosulfan I	2.06 U	2.08 U	2.71 U	2.01 U
Endosulfan II	4 U	4.03 U	5.27 U	3.9 U
Endosulfan sulfate	4 U	4.03 U	5.27 U	3.9 U
Endrin	4 U	4.03 U	5.27 U	3.9 U
Endrin aldehyde	4 U	4.03 U	5.27 U	3.9 U
Endrin ketone	4 U	4.03 U	5.27 U	3.9 U
Heptachlor	2.06 U	2.08 U	2.71 U	2.01 U
Heptachlor epoxide	2.06 U	2.08 U	2.71 U	2.01 U
Methoxychlor	20.59 U	20.78 U	27.15 U	20.1 U
Toxaphene	205.94 U	207.8 U	271.48 U	201.04 U
alpha-BHC	2.06 U	2.08 U	2.71 U	2.01 U
alpha-Chlordane	2.06 U	2.08 U	2.71 U	2.01 U
beta-BHC	2.06 U	2.08 U	2.71 U	2.01 U
delta-BHC	2.06 U	2.08 U	2.71 U	2.01 U
gamma-BHC (Lindane)	2.06 U	2.08 U	2.71 U	2.01 U
gamma-Chlordane	2.06 U	2.08 U	2.71 U	2.01 U
Total Metals (MG/KG)				
Aluminum	1,620	950	9,750	6,560
Antimony	0.44 U	0.51 U	0.6 U	0.44 U
Arsenic	0.69 UL	0.78 UL	1.5 L	1.4 L
Barium	6.9 B	4.2 B	51.7 J	32.4 J
Beryllium	0.13 UL	0.15 UL	0.21 L	0.23 L
Cadmium	0.12 B	0.09 B	0.46 B	0.15 B
Calcium	187 B	114 B	1,160 J	234 B

NS - Not sampled
B - Analyte not detected above associated blank
J - Reported value is estimated
L - Reporte lue may be biased low
U - Analyt etected

UJ - Not detected, quantitation limit may be inaccurate
UL

Table . . 2-2
Raw Data
SWMU 11 - Sediment
NAS Oceana, Virginia Beach, Virginia

Sample Date	OW11-SD01	OW11-SD01-P	OW11-SD02	OW11-SD03
Chemical Name				
Chromium	2.8	1.6 J	12.5	7.9
Cobalt	1.3 U	1.4 U	1.7 U	1.2 U
Copper	1.8 J	1.8 J	6.6 J	3.8 J
Cyanide	0.02 UL	0.02 UL	0.03 U	0.02 L
Iron	676 L	441 L	3,140 L	2,160 L
Lead	3	1.5	22	72.3
Magnesium	115 J	64.8 J	625 J	279 J
Manganese	6.3	3.1 J	39.5	7.2
Mercury	0.03 J	0.04 J	0.07 J	0.03 J
Nickel	1.3 J	1.4 J	6.2 J	3.9 J
Potassium	105 B	51.7 B	527 J	153 B
Selenium	0.6 UL	0.69 UL	0.82 UL	0.6 UL
Silver	0.79 U	0.9 U	1.1 U	0.78 U
Sodium	29.4 B	48.2 B	65 B	43.7 B
Thallium	0.48 U	0.55 U	0.79 J	0.48 U
Vanadium	2 J	1.5 J	14.1	8.5 J
Zinc	7.1 B	5.3 B	32.5 B	8.3 B

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NS - Not sampled
B - Analyte not detected above associated blank
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U - Analyte not detected

UJ - Not detected, quantitation limit may be inaccurate
UL

Table A-2-3
Raw Data
SWMU 11 - Surface Soil
NAS Oceana, Virginia Beach, Virginia

Sample Date	OW11-SS10-1-94A	OW11-SS11-94A	OW11-SS12-94A	OW11-SS13-94A	OW11-SS14-94A
Chemical Name					
Volatile Organic Compounds (UG/KG)					
1,1,1-Trichloroethane	6 U	NS	NS	NS	NS
1,1,2,2-Tetrachloroethane	6 U	NS	NS	NS	NS
1,1,2-Trichloroethane	6 U	NS	NS	NS	NS
1,1-Dichloroethane	6 U	NS	NS	NS	NS
1,1-Dichloroethene	6 U	NS	NS	NS	NS
1,2,3-Trichloropropane	6 U	NS	NS	NS	NS
1,2-Dichlorobenzene	6 U	NS	NS	NS	NS
1,2-Dichloroethane	6 U	NS	NS	NS	NS
1,2-Dichloroethene (total)	6 U	NS	NS	NS	NS
1,2-Dichloropropane	6 U	NS	NS	NS	NS
1,3-Dichlorobenzene	6 U	NS	NS	NS	NS
1,4-Dichlorobenzene	6 U	NS	NS	NS	NS
2-Butanone	11 U	NS	NS	NS	NS
2-Chloroethyl vinyl ether	11 U	NS	NS	NS	NS
2-Hexanone	11 U	NS	NS	NS	NS
4-Methyl-2-pentanone	11 U	NS	NS	NS	NS
Acetone	65	NS	NS	NS	NS
Acrolein	110 U	NS	NS	NS	NS
Acrylonitrile	110 U	NS	NS	NS	NS
Benzene	6 U	NS	NS	NS	NS
Bromodichloromethane	6 U	NS	NS	NS	NS
Bromoform	6 U	NS	NS	NS	NS
Bromomethane	11 U	NS	NS	NS	NS
Carbon disulfide	6 U	NS	NS	NS	NS
Carbon tetrachloride	6 U	NS	NS	NS	NS
Chlorobenzene	6 U	NS	NS	NS	NS
Chloroethane	11 U	NS	NS	NS	NS
Chloroform	6 U	NS	NS	NS	NS
Chloromethane	11 U	NS	NS	NS	NS
Dibromochloromethane	6 U	NS	NS	NS	NS
Dibromomethane	6 U	NS	NS	NS	NS
Dichlorodifluoromethane	NS	NS	NS	NS	NS
Ethyl methacrylate	6 U	NS	NS	NS	NS
Ethylbenzene	6 U	NS	NS	NS	NS
Iodomethane	11 U	NS	NS	NS	NS

NS - Not sampled
BD
J - Reported value is estimated
L - Reported value may be biased low
U - Analyte not detected

UJ - Not detected, quantitation limit may be inaccurate
UL - Not detected, quantitation limit is probably higher

Table A-2-3
Raw Data
SWMU 11 - Surface Soil
NAS Oceana, Virginia Beach, Virginia

Sample Date	OW11-SS10-1-94A	OW11-SS11-94A	OW11-SS12-94A	OW11-SS13-94A	OW11-SS14-94A
Chemical Name					
Methylene chloride	15 B	NS	NS	NS	NS
Styrene	6 U	NS	NS	NS	NS
Tetrachloroethene	6 U	NS	NS	NS	NS
Toluene	2 J	NS	NS	NS	NS
Trichloroethene	6 U	NS	NS	NS	NS
Trichlorofluoromethane	6 U	NS	NS	NS	NS
Vinyl acetate	11 U	NS	NS	NS	NS
Vinyl chloride	2 U	NS	NS	NS	NS
Xylene, total	2 J	NS	NS	NS	NS
cis-1,3-Dichloropropene	6 U	NS	NS	NS	NS
trans-1,3-Dichloropropene	6 U	NS	NS	NS	NS
trans-1,4-Dichloro-2-butene	6 U	NS	NS	NS	NS
Semi-volatile Organic Compounds (UG/KG)					
1-Methylnaphthalene	110 U	NS	NS	NS	NS
2-Methylnaphthalene	110 U	NS	NS	NS	NS
Acenaphthene	110 U	NS	NS	NS	NS
Acenaphthylene	110 U	NS	NS	NS	NS
Anthracene	110 U	NS	NS	NS	NS
Benzo(a)anthracene	110 U	NS	NS	NS	NS
Benzo(a)pyrene	110 U	NS	NS	NS	NS
Benzo(b)fluoranthene	110 U	NS	NS	NS	NS
Benzo(g,h,i)perylene	110 U	NS	NS	NS	NS
Benzo(k)fluoranthene	110 U	NS	NS	NS	NS
Chrysene	110 U	NS	NS	NS	NS
Dibenz(a,h)anthracene	110 U	NS	NS	NS	NS
Fluoranthene	110 U	NS	NS	NS	NS
Fluorene	110 U	NS	NS	NS	NS
Indeno(1,2,3-cd)pyrene	110 U	NS	NS	NS	NS
Naphthalene	110 U	NS	NS	NS	NS
Phenanthrene	110 U	NS	NS	NS	NS
Pyrene	110 U	NS	NS	NS	NS
Total Petroleum Hydrocarbons (MG/KG)					
Total petroleum hydrocarbons (TPH)	325	14.4	607	250	207

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NS - Not sampled
BD
J - Reported value is estimated
L - Report· ·lue may be biased low
U - Analy· ·letected

UJ - Not detected, quantitation limit may be inaccurate
UL - Not detected, quantitation limit is probably higher

Table -3-1
Raw Data
SWMU 16 - Surface Water
NAS Oceana, Virginia Beach, Virginia

	OW16-SW01
Sample Date	
Chemical Name	
Pesticide/Polychlorinated Biphenyls (UG/L)	
4,4'-DDD	0.1 U
4,4'-DDE	0.1 U
4,4'-DDT	0.1 U
Aldrin	0.05 U
Dieldrin	0.1 U
Endosulfan I	0.05 U
Endosulfan II	0.1 U
Endosulfan sulfate	0.1 U
Endrin	0.1 U
Endrin aldehyde	0.1 U
Endrin ketone	0.1 U
Heptachlor	0.05 U
Heptachlor epoxide	0.05 U
Methoxychlor	0.5 U
Toxaphene	5 U
alpha-BHC	0.05 U
alpha-Chlordane	0.05 U
beta-BHC	0.05 U
delta-BHC	0.05 U
gamma-BHC (Lindane)	0.05 U
Total Metals (UG/L)	
Aluminum	196 B
Antimony	2.2 U
Arsenic	3.4 UL
Barium	37 J
Beryllium	0.66 UL
Cadmium	0.34 U
Calcium	12,200
Chromium	6.2 U
Cobalt	6.2 U
Copper	5.4 U
Cyanide	0.2 UL
Iron	1,720 J

NS - Not sampled
B - Analyte not detected above associated blank
J - Reported value is estimated
L - Reported value may be biased low
U - Analyte not detected

UL - Not detected, quantitation limit is probably higher

Table A-3-1
Raw Data
SWMU 16 - Surface Water
NAS Oceana, Virginia Beach, Virginia

Sample Date	OW16-SW01
Chemical Name	
Lead	1.4 U
Magnesium	3,420 J
Manganese	236 J
Mercury	0.06 U
Nickel	6 U
Potassium	4,650 J
Selenium	3 UL
Silver	3.9 U
Sodium	11,100
Thallium	2.4 U
Vanadium	5.7 U
Zinc	36.8 B

WDC003670364.ZIP

NS - Not sampled
B - Analyte not detected above associated blank
J - Reported value is estimated
L - Reported value may be biased low
U - Analy' detected

UL - Not detected, quantitation limit is probably higher

Table _3-2
Raw Data
SWMU 16 - Sediment
NAS Oceana, Virginia Beach, Virginia

	OW16-SD01	
Sample Date		
Chemical Name		
Pesticide/Polychlorinated Biphenyls (UG/KG)		
4,4'-DDD	46	J
4,4'-DDE	16	J
4,4'-DDT	26	J
Aldrin	6.99	U
Dieldrin	13.57	U
Endosulfan I	6.99	U
Endosulfan II	13.57	U
Endosulfan sulfate	13.57	U
Endrin	13.57	U
Endrin aldehyde	13.57	U
Endrin ketone	13.57	U
Heptachlor	6.99	U
Heptachlor epoxide	6.99	U
Methoxychlor	69.9	U
Toxaphene	699.01	U
alpha-BHC	6.99	U
alpha-Chlordane	11	J
beta-BHC	6.99	U
delta-BHC	6.99	U
gamma-BHC (Lindane)	6.99	U
Total Metals (MG/KG)		
Aluminum	16,000	
Antimony	1	U
Arsenic	4	L
Barium	108	
Beryllium	0.44	L
Cadmium	1.1	J
Calcium	4,200	
Chromium	26.6	
Cobalt	4.6	J
Copper	26.9	
Cyanide	0.05	U
Iron	8,590	L

NS - Not sampled
J - Reported value is estimated
L - Reported value may be biased low
U - Analyte not detected
UL - Not detected, quantitation limit is probably higher

Table A-3-2
Raw Data
SWMU 16 - Sediment
NAS Oceana, Virginia Beach, Virginia

	OW16-SD01	
Sample Date		
Chemical Name		
Lead	27.2	
Magnesium	2,710	
Manganese	138	
Mercury	0.15	J
Nickel	13.5	J
Potassium	1,370	J
Selenium	1.4	UL
Silver	1.8	U
Sodium	218	J
Thallium	1.1	U
Vanadium	30.6	
Zinc	169	

NS - Not sampled
J - Reported value is estimated
L - Reported value may be biased low
U - Analyte not detected
UL - Not d[illegible]ed, quantitation limit is probably higher

Table A-3-3
Raw Data
SWMU 16 - Surface Soil
NAS Oceana, Virginia Beach, Virginia

Sample Date	OW16-SS01-00
Chemical Name	
Pesticide/Polychlorinated Biphenyls (UG/KG)	
4,4'-DDD	12 J
4,4'-DDE	23
4,4'-DDT	110
Aldrin	2.13 U
Chlordane	NS
Dieldrin	45
Endosulfan I	2.13 U
Endosulfan II	4.14 U
Endosulfan sulfate	4.14 U
Endrin	4.14 U
Endrin aldehyde	4.14 U
Endrin ketone	4.14 U
Heptachlor	2.13 U
Heptachlor epoxide	3.8 J
Methoxychlor	21.31 U
Toxaphene	213.06 U
alpha-BHC	2.13 U
alpha-Chlordane	11
beta-BHC	2.13 U
delta-BHC	2.13 U
gamma-BHC (Lindane)	2.13 U
Total Metals (MG/KG)	
Aluminum	12,100
Antimony	1.4 J
Arsenic	89.5
Barium	111
Beryllium	0.28 L
Cadmium	0.07 U
Calcium	1,950
Chromium	51.8
Cobalt	9.6 J
Copper	86.9
Cyanide	0.02 UL

NS - Not sampled
B - Analyte not detected above associated blank
J - Reported value is estimated
L - Reported value may be biased low
U - Analyte not detected

UL - Not detected, quantitation limit is probably higher

Table A-3-3
Raw Data
SWMU 16 - Surface Soil
NAS Oceana, Virginia Beach, Virginia

	OW16-SS01-00
Sample Date	
Chemical Name	
Iron	29,100 L
Lead	10.2
Magnesium	4,430
Manganese	339
Mercury	0.04 J
Nickel	27
Potassium	4,770
Selenium	0.63 UL
Silver	6.8
Sodium	120 B
Thallium	0.57 J
Vanadium	36.7
Zinc	198

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NS - Not sampled
B - Analyte not detected above associated blank
J - Reported value is estimated
L - Reported value may be biased low
U - Analyt detected

UL - Not detected, quantitation limit is probably higher

Table A-4-1
Raw Data
SWMU 16GC - Surfacewater
NAS Oceana, Virginia Beach, Virginia

	OW16GC-SW01		OW16GC-SW02	
Sample Date				
Chemical Name				
Pesticide/Polychlorinated Biphenyls (UG/L)				
4,4'-DDD	0.1	UL	0.1	U
4,4'-DDE	0.1	U	0.1	U
4,4'-DDT	0.1	UL	0.1	U
Aldrin	0.05	UL	0.05	U
Dieldrin	0.1	UL	0.1	U
Endosulfan I	0.05	UL	0.05	U
Endosulfan II	0.1	UL	0.1	U
Endosulfan sulfate	0.1	UL	0.1	U
Endrin	0.1	UL	0.1	U
Endrin aldehyde	0.1	UL	0.1	U
Endrin ketone	0.1	UL	0.1	U
Heptachlor	0.05	UL	0.05	U
Heptachlor epoxide	0.05	UL	0.05	U
Methoxychlor	0.5	UL	0.5	U
Toxaphene	5	UL	5	U
alpha-BHC	0.05	UL	0.05	U
alpha-Chlordane	0.05	UL	0.05	U
beta-BHC	0.05	UL	0.05	U
delta-BHC	0.05	UL	0.05	U
gamma-BHC (Lindane)	0.05	UL	0.05	U
gamma-Chlordane	0.05	UL	0.05	U
Total Metals (UG/L)				
Aluminum	514		544	
Antimony	2.2	U	2.2	U
Arsenic	23.7		14.4	L
Barium	12.7	B	22.4	B
Beryllium	0.66	UL	0.66	UL
Cadmium	0.56	B	0.5	B
Calcium	10,400		13,100	
Chromium	6.2	U	6.2	U
Cobalt	6.2	U	6.2	U
Copper	11.4	J	7.6	J
Cyanide	3.1	L	0.2	UL

NS - Not sampled
B - Analyte not detected above associated blank
J - Reported value is estimated
L - Reported value may be biased low

Table A-4-1
Raw Data
SWMU 16GC - Surfacewater
NAS Oceana, Virginia Beach, Virginia

	OW16GC-SW01		OW16GC-SW02	
Sample Date				
Chemical Name				
Iron	380	J	552	J
Lead	1.5	J	1.4	U
Magnesium	2,500	J	3,170	J
Manganese	34.4	J	106	J
Mercury	0.06	U	0.06	U
Nickel	8.3	J	6	U
Potassium	11,900		10,900	
Selenium	3	UL	3	UL
Silver	3.9	U	3.9	U
Sodium	5,280		6,110	
Thallium	2.4	U	2.4	U
Vanadium	5.7	U	5.7	U
Zinc	265	J	119	B

NS - Not sampled
B - Analyte not detected above associated blank
J - Reported value is estimated
L - Reportr 'ue may be biased low

Table ‑2
Raw Data
SWMU 16GC- Sediment
NAS Oceana, Virginia Beach, Virginia

	OW16GC-SD01		OW16GC-SD02	
Sample Date				
Chemical Name				
Pesticide/Polychlorinated Biphenyls (UG/KG)				
4,4'-DDD	5.61	U	5.43	U
4,4'-DDE	5.61	U	5.43	U
4,4'-DDT	7.4	J	5.43	U
Aldrin	2.89	U	2.8	U
Dieldrin	5.61	U	5.43	U
Endosulfan I	2.89	U	2.8	U
Endosulfan II	5.61	U	5.43	U
Endosulfan sulfate	5.61	U	5.43	U
Endrin	5.61	U	5.43	U
Endrin aldehyde	5.61	U	5.43	U
Endrin ketone	5.61	U	5.43	U
Heptachlor	2.89	U	2.8	U
Heptachlor epoxide	2.89	U	2.8	U
Methoxychlor	28.92	U	27.96	U
Toxaphene	289.25	U	279.61	U
alpha-BHC	2.89	U	2.8	U
alpha-Chlordane	2.89	U	6	J
beta-BHC	2.89	U	2.8	U
delta-BHC	2.89	U	2.8	U
gamma-BHC (Lindane)	2.89	U	2.8	U
gamma-Chlordane	2.89	U	2.8	U
Total Metals (MG/KG)				
Aluminum	10,900		9,290	
Antimony	1.1	J	0.78	U
Arsenic	9.4		6.2	L
Barium	45.1	J	39.6	J
Beryllium	0.18	UL	0.23	UL
Cadmium	0.62	B	0.56	B
Calcium	1,220	J	1,690	J
Chromium	15.9		14.3	
Cobalt	1.7	U	2.2	U
Copper	10.2		15.1	
Cyanide	0.03	UL	0.04	UL

NS - Not sampled
B - Analyte not detected above associated blank
J - Reported value is estimated
L - Reported value may be biased low

Table A-4-2
Raw Data
SWMU 16GC- Sediment
NAS Oceana, Virginia Beach, Virginia

	OW16GC-SD01		OW16GC-SD02	
Sample Date				
Chemical Name				
Iron	4,860	L	4,310	L
Lead	16.6	L	12.6	
Magnesium	906	B	847	J
Manganese	47.5	J	44.3	
Mercury	0.12	B	0.11	J
Nickel	5.8	J	4.3	J
Potassium	793	J	654	J
Selenium	0.83	J	1.1	UL
Silver	1.1	UL	1.4	U
Sodium	94.8	B	124	B
Thallium	0.66	U	0.85	U
Vanadium	15		13.3	J
Zinc	101		81.8	

NS - Not sampled
B - Analyte not detected above associated blank
J - Reported value is estimated
L - Repor' 'ue may be biased low

Table [illegible]-3
Raw Data
SWMU 16GC - Surface Soil
NAS Oceana, Virginia Beach, Virginia

	OW16GC-SS1-93A		OW16GC-SS2-93A		OW16GC-SS3-93A		OW16GC-SS4-93A	
Sample Date								
Chemical Name								
Pesticide/Polychlorinated Biphenyls (UG/KG)								
4,4'-DDD	3.3	U	92	U	15	J	14	
4,4'-DDE	1.7	U	47	U	23		26	
4,4'-DDT	3.3	U	92	U	9.2	J	12	
Aldrin	1.7	U	47	U	8.3	U	4.2	U
Chlordane	17	U	470	U	83	U	40	J
Dieldrin	1.7	U	47	U	8.3	U	4.2	U
Endosulfan I	1.7	U	47	U	8.3	U	4.2	U
Endosulfan II	3.3	U	92	U	16	U	8.1	U
Endosulfan sulfate	3.3	U	92	U	16	U	8.1	U
Endrin	3.3	U	92	U	16	U	8.1	U
Endrin aldehyde	3.3	U	92	U	16	U	8.1	U
Heptachlor	1.7	U	47	U	8.3	U	4.2	U
Heptachlor epoxide	1.7	U	47	U	8.3	U	4.2	U
Methoxychlor	6.9	U	190	U	33	U	17	U
Toxaphene	85	U	2,300	U	410	U	210	U
alpha-BHC	1.7	U	47	U	8.3	U	4.2	U
beta-BHC	3.3	U	92	U	16	U	8.1	U
delta-BHC	1.7	U	47	U	8.3	U	4.2	U
gamma-BHC (Lindane)	1.7	U	47	U	8.3	U	4.2	U

NS - Not sampled
J - Reported value is estimated
U - Analyte not detected

Table [illegible]-1
Raw Data
SWMU 21 - Surface Soil
NAS Oceana, Virginia Beach, Virginia

Sample Date	OW21-SS1-93A	OW21-SS10-93A	OW21-SS11	OW21-SS12	OW21-SS12P	OW21-SS13	OW21-SS13P	OW21-SS2-93A	OW21-SS3-93A	OW21-SS4-93A
Chemical Name										
Semi-volatile Organic Compounds (UG/KG)										
1,2,4-Trichlorobenzene	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
1,2-Dichlorobenzene	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
1,3-Dichlorobenzene	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
1,4-Dichlorobenzene	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
2,2'-Oxybis(1-chloropropane)	NS	NS	430 UJ	450 U	460 UJ	420 UJ	410 UJ	NS	NS	NS
2,4,5-Trichlorophenol	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
2,4,6-Trichlorophenol	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
2,4-Dichlorophenol	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
2,4-Dimethylphenol	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
2,4-Dinitrophenol	NS	NS	1,000 U	1,100 U	1,100 U	1,000 U	1,000 U	NS	NS	NS
2,4-Dinitrotoluene	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
2,6-Dinitrotoluene	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
2-Chloronaphthalene	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
2-Chlorophenol	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
2-Methylnaphthalene	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
2-Methylphenol	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
2-Nitroaniline	NS	NS	1,000 U	1,100 U	1,100 U	1,000 U	1,000 U	NS	NS	NS
2-Nitrophenol	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
3,3'-Dichlorobenzidine	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
3-Nitroaniline	NS	NS	1,000 U	1,100 U	1,100 U	1,000 U	1,000 U	NS	NS	NS
4,6-Dinitro-2-methylphenol	NS	NS	1,000 U	1,100 U	1,100 U	1,000 U	1,000 U	NS	NS	NS
4-Bromophenyl-phenylether	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
4-Chloro-3-methylphenol	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
4-Chloroaniline	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
4-Chlorophenyl-phenylether	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
4-Methylphenol	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
4-Nitroaniline	NS	NS	1,000 U	1,100 U	1,100 U	1,000 U	1,000 U	NS	NS	NS
4-Nitrophenol	NS	NS	1,000 U	1,100 U	1,100 U	1,000 U	1,000 U	NS	NS	NS
Acenaphthene	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
Acenaphthylene	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
Anthracene	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
Benzo(a)anthracene	NS	NS	430 U	450 U	460 U	50 J	410 U	NS	NS	NS
Benzo(a)pyrene	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
Benzo(b)fluoranthene	NS	NS	430 U	450 U	460 U	57 J	410 U	NS	NS	NS
Benzo(g,h,i)perylene	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
Benzo(k)fluoranthene	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
Butylbenzylphthalate	NS	NS	430 UJ	450 U	460 UJ	420 UJ	410 UJ	NS	NS	NS
Carbazole	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
Chrysene	NS	NS	430 U	450 U	460 U	67 J	410 U	NS	NS	NS

NS - Not sampled
BD
J - Reported value is estimated
L - Reported value may be biased low
U - Analyte not detected

UJ - Not detected, quantitation limit may be inaccurate
UL - Not detected, quantitation limit is probably higher

Table A-5-1
Raw Data
SWMU 21 - Surface Soil
NAS Oceana, Virginia Beach, Virginia

Sample Date	OW21-SS1-93A	OW21-SS10-93A	OW21-SS11	OW21-SS12	OW21-SS12P	OW21-SS13	OW21-SS13P	OW21-SS2-93A	OW21-SS3-93A	OW21-SS4-93A
Chemical Name										
Di-n-butylphthalate	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
Di-n-octylphthalate	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
Dibenz(a,h)anthracene	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
Dibenzofuran	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
Diethylphthalate	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
Dimethyl phthalate	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
Fluoranthene	NS	NS	430 U	450 U	460 U	74 J	410 U	NS	NS	NS
Fluorene	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
Hexachlorobenzene	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
Hexachlorobutadiene	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
Hexachlorocyclopentadiene	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
Hexachloroethane	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
Indeno(1,2,3-cd)pyrene	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
Isophorone	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
Naphthalene	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
Nitrobenzene	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
Pentachlorophenol	NS	NS	1,000 U	1,100 U	1,100 U	1,000 U	1,000 U	NS	NS	NS
Phenanthrene	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
Phenol	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
Pyrene	NS	NS	430 UJ	450 U	460 UJ	87 J	410 UJ	NS	NS	NS
bis(2-Chloroethoxy)methane	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
bis(2-Chloroethyl)ether	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
bis(2-Ethylhexyl)phthalate	NS	NS	1,200	730	750	280 J	410 U	NS	NS	NS
n-Nitroso-di-n-propylamine	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
n-Nitrosodiphenylamine	NS	NS	430 U	450 U	460 U	420 U	410 U	NS	NS	NS
Pesticide/Polychlorinated Biphenyls (UG/KG)										
Aroclor-1016	230 U	44 U	NS	NS	NS	42 U	41 U	45 U	45 U	43 U
Aroclor-1221	460 U	89 U	NS	NS	NS	42 U	41 U	92 U	92 U	88 U
Aroclor-1232	460 U	89 U	NS	NS	NS	42 U	41 U	92 U	92 U	88 U
Aroclor-1242	230 U	44 U	NS	NS	NS	42 U	41 U	45 U	45 U	43 U
Aroclor-1248	230 U	44 U	NS	NS	NS	42 U	41 U	45 U	45 U	43 U
Aroclor-1254	120 U	23 U	NS	NS	NS	42 U	41 U	23 U	23 U	22 U
Aroclor-1260	120 U	23 U	NS	NS	NS	42 U	41 U	23 U	23 U	22 U
Total Petroleum Hydrocarbons (MG/KG)										
Total petroleum hydrocarbons (TPH)	9.1	NS	NS	NS	NS	NS	NS	NS	NS	NS

WDC003670364.ZIP

NS - Not sampled
BD
J - Reported value is estimated
L - Reported value may be biased low
U - Analyte tected

UJ - Not detected, quantitation limit may be inaccurate
UL - Not detected, quantitation limit is probably higher

Table ...-1
Raw Data
SWMU 21 - Surface Soil
NAS Oceana, Virginia Beach, Virginia

Sample Date	OW21-SS5-93A	OW21-SS6-93A	OW21-SS7-93A	OW21-SS8-93A	OW21-SS9-93A
Chemical Name					
Semi-volatile Organic Compounds (UG/KG)					
1,2,4-Trichlorobenzene	NS	NS	NS	NS	NS
1,2-Dichlorobenzene	NS	NS	NS	NS	NS
1,3-Dichlorobenzene	NS	NS	NS	NS	NS
1,4-Dichlorobenzene	NS	NS	NS	NS	NS
2,2'-Oxybis(1-chloropropane)	NS	NS	NS	NS	NS
2,4,5-Trichlorophenol	NS	NS	NS	NS	NS
2,4,6-Trichlorophenol	NS	NS	NS	NS	NS
2,4-Dichlorophenol	NS	NS	NS	NS	NS
2,4-Dimethylphenol	NS	NS	NS	NS	NS
2,4-Dinitrophenol	NS	NS	NS	NS	NS
2,4-Dinitrotoluene	NS	NS	NS	NS	NS
2,6-Dinitrotoluene	NS	NS	NS	NS	NS
2-Chloronaphthalene	NS	NS	NS	NS	NS
2-Chlorophenol	NS	NS	NS	NS	NS
2-Methylnaphthalene	NS	NS	NS	NS	NS
2-Methylphenol	NS	NS	NS	NS	NS
2-Nitroaniline	NS	NS	NS	NS	NS
2-Nitrophenol	NS	NS	NS	NS	NS
3,3'-Dichlorobenzidine	NS	NS	NS	NS	NS
3-Nitroaniline	NS	NS	NS	NS	NS
4,6-Dinitro-2-methylphenol	NS	NS	NS	NS	NS
4-Bromophenyl-phenylether	NS	NS	NS	NS	NS
4-Chloro-3-methylphenol	NS	NS	NS	NS	NS
4-Chloroaniline	NS	NS	NS	NS	NS
4-Chlorophenyl-phenylether	NS	NS	NS	NS	NS
4-Methylphenol	NS	NS	NS	NS	NS
4-Nitroaniline	NS	NS	NS	NS	NS
4-Nitrophenol	NS	NS	NS	NS	NS
Acenaphthene	NS	NS	NS	NS	NS
Acenaphthylene	NS	NS	NS	NS	NS
Anthracene	NS	NS	NS	NS	NS
Benzo(a)anthracene	NS	NS	NS	NS	NS
Benzo(a)pyrene	NS	NS	NS	NS	NS
Benzo(b)fluoranthene	NS	NS	NS	NS	NS
Benzo(g,h,i)perylene	NS	NS	NS	NS	NS
Benzo(k)fluoranthene	NS	NS	NS	NS	NS
Butylbenzylphthalate	NS	NS	NS	NS	NS
Carbazole	NS	NS	NS	NS	NS
Chrysene	NS	NS	NS	NS	NS

NS - Not sampled
BD
J - Reported value is estimated
L - Reported value may be biased low
U - Analyte not detected

UJ - Not detected, quantitation limit may be inaccurate
UL - Not detected, quantitation limit is probably higher

Table A-5-1
Raw Data
SWMU 21 - Surface Soil
NAS Oceana, Virginia Beach, Virginia

Sample Date	OW21-SS5-93A	OW21-SS6-93A	OW21-SS7-93A	OW21-SS8-93A	OW21-SS9-93A
Chemical Name					
Di-n-butylphthalate	NS	NS	NS	NS	NS
Di-n-octylphthalate	NS	NS	NS	NS	NS
Dibenz(a,h)anthracene	NS	NS	NS	NS	NS
Dibenzofuran	NS	NS	NS	NS	NS
Diethylphthalate	NS	NS	NS	NS	NS
Dimethyl phthalate	NS	NS	NS	NS	NS
Fluoranthene	NS	NS	NS	NS	NS
Fluorene	NS	NS	NS	NS	NS
Hexachlorobenzene	NS	NS	NS	NS	NS
Hexachlorobutadiene	NS	NS	NS	NS	NS
Hexachlorocyclopentadiene	NS	NS	NS	NS	NS
Hexachloroethane	NS	NS	NS	NS	NS
Indeno(1,2,3-cd)pyrene	NS	NS	NS	NS	NS
Isophorone	NS	NS	NS	NS	NS
Naphthalene	NS	NS	NS	NS	NS
Nitrobenzene	NS	NS	NS	NS	NS
Pentachlorophenol	NS	NS	NS	NS	NS
Phenanthrene	NS	NS	NS	NS	NS
Phenol	NS	NS	NS	NS	NS
Pyrene	NS	NS	NS	NS	NS
bis(2-Chloroethoxy)methane	NS	NS	NS	NS	NS
bis(2-Chloroethyl)ether	NS	NS	NS	NS	NS
bis(2-Ethylhexyl)phthalate	NS	NS	NS	NS	NS
n-Nitroso-di-n-propylamine	NS	NS	NS	NS	NS
n-Nitrosodiphenylamine	NS	NS	NS	NS	NS
Pesticide/Polychlorinated Biphenyls (UG/KG)					
Aroclor-1016	43 U	44 U	41 U	44 U	43 U
Aroclor-1221	88 U	89 U	84 U	90 U	88 U
Aroclor-1232	88 U	89 U	84 U	90 U	88 U
Aroclor-1242	43 U	44 U	41 U	44 U	43 U
Aroclor-1248	43 U	44 U	41 U	44 U	43 U
Aroclor-1254	22 U	23 U	21 U	23 U	22 U
Aroclor-1260	22 U	23 U	21 U	23 U	22 U
Total Petroleum Hydrocarbons (MG/KG)					
Total petroleum hydrocarbons (TPH)	NS	242	NS	NS	NS

WDC003670364.ZIP

NS - Not sampled
BD
J - Reported value is estimated
L - Reported value may be biased low
U - Analyte ``etected

UJ - Not detected, quantitation limit may be inaccurate
UL - Not detected, quantitation limit is probably higher

Table A-6-1
Raw Data
SWMU 22 - Ground Water
NAS Oceana, Virginia Beach, Virginia

	OW22-MW1-93A		OW22-MW2-93A		OW22-MW3-93A		OW22-MW4-93A	
Sample Date								
Chemical Name								
Volatile Organic Compounds (UG/L)								
1,1,1,2-Tetrachloroethane	NS		5	U	NS		NS	
1,1,1-Trichloroethane	5	U	5	U	5	U	5	U
1,1,2,2-Tetrachloroethane	5	U	5	U	5	U	5	U
1,1,2-Trichloroethane	5	U	5	U	5	U	5	U
1,1-Dichloroethane	5	U	5	U	5	U	5	U
1,1-Dichloroethene	5	U	5	U	5	U	5	U
1,2,3-Trichloropropane	5	U	5	U	5	U	5	U
1,2-Dibromo-3-chloropropane	NS		10	U	NS		NS	
1,2-Dibromoethane	NS		5	U	NS		NS	
1,2-Dichlorobenzene	5	U	5	U	5	U	5	U
1,2-Dichloroethane	5	U	5	U	5	U	5	U
1,2-Dichloroethene (total)	5	U	5	U	5	U	5	U
1,2-Dichloropropane	5	U	5	U	5	U	5	U
1,3-Dichlorobenzene	5	U	5	U	5	U	5	U
1,4-Dichlorobenzene	5	U	5	U	5	U	5	U
1,4-Dioxane	NS		200	U	NS		NS	
2-Butanone	10	U	10	U	10	U	10	U
2-Chloro-1,3-butadiene	NS		200	U	NS		NS	
2-Chloroethyl vinyl ether	10	U	10	U	10	U	10	U
2-Hexanone	10	U	10	U	10	U	10	U
4-Methyl-2-pentanone	10	U	10	U	10	U	10	U
Acetone	6	J	6	J	5	J	6	J
Acetonitrile	NS		100	U	NS		NS	
Acrolein	100	U	100	U	100	U	100	U
Acrylonitrile	100	U	100	U	100	U	100	U
Allyl chloride	NS		5	U	NS		NS	
Benzene	5	U	5	U	5	U	5	U
Bromodichloromethane	5	U	5	U	5	U	5	U
Bromoform	5	U	5	U	5	U	5	U
Bromomethane	10	U	10	U	10	U	10	U
Carbon disulfide	5	U	5	U	5	U	5	U
Carbon tetrachloride	5	U	5	U	5	U	5	U
Chlorobenzene	5	U	5	U	5	U	5	U
Chloroethane	10	U	10	U	10	U	10	U

NS - Not sampled
B - Analyte not detected above associated blank
BJ
BU
J - Reported value is estimated

U - Analyte not detected

Table A-6-1
Raw Data
SWMU 22 - Ground Water
NAS Oceana, Virginia Beach, Virginia

	OW22-MW1-93A		OW22-MW2-93A		OW22-MW3-93A		OW22-MW4-93A	
Sample Date								
Chemical Name								
Chloroform	5	U	5	U	5	U	5	U
Chloromethane	10	U	10	U	10	U	10	U
Dibromochloromethane	5	U	5	U	5	U	5	U
Dibromomethane	5	U	5	U	5	U	5	U
Dichlorodifluoromethane	NS		10	U	NS		NS	
Ethyl methacrylate	5	U	5	U	5	U	5	U
Ethylbenzene	5	U	5	U	5	U	5	U
Iodomethane	10	U	10	U	10	U	10	U
Isobutanol	NS		200	U	NS		NS	
Methacrylonitrile	NS		5	U	NS		NS	
Methyl methacrylate	NS		10	U	NS		NS	
Methylene chloride	3	BJ	3	BJ	3	BJ	2	BJ
Pentachloroethane	NS		10	U	NS		NS	
Propionitrile	NS		100	U	NS		NS	
Styrene	5	U	5	U	5	U	5	U
Tetrachloroethene	5	U	5	U	5	U	5	U
Toluene	5	U	5	U	5	U	5	U
Trichloroethene	5	U	5	U	5	U	5	U
Trichlorofluoromethane	5	U	5	U	5	U	5	U
Vinyl acetate	10	U	10	U	10	U	10	U
Vinyl chloride	2	U	2	U	2	U	2	U
Xylene, total	5	U	5	U	5	U	5	U
cis-1,3-Dichloropropene	5	U	5	U	5	U	5	U
trans-1,3-Dichloropropene	5	U	5	U	5	U	5	U
trans-1,4-Dichloro-2-butene	5	U	5	U	5	U	5	U
Semi-volatile Organic Compounds (UG/L)								
1,2,4,5-Tetrachlorobenzene	50	U	50	U	50	U	50	U
1,2,4-Trichlorobenzene	10	U	10	U	10	U	10	U
1,2-Dichlorobenzene	10	U	10	U	10	U	10	U
1,2-Diphenylhydrazine	10	U	10	U	10	U	10	U
1,3,5-Trinitrobenzene	NS		10	U	NS		NS	
1,3-Dichlorobenzene	10	U	10	U	10	U	10	U
1,3-Dinitrobenzene	NS		10	U	NS		NS	
1,4-Dichlorobenzene	10	U	10	U	10	U	10	U

NS - Not sampled
B - Analyte not detected above associated blank
BJ
BU
J - Repor' lue is estimated

U - Analyte not detected

Table A-6-1
Raw Data
SWMU 22 - Ground Water
NAS Oceana, Virginia Beach, Virginia

	OW22-MW1-93A		OW22-MW2-93A		OW22-MW3-93A		OW22-MW4-93A	
Sample Date								
Chemical Name								
1,4-Naphthoquinone	NS		50	U	NS		NS	
1-Chloronaphthalene	10	U	NS		10	U	10	U
1-Naphthylamine	50	U	50	U	50	U	50	U
2,2'-Oxybis(1-chloropropane)	10	U	10	U	10	U	10	U
2,3,4,6-Tetrachlorophenol	10	U	10	U	10	U	10	U
2,4,5-Trichlorophenol	50	U	50	U	50	U	50	U
2,4,6-Trichlorophenol	10	U	10	U	10	U	10	U
2,4-Dichlorophenol	10	U	10	U	10	U	10	U
2,4-Dimethylphenol	10	U	10	U	10	U	10	U
2,4-Dinitrophenol	50	U	50	U	50	U	50	U
2,4-Dinitrotoluene	10	U	10	U	10	U	10	U
2,6-Dichlorophenol	10	U	10	U	10	U	10	U
2,6-Dinitrotoluene	10	U	10	U	10	U	10	U
2-Acetylaminofluorene	NS		10	U	NS		NS	
2-Chloronaphthalene	10	U	10	U	10	U	10	U
2-Chlorophenol	10	U	10	U	10	U	10	U
2-Methyl-5-nitroaniline	NS		10	U	NS		NS	
2-Methylaniline	NS		10	U	NS		NS	
2-Methylnaphthalene	10	U	10	U	10	U	10	U
2-Methylphenol	10	U	10	U	10	U	10	U
2-Naphthylamine	50	U	50	U	50	U	50	U
2-Nitroaniline	50	U	50	U	50	U	50	U
2-Nitrophenol	10	U	10	U	10	U	10	U
2-Picoline	50	U	50	U	50	U	50	U
3,3'-Dichlorobenzidine	20	U	20	U	20	U	20	U
3,3'-Dimethylbenzidine	NS		10	U	NS		NS	
3-Methylcholanthrene	10	U	10	U	10	U	10	U
3-Nitroaniline	50	U	50	U	50	U	50	U
4,6-Dinitro-2-methylphenol	50	U	50	U	50	U	50	U
4-Aminobiphenyl	50	U	50	U	50	U	50	U
4-Bromophenyl-phenylether	10	U	10	U	10	U	10	U
4-Chloro-3-methylphenol	10	U	10	U	10	U	10	U
4-Chloroaniline	10	U	10	U	10	U	10	U
4-Chlorophenyl-phenylether	10	U	10	U	10	U	10	U
4-Methylphenol	10	U	NS		10	U	10	U

NS - Not sampled
B - Analyte not detected above associated blank
BJ
BU
J - Reported value is estimated

U - Analyte not detected

Table A-6-1
Raw Data
SWMU 22 - Ground Water
NAS Oceana, Virginia Beach, Virginia

	OW22-MW1-93A		OW22-MW2-93A		OW22-MW3-93A		OW22-MW4-93A	
Sample Date								
Chemical Name								
4-Nitroaniline	50	U	50	U	50	U	50	U
4-Nitrophenol	50	U	50	U	50	U	50	U
4-Nitroquinoline-1-oxide	NS		10	U	NS		NS	
7,12-Dimethylbenz(a)anthracene	10	U	10	U	10	U	10	U
Acenaphthene	10	U	10	U	10	U	10	U
Acenaphthylene	10	U	10	U	10	U	10	U
Acetophenone	10	U	10	U	10	U	10	U
Aniline	10	U	10	U	10	U	10	U
Anthracene	10	U	10	U	10	U	10	U
Aramite	NS		50	U	NS		NS	
Benzidine	50	U	50	U	50	U	50	U
Benzo(a)anthracene	10	U	10	U	10	U	10	U
Benzo(a)pyrene	10	U	10	U	10	U	10	U
Benzo(b)fluoranthene	10	U	10	U	10	U	10	U
Benzo(g,h,i)perylene	10	U	10	U	10	U	10	U
Benzo(k)fluoranthene	10	U	10	U	10	U	10	U
Benzoic acid	50	U	50	U	50	U	50	U
Benzyl alcohol	10	U	10	U	10	U	10	U
Butylbenzylphthalate	10	U	10	U	10	U	10	U
Chrysene	10	U	10	U	10	U	10	U
Di-n-butylphthalate	10	U	10	U	10	U	2	U
Di-n-octylphthalate	10	U	10	U	10	U	10	U
Dibenz(a,h)anthracene	10	U	10	U	10	U	10	U
Dibenzofuran	10	U	10	U	10	U	10	U
Diethylphthalate	10	U	10	U	10	U	10	U
Dimethyl phthalate	10	U	10	U	10	U	10	U
Ethyl methanesulfonate	10	U	10	U	10	U	10	U
Fluoranthene	10	U	10	U	10	U	10	U
Fluorene	10	U	10	U	10	U	10	U
Hexachlorobenzene	10	U	10	U	10	U	10	U
Hexachlorobutadiene	10	U	10	U	10	U	10	U
Hexachlorocyclopentadiene	10	U	10	U	10	U	10	U
Hexachloroethane	10	U	10	U	10	U	10	U
Hexachlorophene	NS		50	U	NS		NS	
Hexachloropropene	NS		50	U	NS		NS	

NS - Not sampled
B - Analyte not detected above associated blank
BJ
BU
J - Repor ue is estimated

U - Analyte not detected

Table [illegible]-1
Raw Data
SWMU 22 - Ground Water
NAS Oceana, Virginia Beach, Virginia

Sample Date	OW22-MW1-93A		OW22-MW2-93A		OW22-MW3-93A		OW22-MW4-93A	
Chemical Name								
Indeno(1,2,3-cd)pyrene	10	U	10	U	10	U	10	U
Isophorone	10	U	10	U	10	U	10	U
Isosafrole	NS		50	U	NS		NS	
Methapyrilene	NS		50	U	NS		NS	
Methyl methanesulfonate	10	U	10	U	10	U	10	U
N-Nitrosomorpholine	NS		10	U	NS		NS	
N-Nitrosopiperidine	10	U	10	U	10	U	10	U
Naphthalene	10	U	10	U	10	U	10	U
Nitrobenzene	10	U	10	U	10	U	10	U
Pentachlorobenzene	50	U	50	U	50	U	50	U
Pentachloronitrobenzene	50	U	50	U	50	U	50	U
Pentachlorophenol	50	U	50	U	50	U	50	U
Phenacetin	10	U	10	U	10	U	10	U
Phenanthrene	10	U	10	U	10	U	10	U
Phenol	10	U	10	U	10	U	10	U
Pronamide	10	U	10	U	10	U	10	U
Pyrene	10	U	10	U	10	U	10	U
Pyridine	NS		50	U	NS		NS	
Safrole	NS		50	U	NS		NS	
a,a-Dimethylphenethylamine	50	U	50	U	50	U	50	U
bis(2-Chloroethoxy)methane	10	U	10	U	10	U	10	U
bis(2-Chloroethyl)ether	10	U	10	U	10	U	10	U
bis(2-Ethylhexyl)phthalate	7	BJ	10	BU	10	BU	10	U
n-Nitroso-di-n-butylamine	10	U	10	U	10	U	10	U
n-Nitroso-di-n-propylamine	10	U	10	U	10	U	10	U
n-Nitroso-n-methylethylamine	NS		10	U	NS		NS	
n-Nitrosodiethylamine	NS		10	U	NS		NS	
n-Nitrosodimethylamine	10	U	10	U	10	U	10	U
n-Nitrosodiphenylamine	10	U	10	U	10	U	10	U
n-Nitrosopyrrolidine	NS		10	U	NS		NS	
p-Dimethylaminoazobenzene	10	U	10	U	10	U	10	U
p-Phenylenediamine	NS		50	U	NS		NS	
Pesticide/Polychlorinated Biphenyls (UG/L)								
4,4'-DDD	0.04	U	0.04	U	0.04	U	0.04	U

NS - Not sampled
B - Analyte not detected above associated blank
BJ
BU
J - Reported value is estimated

U - Analyte not detected

Table A-6-1
Raw Data
SWMU 22 - Ground Water
NAS Oceana, Virginia Beach, Virginia

	OW22-MW1-93A		OW22-MW2-93A		OW22-MW3-93A		OW22-MW4-93A	
Sample Date								
Chemical Name								
4,4'-DDE	0.02	U	0.02	U	0.02	U	0.02	U
4,4'-DDT	0.04	U	0.04	U	0.04	U	0.04	U
Aldrin	0.02	U	0.02	U	0.02	U	0.02	U
Aroclor-1016	1	U	1	U	1	U	1	U
Aroclor-1221	2	U	2	U	2	U	2	U
Aroclor-1232	2	U	2	U	2	U	2	U
Aroclor-1242	1	U	1	U	1	U	1	U
Aroclor-1248	1	U	1	U	1	U	1	U
Aroclor-1254	0.5	U	0.5	U	0.5	U	0.5	U
Aroclor-1260	0.5	U	0.5	U	0.5	U	0.5	U
Chlordane	0.2	U	0.2	U	0.2	U	0.2	U
Chlorobenzilate	NS		0.5	U	NS		NS	
Diallate	NS		1	U	NS		NS	
Dieldrin	0.02	U	0.02	U	0.02	U	0.02	U
Endosulfan I	0.02	U	0.02	U	0.02	U	0.02	U
Endosulfan II	0.04	U	0.04	U	0.04	U	0.04	U
Endosulfan sulfate	0.04	U	0.04	U	0.04	U	0.04	U
Endrin	0.04	U	0.04	U	0.04	U	0.04	U
Endrin aldehyde	0.04	U	0.04	U	0.04	U	0.04	U
Endrin ketone	NS		0.02	U	NS		NS	
Heptachlor	0.02	U	0.02	U	0.02	U	0.02	U
Heptachlor epoxide	0.02	U	0.02	U	0.02	U	0.02	U
Isodrin	NS		0.02	U	NS		NS	
Methoxychlor	0.08	U	0.08	U	0.08	U	0.08	U
Toxaphene	1	U	1	U	1	U	1	U
alpha-BHC	0.02	U	0.02	U	0.02	U	0.02	U
beta-BHC	0.04	U	0.04	U	0.04	U	0.04	U
delta-BHC	0.02	U	0.02	U	0.02	U	0.02	U
gamma-BHC (Lindane)	0.02	U	0.02	U	0.02	U	0.02	U
Total Metals (UG/L)								
Aluminum	439		NS		122	B	752	
Antimony	16.4	U	16.4	U	16.4	U	16.4	U
Arsenic	0.68	B	0.68	U	0.68	U	0.68	U
Barium	44.4	B	24.3	B	38	B	40.5	B

NS - Not sampled
B - Analyte not detected above associated blank
BJ
BU
J - Report' 'ue is estimated

U - Analyte not detected

Tabl..-6-1
Raw Data
SWMU 22 - Ground Water
NAS Oceana, Virginia Beach, Virginia

Sample Date	OW22-MW1-93A		OW22-MW2-93A		OW22-MW3-93A		OW22-MW4-93A	
Chemical Name								
Beryllium	0.43		0.26	U	0.26	U	0.26	U
Cadmium	2.8	U	2.8	U	2.8	U	2.8	U
Calcium	13,500	U	NS		14,500		13,800	
Chromium	3.7	B	3	B	2.8	U	2.8	U
Cobalt	4.6	B	3	B	2.6	U	2.6	U
Copper	2.2	B	5.3	B	1.2	U	1.4	B
Cyanide	NS		1.4	U	NS		NS	
Iron	615		NS		9,340		9,110	
Lead	1.7	U	1.7	U	1.7	U	1.9	B
Magnesium	3,920	B	NS		7,260		9,630	
Manganese	52.3		NS		279		303	
Mercury	0.07	U	0.07	U	0.07	U	0.1	B
Nickel	9.4	U	9.4	U	9.4	U	9.4	U
Potassium	3,420	B	NS		1,600	B	1,910	B
Selenium	1.8	U	1.8	U	1.8	U	1.8	U
Silver	2	U	2.5	B	2	U	2	U
Sodium	14,300		NS		12,800		12,800	
Thallium	2.3	U	2.3	U	2.3	U	2.3	U
Tin	NS		12.7	U	NS		NS	
Vanadium	2.6	U	2.6	U	2.6	U	2.6	U
Zinc	9	U	9.4	B	9	U	9	U

NS - Not sampled
B - Analyte not detected above associated blank
BJ
BU
J - Reported value is estimated

U - Analyte not detected

Table [illegible]-2

Raw Data

SWMU 22 - Surface Water

NAS Oceana, Virginia Beach, Virginia

	OW22-SW1-93A		OW22-SW2-93A	
Sample Date				
Chemical Name				
Semi-volatile Organic Compounds (UG/L)				
1,1,1-Trichloroethane	NS		5	U
1,1,2,2-Tetrachloroethane	NS		5	U
1,1,2-Trichloroethane	NS		5	U
1,1-Dichloroethane	NS		5	U
1,1-Dichloroethene	NS		5	U
1,2,3-Trichloropropane	NS		5	U
1,2-Dichlorobenzene	NS		5	U
1,2-Dichloroethane	NS		5	U
1,2-Dichloroethene (total)	NS		5	U
1,2-Dichloropropane	NS		5	U
1,3-Dichlorobenzene	NS		5	U
1,4-Dichlorobenzene	NS		5	U
2-Butanone	NS		10	U
2-Chloroethyl vinyl ether	NS		10	U
2-Hexanone	NS		10	U
4-Methyl-2-pentanone	NS		10	U
Acetone	NS		5	J
Acrolein	NS		100	U
Acrylonitrile	NS		100	U
Benzene	NS		5	U
Bromodichloromethane	NS		5	U
Bromoform	NS		5	U
Bromomethane	NS		10	U
Carbon disulfide	NS		5	U
Carbon tetrachloride	NS		5	U
Chlorobenzene	NS		5	U
Chloroethane	NS		10	U
Chloroform	NS		5	U
Chloromethane	NS		10	U
Dibromochloromethane	NS		5	U
Dibromomethane	NS		5	U
Ethyl methacrylate	NS		5	U
Ethylbenzene	NS		5	U
Iodomethane	NS		10	U
Methylene chloride	NS		4	BJ
Styrene	NS		5	U

NS - Not sampled

B - Analyte not detected above associated blank

BJ

J - Reported value is estimated

Table A-6-2
Raw Data
SWMU 22 - Surface Water
NAS Oceana, Virginia Beach, Virginia

	OW22-SW1-93A		OW22-SW2-93A	
Sample Date				
Chemical Name				
Tetrachloroethene	NS		5	U
Toluene	NS		5	U
Trichloroethene	NS		5	U
Trichlorofluoromethane	NS		5	U
Vinyl acetate	NS		10	U
Vinyl chloride	NS		2	U
Xylene, total	NS		5	U
cis-1,3-Dichloropropene	NS		5	U
trans-1,3-Dichloropropene	NS		5	U
Pesticide/Polychlorinated Biphenyls (UG/L)				
4,4'-DDD	0.04	U	0.04	U
4,4'-DDE	0.02	U	0.02	U
4,4'-DDT	0.04	U	0.04	U
Aldrin	0.02	U	0.02	U
Aroclor-1016	1	U	1	U
Aroclor-1221	2	U	2	U
Aroclor-1232	2	U	2	U
Aroclor-1242	1	U	1	U
Aroclor-1248	1	U	1	U
Aroclor-1254	0.5	U	0.5	U
Aroclor-1260	0.5	U	0.5	U
Chlordane	0.2	U	0.2	U
Dieldrin	0.02	U	0.02	U
Endosulfan I	0.02	U	0.02	U
Endosulfan II	0.04	U	0.04	U
Endosulfan sulfate	0.04	U	0.04	U
Endrin	0.04	U	0.04	U
Endrin aldehyde	0.04	U	0.04	U
Heptachlor	0.02	U	0.02	U
Heptachlor epoxide	0.02	U	0.02	U
Methoxychlor	0.08	U	0.08	U
Toxaphene	1	U	1	U
alpha-BHC	0.02	U	0.02	U
beta-BHC	0.04	U	0.04	U
delta-BHC	0.02	U	0.02	U
gamma-BHC (Lindane)	0.02	U	0.02	U

NS - Not sampled
B - Analyte detected above associated blank
BJ
J - Reported value is estimated

Table A-6-2
Raw Data
SWMU 22 - Surface Water
NAS Oceana, Virginia Beach, Virginia

Sample Date	OW22-SW1-93A		OW22-SW2-93A	
Chemical Name				
Total Metals (UG/L)				
Aluminum	138	B	181	B
Antimony	16.4	U	16.4	U
Arsenic	1.1	B	0.68	U
Barium	34	B	36.3	B
Beryllium	0.26	U	0.26	U
Cadmium	2.8	U	2.8	U
Calcium	8,760		9,170	
Chromium	2.8	U	2.8	U
Cobalt	3.4	B	2.6	U
Copper	1.2	U	1.2	U
Iron	1,250		1,070	
Lead	1.7	B	1.7	U
Magnesium	5,520		5,260	
Manganese	102		73.9	
Mercury	0.07	U	0.07	U
Nickel	9.4	U	9.4	U
Potassium	1,300	B	1,920	B
Selenium	1.8	U	1.8	U
Silver	2	U	2	U
Sodium	9,200		8,970	
Thallium	2.3	U	2.3	U
Vanadium	2.6	U	2.6	U
Zinc	15.9	B	14.1	B

NS - Not sampled
B - Analyte not detected above associated blank
BJ
J - Reported value is estimated

Tabl... 6-3
Raw Data
SWMU 22- Sediment
NAS Oceana, Virginia Beach, Virginia

	OW22-SD1-93A		OW22-SD2-93A	
Sample Date				
Chemical Name				
Pesticide/Polychlorinated Biphenyls (UG/KG)				
4,4'-DDD	1.1	J	1.5	U
4,4'-DDE	1.6		0.68	J
4,4'-DDT	1.1	J	0.68	J
Aldrin	0.83	U	0.79	U
Aroclor-1016	41	U	39	U
Aroclor-1221	83	U	39	U
Aroclor-1232	83	U	39	U
Aroclor-1242	41	U	39	U
Aroclor-1248	41	U	39	U
Aroclor-1254	21	U	20	U
Aroclor-1260	21	U	20	U
Chlordane	8.3	U	7.9	U
Dieldrin	0.56	J	0.79	U
Endosulfan I	0.83	U	0.79	U
Endosulfan II	1.6	U	1.5	U
Endosulfan sulfate	1.6	U	1.5	U
Endrin	1.6	U	1.5	U
Endrin aldehyde	1.6	U	1.5	U
Heptachlor	0.83	U	0.79	U
Heptachlor epoxide	0.83	U	0.79	U
Methoxychlor	3.3	U	3.2	U
Toxaphene	41	U	39	U
alpha-BHC	0.83	U	0.79	U
beta-BHC	1.6	U	1.5	U
delta-BHC	0.83	U	0.79	U
gamma-BHC (Lindane)	0.83	U	0.79	U
Total Metals (MG/KG)				
Aluminum	2,400		384	
Antimony	3.9	U	4	U
Arsenic	1.8	B	0.64	B
Barium	8.5	B	3.6	B
Beryllium	0.08	B	0.06	U
Cadmium	0.66	U	0.67	U
Calcium	191	B	98.8	B
Chromium	6.2		1.3	B

NS - Not sampled
B - Analyte not detected above associated blank
J - Reported value is estimated
U - Analyte not detected

Table A-6-3
Raw Data
SWMU 22- Sediment
NAS Oceana, Virginia Beach, Virginia

	OW22-SD1-93A		OW22-SD2-93A	
Sample Date				
Chemical Name				
Cobalt	0.75	B	0.65	U
Copper	1.8	B	0.29	U
Iron	3,000		714	
Lead	3.5		5.5	
Magnesium	357	B	44.2	B
Manganese	12.4		1.5	B
Mercury	0.05	B	0.05	B
Nickel	2.3	U	2.3	U
Potassium	238	B	228	U
Selenium	0.44	U	0.45	U
Silver	0.47	U	0.48	U
Sodium	241	B	244	B
Thallium	0.55	U	0.57	U
Vanadium	7.7	B	1.2	B
Zinc	6.8		4.3	B

NS - Not sampled
B - Analyte detected above associated blank
J - Repor ue is estimated
U - Analyte ... detected

Table A-6-4
Raw Data
SWMU 22 - Surface Soil
NAS Oceana, Virginia Beach, Virginia

Sample Date	OW22-SS01-00		OW22-SS02-00		OW22-SS03-00	
Chemical Name						
Volatile Organic Compounds (UG/KG)						
1,1,1-Trichloroethane	11.86	U	11.67	U	12.92	U
1,1,2,2-Tetrachloroethane	11.86	U	11.67	U	12.92	U
1,1,2-Trichloroethane	11.86	U	11.67	U	12.92	U
1,1-Dichloroethane	11.86	U	11.67	U	12.92	U
1,1-Dichloroethene	11.86	U	11.67	U	12.92	U
1,2-Dichloroethane	11.86	U	11.67	U	12.92	U
1,2-Dichloroethene (total)	11.86	U	11.67	U	12.92	U
1,2-Dichloropropane	11.86	U	11.67	U	12.92	U
2-Butanone	11.86	U	11.67	U	12.92	U
2-Hexanone	11.86	U	11.67	U	12.92	U
4-Methyl-2-pentanone	11.86	U	11.67	U	12.92	U
Acetone	16	B	10	B	16	B
Benzene	11.86	U	11.67	U	12.92	U
Bromochloromethane	50		50		50	
Bromodichloromethane	11.86	U	11.67	U	12.92	U
Bromoform	11.86	U	11.67	U	12.92	U
Bromomethane	11.86	U	11.67	U	12.92	U
Carbon disulfide	11.86	U	11.67	U	12.92	U
Carbon tetrachloride	11.86	U	11.67	U	12.92	U
Chlorobenzene	11.86	U	11.67	U	12.92	U
Chloroethane	11.86	U	11.67	U	12.92	U
Chloroform	11.86	U	11.67	U	12.92	U
Chloromethane	11.86	U	11.67	U	12.92	U
Dibromochloromethane	11.86	U	11.67	U	12.92	U
Ethylbenzene	11.86	U	11.67	U	12.92	U
Methylene chloride	35		34	J	45	J
Styrene	11.86	U	11.67	U	12.92	U
Tetrachloroethene	11.86	U	11.67	U	12.92	U
Toluene	11.86	U	11.67	U	12.92	U
Trichloroethene	11.86	U	11.67	U	12.92	U
Vinyl chloride	11.86	U	11.67	U	12.92	U
Xylene, total	11.86	U	11.67	U	12.92	U
cis-1,2-Dichloroethene	11.86	U	11.67	U	12.92	U
cis-1,3-Dichloropropene	11.86	U	11.67	U	12.92	U
o-Xylene	11.86	U	11.67	U	12.92	U
trans-1,2-Dichloroethene	11.86	U	11.67	U	12.92	U

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J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low

R - Unreliable result
U - Analyte not detected
UL

Table A-6-4
Raw Data
SWMU 22 - Surface Soil
NAS Oceana, Virginia Beach, Virginia

Sample Date	OW22-SS01-00		OW22-SS02-00		OW22-SS03-00	
Chemical Name						
trans-1,3-Dichloropropene	11.86	U	11.67	U	12.92	U
Semi-volatile Organic Compounds (UG/KG)						
1,2,4-Trichlorobenzene	400	U	390	U	420	U
1,2-Dichlorobenzene	400	U	390	U	420	U
1,3-Dichlorobenzene	400	U	390	U	420	U
1,4-Dichlorobenzene	400	U	390	U	420	U
1-Methylnaphthalene	40	K	20	U	21	R
2,2'-Oxybis(1-chloropropane)	400	U	390	U	420	U
2,4,5-Trichlorophenol	990	U	980	U	1,000	U
2,4,6-Trichlorophenol	400	U	390	U	420	U
2,4-Dichlorophenol	400	U	390	U	420	U
2,4-Dimethylphenol	400	U	390	U	420	U
2,4-Dinitrophenol	990	U	980	U	1,000	U
2,4-Dinitrotoluene	400	U	390	U	420	U
2,6-Dinitrotoluene	400	U	390	U	420	U
2-Chloronaphthalene	400	U	390	U	420	U
2-Chlorophenol	400	U	390	U	420	U
2-Methylnaphthalene	40	K	20	U	420	U
2-Methylphenol	400	U	390	U	420	U
2-Nitroaniline	990	U	980	U	1,000	U
2-Nitrophenol	400	U	390	U	420	U
3,3'-Dichlorobenzidine	400	U	390	U	420	U
3-Nitroaniline	990	U	980	U	1,000	U
4,6-Dinitro-2-methylphenol	990	U	980	U	1,000	U
4-Bromophenyl-phenylether	400	U	390	U	420	U
4-Chloro-3-methylphenol	400	U	390	U	420	U
4-Chloroaniline	400	U	390	U	420	U
4-Chlorophenyl-phenylether	400	U	390	U	420	U
4-Methylphenol	400	U	390	U	420	U
4-Nitroaniline	990	U	980	U	1,000	U
4-Nitrophenol	990	U	980	U	1,000	U
Acenaphthene	40	K	20	U	420	U
Acenaphthylene	40	K	39	U	420	U
Anthracene	7.9	K	2	U	420	U
Benzo(a)anthracene	59	K	2.3		2.2	L
Benzo(a)pyrene	85	K	2.3		1.8	L

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Table ..6-4
Raw Data
SWMU 22 - Surface Soil
NAS Oceana, Virginia Beach, Virginia

Sample Date	OW22-SS01-00		OW22-SS02-00		OW22-SS03-00	
Chemical Name						
Benzo(b)fluoranthene	68	K	2.2	J	2.4	L
Benzo(g,h,i)perylene	78	K	3.9	U	1.7	L
Benzo(k)fluoranthene	31	K	2		420	U
Butylbenzylphthalate	400	U	390	U	420	U
Carbazole	400	U	390	U	420	U
Chrysene	68	K	3		420	U
Di-n-butylphthalate	400	U	390	U	420	U
Di-n-octylphthalate	400	U	390	U	420	U
Dibenz(a,h)anthracene	40	K	3.9	U	420	U
Dibenzofuran	400	U	390	U	420	U
Diethylphthalate	400	U	390	U	420	U
Dimethyl phthalate	400	U	390	U	420	U
Fluoranthene	120	K	11		420	U
Fluorene	40	K	3.9	U	4.7	L
Hexachlorobenzene	400	U	390	U	420	U
Hexachlorobutadiene	400	U	390	U	420	U
Hexachlorocyclopentadiene	400	U	390	U	420	U
Hexachloroethane	400	U	390	U	420	U
Indeno(1,2,3-cd)pyrene	56	K	2		3.2	L
Isophorone	400	U	390	U	420	U
Naphthalene	40	K	20	U	420	U
Nitrobenzene	400	U	390	U	420	U
Pentachlorophenol	990	U	980	U	1,000	U
Phenanthrene	51	K	2	U	2.4	L
Phenol	400	U	390	U	420	U
Pyrene	99	K	2	U	420	U
bis(2-Chloroethoxy)methane	400	U	390	U	420	U
bis(2-Chloroethyl)ether	400	U	390	U	420	U
bis(2-Ethylhexyl)phthalate	60	R	390	U	420	U
n-Nitroso-di-n-propylamine	400	U	390	U	420	U
n-Nitrosodiphenylamine	400	U	390	U	420	U
Pesticide/Polychlorinated Biphenyls (UG/KG)						
4,4'-DDD	5.3	J	3.93	U	4.12	U
4,4'-DDE	4.2		20		23	
4,4'-DDT	9.4		9.1		6.8	
Aldrin	2.02	U	2.02	U	2.12	U

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UL

Table A-6-4
Raw Data
SWMU 22 - Surface Soil
NAS Oceana, Virginia Beach, Virginia

Sample Date	OW22-SS01-00		OW22-SS02-00		OW22-SS03-00	
Chemical Name						
Aroclor-1016	39.24	U	39.29	U	41.22	U
Aroclor-1221	79.66	U	79.76	U	83.69	U
Aroclor-1232	39.24	U	39.29	U	41.22	U
Aroclor-1242	39.24	U	39.29	U	41.22	U
Aroclor-1248	39.24	U	39.29	U	41.22	U
Aroclor-1254	39.24	U	39.29	U	41.22	U
Aroclor-1260	26	J	39.29	U	41.22	U
Dieldrin	10		20		15	
Endosulfan I	2.02	U	2.02	U	2.12	U
Endosulfan II	3.92	U	3.93	U	4.12	U
Endosulfan sulfate	3.92	U	3.93	U	4.12	U
Endrin	3.92	U	3.93	U	4.12	U
Endrin aldehyde	3.92	U	3.93	U	4.12	U
Endrin ketone	3.92	U	3.93	U	4.12	U
Heptachlor	2.02	U	2.02	U	2.12	U
Heptachlor epoxide	2.02	U	2.02	U	2.12	U
Methoxychlor	20.21	U	20.24	U	21.24	U
Toxaphene	202.12	U	202.38	U	212.36	U
alpha-BHC	2.02	U	2.02	U	2.12	U
alpha-Chlordane	2.02	U	2.02	U	3.2	J
beta-BHC	2.02	U	2.02	U	2.12	U
delta-BHC	2.02	U	2.02	U	2.12	U
gamma-BHC (Lindane)	2.02	U	2.02	U	2.12	U
gamma-Chlordane	2.02	U	2.02	U	2.4	
Total Metals (MG/KG)						
Aluminum	11,900		15,400		13,600	
Antimony	0.42	UL	0.45	UL	0.48	UL
Arsenic	2.3		2.7		1.9	J
Barium	46.9		64.6		63.4	
Beryllium	0.28	L	0.42	L	0.32	L
Cadmium	0.37	J	0.14	J	0.21	J
Calcium	1,350		755	L	429	L
Chromium	14.2		19.7		17.1	
Cobalt	1.7	J	2.3	J	1.8	J
Copper	9.5		9.1		8.6	
Cyanide	0.02	UL	0.02	UL	0.12	L

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Table _-6-4
Raw Data
SWMU 22 - Surface Soil
NAS Oceana, Virginia Beach, Virginia

	OW22-SS01-00		OW22-SS02-00		OW22-SS03-00	
Sample Date						
Chemical Name						
Iron	5,310		6,270		5,190	
Lead	25		20.5		17.4	
Magnesium	741	J	795	J	608	J
Manganese	37		33.5		28.9	
Mercury	0.06	B	0.07	B	0.09	B
Nickel	7.8		7.6	J	8	J
Potassium	480	J	517	J	603	J
Selenium	0.57	UL	0.62	UL	0.66	UL
Silver	1.6	J	1.6	J	1.1	J
Sodium	45.7	L	60.4	L	45.2	L
Thallium	0.51	B	0.59	B	0.64	B
Vanadium	16.1		20.1		18.8	
Zinc	28.6		24.2	B	20.8	B

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U - Analyte not detected
UL

Table .-7-1
Raw Data
SWMU 26 - Surface Soil
NAS Oceana, Virginia Beach, Virginia

	OW26-SS01-00		OW26-SS02-00		OW26-SS03-00	
Sample Date						
Chemical Name						
Volatile Organic Compounds (UG/KG)						
1,1,1-Trichloroethane	13.94	UL	13.96	U	13.44	U
1,1,2,2-Tetrachloroethane	13.94	UL	13.96	U	13.44	U
1,1,2-Trichloroethane	13.94	UL	13.96	U	13.44	U
1,1-Dichloroethane	13.94	U	13.96	U	13.44	U
1,1-Dichloroethene	13.94	U	13.96	U	13.44	U
1,2-Dichloroethane	13.94	U	13.96	U	13.44	U
1,2-Dichloroethene (total)	13.94	U	13.96	U	13.44	U
1,2-Dichloropropane	13.94	UL	13.96	U	13.44	U
2-Butanone	13.94	U	3	B	3	B
2-Hexanone	13.94	UL	13.96	U	13.44	U
4-Methyl-2-pentanone	13.94	UL	13.96	U	13.44	U
Acetone	9	B	30	B	13	B
Benzene	13.94	U	13.96	U	13.44	U
Bromochloromethane	50		50		50	
Bromodichloromethane	13.94	UL	13.96	U	13.44	U
Bromoform	13.94	UL	13.96	U	13.44	U
Bromomethane	13.94	U	13.96	U	13.44	U
Carbon disulfide	13.94	U	13.96	U	13.44	U
Carbon tetrachloride	13.94	UL	13.96	U	13.44	U
Chlorobenzene	13.94	UL	13.96	UJ	13.44	UJ
Chloroethane	13.94	U	13.96	U	13.44	U
Chloroform	13.94	U	13.96	U	13.44	U
Chloromethane	13.94	U	13.96	U	13.44	U
Dibromochloromethane	13.94	UL	13.96	U	13.44	U
Ethylbenzene	13.94	UL	13.96	U	13.44	U
Methylene chloride	54	B	38	B	30	B
Styrene	13.94	UL	13.96	U	13.44	U
Tetrachloroethene	13.94	UL	13.96	U	13.44	U
Toluene	13.94	UL	13.96	U	13.44	U
Trichloroethene	13.94	UL	13.96	U	13.44	U
Vinyl chloride	13.94	U	13.96	U	13.44	U
Xylene, total	13.94	UL	2	J	13.44	U
cis-1,2-Dichloroethene	13.94	UL	13.96	U	13.44	U
cis-1,3-Dichloropropene	13.94	UL	13.96	U	13.44	U

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UJ
UL

Table A-7-1
Raw Data
SWMU 26 - Surface Soil
NAS Oceana, Virginia Beach, Virginia

Sample Date	OW26-SS01-00		OW26-SS02-00		OW26-SS03-00	
Chemical Name						
o-Xylene	13.94	UL	13.96	U	13.44	U
trans-1,2-Dichloroethene	13.94	UL	13.96	U	13.44	U
trans-1,3-Dichloropropene	13.94	UL	13.96	U	13.44	U
Semi-volatile Organic Compounds (UG/KG)						
1,2,4-Trichlorobenzene	2,400	U	440	U	470	U
1,2-Dichlorobenzene	2,400	U	440	U	470	U
1,3-Dichlorobenzene	2,400	U	440	U	470	U
1,4-Dichlorobenzene	2,400	U	440	U	470	U
1-Methylnaphthalene	24	U	23	U	21	U
2,2'-Oxybis(1-chloropropane)	2,400	U	440	U	470	U
2,4,5-Trichlorophenol	6,000	U	1,100	U	1,200	U
2,4,6-Trichlorophenol	2,400	U	440	U	470	U
2,4-Dichlorophenol	2,400	U	440	U	470	U
2,4-Dimethylphenol	2,400	U	440	U	470	U
2,4-Dinitrophenol	6,000	U	1,100	U	1,200	U
2,4-Dinitrotoluene	2,400	U	440	U	470	U
2,6-Dinitrotoluene	2,400	U	440	U	470	U
2-Chloronaphthalene	2,400	U	440	U	470	U
2-Chlorophenol	2,400	U	440	U	470	U
2-Methylnaphthalene	24	U	23	U	21	U
2-Methylphenol	2,400	U	440	U	470	U
2-Nitroaniline	6,000	U	1,100	U	1,200	U
2-Nitrophenol	2,400	U	440	U	470	U
3,3'-Dichlorobenzidine	2,400	U	440	U	470	U
3-Nitroaniline	6,000	U	1,100	U	1,200	U
4,6-Dinitro-2-methylphenol	6,000	U	1,100	U	1,200	U
4-Bromophenyl-phenylether	2,400	U	440	U	470	U
4-Chloro-3-methylphenol	2,400	U	440	U	470	U
4-Chloroaniline	2,400	U	440	U	470	U
4-Chlorophenyl-phenylether	2,400	U	440	U	470	U
4-Methylphenol	2,400	U	440	U	470	U
4-Nitroaniline	6,000	U	1,100	U	1,200	U
4-Nitrophenol	6,000	U	1,100	U	1,200	U
Acenaphthene	24	U	23	U	21	U

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UJ
UL

Table A-7-1
Raw Data
SWMU 26 - Surface Soil
NAS Oceana, Virginia Beach, Virginia

	OW26-SS01-00		OW26-SS02-00		OW26-SS03-00	
Sample Date						
Chemical Name						
Acenaphthylene	48	U	45	U	42	U
Anthracene	2	U	2	U	18	K
Benzo(a)anthracene	2	U	19		78	K
Benzo(a)pyrene	7.9		21		90	K
Benzo(b)fluoranthene	10		28		480	
Benzo(g,h,i)perylene	4.8	U	16		120	K
Benzo(k)fluoranthene	2	U	14		79	K
Butylbenzylphthalate	2,400	U	440	U	64	J
Carbazole	2,400	U	440	U	61	J
Chrysene	2	U	21		110	K
Di-n-butylphthalate	2,400	U	150	B	120	B
Di-n-octylphthalate	2,400	U	440	U	470	U
Dibenz(a,h)anthracene	4.8	U	4.5	U	4.2	U
Dibenzofuran	2,400	U	440	U	470	U
Diethylphthalate	2,400	U	440	U	470	U
Dimethyl phthalate	2,400	U	440	U	470	U
Fluoranthene	48		45		660	
Fluorene	4.8	U	4.5	U	4.2	U
Hexachlorobenzene	2,400	U	440	U	470	U
Hexachlorobutadiene	2,400	U	440	U	470	U
Hexachlorocyclopentadiene	2,400	U	440	U	470	U
Hexachloroethane	2,400	U	440	U	470	U
Indeno(1,2,3-cd)pyrene	8.7		22		89	K
Isophorone	2,400	U	440	U	470	U
Naphthalene	24	U	23	U	21	U
Nitrobenzene	2,400	U	440	U	470	U
Pentachlorophenol	6,000	U	1,100	U	1,200	U
Phenanthrene	12		20		83	K
Phenol	2,400	U	440	U	470	U
Pyrene	28		42		560	
bis(2-Chloroethoxy)methane	2,400	U	440	U	470	U
bis(2-Chloroethyl)ether	2,400	U	440	U	470	U
bis(2-Ethylhexyl)phthalate	2,400	U	210	J	360	J
n-Nitroso-di-n-propylamine	2,400	U	440	U	470	U
n-Nitrosodiphenylamine	2,400	U	440	U	470	U

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UL

Table A-7-1
Raw Data
SWMU 26 - Surface Soil
NAS Oceana, Virginia Beach, Virginia

Sample Date	OW26-SS01-00		OW26-SS02-00		OW26-SS03-00	
Chemical Name						
Pesticide/Polychlorinated Biphenyls (UG/KG)						
4,4'-DDD	4.77	U	4.43	U	4.72	U
4,4'-DDE	4.77	U	4.43	U	4.72	U
4,4'-DDT	4.77	U	4.43	U	4.72	U
Aldrin	2.46	U	2.28	U	2.43	U
Aroclor-1016	47.67	U	44.3	U	47.2	U
Aroclor-1221	96.78	U	89.94	U	95.82	U
Aroclor-1232	47.67	U	44.3	U	47.2	U
Aroclor-1242	47.67	U	44.3	U	47.2	U
Aroclor-1248	47.67	U	44.3	U	47.2	U
Aroclor-1254	47.67	U	44.3	U	47.2	U
Aroclor-1260	47.67	U	44.3	U	47.2	U
Dieldrin	4.77	U	4.43	U	4.72	U
Endosulfan I	2.46	U	2.28	U	2.43	U
Endosulfan II	4.77	U	4.43	U	4.72	U
Endosulfan sulfate	4.77	U	4.43	U	4.72	U
Endrin	4.77	U	4.43	U	4.72	U
Endrin aldehyde	4.77	U	4.43	U	4.72	U
Endrin ketone	4.77	U	4.43	U	4.72	U
Heptachlor	2.46	U	2.28	U	2.43	U
Heptachlor epoxide	5.8		4.1		8.8	
Methoxychlor	24.56	U	22.82	U	24.31	U
Toxaphene	245.56	U	228.21	U	243.14	U
alpha-BHC	2.46	U	2.28	U	2.43	U
alpha-Chlordane	2.46	U	4.2		7.1	
beta-BHC	2.46	U	2.28	U	2.43	U
delta-BHC	2.46	U	2.28	U	2.43	U
gamma-BHC (Lindane)	2.46	U	2.28	U	2.43	U
gamma-Chlordane	4.5	J	5	J	9.4	J
Total Metals (MG/KG)						
Aluminum	17,900		20,600		21,100	
Antimony	0.57	U	0.53	J	0.53	U
Arsenic	2.2	L	3.2	L	2.4	L

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UL

Table ..-7-1
Raw Data
SWMU 26 - Surface Soil
NAS Oceana, Virginia Beach, Virginia

	OW26-SS01-00		OW26-SS02-00		OW26-SS03-00	
Sample Date						
Chemical Name						
Barium	72.2		85.9		74.5	
Beryllium	0.79	J	0.83	L	0.69	L
Cadmium	0.52	B	0.54	B	0.86	J
Calcium	1,220	J	510	J	1,060	J
Chromium	19		20.7		23.5	
Cobalt	1.6	U	2.5	J	3.1	J
Copper	12.3		8.7		15.7	
Cyanide	0.03	UL	0.03	UL	0.03	UL
Iron	6,050	L	4,480	L	6,040	L
Lead	23	J	19.6		44.5	
Magnesium	606	J	722	J	1,070	J
Manganese	14.8		20.2		33.9	
Mercury	0.1	J	0.09	J	0.09	J
Nickel	8.9	J	9.4		11.3	
Potassium	1,000	J	759	J	1,010	J
Selenium	1.5	L	0.65	UL	0.73	UL
Silver	1	U	1.2	J	0.95	U
Sodium	86.7	B	65.6	B	87.5	B
Thallium	0.62	U	0.52	U	0.58	U
Vanadium	22.5		24.7		26.8	
Zinc	28.1	B	25.5	B	66.1	

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UJ
UL

Appendix B
Receptor Profiles

Short-tailed Shrew (*Blarina brevicauda*)

Shrews are small insectivorous mammals that have a high metabolic rate and can eat approximately their body weight in food each day. Short-tailed shrews eat insects, worms, snails, and other invertebrates and also may eat mice, voles, frogs, and other vertebrates (Robinson and Brodie 1982). For the purposes of this risk assessment, it was assumed that soil invertebrates comprised the majority of the shrew's diet. Short-tailed shrews can measure 8 to 10 cm in length and weigh from 0.015 to 0.022 kg (Schlesinger and Potter 1974; George et al. 1986). The minimum and average body weights are 0.0155 kg and 0.01687 kg, respectively (USEPA 1993). A maximum food ingestion rate of 0.00192 kg/day (dry weight basis) and an average food ingestion rate of 0.00149 kg/day was used (USEPA 1993). A maximum water ingestion rate of 0.00479 L/day and an average water ingestion rate of 0.0.00376 L/day was used (USEPA 1993). The shrew's home range varies from 0.1 to 0.39 hectares and is smaller during the winter (Buckner 1996).

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Raccoon (*Procyon lotor*)

Raccoons are found across most of the United States primarily in forested areas. They feed in all types of wetlands from swamps to salt marshes. Adult raccoons weigh between 4.2 and 8.3 kg (Sanderson 1984). The minimum (4.2 kg) and average (5394 kg) body weight for the raccoon were used in this risk assessment. Raccoons are omnivorous and will feed on fruits, nuts, grains, crayfish, frogs, clams, insects, birds, eggs, and small rabbits (White 1989). For this risk assessment, it was assumed that invertebrates comprised 43.6 percent, plants comprised 36 percent, small mammals comprised 4 percent, and fish comprised 7 percent of the raccoon's diet. Beyer et al. (1994) estimated that sediment makes up 9.4 percent (0.03196 kg/day) of the raccoon's diet. Their home range varies from 39 to 65 hectares (Lotze 1979). A maximum and average food ingestion rate of 0.14557 kg/day and 0.10003 kg/day (dry weight basis) were used in this risk assessment (Conover 1989). A maximum and average water ingestion rate of 0.6806 L/day and 0.49209 L/day were used in the risk assessment (USEPA 1993).

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Mink (*Mustela vison*)

Mink are distributed throughout most of the continental United States and Canada except in the extreme northern portion of Canada and in the arid areas of the southwestern United States (USEPA 1993, Linscombe et al. 1982). The composition of mink diets varies considerably according to season, prey availability, and habitat type. Mink are opportunistic feeders, with prey species generally taken in relation to their availability (relative abundance and accessibility) (Allen 1986). In general, small mammals and fish are the two principal components of the diet in most areas, seasons, and habitats (Wren 1991). Small mammals (mice, voles, muskrats, and rabbits) typically compose about 50 percent of the annual diet and become increasingly important in fall and winter, especially in northern areas where water bodies freeze solid for portions of the year. Fish are important prey items, especially in fall and winter, but their contribution to the diet is variable (4 to 85 percent). For the purposes of this risk assessment, fish comprised 89 percent of the mink's diet, small mammals comprised 6 percent, aquatic plants comprised 1 percent and aquatic invertebrates comprised 4 percent of their diet. A minimum body weight of 0.564 kg, an average body weight of 0.777 kg, a maximum food ingestion rate of 0.03934 kg/day, an average food ingestion rate of 0.02587 kg/day, a maximum water ingestion rate of 0.10879 L/day, and an average water ingestion rate of 0.02176 L/day were used in this risk assessment (USEPA 1993).

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Red Fox (*Vulpes vulpes*)

Red foxes are the most widely distributed carnivore in the world. They utilize many different types of habitats including salt marshes, cropland, rolling farmland, brush, pastures, hardwood stands, and coniferous forests. Their diet consists primarily of small mammals including meadow voles, mice, and rabbits. In the salt marsh, they forage upon resident animals including voles, muskrats, small marsh birds, and invertebrates. They also consume plant material mainly in the summer and fall when fruits, berries, and nuts become available (USEPA 1993). For the purposes of this risk assessment, in a terrestrial habitat it was assumed that small mammals comprised the majority of the fox's diet; soil ingestion accounts for about 2.8 percent of the diet (Beyer et al. 1994). An adult red fox body weight ranges from 3.2 to 5.25 kg (Merritt 1987; Storm et al. 1976). The minimum (3.17 kg) and average (4.06 kg) body weights for the red fox were used in this risk assessment. The maximum and minimum food ingestion rates (0.14763 kg/day and 0.12308 kg/day on a dry weight basis) (Sample and Suter 1994) and maximum and minimum water ingestion rates of 0.41395 L/day and 0.34939 (USEPA 1993) were used in the risk assessment. Their year-round home range is 717 hectares (Ables 1969).

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Meadow Vole (*Microtus pennsylvanicus*)

Meadow voles inhabit grassy fields, marshes, bogs, and other wet habitats. They are primarily terrestrial but they are strong swimmers. Their diet is composed mostly of plants but voles are also known to eat insects and animal matter . For the purposes of this risk assessment, it was assumed that plants comprised 95.6 percent and soil invertebrates comprised 2.0 percent of the vole's diet. Soil ingestion comprises 2.4 percent of their diet (Beyer et al. 1994). The meadow vole's home range varies from 0.0002 to 0.014 hectares depending on the sex of the vole and the season (Douglass 1976). Meadow voles weigh a minimum of approximately 0.03 kg an an average of 0.0428 kg (Silva and Downing 1995). A maximum food ingestion rate of 0.00334 kg/day (dry weight basis) and an average food ingestion rate of 0.00209 kg/day (dry weight basis) were reported in the literature (USEPA 1993). A maximum water ingestion rate of 0.01334 L/day an average water ingestion rate of 0.00899 L/day were reported in the literature (USEPA 1993).

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Deer Mouse (*Peromyscus maniculatus*)

The deer mouse inhabits nearly all types of dry-land habitats within their range. They are opportunistic feeders and eat seeds, arthropods, some green vegetation, roots, and fruit. For the purposes of this risk assessment, it was assumed that soil invertebrates comprised 44 percent of their diet, while plants comprised 54 percent of their diet. Soil ingestion comprised 2 percent of their diet (Beyer et al. 1994). The deer mouse has a maximum food ingestion rate of 0.00067 kg/day and an average food ingestion rate of 0.00051 kg/day (dry weight basis; USEPA 1993). Their maximum and average water ingestion rates are 0.0042 and 0.00302 L/day, respectively (USEPA 1993). Minimum body weights are approximately 0.0122 kg and average body weights are 0.0168 kg (Silva and Downing 1995). Breeding adults in a mixed/deciduous forest in Virginia have a home range of 0.058 ha for males and 0.061 ha for females (Wolff 1985).

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Great Blue Heron (*Ardea herodias*)

The great blue heron occupies a variety of freshwater and marine areas, including brackish marshes, coastal wetlands, lakes, and rivers where small fish are abundant in shallow areas. Fish are preferred prey, but they also feed on amphibians, reptiles, insects, crustaceans, birds, and mammals (Alexander 1977; Peifer 1979). For purposes of this risk assessment, it was assumed that fish comprised 100 percent of the heron's diet. Heronries may range up to 7 to 8 km from foraging areas, although travel of up to 20 km is known. A home range of 8.4 hectares has been reported (Bayer 1978). The minimum and average body weights of 2.1 and 2.23 kg were used in the risk calculations (Butler 1992). Their maximum food and water ingestion rates are 0.11025 kg/day (dry weight basis) and 0.1125 L/day, respectively (USEPA 1993). Their average food and water ingestion rates are 0.39306 kg/day (dry weight basis) and 0.10098 L/day, respectively (USEPA 1993).

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Marsh Wren (*Cistothorus palustris*)

The marsh wren is common near freshwater marshes and coastal wetlands. Body weight varies seasonally. The minimum body weight for an adult is 0.009 kg (USEPA 1993). The average body weight is 0.01125 kg (Dunning 1993). The marsh wren feeds primarily on aquatic invertebrates and other insects, which they glean from the surface of vegetation. Organisms that are aquatic for all or part of their lives are an important component of the marsh wren's diet. For purposes of this risk assessment, it was assumed that aquatic invertebrates comprised 95 percent of the wren's diet. A sediment ingestion rate of 5 percent was assumed. A maximum and average food ingestion rate of 0.002764 kg/day and 0.00249 kg/day (dry weight basis) and maximum and average water ingestion rates of 0.00365 were used in this risk assessment (USEPA 1993). The home range for the adult male wren is 0.17 hectares (Verner 1965).

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American kestrel (*Falco sparverius*)

The American kestrel is one of the most common falcons in North America. They are found in open to semi-open areas and near the edges of groves. American kestrels eat small mammals, birds, and invertebrates. This risk assessment assumed a diet of 40 percent invertebrates and 60 percent small mammals. American kestrels generally weigh just over one tenth of a kilogram. For the purpose of this risk assessment, a minimum body weight of 0.103 kg and an average body weight of 0.114 kg were used (USEPA 1993). Kestrels have a maximum and average food ingestion rate of 0.01068 kg/day and 0.00882(dry weight basis), respectively (USEPA 1993). Kestrels have a maximum and average water ingestion rate of 0.01587 L/day and 0.01377 L/day, respectively (USEPA 1993). Kestrels have a home range of 323.57 acres (Craighead and Craighead 1956).

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American Robin (*Turdus migratorius*)

Robins live in a variety of habitats, including woodlands, swamps, suburbs, and parks. Robins forage on the ground in open areas, along edge habitats, or along the edges of streams. They forage along the ground for ground-dwelling invertebrates and search for fruit and foliage-dwelling insects in low tree branches (Malmborg and Willson 1988). For the purposes of this risk assessment, it was assumed that soil invertebrates comprise 58 percent, plants comprise 33.6 percent and soil comprises 8.4 percent of the robin's diet (USEPA 1993; Beyer et al. 1994). The size of their home range varies from 0.11 to 0.42 hectares (Pitts 1984; Howell 1942). A minimum body weight of 0.0635 kg and an average body weight of 0.0773 kg (USEPA 1993) was used in the risk calculations. Their maximum food ingestion rate is 0.008615 kg/day and their average food ingestion rate is 0.00552 kg/day (dry weight basis) (Levey and Karasov 1989). Their maximum and average water ingestion rates are 0.01442 and 0.01062 L/day, repectively (USEPA 1993).

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Mallard (*Anas platyrhynchos*)

The mallard is the most widespread and abundant duck in North America (USEPA 1993). This species occurs most frequently in shallow wetland habitats, preferring freshwater to saltwater or brackish water bodies, and also commonly occurs in agricultural and suburban areas. The mallard reaches its highest breeding densities in the prairie pothole region of northern North and South Dakota and southern Saskatchewan, Alberta, and Manitoba (Bellrose 1980; Palmer 1976).

A food ingestion rate of 0.08297 and 0.06471 kg/day (dry weight basis) was used in this risk assessment (USEPA 1993 - allometric equation based on maximum and mean body weights, respectively). USEPA (1993) has estimated mallard water ingestion rates at 5.5 to 5.8 percent of body weight per day. Maximum and average water ingestion rates of 0.09827 and 0.06581 L/day were used. A minimum body weight of 0.612 kg was used in Step 2 of this risk assessment (Bellrose 1980). An average body weight of 1.177 kg was used in Step 3 of the ERA.

The habitats used and the foods consumed by mallards vary by season, location, and the sex of the bird. On an annual basis, mallards normally consume about 90 percent plant material and 10 percent animal matter. Of the animal matter consumed, most is aquatic invertebrates but small quantities of fish (typically 5 percent or less of the total diet) may also be consumed (Newell et al. 1987; Palmer 1976). Invertebrates consumed include aquatic insects, mollusks (mostly snails and small bivalves), and crustaceans. Mallards may also consume earthworms, spiders, tadpoles, frogs, small fish, and fish eggs in small quantities (Palmer 1976). Mallards also consume small amounts of grit to aid in the digestion of foods and also ingest soil or sediment incidental to feeding. In fall, the crop contents of mallards were found to include approximately 0.1 percent grit (Junca et al. 1962). Beyer et al. (1994) estimate that about 3.3 percent of the total diet consists of soil or sediment ingested incidentally while feeding.

On the breeding grounds, the home range of males (240 to 620 ha) is generally larger than for females (135 to 540 ha). The home range of mallards in winter consists of the distance they will fly between roosting and feeding locations. This distance is typically less than 8 km (Allen 1987), although maximum distances are 15 to 20 km (rarely 50 to 60 km).

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Killdeer (*Charadrius vociferus*)

The killdeer is a medium-sized plover of open habitats and is one of the most widely distributed North American shorebirds. The killdeer uses a wide variety of structurally open habitats and is quite tolerant of human activity. During the breeding season, this species favors open dry uplands, such as meadows, pastures, cultivated fields, and disturbed or heavily grazed areas, where the vegetation is short, sparse, or absent. This species nests in the open on bare dirt or gravel substrates, sometimes nesting on gravel rooftops, gravel roads, railroad beds, and gravel parking lots. (AOU 1998; Palmer 1967; Johnsgard 1981; Rappole and Blacklock 1985; 1994; Verner and Boss 1980).

For the purposes of this risk assessment, a maximum body weight of 0.0858 kg and average body weight of 0.0966 were used(Dunning 1993). Killdeers have a maximum water ingestion rate and maximum food ingestion rate of 0.01385 L/day and 0.01424 kg/day respectively (USEPA 1993). Killdeers have an average water ingestion rate and average food ingestion rate of 0.0966 L/day and 0.01232 kg/day respectively (USEPA 1993). An incidental ingestion rate of soil of five percent was assumed based on diet. Their diet consists of 93 percent soil invertebrates, five percent soil ingestion, and two percent terrestrial plants (Robbins and Blom 1996).

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Appendix C
Chemical Profiles

Inorganics

Aluminum

Aluminum occurs naturally and makes up about 8 percent of the earth's crust. In the environment, aluminum binds to air particles; dissolves in lakes, streams, and rivers depending on water quality; and can be taken up into plants from soil. The direct toxic potential of aluminum is low compared to that of many other metals (Scheuhammer 1987). The toxicity of aluminum has been shown to vary widely with water hardness and pH (Ingersoll et al. 1990; Woodard et al. 1989). The chronic toxicity of orally ingested aluminum in birds and mammals is probably more a function of its disruptive effects on calcium and phosphorus homeostasis than direct cytotoxicity of aluminum itself (Scheuhammer 1987). High levels of aluminum in the diet may cause decreased growth rates, bone abnormalities, and muscle weakness concurrent with marked disturbances of calcium and phosphorus metabolism. Studies using high levels in mice and rabbits show that aluminum may cause delays in skeletal and neurological development in young animals (ATSDR 1992). Studies of the possible aetiologic role of aluminum in breeding impairment of wild passerines reported severe eggshell defects, reduced clutch sizes, and high incidence of mortality in pied flycatchers and other species of small passerines nesting by the shore of an acid-stressed Swedish lake (Nyholm and Myhrberg 1977; Nyholm 1981). The source of the dietary ingestion of aluminum was thought to be the emergent insect biomass utilized as a food source by the shore-nesting flycatchers.

A literature search was conducted on the toxicological effects of aluminum ingestion to mammals. A 390-day reproductive study conducted on mice indicated a chronic oral toxicity dose of 193 mg/kg/day of aluminum (Ondreicka et al. 1966). The dose was considered to be a chronic LOAEL because there were no effects on the number of litters or number of offspring per litter, but the growth of generations 2 and 3 was significantly reduced. A chronic NOAEL of 19.3 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1 (ATSDR 1990). A 6-month reproductive study with dogs (ATSDR 1990) indicated a chronic LOAEL of 600 mg/kg/day. A chronic NOAEL of 60 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1.

A literature search was conducted on the toxicological effects of aluminum to birds. A 4-month reproductive study conducted with ringed doves indicated no chronic oral toxicity at a dose of 1000 ppm (Carriere et al. 1986). This dose was considered to be a chronic NOAEL because no significant differences were observed at the 1000 ppm dose level and the study considered exposure over 4 months including a critical life stage (reproduction). The dose was converted to a final NOAEL of 109.7 mg/kg/day (Sample et al. 1996). A chronic LOAEL of 1097 mg/kg/day was estimated by multiplying the chronic NOAEL by an uncertainty factor of 10.

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Antimony

Antimony is a silvery-white metal that is found in the earth's crust. Antimony ores are mined and then mixed with other metals to form antimony alloys or combined with oxygen to form antimony oxide. Antimony is released to the environment from natural sources and from industry. Most antimony ends up in soil, where it attaches strongly to particles that contain iron, manganese, or aluminum. Antimony is found at low levels in some rivers, lakes, and streams.

In short-term studies, animals that inhaled high levels of antimony had lung, heart, liver, and kidney damage and some died. In long-term studies, animals that inhaled low levels of antimony suffered eye irritation, hair loss, lung damage, and heart problems. Reproductive problems in rats have been caused by inhalation of high levels of antimony for a 3-month period. Long-term animal studies have reported liver damage and blood changes when animals ingested antimony (ATSDR 1992).

A literature search was conducted on the toxicological effects of antimony ingestion to mammals. A 1-year study conducted on the effects of antimony on the growth, survival, and tissue levels in mice indicated a chronic oral toxicity dose of 5 ppm (Schroeder et al. 1968). This dose was converted to 1.25 mg/kg/day and considered a chronic LOAEL because median life span was reduced among female mice exposed to the 5 ppm dose level (Sample et al. 1996). A chronic NOAEL of 0.125 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1.

A 6-week study with northern bobwhites, conducted during a critical life stage (reproduction), showed chronic oral toxicity at a dose of 47400 mg/kg/day (Opresko et al. 1993). This dose was considered a chronic LOAEL. A chronic NOAEL of 4740 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1.

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Schroeder, H.A., M. Mitchener, J.J. Balassa, M. Kanisawa, and A.P. Nason. 1968. Zirconium, niobium, antimony, and fluorine in mice: effects on growth, survival and tissue levels. *J. Nutr.* 95: 95-101.

Arsenic

Arsenic tends to be widespread in the environment (Woolson 1975) and is constantly being oxidized, reduced, or mobilized (Eisler 1988). Arsenic is readily adsorbed onto sediments with high organic matter. Adsorption depends on the arsenic concentration, sediment characteristics, pH, and the ionic concentration of other compounds (Eisler 1988). Arsenate (pentavalent, As+5) is the predominant arsenic form in oxygenated water and arsenite (trivalent, As+3) is the predominant arsenic form under anaerobic conditions (USEPA 1981).

Arsenic is not significantly concentrated in aquatic invertebrates. Arsenic may be bioaccumulated by lower trophic level organisms; however, data does not indicate that significant biomagnification occurs (USEPA 1985).

A literature search was conducted on the toxicological effects of arsenic ingestion to mammals. A 3-generation study on the reproductive effects of arsenite in mice determined a LOAEL of 1.26 mg/kg/day (Schroeder and Mitchner 1971). At this dose, mice displayed declining litter sizes. A chronic NOAEL of 0.126 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1.

A literature search was conducted on the toxicological effects of arsenic ingestion to birds. In a 7-month study conducted by USFWS (1969) on male brown-headed cowbirds, four dietary dose levels were used. Doses of 675 and 225 ppm caused 100 percent mortality and doses of 75 (33.26 mg/kg) and 25 (11.09 mg/kg) ppm caused 20 percent and 0 percent mortality, respectively. The 75 and 25 ppm doses were considered the chronic LOAEL and NOAEL, respectively. A chronic NOAEL of 2.46 mg/kg/day and a LOAEL of 7.38 mg/kg/day were calculated from these data (Sample et al. 1996). Mallards exposed to arsenic in the diet for 128 days showed effects to survival at doses of 12.84 mg/kg/day (the estimated chronic LOAEL) with the NOAEL estimated at 5.14 mg/kg/day (Sample et al. 1996).

Eisler, R. 1988. *Arsenic hazards to fish, wildlife, and invertebrates: a synoptic review.* U.S. Fish and Wildlife Service Biological Report 85(1.12), Contaminant Hazard Reviews Report No. 12. 92 pp.

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. *Toxicological benchmarks for wildlife: 1996 revision.* Risk Assessment Program, Health Sciences Research Division. Oak Ridge, Tennessee.

Schroeder, H.A. and M. Mitchener. 1971. Toxic effects of trace elements on the reproduction of mice and rats. *Arch. Environ. Health.* 23: 102-106.

United States Environmental Protection Agency (USEPA). 1981. *The carcinogen assessment group's final risk assessment on arsenic.* Office of Health and Environmental Assessment, Washington, D.C. PB 81-206013.

United States Environmental Protection Agency (USEPA). 1985. *Health advisory for arsenic.* Draft. Office of Drinking Water, Washington, D.C.

United States Fish and Wildlife Service (USFWS). 1969. Bureau of sport fisheries and wildlife. Publication 74:56-57.

Woolson, E.A. 1975. Arsenical pesticides. *ACS Ser* 7:1-176.

Barium

Barium occurs in nature combined with other chemicals such as sulfur, or carbon and oxygen. Some barium compounds dissolve easily in water and are found in lakes, rivers, and streams. Barium is found in most soils and foods at low levels. Fish and aquatic organisms accumulate barium in their tissues (ATSDR 1992). Studies on animals have shown that ingesting low levels of barium over the long term causes increased blood pressure and heart changes (ATSDR 1992).

A 16-month study conducted with barium administered orally in water to rats was used to derive a chronic NOAEL (endpoints were growth and hypertension) of 5.1 mg/kg/day, while a second study with rats (endpoint was mortality) was used to derive a chronic LOAEL of 19.8 mg/kg/day (Sample et al. 1996).

In a study conducted by Johnson (1960) over a 4-week period, chicks were exposed to eight barium dose levels in their diet. Exposures of up to 2000 ppm produced no mortality. Chicks in the 4000 to 32000 ppm groups experienced 5 to 100 percent mortality, respectively. The 2000 and 4000 ppm doses were considered the chronic NOAEL and LOAEL, respectively. These dietary concentrations were converted to a chronic NOAEL of 208 mg/kg/day and a chronic LOAEL of 417 mg/kg/day (Sample et al. 1996).

Agency for Toxic Substances and Disease Registry (ATSDR). 1992. *Toxicological Profile for Barium.* U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Johnson, D., Jr., A.L. Mehring, Jr., and H.W. Titus. 1960. Tolerance of chickens for barium. *Proc. Soc. Exp. Biol. Med.* 104: 436-438.

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. *Toxicological benchmarks for wildlife: 1996 revision.* Risk Assessment Program, Health Sciences Research Division. Oak Ridge, Tennessee.

Beryllium

In nature, beryllium can be found, in compounds with other elements, in mineral rocks, coal, soil, and volcanic dust. It can enter water from rocks, soil, and industrial waste. Most beryllium compounds do not dissolve in water and settle to the bottom as particles. Fish are not known to accumulate beryllium in their bodies from the surrounding water to any great extent (ATSDR 1993). Based on animal studies, beryllium compounds may be considered carcinogens (ATSDR 1993).

A literature search was conducted on the toxicological effects of beryllium ingestion to mammals. A study conducted on the effect to longevity and weight loss from beryllium given orally in water to rats (lifetime exposures) indicated a chronic no effect level of 5 ppm, the only dose tested (Schroeder and Mitchner 1975). Exposure to 5 ppm beryllium in water did not reduce longevity, but weight loss by male rats was observed in the second and sixth month. Because weight loss was not considered an adverse effect, the 5 ppm dose level was considered to be a chronic NOAEL. The 5 ppm dietary concentration was converted to a daily dose of 0.66 mg/kg/day (Sample et al. 1996), which was considered the chronic NOAEL. A chronic LOAEL of 6.6 mg/kg/day was estimated by multiplying the NOAEL by an uncertainty factor of 10.

No dietary information was found on the toxicological effects of beryllium to birds.

Agency for Toxic Substances and Disease Registry (ATSDR). 1993. *Toxicological profile for beryllium.* U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. *Toxicological benchmarks for wildlife: 1996 revision.* Risk Assessment Program, Health Sciences Research Division. Oak Ridge, Tennessee.

Schroeder, H.A. and M. Mitchener. 1975. Life-term studies in rats: effects of aluminum, barium, beryllium, and tungsten. *J. Nutr.* 105: 421-427.

Cadmium

Freshwater aquatic species are most sensitive to the toxic effects of cadmium, followed by marine organisms, birds, and mammals. Cadmium is a reproductive toxin in fish and other aquatic life. Adverse effects include carcinogenicity and teratogenicity. Other adverse effects in aquatic organisms include decreased oxygen utilization, bone marrow, heart, kidney, and vascular pressure. Diatoms and aquatic plants also show impaired growth and development at low concentrations of cadmium. Cadmium can concentrate in tissues and thus can accumulate in food chains. Vertebrates tend to accumulate cadmium in the kidney and liver (Eisler 1985).

A literature search was conducted on the toxicological effects of cadmium ingestion to mammals. A 6-week study conducted with rats indicated that oral doses of 1 mg/kg/day caused no reproductive impairment (Sample et al. 1996). This dose was considered a chronic NOAEL. Adverse reproductive (fetal) effects occurred at a dose of 10 mg/kg/day. This dose was considered a chronic LOAEL.

A similar study, conducted with dogs over a period of 3 months, indicated a NOAEL of 0.75 mg/kg/day because no adverse reproductive effects were observed (Loser and Lorke

1977). A chronic LOAEL was estimated by multiplying the chronic NOAEL by an uncertainty factor of 10.

A 90-day study on the effects of cadmium administered orally in the diet on the reproduction of mallards indicated a chronic LOAEL of 20.03 mg/kg/day (White and Finley 1978). Ducks fed cadmium at this level were observed to produce significantly fewer eggs than those in lower dose groups. No adverse reproductive effects were observed at a dose of 1.45 mg/kg/day. This dose was considered to be a chronic NOAEL.

Eisler, R. 1985. *Cadmium hazards to fish, wildlife, and invertebrates: a synoptic review.* U.S. Fish and Wildlife Service Biological Report 85(1.2), Contaminant Hazard Reviews. Report No. 2. 46 pp.

Loser, E. and D. Lorke. 1977. Semichronic oral toxicity of cadmium. II. Studies on dogs. *Toxicology.* 7:225-232.

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. *Toxicological benchmarks for wildlife: 1996 revision.* Risk Assessment Program, Health Sciences Research Division. Oak Ridge, Tennessee.

White, D.H. and M.T. Finley. 1978. Uptake and retention of dietary cadmium in mallard ducks. *Environ. Res.* 17:53-59.

Chromium

Chromium is a naturally occurring element. Chromium compounds are used in the chemical industry for metal finishing, manufacture of pigments, leather tanning, and water treatment. Chromium has been widely studied and its effects are well known.

A 3-month study on the effects of chromium on survival in rats indicated adverse effects at a dose of 131.4 mg/kg/day. This dose was considered to be a chronic LOAEL (Sample et al. 1996). A chronic NOAEL of 13.14 mg/kg/day was estimated by multiplying the chronic NOAEL by an uncertainty factor of 0.1.

A literature search was conducted on the toxicological effects of chromium ingestion to birds. A study conducted with American black ducks indicated that dietary levels of 5.0 mg/kg/day of chromium caused reduced duckling survival. This dose was considered a chronic LOAEL (Sample et al. 1996). A dose of 1.0 mg/kg/day was considered a chronic NOAEL because no adverse reproductive effects were observed at this level.

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. *Toxicological benchmarks for wildlife: 1996 revision.* Risk Assessment Program, Health Sciences Research Division. Oak Ridge, Tennessee.

Cobalt

Rats exposed to cobalt in the diet for 69 days showed impaired reproduction at 50 mg/kg/day; this dose is considered a chronic LOAEL. A chronic NOAEL of 5 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1 (ATSDR 1992). Chickens exposed to cobalt in the diet for 14 days showed impaired growth at 14.7 mg/kg/day; this dose is considered a chronic LOAEL (Diaz et al. 1994). A chronic NOAEL of 1.47 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1.

Agency for Toxic Substances and Disease Registry (ATSDR). 1992. *Toxicological profile for cobalt.* July.

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.

Copper

Excess ingestion of copper leads to accumulation in tissues, mainly in the liver. When concentrations in the liver exceed a certain level, the metal is released into the blood causing hemolysis and jaundice. High levels of copper also inhibit essential metabolic enzymes (Demayo et al. 1982). Toxic symptoms appear when the liver accumulates 3 to 15 times the normal level of copper (Demayo et al. 1982).

Ruminants are the most sensitive mammalian species to the toxic effects of copper. Young animals retain more dietary copper than older animals and are more sensitive to copper toxicity (Venugopal and Luckey 1978). Copper is known to have adverse effects on aquatic organisms, but is dependent upon pH and hardness. Copper tends not to accumulate in most organisms or to biomagnify in food chains.

A 357-day study on the effects of copper on the reproduction of mink indicated increased mortality of mink kits at oral doses of 50, 100, and 200 ppm (Aulerich et al. 1982). The 50 ppm dose was converted to a chronic LOAEL of 15.14 mg/kg/day. A chronic NOAEL of 11.7 mg/kg/day was determined from the 25 ppm dietary concentration at which no adverse reproductive effects were observed.

A 10-week study on the effects of copper on the growth and mortality of day old chicks indicated reduced growth and increased mortality at a dietary concentration of 749 ppm (Mehring et al. 1960). This concentration, considered to be a chronic LOAEL, was converted to a daily dose of 61.7 mg/kg/day (Sample et al. 1996). No adverse effects were observed at a dietary concentration of 570 ppm. This concentration, considered to be a chronic NOAEL, was converted to a daily dose of 47 mg/kg/day.

Aulerich, R.J., R.K. Ringer, M.R. Bleavins et al. 1982. Effects of supplemental dietary copper on growth, reproduction performance and kit survival of standard dark mink and the acute toxicity of copper to mink. *J. Animal Sci.* 55:337-343.

DeMayo, A., M.C. Tyalor and K.W. Taylor. 1982. Effects of copper on humans, laboratory and farm animals, terrestrial plants and aquatic life. *CRC Critical Reviews in Environmental Control.* 12(3):183-255.

Mehring, A.L. Jr., J.H. Brumbaugh, A.J. Sutherland, and H.W. Titus. 1960. The tolerance of growing chickens for dietary copper. *Poult. Sci.* 39:713-719.

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. *Toxicological benchmarks for wildlife: 1996 revision.* Risk Assessment Program, Health Sciences Research Division. Oak Ridge, Tennessee.

Venugopal, B. and T.D. Luckey. 1978. *Metal toxicity in mammals, Volume 2.* Plenum Press, New York, N.Y.

Cyanide

Cyanide has a greater impact upon fish, in general, than upon invertebrates. Plants demonstrate a wide range of susceptibility. In general terms, plants will be protected at the same range considered safe for animals. Cyanide, which is readily metabolized by most organisms, does not bioaccumulate in food chains (Eisler 1991).

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.

Iron

Iron can have effects on plants. Chlorosis, the yellowing or dropping of leaves, can occur when iron, within alkaline soils, becomes insoluble and unavailable for uptake. At extremely high concentrations, iron has been reported to be toxic to livestock.

A literature search was conducted on the toxicological effects of iron ingestion to mammals and birds. The maximum tolerable level of iron for sheep and rabbits is 500 mg/kg/day (NAS 1980). The maximum tolerable level of iron for poultry is 1,000 mg/kg/day (NAS 1980). In the literature, *"maximum tolerable level"* is defined as that dietary level that, when fed for a limited period, will not impair animal performance (NAS 1980). Therefore, 500 mg/kg/day and 1,000 mg/kg/day were used as chronic LOAELs for mammals and birds, respectively. A chronic NOAEL was estimated by multiplying each LOAEL by an uncertainty factor of 0.1.

NAS (National Academy of Sciences). 1980. *Mineral tolerance of domestic animals.* National Research Council, Committee on Animal Nutrition, Board on Agriculture and Renewable Resources, Commission on Natural Resources. Washington, D.C.

Lead

Organic forms of lead are more bioavailable than inorganic forms, but microorganisms in streams are capable of transforming inorganic lead into organic forms. Soluble lead is toxic to all aquatic plant phyla. In plants, lead inhibits growth by reducing photosynthetic activity, mitosis, and water absorption. In the terrestrial environment, lead has been demonstrated to be toxic to birds, mammals, reptiles, and amphibians. Lead poisoning in birds is particularly well documented, but most lead poisoning in wild birds results from ingestion of lead pellets. In contrast, lead poisoning of birds, such as raptors, from biologically incorporated lead is considered unlikely. Lead is known to be toxic to mammalian species, but information on the effects on wild species is very limited. Toxic effects include mortality, reduced growth and reproduction, alterations of blood chemistry, lesions, and behavioral changes. Terrestrial vegetation also may be affected by elevated lead concentrations. Demonstrated effects include reduced photosynthesis, mitosis, and water absorption. Lead, however, appears to bind tightly to moist soil, and substantial amounts of lead typically need to accumulate before effects on plants are observed. Lead does not biomagnify to a great extent in food chains, although bioaccumulation in plants and animals has been extensively documented (Wixson and Davis 1993, Eisler 1988).

A study on three generations of rats fed lead acetate indicated a chronic NOAEL of 8 mg/kg/day (Azar et al. 1973). Rats fed this dose level were not observed to exhibit any adverse reproductive effects. Rats fed 80 mg/kg/day were observed to have reduced offspring weights and kidney damage in the young. This dose was considered to be a chronic LOAEL.

A 7-month study on the toxicological effects of lead ingestion in American kestrels found that an oral dose of 3.85 mg/kg/day did not cause any adverse reproductive effects (Sample et al. 1996); this dose was considered a chronic NOAEL. A chronic LOAEL of 38.5 mg/kg/day was estimated by multiplying the chronic NOAEL by an uncertainty factor of 10. A 12-week study with Japanese quail found that oral exposures to lead acetate in the diet did not have any adverse reproductive effects at doses of 1.13 mg/kg/day (chronic NOAEL) although adverse effects were observed at a dose of 11.3 mg/kg/day (chronic LOAEL; Sample et al. 1996).

Azar, A., H.J. Trochimowicz, and M.E. Maxwell. 1973. Review of lead studies in animals carried out at Haskell Laboratory: two-year feeding study and response to hemorrhage study. Pages 199-210 IN Barth, D et al. (eds). *Environmental health aspects of lead: proceedings, international symposium*. Commission of European Communities.

Eisler, R. 1988. *Lead hazards to fish, wildlife, and invertebrates: a synoptic review*. U.S. Fish and Wildlife Service Biological Report 85(1.14), Contaminant Hazard Reviews Report No. 14. 134 pp.

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. *Toxicological benchmarks for wildlife: 1996 revision*. Risk Assessment Program, Health Sciences Research Division. Oak Ridge, Tennessee.

Wixson, B.G. and B.E. Davis. 1993. *Lead in soil*. Lead in Soil Task Force, Science Reviews. Northwood. 132 pp.

Manganese

Manganese is a vital micronutrient in plants and animals. Plant leaves will turn yellow when manganese is not present is sufficient quantities. Manganese can be toxic to plants if irrigated with water and pH values are less than 6.0. Because it is an essential nutrient, plants likely have a wide range of tolerance to manganese.

A literature search was conducted on the toxicological effects of manganese ingestion to mammals. A study was conducted on the reproductive effects of manganese on rats (Laskey et al. 1982). The rats were fed three dose levels of manganese: 400, 1100, and 3550 ppm. A dose of 3550 ppm caused reduced pregnancy and fertility and was therefore considered a chronic LOAEL. The chronic LOAEL was converted to a daily dose of LOAEL of 284 mg/kg/day (Sample et al. 1996). No effects were observed at lower exposure levels. A chronic NOAEL of 1100 ppm was converted to a daily dose of 88 mg/kg/day (Sample et al. 1996).

A literature search was conducted on the toxicological effects of manganese ingestion to birds. A 75-day study conducted on growth and behavioral effects of manganese on Japanese quail indicated a chronic NOAEL of 977 mg/kg/day (Laskey and Edens 1985) because no reduction in growth was observed but aggressive behavior declined. A chronic LOAEL of 9770 mg/kg/day was estimated by multiplying the chronic NOAEL by an uncertainty factor of 10.

Laskey, J.W. and F.W. Edens. 1985. Effects of chronic high-level manganese exposure on male behavior in the Japanese quail *(Cotirnix coturnix japonica)*. *Poult. Sci.* 64:579-584.

Laskey, J.W., G.L. Rehnberg, J.F. Hein, and S.D. Carter. 1982. Effects of chronic manganese (Mn_3O_4) exposure on selected reproductive parameters in rats. *J. Toxicol. Environ. Health.* 9:677-687.

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. *Toxicological benchmarks for wildlife: 1996 revision.* Risk Assessment Program, Health Sciences Research Division. Oak Ridge, Tennessee.

Mercury

Mercury is persistent in the environment and may cause significant effects on ecological receptors. A variety of adverse biological effects have been attributed to mercury. Mercury is a known teratogen, mutagen, and carcinogen. Mercury has been documented to adversely effect reproduction, growth and development, behavior, blood and serum chemistry, motor coordination, vision, hearing, histology, and metabolism at relatively low concentrations in birds and mammals. The reproduction, growth, metabolism, blood chemistry, and oxygen exchange of marine and freshwater organisms also is adversely affected by relatively low concentrations of mercury. The form of mercury most readily assimilated by biota is methylmercury. Once incorporated in tissues, methylmercury is very slow to depurate. The rate of bioaccumulation of methylmercury is species- and site-specific.

A three-generation study on the effects of mercury (administered orally as methyl mercury chloride) on the reproduction of rats indicated a LOAEL of 0.16 mg/kg/day because reduced pup viability was observed (Verschuuren et al. 1976). A chronic NOAEL of 0.032 mg/kg/day was determined because no adverse reproductive effects were observed at this level.

A 93-day study conducted on mink indicated that a dose of 1.8 ppm (administered orally as methyl mercury chloride) caused mortality, weight loss, and behavioral abnormalities (Wobeser et al. 1976). No adverse effects were observed at 1.1 ppm so this dose was considered a chronic NOAEL. These values were converted to a daily dose of 0.25 mg/kg/day (chronic LOAEL) and 0.15 mg/kg/day (chronic NOAEL).

A literature search was conducted on the toxicological effects of mercury ingestion to birds. A one-year study conducted on Japanese quail indicated that an oral dose of 0.9 mg/kg/day (as mercuric chloride) caused reduced fertility and egg hatchability (Sample et al. 1996). This dose was considered a chronic LOAEL. No adverse reproductive effects were observed at a dose of 0.45 mg/kg/day. This dose was considered a chronic NOAEL.

Mallards fed methyl mercury during a 3-generation study showed significant reproductive effects (reduced egg and duckling production) at a daily dose 0.064 mg/kg/day (Sample et al. 1996). This dose was considered a chronic LOAEL. A chronic NOAEL of 0.0064 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1.

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. *Toxicological benchmarks for wildlife: 1996 revision.* Risk Assessment Program, Health Sciences Research Division. Oak Ridge, Tennessee.

Verschuuren, R.G., R. Kroes, E.M. Den Tonkelaar, J.M. Berkvens, P.W. Helleman, A.G. Rauws, P.L. Schuller, and G.J. Van Esch. 1976. Toxicity of methyl mercury chloride in rats. II. Reproduction study. *Toxicol.* 6:97-106.

Wobeser, G., N.O. Nielson, and B. Schiefer. 1976. Mercury and mink. II. Experimental methyl mercury intoxication. *Can. J. Comp. Med.* 34-45.

Nickel

Nickel is a metal that is usually used in the formation of alloys such as stainless steel. It is found in the environment as oxides or sulfides. Nickel may be released to the environment through mining, oil- and coal- burning power plants, and incinerators. Nickel will attach to soil or sediment particles, especially those containing iron or manganese. Under acidic conditions, nickel can become more mobile and infiltrate groundwater. Nickel is present in water mostly as insoluble hydroxides at pH levels higher than 6.7. At pH levels below 6.5, most nickel compounds are soluble. Water-insoluble inorganic nickel is usually unavailable in water and soils. However, low pH can enable nickel to be mobilized and therefore more bioavailable for uptake by plants and animals. Therefore, the speciation and physiochemical state of nickel is important in evaluating its behavior in the environment and its availability to biota. Low nickel concentrations can cause acute toxicity to freshwater and marine organisms.

A 3-generation study on the effects of nickel on the reproduction of rats indicated a chronic LOAEL of 80 mg/kg/day due to reduced body weights in offspring (Ambrose et al. 1976). A dose of 40 mg/kg/day was considered a chronic NOAEL because it caused no adverse effects.

A literature search was conducted on the effects of nickel ingestion to birds. A study conducted on mallard ducklings indicated that a dose of 107 mg/kg/day of nickel over a 90-day period caused reduced growth and resulted in 70 percent mortality (Cain and Pafford 1981). This dose was considered to be the chronic LOAEL. A dose of 77.4 mg/kg/day did not increase mortality or reduce growth and was therefore considered a chronic NOAEL.

Ambrose, A.M., P.S. Larson, and J.F. Borzelleca. 1976. Long-term toxicological assessment of nickel in rats and dogs. *J. Food. Sci. Technol.* 13:181-187.

Cain, B.W. and E.A. Pafford. 1981. Effects of dietary nickel on survival and growth of mallard ducklings. *Arch. Environm. Contam. Toxicol.* 10:737-745.

Selenium

Selenium is a metal commonly found in rocks and soil. In the environment, selenium is not often found in the pure form. Much of the selenium in rocks is combined with sulfide minerals or with silver, copper, lead, and nickel minerals. Selenium and oxygen combine to form several compounds. Small selenium particles in the air settle to the ground or are taken out of the air in rain. Soluble selenium compounds in agricultural fields can be transported from the field in irrigation drainage water. Selenium can accumulate in animals that live in water containing high levels of selenium. Very high amounts of selenium can result in reproductive effects in rats and monkeys. Exposure to high levels of selenium compounds caused malformations in birds, but selenium has not been shown to cause birth defects in other mammals (ATSDR 1996). Chronic exposure of mice and rats to selenium adversely affected fertility and reduced the viability of the offspring of the pairs of mice that were able to breed (Schroeder and Mitchener 1971).

A one-year study on the effects of potassium selenate on the reproduction of rats indicated a chronic oral toxic dose of 1.5 mg/L (Rosenfeld and Beath 1954). This dose was considered to be a chronic NOAEL because no adverse effects were observed. This dose was converted to a daily dose of 0.20 mg/kg/day. A chronic LOAEL of 2.5 mg/L was indicated due to a reduction in the number of second-generation young. This dose was converted to a daily dose of 0.33 mg/kg/day.

A 100-day study conducted on the effects of selanomethionine on reproduction in mallard ducks indicated a chronic NOAEL of 4 ppm in food because it produced no adverse effects on reproduction. This dose was converted to a daily dose of 0.4 mg/kg/day (Sample et al. 1996). A dose of 8 ppm was determined to be the chronic LOAEL because it resulted in reduced duckling survival and was converted to a daily dose of 0.8 mg/kg/day.

Reproduction in screech owls fed selanomethionine for 13.7 weeks was not adversely affected at a daily dose of 0.44 mg/kg/day (chronic NOAEL), although a daily dose of 1.5 mg/kg/day (chronic LOAEL) resulted in decreased egg production, egg hatchability, and nestling survival (Sample et al. 1996).

Agency for Toxic Substances and Disease Registry (ATSDR). 1996. *Toxicological profile for selenium*. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Rosenfeld, I. and O.A. Beath. 1954. Effect of selenium on reproduction in rats. *Proc. Soc. Exp. Biol. Med.* 87:295-297.

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. *Toxicological benchmarks for wildlife: 1996 revision*. Risk Assessment Program, Health Sciences Research Division. Oak Ridge, Tennessee.

Schroeder, H.A. and M. Mitchener. 1971. Toxic effects of trace elements on the reproduction of mice and rats. *Arch. Environ. Health.* 23:102-106.

Silver

Silver adheres strongly to clay particles found suspended in water and in sediments. The impact of silver is most likely to occur in the soil/water interface. It is acutely toxic to scuds at <6 μg/L and midges at <5 μg/L. Aquatic plants are less sensitive to silver exposure.

A literature search was conducted on the toxicological effects of silver ingestion to mammals and birds. Ingestion-based studies were not available for birds. A study conducted on rats indicated that a dose of 18.1 mg/kg/day did not result in increased mortality. This dose was considered a chronic NOAEL (ASTDR 1990). A chronic LOAEL was estimated by multiplying the chronic NOAEL by an uncertainty factor of 10.

Agency for Toxic Substances and Disease Registry (ATSDR). 1990. *Toxicological profile for silver*. TO-90/24.

Thallium

Thallium enters the environment primarily from coal-burning and smelting, in which it is a trace contaminant of the raw materials. Thallium is absorbed by plants and enters the food chain. It builds up in fish and shellfish. Studies in rats exposed to high levels of thallium, showed adverse developmental effects (ATSDR 1992). Rats ingesting thallium for several weeks had some adverse reproductive effects (ATSDR 1992). Data also suggest that the male animal reproductive system may be susceptible to damage by low levels of thallium.

A literature search was conducted on the toxicological effects of thallium ingestion to mammals and birds. Ingestion-based studies were not available for birds. A study conducted on the reproductive (male testicular function) effects of thallium in rats indicated that a dose of 0.74 mg/kg/day caused reduced sperm motility (Formigli et al. 1986). This dose was considered to be a chronic LOAEL. A chronic NOAEL was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1 to obtain a daily dose 0.074 mg/kg/day.

Agency for Toxic Substances and Disease Registry (ATSDR). 1992. *Toxicological profile for thallium*. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Formigli, L.,R. Scelsi, P. Poggi, C. Gregotti, A. DiNucci, E. Sabbioni, L. Gottardi, and L. Manzo. 1986. Thallium-induced testicular toxicity in the rat. *Environ. Res.* 40:531-539.

Vanadium

Vanadium enters the environment primarily from natural sources and from the burning of fuel oils. It is an essential element in certain animals, but may induce toxic effects in sufficient quantities. Young rats fed 92 and 194 ppm vanadium lost body weight and exhibited gross pathological symptoms, and 56 percent of those fed 368 ppm vanadium died (Daniel and Lillie 1938). In a study with mallard ducks, vanadium accumulated in the bone, kidney, and liver. Hens fed 100 ppm accumulated vanadium in the bone to about five times the levels in drakes (White and Dieter 1978). Several studies have shown contradictory effects of vanadium on lipid metabolism in birds and mammals. Responses were dependent on species, age, and diet composition. The alterations in lipid metabolism caused by vanadium were considered biologically significant because they were demonstrable in ducks that had absorbed and accumulated only minute tissue concentrations of the metal (White and Dieter 1978).

A literature search was conducted on the toxicological effects of vanadium ingestion to mammals. A 60-day study was conducted on the reproductive effects of vanadium to rats. The rats were fed three dose levels of sodium metavanadate: 5, 10, and 20 mg/kg/day. Significant differences in reproductive parameters (e.g., number of dead young, litter size) were observed at all dose levels. Therefore, the lowest dose was considered to be a chronic LOAEL. The LOAEL of 5 mg/kg/day was converted to an elemental vanadium dosage of 2.1 mg/kg/day (Sample et al. 1996). A chronic NOAEL (0.21 mg/kg/day) was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1.

A literature search was conducted on the toxicological effects of vanadium ingestion to birds. A study conducted on mortality, body weight, and blood chemistry effects of vanadium to mallards indicated a chronic NOAEL of 11.4 mg/kg/day (White and Dieter 1978). The mallards were fed three dose levels of vanadium in food over a 12-week period and no effects were observed at any dose level. The maximum dose was considered the chronic NOAEL. A chronic LOAEL (114 mg/kg/day) was estimated by multiplying the chronic NOAEL by an uncertainty factor of 10.

Daniel, E.P. and R.D. Lillie. 1938. Experimental vanadium poisoning in the white rat. *U.S. Public Health Rep.* 53:765-777.

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. *Toxicological benchmarks for wildlife: 1996 revision.* Risk Assessment Program, Health Sciences Research Division. Oak Ridge, Tennessee.

White, D.H. and M.P. Dieter. 1978. Effects of dietary vanadium in mallard ducks. *J. Toxicol. Environ. Health.* 4:43-50.

Zinc

Zinc, like many other metals, is essential in cell growth and enzymatic formation. *Ceriodaphnia,* a genus of aquatic invertebrates, are the most sensitive of 35 genera tested, but some aquatic plants are three times as sensitive to zinc. Zinc toxicity can result in destruction of gill epithelium and tissue hypoxia in fish. In terrestrial species, chronic exposure to zinc can result in softening of bone, anemia, enteropathy, and kidney damage. Zinc is not known to magnify in food chains because the body regulates it and excess zinc is eliminated.

A study conducted with rats indicated that a dose of 320 mg/kg/day of zinc caused adverse reproductive effects in pregnant rats (Sample et al. 1996). This dose was considered a chronic LOAEL. A chronic NOAEL of 160 mg/kg/day was determined since no adverse effects were observed at this dose. Mink exposed to zinc in the diet for 25 weeks did not exhibit any adverse reproductive effects at a daily dose of 20.8 mg/kg/day (ATSDR 1992).

Reproduction in chickens exposed to zinc in the diet for 44 weeks was not adversely affected at a daily dose of 14.5 mg/kg/day but was adversely affected at 131 mg/kg/day. These doses are considered chronic NOAEL and LOAEL values, respectively (Sample et al. 1996).

Agency for Toxic Substances and Disease Registry (ATSDR). 1992. *Toxicological profile for zinc.* Draft.

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. *Toxicological benchmarks for wildlife: 1996 revision.* Risk Assessment Program, Health Sciences Research Division. Oak Ridge, Tennessee.

Polychlorinated Biphenyls (PCBs)

Aroclor 1016, 1221, 1232, 1242, 1248, 1254, and 1260

PCBs are a group of manufactured organic chemicals that were banned in the United States in 1977 because of their proven adverse environmental effects. PCBs occur in a variety of different formulations consisting of mixtures of individual compounds such as Aroclor 1016, 1248, 1254, and Aroclor 1260. The Aroclor formulations vary in the percent chlorine, and generally, the higher the chlorine content the greater the toxicity. PCBs elicit a variety of biologic and toxic effects including death, birth defects, reproductive failure, liver damage, tumors, and a wasting syndrome (Eisler 1986). Skin exposure to PCBs in animals resulted in liver, kidney, and skin damage (ATSDR 1996). They are known to bioaccumulate and to biomagnify within the food chain. PCBs in water accumulate in fish and marine mammals and can reach levels thousands of times higher than the levels in water (ATSDR 1996). Toxicity data for white-footed mice, oldfield mice, and mink show that their reproductive systems and developing embryos were adversely affected by both acute and chronic exposures (McCoy et al. 1995).

An 18-month study conducted on the effects of Aroclor 1016 on the reproduction of mink indicated that 25 ppm in the diet reduced kit growth (Aulerich and Ringer 1980). This dose was considered a chronic LOAEL and was converted to a daily dose of 3.43 mg/kg/day. The 10 ppm dose was considered to be a chronic NOAEL because no adverse effects were observed at this dosage. The chronic NOAEL was converted to a daily dose of 1.37 mg/kg/day.

A 7-month study on the effects of Aroclor 1242 on the reproduction of mink indicated that doses of 5, 10, 20, and 40 ppm caused complete reproductive failure (Bleavins et al. 1980). The 5 ppm dose (chronic LOAEL) was converted to a daily dose of 0.69 mg/kg/day. A chronic NOAEL of 6.9 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1.

A study conducted on the effects of Aroclor 1242 on the reproduction on two generations of screech owls indicated that a 3 ppm dose had no observed effects (McLane and Hughes 1980). This dose (chronic NOAEL) was converted to a daily dose of 0.41 mg/kg/day. A chronic LOAEL of 4.1 mg/kg/day was estimated by multiplying the chronic NOAEL by an uncertainty factor of 10.

A 5-week study on the effects of Aroclor 1248 on immune function in mice indicated a dose of 13 mg/kg/day to be a chronic LOAEL (ATSDR 1996). A chronic NOAEL of 1.3 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1.

A year-long study conducted on oldfield mice indicated that 5 ppm of Aroclor 1254 in the diet reduced the number of litters, offspring weights, and offspring survival (McCoy et al. 1995). This dose was considered a chronic LOAEL and converted to a daily dose of 0.68 mg/kg/day (Sample et al. 1996). A chronic NOAEL of 0.068 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1.

A study conducted by Aulerich and Ringer (1977) exposed mink to 3 dose levels of Aroclor 1254 for a 4.5-month period. Exposure to 5 and 15 ppm in the diet reduced the number of offspring born alive. A dose of 1 ppm caused no adverse effects. The 5 ppm dose was considered to be a chronic LOAEL and was converted to a daily dose of 0.69 mg/kg/day (Sample et al. 1996). The

1 ppm dose was considered to be a chronic NOAEL and was converted to a daily dose of 0.14 mg/kg/day.

A study conducted on ring-necked pheasants indicated that a dose of 1.8 mg/kg/day in the diet for 17 weeks caused significantly reduced egg hatchability (Dahlgren et al. 1972). This dose was considered a chronic LOAEL. A chronic NOAEL of 0.18 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1.

Agency for Toxic Substances and Disease Registry (ATSDR). 1996. *Toxicological profile for polychlorinated biphenyls (update).* U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Aulerich, R.J. and R.K. Ringer. 1977. Current status of PCB toxicity, including reproduction in mink. *Arch. Environ. Contam. Toxicol.* 6:279-292.

Aulerich, R.J. and R.K. Ringer. 1980. *Toxicity of the polychlorinated biphenyl Aroclor 1016 to mink.* Environmental Research Laboratory, Office of Research and Development.

Bleavins, M.R., R.J. Aulerich, and R.K. Ringer. 1980. Polychlorinated biphenyls (Aroclors 1016 and 1242): Effects on survival and reproduction in mink and ferrets. *Arch. Environ. Contam. Toxicol.* 9:627-635.

Dahlgren, R.B., R.L. Linder, and C.W. Carlson. 1972. Polychlorinated biphenyls: their effects on penned pheasants. *Environ. Health Perspect.* 1:89-101.

Eisler, R. 1986. *Polychlorinated biphenyl hazards to fish, wildlife, and invertebrates: a synoptic review.* U.S. Fish and Wildlife Service, Contaminant Hazard Reviews, Report No. 7.

McCoy, G., M.F. Finlay, A. Rhone, K. James, and G.P. Cobb. 1995. Chronic polychlorinated biphenyls exposure on three generations of oldfield mice (*Permyscus polionotus*): effects on reproduction, growth, and body residues. *Arch. Environ. Contam. Toxicol.* 28:431-435.

McLane, M.A.R. and D.L. Hughes. 1980. Reproductive success of screech owls fed Aroclor 1248. *Archives of Environmental Contamination and Toxicology.* 9:661-665.

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. *Toxicological benchmarks for wildlife: 1996 revision.* Risk Assessment Program, Health Sciences Research Division. Oak Ridge, Tennessee.

Pesticides

4, 4'-DDD, 4, 4'-DDE, and 4, 4'-DDT

DDT is a synthetic organochlorine compound which has been used extensively for insect control. DDD and DDE are metabolites of DDT. Both of these two breakdown products and DDT are often found together in the environment and are referred to collectively as total DDT. DDT was banned in the United States in 1972, primarily due to its environmental effects, but is very persistent in the environment and is still detected in many biochemical and geochemical surveys.

The USEPA's Aquatic Information Retrieval Toxicity database (AQUIRE) for DDT contains more than 40 acute toxicity values for various aquatic organisms. These range from 0.36 µg/L for *Daphnia pulex* to 1230 µg/L for the planarian *Polycellis felina* (USEPA 1984).

Historical studies of terrestrial invertebrates have found that earthworms are much more tolerant of organochlorine pesticides than arthropods (Davis 1971). The storage of total DDT in earthworms can lead to harmful effects in higher trophic-level organisms including birds and mammals.

The toxicity and accumulation of DDT in fish are correlated with age, fat content, and body length. Signs of toxicity are similar to those exhibited by insects (Ellgaard et al. 1977). Exposure to lethal concentrations of DDT results in increasing levels of irritability or excitability followed by muscular spasms, complete loss of equilibrium, convulsions, and eventually death. Toxic effects on amphibians and reptiles include uncoordinated behavior, loss of equilibrium, restricted development, weight loss, and death (Russell et al. 1995).

The toxicity and accumulation of DDT and its metabolites are of primary concern in birds. These chemicals can accumulate in fat after even brief, low-level exposures. In general, birds that feed on fish or other birds have greater tissue residues than those that feed on vegetation or seeds, and DDE is more common than either DDT or DDD in bird tissues (Stickel 1973). Adverse effects resulting from DDT poisoning in birds include reproductive impairment, reduced fledging success, and eggshell thinning. DDE produced significant eggshell thinning in three major groups of birds: the orders Strigiformes (owls), Falconiformes (all other raptors), and Anseriformes (most common waterfowl).

Studies of DDT toxicity to mammals have been generally limited to laboratory mammals. Liver, neurological, developmental, reproductive, and carcinogenic effects after exposure to DDT have also been noted for mice, rats, shrews, hamsters, monkeys, dogs, and bats. Laboratory studies with wild mammals have indicated that big brown bats are much more sensitive to DDT than other mammals (Stickel 1973).

A literature search was conducted on the effects of 4, 4'-DDD, 4, 4'-DDE, 4, 4'-DDT ingestion to mammals and birds. A study conducted on the reproductive effects of DDT on rats indicated a chronic NOAEL of 0.8 mg/kg/day and a chronic LOAEL of 4 mg/kg/day (Fitzhugh 1948). The rats ingested three dose levels over a 2-year period. Consumption of 4 mg/kg/day caused a reduction in the number of young produced. No adverse effects were observed at the 0.8 mg/kg/day dose level.

Dogs fed DDT for two generations showed reproductive effects at an oral dose of 5 mg/kg/day but not at 1 mg/kg/day. These values are considered the chronic LOAEL and chronic NOAEL, respectively (ATSDR 1994).

A 2-year reproductive study with American kestrels resulted in estimated chronic NOAEL and LOAEL values of 0.05 and 0.5 mg/kg/day, respectively, for DDE. Chronic oral exposures of mallards with DDT and DDD resulted in chronic NOAEL and LOAEL values (reproductive endpoints) of 0.104 and 1.04 mg/kg/day, respectively, for DDT, and 0.52 and 5.2 mg/kg/day, respectively for DDD (Stickel 1973). Brown pelicans exposed to DDE showed no chronic reproductive effects at 0.131 mg/kg/day (Beyer et al. 1996).

Agency for Toxic Substances and Disease Registry (ATSDR). 1994. *Toxicological profile for 4,4'-DDT, 4,4'-DDE, and 4,4'-DDD.* May.

Beyer, W.N., G.H. Heinz, and A.W. Redmon-Norwood. 1996. *Environmental contaminants in wildlife: interpreting tissue concentrations.* Lewis Publishers, Boca Raton, FL. 494 pp.

Davis, B.N.K. 1971. Laboratory studies on the uptake of dieldrin and DDT by earthworms. *Soil Biol. Biochem.* 3:221-233.

Ellgaard, E.G., J.C. Ochsner, and J.K. Cox. 1977. Locomotor hyperactivity induced in the bluegill sunfish, *Lepomis macrochirus*, by sublethal concentrations of DDT. *Can. J. Zool.* 55:1077-1081.

Fitzhugh, O.G. 1948. Use of DDT insecticides on food products. *Ind. Eng. Chem.* 40:704-705.

McLane, M.A.R. and L.C. Hall. 1972. DDE thins screech owl eggshells. *Bulletin of Environmental Contamination and Toxicology.* 8:65-68.

Russell, R.W., S.J. Hecnar, and G.D. Haffner. 1995. Organochlorine pesticide residues in southern Ontario spring peepers. *Environ. Contam. Toxicol.* 14:815-817.

Stickel, L.F. 1973. Pesticide residues in birds and mammals. Pages 254-312 IN C.A. Edwards (ed). *Environmental pollution by pesticides.* Plenum Press, New York.

United States Environmental Protection Agency (USEPA). 1984. *AQUIRE: Aquatic information retrieval toxicity database.* EPA/600/8-84-021.

Aldrin and Dieldrin

Aldrin and dieldrin are insecticides that do not occur naturally in the environment. From 1950 to 1970, aldrin and dieldrin were popular pesticides for crops like corn and cotton. Because of concerns about damage to the environment and the potential harm to human health, USEPA banned all uses of aldrin and dieldrin in 1974 except to control termites. In 1987, USEPA banned all uses (ATSDR 1993).

Aldrin is easily converted to dieldrin in the environment, and after being ingested and absorbed in animals. Aldrin is found in the blood only after very high doses. Dieldrin binds tightly to soil and slowly evaporates to the air. Dieldrin breaks down very slowly in the environment. Plants uptake and store dieldrin from the soil. In animals, dieldrin accumulates in fatty tissues and leaves the body very slowly. The major acute toxic effects are on the central nervous system. Studies in animals also indicate that dieldrin may reduce the body's ability to resist infection. Mice given high amounts of dieldrin developed liver cancers (ATSDR 1993).

A three-generation study on the effects of dieldrin on rat reproduction indicated that a chronic dose of 2.5 mg/kg (Treon and Cleveland 1955) caused a reduction in the number of pregnancies. This dose was considered a chronic LOAEL and converted to a daily dose of 0.2 mg/kg/day. A chronic NOAEL of 0.02 mg/kg/day was determined by multiplying the chronic LOAEL by an uncertainty factor of 0.1.

A 2-year study of the effects of dieldrin on the reproduction of barn owls indicated a chronic NOAEL of 0.077 mg/kg/day (Mendenhall et al. 1983). A slight reduction in the eggshell thickness was observed, but no effects on the number of eggs laid per pair, number of eggs hatched per pair, percent of eggs broken, or embryo and nestling mortality were observed. A LOAEL of 0.77 mg/kg/day was estimated by multiplying the NOAEL by an uncertainty factor of 10.

Rats exposed to aldrin for three generations showed adverse reproductive effects at a daily dose of 1 mg/kg/day, but not at a dose of 0.2 mg/kg/day. These doses are considered the chronic LOAEL and NOAEL, respectively (Sample et al. 1996). Chronic NOAELs and LOAELs for mallards exposed to aldrin in the diet have been estimated at 0.5 and 5 mg/kg/day based on data from Tucker and Crabtree (1970).

Agency for Toxic Substances and Disease Registry (ATSDR). 1993. *Toxicological profile for dieldrin*. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Mendenhall, V.M., E.E. Klaas, and M.A.R. McLane. 1983. Breeding success of barn owls (Tyto alba) fed low levels of DDE and dieldrin. *Arch. Environ. Contam. Toxicol.* 12:235-240.

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. *Toxicological benchmarks for wildlife: 1996 revision*. Environmental Restoration Division, ORNL Environmental Restoration Program. ES/ER/TM-86/R3.

Treon, J.F. and F.P. Cleveland. 1955. Toxicity of certain chlorinated hydrocarbon insecticides for laboratory animals, with special reference to aldrin and dieldrin. *Ag. Food Chem.* 3:402-408.

Tucker, R.K. and D.G. Crabtree. 1970. *Handbook of toxicity of pesticides to wildlife*. U.S. Fish and Wildlife Service Research Publication 84. 131 pp.

Alpha-, Beta-, and Delta-BHC

A literature search was conducted on the toxicological effects alpha-, beta-, and delta-BHC ingestion to animals. A 4-generation rat study with mixed BHC isomers indicated adverse reproductive effects at 3.2 mg/kg/day (chronic LOAEL) but not at 1.6 mg/kg/day (chronic NOAEL; Sample et al. 1996). Rats exposed to beta-BHC for 13 weeks exhibited growth and systemic effects at 20 mg/kg/day (chronic LOAEL) but not 4 mg/kg/day (chronic NOAEL; Sample et al. 1996). Japanese quail exposed to mixed BHC isomers BHC for 90 days exhibited reproductive effects at 2.25 mg/kg/day (chronic LOAEL) but not 0.56 mg/kg/day (chronic NOAEL; Sample et al. 1996).

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. *Toxicological benchmarks for wildlife: 1996 revision.* Environmental Restoration Division, ORNL Environmental Restoration Program. ES/ER/TM-86/R3.

Chlordane

Chlordane is a manufactured chemical that was used as a pesticide in the United States from 1948 to 1988. Chlordane is not a single chemical, but is actually a mixture of pure chlordane mixed with many related chemicals. It does not occur naturally in the environment. Chlordane adsorbs to soil particles and can remain in the soil for over 20 years. Most chlordane leaves soil by evaporation to the air. It breaks down very slowly and does not dissolve easily in water. It bioaccumulates in the tissues of fish, birds, and mammals (ATSDR 1994).

Chlordane affects the nervous system, the digestive system, and the liver in animals. Acute ingestion-based exposure of high levels of chlordane can cause mortality and convulsions in animals. Chronic exposure caused harmful effects in the liver of test animals. Animals exposed before birth or while nursing developed behavioral effects (ATSDR 1994).

A study on the effects of chlordane on the reproductive systems of six generations of mice indicated a chronic NOAEL of 4.58 mg/kg/day (WHO 1984) because no adverse effects were observed. The study indicated a chronic LOAEL of 9.16 mg/kg/day because of observations of decreased viability and reduced abundance of offspring in the test mice.

A 10-week study on the effects of chlordane on the mortality rates in red-winged blackbirds indicated a chronic NOAEL of 2.14 mg/kg/day because no adverse effects were observed at this dose level (Stickel et al. 1983). A chronic LOAEL of 10.7 mg/kg/day was determined based on a 26 percent mortality rate at this dose.

These chronic NOAEL and LOAEL values were used for both alpha- and gamma-chlordane.

Agency for Toxic Substances and Disease Registry (ATSDR). 1994. *Toxicological profile for chlordane.* U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Stickel, L.F., W.H. Stickel, R. A. Dyrland, and D. L. Hughes. 1983. Oxychlordane, HCS-3260, and nanchlor in birds; lethal residues and loss rates. *J. Toxicol. Environ. Health.* 12:611-622.

World Health Organization (WHO). 1984. Chlordane. *Environ. Health Criteria* 34. 82 pp.

Endosulfan I, Endosulfan II, and Endosulfan Sulfate

Endosulfan occurs in two isomeric forms, endosulfan I and endosulfan II. The ratio of these two forms varies depending on the environmental media from which the samples are collected. Air tends to have the highest ratio of endosulfan I to endosulfan II. Air/water partitioning experiments were conducted with the technical mix of endosulfan and with the individual isomers. The partitioning in these experiments resulted in a ratio of endosulfan I to endosulfan II similar to what was observed in the environment. The results of this experiment suggest that endosulfan II is being converted to endosulfan I as it transfers across the air/water interface. This has important implications to modeling the fate of these materials in the environment

(ATSDR 1993). Endosulfan sulfate results from the oxidation of endosulfan in nature (Coleman and Dolinger 1982).

A literature search was conducted on the toxicological effects of endosulfan ingestion to mammals and birds. Form-specific information was not available therefore toxicity studies on total endosulfan were used for endosulfan I, endosulfan II, and endosulfan sulfate. A 30-day study conducted on male and female rats indicated that 1.5 mg/kg/day of endosulfan in the diet did not cause adverse reproductive effects (Dikshith et al. 1984). This dose was considered a chronic NOAEL. A chronic LOAEL of 15 mg/kg/d was estimated by multiplying the chronic NOAEL by an uncertainty factor of 10.

A literature search was conducted on the toxicological effects of endosulfan ingestion to birds. A study conducted by Abiola (1992) on gray partridges indicated that 5, 25, and 125 ppm of endosulfan in the diet did not cause adverse reproductive effects. The maximum dose of 125 ppm (10 mg/kg/d) was considered a chronic NOAEL because exposure occurred during reproduction (Sample et al. 1996). A LOAEL of 100 mg/kg/d was estimated by multiplying the NOAEL by an uncertainty factor of 10.

Abiola, F.A. 1992. Ecotoxicity of organochloride insecticides: effects of endosulfan on birds' reproduction and evaluation of its induction effects in partridge, *Perdix perdix* L. *Rev.Vet. Med.* 143:443-450.

Agency for Toxic Substances and Disease Registry (ATSDR). 1993. *Toxicological profile for 1,4-endosulfan.* U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Coleman, P.F. and P.M. Dolinger. 1982. *Endosulfan monograph number four: environmental health evaluations of California restricted pesticides.* Prepared by Peter M. Dolinger Associates, Menlo Park, CA. Sacramento, CA: State of California Department of Food and Agriculture.

Dikshith, T.S.S., R.B. Raizada, M.K. Srivastava, and B.S. Kaphalia. 1984. Response of rats to repeated oral administration of endosulfan. *Ind. Health.* 22:295-304.

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. *Toxicological benchmarks for wildlife: 1996 revision.* Risk Assessment Program, Health Sciences Research Division. Oak Ridge, Tennessee.

Endrin, Endrin Aldehyde, and Endrin Ketone

Endrin was used in the United States as a pesticide and rodenticide but the use of endrin was banned in 1984. Endrin does not easily dissolve in water and is more likely to be found in sediments. Endrin breaks down slowly in the environment (ATSDR 1989). Endrin can bioaccumulate in aquatic animals from 1450 to 10000 times the concentration in water (USEPA 1980).

Little information is known about the properties of endrin aldehyde. It is not commercially used but is found as an impurity and breakdown product of endrin. It is not known what happens to this substance once it is released to the environment (ATSDR 1989). Endrin ketone might be found in the environment as a breakdown product of endrin. Little information is known about the properties of endrin ketone (ATSDR 1996).

A dietary dose of 0.92 mg/kg/day of endrin over 120 days caused significant reproductive effects in mice including reduced parental survival, litter size, and number of young (Good and Ware 1969). This dose was considered a chronic LOAEL. A chronic NOAEL of 0.092 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1.

A study conducted by Fleming et al. (1982) exposed screech owls to a dietary dose of 0.75 ppm (0.1 mg/kg/day) of endrin over 10 weeks to assess reproductive effects. Egg production and hatching success was reduced. This dose was considered a chronic LOAEL. A chronic NOAEL of 0.01 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1. Mallards exposed to endrin in the diet for 200+ days showed no adverse reproductive effects at 0.3 mg/kg/day (the highest dose tested). This dose is considered a chronic NOAEL (Sample et al. 1996). A chronic LOAEL was estimated by multiplying the chronic NOAEL by and uncertainty factor of 10.

Agency for Toxic Substances and Disease Registry (ATSDR). 1996. *Endrin ketone*. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Agency for Toxic Substances and Disease Registry (ATSDR). 1989. *Toxicological profile for endrin/endrin aldehyde*. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Fleming, W.J., M.A. Ross McLane, and E. Cromartie. 1982. Endrin decreases screech owl productivity. *J. Wildl. Manage.* 46:462-468.

Good, E.E. and G.W. Ware. 1969. Effects of insecticides on reproduction in the laboratory mouse. IV. Endrin and dieldrin. *Toxicol. Appl. Pharmacol.* 14:201-203.

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. *Toxicological benchmarks for wildlife: 1996 revision*. Risk Assessment Program, Health Sciences Research Division. Oak Ridge, Tennessee.

United States Environmental Protection Agency (USEPA). 1980. *Ambient water quality criteria for endrin*. Washington, D.C. Office of Water Regulations and Standards. EPA-440/5-80-047. NTIS No. PB81-117582.

Gamma-BHC (Lindane)

A literature search was conducted on the toxicological effects of gamma-BHC ingestion to mammals. A 3-generation study on the effects of gamma-BHC to reproduction in rats determined a chronic NOAEL of 8 mg/kg/day (Palmer et al. 1978). At this dose, rats did not display any adverse reproductive effects. A chronic LOAEL of 80 mg/kg/day was estimated by multiplying the chronic NOAEL by an uncertainty factor of 10.

A literature search was conducted on the toxicological effects of gamma-BHC ingestion to birds. An 8-week study on the effects of gamma-BHC to reproduction in mallards determined a chronic LOAEL of 20 mg/kg/day (Chakravarty and Lahiri 1986). At this dose, ducks displayed reduced eggshell thickness, laid fewer eggs, and had longer time intervals between eggs. A chronic NOAEL of 2 mg/kg/day was estimated by multiplying the chronic NOAEL by an uncertainty factor of 0.1.

Chakravarty, S. and P. Lahiri. 1986. Effect of lindane on eggshell characteristics and calcium level in the domestic duck. *Toxixology*. 42:245-258.

Palmer, A.K., D.D. Cozens, E.J.F. Spicer, and A.N. Worden. 1978. Effects of lindane upon reproductive functions in a 3-generation study in rats. *Toxicology*. 10:45-54.

Heptachlor and Heptachlor Epoxide

Heptachlor is a manufactured chemical that does not occur naturally. Heptachlor does not dissolve easily in water, adheres strongly to soil particles, and evaporates slowly to air. Plants and animals can change heptachlor ($C_{10}H_5Cl_7$) to heptachlor epoxide ($C_{10}H_5Cl_7O$) by means of oxidation. Heptachlor epoxide can remain in the soil and water for many years. Plants can uptake heptachlor from the soil. Heptachlor and heptachlor epoxide have been shown to bioaccumulate in the tissues of fish, bivalves, and cattle (ATSDR 1993).

Most of what we know about the health effects of these pesticides comes from studies on mice and rats fed heptachlor and heptachlor epoxide. Acute studies using high levels of heptachlor damaged the livers of rats and the livers and adrenal glands of mice. Mice also had trouble walking and rats developed tremors. Animals that ingested heptachlor or heptachlor epoxide before and/or during pregnancy had smaller litters or were unable to reproduce. Some of the offspring had cataracts and others died shortly after birth (ATSDR 1993).

A literature search was conducted on the toxicological effects of heptachlor ingestion to mammals and birds. An 181-day study on the effects of heptachlor on the reproduction of mink indicated a chronic LOAEL of 6.25 ppm (Crum et al. 1993) which was converted to a daily dose of 1.0 mg/kg/day. Minks given this dose were observed to have reduced kit weights at 3 and 6 weeks as compared to controls. A chronic NOAEL of 0.1 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1. Studies with quail (Hill et al. 1975) result in estimated chronic NOAELs and LOAELs of 0.405 and 4.05 mg/kg/day, respectively.

Agency for Toxic Substances and Disease Registry (ATSDR). 1993. *Toxicological profile for heptachlor*. .S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Crum, J.A., S.J. Bursian, R.J. Aulerich, P.Polin, and W.E. Braselton. 1993. The reproductive effects of dietary heptachlor in mink (*Mustela vison*). *Arch. Environ. Contam. Toxicol.* 24:156-164.

Hill, E.F., R.G. Heath, J.W. Spann, and J.D. Williams. 1975. *Lethal dietary toxicities of environmental pollutants to birds.* U.S. Fish and Wildlife Service Special Scientific Report - Wildlife No. 191, Washington D.C.

Methoxychlor

Methoxychlor is a man made insecticide used to kill flies, cockroaches and mosquitoes. Methoxychlor is released to the environment from chemical plants that produce it and from hazardous waste sites. Methoxychlor remains in the atmosphere for under a month. Methoxychlor does not dissolve in water but instead binds to sediments where it is degraded. It bioaccumulates in some aquatic species but not in mammalian species due to high metabolism and elimination.

Methoxychlor is a structural analogue of the pesticide DDT. Renal nephrosis was observed in rats administered methoxychlor in their diets. In pigs fed methoxychlor, cytic tubular nephropathy and elevated blood urea nitrogen was observed (ATSDR 1992).

In an 11-month study on the effects of methoxychlor on the reproduction of rats, no significant effects were observed at doses of 50 ppm (Gray et al. 1988). This exposure level was considered to be a chronic NOAEL and was converted to a daily dose of 4 mg/kg/day. A dose of 100 ppm caused significant reduction in the fertility and litter size of the rats. This dose (8 mg/kg/day) was considered a chronic LOAEL. Mortality studies with quail indicate estimated chronic LOAEL and NOAEL values of 4050 and 405 mg/kg/day, respectively (Hill and Camardese 1986).

Agency for Toxic Substances and Disease Registry (ATSDR). 1992. *Toxicological profile for methoxychlor*. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Gray L.E., J.S. Ostby, and J.M. Ferrell. 1988. Methoxychlor induces estrogen-like alterations of behavior and the reproductive tract in the female rat and hamster: Effects on sex behavior, running wheel activity, and uterine morphology. *Toxicol. Appl. Pharmacol.* 96:525-540.

Hill, E.F. and M.B. Camardese. 1986. *Lethal dietary toxicities of environmental contaminants and pesticides to Coturnix*. U.S. Fish and Wildlife Service Technical Report 2.

Toxaphene

Toxaphene is a pesticide used to control insects on crops such as cotton, on livestock, and to control unwanted fish species in lakes. Most uses of toxaphene were banned in 1982 due to its effects on the health of both humans and animals. Toxaphene is a mixture of over 160 chemicals. In soil, toxaphene will vaporize or will adhere to soil particles. In surface water, it vaporizes or settles to the sediment, but does not dissolve easily in the water. Toxaphene can be transported in the air without change for long distances from the site of release due to its resistance to abiotic transformation (ATSDR 1990).

Toxaphene bioaccumulates in aquatic animals at levels of 10^4 and biomagnifies in aquatic food chains. Under anaerobic conditions, toxaphene has a half-life of approximately weeks or months, but in aerobic conditions, it has a half-life of years (ATSDR 1990).

A study over three generations of rats on the effects of toxaphene on reproduction reported no adverse effects at dose levels of 25 and 100 ppm of toxaphene (Kennedy et al. 1973). The 100 ppm dose was considered a chronic NOAEL (8 mg/kg/day). A chronic LOAEL of 80 mg/kg/day was estimated by multiplying the chronic NOAEL by an uncertainty factor of 10. Mortality studies with mallards indicate estimated chronic LOAEL and NOAEL values of 3.07 and 0.307 mg/kg/day, respectively (Hill and Camardese 1986).

Agency for Toxic Substances and Disease Registry (ATSDR). 1990. *Toxicological profile for toxaphene*. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Hill, E.F. and M.B. Camardese. 1986. *Lethal dietary toxicities of environmental contaminants and pesticides to Coturnix*. U.S. Fish and Wildlife Service Technical Report 2.

Kennedy, G.G. Jr., M.P. Frawley, and J.C. Calandra. 1973. Multigeneration reproductive effects of three pesticides in rats. *Toxicol. Appl. Pharmacol.* 25:589-596.

Semi-Volatile Organics

1,2-Dichlorobenzene and 1,3-Dichlorobenzene

Chronic rat studies with 1,2-dichlorobenzene indicate adverse effects on the liver and kidney at oral doses of 857 mg/kg/day (Coulston and Kolbye 1994). This dose is considered a chronic LOAEL. A chronic NOAEL of 85.7 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1. Avian data for 1,4-dichlorobenzene is applied to these two chemicals.

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.

1,2,4-Trichlorobenzene

Three-generation rat studies with 1,2,4-trichlorobenzene indicate adverse effects on reproduction at oral doses of 106 mg/kg/day (Coulston and Kolbye 1994). This dose is considered a chronic LOAEL. No adverse reproductive effects were found at a dose of 53 mg/kg/day. This dose is considered the chronic NOAEL. No avian toxicological data were found for this chemical.

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.

1,4-Dichlorobenzene

1,4-dichlorobenzene is used mainly as a fumigant for the control of moths, molds, and mildews and as a space deodorant for toilets and refuse containers (ATSDR 1993). Tests involving acute exposure of animals, such as the LD_{50} test in rats and mice, have shown that 1,4-dichlorobenzene has moderate toxicity from oral exposure (RTECS 1993). Studies have reported effects on the blood, liver, and kidneys from acute, oral exposure. Chronic inhalation exposures can cause adverse effects on the respiratory system, liver, and kidneys. A study on pregnant rats reported adverse developmental effects in fetuses when administering the chemical by gavage (HSDB 1993).

An oral study on the effects of 1,4-dichlorobenzene on pregnant rats determined a NOAEL of 250 mg/kg/day (Coulston and Kolbye 1994). At this level, no adverse effects were seen for maternal and developmental toxicity. Effects were observed at 500 mg/kg/day (the chronic LOAEL).

Fourteen-day studies with northern bobwhites showed adverse effect on growth and survival from oral exposures of 2500 mg/kg/day (Grimes and Jaber 1989). A chronic NOAEL was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1.

Agency for Toxic Substances and Disease Registry (ATSDR). 1993. *Toxicological profile for 1,4-dichlorobenzene*. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

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.

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, DC, report dated July 19, 1989.

Hazardous Substances Databank (HSDB). 1987. Record for 1,4-Dichlorobenzene. Computer Printout. National Library of Medicine.

Registry of Toxic Effects of Chemical Substances (RTECS). 1993. Online database. U.S. Department of Health and Human Services. National Toxicology Information Program, National Library of Medicine. Bethesda, MD.

2-Chloronaphthalene

Information regarding 2-chloronaphthalene was not available in the literature.

2-Chlorophenol

Information regarding 2-chlorophenol was not available in the literature.

2-Methylnaphthalene

Mice exposed to 2-methylnaphthalene in the diet for 81 weeks showed systemic effects at a dose of 1437 mg/kg/day (the chronic LOAEL; ATSDR 1995). A chronic NOAEL was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1. Information on the toxicity of 2-methylnaphthalene on birds was not available in the literature.

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. *Toxicological profile for polycyclic aromatic hydrocarbons (PAHs)*. August.

2-Methylphenol and 4-Methylphenol

2-methylphenol and 4-methylphenol are also known as cresols. Cresols are manufactured and also occur naturally. These forms occur separately or as a mixture. 2-methylphenol is used to dissolve other chemicals, as a disinfectant and deodorizer, and to produce pesticides. It is found in many foods and in wood and tobacco smoke, crude oil, coal tar, and in brown mixtures such as creosote and cresylic acids, which are wood preservatives. Microorganisms in soil and water produce cresols when they break down materials in the environment (ATSDR 1992).

2-methylphenol occurs widely in the environment at low levels, because it quickly breaks down. It does not evaporate quickly from water, but can be removed by bacteria. In soils, half the total amount of 2-methylphenol will break down in about a week. It does not appear to accumulate in fish or animal tissue (ATSDR 1992).

Agency for Toxic Substances and Disease Registry (ATSDR). 1992. *Toxicological profile for cresols*. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

2-Nitroaniline

Information regarding 2-nitroaniline was not available in the literature.

2-Nitrophenol

Information regarding 2-nitrophenol was not available in the literature.

2,2'-Oxybis(1-Chloropropane)

Information regarding 2,2'-oxybis(1-chloropropane) was not available in the literature.

2,4-Dichlorophenol

2,4-Dichlorophenol is a white solid with a medicinal smell that is used to kill germs and to make other chemicals that are used to kill weeds and other plants. In air, 2,4-dichlorophenol degrades to other chemicals within a few days or weeks. 2,4-Dichlorophenol is not expected to bioconcentrate in plants or animals or to biomagnify in food chains (ATSDR 1991).

In a 103-week study on the effects of 2,4-dichlorophenol on reproduction in rats, no adverse effects were observed at concentrations of 440 mg/kg/day in the diet (NTP 1989). This doss was considered to be a chronic NOAEL. A chronic LOAEL of 4400 mg/kg/day was estimated by multiplying the chronic NOAEL by an uncertainty factor of 10.

Agency for Toxic Substances and Disease Registry (ATSDR). 1991. *Toxicological profile for 2,4-dichlorophenol.* U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

NTP (National Toxicology Program). 1989. *Toxicology and carcinogenesis studies of 2,4-dichlorophenol in F344/N rats and B6C3F1 mice (feed studies).* Technical Report Series No. 353. Research Triangle Park, NC: U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health.

2,4-Dimethylphenol

2,4-dimethylphenol may enter the environment from industrial and municipal discharges or spills. Acute toxic effects may include the death of animals, birds, or fish, and death or low growth rate in plants. 2,4-dimethylphenol has moderate acute toxicity to aquatic life. Insufficient data are available to evaluate or predict the short-term effects of 2,4-dimethylphenol to plants, birds, or land animals. Chronic toxic effects may include shortened life span, reproductive problems, lower fertility, and changes in appearance or behavior. 2,4-dimethylphenol has moderate chronic toxicity to aquatic life (ATDSR 1993).

Agency for Toxic Substances and Disease Registry (ATSDR). 1993. *Toxicological profile for 2,4-dimethylphenol.* U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

2,4-Dinitrophenol

Dinitrophenols are a class of manmade chemicals of which 2,4-dinitrophenol is the most commercially important. 2,4-dinitrophenol is used for making dyes, wood preservatives, and other organic chemicals. 2,4-dinitrophenol is a yellow solid that dissolves slightly in water. It does not evaporate easily into air but instead settles to the ground in rain and snow. When it enters water it adheres to particles and accumulates in the sediment. It does not bioaccumulate in fish.

2,4-Dinitrotoluene and 2,6-Dinitrotoluene

2,4-dinitrotoluene and 2,6-dinitrotoluene are two of the six forms of dinitrotoluene. They are usually formed by mixing toluene with nitric acid. Dinitrotoluene is used in the production of foams for use in furniture, and in the productions of dyes and munitions. Dinitrotoluene is decomposed by sunlight and by bacteria and therefore does not persist in the environment. It can be transported by surface and groundwater due to its moderate water solubility. Bioaccumulation of 2,4-dinitrotoluene and 2,6-dinitrotoluene in animal tissues is not expected. Plants have been shown to readily uptake 2,4-dinitrotoluene and 2,6-dinitrotoluene.

2,4,5-Trichlorophenol and 2,4,6-Trichlorophenol

Rats exposed to 2,4,5-trichlorophenol for 98 days in the diet demonstrated adverse effects to the hepatic and renal systems at doses of 800 mg/kg/day (McCollister et al. 1961). This dose is considered a chronic LOAEL. A chronic NOAEL was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1. Information regarding toxicological effects on avian species from exposure to 2,4,5-trichlorophenol and 2,4,6-trichlorophenol was not available in the literature.

McCollister, D.D., P.T. Lockwood, and V.K. Rowe. 1961. Toxicologic information on 2,4,5-trichlorophenol. *Toxicology and Applied Pharmacology*. 3:63-70.

3-Nitroaniline

Information regarding 3-nitroaniline was not available in the literature.

3,3'-Dichlorobenzidine

3,3'-dichlorobenzidine breaks down rapidly in water exposed to natural sunlight and in air, but is retained in soil for months. In air, it is estimated that half of the 3,3'-dichlorobenzidine can breakdown within 2 hours. In water exposed to natural sunlight, 3,3'-dichlorobenzidine is expected to break down rapidly with half being removed in approximately 90 seconds.

Death has occurred in experimental animals that have ingested high concentrations of 3,3'-dichlorobenzidine. In studies conducted on pregnant mice, exposure to 3,3'-dichlorobenzidine caused the kidneys of their offspring to develop improperly. Chronic dietary exposure of experimental animals to moderate levels of 3,3'-dichlorobenzidine caused mild injury to the liver (ATSDR 1989).

Agency for Toxic Substances and Disease Registry (ATSDR). 1989. *Toxicological profile for 3,3'-dichlorobenzidine*. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

4-Bromophenyl-phenylether

Information regarding 4-bromophenyl-phenylether was not available in the literature.

4-Chloro-3-methylphenol

Information regarding 4-chloro-3-methylphenol was not available in the literature.

4-Chloroaniline

Information regarding 4-chloroaniline was not available in the literature.

4-Chlorophenyl-phenylether

Information regarding 4-chlorophenyl-phenylether was not available in the literature.

4-Nitroaniline

Information regarding 4-nitroaniline was not available in the literature.

4-Nitrophenol

Information regarding 4-nitrophenol was not available in the literature.

4,6-Dinitro-2-methylphenol

Information regarding 4,6-dinitro-2-methylphenol was not available in the literature.

Bis(2-chloroethyl)ether

Bis(2-chloroethyl)ether is a manmade colorless non-flammable liquid used in the production of pesticides and other chemicals. Bis(2-chloroethyl)ether is broken down in the air by chemical reactions and in soil and water by bacteria, so it does not persist for long. Studies in animals show that bis(2-chloroethyl)ether can cause severe damage to lungs and can cause death. Studies in mice that ingested bis(2-chloroethyl)ether showed evidence of liver tumors.

Bis(2-chloroethoxy)methane

Information regarding bis(2-chloroethoxy)methane was not available in the literature.

Bis(2-ethylhexyl)phthalate

Bis(2-ethylhexyl)phthalate (DEHP) is used in the production of polyvinyl chloride, where it is added to plastics to make them flexible. Acute animal tests, such as the LD_{50} test in rats, have shown DEHP to have low acute toxicity from oral exposure (RTECS 1993). Oral exposure animal studies indicate that DEHP has adverse effects on the liver, kidney, weight gain and food consumption, and can cause liver tumors in rats and mice. Tests on rats and mice demonstrated that DEHP can cause developmental and reproductive toxicity, such as birth defects, decrease in testicular weights, and tubular atrophy (ATSDR 1993). Animal chronic, inhalation exposure studies have reported increased lung weights and liver weights (ATSDR 1993).

A literature search was conducted on the effects of bis(2-ethylhexyl)phthalate ingestion to mammals and birds. A 105-day study conducted on mice indicated that 1000 mg/kg of bis(2-ethylhexyl)phthalate in the diet caused significant reproductive effects (Lamb et al. 1987). The 1000 mg/kg dose was considered the chronic LOAEL. No adverse effects were observed among the 100 mg/kg dose group; this value was considered the chronic NOAEL. These dietary concentrations were converted to a daily doses of 183.3 mg/kg/day (LOAEL) and 18.3 mg/kg/day (NOAEL; Sample et al. 1996).

A 4-week study conducted on the reproductive effects of bis(2-ethylhexyl)phthalate to ringed doves indicated a chronic NOAEL of 10 ppm (Peakall 1974). No significant reproductive effects were observed among doves on diets containing 10 ppm of bis(2-ethylhexyl)phthalate. This dietary concentration was converted to daily dose (NOAEL) of 1.1 mg/kg/day (Sample et al. 1996). A chronic LOAEL was estimated by multiplying the chronic NOAEL by an uncertainty factor of 10.

Agency for Toxic Substances and Disease Registry (ATSDR). 1993. *Toxicological profile for bis(2-ethylhexyl)phthalate*. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Lamb, J.C., IV, R.E. Chapin, J. Teaque, A.D. Lawton, and J.R. Real. 1987. Reproductive effects of four phthalic acid esters in a mouse. *Toxicol. Appl. Pharmacol.* 88:255-269.

Peakall, D.B. 1974. Effects of di-n-butylphthalate and di-2-ethylhexylphthalate on the eggs of ring doves. *Bull. Environ. Contam. Toxicol.* 12:698-702.

Registry of Toxic Effects of Chemical Substances (RTECS). 1993. Online database. U.S. Department of Health and Human Services. National Toxicology Information Program, National Library of Medicine. Bethesda, MD.

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. *Toxicological benchmarks for wildlife: 1996 revision.* Risk Assessment Program, Health Sciences Research Division. Oak Ridge, Tennessee.

Butylbenzylphthalate

Butylbenzylphthalate is used as a plasticizer. When it is released into the environment, butylbenzylphthalate tends to bind to soil and sediment. It does not persist in the environment when oxygen is present, with half-lives in air, water, and soil of only a few days. It is more persistent at low temperatures, and in an anaerobic environment.

A 2-year study with rats indicated hepatic effects when this chemical was administered orally at a dose of 2400 mg/kg/day (NTP 1997). This value is considered the chronic LOAEL. A chronic NOAEL was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1. No toxicological data were found for birds.

NTP (National Toxicology Program). 1997. *Effect of dietary restriction on toxicology and carcinogenesis studies of butyl benzyl phthalate (CAS No. 85-68-7) in F344/N rats and B6C3F1 mice (feed studies).* Technical Report Series No. 458, NTP TR458. Prepared by U.S. Department of Health and Human Services.

Di-n-butylphthalate

Di-n-butylphthalate is a man-made chemical that is used to make soft plastics, carpet backing, paints, glue, insect repellents, hairspray, nail polish, and rocket fuel. Di-n-butylphthalate does not evaporate easily, but small amounts do enter into the air as a gas and by attaching to dust particles. In the air, di-n-butylphthalate usually breaks down within a few days. Di-n-butylphthalate does not dissolve easily in water, but can be transported to water by adhering to soil/sediment particles. Bacteria break down di-n-butylphthalate in water and soil within a day or up to a month. The length of time it takes to break down di-n-butylphthalate in soil or water depends on the kind of bacteria present and the soil/water temperature (ATSDR 1990). Di-n-butylphthalate appears to have relatively low toxicity. The levels of di-n-butylphthalate which cause toxic effects in animals are about 10,000 times higher than the typical levels of di-n-butylphthalate found in air, food, or water (ATSDR 1990).

In animals, ingestion of high levels of di-n-butylphthalate can affect their ability to reproduce, cause death of unborn animals, and decrease sperm production. Sperm production seems to return to near normal levels when exposure to di-n-butylphthalate ceases.

A literature search was conducted on the toxicological effects of di-n-butylphthalate ingestion to mammals and birds. In a 105-day study on the effects of di-n-butylphthalate on reproduction of mice, reduced litters per pair and reduced live pups per pair were observed among mice who were fed a diet containing 1 percent di-n-butyl-phthalate (Lamb et al. 1987). This equates to a daily dose of 1833 mg/kg/day (chronic LOAEL). No adverse effects were observed among mice fed diets containing 0.03 or 0.3 percent d-n-butylphthalate. The 0.3 percent dose (550 mg/kg/day) was considered the chronic NOAEL.

A study on the effects of di-n-butylphthalate on the reproduction of ringed doves was conducted over a 4-week period (Peakall 1974). Doves fed diets containing 10 ppm di-n-butylphthalate (1.1 mg/kg/day) were observed to have reduced eggshell thickness and water permeability of the shell. This dose was considered a chronic LOAEL. A chronic NOAEL was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1.

Agency for Toxic Substances and Disease Registry (ATSDR). 1990. *Toxicological profile for di-n-butylphthalate.* U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Lamb, J.C., IV, R.E. Chapin, J. Teaque, A.D. Lawton, and J.R. Real. 1987. Reproductive effects of four phthalic acid esters in a mouse. *Toxicol. Appl. Pharmacol.* 88:255-269.

Peakall, D.B. 1974. Effects of di-n-butylphthalate and di-2-ethylhexylphthalate on the eggs of ring doves. *Bull. Environ. Contam. Toxicol.* 12: 698-702.

Di-n-octylphthalate

Small amounts of di-n-octylphthalate can accumulate in animals that live in water, such as fish and oysters. Some rats and mice that were given very high doses of di-n-octylphthalate orally died. Mildly harmful effects have been seen in the livers of some rats and mice given very high doses of di-n-octylphthalate orally for short (14 days or less) or intermediate periods (15 to 365 days) of time, but lower doses given for short periods of time generally caused no harmful effects.

Acute toxic effects may include the death of animals, birds, or fish, and death or low growth rate in plants. Acute effects are seen 2 to 4 days after animals or plants come in contact with the chemical. Di-n-octylphthalate has moderate acute toxicity to aquatic life. Insufficient data are available to evaluate or predict the short- term effects of di-n-octylphthalate to plants, birds, or land animals. Chronic toxic effects may include shortened life span, reproductive problems, lower fertility, and changes in appearance or behavior. Chronic effects can be seen long after first exposure(s). Di-n-octylhthalate has moderate chronic toxicity to aquatic life. Insufficient data are available to evaluate or predict the long- term effects of di-n-octylphthalate to plants, birds, or land animals.

Estimated chronic LOAELs and NOAELs for mice exposed to di-n-hexylphthalate orally for 105 days were 550 and 55 mg/kg/day, respectively (Sample et al. 1996). These values are directly extrapolated to di-n-octylphthalate. Estimated chronic LOAELs and NOAELs for ring-necked pheasant are 500 and 50 mg/kg/day, respectively (TERRETOX 1998).

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. *Toxicological benchmarks for wildlife: 1996 revision*. Environmental Restoration Division, ORNL Environmental Restoration Program. ES/ER/TM-86/R3.

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

Dibenzofuran

Dibenzofuran is a polynuclear aromatic compound that may be found in coke dust, grate ash, fly ash, and flame soot. It has been listed as a pollutant of concern to USEPA's Great Waters Program due to its persistence in the environment, potential to bioaccumulate, and toxicity to the environment.

A literature search was conducted on the toxicological effects of dibenzofuran ingestion to mammals and birds. Studies measuring the toxicological effects of dietary dibenzofuran were not available.

Diethylphthalate

Diethylphthalate is a synthetic substance that is commonly used to make plastics more flexible. Products in which it is found include toothbrushes, automobile parts, tools, toys, and food packaging. Diethylphthalate can be released fairly easily from these products because it is not part of the chain of chemicals (polymers) that makes up the plastic. Diethylphthalate is also used in cosmetics, insecticides, and aspirin. Diethylphthalate has a moderate acute and chronic toxicity to aquatic organisms and can be mildly irritating when applied to the skin or eyes of animals.

A literature search was conducted on the toxicological effects of diethylphthalate ingestion to mammals and birds. Information was not available for birds. A 105-day study was conducted on the effects of diethylphthalate on reproduction of mice. Mice fed diets containing 2500, 12,500, and 25,000 mg/kg diethylphthalate did not exhibit any negative reproductive effects (Lamb et al. 1987). The dose of 25,000 mg/kg (chronic NOAEL) was converted to a daily dose of 4,583 mg/kg/day. A chronic LOAEL of 45,830 mg/kg/day was estimated by multiplying the chronic NOAEL by an uncertainty factor of 10.

Lamb, J.C., IV, R.E. Chapin, J. Teaque, A.D. Lawton, and J.R. Real. 1987. Reproductive effects of four phthalic acid esters in a mouse. *Toxicol. Appl. Pharmacol.* 88:255-269.

Dimethylphthalate

Dimethylphthalate is a colorless oily liquid with a slightly sweet odor that is used in solid rocket propellants, lacquers, plastics, safety glasses, rubber coating agents, molding powders, insect repellants, and pesticides. In animal studies, acute exposure to dimethylphthalate via inhalation results in irritation of the eyes, nose, and throat. The LD_{50} test in rats has shown dimethylphthalate to have moderate acute toxicity from oral and dermal exposures. Animal studies have reported slight effects on growth and on the kidney from chronic oral exposure to dimethylphthalate.

Hexachlorobenzene

Rats exposed orally to hexachlorobenzene for 2 years demonstrated adverse effects to their reproduction at a dose of 16 mg/kg/day (ATSDR 1989). This dose was considered a chronic LOAEL. A chronic NOAEL (1.6 mg/kg/day) was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1. Reproductive effects in birds from oral exposures occurred at a dose of 0.8 mg/kg/day (Coulston and Kolbye 1994). This dose was considered a chronic LOAEL. A chronic NOAEL (0.08 mg/kg/day) was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1.

Agency for Toxic Substances and Disease Registry (ATSDR). 1989. *Toxicological profile for hexachlorobenzene*. Draft.

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.

Hexachloro-1,3-butadiene

Hexachloro-1,3-butadiene is a colorless, manmade liquid that is used in the production of rubber compounds, and lubricants. Hexachloro-1,3-butadiene in the water can be released to soil and air. It is expected to remain there for a long time because it attaches to organic matter in the soil. Hexachloro-1,3-butadiene can accumulate in fish and shellfish that live in contaminated waters, but it is not known if hexachloro-1,3-butadiene accumulates in plants. Under aerobic conditions in water, hexachloro-1,3-butadiene undergoes degradation. Degradation does not occur under anaerobic conditions.

Rats exposed orally to hexachlorobenzene for 90 days demonstrated adverse effects to their reproduction at a dose of 20 mg/kg/day (IPCS 1994). This dose was considered a chronic LOAEL. A chronic NOAEL (2 mg/kg/day) was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1. Reproductive effects in Japanese quail from oral exposures occurred at a dose of 8 mg/kg/day (Coulston and Kolbye 1994). This dose was considered a chronic LOAEL. The chronic NOAEL from this study was 2.5 mg/kg/day.

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.

International Programme on Chemical Safety (IPCS). 1994. *Environmental health criteria 156 - hexachlorobutadiene*. World Health Organization, Geneva.

Hexachlorocyclopentadiene

Rats exposed to hexachlorocyclopentadiene during pregnancy demonstrated adverse effects at a dose of 30 mg/kg/day but no adverse effects at 10 mg/kg/day (USEPA 1984). These doses were considered the chronic LOAEL and NOAEL, respectively. Information regarding the toxicological effects on avian species from exposure to hexachlorocyclopentadiene was not available in the literature.

U.S. Environmental Protection Agency (USEPA). 1984. *Health assessment document for hexachlorocyclopentadiene.* EPA/600/8-84/001F.

Hexachloroethane

Information regarding hexachloroethane was not available in the literature.

Isophorone

Isophorone is a man-made chemical for use commercially, but it has been found to occur naturally in cranberries. It is a clear liquid with a peppermint-like odor. It is used as a solvent in some printing inks, paints, lacquers, and adhesives. It evaporates faster than water and it does not mix completely with water. Isophorone does not remain in the air very long, but can remain in water for possibly more than 20 days. The length of time that isophorone will remain in soil is not known, but it is most likely the same as the length of time it remains in water (ATSDR 1989).

Acute exposure of animals to high vapor amounts and chronic exposure of animals to high doses through ingestion caused death, a shortened life span, inactivity, and coma. Inconclusive studies suggest that isophorone may have caused birth defects and growth retardation in the offspring of rats and mice that breathed vapors during pregnancy. Some harmful health effects were observed in adult female animals in these studies. In a long-term study in which rats and mice were given high doses of isophorone orally, the male rats developed kidney disease and kidney tumors. Male rats also developed tumors in a reproductive gland. Some male mice developed tumors in the liver, in connective tissue, and in lymph glands (tissues of the body that help fight disease), but the evidence was not conclusive (ATSDR 1989).

Evidence of carcinogenicity is limited to one sex of one animal species as shown by an increased incidence of preputial gland tumors in male rats; an apparent increase in hepatocellular and integumentary tumors in male mice was complicated by high mortality. No increases were seen in females of either species (USEPA 1988).

Agency for Toxic Substances and Disease Registry (ATSDR). 1989. *Toxicological profile for isophorone.* U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

United States Environmental Protection Agency (USEPA). 1988. Integrated Risk Information System (IRIS). Reference Dose (RfD) for oral exposure of isophorone. Online. (Revised; verification date 5/15/86). Office of Health and Environmental Assessment. Environmental Criteria and Assessment Office, Cincinnati, OH.

N-Nitrosodiphenylamine

N-nitrosodiphenylamine is an industrial compound that has been produced since 1945 in the manufacture of rubber products and other chemicals. Manufacturers have since replaced it with more efficient chemicals. It is not known whether it exists naturally in the environment; there is some evidence that microorganisms may produce it. Aquatic organisms can accumulate low levels of n-nitrosodiphenylamine in their bodies (ATSDR 1993). It is not known whether terrestrial animals and plants accumulate n-nitrosodiphenylamine. Animals exposed to n-nitrosodiphenylamine through long-term dietary intake developed swelling, cancer of the bladder, and changes in body weight (ATSDR 1993). Higher levels have caused death.

Systemic effects in rats fed n-nitrosodiphenylamine for 8 to 11 weeks were observed at a dose of 1500 mg/kg/day (ATSDR 1993). This dose was considered a chronic LOAEL. A chronic NOAEL of 150 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1. No avian toxicological data were found.

Agency for Toxic Substances and Disease Registry (ATSDR). 1993. *Toxicological profile for n-nitrosodiphenylamine.*

N-Nitrosodi-n-propylamine

N-Nitrosodi-n-propylamine is a manmade, yellow liquid produced in small quantities for research. Some n-nitrosodi-n-propylamine is produced as an impurity of some weed killers and during the production of some rubbers. In sunlight (in air or water), n-nitrosodi-n-propylamine degrades within a day by photolysis. In the absence of sunlight, n-nitrosodi-n-propylamine has a half-life of 14 to 80 days in soil (ATSDR 1989). N-Nitrosodi-n-propylamine has been shown to cause cancer of the liver, esophagus, and nasal cavities in mice.

Agency for Toxic Substances and Disease Registry (ATSDR). 1989. *Toxicological profile for n-nitrosodi-n-propylamine.* U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Nitrobenzene

Nitrobenzene is an oily yellow liquid with an almond-like odor that is produced in large quantities for industrial use. In studies conducted on rats, a single dose of nitrobenzene fed to males resulted in damage to the testicles and decreased levels of sperm. Increased levels of blood methemoglobin have been reported in rats exposed to nitrobenzene at levels as low as 10 ppm per week (Medinsky and Irons 1985) or 5 ppm for 90 days (Hamm et al. 1984). Other studies on rats have reported liver lesions and the degeneration or death of liver cells in male rats exposed to nitrobenzene at 35 ppm for 2 weeks (Medinsky and Irons 1985). Male mice exposed to nitrobenzene at 16 ppm for 90 days suffered increased liver weight, hepatocyte hyperplasi, and multinucleated hepatcytes (Hamm et al. 1984).

There is very little information available about the effects of long-term exposure of animals to nitrobenzene, and it is not known whether exposure to nitrobenzene can cause cancer (ATSDR 1990).

Agency for Toxic Substances and Disease Registry (ATSDR). 1990. *Toxicological profile for nitrobenzene.* U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Hamm, T.E. Jr., M. Phelps, and T.H. Raynor. 1984. A 90-day inhalation study of nitrobenzene in F-344 rats, CD rats and B6C3F1 mice [Abstract]. *Toxicologist*. 4:181.

Medinsky, M.A. and R.D. Irons. 1985. Sex, strain, and species differences in the response of rodents to nitrobenzene vapors. Pages 35-51 IN Rickert D.E. (ed). Chemical Industry Institute of Toxicology Series. *Toxicity of nitroaromatic compounds*. New York, NY: Hemisphere Publishing Corporation.

Pentachlorophenol

Pentachlorophenol is a manufactured chemical not found naturally in the environment. Pentachlorophenol has been used as a biocide and wood preservative. It was one of the most heavily used pesticides in the United States. Now, only certified applicators can purchase and use pentachlorophenol (ATSDR 1992).

Pentachlorophenol adsorbs to soil particles, but is more likely to occur under acidic conditions than neutral or basic conditions. Microorganisms break it down into other compounds in soil and surface waters (ATSDR 1992).

Reproductive effects of pentachlorophenol on rats exposed to pentachlorphenol in the diet for up to 24 months occurred at a dose of 30 mg/kg/day while a dose of 3 mg/kg/day caused no adverse reproductive effects (Coulston and Kolbye 1994). These doses were considered chronic LOAELs and NOAELs, respectively. Chickens fed pentachlorophenol for 8 weeks showed adverse effects on growth at a dose of 200 mg/kg/day but not at 100 mg/kg/day (Eisler 1989). These doses are considered chronic LOAELs and NOAELs, respectively.

Agency for Toxic Substances and Disease Registry (ATSDR). 1992. *Toxicological profile for pentachlorophenol*. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

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.

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.

Phenol

Phenol is mainly a man-made chemical, although it is found in animal wastes and organic material. Phenol is a colorless or white solid when it is pure but it is usually sold and used as a liquid. The largest single use of phenol is production of plastics. It evaporates more slowly than water and dissolves fairly well in water. Phenol is also ignitable (ASTDR 1989).

Pregnant animals that drank water containing high levels of phenol gave birth to offspring that had low birth weights and birth defects. Dermal exposure to small amounts of phenol for short durations can cause blisters and burns on the exposed area. Spilling weak phenol solutions on large parts of the body (more than 25 percent of the body surface) can result in death (ATSDR 1989). The toxicity of dermal exposure to phenol is influenced by the size of the skin area exposed.

Agency for Toxic Substances and Disease Registry (ATSDR). 1989. *Toxicological profile for phenol*. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Polynuclear Aromatic Hydrocarbons (PAHs)

PAHs are virtually ubiquitous in nature, primarily as a result of natural processes such as forest fires, microbial synthesis, and volcanic activity. They have been detected in animal and plant tissues, sediments, soils, air, surface water, drinking water, and groundwater. Anthropogenic sources of PAHs in the environment include high temperature combustion of organic materials typical of processes used in the steel industry, heating and power generation, and petroleum refining.

Environmental concern has focused on PAHs, which range in molecular size from two-ring structures to seven-ring structures. The number of rings on the molecule strongly affects its biochemical interactions in the environment. Consequently, the fate, transport, and toxicity of PAHs correlate strongly with the size of the specific PAH molecule.

Relatively little information is known on the fate and transport of specific PAH compounds. Information on PAHs as a group is largely inferred from information on benzo(a)pyrene and mixtures of PAHs.

PAHs are moderately persistent in the environment and therefore may potentially cause significant effects to vegetation, wildlife and fish. The carcinogenicity of individual PAHs differs. Some lower weight compounds such as naphthalene, fluorene, phenanthrene, and anthracene exhibit acute toxicity and other adverse effects to some organisms, but are non-carcinogenic. In contrast, the higher molecular weight compounds are significantly less acutely toxic, but many are demonstrably carcinogenic, mutagenic, or teratogenic to a wide variety of organisms, including fish and other aquatic life, amphibians, birds, and mammals.

PAHs can be taken into the mammalian body by inhalation, ingestion or dermal contact. Acute and chronic exposure to carcinogenic PAHs have been shown to cause tumors in the stomach, lung, and skin. PAHs also have been associated with the destruction of hematopoietci and lymphoid tissues, ovatoxicity, adrenal necrosis, changes in intestinal and respiratory epithelia and immunosuppression.

The environmental effects of most non-carcinogenic PAHs are poorly understood. Available information suggests that these PAHs are not very potent teratogens or reproductive toxins. Effects include damage to the liver and kidney, and external effects of sebaceous gland ulceration.

Studies on PAH toxicity in birds indicated no mortality or visible signs of toxicity when fed 4,000 mg total PAH per kilogram of body weight for 7 months. In another study, toxic and sub-lethal effects were noted at concentrations of between 0.036 and 0.18 μg PAH per egg following application of various PAHs (e.g., chrysene and benzo(a)pyrene) to the surface of mallard eggs. Another study reported acute oral effect levels for the red-winged blackbird and house sparrow and acenaphthene, phenanthrene and anthracene LD_{50}values exceeded 100 mg/kg of body weight for these species.

Few ingestion-based studies have been conducted on mammals using PAHs. Neal and Rigdon (1967) conducted a study on mice for the development of forestomach tumors. Mice were fed between 0.13 mg/kg/day and 32.5 mg/kg/day of PAH for 110 days. The highest dose produced tumors in 90 percent of the mice. The NOAEL was calculated at 1.3 mg/kg/day and the LOAEL was 2.6 mg/kg/day (4 percent occurrence of tumors) (Charters et al. 1996).

A study conducted on nestling European starlings indicated that a dose of 100 mg/kg/day of 7,12-dimethylbenz(a)anthracene caused an 11 percent reduction in mean body weight, a 16 percent reduction in mean hemoglobin concentrations, and a 90 percent reduction in lymphocyte proliferation (Trust et al. 1993). A dose of 10 mg/kg/day caused no adverse effects to nestling birds. Adult starlings dosed as high as 300 mg/kg/day showed no adverse effects.

Charters, D.W., N.J. Finley, and M. Huston. 1996. *Draft report, preliminary ecological risk assessment, Avtex Fibers Site, Front Royal, Virginia*. U.S. Environmental Protection Agency, Environmental Response Team Center, Office of Emergency and Remedial Response.

Neal, J. and R.H. Rigdon. 1967. Gastric tumors in mice fed benzo(a)pyrene: a quantitative study. *Tex. Rep. Biol. Med.* 25:553-557.

Trust, K.A., A. Fairbrother, and M.J. Hooper. 1993. Effects of 7,12-dimethylbenz(a)anthracene on immune function and mixed-function oxygenase activity in the European starling. *Environ. Toxicol. and Chemistry*. 13:821-830.

Acenaphthene

Mice fed acenaphthene orally for 13 weeks showed adverse reproductive effects at a dose of 3500 mg/kg/day (ATSDR 1995). This dose was considered a chronic LOAEL. A chronic NOAEL of 350 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1. For birds, data for benzo(a)pyrene was applied to this chemical.

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. *Toxicological profile for polycyclic aromatic hydrocarbons (PAHs)*. August.

Acenaphthylene

Information regarding acenaphthylene was not available in the literature. For mammals, data for acenaphthene was applied to this chemical. For birds, data for benzo(a)pyrene was applied to this chemical.

Anthracene

Mice fed anthracene orally for 13 weeks showed adverse reproductive effects at a dose of 10,000 mg/kg/day (ATSDR 1995). This dose was considered a chronic LOAEL. A chronic NOAEL of 1,000 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1.

Mallards fed anthracene orally for 7 months showed adverse effects to the hepatic system at a dose of 228 mg/kg/day (Patton and Dieter 1980). This dose was considered a chronic LOAEL. A chronic NOAEL of 22.8 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1.

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. *Toxicological profile for polycyclic aromatic hydrocarbons (PAHs)*. August.

Patton, J.F. and M.P. Dieter. 1980. Effects of petroleum hydrocarbons on hepatic function in the duck. *Comp. Biochem. Physiol.* 65C:33-36.

Benzo(a)anthracene

Information regarding benzo(a)anthracene was not available in the literature. Data for benzo(a)pyrene was applied to this chemical for both birds and mammals.

Benzo(a)pyrene

Female mice were fed benzo(a)pyrene during pregnancy. Adverse reproductive effects were found at a dose of 10 mg/kg/day (Sample et al. 1996). This dose was considered a chronic LOAEL. A chronic NOAEL of 1 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1.

Mice fed benzo(a)pyrene orally for 19 to 29 days showed adverse reproductive effects at a dose of 1330 mg/kg/day (ATSDR 1995). This dose was considered a chronic LOAEL. A chronic NOAEL of 133 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1.

Chickens were fed benzo(a)pyrene for 34 days. Adverse reproductive effects were found at a dose of 395 mg/kg/day (Rigdon and Neal 1963). This dose was considered a chronic LOAEL. A chronic NOAEL of 39.5 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1.

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. *Toxicological profile for polycyclic aromatic hydrocarbons (PAHs).* August.

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., D.M. Opresko, and G.W. Suter II. 1996. *Toxicological benchmarks for wildlife: 1996 revision.* Environmental Restoration Division, ORNL Environmental Restoration Program. ES/ER/TM-86/R3.

Benzo(b)fluoranthene

Information regarding benzo(b)fluoranthene was not available in the literature. Data for benzo(a)pyrene was applied to this chemical for both birds and mammals.

Benzo(g,h,i)perylene

Information regarding benzo(g,h,i)perylene was not available in the literature. Data for benzo(a)pyrene was applied to this chemical for both birds and mammals.

Benzo(k)fluoranthene

Information regarding benzo(k)fluoranthene was not available in the literature. Data for benzo(a)pyrene was applied to this chemical for both birds and mammals.

Carbazole

Information regarding carbazole was not available in the literature.

Chrysene

Information regarding chrysene was not available in the literature. Data for benzo(a)pyrene was applied to this chemical for both birds and mammals.

Dibenz(a,h)anthracene

Information regarding dibenz(a,h)anthracene was not available in the literature. Data for benzo(a)pyrene was applied to this chemical for both birds and mammals.

Fluoranthene

Mice fed fluoranthene orally for 13 weeks showed adverse effects to the hepatic system at a dose of 1250 mg/kg/day (ATSDR 1995). This dose was considered a chronic LOAEL. A chronic NOAEL of 125 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1. For birds, data for benzo(a)pyrene was applied to this chemical.

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. *Toxicological profile for polycyclic aromatic hydrocarbons (PAHs).* August.

Fluorene

Mice fed fluorene orally for 13 weeks showed adverse hematological effects at a dose of 1250 mg/kg/day (ATSDR 1995). This dose was considered a chronic LOAEL. A chronic NOAEL of 125 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1. For birds, data for benzo(a)pyrene was applied to this chemical.

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. *Toxicological profile for polycyclic aromatic hydrocarbons (PAHs).* August.

Indeno(1,2,3-cd)pyrene

Information regarding indeno(1,2,3-cd)pyrene was not available in the literature. Data for benzo(a)pyrene was applied to this chemical for both birds and mammals.

Naphthalene

Mice fed naphthalene orally for 13 weeks showed adverse reproductive effects at a dose of 1400 mg/kg/day (ATSDR 1995). This dose was considered a chronic LOAEL. A chronic NOAEL of 140 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1.

Mallards fed naphthalene orally for 7 months showed adverse effects to the hepatic system at a dose of 228 mg/kg/day (Patton and Dieter 1980). This dose was considered a chronic LOAEL. A chronic NOAEL of 22.8 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1.

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. *Toxicological profile for polycyclic aromatic hydrocarbons (PAHs).* August.

Patton, J.F. and M.P. Dieter. 1980. Effects of petroleum hydrocarbons on hepatic function in the duck. *Comp. Biochem. Physiol.* 65C:33-36.

Phenanthrene

Information regarding phenanthrene was not available in the literature. Data for benzo(a)pyrene was applied to this chemical for both birds and mammals.

Pyrene

Information regarding pyrene was not available in the literature. Data for benzo(a)pyrene was applied to this chemical for both birds and mammals.

Volatile Organics

1,1-Dichloroethane

1,1-dichloroethane is a manmade liquid that is a vapor when released to the environment. It is used to make other chemicals, and to dissolve paints, varnishes, and grease. 1,1-dichloroethane does not dissolve easily in water but can evaporate easily to the air. 1,1-dichloroethane found in soils can evaporate to the air or can move to groundwater (ATSDR 1989). Brief exposures to high levels of 1,1-dichloroethane have caused death in animals. Longer exposures to 1,1-dichloroethane in the air have caused kidney disease in animals (ATSDR 1989).

Agency for Toxic Substances and Disease Registry (ATSDR). 1989. *Toxicological profile for 1,1-dichloroethane*. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

1,1-Dichloroethene

1,1-dichloroethene is a clear, colorless, manmade liquid with a sweet odor that is used to make other chemicals such as polyvinylidene chloride. 1,1-dichloroethene evaporates from water into the air where it is broken down quickly by compounds formed by sunlight. In water, 1,1-dichloroethene breaks down slowly and is not readily transferred to fish or animals. In soils, 1,1-dichloroethene either evaporates to the air or moves to the groundwater where it may be broken down slowly by organisms (ATSDR 1989).

Agency for Toxic Substances and Disease Registry (ATSDR). 1989. *Toxicological profile for 1,1-dichloroethene*. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

1,1,2-Trichloroethane

1,1,2-trichloroethane is a manmade colorless liquid that is used as a solvent. Most of 1,1,2-trichloroethane that is released moves to the atmosphere or groundwater where reaction is slow. In air, 1,1,2-trichloroethane has a half-life of 49 days and persists for years in the groundwater and soil. Short-term exposure to high concentrations in air or relatively high concentrations given orally or applied to the skin have caused death in animals. Long-term exposure at high concentrations by mouth cause shortened life span in animals (ATSDR 1989).

Agency for Toxic Substances and Disease Registry (ATSDR). 1989. *Toxicological profile for 1,1,2-trichloroethane*. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

1,1,2,2-Tetrachloroethane

Information regarding 1,1,2,2-tetrachloroethane was not available in the literature.

1,2-Dibromo-3-chloropropane

1,2-dibromo-3-chloropropane is a colorless manmade liquid used in the past as a pesticide. It has not been used in the continental United States since 1979 and in Hawaii since 1985. It is used today for research. 1,2-dibromo-3-chloropropane dissolves in water and evaporates within a few days to a week to the air where it breaks down slowly. Most disappears in a few months. 1,2-dibromo-3-chloropropane does not adhere to sediments in streams, lakes and rivers. When in soil, it can leach to the groundwater where it remains for long periods of time. 1,2-dibromo-3-chloropropane present in surface soils can evaporate to the air. 1,2-dibromo-3-chloropropane may break down to simpler chemicals in soils and water (ATSDR 1991).

Agency for Toxic Substances and Disease Registry (ATSDR). 1991. *Toxicological profile for 1,2-dibromo-3-chloropropane.* U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

1,2-Dibromoethane

1,2-dibromoethane is a colorless liquid that is used as a pesticide and a gasoline additive to improve fuel efficiency. 1,2-dibromoethane is mostly manmade, but small amounts may occur naturally in the water. The USEPA banned most uses in 1984. 1,2-Dibromoethane evaporates into the air where it breaks down quickly. It dissolves in water and remains in the groundwater and soils for long periods of time (ATSDR 1991).

Agency for Toxic Substances and Disease Registry (ATSDR). 1990. *Toxicological profile for 1,2-dibromoethane.* U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

1,2-Dichloroethane

1,2-dichloroethane is a clear, manmade liquid used to make vinyl chloride and other substances that dissolve grease, glue, and dirt. It is also added to leaded gasoline to remove lead. Small amounts of 1,2-dichloroethane evaporate from the water and soil into the air where it is quickly broken down by the sun. 1,2-dichloroethane in the soil will travel into the groundwater where it can stay for up to 40 days. Animals that ingest or inhale large amounts of 1,2-dichloroethane exhibit nervous system disorders and kidney disease (ATSDR 1993).

Agency for Toxic Substances and Disease Registry (ATSDR). 1993. *Toxicological profile for 1,2-dichloroethane.* U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

1,2-Dichloroethene

1,2-dichloroethene is a manmade colorless liquid used in the production of solvents. 1,2-dichloroethene dissolves rapidly and almost all of it that is in surface soil or water will evaporate to the air. Once in the air, 1,2-dichloroethene has a half-life of 4 to 8 days. When present in deeper soils, 1,2-dichloroethene will move downward and possibly contaminate groundwater where it has a half-life of 13 to 48 weeks. Animals that breathed high levels of 1,2-dichloroethene exhibited lung and heart damage. Liver and lung damage and death are caused by ingestion of high levels of 1,2-dichloroethene by animals (ATDSR 1990).

Agency for Toxic Substances and Disease Registry (ATSDR). 1990. *Toxicological profile for 1,2-dichloroethene.* U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

1,2-Dichloropropane

1,2-dichloropropane is a colorless, manmade liquid that is used currently in research and industry. 1,2-dichloropropane was used prior to the early 1980s as a soil fumigant and was found in some paint thinners, strippers, and finish removers. 1,2-dichloropropane degrades slowly in the atmosphere and soil. In groundwater, 1,2-dichloropropane has a half-life of 6 months to 2 years. Animals given 1,2-dichloropropane orally were seen to exhibit liver and kidney damage. Those given higher doses died (ATSDR 1988).

Agency for Toxic Substances and Disease Registry (ATSDR). 1988. *Toxicological profile for 1,2-dichloropropane*. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Cis- and Trans-1,3-Dichloropropene

1,3-dichloropropene is a colorless liquid that exists in two forms, cis-1,3-dichloropropene and trans-1,3-dichloropropene. Mixtures of these are used to kill nematodes that eat the roots of crops. Once in the soil, 1,3-dichloropropene is likely to be broken down into smaller molecules by biotic and abiotic processes. The resulting chemicals may also be harmful. In air and water, 1,3-dichloropropene is also broken down into smaller chemicals. Rats and mice fed large amounts of 1,3-dichloropropene got cancer and rats that breathed 1,3-dichloropropene had fewer pups per litter (ATSDR 1990).

Agency for Toxic Substances and Disease Registry (ATSDR). 1990. *Toxicological profile for cis- and trans-1,3-dichloropropene*. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

2-Butanone

2-butanone is a manufactured chemical but it is also present in the environment from natural sources. It is used in paints, glues, and as a cleaning agent. 2-butanone is also produced naturally by some trees and is found in some fruits and vegetables in small amounts (ATSDR 1992). It is also known as methyl ethyl ketone (MEK).

2-butanone enters the air during production, use and transport, and from hazardous waste sites. It dissolves in water and is broken down to a simpler chemical form in about 2 weeks. It does not adsorb to soil, therefore it is highly mobile and can infiltrate to the groundwater. It is not known to bioaccumulate in fish or animal tissues and does not biomagnify in the food chain (ATSDR 1992).

Agency for Toxic Substances and Disease Registry (ATSDR). 1990. *Toxicological profile for 2-butanone*. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

2-Chloroethyl Vinyl Ether

Information regarding 2-chloroethyl vinyl ether was not available in the literature.

2-Hexanone

2-hexanone is a clear, colorless liquid that is formed as a waste product of wood pulping. The liquid form evaporates quickly into air and dissolves easily in water. 2-hexanone is probably broken down into smaller products within a few days. Rats given 4700 ppm of 2-hexanone for over 14 days became paralyzed (ATSDR 1990).

Agency for Toxic Substances and Disease Registry (ATSDR). 1990. *Toxicological profile for 2-hexanone*. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

4-Methyl-2-Pentanone

Information regarding 4-methyl-2-pentanone was not available in the literature.

Acetone

Acetone is a manufactured chemical that is also found naturally in the environment. Acetone is used to make plastic, fibers, drugs, and other chemicals. It is also used to dissolve other substances. It occurs naturally in plants, trees, volcanic gases, forest fires, and as a product of the breakdown of body fat. Industrial processes contribute more acetone to the environment than natural processes (ATSDR 1994).

Acetone is transported from the atmosphere into surface water and soil by rain and snow. It also moves quickly from soil and water back to air. Acetone does not bind to soil or bioaccumulate in animals and is broken down by microorganisms in soil and water (ATSDR 1994).

Agency for Toxic Substances and Disease Registry (ATSDR). 1994. *Toxicological profile for acetone.* U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Benzene

Benzene is a naturally occurring chemical produced by volcanoes and forest fires but is also a major industrial chemical made from coal and oil. Benzene is present naturally in many plants and animals. As a pure chemical, benzene is a clear, colorless liquid. In industry, benzene is used to make intermediate chemicals, to make some types of plastics, detergents, and pesticides, and as a component of gasoline (ATSDR 1987).

Benzene is released to the environment from both natural and man-made sources. Chemical degradation reactions limit the atmospheric residence time of benzene to only a few days. Biodegradation, principally aerobic, is the most important fate mechanism for benzene in water and soil (ATSDR 1987). Much of the benzene released to water will volatilize to the air. Transport to sediment is not likely to be a significant fate process. Benzene released to soil will either volatilize to the air or leach to groundwater (ATSDR 1987).

Benzene can be absorbed into the body following ingestion, inhalation, and dermal contact. Benzene must undergo metabolic transformation to exert its toxic effects. The toxic effects of benzene include hematotoxicity, immunotoxicity, ad neurotoxicity. Benzene is not teratogenic but does cause some reproductive effects such as reduced fetal weight. Benzene is genotoxic and is a known carcinogen (ATSDR 1987).

Agency for Toxic Substances and Disease Registry (ATSDR). 1987. *Toxicological profile for benzene. Draft.* U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Bromodichloromethane

Bromodichloromethane is a colorless, heavy liquid that is formed as a by-product when chlorine is added to drinking water. Bromodichloromethane is also used in the production of other chemicals. Bromodichloromethane evaporates quickly and most that is released evaporates into the air where it is slowly broken down. Animals that have been fed quantities of bromodichloromethane have developed cancer of the liver, kidney, and intestines (ATSDR 1989).

Agency for Toxic Substances and Disease Registry (ATSDR). 1989. *Toxicological profile for bromodichloromethane.* U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Bromoform

Bromoform is a colorless, heavy, nonburnable liquid used to dissolve dirt and grease and to make other chemicals. Bromoform is also produced when chlorine is added to drinking water. Bromoform is stable in the air but breaks down slowly into other chemicals. Bromoform present in soil or water is slowly broken down by bacteria. Long-term intake of bromoform can cause cancer in animals (ATSDR 1990).

Agency for Toxic Substances and Disease Registry (ATSDR). 1990. *Toxicological profile for bromoform.* U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Bromomethane

Bromomethane is a manufactured chemical that also occurs naturally in small amounts in the ocean where it is probably formed by algae and kelp. Commercially, it is used to kill a variety of pests including rats, insects, and fungi. It is also used to make other chemicals or as a solvent to get oil out of nuts, seeds, and wool (ATSDR 1992). Bromomethane is not known to bioaccumulate in plants or animals.

Agency for Toxic Substances and Disease Registry (ATSDR). 1992. *Toxicological profile for bromomethane.* U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Carbon Disulfide

The chief uses of carbon disulfide are for the manufacture of rayon and for regenerated cellulose film. Acute and chronic exposure to carbon disulfide affects the central nervous system.

Carbon Tetrachloride

Carbon tetrachloride is a clear liquid that was produced in large quantities to make refridgeration fluid and propellant for aerosol cans. Production of this chemical is being phased out due its harmful effects on the ozone layer. Carbon tetrachloride evaporates very easily and can remain in the air for several years. Carbon tetrachloride does not adhere to soil or sediment particles but instead will move to the groundwater where it will be broken down into other chemicals.

A 2-year study on the effects of carbon tetrachloride on reproduction in rats indicated a chronic NOAEL of 16 mg/kg/day (Alumot et al. 1976). This was the highest dose administered and no adverse effects were observed. A chronic LOAEL of 160 mg/kg/day was estimated by multiplying the chronic NOAEL by an uncertainty factor of 10. No data were found on the toxicological effects to birds from ingestion exposures.

Alumot, E., E. Nachtomi, E. Mandel et al. 1976. Tolerance and acceptable daily intake of chlorinated fumigants in the rat diet. *Food Cosmet. Toxicol.* 14:105-110.

Chlorobenzene

Chlorobenzene is a colorless liquid with an almond-like odor. This chemical does not widely occur naturally but is manufactured for use as a solvent and to produce other chemicals. Chlorobenzene can persist in soil for several months but will persist in air and water for only hours or a few days (ATSDR 1990).

A chronic study on the effects of chlorobenzene on dogs showed adverse effects to the liver at a dose of 273 mg/kg/day (IRIS 1998). This dose is considered a chronic LOAEL. A chronic NOAEL of 27.3 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1. No data were found on the toxicological effects to birds from ingestion exposures.

Agency for Toxic Substances and Disease Registry (ATSDR). 1990. *Toxicological profile for chlorobenzene. Draft.* U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Integrated Risk Information System (IRIS). 1998. U.S. Environmental Protection Agency, Washington DC.

Chloroethane

Chloroethane is a man-made colorless gas with a sharp odor that is used mainly in the production of tetraethyl lead, a gasoline additive. Due to stricter government control on the amount of lead in gasoline, production of chloroethane has dropped in recent years. Chloroethane is also used in the production of dyes, cellulose, medicinal drugs, and as a solvent, refrigerant, and skin numbing agent. Most of the chloroethane released to the environment ends up in the atmosphere where it quickly breaks up by reactions with other substances. Smaller amounts are released into groundwater where it is believed to break down into simpler forms through reactions with water. Little is known about this reaction or how long it stays in the groundwater (ATSDR 1989).

Agency for Toxic Substances and Disease Registry (ATSDR). 1989. *Toxicological profile for chloroethane.* U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Chloroform

Chloroform is a colorless or water-white liquid. Most of what is produced in the United States is used to make fluorocarbon 22, which is a cooling fluid for air conditioners. A lesser amount is used in the production of pesticides and solvents. Most of the chloroform that is released to the environment is transported to the air (ATSDR 1988).

A literature search was conducted on the toxicological effects of chloroform ingestion to mammals and birds. Ingestion-based studies were not available for birds.

A 13-week study of the effects of chloroform on livers, kidneys, and gonad condition in rats indicated a chronic LOAEL of 410 mg/kg/day (Palmer et al. 1979). At this dosage, both female and male rats developed gonadal atrophy. A dose of 150 mg/kg/day was determined to be the chronic NOAEL because no adverse effects were observed at this dosage.

Agency for Toxic Substances and Disease Registry (ATSDR). 1988. *Toxicological profile for chloroform*. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Palmer, A.K., A.E. Street, F.J.C. Roe, A.N. Worden, and N.J. Van Abbe. 1979. Safety evaluation of toothpaste containing chloroform. II. Long term studies in rats. *J. Environ. Pathol. Toxicol.* 2:821-833.

Chloromethane

Chloromethane is a clear colorless gas that is produced naturally in the oceans and by microbial fermentation, and by industry to create other chemicals. Chloromethane evaporates into the air where it can remain for up to 2 years. If present in a landfill, it can leach through the soil and infiltrate groundwater.

Dibromochloromethane

Information regarding dibromochloromethane was not available in the literature.

Ethylbenzene

Ethylbenzene occurs naturally in coal tar and petroleum and is also found in many man-made products including paints, inks, and insecticides. Gasoline contains about 2 percent (by weight) ethylbenzene. Ethylbenzene is a colorless liquid that smells like gasoline. It evaporates at room temperature and burns easily. Ethylbenzene is most commonly found as a vapor because it evaporates easily into the air from water and soil. Once in the air, other chemicals help break down ethylbenzene into chemicals found in smog. This breakdown happens in about 3 days with the aid of sunlight. In surface water such as rivers and harbors, ethylbenzene breaks down by reacting with other compounds naturally present in water. In soil, bacteria break down ethylbenzene. It can also infiltrate groundwater since it does not readily bind to soil. Several studies indicate that ethylbenzene causes systemic effects in animals following inhalation exposure. The principal target organs appear to be the lungs, liver, and kidney, with transient toxic effects on the hematological system (ATSDR 1990).

A chronic study on the effects of ethylbenzene on rats showed adverse effects to the liver and kidney at a dose of 971 mg/kg/day (Wolf et al. 1956). This dose is considered a chronic

LOAEL. A chronic NOAEL of 97.1 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1. No data were found on the toxicological effects to birds from ingestion exposures.

Agency for Toxic Substances and Disease Registry (ATSDR). 1990. *Toxicological profile for ethylbenzene*. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Wolf, M.A., V.K. Rowe, D.D. McCollister, R.L. Hollinsworth, and F. Oyen. 1956. Toxicological studies of certain alkylated benzenes and benzene. *Arch. Ind. Health*. 14:387-398.

Methylene Chloride

Methylene chloride is an organic solvent with a sweet smell that is used as an industrial solvent, a paint stripper, and in the manufacture of photographic film. Animals given large amounts of methylene chloride have developed cancer (ATSDR 1989).

Agency for Toxic Substances and Disease Registry (ATSDR). 1989. *Toxicological profile for methylene chloride*. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Styrene

Styrene is a colorless liquid used to make rubber and plastics. Billions of pounds of styrene are produced each year in the United States. It does not occur naturally in the environment. Styrene is quickly broken down in the air when ozone is present, but remains in the soil and water for several months (ATSDR 1991).

A 90-day study on the effects of ingestion of styrene on reproduction in rats indicated a chronic NOAEL of 35 mg/kg/day (Beliles et al. 1985). A chronic LOAEL of 350 mg/kg/day was estimated by multiplying the chronic NOAEL by an uncertainty factor of 10.

In a 560-day study on the effects of styrene on the hepatic system of dogs indicated a chronic LOAEL of 400 mg/kg/day (Quast et al. 1979). Dogs given this dosage by gavage exhibited increased numbers of Heinz bodies, decreased packed cell values, and sporadic decreases in hemoglobin and erythrocyte counts. No adverse effects were observed a dose of 200 mg/kg/day. This was determined to be a chronic NOAEL.

No data on the toxicological effects of styrene on birds were found in the literature.

Agency for Toxic Substances and Disease Registry (ATSDR). 1990. *Toxicological profile for styrene*. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Beliles, R.P., J.H. Butala, C.R. Stack et al. 1985. Chronic toxicity and three-generation reproduction study of styrene monomer in the drinking water of rats. *Fundam. Appl. Toxicol*. 5:855-868.

Quast J.F., C.G. Humiston, and R.V. Kalnins. 1979. Results of a toxicity study of monomeric styrene administered to beagle dogs by oral intubation for 19 months. Report to manufacturing Chemists Association, Washington, D.C., by Health and Environmental Sciences, Dow Chemical USA, Midland, MI.

Tetrachloroethene

Tetrachloroethene (PCE) is a nonflammable liquid solvent widely used in the dry cleaning industry. Most of the PCE used is released to the atmosphere via evaporation. PCE has a relatively long (about 96 days) half-life in the atmosphere. PCE in water and surface soil will most likely volatilize to the air. PCE in subsurface soils may persist there or be leached to groundwater (ATSDR 1987).

PCE causes toxic effect in the liver, kidneys, and central nervous system. Hepatic, fetotoxic, reproductive, and genotoxic effects are also known. PCE is a know carcinogen (ATSDR 1987).

A 6-week study on the effects of tetrachloroethene on mice showed adverse effects to the hepatic system at a dose of 70 mg/kg/day (Sample et al. 1996). This dose is considered a chronic LOAEL. A chronic NOAEL of 14 mg/kg/day was determined in this study since no adverse effects were found at this dose. No data were found on the toxicological effects to birds from ingestion exposures.

Agency for Toxic Substances and Disease Registry (ATSDR). 1987. *Toxicological profile for tetrachloroethylene*. Draft. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. *Toxicological benchmarks for wildlife: 1996 revision*. Environmental Restoration Division, ORNL Environmental Restoration Program. ES/ER/TM-86/R3.

Toluene

Toluene is produced as a by-product in the processing of gasoline and coke, and in the manufacture of styrene. Toluene readily degrades once it is released to the environment. It is readily broken down by microorganisms in the soil and evaporates quickly from the soil and surface water. Toluene can accumulate in aquatic organisms such as fish, shellfish, plants, and aquatic mammals. It is not known to biomagnify in food chains.

Studies on animals have shown that toluene can effect the central nervous system, liver, kidney and lungs. Studies using moderate to high concentrations of toluene indicate that toluene is a developmental toxicant, but not a reproductive toxicant (ATSDR 1994).

A literature search was conducted on the toxicological effects of toluene ingestion to mammals and birds. Ingestion-based studies were not available for birds.

A study on the effects of toluene on the reproduction of rats indicated a chronic LOAEL of 0.3 mL/kg/day (Nawrot and Staples 1979). Exposure to this dose via oral gavage during gestation significantly reduced fetal weights and significantly reduced embryo mortality. The chronic LOAEL was converted to a daily dose of 260 mg/kg/day (Sample et al. 1996). A chronic NOAEL of 26 mg/kg/day was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1.

Agency for Toxic Substances and Disease Registry (ATSDR). 1994. *Toxicological profile for toluene*. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Nawrot, P.S. and R.E. Staples. 1979. Embryofetal toxicity and teragenicity of benzene and toluene in the mouse. *Teratology.* 19: 41A.

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. *Toxicological benchmarks for wildlife: 1996 revision.* Environmental Restoration Division, ORNL Environmental Restoration Program. ES/ER/TM-86/R3.

Trichloroethene

A study on the effects of trichloroethene on rats showed adverse reproductive effects at a dose of 10,000 mg/kg/day (Coulston and Kolbye 1994). This dose is considered a chronic LOAEL. A chronic NOAEL of 1,000 mg/kg/day was calculated by multiplying the chronic LOAEL by an uncertainty factor of 0.1. No data were found on the toxicological effects to birds from ingestion exposures.

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.

Vinyl Acetate

Vinyl acetate is a clear, colorless liquid with a distinctive odor. It does not occur naturally in the environment. Vinyl acetate is used to make other chemicals for the manufacture of glues, paints, textiles, and paper.

Vinyl acetate evaporates readily and is soluble in water. The half-life in air and water is about 6 hours and 7 days, respectively. Vinyl acetate partitions to the atmosphere and to surface water and groundwater. The compound is transformed by photochemical oxidation in air, and by hydrolysis and biodegradation in surface water, groundwater, and soil. Due to its high vapor pressure and water solubility, vinyl acetate is not expected to bioconcentrate in terrestrial or aquatic organisms or biomagnify in food chains (ATSDR 1991).

Agency for Toxic Substances and Disease Registry (ATSDR). 1991. *Toxicological profile forvinyl acetate. Draft.* U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Vinyl Chloride

Vinyl chloride is a colorless gas that is used mainly to produce polyvinyl chloride for the plastics and vinyl industries. Most releases to the environment are from atmospheric emissions and wastewater discharges. When released to the air, vinyl chloride has a relatively short half-life of 1 to 2 days. When released to water, volatilization is the primary fate process with half-lives of 1 to 2 days. Vinyl chloride released to soils will either volatilize to the atmosphere or leach to groundwater (ATSDR 1988).

The principal route of exposure to vinyl chloride is inhalation or ingestion of water containing the chemical. Adverse effects include hepatotoxicity, developmental toxicity, genotoxicity, and reproductive effects. Vinyl chloride is a known carcinogen (ATSDR 1988).

Agency for Toxic Substances and Disease Registry (ATSDR). 1988. *Toxicological profile for vinyl chloride*. Draft. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Xylenes

Xylene is primarily a man-made chemical that is produced from petroleum and coal. Xylene also occurs naturally in petroleum and coal tar, and is formed during forest fires. There are three forms or isomers of xylene including *meta*-xylene, *ortho*-xylene, and *para*-xylene.

Xylene evaporates and burns easily. Xylene does not mix well with water, however, it does mix with alcohol and with many other chemicals. Xylene is a liquid and it can leach into soil, surface water (creeks, streams, and rivers), and groundwater where it can remain for 6 months or longer before it is broken down into other chemicals. Because it evaporates readily, most xylene is transported to the air, where it lasts for several days and is broken down by sunlight into other kinds of chemicals.

Results of studies with animals indicate that large amounts of xylene can cause changes in the liver and adverse effects on the kidney, lung, heart, and nervous system. Short-term exposure to high concentrations of xylene causes death in some animals, as well as muscular spasms, incoordination, hearing loss, changes in behavior, changes in organ weights, and changes in enzyme activity. Long-term exposure to low concentrations of xylene has not been well studied in animals (ATSDR 1990).

A study on the effects of xylene on the reproduction in mice indicated a chronic LOAEL of 2.6 mg/kg/day (Marks et al. 1982). A dose of 2.6 mg/kg/day showed significantly reduced fetal weights and increased the incidence of fetal malformations. While the xylene exposure studies were of a short duration, they occurred during a critical lifestage. The highest dose that produced no adverse effects (2.1 mg/kg/day) was considered to be a chronic NOAEL.

Quail exposed to xylene in the diet showed chronic effects at an estimated dose of 405 mg/kg/day (Hill and Camardese 1986). A chronic NOAEL of 40.5 mg/kg/day was estimated by multiplying this chronic LOAEL by an uncertainty factor of 0.1.

Agency for Toxic Substances and Disease Registry (ATSDR). 1990. *Toxicological profile for xylene*. U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Hill, E.F. and M.B. Camardese. 1986. *Lethal dietary toxicities of environmental contaminants and pesticides to Coturnix*. U.S. Fish and Wildlife Service Technical Report 2.

Marks, T.A., T.A. Ledoux, and J. A. Moore. 1982. Teratogenicity of a commercial xylene mixture in the mouse. *J. Toxicol. Environ. Health.* 9:97-105.