

Final Technical Memorandum
Human Health Risk Assessment of
Shoreline Surface Waters and Sediments,
and Groundwater in Shallow Piezometers
Site 07, Calf Pasture Point

Former Naval Construction
Battalion Center Davisville
North Kingstown, Rhode Island



Naval Facilities Engineering Command
Mid-Atlantic

Contract Number N62472-03-D-0057

Contract Task Order 019

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FINAL TECHNICAL MEMORANDUM

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SHORELINE SURFACE WATERS AND SEDIMENTS,
AND GROUNDWATER IN SHALLOW PIEZOMETERS
SITE 07, CALF PASTURE POINT**

**FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND**

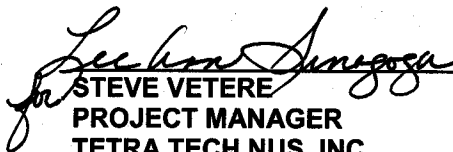
**COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION – NAVY (CLEAN) CONTRACT**

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FINAL TECHNICAL MEMORANDUM

HUMAN HEALTH RISK ASSESSMENT OF SHORELINE SURFACE WATERS AND SEDIMENTS, AND GROUNDWATER IN SHALLOW PIEZOMETERS SITE 07, CALF PASTURE POINT FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE NORTH KINGSTOWN, RHODE ISLAND

EXECUTIVE SUMMARY

This human health risk assessment (HHRA) was conducted to evaluate risks associated with potential human exposure to volatile organic compounds (for example trichloroethene) detected in surface water and shallow groundwater samples, and volatile organic compounds (VOCs) and metals detected in sediment samples collected along the Site 07 shoreline. The impetus for the assessment was the detection of VOCs in groundwater samples collected from shoreline piezometers at Site 07. The environmental samples were collected as part of the long-term monitoring program for Site 07 as required by the Record of Decision established for this site (September 1999). For purposes of completeness, the assessment also re-evaluated risks using the analytical data for shellfish previously collected during the Phase III Remedial Investigation for Site 07. The HHRA was prepared per methodology presented in the *Final Technical Memorandum, Human Health Risk Assessment Methodology for the Evaluation of Shoreline Surface Waters and Sediments, and Groundwater in Shallow Piezometers, Site 07 (Calf Pasture Point), Former Naval Construction Battalion Center (NCBC) Davisville, RI* (December 2006). The methodology was reviewed and approved by EPA Region I and the Rhode Island Department of Environmental Management (RIDEM).

The following chemicals of potential concern were selected for the HHRA utilizing a conservative toxicity screening protocol:

- **Shallow groundwater (from piezometers along the shoreline):** 1,1,2,2-tetrachloroethane, 1,1,2-trichloroethane, 1,1-dichloroethene, 1,2-dichloroethane, benzene, chloroform, cis-1,2-dichloroethene, trans-1,2-dichloroethene, trichloroethene, and vinyl chloride.
- **Surface water (along the shoreline):** 1,1,2,2-tetrachloroethane, cis-1,2-dichloroethene, trichloroethene, and vinyl chloride.
- **Sediments (along the shoreline):** Trichloroethene, vinyl chloride, aluminum, arsenic, beryllium, and iron.
- **Shellfish data (as presented in the Phase III Remedial Investigation for Site 07):** Polycyclic aromatic hydrocarbons (benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene), Aldrin, 4,4'-DDE, Aroclor-1242, Aroclor-1254, and Aroclor-1260, arsenic, cadmium, chromium, copper, iron, manganese, mercury, nickel, and silver.

The human receptors considered in the HHRA were individuals potentially exposed to the chemicals of potential concern in the Site 07 shoreline surface waters, sediments, or shallow groundwater while swimming, wading, or gathering shellfish. The exposure pathways evaluated were:

- Dermal contact (skin surface exposure) with or the incidental ingestion of surface waters and sediments while swimming, wading, or gathering shellfish.
- Dermal contact with shallow groundwater while digging into the shoreline sediments to gather shellfish.
- Consumption of shellfish collected along the Site 07 shoreline.

Chemical intakes (or doses) resulting from exposure to chemicals of concern were estimated according to the exposure assumptions (e.g., water or sediment ingestion rates) and equations presented in aforementioned Technical Memorandum dated December 2006. The exposure assumptions and equations presented in this Technical Memorandum are conservative (i.e., the exposure assumptions were selected to error on the side of safety).

Standard EPA methodology, as presented in the EPA's Risk Assessment Guidance for Superfund (Part A) (December 1989), was used to estimate cancer and non-cancer risk. Cancer risk estimates were presented in terms of the probability of developing cancer. Non-cancer risk estimates were presented in terms of a hazard quotient which is simply the ratio of an exposure dose or concentration to an acceptable dose or concentration.

All of the cancer risk estimates developed for potential human exposure to chemicals of potential concern in the shallow groundwater, surface waters, and sediments while swimming, wading, or shell-fishing were within the EPA's generally acceptable cancer risk range and did not exceed the State of Rhode Island cancer risk benchmark of 10^{-5} . All of the hazard quotients and hazard indices for these same potential exposures were less than 1.

The cancer risk and non-cancer risk estimates developed for consumption of shellfish do exceed both EPA and State of Rhode Island risk management benchmarks. The primary chemicals of potential concern contributing to the cancer and non-cancer risk estimates are arsenic, mercury, and the polychlorinated biphenyls. However, a review of source area data for Site 07 and background data for sediments and shellfish indicates that these chemicals are not present in the shellfish as a consequence of disposal activities at Site 07. The shellfish samples were collected in the mid-1990's and the determination that mercury concentrations in shellfish are not related to Site 07 disposal activities is clearly documented in the September 1999 ROD for Calf Pasture Point.

1.0 INTRODUCTION

This technical memorandum presents the results of a human health risk assessment (HHRA) of volatile organic chemicals (VOCs) detected in the surface water and shallow groundwater (piezometers), and VOCs and metals detected in sediment samples collected along the shoreline at Site 07 Calf Pasture Point, Former Naval Construction Battalion Center (NCBC) Davisville, Kingstown, Rhode Island. The assessment was prepared to evaluate human health risks potentially associated with exposures to these environmental media while swimming, wading, and shell fishing along the Site 07 shoreline. A "No Wading" sign currently exists along the Site 07 shoreline.

This HHRA was prepared under the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract No. 62472-03-D-0057, Contract Task Order No. 19.

1.1 Site History

Calf Pasture Point is a peninsula located in the northeast portion of the former NCBC Davisville. Site 07 is located in the southern portion of Calf Pasture Point, bordered by Allen Harbor to the south and west and Narragansett Bay to the east (Figure 1-1). Site 07 is the former location of three earthen-covered munitions bunkers which were located in the middle of Calf Pasture Point to the north, east, and south of a bedrock outcrop. This outcrop is a prominent hill with a maximum elevation of approximately 55 feet above mean sea level (MSL), located north of well MW07-07S (Figure 1-2). The bunkers were demolished by the Navy in February 1997 and September 2000.

Some time between 1968 and 1974, in the area south of the former munitions bunkers, a trench was reportedly filled with cans that contained Decontaminating Agent Non-Corrosive (DANC) solution. This trench is believed to be the source of a chlorinated volatile organic compound (CVOC) groundwater plume that is present beneath Site 07. The approximate location of the disposal area has been inferred through various phases of investigation at Site 07.

The Navy completed a Remedial Investigation/Feasibility Study (RI/FS) for Site 07 in September 1998. In September 1999, a Record of Decision (ROD) was signed to document the selection of the following remedy for Site 07:

- A deed restriction prohibiting the use of groundwater in order to prevent human contact with, or use of, impacted groundwater (e.g. for drinking or showering purposes). The deed restriction also imposes restrictions on the future use of the property (recreational only) and requires that any

building, structure, or other improvement be designed and constructed to include adequate ventilation.

- Long-term monitoring (LTM) of groundwater, as well as sampling of sediment in the shoreline area as warranted based upon trends in the groundwater data. LTM at Site 07 also includes risk monitoring to demonstrate the protection of human health and the environment, which is the objective of this Technical Memorandum.
- Five-year reviews as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

In November 2000, the Navy completed a Conceptual Long-Term Monitoring Plan (CLTMP) for Site 07, establishing the basis for the long-term monitoring program that is currently being implemented at the Site. In July 2001, the Navy completed a Quality Assurance Project Plan (QAPP) for the long-term monitoring program (LTMP). LTM at Site 07 commenced in August 2001 on a nine-month monitoring schedule. To date, seven monitoring events have been completed (the seventh event occurred in November 2006, but this HHRA was completed before validated data was available from this event).

In October 2004, based upon the detection of CVOCs in shoreline piezometers adjacent to the Allen Harbor entrance channel, and as directed by the LTM QAPP rules, the Navy performed supplemental groundwater and surface water sampling from P07-06 through P07-10 and P07-24. This supplemental sampling was performed bi-monthly until January 2006 to monitor the concentrations of CVOCs present in shallow groundwater and surface water along the Site 07 shoreline. The supplemental data, along with data collected during the first six 9-month sampling events, was used to support this shoreline HHRA.

1.2 Shoreline Human Health Risk Assessment

The shoreline HHRA utilizes shallow groundwater (piezometer), surface water, and sediment sampling results to calculate human health risks associated with wading and shellfishing along the Site 07 shoreline adjacent to the Allen Harbor entrance channel. The samples used to support the assessment were collected as part of the LTMP for Site 07 (and supplemental investigations) as described in the *Quality Assurance Project Plan for Long-Term Monitoring of Site 07 (Calf Pasture Point), NCBC, North Kingstown, Rhode Island* (EA, July 2001).

The shallow groundwater samples were collected from shoreline piezometers located along the northern bank of the entrance channel separating Narragansett Bay from Allen Harbor (i.e., the southern boundary of Site 07) and along the Allen Harbor shoreline which adjoins the western edge of Site 07. The screened

interval for the piezometers is approximately two to three feet below ground surface (bgs). The surface water samples (shallow shoreline samples) were collected from eight locations co-located with piezometer stations positioned along the northern bank of the entrance channel separating Narragansett Bay from Allen Harbor. The sediment samples were collected from six locations also located in this area. All samples were collected at low- to mid-tide. For purposes of completeness, the HHRA also re-assessed the analytical data for shellfish previously evaluated in the Phase III RI for Site 07.

The HHRA was prepared per methodology presented in the *Final Technical Memorandum, Human Health Risk Assessment Methodology for the Evaluation of Shoreline Surface Waters and Sediments, and Groundwater in Shallow Piezometers, Site 07 (Calf Pasture Point), Former Naval Construction Battalion Center (NCBC) Davisville, RI* (TtNUS, December 2006).

2.0 CHEMICAL OF POTENTIAL CONCERN SELECTION AND DETERMINATION OF THE EXPOSURE POINT CONCENTRATION

2.1 Determination of Chemicals of Potential Concern

Chemicals of Potential Concern (COPCs) are those chemicals evaluated qualitatively or quantitatively in a HHRA to determine potential human health risks as a result of exposure to an environmental medium. COPCs for this Site 07 Shoreline Risk Assessment (SRA) were selected primarily based on a toxicity screen (i.e., a comparison of site contaminant concentrations to conservative toxicity screening values). In addition, as discussed below, factors such as frequency of detection were considered in some cases.

2.1.1 Derivation of Screening Criteria

The toxicity screening levels used to identify **COPCs** for the Site 07 SRA were based on preliminary remediation goals (PRGs) for residential soil and tap-water developed by USEPA Region 9 (USEPA Region 9, October 2004, updated December 28, 2004), criteria established by the Rhode Island Department of Environmental Management, Office of Waste Management (RIDEM, February 2004), and USEPA Region 3 risk-based concentrations (RBCs) for fish tissue (USEPA, Region 3, October 20, 2006). COPCs were selected based on the lowest screening level derived from these criteria.

The screening concentrations based on the PRGs and RBCs correspond to a systemic hazard quotient (HQ) of 0.1 for non-carcinogens or an incremental lifetime cancer risk of 1×10^{-6} for carcinogens. Note that the USEPA Region 9 PRGs and the USEPA Region 3 RBCs for non-carcinogens are based on an HQ of 1.0, whereas the screening concentrations are based on an HQ of 0.1. The screening concentrations are based on an HQ of 0.1 to account for the potential cumulative effects of several

chemicals affecting the same target organ or producing the same adverse non-carcinogenic effect. Chemicals detected at maximum concentrations in surface water or groundwater that exceed screening concentrations based on the Region 9 PRGs for tap water or the RIDEM criteria for groundwater were selected as COPCs for groundwater or surface water. Chemicals detected at maximum concentrations in sediment that exceed screening concentrations based on the Region 9 PRGs for residential soil or the RIDEM direct contact for residential soils were selected as COPCs for sediment. Chemicals detected at maximum concentrations in shellfish tissue samples that exceed screening concentrations based on the Region 3 RBCs for consumption of fish were selected as COPCs for shell-fish consumption.

Individual chemicals were eliminated as COPCs if they are detected at a frequency less than 5 percent in any given medium but only if there were no other indications that the chemical would pose an unacceptable risk to receptors (e.g., there was no evidence of a contaminant "hot spot").

2.1.2 Selection of COPCs

Groundwater

Analytical data for shallow groundwater samples collected between August 2001 and January 2006 from piezometers locations PZ1 through PZ33 were evaluated in the COPC selection. Eighteen VOCs were detected in the shallow groundwater samples collected at the Site 07. A comparison of the maximum detected groundwater concentrations to screening levels based on the USEPA Region 9 PRGs for ingestion of tap water and RIDEM GA groundwater objectives is presented in Table 2-1. The following chemicals were detected in the shallow groundwater samples at maximum concentrations exceeding the COPC screening levels and were retained as COPCs for shallow groundwater at Site 07:

1,1,2,2-TCA	1,1,2-TCA	1,1-DCE	1,2-DCA	Benzene
Chloroform	<i>cis</i> -1,2-DCE	<i>trans</i> -1,2-DCE	TCE	Vinyl Chloride

- TCA = tetrachloroethane, DCA = dichloroethane, TCE = trichloroethene, DCE = dichloroethene

Concentrations of tetrachloroethene also exceeded the USEPA Region 9 PRG but were less than the RIDEM GA groundwater objectives. The maximum detected concentration of tetrachloroethene (1.19 µg/L) is also less than the USEPA MCL (5 µg/L). Tetrachloroethene was detected in only 6 of 238 samples. Tetrachloroethene was not retained as a COPC because it was detected infrequently in groundwater (less than 2.5 percent of the samples) and at low concentrations (i.e., less than the EPA MCL and RIDEM GA groundwater objectives). Concentrations of total 1,2-DCE also exceeded the screening criteria. The analytical result reported for total 1,2-DCE for each sample is the sum of the

results reported for the "cis" and "trans" isomers of 1,2-DCE. Consequently 1,2-DCE was evaluated in this HHRA as cis-1,2-DCE and trans-1,2-DCE.

Surface Water

Analytical data for surface water samples collected between December 1995 and January 2006 from locations SW04 through SW10 and location SW24 were evaluated in the COPC selection. Six VOCs were detected in the surface water samples collected at the Site 07. A comparison of the maximum detected surface water concentrations to screening levels based on the USEPA Region 9 PRGs for ingestion of tap water and RIDEM GA groundwater objectives is presented in Table 2-2. The following chemicals were detected in the surface water samples at maximum concentrations exceeding the COPC screening levels and were retained as COPCs for surface water at Site 07:

- 1,1,2,2-tetrachloroethane, cis-1,2-dichloroethene, trichloroethene, and vinyl chloride

Concentrations of 1,1,2-trichloroethane also exceeded the USEPA Region 9 PRG but were less than the RIDEM GA groundwater objectives. The maximum detected concentration of 1,1,2-trichloroethane (3 µg/L) is also less than the USEPA MCL (5 µg/L). 1,1,2-Trichloroethane was detected in only 2 of 89 samples. 1,1,2-Trichloroethane was not retained as a COPC because it was detected infrequently in groundwater (less than 2.2 percent of the samples) and at low concentrations (i.e., less than the EPA MCL and RIDEM GA groundwater objectives).

Sediment

Analytical data for sediment samples collected between September 2002 and September 2005 from locations SD05 through SD10, SD15, SD16, SD20, SD21, and SD22 were used in the COPC selection. 10 VOCs and 12 inorganics were detected in sediment samples collected at Site 07. A comparison of the maximum detected sediment concentrations to screening levels based on the USEPA Region 9 PRGs and RIDEM direct contact criteria for residential exposures is presented in Table 2-3. The following chemicals were detected in sediments at maximum concentrations exceeding the COPC screening levels and were retained as COPCs for sediment at Site 07.

- VOCs [trichloroethene and vinyl chloride]
- Inorganics [aluminum, arsenic, beryllium, and iron]

Concentrations of trichloroethene, arsenic, and iron exceeded the USEPA Region IX PRGs but were less than the RIDEM direct contact criteria. Concentrations of beryllium exceeded the RIDEM direct contact criteria but were less than the USEPA Region 9 PRGs.

Shellfish

Analytical data for shellfish samples evaluated in the human health risk assessment prepared for the Phase III Remedial Investigation Report (dated September 1998) were used in the COPC selection. Twenty-one SVOCs, 12 pesticides/PCBs, and 12 inorganics were detected in shellfish samples collected from Allen Harbor in the general vicinity of Site 07. A comparison of the maximum detected concentrations in shellfish to USEPA Region 3 RBCs for fish tissue is presented in Table 2-4. The following chemicals were detected in shellfish at maximum concentrations exceeding the COPC screening levels and were retained as COPCs for shellfish at Site 07.

- SVOCs [benzo(a)pyrene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene]
- Pesticides/PCBs [Aldrin, 4,4'-DDE, Aroclor-1242, Aroclor-1254, and Aroclor-1260]
- Inorganics [arsenic, cadmium, chromium, copper, iron, manganese, mercury, nickel, and silver]

2.2 Calculation of the Exposure Point Concentration

The **exposure point concentration (EPC)**, which is calculated for COPCs only, is an estimate of the chemical concentration within an exposure unit (EU). The EPC is an estimate of the concentration to which a receptor may be exposed and is used to estimate exposure intakes. An EU is the area over which receptor activity is expected to occur. The two most important considerations in defining an EU are: 1) the anticipated receptor activity, and 2) the spatial distribution of contaminant concentrations. The EPCs calculated for receptors potentially exposed to the environmental media along the Site 07 shoreline considered the presence of a "hot spot" area along the southern boundary of Site 07 (locations 07-02 through 07-10 and 07-20 through 07-24, (see Figure 2-1). The EPC calculations also considered the fact that COPC levels have changed at some locations over the time-span that the Site 07 long-term monitoring program has been conducted. For example, VOC concentrations in the more recent sediment data (2004, 2005) exceed VOC concentrations detected in samples collected in 2002 and 2003. Consequently, the Site 07 SRA evaluated the following different data groupings/EUs for shallow groundwater, surface waters, and sediments:

Shallow Groundwater (Piezometers) (Table 2-5):

- **Case 1:** All available VOC data for 2005 and 2006 for locations 07-02 through 07-10, and locations 07-20 through 07-24 (i.e., the southern boundary area).

- **Case 2:** All available VOC data for the last quarter of sampling (November 2005 through January 2006) for locations 07-02 through 07-10, and locations 07-20 through 07-24 (i.e., the most recent data for the southern boundary area).
- **Case 3:** All available VOC data for 2005 and 2006 for *all* locations.
- **Case 4:** All available VOC data for 2005 and 2006 for all locations *except* those noted in Case 1 and Case 2 (i.e., *not including* the southern boundary area).

Surface Waters (Table 2-6):

- **Case 1:** All available VOC data for 2005 and 2006 for locations 07-04 through 07-10, and location 07-24 (i.e., all 2005/2006 data collected under the long-term monitoring plan).
- **Case 2:** All available VOC data for the last quarter of sampling (November 2005 through January 2006) for locations 07-04 through 07-10, and location 07-24 (i.e., the most recent data collected under the long-term monitoring plan).

Sediments (Table 2-7):

- **Case 1:** All available 2004 and 2005 VOC data plus any available metals data collected under the long term monitoring program.

The following guidelines were used to calculate the EPCs:

- If the data set for an EU contained fewer than 10 samples, the EPC was defined as the maximum detected concentration.
- If the data set for an EU contained 10 or more samples, the 95 percent upper confidence limit (UCL) on the arithmetic mean, which was based on the distribution of the data set, was selected as the EPC. EPCs were calculated following *USEPA's Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites* (USEPA, December 2002).
- One-half the sample quantitation limit was used as a surrogate concentration for non-detect results. Duplicates were averaged for purposes of calculating the EPC for COPCs in the environmental media along the shoreline at Site 07.

The RAGS Part D Table 3s in Attachment 1 present the EPCs and additional statistical information, including the rationale for the selection of each EPC value. The EPCs were calculated using a version of EPA's PROUCL modified to operate in batch mode (i.e., calculate the desired statistics for multiple parameters in a single run).

The shell fish data evaluated in this HHRA are presented in Table 2-8.

3.0 METHODOLOGIES FOR CALCULATING CHEMICAL INTAKE

The human health risk assessment (HHRA) of the COPCs detected in the shallow groundwater, shallow surface water, shoreline sediments, and shellfish assumed that receptors may be exposed as a result of ***trespass or recreational activities*** along the Site 07 shoreline area. Specifically it is assumed that:

- Recreational receptors may be exposed to surface waters (dermal contact, incidental ingestion) and sediments (dermal contact, incidental ingestion) while swimming/wading along the shoreline or to surface waters (dermal contact, incidental ingestion), exposed sediments (dermal contact, incidental ingestion), or shallow groundwater (dermal contact) while harvesting shellfish. The recreational receptor harvesting shellfish may also be exposed as a result of the consumption of shellfish taken from the Site 07 shoreline area.
- The receptor is a resident living in proximity to NCBC Davisville and is exposed over a 30-year duration, including exposure that may occur during childhood and adolescent years. Therefore, the following three receptors were considered in the HHRA:
 - Adult
 - Adolescent child (approximately age 8 through 16)
 - Young child (approximately age 2 through 7)

It should be noted that there are no formal recreational facilities (e.g., public swimming areas) located along this shoreline area and there are currently no plans to develop a public swimming area in the future. Therefore, it is unlikely that a young child (approximately age 2 through 7) would be *routinely* exposed to the environmental media along this shoreline. However, conservatively, exposures to young children were evaluated in the HHRA.

3.1 Methodology for Calculating Intake for the Dermal Route of Exposure

The recommended HHRA methodology for the dermal route of exposure considers the most current U.S. Environmental Protection agency (USEPA) guidance on the subject: *Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim (EPA/540/R/99/005) (USEPA, July 2004 (Attachment 2))* as well as

guidance presented in the *USEPA Exposure Factors Handbook, Volume I, General Factors (EPA/600/P-95/002Fa) (USEPA, August 1997)*.

The methodology assumes that a recreational receptor may be dermally exposed to COPCs detected in the shallow shoreline surface waters and shoreline sediments while trespassing or recreating at Site 07. The HHRA also considered dermal exposure to the shallow groundwater that may occur while a receptor (adolescent or adult) is harvesting shellfish along the Site 07 shoreline.

The following equation was used to calculate the dermal absorbed dose hypothetically resulting from dermal exposure to COPCs in the shoreline surface water and the shallow groundwater:

$$DAD = (DA_{event} * EV * ED * EF * SA) / (BW * AT)$$

The terms of the equation are defined in the following table:

Parameter	Adult	Receptors Adolescent	Young Child
Dermal absorbed dose (DAD) (mg/kg/day)	Calculated	Calculated	Calculated
Absorbed dose per event (DA _{event}) – (mg/cm ²)	Calculated ⁽¹⁾	Calculated ⁽¹⁾	Calculated ⁽¹⁾
Events/day (EV)	1	1	1
Exposure duration (ED) (years)	15	9	6
Exposure frequency (EF) (days/year)	80	80	80
Skin surface area exposed (SA) – (cm ²)			
- Swimming in surface water	18,000	13,000	7,300
- Exposure to surface water while shell fishing	5,940	4,300	Not applicable
- Exposure to shallow groundwater while shell fishing	1,800	1,300	Not applicable
Body weight (BW) (kg)	70	45	15
Averaging time (AT) for Carcinogens – (days) (AT = 70 yr * 365 days/yr)	25,550	25,550	25,550
Averaging time (AT) for Non-carcinogens – (days) (AT = ED * 365 days/yr)	5,475	3,285	2,190

1 - The DA_{event} term is calculated based on the chemical concentration, chemical specific permeability constant, and other intermediate terms as demonstrated in Attachment 2.

An exposure frequency of 80 days per year was used in the HHRA. This value was selected based on discussions and negotiations with USEPA Region I and RIDEM and is based on the assumption that a recreational receptor may visit the shoreline an average of 2 to 3 days per week over the course of the warmer-weather months (April through October). The combined exposure duration of 30 years is the duration typically recommended by USEPA for evaluation of the residential land use scenario (USEPA,

December 1989) and assumes that the receptor lives in close proximity to NCBC Davisville and routinely visits the shoreline. The skin surface area exposed for the recreational user assumes that the total skin surface area is directly contacting the surface water while the receptor is swimming along the shoreline and that approximately 33 percent of the total skin surface area is exposed while harvesting shellfish. As indicated above, the HHRA also evaluated dermal exposure to the shallow groundwater while harvesting shellfish; it was assumed that 10 percent of the total skin surface area (i.e., the hands and a portion of the arms) were exposed to the shallow groundwater while harvesting shellfish. (The total skin surface areas [50th percentile values] and body weights of the receptors are based on information presented in RAGS E and the 1997 version of the Exposure Factors Handbook [EFH]) (USEPA; August 1997) (see Attachment 3).

The DA_{event} term (i.e., the absorbed chemical dose per event) is calculated based on the chemical concentration in the surface water, the chemical specific dermal permeability coefficient, the exposure time (a 2-hour exposure time was assumed), and several other intermediate terms and calculations as demonstrated in Attachment 2).

The following equation was used to calculate the dermal absorbed dose hypothetically resulting from dermal exposure to COPCs in exposed sediments:

$$DAD = (\text{Conc} * CF * EV * ED * EF * SA * AF * ABS) / (BW * AT)$$

The DAD, EV, ED, EF, BW, and AT terms were defined previously for dermal exposure to surface water. It was assumed that the recreational receptor harvesting shellfish would be more intensively contacting exposed sediments than the recreational receptor simply swimming/wading along the shoreline (i.e., the SA assumed for the recreational receptor harvesting shellfish was set at approximately 33 percent of the total skin surface area while the SA assumed for the recreational receptor simply swimming/wading along the shoreline was set at approximately 25 percent of the total skin surface area). ABS (unitless) is the chemical specific absorption factor as specified in RAGS Part E (see Attachment 4). SA and other terms listed in the equation but not previously defined are presented in the following table:

Parameter	Adult	Receptors Adolescent	Young Child
Chemical concentration in sediments (Conc.) (mg/kg)	Measured	Measured	Measured
Conversion Factor (CF) (kg/mg)	10 ⁻⁶	10 ⁻⁶	10 ⁻⁶
Skin surface area exposed (SA) – (cm ²)	4,500 (swimming or wading) 6,073 (clamming)	3,250 (swimming or wading) 4,300 clamming)	1,825 (swimming or wading) Not applicable
Sediment adherence factor (AF) – (mg/cm ²)	0.335 (swimming, wading, or clamming)	5 (swimming or wading) 0.335 (clamming)	5 (swimming or wading)

The sediment adherence values are based on data presented in Shoaf et al (2005). The average dermal sediment loading for the 50th percentile male and female child (age 7 to 12) playing in tide flat sediment was calculated to be 5 mg/cm². This sediment loading value was based on the 50th percentile child male and female total exposed surface area of 3,065 cm² for hands, forearms, lower legs, face and feet calculated from Tables 8-1, 8-2, and 8-3 of the Child-Specific Exposure Factors Handbook (USEPA, September 2002) and the dermal loading to these body parts of children playing in the tide flat reported by Shoaf et al (2005). The average and maximum dermal sediment loading for the 50th percentile adult male and female clam digger was calculated to be 0.335 and 7 mg dry weight per cm², respectively. This was based on the 50th percentile adult male and female total exposed surface area of 6,073 cm² for hands, forearms, lower legs, face, and feet calculated from Tables 6-2 and 6-3 of the Exposure Factors Handbook (USEPA, July 1997) and the dermal loading to these parts of adult clam diggers reported by Shoaf et al, (2005).

3.2 Methodology for Calculating Intake for the Ingestion Route of Exposure

The HHRA methodology for the ingestion route of exposure considers USEPA guidance, Risk Assessment for Superfund (RAGS), Volume I: Human Health Evaluation Manual (Part A) Interim Final (EPA/540/1-89/002) (USEPA, December 1989) as well as many of the exposure assumptions already presented for the evaluation for the dermal route of exposure. Also, note that the ingestion pathway considered in this HHRA is the *incidental ingestion* pathway only because the shoreline surface water can not be used as a domestic drinking water supply due to salinity.

The following equation was used to calculate the exposure dose hypothetically resulting from ingestion of COPCs in shoreline surface waters:

$$\text{Dose} = (\text{Conc.} * \text{IR} * \text{ET} * \text{ED} * \text{EF}) / (\text{BW} * \text{AT})$$

The ED, EF, BW, and AT terms were defined above. Other terms presented in the equation are defined in the following table:

Parameter	Adult	Receptors Adolescent	Young Child
Chemical concentration in shoreline surface water (Conc.) (ug/L)	Measured	Measured	Measured
Shoreline surface water ingestion Rate (IR) – (L/hr)	0.05 (swimming) 0.01 (harvesting shellfish)	0.05 (swimming) 0.01 (harvesting shellfish)	0.05 (swimming) Not applicable
Exposure time per day (ET) – (hrs/day)	2	2	2

The surface water ingestion rate of 0.01 L/hr for the adolescent and adult receptors (harvesting shellfish) differs from that recommended in USEPA, RAGS Part A as the ingestion rate appropriate for a recreational swimming scenario (0.05 L/hr; USEPA, December 1989). This surface water ingestion rate is based on professional judgment and a recommendation published in USEPA Region IV guidelines for a wading-type scenario (USEPA Region IV, May 2000).

The following equation was used to calculate the exposure dose hypothetically resulting from ingestion of COPCs in exposed shoreline sediments:

$$\text{Dose} = (\text{Conc.} * \text{IR} * \text{CF} * \text{FI} * \text{ED} * \text{EF}) / (\text{BW} * \text{AT})$$

The ED, EF, CF, BW, and AT terms were defined above. Other terms presented in the equation are defined in the following table:

Parameter	Adult	Receptors Adolescent	Young Child
Chemical concentration in shoreline sediment (Conc.) (ug/L)	Measured	Measured	Measured
Fraction ingested from source (FI) – unitless	1	1	1
Sediment ingestion Rate (IR) – (mg/day)	50	100	200

The sediment ingestion rate for the adult receptor is the daily ingestion rate recommended by the USEPA for soil ingestion assuming a residential land use scenario. The sediment ingestion rate for the adolescent receptor is based on professional judgment.

3.3 Methodology for Calculating Intake for the Consumption of Shellfish

The HHRA methodology for calculation of chemical intake resulting from the consumption of shellfish considers USEPA guidance, Risk Assessment for Superfund (RAGS), Volume I: Human Health Evaluation Manual (Part A) Interim Final (EPA/540/1-89/002) (USEPA, December 1989) and the USEPA 1997 Exposure Factors Handbook as well as seafood consumption rates available as a result of the Narragansett Bay Project (NBP-92-105, Brown et al., Clark University, 1992).

The following equation was used to calculate the exposure dose hypothetically resulting from ingestion of COPCs in shellfish:

$$\text{Dose} = (\text{Conc.} * \text{IR} * \text{FI} * \text{CF} * \text{ED} * \text{EF}) / (\text{BW} * \text{AT})$$

All terms were defined in the following table:

Parameter	Adult	Receptors Adolescent	Young Child
Chemical concentration in shellfish (Conc.) ⁽¹⁾ (mg/kg)	Concentration based on data presented in the Phase III RI report for Site 07.		
Shellfish Ingestion ⁽²⁾ Rate (IR) – (mg/day)	26,000	26,000	5,500
Fraction ingested from source (FI) – unitless	0.5	0.5	0.5
Conversion Factor (CF)(kg/mg)	10 ⁻⁶	10 ⁻⁶	10 ⁻⁶
Exposure duration (ED)(years)	15	9	6
Exposure frequency (EF) (days/year)	350	350	350
Body weight (BW) (kg)	70	45	15
Averaging time (AT) for Carcinogens – (days) (AT = 70 yr * 365 days/yr)	25,550	25,550	25,550
Averaging time (AT) for Non-carcinogens – (days)(AT = ED * 365 days/yr)	5,475	3,285	2,190

1) The EPC for human exposure to chemical concentration in the shellfish was based on the environmental data presented in the Phase III Remedial investigation report prepared for Site 07 (dated September 1998).

2) Adult/Adolescent: 227,000 mg seafood per serving * 40 servings per year * 1 year/365 days = 26,000 mg/day based on data presented in the 1997 USEPA Exposure Factors Handbook. Small child: 48,000 mg seafood per serving * 40 servings per year * 1 year/365 days = 5,500 mg/day Source: Narragansett Bay Project, NBP-92-105, Brown et al., Clark University, 1992. Servings per year: Professional judgment based on recreational level reported in USEPA's "Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories" EPA 823-B-00-007, August 2000.

4.0 TOXICITY CRITERIA

The carcinogenic potency of a compound is often expressed in terms of a cancer slope factor (CSF). The potential of a compound to produce noncarcinogenic effects is often expressed in terms of a reference dose (RfD). Oral and inhalation reference doses (RfDs) and cancer slope factors (CSFs) used in this

HHRA to estimate the potential for adverse carcinogenic and non-carcinogenic effects were obtained from the following primary USEPA sources (USEPA, December 2003):

- Integrated Risk Information System (IRIS) (Online).
- USEPA Provisional Peer Reviewed Toxicity Values (PPRTVs) – The Office of Research and Development/National Center for Environmental Assessment (NCEA) Superfund Health Risk Technical Support Center develops PPRTVs on a chemical specific basis when requested by USEPA's Superfund program.
- Other Toxicity Values – These sources include but are not limited to California Environmental Protection Agency (Cal EPA) toxicity values, the Agency for Toxic Substances and Disease Registry (ATSDR) Minimal Risk Levels (MRLs), and the Annual Health Effects Assessment Summary Tables (HEAST) (USEPA, July 1997).

Although RfDs and CSFs can be found in several toxicological sources, USEPA's IRIS on-line database is the preferred source of toxicity values. This database is continuously updated and values presented have been verified by USEPA. The USEPA Region 3 Risk-Based Concentration (RBC) Table was also used as a source of toxicity criteria when these criteria were not available from the aforementioned references. Oral and dermal RfDs and CSFs for the constituents identified as COPCs for Site 07 are presented in Tables 5.1 and 6.1 in Attachment 1.

5.0 RISK CHARACTERIZATION

Potential risks (noncarcinogenic and carcinogenic) for human receptors resulting from the potential exposures outlined in the exposure assessment are quantitatively determined during the risk characterization component of the HHRA. Sections 5.1 and 5.2 outline the methods used to quantitatively estimate the type and magnitude of potential risks for human receptors. The detailed results of the risk characterization are provided in the RAGS Part D tables presented in Attachment 1. A summary of the risk characterization for Site 07 is provided in Section 5.3.

5.1 Quantitative Risk Estimation

Quantitative estimates of risk for the Site 07 COPCs were calculated according to risk assessment methods outlined in USEPA guidance (USEPA, December 1989). Lifetime cancer risks are expressed in the form of dimensionless probabilities, referred to as incremental lifetime cancer risks (ILCRs), based on

CSFs. Noncarcinogenic risk estimates are presented in the form of hazard quotients (HQs) that are determined through a comparison of intakes with published RfDs.

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

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

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

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

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

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

$$\text{HQ} = (\text{Estimated Exposure Intake}) / (\text{RfD})$$

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

5.2 Interpretation of Risk Assessment Results

To interpret the quantitative risk estimates and to aid risk managers in determining the need for remediation, quantitative risk estimates were compared to typical USEPA risk benchmarks. The USEPA has defined a "target cancer risk" range of 1×10^{-6} to 1×10^{-4} (i.e., a one-in-ten thousand to one in-one-million chance of developing cancer). Individual or cumulative ILCRs greater than 1×10^{-4} are typically not considered as protective of human health, and ILCRs less than 1×10^{-6} are typically regarded as protective. HQs and HIs are typically evaluated using a value of 1.0. Generally, adverse noncarcinogenic health effects are not anticipated if an HQ or HI, developed on a target organ/effect-specific basis, does not exceed 1.0 (unity). If an HI exceeds unity, a segregation of target organ effects associated with exposure to COPCs is performed. Only those chemicals that affect the same target organ(s) or exhibit similar critical effect(s) were regarded as truly additive. Consequently, it may be possible for a cumulative HI to exceed 1.0, but no adverse health effects are anticipated if the COPCs do not affect the same target organ or exhibit the same critical effect.

As a general guideline, remediation (e.g., institutional controls) is recommended when the cancer risk estimates or total HIs (developed on a target organ/target effects basis) for critical receptors of concern exceed 1×10^{-4} or 1, respectively. However, as indicated in RAGS Part D, the upper limit of the acceptable cancer risk range is not a discrete limit at exactly 1×10^{-4} . Risks slightly greater than 1×10^{-4} may be considered to be acceptable (i.e., protective) if justified based on site-specific conditions, including any uncertainties about the nature and extent of contamination and associated risks. Risk management decisions are made on a case by case basis when the cancer risk estimates are within the 1×10^{-4} to 1×10^{-6} cancer risk range. No remediation is recommended when the cancer risk estimates are less than 1×10^{-6} . The following factors will also be considered in the evaluation of the risk assessment results:

- The magnitude of the media-specific risk estimates.
- Significant uncertainties in the baseline HHRA that would tend to overestimate baseline risk assessment results such as uncertainties in the HHRA intake estimates (and their impact on the risk estimates) and uncertainties associated with the toxicity criteria. These are evaluated qualitatively in the uncertainty analysis section.
- Significant uncertainties in the EPC estimates that would tend to overestimate baseline risk assessment results.

5.3 Results of the Risk Characterization

This section contains a summary of the results of the risk characterization for Site 07. Quantitative risk estimates for potential human receptors were developed for those chemicals identified as COPCs. Uncertainties associated with the risk estimates are discussed in Section 6. The methodology used to calculate the risks presented in this section was discussed in Sections 2, 3, 4, 5.1 and 5.2. For Site 07, potential cancer risks and HIs were calculated for child, adolescent, adult, and lifelong recreational users. Potential cancer risks and HIs are summarized in Table 5-1. Sample calculations are included in Attachment 5 and the results of the risk assessment in RAGS Part D format are included in Attachment 1.

5.3.1 Groundwater

As discussed in Section 2.2, four cases were evaluated for receptor exposure to COPCs in the shallow groundwater (sampled via piezometer). Adolescent and adult recreational users were assumed to be exposed to the shallow groundwater while digging for shellfish. The HIs for all four cases were less than

unity (1.0), indicating that adverse noncarcinogenic health effects are not anticipated for these receptors under the defined exposure conditions.

As shown in Table 5-1, the ILCRs for Cases 1 through 3 were within USEPA's target cancer risk range of 10^{-4} to 10^{-6} while ILCRs for Case 4 were less than the target risk range. The ILCRs estimated for Cases 1, 2, and 3 (i.e., the cases that include data for sampling locations along the southern Site 07 boundary) exceed those presented for Case 4 (i.e., the case that does not include data for sampling locations along the southern Site 07 boundary). The ILCRs presented on Table 5-1 are also less than 10^{-5} (the State of Rhode Island cumulative risk benchmark).

5.3.2 Surface Water

As discussed in Section 2.2, two cases were evaluated for recreational user exposure to COPCs selected for Site 07 surface water. Small child, adolescent, and adult recreational users were assumed to be exposed to the surface water while swimming and shell fishing along the Site 07 shoreline. HIs for both cases were less than unity (1.0), indicating that adverse noncarcinogenic health effects are not anticipated for these receptors under the defined exposure conditions.

ILCRs for child, adolescent, adult, and lifelong recreational users exposed to surface water while swimming were within USEPA's target risk range of 10^{-4} to 10^{-6} . ILCRs for adolescent, adult, and lifelong recreational users exposed to surface water while shell fishing were less than the target risk range. All of the risk estimates presented for receptor exposure to COPCs in surface water were also less than the State of Rhode Island cumulative risk benchmark of 10^{-5} . Risk estimates for Case 2 (i.e., the most recent 2005/2006 data collected under the long-term monitoring plan) marginally exceed risk estimates developed for Case 1 (i.e., all 2005/2006 data collected under the long-term monitoring plan).

5.3.3 Sediment

Only one case was evaluated for recreational user exposure to sediments while swimming and shell fishing. HIs for all receptors were less than unity (1.0), indicating that adverse noncarcinogenic health effects are not anticipated for these receptors under the defined exposure conditions.

ILCRs for child, adolescent, adult, lifelong recreational users exposed to sediment while swimming were within USEPA's target risk range of 10^{-4} to 10^{-6} . ILCRs for adolescent, adult, and lifelong recreational users exposed to sediment while shell fishing were less than the target risk range. All of the risk estimates presented for receptor exposure to COPCs in sediment were also less than the State of Rhode Island cumulative risk benchmark of 10^{-5} .

5.3.4 Ingestion of Shellfish

The HIs calculated for ingestion of shellfish by child (HI = 91), adolescent (HI = 144), and adult (HI = 92) recreational users exceeded the acceptable level of 1. The majority of the unacceptable noncarcinogenic risk was due to exposure to mercury although PCBs and arsenic also contributed significantly to the estimated noncarcinogenic risk.

ILCRs for ingestion of shellfish by child recreational users (ILCR = 7×10^{-5}) were within USEPA's target risk range of 10^{-4} to 10^{-6} . ILCRs for adolescent (ILCR = 2×10^{-4}), adult (ILCR = 2×10^{-4}), and lifelong (ILCR = 4×10^{-4}) recreational users exceeded the target risk range. Arsenic was the major contributor to the estimated carcinogenic risks.

There is uncertainty associated with the ILCRs for exposure to arsenic in shellfish samples. The shellfish samples were analyzed for total arsenic. However, the form of arsenic considered to be carcinogenic is the inorganic fraction, which typically only accounts for a very small percentage of the total arsenic found in shellfish. Recent scientific findings indicate that the percentage of available inorganic arsenic in fish tissue may be less than 4 percent; concentrations in marine fish are anticipated to be even lower (Morrissey, et. Al., 1999). If it is assumed that only 4 percent of the total arsenic detected in the shellfish samples is in the form of inorganic arsenic, then the ILCRs for adolescent (ILCR = 3×10^{-5}), adult (ILCR = 3×10^{-5}), and lifelong (ILCR = 6×10^{-5}) recreational users would be within the USEPA target risk range. As discussed in the uncertainty sections, it also should be noted that the concentrations of arsenic detected in the shellfish samples are comparable to those detected in background samples.

6.0 UNCERTAINTY ASSOCIATED WITH THE HHRA METHODOLOGY

The sources of uncertainty in the HHRA methodology used for the evaluation of COPCs in surface water, sediments, and shallow groundwater along the Site 07 shoreline include the following:

- The risk estimates presented for the consumption-of-shellfish exposure pathway were included for purposes of completeness and are based on analytical data evaluated in the risk assessment presented Phase III Remedial Investigation report for Site 07 (Phase I and II RI locations AH3, AH10, AH14, and FDA, and MERA locations AHW10 and AHW12). The primary COPCs contributing to the risk estimates for consumption of shellfish are mercury, arsenic, and the polychlorinated biphenyls. However, the Phase III RI for Site 07 concluded that, "... upon evaluation of the Phase III hydrogeological and onsite media sample results, no clear evidence (direct relation) was found for a completed risk pathway from the Site (onsite media) to the shellfish (offshore media) in the adjacent

portions of Allen Harbor and the entrance channel; i.e. sampling and analysis conducted to date by the Navy have identified no *related* unacceptable risk". Additionally, the following should be noted:

- The maximum detected arsenic and mercury concentrations reported for **sediment** samples collected during the long-term monitoring program are 3.1 mg/kg and 0.041 mg/kg, respectively. These concentrations likely represent background conditions for Site 07. Attachment 6 presents background concentrations for arsenic and mercury which were acquired from the USEPA's National Coastal Assessment Program for the Narragansett Bay stations. Background concentrations of arsenic range from 1 mg/kg to 20 mg/kg and background concentrations of mercury range from 0.01 mg/kg to 1.82 mg/kg.
- The maximum arsenic concentration evaluated for the 0 to 10 foot depth **soil** samples in the risk assessment for the Site 07 Phase III RI was 3.3 mg/kg. Neither mercury nor PCBs were detected in the 0 to 10 foot depth interval samples.
- Mercury was detected infrequently and at low concentrations in the **groundwater** samples evaluated in the risk assessment for the Site 07 Phase III RI. PCBs were not detected in those same samples.
- Arsenic was detected in groundwater samples evaluated in the risk assessment for the Site 07 Phase III RI at concentrations exceeding the current SDWA MCL. However, the arsenic concentrations reported for the shellfish samples evaluated in the risk assessment for the Site 07 Phase III RI are similar to arsenic concentrations noted in reference shell fish data acquired from the NOAA Mussel Watch Program for the Narragansett Bay stations. (Attachment 6).
- The USEPA RAGS Part E dermal exposure model assumes that the receptor is in constant contact with the water source for the time specified as T_{event} . However, the recreational receptor may not be in constant contact with the surface water. He/she is likely to be sporadically contacting the surface water as the receptor recreates along the beach.
- There is a significant amount of uncertainty associated with any exposure frequency value assumed for recreational exposure to the surface waters or sediments along the Site 07 shoreline. There are no definitive published data indicating the number of days that a recreational receptor may visit a recreational area such as the Site 07 shoreline.

- The HHRA considered dermal exposure to the shallow groundwater that may occur while a receptor is harvesting shellfish along the Site 07 shoreline. However, there is a significant amount of uncertainty associated with this component of the risk assessment because the screened interval for the shoreline piezometers is approximately two to three feet bgs (i.e., below the depth that a recreational receptor is likely to dig when harvesting shellfish).
- The HHRA does not consider the inhalation route of exposure. Although VOCs are the predominant COPCs in the environmental media along the Site 07 shoreline, VOC concentrations will be quickly diluted as environmental media are exposed to the atmosphere. Consequently, receptor exposure via the inhalation route of exposure is not anticipated to be significant.
- The FI term for ingestion of sediments is set at 1. However, this is a conservative assumption because *recreational* receptors are likely to spend (on average) a *portion* of the day engaged in recreational activities at Site 07 while a resident is anticipated (conservatively) to spend (on average) *all day* at a residence.
- Toxicity criteria (i.e., RfDs, CSFs) for trichloroethene are not currently published on the USEPA's IRIS database or in HEAST. Per current Navy guidelines, the toxicity criteria developed by the California EPA (CA EPA, December 2002) were used for trichloroethene in this risk assessment. USEPA has published draft toxicity values for trichloroethene in a technical document (USEPA, August 2001). The draft toxicity criteria are currently undergoing peer review. A range of CSFs [0.02 – 0.4 (mg/kg/day)⁻¹], as opposed to a single recommended value, is presented in the recent guidance. The draft CSFs are 2 to 30 times higher than the CA EPA CSF [0.013 (mg/kg/day)⁻¹]. The draft oral RfD is 0.0004 mg/kg/day as compared to the CA EPA RfD of 0.5 mg/kg/day. Trichloroethene was retained as a COPC in groundwater, surface water, and sediment. Table 6-1 presents the cancer risks and hazard indices calculated using the draft USEPA toxicity values. While the cancer risks and hazard indices calculated using the draft USEPA toxicity values are higher than those calculated using the CA EPA toxicity values, the cancer risks and hazard indices are still within the USEPA target risk range.

7.0 SUMMARY AND CONCLUSIONS

This baseline human health risk assessment for Site 07 was performed to estimate risks to human receptors potentially exposed to chemicals of potential concern in environmental media while swimming, wading, and shell fishing along the Site 07 shoreline. A "No wading" sign currently exists along the Site 07 shoreline. The environmental media evaluated in this HHRA were shallow groundwater (piezometers),

surface water, shoreline sediments; analytical data for shellfish collected in the general vicinity of Site 07 were also evaluated.

The following chemicals were selected as COPCs for direct contact with shallow groundwater (piezometers):

- 1,1,2,2-tetrachloroethane, 1,1,2-trichloroethane, 1,1-dichloroethene, 1,2-dichloroethane, benzene, chloroform, cis-1,2-dichloroethene, trans-1,2-dichloroethene, trichloroethene, and vinyl chloride.

The following chemicals were selected as COPCs for direct contact with surface water:

- 1,1,2,2-tetrachloroethane, cis-1,2-dichloroethene, trichloroethene, and vinyl chloride.

The following chemicals were selected as COPCs for direct contact with shoreline sediments:

- Trichloroethene, vinyl chloride, aluminum, arsenic, beryllium, and iron.

The following chemicals were selected as COPCs for ingestion of shellfish:

- Benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, Aldrin, 4,4'-DDE, Aroclor-1242, Aroclor-1254, and Aroclor-1260, arsenic, cadmium, chromium, copper, iron, manganese, mercury, nickel, and silver.

Quantitative estimates of noncarcinogenic and carcinogenic risks (HIs and ILCRs, respectively) were developed for potential human receptors.

Cumulative HIs for direct contact exposures with chemicals of potential concern in shallow groundwater, surface water, and shoreline sediments are less than or equal to unity (1) for all receptors. Consequently adverse non-carcinogenic health effects are not anticipated under the exposure conditions established in this risk assessment. Cumulative ILCRs for direct contact exposures with chemicals of potential concern in shallow groundwater, surface water, and shoreline sediments also do not exceed the USEPA target risk range of 1×10^{-6} to 1×10^{-4} or the State of Rhode Island cumulative risk benchmark of 10^{-5} for all receptors.

The HIs calculated for ingestion of shellfish by child, adolescent, and adult recreational users exceeded the acceptable level of 1. The majority of the unacceptable noncarcinogenic risk was attributable to

exposure to mercury although PCBs and arsenic also contributed significantly to the estimated noncarcinogenic risk. ILCRs for ingestion of shellfish by child recreational users were within USEPA's target risk range of 10^{-4} to 10^{-6} while ILCRs for adolescent, adult, and lifelong recreational users exceeded the target risk range. ILCRs for all receptors potentially consuming shellfish exceeded the State of Rhode Island cumulative risk benchmark of 10^{-5} . Arsenic was the major contributor to the estimated carcinogenic risks. A review of source area data for Site 07 and background data for sediments and shellfish indicates that the primary chemicals of potential concern for the shell fish exposure pathway (i.e., the risk drivers) are not likely present in the shellfish as a consequence of disposal activities at Site 07. The shellfish samples were collected in the mid-1990's and the determination that mercury concentrations in shellfish are not related to Site 07 disposal activities is clearly documented in the September 1999 ROD for Calf Pasture Point.

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TABLE 2-1
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - GROUNDWATER (PIEZOMETERS)
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
 NORTH KINGSTON, RHODE ISLAND
 PAGE 1 OF 2

Scenario Timeframe: Current/Future
 Medium: Groundwater
 Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration ⁽¹⁾	Maximum Concentration ⁽¹⁾	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects ⁽²⁾	Concentration Used for Screening ⁽³⁾	Background Value ⁽⁴⁾	Risk-Based COPC Screening Level ⁽⁵⁾	RIDEM GA Groundwater Objective ⁽⁶⁾	COPC Flag	Rationale for Contaminant Deletion or Selection ⁽⁷⁾	
Site 7	Volatile Organic Compounds														
	79-34-5	1,1,2,2-Tetrachloroethane	0.2 J	1200	ug/L	P07-08-NWG-121903	109/239	0.2 - 1	1200	NA	0.055 C	NA	Yes	ASL	
	79-00-5	1,1,2-Trichloroethane	0.1	150	ug/L	P07-09-NWG-121903	112/239	0.34 - 3.1	150	NA	0.2 C	5	Yes	ASL	
	75-34-3	1,1-Dichloroethane	0.1 J	9.77	ug/L	P07-09-NWG-121903	43/239	0.45 - 7.3	9.77	NA	34 N	7	Yes	ASL	
	107-06-2	1,2-Dichloroethane	0.1	5.33 J	ug/L	P07-06-NWG-121803	64/238	0.2 - 4.1	5.33	NA	0.12 C	5	Yes	ASL	
	67-64-1	Acetone	2.53 J	14 J	ug/L	P07-07-NWG-052202	13/13	- - -	14	NA	550 N	NA	No	BSL	
	71-43-2	Benzene	0.1	5.8	ug/L	P07-20-NWG-052405	47/236	0.2 - 3.6	5.8	NA	0.35 C	5	Yes	ASL	
	75-15-1	Carbon Disulfide	0.1	1.25 J	ug/L	P07-07-NWG-052202-D	19/23	1 - 1	1.25	NA	100 N	NA	No	BSL	
	67-66-3	Chloroform	0.1 J	7.9 J	ug/L	P07-09-NWG-052405-D	34/238	0.2 - 6.6	7.9	NA	0.17 C	NA	Yes	ASL	
	156-59-2	cis-1,2-Dichloroethane	0.11 J	1700	ug/L	P07-09-NWG-121903	153/239	0.5 - 1.2	1700	NA	6.1 N	70	Yes	ASL	
	100-41-4	Ethylbenzene	0.13	0.9 J	ug/L	P07-16-NWG-052302	4/23	1 - 1	0.9	NA	130 N	700	No	BSL	
		m-p-Xylenes	0.1	5	ug/L	P07-16-NWG-052302	10/23	1 - 2	5	NA	21 N ⁽⁸⁾	10000 ⁽⁸⁾	No	BSL	
	75-09-2	Methylene Chloride	0.5 J	0.5 J	ug/L	P07-16-NWG-052302	1/23	1 - 1.96	0.5	NA	4.3 C	5	No	BSL	
		o-Xylene	0.1	5	ug/L	P07-11-NWG-052302-D, P07-16-NWG-052302	9/23	1 - 1	5	NA	21 N ⁽⁸⁾	10000 ⁽⁸⁾	No	BSL	
	127-18-4	Tetrachloroethane	0.13 J	1.19	ug/L	P07-09-NWG-121903	6/238	0.37 - 4	1.19	NA	0.1 C	5	No	FOD	
	108-88-3	Toluene	0.1 J	26 J	ug/L	P07-16-NWG-052302	13/23	1 - 1	26	NA	72 N	1000	No	BSL	
	540-59-0	Total 1,2-Dichloroethane	0.11	2050	ug/L	P07-09-NWG-121903	153/239	0.5 - 1	2050	NA	6.1 N ⁽⁹⁾	70	Yes	ASL	
	1330-20-7	Total Xylenes	0.1	10	ug/L	P07-16-NWG-052302	10/23	1 - 1	10	NA	21 N	10000 ⁽⁸⁾	No	BSL	
	156-60-5	trans-1,2-Dichloroethane	0.1	350	ug/L	P07-09-NWG-121903	121/239	0.5 - 1	350	NA	12 N	100	Yes	ASL	
	79-01-6	Trichloroethane	0.1 J	3900	ug/L	P07-09-NWG-121903	123/239	0.26 - 1.08	3900	NA	0.028 C	5	Yes	ASL	
75-01-4	Vinyl Chloride	0.2 J	243	ug/L	P07-07-NWG-102704	96/238	0.49 - 2.5	243	NA	0.02 C	2	Yes	ASL		

Notes:

- Sample and duplicate are counted as two separate samples when determining the minimum and maximum detected concentrations and as one sample when determining frequency of detection.
- Values presented are sample-specific quantitation limits.
- The maximum detected concentration is used for screening purposes.
- No background values are available.
- The risk-based COPC screening level for tap water is presented. The value is based upon a target HQ of 0.1 for noncarcinogens (denoted with a "N" flag), or an incremental cancer risk of 1×10^{-6} for carcinogens (denoted with a "C" flag) (EPA Region 9, October 2004, Updated December 28, 2004).
- Rhode Island Department of Environmental Management, DEM-DSR-01-93, February 2004.
- The chemical is selected as a COPC if the maximum detected concentration exceeds the COPC screening level. Chemicals selected as COPCs are indicated by shaded chemical names.
- The value for total xylenes is presented.
- The value for cis-1,2-dichloroethane is presented.

Definitions:

- NA = Not Applicable
- SQL = Sample Quantitation Limit
- COPC = Chemical of Potential Concern
- J = Estimated Value
- C = Carcinogenic
- NA = Not applicable/not available.
- N = Noncarcinogen.

Rationale Codes:

- For selection as a COPC:
- ASL = Above Screening Level

For elimination as a COPC:

- BSL = Below Screening Level
- FOD = Frequency of detection

TABLE 2-1
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - GROUNDWATER (PIEZOMETERS)
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
 NORTH KINGSTON, RHODE ISLAND
 PAGE 2 OF 2

Scenario Timeframe: Current/Future
 Medium: Groundwater
 Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration ⁽¹⁾	Maximum Concentration ⁽¹⁾	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects ⁽²⁾	Concentration Used for Screening ⁽³⁾	Background Value ⁽⁴⁾	Risk-Based COPC Screening Level ⁽⁵⁾	RIDEM GA Groundwater Objective ⁽⁶⁾	COPC Flag	Rationale for Contaminant Deletion or Selection ⁽⁷⁾
Associated Samples														
P07-01-NWG-030303		P07-05-NWG-082901	P07-08-NWG-042105	P07-10-NWG-052902		P07-10-NWG-052902	P07-17-NWG-022703-D		P07-24-NWG-042105		P07-32-NWG-121803			
P07-01-NWG-030303-D		P07-05-NWG-092805	P07-08-NWG-052405	P07-10-NWG-072905		P07-10-NWG-072905	P07-17-NWG-052405		P07-24-NWG-052202		P07-33-NWG-022703			
P07-01-NWG-052202		P07-05-NWG-102704	P07-08-NWG-072905	P07-10-NWG-082504		P07-10-NWG-082504	P07-17-NWG-052902		P07-24-NWG-052405		P07-33-NWG-052405			
P07-01-NWG-052405		P07-05-NWG-111604	P07-08-NWG-082504	P07-10-NWG-082901		P07-10-NWG-082901	P07-17-NWG-082504		P07-24-NWG-072905		P07-33-NWG-082504			
P07-01-NWG-082901		P07-05-NWG-112905	P07-08-NWG-082901	P07-10-NWG-092805		P07-10-NWG-092805	P07-17-NWG-121903		P07-24-NWG-082604		P07-33-NWG-121803			
P07-01-NWG-082901		P07-05-NWG-121903	P07-08-NWG-102704	P07-10-NWG-092805		P07-10-NWG-092805	P07-17-NWG-121903-D		P07-24-NWG-092805		PW07-06-NPW-052704			
P07-01-NWG-121703		P07-06-NWG-013006	P07-08-NWG-102704	P07-10-NWG-111604		P07-10-NWG-111604	P07-17-NWG-121903		P07-24-NWG-102704		PW07-07-NPW-052704			
P07-01-NWG-121703-D		P07-06-NWG-022703	P07-08-NWG-111604	P07-10-NWG-111604		P07-10-NWG-111604	P07-17-NWG-121903		P07-24-NWG-111604		PW07-08-NPW-052704			
P07-02-NWG-022703		P07-06-NWG-032305	P07-08-NWG-111604	P07-10-NWG-111604		P07-10-NWG-111604	P07-17-NWG-121903		P07-24-NWG-111604		PW07-09-NPW-052704			
P07-02-NWG-052202		P07-06-NWG-042105	P07-08-NWG-121903	P07-10-NWG-112905		P07-10-NWG-112905	P07-17-NWG-121903		P07-24-NWG-112905		PW07-10-NPW-052704			
P07-02-NWG-052405		P07-06-NWG-052202	P07-08-NWG-011905	P07-10-NWG-011905		P07-10-NWG-011905	P07-17-NWG-121803		P07-24-NWG-121703					
P07-02-NWG-082504		P07-06-NWG-052405	P07-09-NWG-011905-D	P07-11-NWG-052302		P07-11-NWG-052302	P07-18-NWG-121803		P07-25-NWG-022703					
P07-02-NWG-082901		P07-06-NWG-072905	P07-09-NWG-013006	P07-11-NWG-052405		P07-11-NWG-052405	P07-18-NWG-121803		P07-25-NWG-052405					
P07-02-NWG-121703		P07-06-NWG-082504	P07-09-NWG-013006-D	P07-11-NWG-082504		P07-11-NWG-082504	P07-18-NWG-121803		P07-25-NWG-082504					
P07-03-NWG-022703		P07-06-NWG-082901	P07-09-NWG-022703	P07-11-NWG-122203		P07-11-NWG-122203	P07-18-NWG-082504		P07-25-NWG-121803					
P07-03-NWG-052202		P07-06-NWG-092805	P07-09-NWG-032305	P07-12-NWG-022703		P07-12-NWG-022703	P07-19-NWG-082504		P07-26-NWG-022703					
P07-03-NWG-052405		P07-06-NWG-102704	P07-09-NWG-032305-D	P07-12-NWG-032305-D		P07-12-NWG-032305-D	P07-19-NWG-121803		P07-26-NWG-052405					
P07-03-NWG-082504		P07-06-NWG-111604	P07-09-NWG-042105	P07-12-NWG-042105		P07-12-NWG-042105	P07-20-NWG-022703		P07-26-NWG-121803					
P07-03-NWG-082901		P07-06-NWG-112905	P07-09-NWG-042105-D	P07-12-NWG-042105-D		P07-12-NWG-042105-D	P07-20-NWG-052202		P07-26-NWG-121803					
P07-03-NWG-121903		P07-06-NWG-121803	P07-09-NWG-052202	P07-12-NWG-052202		P07-12-NWG-052202	P07-20-NWG-082504		P07-26-NWG-052405					
P07-04-NWG-013006		P07-07-NWG-011905	P07-09-NWG-052405	P07-13-NWG-030303		P07-13-NWG-030303	P07-20-NWG-121903		P07-26-NWG-082504					
P07-04-NWG-022703		P07-07-NWG-013006	P07-09-NWG-052405-D	P07-13-NWG-052405-D		P07-13-NWG-052405-D	P07-21-NWG-022703		P07-27-NWG-082504					
P07-04-NWG-032305		P07-07-NWG-022703	P07-09-NWG-072905	P07-13-NWG-052902		P07-13-NWG-052902	P07-21-NWG-052202		P07-27-NWG-121803					
P07-04-NWG-042105		P07-07-NWG-032305	P07-09-NWG-072905-D	P07-13-NWG-082604		P07-13-NWG-082604	P07-21-NWG-082504		P07-27-NWG-052405					
P07-04-NWG-052202		P07-07-NWG-042105	P07-09-NWG-082504	P07-13-NWG-121803		P07-13-NWG-121803	P07-21-NWG-121903		P07-27-NWG-082504					
P07-04-NWG-052405		P07-07-NWG-052202	P07-09-NWG-082504-D	P07-14-NWG-022703		P07-14-NWG-022703	P07-22-NWG-022703		P07-27-NWG-121803					
P07-04-NWG-072905		P07-07-NWG-052202-D	P07-09-NWG-082901	P07-14-NWG-052302		P07-14-NWG-052302	P07-22-NWG-052202		P07-27-NWG-121803					
P07-04-NWG-082504		P07-07-NWG-052405	P07-09-NWG-082901-D	P07-14-NWG-052405		P07-14-NWG-052405	P07-22-NWG-082504		P07-27-NWG-022703					
P07-04-NWG-082901		P07-07-NWG-052405-D	P07-09-NWG-092805	P07-14-NWG-082504		P07-14-NWG-082504	P07-22-NWG-121703		P07-27-NWG-052405					
P07-04-NWG-092805		P07-07-NWG-072905	P07-09-NWG-092805-D	P07-14-NWG-121903		P07-14-NWG-121903	P07-23-NWG-082504		P07-27-NWG-121803					
P07-04-NWG-102704		P07-07-NWG-082504	P07-09-NWG-102704	P07-15-NWG-022703		P07-15-NWG-022703	P07-23-NWG-121803		P07-27-NWG-082504					
P07-04-NWG-111604		P07-07-NWG-082504-D	P07-09-NWG-102704-D	P07-15-NWG-052302		P07-15-NWG-052302	P07-23-NWG-052202		P07-27-NWG-121803-D					
P07-04-NWG-112905		P07-07-NWG-082901	P07-09-NWG-111604	P07-15-NWG-052405		P07-15-NWG-052405	P07-23-NWG-082504		P07-27-NWG-052405					
P07-04-NWG-121803		P07-07-NWG-092805	P07-09-NWG-111604-D	P07-15-NWG-082504		P07-15-NWG-082504	P07-23-NWG-121803		P07-27-NWG-121803					
P07-05-NWG-013006		P07-07-NWG-102704	P07-09-NWG-112905	P07-15-NWG-112905		P07-15-NWG-112905	P07-23-NWG-052302		P07-27-NWG-121803					
P07-05-NWG-022703		P07-07-NWG-111604	P07-09-NWG-112905-D	P07-15-NWG-121903		P07-15-NWG-121903	P07-23-NWG-082504		P07-27-NWG-052405					
P07-05-NWG-032305		P07-07-NWG-112905	P07-10-NWG-011905	P07-16-NWG-121803		P07-16-NWG-121803	P07-23-NWG-121803		P07-27-NWG-082504					
P07-05-NWG-042105		P07-07-NWG-121803	P07-10-NWG-013006	P07-16-NWG-011905		P07-16-NWG-011905	P07-23-NWG-082504		P07-27-NWG-121803					
P07-05-NWG-052202		P07-07-NWG-121803-D	P07-10-NWG-022703	P07-16-NWG-052302		P07-16-NWG-052302	P07-24-NWG-011905		P07-27-NWG-082504					
P07-05-NWG-052202-D		P07-08-NWG-011905	P07-10-NWG-032305	P07-16-NWG-082504		P07-16-NWG-082504	P07-24-NWG-013006		P07-27-NWG-022703					
P07-05-NWG-052405		P07-08-NWG-013006	P07-10-NWG-032305	P07-16-NWG-082504		P07-16-NWG-082504	P07-24-NWG-013006		P07-27-NWG-052405					
P07-05-NWG-072905		P07-08-NWG-022703	P07-10-NWG-042105	P07-16-NWG-121803		P07-16-NWG-121803	P07-24-NWG-022703		P07-27-NWG-052405					
P07-05-NWG-082504		P07-08-NWG-032305	P07-10-NWG-052405	P07-17-NWG-022703		P07-17-NWG-022703	P07-24-NWG-032305		P07-27-NWG-082504					

TABLE 2-2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SURFACE WATER
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
 NORTH KINGSTON, RHODE ISLAND

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

Exposure Point	CAS Number	Chemical	Minimum Concentration ⁽¹⁾	Maximum Concentration ⁽¹⁾	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects ⁽²⁾	Concentration Used for Screening ⁽³⁾	Background Value ⁽⁴⁾	Risk-Based COPC Screening Level ⁽⁵⁾	RIDEM GA Groundwater Objective ⁽⁶⁾	COPC Flag	Rationale for Contaminant Deletion or Selection ⁽⁷⁾	
Site 7	Volatile Organic Compounds														
	79-34-5	1,1,2,2-Tetrachloroethane	0.73 J	11.9	ug/L	SW07-10-NPW-013006	23/90	0.23 - 10	11.9	NA	0.055 C	NA	Yes	ASL	
	79-00-5	1,1,2-Trichloroethane	2.3	3	ug/L	SW07-10-NPW-013006	2/90	0.34 - 10	3	NA	0.2 C	5	No	FOD	
	156-59-2	cis-1,2-Dichloroethane	0.98 J	69.9 J	ug/L	SW07-09-NPW-052405	48/88	0.7 - 1.2	69.9	NA	6.1 N	70	Yes	ASL	
	540-59-0	Total 1,2-Dichloroethane	0.98	76.7	ug/L	SW07-09-NPW-052405	48/90	0.51 - 10	76.7	NA	6.1 N ⁽⁶⁾	70	Yes	ASL	
	156-60-5	trans-1,2-Dichloroethane	0.85 J	6.8 J	ug/L	SW07-09-NPW-052405	11/88	0.51 - 0.8	6.8	NA	12 N	100	No	BSL	
	79-01-6	Trichloroethane	0.54 J	47	ug/L	SW07-09-NPW-102704	32/90	0.26 - 10	47	NA	0.028 C	5	Yes	ASL	
	75-01-4	Vinyl Chloride	0.76 J	12.9 J	ug/L	SW07-09-NPW-052405	21/90	0.49 - 10	12.9	NA	0.02 C	2	Yes	ASL	

Notes:

- 1 - Sample and duplicate are counted as two separate samples when determining the minimum and maximum detected concentrations and as one sample when determining frequency of detection.
- 2 - Values presented are sample-specific quantitation limits.
- 3 - The maximum detected concentration is used for screening purposes.
- 4 - No background values are available.
- 5 - The risk-based COPC screening level for tap water is presented. The value is based upon a target HQ of 0.1 for noncarcinogens (denoted with a "N" flag), or an incremental cancer risk of 1×10^{-6} for carcinogens (denoted with a "C" flag) (EPA Region 9, October 2004, Updated December 28, 2004).
- 6 - Rhode Island Department of Environmental Management, DEM-DSR-01-93, February 2004.
- 7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the COPC screening level.
Chemicals selected as COPCs are indicated by shaded chemical names.
- 8 - The value for cis-1,2-dichloroethane is presented.

Associated Samples

MW07-AH1-NSW-122195	SW07-05-NPW-013006	SW07-07-NPW-013006	SW07-09-NPW-052405	SW07-24-NPW-111604
MW07-NB1-NSW-122295	SW07-06-NPW-082404-D	SW07-08-NPW-082404	SW07-09-NPW-072905-D	SW07-24-NPW-011905
SW07-04-NPW-082404	SW07-06-NPW-082404	SW07-08-NPW-102704	SW07-09-NPW-072905	SW07-24-NPW-032305
SW07-04-NPW-102704	SW07-06-NPW-102704	SW07-08-NPW-111604	SW07-09-NPW-092805-D	SW07-24-NPW-042105
SW07-04-NPW-111604	SW07-06-NPW-111604	SW07-08-NPW-011905	SW07-09-NPW-092805	SW07-24-NPW-052405
SW07-04-NPW-011905	SW07-06-NPW-011905	SW07-08-NPW-032305	SW07-09-NPW-112905-D	SW07-24-NPW-072905
SW07-04-NPW-032305	SW07-06-NPW-032305	SW07-08-NPW-042105	SW07-09-NPW-112905	SW07-24-NPW-092805
SW07-04-NPW-042105	SW07-06-NPW-042105	SW07-08-NPW-052405	SW07-09-NPW-013006-D	SW07-24-NPW-112905
SW07-04-NPW-052405	SW07-06-NPW-052405	SW07-08-NPW-072905	SW07-09-NPW-013006	SW07-24-NPW-013006
SW07-04-NPW-072905	SW07-06-NPW-072905	SW07-08-NPW-092805	SW07-10-NPW-082404	
SW07-04-NPW-092805	SW07-06-NPW-092805	SW07-08-NPW-112905	SW07-10-NPW-102704	
SW07-04-NPW-112905	SW07-06-NPW-112905	SW07-08-NPW-013006	SW07-10-NPW-111604	
SW07-04-NPW-013006	SW07-06-NPW-013006	SW07-08-NPW-082404	SW07-10-NPW-011905	
SW07-05-NPW-082404	SW07-07-NPW-082404	SW07-09-NPW-102704-D	SW07-10-NPW-032305	
SW07-05-NPW-102704	SW07-07-NPW-102704	SW07-09-NPW-102704	SW07-10-NPW-032305	
SW07-05-NPW-111604	SW07-07-NPW-111604	SW07-09-NPW-111604-D	SW07-10-NPW-042105	
SW07-05-NPW-011905	SW07-07-NPW-011905	SW07-09-NPW-111604	SW07-10-NPW-052405	
SW07-05-NPW-032305	SW07-07-NPW-032305	SW07-09-NPW-011905-D	SW07-10-NPW-072905	
SW07-05-NPW-042105	SW07-07-NPW-042105	SW07-09-NPW-011905	SW07-10-NPW-092805	
SW07-05-NPW-052405	SW07-07-NPW-052405	SW07-09-NPW-032305-D	SW07-10-NPW-112905	
SW07-05-NPW-072905	SW07-07-NPW-072905	SW07-09-NPW-032305	SW07-10-NPW-013006	
SW07-05-NPW-092805	SW07-07-NPW-092805	SW07-09-NPW-042105	SW07-24-NPW-082404	
SW07-05-NPW-112905	SW07-07-NPW-112905	SW07-09-NPW-052405-D	SW07-24-NPW-102704	

Definitions:

- NA = Not Applicable
- SQL = Sample Quantitation Limit
- COPC = Chemical of Potential Concern
- J = Estimated Value
- C = Carcinogenic
- NA = Not applicable/not available.
- N = Noncarcinogen.

Rationale Codes:

- For selection as a COPC:
- ASL = Above Screening Level

For elimination as a COPC:

- BSL = Below Screening Level
- FOD = Frequency of detection.

TABLE 2-3
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SEDIMENT
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
 NORTH KINGSTON, RHODE ISLAND
 PAGE 1 OF 2

Scenario Timeframe: Current/Future
 Medium: Sediment
 Exposure Medium: Sediment

Exposure Point	CAS Number	Chemical	Minimum Concentration ⁽¹⁾	Maximum Concentration ⁽¹⁾	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondepts ⁽²⁾	Concentration Used for Screening ⁽³⁾	Background Value ⁽⁴⁾	EPA Region 9 PRG (Residential) ⁽⁵⁾	RIDEM Residential Direct Contact Criteria ⁽⁶⁾	COPC Flag	Rationale for Contaminant Deletion or Selection ⁽⁷⁾	
Site 7	Volatile Organic Compounds														
	79-34-5	1,1,2,2-Tetrachloroethane	7.5	12	ug/kg	SED07-22-NSD-022803	2/27	0.21 - 7	12	NA	410 C	1300	No	BSL	
	79-00-5	1,1,2-Trichloroethane	1 J	5.5 J	ug/kg	SED07-09-NSD-052505-D	4/27	0.11 - 7	5.5	NA	730 C	3600	No	BSL	
	107-06-2	1,2-Dichloroethane	1 J	1 J	ug/kg	SED07-16-NSD-121603, SED07-16NSD-082404	2/27	0.091 - 7	1	NA	280 C	900	No	BSL	
	67-64-1	Acetone	10	20	ug/kg	SED07-07NSD-052202	2/3	12 - 14	20	NA	1400000 N	7800000	No	BSL	
	71-43-2	Benzene	0.13 J	1 J	ug/kg	SED07-08NSD-121903	2/27	0.085 - 7	1	NA	640 C	2500	No	BSL	
	75-15-0	Carbon Disulfide	1 J	3 J	ug/kg	SED07-10-NSD-052202	3/3	5 - 5	3	NA	36000 N	NA	No	BSL	
	156-59-2	cis-1,2-Dichloroethene	0.55 J	271 J	ug/kg	SED07-09-NSD-052505-D	19/27	0.31 - 7	271	NA	4300 N	630000	No	BSL	
	156-60-5	Total 1,2-Dichloroethene	0.9	334.5	ug/kg	SED07-09-NSD-052505-D	19/27	0.31 - 7	334.5	NA	4300 N ⁽⁶⁾	630000	No	BSL	
	79-01-6	trans-1,2-Dichloroethene	0.35 J	63.5	ug/kg	SED07-09-NSD-052505-D	14/27	0.32 - 7	63.5	NA	6900 N	1100000	No	BSL	
	75-01-4	Trichloroethene	0.66 J	152 J	ug/kg	SED07-09-NSD-052505-D	7/27	0.14 - 7	152	NA	53 C	13000	Yes	ASL	
			Vinyl Chloride	4.4	110	ug/kg	SED07-09-NSD-121903-D	5/27	0.21 - 7	110	NA	79 C	20	Yes	ASL
	Inorganics														
	7429-90-5	Aluminum		2300	8260 J	mg/kg	SED07-09-NSD-121903	4/4	---	8260	NA	7600 N	NA	Yes	ASL
	7440-36-0	Antimony		0.32 J	0.32 J	mg/kg	SED07-09-NSD-052505-D	1/4	0.19 - 1.4	0.32	NA	3.1 N	10	No	BSL
	7440-38-2	Arsenic		1.2 J	3.1	mg/kg	SED07-09-NSD-081704-D, SED07-09-NSD-081704	3/4	1.9 - 2.4	3.1	NA	0.39 C	7	Yes	ASL
	7440-41-7	Beryllium		0.37 J	0.92 J	mg/kg	SED07-09-NSD-121903	2/4	0.36 - 0.58	0.92	NA	15 N	0.4	Yes	ASL
	18540-29-9	Chromium		4.3	15 J	mg/kg	SED07-09-NSD-121903	4/4	---	15	NA	23 C ^(8,10)	390	No	BSL
	7440-50-8	Copper		6.2	9.5	mg/kg	SED07-09-NSD-081704-D	2/2	---	9.5	NA	310 N	3100	No	BSL
	7439-89-6	Iron		5200	17000 J	mg/kg	SED07-09-NSD-121903	4/4	---	17000	NA	2300 N	NA	Yes	ASL
7439-92-1	Lead		3.2 J	11 J	mg/kg	SED07-09-NSD-121903	4/4	---	11	NA	40	150	No	BSL	
7439-96-5	Manganese		52	173 J	mg/kg	SED07-09-NSD-121903	4/4	---	173	NA	180 N	390	No	BSL	
7487-94-7	Mercury		0.017 J	0.041 J	mg/kg	SED07-09-NSD-052505-D	2/2	---	0.041	NA	2.3 N	23	No	BSL	
7440-02-0	Nickel		5.5 J	14.2 J	mg/kg	SED07-09-NSD-121903	4/4	9.1 - 9.1	14.2	NA	160 N	1000	No	BSL	
7440-66-6	Zinc		24.4	30.1	mg/kg	SED07-09-NSD-052505-D, SED07-09-NSD-052505	2/2	---	30.1	NA	2300 N	6000	No	BSL	

Footnotes

- Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
- Values presented are sample-specific quantitation limits.
- The maximum detected concentration is used for screening purposes.
- To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
- USEPA Region IX Preliminary Remediation Goal (PRG). The noncarcinogenic values (denoted with a "N" flag) are the PRG divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag) (USEPA Region IX, October 2004, Updated December 28, 2004).
- Rhode Island Department of Environmental Management (RIDEM), DEM-DSR-01-93, February 2004.
- The chemical is selected as a COPC if the maximum detected concentration exceeds the COPC screening level. Chemicals selected as COPCs are indicated by shaded chemical names.
- The value for cis-1,2-dichloroethene is presented.
- The value for hexavalent chromium is presented.
- One tenth of the noncarcinogenic PRG is less than the carcinogenic PRG, therefore the noncarcinogenic PRG is presented.

Definitions:

- ARAR/TBC = Applicable or Relevant and Appropriate Requirements To Be Considered
- C = Carcinogen
- COPC = Chemical Of Potential Concern
- J = Estimated value
- N = Noncarcinogen
- NA = Not Applicable/Not Available
- PRG = Preliminary Remediation Goal

Rationale Codes:

- For selection as a COPC:
- ASL = Above Screening Level and site background.
- For elimination as a COPC:
- BSL = Below COPC Screening Level

TABLE 2-3
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SEDIMENT
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
 NORTH KINGSTON, RHODE ISLAND
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Scenario Timeframe: Current/Future
 Medium: Sediment
 Exposure Medium: Sediment

Exposure Point/CAS Number	Chemical	Minimum Concentration ⁽¹⁾	Maximum Concentration ⁽¹⁾	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects ⁽²⁾	Concentration Used for Screening ⁽³⁾	Background Value ⁽⁴⁾	EPA Region 9 PRG (Residential) ⁽⁵⁾	RIDEM Residential Direct Contact Criteria ⁽⁶⁾	COPC Flag	Rationale for Contaminant Deletion or Selection ⁽⁷⁾
Associated Samples													
SED07-05-NSD-022803-D					SED07-09-NSD-081704								
SED07-05-NSD-022803					SED07-09-NSD-052505-D								
SED07-06-NSD-052202-D					SED07-09-NSD-052505								
SED07-06-NSD-052202					SED07-10-NSD-052202								
SED07-06-NSD-052505					SED07-10-NSD-121603								
SED07-07NSD-052202					SED07-10-NSD-052505								
SED07-07NSD-022803					SED07-15-NSD-022803								
SED07-07NSD-081704					SED07-15-NSD-121603								
SED07-07NSD-052505					SED07-15-NSD--082404								
SED07-08-NSD-121903					SED07-16-NSD-022803								
SED07-08-NSD-081704					SED07-16-NSD-121603								
SED07-08-NSD-052505					SED07-16NSD-082404								
SED07-09-NSD-022803					SED07-20-NSD-121903								
SED07-09-NSD-121903-D					SED07-21-05250								
SED07-09-NSD-121903					SED07-22-NSD-022803								
SED07-09-NSD-081704-D					SED07-22-NSD-082404								

TABLE 2-4
 SELECTION OF CHEMICALS OF CONCERN - SHELLFISH
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
 NORTH KINGSTON, RHODE ISLAND

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Chemical	Frequency of Detection	Maximum Detected Concentration (mg/kg)	USEPA Region III RBC ⁽¹⁾ (mg/kg)	Chemical Retained as a COPC?	Rational for Contaminant Selection of Deletion ⁽²⁾
Semivolatile Organic Compounds					
Acenaphthene	2/2	0.00846	8.1 N	No	BSL
Acenaphthylene	2/2	0.00316	8.1 N ⁽³⁾	No	BSL
Anthracene	6/6	0.00625	41 N	No	BSL
Benzo(a)anthracene	6/6	0.003	0.0043 C	No	BSL
Benzo(a)pyrene	5/6	0.00606	0.00043 C	Yes	ASL
Benzo(b)fluoranthene	6/6	0.0358	0.0043 C	Yes	ASL
Benzo(e)pyrene	6/6	0.0374	4.1 N ⁽⁴⁾	No	BSL
Benzo(g,h,i)perylene	5/6	0.0113	4.1 N ⁽⁴⁾	No	BSL
Benzo(k)fluoranthene	2/2	0.00596	0.043 C	No	BSL
Benzotriazole	4/4	0.0254	NA	No	NTX
Chlorinated benzotriazole	4/4	0.00362	NA	No	NTX
Chrysene	6/6	0.0893	0.43 C	No	BSL
Coronene	4/4	0.00052	4.1 N ⁽⁴⁾	No	BSL
Dibenzo(a,h)anthracene	5/6	0.00128	0.00043 C	Yes	ASL
Fluoranthene	6/6	0.216	5.4 N	No	BSL
Fluorene	6/6	0.0107	5.4 N	No	BSL
Hexachlorobenzene	3/5	0.00101	0.002 C	No	BSL
Indeno(1,2,3-cd)pyrene	5/6	0.00416	0.0043 C	No	BSL
Perylene	5/6	0.00609	4.1 N ⁽⁴⁾	No	BSL
Phenanthrene	6/6	0.062	4.1 N ⁽⁴⁾	No	BSL
Pyrene	6/6	0.0979	4.1 N	No	BSL
Pesticides/PCBs					
Aldrin	1/2	0.000244	0.00019 C	Yes	ASL
alpha-BHC	1/3	0.00007	0.0005 C	No	BSL
gamma-BHC (Lindane)	1/3	0.00004	0.0024 C	No	BSL
alpha-Chlordane	2/3	0.00042	0.009 C ⁽⁵⁾	No	BSL
gamma-Chlordane	3/3	0.00054	0.009 C ⁽⁵⁾	No	BSL
4,4'-DDD	2/3	0.00697	0.013 C	No	BSL
4,4'-DDE	4/5	0.0228	0.0093 C	Yes	ASL
4,4'-DDT	2/3	0.00025	0.0093 C	No	BSL
Mirex	1/2	0.0000928	0.027 N	No	BSL
Aroclor-1242	2/6	0.022	0.0016 C	Yes	ASL
Aroclor-1254	6/6	0.1335	0.0016 C	Yes	ASL
Aroclor-1260	2/2	0.0849	0.0016 C	Yes	ASL
Inorganics					
Aluminum	1/2	0.0314	NA	No	NTX
Arsenic	6/6	2.5	0.0021 C	Yes	ASL
Cadmium	6/6	2.39	0.068 N ⁽⁶⁾	Yes	ASL
Chromium	5/6	0.704	0.41 N ⁽⁷⁾	Yes	ASL

**TABLE 2-4
SELECTION OF CHEMICALS OF CONCERN - SHELLFISH
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
NORTH KINGSTON, RHODE ISLAND**

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Chemical	Frequency of Detection	Maximum Detected Concentration (mg/kg)	USEPA Region III RBC ⁽¹⁾ (mg/kg)	Chemical Retained as a COPC?	Rational for Contaminant Selection of Deletion ⁽²⁾
Copper	6/6	126	5.4 N	Yes	ASL
Iron	6/6	800	41 N	Yes	ASL
Lead	4/6	0.36	NA	No	NTX
Manganese	6/6	21.6	2.7 N ⁽⁸⁾	Yes	ASL
Mercury	4/4	49.1	0.014 N ⁽⁹⁾	Yes	ASL
Nickel	6/6	5	2.7 N	Yes	ASL
Silver	6/6	6.2	0.68 N	Yes	ASL
Zinc	6/6	4.73	41 N	No	BSL

Notes:

- 1 - USEPA Region III Risk-Based Concentration (RBC). The noncarcinogenic values (denoted with a "N" flag) are the RBC divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag) (USEPA Region III, October 2006).
- 2 - The chemical is selected as a COPC if the maximum detected concentration exceeds the COPC screening level. Chemicals selected as COPCs are indicated by shaded chemical names.
- 3 - Acenaphthene is used as a surrogate for acenaphthylene.
- 4 - Pyrene is used as a surrogate for benzo(e)pyrene, benzo(g,h,i)perylene, coronene, perylene, and phenanthrene.
- 5 - Chlordane is used as a surrogate for alpha- and gamma-chlordane.
- 6 - The value for cadmium-water is presented.
- 7 - The value for hexavalent chromium is presented.
- 8 - The value for manganese-nonfood is presented.
- 9 - The value for methyl mercury is presented.

Rationale Codes:

For selection as a COPC:

ASL = Above Screening Level

For elimination as a COPC:

BSL = Below Screening Level

NTX - No toxicity criteria available.

TABLE 2-5
 SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
 NORTH KINGSTON, RHODE ISLAND
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LOCATION NSAMPLE SAMPLE MATRIX SACODE SAMPLE DATE	P07-01 P07-01-NWG-082901 P07-01-NWG-082901 NORMAL 20010829	P07-01 P07-01-NWG-052202 P07-01-NWG-052202 NORMAL 20020522	P07-01 P07-01-NWG-030303-AVG P07-01-NWG-030303-AVG GW AVG 20030303	P07-01 P07-01-NWG-030303-D P07-01FDWGW030303 GW DUP 20030303	P07-01 P07-01-NWG-030303 GW ORIG 20030303	P07-01 P07-01-NWG-121703-AVG P07-01-NWG-121703-AVG GW AVG 20031217	P07-01 P07-01-NWG-121703-D P07-01FDWGW121703 GW DUP 20031217
Volatile Organics (ug/L)							
1,1,2,2-Tetrachloroethane	1 U	1 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
1,1,2-Trichloroethane	1 U	1 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U
1,1-Dichloroethane	1 U	1 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U
1,2-Dichloroethane	1 U	1 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Acetone		4.48 J					
Benzene	1 U	1 U	0.30 U	0.30 U	0.30 U	0.30 U	0.30 U
BTEX	1 U	1 U	0.30 U	0.3 U	0.3 U	0.30 U	0.30 U
Carbon Disulfide		0.17					
Chloroform	1 U	1 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
cis-1,2-Dichloroethane	1 U	1 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Ethylbenzene		2 U					
m+p-Xylenes		1 UJ					
Methylene Chloride		1 U					
o-Xylene		1 U					
Tetrachloroethane	1 U	1 U	0.40 U	0.40 U	0.40 U	0.40 UJ	0.40 UJ
Toluene	1 U	1 U	0.50 U	0.5 U	0.5 U	0.50 U	0.5 U
Total 1,2-Dichloroethane	1 U	1 U	0.20 U	0.2 U	0.2 U	0.20 U	0.2 U
Total Chlorinated VOCs	1 U	1 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Total Xylenes	1 U	1 U	0.20 U	0.2 U	0.2 U	0.20 U	0.2 U
trans-1,2-Dichloroethane	1 U	1 U	0.50 U	0.50 U	0.50 U	0.50 UJ	0.50 UJ
Trichloroethane	1 U	1 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U
Vinyl Chloride	1 U	1 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U
Miscellaneous Parameters							
Salinity (g/kg)	18.5 J		15.75	14.8	16.7	17.6	19.5

TABLE 2-5
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
NORTH KINGSTON, RHODE ISLAND
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LOCATION NSAMPLE SAMPLE MATRIX SACODE SAMPLE DATE	P07-01 P07-01-NWG-121703 P07-01NWG121703 GW ORIG 20031217	P07-01 P07-01-NWG-082504 P07-01 GW NORMAL 20040825	P07-01 P07-01-NWG-052405 P07-01 GW NORMAL 20050524	P07-02 P07-02-NWG-082901 P07-02NWG082901 GW NORMAL 20010829	P07-02 P07-02-NWG-052202 P07-02NWG052202 GW NORMAL 20020522	P07-02 P07-02-NWG-022703 P07-02NWG022703 GW NORMAL 20030227	P07-02 P07-02-NWG-121703 P07-02NWG121703 GW NORMAL 20031217	P07-02 P07-02-NWG-082504 P07-02 GW NORMAL 20040825
Volatiles Organics (ug/L)								
1,1,2,2-Tetrachloroethane	0.20 U	0.5 U	0.5 U	1 U	1 U	0.20 U	0.20 U	0.5 U
1,1,2-Trichloroethane	0.40 U	0.61 U	0.61 U	1 U	1 U	0.40 U	0.40 U	0.61 U
1,1-Dichloroethane	0.80 U	0.73 U	0.73 U	1 U	1 U	0.80 U	0.60 U	0.73 U
1,2-Dichloroethane	0.20 U	0.41 U	0.41 U	1 U	1 U	0.20 U	0.20 U	0.41 U
Acetone				5 R				
Benzene	0.30 U	0.36 U	0.36 U	1 U	1 U	0.30 U	0.30 U	0.36 U
BTEX	0.3 U	0.36 U	0.36 U	1 U	1 U	0.3 U	0.3 U	0.36 U
Carbon Disulfide								
Chloroform	0.20 U	0.66 U	0.66 U	1 U	1 U	0.20 U	0.20 U	0.66 U
cis-1,2-Dichloroethane	0.50 U	1.2 U	1.2 U	1 U	1 U	0.50 U	0.50 U	1.2 U
Ethylbenzene				2 U				
m-p-Xylenes				1 U				
Methylene Chloride				1 U				
o-Xylene				1 U				
Tetrachloroethene	0.40 U	0.37 U	0.37 U	1 U	1 U	0.40 U	0.40 U	0.37 U
Toluene								
Total 1,2-Dichloroethene	0.5 U	0.8 U	0.8 U	1 U	1 U	0.5 U	0.5 U	0.8 U
Total Chlorinated VOCs	0.2 U	0.37 U	0.37 U	1 U	1 U	0.2 U	0.2 U	0.37 U
Total Xylenes								
trans-1,2-Dichloroethene	0.50 U	0.8 U	0.8 U	1 U	1 U	0.50 U	0.50 U	0.8 U
Trichloroethene	0.53 U	0.49 U	0.49 U	1 U	1 U	0.40 U	0.41 U	0.49 U
Vinyl Chloride	0.60 U	0.49 U	0.49 U	1 U	1 U	0.60 U	0.60 U	0.49 U
Miscellaneous Parameters								
Salinity (g/kg)	15.7	29.9	20.2	9.02 J	1.06	12.2	12.2	9.1

TABLE 2-5
 SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION	P07-02 P07-02-NWG-052405 P07-02 GW NORMAL 20050524	P07-03 P07-03-NWG-082901 P07-03-NWG082901 GW NORMAL 20010829	P07-03 P07-03-NWG-052202 P07-03-NWG052202 GW NORMAL 20020522	P07-03 P07-03-NWG-022703 P07-03-NWG022703 GW NORMAL 20030227	P07-03 P07-03-NWG-121903 P07-03-NWG121903 GW NORMAL 20031219	P07-03 P07-03-NWG-082504 P07-03 GW NORMAL 20040825	P07-03 P07-03-NWG-052405 P07-03 GW NORMAL 20050524	P07-04 P07-04-NWG-082901 P07-04-NWG082901 GW NORMAL 20010829
Volatiles Organics (ug/L)								
1,1,2,2-Tetrachloroethane	0.5 U	1 U	1 U	0.20 U	0.20 U	0.5 U	0.5 U	1 U
1,1,2-Trichloroethane	0.61 U	1 U	1 U	0.40 U	0.40 U	0.61 U	0.61 U	1 U
1,1-Dichloroethane	0.73 U	1 U	1 U	0.60 U	0.60 U	0.73 U	0.73 U	1 U
1,2-Dichloroethane	0.41 U	1 U	1 U	0.20 U	0.20 U	0.41 U	0.41 U	1 U
Acetone								
Benzene	0.36 U	1 U	5 R	0.20 U	0.20 U	0.41 U	0.41 U	1 U
BTEX	0.36 U	1 U	1 U	0.30 U	0.30 U	0.36 R	0.36 U	1 U
Carbon Disulfide	0.36 U	1 U	1 U	0.3 U	0.3 U	0.36 U	0.36 U	1 U
Chloroform	0.66 U	1 U	1 U	0.20 U	0.20 U	0.66 U	0.66 U	1 U
cis-1,2-Dichloroethane	1.2 U	1 U	1 U	0.50 U	0.50 U	1.2 U	1.2 U	1 U
Ethylbenzene								
m+p-Xylenes								
Methylene Chloride								
o-Xylene								
Tetrachloroethene								
Toluene	0.37 U	1 U	1 U	0.40 U	0.40 U	0.37 U	0.37 U	1 U
Total 1,2-Dichloroethene	0.8 U	1 U	1 U	0.5 U	0.5 U	0.8 U	0.8 U	1 U
Total Chlorinated VOCs	0.37 U	1 U	1 U	0.4	0.2 U	0.37 U	0.37 U	1 U
Total Xylenes								
trans-1,2-Dichloroethene	0.8 U	1 U	1 U	0.50 U	0.50 U	0.8 U	0.8 U	1 U
Trichloroethene	0.49 U	1 U	1 U	0.40	0.40 U	0.49 U	0.49 U	1 U
Vinyl Chloride	0.49 U	1 U	1 U	0.60 U	0.60 U	0.49 U	0.49 U	1 U
Miscellaneous Parameters								
Salinity (g/kg)	7.5			1.18	10.1	12.6	8.1	

TABLE 2-5
 SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
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LOCATION	P07-04 P07-04-NWG-052202 P07-04-NWG052202 GW NORMAL 20020522	P07-04 P07-04-NWG-022703 P07-04-NWG022703 GW NORMAL 20030227	P07-04 P07-04-NWG-121803 P07-04-NWG121803 GW NORMAL 20031218	P07-04 P07-04-NWG-082504 P07-04 GW NORMAL 20040825	P07-04 P07-04-NWG-102704 P07-04 GW NORMAL 20041027	P07-04 P07-04-NWG-111604 P07-04 GW NORMAL 20041116	P07-04 P07-04-NWG-032305 P07-04 GW NORMAL 20050323	P07-04 P07-04-NWG-042105 P07-04 GW NORMAL 20050421
Volatile Organics (ug/L)								
1,1,2,2-Tetrachloroethane	1 U	0.20 U	0.20 U	0.5 U	0.5 U	0.5 U	0.5 U	1.8 J
1,1,2-Trichloroethane	1 U	0.40 U	0.40 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U
1,1-Dichloroethane	1 U	0.60 U	0.60 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U
1,2-Dichloroethane	1 U	0.20 U	0.20 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U
Acetone	4.8 J							
Benzene	1 U	0.30 U	0.30 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U
BTEX	1 U	0.3 U	0.3 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U
Carbon Disulfide	0.71							
Chloroform	1 U	0.20 U	0.20 U	0.66 U	0.66 U	0.66 U	0.66 U	0.66 U
cis-1,2-Dichloroethane	0.81	1.56	3.12	3.7	4.5	6.1	16.1	12.2
Ethylbenzene	1 U							
m-p-Xylenes	2 U							
Methylene Chloride	1 U							
o-Xylene	1 U							
Tetrachloroethene	1 U	0.40 U	0.40 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
Toluene	1 U							
Total 1,2-Dichloroethene	0.81	1.56	3.12	3.7	4.5	6.1	16.1	12.2
Total Chlorinated VOCs	0.73	0.2 U	2.99	2.6	2.8	0.37 U	3	3.5
Total Xylenes	1 U							
trans-1,2-Dichloroethene	1 U	0.50 U	0.50 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Trichloroethene	1 U	0.40 U	0.40 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U
Vinyl Chloride	1 U	0.60 U	2.99	2.6	2.8	0.49 U	3	1.7 J
Miscellaneous Parameters								
Salinity (g/kg)	14 J	1.52	10.2	22.6				

TABLE 2-5
 SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION	P07-04 P07-04-NWG-052405 P07-04 GW NORMAL 20050524	P07-04 P07-04-NWG-092805 P07-04 GW NORMAL 20050928	P07-04 P07-04-NWG-112805 P07-04 GW NORMAL 20051129	P07-04 P07-04-NWG-013006 P07-04 GW NORMAL 20060130	P07-05 P07-05-NWG-082901 P07-05-NWG-082901 GW NORMAL 20010829	P07-05 P07-05-NWG-052202-AVG P07-05-NWG-052202-AVG GW AVG 20020522	P07-05 P07-05-NWG-052202-D P07-05-FDWG052202 GW DUP 20020522
Volatiles Organics (ug/L)							
1,1,2,2-Tetrachloroethane	0.5 U	0.5 U	0.23 U	0.23 U	1 U	20.5 J	25 J
1,1,2-Trichloroethane	0.61 U	0.61 U	0.34 U	0.34 U	0.10	7.74 J	7.48
1,1-Dichloroethane	0.73 U	0.73 U	0.45 U	0.45 U	1 U	0.835 J	0.87
1,2-Dichloroethane	0.41 U	0.44 J	0.56 J	0.23 U	0.50	0.575 J	0.55
Acetone						5 R	5 R
Benzene	0.36 U	0.36 U	0.2 U	0.2 U	1 U	0.155 J	0.11 J
BTEX	0.36 U	0.36 U	0.2 U	0.2 U	1 U	0.205	0.11
Carbon Disulfide						0.25	0.25
Chloroform	0.66 UJ	0.66 U	0.27 U	0.27 U	1 U	0.12 J	0.14 J
cis-1,2-Dichloroethane	19.7	3.3	8.9	0.7 U	0.20	280 E	300 E
Ethylbenzene						1 U	1 U
m+p-Xylenes						2 U	2 U
Methylene Chloride						1 UJ	1 UJ
o-Xylene						1 U	1 U
Tetrachloroethane	0.37 U	0.37 U	0.44 U	0.44 U	1 U	1 U	1 U
Toluene						0.10 J	1 U
Total 1,2-Dichloroethane	21.2	3.3	9.83	0.51 U	0.8	305.5	327
Total Chlorinated VOCs	4.5	0.44	12.79	0.23 U	1.4	275.03	291.56
Total Xylenes						1 U	1 U
trans-1,2-Dichloroethane	1.5 J	0.8 U	0.93 J	0.51 U	0.60	25.5	27
Trichloroethane	0.49 U	0.49 U	0.26 U	0.26 U	1 U	21 J	23
Vinyl Chloride	4.5	0.49 U	1.8	0.83 U	1 U	4.26 J	4.52
Miscellaneous Parameters							
Salinity (g/kg)	17.8					4.88 J	4.88 J

TABLE 2-5
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION	P07-05 P07-05-NWG-052202 P07-05-NWG052202 GW ORIG 20020522	P07-05 P07-05-NWG-022703 P07-05-NWG022703 GW NORMAL 20030227	P07-05 P07-05-NWG-121903 P07-05-NWG121903 GW NORMAL 20031219	P07-05 P07-05-NWG-082504 P07-05 GW NORMAL 20040825	P07-05 P07-05-NWG-102704 P07-05 GW NORMAL 20041027	P07-05 P07-05-NWG-111604 P07-05 GW NORMAL 20041116	P07-05 P07-05-NWG-032305 P07-05 GW NORMAL 20050323	P07-05 P07-05-NWG-042105 P07-05 GW NORMAL 20050421
1,1,2,2-Tetrachloroethane	16 J	31	0.20 U	0.5 U	0.5 U	0.5 U	23.9	31.7
1,1,2-Trichloroethane	8 J	12	3.08	0.61 U	0.61 U	0.61 U	5.4	7.7
1,1-Dichloroethane	0.80 J	1.04	0.79	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U
1,2-Dichloroethane	0.60 J	0.67	2.3	1.2 J	0.41 U	0.41 U	0.41 U	0.41 U
Acetone	5 R							
Benzene	0.20 J	0.20 J	0.30 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U
BTEX	0.3	0.2	0.3 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U
Carbon Disulfide	1 U							
Chloroform	0.10 J	0.22	0.20 U	0.66 U	0.66 U	0.66 U	0.66 U	0.66 U
cis-1,2-Dichloroethane	260 E	320	260 J	50	60.2	38.5	181	212
Ethylbenzene	1 U							
m-p-Xylenes	2 U							
Methylene Chloride	1 U							
o-Xylene	1 U							
Tetrachloroethene	1 U							
Toluene	0.10 J	0.40 U	0.40 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
Total 1,2-Dichloroethene	284	339	292	60.2	78.2	47.6	193.7	233.4
Total Chlorinated VOCs	258.5	102.28	48.73	20.5	32.3	17.5	49.2	82.7
Total Xylenes	1 U							
trans-1,2-Dichloroethene	24	19	32	10.2	18	9.1	12.7	21.4
Trichloroethene	19 J	54 J	0.56	0.49 U	0.49 U	0.49 U	5.3	5.3
Vinyl Chloride	4 J	3.35	42	19.3	32.3	17.5	14.6	38
Miscellaneous Parameters								
Salinity (g/kg)		2.49	13.2	10.7				

TABLE 2-5
 SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
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LOCATION SAMPLE MATRIX SAMPLE DATE	P07-05 P07-05-NWG-052405 P07-05 GW NORMAL 20050524	P07-05 P07-05-NWG-092805 P07-05 GW NORMAL 20050928	P07-05 P07-05-NWG-112905 P07-05 GW NORMAL 20051129	P07-05 P07-05-NWG-013006 P07-05 GW NORMAL 20060130	P07-06 P07-06-NWG-082901 P07-06 GW NORMAL 20010829	P07-06 P07-06-NWG-052202 P07-06 GW NORMAL 20020522	P07-06 P07-06-NWG-022703 P07-06 GW NORMAL 20030227	P07-06 P07-06-NWG-121803 P07-06 GW NORMAL 20031218
Volatile Organics (ug/L)								
1,1,2,2-Tetrachloroethane	10	0.5 U	0.7 J	0.23 U	1 U	1 U	0.20 U	0.20 U
1,1,2-Trichloroethane	4.9	0.61 U	0.34 U	1.8	1 U	0.36	0.86	0.43
1,1-Dichloroethane	0.73 U	0.73 U	0.45 U	0.45 U	1 U	1 U	0.60	1.17
1,2-Dichloroethane	0.41 U	0.98 J	1.4	0.23 U	0.10	1.87	3.66	5.33 J
Acetone						3.12 J		
Benzene	0.36 U	0.36 U	0.2 U	0.2 U	1 U	1 U	0.30 U	0.30 U
BTEX	0.36 U	0.36 U	0.2 U	0.2 U	1 U	1 U	0.3 U	0.3 U
Carbon Disulfide						0.56		
Chloroform	0.66 UJ	0.66 U	0.27 U	0.27 U	1 U	1 U	0.20 U	0.20 UJ
cis-1,2-Dichloroethane	125	12.1	24.2	97.8	3	140 E	290	490 J
Ethylbenzene						1 U		
m-p-Xylenes						2 U		
Methylene Chloride						1 UJ		
o-Xylene						1 U		
Tetrachloroethane	0.37 U	0.37 U	0.44 U	0.44 U	1 U	1 U	0.40 U	0.40 U
Toluene						1 U		
Total 1,2-Dichloroethane	137.8	19.6	34.6	112.5	3	147.42	311	538
Total Chlorinated VOCs	23.6	6.58	54.31	153.9	3.1	153.95	10.54	19.62
Total Xylenes						1 U		
trans-1,2-Dichloroethane	12.8	7.5	10.4	14.7	1 U	7.42	21	48
Trichloroethane	0.49 U	0.49 U	0.71 J	3.7	1 U	0.26	0.90 U	0.69 J
Vinyl Chloride	8.7	5.6	16.9	35.9	1 U	1.46	5.42	12 J
Miscellaneous Parameters								
Salinity (g/kg)	8.2					5.3 J	2.52	1.44

TABLE 2-5
 SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
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LOCATION NSAMPLE SAMPLE MATRIX SACODE SACODE DATE	P07-06 P07-06-NWVG-013006 GW NORMAL 20060130	P07-07 P07-07-NWVG-082901 P07-07-NWVG082901 GW NORMAL 20010829	P07-07 P07-07-NWVG-052202-AVG P07-07-NWVG-052202-AVG GW AVG 20020522	P07-07 P07-07-NWVG-052202-D P07-07-FDWG052202 GW DUP 20020522	P07-07 P07-07-NWVG-052202 GW ORIG 20020522	P07-07 P07-07-NWVG-022703 P07-07-NWVG022703 GW NORMAL 20030227	P07-07 P07-07-NWVG-121803-AVG P07-07-NWVG-121803-AVG GW AVG 20031218
Volatile Organics (ug/L)							
1,1,2,2-Tetrachloroethane	0.23 U	5	65.5 J	80 J	51 J	63	480 J
1,1,2-Trichloroethane	2	5	7.55 J	9.87 J	5.23 J	5.19	42 J
1,1-Dichloroethane	0.45 U	1 U	0.55 J	0.76 J	0.34 J	0.52 J	4.135 J
1,2-Dichloroethane	2.1	0.80	0.45 J	0.54 J	0.36 J	0.44	1.24 J
Acetone			11.315 J	8.63 J	14 J		
Benzene	0.2 U	0.20	0.12 J	0.12 J	1 UJ	0.12 J	0.31 J
BTEX	0.2 U	0.2	1.79	0.41	3.17	0.12	0.31
Carbon Disulfide			0.875 J	1.25 J	1 UJ		
Chloroform	0.27 U	0.20 E	0.30 J	0.30 J	1 UJ	0.29	1.11 J
cis-1,2-Dichloroethane	280	8	250 E	340 E	160 E	210	975 J
Ethylbenzene			0.24 J	1 UJ	0.24 J		
m-p-Xylenes			0.865	0.16	1.57		
Methylene Chloride			1 UJ	1 UJ	1 UJ		
o-Xylene			0.745	0.13	1.36		
Tetrachloroethane	0.44 U	1 U	1 UJ	1 U	1 UJ	0.40 U	2.2 U
Toluene			1 UJ	1 U	1 UJ		
Total 1,2-Dichloroethane	308.3	37	270.5	370	171	226	1035
Total Chlorinated VOCs	331.1	48.1	314.43	391.3	237.56	91.38	956.865
Total Xylenes			1.61	0.29	2.93		
trans-1,2-Dichloroethane	28.3	29	20.5	30	11	16	60 J
Trichloroethane	0.26 U	0.50	31.5 J	47 J	16 J	18	365 J
Vinyl Chloride	18.7	0.60	3.73 J	2.83 J	4.63 J	3.94	64 J
Miscellaneous Parameters							
Salinity (g/kg)			14.15 J	13.4 J	14.9 J	1.32	3.98

TABLE 2-5
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
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LOCATION NSAMPLE MATRIX SACODE SAMPLE DATE	P07-07 P07-07-NWG-121803-D P07-07FDWG121803 GW DUP 20031218	P07-07 P07-07-NWG-121803 P07-07NWG121803 GW ORIG 20031218	P07-07 P07-07-NWG-082504-AVG P07-07-NWG-082504-AVG GW AVG 20040825	P07-07 P07-07-NWG-082504-D P07-DUP1 GW DUP 20040825	P07-07 P07-07-NWG-082504 GW ORIG 20040825	P07-07 P07-07-NWG-102704 P07-07 GW NORMAL 20041027	P07-07 P07-07 GW NORMAL 20041116
Volatiles Organics (ug/L)							
1,1,2,2-Tetrachloroethane	440 J	520 J	249	244	254	161	236
1,1,2-Trichloroethane	42	42 J	238	236	24	26	24.6
1,1-Dichloroethane	3.7	4.57 J	2.4	2.7	2.1	4.2	0.73 U
1,2-Dichloroethane	1.24 J	2 UJ	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U
Acetone							
Benzene	0.30	0.32 J	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U
BTEX	0.3	0.32	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U
Carbon Disulfide							
Chloroform	1.08 J	1.14 J	0.66 U	0.66 U	0.66 U	0.66 U	0.66 U
cis-1,2-Dichloroethane	1000 J	950 J	564.5	597	532	812	666
Ethylbenzene							
m+p-Xylenes							
Methylene Chloride							
o-Xylene							
Tetrachloroethane	0.40 U	4 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
Toluene							
Total 1,2-Dichloroethane	1064	1006	615.25	643.8	586.7	879.3	709.5
Total Chlorinated VOCs	944.02	969.71	629.2	633.3	625.1	672.2	534.6
Total Xylenes							
trans-1,2-Dichloroethane	64 J	56	50.75	46.8	54.7	67.3	43.5
Trichloroethane	400 J	330 J	160.5	159	162	238	115
Vinyl Chloride	56 J	72	193.5	204	183	243	159
Miscellaneous Parameters							
Salinity (g/kg)	4.22	3.74	4.3	4.3	4.3	4.3	

TABLE 2-5
 SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
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LOCATION NSAMPLE SAMPLE MATRIX SAMPLE DATE	P07-07 P07-07-NWVG-011905 GW NORMAL 20050119	P07-07 P07-07-NWVG-032305 GW NORMAL 20050323	P07-07 P07-07-NWVG-042105 GW NORMAL 20050421	P07-07 P07-07-NWVG-052405-AVG GW AVG 20050524	P07-07 P07-07-NWVG-052405-D GW DUP 20050524	P07-07 P07-07-NWVG-052405 GW ORIG 20050524	P07-07 P07-07-NWVG-092805 GW NORMAL 20050928
Volatiles Organics (ug/L)							
1,1,2,2-Tetrachloroethane	305	268	308	443	433	453	284 J
1,1,2-Trichloroethane	35	3.1 U	32.5	38.65	38	39.3	26.5 J
1,1-Dichloroethane	1.5 U	3.6 U	3.6 U	3.85 J	3.6 J	4.1 J	2.1 J
1,2-Dichloroethane	0.82 U	2 U	2 U	2 U	2 U	2 U	1.2 J
Acetone							
Benzene	0.72 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	0.72 UJ
BTEX	0.72 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	0.72 U
Carbon Disulfide							
Chloroform	1.3 U	3.3 U	3.3 U	3.3 UJ	3.3 UJ	3.3 UJ	1.3 UJ
cis-1,2-Dichloroethane	782	1080	1150	1335	1340	1330	840
Ethylbenzene							
m-p-Xylenes							
Methylene Chloride							
o-Xylene							
Tetrachloroethene	0.74 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	0.74 UJ
Toluene							
Total 1,2-Dichloroethene	833.2	1153.8	1210.7	1412.2	1417.9	1406.5	921.2
Total Chlorinated VOCs	754.1	666.5	787.9	1082.4	1066	1098.8	765.8
Total Xylenes							
trans-1,2-Dichloroethene	51.2	73.8	60.7	77.2	77.9	76.5	81.2 J
Trichloroethene	401	376	424	575	570	580	273 J
Vinyl Chloride	13.1	22.5	23.4	21.9	21.4	22.4	179 J
Miscellaneous Parameters							
Salinity (g/kg)				3.65	6.3	2 U	

TABLE 2-5
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
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LOCATION NSAMPLE SAMPLE MATRIX SACODE SAMPLE DATE	P07-07 P07-07-NWG-112905 P07-07 GW NORMAL 20051129	P07-07 P07-07-NWG-013006 P07-07 GW NORMAL 20060130	P07-08 P07-08-NWG-082901 P07-08 GW NORMAL 20010829	P07-08 P07-08-NWG-022703 P07-08 GW NORMAL 20030227	P07-08 P07-08-NWG-121903 P07-08 GW NORMAL 20031219	P07-08 P07-08-NWG-082504 P07-08 GW NORMAL 20040825	P07-08 P07-08-NWG-102704 P07-08 GW NORMAL 20041027	P07-08 P07-08-NWG-111604 P07-08 GW NORMAL 20041116
Volatiles Organics (ug/L)								
1,1,2,2-Tetrachloroethane	338	322	1 U	120	1200	550	368	599
1,1,2-Trichloroethane	27.9	29.9	0.20	14	94	55.1	55.2	3.1 U
1,1-Dichloroethane	2.3	2.2 U	1 U	2.25	7.06	2.5	5.5	3.6 U
1,2-Dichloroethane	1.7 J	1.1 U	0.90	1.54	0.20 U	1.5 J	0.41 U	2 U
Acetone								
Benzene	0.4 U	1 U	1 U	0.29 J	0.51	0.36 U	0.36 U	1.8 U
BTEX		1 U	1 U	0.29	0.51	0.36 U	0.36 U	1.8 U
Carbon Disulfide								
Chloroform	1 J	1.4 U	0.10 E	0.75	3.18	1.5 J	2.6	3.3 U
cis-1,2-Dichloroethane	705	1110	0.60	400	1400	634	788	832
Ethylbenzene								
m-p-Xylenes								
Methylene Chloride								
o-Xylene								
Tetrachloroethene	0.88 U	2.2 U	1 U	0.40 U	1.15	0.37 U	1.1 J	1.9 U
Toluene								
Total 1,2-Dichloroethene	782.2	1149.3	1.2	437	1520	692.6	904	896.5
Total Chlorinated VOCs	1876.9	1845.3	2.2	266.1	4081.39	1670.5	2086.7	1939
Total Xylenes								
trans-1,2-Dichloroethene	77.2	39.3	0.60	37	120	58.6	116	64.5
Trichloroethene	664 J	313	1 U	120 J	2700	1050	1620	1340
Vinyl Chloride	59.8	31.1	1 U	7.56	76	9.9	34.3	2.5 U
Miscellaneous Parameters								
Salinity (g/kg)				0.96	4.03	9		

TABLE 2-5
 SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION	P07-08 P07-08-NWG-011905 P07-08 GW NORMAL 20050119	P07-08 P07-08-NWG-032305 P07-08 GW NORMAL 20050323	P07-08 P07-08-NWG-042105 P07-08 GW NORMAL 20050421	P07-08 P07-08-NWG-052405 P07-08 GW NORMAL 20050524	P07-08 P07-08-NWG-092805 P07-08 GW NORMAL 20050928	P07-08 P07-08-NWG-112905 P07-08 GW NORMAL 20051129	P07-08 P07-08-NWG-013006 P07-08 GW NORMAL 20060130	P07-09 P07-09-NWG-082901-AVG P07-09-NWG-082901-AVG GW AVG 20010829
Volatile Organics (ug/L)								
1,1,2,2-Tetrachloroethane	465	538	546	531	394	205	343	1 U
1,1,2-Trichloroethane	44	54.2	51.3	45	39.5	20.4	29.2	0.70
1,1-Dichloroethane	3.6 U	4.3 J	7.3 U	3.8 J	3.6 U	2	2.2 U	1 U
1,2-Dichloroethane	2 U	2 U	4.1 U	2 U	2.1 J	1.3 J	1.1 U	0.40
Acetone								
Benzene	1.8 U	1.8 U	3.6 U	1.8 U	1.8 U	0.4 U	1 U	0.10
BTEX	1.8 U	1.8 U	3.6 U	1.8 U	1.8 U		1 U	0.10
Carbon Disulfide								
Chloroform	3.3 U	3.3 U	6.6 U	3.3 U	3.3 U	0.79 J	1.4 U	1 U
cis-1,2-Dichloroethane	853	1010	918	1020	704	696	902	0.55
Ethylbenzene								
m+p-Xylenes								
Methylene Chloride								
o-Xylene								
Tetrachloroethane	1.9 U	1.9 U	3.7 U	1.9 U	1.9 U	0.88 U	2.2 U	1 U
Toluene								
Total 1,2-Dichloroethane	920.7	1095.4	987.6	1097.2	775.9	782.2	949.3	0.60
Total Chlorinated VOCs	1862.2	2449.2	2257.5	1973.3	1668.4	1241.69	1908	1.75
Total Xylenes								
trans-1,2-Dichloroethane	67.7	85.4	69.6	77.2	71.9	86.2	47.3	0.10
Trichloroethane	1320	1830	1650	1380	1220	104	531	1 U
Vinyl Chloride	33.2	22.7	10.2 J	13.5	18.8	126	55.5	1 U
Miscellaneous Parameters								
Salinity (g/kg)				9.7				

TABLE 2-5
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION	P07-09 P07-09-NWG-082901-D P07-09FDWG082901 GW DUP 20010829	P07-09 P07-09-NWG-082901 P07-09NWG082901 GW ORIG 20010829	P07-09 P07-09-NWG-052202 P07-09NWG052202 GW NORMAL 20020522	P07-09 P07-09-NWG-022703 P07-09NWG022703 GW NORMAL 20030227	P07-09 P07-09-NWG-121903 P07-09NWG121903 GW NORMAL 20031219	P07-09 P07-09-NWG-082504-AVG P07-09-NWG-082504-AVG GW AVG 20040825	P07-09 P07-09-NWG-082504-D P07-DUP2 GW DUP 20040825
Volatile Organics (ug/L)							
1,1,2,2-Tetrachloroethane	1 U	1 U	33	110	1100	464	466
1,1,2-Trichloroethane	0.70	0.70	4.01	19	150	68.35	69.8
1,1-Dichloroethane	1 U	1 U	0.75	3.05	9.77	5.5	6.1
1,2-Dichloroethane	0.40	0.40	0.80	0.89	4.18	1.8 J	1.9 J
Acetone			3.6 J				
Benzene	1 U	0.10	0.11	0.30 U	0.30 U	0.36 U	0.36 U
BTEX	1 U	0.1	0.11	0.3 U	0.3 U	0.36 U	0.36 U
Carbon Disulfide			0.28				
Chloroform	1 U	1 U	0.62	1.08	2.94	1.2 J	1.2 J
dis-1,2-Dichloroethane	0.60	0.50	210 E	310	1700	1090	1180
Ethylbenzene			1 U				
m-p-Xylenes			2 U				
Methylene Chloride			1 U				
o-Xylene			1 U				
Tetrachloroethene	1 U	1 U	1 U	0.13 J	1.19	0.37 U	0.37 U
Toluene			1 U				
Total 1,2-Dichloroethene	0.7	0.5	226	351	2050	1243	1335
Total Chlorinated VOCs	1.9	1.6	230.91	417.15	5216.08	2279.65	2369.3
Total Xylenes			1 U				
trans-1,2-Dichloroethene	0.10	1 U	16	41	350	153	155
Trichloroethene	1 U	1 U	9.55	270 J	3900	1695	1780
Vinyl Chloride	1 U	1 U	2.18	13	48	43.8	44.3
Miscellaneous Parameters							
Salinity (g/kg)			11.7 J	1.16	1.57	3.65	3.5

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SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION NSAMPLE SAMPLE MATRIX SACODE SAMPLE DATE	P07-09 P07-09-NWG-082504 GW ORIG 20040825	P07-09 P07-09-NWG-102704-AVG GW AVG 20041027	P07-09 P07-09-NWG-102704-D GW DUP 20041027	P07-09 P07-09-NWG-102704 GW ORIG 20041027	P07-09 P07-09-NWG-111604-AVG GW AVG 20041116	P07-09 P07-09-NWG-111604-D GW DUP 20041116	P07-09 P07-09-NWG-111604 GW ORIG 20041116
Volatile Organics (ug/L)							
1,1,2,2-Tetrachloroethane	462	227.5 J	189 J	266 J	613.5	606	621
1,1,2-Trichloroethane	66.9	35.65 J	26.8 J	44.5 J	67.15	66	68.3
1,1-Dichloroethane	4.9	6.25	5.8	6.7	0.73 U	0.73 U	0.73 U
1,2-Dichloroethane	1.7 J	0.41 UJ	0.41 U	0.41 UJ	0.41 U	0.41 U	0.41 U
Acetone							
Benzene	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U
BTEX	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U
Carbon Disulfide							
Chloroform							
cis-1,2-Dichloroethane	1.2 J	0.995 J	0.89 J	1.1 J	0.66 U	0.66 U	0.66 U
Ethylbenzene	1000	867	860	874	1200	1240	1160
m-p-Xylenes							
Methylene Chloride							
o-Xylene							
Tetrachloroethane	0.37 U	0.5925 J	1 J	0.37 U	0.37 U	0.37 U	0.37 U
Toluene							
Total 1,2-Dichloroethane	1151	1010.5	994	1027	1325.5	1364	1287
Total Chlorinated VOCs	2190	1886.745	1850.19	1923.3	2598.75	2513.4	2684.1
Total Xylenes							
trans-1,2-Dichloroethane	151	143.5	134	153	125.5	124	127
Trichloroethane	1610	1520	1540	1500	1870	1790	1950
Vinyl Chloride	43.3	95.85	86.7	105	48.1	51.4	44.8
Miscellaneous Parameters							
Salinity (g/kg)	3.8						

TABLE 2-5
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
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LOCATION	P07-09 P07-09-NWG-011905-AVG P07-09-NWG-011905-AVG GW AVG 20050119	P07-09 P07-09-NWG-011905-D P07-DUP1 GW DUP 20050119	P07-09 P07-09-NWG-011905 GW ORIG 20050119	P07-09 P07-09-NWG-032305-AVG P07-09-032305-AVG GW AVG 20050323	P07-09 P07-09-NWG-032305-D P07-DUP-1 GW DUP 20050323	P07-09 P07-09-NWG-032305 GW ORIG 20050323	P07-09 P07-09-NWG-042105-AVG P07-09-NWG-042105-AVG GW AVG 20050421
Volatile Organics (ug/L)							
1,1,2,2-Tetrachloroethane	584	586	582	419.5	389	450	501
1,1,2-Trichloroethane	76.6	80.3	72.9	61.2	58.6	53.8	62.35
1,1-Dichloroethane	5.45 U	3.6 U	7.3 U	4.05	4.1	4	3.1
1,2-Dichloroethane	3.05 U	2 U	4.1 U	1.3 J	1.2 J	1.4 J	1.7 J
Acetone							
Benzene	2.7 U	1.8 U	3.6 U	0.36 U	0.36 U	0.36 U	1.08 U
BTEX	2.7 U	1.8 U	3.6 U	0.36 U	0.36 U	0.36 U	1.08 U
Carbon Disulfide							
Chloroform	4.95 U	3.3 U	6.6 U	1.4 J	1.4 J	1.4 J	1.3 J
cis-1,2-Dichloroethane	1215	1280	1150	1320	1270	1370	1355
Ethylbenzene							
m+p-Xylenes							
Methylene Chloride							
o-Xylene							
Tetrachloroethane	2.8 U	1.9 U	3.7 U	1.1 J	1.1 J	1.1 J	1.135 U
Toluene							
Total 1,2-Dichloroethane	1361.5	1440	1283	1456	1399	1513	1491
Total Chlorinated VOCs	2892.95	2977.5	2808.4	2718.15	2653.7	2782.6	2411
Total Xylenes							
trans-1,2-Dichloroethane	146.5	160	133	136	129	143	136
Trichloroethane	2195	2270	2120	2200	2170	2230	1820
Vinyl Chloride	37.35	41.2	33.5	29.6	28.3	30.9	23.95
Miscellaneous Parameters							
Salinity (g/kg)							

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 SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION NSAMPLE SAMPLE MATRIX SACODE SAMPLE DATE	P07-09 P07-09-NWG-042105-D P07-DUP01 GW DUP 20050421	P07-09 P07-09-NWG-042105 GW ORIG 20050421	P07-09 P07-09-NWG-052405-AVG GW AVG 20050524	P07-09 P07-09-NWG-052405-D-RE GW DUP 20050524	P07-09 P07-09-NWG-052405 GW ORIG 20050524	P07-09 P07-09-NWG-092805-AVG GW AVG 20050928	P07-09 P07-09-NWG-092805-D P07-DUP 1 GW DUP 20050928
Volatle Organics (ug/L)							
1,1,2,2-Tetrachloroethane	505	497	686.5	723	650	438.5	448
1,1,2-Trichloroethane	63	61.7	85.45	89.2	81.7	41.2	42.4
1,1-Dichloroethane	4.4	3.6 U	5.775 J	7.9 J	7.3 U	7.3 U	7.3 U
1,2-Dichloroethane	1.7 J	2 U	3.05 U	2 U	4.1 U	4.1 U	4.1 U
Acetone							
Benzene	0.36 U	1.8 U	2.7 U	1.8 U	3.6 U	3.6 U	3.6 U
BTEX	0.36 U	1.8 U	2.7 U	1.8 U	3.6 U	3.6 U	3.6 U
Carbon Disulfide							
Chloroform	1.3 J	3.3 U	5.6 J	7.9 J	6.6 UJ	6.6 U	6.6 U
cis-1,2-Dichloroethane	1420	1290	1525	1430	1620	1385	1350
Ethylbenzene							
m+p-Xylenes							
o-Xylene							
Methylene Chloride							
Tetrachloroethane	0.37 U	1.9 U	2.8 U	1.9 U	3.7 U	3.7 U	3.7 U
Toluene							
Total 1,2-Dichloroethane	1569	1413	1713	1610	1816	1554.5	1506
Total Chlorinated VOCs	2372.6	2449.4	3407.6	3339.2	3476	2385.7	2402.2
Total Xylenes							
trans-1,2-Dichloroethane	149	123	188	180	196	169.5	156
Trichloroethane	1770	1870	2595	2480	2710	1875	1860
Vinyl Chloride	27.2	20.7	32.75 J	31.2 J	34.3	31	31.8
Miscellaneous Parameters							
Salinity (g/kg)			3.05	3	3.1		

TABLE 2-5
 SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
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LOCATION NSAMPLE SAMPLE MATRIX SACODE SAMPLE DATE	P07-09 P07-09-NWG-092805 GW ORIG 20050928	P07-09 P07-09-NWG-112905-D P07-DUP1 GW DUP 20051129	P07-09 P07-09-NWG-112905 GW ORIG 20051129	P07-09 P07-09-NWG-013006-AVG P07-09-NWG-013006-AVG GW AVG 20060130	P07-09 P07-09-NWG-013006-D P07-DUP GW DUP 20060130	P07-09 P07-09-NWG-013006 GW ORIG 20060130	P07-10 P07-10-NWG-082901 P07-10-NWG082901 GW NORMAL 20010829
Volatile Organics (ug/L)							
1,1,2,2-Tetrachloroethane	429	389	370	218.5 J	158 J	279 J	14
1,1,2-Trichloroethane	40	50.9	45.6	24.25 J	16.4 J	32.1 J	5
1,1-Dichloroethane	7.3 U	5.3	4.8 J	0.45 UJ	0.45 UJ	0.45 UJ	1 U
1,2-Dichloroethane	4.1 U	2.7 J	2.8 J	0.23 U	0.23 U	0.23 U	0.50
Acetone	3.6 U	1 U	1 U	0.20 U	0.2 U	0.2 U	0.50
Benzene	3.6 U			0.2 U	0.2 U	0.2 U	0.5
BTEX							
Carbon Disulfide							
Chloroform	6.6 U	1.4 UJ	1.5 J	0.27 U	0.27 U	0.27 U	1 U
cis-1,2-Dichloroethane	1420	1170	1110	492.5	474	511	54
Ethylbenzene							
m+p-Xylenes							
Methylene Chloride							
o-Xylene							
Tetrachloroethane	3.7 U	2.2 U	2.2 U	0.44 U	0.44 U	0.44 U	1 U
Toluene							
Total 1,2-Dichloroethane	1603	1363	1288	586.9	548.8	625	58
Total Chlorinated VOCs	2369.2	3594.7	3361	1143.55	1001.4	1285.7	90.5
Total Xylenes							
trans-1,2-Dichloroethane	183	193	178	94.4 J	74.8 J	114 J	4
Trichloroethane	1870	1720	1590	235.5	211	260	10
Vinyl Chloride	30.2	63.8	56.3	78.4	67.2	89.6	1 U
Miscellaneous Parameters							
Salinity (g/kg)							

TABLE 2-5
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION	P07-10 P07-10-NWVG-052902 P07-10NWVG052902 GW NORMAL 20020529	P07-10 P07-10-NWVG-022703 P07-10NWVG022703 GW NORMAL 20030227	P07-10 P07-10-NWVG-121703 P07-10NWVG121703 GW NORMAL 20031217	P07-10 P07-10-NWVG-082504 P07-10 GW NORMAL 20040825	P07-10 P07-10-NWVG-102704 P07-10 GW NORMAL 20041027	P07-10 P07-10-NWVG-111604 P07-10 GW NORMAL 20041116	P07-10 P07-10-NWVG-011905 P07-10 GW NORMAL 20050119	P07-10 P07-10-NWVG-032305 P07-10 GW NORMAL 20050323
Volatile Organics (ug/L)								
1,1,2,2-Tetrachloroethane	17 J	130	98 J	86.1	31.3	80.4	78.8	63.5
1,1,2-Trichloroethane	7 J	15	10 J	13.4	0.61 U	12.9	13	15
1,1-Dichloroethane	0.40 J	0.61	1.15 J	0.73 U	1.6	0.73 U	0.73 U	0.73 U
1,2-Dichloroethane	1 R	1.27	2 U	1.1 J	0.41 U	0.41 U	0.41 U	1.2 J
Acetone	5 R							
Benzene	0.60 J	0.81	0.97 J	0.8	1.1	0.36 U	0.94	0.9
BTEX	0.9	0.81	0.97	0.8	1.1	0.36 U	0.94	0.9
Carbon Disulfide	1 J							
Chloroform	1 R	0.30	0.27 J	0.66 U	0.66 U	0.66 U	0.66 U	0.66 U
cis-1,2-Dichloroethane	230 E	220	180	156	172	173	163	272
Ethylbenzene	1 UJ							
m+p-Xylenes	1 U							
Methylene Chloride	1 UJ							
o-Xylene	1 U							
Tetrachloroethane	1 R	0.40 U	4 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
Toluene	0.30 J							
Total 1,2-Dichloroethane	251	244	211	179.9	201.6	195.2	189.2	304.7
Total Chlorinated VOCs	85.4	440.18	310.42	406.8	412.9	360.3	419.8	418.4
Total Xylenes	1 U							
trans-1,2-Dichloroethane	21	24	31 J	23.9	29.6	22.2	26.2	32.7
Trichloroethane	13 J	280 J	190	302	370	267	328	322
Vinyl Chloride	1 J	13	11 J	4.2	10	0.49 U	0.49 U	16.7
Miscellaneous Parameters								
Salinity (g/kg)	16.6 J	0.57	6.03	6.3				

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SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION	P07-10 P07-10-NWG-042105	P07-10 P07-10-NWG-052405	P07-10 P07-10-NWG-092805	P07-10 P07-10-NWG-112905	P07-10 P07-10-NWG-013006
NSAMPLE	GW	NORMAL	NORMAL	GW	GW
MATRIX	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
SACODE	20050421	20050524	20050928	20051129	20060130
SAMPLE DATE					
Volatle Organics (ug/L)					
1,1,2,2-Tetrachloroethane	72	64.9	39.9	66.8	59.9
1,1,2-Trichloroethane	14.9	11.1	6.1	11.2	12
1,1-Dichloroethane	0.73 U	0.81 J	0.73 U	0.45 U	0.45 U
1,2-Dichloroethane	1.2 J	1.2 J	1.2	1.5	1.2
Acetone					
Benzene	0.76	0.84	0.81	0.79	0.2 U
BTEX	0.76	0.84	0.81		0.2 U
Carbon Disulfide					
Chloroform	0.66 U	0.66 UJ	0.66 U	0.27 U	0.27 U
cis-1,2-Dichloroethane	185	225	110	107	159
Ethylbenzene					
m+p-Xylenes					
Methylene Chloride					
o-Xylene					
Tetrachloroethene	0.37 U	0.37 U	0.37 U	0.44 U	0.44 U
Toluene					
Total 1,2-Dichloroethene	208.8	251.8	134.1	126.7	173.7
Total Chlorinated VOCs	363	282.41	202.1	459.6	431.5
Total Xylenes					
trans-1,2-Dichloroethene	23.8	26.8	24.1	19.7	14.7
Trichloroethene	266	191	153	249	180
Vinyl Chloride	8.9	13.4	1.9	4.4	4.7
Miscellaneous Parameters					
Salinity (g/kg)		6.5			

TABLE 2-5
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 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION	P07-11 P07-11-NWG-052302-AVG P07-11-NWG-052302-AVG GW 20020523	P07-11 P07-11-NWG-052302-D P07-11FDWG052302 DUP 20020523	P07-11 P07-11-NWG-052302 GW ORIG 20020523	P07-11 P07-11-NWG-022703 P07-11NWG022703 GW NORMAL 20030227	P07-11 P07-11-NWG-122203 P07-11NWG122203 GW NORMAL 20031222	P07-11 P07-11-NWG-082504 P07-11 GW NORMAL 20040825	P07-11 P07-11-NWG-052405 P07-11 GW NORMAL 20050524
Volatile Organics (ug/L)							
1,1,2,2-Tetrachloroethane	1 UJ	1 UJ	1 U	0.20 U	0.20 U	0.5 U	0.5 U
1,1,2-Trichloroethane	1 U	1 U	1 U	0.40 U	0.40 U	0.61 U	0.61 U
1,1-Dichloroethane	1 UJ	1 UJ	1 U	0.60 U	0.60 U	0.73 U	0.73 U
1,2-Dichloroethane	1 UJ	1 UJ	1 U	0.20 U	0.20 U	0.41 U	0.41 U
Acetone	5 R	5 R	5 R				
Benzene	1 UJ	1 UJ	1 U	0.30 U	0.30 U	0.36 U	0.36 U
BTEX	5.9	10.5	1.3	0.3 U	0.3 U	0.36 U	0.36 U
Carbon Disulfide	0.10 J	1 UJ	0.10				
Chloroform	1 UJ	1 UJ	1 U	0.20 U	0.20 U	0.66 U	0.66 U
cis-1,2-Dichloroethane	1 U	1 U	1 U	0.12 J	0.50 U	1.2 U	1.2 U
Ethylbenzene	0.50 J	0.50 J	1 U				
m+p-Xylenes	1.66	3	0.32				
Methylene Chloride	1 UJ	1 UJ	1 U				
o-Xylene	2.695	5	0.39				
Tetrachloroethane	1 UJ	1 UJ	1 U	0.40 U	0.40 U	0.37 U	0.37 U
Toluene	1.29 J	2 J	0.58 J				
Total 1,2-Dichloroethane	1 U	1 U	1 U	0.12	0.5 U	0.8 U	0.8 U
Total Chlorinated VOCs	1 U	1 U	1 U	0.14	0.2 U	0.37 U	0.37 U
Total Xylenes	4.355	8	0.71				
trans-1,2-Dichloroethane	1 U	1 U	1 U	0.50 U	0.50 U	0.8 U	0.8 U
Trichloroethane	1 UJ	1 UJ	1 U	0.14 J	0.40 U	0.49 U	0.49 U
Vinyl Chloride	1 UJ	1 UJ	1 U	0.60 U	0.60 U	0.49 U	0.49 U
Miscellaneous Parameters							
Salinity (g/kg)	24.1 J	24.3 J	23.9 J	1.61	3.64	2.1	6.6

TABLE 2-5
 SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION	P07-12 P07-12-NWG-052302 P07-12-NWG-022703 P07-12-NWG-022703	P07-12 P07-12-NWG-121903 P07-12-NWG-121903	P07-12 P07-12-NWG-082604 P07-12 NORMAL 20040826	P07-12 P07-12-NWG-052405 P07-12 NORMAL 20050524	P07-13 P07-13-NWG-052902 P07-13-NWG-052902	P07-13 P07-13-NWG-030303 P07-13-NWG-030303	P07-13 P07-13-NWG-121803 P07-13-NWG-121803
NSAMPLE	P07-12-NWG-052302 P07-12-NWG-022703	P07-12-NWG-121903 P07-12-NWG-121903	P07-12-NWG-082604 P07-12 NORMAL 20040826	P07-12-NWG-052405 P07-12 NORMAL 20050524	P07-13-NWG-052902 P07-13-NWG-052902	P07-13-NWG-030303 P07-13-NWG-030303	P07-13-NWG-121803 P07-13-NWG-121803
MATRIX	GW NORMAL 20030227	GW NORMAL 20031219	GW NORMAL 20040826	GW NORMAL 20050524	GW NORMAL 20020529	GW NORMAL 20030303	GW NORMAL 20031218
SACODE	20020523	20031219	20040826	20050524	20020529	20030303	20031218
SAMPLE DATE							
Volatile Organics (ug/L)							
1,1,2,2-Tetrachloroethane	1 U	0.20 U	0.5 UJ	0.5 U	1 U	0.20 U	0.20 U
1,1,2-Trichloroethane	1 U	0.40 U	0.61 U	0.61 U	1 U	0.40 U	0.40 U
1,1-Dichloroethane	1 U	0.60 U	0.73 U	0.73 U	1 U	0.60 U	0.60 U
1,2-Dichloroethane	1 U	0.20 U	0.41 U	0.41 U	1 U	0.20 U	0.20 U
Acetone	3.62 J				5 R		
Benzene	1 U	0.30 U	0.36 U	0.36 U	1 U	0.30 U	0.30 U
BTEX	0.77	0.3 U	0.36 U	0.36 U	1 U	0.3 U	0.3 U
Carbon Disulfide	0.23				1 U		
Chloroform	1 U	0.20 U	0.66 U	0.66 U	1 U	0.20 U	0.20 U
cis-1,2-Dichloroethane	1 U	0.73	1.2 U	1.2 U	0.30 J	0.14 J	0.58
Ethylbenzene	1 U				1 U		
m-p-Xylenes	0.16				1 U		
Methylene Chloride	1 U				1 U		
o-Xylene	0.17				1 U		
Tetrachloroethene	1 U	0.40 U	0.37 U	0.37 U	1 U	0.40 U	0.40 U
Toluene	0.43				1 U		
Total 1,2-Dichloroethene	1 U	0.83	0.8 U	0.8 U	0.3	0.14	0.58
Total Chlorinated VOCs	1 U	0.2 U	0.37 U	0.37 U	0.5	0.2 U	0.5
Total Xylenes	0.33				1 U		
trans-1,2-Dichloroethane	1 U	0.10 J	0.8 U	0.8 U	1 U	0.50 U	0.50 U
Trichloroethene	1 U	1.08 U	0.49 U	0.49 U	1 U	0.40 U	0.50 U
Vinyl Chloride	1 U	0.60 U	0.49 U	0.49 U	0.20 J	0.60 U	0.60 U
Miscellaneous Parameters							
Salinity (g/kg)	24.4 J	17	12.8	2 U	26 J	16.5	12.9

TABLE 2-5
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION NSAMPLE SAMPLE MATRIX SACODE SAMPLE DATE	P07-13 P07-13-NWG-082604 P07-13 GW NORMAL 20040826	P07-13 P07-13-NWG-052405 P07-13 GW NORMAL 20050524	P07-14 P07-14-NWG-052302 P07-14 GW NORMAL 20020523	P07-14 P07-14-NWG-022703 P07-14 GW NORMAL 20030227	P07-14 P07-14-NWG-121903 P07-14 GW NORMAL 20031219	P07-14 P07-14-NWG-082504 P07-14 GW NORMAL 20040825	P07-14 P07-14-NWG-052405 P07-14 GW NORMAL 20050524	P07-15 P07-15-NWG-052302 P07-15 GW NORMAL 20020523
Volatile Organics (ug/L)								
1,1,2,2-Tetrachloroethane	0.5 UJ	0.5 U	1 U	0.20 U	0.20 U	0.5 U	0.5 U	1 U
1,1,2-Trichloroethane	0.61 U	0.61 U	1 U	0.40 U	0.40 U	0.61 U	0.61 U	0.41
1,1-Dichloroethane	0.73 U	0.73 U	1 U	0.60 U	0.60 U	0.73 U	0.73 U	1 U
1,2-Dichloroethane	0.41 U	0.41 U	1 U	0.20 U	0.20 U	0.41 U	0.41 U	0.24
Acetone			4.22 J					3.97 J
Benzene	0.36 U	0.36 U	1 U	0.30 U	0.30 U	0.36 U	0.36 U	1 U
BTEX	0.36 U	0.36 U	1.03	0.3 U	0.3 U	0.36 U	0.36 U	2.46
Carbon Disulfide			0.32					1 U
Chloroform	0.66 U	0.66 U	1 U	0.20 U	0.20 U	0.66 U	0.66 U	1 U
cis-1,2-Dichloroethane	14.6	7.5	0.29	0.30 J	0.50 U	1.2 U	1.2 U	0.89
Ethylbenzene			1 U					0.13
m+p-Xylenes			0.19					0.77
Methylene Chloride			1 U					1 U
o-Xylene			0.18					1.05
Tetrachloroethane	0.37 U	0.37 U	1 U	0.40 U	0.40 U	0.37 U	0.37 U	1 U
Toluene			0.66					0.51
Total 1,2-Dichloroethane	19	9.4	0.29	0.3	0.5 U	0.8 U	0.8 U	1.08
Total Chlorinated VOCs	3.3	0.37 U	0.25	0.18	0.2 U	0.37 U	0.37 U	1.62
Total Xylenes			0.37					1.82
trans-1,2-Dichloroethane	4.4	1.9 J	1 U	0.50 U	0.50 U	0.8 U	0.8 U	0.19
Trichloroethane	1.5 J	0.49 U	1 U	0.18 J	0.40 U	0.49 U	0.49 U	1 U
Vinyl Chloride	1.8 J	0.49 U	1 U	0.60 U	0.60 U	0.49 U	0.49 UJ	1 U
Miscellaneous Parameters								
Salinity (g/kg)	12.8	10.1	18.2 J	1.72	1.72	2.2	2 U	23.2 J

TABLE 2-5
 SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION	P07-15 P07-15-NWVG-022703 P07-15NWVG022703 GW NORMAL 20030227	P07-15 P07-15-NWVG-121803 P07-15NWVG121803 GW NORMAL 20031218	P07-15 P07-15-NWVG-082504-AVG P07-15-NWVG-082504-AVG GW AVG 20040825	P07-15 P07-15-NWVG-082504-D P07-DUP3 GW DUP 20040825	P07-15 P07-15-NWVG-082504 P07-15 GW ORIG 20040825	P07-15 P07-15-NWVG-052405-AVG P07-15-NWVG-052405-AVG GW AVG 20050524	P07-15 P07-15-NWVG-052405-D P07-DUP3 GW DUP 20050524
Volatile Organics (ug/L)							
1,1,2,2-Tetrachloroethane	4.01	4.85	2.25 J	3.1 J	1.4 J	34.05	35.1
1,1,2-Trichloroethane	2.61	2.37	1.85 J	2.2 J	1.5 J	6.7	6.9
1,1-Dichloroethane	0.60 U	0.60 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U
1,2-Dichloroethane	1.4	1.31 J	0.6025 J	0.41 UJ	1 J	0.41 U	0.41 U
Acetone							
Benzene	0.30 U	0.30 U	0.36 U	0.36 U	0.36 R	0.36 U	0.36 U
BTEX	0.3 U	0.3 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U
Carbon Disulfide							
Chloroform	0.20 U	0.20 UJ	0.66 U	0.66 U	0.66 U	0.66 U	0.66 U
cis-1,2-Dichloroethane	5.56	5.31	5.05	5.4	4.7	21.25 J	22.9
Ethylbenzene							
m+p-Xylenes							
Methylene Chloride							
o-Xylene							
Tetrachloroethane	0.40 U	0.40 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
Toluene							
Total 1,2-Dichloroethane	6.4	6.42	6.3	6.7	5.9	25.45	27.3
Total Chlorinated VOCs	10.58	11.96	7.65	8.8	6.5	45.85	47.5
Total Xylenes							
trans-1,2-Dichloroethane	0.84	1.11	1.25 J	1.3 J	1.2 J	4.2	4.4
Trichloroethane	2.32 J	3.43 J	3.05	3.5	2.6	5.1 J	5.5
Vinyl Chloride	0.24 J	0.60 UJ	0.49 U	0.49 U	0.49 U	0.49 UJ	0.49 UJ
Miscellaneous Parameters							
Salinity (g/kg)	0.99	0.82	5.9 J	9.2 J	2.6 J	2 U	2 U

TABLE 2-5
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
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LOCATION NSAMPLE SAMPLE MATRIX SACODE SAMPLE DATE	P07-15 P07-15-NWG-052405 P07-15 GW ORIG 20050524	P07-16 P07-16-NWG-052302 P07-16NWG052302 GW NORMAL 20020523	P07-16 P07-16-NWG-022703 P07-16NWG022703 GW NORMAL 20030227	P07-16 P07-16-NWG-121803 P07-16NWG121803 GW NORMAL 20031218	P07-16 P07-16-NWG-082504 P07-16 GW NORMAL 20040825	P07-16 P07-16-NWG-052405 P07-16 GW NORMAL 20050524	P07-17 P07-17-NWG-052902 P07-17NWG052902 GW NORMAL 20020529	P07-17 P07-17-NWG-022703-AVG P07-17-NWG-022703-AVG GW AVG 20030227
Volatle Organics (ug/L)								
1,1,2,2-Tetrachloroethane	33	0.20 J	0.20 U	1.97	0.93 J	2.5	1 U	0.20 U
1,1,2-Trichloroethane	6.5	0.30 J	0.15 J	2.21	2	3.2	1 U	0.40 U
1,1-Dichloroethane	0.73 U	1 UJ	0.60 U	0.60 U	0.73 U	0.73 U	1 U	0.60 U
1,2-Dichloroethane	0.41 U	1 UJ	0.20 U	1.73 J	2	2.4	1 U	0.20 U
Acetone		5 R					5 R	
Benzene	0.36 U	1 UJ	0.30 U	0.30 U	0.36 U	0.36 U	1 U	0.30 U
BTEX	0.36 U	37.9	0.3 U	0.3 U	0.36 U	0.36 U	1 U	0.30 U
Carbon Disulfide		1 J						
Chloroform	0.66 U	1 UJ	0.20 U	0.20 UJ	0.66 U	0.66 U	1 U	0.20 U
cis-1,2-Dichloroethene	19.6 J	0.20 J	0.15 J	0.58	1.2 U	1.2 U	1 U	0.50 U
Ethylbenzene		0.90 J					1 U	
m-p-Xylenes		5					1 U	
Methylene Chloride		0.50 J					1 UJ	
o-Xylene		5					1 U	
Tetrachloroethene	0.37 U	1 UJ	0.40 U	0.40 U	0.37 U	0.37 U	1 U	0.40 U
Toluene		26 J					1 U	
Total 1,2-Dichloroethene	23.6	0.2	0.15	0.58	0.8 U	0.8 U	1 U	0.50 U
Total Chlorinated VOCs	44.2	3.2	0.84	11.85	12.53	16.1	1 U	0.10
Total Xylenes		.10					1 U	
trans-1,2-Dichloroethene	4	1 UJ	0.50 U	0.50 U	0.8 U	0.8 U	1 U	0.50 U
Trichloroethene	4.7 J	2 J	0.69 J	5.94 J	7.6	8	1 UJ	0.10 J
Vinyl Chloride	0.49 UJ	1 UJ	0.60 U	0.60 UJ	0.49 U	0.49 UJ	1 U	0.60 U
Miscellaneous Parameters								
Salinity (g/kg)	2 U	2 UJ	6	0.76	2.2	2 U	13 J	2.29 J

TABLE 2-5
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION NSAMPLE SAMPLE MATRIX SACODE SAMPLE DATE	P07-17 P07-17FDWG022703-D GW DUP 20030227	P07-17 P07-17NWG-022703 GW ORIG 20030227	P07-17 P07-17-NWG-121903-AVG P07-17-NWG-121903-AVG GW AVG 20031219	P07-17 P07-17-NWG-121903-D P07-17FDWG121903 GW DUP 20031219	P07-17 P07-17-NWG-121903 GW ORIG 20031219	P07-17 P07-17-NWG-082504 GW NORMAL 20040825	P07-17 P07-17 GW NORMAL 20050524
Volatile Organics (ug/L)							
1,1,2,2-Tetrachloroethane	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.5 U	0.5 U
1,1,2-Trichloroethane	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.61 U	0.61 U
1,1-Dichloroethane	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.73 U	0.73 U
1,2-Dichloroethane	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.41 U	0.41 U
Acetone							
Benzene	0.30 U	0.30 U	0.30 U	0.30 U	0.30 U	0.36 U	0.36 U
BTEX	0.3 U	0.3 U	0.30 U	0.3 U	0.3 U	0.36 U	0.36 U
Carbon Disulfide							
Chloroform	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.66 U	0.66 U
cis-1,2-Dichloroethane	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	1.2 U	1.2 U
Ethylbenzene							
m-p-Xylenes							
Methylene Chloride							
o-Xylene							
Tetrachloroethene	0.40 U	0.40 U	0.40 UJ	0.40 UJ	0.40 U	0.37 U	0.37 U
Toluene							
Total 1,2-Dichloroethene	0.5 U	0.5 U	0.50 U	0.5 U	0.5 U	0.8 U	0.8 U
Total Chlorinated VOCs	0.2 U	0.1	0.20 U	0.2 U	0.2 U	0.37 U	0.37 U
Total Xylenes							
trans-1,2-Dichloroethene	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.8 U	0.8 U
Trichloroethene	0.40 UJ	0.10 J	0.40 U	0.40 U	0.40 U	0.49 U	0.49 U
Vinyl Chloride	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.49 U	0.49 UJ
Miscellaneous Parameters							
Salinity (g/kg)	1.74 J	2.84 J	3.81	3.12	4.5	5.6	2 U

TABLE 2-5
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION NSAMPLE MATRIX SACODE SAMPLE DATE	P07-18 P07-18-NWVG-052302 P07-18NWVG052302 GW NORMAL 20020523	P07-18 P07-18-NWVG-022703 P07-18NWVG022703 GW NORMAL 20030227	P07-18 P07-18-NWVG-121803 P07-18NWVG121803 GW NORMAL 20031218	P07-18 P07-18-NWVG-082504 P07-18 GW NORMAL 20040825	P07-18 P07-18-NWVG-052405 P07-18 GW NORMAL 20050524	P07-19 P07-19-NWVG-052202 P07-19NWVG052202 GW NORMAL 20020522	P07-19 P07-19-NWVG-022703 P07-19NWVG022703 GW NORMAL 20030227	P07-19 P07-19-NWVG-121803 P07-19NWVG121803 GW NORMAL 20031218
Volatile Organics (ug/L)								
1,1,2,2-Tetrachloroethane	1 U	0.20 U	0.20 U	0.5 U	0.5 U	0.21	0.20 U	0.20 U
1,1,2-Trichloroethane	1 U	0.40 U	0.40 U	0.61 U	0.61 U	1 U	0.40 U	0.40 U
1,1-Dichloroethane	1 U	0.60 U	0.60 U	0.73 U	0.73 U	1 U	0.60 U	0.60 U
1,2-Dichloroethane	1 U	0.20 U	0.20 U	0.41 U	0.41 U	1 U	0.20 U	0.20 U
Acetone	10 J					2.53 J		
Benzene	1 U	0.30 U	0.30 U	0.36 U	0.36 U	1 U	0.30 U	0.30 U
BTEX	2.01	0.3 U	0.3 U	0.36 U	0.36 U	2.72	0.3 U	0.3 U
Carbon Disulfide	0.23					0.26		
Chloroform	1 U	0.20 U	0.20 U	0.66 U	0.66 U	1 U	0.20 U	0.20 U
cis-1,2-Dichloroethane	1 U	0.50 U	0.50 U	1.2 U	1.2 U	1 U	0.50 U	0.50 U
Ethylbenzene	1 U					1 U		
m+p-Xylenes	0.14					0.21		
Methylene Chloride	1.96 U					1 U		
o-Xylene	0.13					1 U		
Tetrachloroethene	1 U	0.40 U	0.40 U	0.37 U	0.37 U	0.21	0.40 U	0.40 U
Toluene	1.73					1 U		
Total 1,2-Dichloroethene	1 U	0.5 U	0.5 U	0.8 U	0.8 U	2.29	0.5 U	0.5 U
Total Chlorinated VOCs	1 U	0.2 U	0.2 U	0.37 U	0.37 U	0.76	0.2 U	0.2 U
Total Xylenes	0.27					0.42		
trans-1,2-Dichloroethene	1 U	0.50 U	0.50 U	0.8 U	0.8 U	1 U	0.50 U	0.50 U
Trichloroethene	1 U	0.40 U	0.40 U	0.49 U	0.49 U	0.55	0.40 U	0.40 U
Vinyl Chloride	1 U	0.60 U	0.60 U	0.49 U	0.49 U	1 U	0.60 U	0.60 U
Miscellaneous Parameters								
Salinity (g/kg)	5.36 J	3.61	4.17	2.3	5.8	21.9 J	20.1	19.8

TABLE 2-5
 SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION NSAMPLE SAMPLE MATRIX SACODE SAMPLE DATE	P07-19 P07-19-NWG-082504 P07-19 GW NORMAL 20040825	P07-19 P07-19-NWG-052405 P07-19 GW NORMAL 20050524	P07-20 P07-20-NWG-052202 P07-20-NWG-052202 NORMAL 20020522	P07-20 P07-20-NWG-022703 P07-20-NWG-022703 NORMAL 20030227	P07-20 P07-20-NWG-121903 P07-20-NWG-121903 NORMAL 20031219	P07-20 P07-20-NWG-082504 P07-20 GW NORMAL 20040825	P07-20 P07-20-NWG-052405 P07-20 GW NORMAL 20050524	P07-21 P07-21-NWG-052202 P07-21-NWG-052202 NORMAL 20020522
Volatile Organics (ug/L)								
1,1,2-Trichloroethane	0.5 U	0.5 U	6.88	88	0.20 UJ	5	2.13	36
1,1,2-Trichloroethane	0.61 U	0.61 U	0.75	23	0.40 UJ	3.6	23.1	5.6
1,1-Dichloroethane	0.73 U	0.73 U	1 U	0.72	0.60 UJ	0.73 U	2.6	0.24
1,2-Dichloroethane	0.41 U	0.41 U	1 U	2.31	0.20 UJ	0.41 U	2.5	0.72
Acetone			2.77 J					4.35 J
Benzene	0.36 U	0.36 U	0.23	4.38	0.30 UJ	0.46 J	5.8	0.57
BTEX	0.36 U	0.36 U	1.97	4.38	0.3 U	0.46	5.8	0.86
Carbon Disulfide			0.12					0.12
Chloroform	0.66 U	0.66 U	1 U	0.64	0.20 UJ	0.66 U	0.86 U	0.16
cis-1,2-Dichloroethane	1.2 U	1.2 U	34	130	1.39 J	67.4	804	20
Ethylbenzene			1 U					1 U
m-p-Xylenes			0.10					2 U
Methylene Chloride			1 UJ					1 UJ
o-Xylene			1 U					1 U
Tetrachloroethene	0.37 U	0.37 U	1 U	0.40 U	0.40 UJ	0.37 U	0.37 U	1 U
Toluene			1.64					1 U
Total 1,2-Dichloroethene	0.8 U	0.8 U	36.24	179	1.39	71.9	859	0.29
Total Chlorinated VOCs	0.37 U	0.37 U	40.4	200.52	0.2 U	12.8	261	22.85
Total Xylenes			0.1					122.19
trans-1,2-Dichloroethene	0.8 U	0.8 U	2.24	49	0.50 UJ	4.5	55	1 U
Trichloroethene	0.49 U	0.49 U	0.25	84 J	0.40 UJ	4.2	17.2	2.85
Vinyl Chloride	0.49 U	0.49 UJ	0.52	1.85	0.60 UJ	0.49 U	2.6 J	58 J
Miscellaneous Parameters								
Salinity (g/kg)	38.7	24.5		8.22	20.1	27.2	7.5	0.47

TABLE 2-5
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION	P07-21 P07-21-NWG-022703 P07-21NWG022703 GW NORMAL 20030227	P07-21 P07-21-NWG-121803 P07-21NWG121803 GW NORMAL 20031218	P07-21 P07-21-NWG-082504 P07-21 GW NORMAL 20040825	P07-21 P07-21-NWG-082405 P07-21 GW NORMAL 20050524	P07-22 P07-22-NWG-052202 P07-22NWG052202 GW NORMAL 20020522	P07-22 P07-22-NWG-022703-AVG P07-22-NWG-022703-AVG GW AVG 20030227	P07-22 P07-22-NWG-022703-D P07-22FDWG022703 GW DUP 20030227
Volatile Organics (ug/L)							
1,1,1,2-Tetrachloroethane	14 J	0.20 UJ	35.6	20.5	63	57	52
1,1,2-Trichloroethane	4.39 J	0.40 UJ	6.2	3.7	6.84	8.12	7.45
1,1-Dichloroethane	0.10 J	0.60 UJ	0.73 U	0.73 U	1 U	0.32 J	0.27 J
1,2-Dichloroethane	0.92 J	0.20 UJ	0.5 J	0.41 U	0.46	0.71	0.64
Acetone					5.83 J		
Benzene	0.34 J	0.30 UJ	0.83	0.74	0.80	1.245	1.18
BTEX	0.34	0.3 U	0.83	0.74	1.04	1.245	1.18
Carbon Disulfide					0.17		
Chloroform	0.20 UJ	0.20 UJ	0.66 U	0.66 U	0.34	0.36	0.33
dis-1,2-Dichloroethane	15 J	2.14 J	19.1	37.6	39	65.5	62
Ethylbenzene					1 U		
m-p-Xylenes					0.13		
Methylene Chloride					1 UJ		
o-Xylene					0.10		
Tetrachloroethene	0.40 UJ	0.40 UJ	0.37 U	0.37 U	1 U	0.40 U	0.40 U
Toluene					1 U		
Total 1,2-Dichloroethene	17.15	2.14	21.2	39.9	42.29	69.34	65.59
Total Chlorinated VOCs	43.41	1.81	94.6	39.6	163	87.65	80.27
Total Xylenes					0.23		
trans-1,2-Dichloroethene	2.15 J	0.50 UJ	2.1	2.3	3.29	3.84	3.59
Trichloroethene	24 J	1.81 J	52.3	14.3	53	20.5 J	19 J
Vinyl Chloride	0.60 UJ	0.60 UJ	0.49 U	1.1 J	0.36	0.64 J	0.58 J
Miscellaneous Parameters							
Salinity (g/kg)	11.8	19.8	11	14	15.8 J	13.5	13.8

TABLE 2-5
 SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION	P07-22 P07-22-NWG-022703 P07-22NWG022703	P07-22 P07-22-NWG-121703 P07-22NWG121703	P07-22 P07-22-NWG-082504-AVG P07-22-NWG-082504-AVG	P07-22 P07-22-NWG-082504-D P07-DUP4	P07-22 P07-22-NWG-082504 P07-22 GW ORIG	P07-22 P07-22-NWG-052405-AVG P07-22-NWG-052405-AVG	P07-22 P07-22-NWG-052405-AVG P07-22-NWG-052405-AVG
Volatile Organics (ug/L)							
1,1,2,2-Tetrachloroethane	62	100	32.85	37.4	28.3	84.25	86.1
1,1,2-Trichloroethane	8.79	10 J	6	6.5	5.5	9.8	10.1
1,1-Dichloroethane	0.37 J	3 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U
1,2-Dichloroethane	0.78	1 U	0.41 U	0.41 U	0.41 U	0.5875 J	0.41 UJ
Acetone							
Benzene	1.31	1.24 J	1.5	1.6	1.4	1.9	1.9
BTEX	1.31	1.24	1.5	1.6	1.4	1.9	1.9
Carbon Disulfide							
Chloroform	0.39	0.45 J	0.66 U	0.66 U	0.66 U	0.66 U	0.66 U
cis-1,2-Dichloroethane	69	17 J	53.3	57.2	49.4	42.9	43.4
Ethylbenzene							
m+p-Xylenes							
Methylene Chloride							
o-Xylene							
Tetrachloroethane	0.40 U	2 UJ	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
Toluene							
Total 1,2-Dichloroethane	73.09	18.09	58.65	62.1	55.2	47.05	47.7
Total Chlorinated VOCs	95.03	185.45	45.9	50.4	41.4	220.035	225.2
Total Xylenes							
trans-1,2-Dichloroethane	4.09	1.09 J	5.35	4.9	5.8	4.15	4.3
Trichloroethane	22	75	7.05	6.5	7.6	125.5	129
Vinyl Chloride	0.70	0.60 UJ	0.49 U	0.49 U	0.49 U	0.49 UJ	0.49 UJ
Miscellaneous Parameters							
Salinity (g/kg)	13.2	12.7	14.25	15.5	13	11.2	11.1

TABLE 2-5
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION NSAMPLE SAMPLE MATRIX SACODE SAMPLE DATE	P07-22 P07-22-NWVG-052405 GW ORIG 20050524	P07-23 P07-23-NWVG-052202 GW NORMAL 20020522	P07-23 P07-23-NWVG-022703 GW NORMAL 20030227	P07-23 P07-23-NWVG-121803 GW NORMAL 20031218	P07-23 P07-23-NWVG-082504 GW NORMAL 20040825	P07-23 P07-23-NWVG-052405 GW NORMAL 20050524	P07-24 P07-24-NWVG-052202 GW NORMAL 20020522	P07-24 P07-24-NWVG-022703 GW NORMAL 20030227
Volatiles Organics (ug/L)								
1,1,2,2-Tetrachloroethane	82.4	36	10	32	14	26.3	7.73	41
1,1,2-Trichloroethane	9.5	2.54	0.95	3.14	1.7 J	3	1.45	6.47
1,1-Dichloroethane	0.73 U	1 U	0.60 U	0.60 U	0.73 U	0.73 U	1 U	0.60 U
1,2-Dichloroethane	0.97 J	1 U	0.20 U	0.20 UJ	0.41 U	0.41 U	1 U	0.45
Acetone		5 R					5 R	
Benzene	1.9	1 U	0.30 U	0.30 U	0.36 U	0.36 U	0.48	1.29
BTEX	1.9	0.62	0.3 U	0.3 U	0.36 U	0.36 U	7.71	1.29
Carbon Disulfide		0.14					0.13	
Chloroform	0.66 U	0.18	0.20 U	0.20 UJ	0.66 U	0.66 U	1 U	0.32
cis-1,2-Dichloroethane	42.4	4.73	2.3	6.06	3.7	5.8	26	15
Ethylbenzene		1 U					1 UJ	
m-p-Xylenes		2 U					2 U	
Methylene Chloride		1 UJ					1 UJ	
o-Xylene		1 U					1 U	
Tetrachloroethene	0.37 U	1 U	0.40 U	0.40 U	0.37 U	0.37 U	1 U	0.40 U
Toluene		0.62					7.23	
Total 1,2-Dichloroethene	46.4	5.01	2.44	6.06	3.7	5.8	26.57	15.5
Total Chlorinated VOCs	214.87	90.26	23.95	69.14	36.7	79.2	34.52	90.24
Total Xylenes		1 U					1 U	
trans-1,2-Dichloroethene	4	0.28	0.14 J	0.50 U	0.8 U	0.8 U	0.57	0.50
Trichloroethene	122	47	13 J	34 J	21	49.9	0.95	42
Vinyl Chloride	0.49 UJ	1 U	0.60 U	0.60 UJ	0.49 U	0.49 UJ	0.39	0.60 U
Miscellaneous Parameters								
Salinity (g/kg)	11.3		19.8	18.4	30.5	22	17.8 J	16.1

TABLE 2-5
 SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION	P07-24 P07-24-NWG-121703 P07-24NWG121703 GW NORMAL 20031217	P07-24 P07-24-NWG-082604 P07-24 GW NORMAL 20040825	P07-24 P07-24-NWG-082504 P07-24-082504 GW NORMAL 20040826	P07-24 P07-24-NWG-102704 P07-24 GW NORMAL 20041027	P07-24 P07-24-NWG-111604 P07-24 GW NORMAL 20041116	P07-24 P07-24-NWG-011905 P07-24 GW NORMAL 20050119	P07-24 P07-24-NWG-032305 P07-24 GW NORMAL 20050323	P07-24 P07-24-NWG-042105 P07-24 GW NORMAL 20050421
Volatile Organics (ug/L)								
1,1,2,2-Tetrachloroethane	29	32.4		10.5	36.3	34.2	37	44.2
1,1,2-Trichloroethane	3.93	4.4		2.8	0.61 U	5.7	5.6	6
1,1-Dichloroethane	0.60 U	0.73 U		0.73 U	0.73 U	0.73 U	0.73 U	0.73 U
1,2-Dichloroethane	0.20 U	0.41 U		0.41 U	0.41 U	0.41 U	0.41 U	0.41 U
Acetone								
Benzene	0.92	0.87		0.65	0.36 U	0.86	1.4	1.2
BTEX	0.92	0.87		0.65	0.36 U	0.86	1.4	1.2
Carbon Disulfide								
Chloroform	0.20 U	0.66 U		0.66 U	0.66 U	0.66 U	0.66 U	0.66 U
cis-1,2-Dichloroethane	14	9.5		6.6	10	12.7	24.3	23.6
Ethylbenzene								
m+p-Xylenes								
Methylene Chloride								
o-Xylene								
Tetrachloroethane	0.40 UJ	0.37 U		0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
Toluene								
Total 1,2-Dichloroethane	16.14	10.9		6.6	10	12.7	26	25.8
Total Chlorinated VOCs	75.93	88		42.2	87.9	97.8	127.4	131.3
Total Xylenes								
trans-1,2-Dichloroethane	2.14 J	1.4 J		0.8 U	0.8 U	0.8 U	1.7 J	2.2
Trichloroethane	43 J	51.2		28.9	51.6	57.9	84.8	81.1
Vinyl Chloride	0.60 U	0.49 U		0.49 U	0.49 U	0.49 U	0.49 U	0.49 U
Miscellaneous Parameters								
Salinity (g/kg)	13.9		41.5					

TABLE 2-5
 SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION	P07-24 P07-24-NWG-052405 P07-24 GW NORMAL 20050524	P07-24 PZ07-24-072905 PZ07-24 GW NORMAL 20050729	P07-24 P07-24-NWG-092805 P07-24 GW NORMAL 20050928	P07-24 P07-24-NWG-112905 P07-24 GW NORMAL 20051129	P07-24 P07-24-NWG-013006 P07-24 GW NORMAL 20060130	P07-25 P07-25-NWG-022703 P07-25 GW NORMAL 20030227	P07-25 P07-25-NWG-121803 P07-25 GW NORMAL 20031218	P07-25 P07-25-NWG-082504 P07-25 GW NORMAL 20040825
Volatle Organics (ug/L)								
1,1,2,2-Tetrachloroethane	47.7	23.4	9.3	29.2	34.7	0.20 U	0.20 U	0.5 U
1,1,2-Trichloroethane	6	3.7	0.61 U	4.5	5.1	0.40 U	0.40 U	0.61 U
1,1-Dichloroethane	0.73 U	0.73 U	0.73 U	0.45 U	0.45 U	0.60 U	0.60 U	0.73 U
1,2-Dichloroethane	0.41 U	0.41 U	0.41 U	0.61 J	0.23 U	0.20 U	0.20 UJ	0.41 U
Acetone								
Benzene	1.2	0.51	0.36 U	0.6	0.2 U	0.30 U	0.30 U	0.36 U
BTEX	1.2	0.51	0.36 U		0.2 U	0.3 U	0.3 U	0.36 U
Carbon Disulfide								
Chloroform	0.66 UJ	0.66 U	0.66 U	0.27 U	0.27 U	0.20 U	0.20 UJ	0.66 U
cis-1,2-Dichloroethane	24.3	2.1	1.2	3.3	4.4	0.50 U	0.50 U	1.2 U
Ethylbenzene								
m-p-Xylenes								
Methylene Chloride								
o-Xylene								
Tetrachloroethane	0.37 U	0.37 U	0.37 U	0.44 U	0.44 U	0.40 U	0.40 U	0.37 U
Toluene								
Total 1,2-Dichloroethane	26.1	2.1	1.2	4.7	4.4	0.5 U	0.5 U	0.8 U
Total Chlorinated VOCs	142.5	37.3	11.5	56.41	73.9	0.17	0.2 U	0.37 U
Total Xylenes								
trans-1,2-Dichloroethane	1.8 J	0.8 U	0.8 U	1.4	0.51 U	0.50 U	0.50 U	0.8 U
Trichloroethane	88.8	10.2	2.2	17.4	29.7	0.17 J	0.40 UJ	0.49 U
Vinyl Chloride	0.49 U	0.49 U	0.49 U	0.83 U	0.83 U	0.60 U	0.60 UJ	0.49 U
Miscellaneous Parameters								
Salinity (g/kg)	14.1					14.1	2.25	21.7

TABLE 2-5
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION	P07-25 P07-25-NWG-052405 P07-25 GW NORMAL 20050524	P07-26 P07-26-NWG-022703 P07-26NWG022703 GW NORMAL 20030227	P07-26 P07-26-NWG-121803 P07-26NWG121803 GW NORMAL 20031218	P07-26 P07-26-NWG-082504 P07-26 GW NORMAL 20040825	P07-26 P07-26-NWG-052405 P07-26 GW NORMAL 20050524	P07-27 P07-27-NWG-022703 P07-27NWG022703 GW NORMAL 20030227	P07-27 P07-27-NWG-121803 P07-27NWG121803 GW NORMAL 20031218	P07-27 P07-27-NWG-082504 P07-27 GW NORMAL 20040825
Volatle Organics (ug/L)								
1,1,2,2-Tetrachloroethane	0.5 U	0.20 U	0.20 U	0.5 U	0.5 U	0.20 UJ	0.20 U	0.5 U
1,1,2-Trichloroethane	0.61 U	0.40 U	0.40 U	0.61 U	0.61 U	0.40 UJ	0.40 U	0.61 U
1,1-Dichloroethane	0.73 U	0.60 U	0.60 U	0.73 U	0.73 U	0.60 UJ	0.60 U	0.73 U
1,2-Dichloroethane	0.41 U	0.20 U	0.20 UJ	0.41 U	0.41 U	0.20 UJ	0.20 UJ	0.41 U
Acetone								
Benzene	0.36 U	0.30 U	0.30 U	0.36 U	0.36 U	0.30 UJ	0.30 U	0.36 U
BTEX	0.36 U	0.3 U	0.3 U	0.36 U	0.36 U	0.3 U	0.3 U	0.36 U
Carbon Disulfide								
Chloroform	0.66 U	0.20 U	0.20 UJ	0.66 U	0.66 U	0.20 UJ	0.20 UJ	0.66 U
cis-1,2-Dichloroethene	1.2 U	0.50 U	0.50 U	1.2 U	1.2 U	0.50 UJ	0.50 U	1.2 U
Ethylbenzene								
m+p-Xylenes								
Methylene Chloride								
o-Xylene								
Tetrachloroethene	0.37 U	0.40 U	0.40 U	0.37 U	0.37 U	0.40 UJ	0.40 U	0.37 U
Toluene								
Total 1,2-Dichloroethene	0.8 U	0.5 U	0.5 U	0.8 U	0.8 U	0.5 U	0.5 U	0.8 U
Total Chlorinated VOCs	0.37 U	0.2 U	0.2 U	0.37 U	0.37 U	0.2 U	0.2 U	0.37 U
Total Xylenes								
trans-1,2-Dichloroethene	0.8 U	0.50 U	0.50 U	0.8 U	0.8 U	0.50 UJ	0.50 U	0.8 U
Trichloroethene	0.49 U	0.40 U	0.40 UJ	0.49 U	0.49 U	0.40 UJ	0.40 UJ	0.49 U
Vinyl Chloride	0.49 UJ	0.60 U	0.60 UJ	0.49 U	0.49 UJ	0.60 UJ	0.60 UJ	0.49 U
Miscellaneous Parameters								
Salinity (g/kg)	17.8	17.4	19.9	24.8	24.8	20.3	22.6	30.6

TABLE 2-5
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION	P07-27 P07-27-NWVG-052405 GW NORMAL 20050524	P07-28 P07-28-NWVG-022703 GW NORMAL 20030227	P07-28 P07-28-NWVG-121903 GW NORMAL 20031219	P07-28 P07-28-NWVG-082504 GW NORMAL 20040825	P07-28 P07-28-NWVG-052405 GW NORMAL 20050524	P07-29 P07-29-NWVG-022703 GW NORMAL 20030227	P07-29 P07-29-NWVG-121803 GW NORMAL 20031218	P07-29 P07-29-NWVG-082504 GW NORMAL 20040825
Volatiles Organics (ug/L)								
1,1,2,2-Tetrachloroethane	0.5 U	0.20 U	0.20 U	0.5 U	0.5 U	0.20 U	0.20 U	0.5 U
1,1,2-Trichloroethane	0.61 U	0.40 U	0.40 U	0.61 U	0.61 U	0.40 U	0.40 U	0.61 U
1,1-Dichloroethane	0.73 U	0.60 U	0.60 U	0.73 U	0.73 U	0.60 U	0.60 U	0.73 U
1,2-Dichloroethane	0.41 U	0.20 U	0.20 U	0.41 U	0.41 U	0.20 U	0.20 U	0.41 U
Acetone								
Benzene	0.36 U	0.30 U	0.30 U	0.36 U	0.36 U	0.30 U	0.30 U	0.36 U
BTEX	0.36 U	0.3 U	0.3 U	0.36 U	0.36 U	0.3 U	0.3 U	0.36 U
Carbon Disulfide								
Chloroform	0.66 U	0.20 U	0.20 U	0.66 U	0.66 U	0.20 U	0.20 U	0.66 U
cis-1,2-Dichloroethane	1.2 U	0.50 U	0.50 U	1.2 U	1.2 U	0.50 U	0.50 U	1.2 U
Ethylbenzene								
m-p-Xylenes								
Methylene Chloride								
o-Xylene								
Tetrachloroethene	0.37 U	0.40 U	0.40 U	0.37 U	0.37 U	0.40 U	0.40 U	0.37 U
Toluene								
Total 1,2-Dichloroethene	0.8 U	0.5 U	0.5 U	0.8 U	0.8 U	0.5 U	0.5 U	0.8 U
Total Chlorinated VOCs	0.37 U	0.16	0.2 U	0.37 U	0.37 U	0.2 U	0.2 U	0.37 U
Total Xylenes								
trans-1,2-Dichloroethene	0.8 U	0.50 U	0.50 U	0.8 U	0.8 U	0.50 U	0.50 U	0.8 U
Trichloroethene	0.49 U	0.16 U	0.40 U	0.49 U	0.49 U	0.40 U	0.40 U	0.49 U
Vinyl Chloride	0.49 U	0.60 U	0.60 U	0.49 U	0.49 U	0.60 U	0.60 U	0.49 U
Miscellaneous Parameters								
Salinity (g/kg)	23.2	19.3	20.2	36.7	24.8	15.4	17.2	29

TABLE 2-5
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION SAMPLE MATRIX SACODE SAMPLE DATE	P07-29 P07-29- GW NORMAL 20050524	P07-30 P07-30-NWG-022703-AVG P07-30-NWG-022703-AVG	P07-30 P07-30-NWG-022703-D P07-30FDWG022703	P07-30 P07-30-NWG-022703 GW ORIG 20030227	P07-30 P07-30-NWG-121803-AVG P07-30NWG-121803-AVG	P07-30 P07-30-NWG-121803-D PZ07-30FDWG121803	P07-30 P07-30-NWG-121803-D P07-30NWG121803 GW ORIG 20031218
Volatile Organics (ug/L)							
1,1,2,2-Tetrachloroethane	0.5 U	0.20 U	0.20 U	0.20 U	0.21 J	0.32 J	0.20 UJ
1,1,2-Trichloroethane	0.61 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U
1,1-Dichloroethane	0.73 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U
1,2-Dichloroethane	0.41 U	0.20 U	0.20 U	0.20 U	0.20 UJ	0.20 UJ	0.20 UJ
Acetone							
Benzene	0.36 U	0.30 U	0.30 U	0.30 U	0.30 U	0.30 U	0.30 U
BTEX	0.36 U	0.30 U	0.3 U	0.3 U	0.30 U	0.3 U	0.3 U
Carbon Disulfide							
Chloroform	0.66 U	0.20 U	0.20 U	0.20 U	0.20 UJ	0.20 UJ	0.20 UJ
cis-1,2-Dichloroethane	1.2 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Ethylbenzene							
m+p-Xylenes							
Methylene Chloride							
o-Xylene							
Tetrachloroethene	0.37 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U
Toluene							
Total 1,2-Dichloroethene	0.8 U	0.50 U	0.5 U	0.5 U	0.50 U	0.5 U	0.5 U
Total Chlorinated VOCs	0.37 U	0.20 U	0.2 U	0.2 U	0.41	0.72	0.2 U
Total Xylenes							
trans-1,2-Dichloroethene	0.8 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Trichloroethene	0.49 U	0.40 UJ	0.40 UJ	0.40 U	0.30 J	0.40 J	0.40 UJ
Vinyl Chloride	0.49 UJ	0.60 U	0.60 U	0.60 U	0.60 UJ	0.60 UJ	0.60 UJ
Miscellaneous Parameters							
Salinity (g/kg)	21.7	24.75	24.5	25	24.9	25.2	24.6

TABLE 2-5
 SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION	P07-30 P07-30-NWG-082504 P07-30 GW NORMAL 20040825	P07-30 P07-30-NWG-052405 P07-30 GW NORMAL 20050524	P07-31 P07-31-NWG-022703 P07-31NWG022703 GW NORMAL 20030227	P07-31 P07-31-NWG-121803 P07-31NWG121803 GW NORMAL 20031218	P07-31 P07-31-NWG-082504 P07-31 GW NORMAL 20040825	P07-31 P07-31-NWG-121803 P07-31NWG121803 GW NORMAL 20031218	P07-32 P07-32-NWG-022703 P07-32NWG022703 GW NORMAL 20030227	P07-32 P07-32-NWG-121803 P07-32NWG121803 GW NORMAL 20031218
Volatile Organics (ug/L)								
1,1,2,2-Tetrachloroethane	0.5 U	0.5 U	0.20 UJ	0.20 U	0.5 U	0.20 U	0.20 U	0.20 U
1,1,2-Trichloroethane	0.61 U	0.61 U	0.40 UJ	0.40 U	0.61 U	0.40 U	0.40 U	0.40 U
1,1-Dichloroethane	0.73 U	0.73 U	0.60 UJ	0.60 U	0.73 U	0.60 U	0.60 U	0.60 U
1,2-Dichloroethane	0.41 U	0.41 U	0.20 UJ	0.20 UJ	0.41 U	0.20 U	0.20 U	0.20 UJ
Acetone								
Benzene	0.36 U	0.36 U	0.30 UJ	0.30 U	0.36 U	0.30 U	0.30 U	0.30 U
BTEX	0.36 U	0.36 U	0.3 U	0.3 U	0.36 U	0.3 U	0.3 U	0.3 U
Carbon Disulfide								
Chloroform	0.66 U	0.66 U	0.20 UJ	0.20 UJ	0.66 U	0.20 U	0.20 U	0.20 UJ
cis-1,2-Dichloroethane	1.2 U	1.2 U	0.50 UJ	0.50 U	1.2 U	0.50 U	0.50 U	0.50 U
Ethylbenzene								
m+p-Xylenes								
Methylene Chloride								
o-Xylene								
Tetrachloroethane	0.37 U	0.37 U	0.40 UJ	0.40 U	0.37 U	0.40 U	0.40 U	0.40 U
Toluene								
Total 1,2-Dichloroethane	0.8 U	0.8 U	0.5 U	0.5 U	0.8 U	0.5 U	0.5 U	0.5 U
Total Chlorinated VOCs	0.37 U	0.36 U	0.2 U	0.2 U	0.37 U	0.2 U	0.2 U	0.2 U
Total Xylenes								
trans-1,2-Dichloroethane	0.8 U	0.8 U	0.50 UJ	0.50 U	0.8 U	0.50 U	0.50 U	0.50 U
Trichloroethane	0.49 U	0.49 U	0.40 UJ	0.40 UJ	0.49 U	0.40 UJ	0.40 UJ	0.40 UJ
Vinyl Chloride	0.49 U	0.49 UJ	0.60 UJ	0.60 UJ	0.49 U	0.60 UJ	0.60 U	0.60 UJ
Miscellaneous Parameters								
Salinity (g/kg)	34.3	30.2	21.3	25.3	36.2	25	24.7	16.5

TABLE 2-5
 SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
 NORTH KINGSTON, RHODE ISLAND
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LOCATION NSAMPLE MATRIX SACODE SAMPLE DATE	P07-32 P07-32-NWG-082504 P07-32 GW NORMAL 20040825	P07-32 P07-32-NWG-052405 P07-32 GW NORMAL 20050524	P07-33 P07-33-NWG-022703 P07-33NWG022703 GW NORMAL 20030227	P07-33 P07-33-NWG-121803 P07-33NWG121803 GW NORMAL 20031218	P07-33 P07-33-NWG-082504 P07-33 GW NORMAL 20040825	P07-33 P07-33-NWG-052405 P07-33 GW NORMAL 20050524
Volatile Organics (ug/L)						
1,1,2,2-Tetrachloroethane	0.5 U	0.5 U	0.20 UJ	0.20 U	0.5 U	0.5 U
1,1,2-Trichloroethane	0.61 U	0.61 U	0.40 UJ	0.40 U	0.61 U	0.61 U
1,1-Dichloroethane	0.73 U	0.73 U	0.60 UJ	0.60 U	0.73 U	0.73 U
1,2-Dichloroethane	0.41 U	0.41 U	0.20 UJ	0.20 UJ	0.41 U	0.41 U
Acetone						
Benzene	0.36 U	0.36 R	0.30 UJ	0.30 U	0.36 U	0.36 U
BTEX	0.36 U	0.36 U	0.3 U	0.3 U	0.36 U	0.36 U
Carbon Disulfide						
Chloroform	0.66 U	0.66 U	0.20 UJ	0.20 UJ	0.66 U	0.66 U
cis-1,2-Dichloroethane	1.2 U	1.2 U	0.50 UJ	0.50 U	1.2 U	1.2 U
Ethylbenzene						
m+p-Xylenes						
Methylene Chloride						
o-Xylene						
Tetrachloroethane	0.37 U	0.37 U	0.40 UJ	0.40 U	0.37 U	0.37 U
Toluene						
Total 1,2-Dichloroethane	0.8 U	0.8 U	0.5 U	0.5 U	0.8 U	0.8 U
Total Chlorinated VOCs	0.37 U	0.37 U	0.2 U	0.2 U	0.37 U	0.37 U
Total Xylenes						
trans-1,2-Dichloroethane	0.8 U	0.8 U	0.50 UJ	0.50 U	0.8 U	0.8 U
Trichloroethane	0.49 U	0.49 U	0.40 UJ	0.40 UJ	0.49 U	0.49 U
Vinyl Chloride	0.49 U	0.49 U	0.60 UJ	0.60 UJ	0.49 U	0.49 UJ
Miscellaneous Parameters						
Salinity (g/kg)	2.4	27.4	20.4	16.5	33.3	24.7

TABLE 2-6
 SUMMARY OF CHEMICALS DETECTED IN SURFACE WATER
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION NSAMPLE SAMPLE MATRIX SACODE SAMPLE DATE	MW07-AH1 MW07-AH1NSW122195 MW07-AH1NSW122195 NORMAL 19951221	MW07-NB1 MW07-NB1NSW122295 MW07-NB1NSW122295 NORMAL 19951222	SW07-04 SW07-04-NPW-082404 SW07-04 NORMAL 20040824	SW07-04 SW07-04-NPW-102704 SW07-04 NORMAL 20041027	SW07-04 SW07-04-NPW-111604 SW07-04 NORMAL 20041116	SW07-04 SW07-04-NPW-011905 SW07-04 NORMAL 20050119	SW07-04 SW07-04-NPW-032305 SW07-04 NORMAL 20050323
Volatile Organics (ug/L)							
1,1,2,2-TETRACHLOROETHANE	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-TRICHLOROETHANE	10 U	10 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U
CIS-1,2-DICHLOROETHENE			1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
TOTAL 1,2-DICHLOROETHENE	10 U	10 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
TOTAL CHLORINATED VOCS	10 U	10 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
TRANS-1,2-DICHLOROETHENE			0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
TRICHLOROETHENE	10 U	10 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U
VINYL CHLORIDE	10 U	10 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U

TABLE 2-6
SUMMARY OF CHEMICALS DETECTED IN SURFACE WATER
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION NSAMPLE SAMPLE MATRIX SACODE SAMPLE DATE	SW07-04 SW07-04-NPW-042105 SW07-04 SW NORMAL 20050421	SW07-04 SW07-04-NPW-052405 SW07-04 SW NORMAL 20050524	SW07-04 SW07-04-NPW-072905 SW07-4 SW NORMAL 20050729	SW07-04 SW07-04-NPW-092805 SW07-04 SW NORMAL 20050928	SW07-04 SW07-04-NPW-112905 SW07-04 SW NORMAL 20051129	SW07-04 SW07-04-NPW-013006 SW07-04 SW NORMAL 20060130	SW07-05 SW07-05-NPW-082404 SW07-05 SW NORMAL 20040824
Volatle Organics (ug/L)							
1,1,2,2-TETRACHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.23 U	0.23 U	0.5 U
1,1,2-TRICHLOROETHANE	0.61 U	0.61 U	0.61 U	0.61 U	0.34 U	0.34 U	0.61 U
CIS-1,2-DICHLOROETHENE	1.2 U	1.2 U	1 U	1 U	0.7 U	0.7 U	1.2 U
TOTAL 1,2-DICHLOROETHENE	0.8 U	0.8 U	0.8 U	0.8 U	0.51 U	0.51 U	0.8 U
TOTAL CHLORINATED VOCS	0.37 U	0.37 U	0.37 U	0.37 U	0.23 U	0.23 U	0.37 U
TRANS-1,2-DICHLOROETHENE	0.8 U	0.8 U	0.8 U	0.8 U	0.51 U	0.51 U	0.8 U
TRICHLOROETHENE	0.49 U	0.49 U	0.49 U	0.49 U	0.26 U	0.26 U	0.49 U
VINYL CHLORIDE	0.49 U	0.49 U	0.49 U	0.49 U	0.83 U	0.83 U	0.49 U

TABLE 2-6
 SUMMARY OF CHEMICALS DETECTED IN SURFACE WATER
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION NSAMPLE SAMPLE MATRIX SACODE SAMPLE DATE	SW07-05 SW07-05-NPW-092805 SW07-05 SW NORMAL 20050928	SW07-05 SW07-05-NPW-112905 SW07-05 SW NORMAL 20051129	SW07-05 SW07-05-NPW-013006 SW07-05 SW NORMAL 20060130	SW07-06 SW07-06-NPW-082404-AVG SW07-06-NPW-082404-AVG SW AVG 20040824	SW07-06 SW07-06-NPW-082404-D SW07-DUP1 SW DUP 20040824	SW07-06 SW07-06-NPW-082404 SW07-06 SW ORIG 20040824	SW07-06 SW07-06-NPW-102704 SW07-06 SW NORMAL 20041027
Volatile Organics (ug/L)							
1,1,2,2-TETRACHLOROETHANE	0.5 U	0.23 U	0.23 U	0.50 U	0.5 U	0.5 U	1.5 J
1,1,2-TRICHLOROETHANE	0.61 U	0.34 U	0.34 U	0.61 U	0.61 U	0.61 U	0.61 U
CIS-1,2-DICHLOROETHENE	1 U	0.7 U	1.4	1.2 U	1.2 U	1.2 U	6.6
TOTAL 1,2-DICHLOROETHENE	0.8 U	0.51 U	1.4	0.80 U	0.8 U	0.8 U	6.6
TOTAL CHLORINATED VOCS	0.37 U	0.23 U	1.4	0.37 U	0.37 U	0.37 U	7.2
TRANS-1,2-DICHLOROETHENE	0.8 U	0.51 U	0.51 U	0.80 U	0.8 U	0.8 U	0.8 U
TRICHLOROETHENE	0.49 U	0.26 U	0.26 U	0.49 U	0.49 U	0.49 U	3.8
VINYL CHLORIDE	0.49 U	0.83 U	0.83 U	0.49 U	0.49 U	0.49 U	1.9 J

TABLE 2-6
SUMMARY OF CHEMICALS DETECTED IN SURFACE WATER
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION NSAMPLE SAMPLE MATRIX SACODE SAMPLE DATE	SW07-06 SW07-06-NPW-112905 SW07-06 SW NORMAL 20051129	SW07-06 SW07-06-NPW-013006 SW07-06 SW NORMAL 20060130	SW07-07 SW07-07-NPW-082404 SW07-07 SW NORMAL 20040824	SW07-07 SW07-07-NPW-102704 SW07-07 SW NORMAL 20041027	SW07-07 SW07-07-NPW-111604 SW07-07 SW NORMAL 20041116	SW07-07 SW07-07-NPW-011905 SW07-07 SW NORMAL 20050119	SW07-07 SW07-07-NPW-032305 SW07-07 SW NORMAL 20050323
Volatile Organics (ug/L)							
1,1,1,2-TETRACHLOROETHANE	0.23 U	0.23 U	0.5 U	0.73 J	0.5 U	3.2	3.3
1,1,2-TRICHLOROETHANE	0.34 U	0.34 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U
CIS-1,2-DICHLOROETHENE	0.7 U	0.98 J	1.2 U	4.2	1.2 U	15.2	16.5
TOTAL 1,2-DICHLOROETHENE	0.51 U	0.98	0.8 U	4.2	0.8 U	15.2	16.5
TOTAL CHLORINATED VOCS	0.23 U	0.98	0.37 U	2.83	0.37 U	7.9	5.7
TRANS-1,2-DICHLOROETHENE	0.51 U	0.51 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
TRICHLOROETHENE	0.26 U	0.26 U	0.49 U	0.49 U	0.49 U	4.7	2.4
VINYL CHLORIDE	0.83 U	0.83 U	0.49 U	2.1	0.49 U	0.49 U	0.49 U

TABLE 2-6
SUMMARY OF CHEMICALS DETECTED IN SURFACE WATER
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION	SW07-07 SW07-07-NPW-042105 SW07-07 NORMAL 20050421	SW07-07 SW07-07-NPW-062405 SW07-07 NORMAL 20050524	SW07-07 SW07-07-NPW-072905 SW07-07 NORMAL 20050729	SW07-07 SW07-07-NPW-092805 SW07-07 NORMAL 20050928	SW07-07 SW07-07-NPW-112905 SW07-07 NORMAL 20051129	SW07-07 SW07-07-NPW-013006 SW07-07 NORMAL 20060130	SW07-08 SW07-08-NPW-082404 SW07-08 NORMAL 20040824
1,1,2,2-TETRACHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.23 U	0.23 U	0.5 U
1,1,2-TRICHLOROETHANE	0.61 U	0.61 U	0.61 U	0.61 U	0.34 U	0.34 U	0.61 U
CIS-1,2-DICHLOROETHENE	5	3.4	1 U	1 U	0.7 U	2.8	1.4 J
TOTAL 1,2-DICHLOROETHENE	5	3.4	0.8 U	0.8 U	0.51 U	2.8	1.4
TOTAL CHLORINATED VOCS	1.2	1.7	0.37 U	0.37 U	0.23 U	3.46	0.37 U
TRANS-1,2-DICHLOROETHENE	0.8 U	0.8 U	0.8 U	0.8 U	0.51 U	0.51 U	0.8 U
TRICHLOROETHENE	0.49 U	0.49 U	0.49 U	0.49 U	0.26 U	0.66 J	0.49 U
VINYL CHLORIDE	1.2 J	1.7 J	0.49 U	0.49 U	0.83 U	0.83 U	0.49 U

TABLE 2-6
SUMMARY OF CHEMICALS DETECTED IN SURFACE WATER
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION NSAMPLE SAMPLE MATRIX SACODE SAMPLE DATE	SW07-08 SW07-08-NPW-102704 SW07-08 SW NORMAL 20041027	SW07-08 SW07-08-NPW-111604 SW07-08 SW NORMAL 20041116	SW07-08 SW07-08-NPW-011905 SW07-08 SW NORMAL 20050119	SW07-08 SW07-08-NPW-032305 SW07-08 SW NORMAL 20050323	SW07-08 SW07-08-NPW-042105 SW07-08 SW NORMAL 20050421	SW07-08 SW07-08-NPW-052405 SW07-08 SW NORMAL 20050524	SW07-08 SW07-08-NPW-072905 SW07-08 SW NORMAL 20050729
Volatile Organics (ug/L)							
1,1,2,2-TETRACHLOROETHANE	2	1.9 J 0.61 U	3.1 0.61 U	4.9 0.61 U	3.2 0.61 U	0.5 UJ 0.61 U	0.5 U 0.61 U
1,1,2-TRICHLOROETHANE		8.2	13.5	21.7	20	8.7	1 U
CIS-1,2-DICHLOROETHENE	12.05	8.2	13.5	21.7	21.6	8.7	0.8 U
TOTAL 1,2-DICHLOROETHENE	8	6.1	10.3	15.6	10	3.6	0.37 U
TOTAL CHLORINATED VOCS	0.95 J	0.8 U	0.8 U	0.8 U	1.6 J	0.8 U	0.8 U
TRANS-1,2-DICHLOROETHENE	1.7 J	2.4	7.2	10.7	3.4	0.49 U	0.49 U
TRICHLOROETHENE		1.8 J	0.49 U	0.49 U	3.4	3.6	0.49 U
VINYL CHLORIDE	4.3						

TABLE 2-6
SUMMARY OF CHEMICALS DETECTED IN SURFACE WATER
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION	SW07-08 SW07-08-NPW-092805 SW07-08 SW NORMAL 20050928	SW07-08 SW07-08-NPW-112905 SW07-08 SW NORMAL 20051129	SW07-08 SW07-08-NPW-013006 SW07-08 SW NORMAL 20060130	SW07-09 SW07-09-NPW-082404 SW07-09 SW NORMAL 20040824	SW07-09 SW07-09-NPW-102704-AVG SW07-09-NPW-102704-AVG SW AVG 20041027	SW07-09 SW07-09-NPW-102704-D SW07-DUP 1 SW DUP 20041027	SW07-09 SW07-09-NPW-102704 SW ORIG 20041027
Volatile Organics (ug/L)							
1,1,1,2-TETRACHLOROETHANE	1.3	0.23 U	2	0.5 U	10.3	10.1	10.5
1,1,2-TRICHLOROETHANE	0.61 U	0.34 U	0.34 U	0.61 U	2.4	2.3	2.5
CIS-1,2-DICHLOROETHENE	6.7	0.7 U	9.5	1.2 U	56.2 J	54.8	57.6 J
TOTAL 1,2-DICHLOROETHENE	7.55	0.51 U	9.5	0.8 U	62.55	61.1	64
TOTAL CHLORINATED VOCS	9	0.23 U	13.94	0.37 U	68.65	66.4	70.9
TRANS-1,2-DICHLOROETHENE	0.85 J	0.51 U	0.51 U	0.8 U	6.35	6.3	6.4
TRICHLOROETHENE	5.7	0.26 U	1.5	0.49 U	45.65	44.3	47
VINYL CHLORIDE	2	0.83 U	0.94 J	0.49 U	10.3	9.7	10.9

TABLE 2-6
 SUMMARY OF CHEMICALS DETECTED IN SURFACE WATER
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION NSAMPLE SAMPLE MATRIX SACODE SAMPLE DATE	SW07-09 SW07-09-NPW-111604-AVG SW07-09-NPW-111604-AVG SW AVG 20041116	SW07-09 SW07-09-NPW-111604-D SW07-DUP1 SW DUP 20041116	SW07-09 SW07-09-NPW-111604 SW ORIG 20041116	SW07-09 SW07-09-NPW-011905-AVG SW07-09-NPW-011905-AVG SW AVG 20050119	SW07-09 SW07-09-NPW-011905-D SW07-DUP1 SW DUP 20050119	SW07-09 SW07-09-NPW-011905 SW ORIG 20050119
Volatile Organics (ug/L)						
1,1,2,2-TETRACHLOROETHANE	4.1 J 0.61 U	5.1 J 0.61 U	3.1 J 0.61 U	4.8 0.61 U	4.6 0.61 U	5 0.61 U
1,1,2-TRICHLOROETHANE	15.75 J	19.3 J	12.2 J	18.15	18	18.3
CIS-1,2-DICHLOROETHENE	16.8	21.4	12.2	20.05	19.8	20.3
TOTAL 1,2-DICHLOROETHENE	18.7	25.3	12.1	21.05	19.6	22.5
TOTAL CHLORINATED VOCS	1.25 J	2.1 J	0.8 UJ	1.9 J	1.8 J	2
TRANS-1,2-DICHLOROETHENE	13.15 J	17.3 J	9 J	16.25	15	17.5
TRICHLOROETHENE	1.5725 J	2.9 J	0.49 UJ	0.49 U	0.49 U	0.49 U
VINYL CHLORIDE						

TABLE 2-6
 SUMMARY OF CHEMICALS DETECTED IN SURFACE WATER
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
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LOCATION NSAMPLE SAMPLE MATRIX SACODE SAMPLE DATE	SW07-09 SW07-09-NPW-032305-AVG SW07-09-032305-AVG SW AVG 20050323	SW07-09 SW07-09-NPW-032305-D SW07-DUP-1 SW DUP 20050323	SW07-09 SW07-09-NPW-032305 SW ORIG 20050323	SW07-09 SW07-09-NPW-042105 SW NORMAL 20050421	SW07-09 SW07-09-NPW-052405-AVG SW AVG 20050524	SW07-09 SW07-09-NPW-052405-D SW07-DUP1 SW DUP 20050524
Volatile Organics (ug/L)						
1,1,2,2-TETRACHLOROETHANE	4.85	5.4	4.3	3.1	5 J	4.8 J
1,1,2-TRICHLOROETHANE	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U
CIS-1,2-DICHLOROETHENE	30.5	33	28	26.1	67 J	64.1
TOTAL 1,2-DICHLOROETHENE	30.5	33	28	29	73.5	70.3
TOTAL CHLORINATED VOCS	14	15.6	12.4	16.2	41	39.8
TRANS-1,2-DICHLOROETHENE	0.80 U	0.8 U	0.8 U	2.9	6.5 J	6.2
TRICHLOROETHENE	9.15	10.2	8.1	10.1	24.05 J	24
VINYL CHLORIDE	0.49 U	0.49 U	0.49 U	3	11.95 J	11

TABLE 2-6
SUMMARY OF CHEMICALS DETECTED IN SURFACE WATER
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
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LOCATION NSAMPLE SAMPLE MATRIX SACODE SAMPLE DATE	SW07-09 SW07-09-NPW-052405 SW ORIG 20050524	SW07-09 SW07-09-NPW-072905-AVG SW07-09-NPW-072905-AVG SW AVG 20050729	SW07-09 SW07-09-NPW-072905-D SW07-FD2 SW DUP 20050729	SW07-09 SW07-09-NPW-072905 SW ORIG 20050729	SW07-09 SW07-09-NPW-092805-AVG SW07-09-NPW-092805-AVG SW AVG 20050928	SW07-09 SW07-09-NPW-092805-D SW DUP 20050928
<i>Volatile Organics (ug/L)</i>						
1,1,2,2-TETRACHLOROETHANE	5.2 J	0.50 U	0.5 U	0.5 U	0.50 U	0.5 U
1,1,2-TRICHLOROETHANE	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U
CIS-1,2-DICHLOROETHENE	69.9 J	2.2 J	3.9 J	1 UJ	2.9	3.1
TOTAL 1,2-DICHLOROETHENE	76.7	2.15	3.9	0.8 U	2.9	3.1
TOTAL CHLORINATED VOCS	42.2	1.0425	1.9	0.37 U	3.1	3.1
TRANS-1,2-DICHLOROETHENE	6.8 J	0.80 U	0.8 U	0.8 U	0.80 U	0.8 U
TRICHLOROETHENE	24.1 J	1.0725 J	1.9 J	0.49 UJ	1.75	1.8
VINYL CHLORIDE	12.9 J	0.49 U	0.49 U	0.49 U	1.35	1.3

TABLE 2-6
SUMMARY OF CHEMICALS DETECTED IN SURFACE WATER
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION NSAMPLE SAMPLE MATRIX SACODE SAMPLE DATE	SW07-09 SW07-09-NPW-092805 SW07-09 ORIG 20050928	SW07-09 SW07-09-NPW-112905-D SW07-DUP1 DUP 20051129	SW07-09 SW07-09-NPW-112905 SW07-09 ORIG 20051129	SW07-09 SW07-09-NPW-013006-AVG SW07-09-NPW-013006-AVG SW AVG 20060130	SW07-09 SW07-09-NPW-013006-D SW07-DUP DUP 20060130	SW07-09 SW07-09-NPW-013006 SW ORIG 20060130
Volatile Organics (ug/L)						
1,1,2,2-TETRACHLOROETHANE	0.5 U	0.23 UJ	1.1 J	2.7	2.6	2.8
1,1,2-TRICHLOROETHANE	0.61 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
CIS-1,2-DICHLOROETHENE	2.7	3.7	2.9	12.7	12.5	12.9
TOTAL 1,2-DICHLOROETHENE	2.7	3.7	2.9	12.7	12.5	12.9
TOTAL CHLORINATED VOCS	3.1	6.9	8	22.8075	22.2	23
TRANS-1,2-DICHLOROETHENE	0.8 U	0.51 U	0.51 U	0.51 U	0.51 U	0.51 U
TRICHLOROETHENE	1.7	3.2	4	6.7	6.1	7.3
VINYL CHLORIDE	1.4	0.83 U	0.83 U	0.7075 J	1 J	0.83 UJ

TABLE 2-6
SUMMARY OF CHEMICALS DETECTED IN SURFACE WATER
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION NSAMPLE SAMPLE MATRIX SACODE SAMPLE DATE	SW07-10 SW07-10-NPW-082404 SW07-10 SW NORMAL 20040824	SW07-10 SW07-10-NPW-102704 SW07-10 SW NORMAL 20041027	SW07-10 SW07-10-NPW-111604 SW07-10 SW NORMAL 20041116	SW07-10 SW07-10-NPW-011905 SW07-10 SW NORMAL 20050119	SW07-10 SW07-10-NPW-032305 SW07-10 SW NORMAL 20050323	SW07-10 SW07-10-NPW-042105-AVG SW07-10-NPW-042105-AVG SW AVG 20050421	SW07-10 SW07-10-NPW-042105-D SW07-DUP1 SW DUP 20050421
Volatle Organics (ug/L)							
1,1,2,2-TETRACHLOROETHANE	0.5 U	1.7 J	0.5 U	2.4	0.5 U	0.50 U	0.5 U
1,1,2-TRICHLOROETHANE	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U
CIS-1,2-DICHLOROETHENE	1.2 U	9.6	1.2 U	11.7	6	6.5 J	8.9 J
TOTAL 1,2-DICHLOROETHENE	0.8 U	10.7	0.8 U	11.7	6	6.5	8.9
TOTAL CHLORINATED VOCS	0.37 U	8.9	0.37 U	10.9	0.37 U	1.775	2.45
TRANS-1,2-DICHLOROETHENE	0.8 U	1.1 J	0.8 U	0.8 U	0.8 U	0.80 U	0.8 U
TRICHLOROETHENE	0.49 U	5.1	0.49 U	8.5	0.49 U	1.35 J	1.6 J
VINYL CHLORIDE	0.49 U	2.1	0.49 U	0.49 U	0.49 U	0.5475 J	0.85 J

TABLE 2-6
SUMMARY OF CHEMICALS DETECTED IN SURFACE WATER
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION	SW07-10 SW07-10-NPW-042105	SW07-10 SW07-10-NPW-052405	SW07-10 SW07-10-NPW-072905	SW07-10 SW07-10-NPW-092805	SW07-10 SW07-10-NPW-112905	SW07-10 SW07-10-NPW-013006	SW07-24 SW07-24-NPW-082404
NSAMPLE							
MATRIX	SW ORIG 20050421	SW NORMAL 20050524	SW NORMAL 20050729	SW NORMAL 20050928	SW NORMAL 20051129	SW NORMAL 20060130	SW NORMAL 20040824
SACODE							
SAMPLE DATE							
Volatile Organics (ug/L)							
1,1,2,2-TETRACHLOROETHANE	0.5 U	0.5 UJ	0.5 U	0.5 U	0.23 U	11.9	0.5 U
1,1,2-TRICHLOROETHANE	0.61 U	0.61 U	0.61 U	0.61 U	0.34 U	3	0.61 U
CIS-1,2-DICHLOROETHENE	4.1 J	3.2	2.4	1 U	5.1	56	1.2 U
TOTAL 1,2-DICHLOROETHENE	4.1	3.2	2.4	0.8 U	5.1	61.7	0.8 U
TOTAL CHLORINATED VOCS	1.1	2.06	0.37 U	0.54	8.2	124.4	0.37 U
TRANS-1,2-DICHLOROETHENE	0.8 U	0.8 U	0.8 U	0.8 U	0.51 U	5.7	0.8 U
TRICHLOROETHENE	1.1 J	1.3 J	0.49 U	0.54 J	3.1	43.7	0.49 U
VINYL CHLORIDE	0.49 UJ	0.76 J	0.49 U	0.49 U	0.83 U	4.1	0.49 U

TABLE 2-6
 SUMMARY OF CHEMICALS DETECTED IN SURFACE WATER
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION NSAMPLE SAMPLE MATRIX SACODE SAMPLE DATE	SW07-24 SW07-24-NPW-102704 SW07-24 SW NORMAL 20041027	SW07-24 SW07-24-NPW-111604 SW07-24 SW NORMAL 20041116	SW07-24 SW07-24-NPW-011905 SW07-24 SW NORMAL 20050119	SW07-24 SW07-24-NPW-032305 SW07-24 SW NORMAL 20050323	SW07-24 SW07-24-NPW-042105 SW07-24 SW NORMAL 20050421	SW07-24 SW07-24-NPW-052405 SW07-24 SW NORMAL 20050524	SW07-24 SW07-24-NPW-072905 SW07-24 SW NORMAL 20050729
Volatlie Organics (ug/L)							
1,1,2,2-TETRACHLOROETHANE	0.5 U	0.5 U	2.5	0.5 U	0.5 U	0.5 UJ	0.5 U
1,1,2-TRICHLOROETHANE	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U
CIS-1,2-DICHLOROETHENE	1.2 J	1.2 U	10.2	6.9	4.4	11.6	1 U
TOTAL 1,2-DICHLOROETHENE	1.2	0.8 U	10.2	6.9	4.4	12.7	0.8 U
TOTAL CHLORINATED VOCS	0.37 U	0.37 U	11.3	0.37 U	0.37 U	8.4	0.37 U
TRANS-1,2-DICHLOROETHENE	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	1.1 J	0.8 U
TRICHLOROETHENE	0.49 U	0.49 U	8.8	0.49 U	0.49 U	5.9	0.49 U
VINYL CHLORIDE	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	2.5	0.49 U

TABLE 2-6
SUMMARY OF CHEMICALS DETECTED IN SURFACE WATER
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION	SW07-24 SW07-24-NPW-092805	SW07-24 SW07-24-NPW-112905	SW07-24 SW07-24-NPW-013006
NSAMPLE	SW07-24 SW07-24	SW07-24 SW07-24	SW07-24 SW07-24
SAMPLE MATRIX	SW NORMAL	SW NORMAL	SW NORMAL
SACODE	20050928	20051129	20060130
SAMPLE DATE			
Volatile Organics (ug/L)			
1,1,2,2-TETRACHLOROETHANE	0.5 U	0.23 U	0.23 U
1,1,2-TRICHLOROETHANE	0.61 U	0.34 U	0.34 U
CIS-1,2-DICHLOROETHENE	1 U	5.3	2.2
TOTAL 1,2-DICHLOROETHENE	0.8 U	5.3	2.2
TOTAL CHLORINATED VOCS	0.37 U	6.8	2.2
TRANS-1,2-DICHLOROETHENE	0.8 U	0.51 U	0.51 U
TRICHLOROETHENE	0.49 U	1.5	0.26 U
VINYL CHLORIDE	0.49 U	0.83 U	0.83 U

TABLE 2-7
 SUMMARY OF CHEMICALS DETECTED IN SEDIMENT
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
 NORTH KINGSTON, RHODE ISLAND
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LOCATION SAMPLE ID MATRIX SACODE SAMPLE DATE TOP DEPTH BOTTOM DEPTH DEPTH UNIT	SED07-05 SED07-05-NSD-022803 SD ORIG 20030228 0 0.5 FT	SED07-05 SED07-05-NSD-022803-AVG SD AVG 20030228 0 FT	SED07-05 SED07-05-NSD-022803-D SD DUP 20030228 0 0.5 FT	SED07-06 SED07-06-NSD-052202 SD ORIG 20020522 0 0.5 FT	SED07-06 SED07-06-NSD-052202-AVG SD AVG 20020522 0 0.5 FT
Volatle Organics (ug/kg)					
1,1,2,2-Tetrachloroethane	6 U	5.5 U	5 U	4 U	4.5 UJ
1,1,2-Trichloroethane	6 U	5.5 U	5 U	4 U	4.5 U
1,2-Dichloroethane	6 U	5.5 U	5 U	4 U	4.5 U
Acetone				10	10
Benzene	6 U	5.5 U	5 U	4 U	4.5 U
BTEX	6 U	5.5 U	5 U	4 U	4.5 U
Carbon Disulfide				1 J	1 J
cis-1,2-Dichloroethane	6 U	1 J	1 J	4 U	4.5 U
Total 1,2-Dichloroethane	6 U	1	1	4 U	4.5 U
Total Chlorinated VOCs	6 U	5.5 U	5 U	4 U	4.5 U
trans-1,2-Dichloroethane	6 U	5.5 U	5 U	4 U	4.5 U
Trichloroethane	6 U	5.5 U	5 U	4 U	4.5 U
Vinyl Chloride	6 U	5.5 U	5 U	4 U	4.5 U
Inorganics (mg/kg)					
Aluminum	2300	2450	2600		
Antimony	0.37 UJ	0.34 UJ	0.31 UJ		
Arsenic	1.2 J	1.4 J	1.6		
Beryllium	0.39 U	0.385 U	0.38 U		
Chromium	4.3	4.6	4.9		
Copper					
Iron	5200	5550	5900		
Lead	3.2 J	3.25 J	3.3 J		
Manganese	52	55	58		
Mercury					
Nickel	9.1 U	7.775	11		
Zinc					
Miscellaneous Parameters					
Total Inorganic Carbon (mg/kg)					
Total Organic Carbon (mg/kg)					

TABLE 2-7
 SUMMARY OF CHEMICALS DETECTED IN SEDIMENT
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION SAMPLE ID MATRIX SACODE SAMPLE DATE TOP DEPTH BOTTOM DEPTH DEPTH UNIT	SED07-06 SED07-06-NSD-052202-D SD DUP 20020522 0 0.5 FT	SED07-06 SED07-06-NSD-052505 SD NORMAL 20050525 0 0.5 FT	SED07-07 SED07-07NSD-022803 SD NORMAL 20030228 0 0.5 FT	SED07-07 SED07-07NSD-052202 SD NORMAL 20020522 0 0.5 FT	SED07-07 SED07-07NSD-052505 SD NORMAL 20050525 0 0.5 FT	SED07-07 SED07-07NSD-081704 SD NORMAL 20040817 0 0.5 FT
Volatile Organics (ug/kg)						
1,1,2,2-Tetrachloroethane	5 U	0.3 U	5 U	7 U	0.41 U	0.21 U
1,1,2-Trichloroethane	5 U	0.15 U	5 U	7 U	0.21 U	0.11 U
1,2-Dichloroethane	5 U	0.13 U	5 U	7 U	0.17 U	0.091 U
Acetone	14 U			20		
Benzene	5 U	0.12 U	5 U	7 U	0.16 U	0.065 U
BTEX	5 U	0.12 U	5 U	7 U	0.16 U	0.085 U
Carbon Disulfide	5 U			1 J		
cis-1,2-Dichloroethane	5 U	22.3	3 J	7 U	53	0.61 J
Total 1,2-Dichloroethane	5 U	28.6	8	7 U	63.3	1.21
Total Chlorinated VOCs	5 U	4.4	5 U	7 U	0.17 U	0.091 U
trans-1,2-Dichloroethane	5 U	6.3	5	7 U	10.3	0.6 J
Trichloroethane	5 U	0.2 U	5 U	7 U	0.27 U	0.14 U
Vinyl Chloride	5 U	4.4	5 U	7 U	0.4 U	0.21 U
Inorganics (mg/kg)						
Aluminum						
Antimony						
Arsenic						
Beryllium						
Chromium						
Copper						
Iron						
Lead						
Manganese						
Mercury						
Nickel						
Zinc						
Miscellaneous Parameters						
Total Inorganic Carbon (mg/kg)						
Total Organic Carbon (mg/kg)						

TABLE 2-7
 SUMMARY OF CHEMICALS DETECTED IN SEDIMENT
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
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LOCATION	SED07-08 SED07-08-NSD-052505 SD NORMAL 20050525 0 0.5 FT	SED07-08 SED07-08-NSD-081704 SD NORMAL 20040817 0 0.5 FT	SED07-08 SED07-08-NSD-121903 SD NORMAL 20031219 0 0.5 FT	SED07-09 SED07-09-NSD-022803 SD NORMAL 20030228 0 0.5 FT	SED07-09 SED07-09-NSD-052505 SD ORIG 20050525 0 0.5 FT	SED07-09 SED07-09-NSD-052505-AVG SD AVG 20050525 0 0.5 FT
Volatile Organics (ug/kg)						
1,1,2,2-Tetrachloroethane	0.3 U	0.29 U	5 U	5 U	0.29 U	0.305 U
1,1,2-Trichloroethane	0.16 U	0.15 U	5 U	1 J	0.15 U	2.7875 J
1,2-Dichloroethane	0.13 U	0.13 U	5 U	5 U	0.13 U	0.135 U
Acetone						
Benzene	0.12 U	0.12 U	1 J	5 U	0.12 U	0.125 U
BTEX	0.12 U	0.12 U	1	5 U	0.12 U	0.125 U
Carbon Disulfide						
cis-1,2-Dichloroethene	131	0.31 U	5 U	6	149 J	210 J
Total 1,2-Dichloroethene	158.1	0.31 U	5 U	8	172.1	253.3
Total Chlorinated VOCs	14.6	0.13 U	2 U	1	109.6	148.15
trans-1,2-Dichloroethene	27.1	0.32 U	5 U	2 J	23.1	43.3
Trichloroethene	5.6	0.19 U	2 U	5 U	101 J	126.5 J
Vinyl Chloride	9	0.29 U	5 U	5 U	8.6 J	18.9 J
Inorganics (mg/kg)						
Aluminum					2760	2780
Antimony					0.19 UJ	0.2075 J
Arsenic					2.6	2.6
Beryllium					0.37 J	0.37 J
Chromium					6.1	5.9
Copper					6.7	6.45
Iron					6950	6990
Lead					5.8	5.75
Manganese					60	61.2
Mercury					0.017 J	0.029 J
Nickel					5.5	5.55
Zinc					30.1	30.1
Miscellaneous Parameters						
Total Inorganic Carbon (mg/kg)						
Total Organic Carbon (mg/kg)					8590	8740

TABLE 2-7
 SUMMARY OF CHEMICALS DETECTED IN SEDIMENT
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
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LOCATION SAMPLE ID MATRIX SACODE SAMPLE DATE TOP DEPTH BOTTOM DEPTH DEPTH UNIT	SED07-09 NSD-052505-D SD DUP 20050825 0 0.5 FT	SED07-09 NSD-081704 SD ORIG 20040817 0 0.5 FT	SED07-09 NSD-081704-AVG SD AVG 20040817 0 0.5 FT	SED07-09 NSD-081704-D SD DUP 20040817 0 0.5 FT	SED07-09 NSD-121903 SD ORIG 20031219 0 0.5 FT
Volatiles Organics (ug/kg)					
1,1,2,2-Tetrachloroethane	0.32 U	10.8	9.15	7.5	5 U
1,1,2-Trichloroethane	5.5 J	1.2	1.1	1	5 U
1,2-Dichloroethane	0.14 U	0.1 U	0.10 U	0.1 U	5 U
Acetone					
Benzene	0.13 U	0.097 U	0.095 U	0.093 U	5 U
BTEX	0.13 U	0.097 U	0.095 U	0.093 U	5 U
Carbon Disulfide					
cis-1,2-Dichloroethene	271 J	53.3 J	62.55 J	71.8 J	26
Total 1,2-Dichloroethene	334.5	60.6	72.25	83.9	29
Total Chlorinated VOCs	186.7	52.2	70.7	89.2	70
trans-1,2-Dichloroethene	63.5	7.3	9.7	12.1	3 J
Trichloroethene	152 J	32.6	33.7	34.8	2 U
Vinyl Chloride	29.2 J	7.6	26.75	45.9	70
Inorganics (mg/kg)					
Aluminum	2800	3740	3820	3900	8260 J
Antimony	0.32 J	0.19 UJ	0.19 UJ	0.19 UJ	0.73 U
Arsenic	2.6	3.1	3.1	3.1	2.4 U
Beryllium	0.37 J	0.36 U	0.36 U	0.36 U	0.92 J
Chromium	5.7	7.2	7.5	7.8	15 J
Copper	6.2	8.7	9.1	9.5	
Iron	7030	8740	8970	9200	17000 J
Lead	5.7	5.9	6.15	6.4	11 J
Manganese	62.4	77.5	79.75	82	173 J
Mercury	0.041 J	0.026 J	0.03 J	0.034 J	
Nickel	5.6	11.8	12.3	12.8	14.2 J
Zinc	30.1	24.4	25.2	26	
Miscellaneous Parameters					
Total Inorganic Carbon (mg/kg)	8890	6560	7350	8140	5200
Total Organic Carbon (mg/kg)					

TABLE 2-7
 SUMMARY OF CHEMICALS DETECTED IN SEDIMENT
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION	SED07-09 SED07-09-NSD-121903-AVG SD AVG 20031219 0 FT	SED07-09 SED07-09-NSD-121903-D DUP 20031219 0 0.5 FT	SED07-10 SED07-10-NSD-052202 SD NORMAL 20020522 0 0.5 FT	SED07-10 SED07-10-NSD-052505 SD NORMAL 20031216 0 0.5 FT	SED07-15 SED07-15-NSD--082404 SD NORMAL 20040824 0 0.5 FT
Volatiles Organics (ug/kg)					
1,1,1,2,2-Tetrachloroethane	5.5 U	6 U	6 UJ	0.41 U	5 U
1,1,2-Trichloroethane	5.5 U	6 U	6 UJ	0.21 U	5 U
1,2-Dichloroethane	5.5 U	6 U	6 UJ	0.17 U	5 U
Acetone			12 UJ		
Benzene	5.5 U	6 U	6 UJ	0.16 U	5 U
BTEX	5.5 U	6 U	6 U	0.16 U	5 U
Carbon Disulfide			3 J		
cis-1,2-Dichloroethane	28.5	31	6 U	27.1	1 J
Total 1,2-Dichloroethane	32.5	36	6 U	32	1
Total Chlorinated VOCs	90	110	6 U	0.17 U	1 U
trans-1,2-Dichloroethane	4 J	5 J	6 U	4.9	5 U
Trichloroethane	2 U	2 U	6 UJ	0.27 U	1 U
Vinyl Chloride	90	110	6 UJ	0.4 U	5 U
Inorganics (mg/kg)					
Aluminum	7130 J	6000 J			
Antimony	1.065 U	1.4 U			
Arsenic	2.15 U	1.9 U			
Beryllium	0.605 J	0.58 UJ			
Chromium	12.5 J	10 J			
Copper					
Iron	15100 J	13200 J			
Lead	9.2 J	7.4 J			
Manganese	153.5 J	134 J			
Mercury					
Nickel	12.55 J	10.9 J			
Zinc					
Miscellaneous Parameters					
Total Inorganic Carbon (mg/kg)	5600	6000			
Total Organic Carbon (mg/kg)					

TABLE 2-7
 SUMMARY OF CHEMICALS DETECTED IN SEDIMENT
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
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LOCATION	SED07-15	SED07-15	SED07-16	SED07-16	SED07-16	SED07-16	SED07-20
SAMPLE ID	SED07-15-NSD-022803	SED07-15-NSD-121603	SED07-16-NSD-022803	SED07-16-NSD-121603	SED07-16-NSD-082404	SED07-20-NSD-121903	
MATRIX	SD	SD	SD	SD	SD	SD	
SACODE	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	
SAMPLE DATE	20030228	20031216	20030228	20031216	20040824	20031219	
TOP DEPTH	0	0	0	0	0	0	
BOTTOM DEPTH	0.5	0.5	0.5	0.5	0.5	0.5	
DEPTH UNIT	FT	FT	FT	FT	FT	FT	
Volatile Organics (ug/kg)							
1,1,2,2-Tetrachloroethane	5 U	5 U	6 U	5 U	0.25 U	5 U	
1,1,2-Trichloroethane	5 U	5 U	6 U	5 U	0.13 U	5 U	
1,2-Dichloroethane	5 U	5 U	6 U	1 J	1	5 U	
Benzene	5 U	5 U	6 U	5 U	0.1 U	5 U	
BTEX	5 U	5 U	6 U	5 U	0.1 U	5 U	
Carbon Disulfide							
cis-1,2-Dichloroethene	1 J	2 J	6 U	0.90 J	0.55 J	5 U	
Total 1,2-Dichloroethene	1	2	6 U	0.9	0.9	5 U	
Total Chlorinated VOCs	5 U	2 U	3	1	3.5	5 U	
trans-1,2-Dichloroethene	5 U	5 U	6 U	5 U	0.35 J	5 U	
Trichloroethene	5 U	2 U	3 J	4 U	2.5	5 U	
Vinyl Chloride	5 U	5 U	6 U	5 U	0.25 U	5 U	
Inorganics (mg/kg)							
Aluminum							
Antimony							
Arsenic							
Beryllium							
Chromium							
Copper							
Iron							
Lead							
Manganese							
Mercury							
Nickel							
Zinc							
Miscellaneous Parameters							
Total Inorganic Carbon (mg/kg)							
Total Organic Carbon (mg/kg)							

TABLE 2-7
 SUMMARY OF CHEMICALS DETECTED IN SEDIMENT
 SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
 NORTH KINGSTON, RHODE ISLAND
 PAGE 7 OF 7

LOCATION	SED07-21	SED07-22	SED07-22
SAMPLE ID	SED07-21-NSD-052505	SED07-22-NSD-022803	SED07-22-NSD-082404
MATRIX	SD	SD	SD
SACODE	NORMAL	NORMAL	NORMAL
SAMPLE DATE	20050525	20030228	20040824
TOP DEPTH	0	0	0
BOTTOM DEPTH	0.5	0.5	0.5
DEPTH UNIT	FT	FT	FT
Volatile Organics (ug/kg)			
1,1,2,2-Tetrachloroethane	0.32 U	12	0.27 U
1,1,2-Trichloroethane	0.16 U	2 J	0.14 U
1,2-Dichloroethane	0.13 U	5 U	0.12 U
Acetone			
Benzene	0.13 U	5 U	0.11 U
BTEX	0.13 U	5 U	0.11 U
Carbon Disulfide			
cis-1,2-Dichloroethene	0.33 U	13	1.5
Total 1,2-Dichloroethene	0.33 U	15	2.46
Total Chlorinated VOCs	0.13 U	17	0.12 U
trans-1,2-Dichloroethene	0.35 U	2 J	0.96
Trichloroethene	0.21 U	3 J	0.18 U
Vinyl Chloride	0.31 U	5 U	0.27 U
Inorganics (mg/kg)			
Aluminum			
Antimony			
Arsenic			
Beryllium			
Chromium			
Copper			
Iron			
Lead			
Manganese			
Mercury			
Nickel			
Zinc			
Miscellaneous Parameters			
Total Inorganic Carbon (mg/kg)			
Total Organic Carbon (mg/kg)			

TABLE 2-8
SUMMARY OF CHEMICALS DETECTED IN SHELLFISH
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
NORTH KINGSTON, RHODE ISLAND

PAGE 1 OF 2

Chemical	Frequency of Detection	Maximum Detected Concentration (mg/kg)
Semivolatile Organic Compounds		
Acenaphthene	2/2	0.00846
Acenaphthylene	2/2	0.00316
Anthracene	6/6	0.00625
Benzo(a)anthracene	6/6	0.003
Benzo(a)pyrene	5/6	0.00606
Benzo(b)fluoranthene	6/6	0.0358
Benzo(e)pyrene	6/6	0.0374
Benzo(g,h,i)perylene	5/6	0.0113
Benzo(k)fluoranthene	2/2	0.00596
Benzotriazole	4/4	0.0254
Chlorinated benzotriazole	4/4	0.00362
Chrysene	6/6	0.0893
Coronene	4/4	0.00052
Dibenzo(a,h)anthracene	5/6	0.00128
Fluoranthene	6/6	0.216
Fluorene	6/6	0.0107
Hexachlorobenzene	3/5	0.00101
Indeno(1,2,3-cd)pyrene	5/6	0.00416
Perylene	5/6	0.00609
Phenanthrene	6/6	0.062
Pyrene	6/6	0.0979
Pesticides/PCBs		
Aldrin	1/2	0.000244
alpha-BHC	1/3	0.00007
gamma-BHC (Lindane)	1/3	0.00004
alpha-Chlordane	2/3	0.00042
gamma-Chlordane	3/3	0.00054
4,4'-DDD	2/3	0.00697
4,4'-DDE	4/5	0.0228
4,4'-DDT	2/3	0.00025
Mirex	1/2	0.0000928
Aroclor-1242	2/6	0.022
Aroclor-1254	6/6	0.1335
Aroclor-1260	2/2	0.0849
Inorganics		
Aluminum	1/2	0.0314
Arsenic	6/6	2.5
Cadmium	6/6	2.39
Chromium	5/6	0.704
Copper	6/6	126

TABLE 2-8
SUMMARY OF CHEMICALS DETECTED IN SHELLFISH
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
NORTH KINGSTON, RHODE ISLAND
PAGE 2 OF 2

Chemical	Frequency of Detection	Maximum Detected Concentration (mg/kg)
Iron	6/6	800
Lead	4/6	0.36
Manganese	6/6	21.6
Mercury	4/4	49.1
Nickel	6/6	5
Silver	6/6	6.2
Zinc	6/6	4.73

Source: Phase III Remedial investigation report prepared for Site 07 (dated September 1998).

TABLE 5-1
SUMMARY OF CANCER RISKS AND HAZARD INDICES
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
NORTH KINGSTON, RHODE ISLAND

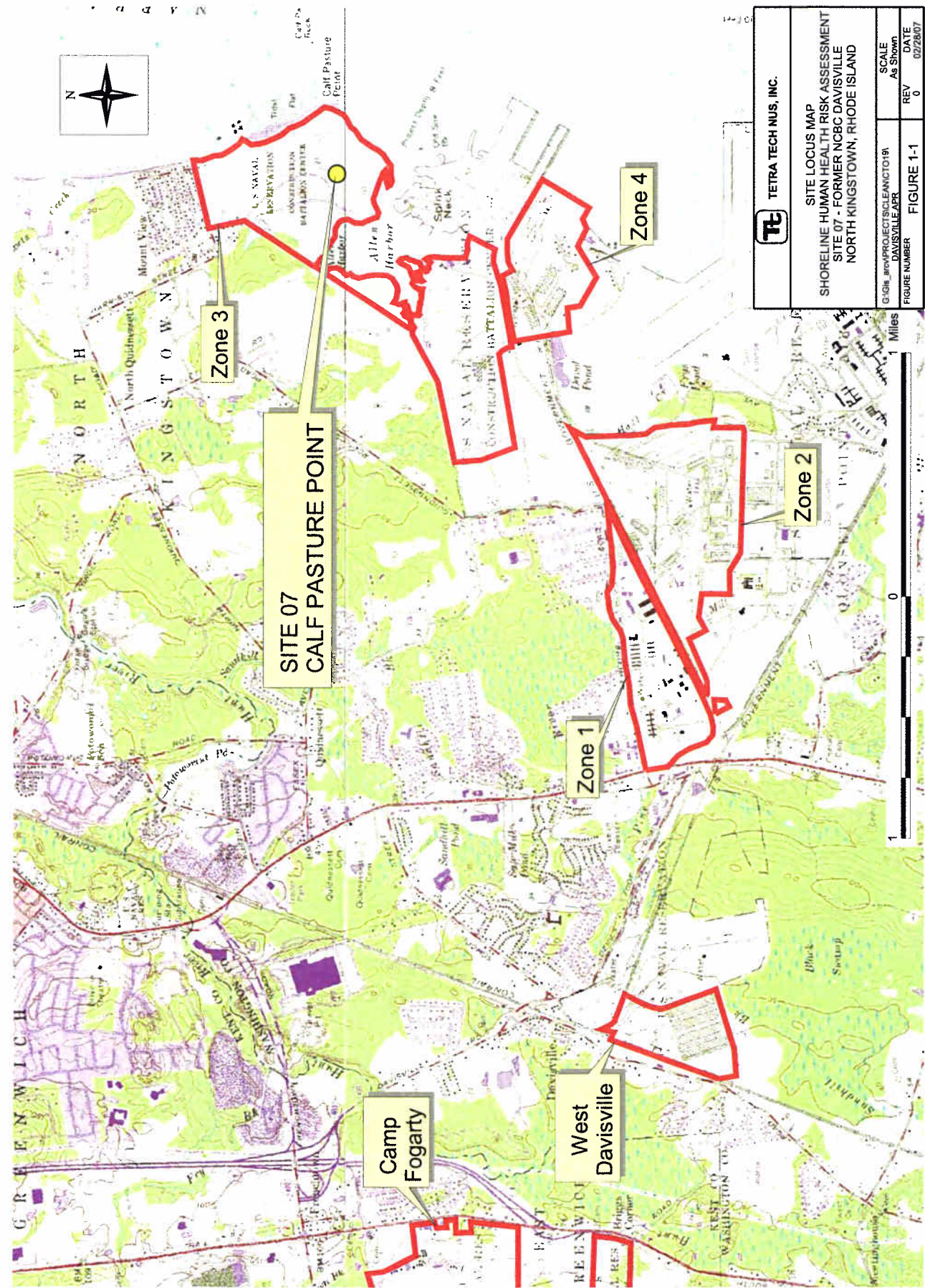
Scenario	Case	Incremental Lifetime Cancer Risk			Hazard Index			
		Child	Adolescent	Adult	Lifelong	Child	Adolescent	Adult
Groundwater								
Shell Fisherman	Case 1	NA	3E-06	5E-06	8E-06	NA	0.02	0.02
	Case 2	NA	3E-06	4E-06	7E-06	NA	0.02	0.02
	Case 3	NA	2E-06	4E-06	6E-06	NA	0.02	0.02
	Case 4	NA	9E-08	1E-07	2E-07	NA	0.0003	0.0003
Surface Water								
Swimmer	Case 1	3E-07	6E-07	8E-07	2E-06	0.01	0.005	0.004
	Case 2	8E-07	1E-06	1E-06	2E-06	0.009	0.005	0.004
Shell Fisherman	Case 1	NA	2E-07	2E-07	4E-07	NA	0.001	0.001
	Case 2	NA	3E-07	4E-07	6E-07	NA	0.001	0.001
Sediment								
Swimmer	Case 1	3E-06	2E-06	3E-07	5E-06	0.3	0.06	0.01
Shell Fisherman	Case 1	NA	4E-07	3E-07	8E-07	NA	0.04	0.01
Shellfish								
Ingestion	--	7E-05	2E-04	2E-04	4E-04	91	144	92
Total for Swimmer⁽¹⁾								
Total for Swimmer ⁽¹⁾	--	4E-06	3E-06	1E-06	8E-06	0.3	0.07	0.02
Total for Shell Fisherman ⁽¹⁾	--	NA	2E-04	2E-04	4E-04	NA	144	93
Total for Shell Fisherman	--	NA	5E-06	7E-06	1E-05	NA	0.07	0.04
Minus Consumption of Fish ⁽¹⁾	--							

NA - Not an applicable exposure pathway.
1 - Total risk is the sum of the maximum risk for each case.

TABLE 6-1
SUMMARY OF CANCER RISKS AND HAZARD INDICES
CALCULATED USING DRAFT USEPA TOXICITY CRITERIA FOR TRICHLOROETHENE
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
NORTH KINGSTON, RHODE ISLAND

Scenario	Case	Incremental Lifetime Cancer Risk			Hazard Index			
		Child	Adolescent	Adult	Lifelong	Child	Adolescent	Adult
Groundwater								
Shell Fisherman	Case 1	NA	2E-05	3E-05	4E-05	NA	1	0.9
	Case 2	NA	9E-06	1E-05	2E-05	NA	0.4	0.4
	Case 3	NA	8E-06	1E-05	2E-05	NA	0.4	0.3
	Case 4	NA	2E-07	2E-07	4E-07	NA	0.005	0.004
Surface Water								
Swimmer	Case 1	2E-06	2E-06	2E-06	6E-06	0.2	0.08	0.07
	Case 2	6E-06	5E-06	7E-06	1E-05	0.6	0.3	0.2
Shell Fisherman	Case 1	NA	5E-07	7E-07	1E-06	NA	0.03	0.02
	Case 2	NA	2E-06	2E-06	3E-06	NA	0.09	0.08
Sediment								
Swimmer	Case 1	3E-06	2E-06	3E-07	5E-06	0.3	0.06	0.01
Shell Fisherman	Case 1	NA	4E-07	3E-07	8E-07	NA	0.04	0.01
Shellfish								
Ingestion	--	7E-05	2E-04	2E-04	4E-04	91	144	92
Total for Swimmer⁽¹⁾								
Total for Swimmer ⁽¹⁾	--	9E-06	7E-06	8E-06	2E-05	0.8	0.4	0.3
Total for Shell Fisherman ⁽¹⁾	--	NA	2E-04	2E-04	4E-04	NA	145	93
Minus Consumption of Fish ⁽¹⁾	--	NA	2E-05	3E-05	6E-05	NA	1	1

NA - Not an applicable exposure pathway.
1 - Total risk is the sum of the maximum risk for each case.




Zone 3

SITE 07
CALF PASTURE POINT

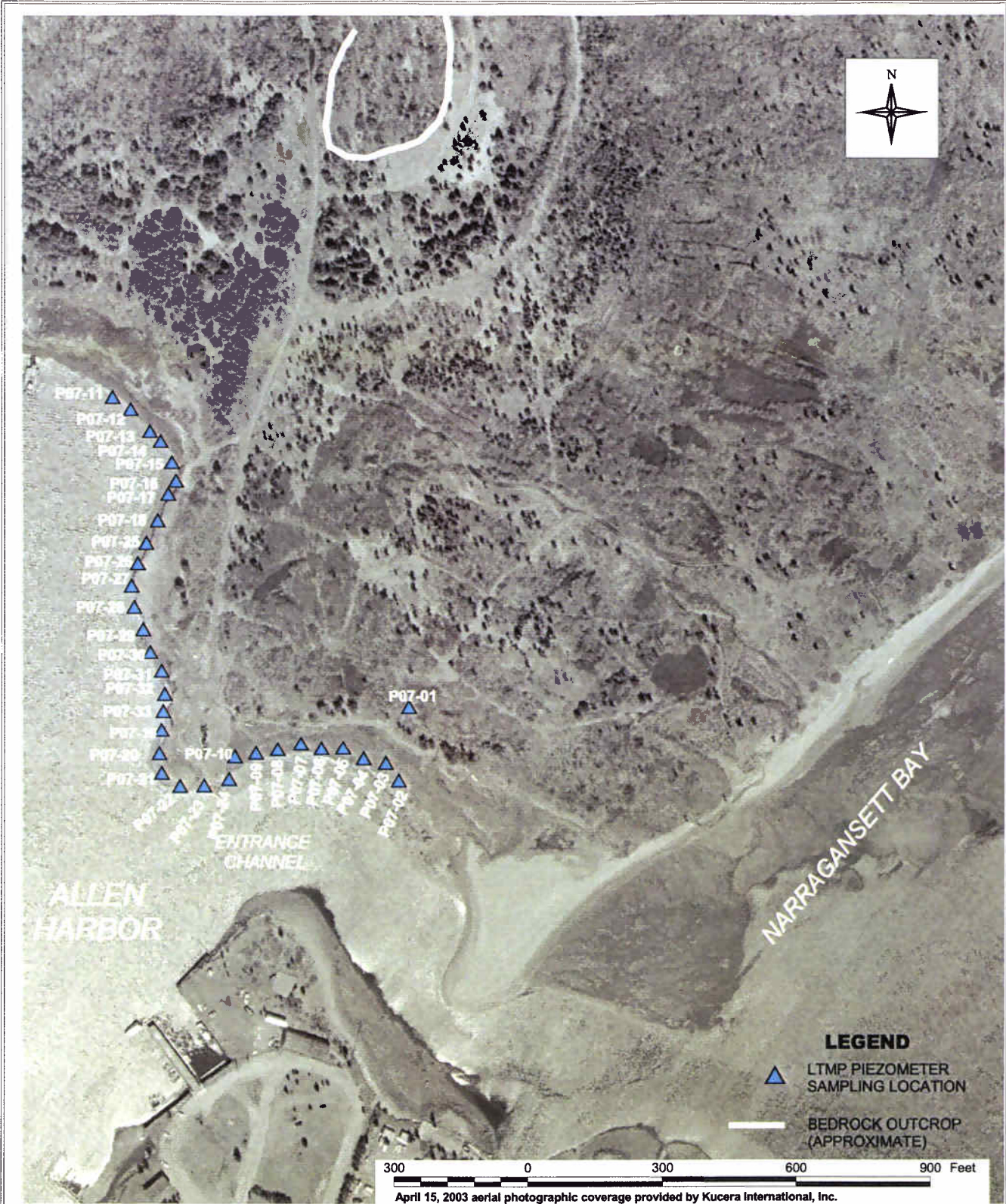
Zone 1

Zone 2

Zone 4

 TETRA TECH NUS, INC.	
SITE LOCUS MAP	
SHORELINE HUMAN HEALTH RISK ASSESSMENT	
SITE 07 - FORMER NBC DAVISVILLE	
NORTH KINGSTOWN, RHODE ISLAND	
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DAVISVILLE.APR	AS SHOWN
FIGURE NUMBER	FIGURE 1-1
REV	0
DATE	02/28/07





TETRA TECH NUS, INC.
55 Jonspin Road
Wilmington, MA 01887

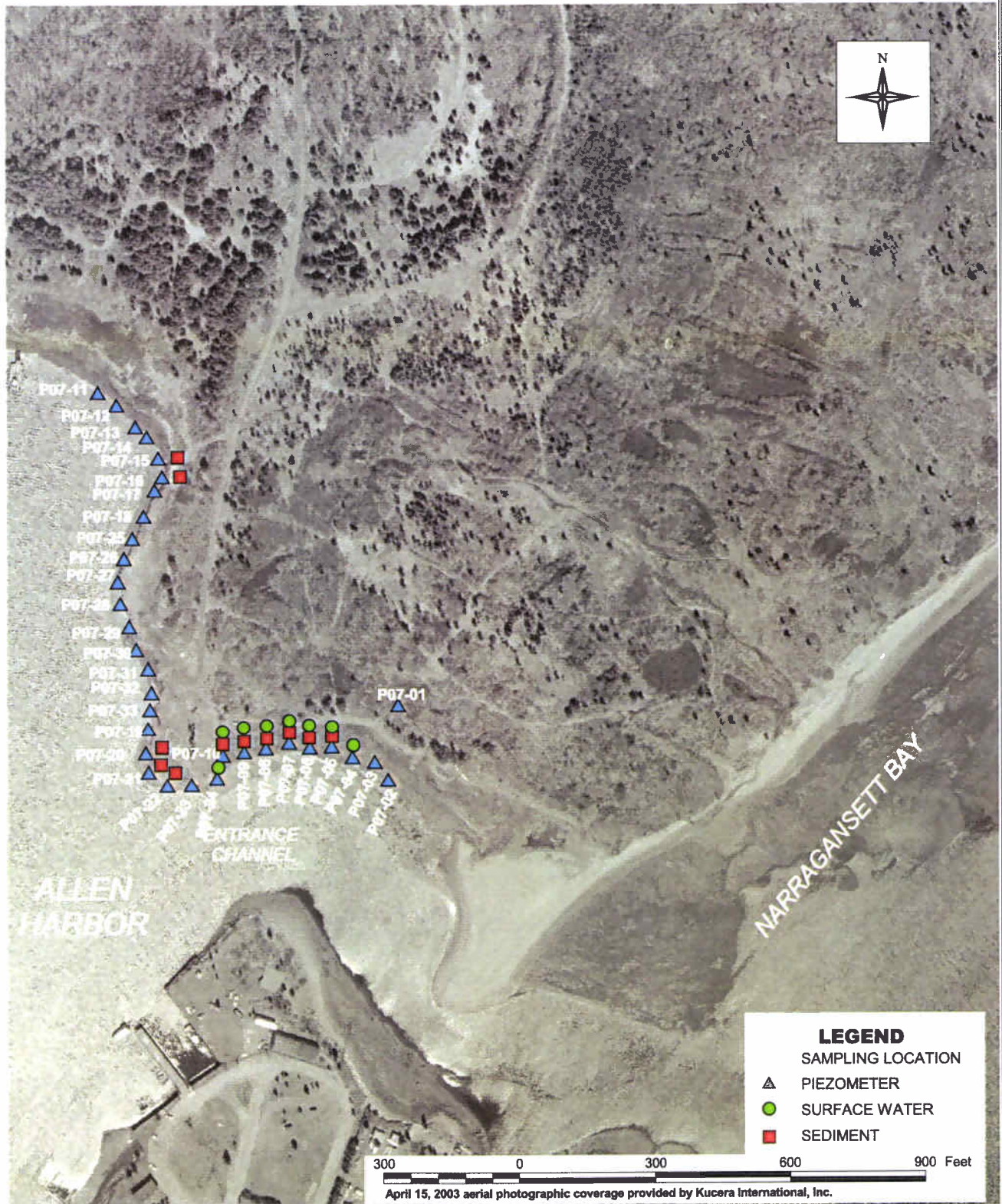
SITE MAP AND LTMP PIEZOMETER SAMPLING LOCATIONS
SHORELINE HUMAN HEALTH RISK ASSESSMENT
SITE 07 - CALF PASTURE POINT
FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

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As Shown

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DAVISVILLE.APR

REV DATE
0 02/28/07

FIGURE NUMBER
FIGURE 1-2



TETRA TECH NUS, INC.
55 Jonspin Road
Wilmington, MA 01887

PIEZOMETER, SURFACE WATER, AND
SEDIMENT SAMPLING LOCATIONS
SITE 07, CALF PASTURE POINT
FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

SCALE
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DATE
02/12/07

FIGURE NUMBER
FIGURE 2-1

ATTACHMENT 1

RAGS PART D TABLES

TABLE 1
SELECTION OF EXPOSURE PATHWAYS
SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
NORTH KINGSTON, RHODE ISLAND

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/Future	Surface Water	Surface Water	Site 07	Recreational Users	Child	Ingestion Dermal	On-Site On-Site	Quant Quant	Child recreational users may be exposed to surface water while swimming.
					Adolescents	Ingestion Dermal	On-Site On-Site	Quant Quant	Adolescent recreational users may be exposed to surface water while swimming and clamming.
					Adult	Ingestion Dermal	On-Site On-Site	Quant Quant	Adult recreational users may be exposed to surface water while swimming and clamming.
					Child	Ingestion	On-site	Quant	Child recreational users may ingest shellfish that were caught at the site.
					Adolescents	Ingestion	On-site	Quant	Adolescent recreational users may ingest shellfish that were caught at the site.
					Adult	Ingestion	On-site	Quant	Adult recreational users may ingest shellfish that were caught at the site.
	Groundwater	Groundwater	Site 07	Recreational Users	Child	Ingestion Dermal	On-Site On-Site	None None	Child recreational users do not contact groundwater at the site.
					Adolescents	Ingestion Dermal	On-Site On-Site	None Quant	Adolescent recreational users may have dermal contact with shallow groundwater while clamming.
					Adult	Ingestion Dermal	On-Site On-Site	None Quant	Adult recreational users may have dermal contact with shallow groundwater while clamming.
					Child	Ingestion Dermal	On-Site On-Site	Quant Quant	Child recreational users may be exposed to sediment while swimming.
					Adolescents	Ingestion Dermal	On-Site On-Site	Quant Quant	Adolescent recreational users may be exposed to sediment while swimming and clamming.
					Adult	Ingestion Dermal	On-Site On-Site	Quant Quant	Adult recreational users may be exposed to sediment while swimming and clamming.

LIST OF TABLES
RAGS PART D TABLE 2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Table No.

- 2.1 Groundwater
- 2.2 Surface Water
- 2.3 Sediment
- 2.4 Shellfish

TABLE 2.1
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - GROUNDWATER (PIEZOMETERS)
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
 NORTH KINGSTON, RHODE ISLAND
 PAGE 1 OF 2

Scenario Timeframe: Current/Future
 Medium: Groundwater
 Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration ⁽¹⁾	Maximum Concentration ⁽¹⁾	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects ⁽²⁾	Concentration Used for Screening ⁽³⁾	Background Value ⁽⁴⁾	Risk-Based COPC Screening Level ⁽⁵⁾	RIDEM GA Groundwater Objective ⁽⁶⁾	COPC Flag	Rationale for Contaminant Deletion or Selection ⁽⁷⁾	
Site 07	79-34-5	1,1,2,2-Tetrachloroethane	0.2 J	1200	ug/L	P07-08-NWVG-121903	109/239	0.2 - 1.1	1200	NA	0.055 C	NA	Yes	ASL	
	79-00-5	1,1,2-Trichloroethane	0.1	150	ug/L	P07-09-NWVG-121903	112/239	0.34 - 3.1	150	NA	0.2 C	5	Yes	ASL	
	75-34-3	1,1-Dichloroethane	0.1 J	9.77	ug/L	P07-09-NWVG-121903	43/239	0.45 - 7.3	9.77	NA	34 N	7	Yes	ASL	
	107-06-2	1,2-Dichloroethane	0.1	5.33 J	ug/L	P07-08-NWVG-121903	64/238	0.2 - 4.1	5.33	NA	0.12 C	5	Yes	ASL	
	67-64-1	Acetone	2.53 J	14 J	ug/L	P07-07-NWVG-052202	13/13	---	14	NA	550 N	NA	No	BSL	
	71-43-2	Benzene	0.1	5.8	ug/L	P07-20-NWVG-052405	47/236	0.2 - 3.6	5.8	NA	0.35 C	5	Yes	ASL	
	75-15-1	Carbon Disulfide	0.1	1.25 J	ug/L	P07-07-NWVG-052202-D	19/23	1 - 1	1.25	NA	100 N	NA	No	BSL	
	67-66-3	Chloroform	0.1 J	7.9 J	ug/L	P07-09-NWVG-052405-D	34/238	0.2 - 6.6	7.9	NA	0.17 C	NA	Yes	ASL	
	156-59-2	cis-1,2-Dichloroethane	0.11 J	1700	ug/L	P07-09-NWVG-121903	153/239	0.5 - 1.2	1700	NA	6.1 N	70	Yes	ASL	
	100-41-4	Ethylbenzene	0.13	0.9 J	ug/L	P07-16-NWVG-052302	4/23	1 - 1	0.9	NA	130 N	700	No	BSL	
	75-09-2	m+p-Xylenes	0.1	5	ug/L	P07-16-NWVG-052302	10/23	1 - 2	5	NA	21 N ⁽⁸⁾	10000 ⁽⁸⁾	No	BSL	
			Methylene Chloride	0.5 J	0.5 J	ug/L	P07-16-NWVG-052302	1/23	1 - 1.96	0.5	NA	4.3 C	5	No	BSL
			o-Xylene	0.1	5	ug/L	P07-11-NWVG-052302-D	9/23	1 - 1	5	NA	21 N ⁽⁸⁾	10000 ⁽⁸⁾	No	BSL
	127-18-4	Tetrachloroethane	0.13 J	1.19	ug/L	P07-09-NWVG-121903	6/238	0.37 - 4	1.19	NA	0.1 C	5	No	FOD	
	108-88-3	Toluene	0.1 J	26 J	ug/L	P07-16-NWVG-052302	13/23	1 - 1	26	NA	72 N	1000	No	BSL	
	540-59-0	Total 1,2-Dichloroethane	0.11	2050	ug/L	P07-09-NWVG-121903	153/239	0.5 - 1	2050	NA	6.1 N ⁽⁸⁾	70	Yes	ASL	
	1330-20-7	Total Xylenes	0.1	10	ug/L	P07-16-NWVG-052302	10/23	1 - 1	10	NA	21 N	10000 ⁽⁸⁾	No	BSL	
	156-60-5	trans-1,2-Dichloroethane	0.1	350	ug/L	P07-09-NWVG-121903	121/238	0.5 - 1	350	NA	12 N	100	Yes	ASL	
	79-01-6	Trichloroethane	0.1 J	3900	ug/L	P07-09-NWVG-121903	123/239	0.26 - 1.08	3900	NA	0.028 C	5	Yes	ASL	
	75-01-4	Vinyl Chloride	0.2 J	243	ug/L	P07-07-NWVG-102704	96/238	0.49 - 2.5	243	NA	0.02 C	2	Yes	ASL	

Notes:
 1 - Sample and duplicate are counted as two separate samples when determining the minimum and maximum detected concentrations and as one sample when determining frequency of detection.
 2 - Values presented are sample-specific quantitation limits.
 3 - The maximum detected concentration is used for screening purposes.
 4 - No background values are available.
 5 - The risk-based COPC screening level for tap water is presented. The value is based upon a target HQ of 0.1 for noncarcinogens (denoted with a "N" flag), or an incremental cancer risk of 1×10^{-6} for carcinogens (denoted with a "C" flag) (EPA Region 9, October 2004, Updated December 28, 2004).
 6 - Rhode Island Department of Environmental Management, DEM-DSP-01-93, February 2004.
 7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the COPC screening level.
 8 - Chemicals selected as COPCs are indicated by shaded chemical names.
 9 - The value for cis-1,2-dichloroethane is presented.

TABLE 2.1
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - GROUNDWATER (PIEZOMETERS)
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
 NORTH KINGSTON, RHODE ISLAND

PAGE 2 OF 2

Scenario Timeframe: Current/Future
 Medium: Groundwater
 Exposure Medium: Groundwater

Associated Samples	Exposure Point	CAS Number	Chemical	Minimum Concentration ⁽¹⁾	Maximum Concentration ⁽¹⁾	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects ⁽²⁾	Concentration Used for Screening ⁽³⁾	Background Value ⁽⁴⁾	Risk-Based COPC Screening Level ⁽⁵⁾	RIDEM GA Groundwater Objective ⁽⁶⁾	COPC Flag	Rationale for Contaminant Deletion or Selection ⁽⁷⁾
P07-01-NWG-030303															
P07-01-NWG-030303-D															
P07-01-NWG-052202															
P07-01-NWG-052405															
P07-01-NWG-082504															
P07-01-NWG-082901															
P07-01-NWG-121703															
P07-01-NWG-121703-D															
P07-02-NWG-052202															
P07-02-NWG-052405															
P07-02-NWG-082504															
P07-02-NWG-082901															
P07-02-NWG-121703															
P07-02-NWG-121703-D															
P07-03-NWG-052202															
P07-03-NWG-052405															
P07-03-NWG-082504															
P07-03-NWG-082901															
P07-03-NWG-121903															
P07-04-NWG-013006															
P07-04-NWG-022703															
P07-04-NWG-032305															
P07-04-NWG-042105															
P07-04-NWG-052202															
P07-04-NWG-052405															
P07-04-NWG-072905															
P07-04-NWG-082504															
P07-04-NWG-082901															
P07-04-NWG-102704															
P07-04-NWG-111604															
P07-04-NWG-112905															
P07-04-NWG-121803															
P07-04-NWG-121803-D															
P07-05-NWG-013006															
P07-05-NWG-022703															
P07-05-NWG-032305															
P07-05-NWG-042105															
P07-05-NWG-052202															
P07-05-NWG-052405															
P07-05-NWG-072905															
P07-05-NWG-082504															
P07-05-NWG-082901															
P07-05-NWG-102704															
P07-05-NWG-112905															
P07-05-NWG-121803															
P07-05-NWG-121803-D															
P07-06-NWG-013006															
P07-06-NWG-022703															
P07-06-NWG-032305															
P07-06-NWG-042105															
P07-06-NWG-052202															
P07-06-NWG-052405															
P07-06-NWG-072905															
P07-06-NWG-082504															
P07-06-NWG-082901															
P07-06-NWG-102704															
P07-06-NWG-111604															
P07-06-NWG-112905															
P07-06-NWG-121803															
P07-06-NWG-121803-D															
P07-07-NWG-013006															
P07-07-NWG-022703															
P07-07-NWG-032305															
P07-07-NWG-042105															
P07-07-NWG-052202															
P07-07-NWG-052405															
P07-07-NWG-072905															
P07-07-NWG-082504															
P07-07-NWG-082901															
P07-07-NWG-102704															
P07-07-NWG-111604															
P07-07-NWG-112905															
P07-07-NWG-121803															
P07-07-NWG-121803-D															
P07-08-NWG-013006															
P07-08-NWG-022703															
P07-08-NWG-032305															
P07-08-NWG-042105															
P07-08-NWG-052202															
P07-08-NWG-052405															
P07-08-NWG-072905															
P07-08-NWG-082504															
P07-08-NWG-082901															
P07-08-NWG-102704															
P07-08-NWG-111604															
P07-08-NWG-112905															
P07-08-NWG-121803															
P07-08-NWG-121803-D															
P07-09-NWG-013006															
P07-09-NWG-022703															
P07-09-NWG-032305															
P07-09-NWG-042105															
P07-09-NWG-052202															
P07-09-NWG-052405															
P07-09-NWG-072905															
P07-09-NWG-082504															
P07-09-NWG-082901															
P07-09-NWG-102704															
P07-09-NWG-111604															
P07-09-NWG-112905															
P07-09-NWG-121803															
P07-09-NWG-121803-D															
P07-10-NWG-013006															
P07-10-NWG-022703															
P07-10-NWG-032305															
P07-10-NWG-042105															
P07-10-NWG-052202															
P07-10-NWG-052405															
P07-10-NWG-072905															
P07-10-NWG-082504															
P07-10-NWG-082901															
P07-10-NWG-102704															
P07-10-NWG-111604															
P07-10-NWG-112905															
P07-10-NWG-121803															
P07-10-NWG-121803-D															
P07-11-NWG-013006															

TABLE 2.2
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SURFACE WATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
 NORTH KINGSTON, RHODE ISLAND

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

Exposure Point	CAS Number	Chemical	Minimum Concentration ⁽¹⁾	Maximum Concentration ⁽¹⁾	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects ⁽²⁾	Concentration Used for Screening ⁽³⁾	Background Value ⁽⁴⁾	Risk-Based COPC Screening Level ⁽⁵⁾	RIDEM GA Groundwater Objective ⁽⁶⁾	COPC Flag	Rationale for Contaminant Deletion or Selection ⁽⁷⁾
Site 07	Volatile Organic Compounds													
	79-34-5	1,1,2,2-Tetrachloroethane	0.73 J	11.9	µg/L	SW07-10-NPW-013006	23/60	0.23 - 1.0	11.9	NA	0.055 C	NA	Yes	ASL
	79-00-5	1,1,2-Trichloroethane	2.3	3	µg/L	SW07-10-NPW-013006	2/90	0.34 - 1.0	3	NA	0.2 C	5	No	FOO
	156-59-2	cis-1,2-Dichloroethane	0.88 J	69.9 J	µg/L	SW07-09-NPW-052405	48/88	0.7 - 1.2	69.9	NA	6.1 N	70	Yes	ASL
	540-59-0	Total 1,2-Dichloroethane	0.88	76.7	µg/L	SW07-09-NPW-052405	48/90	0.51 - 1.0	76.7	NA	6.1 N ^(b)	100	Yes	ASL
	156-80-5	trans-1,2-Dichloroethane	0.85 J	6.8 J	µg/L	SW07-09-NPW-052405	11/88	0.51 - 0.8	6.8	NA	12 N	100	No	BSL
	79-01-6	Trichloroethene	0.54 J	47	µg/L	SW07-09-NPW-102704	32/90	0.28 - 1.0	47	NA	0.028 C	5	Yes	ASL
	75-01-4	Vinyl Chloride	0.76 J	12.9 J	µg/L	SW07-09-NPW-052405	21/90	0.49 - 1.0	12.9	NA	0.02 C	2	Yes	ASL

Notes:

- 1 - Sample and duplicate are counted as two separate samples when determining the minimum and maximum detected concentrations and as one sample when determining frequency of detection.
- 2 - Values presented are sample-specific quantitation limits.
- 3 - The maximum detected concentration is used for screening purposes.
- 4 - No background values are available.
- 5 - The risk-based COPC screening level for tap water is presented. The value is based upon a target HQ of 0.1 for noncarcinogens (denoted with a "N" flag), or an incremental cancer risk of 1 x 10⁻⁶ for carcinogens (denoted with a "C" flag) (EPA Region 9, October 2004, Updated December 28, 2004).
- 6 - Rhode Island Department of Environmental Management, DEM-DSR-01-93, February 2004.
- 7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the COPC screening level.
- 8 - Chemicals selected as COPCs are indicated by shaded chemical names.

Associated Samples

SW07-05-NPW-122195	SW07-05-NPW-013006	SW07-07-NPW-013006	SW07-09-NPW-052405	SW07-10-NPW-102704	SW07-24-NPW-111604
SW07-NB1-NSW-122295	SW07-06-NPW-082404-D	SW07-08-NPW-082404	SW07-09-NPW-072905-D	SW07-10-NPW-111604	SW07-24-NPW-011905
SW07-04-NPW-082404	SW07-06-NPW-102704	SW07-08-NPW-102704	SW07-09-NPW-092805-D	SW07-10-NPW-032305	SW07-24-NPW-042105
SW07-04-NPW-111604	SW07-06-NPW-111604	SW07-08-NPW-111604	SW07-09-NPW-092805	SW07-10-NPW-052405	SW07-24-NPW-052405
SW07-04-NPW-011905	SW07-06-NPW-011905	SW07-08-NPW-011905	SW07-09-NPW-112905-D	SW07-10-NPW-112905	SW07-24-NPW-072905
SW07-04-NPW-032305	SW07-06-NPW-032305	SW07-08-NPW-032305	SW07-09-NPW-013006-D	SW07-10-NPW-013006	SW07-24-NPW-092805
SW07-04-NPW-042105	SW07-06-NPW-042105	SW07-08-NPW-042105	SW07-09-NPW-013006-D	SW07-10-NPW-013006	SW07-24-NPW-112905
SW07-04-NPW-052405	SW07-06-NPW-052405	SW07-08-NPW-052405	SW07-09-NPW-082404	SW07-10-NPW-082404	SW07-24-NPW-013006
SW07-04-NPW-072905	SW07-06-NPW-072905	SW07-08-NPW-072905	SW07-09-NPW-102704	SW07-10-NPW-102704	
SW07-04-NPW-092805	SW07-06-NPW-092805	SW07-08-NPW-092805	SW07-09-NPW-111604	SW07-10-NPW-111604	
SW07-04-NPW-112905	SW07-06-NPW-112905	SW07-08-NPW-112905	SW07-09-NPW-011905	SW07-10-NPW-011905	
SW07-05-NPW-082404	SW07-07-NPW-082404	SW07-09-NPW-082404	SW07-10-NPW-032305	SW07-10-NPW-032305	
SW07-05-NPW-102704	SW07-07-NPW-102704	SW07-09-NPW-102704	SW07-10-NPW-042105-D	SW07-10-NPW-042105-D	
SW07-05-NPW-111604	SW07-07-NPW-111604	SW07-09-NPW-111604	SW07-10-NPW-052405	SW07-10-NPW-052405	
SW07-05-NPW-011905	SW07-07-NPW-011905	SW07-09-NPW-011905	SW07-10-NPW-072905	SW07-10-NPW-072905	
SW07-05-NPW-032305	SW07-07-NPW-032305	SW07-09-NPW-032305	SW07-10-NPW-092805	SW07-10-NPW-092805	
SW07-05-NPW-042105	SW07-07-NPW-042105	SW07-09-NPW-042105	SW07-10-NPW-112905	SW07-10-NPW-112905	
SW07-05-NPW-052405	SW07-07-NPW-052405	SW07-09-NPW-052405	SW07-10-NPW-013006	SW07-10-NPW-013006	
SW07-05-NPW-072905	SW07-07-NPW-072905	SW07-09-NPW-072905	SW07-10-NPW-032305-D	SW07-10-NPW-032305-D	
SW07-05-NPW-092805	SW07-07-NPW-092805	SW07-09-NPW-092805	SW07-10-NPW-042105	SW07-10-NPW-042105	
SW07-05-NPW-112905	SW07-07-NPW-112905	SW07-09-NPW-112905	SW07-10-NPW-082404	SW07-10-NPW-082404	

TABLE 2.3
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SEDIMENT
SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
NORTH KINGSTON, RHODE ISLAND
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Exposure Point	CAS Number	Chemical	Minimum Concentration ⁽¹⁾	Maximum Concentration ⁽¹⁾	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects ⁽²⁾	Concentration Used for Screening ⁽³⁾	Background Value ⁽⁴⁾	EPA Region 9 PRG (Residential) ⁽⁵⁾	RIDEM Residential Direct Contact Criteria ⁽⁶⁾	COPC Flag	Rationale for Contaminant Deletion or Selection ⁽⁷⁾	
Site 07	Volatile Organic Compounds														
	79-34-5	1,1,2,2-Tetrachloroethane	7.5	12	ug/kg	SED07-09-NSD-022803	2/27	0.21 - 7	12	NA	410 C	1300	No	BSL	
	79-00-5	1,1,2-Trichloroethane	1 J	5.5 J	ug/kg	SED07-09-NSD-052505-D	4/27	0.11 - 7	5.5	NA	730 C	3600	No	BSL	
	107-06-2	1,2-Dichloroethane	1 J	1 J	ug/kg	SED07-16-NSD-121603	2/27	0.091 - 7	1	NA	280 C	900	No	BSL	
	67-64-1	Acetone	10	20	ug/kg	SED07-07-NSD-052202	2/3	12 - 14	20	NA	1400000 N	7800000	No	BSL	
	71-43-2	Benzene	0.13 J	1 J	ug/kg	SED07-08-NSD-121903	2/27	0.085 - 7	1	NA	640 C	2500	No	BSL	
	75-15-0	Carbon Disulfide	1 J	3 J	ug/kg	SED07-10-NSD-052202	3/3	5 - 5	3	NA	36000 N	NA	No	BSL	
	156-59-2	cis-1,2-Dichloroethane	0.55 J	271 J	ug/kg	SED07-09-NSD-052505-D	19/27	0.31 - 7	271	NA	4300 N	630000	No	BSL	
	156-80-5	trans-1,2-Dichloroethane	0.95 J	334.5	ug/kg	SED07-09-NSD-052505-D	19/27	0.31 - 7	334.5	NA	4300 N ⁽⁸⁾	630000	No	BSL	
	79-01-6	Trichloroethane	0.66 J	162 J	ug/kg	SED07-09-NSD-052505-D	14/27	0.32 - 7	63.5	NA	6900 N	1100000	No	BSL	
	75-01-4	Vinyl Chloride	4.4	110	ug/kg	SED07-09-NSD-121903-D	5/27	0.21 - 7	110	NA	53 C	13000	Yes	ASL	
	Inorganics														
	7429-90-5	Aluminum	2300	8260 J	mg/kg	SED07-09-NSD-121903	4/4	---	8260	NA	7600 N	NA	Yes	ASL	
	7440-38-0	Antimony	0.32 J	0.32 J	mg/kg	SED07-09-NSD-052505-D	1/4	0.19 - 1.4	0.32	NA	3.1 N	10	No	BSL	
	7440-38-2	Arsenic	1.2 J	3.1	mg/kg	SED07-09-NSD-081704-D	3/4	1.9 - 2.4	3.1	NA	0.39 C	7	Yes	ASL	
	7440-41-7	Beryllium	0.37 J	0.32 J	mg/kg	SED07-09-NSD-121903	2/4	0.36 - 0.58	0.32	NA	15 N	0.4	Yes	ASL	
	18540-29-9	Chromium	4.3	15 J	mg/kg	SED07-09-NSD-121903	4/4	---	15	NA	23 C ⁽¹⁰⁾	380 ⁽⁹⁾	No	BSL	
	7440-50-8	Copper	6.2	9.5	mg/kg	SED07-09-NSD-061704-D	2/2	---	9.5	NA	310 N	3100	No	BSL	
	7439-89-6	Iron	5300	17000 J	mg/kg	SED07-09-NSD-121903	4/4	---	17000	NA	2300 N	NA	Yes	ASL	
	7439-92-1	Lead	32 J	11 J	mg/kg	SED07-09-NSD-121903	4/4	---	11	NA	400	150	No	BSL	
	7439-96-5	Manganese	52	173 J	mg/kg	SED07-09-NSD-121903	4/4	---	173	NA	180 N	330	No	BSL	
	7487-94-7	Mercury	0.017 J	0.041 J	mg/kg	SED07-09-NSD-052505-D	2/2	---	0.041	NA	2.3 N	23	No	BSL	
	7440-02-0	Nickel	5.5 J	14.2 J	mg/kg	SED07-09-NSD-121903	4/4	9.1 - 9.1	14.2	NA	160 N	1000	No	BSL	
7440-66-6	Zinc	24.4	30.1	mg/kg	SED07-09-NSD-052505-D	2/2	---	30.1	NA	2300 N	6000	No	BSL		

Footnotes
 1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
 2 - Values presented are sample-specific quantitation limits.
 3 - The maximum detected concentration is used for screening purposes.
 4 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
 5 - USEPA Region IX Preliminary Remediation Goal (PRG). The noncarcinogenic values (denoted with a "N" flag) are the PRG divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag) (USEPA Region IX, October 2004, Updated December 28, 2004).
 6 - Rhode Island Department of Environmental Management (RIDEM), DEM-DSR-01-93, February 2004.
 7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the COPC screening level.
 8 - Chemicals selected as COPCs are indicated by shaded chemical names.
 9 - The value for cis-1,2-dichloroethane is presented.
 10 - The value for hexavalent chromium is presented.

Definitions:
 ARA/TBC = Applicable or Relevant and Appropriate Requirements To Be Considered
 C = Carcinogen
 COPC = Chemical Of Potential Concern
 J = Estimated value
 N = Noncarcinogen
 NA = Not Applicable/Not Available
 PRG = Preliminary Remediation Goal

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

TABLE 2.3
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - SEDIMENT
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
 NORTH KINGSTON, RHODE ISLAND
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Scenario Timeframe: Current/Future Medium: Sediment Exposure Medium: Sediment		Exposure Point	CAS Number	Chemical	Minimum Concentration ⁽¹⁾	Maximum Concentration ⁽¹⁾	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects ⁽²⁾	Concentration Used for Screening ⁽³⁾	Background Value ⁽⁴⁾	EPA Region 9 PRG (Residential) ⁽⁵⁾	RIDEM Residential Direct Contact Criteria ⁽⁶⁾	COPC Flag	Rationale for Contaminant Deletion or Selection ⁽⁷⁾
Associated Samples																
		SED07-05-NSD-022803-D														
		SED07-05-NSD-022803														
		SED07-06-NSD-052202-D														
		SED07-06-NSD-052202														
		SED07-06-NSD-052505														
		SED07-07NSD-022803														
		SED07-07NSD-081704														
		SED07-07NSD-052505														
		SED07-08-NSD-121903														
		SED07-08-NSD-081704														
		SED07-08-NSD-052505														
		SED07-08-NSD-022803														
		SED07-09-NSD-121903-D														
		SED07-09-NSD-121903														
		SED07-09-NSD-081704-D														

TABLE 2.4
SELECTION OF CHEMICALS OF CONCERN - SHELLFISH
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
NORTH KINGSTON, RHODE ISLAND

PAGE 1 OF 2

Chemical	Frequency of Detection	Maximum Detected Concentration (mg/kg)	USEPA Region III RBC ⁽¹⁾ (mg/kg)	Chemical Retained as a COPC?	Rational for Contaminant Selection of Deletion ⁽²⁾
Semivolatile Organic Compounds					
Acenaphthene	2/2	0.00846	8.1 N	No	BSL
Acenaphthylene	2/2	0.00316	8.1 N ⁽³⁾	No	BSL
Anthracene	6/6	0.00625	41 N	No	BSL
Benzo(a)anthracene	6/6	0.003	0.0043 C	No	BSL
Benzo(a)pyrene	5/6	0.00606	0.00043 C	Yes	ASL
Benzo(b)fluoranthene	6/6	0.0358	0.0043 C	Yes	ASL
Benzo(e)pyrene	6/6	0.0374	4.1 N ⁽⁴⁾	No	BSL
Benzo(g,h,i)perylene	5/6	0.0113	4.1 N ⁽⁴⁾	No	BSL
Benzo(k)fluoranthene	2/2	0.00596	0.043 C	No	BSL
Benzotriazole	4/4	0.0254	NA	No	NTX
Chlorinated benzotriazole	4/4	0.00362	NA	No	NTX
Chrysene	6/6	0.0893	0.43 C	No	BSL
Coronene	4/4	0.00052	4.1 N ⁽⁴⁾	No	BSL
Dibenzo(a,h)anthracene	5/6	0.00128	0.00043 C	Yes	ASL
Fluoranthene	6/6	0.216	5.4 N	No	BSL
Fluorene	6/6	0.0107	5.4 N	No	BSL
Hexachlorobenzene	3/5	0.00101	0.002 C	No	BSL
Indeno(1,2,3-cd)pyrene	5/6	0.00416	0.0043 C	No	BSL
Perylene	5/6	0.00609	4.1 N ⁽⁴⁾	No	BSL
Phenanthrene	6/6	0.062	4.1 N ⁽⁴⁾	No	BSL
Pyrene	6/6	0.0979	4.1 N	No	BSL
Pesticides/PCBs					
Aldrin	1/2	0.000244	0.00019 C	Yes	ASL
alpha-BHC	1/3	0.00007	0.0005 C	No	BSL
gamma-BHC (Lindane)	1/3	0.00004	0.0024 C	No	BSL
alpha-Chlordane	2/3	0.00042	0.009 C ⁽⁵⁾	No	BSL
gamma-Chlordane	3/3	0.00054	0.009 C ⁽⁵⁾	No	BSL
4,4'-DDD	2/3	0.00697	0.013 C	No	BSL
4,4'-DDE	4/5	0.0228	0.0093 C	Yes	ASL
4,4'-DDT	2/3	0.00025	0.0093 C	No	BSL
Mirex	1/2	0.0000928	0.027 N	No	BSL
Aroclor-1242	2/6	0.022	0.0016 C	Yes	ASL
Aroclor-1254	6/6	0.1335	0.0016 C	Yes	ASL
Aroclor-1260	2/2	0.0849	0.0016 C	Yes	ASL
Inorganics					
Aluminum	1/2	0.0314	NA	No	NTX
Arsenic	6/6	2.5	0.0021 C	Yes	ASL
Cadmium	6/6	2.39	0.068 N ⁽⁶⁾	Yes	ASL
Chromium	5/6	0.704	0.41 N ⁽⁷⁾	Yes	ASL

TABLE 2.4
SELECTION OF CHEMICALS OF CONCERN - SHELLFISH
SITE 7, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
NORTH KINGSTON, RHODE ISLAND

PAGE 2 OF 2

Chemical	Frequency of Detection	Maximum Detected Concentration (mg/kg)	USEPA Region III RBC ⁽¹⁾ (mg/kg)	Chemical Retained as a COPC?	Rational for Contaminant Selection of Deletion ⁽²⁾
Copper	6/6	126	5.4 N	Yes	ASL
Iron	6/6	800	41 N	Yes	ASL
Lead	4/6	0.36	NA	No	NTX
Manganese	6/6	21.6	2.7 N ⁽⁸⁾	Yes	ASL
Mercury	4/4	49.1	0.014 N ⁽⁹⁾	Yes	ASL
Nickel	6/6	5	2.7 N	Yes	ASL
Silver	6/6	6.2	0.68 N	Yes	ASL
Zinc	6/6	4.73	41 N	No	BSL

Notes:

- 1 - USEPA Region III Risk-Based Concentration (RBC). The noncarcinogenic values (denoted with a "N" flag) are the RBC divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag) (USEPA Region III, October 2006).
- 2 - The chemical is selected as a COPC if the maximum detected concentration exceeds the COPC screening level. Chemicals selected as COPCs are indicated by shaded chemical names.
- 3 - Acenaphthene is used as a surrogate for acenaphthylene.
- 4 - Pyrene is used as a surrogate for benzo(e)pyrene, benzo(g,h,i)perylene, coronene, perylene, and phenanthrene.
- 5 - Chlordane is used as a surrogate for alpha- and gamma-chlordane.
- 6 - The value for cadmium-water is presented.
- 7 - The value for hexavalent chromium is presented.
- 8 - The value for manganese-nonfood is presented.
- 9 - The value for methyl mercury is presented.

Rationale Codes:

For selection as a COPC:

ASL = Above Screening Level

For elimination as a COPC:

BSL = Below Screening Level

NTX - No toxicity criteria available.

LIST OF TABLES
RAGS PART D TABLE 3
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Table No.

Reasonable Maximum/Central Tendency Exposures

- | | |
|---------|---|
| 3.1.RME | Groundwater - All 2005/2006 VOC Data - Southern Boundary Area |
| 3.2.RME | Groundwater - All 2005/2006 VOC Data for Last Quarter of Sampling- Southern Boundary Area |
| 3.3.RME | Groundwater - All 2005/2006 VOC Data - All Locations |
| 3.4.RME | Groundwater - All 2005/2006 VOC Data - Minus Southern Boundary Area |
| 3.5.RME | Surface Water - All 2005/2006 VOC Data - Southern Boundary Area |
| 3.6.RME | Surface Water - All 2005/2006 VOC Data for Last Quarter of Sampling- Southern Boundary Area |
| 3.7.RME | Sediment - All 2004/2005 VOC Data Plus Any Available Metals Data |
| 3.8.RME | Shellfish - Shellfish Data Presented In The Site 07 Phase III RI Report |

TABLE 3.1.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration		Rationale
						Value	Statistic	
Site 07 All 2005/2006 VOC Data Southern Boundary Area	1,1,2,2-Tetrachloroethane	ug/L	166	410 (NP)	723	410	99% Chebyshev(Mean, Std) UCL	W-, A-D, & K-S Test (1)
	1,1,2-Trichloroethane	ug/L	17.8	33.9 (NP)	89.2	33.9	97.5% Chebyshev(Mean, Std) UCL	W-, A-D, & K-S Test (2)
	1,1-Dichloroethane	ug/L	1.22	2.30 (NP)	7.9 J	2.3	97.5% Chebyshev(Mean, Std) UCL	W-, A-D, & K-S Test (2)
	1,2-Dichloroethane	ug/L	0.859	1.44 (NP)	3.5	1.44	97.5% Chebyshev(Mean, Std) UCL	W-, A-D, & K-S Test (2)
	Benzene	ug/L	0.623	1.05 (NP)	5.8	1.05	95% Chebyshev(Mean, Std) UCL	W-, A-D, & K-S Test (3)
	Chloroform	ug/L	0.764	1.27 (NP)	7.9 J	1.27	95% Chebyshev(Mean, Std) UCL	W-, A-D, & K-S Test (3)
	cis-1,2-Dichloroethane	ug/L	435	1014 (NP)	1620	1014	99% Chebyshev(Mean, Std) UCL	W-, A-D, & K-S Test (1)
	trans-1,2-Dichloroethane	ug/L	41.9	56.9 (G)	196	56.9	Approximate Gamma 95% UCL	A-D, K-S (4)
	Trichloroethane	ug/L	435	1278 (NP)	2710	1278	99% Chebyshev(Mean, Std) UCL	W-, A-D, & K-S Test (1)
	Vinyl Chloride	ug/L	21.7	62.0 (NP)	179 J	62	99% Chebyshev(Mean, Std) UCL	W-, A-D, & K-S Test (1)

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

J - Estimated value.

G - Gamma distribution.

NP - Non-parametric distribution.

1 - The Shapiro-Wilks, Anderson-Darling, and Kolmogorov-Smirnov tests indicate that the data is non-parametric. The ProUCL guidance recommends that the 99% Chebyshev(Mean, Std) UCL be used as the exposure point concentration.

2 - The Shapiro-Wilks, Anderson-Darling, and Kolmogorov-Smirnov tests indicate that the data is non-parametric. The ProUCL guidance recommends that the 97.5% Chebyshev(Mean, Std) UCL be used as the exposure point concentration.

3 - The Shapiro-Wilks, Anderson-Darling, and Kolmogorov-Smirnov tests indicate that the data is non-parametric. The ProUCL guidance recommends that the 95% Chebyshev(Mean, Std) UCL be used as the exposure point concentration.

4 - Anderson-Darling (A-D) and Kolmogorov Smirnov (K-S) test indicates that the data follows a gamma distribution, the approximate gamma 95% UCL is used as the exposure point concentration.

TABLE 3.2.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration		Rationale
						Value	Units		Statistic
Site 07 All 2005/2005 VOC Data for Last Quarter of Sampling Southern Boundary Area	1,1,2,2-Tetrachloroethane	ug/L	132	413 (G)	389	389	Maximum Detected Concentration	A-D, K-S (1)
	1,1,2-Trichloroethane	ug/L	13.3	26.7 (G)	50.9	26.7	Approximate Gamma 95% UCL	A-D, K-S (2)
	1,1-Dichloroethane	ug/L	0.783	3.16 (NP)	5.3	3.16	99% Chebyshev(Mean, Std) UCL	W-, A-D, & K-S Test (2)
	1,2-Dichloroethane	ug/L	0.935	1.26 (N)	2.8 J	1.26	Student-t	W-Test (3)
	Benzene	ug/L	0.246	0.506 (NP)	0.79	0.506	95% Chebyshev(Mean, Std) UCL	W-, A-D, & K-S Test (4)
	Chloroform	ug/L	0.376	0.788 (NP)	1.5 J	0.788	95% Chebyshev(Mean, Std) UCL	W-, A-D, & K-S Test (4)
	cis-1,2-Dichloroethane	ug/L	335	843 (G)	1170	843	Adjusted Gamma 95% UCL	A-D, K-S (5)
	trans-1,2-Dichloroethane	ug/L	34.8	71.8 (G)	193	71.8	Approximate Gamma 95% UCL	A-D, K-S (6)
	Trichloroethane	ug/L	180	552 (G)	1720	552	Adjusted Gamma 95% UCL	A-D, K-S (5)
	Vinyl Chloride	ug/L	33.5	70.7 (G)	126	70.7	Approximate Gamma 95% UCL	A-D, K-S (6)

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

J - Estimated value.

G - Gamma distribution.

N - Normal distribution.

NP - Non-parametric distribution.

1 - Anderson-Darling (A-D) and Kolmogorov Smirnov (K-S) test indicates that the data follows a gamma distribution, The ProUCL guidance recommends that the adjusted gamma 95% UCL be used as the exposure point concentration. The adjusted UCL is greater than the maximum detected concentration therefore the maximum detected concentration is used as the exposure point concentration.

2 - Anderson-Darling (A-D) and Kolmogorov Smirnov (K-S) test indicates that the data follows a gamma distribution, The ProUCL guidance recommends that the approximate gamma 95% UCL be used as the exposure point concentration.

3 - The Shapiro-Wilks, Anderson-Darling, and Kolmogorov-Smirnov tests indicate that the data is non-parametric. The ProUCL guidance recommends that the 99% Chebyshev(Mean, Std) UCL be used as the exposure point concentration.

4 - The Shapiro-Wilks W test indicates that the data are normally distributed. The ProUCL guidance recommends that the 95% Student-t UCL be used as the exposure point concentration.

5 - The Shapiro-Wilks, Anderson-Darling, and Kolmogorov-Smirnov tests indicate that the data is non-parametric. The ProUCL guidance recommends that the 95% Chebyshev(Mean, Std) UCL be used as the exposure point concentration.

6 - Anderson-Darling (A-D) and Kolmogorov Smirnov (K-S) test indicates that the data follows a gamma distribution, The ProUCL guidance recommends that the adjusted gamma 95% UCL be used as the exposure point concentration.

TABLE 3.3.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration		Rationale
						Value	Units	
Site 07 All 2005/2006 VOC Data All Locations	1,1,2,2-Tetrachloroethane	ug/L	129	333 (NP)	723	333	ug/L	99% Chebyshev(Mean, Std) UCL W-, A-D, & K-S Test (1)
	1,1,2-Trichloroethane	ug/L	14.0	35.4 (NP)	89.2	35.4	ug/L	99% Chebyshev(Mean, Std) UCL W-, A-D, & K-S Test (1)
	1,1-Dichloroethane	ug/L	1.03	1.64 (NP)	7.9 J	1.64	ug/L	95% Chebyshev(Mean, Std) UCL W-, A-D, & K-S Test (2)
	1,2-Dichloroethane	ug/L	0.739	1.09 (NP)	3.5	1.09	ug/L	95% Chebyshev(Mean, Std) UCL W-, A-D, & K-S Test (2)
	Benzene	ug/L	0.528	0.877 (NP)	5.8	0.887	ug/L	95% Chebyshev(Mean, Std) UCL W-, A-D, & K-S Test (2)
	Chloroform	ug/L	0.667	1.07 (NP)	7.9 J	1.07	ug/L	95% Chebyshev(Mean, Std) UCL W-, A-D, & K-S Test (2)
	cis-1,2-Dichloroethane	ug/L	338	828 (NP)	1620	828	ug/L	99% Chebyshev(Mean, Std) UCL W-, A-D, & K-S Test (1)
	trans-1,2-Dichloroethane	ug/L	32.7	80.6 (NP)	196	80.6	ug/L	99% Chebyshev(Mean, Std) UCL W-, A-D, & K-S Test (1)
	Trichloroethene	ug/L	338	466 (NP)	2710	466	ug/L	Hall's Bootstrap UCL W-, A-D, & K-S Test (3)
	Vinyl Chloride	ug/L	16.9	49.6 (NP)	179 J	49.6	ug/L	99% Chebyshev(Mean, Std) UCL W-, A-D, & K-S Test (1)

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

J - Estimated value.

NP - Non-parametric distribution.

- 1 - The Shapiro-Wilks, Anderson-Darling, and Kolmogorov-Smirnov tests indicate that the data is non-parametric. The ProUCL guidance recommends that the 99% Chebyshev(Mean, Std) UCL be used as the exposure point concentration.
- 2 - The Shapiro-Wilks, Anderson-Darling, and Kolmogorov-Smirnov tests indicate that the data is non-parametric. The ProUCL guidance recommends that the 95% Chebyshev(Mean, Std) UCL be used as the exposure point concentration.
- 3 - The Shapiro-Wilks, Anderson-Darling, and Kolmogorov-Smirnov tests indicate that the data is non-parametric. The ProUCL guidance recommends that the Hall's Bootstrap UCL be used as the exposure point concentration.

TABLE 3.4.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration		Rationale
						Value	Units	
Site 07 All VOC Data Minus Southern Boundary Area	1,1,2,2-Tetrachloroethane	ug/L	2.15	19.8 (NP)	35.1	19.8	ug/L	99% Chebyshev(Mean, Std) UCL W-, A-D, & K-S Test (1)
	1,1,2-Trichloroethane	ug/L	0.794	2.37 (NP)	6.9	2.37	ug/L	95% Chebyshev(Mean, Std) UCL W-, A-D, & K-S Test (2)
	1,2-Dichloroethane	ug/L	0.321	0.824 (NP)	2.4	0.824	ug/L	95% Chebyshev(Mean, Std) UCL W-, A-D, & K-S Test (2)
	cis-1,2-Dichloroethane	ug/L	2.05	6.96 (NP)	22.9	6.96	ug/L	95% Chebyshev(Mean, Std) UCL W-, A-D, & K-S Test (2)
	trans-1,2-Dichloroethane	ug/L	0.679	1.60 (NP)	4.4	1.6	ug/L	95% Chebyshev(Mean, Std) UCL W-, A-D, & K-S Test (2)
	Trichloroethane	ug/L	0.909	5.58 (NP)	8	5.58	ug/L	99% Chebyshev(Mean, Std) UCL W-, A-D, & K-S Test (2)

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

J - Estimated value.

NP - Non-parametric distribution.

1 - The Shapiro-Wilks, Anderson-Darling, and Kolmogorov-Smirnov tests indicate that the data is non-parametric. The ProUCL guidance recommends that the 99% Chebyshev(Mean, Std) UCL be used as the exposure point concentration.

2 - The Shapiro-Wilks, Anderson-Darling, and Kolmogorov-Smirnov tests indicate that the data is non-parametric. The ProUCL guidance recommends that the 95% Chebyshev(Mean, Std) UCL be used as the exposure point concentration.

TABLE 3.5.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

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

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration		Rationale
						Value	Units	
Site 07 All 2005/2006 VOC Data for Southern Boundary Area	1,1,2,2-Tetrachloroethane	ug/L	1.08	2.61 (NP)	11.9	2.61	ug/L	97.5% Chebyshev(Mean, Std) UCL W-, A-D, & K-S Test (1)
	cis-1,2-Dichloroethene	ug/L	6.95	16.3 (NP)	69.9 J	16.3	ug/L	97.5% Chebyshev(Mean, Std) UCL W-, A-D, & K-S Test (1)
	Trichloroethene	ug/L	3.01	8.27 (NP)	43.7	8.27	ug/L	97.5% Chebyshev(Mean, Std) UCL W-, A-D, & K-S Test (1)
	Vinyl Chloride	ug/L	0.816	1.72 (NP)	12.9 J	1.72	ug/L	95% Chebyshev(Mean, Std) UCL W-, A-D, & K-S Test (2)

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

NP - Non-parametric distribution.

J - Estimated value.

1 - The Shapiro-Wilks, Anderson-Darling, and Kolmogorov-Smirnov tests indicate that the data is non-parametric. The ProUCL guidance recommends that the 97.5% Chebyshev(Mean, Std) UCL be used as the exposure point concentration.

2 - The Shapiro-Wilks, Anderson-Darling, and Kolmogorov-Smirnov tests indicate that the data is non-parametric. The ProUCL guidance recommends that the 95% Chebyshev(Mean, Std) UCL be used as the exposure point concentration.

TABLE 3.6.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

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

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration		Rationale	
						Value	Units		Statistic
Site 07	1,1,2,2-Tetrachloroethane	ug/L	1.16	8.54 (NP)	11.9	8.54	ug/L	99% Chebyshev(Mean, Std) UCL	W-, A-D, & K-S Test (1)
All 2005/2006 VOC Data for Last Quarter of Sampling	cis-1,2-Dichloroethene	ug/L	6.54	13.8 (G)	56	13.8	ug/L	Approximate Gamma 95% UCL	A-D, K-S (2)
Southern Boundary Area	Trichloroethene	ug/L	3.87	30.7 (NP)	43.7	30.7	ug/L	99% Chebyshev(Mean, Std) UCL	W-, A-D, & K-S Test (1)
	Vinyl Chloride	ug/L	0.696	1.70 (NP)	4.1	1.70	ug/L	95% Chebyshev(Mean, Std) UCL	W-, A-D, & K-S Test (4)

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

G - Gamma distribution.
 NP - Non-parametric distribution.
 J - Estimated value.

- 1 - The Shapiro-Wilks, Anderson-Darling, and Kolmogorov-Smirnov tests indicate that the data is non-parametric. The ProUCL guidance recommends that the 99% Chebyshev(Mean, Std) UCL be used as the exposure point concentration.
- 2 - Anderson-Darling (A-D) and Kolmogorov Smirnov (K-S) test indicates that the data follows a gamma distribution, the approximate gamma 95% UCL is used as the exposure point concentration.
- 3 - Anderson-Darling (A-D) and Kolmogorov Smirnov (K-S) test indicates that the data follows a gamma distribution, the adjusted gamma 95% UCL is used as the exposure point concentration.
- 4 - The Shapiro-Wilks, Anderson-Darling, and Kolmogorov-Smirnov tests indicate that the data is non-parametric. The ProUCL guidance recommends that the 95% Chebyshev(Mean, Std) UCL be used as the exposure point concentration.

**TABLE 3.7. RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND**

**Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment**

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration		Rationale
						Value	Units	
Site 07 All Available 2004/2005 Data Plus Any Available Metal Data	Trichloroethene	mg/kg	0.015	0.130 (NP)	0.152 J	0.130	mg/kg	99% Chebyshev(MVUE) UCL W-Test (1)
	Vinyl Chloride	mg/kg	0.005	0.033 (NP)	0.046	0.033	mg/kg	99% Chebyshev(MVUE) UCL W-Test (1)
	Aluminum	mg/kg	4045	6561 (N)	8260 J	8260	mg/kg	Maximum Detected Concentration (2)
	Arsenic	mg/kg	2.04	3.18 (N)	3.1	3.1	mg/kg	Maximum Detected Concentration (2)
	Beryllium	mg/kg	0.337	0.571 (N)	0.92 J	0.920	mg/kg	Maximum Detected Concentration (2)
	Iron	mg/kg	9153	14100 (N)	17000 J	17000	mg/kg	Maximum Detected Concentration (2)

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

N - Normal distribution.

NP - Non-parametric distribution.

J - Estimated value.

1 - The Shapiro-Wilks, Anderson-Darling, and Kolmogorov-Smirnov tests indicate that the data is non-parametric. The ProUCL guidance recommends that the 99% Chebyshev(Mean, Std) UCL be used as the exposure point concentration.

2 - There were less than 10 samples therefore the maximum detected concentration is used as the exposure point concentration.

TABLE 3.8.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Medium: Fish Tissue
 Exposure Medium: Fish Tissue

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Site 07	Benzo(a)pyrene	mg/kg	(1)	(1)	0.00606	0.0061	mg/kg	Maximum Detected Concentration	(1)
	Benzo(b)fluoranthene	mg/kg	(1)	(1)	0.0358	0.036	mg/kg	Maximum Detected Concentration	(1)
	Dibenzo(a,h)anthracene	mg/kg	(1)	(1)	0.00128	0.001	mg/kg	Maximum Detected Concentration	(1)
	Aldrin	mg/kg	(1)	(1)	0.000244	0.0002	mg/kg	Maximum Detected Concentration	(1)
	4,4'-DDE	mg/kg	(1)	(1)	0.0228	0.023	mg/kg	Maximum Detected Concentration	(1)
	Aroclor-1242	mg/kg	(1)	(1)	0.022	0.022	mg/kg	Maximum Detected Concentration	(1)
	Aroclor-1254	mg/kg	(1)	(1)	0.1335	0.134	mg/kg	Maximum Detected Concentration	(1)
	Aroclor-1260	mg/kg	(1)	(1)	0.0849	0.085	mg/kg	Maximum Detected Concentration	(1)
	Arsenic	mg/kg	(1)	(1)	2.5	2.50	mg/kg	Maximum Detected Concentration	(1)
	Cadmium	mg/kg	(1)	(1)	2.39	2.39	mg/kg	Maximum Detected Concentration	(1)
	Chromium	mg/kg	(1)	(1)	0.704	0.704	mg/kg	Maximum Detected Concentration	(1)
	Copper	mg/kg	(1)	(1)	126	126	mg/kg	Maximum Detected Concentration	(1)
	Iron	mg/kg	(1)	(1)	800	800	mg/kg	Maximum Detected Concentration	(1)
	Manganese	mg/kg	(1)	(1)	21.6	21.6	mg/kg	Maximum Detected Concentration	(1)
	Mercury	mg/kg	(1)	(1)	49.1	49.1	mg/kg	Maximum Detected Concentration	(1)
	Nickel	mg/kg	(1)	(1)	5	5.00	mg/kg	Maximum Detected Concentration	(1)
	Silver	mg/kg	(1)	(1)	6.2	6.20	mg/kg	Maximum Detected Concentration	(1)

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

1 - There were an insufficient number of samples to calculate statistics.

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RAGS PART D TABLE 4
VALUES USED FOR DAILY INTAKE CALCULATIONS

Table No.

Reasonable Maximum Exposures

4.1.RME	Child Recreational Users Exposed to Surface Water While Swimming
4.2.RME	Child Recreational Users Exposed to Sediment
4.3.RME	Child Recreational Users Exposed via Ingestion of Shellfish
4.4.RME	Adolescent Recreational Users Exposed to Surface Water While Swimming
4.5.RME	Adolescent Recreational Users Exposed to Surface Water While Clamming
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4.16	Intermediate Variables For Calculating DA(Event)

TABLE 4.1.RME
 VALUES USED FOR DAILY INTAKE CALCULATIONS
 REASONABLE MAXIMUM EXPOSURE
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Future
 Medium: Surface Water
 Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Recreational Users Swimming	Child	Site 07	CW	Chemical Concentration in Water	Max or 95% UCL	ug/L	U.S. EPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) = $CW \times CF \times CR \times ET \times EF \times ED$ $BW \times AT$
				CR	Contact Rate	0.05	L/hour	U.S. EPA, 1989	
				CF	Conversion factor	0.001	mg/ug	..	
				ET	Exposure Time	2	hours/event	(1)	
				EF	Exposure Frequency	80	events/year	(1)	
				ED	Exposure Duration	6	years	U.S. EPA, 1983	
				BW	Body Weight	15	kg	U.S. EPA, 1993	
				AT-C	Averaging Time (Cancer)	25,550	days	U.S. EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	U.S. EPA, 1989	
				Dermal	Recreational Users	Child	Site 07	DAevent		Absorbed dose per event	Calculated	mg/cm^{2}-event	U.S. EPA, 2004	Dermally Absorbed Dose (mg/kg/day) = $DA_{event} \times EV \times EF \times ED \times SA$ $BW \times AT$ See Attachment 2 for calculation of DAevent.
SA	Skin Surface Available for Contact	7,300	cm ²					U.S. EPA, 1997	
EV	Event Frequency	1	events/day					U.S. EPA, 2004	
ET	Exposure Time	2	hours/event					(1)	
EF	Exposure Frequency	80	days/year					(2)	
ED	Exposure Duration	6	years					U.S. EPA, 1993	
BW	Body Weight	15	kg					U.S. EPA, 1993	
AT-C	Averaging Time (Cancer)	25,550	days					U.S. EPA, 1989	
AT-N	Averaging Time (Non-Cancer)	2,190	days					U.S. EPA, 1989	

Notes:

- 1 - Professional judgement
- 2 - Assumes three days a week from April through October.

Sources:

U.S. EPA, 1989; Risk Assessment Guidance for Superfund, Vol 1: Human Health Evaluation Manual, Part A, EPA/540/1-86/060.
 EPA Region IV, 2000; Supplemental Guidance to RAGS; Region 4 Bulletins.
 U.S. EPA, 2002; Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.
 U.S. EPA, 2004; Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

$$\text{Ingestion Intake} = (CR \times CF \times ET \times EF \times ED) / (BW \times AT)$$

$$\text{Dermal Intake} = (SA \times EV \times EF \times ED) / (BW \times AT)$$

$$\text{Cancer Ingestion Intake} = 1.25E-07$$

$$\text{Noncancer Ingestion Intake} = 1.48E-06$$

$$\text{Cancer Dermal Intake} = 9.14E-00$$

$$\text{Noncancer Dermal Intake} = 1.07E+02$$

Cancer risk from ingestion = Surface Water concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor
 Cancer risk from dermal contact = Surface Water concentration x Cancer Dermal Intake x Dermal Cancer Slope Factor
 Hazard Index from ingestion = Surface Water concentration x Noncancer Ingestion Intake / Oral Reference Dose
 Hazard Index from dermal contact = Surface Water concentration x Noncancer Dermal Intake x Dermal Reference Dose

TABLE 4.2.RME
 VALUES USED FOR DAILY INTAKE CALCULATIONS
 REASONABLE MAXIMUM EXPOSURE
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Future
 Medium: Sediment
 Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Ingestion	Recreational Users Swimming	Child	Site 07	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	U.S. EPA, 2002	Intake (mg/kg/day) = $CS \times IR-S \times CF3 \times FI \times EF \times ED$ BW x AT
				IR-S	Ingestion Rate	200	mg/day	U.S. EPA, 1993	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				FI	Fraction Ingested	1	unitless	--	
				EF	Exposure Frequency	80	days/year	(1)	
				ED	Exposure Duration	6	years	U.S. EPA, 1993	
				BW	Body Weight	15	kg	U.S. EPA, 1993	
				AT-C	Averaging Time (Cancer)	25,550	days	U.S. EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	U.S. EPA, 1989	
				Dermal	Recreational Users	Child	Site 07	CS		Chemical concentration in sediment	Max or 95% UCL	mg/kg	U.S. EPA, 2002	Dermally Absorbed Dose (mg/kg/day) = $CS \times CF3 \times SA \times SSAF \times DABS \times EF \times ED$ BW x AT
CF3	Conversion Factor 3	1.0E-06	kg/mg					--	
SA	Skin Surface Available for Contact	1,825	cm ²					(2)	
SSAF	Soil to Skin Adherence Factor	5.0	mg/cm ² /event					Shoaf et al. 2005	
DABS	Absorption Factor	Chemical Specific	unitless					U.S. EPA, 2004	
EF	Exposure Frequency	80	days/year					(1)	
ED	Exposure Duration	6	years					U.S. EPA, 1993	
BW	Body Weight	15	kg					U.S. EPA, 1993	
AT-C	Averaging Time (Cancer)	25,550	days					U.S. EPA, 1989	
AT-N	Averaging Time (Non-Cancer)	2,190	days					U.S. EPA, 1989	

Notes:

- 1 - Assumes three days a week from April through October.
- 2 - Assumes 25 percent of total body surface area is exposed.

Sources:

Shoaf et al. 2005: Child Dermal Sediment Loads Following Clay in Tide Flat, Journal of Exposure Analysis and Environmental Epidemiology 15, 407-412.
 U.S. EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.
 U.S. EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.
 U.S. EPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 2285.6-10.
 U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = $(IR-S \times CF3 \times FI \times EF \times ED) / (BW \times AT)$
 Dermal Intake = $(CF3 \times SA \times SSAF \times EF \times ED) / (BW \times AT)$

Cancer Ingestion Intake = 2.50E-07
 Noncancer Ingestion Intake = 2.92E-06
 Cancer Dermal Intake = 1.14E-05
 Noncancer Dermal Intake = 1.33E-04

Cancer risk from ingestion = Sediment concentration x Cancer ingestion Intake x Oral Cancer Slope Factor
 Cancer risk from dermal contact = Sediment concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor
 Hazard Index from ingestion = Sediment concentration x Noncancer ingestion Intake / Oral Reference Dose
 Hazard Index from dermal contact = Sediment concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.3.RME
 VALUES USED FOR DAILY INTAKE CALCULATIONS
 REASONABLE MAXIMUM EXPOSURE
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Medium: Surface Water
 Exposure Medium: Shellfish

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Ingestion	Recreational User	Child	Site 07	CFish	Chemical Concentration in Fish	Max or 95% UCL	mg/kg	U.S. EPA, 2002	$\text{Intake (mg/kg/day)} = \frac{\text{C}_{\text{Fish}} \times \text{IR} \times \text{FI} \times \text{EF} \times \text{ED}}{\text{BW} \times \text{AT}}$
				IR	Ingestion Rate of fish/shellfish	0.0055	kg/meal	U.S. EPA, 1997	
				FI	Fraction ingested from source	0.5	unitless	--	
				EF	Exposure Frequency	350	meals/year	(1)	
				ED	Exposure Duration	6	years	U.S. EPA, 1991	
				BW	Body Weight	15	kg	U.S. EPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	U.S. EPA, 1989	
AT-N	Averaging Time (Non-Cancer)	2190	days	U.S. EPA, 1989					

Notes:

1 - Assumes one meal per week of fish caught at site during the warm summer months for RME. CTE is assumed to be one half of RME.

Sources:

U.S. EPA, 1989: Risk Assessment Guidance for Superfund, Vol 1: Human Health Evaluation Manual, Part A. U.S. EPA/540/1-88/060.

U.S. EPA, 1997: Exposure Factors Handbook. U.S. EPA/600/P-95/002Fa.

U.S. EPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

Unit Intake Calculations

$$\text{Ingestion Intake} = (\text{IR} \times \text{FI} \times \text{EF} \times \text{ED}) / (\text{BW} \times \text{AT})$$

$$\text{Cancer Ingestion Intake} = 1.51\text{E-05}$$

$$\text{Noncancer Ingestion Intake} = 1.76\text{E-04}$$

$$\text{Cancer risk from ingestion} = \text{Fish tissue concentration} \times \text{Cancer Ingestion Intake} \times \text{Oral Cancer Slope Factor}$$

$$\text{Hazard Index from ingestion} = \text{Fish tissue concentration} \times \text{Noncancer Ingestion Intake} / \text{Oral Reference Dose}$$

TABLE 4.4.RME
 VALUES USED FOR DAILY INTAKE CALCULATIONS
 REASONABLE MAXIMUM EXPOSURE
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH-KINGSTOWN, RHODE ISLAND

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Ingestion	Recreational User Swimming	Adolescent	Site 07	CW	Chemical Concentration in Water	Max or 95% UCL	ug/L	U.S. EPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) = $CW \times CF \times CR \times ET \times EF \times ED$ $BW \times AT$
				CR	Contact Rate	0.05	L/hr	U.S. EPA, 1989	
				CF	Conversion Factor	0.001	mg/ug		
				ET	Exposure Time	2	hours/event	(1)	
				EF	Exposure Frequency	80	events/year	(2)	
				ED	Exposure Duration	9	years	(3)	
				BW	Body Weight	45	kg	U.S. EPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	U.S. EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	U.S. EPA, 1989	
				Dermal	Recreational User	Adolescent	Site 07	DAevent		Absorbed dose per event	Calculated	mg/cm^{2}-event	U.S. EPA, 2004	Dermally Absorbed Dose (mg/kg/day) = $DAevent \times EV \times EF \times ED \times SA$ $BW \times AT$ See Attachment 2 for calculation of DAevent.
SA	Skin Surface Available for Contact	13,000	cm ²					U.S. EPA, 1997	
EV	Event Frequency	1	events/day					(1)	
ET	Exposure Time	2	hours/event					(1)	
EF	Exposure Frequency	80	days/year					(2)	
ED	Exposure Duration	9	years					(3)	
BW	Body Weight	45	kg					U.S. EPA, 1997	
AT-C	Averaging Time (Cancer)	25,550	days					U.S. EPA, 1989	
AT-N	Averaging Time (Non-Cancer)	3,285	days					U.S. EPA, 1989	

Notes:

- 1 - Professional judgment.
- 2 - Assumes three days a week from April through October.
- 3 - Adolescents from age 8 to 16.

Sources:

U.S. EPA, 1989: Risk Assessment Guidance for Superfund, Vol 1: Human Health Evaluation Manual, Part A. EPA/540/r-86/060.
 U.S. EPA, 1997: Exposure Factors Handbook. EPA/600/8-95/002FA.
 U.S. EPA Region IV, 2000: Supplemental Guidance to RAGS: Region 4 Bulletins.
 U.S. EPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.
 U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E: Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Ingestion Intake = $(CR \times CF \times ET \times EF \times ED) / (BW \times AT)$
 Dermal Intake = $(SA \times EV \times EF \times ED) / (BW \times AT)$

Cancer Ingestion Intake = 6.26E-08
 Noncancer Ingestion Intake = 4.87E-07
 Cancer Dermal Intake = 8.14E-00
 Noncancer Dermal Intake = 6.33E-01

Cancer risk from ingestion = Surface Water concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor
 Cancer risk from dermal contact = Surface Water concentration x Cancer Dermal Intake x Dermal Cancer Slope Factor
 Hazard Index from ingestion = Surface Water concentration x Noncancer Ingestion Intake / Oral Reference Dose
 Hazard Index from dermal contact = Surface Water concentration x Noncancer Dermal Intake / Dermal Reference Dose

TABLE 4.5.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name					
Ingestion	Recreational User Clamming	Adolescent	Site 07	CW	Chemical Concentration in Water	Max or 95% UCL	ug/L	U.S. EPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) = $CW \times CF \times IR \times BW \times EF \times ED \times SA$ BW x AT					
				CR	Contact Rate	0.01	L/hr	U.S. EPA IV, 2000						
				CF	Conversion factor	0.001	ug/mg							
				ET	Exposure Time	2	hours/event	(1)						
				EF	Exposure Frequency	80	events/year	(2)						
				ED	Exposure Duration	9	years	(3)						
				BW	Body Weight	45	kg	U.S. EPA, 1987						
				AT-C	Averaging Time (Cancer)	25,550	days	U.S. EPA, 1989						
				AT-N	Averaging Time (Non-Cancer)	3,285	days	U.S. EPA, 1989						
				Dermal	Recreational User	Adolescent	Site 07	DAevent		Absorbed dose per event	Calculated	mg/cm ² -event	U.S. EPA, 2004	Dermally Absorbed Dose (mg/kg/day) = $DAevent \times EV \times EF \times ED \times SA$ BW x AT See Attachment 2 for calculation of DAevent.
								SA		Skin Surface Available for Contact	4,300	cm ²	(4)	
EV	Event Frequency	1	events/day					(1)						
ET	Exposure Time	2	hours/event					(1)						
EF	Exposure Frequency	80	days/year					(2)						
ED	Exposure Duration	9	years					(3)						
BW	Body Weight	45	kg					U.S. EPA, 1987						
AT-C	Averaging Time (Cancer)	25,550	days					U.S. EPA, 1989						
AT-N	Averaging Time (Non-Cancer)	3,285	days					U.S. EPA, 1989						

Notes:

- Professional judgment.
- Assumes three days a week from April through October.
- Adolescents from age 8 to 16.
- Assumes that 33 percent of the total surface body area is exposed.

Sources:

- U.S. EPA, 1989: Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual, Part A. EPA/540/1-89/060.
- U.S. EPA, 1997: Exposure Factors Handbook. EPA/600/8-95/002FA.
- U.S. EPA Region IV, 2000: Supplemental Guidance to RAGS, Region 4 Bulletins.
- U.S. EPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.
- U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R99/005.

Unit Intake Calculations

$$\text{Ingestion Intake} = (CR \times CF \times ET \times EF \times ED) / (BW \times AT)$$

$$\text{Dermal Intake} = (SA \times EV \times EF \times ED) / (BW \times AT)$$

Cancer Ingestion Intake = 1.25E-08
Noncancer Ingestion Intake = 9.74E-08

Cancer Dermal Intake = 2.69E-00
Noncancer Dermal Intake = 2.09E-01

Cancer risk from ingestion = Surface Water concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor
Cancer risk from dermal contact = Surface Water concentration x Cancer Dermal Intake x Dermal Cancer Slope Factor
Hazard Index from ingestion = Surface Water concentration x Noncancer Ingestion Intake / Oral Reference Dose
Hazard Index from dermal contact = Surface Water concentration x Noncancer Dermal Intake / Dermal Reference Dose

TABLE 4.6.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Ingestion	Recreational User Clamming	Adolescent	Site 07	CW	Chemical Concentration in Water	Max or 95% UCL	ug/L	U.S. EPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) = $CW \times CF \times CR \times ET \times EF \times ED$ BW x AT
				CR	Contact Rate	0	L/hr	U.S. EPA IV, 2000	
				CF	Conversion factor	0.001	mg/ug	--	
				ET	Exposure Time	2	hours/event	(1)	
				EF	Exposure Frequency	80	events/year	(2)	
				ED	Exposure Duration	9	years	(3)	
				BW	Body Weight	45	kg	U.S. EPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	U.S. EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	U.S. EPA, 1989	
				Dermal	Recreational User	Adolescent	Site 07	DAevent		Absorbed dose per event	Calculated	mg/cm2-event	U.S. EPA, 2004	Dermally Absorbed Dose (mg/kg/day) = $DAevent \times EV \times EF \times ED \times SA$ BW x AT See Attachment 2 for calculation of DAevent.
SA	Skin Surface Available for Contact	1,300	cm2					(4)	
EV	Event Frequency	1	events/day					(1)	
ET	Exposure Time	2	hours/event					(1)	
EF	Exposure Frequency	80	days/year					(2)	
ED	Exposure Duration	9	years					(3)	
BW	Body Weight	45	kg					U.S. EPA, 1997	
AT-C	Averaging Time (Cancer)	25,550	days					U.S. EPA, 1989	
AT-N	Averaging Time (Non-Cancer)	3,285	days					U.S. EPA, 1989	

Notes:

- 1 - Professional judgment.
- 2 - Assumes three days a week from April through October.
- 3 - Adolescents from age 8 to 16.
- 4 - Assumes that 10 percent of the total surface body area is exposed.

Sources:

U.S. EPA, 1989; Risk Assessment Guidance for Superfund, Vol 1: Human Health Evaluation Manual, Part A, EPA/540/1-86/060.
U.S. EPA, 1997; Exposure Factors Handbook, EPA/600/9-95/002FA.
U.S. EPA Region IV, 2000; Supplemental Guidance to RAGS: Region 4 Bulletins.
U.S. EPA, 2002; Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites, OSWER 9285.6-10.
U.S. EPA, 2004; Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R-04/005.

Unit Intake Calculations

Ingestion Intake = $(CR \times CF \times ET \times EF \times ED) / (BW \times AT)$
Dermal Intake = $(SA \times EV \times EF \times ED) / (BW \times AT)$

Cancer Ingestion Intake = 0.00E+00
Noncancer Ingestion Intake = 0.00E+00
Cancer Dermal Intake = 6.14E-01
Noncancer Dermal Intake = 6.33E+00

Cancer risk from ingestion = Groundwater concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor
Cancer risk from dermal contact = Groundwater concentration x Cancer Dermal Intake x Dermal Cancer Slope Factor
Hazard Index from ingestion = Groundwater concentration x Noncancer Ingestion Intake / Oral Reference Dose
Hazard Index from dermal contact = Groundwater concentration x Noncancer Dermal Intake / Dermal Reference Dose

TABLE 4.7.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Ingestion	Recreational User Swimming	Adolescent	Site 07	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	U.S. EPA, 2002	Intake (mg/kg/day) = $CS \times IRS \times CF3 \times FI \times EF \times ED$ BW x AT
				IR-S	Ingestion Rate	100	mg/day	(1)	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				FI	Fraction Ingested	1	unitless	--	
				EF	Exposure Frequency	80	days/year	(2)	
				ED	Exposure Duration	9	years	(3)	
				BW	Body Weight	45	kg	U.S. EPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	U.S. EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	U.S. EPA, 1989	
				Dermal	Recreational User	Adolescent	Site 07	CS		Chemical concentration in sediment	Max or 95% UCL	mg/kg	U.S. EPA, 2002	Dermally Absorbed Dose (mg/kg/day) = $CS \times CF3 \times SA \times SSAF \times DABS \times EF \times ED$ BW x AT
CF3	Conversion Factor 3	1.0E-06	kg/mg					--	
SA	Skin Surface Available for Contact	3,250	cm ²					(4)	
SSAF	Soil to Skin Adherence Factor	5.0	mg/cm ² /event					Shoaf et al. 2005	
DABS	Absorption Factor	Chemical Specific	unitless					U.S. EPA, 2004	
EF	Exposure Frequency	80	days/year					(2)	
ED	Exposure Duration	9	years					(3)	
BW	Body Weight	45	kg					U.S. EPA, 1997	
AT-C	Averaging Time (Cancer)	25,550	days					U.S. EPA, 1989	
AT-N	Averaging Time (Non-Cancer)	3,285	days					U.S. EPA, 1989	

Notes:
1 - Professional judgement.
2 - Assumes three days a week from April through October.
3 - Adolescents from age 6 to 16.
4 - Assumes that 25 percent of the total surface body area is exposed.

Sources:
Shoaf et. Al. 2005: Child Dermal Sediment Loads Following Oily in Tide Flat, Journal of Exposure Analysis and Environmental Epidemiology 15, 407-412.
U.S. EPA, 1989: Risk Assessment Guidance for Superfund, Vol 1: Human Health Evaluation Manual, Part A, EPA/540/1-89/060.
U.S. EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.
U.S. EPA, 1997: Exposure Factors Handbook, U.S. EPA/600/9-95/02FA.
U.S. EPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.
U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R99/005.

Unit Intake Calculations
Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)
Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)
Cancer Ingestion Intake = 6.28E-08
Noncancer Ingestion Intake = 4.87E-07
Cancer Dermal Intake = 1.02E-05
Noncancer Dermal Intake = 7.91E-05

Cancer risk from ingestion = Sediment concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor
Cancer risk from dermal contact = Sediment concentration x Cancer Dermal Intake x Dermal Cancer Slope Factor
Hazard Index from ingestion = Sediment concentration x Noncancer Ingestion Intake / Oral Reference Dose
Hazard Index from dermal contact = Sediment concentration x Noncancer Dermal Intake / Dermal Reference Dose

TABLE 4.8. RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
DAYSVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Ingestion	Recreational User Clamming	Adolescent	Site 07	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	U.S. EPA, 2002	$CS \times IRS \times CF3 \times EF \times ED \times BW \times AT$
				IR-S	Ingestion Rate	100	mg/day	(1)	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				FI	Fraction Ingested	1	unitless	--	
				EF	Exposure Frequency	80	days/year	(2)	
				ED	Exposure Duration	9	years	(3)	
				BW	Body Weight	45	kg	U.S. EPA, 1997	
				AT-C	Averaging Time (Cancer)	25,550	days	U.S. EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	U.S. EPA, 1989	
				Dermal	Recreational User	Adolescent	Site 07	CS		Chemical concentration in sediment	Max or 95% UCL	mg/kg	U.S. EPA, 2002	Dermally Absorbed Dose (mg/kg/day) = $CS \times CF3 \times SA \times SSAF \times DABS \times EE \times ED$
CF3	Conversion Factor 3	1.0E-06	kg/mg					--	
SA	Skin Surface Available for Contact	4,300	cm ²					(3)	
SSAF	Soil to Skin Adherence Factor	0.3	mg/cm ² /event					Shoaf et al. 2005	
DABS	Absorption Factor	Chemical Specific	unitless					U.S. EPA, 2004	
EF	Exposure Frequency	80	days/year					(2)	
ED	Exposure Duration	9	years					(3)	
BW	Body Weight	45	kg					U.S. EPA, 1997	
AT-C	Averaging Time (Cancer)	25,550	days					U.S. EPA, 1989	
AT-N	Averaging Time (Non-Cancer)	3,285	days					U.S. EPA, 1989	

Notes:

- Professional judgement.
- Assumes three days a week from April through October.
- Adolescents from age 8 to 16.
- Assumes that 25 percent of the total surface body area is exposed.

Sources:

Shoaf et al. 2005. Child Dermal Sediment Loads Following Oily in Tide Flat. Journal of Exposure Analysis and Environmental Epidemiology 15, 407-412.
U.S. EPA, 1989. Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual. Part A. EPA/540/1-89/060.
U.S. EPA, 1993. Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.
U.S. EPA, 1997. Exposure Factors Handbook. U.S. EPA/600/8-95/002FA.
U.S. EPA, 2002. Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285-6-10.
U.S. EPA, 2004. Risk Assessment Guidance for Superfund (Part E. Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R-99/005.

Unit Intake Calculations

$$\text{Incidental Ingestion Intake} = (IRS \times CF3 \times FI \times EF \times ED) / (BW \times AT)$$

$$\text{Dermal Intake} = (CF3 \times SA \times SSAF \times EF \times ED) / (BW \times AT)$$

$$\text{Cancer Ingestion Intake} = 6.26E-08$$

$$\text{Cancer Dermal Intake} = 9.02E-07$$

$$\text{Noncancer Ingestion Intake} = 4.87E-07$$

$$\text{Noncancer Dermal Intake} = 7.02E-06$$

Cancer risk from ingestion = Sediment concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor
Cancer risk from dermal contact = Sediment concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor
Hazard Index from ingestion = Sediment concentration x Noncancer Ingestion Intake / Oral Reference Dose
Hazard Index from dermal contact = Sediment concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.9.RME
 VALUES USED FOR DAILY INTAKE CALCULATIONS
 REASONABLE MAXIMUM EXPOSURE
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Medium: Surface Water
 Exposure Medium: Shellfish

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Ingestion	Recreational User	Adolescent	Site 07	CFish	Chemical Concentration in Fish	Max or 95% UCL	mg/kg	U.S. EPA, 2002	$\text{CFish} \times \text{IR} \times \text{FI} \times \text{EF} \times \text{ED}$ $\text{BW} \times \text{AT}$
				IR	Ingestion Rate of fish/shellfish	0.026	kg/meal	U.S. EPA, 1997	
				FI	Fraction ingested from source	0.5	unitless	--	
				EF	Exposure Frequency	350	meals/year	(1)	
				ED	Exposure Duration	9	years	U.S. EPA, 1991	
				BW	Body Weight	45	kg	U.S. EPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	U.S. EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3285	days	U.S. EPA, 1989	

Notes:
 1 - Assumes one meal per week of fish caught at site during the warm summer months for RME. CTE is assumed to be one half of RME.
 Sources:
 U.S. EPA, 1999: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. U.S. EPA/540/1-86/060.
 U.S. EPA, 1997: Exposure Factors Handbook. U.S. EPA/600/P-95/002Fa.
 U.S. EPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

Unit Intake Calculations
 Ingestion Intake = $(\text{IR} \times \text{FI} \times \text{EF} \times \text{ED}) / (\text{BW} \times \text{AT})$
 Cancer Ingestion Intake = 3.56E-05 Noncancer Ingestion Intake = 2.77E-04

Cancer risk from ingestion = Fish tissue concentration x Cancer ingestion Intake x Oral Cancer Slope Factor
 Hazard Index from ingestion = Fish tissue concentration x Noncancer ingestion Intake / Oral Reference Dose

TABLE 4.10.RME
 VALUES USED FOR DAILY INTAKE CALCULATIONS
 REASONABLE MAXIMUM EXPOSURE
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Future
 Medium: Surface Water
 Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name	
Ingestion	Recreational Users	Adult	Site 07	CW	Chemical Concentration in Water	Max or 95% UCL	ug/L	U.S. EPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) =	
				CR	Contact Rate	0.05	L/hour	U.S. EPA, 1989	$CW \times CF \times CR \times ET \times EF \times ED \times BW \times AT$	
				CF	Conversion factor	0.001	mg/ug			
				ET	Exposure Time	2	hours/event	(1)		
				EF	Exposure Frequency	80	events/year	(2)		
				ED	Exposure Duration	15	years	U.S. EPA, 1993		
				BW	Body Weight	70	kg	U.S. EPA, 1993		
				AT-C	Averaging Time (Cancer)	25,550	days	U.S. EPA, 1989		
				AT-N	Averaging Time (Non-Cancer)	5,475	days	U.S. EPA, 1989		
				DAevent	Absorbed dose per event	Calculated	mg/cm ² -event	U.S. EPA, 2004		
				SA	Skin Surface Available for Contact	18,000	cm ²	U.S. EPA, 2004		
				EV	Event Frequency	1	events/day	(1)		
				ET	Exposure Time	2	hours/event	(1)		
EF	Exposure Frequency	80	days/year	(2)						
ED	Exposure Duration	15	years	U.S. EPA, 1993						
BW	Body Weight	70	kg	U.S. EPA, 1993						
AT-C	Averaging Time (Cancer)	25,550	days	U.S. EPA, 1989						
AT-N	Averaging Time (Non-Cancer)	5,475	days	U.S. EPA, 1989						
Dermal	Recreational Users	Adult	Site 07	DAevent	Absorbed dose per event	Calculated	mg/cm ² -event	U.S. EPA, 2004	Dermaally Absorbed Dose (mg/kg/day) =	
				SA	Skin Surface Available for Contact	18,000	cm ²	U.S. EPA, 2004	$DAevent \times EV \times EF \times ED \times SA \times BW \times AT$	
				EV	Event Frequency	1	events/day	(1)		
				ET	Exposure Time	2	hours/event	(1)		
				EF	Exposure Frequency	80	days/year	(2)		
				ED	Exposure Duration	15	years	U.S. EPA, 1993		
				BW	Body Weight	70	kg	U.S. EPA, 1993		
				AT-C	Averaging Time (Cancer)	25,550	days	U.S. EPA, 1989		
				AT-N	Averaging Time (Non-Cancer)	5,475	days	U.S. EPA, 1989		
										See Attachment 2 for calculation of DAevent.

Notes:

- 1 - Professional Judgment.
- 2 - Assumes three days a week from April through October.

Sources:

U.S. EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.
 U.S. EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.
 U.S. EPA Region IV, 2000: Supplemental Guidance to RAGS: Region 4 Bulletins.
 U.S. EPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.
 U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E. Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

$$\text{Ingestion Intake} = (CR \times CF \times ET \times EF \times ED) / (BW \times AT)$$

$$\text{Dermal Intake} = (SA \times EV \times EF \times ED) / (BW \times AT)$$

$$\text{Cancer Ingestion Intake} = 6.71E-08$$

$$\text{Noncancer Ingestion Intake} = 3.13E-07$$

$$\text{Cancer Dermal Intake} = 1.21E+01$$

$$\text{Noncancer Dermal Intake} = 5.64E-01$$

Cancer risk from ingestion = Surface Water concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor
 Cancer risk from dermal contact = Surface Water concentration x Cancer Dermal Intake x Dermal Cancer Slope Factor
 Hazard Index from ingestion = Surface Water concentration x Noncancer Ingestion Intake / Oral Reference Dose
 Hazard Index from dermal contact = Surface Water concentration x Noncancer Dermal Intake x Dermal Reference Dose

TABLE 4.11. FIME
 VALUES USED FOR DAILY INTAKE CALCULATIONS
 REASONABLE MAXIMUM EXPOSURE
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Future
 Medium: Surface Water
 Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Ingestion	Recreational Users Clamming	Adult	Site 07	CW	Chemical Concentration in Water	Max or 95% UCL	ug/L	U.S. EPA, 2002	$Chronic\ Daily\ Intake\ (CDI)\ (mg/kg/day) = \frac{C \times W \times A \times C R \times E T \times E F \times E D \times B W \times A T - C}{B W \times A T}$
				CR	Contact Rate	0.01	L/hour	U.S. EPA IV, 2000	
				CF	Conversion Factor	0.001	mg/ug	--	
				ET	Exposure Time	2	hours/event	(1)	
				EF	Exposure Frequency	80	events/year	(1)	
				ED	Exposure Duration	15	years	U.S. EPA, 1993	
				BW	Body Weight	70	kg	U.S. EPA, 1993	
				AT-C	Averaging Time (Cancer)	25,550	days	U.S. EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	5,475	days	U.S. EPA, 1989	
				Dermal	Recreational Users	Adult	Site 07	DAevent		Absorbed dose per event	Calculated	mg/cm^{2}-event	U.S. EPA, 2004	$Dermally\ Absorbed\ Dose\ (mg/kg/day) = \frac{D \times A_{event} \times E V \times E F \times E D \times S A}{B W \times A T}$
SA	Skin Surface Available for Contact	5,940	cm ²					(3)	
EV	Event Frequency	1	events/day					(1)	
ET	Exposure Time	2	hours/event					(1)	
EF	Exposure Frequency	80	days/year					(2)	
ED	Exposure Duration	15	years					U.S. EPA, 1993	
BW	Body Weight	70	kg					U.S. EPA, 1993	
AT-C	Averaging Time (Cancer)	25,550	days					U.S. EPA, 1989	
AT-N	Averaging Time (Non-Cancer)	5,475	days					U.S. EPA, 1989	

Notes:
 1 - Professional judgment.
 2 - Assumes three days a week from April through October.
 3 - Assumes 33 percent of the total body surface area is exposed.

Sources:
 U.S. EPA, 1989, Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual, Part A. EPA/540/1-89/060.
 U.S. EPA, 1993, Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.
 U.S. EPA Region IV, 2000, Supplemental Guidance to RAGS: Region 4 Bulletins.
 U.S. EPA, 2002, Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.
 U.S. EPA, 2004, Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Ingestion Intake = $(CR \times CF \times ET \times EF \times ED) / (BW \times AT)$
 Dermal Intake = $(SA \times EV \times EF \times ED) / (BW \times AT)$

Cancer Ingestion Intake = 1.34E-06
 Noncancer Ingestion Intake = 6.26E-08
 Cancer Dermal Intake = 3.99E+00
 Noncancer Dermal Intake = 1.86E+01

Cancer risk from ingestion = Surface Water concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor
 Cancer risk from dermal contact = Surface Water concentration x Cancer Dermal Intake x Dermal Cancer Slope Factor
 Hazard Index from ingestion = Surface Water concentration x Noncancer Ingestion Intake / Oral Reference Dose
 Hazard Index from dermal contact = Surface Water concentration x Noncancer Dermal Intake x Dermal Reference Dose

TABLE 4.12.RME
 VALUES USED FOR DAILY INTAKE CALCULATIONS
 REASONABLE MAXIMUM EXPOSURE
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeline: Future
 Medium: Groundwater
 Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Ingestion	Recreational Users	Adult	Site 07	CW	Chemical Concentration in Water	Max or 95% UCL	ug/L	U.S. EPA, 2002	$CW \times CF \times CR \times ET \times EF \times ED \times SA$ BW x AT
				CR	Contact Rate	0	L/hour	U.S. EPA IV, 2000	
				CF	Conversion factor	0.001	mg/ug	(1)	
				ET	Exposure Time	2	hours/event	(2)	
				EF	Exposure Frequency	80	events/year	U.S. EPA, 1993	
				ED	Exposure Duration	15	years	U.S. EPA, 1993	
				BW	Body Weight	70	kg	U.S. EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	U.S. EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	5,475	days	U.S. EPA, 1989	
				Dermal	Recreational Users	Adult	Site 07	DAevent		Absorbed dose per event	Calculated	mg/cm^{2}-event	U.S. EPA, 2004	$DAevent \times EV \times EF \times ED \times SA$ BW x AT
SA	Skin Surface Available for Contact	1,800	cm ²					(3)	
EV	Event Frequency	1	events/day					(1)	
ET	Exposure Time	2	hours/event					(2)	
EF	Exposure Frequency	80	days/year					U.S. EPA, 1993	
ED	Exposure Duration	15	years					U.S. EPA, 1993	
BW	Body Weight	70	kg					U.S. EPA, 1989	
AT-C	Averaging Time (Cancer)	25,550	days					U.S. EPA, 1989	
AT-N	Averaging Time (Non-Cancer)	5,475	days					U.S. EPA, 1989	

Notes:

- Professional judgment.
- Assumes three days a week from April through October.
- Assumes that 10 percent of the total body surface area is exposed.

Sources:

U.S. EPA, 1989: Risk Assessment Guidance for Superfund, Vol 1: Human Health Evaluation Manual, Part A, EPA/540/1-89/060.
 U.S. EPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.
 U.S. EPA Region IV, 2000: Supplement Guidance to RAGS: Region 4 Bulletins.
 U.S. EPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285-6-10.
 U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

$$\text{Ingestion Intake} = (CR \times CF \times ET \times EF \times ED) / (BW \times AT)$$

$$\text{Dermal Intake} = (SA \times EV \times EF \times ED) / (BW \times AT)$$

Cancer Ingestion Intake = 0.00E+00
 Noncancer Ingestion Intake = 0.00E+00
 Cancer Dermal Intake = 1.21E+00
 Noncancer Dermal Intake = 5.64E+00

Cancer risk from ingestion = Groundwater concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor
 Cancer risk from dermal contact = Groundwater concentration x Cancer Dermal Intake x Dermal Cancer Slope Factor
 Hazard Index from ingestion = Groundwater concentration x Noncancer Ingestion Intake / Oral Reference Dose
 Hazard Index from dermal contact = Groundwater concentration x Noncancer Dermal Intake / Dermal Reference Dose

TABLE 4.13 RME
 VALUES USED FOR DAILY INTAKE CALCULATIONS
 REASONABLE MAXIMUM EXPOSURE
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Future
 Medium: Sediment
 Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Modal Name					
Ingestion	Recreational Users Swimming	Adult	Site 07	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	U.S. EPA, 2002	$\text{Intake (mg/kg/day)} = \text{CS} \times \text{IR-S} \times \text{CF3} \times \text{FI} \times \text{EF} \times \text{ED} / \text{BW} \times \text{AT}$					
				IR-S	Ingestion Rate	50	mg/day	U.S. EPA, 1993						
				CF3	Conversion Factor 3	1.0E-06	kg/mg							
				FI	Fraction Ingested	1	unitless							
				EF	Exposure Frequency	80	days/year	(1)						
				ED	Exposure Duration	15	years	U.S. EPA, 1993						
				BW	Body Weight	70	kg	U.S. EPA, 1993						
				AT-C	Averaging Time (Cancer)	25,550	days	U.S. EPA, 1989						
				AT-N	Averaging Time (Non-Cancer)	5,475	days	U.S. EPA, 1989						
				Dermal	Recreational Users	Adult	Site 07	CS		Chemical concentration in sediment	Max or 95% UCL	mg/kg	U.S. EPA, 2002	$\text{Dermally Absorbed Dose (mg/kg/day)} = \text{CS} \times \text{CF3} \times \text{SA} \times \text{SSAF} \times \text{DABS} \times \text{EF} \times \text{ED} / \text{BW} \times \text{AT}$
								CF3		Conversion Factor 3	1.0E-06	kg/mg		
								SA		Skin Surface Available for Contact	4,500	cm ²	(2)	
								SSAF		Soil to Skin Adherence Factor	0.335	mg/cm ² /event	Shoaf et al., 2005	
DABS	Absorption Factor	Chemical Specific	unitless					U.S. EPA, 2004						
EF	Exposure Frequency	80	days/year					(1)						
ED	Exposure Duration	15	years					U.S. EPA, 1993						
BW	Body Weight	70	kg					U.S. EPA, 1993						
AT-C	Averaging Time (Cancer)	25,550	days					U.S. EPA, 1989						
AT-N	Averaging Time (Non-Cancer)	5,475	days					U.S. EPA, 1989						

Notes:

- 1 - Assumes three days a week from April through October.
- 2 - Assumes 25 percent of the total body surface area is exposed.

Sources:

Shoaf et al., 2005; Child Dermal Sediment Loads Following Olay in Tide Flat, Journal of Exposure Analysis and Environmental Epidemiology 15, 407-412.
 U.S. EPA, 1989; Risk Assessment Guidance for Superfund, Vol 1: Human Health Evaluation Manual, Part A, EPA/540/1-89/060.
 U.S. EPA, 1993; Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.
 U.S. EPA, 2002; Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites, OSWER 9285.6-10.
 U.S. EPA, 2004; Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = $(\text{IR-S} \times \text{CF3} \times \text{FI} \times \text{EF} \times \text{ED}) / (\text{BW} \times \text{AT})$
 Dermal Intake = $(\text{CF3} \times \text{SA} \times \text{SSAF} \times \text{EF} \times \text{ED}) / (\text{BW} \times \text{AT})$

Cancer Ingestion Intake = 3.35E-08 Cancer Dermal Intake = 1.01E-06
 Noncancer Ingestion Intake = 1.57E-07 Noncancer Dermal Intake = 4.72E-06

Cancer risk from Ingestion = Sediment concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor
 Cancer risk from dermal contact = Sediment concentration x Cancer Dermal Intake x Dermal Cancer Slope Factor
 Hazard Index from Ingestion = Sediment concentration x Noncancer Ingestion Intake / Oral Reference Dose
 Hazard Index from dermal contact = Sediment concentration x Noncancer Dermal Intake / Dermal Reference Dose

TABLE 4.14.RME
 VALUES USED FOR DAILY INTAKE CALCULATIONS
 REASONABLE MAXIMUM EXPOSURE
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Future
 Medium: Sediment
 Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Ingestion	Recreational Users Clamming	Adult	Site 07	CS	Chemical concentration in sediment	Max or 95% UCL	mg/kg	U.S. EPA, 2002	$CS \times CF3 \times SA \times SSAF \times EF \times ED$ BW x AT
				IR-S	Ingestion Rate	50	mg/day	U.S. EPA, 1993	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				FI	Fraction Ingested	1	unitless	--	
				EF	Exposure Frequency	80	days/year	(1)	
				ED	Exposure Duration	15	years	U.S. EPA, 1993	
				BW	Body Weight	70	kg	U.S. EPA, 1993	
				AT-C	Averaging Time (Cancer)	25,550	days	U.S. EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	5,475	days	U.S. EPA, 1989	
				Dermal	Recreational Users	Adult	Site 07	CS		Chemical concentration in sediment	Max or 95% UCL	mg/kg	U.S. EPA, 2002	$CS \times CF3 \times SA \times SSAF \times DABS \times EF \times ED$ BW x AT
CF3	Conversion Factor 3	1.0E-06	kg/mg					--	
SA	Skin Surface Available for Contact	6.073	cm ²					(2)	
SSAF	Soil to Skin Adherence Factor	0.335	mg/cm ² /event					Shoaf et al. 2005	
DABS	Absorption Factor	Chemical Specific	unitless					U.S. EPA, 2004	
EF	Exposure Frequency	80	days/year					(1)	
ED	Exposure Duration	15	years					U.S. EPA, 1993	
BW	Body Weight	70	kg					U.S. EPA, 1993	
AT-C	Averaging Time (Cancer)	25,550	days					U.S. EPA, 1989	
AT-N	Averaging Time (Non-Cancer)	5,475	days					U.S. EPA, 1989	

Notes:
 1 - Assumes three days a week from April through October.
 2 - Assumes 33 percent of the total body surface area is exposed.

Sources:

- Shoaf et al. 2005; Child Dermal Sediment Loads Following Oily in Tide Flat, Journal of Exposure Analysis and Environmental Epidemiology 15, 407-412.
- U.S. EPA, 1989; Risk Assessment Guidance for Superfund, Vol 1: Human Health Evaluation Manual, Part A, EPA/540/1-86/060.
- U.S. EPA, 1993; Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.
- U.S. EPA, 2002; Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.
- U.S. EPA, 2004; Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = $(IR-S \times CF3 \times FI \times EF \times ED) / (BW \times AT)$
 Dermal Intake = $(CF3 \times SA \times SSAF \times EF \times ED) / (BW \times AT)$
 Cancer Ingestion Intake = 3.35E-08
 Noncancer Ingestion Intake = 1.57E-07
 Cancer Dermal Intake = 1.37E-06
 Noncancer Dermal Intake = 6.37E-06

Cancer risk from ingestion = Sediment concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor
 Cancer risk from dermal contact = Sediment concentration x Cancer Dermal Intake x Dermal Cancer Slope Factor
 Hazard Index from ingestion = Sediment concentration x Noncancer Ingestion Intake / Oral Reference Dose
 Hazard Index from dermal contact = Sediment concentration x Noncancer Dermal Intake x Dermal Reference Dose

TABLE 4.15.RME
 VALUES USED FOR DAILY INTAKE CALCULATIONS
 REASONABLE MAXIMUM EXPOSURE
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH-KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Medium: Surface Water
 Exposure Medium: Shellfish

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Ingestion	Recreational User	Adult	Site 07	CFish	Chemical Concentration in Fish	Max or 95% UCL	mg/kg	U.S. EPA, 2002	$\text{Intake (mg/kg/day)} = \frac{\text{CFish} \times \text{IR} \times \text{FI} \times \text{EF} \times \text{ED}}{\text{BW} \times \text{AT}}$
				IR	Ingestion Rate of fish/shellfish	0.026	kg/meal	U.S. EPA, 1997	
				FI	Fraction ingested from source	0.5	unitless	-	
				EF	Exposure Frequency	350	meals/year	(1)	
				ED	Exposure Duration	15	years	U.S. EPA, 1991	
				BW	Body Weight	70	kg	U.S. EPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	U.S. EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	5475	days	U.S. EPA, 1989	

Notes:

1 - Assumes one meal per week of fish caught at site during the warm summer months for RME. CTE is assumed to be one half of RME.

Sources:

U.S. EPA, 1989; Risk Assessment Guidance for Superfund, Vol 1: Human Health Evaluation Manual, Part A. U.S. EPA/540/1-86/060.

U.S. EPA, 1997; Exposure Factors Handbook. U.S. EPA/600/P-95/002Fa.

U.S. EPA, 2002; Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

Unit Intake Calculations

$$\text{Ingestion Intake} = (\text{IR} \times \text{FI} \times \text{EF} \times \text{ED}) / (\text{BW} \times \text{AT})$$

$$\text{Cancer Ingestion Intake} = 3.82\text{E-05}$$

$$\text{Noncancer Ingestion Intake} = 1.78\text{E-04}$$

$$\text{Cancer risk from ingestion} = \text{Fish tissue concentration} \times \text{Cancer Ingestion Intake} \times \text{Oral Cancer Slope Factor}$$

$$\text{Hazard Index from ingestion} = \text{Fish tissue concentration} \times \text{Noncancer Ingestion Intake} / \text{Oral Reference Dose}$$

TABLE 4.16
 INTERMEDIATE VARIABLES FOR CALCULATING DA(EVENT)
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
 NORTH KINGSTON, RHODE ISLAND

Chemical of Potential Concern	Media	Dermal Absorption Fraction (soil)	FA Value	Kp		T(event)		Tau		T*		B Value
				Value	Units	Value	Units	Value	Units	Value	Units	
Volatile Organic Compounds												
1,1,2,2-Tetrachloroethane	Groundwater, Surface Water	NA	1	6.9E-03	cm/hr	2	hr	9.3E-01	hr	2.2E+00	hr	3.5E-02
1,1,2-Trichloroethane	Groundwater	NA	1	6.4E-03	cm/hr	2	hr	6.0E-01	hr	1.4E+00	hr	2.9E-02
1,1-Dichloroethane	Groundwater	NA	1	1.2E-02	cm/hr	2	hr	3.7E-01	hr	8.9E-01	hr	4.4E-02
1,2-Dichloroethane	Groundwater	NA	1	4.2E-03	cm/hr	2	hr	3.8E-01	hr	9.2E-01	hr	1.6E-02
Benzene	Groundwater	NA	1	1.5E-02	cm/hr	2	hr	2.9E-01	hr	7.0E-01	hr	5.1E-02
Chloroform	Groundwater	NA	1	6.8E-03	cm/hr	2	hr	5.0E-01	hr	1.2E+00	hr	2.9E-02
cis-1,2-Dichloroethane	Groundwater, Surface Water	NA	1	1.1E-02	cm/hr	2	hr	3.7E-01	hr	8.8E-01	hr	4.1E-02
trans-1,2-Dichloroethane	Groundwater	NA	1	7.7E-03	cm/hr	2	hr	3.7E-01	hr	8.9E-01	hr	2.9E-02
Trichloroethane	Groundwater, Surface Water, Sediment	0	1	1.2E-02	cm/hr	2	hr	5.8E-01	hr	1.4E+00	hr	5.1E-02
Vinyl Chloride	Groundwater, Surface Water, Sediment	0	1	5.6E-03	cm/hr	2	hr	2.4E-01	hr	5.7E-01	hr	1.7E-02
Inorganics												
Aluminum	Sediment	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	Sediment	0.03	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	Sediment	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	Sediment	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

All values from EPA's Risk Assessment Guidance for Superfund Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, July 2004.

FA = Fraction Absorbed Water

Kp = Dermal Permeability Coefficient of Compound in Water

T(event) = Event Duration

Tau = Lag Time

T* = Time to Reach Steady-State

B = Dimensionless Ratio of the Permeability Coefficient of a Compound Through the

Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis

NA = Not applicable.

LIST OF TABLES
RAGS PART D TABLE 5
NON-CANCER TOXICITY DATA

Table No.

5-1 Non-Cancer Toxicity Data - Oral/Dermal

TABLE 5.1
 NON-CANCER TOXICITY DATA -- ORAL/DERMAL
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
 NORTH KINGSTON, RHODE ISLAND

Chemical of Potential Concern	Chronic/Subchronic	Oral RID		Oral Absorption Efficiency for Dermal ⁽¹⁾	Absorbed RID for Dermal ⁽²⁾		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RID: Target Organ(s)		
		Value	Units		Value	Units			Source(s)	Date(s) (MM/DD/YYYY)	
Volatile Organic Compounds											
1,1,2-Tetrachloroethane	Chronic	4.0E-02	mg/kg/day	1	4.0E-02	mg/kg/day	Liver	NA	EPA III	10/31/2006	
1,1,2-Trichloroethane	Chronic	4.0E-03	mg/kg/day	1	4.0E-03	mg/kg/day	Blood	1000/1	IRIS	1/16/2007	
1,1-Dichloroethane	Chronic	5.0E-02	mg/kg/day	1	5.0E-02	mg/kg/day	Liver	100/1	IRIS	1/16/2007	
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Benzene	Chronic	4.0E-03	mg/kg/day	1	4.0E-03	mg/kg/day	Blood	300/1	IRIS	1/16/2007	
Chloroform	Chronic	1.0E-02	mg/kg/day	1	1.0E-02	mg/kg/day	Liver	100/1	IRIS	1/16/2007	
cis-1,2-Dichloroethane	Chronic	1.0E-02	mg/kg/day	1	1.0E-02	mg/kg/day	Blood	NA	EPA III	10/31/2006	
trans-1,2-Dichloroethane	Chronic	2.0E-02	mg/kg/day	1	2.0E-02	mg/kg/day	Blood	1000/1	IRIS	12/22/2006	
Trichloroethane	Chronic	5.0E-01	mg/kg/day	1	5.0E-01	mg/kg/day	Liver	NA	CA EPA	12/2002	
Vinyl Chloride	Chronic	3.0E-04	mg/kg/day	1	3.0E-04	mg/kg/day	Liver	30/1	IRIS	1/16/2007	
Semivolatile Organic Compounds											
Benz(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Benz(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Pesticides/PCBs											
Aldrin	Chronic	3.0E-05	mg/kg/day	1	3.0E-05	mg/kg/day	Liver	1000/1	IRIS	1/16/2007	
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Aroclor-1242	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Aroclor-1254	Chronic	2.0E-05	mg/kg/day	1	2.0E-05	mg/kg/day	Immunological	300/1	IRIS	1/16/2007	
Aroclor-1260	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Metals											
Aluminum	Chronic	1.0E+00	mg/kg/day	1	1.0E+00	mg/kg/day	Body Weight	NA	EPA IX	10/20/2004	
Arsenic	Chronic	3.0E-04	mg/kg/day	1	3.0E-04	mg/kg/day	Skin, CVS	3/1	IRIS	1/16/2007	
Beryllium	Chronic	2.0E-03	mg/kg/day	0.007	1.4E-05	mg/kg/day	GS	300/1	IRIS	1/16/2007	
Cadmium ⁽³⁾	Chronic	5.0E-04	mg/kg/day	0.05	2.5E-05	mg/kg/day	Kidney	10/1	IRIS	1/16/2007	
Chromium	Chronic	3.0E-03	mg/kg/day	0.025	7.5E-05	mg/kg/day	Fetotoxicity, GS, Bone	300/1	IRIS	1/16/2007	
Copper	Chronic	4.0E-02	mg/kg/day	1	4.0E-02	mg/kg/day	GS	NA	HEAST	7/1997	
Iron	Chronic	3.0E-01	mg/kg/day	1	3.0E-01	mg/kg/day	None Reported	NA	EPA III	10/31/2006	
Manganese ⁽⁴⁾	Chronic	2.4E-02	mg/kg/day	0.04	9.6E-04	mg/kg/day	CNS	1/3	IRIS	1/16/2007	
Mercury ⁽⁵⁾	Chronic	1.0E-04	mg/kg/day	1	1.0E-04	mg/kg/day	CNS	10/1	IRIS	1/16/2007	
Nickel	Chronic	2.0E-02	mg/kg/day	0.04	8.0E-04	mg/kg/day	Body Weight	300/1	IRIS	1/16/2007	
Silver	Chronic	5.0E-03	mg/kg/day	0.04	2.0E-04	mg/kg/day	Skin	3/1	IRIS	1/16/2007	

Notes:
 1 - U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.
 2 - Adjusted dermal RID = Oral RID x Oral Absorption Efficiency for Dermal.
 3 - Values are for cadmium - water.
 4 - Values have been adjusted for to account for dietary intakes and exposures to water.
 5 - Values are for methyl mercury.
 Definitions:
 CVS = Cardiovascular System
 GS = Gastrointestinal System
 IRIS = Integrated Risk Information System
 NA = Not Applicable
 CA EPA = California EPA, Technical Support Document for Describing Available Cancer Potency Factors, December 2002.

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CANCER TOXICITY DATA**

Table No.

6-1 Cancer Toxicity Data - Oral/Dermal

TABLE 6.1
 CANCER TOXICITY DATA -- ORAL/DERMAL
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
 NORTH KINGSTON, RHODE ISLAND
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Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal ⁽¹⁾	Absorbed Cancer Slope Factor for Dermal ⁽²⁾		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
	Value	Units		Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
Volatile Organic Compounds								
1,1,2,2-Tetrachloroethane	2.0E-01	(mg/kg/day) ⁻¹	1	2.0E-01	(mg/kg/day) ⁻¹	C	IRIS	1/16/2007
1,1,2-Trichloroethane	5.7E-02	(mg/kg/day) ⁻¹	1	5.7E-02	(mg/kg/day) ⁻¹	C	IRIS	1/16/2007
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	9.1E-02	(mg/kg/day) ⁻¹	1	9.1E-02	(mg/kg/day) ⁻¹	B2	IRIS	1/16/2007
Benzene	5.5E-02	(mg/kg/day) ⁻¹	1	5.5E-02	(mg/kg/day) ⁻¹	A	IRIS	1/16/2007
Chloroform	NA	NA	NA	NA	NA	B2	IRIS	1/16/2007
cis-1,2-Dichloroethane	NA	NA	NA	NA	NA	D	IRIS	1/16/2007
trans-1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	1.3E-02	(mg/kg/day) ⁻¹	1	1.3E-02	(mg/kg/day) ⁻¹	C	CA EPA	12/2002
Vinyl Chloride (Child)	1.4E+00	(mg/kg/day) ⁻¹	1	1.4E+00	(mg/kg/day) ⁻¹	A	IRIS	1/16/2007
Vinyl Chloride (Adult)	7.2E-01	(mg/kg/day) ⁻¹	1	7.2E-01	(mg/kg/day) ⁻¹	A	IRIS	1/16/2007
Semivolatile Organic Compounds								
Benzo(a)pyrene	7.3E+00	(mg/kg/day) ⁻¹	1	7.3E+00	(mg/kg/day) ⁻¹	B2	IRIS	1/16/2007
Benzo(b)fluoranthene	7.3E-01	(mg/kg/day) ⁻¹	1	7.3E-01	(mg/kg/day) ⁻¹	B2	EPA(1)	7/1993
Dibenz(a,h)anthracene	7.3E+00	(mg/kg/day) ⁻¹	1	7.3E+00	(mg/kg/day) ⁻¹	B2	EPA(1)	7/1993
Pesticides/PCBs								
Aldrin	1.7E+01	(mg/kg/day) ⁻¹	1	1.7E+01	(mg/kg/day) ⁻¹	B2	IRIS	1/16/2007
4,4'-DDE	3.4E-01	(mg/kg/day) ⁻¹	1	3.4E-01	(mg/kg/day) ⁻¹	B2	IRIS	1/16/2007
Aroclor-1242	2.0E+00	(mg/kg/day) ⁻¹	1	2.0E+00	(mg/kg/day) ⁻¹	B2	IRIS	1/16/2007
Aroclor-1254	2.0E+00	(mg/kg/day) ⁻¹	1	2.0E+00	(mg/kg/day) ⁻¹	B2	IRIS	1/16/2007
Aroclor-1260	2.0E+00	(mg/kg/day) ⁻¹	1	2.0E+00	(mg/kg/day) ⁻¹	B2	IRIS	1/16/2007
Metals								
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	1.5E+00	(mg/kg/day) ⁻¹	1	1.5E+00	(mg/kg/day) ⁻¹	A	IRIS	1/16/2007
Beryllium	NA	NA	NA	NA	NA	A	IRIS	1/16/2007
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	D	IRIS	1/16/2007
Copper	NA	NA	NA	NA	NA	D	IRIS	1/16/2007
Iron	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	D	IRIS	1/16/2007
Mercury	NA	NA	NA	NA	NA	C	IRIS	1/16/2007
Nickel	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	D	IRIS	1/16/2007

TABLE 6.1
CANCER TOXICITY DATA -- ORAL/DERMAL
SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
NORTH KINGSTON, RHODE ISLAND
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Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal ⁽¹⁾	Absorbed Cancer Slope Factor for Dermal ⁽²⁾		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
	Value	Units		Value	Units		Source(s)	Date(s) (MM/DD/YYYY)

Notes:

- 1 - U.S. EPA, 2004; Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.
- 2 - Adjusted cancer slope factor for dermal =
Oral cancer slope factor x Oral Absorption Efficiency for Dermal.

EPA Group:

- A - Human carcinogen.
- B1 - Probable human carcinogen - indicates that limited human data are available.
- B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans.
- C - Possible human carcinogen.
- D - Not classifiable as a human carcinogen.
- E - Evidence of noncarcinogenicity.

IRIS = Integrated Risk Information System.

NA = Not Available.

CA EPA = California EPA, Technical Support Document for Describing Available Cancer Potency Factors, December 2002.

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CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

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REASONABLE MAXIMUM EXPOSURES	
7.1.RME	Child Recreational Users Exposed to Surface Water - Swimmer - All 2005/2006 VOC Data - Southern Boundary Area
7.2.RME	Child Recreational Users Exposed to Surface Water - Swimmer - All 2005/2006 VOC Data for Last Quarter of Sampling - Southern Boundary Area
7.3.RME	Child Recreational Users Exposed to Sediment - Swimmer - All 2004/2005 VOC Data Plus Any Available Metals Data
7.4.RME	Child Recreational Users Ingesting Shellfish - Shellfish Data Presented In The Site 07 Phase III RI Report
7.5.RME	Adolescent Recreational Users Exposed to Surface Water - Swimmer - All 2005/2006 VOC Data - Southern Boundary Area
7.6.RME	Adolescent Recreational Users Exposed to Surface Water - Swimmer - All 2005/2006 VOC Data for Last Quarter of Sampling - Southern Boundary Area
7.7.RME	Adolescent Recreational Users Exposed to Groundwater - Shell Fisherman - All 2005/2006 Voc Data - Southern Boundary Area
7.8.RME	Adolescent Recreational Users Exposed to Groundwater - Shell Fisherman - All 2005/2006 VOC Data for Last Quarter of Sampling - Southern Boundary Area
7.9.RME	Adolescent Recreational Users Exposed to Groundwater - Shell Fisherman - All 2005/2006 VOC Data - All Locations
7.10.RME	Adolescent Recreational Users Exposed to Groundwater - Shell Fisherman - All 2005/2006 VOC Data - Minus Southern Boundary Area
7.11.RME	Adolescent Recreational Users Exposed to Sediment - Swimmer & Shell Fisherman - All 2004/2005 VOC Data Plus Any Available Metals Data
7.12.RME	Adolescent Recreational Users Ingesting Shellfish - Shellfish Data Presented In The Site 07 Phase III RI Report
7.13.RME	Adult Recreational Users Exposed to Surface Water - Swimmer - All 2005/2006 VOC Data - Southern Boundary Area
7.14.RME	Adult Recreational Users Exposed to Surface Water - Swimmer - All 2005/2006 VOC Data for Last Quarter of Sampling - Southern Boundary Area
7.15.RME	Adult Recreational Users Exposed to Groundwater - Shell Fisherman - All 2005/2006 Voc Data - Southern Boundary Area
7.16.RME	Adult Recreational Users Exposed to Groundwater - Shell Fisherman - All 2005/2006 VOC Data for Last Quarter of Sampling - Southern Boundary Area
7.17.RME	Adult Recreational Users Exposed to Groundwater - Shell Fisherman - All 2005/2006 VOC Data - All Locations
7.18.RME	Adult Recreational Users Exposed to Groundwater - Shell Fisherman - All 2005/2006 VOC Data - Minus Southern Boundary Area
7.19.RME	Adult Recreational Users Exposed to Sediment - Swimmer & Shell Fisherman - All 2004/2005 VOC Data Plus Any Available Metals Data
7.20.RME	Adult Recreational Users Ingesting Shellfish - Shellfish Data Presented In The Site 07 Phase III RI Report

TABLE 7.4.RME
 CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
 REASONABLE MAXIMUM EXPOSURES - CHILD RECREATIONAL USER - CONSUMER OF SHELLFISH
 SHELLFISH DATA PRESENTED IN THE SITE 07 PHASE III REPORT
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations		Non-Cancer Hazard Calculations		Hazard Quotient								
					Value	Units	Intake/Exposure Concentration	CSF/Unit Risk	Cancer Risk	Intake/Exposure Concentration		RfD/RfC							
Surface Water	Fish/Shellfish	Site 07	Ingestion		Benzo(a)pyrene	6.1E-3	mg/kg	9.1E-08	(mg/kg/day)	7.3E+00	(mg/kg/day) ⁻¹	6.7E-07	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--		
					Benzo(b)fluoranthene	0.036	mg/kg	5.4E-07	(mg/kg/day)	7.3E+01	(mg/kg/day) ⁻¹	3.9E-07	6.3E-06	(mg/kg/day)	NA	(mg/kg/day)	NA	(mg/kg/day)	--
					Dibenz(a,h)anthracene	0.001	mg/kg	1.9E-08	(mg/kg/day)	7.3E+00	(mg/kg/day) ⁻¹	1.4E-07	2.3E-07	(mg/kg/day)	NA	(mg/kg/day)	NA	(mg/kg/day)	--
					Aldrin	2.4E-4	mg/kg	3.7E-09	(mg/kg/day)	1.7E+01	(mg/kg/day) ⁻¹	6.3E-08	4.3E-08	(mg/kg/day)	3.0E-05	(mg/kg/day)	3.0E-05	(mg/kg/day)	0.001
					4,4'-DDE	0.023	mg/kg	3.4E-07	(mg/kg/day)	3.4E+01	(mg/kg/day) ⁻¹	1.2E-07	4.0E-06	(mg/kg/day)	NA	(mg/kg/day)	NA	(mg/kg/day)	--
					Aroclor-1242	0.022	mg/kg	3.3E-07	(mg/kg/day)	2.0E+00	(mg/kg/day) ⁻¹	6.6E-07	3.9E-06	(mg/kg/day)	NA	(mg/kg/day)	NA	(mg/kg/day)	--
					Aroclor-1254	0.134	mg/kg	2.0E-06	(mg/kg/day)	2.0E+00	(mg/kg/day) ⁻¹	4.0E-06	2.3E-05	(mg/kg/day)	2.0E-05	(mg/kg/day)	2.0E-05	(mg/kg/day)	1.2
					Aroclor-1260	0.085	mg/kg	1.3E-06	(mg/kg/day)	2.0E+00	(mg/kg/day) ⁻¹	2.6E-06	1.5E-05	(mg/kg/day)	NA	(mg/kg/day)	NA	(mg/kg/day)	--
					Arsenic	2.50	mg/kg	3.8E-05	(mg/kg/day)	1.5E+00	(mg/kg/day) ⁻¹	5.7E-05	4.4E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	1.5
					Cadmium	2.39	mg/kg	3.6E-05	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	--	4.2E-04	(mg/kg/day)	5.0E-04	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.8
					Chromium	0.704	mg/kg	1.1E-05	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	--	1.2E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.04
					Copper	126	mg/kg	1.9E-03	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	--	2.2E-02	(mg/kg/day)	4.0E-02	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.6
					Iron	800	mg/kg	1.2E-02	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	--	1.4E-01	(mg/kg/day)	3.0E-01	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.5
					Manganese	21.6	mg/kg	3.3E-04	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	--	3.8E-03	(mg/kg/day)	2.4E-02	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.2
					Mercury	49.1	mg/kg	7.4E-04	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	--	8.6E-03	(mg/kg/day)	1.0E-04	(mg/kg/day)	1.0E-04	(mg/kg/day)	86
					Nickel	5.00	mg/kg	7.5E-05	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	--	8.8E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.04
Silver	6.20	mg/kg	9.3E-05	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	--	1.1E-03	(mg/kg/day)	5.0E-03	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.2					
Exp. Route Total																		91	
Exposure Point Total																			91
Exposure Medium Total																			91
Medium Total																			91

TABLE 7.5.RME

CALCULATION OF CHEMICAL, CANCER RISKS AND NON-CANCER HAZARDS
 REASONABLE MAXIMUM EXPOSURES - ADOLESCENT RECREATIONAL USER - SWIMMER & SHELL FISHERMAN
 ALL 2005/2006 VOC DATA FOR SOUTHERN BOUNDARY AREA - SURFACE WATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Swimmer & Shell Fisherman
 Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations			Non-Cancer Hazard Calculations			Hazard Quotient							
					Value	Units	Intake/Exposure Concentration	CSF/Unit Risk	Cancer Risk	Intake/Exposure Concentration	RfD/RfC									
Surface Water	Surface Water	Site 07-Swimming	Ingestion	1,1,2,2-Tetrachloroethane	2.61	ug/L	1.6E-07	(mg/kg/day)	2.0E-01	(mg/kg/day) ⁻¹	3.3E-08	1.3E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00003				
					16.3	ug/L	1.0E-06	NA	NA	NA	7.9E-06	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.0008					
					8.3	ug/L	5.2E-07	(mg/kg/day)	1.3E-02	(mg/kg/day) ⁻¹	6.7E-09	(mg/kg/day)	5.0E-01	(mg/kg/day)	0.000008					
					1.72	ug/L	1.1E-07	(mg/kg/day)	1.4E+00	(mg/kg/day) ⁻¹	1.5E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0003					
					2.61	ug/L	5.6E-07	(mg/kg/day)	2.0E-01	(mg/kg/day) ⁻¹	1.1E-07	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0001					
					16.3	ug/L	3.9E-06	(mg/kg/day)	NA	NA	3.0E-05	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.003					
					8.3	ug/L	2.4E-06	(mg/kg/day)	1.3E-02	(mg/kg/day) ⁻¹	3.2E-08	(mg/kg/day)	5.0E-01	(mg/kg/day)	0.00004					
					1.72	ug/L	1.9E-07	(mg/kg/day)	1.4E+00	(mg/kg/day) ⁻¹	2.7E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0005					
					Exp. Route Total															
					Exp. Route Total															
Exposure Medium Total																				
Surface Water	Surface Water	Site 07-Shell Fishing	Ingestion	1,1,2,2-Tetrachloroethane	2.61	ug/L	3.3E-08	(mg/kg/day)	2.0E-01	(mg/kg/day) ⁻¹	6.5E-09	2.5E-07	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.000006				
					16.3	ug/L	2.0E-07	(mg/kg/day)	NA	NA	1.6E-06	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.0002					
					8.3	ug/L	1.0E-07	(mg/kg/day)	1.3E-02	(mg/kg/day) ⁻¹	1.3E-09	(mg/kg/day)	5.0E-01	(mg/kg/day)	0.000002					
					1.72	ug/L	2.2E-08	(mg/kg/day)	1.4E+00	(mg/kg/day) ⁻¹	3.0E-08	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00006					
					2.61	ug/L	1.8E-07	(mg/kg/day)	2.0E-01	(mg/kg/day) ⁻¹	3.8E-08	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0002					
					16.3	ug/L	1.3E-06	(mg/kg/day)	NA	NA	3.7E-08	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.00004					
					8.3	ug/L	8.1E-07	(mg/kg/day)	1.3E-02	(mg/kg/day) ⁻¹	1.1E-08	(mg/kg/day)	5.0E-01	(mg/kg/day)	0.0001					
					1.72	ug/L	6.4E-08	(mg/kg/day)	1.4E+00	(mg/kg/day) ⁻¹	8.9E-08	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0002					
					Exp. Route Total															
					Exp. Route Total															
Exposure Medium Total																				
Medium Total																				

TABLE 7.6 RME
 CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
 REASONABLE MAXIMUM EXPOSURES - ADOLESCENT RECREATIONAL USER - SWIMMER & SHELL FISHERMAN
 ALL 2005/2006 VOC DATA FOR LAST QUARTER OF SAMPLING - SOUTHERN BOUNDARY AREA - SURFACE WATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations			Non-Cancer Hazard Calculations			Hazard Quotient				
					Value	Units	Intake/Exposure Concentration	CSF/Unit Risk	Cancer Risk	Intake/Exposure Concentration	Value	Units		RID/RIC			
Surface Water	Surface Water	Site 07-Swimming	Ingestion	1,1,2,2-Tetrachloroethane	8.54	ug/L	5.3E-07	(mg/kg/day)	2.0E-01	(mg/kg/day) ⁻¹	1.1E-07	4.2E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0001	
					13.8	ug/L	8.6E-07	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	**	6.7E-06	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.0007	
					30.7	ug/L	1.9E-06	(mg/kg/day)	1.3E-02	(mg/kg/day) ⁻¹	2.5E-08	1.5E-05	(mg/kg/day)	5.0E-01	(mg/kg/day)	0.00003	
					1.70	ug/L	1.1E-07	(mg/kg/day)	1.4E+00	(mg/kg/day) ⁻¹	1.5E-07	8.3E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0003	
					Exp. Route Total												
					8.54	ug/L	1.8E-06	(mg/kg/day)	2.0E-01	(mg/kg/day) ⁻¹	3.6E-07	1.4E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0004	
					13.8	ug/L	3.3E-06	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	**	2.6E-05	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.003	
					30.7	ug/L	9.1E-06	(mg/kg/day)	1.3E-02	(mg/kg/day) ⁻¹	1.2E-07	7.1E-05	(mg/kg/day)	5.0E-01	(mg/kg/day)	0.0001	
					1.70	ug/L	1.9E-07	(mg/kg/day)	1.4E+00	(mg/kg/day) ⁻¹	2.7E-07	1.5E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0005	
					Exp. Route Total												
Exposure Point Total																	
Exposure Medium Total																	
Surface Water	Surface Water	Site 07-Shell Fishing	Ingestion	1,1,2,2-Tetrachloroethane	8.54	ug/L	1.1E-07	(mg/kg/day)	2.0E-01	(mg/kg/day) ⁻¹	2.1E-08	8.3E-07	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00002	
					13.8	ug/L	1.7E-07	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	**	1.3E-06	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.0001	
					30.7	ug/L	3.8E-07	(mg/kg/day)	1.3E-02	(mg/kg/day) ⁻¹	5.0E-09	3.0E-06	(mg/kg/day)	5.0E-01	(mg/kg/day)	0.000006	
					1.70	ug/L	2.1E-08	(mg/kg/day)	1.4E+00	(mg/kg/day) ⁻¹	3.0E-08	1.7E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00006	
					Exp. Route Total												
					8.54	ug/L	6.0E-07	(mg/kg/day)	2.0E-01	(mg/kg/day) ⁻¹	5.6E-08	4.7E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0001	
					13.8	ug/L	1.1E-06	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	**	8.4E-06	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.0008	
					30.7	ug/L	3.0E-06	(mg/kg/day)	1.3E-02	(mg/kg/day) ⁻¹	3.9E-08	2.3E-05	(mg/kg/day)	5.0E-01	(mg/kg/day)	0.00005	
					1.70	ug/L	6.3E-08	(mg/kg/day)	1.4E+00	(mg/kg/day) ⁻¹	8.8E-08	4.9E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0002	
					Exp. Route Total												
Exposure Point Total																	
Exposure Medium Total																	
Medium Total																	

TABLE 7.7: RME
 CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
 REASONABLE MAXIMUM EXPOSURES - ADOLESCENT RECREATIONAL USER - SHELL FISHERMAN
 ALL 2005/2006 VOC DATA - SOUTHERN BOUNDARY AREA - GROUNDWATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations			Non-Cancer Hazard Calculations			Hazard Quotient							
					Value	Units	Intake/Exposure Concentration	CSF/Unit Risk	Cancer Risk	Intake/Exposure Concentration	Value	Units		RfD/RfC						
Groundwater	Groundwater	Site 07-Shell Fishing	Dermal	1,1,2,2-Tetrachloroethane	410	ug/L	8.7E-06	(mg/kg/day)	2.0E-01	(mg/kg/day) ⁻¹	1.7E-06	6.8E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.002				
					33.9	ug/L	5.6E-07	(mg/kg/day)	5.7E-02	(mg/kg/day) ⁻¹	3.2E-08	4.4E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.001		
					2.30	ug/L	5.9E-08	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	--	4.6E-07	(mg/kg/day)	5.0E-02	(mg/kg/day)	5.0E-02	(mg/kg/day)	0.000009		
					1.44	ug/L	1.4E-08	(mg/kg/day)	9.1E-02	(mg/kg/day) ⁻¹	1.2E-09	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)	NA	(mg/kg/day)	--		
					1.05	ug/L	3.2E-08	(mg/kg/day)	5.5E-02	(mg/kg/day) ⁻¹	1.8E-09	2.5E-07	(mg/kg/day)	4.0E-03	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.00006		
					1.27	ug/L	2.1E-08	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	--	1.6E-07	(mg/kg/day)	1.0E-02	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.00002		
					1014	ug/L	2.4E-05	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	--	1.9E-04	(mg/kg/day)	1.0E-02	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.02		
					56.9	ug/L	9.7E-07	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	--	7.5E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0004		
					1278	ug/L	3.8E-05	(mg/kg/day)	1.3E-02	(mg/kg/day) ⁻¹	4.9E-07	2.9E-04	(mg/kg/day)	5.0E-01	(mg/kg/day)	5.0E-01	(mg/kg/day)	0.0006		
					62.0	ug/L	6.9E-07	(mg/kg/day)	1.4E+00	(mg/kg/day) ⁻¹	9.7E-07	5.4E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.002		
								Exp. Route Total			3.2E-06									0.02
								Exposure Point Total			3.2E-06									0.02
			Exposure Medium Total			3.2E-06									0.02					
			Medium Total			3.2E-06									0.02					

TABLE 7.8.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
 REASONABLE MAXIMUM EXPOSURES - ADOLESCENT RECREATIONAL USER - SHELL FISHERMAN
 ALL 2005/2006 VOC DATA FOR LAST QUARTER OF SAMPLING - SOUTHERN BOUNDARY AREA - GROUNDWATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Shell Fisherman
 Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations			Non-Cancer Hazard Calculations			Hazard Quotient	
					Value	Units	Intake/Exposure Concentration	CSF/Unit Risk	Cancer Risk	Intake/Exposure Concentration	RfD/RfC			
Groundwater	Groundwater	Site 07-Shell Fishing	Dermal	1,1,2,2-Tetrachloroethane	389	ug/L	8.3E-06	2.0E-01	1.7E-06	6.4E-05	4.0E-02	(mg/kg/day)	0.002	
					26.7	ug/L	4.4E-07	5.7E-02	2.5E-08	3.5E-06	4.0E-03	(mg/kg/day)	0.0009	
					3.16	ug/L	8.1E-08	NA	**	6.3E-07	5.0E-02	(mg/kg/day)	0.00001	
					1.26	ug/L	1.2E-08	9.1E-02	1.1E-09	9.2E-08	NA	(mg/kg/day)	**	
					0.506	ug/L	1.5E-08	5.5E-02	8.5E-10	1.2E-07	4.0E-03	(mg/kg/day)	0.00003	
					0.788	ug/L	1.3E-08	NA	**	1.0E-07	1.0E-02	(mg/kg/day)	0.00001	
					843	ug/L	2.0E-05	NA	**	1.6E-04	1.0E-02	(mg/kg/day)	0.02	
					71.8	ug/L	1.2E-06	NA	**	9.5E-06	2.0E-02	(mg/kg/day)	0.0005	
					552	ug/L	1.6E-05	1.3E-02	2.1E-07	1.3E-04	5.0E-01	(mg/kg/day)	0.0003	
					70.7	ug/L	7.9E-07	1.4E+00	1.1E-06	6.1E-06	3.0E-03	(mg/kg/day)	0.002	
Exp. Route Total														
Exposure Point Total														
Exposure Medium Total														
Medium Total														

TABLE 7.9.F.1ME
 CALCULATION OF CHEMICAL, CANCER RISKS AND NON-CANCER HAZARDS
 REASONABLE MAXIMUM EXPOSURES - ADOLESCENT RECREATIONAL USER - SHELL FISHERMAN
 ALL 2005/2006 VOC DATA - ALL LOCATIONS - GROUNDWATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Shell Fisherman
 Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations			Non-Cancer Hazard Calculations			Hazard Quotient				
					Value	Units	Intake/Exposure Concentration	CSF/Unit Risk	Cancer Risk	Intake/Exposure Concentration	Value	Units		RfD/RfC			
Groundwater		Site 07-Shell Fishing	Dermal	1,1,2,2-Tetrachloroethane	333	ug/L	7.1E-06	(mg/kg/day)	2.0E-01	(mg/kg/day) ¹	1.4E-06	5.5E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.001	
				1,1,2-Trichloroethane	35.4	ug/L	5.9E-07	(mg/kg/day)	5.7E-02	(mg/kg/day) ¹	3.4E-08	4.6E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.001	
				1,1-Dichloroethane	1.64	ug/L	4.2E-08	(mg/kg/day)	NA	--	--	3.3E-07	(mg/kg/day)	5.0E-02	(mg/kg/day)	0.000007	
				1,2-Dichloroethane	1.09	ug/L	1.0E-08	(mg/kg/day)	9.1E-02	(mg/kg/day) ¹	9.3E-10	8.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--	
				Benzene	0.887	ug/L	2.7E-08	(mg/kg/day)	5.5E-02	(mg/kg/day) ¹	1.5E-09	2.1E-07	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.00005	
				Chloroform	1.070	ug/L	1.9E-08	(mg/kg/day)	NA	--	--	1.4E-07	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.00001	
				cis-1,2-Dichloroethane	828	ug/L	2.0E-05	(mg/kg/day)	NA	--	--	1.5E-04	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.02	
				trans-1,2-Dichloroethane	80.6	ug/L	1.4E-05	(mg/kg/day)	NA	--	--	1.1E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0005	
				Trichloroethane	466	ug/L	1.4E-05	(mg/kg/day)	1.3E-02	(mg/kg/day) ¹	1.8E-07	1.1E-04	(mg/kg/day)	5.0E-01	(mg/kg/day)	0.0002	
				Vinyl Chloride	49.6	ug/L	5.5E-07	(mg/kg/day)	1.4E-00	(mg/kg/day) ¹	7.8E-07	4.3E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.001	
Exposure Point Total																0.02	
Exposure Medium Total																	0.02
Medium Total																	0.02

TABLE 7.10: RME
 CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
 REASONABLE MAXIMUM EXPOSURES - ADOLESCENT RECREATIONAL USER - SHELL FISHERMAN
 ALL 2005/2006 VOC DATA - MINUS SOUTHERN BOUNDARY DATA - GROUNDWATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations			Non-Cancer Hazard Calculations			Hazard Quotient			
					Value	Units	Intake/Exposure Concentration	CSF/Unit Risk	Cancer Risk	Intake/Exposure Concentration	Value	Units		RfD/RfC		
Groundwater	Groundwater	Site 07-Shell Fishing	Dermal	1,1,2,2-Tetrachloroethane	19.8	ug/L	4.2E-07	(mg/kg/day)	2.0E-01	(mg/kg/day) ¹	8.4E-08	3.3E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00008
				1,1,2-Trichloroethane	2.37	ug/L	3.9E-08	(mg/kg/day)	5.7E-02	(mg/kg/day) ¹	2.2E-09	3.1E-07	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.00008
				1,2-Dichloroethane	0.824	ug/L	7.7E-09	(mg/kg/day)	9.1E-02	(mg/kg/day) ¹	7.0E-10	6.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				cis-1,2-Dichloroethane	6.96	ug/L	1.7E-07	(mg/kg/day)	NA	(mg/kg/day) ¹	--	1.3E-06	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.0001
				trans-1,2-Dichloroethane	1.60	ug/L	2.7E-08	(mg/kg/day)	NA	(mg/kg/day) ¹	--	2.1E-07	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.00001
				Trichloroethane	5.58	ug/L	1.7E-07	(mg/kg/day)	1.3E-02	(mg/kg/day) ¹	2.1E-09	1.3E-06	(mg/kg/day)	5.0E-01	(mg/kg/day)	0.000003
			Exp. Route Total								8.9E-08					0.0003
		Exposure Point Total									8.9E-08					0.0003
		Exposure Medium Total									8.9E-08					0.0003
Medium Total											8.9E-08					0.0003

TABLE 7.11 RME
 CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
 REASONABLE MAXIMUM EXPOSURES - ADOLESCENT RECREATIONAL USER - SWIMMER & SHELL FISHERMAN
 ALL AVAILABLE 2004/2005 VOC DATA PLUS ANY AVAILABLE METALS DATA - SEDIMENT
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations			Non-Cancer Hazard Calculations			Hazard Quotient					
					Value	Units	Intake/Exposure Concentration	CSF/Unit Risk	Cancer Risk	Intake/Exposure Concentration	RfD/RfC							
					Value	Units	Value	Units	Value	Units	Value	Units						
Sediment	Sediment	Site 07-Swimming	Ingestion	Trichloroethene	0.130	mg/kg	6.1E-09	(mg/kg/day)	1.3E-02	(mg/kg/day) ⁻¹	1.1E-10	6.3E-08	(mg/kg/day)	5.0E-01	(mg/kg/day)	0.0000001		
				Vinyl Chloride	0.033	mg/kg	2.1E-09	(mg/kg/day)	1.4E+00	(mg/kg/day) ⁻¹	2.9E-09	1.6E-08	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.000005		
				Aluminum	8260	mg/kg	5.2E-04	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	..	4.0E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.004		
				Arsenic	3.10	mg/kg	1.9E-07	(mg/kg/day)	1.5E+00	(mg/kg/day) ⁻¹	2.9E-07	1.5E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.005		
				Beryllium	0.920	mg/kg	5.8E-08	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	..	4.5E-07	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.0002		
				Iron	17000	mg/kg	1.1E-03	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	..	8.3E-07	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.03		
				Exp. Route Total							2.9E-07							0.04
				Trichloroethene	0.130	mg/kg	0.0E+00	(mg/kg/day)	1.3E-02	(mg/kg/day) ⁻¹	..	0.0E+00	(mg/kg/day)	5.0E-01	(mg/kg/day)
				Vinyl Chloride	0.033	mg/kg	0.0E+00	(mg/kg/day)	1.4E+00	(mg/kg/day) ⁻¹	..	0.0E+00	(mg/kg/day)	3.0E-03	(mg/kg/day)
				Aluminum	8260	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	..	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)
Arsenic	3.10	mg/kg	9.5E-07	(mg/kg/day)	1.5E+00	(mg/kg/day) ⁻¹	1.4E-06	7.4E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02	..	..		
Beryllium	0.920	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	..	0.0E+00	(mg/kg/day)	1.4E-05	(mg/kg/day)	..	..	..	
Iron	17000	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	..	0.0E+00	(mg/kg/day)	3.0E-01	(mg/kg/day)	..	..	..	
Exp. Route Total								1.4E-06						0.02				
Exposure Point Total								1.7E-06						0.06				
Medium Total								1.7E-06						0.06				
Sediment	Sediment	Site 07-Shell Fishing	Ingestion	Trichloroethene	0.130	mg/kg	8.1E-09	(mg/kg/day)	1.3E-02	(mg/kg/day) ⁻¹	1.1E-10	6.3E-08	(mg/kg/day)	5.0E-01	(mg/kg/day)	0.0000001		
				Vinyl Chloride	0.033	mg/kg	2.1E-09	(mg/kg/day)	1.4E+00	(mg/kg/day) ⁻¹	2.9E-09	1.6E-08	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.000005		
				Aluminum	8260	mg/kg	5.2E-04	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	..	4.0E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.004		
				Arsenic	3.10	mg/kg	1.9E-07	(mg/kg/day)	1.5E+00	(mg/kg/day) ⁻¹	2.9E-07	1.5E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.005		
				Beryllium	0.920	mg/kg	5.8E-08	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	..	4.5E-07	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.0002		
				Iron	17000	mg/kg	1.1E-03	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	..	8.3E-07	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.03		
				Exp. Route Total							2.9E-07							0.04
				Trichloroethene	0.130	mg/kg	0.0E+00	(mg/kg/day)	1.3E-02	(mg/kg/day) ⁻¹	..	0.0E+00	(mg/kg/day)	5.0E-01	(mg/kg/day)
				Vinyl Chloride	0.033	mg/kg	0.0E+00	(mg/kg/day)	1.4E+00	(mg/kg/day) ⁻¹	..	0.0E+00	(mg/kg/day)	3.0E-03	(mg/kg/day)
				Aluminum	8260	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	..	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)
Arsenic	3.10	mg/kg	8.4E-08	(mg/kg/day)	1.5E+00	(mg/kg/day) ⁻¹	1.3E-07	6.5E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02	..	..		
Beryllium	0.920	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	..	0.0E+00	(mg/kg/day)	1.4E-05	(mg/kg/day)	..	..	..	
Iron	17000	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	..	0.0E+00	(mg/kg/day)	3.0E-01	(mg/kg/day)	..	..	..	
Exp. Route Total								1.3E-07						0.02				
Exposure Point Total								4.2E-07						0.04				
Medium Total								4.2E-07						0.04				

TABLE 7.12.FMIE
 CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
 REASONABLE MAXIMUM EXPOSURES - ADOLESCENT RECREATIONAL USER - CONSUMER OF SHELLFISH
 SHELLFISH DATA PRESENTED IN THE SITE 07 PHASE III RI REPORT
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations		Cancer Risk		Non-Cancer Hazard Calculations		Hazard Quotient				
					Value	Units	Intake/Exposure Concentration	CSF/Unit Risk	Value	Units	Intake/Exposure Concentration	Value		Units			
Surface Water	Fish/Shellfish	Site 07	Ingestion	Benz(a)pyrene	6.1E-3	mg/kg	2.2E-07	(mg/kg/day)	7.3E+00	(mg/kg/day) ⁻¹	1.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--		
				Benz(b)fluoranthene	0.038	mg/kg	1.3E-06	(mg/kg/day)	7.3E-01	(mg/kg/day) ⁻¹	9.3E-07	(mg/kg/day)	9.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenz(a,h)anthracene	0.001	mg/kg	4.8E-08	(mg/kg/day)	7.3E+00	(mg/kg/day) ⁻¹	3.3E-07	(mg/kg/day)	3.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aldrin	2.4E-4	mg/kg	8.7E-09	(mg/kg/day)	1.7E-01	(mg/kg/day) ⁻¹	1.5E-07	(mg/kg/day)	6.8E-08	(mg/kg/day)	3.0E-05	(mg/kg/day)	0.002
				4,4'-DDE	0.023	mg/kg	8.1E-07	(mg/kg/day)	3.4E-01	(mg/kg/day) ⁻¹	2.8E-07	(mg/kg/day)	6.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1242	0.022	mg/kg	7.8E-07	(mg/kg/day)	2.0E+00	(mg/kg/day) ⁻¹	1.6E-06	(mg/kg/day)	6.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1254	0.134	mg/kg	4.8E-06	(mg/kg/day)	2.0E+00	(mg/kg/day) ⁻¹	9.5E-06	(mg/kg/day)	3.7E-05	(mg/kg/day)	2.0E-05	(mg/kg/day)	1.8
				Aroclor-1260	0.085	mg/kg	3.0E-06	(mg/kg/day)	2.0E+00	(mg/kg/day) ⁻¹	6.0E-06	(mg/kg/day)	2.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Arsenic	2.50	mg/kg	8.9E-05	(mg/kg/day)	1.5E+00	(mg/kg/day) ⁻¹	1.3E-04	(mg/kg/day)	6.9E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	2.3
				Cadmium	0.704	mg/kg	8.5E-05	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	--	(mg/kg/day)	6.6E-04	(mg/kg/day)	5.0E-04	(mg/kg/day)	1.3
				Chromium	126	mg/kg	2.5E-05	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	--	(mg/kg/day)	2.0E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.07
				Copper	800	mg/kg	4.5E-03	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	--	(mg/kg/day)	3.5E-02	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.9
				Iron	21.6	mg/kg	2.8E-02	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	--	(mg/kg/day)	2.2E-01	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.7
				Manganese	48.1	mg/kg	7.7E-04	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	--	(mg/kg/day)	6.0E-03	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.2
				Mercury	5.00	mg/kg	1.7E-03	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	--	(mg/kg/day)	1.4E-02	(mg/kg/day)	1.0E-04	(mg/kg/day)	136
				Nickel	6.20	mg/kg	1.8E-04	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	--	(mg/kg/day)	1.4E-03	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.07
				Silver		mg/kg	2.2E-04	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	--	(mg/kg/day)	1.7E-03	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.3
Exp. Route Total														144			
Exposure Point Total														144			
Exposure Medium Total														144			
Medium Total														144			

TABLE 7.13.RME
 CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
 REASONABLE MAXIMUM EXPOSURES - ADULT RECREATIONAL USER - SWIMMER & SHELL FISHERMAN
 ALL 2005/2006 VOC DATA FOR SOUTHERN BOUNDARY AREA - SURFACE WATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations				Non-Cancer Hazard Calculations				Hazard Quotient						
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Value	Units	Intake/Exposure Concentration			RfD/RfC					
							Value	Units	Value	Units			Value	Units		Value	Units				
Surface Water	Surface Water	Site 07-Swimming	Ingestion	1,1,2,2-Tetrachloroethane	2.61	ug/L	1.8E-07	(mg/kg/day)	2.0E-01	(mg/kg/day) ¹	3.8E-08	(mg/kg/day)	8.2E-07	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0002				
					16.3	ug/L	1.1E-06	(mg/kg/day)	NA	(mg/kg/day) ¹	--	(mg/kg/day)	5.1E-06	(mg/kg/day)	1.0E-02	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.0005		
					8.3	ug/L	5.8E-07	(mg/kg/day)	1.3E-02	(mg/kg/day) ¹	7.2E-09	(mg/kg/day)	2.8E-06	(mg/kg/day)	5.0E-01	(mg/kg/day)	5.0E-01	(mg/kg/day)	0.00005		
					1.72	ug/L	1.2E-07	(mg/kg/day)	1.4E+00	(mg/kg/day) ¹	1.8E-07	(mg/kg/day)	5.4E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0002		
					2.61	ug/L	8.2E-07	(mg/kg/day)	2.0E-01	(mg/kg/day) ¹	2.0E-07	(mg/kg/day)	3.8E-08	(mg/kg/day)	4.0E-02	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00010		
					16.3	ug/L	5.7E-06	(mg/kg/day)	NA	(mg/kg/day) ¹	--	(mg/kg/day)	2.7E-05	(mg/kg/day)	1.0E-02	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.003		
					8.3	ug/L	3.8E-06	(mg/kg/day)	1.3E-02	(mg/kg/day) ¹	4.7E-08	(mg/kg/day)	1.7E-05	(mg/kg/day)	5.0E-01	(mg/kg/day)	5.0E-01	(mg/kg/day)	0.00003		
					1.72	ug/L	2.9E-07	(mg/kg/day)	1.4E+00	(mg/kg/day) ¹	4.0E-07	(mg/kg/day)	1.3E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0004		
					Exp. Route Total					6.1E-07											0.003
					Exposure Point Total					8.2E-07											
Exposure Medium Total					8.2E-07												0.004				
Surface Water	Surface Water	Site 07-Shell Fishing	Ingestion	1,1,2,2-Tetrachloroethane	2.61	ug/L	3.5E-08	(mg/kg/day)	2.0E-01	(mg/kg/day) ¹	7.0E-09	(mg/kg/day)	1.8E-07	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00004				
					16.3	ug/L	2.2E-07	(mg/kg/day)	NA	(mg/kg/day) ¹	--	(mg/kg/day)	1.0E-06	(mg/kg/day)	1.0E-02	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.0001		
					8.3	ug/L	1.1E-07	(mg/kg/day)	1.3E-02	(mg/kg/day) ¹	1.4E-09	(mg/kg/day)	5.2E-07	(mg/kg/day)	5.0E-01	(mg/kg/day)	5.0E-01	(mg/kg/day)	0.000001		
					1.72	ug/L	2.3E-08	(mg/kg/day)	1.4E+00	(mg/kg/day) ¹	3.2E-08	(mg/kg/day)	1.1E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00004		
					2.61	ug/L	2.7E-07	(mg/kg/day)	2.0E-01	(mg/kg/day) ¹	4.1E-08	(mg/kg/day)	1.3E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0001		
					16.3	ug/L	1.9E-06	(mg/kg/day)	NA	(mg/kg/day) ¹	--	(mg/kg/day)	8.9E-06	(mg/kg/day)	1.0E-02	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.00003		
					8.3	ug/L	1.2E-06	(mg/kg/day)	1.3E-02	(mg/kg/day) ¹	1.6E-08	(mg/kg/day)	5.6E-06	(mg/kg/day)	5.0E-01	(mg/kg/day)	5.0E-01	(mg/kg/day)	0.00001		
					1.72	ug/L	9.4E-08	(mg/kg/day)	1.4E+00	(mg/kg/day) ¹	1.3E-07	(mg/kg/day)	4.4E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0001		
					Exp. Route Total					2.4E-07											0.001
					Exposure Point Total					2.4E-07											
Exposure Medium Total					2.4E-07												0.001				

TABLE 7.14 RME
 CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
 REASONABLE MAXIMUM EXPOSURES - ADULT RECREATIONAL USER - SWIMMER & SHELL FISHERMAN
 ALL 2005/2006 VOC DATA FOR LAST QUARTER OF SAMPLING - SOUTHERN BOUNDARY AREA - SURFACE WATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations			Non-Cancer Hazard Calculations			Hazard Quotient							
					Value	Units	Intake/Exposure Concentration	CSF/Unit Risk	Cancer Risk	Intake/Exposure Concentration	Value	Units		RfD/RfC						
Surface Water	Surface Water	Site 07-Swimming	Ingestion	1,1,2,2-Tetrachloroethane	6.54	ug/L	5.7E-07	(mg/kg/day) ⁻¹	2.0E-01	(mg/kg/day) ⁻¹	1.1E-07	2.7E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0007				
					13.8	ug/L	9.3E-07	NA	NA	NA	4.9E-06	(mg/kg/day)	1.0E-02	4.9E-06	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.0004		
					30.7	ug/L	2.1E-06	(mg/kg/day) ⁻¹	1.3E-02	(mg/kg/day) ⁻¹	2.7E-08	9.8E-06	(mg/kg/day)	5.0E-01	9.8E-06	(mg/kg/day)	5.0E-01	(mg/kg/day)	0.0002	
					1.70	ug/L	1.1E-07	(mg/kg/day)	1.4E+00	(mg/kg/day)	3.0E-07	5.3E-07	(mg/kg/day)	3.0E-03	5.3E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0002	
					6.54	ug/L	2.7E-06	(mg/kg/day)	2.0E-01	(mg/kg/day)	5.4E-07	1.3E-05	(mg/kg/day)	4.0E-02	1.3E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0003	
					13.8	ug/L	4.9E-06	(mg/kg/day)	NA	(mg/kg/day)	NA	2.3E-05	(mg/kg/day)	1.0E-02	2.3E-05	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.002	
					30.7	ug/L	1.3E-05	(mg/kg/day)	1.3E-02	(mg/kg/day)	1.8E-07	6.3E-05	(mg/kg/day)	5.0E-01	6.3E-05	(mg/kg/day)	5.0E-01	(mg/kg/day)	0.0001	
					1.70	ug/L	2.8E-07	(mg/kg/day)	1.4E+00	(mg/kg/day)	3.9E-07	1.3E-06	(mg/kg/day)	3.0E-03	1.3E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0004	
					Exp. Route Total															
					Exp. Route Total															
Exposure Point Total																				
Exposure Medium Total																				
Surface Water	Surface Water	Site 07-Shell Fishing	Ingestion	1,1,2,2-Tetrachloroethane	6.54	ug/L	1.1E-07	(mg/kg/day) ⁻¹	2.0E-01	(mg/kg/day) ⁻¹	2.3E-08	5.3E-07	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0001				
					13.8	ug/L	1.9E-07	NA	NA	NA	8.6E-07	(mg/kg/day)	1.0E-02	8.6E-07	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.0009		
					30.7	ug/L	4.1E-07	(mg/kg/day) ⁻¹	1.3E-02	(mg/kg/day) ⁻¹	5.4E-09	1.9E-06	(mg/kg/day)	5.0E-01	1.9E-06	(mg/kg/day)	5.0E-01	(mg/kg/day)	0.000004	
					1.70	ug/L	2.3E-08	(mg/kg/day)	1.4E+00	(mg/kg/day)	3.2E-08	1.1E-07	(mg/kg/day)	3.0E-03	1.1E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.00004	
					6.54	ug/L	8.9E-07	(mg/kg/day)	2.0E-01	(mg/kg/day)	6.0E-08	4.2E-06	(mg/kg/day)	4.0E-02	4.2E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0001	
					13.8	ug/L	1.6E-06	(mg/kg/day)	NA	(mg/kg/day)	NA	7.5E-06	(mg/kg/day)	1.0E-02	7.5E-06	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.0007	
					30.7	ug/L	4.4E-06	(mg/kg/day)	1.3E-02	(mg/kg/day)	5.8E-08	2.1E-05	(mg/kg/day)	5.0E-01	2.1E-05	(mg/kg/day)	5.0E-01	(mg/kg/day)	0.00004	
					1.70	ug/L	9.3E-08	(mg/kg/day)	1.4E+00	(mg/kg/day)	1.3E-07	4.3E-07	(mg/kg/day)	3.0E-03	4.3E-07	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0001	
					Exp. Route Total															
					Exp. Route Total															
Exposure Point Total																				
Exposure Medium Total																				
Medium Total																				

TABLE 7.15.FME
 CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
 REASONABLE MAXIMUM EXPOSURES - ADULT RECREATIONAL USER - SHELL FISHERMAN
 ALL 2005/2006 VOC DATA - SOUTHERN BOUNDARY AREA - GROUNDWATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario: Timeframe: Current/Future
 Receptor Population: Recreational User - Shell Fisherman
 Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations			Non-Cancer Hazard Calculations			Hazard Quotient					
					Value	Units	Intake/Exposure Concentration	CSF/Unit Risk	Cancer Risk	Intake/Exposure Concentration	RfD/RfC	Hazard Quotient						
Groundwater		Site 07-Shell Fishing	Dermal	1,1,2,2-Tetrachloroethane	410	ug/L	1.3E-05	(mg/kg/day)	2.0E-01	(mg/kg/day) ⁻¹	2.6E-06	6.0E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.002		
					33.9	ug/L	8.4E-07	(mg/kg/day)	5.7E-02	(mg/kg/day) ⁻¹	4.8E-08	3.9E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.0010
					2.30	ug/L	8.7E-08	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	--	4.1E-07	(mg/kg/day)	5.0E-02	(mg/kg/day)	5.0E-02	(mg/kg/day)	0.000008
					1.44	ug/L	2.0E-08	(mg/kg/day)	9.1E-02	(mg/kg/day) ⁻¹	1.8E-09	9.4E-08	(mg/kg/day)	NA	(mg/kg/day)	NA	(mg/kg/day)	--
					1.05	ug/L	4.7E-08	(mg/kg/day)	5.5E-02	(mg/kg/day) ⁻¹	2.6E-09	2.2E-07	(mg/kg/day)	4.0E-03	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.00006
					1.27	ug/L	3.1E-08	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	--	1.5E-07	(mg/kg/day)	1.0E-02	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.00001
					1014	ug/L	3.6E-05	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	--	1.7E-04	(mg/kg/day)	1.0E-02	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.02
					56.9	ug/L	1.4E-06	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	--	6.7E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0003
					1278	ug/L	5.6E-05	(mg/kg/day)	1.3E-02	(mg/kg/day) ⁻¹	7.3E-07	2.6E-04	(mg/kg/day)	5.0E-01	(mg/kg/day)	5.0E-01	(mg/kg/day)	0.0005
					62.0	ug/L	1.0E-06	(mg/kg/day)	1.4E-00	(mg/kg/day) ⁻¹	1.4E-06	4.8E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.002
					Exp. Route Total													
Exposure Point Total																		
Exposure Medium Total																		
Medium Total																		

TABLE 7.16.RME
 CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
 REASONABLE MAXIMUM EXPOSURES - ADULT RECREATIONAL USER - SHELL FISHERMAN
 ALL 2005/2006 VOC DATA FOR LAST QUARTER OF SAMPLING - SOUTHERN BOUNDARY AREA - GROUNDWATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Shell Fisherman
 Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations			Non-Cancer Hazard Calculations			Hazard Quotient				
					Value	Units	Intake/Exposure Concentration	CSF/Unit Risk	Cancer Risk	Intake/Exposure Concentration	Value	Units					
Groundwater		Site 07-Shell Fishing	Dermal	1,1,1,2,2-Tetrachloroethane	389	ug/L	1.2E-05	(mg/kg/day)	2.0E-01	(mg/kg/day) ⁻¹	2.5E-06	5.7E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.001	
				1,1,2-Trichloroethane	26.7	ug/L	6.6E-07	(mg/kg/day)	5.7E-02	(mg/kg/day) ⁻¹	3.8E-08	3.1E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.0008	
				1,1-Dichloroethane	3.16	ug/L	1.2E-07	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	--	5.6E-07	(mg/kg/day)	5.0E-02	(mg/kg/day)	0.00001	
				1,2-Dichloroethane	1.26	ug/L	1.8E-08	(mg/kg/day)	9.1E-02	(mg/kg/day) ⁻¹	1.6E-09	8.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--	
				Benzene	0.506	ug/L	2.3E-08	(mg/kg/day)	5.5E-02	(mg/kg/day) ⁻¹	1.3E-09	1.1E-07	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.00003	
				Chloroform	0.768	ug/L	1.9E-08	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	--	9.0E-08	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.000009	
				cis-1,2-Dichloroethane	843	ug/L	3.0E-05	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	--	1.4E-04	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.01	
				trans-1,2-Dichloroethane	71.8	ug/L	1.6E-06	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	--	8.5E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0004	
				Trichloroethene	552	ug/L	2.4E-05	(mg/kg/day)	1.3E-02	(mg/kg/day) ⁻¹	3.2E-07	1.1E-04	(mg/kg/day)	5.0E-01	(mg/kg/day)	0.0002	
				Vinyl Chloride	70.7	ug/L	1.2E-06	(mg/kg/day)	1.4E-00	(mg/kg/day) ⁻¹	1.6E-06	5.5E-08	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.002	
Exp. Route Total																	
Exposure Point Total																	
Exposure Medium Total																	
Medium Total																	

TABLE 7.17.RME
 CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
 REASONABLE MAXIMUM EXPOSURES - ADULT RECREATIONAL USER - SHELL FISHERMAN
 ALL 2005/2006 VOC DATA - ALL LOCATIONS - GROUNDWATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations			Non-Cancer Hazard Calculations			Hazard Quotient			
					Value	Units	Intake/Exposure Concentration	CSF/Unit Risk	Cancer Risk	Intake/Exposure Concentration	Value	Units		RfD/RfC		
Groundwater		Site 07-Shell Fishing	Dermal	1,1,2,2-Tetrachloroethane	333	ug/L	1.1E-05	(mg/kg/day)	2.0E-01	(mg/kg/day) ⁻¹	2.1E-08	4.9E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.001
					35.4	ug/L	8.7E-07	(mg/kg/day)	5.7E-02	(mg/kg/day) ⁻¹	5.0E-08	4.1E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.001
					1.64	ug/L	6.2E-08	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	..	2.9E-07	(mg/kg/day)	5.0E-02	(mg/kg/day)	0.000006
					1.09	ug/L	1.5E-08	(mg/kg/day)	9.1E-02	(mg/kg/day) ⁻¹	1.4E-09	7.1E-08	(mg/kg/day)	NA	(mg/kg/day)	..
					0.887	ug/L	4.0E-08	(mg/kg/day)	5.5E-02	(mg/kg/day) ⁻¹	2.2E-09	1.9E-07	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.00005
					1.070	ug/L	2.6E-08	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	..	1.2E-07	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.00001
					828	ug/L	2.9E-05	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	..	1.4E-04	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.01
					80.6	ug/L	2.0E-06	(mg/kg/day)	NA	(mg/kg/day) ⁻¹	..	9.5E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0005
					466	ug/L	2.0E-05	(mg/kg/day)	1.3E-02	(mg/kg/day) ⁻¹	2.7E-07	9.5E-05	(mg/kg/day)	5.0E-01	(mg/kg/day)	0.0002
					49.6	ug/L	8.2E-07	(mg/kg/day)	1.4E-00	(mg/kg/day) ⁻¹	1.2E-06	3.6E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.001
			Exp. Route Total					3.6E-06							0.02	
			Exposure Point Total					3.6E-06								0.02
			Exposure Medium Total					3.6E-06								0.02
			Medium Total					3.6E-06								0.02

TABLE 7.18 RME
 CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
 REASONABLE MAXIMUM EXPOSURES - ADULT RECREATIONAL USER - SHELL FISHERMAN
 ALL 2005/2006 VOC DATA - MINUS SOUTHERN BOUNDARY DATA - GROUNDWATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations			Non-Cancer Hazard Calculations			Hazard Quotient
					Value	Units	Intake/Exposure Concentration	CSF/Unit Risk	Cancer Risk	Intake/Exposure Concentration	RfD/RfC	Hazard Quotient	
Groundwater	Groundwater	Site 07-Shell Fishing	Dermal	1,1,2,2-Tetrachloroethane	19.8	ug/L	6.3E-07	2.0E-01	1.3E-07	2.9E-06	4.0E-02	(mg/kg/day)	0.00007
					2.37	ug/L	5.6E-08	5.7E-02	3.3E-09	2.7E-07	4.0E-03	(mg/kg/day)	0.00007
					0.824	ug/L	1.1E-08	9.1E-02	1.0E-09	5.4E-08	NA	(mg/kg/day)	--
					6.96	ug/L	2.5E-07	NA	--	1.1E-05	1.0E-02	(mg/kg/day)	0.0001
					1.60	ug/L	4.0E-08	NA	--	1.9E-07	2.0E-02	(mg/kg/day)	0.000009
				Trichloroethene	5.58	ug/L	2.5E-07	1.3E-02	3.2E-09	1.1E-06	(mg/kg/day)	0.000002	
			Exp. Route Total										
		Exposure Point Total											
	Exposure Medium Total												
Medium Total													

TABLE 7.19 RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
 REASONABLE MAXIMUM EXPOSURES - ADULT RECREATIONAL USER - SWIMMER & SHELL FISHERMAN
 ALL AVAILABLE 2004/2005 VOC DATA PLUS ANY AVAILABLE METALS DATA - SEDIMENT
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations			Non-Cancer Hazard Calculations			Hazard Quotient					
					Value	Units	Intake/Exposure Concentration	CSF/Unit Risk	Cancer Risk	Intake/Exposure Concentration	Value	Units		RfD/RfC				
															Value	Units	Value	Units
Sediment	Sediment	Site 07-Swimming	Ingestion	Trichloroethene	0.130	mg/kg	4.4E-09	(mg/kg/day)	1.3E-02	(mg/kg/day)-1	5.7E-11	2.0E-08	(mg/kg/day)	5.0E-01	(mg/kg/day)	0.00000004		
				Vinyl Chloride	0.033	mg/kg	1.1E-09	(mg/kg/day)	1.4E+00	(mg/kg/day)-1	1.5E-09	5.2E-09	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.000002		
				Aluminum	8260	mg/kg	2.8E-04	(mg/kg/day)	NA	(mg/kg/day)-1	--	1.3E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.001		
				Arsenic	3.10	mg/kg	1.0E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)-1	1.6E-07	4.9E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002		
				Beryllium	0.920	mg/kg	3.1E-08	(mg/kg/day)	NA	(mg/kg/day)-1	--	1.4E-07	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.00007		
				Iron	17000	mg/kg	5.7E-04	(mg/kg/day)	NA	(mg/kg/day)-1	--	2.7E-03	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.009		
				Exp. Route Total														
				Dermal	0.130	mg/kg	0.0E+00	(mg/kg/day)	1.3E-02	(mg/kg/day)-1	--	0.0E+00	(mg/kg/day)	5.0E-01	(mg/kg/day)	--		
				Vinyl Chloride	0.033	mg/kg	0.0E+00	(mg/kg/day)	1.4E+00	(mg/kg/day)-1	--	0.0E+00	(mg/kg/day)	3.0E-03	(mg/kg/day)	--		
				Aluminum	8260	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)-1	--	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--		
Arsenic	3.10	mg/kg	9.4E-08	(mg/kg/day)	1.5E+00	(mg/kg/day)-1	1.4E-07	4.4E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001						
Beryllium	0.920	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)-1	--	0.0E+00	(mg/kg/day)	1.4E-05	(mg/kg/day)	--						
Iron	17000	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)-1	--	0.0E+00	(mg/kg/day)	3.0E-01	(mg/kg/day)	--						
Exp. Route Total																		
Exposure Point Total																		
Exposure Medium Total																		
Sediment	Sediment	Site 07-Shell Fishing	Ingestion	Trichloroethene	0.130	mg/kg	4.4E-09	(mg/kg/day)	1.3E-02	(mg/kg/day)-1	5.7E-11	2.0E-08	(mg/kg/day)	5.0E-01	(mg/kg/day)	0.00000004		
				Vinyl Chloride	0.033	mg/kg	1.1E-09	(mg/kg/day)	1.4E+00	(mg/kg/day)-1	1.5E-09	5.2E-09	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.000002		
				Aluminum	8260	mg/kg	2.8E-04	(mg/kg/day)	NA	(mg/kg/day)-1	--	1.3E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.001		
				Arsenic	3.10	mg/kg	1.0E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)-1	1.6E-07	4.9E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002		
				Beryllium	0.920	mg/kg	3.1E-08	(mg/kg/day)	NA	(mg/kg/day)-1	--	1.4E-07	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.00007		
				Iron	17000	mg/kg	5.7E-04	(mg/kg/day)	NA	(mg/kg/day)-1	--	2.7E-03	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.009		
				Exp. Route Total														
				Dermal	0.130	mg/kg	0.0E+00	(mg/kg/day)	1.3E-02	(mg/kg/day)-1	--	0.0E+00	(mg/kg/day)	5.0E-01	(mg/kg/day)	--		
				Vinyl Chloride	0.033	mg/kg	0.0E+00	(mg/kg/day)	1.4E+00	(mg/kg/day)-1	--	0.0E+00	(mg/kg/day)	3.0E-03	(mg/kg/day)	--		
				Aluminum	8260	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)-1	--	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--		
Arsenic	3.10	mg/kg	1.3E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)-1	1.6E-07	5.0E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002						
Beryllium	0.920	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)-1	--	0.0E+00	(mg/kg/day)	1.4E-05	(mg/kg/day)	--						
Iron	17000	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)-1	--	0.0E+00	(mg/kg/day)	3.0E-01	(mg/kg/day)	--						
Exp. Route Total																		
Exposure Point Total																		
Exposure Medium Total																		
Medium Total																		

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9.2.RME	Child Recreational Users Exposed to Surface Water - Swimmer - All 2005/2006 VOC Data for Last Quarter of Sampling - Southern Boundary Area
9.3.RME	Child Recreational Users Exposed to Sediment - Swimmer - All 2004/2005 VOC Data Plus Any Available Metals Data
9.4.RME	Child Recreational Users Ingesting Shellfish - Shellfish Data Presented In The Site 07 Phase III RI Report
9.5.RME	Adolescent Recreational Users Exposed to Surface Water - Swimmer & Shell Fisherman - All 2005/2006 VOC Data - Southern Boundary Area
9.6.RME	Adolescent Recreational Users Exposed to Groundwater - Shell Fisherman - All 2005/2006 VOC Data for Last Quarter of Sampling - Southern Boundary Area
9.7.RME	Adolescent Recreational Users Exposed to Groundwater - Shell Fisherman - All 2005/2006 Voc Data - Southern Boundary Area
9.8.RME	Adolescent Recreational Users Exposed to Groundwater - Shell Fisherman - All 2005/2006 VOC Data for Last Quarter of Sampling - Southern Boundary Area
9.9.RME	Adolescent Recreational Users Exposed to Groundwater - Shell Fisherman - All 2005/2006 VOC Data - All Locations
9.10.RME	Adolescent Recreational Users Exposed to Groundwater - Shell Fisherman - All 2005/2006 VOC Data - Minus Southern Boundary Area
9.11.RME	Adolescent Recreational Users Exposed to Sediment - Swimmer & Shell Fisherman - All 2004/2005 VOC Data Plus Any Available Metals Data
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9.25.RME	Lifelong Recreational Users Exposed to Groundwater - Shell Fisherman - All 2005/2006 VOC Data - All Locations
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TABLE 9.1.FME
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS
 REASONABLE MAXIMUM EXPOSURES - CHILD RECREATIONAL USER - SWIMMER
 ALL 2005/2006 VOC DATA FOR SOUTHERN BOUNDARY AREA - SURFACE WATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Swimmer
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk						Non-Carcinogenic Hazard Quotient					
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total		
Surface Water	Surface Water	Site 07-Swimming	1,1,2,2-Tetrachloroethane	7E-08	--	1E-07	--	2E-07	Liver	0.00010	--	0.0002	0.0003		
			cis-1,2-Dichloroethene	--	--	--	--	--	Blood	0.002	--	0.005	0.007		
			Trichloroethene	1E-08	--	4E-08	--	5E-08	Liver	0.00002	--	0.00006	0.00009		
			Vinyl Chloride	2E-08	--	2E-08	--	3E-08	Liver	0.0008	--	0.0008	0.002		
			Chemical Total	9E-08	--	2E-07	--	3E-07		0.003	--	0.006	0.010		
Exposure Point Total															
Exposure Medium Total															
Medium Total															

TABLE 9.2.RME
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS
 REASONABLE MAXIMUM EXPOSURES - CHILD RECREATIONAL USER - SWIMMER
 ALL 2005/2006 VOC DATA FOR LAST QUARTER OF SAMPLING - SOUTHERN BOUNDARY AREA - SURFACE WATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Swimmer
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient					
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	
Surface Water	Surface Water	Site 07-Swimming	1,1,2,2-Tetrachloroethane	2E-07	--	4E-07	--	6E-07	Liver	0.0003	--	0.0006	0.0009	
			cis-1,2-Dichloroethene	--	--	--	--	--	Blood	0.002	--	0.004	0.006	
			Trichloroethene	5E-08	--	1E-07	--	2E-07	Liver	0.00009	--	0.0002	0.0003	
			Vinyl Chloride	2E-08	--	2E-08	--	3E-08	Liver	0.0008	--	0.0008	0.002	
			Chemical Total	3E-07	--	6E-07	--	8E-07		0.003	--	0.006	0.009	
		Exposure Point Total												
		Exposure Medium Total												
Medium Total														

TABLE 9.3.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS
 REASONABLE MAXIMUM EXPOSURES - CHILD RECREATIONAL USER - SWIMMER
 ALL 2004/2005 VOC DATA PLUS ANY AVAILABLE METALS DATA - SEDIMENTS
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Swimmer
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment		Site 07-Swimming	Trichloroethene	4E-10	--	--	--	4E-10	Liver	0.0000008	--	--	0.0000008
			Vinyl Chloride	6E-10	--	--	--	6E-10	Liver	0.000003	--	--	0.000003
			Aluminum	--	--	--	--	--	Body Weight	0.02	--	--	0.02
			Arsenic	1E-06	--	2E-06	--	3E-06	Skin, CVS	0.03	--	0.04	0.07
			Beryllium	--	--	--	--	--	GS	0.001	--	--	0.001
			Iron	--	--	--	--	--	None Reported	0.2	--	--	0.2
			Chemical Total	1E-06	--	2E-06	--	3E-06		0.2	--	0.04	0.3
			Exposure Point Total					3E-06					0.3
			Exposure Medium Total					3E-06					0.3
Medium Total								3E-06					0.3

TABLE 9.4.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS
 REASONABLE MAXIMUM EXPOSURES - CHILD RECREATIONAL USER - CONSUMER OF SHELLFISH
 SHELLFISH DATA PRESENTED IN THE SITE 07 PHASE III RI REPORT
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Consumer of Shellfish
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient					
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	
Surface Water	Finfish/Shellfish	Site 07	Benzo(a)pyrene	7E-07	--	--	--	7E-07	NA	--	--	--	--	
			Benzo(b)fluoranthene	4E-07	--	--	--	4E-07	NA	--	--	--	--	--
			Dibenzo(a,h)anthracene	1E-07	--	--	--	1E-07	NA	--	--	--	--	--
			Aldrin	6E-08	--	--	--	6E-08	Liver	0.001	--	--	--	0.001
			4,4'-DDE	1E-07	--	--	--	1E-07	NA	--	--	--	--	--
			Aroclor-1242	7E-07	--	--	--	7E-07	NA	--	--	--	--	--
			Aroclor-1254	4E-06	--	--	--	4E-06	Immune	1	--	--	--	1
			Aroclor-1260	3E-06	--	--	--	3E-06	NA	--	--	--	--	--
			Arsenic	6E-05	--	--	--	6E-05	Skin, CVS	1	--	--	--	1
			Cadmium	--	--	--	--	--	Kidney	0.8	--	--	--	0.8
			Chromium	--	--	--	--	--	Ferotoxicity, GS, Bone	0.04	--	--	--	0.04
			Copper	--	--	--	--	--	GS	0.6	--	--	--	0.6
			Iron	--	--	--	--	--	None Reported	0.5	--	--	--	0.5
			Manganese	--	--	--	--	--	CNS	0.2	--	--	--	0.2
			Mercury	--	--	--	--	--	CNS	86	--	--	--	86
			Nickel	--	--	--	--	--	CNS	86	--	--	--	86
			Silver	--	--	--	--	--	Body Weight	0.04	--	--	--	0.04
			Chemical Total	7E-05	--	--	--	7E-05	Skin	--	--	0.2		
Medium Total			Exposure Point Total	7E-05	--	--	--	7E-05		--	--	91		
Receptor Total			Exposure Medium Total	7E-05	--	--	--	7E-05		--	--	91		
			Receptor Risk Total	7E-05	--	--	--	7E-05		--	--	91		

Total Body Weight HI	0.04
Total CNS HI	86
Total CVS HI	1
Total GS HI	0.6
Total Immune HI	1
Total Kidney HI	0.8
Total Liver HI	0.001
Total Skin HI	2
Total Bone HI	0.04
Total Fetotoxicity HI	0.04
Total None Reported HI	0.5

TABLE 9.6.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
 REASONABLE MAXIMUM EXPOSURES - ADOLESCENT RECREATIONAL USER - SWIMMER & SHELL FISHERMAN
 ALL 2005/2006 VOC DATA FOR LAST QUARTER OF SAMPLING - SOUTHERN BOUNDARY AREA - SURFACE WATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Swimmer & Shell Fisherman
 Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Site 07-Swimming	1,1,2,2-Tetrachloroethane	1E-07	--	4E-07	--	5E-07	Liver	0.0001	--	0.0004	0.0005
			cis-1,2-Dichloroethene	--	--	--	--	--	Blood	0.0007	--	0.003	0.003
			Trichloroethene	2E-08	--	1E-07	--	1E-07	Liver	0.00003	--	0.001	0.0002
			Vinyl Chloride	1E-07	--	3E-07	--	4E-07	Liver	0.0003	--	0.0005	0.0008
			Chemical Total	3E-07	--	7E-07	--	1E-06		0.001	--	0.004	0.005
		Exposure Point Total											
		Exposure Medium Total											
Medium Total													
Surface Water	Surface Water	Site 07-Shell Fishing	1,1,2,2-Tetrachloroethane	2E-08	--	1E-07	--	1E-07	Liver	0.00002	--	0.0001	0.0001
			cis-1,2-Dichloroethene	--	--	--	--	--	Blood	0.0001	--	0.0008	0.0010
			Trichloroethene	5E-09	--	4E-08	--	4E-08	Liver	0.000006	--	0.00005	0.00005
			Vinyl Chloride	3E-08	--	9E-08	--	1E-07	Liver	0.00006	--	0.0002	0.0002
			Chemical Total	6E-08	--	2E-07	--	3E-07		0.0002	--	0.001	0.001
		Exposure Point Total											
		Exposure Medium Total											
Medium Total													

TABLE 9.7.RMIE
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
 REASONABLE MAXIMUM EXPOSURES - ADOLESCENT RECREATIONAL USER - SHELL FISHERMAN
 ALL 2005/2006 VOC DATA - SOUTHERN BOUNDARY AREA - GROUNDWATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Shell Fisherman
 Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radclation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Site 07 - Shell Fishing	1,1,1,2-Tetrachloroethane	..	..	2E-06	..	2E-06	Liver	..	..	0.002	0.002
			1,1,2-Trichloroethane	..	..	3E-08	..	3E-08	Blood	..	..	0.001	0.001
			1,1-Dichloroethene	..	..	..	..	..	Liver	..	..	0.000009	0.000009
			1,2-Dichloroethane	..	..	1E-09	..	1E-09	NA	..	..	..	..
			Benzene	..	..	2E-09	..	2E-09	Blood	..	..	0.00006	0.00006
			Chloroform	..	..	..	..	..	Liver	..	..	0.00002	0.00002
			cis-1,2-Dichloroethene	..	..	..	..	..	Blood	..	..	0.02	0.02
			trans-1,2-Dichloroethene	..	..	..	..	..	Blood	..	..	0.0004	0.0004
			Trichloroethene	..	..	5E-07	..	5E-07	Liver	..	..	0.0006	0.0006
			Vinyl Chloride	..	..	1E-06	..	1E-06	Liver	..	..	0.002	0.002
			Chemical Total	..	..	3E-06	..	..	..	..	..	0.02	
		Exposure Point Total		..	..	3E-06	..	..	..	..	..	0.02	
		Exposure Medium Total		..	..	3E-06	..	..	..	..	..	0.02	
Medium Total				..	..	3E-06	..	..	..	..	..	0.02	

TABLE 9.8.RME
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
 REASONABLE MAXIMUM EXPOSURES - ADOLESCENT RECREATIONAL USER - SHELL FISHERMAN
 ALL 2006/2006 VOC DATA FOR LAST QUARTER OF SAMPLING - SOUTHERN BOUNDARY AREA - GROUNDWATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Shell Fisherman
 Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk						Non-Carcinogenic Hazard Quotient						
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total			
Groundwater	Groundwater	Site 07-Shell Fishing	1,1,2,2-Tetrachloroethane	--	--	2E-06	--	2E-06	--	--	--	0.002	--	--	0.002	
			1,1,2-Trichloroethane	--	--	3E-08	--	3E-08	--	--	--	--	0.0009	--	--	0.0009
			1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	0.00001	--	--	0.00001
			1,2-Dichloroethane	--	--	1E-09	--	1E-09	--	--	--	--	--	--	--	--
			Benzene	--	--	8E-10	--	8E-10	--	--	--	--	0.00003	--	--	0.00003
			Chloroform	--	--	--	--	--	--	--	--	--	0.00001	--	--	0.00001
			cis-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	0.02	--	--	0.02
			trans-1,2-Dichloroethene	--	--	2E-07	--	2E-07	--	--	--	--	0.0005	--	--	0.0005
			Trichloroethene	--	--	1E-06	--	1E-06	--	--	--	--	0.0003	--	--	0.0003
			Vinyl Chloride	--	--	3E-06	--	3E-06	--	--	--	--	0.02	--	--	0.02
					Exposure Point Total											
		Exposure Medium Total														
Medium Total																

TABLE 9.9.RME
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
 REASONABLE MAXIMUM EXPOSURES - ADOLESCENT RECREATIONAL USER - SHELL FISHERMAN
 ALL 2005/2006 VOC DATA - ALL LOCATIONS - GROUNDWATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Shell Fisherman
 Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient					
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	
Groundwater	Groundwater	Site 07-Shell Fishing	1,1,2,2-Tetrachloroethane	--	--	1E-06	--	1E-06	--	--	0.001	--	--	0.001
			1,1,2-Trichloroethane	--	--	3E-08	--	3E-08	--	--	0.001	--	--	0.001
			1,1-Dichloroethene	--	--	9E-10	--	9E-10	--	--	0.000007	--	--	0.000007
			1,2-Dichloroethane	--	--	1E-09	--	1E-09	--	--	--	--	--	--
			Benzene	--	--	--	--	--	--	--	0.00005	--	--	0.00005
			Chloroform	--	--	--	--	--	--	--	0.00001	--	--	0.00001
			cis-1,2-Dichloroethene	--	--	--	--	--	--	--	0.02	--	--	0.02
			trans-1,2-Dichloroethene	--	--	--	--	--	--	--	0.0005	--	--	0.0005
			Trichloroethene	--	--	2E-07	--	2E-07	--	--	0.0002	--	--	0.0002
			Vinyl Chloride	--	--	8E-07	--	8E-07	--	--	0.001	--	--	0.001
			Chemical Total	--	--	2E-06	--	2E-06	--	--	0.02	--	--	0.02
Exposure Point Total								2E-06				0.02		
Exposure Medium Total								2E-06				0.02		
Medium Total								2E-06				0.02		

TABLE 9.10.RME
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COFCs
 REASONABLE MAXIMUM EXPOSURES - ADOLESCENT RECREATIONAL USER - SHELL FISHERMAN
 ALL 2005/2006 VOC DATA - MINUS SOUTHERN BOUNDARY DATA - GROUNDWATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Shell Fisherman
 Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk						Non-Carcinogenic Hazard Quotient					
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total		
Groundwater	Groundwater	Site 07-Shell Fishing	1,1,2,2-Tetrachloroethane	**	**	8E-08	**	8E-08	**	**	0.00008	**	**	0.00008	
			1,1,2-Trichloroethane	**	**	2E-09	**	2E-09	**	**	0.00008	**	**	0.00008	
			1,2-Dichloroethane	**	**	7E-10	**	7E-10	**	**	0.0001	**	**	0.0001	
			cis-1,2-Dichloroethene	**	**	**	**	**	**	**	0.00001	**	**	0.00001	
			trans-1,2-Dichloroethene	**	**	**	**	**	**	**	0.00001	**	**	0.00001	
			Trichloroethene	**	**	2E-09	**	2E-09	**	**	0.000003	**	**	0.000003	
			Chemical Total	**	**	9E-08	**	9E-08	**	**	0.0003	**	**	0.0003	
			Exposure Point Total					9E-08						0.0003	
			Exposure Medium Total					9E-08						0.0003	
Medium Total								9E-08						0.0003	

TABLE 9.11.R1ME
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
 REASONABLE MAXIMUM EXPOSURES - ADOLESCENT RECREATIONAL USER - SWIMMER & SHELL FISHERMAN
 ALL AVAILABLE 2004/2005 VOC DATA PLUS ANY AVAILABLE METALS DATA - SEDIMENT
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Swimmer & Shell Fisherman
 Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Site 07-Swimming	Trichloroethene Vinyl Chloride Aluminum Arsenic Beryllium Iron Chemical Total	1E-10	--	--	--	1E-10	Liver	0.0000001	--	--	0.0000001
				3E-09	--	--	--	3E-09	Liver	0.0000005	--	--	0.0000005
				--	--	--	--	--	Body Weight	0.004	--	--	0.004
				3E-07	--	1E-06	--	2E-06	Skin, CVS	0.005	--	0.02	0.03
				--	--	--	--	--	GS	0.0002	--	--	0.0002
			Chemical Total	3E-07	--	1E-06	--	2E-06	None Reported	0.03	--	--	0.03
			Exposure Point Total					2E-06		0.04			0.06
			Exposure Medium Total					2E-06					0.06
Medium Total								2E-06					0.06
Sediment	Sediment	Site 07-Shell Fishing	Trichloroethene Vinyl Chloride Aluminum Arsenic Beryllium Iron Chemical Total	1E-10	--	--	--	1E-10	Liver	0.0000001	--	--	0.0000001
				3E-09	--	--	--	3E-09	Liver	0.0000005	--	--	0.0000005
				--	--	--	--	--	Body Weight	0.004	--	--	0.004
				3E-07	--	1E-07	--	4E-07	Skin, CVS	0.005	--	0.002	0.007
				--	--	--	--	--	GS	0.0002	--	--	0.0002
			Chemical Total	3E-07	--	1E-07	--	4E-07	None Reported	0.03	--	--	0.03
			Exposure Point Total					4E-07		0.04			0.04
			Exposure Medium Total					4E-07					0.04
Medium Total								4E-07					0.04

TABLE 9.12.RME
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
 REASONABLE MAXIMUM EXPOSURES - ADOLESCENT RECREATIONAL USER - CONSUMER OF SHELLFISH
 SHELLFISH DATA PRESENTED IN THE SITE 07 PHASE III RI REPORT
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Consumer of Shellfish
 Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient					
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	
Surface Water	Fish/Shellfish	Site 07	Benzo(a)pyrene	2E-06	--	--	--	2E-06	NA	--	--	--	0.002	
			Benzo(b)fluoranthene	9E-07	--	--	--	9E-07	NA	--	--	--	--	--
			Dibenzo(a,h)anthracene	3E-07	--	--	--	3E-07	NA	--	--	--	--	--
			Aldrin	1E-07	--	--	--	1E-07	Liver	0.002	--	--	--	0.002
			4,4'-DDE	3E-07	--	--	--	3E-07	NA	--	--	--	--	--
			Aroclor-1242	2E-06	--	--	--	2E-06	NA	--	--	--	--	--
			Aroclor-1254	1E-05	--	--	--	1E-05	Immune	2	--	--	--	2
			Aroclor-1260	6E-06	--	--	--	6E-06	NA	2	--	--	--	2
			Arsenic	1E-04	--	--	--	1E-04	Skin, CVS	1	--	--	--	1
			Cadmium	--	--	--	--	--	Kidney	1	--	--	--	1
			Chromium	--	--	--	--	--	Ferotoxicity, GS, Bone	0.07	--	--	--	0.07
			Copper	--	--	--	--	--	GS	0.9	--	--	--	0.9
			Iron	--	--	--	--	--	None Reported	0.7	--	--	--	0.7
			Manganese	--	--	--	--	--	CNS	0.2	--	--	--	0.2
			Mercury	--	--	--	--	--	CNS	136	--	--	--	136
			Nickel	--	--	--	--	--	Body Weight	0.07	--	--	--	0.07
			Silver	--	--	--	--	--	Skin	0.3	--	--	--	0.3
Chemical Total			2E-04	--	--	--	2E-04	144	--	--	--	144		
Exposure Point Total			2E-04	--	--	--	2E-04	144	--	--	--	144		
Exposure Medium Total			2E-04	--	--	--	2E-04	144	--	--	--	144		
Medium Total			2E-04	--	--	--	2E-04	144	--	--	--	144		
Receptor Total			2E-04	--	--	--	2E-04	144	--	--	--	144		

Total Body Weight HI	0.07
Total CNS HI	136
Total CVS HI	2
Total GS HI	0.9
Total Immune HI	2
Total Kidney HI	1
Total Liver HI	0.002
Total Skin HI	3
Total Bone HI	0.07
Total Fetotoxicity HI	0.07
Total None Reported HI	0.7

TABLE 9.13.RME
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS
 REASONABLE MAXIMUM EXPOSURES - ADULT RECREATIONAL USER - SWIMMER & SHELL FISHERMAN
 ALL 2005/2006 VOC DATA FOR SOUTHERN BOUNDARY AREA - SURFACE WATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Swimmer & Shell Fisherman
 Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Site 07-Swimming	1,1,2,2-Tetrachloroethane	4E-08	--	2E-07	--	2E-07	Liver	0.00002	--	0.00010	0.0001
			cis-1,2-Dichloroethene	--	--	--	--	--	Blood	0.00005	--	0.003	0.003
			Trichloroethene	7E-09	--	5E-08	--	5E-08	Liver	0.000005	--	0.00003	0.00004
			Vinyl Chloride	2E-07	--	4E-07	--	6E-07	Liver	0.0002	--	0.0004	0.0006
			Chemical Total	2E-07	--	6E-07	--	8E-07		0.0007	--	0.003	0.004
		Exposure Point Total											
		Exposure Medium Total											
Medium Total													
Surface Water	Surface Water	Site 07-Shell Fishing	1,1,2,2-Tetrachloroethane	7E-09	--	5E-08	--	6E-08	Liver	0.000004	--	0.00003	0.00004
			cis-1,2-Dichloroethene	--	--	--	--	--	Blood	0.0001	--	0.0009	0.0010
			Trichloroethene	1E-09	--	2E-08	--	2E-08	Liver	0.000001	--	0.00001	0.00001
			Vinyl Chloride	3E-08	--	1E-07	--	2E-07	Liver	0.00004	--	0.0001	0.0002
			Chemical Total	4E-08	--	2E-07	--	2E-07		0.0001	--	0.001	0.001
		Exposure Point Total											
		Exposure Medium Total											
Medium Total													

TABLE 9.14.RME
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COFCs
 REASONABLE MAXIMUM EXPOSURES - ADULT RECREATIONAL USER - SWIMMER & SHELL FISHERMAN
 ALL 2005/2006 VOC DATA FOR LAST QUARTER OF SAMPLING - SOUTHERN BOUNDARY AREA - SURFACE WATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Swimmer & Shell Fisherman
 Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Site 07-Swimming	1,1,2,2-Tetrachloroethane cis-1,2-Dichloroethene Trichloroethene Vinyl Chloride Chemical Total	1E-07	--	5E-07	--	7E-07	Liver	0.00007	--	0.00003	0.0004
				--	--	--	--	--	Blood	0.00004	--	0.002	0.003
				3E-08	--	2E-07	--	2E-07	Liver	0.00002	--	0.0001	0.0001
				2E-07	--	4E-07	--	6E-07	Liver	0.00002	--	0.0004	0.0006
		Exposure Point Total											
		Exposure Medium Total											
Medium Total													
Surface Water	Surface Water	Site 07-Shell Fishing	1,1,2,2-Tetrachloroethane cis-1,2-Dichloroethene Trichloroethene Vinyl Chloride Chemical Total	2E-08	--	2E-07	--	2E-07	Liver	0.00001	--	0.0001	0.0001
				--	--	--	--	--	Blood	0.00009	--	0.0007	0.0008
				5E-09	--	6E-08	--	6E-08	Liver	0.000004	--	0.00004	0.00005
				3E-08	--	1E-07	--	2E-07	Liver	0.00004	--	0.0001	0.0002
		Exposure Point Total											
		Exposure Medium Total											
Medium Total													

TABLE 9.15.RME
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
 REASONABLE MAXIMUM EXPOSURES - ADULT RECREATIONAL USER - SHELL FISHERMAN
 ALL 2005/2006 VOC DATA - SOUTHERN BOUNDARY AREA - GROUNDWATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Shell Fisherman
 Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical or Potential Concern	Carcinogenic Risk						Non-Carcinogenic Hazard Quotient					
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total		
Groundwater	Groundwater	Site 07-Shell Fishing	1,1,2,2-Tetrachloroethane 1,1,2-Trichloroethane 1,1-Dichloroethene 1,2-Dichloroethane Benzene Chloroform cis-1,2-Dichloroethene trans-1,2-Dichloroethene Trichloroethene Vinyl Chloride Chemical Total	..	..	3E-06	..	3E-06	Liver	..	..	0.002	0.002	0.002
				..	..	5E-08	..	5E-08	Blood	..	..	0.0010	0.0010	0.0010
				..	..	..	..	..	Liver	..	..	0.000008	0.000008	0.000008
				..	..	2E-09	..	2E-09	NA	..	..	..	..	..
				..	..	3E-09	..	3E-09	Blood	..	..	0.00006	0.00006	0.00006
				..	..	..	..	..	Liver	..	..	0.00001	0.00001	0.00001
				..	..	..	..	..	Blood	..	..	0.02	0.02	0.02
				..	..	7E-07	..	7E-07	Blood	..	..	0.0003	0.0003	0.0003
				..	..	1E-06	..	1E-06	Liver	..	..	0.0005	0.0005	0.0005
				..	..	5E-06	..	5E-06	Liver	..	..	0.02	0.02	0.02
				Exposure Point Total				5E-06	..	5E-06	0.02
Exposure Medium Total				..	..	5E-06	..	5E-06	..	..	0.02	0.02	0.02	
Medium Total				..	..	5E-06	..	5E-06	..	..	0.02	0.02	0.02	

TABLE 9.16.RME
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS
 REASONABLE MAXIMUM EXPOSURES - ADULT RECREATIONAL USER - SHELL FISHERMAN
 ALL 2005/2006 VOC DATA FOR LAST QUARTER OF SAMPLING - SOUTHERN BOUNDARY AREA - GROUNDWATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Shell Fisherman
 Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk						Non-Carcinogenic Hazard Quotient					
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total		
Groundwater	Groundwater	Site 07-Shell Fishing	1,1,2,2-Tetrachloroethane	--	--	2E-06	--	2E-06	Liver	--	--	0.001	0.001		
			1,1,2-Trichloroethane	--	--	4E-08	--	4E-08	Blood	--	--	0.0008	0.0008		
			1,1-Dichloroethane	--	--	--	--	--	Liver	--	--	0.00001	0.00001		
			1,2-Dichloroethane	--	--	2E-09	--	2E-09	NA	--	--	--	--		
			Benzene	--	--	1E-09	--	1E-09	Blood	--	--	0.00003	0.00003		
			Chloroform	--	--	--	--	--	Liver	--	--	0.000009	0.000009		
			cis-1,2-Dichloroethene	--	--	--	--	--	Blood	--	--	0.01	0.01		
			trans-1,2-Dichloroethene	--	--	--	--	--	Blood	--	--	0.0004	0.0004		
			Trichloroethene	--	--	3E-07	--	3E-07	Liver	--	--	0.0002	0.0002		
			Vinyl Chloride	--	--	2E-06	--	2E-06	Liver	--	--	0.002	0.002		
			Chemical Total	--	--	4E-06	--	4E-06			0.02	0.02			
			Exposure Point Total			4E-06		4E-06			0.02	0.02			
			Exposure Medium Total			4E-06		4E-06			0.02	0.02			
Medium Total						4E-06		4E-06			0.02	0.02			
Receptor Total						Receptor Risk Total		Receptor Risk Total			Receptor HI Total	0.02			

Total Blood HI 0.02
 Total Liver HI 0.004

TABLE 9.17.RME
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS
 REASONABLE MAXIMUM EXPOSURES - ADULT RECREATIONAL USER - SHELL FISHERMAN
 ALL 2005/2006 VOC DATA - ALL LOCATIONS - GROUNDWATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future Receptor Population: Recreational User - Shell Fisherman Receptor Age: Adult				Carcinogenic Risk					Non-Carcinogenic Hazard Quotient							
Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total			
Groundwater	Groundwater	Site 07-Shell Fishing	1,1,2,2-Tetrachloroethane	--	--	2E-06	--	2E-06	Liver	--	--	0.001	0.001			
			1,1,2-Trichloroethane	--	--	5E-08	--	5E-08	Blood	--	--	0.001	0.001			
			1,1-Dichloroethene	--	--	--	--	--	--	Liver	--	--	0.000006	0.000006		
			1,2-Dichloroethane	--	--	1E-09	--	1E-09	NA	NA	--	--	--	--		
			Benzene	--	--	2E-09	--	2E-09	Blood	Blood	--	--	0.00005	0.00005		
			Chloroform	--	--	--	--	--	--	Liver	--	--	0.00001	0.00001		
			cis-1,2-Dichloroethene	--	--	--	--	--	--	Blood	--	--	0.01	0.01		
			trans-1,2-Dichloroethene	--	--	--	--	--	--	Blood	--	--	0.0005	0.0005		
			Trichloroethene	--	--	3E-07	--	3E-07	--	Liver	--	--	0.0002	0.0002		
			Vinyl Chloride	--	--	1E-06	--	1E-06	--	Liver	--	--	0.001	0.001		
			Chemical Total	--	--	4E-06	--	4E-06	--	Liver	--	--	0.02	0.02		
			Exposure Point Total								4E-06					0.02
			Exposure Medium Total								4E-06					0.02
Medium Total								4E-06					0.02			

TABLE 9.18.RME
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS
 REASONABLE MAXIMUM EXPOSURES - ADULT RECREATIONAL USER - SHELL FISHERMAN
 ALL 2005/2006 VOC DATA - MINUS SOUTHERN BOUNDARY DATA - GROUNDWATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Shell Fisherman
 Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk						Non-Carcinogenic Hazard Quotient					
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total		
Groundwater	Groundwater	Site 07-Shell Fishing	1,1,2,2-Tetrachloroethane	**	**	1E-07	**	1E-07	**	**	0.00007	**	**	0.00007	
			1,1,2-Trichloroethane	**	**	3E-09	**	3E-09	Blood	**	**	0.00007	**	**	0.00007
			1,2-Dichloroethane	**	**	1E-09	**	1E-09	NA	**	**	**	**	**	**
			cis-1,2-Dichloroethane	**	**	**	**	**	Blood	**	**	0.0001	**	**	0.0001
			trans-1,2-Dichloroethane	**	**	**	**	**	Blood	**	**	0.000009	**	**	0.000009
			Trichloroethene	**	**	3E-09	**	3E-09	**	**	0.000002	**	**	0.000002	
			Chemical Total	**	**	1E-07	**	1E-07	**	**	0.0003	**	**	0.0003	
			Exposure Point Total					1E-07						0.0003	
			Exposure Medium Total					1E-07						0.0003	
Medium Total								1E-07						0.0003	

TABLE 9.19.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COFCs
 REASONABLE MAXIMUM EXPOSURES - ADULT RECREATIONAL USER - SWIMMER & SHELL FISHERMAN
 ALL AVAILABLE 2004/2005 VOC DATA PLUS ANY AVAILABLE METALS DATA - SEDIMENT
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Swimmer & Shell Fisherman
 Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk						Non-Carcinogenic Hazard Quotient					
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total		
Sediment		Site 07-Swimming	Trichloroethene	6E-11	--	--	--	6E-11	Liver	0.00000004	--	--	0.00000004		
			Vinyl Chloride	2E-09	--	--	--	2E-09	Liver	0.000002	--	--	0.000002		
			Aluminum	--	--	--	--	--	Body Weight	0.001	--	--	0.001		
			Arsenic	2E-07	--	1E-07	--	3E-07	Skin, CVS	0.002	--	0.001	0.003		
			Beryllium	--	--	--	--	--	GS	0.00007	--	--	0.00007		
Iron	--	--	--	--	--	None Reported	0.009	--	--	0.009					
			Chemical Total	2E-07	--	1E-07	--	3E-07		0.01	--	0.01			
			Exposure Point Total					3E-07				0.01			
			Exposure Medium Total					3E-07				0.01			
Medium Total								3E-07				0.01			
Sediment		Site 07-Shell Fishing	Trichloroethene	6E-11	--	--	--	6E-11	Liver	0.00000004	--	--	0.00000004		
			Vinyl Chloride	2E-09	--	--	--	2E-09	Liver	0.000002	--	--	0.000002		
			Aluminum	--	--	--	--	--	Body Weight	0.001	--	--	0.001		
			Arsenic	2E-07	--	2E-07	--	3E-07	Skin, CVS	0.002	--	0.002	0.004		
			Beryllium	--	--	--	--	--	GS	0.00007	--	--	0.00007		
Iron	--	--	--	--	--	None Reported	0.009	--	--	0.009					
			Chemical Total	2E-07	--	2E-07	--	3E-07		0.01	--	0.01			
			Exposure Point Total					3E-07				0.01			
			Exposure Medium Total					3E-07				0.01			
Medium Total								3E-07				0.01			

TABLE 9.20.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS
 REASONABLE MAXIMUM EXPOSURES - ADULT RECREATIONAL USER - CONSUMER OF SHELLFISH
 SHELLFISH DATA PRESENTED IN THE SITE 07 PHASE III RI REPORT
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Consumer of Shellfish
 Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient					
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	
Surface Water	Finfish/Shellfish	Site 07	Benzo(a)pyrene	2E-06	--	--	--	2E-06	NA	--	--	--	--	
			Benzo(b)fluoranthene	1E-06	--	--	--	1E-06	NA	--	--	--	--	--
			Dibenzo(a,h)anthracene	4E-07	--	--	--	4E-07	NA	--	--	--	--	--
			Aldrin	2E-07	--	--	--	2E-07	Liver	0.001	--	--	--	0.001
			4,4'-DDE	3E-07	--	--	--	3E-07	NA	--	--	--	--	--
			Aroclor-1242	2E-06	--	--	--	2E-06	NA	--	--	--	--	--
			Aroclor-1254	1E-05	--	--	--	1E-05	Immune	1	--	--	--	1
			Aroclor-1260	6E-06	--	--	--	6E-06	NA	--	--	--	--	--
			Arsenic	1E-04	--	--	--	1E-04	Skin, CVS	1	--	--	--	1
			Cadmium	--	--	--	--	--	Kidney	0.9	--	--	--	0.9
			Chromium	--	--	--	--	--	Fetotoxicity, GS, Bone	0.04	--	--	--	0.04
			Copper	--	--	--	--	--	GS	0.6	--	--	--	0.6
			Iron	--	--	--	--	--	None Reported	0.5	--	--	--	0.5
			Manganese	--	--	--	--	--	CNS	0.2	--	--	--	0.2
Mercury	--	--	--	--	--	CNS	87	--	--	--	87			
Nickel	--	--	--	--	--	Body Weight	0.04	--	--	--	0.04			
Silver	--	--	--	--	--	Skin	0.2	--	--	--	0.2			
Chemical Total				2E-04	--	--	--		92	--	--	92		
Exposure Point Total												92		
Exposure Medium Total												92		
Receptor Total												92		

Total Body Weight HI	0.04
Total CNS HI	88
Total CVS HI	1
Total GS HI	0.6
Total Immune HI	1
Total Kidney HI	0.9
Total Liver HI	0.001
Total Skin HI	2
Total Bone HI	0.04
Total Fetotoxicity HI	0.04
Total None Reported HI	0.5

TABLE 9.21.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS
 REASONABLE MAXIMUM EXPOSURES - LIFELONG RECREATIONAL USER - SWIMMER & SHELL FISHERMAN
 ALL 2005/2006 VOC DATA FOR SOUTHERN BOUNDARY AREA - SURFACE WATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Swimmer & Shell Fisherman
 Receptor Age: Lifelong (Child, Adolescent, and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water		Site 07-Swimming	1,1,2,2-Tetrachloroethane	1E-07	--	4E-07	--	5E-07					
			cis-1,2-Dichloroethene	--	--	--	--	--					
			Trichloroethene	3E-08	--	1E-07	--	1E-07					
			Vinyl Chloride	3E-07	--	7E-07	--	1E-06					
			Chemical Total	5E-07	--	1E-06	--	2E-06					
		Exposure Point Total											
		Exposure Medium Total											
Surface Water		Site 07-Shell Fishing	1,1,2,2-Tetrachloroethane	1E-08	--	9E-08	--	1E-07					
			cis-1,2-Dichloroethene	--	--	--	--	--					
			Trichloroethene	3E-09	--	3E-08	--	3E-08					
			Vinyl Chloride	6E-08	--	2E-07	--	3E-07					
			Chemical Total	8E-08	--	3E-07	--	4E-07					
		Exposure Point Total											
		Exposure Medium Total											
Medium Total													

TABLE 9.22.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS
 REASONABLE MAXIMUM EXPOSURES - LIFELONG RECREATIONAL USER - SWIMMER & SHELL FISHERMAN
 ALL 2005/2006 VOC DATA FOR LAST QUARTER OF SAMPLING - SOUTHERN BOUNDARY AREA - SURFACE WATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Swimmer & Shell Fisherman
 Receptor Age: Lifelong (Child, Adolescent, and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk						Non-Carcinogenic Hazard Quotient					
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total		
Surface Water	Surface Water	Site 07-Swimming	1,1,2,2-Tetrachloroethane	2E-07	--	8E-07	--	1E-06							
			cis-1,2-Dichloroethene	--	--	--	--	--							
			Trichloroethene	5E-08	--	2E-07	--	3E-07							
			Vinyl Chloride	3E-07	--	7E-07	--	1E-06							
			Chemical Total	6E-07	--	2E-06	--	2E-06							
		Exposure Point Total													
		Exposure Medium Total													
Medium Total															
Surface Water	Surface Water	Site 07-Shell Fishing	1,1,2,2-Tetrachloroethane	3E-08	--	2E-07	--	2E-07							
			cis-1,2-Dichloroethene	--	--	--	--	--							
			Trichloroethene	7E-09	--	7E-08	--	8E-08							
			Vinyl Chloride	6E-08	--	2E-07	--	3E-07							
			Chemical Total	1E-07	--	5E-07	--	6E-07							
		Exposure Point Total													
		Exposure Medium Total													
Medium Total															

TABLE 9.23.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS
 REASONABLE MAXIMUM EXPOSURES - LIFELONG RECREATIONAL USER - SHELL FISHERMAN
 ALL 2005/2006 VOC DATA - SOUTHERN BOUNDARY AREA - GROUNDWATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Shell Fisherman
 Receptor Age: Lifelong (Adolescent and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk						Non-Carcinogenic Hazard Quotient					
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total		
Groundwater	Groundwater	Site 07-Shell Fishing	1,1,2,2-Tetrachloroethane	--	--	4E-06	--	4E-06							
			1,1,2-Trichloroethane	--	--	8E-08	--	8E-08							
			1,1-Dichloroethane	--	--	--	--	--							
			1,2-Dichloroethane	--	--	3E-09	--	3E-09							
			Benzene	--	--	4E-09	--	4E-09							
			Chloroform	--	--	--	--	--							
			cis-1,2-Dichloroethane	--	--	--	--	--							
			trans-1,2-Dichloroethane	--	--	1E-06	--	1E-06							
			Trichloroethene	--	--	2E-06	--	2E-06							
			Vinyl Chloride	--	--	8E-06	--	8E-06							
			Chemical Total												
Exposure Point Total															
Exposure Medium Total															
Medium Total															

TABLE 9.24.RME
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS
 REASONABLE MAXIMUM EXPOSURES - LIFELONG RECREATIONAL USER - SHELL FISHERMAN
 ALL 2005/2006 VOC DATA FOR LAST QUARTER OF SAMPLING - SOUTHERN BOUNDARY AREA - GROUNDWATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Shell Fisherman
 Receptor Age: Lifelong (Adolescent and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Site 07-Shell Fishing	1,1,2,2-Tetrachloroethane	--	--	4E-06	--	4E-06					
			1,1,1,2-Trichloroethane	--	--	6E-08	--	6E-08					
			1,1-Dichloroethene	--	--	--	--	--					
			1,2-Dichloroethane	--	--	3E-09	--	3E-09					
			Benzene	--	--	2E-09	--	2E-09					
			Chloroform	--	--	--	--	--					
			cis-1,2-Dichloroethene	--	--	--	--	--					
			trans-1,2-Dichloroethene	--	--	--	--	--					
			Trichloroethene	--	--	5E-07	--	5E-07					
			Vinyl Chloride	--	--	3E-06	--	3E-06					
			Chemical Total	--	--	7E-06	--	7E-06					
		Exposure Point Total											
		Exposure Medium Total											
Medium Total													

TABLE 9.25.RME
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
 REASONABLE MAXIMUM EXPOSURES - LIFELONG RECREATIONAL USER - SHELL FISHERMAN
 ALL 2005/2008 VOC DATA - ALL LOCATIONS - GROUNDWATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Shell Fisherman
 Receptor Age: Lifelong (Adolescent and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk						Non-Carcinogenic Hazard Quotient					
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total		
Groundwater	Groundwater	Site 07-Shell Fishing	1,1,2,2-Tetrachloroethane	--	--	4E-06	--	4E-06							
			1,1,2-Trichloroethane	--	--	8E-08	--	8E-08							
			1,1-Dichloroethene	--	--	--	--	--							
			1,2-Dichloroethane	--	--	2E-09	--	2E-09							
			Benzene	--	--	4E-09	--	4E-09							
			Chloroform	--	--	--	--	--							
			cis-1,2-Dichloroethene	--	--	--	--	--							
			trans-1,2-Dichloroethene	--	--	--	--	--							
			Trichloroethene	--	--	4E-07	--	4E-07							
			Vinyl Chloride	--	--	2E-06	--	2E-06							
			Chemical Total	--	--	6E-06	--	6E-06							
Exposure Point Total															
Exposure Medium Total															
Medium Total															

TABLE 9.26.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
 REASONABLE MAXIMUM EXPOSURES - LIFELONG RECREATIONAL USER - SHELL FISHERMAN
 ALL 2005/2006 VOC DATA - MINUS SOUTHERN BOUNDARY DATA - GROUNDWATER
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Shell Fisherman
 Receptor Age: Lifetime (Adolescent and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Site 07-Shell Fishing	1,1,2,2-Tetrachloroethane	--	--	2E-07	--	2E-07					
			1,1,2-Trichloroethane	--	--	6E-09	--	6E-09					
			1,2-Dichloroethane	--	--	2E-09	--	2E-09					
			cis-1,2-Dichloroethene	--	--	--	--	--					
			trans-1,2-Dichloroethene	--	--	--	--	--					
			Trichloroethene	--	--	5E-09	--	5E-09					
			Chemical Total	--	--	2E-07	--	2E-07					
		Exposure Point Total											
		Exposure Medium Total											
Medium Total													

TABLE 9.27.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
 REASONABLE MAXIMUM EXPOSURES - LIFELONG RECREATIONAL USER - SWIMMER & SHELL FISHERMAN
 ALL AVAILABLE 2004/2005 VOC DATA PLUS ANY AVAILABLE METALS DATA - SEDIMENT
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Swimmer & Shell Fisherman
 Receptor Age: Lifelong (Child, Adolescent, and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Site 07-Swimming	Trichloroethene	6E-10	--	--	--	6E-10					
			Vinyl Chloride	5E-09	--	--	--	5E-09					
			Aluminum	--	--	--	--	--					
			Arsenic	2E-06	--	3E-06	--	5E-06					
			Beryllium	--	--	--	--	--					
			Iron	--	--	--	--	--					
			Chemical Total	2E-06	--	3E-06	--	5E-06					
		Exposure Point Total						5E-06					
		Exposure Medium Total						5E-06					
Medium Total								5E-06					
Sediment	Sediment	Site 07-Shell Fishing	Trichloroethene	2E-10	--	--	--	2E-10					
			Vinyl Chloride	4E-09	--	--	--	4E-09					
			Aluminum	--	--	--	--	--					
			Arsenic	4E-07	--	3E-07	--	8E-07					
			Beryllium	--	--	--	--	--					
			Iron	--	--	--	--	--					
			Chemical Total	5E-07	--	3E-07	--	8E-07					
		Exposure Point Total						8E-07					
		Exposure Medium Total						8E-07					
Medium Total								8E-07					

TABLE 9.28-RME
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS
 REASONABLE MAXIMUM EXPOSURES - LIFELONG RECREATIONAL USER - CONSUMER OF SHELLFISH
 SHELLFISH DATA PRESENTED IN THE SITE 07 PHASE III RI REPORT
 SITE 07, CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
 DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Scenario Timeframe: Current/Future
 Receptor Population: Recreational User - Consumer of Shellfish
 Receptor Age: Lifelong (Child, Adolescent, and Adult)

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient						
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total		
Surface Water	Finfish/Shellfish	Site 07	Benzo(a)pyrene	4E-06	--	--	--	4E-06							
			Benzo(b)fluoranthene	2E-06	--	--	--	2E-06							
			Dibenzo(a,h)anthracene	8E-07	--	--	--	8E-07							
			Aldrin	4E-07	--	--	--	4E-07							
			4,4'-DDE	7E-07	--	--	--	7E-07							
			Aroclor-1242	4E-06	--	--	--	4E-06							
			Aroclor-1254	2E-05	--	--	--	2E-05							
			Aroclor-1260	2E-05	--	--	--	2E-05							
			Arsenic	3E-04	--	--	--	3E-04							
			Cadmium	--	--	--	--	--							
			Chromium	--	--	--	--	--							
			Copper	--	--	--	--	--							
			Iron	--	--	--	--	--							
			Manganese	--	--	--	--	--							
			Mercury	--	--	--	--	--							
			Nickel	--	--	--	--	--							
			Silver	--	--	--	--	--							
			Chemical Total	4E-04	--	--	--	4E-04							
		Exposure Point Total						4E-04							
		Exposure Medium Total						4E-04							
Medium Total								4E-04							

ATTACHMENT 2

**RAGS PART E (2004)
EXPOSURE ASSESSMENT METHODOLOGY**

CHAPTER 3

EXPOSURE ASSESSMENT

The exposure assessment evaluates the type and magnitude of exposures to chemicals of potential concern at a site. The exposure assessment considers the source from which a chemical is released to the environment, the pathways by which chemicals are transported through the environmental medium, and the routes by which individuals are exposed. Parameters necessary to quantitatively evaluate dermal exposures, such as permeability coefficients, soil absorption factors, body surface area exposed, and soil adherence factors are developed in the exposure assessment. In this chapter, the dermal assessment is evaluated for two exposure media: water (Section 3.1) and soil (Section 3.2).

EPA's *Policy for Risk Characterization* (U.S. EPA, 1995a) states that each Agency risk assessment should present information on a range of exposures (e.g., provide a description of risks to individuals in average and high end portions of the exposure distribution). Generally, within the Superfund program, to estimate exposure to an average individual (i.e., a central tendency), the 95% upper confidence limit (UCL) on the arithmetic mean is chosen for the exposure point concentration, and central estimates (i.e., arithmetic average, 50th percentile, median) are chosen for all other exposure parameters. This guidance document provides recommended central tendency values for dermal exposure parameters, using updated information from the *Exposure Factors Handbook* (EFH) (U.S. EPA, 1997a).

In comparison with the average exposure, the "high end" exposure estimate is defined as the highest exposure that is reasonably expected to occur at a site but that is still within the range of possible exposures, referred to as the reasonable maximum exposure (RME) (U.S. EPA, 1989). According to the *Guidance on Risk Characterization for Risk Managers and Risk Assessors* (U.S. EPA, 1992b), risk assessors should approach the estimation of the RME by identifying the most sensitive exposure parameters. The sensitivity of a parameter generally refers to its impact on the exposure estimates, which correlates with the degree of variability of the parameter values. Parameters with a

high degree of variability in the distribution of parameter values are likely to have a greater impact on the range of risk estimates than those with low variability. For one or a few of the sensitive parameters, the maximum or near-maximum values should be used, with central tendency or average values used for all other parameters. The high-end estimates are based, in some cases, on statistically based criteria (95th or 90th percentiles), and in others, on best professional judgment. In general, exposure duration, exposure frequency, and contact rate are likely to be the most sensitive parameters in an exposure assessment (U.S. EPA, 1989). In addition, for the dermal exposure route, the soil adherence factor term is also a very sensitive parameter. This guidance provides recommended upper end estimates for individual exposure parameters and a recommended RME exposure scenario for residential and industrial settings, using updated information from the EFH and other literature sources.

3.1 ESTIMATION OF DERMAL EXPOSURES TO CHEMICALS IN WATER

3.1.1 STANDARD EQUATION FOR DERMAL CONTACT WITH CHEMICALS IN WATER

The same mathematical model for dermal absorption recommended in DEA is used here. The skin is assumed to be composed of two main layers, the stratum corneum and the viable epidermis, with the stratum corneum as the main barrier. A two-compartment distributed model was developed to describe the absorption of chemicals from water through the skin as a function of both the thickness of the stratum corneum (l_{sc}) and the event duration (t_{event}). The mathematical representation of the mass balance equation follows Fick's second law and is a partial differential equation with concentration as a function of both time and distance. The exact solution of this model is approximated by two algebraic equations: (1) to describe the absorption process when the chemical is only in the stratum corneum, i.e., non-steady state,

where absorption is a function of $t_{\text{event}}^{1/2}$; and (2) to describe the absorption process as a function of t_{event} , once steady state is reached. One fundamental assumption of this model is that absorption continues long after the exposure has ended, i.e., the final absorbed dose (DA_{event}) is estimated to be the total dose dissolved in the skin at the end of the exposure. For highly lipophilic chemicals or for chemicals that are not highly lipophilic but exhibit a long lag time (τ_{event}), some of the chemical dissolved into skin may be lost due to desquamation during that absorption period. A fraction absorbed term (FA) is included in the evaluation of DA_{event} to account for this loss of chemical due to desquamation. As shown in Appendix A, for normal desquamation rates to completely replace the stratum corneum in about 14 days, only chemicals with $\log K_{\text{ow}} > 3.5$ or chemicals with $t_{\text{event}} > 10$ hours (at any $\log K_{\text{ow}}$) would be affected by this loss.

The following procedures represent updates from the DEA and are recommended for the estimation of the dermal absorbed dose (DAD):

For Organics:

- The equation for DA_{event} is updated to include the net fraction available for absorption in the stratum corneum after exposure has ended (FA).
- The equation for the permeability coefficient (K_p) is updated by excluding three data points from the Flynn data base (Flynn, 1990) in the development of the correlation equation for K_p . The 95% confidence intervals are also provided for the estimation of K_p using this correlation equation.
- The screening procedures are updated to include the new values for K_p and FA in order to provide guidance when the dermal route would pose more than 10% of the ingested dose.
- A statistical analysis of the correlation equation for K_p provides the ranges of the octanol-water partition coefficient ($\log K_{\text{ow}}$) and molecular weight (MW) where the extrapolation of the K_p correlation equation would be valid.
- A discussion of the model validation and uncertainties related to the dermal absorption model for chemicals in water is included.

- Appendix A gives a detailed discussion of the above changes.
- The spreadsheet ORG04_01.XLS and Exhibits B-1 through B-3 of Appendix B provide the calculations of the dermal absorbed dose for over 200 organic chemicals, using a default exposure scenario.

For Inorganics:

- The measured values of the permeability coefficients for available chemicals are updated based on the latest literature.
- Screening procedures for determining when the dermal route would pose more than 10% of the ingested dose are updated to include the relative fraction absorbed by accounting for the actual gastrointestinal absorption (ABS_{GI}) of inorganics.
- Appendix A gives a detailed discussion of the above changes.
- The spreadsheet INORG04_01.XLS and Exhibit B-4 of Appendix B provide the calculations for the inorganics with available measured K_p or ABS_{GI} .

For chemicals in water, Equations 3.1, 3.2, 3.3 and 3.4 are used to evaluate the dermal absorbed dose. The following discussion summarizes the key steps in the procedure detailed in Appendix A.

For short exposure durations to organic chemicals in water (Equation 3.2), DA_{event} is not a function of the parameter B, which measures the ratio of the permeability coefficient of the chemical in the stratum corneum to its permeability coefficient in the viable epidermis, because neither the viable epidermis nor the cutaneous blood flow will limit dermal absorption during such short exposure durations.

For long exposure times, Equation 3.3 should be used to estimate DA_{event} for organic chemicals. The lag time is decreased because the skin has a limited capacity to reduce the transport rate of inorganic and/or highly ionized organic chemicals. In addition, the viable epidermis will contribute insignificantly as a barrier to these chemicals. Consequently, for inorganic and highly ionized organic chemicals, it is appropriate

Dermal Absorbed Dose – Water Contact

$$DAD = \frac{DA_{event} \times EV \times ED \times EF \times SA}{BW \times AT} \quad (3.1)$$

where:

<u>Parameter</u>	<u>Definition (units)</u>	<u>Default Value</u>
DAD	= Dermal Absorbed Dose (mg/kg-day)	–
DA _{event}	= Absorbed dose per event (mg/cm ² -event)	Chemical-specific, see Eq. 3.2, 3.3 and 3.4
SA	= Skin surface area available for contact (cm ²)	See Exhibit 3-2
EV	= Event frequency (events/day)	See Exhibit 3-2
EF	= Exposure frequency (days/year)	See Exhibit 3-2
ED	= Exposure duration (years)	See Exhibit 3-2
BW	= Body weight (kg)	70 kg (adult) 15 kg (child)
AT	= Averaging time (days)	noncarcinogenic effects AT = ED x 365 d/yr carcinogenic effects AT = 70 yr x 365 d/yr

to assume that τ_{event} and B are both near zero, which simplifies Equation 3.3 to Equation 3.4.

Discussions of the permeability coefficient (K_p) and all other parameters for water media are found in Section 3.1.2, with more details and data in Appendix A. Descriptions of the dermal absorption model and equations for calculating all the parameters to evaluate the dermal absorbed dose for organics (DA_{event} in Equations 3.3 and 3.4) are provided in Appendix A.1, and for inorganics (DA_{event} in Equation 3.4) in Appendix A.2. Appendix B (Exhibits B-3 and B-4) contains chemical-specific DA_{event} and DAD values per unit concentration, using default assumptions. Instructions for calculating DA_{event} and DAD values with site-specific exposure assumptions are provided (see Appendix A.5), and the spreadsheets (ORG04_01.XLS and INORG04_01.XLS), including all the calculations, will be available at <http://www.epa.gov/oswer/riskassessment/> or <http://www.epa.gov/superfund/programs/risk/rage/index.htm>.

3.1.2 EXPOSURE PARAMETERS

3.1.2.1 Permeability Coefficient for Compounds in Water (K_p in cm/hr)

Some discussion of criteria for selecting an experimental K_p was presented in DEA, Chapter 5.

The procedure recommended by RAGS Part E to estimate the permeability coefficient (K_p) of a compound is obtained from updating the correlation presented in DEA. Three data points which came from in vivo studies (ethyl benzene, styrene and toluene) from the Flynn database are now excluded in the development of the new K_p correlation, limiting its representation to in vitro studies using human skin. Updated K_p values for over two hundred common organic compounds in water are provided, in Appendix B, as estimated using procedures described below. It is recommended that these K_p values be used in Equations 3.2 and 3.3. K_p values for several inorganic compounds are given, and default permeability constants for all other inorganic compounds are provided in Exhibit 3-1, to be used in Equation 3.4.

Organics. The permeability coefficient is a function of the path length of chemical diffusion (defined here as stratum corneum thickness, l_{sc}), the membrane/vehicle partition coefficient of the chemical (here as octanol/water partition coefficient K_{ow} of the chemical), and the effective diffusion coefficient (D_{sc}) of the chemical in the stratum corneum, and can be written for a simple isotropic membrane as presented in Equations 3.5 and 3.6.

In this approach, K_p from Equation 3.7 is estimated via an empirical correlation as a function of K_{ow} and

Dermal Absorbed Dose per event for Organic Compounds – Water Contact

DA_{event} (mg/cm²-event) is calculated for organic compounds as follows :

$$\text{If } t_{event} \leq t^*, \text{ then: } DA_{event} = 2 FA \times K_p \times C_w \sqrt{\frac{6 \tau_{event} \times t_{event}}{\pi}} \quad (3.2)$$

$$\text{If } t_{event} > t^*, \text{ then: } DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2 \tau_{event} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right] \quad (3.3)$$

where:

<u>Parameter</u>	<u>Definition (units)</u>	<u>Default Value</u>
DA_{event}	= Absorbed dose per event (mg/cm ² -event)	—
FA	= Fraction absorbed water (dimensionless)	Chemical-specific, See Appendix B
K_p	= Dermal permeability coefficient of compound in water (cm/hr)	Chemical-specific, See Appendix B
C_w	= Chemical concentration in water (mg/cm ³)	Site-specific, non-ionized fraction, See Appendix A for more discussion
τ_{event}	= Lag time per event (hr/event)	Chemical-specific, See Appendix B
t_{event}	= Event duration (hr/event)	See Exhibit 3-2
t^*	= Time to reach steady-state (hr) = 2.4 τ_{event}	Chemical-specific, See Eq. A.5 to A.8
B	= Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (ve) (dimensionless)	Chemical-specific, See Eq. A.1

MW (Potts and Guy, 1992) obtained from an experimental data base (the Flynn data base composed of about 90 chemicals, see DEA, Chapter 4, and Appendix B of this document) of absorption of chemicals from water through human skin in vitro.

For ionized organic compounds, Equation 3.8 can be used to estimate K_p with the appropriate K_{ow} value. Note that for ionizable organic chemicals, the K_{ow} value used in Equation 3.8 should be the K_{ow} of only species that are non-ionized. Similarly, for these chemicals, the concentration C_w used in Equations 3.2 and 3.3 should be that of the non-ionized fraction. (See Appendices A and B for more discussion on this topic.) Organic chemicals which are always ionized (including ionized but uncharged zwitterions) and ionized species of ionizable organic chemicals at the conditions of interest should be treated the same as inorganic

chemicals.

For halogenated chemicals, Equation 3.8 could underestimate K_p . The Flynn data set from which Equation 3.8 was derived consists almost entirely of hydrocarbons with a relatively constant ratio of molar volume to MW. Because halogenated chemicals have a lower ratio of molar volume relative to their MW than hydrocarbons (due to the relatively weighty halogen atom), the K_p correlation based on MW of hydrocarbons will tend to underestimate permeability coefficients for halogenated organic chemicals. To address this problem, a new K_p correlation based on molar volume and log K_{ow} will be explored.

Based on the Flynn data set, Equation 3.8 can be used to predict the permeability coefficient of

EXHIBIT 3-1

PERMEABILITY COEFFICIENTS FOR INORGANICS

Compound	Permeability Coefficient K_p (cm/hr)
Cadmium	1×10^{-3}
Chromium (+6)	2×10^{-3}
Chromium (+3)	1×10^{-3}
Cobalt	4×10^{-4}
Lead	1×10^{-4}
Mercury (+2)	1×10^{-3}
Methyl mercury	1×10^{-3}
Mercury vapor	0.24
Nickel	2×10^{-4}
Potassium	2×10^{-3}
Silver	6×10^{-4}
Zinc	6×10^{-4}
All other inorganics	1×10^{-3}

chemicals with K_{ow} and MW within the following "Effective Prediction Domain" (EPD), determined via a statistical analysis (see Appendix A, Section A.1) as presented in Equations 3.9 and 3.10. Contaminants outside the EPD are identified with an asterisk (*) in Appendix B2 and B3. Note that as additional data are received, the contaminants within the EPD may change. Therefore, users of this guidance should review EPA's website at (<http://www.epa.gov/oswer/riskassessment/> or <http://www.epa.gov/superfund/programs/risk/rags/index.htm>) to determine what contaminants are currently inside (or outside) the EPD.

Strictly, chemicals with very large and very small K_{ow} values are outside of the EPD. Although large variances in some data points contributed to the definition of the EPD, it is defined primarily by the properties of the data used to develop Equation 3.8. With no other data presently available for chemicals with very large and very small K_{ow} , it is appropriate to use Equation 3.8 as a preliminary estimate of K_p .

For many chemicals with $\log K_{ow}$ and MW outside of the prediction domain, a fraction absorbed (FA) is estimated to account for the loss of chemicals due to

Dermal Absorbed Dose Per Event for Inorganic Compounds – Water Contact

DA_{event} (mg/cm²-event) is calculated for inorganics or highly ionized organic chemicals as follows:

$$DA_{event} = K_p \times C_w \times t_{event} \quad (3.4)$$

where:

<u>Parameter</u>	<u>Definition (units)</u>	<u>Default Value</u>
DA_{event} =	Absorbed dose per event (mg/cm ² -event)	-
K_p =	Dermal permeability coefficient of compound in water (cm/hr)	Chemical-specific, see Exhibit A-6 and Appendix B
C_w =	Chemical concentration in water (mg/cm ³)	Site-specific, non-ionized fraction, see Appendix A for more discussion
t_{event} =	Event duration (hr/event)	See Exhibit 3-2

Theoretical Derivation of Permeability Coefficient for Organic Chemicals

$$K_p = \frac{K_{sc/w} \times D_{sc}}{l_{sc}} \quad (3.5)$$

or:

$$\log K_p = \log K_{sc/w} + \log \frac{D_{sc}}{l_{sc}} \quad (3.6)$$

Empirically it has been shown that (Kasting, et al., 1987):

$$\log K_{sc/w} = a \log K_{ow} + b$$

and $D_{sc} = D_o \exp(-\beta MV)$

where:

D_o and β are constants, characteristic of the medium through which diffusion is occurring. For hydrocarbons, MV will be related directly to molecular weight (MW). Combining these two relationships with Equation 3.6 leads to the general form:

$$\log K_p = b + a \log K_{ow} - c MW \quad (3.7)$$

where:

<u>Parameter</u>	<u>Definition (units)</u>	<u>Default Value</u>
K_p	= Dermal permeability coefficient of compound in water (cm/hr)	Chemical-specific, see Appendix B
K_{ow}	= Octanol/water partition coefficient (dimensionless)	Chemical-specific, see Appendix B
$K_{sc/w}$	= equilibrium partition coefficient between the stratum corneum and water (dimensionless)	Chemical-specific
D_o	= Diffusivity of a hypothetical molecule with a molecular volume (MV) = 0 (cm^2/hr)	Chemical-specific
β	= Constant specific for the medium through which diffusion is occurring	Medium specific
D_{sc}	= Effective diffusion coefficient for chemical transfer through the stratum corneum (cm^2/hr)	Chemical-specific, see Spreadsheet ORG04_01.XLS (on website given in Section 3.1.1)
l_{sc}	= Apparent thickness of stratum corneum (cm)	10^{-3} cm
a,b,c	= correlation coefficients which have been fitted to the Flynn's data to give Equation 3.8.	-
MV	= Molar volume (cm^3/mol)	Chemical-specific
MW	= Molecular weight (g/mole)	Chemical-specific

the desquamation of the skin, which would decrease the net amount of chemicals available for absorption after the exposure event (t_{event}) has ended. Predictions

of chemical-specific K_p and their use in the estimation of DA_{event} are included in Exhibit B-3 for about two hundred chemicals.

Empirical Predictive Correlation for Permeability Coefficient of Organics

$$\log K_p = -2.80 + 0.66 \log K_{ow} - 0.0056 MW \quad (r^2 = 0.66) \quad (3.8)$$

where:

<u>Parameter</u>	<u>Definition (units)</u>	<u>Default Value</u>
K_p	= Dermal permeability coefficient of compounds in water (cm/hr)	Chemical-specific, see Appendix B
K_{ow}	= Octanol/water partition coefficient of the non-ionized species (dimensionless)	Chemical-specific, see Appendix B
MW	= Molecular weight (g/mole)	Chemical-specific, see Appendix B

Inorganics. Exhibit 3-1 summarizes permeability coefficients for inorganic compounds, obtained from specific chemical experimental data, as modified and updated from DEA, Table 5-3 and from Hostynek, et al. (1998). Permeability coefficients from these references are condensed for each metal and for individual valence states of specific metals. To be most protective of human health, the value listed in this exhibit represents the highest reported permeability coefficient. More detailed information is presented in Appendix A (Exhibit A-6).

3.1.2.2 Chemical Concentration in Water

One of the issues regarding the bioavailability of chemicals in water is the state of ionization, with the non-ionized form being much more readily absorbed

than the ionized form. The fraction of the chemical in the non-ionized state is dependent on the pH of the water and the specific ionization constant for that chemical (pK_a). Further information on the formulas for calculating these fractions is provided in the DEA and in Appendix A. However, given the complexities of calculating the non-ionized fraction across multiple samples and multiple chemicals, it is recommended that a standard risk assessment should make the health-protective assumption that the chemical is entirely in the non-ionized state. Therefore, the total concentration of a chemical in water samples (C_w) should be equal to the total concentration of the chemical in water.

Estimates of C_w , and therefore potential impacts of dermal exposure, may be strongly influenced by the presence of particulates in the sample. Although filtra-

Boundaries of Effective Prediction Domain

$$-0.06831 \leq 0.5103 \times 10^{-4} MW + 0.05616 \log K_{ow} \leq 0.5577 \quad (3.9)$$

$$-0.3010 \leq -0.5103 \times 10^{-4} MW + 0.05616 \log K_{ow} \leq 0.1758 \quad (3.10)$$

where:

<u>Parameter</u>	<u>Definition (units)</u>	<u>Default Value</u>
K_{ow}	= Octanol/water partition coefficient of the non-ionized species (dimensionless)	Chemical-specific, see Appendix B
MW	= Molecular weight (g/mole)	Chemical-specific, see Appendix B

EXHIBIT 3-2

RECOMMENDED DERMAL EXPOSURE VALUES FOR CENTRAL TENDENCY AND RME RESIDENTIAL SCENARIOS – WATER CONTACT

Exposure Parameters	Central Tendency Scenario				RME Scenario			
	Showering/ Bathing		Swimming		Showering/ Bathing		Swimming	
Concentration- C_w (mg/cm ³)	Site-specific		Site-specific		Site-specific		Site-specific	
Event frequency- EV (events/day)	1		Site-specific		1		Site-specific	
Exposure frequency- EF (days/yr)	350		Site-specific		350		Site-specific	
Event duration- t_{event} (hr/event)	Adult ¹	Child ²	Adult	Child	Adult ¹	Child ²	Adult	Child
	0.25	0.33	Site-specific		0.58	1.0	Site-specific	
Exposure duration- ED (yr)	9	6	9	6	30	6	30	6
Skin surface area- SA (cm ²)	18,000	6,600	18,000	6,600	18,000	6,600	18,000	6,600
Dermal permeability coefficient- K_p (cm/hr)	Chemical-specific values Exhibits B-3 and B-4							

¹ Adult showering scenario used as the basis for the chemical screening for the dermal pathway, as shown in Appendix B, Exhibits B-3 and B-4. Event duration for adult exposure is based on showering data from the EFH (U.S. EPA, 1997a).

² Event duration for child exposure is based on bathing data from the EFH (U.S. EPA, 1997a).

tion of water samples in the field has been used to reduce turbidity and estimate the soluble fraction of chemicals in water, existing RAGS guidance (U.S. EPA, 1989) recommends that unfiltered samples be used as the basis for estimating the chemical concentration for calculating the *oral* dose. The rationale is that particulate-bound chemicals may still be available for absorption across the gastrointestinal tract. To be consistent with existing EPA guidance, it is recommended that unfiltered samples also be used as the basis for estimating a chemical concentration for calculating the *dermal* dose.

However, it should be noted that particulate-bound chemicals in an aqueous medium (e.g., suspended sediment particles) would be considered to be much less bioavailable for dermal absorption, due to inefficient adsorption of suspended particles onto the skin surface and a slower rate of absorption into the

skin. The uncertainty in the estimation of the dermal dose from a water sample with high turbidity is directly proportional to the magnitude of the difference in the concentration between an unfiltered and filtered sample. The actual bioavailable concentration is likely to lie somewhere between the unfiltered and filtered sample concentrations. The impact of this health-protective assumption and relevant field factors (e.g., turbidity) should be discussed in the uncertainty section. To reduce the uncertainty in estimating the bioavailable chemical concentration, water sample collection methods that minimize turbidity should be employed (U.S. EPA, 1995b, 1996), rather than sample filtration.

3.1.2.3 Skin Surface Area

The surface area (SA) parameter describes the amount of skin exposed to the contaminated media.

Dermal Absorbed Dose – Soil Contact

$$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT} \quad (3.11)$$

where:

<u>Parameter</u>	<u>Definition (units)</u>	<u>Default Value</u>
DAD	= Dermal Absorbed Dose (mg/kg-day)	–
DA _{event}	= Absorbed dose per event (mg/cm ² -event)	Chemical-specific, see Equation 3.12
SA	= Skin surface area available for contact (cm ²)	See Appendix C and Equations 3.13 to 3.16
EV	= Event frequency (events/day)	See Exhibit 3-5
EF	= Exposure frequency (days/year)	See Exhibit 3-5
ED	= Exposure duration (years)	See Exhibit 3-5
BW	= Body weight (kg)	70 kg (adult), 15 kg (child)
AT	= Averaging time (days)	noncarcinogenic effects AT = ED x 365 d/yr carcinogenic effects AT = 70 yr x 365 d/yr

The amount of skin exposed depends upon the exposure scenario. For dermal contact with water, the total body surface area for adults and children is assumed to be exposed for both swimming and bathing. Since body weight and SA are dependent variables, all SA estimates used 50th percentile values in order to correlate with the average body weights. The recommended SA exposed to contaminated water for the adult resident is 18,000 cm². This SA value was calculated by incorporating data from Tables 6.2 and 6.3 for the Exposure Factors Handbook (U.S. EPA, 1997a), averaging the 50th percentile values for males and females.

The recommended SA value for exposure to contaminated water for the child resident is 6,600 cm². This SA was calculated by incorporating the data from the EFH for the 50th percentile of the total body surface area for male and female children, and calculating a time weighted average surface area for a 0-6 year old child. The lack of data for all ages led to a conservative assumption that a 0-1 year old and 1-2 year old had the same surface area as a 2-3 year old. This recommended child SA was calculated by averaging the male and female surface areas.

Dermal Absorbed Dose Per Event – Soil Contact

DA_{event} (mg/cm²-event) is calculated as follows:

$$DA_{event} = C_{soil} \times CF \times AF \times ABS_d \quad (3.12)$$

where:

<u>Parameter</u>	<u>Definition (units)</u>	<u>Default Value</u>
DA _{event}	= Absorbed dose per event (mg/cm ² -event)	–
C _{soil}	= Chemical concentration in soil (mg/kg)	Site-specific
CF	= Conversion factor (10 ⁻⁶ kg/mg)	10 ⁻⁶ kg/mg
AF	= Adherence factor of soil to skin (mg/cm ² -event) (Referred to as contact rate in RAGS, Part A)	See Section 3.2.2.3 and Appendix C
ABS _d	= Dermal absorption fraction	See Exhibit 3-4

Surface Area Exposed for Adult Resident – Soil Contact

where:

$$\text{Exposed SA (Adult Resident)} = SA_{\text{head}} + SA_{\text{forearms}} + SA_{\text{hands}} + SA_{\text{lower legs}} \quad (3.13)$$

<u>Parameter</u>	<u>Definition (units)</u>	<u>Default Value</u>
SA	= Skin surface area available for contact (cm ²)	See Appendix C

Surface Area Exposed for Adult Commercial/Industrial – Soil Contact

$$\text{Exposed SA (Adult Commercial/Industrial)} = SA_{\text{head}} + SA_{\text{forearms}} + SA_{\text{hands}} \quad (3.14)$$

where:

<u>Parameter</u>	<u>Definition (units)</u>	<u>Default Value</u>
SA	= Skin surface area available for contact (cm ²)	See Appendix C

3.1.2.4 Event Time, Frequency, and Duration of Exposure

Exhibit 3-2 summarizes the default exposure values for both surface area and exposure duration, presented as central tendency and RME. All the central tendency values were obtained from the EFH, while the RME values were derived as previously presented. Recommended event duration values are provided for a showering activity. Even though children may be bathing for a longer duration, the showering adult remains the most highly exposed receptor.

3.2 ESTIMATION OF DERMAL EXPOSURE TO CHEMICALS IN SOIL

3.2.1 STANDARD EQUATION FOR DERMAL CONTACT WITH CHEMICALS IN SOIL

The general guidance for evaluating dermal absorption of compounds from soil is presented in *Risk Assessment Guidance for Superfund* (RAGS, U.S. EPA, 1989) and is expanded upon in the DEA. This section briefly discusses the rationale and updates specific parameters. The standard equation for dermal contact with chemicals (Equation 3.11) is the same as that in Section 3.1.1. (Equation 3.1). Equation 3.12

provides DA_{event} for soil contact.

3.2.2 EXPOSURE PARAMETERS

3.2.2.1 Skin Surface Area

The skin surface area parameter (SA) describes the amount of skin exposed to the contaminated media. The amount of skin exposed depends upon the exposure scenario. Clothing is expected to limit the extent of the exposed surface area in cases of soil contact. All SA estimates used 50th percentile values to correlate with average body weights used for all scenarios and pathways. This was done to prevent inconsistent parameter combinations since body weight and SA are dependent variables. Body part-specific SAs were calculated for adult (>18 years old) and child (<1 to <6 years old) residents as described below and documented in Appendix C.

Adult resident. The adult resident was assumed to wear a short-sleeved shirt, shorts and shoes; therefore, the exposed skin surface is limited to the head, hands, forearms and lower legs. The recommended SA exposed to contaminated soil for the adult resident is 5700 cm² and is the average of the 50th percentile for males and females greater than 18 years of age. Surface area data were taken from EFH, Tables 6-2 (adult male) and 6-3 (adult female). Exposed SA for the adult

Surface Area Exposed for Child Resident – Soil Contact

$$\text{Fraction of Total } SA_{\text{body part } i} = \frac{SA \text{ fraction}_{\text{age } <1} + SA \text{ fraction}_{\text{age } 1<2} + \dots + SA \text{ fraction}_{\text{age } 5<6}}{6} \quad (3.15)$$

$$\text{Exposed SA} = (FTSA_{\text{head}})(SA_{\text{total}}) + (FTSA_{\text{forearms}})(SA_{\text{total}}) + (FTSA_{\text{hands}})(SA_{\text{total}}) + (FTSA_{\text{lowerlegs}})(SA_{\text{total}}) + (FTSA_{\text{feet}})(SA_{\text{total}}) \quad (3.16)$$

where:

<u>Parameter</u>	<u>Definition (units)</u>	<u>Default Value</u>
FTSA	= Fraction of total surface area for the specified body part (cm ²)	See Appendix C
SA	= Skin surface area available for contact (cm ²)	See Appendix C
SA _{total}	= Total skin surface available for contact	See Appendix C
(FTSA _i)(SA _{total})	= Surface area for body part "i" (cm ²)	–

resident was calculated using Equation 3.13, documented in Appendix C with the assumption that the female adult forearm SA was 45% of the arm SA (based on the adult male forearm-to-arm SA ratio).

Adult commercial/industrial. The adult commercial/industrial receptor was assumed to wear a short-sleeved shirt, long pants, and shoes; therefore, the exposed skin surface is limited to the head, hands, and forearms. The recommended SA exposed to contaminated soil for the adult commercial/industrial receptor is 3300 cm² and is the average of the 50th percentile for males and females greater than 18 years of age. Surface area data were taken from EFH, Tables 6-2 (adult male) and 6-3 (adult female). Exposed SA for the adult commercial/industrial receptor was calculated using Equation 3.14 and is documented in Appendix C with the assumption that the female adult forearm SA was 45% of the arm SA (based on the adult male forearm-to-arm SA ratio).

Child. The child resident (<1 to <6 years old) was assumed to wear a short-sleeved shirt and shorts (no shoes); therefore, the exposed skin is limited to the head, hands, forearms, lower legs, and feet. The recommended SA exposed to contaminated soil for the child resident is 2800 cm² and is the average of the 50th percentile for males and females (<1 to <6 years old). Body part-specific data for male and female children were taken from EFH, Table 6-8, as a fraction of total body surface area. Total body SAs for male and female children were taken from EFH, Tables 6-6 (male) and

6-7 (female), and used to calculate average male/female total SA (see Appendix C). Exposed SA for the child resident was calculated, using Equations 3.15 and 3.16 and is documented in Appendix C with the following assumptions: (1) because of the lack of data for certain ages, the fraction of total SA was assumed to be equal to the next oldest age group that had data and (2) the forearm-to-arm ratio (0.45) and lower leg-to-leg ratio (0.4) are equivalent to those of an adult. These assumptions introduce some uncertainty into the calculation, but are used in the absence of age-specific data.

While clothing scenarios described above for the adult and child residents may not be appropriate for all regions, the climate in some areas would allow a short-sleeved shirt and/or shorts to be worn throughout a majority of the year. In addition, in some regions of the country, children may remain barefoot throughout a major portion of the year. These clothing scenarios were chosen to ensure adequate protection for those receptors that may be exposed in the warmer climates, with the realization that risks would likely be over-estimated for some seasons.

When selecting the surface area, site-specific conditions should be evaluated in coordination with the project's risk assessors. For colder climates, the surface area may be weighted for different seasons. Because some studies have suggested that exposure can occur under clothing (Maddy, et al., 1983), these

clothing scenarios are not considered to be overly conservative.

3.2.2.2 Soil-to-Skin Adherence Factors

The adherence factor (AF) describes the amount of soil that adheres to the skin per unit of surface area. Recent data (Kissel et al., 1996; Kissel et al., 1998; and Holmes et al., 1999) provide evidence to demonstrate that 1) soil properties influence adherence, 2) soil adherence varies considerably across different parts of the body; and 3) soil adherence varies with activity.

Given these results, the Workgroup recommends that an activity which best represents all soils, body parts, and activities be selected (U.S. EPA, 1997a). Body part-weighted AFs can then be calculated and used in estimating exposure via dermal contact with soil based on assumed exposed body parts. Given that soil adherence depends upon the body part, an overall body part-weighted AF must be calculated for each activity. The assumed clothing scenario determines which body part-specific AFs are used in calculating the 50th and 95th percentile weighted AFs. The weighted AFs are used with the relative absorption, exposure frequency and duration, exposed surface area, body weight, and averaging time to estimate the dermal absorbed dose. The general equation used to calculate the weighted AF for a particular activity is shown in Equation 3.17.

Adult resident. The adult resident (>18 years old) was assumed to wear a short-sleeved shirt, shorts and shoes; therefore, the exposed skin surface was limited to the face, hands, forearms and lower legs. The

weighted AFs for adult residential activities (e.g., grounds keepers, landscapers, and gardeners) were calculated using Equation 3.18 and are documented in Appendix C. Note: This calculation differs from that presented in Section 3.2.2.1 in the areas used for head and face. In the total surface area calculation presented earlier, the total head area was used. For the soil-to-skin adherence factor, empirical measurements were from the face only and the face surface area was estimated to be 1/3 the total head surface area.

Adult commercial/industrial. The adult commercial/industrial receptor was assumed to wear a short-sleeved shirt, long pants, and shoes. Therefore, the exposed skin surface was limited to the face, hands, and forearms. The weighted AFs for adult commercial/industrial activities (e.g., grounds keepers, landscapers, irrigation installers, gardeners, construction workers, equipment operators, and utility workers) were calculated using Equation 3.19, and documented in Appendix C.

Child resident. The child resident (<1 to <6 years old) was assumed to wear a short-sleeved shirt and shorts (no shoes). Therefore, the exposed skin was limited to face, hands, forearms, lower legs, and feet. Weighted AFs for children in day care and "staged" children playing in dry and wet soil activities were calculated using Equation 3.20, and documented in Appendix C.

As noted in Appendix C, body part-specific AFs for both child and adult receptors were not always available for all body parts assumed to be exposed. Weighted adherence factors for receptors were

Surface Area Weighted Soil Adherence Factor

$$\text{Weighted AF} = \frac{(AF_1)(SA_1) + (AF_2)(SA_2) + \dots + (AF_i)(SA_i)}{SA_1 + SA_2 + \dots + SA_i} \quad (3.17)$$

where:

Parameter	Definition (units)	Default Value
AF	= Adherence factor of soil to skin (mg/cm ² -event) (Referred to as contact rate in RAGS, Part A)	-
AF _i	= Overall adherence factor of soil to skin (mg/cm ² -event)	See Appendix C
SA _i	= Skin surface area available for contact for body part "i" (cm ²)	See Appendix C

Surface Area Weighted Soil Adherence Factor for Adult Resident

$$\text{Weighted } AF_{\text{adult resident}} = \frac{(AF_{\text{face}})(SA_{\text{face}}) + (AF_{\text{forearms}})(SA_{\text{forearms}}) + (AF_{\text{hands}})(SA_{\text{hands}}) + (AF_{\text{lowerlegs}})(SA_{\text{lowerlegs}})}{SA_{\text{face}} + SA_{\text{forearms}} + SA_{\text{hands}} + SA_{\text{lowerlegs}}} \quad (3.18)$$

where:

<u>Parameter</u>	<u>Definition (units)</u>	<u>Default Value</u>
AF	= Adherence factor of soil to skin (mg/cm ² -event) (Referred to as contact rate in RAGS, Part A)	–
AF _i	= Overall adherence factor of soil to skin (mg/cm ² -event)	See Appendix C
SA _i	= Skin surface area available for contact for body part "i" (cm ²)	See Appendix C

Surface Area Weighted Soil Adherence – Adult/Commercial

$$\text{Weighted } AF_{\text{adult commercial}} = \frac{(AF_{\text{face}})(SA_{\text{face}}) + (AF_{\text{forearms}})(SA_{\text{forearms}}) + (AF_{\text{hands}})(SA_{\text{hands}})}{SA_{\text{face}} + SA_{\text{forearms}} + SA_{\text{hands}}} \quad (3.19)$$

where:

<u>Parameter</u>	<u>Definition (units)</u>	<u>Default Value</u>
AF	= Adherence factor of soil to skin (mg/cm ² -event) (Referred to as contact rate in RAGS, Part A)	–
AF _i	= Overall adherence factor of soil to skin (mg/cm ² -event)	See Appendix C
SA _i	= Skin surface area available for contact for body part "i" (cm ²)	See Appendix C

Surface Area Weighted Soil Adherence Factor – Child

$$\text{Weighted } AF_{\text{child}} = \frac{(AF_{\text{face}})(SA_{\text{face}}) + (AF_{\text{forearms}})(SA_{\text{forearms}}) + (AF_{\text{hands}})(SA_{\text{hands}}) + (AF_{\text{lowerlegs}})(SA_{\text{lowerlegs}}) + (AF_{\text{feet}})(SA_{\text{feet}})}{SA_{\text{face}} + SA_{\text{forearms}} + SA_{\text{hands}} + SA_{\text{lowerlegs}} + SA_{\text{feet}}} \quad (3.20)$$

where:

<u>Parameter</u>	<u>Definition (units)</u>	<u>Default Value</u>
AF	= Adherence factor of soil to skin (mg/cm ² -event) (Referred to as contact rate in RAGS, Part A)	–
AF _i	= Overall adherence factor of soil to skin (mg/cm ² -event)	See Appendix C
SA _i	= Skin surface area available for contact for body part "i" (cm ²)	See Appendix C

calculated using only those body parts for which AFs were available because of the difficulty in trying to assign an AF for one body part to another body part. For example, the weighted AF for the children in day

care was based on the forearms, hands, lower legs, and feet (AFs for the face were not available). However, the surface area for all exposed body parts was used in calculating the dermal absorbed dose. For the day care

child example, the surface area used in estimating the DAD included the whole head, forearms, hands, lower legs and feet. Therefore, the body part that may not have had AF data available was assumed, by default, to have the same amount of soil adhered as the weighted AF.

3.2.2.3 Recommended Soil Adherence Factors

This section recommends default soil AFs for the child resident, the adult resident, and the adult commercial/industrial worker, and provides the basis for the recommendations. EPA suggests selecting an activity from AF data which best represents the exposure scenario of concern and using the corresponding weighted AF in the dermal exposure calculations (U.S. EPA, 1997a). To make this selection, activities with available AFs were categorized as those in which a typical residential child, residential adult, and commercial/industrial adult worker would be likely to engage (see Appendix C). Within each receptor category, activities were ranked in order from the activity with the lowest to highest weighted AF (50th percentile) (Exhibit 3-3). The 50th percentile weighted AF was used in ranking the activities from those with the lowest to highest weighted AFs, because the 50th percentile is a more stable estimation of the true AF (i.e., it is not affected as significantly by outliers as the 95th percentile).

As with other contact rates (e.g., soil ingestion), the recommended default value is a conservative, health protective value. To maintain consistency with this approach (i.e., recommending a high-end of a mean), two options exist when recommending default weighted AFs: (1) select a central tendency (i.e., typical) soil contact activity and use the high-end weighted AF (i.e., 95th percentile) for that activity; or (2) select a high-end (i.e., reasonable but higher exposure) soil contact activity and use the central tendency weighted AF (i.e., 50th percentile) for that activity.

It is not recommended that a high-end soil contact activity be used with a high-end weighted AF for that activity, as this use would not be consistent with the use of a reasonable maximum exposure (RME) scenario. The use of these values also needs to be evaluated when combining multiple exposure pathways to insure that an overall RME is being maintained.

Adult resident. Given that there were data available for a wide variety of activities that an adult resident may engage in, a high-end soil contact activity was selected and the central tendency weighted AF (50th percentile) was derived for that activity. In so doing, the recommended weighted AF for an adult resident is 0.07 mg/cm², and is based on the 50th percentile weighted AF for gardeners (the activity determined to represent a reasonable, high-end activity). The basis for this recommendation is as follows: (1) although no single activity would represent the activities an adult resident engages in, a comparison of the gardener 50th percentile weighted AF with the other residential-type activities (Appendix C) shows that gardening represents a high-end soil contact activity; (2) common sense suggests that gardening represents a high-end soil contact activity, whereas, determining which of the other activities (i.e., grounds keeping and landscaping/rockery) would represent a reasonable, central tendency (i.e., typical) soil contact activity would be difficult; and (3) selecting the central tendency weighted AF (i.e., 50th percentile) of a high-end soil contact activity is consistent with an RME for contact rates.

Child resident (<1 to <6 years old). Available data on soil AFs for children were limited to children (1-6½ years old) playing indoors and outdoors (3.5-4 hours) at a day care center (reviewed in U.S. EPA, 1997a) and children (8-12 years old) playing for 20 minutes with an assortment of toys and implements in a preconstructed 8'x8' soil bed (i.e., "staged" activity) containing dry or wet soil (see Kissel et al., 1998, and Appendix C). Therefore, it was not possible to identify a reasonable worst-case soil contact activity as was done for the adult resident. As such, both of the following approaches were used in determining the appropriate weighted AF for children: (1) selecting a central tendency (i.e., typical) soil contact activity using the high-end weighted AF (i.e., 95th percentile) for that activity; and, (2) selecting a high-end soil contact activity using the central tendency weighted AF (i.e., 50th percentile) for that activity. The recommended weighted AF for a child resident (<1 to <6 years old) is 0.2 mg/cm² and is based on the 95th percentile weighted AF for children playing at a day care center (central tendency soil contact activity) or the 50th percentile for children playing in wet soil (high-end soil contact activity).

EXHIBIT 3-3

ACTIVITY SPECIFIC-SURFACE AREA WEIGHTED SOIL ADHERENCE FACTORS

Exposure Scenario	Age (years)	Weighted Soil Adherence Factor (mg/cm ²)	
		Geometric Mean	95 th Percentile
CHILDREN¹			
Indoor Children	1-13	0.01	0.06
Daycare Children (playing indoors and outdoors)	1-6.5	0.04	0.3
Children Playing (dry soil)	8-12	0.04	0.4
Children Playing (wet soil)	8-12	0.2	3.3
Children-in-Mud ⁵	9-14	21	231
RESIDENTIAL ADULTS²			
Grounds Keepers	>18	0.01	0.06
Landscaper/Rockery	>18	0.04	0.2
Gardeners	>16	0.07	0.3
COMMERCIAL/INDUSTRIAL ADULTS³			
Grounds Keepers	>18	0.02	0.1
Landscaper/Rockery	>18	0.04	0.2
Staged Activity: Pipe Layers (dry soil)	>15	0.07	0.2
Irrigation Installers	>18	0.08	0.3
Gardeners	>16	0.1	0.5
Construction Workers	>18	0.1	0.3
Heavy Equipment Operators	>18	0.2	0.7
Utility Workers	>18	0.2	0.9
Staged Activity: Pipe Layers (wet soil)	>15	0.6	13
MISCELLANEOUS ACTIVITIES⁴			
Soccer Players #1 (teens, moist conditions)	13-15	0.04	0.3
Farmers	>20	0.1	0.4
Rugby Players	>21	0.1	0.6
Archeologists	>19	0.3	0.5
Reed Gatherers	>22	0.3	27
Soccer Players #2 (adults)	>18	0.01	0.08

EXHIBIT 3-3 (continued)

ACTIVITY SPECIFIC-SURFACE AREA WEIGHTED SOIL ADHERENCE FACTORS

¹ Weighted AF based on exposure to face, forearms, hands, lower legs, & feet.

² Weighted AF based on exposure to face, forearms, hands, & lower legs.

³ Weighted AF based on exposure to face, forearms, & hands.

Note: this results in different weighted AFs for similar activities between residential and commercial/industrial exposure scenarios.

⁴ Weighted AF based on all body parts for which data were available.

⁵ Information on soil adherence values for the children-in-mud scenario is provided to illustrate the range of values for this type of activity. However, the application of these data to the dermal dose equations in this guidance may result in a significant overestimation of dermal risk. Therefore, it is recommended that the 95th percentile AF values not be used in a quantitative dermal risk assessment. See Exhibit C-4 for bounding estimates.

Children playing at a day care center represent a central tendency (i.e., typical) activity given that: (1) the children played both indoors and outdoors; (2) the clothing worn was not controlled (i.e., some subjects wore long pants, long-sleeve shirts, and/or shoes); and (3) soil conditions were not controlled (e.g., other soil types, moisture content, etc., could result in higher

AFs). The 95th percentile weighted AF for children playing at the day care center is a known, reasonable, "real-life" activity that represents the majority of the population, given that children 1 to 6 years old are either in day care or at home and are likely engaging in activities similar to those at the day care center, and represents a high-end of a typical activity.

EXHIBIT 3-4

RECOMMENDED DERMAL ABSORPTION FRACTION FROM SOIL

Compound	Dermal Absorption Fraction (ABS _d) ¹	Reference
Arsenic	0.03	Wester, et al. (1993a)
Cadmium	0.001	Wester, et al. (1992a) U.S. EPA (1992a)
Chlordane	0.04	Wester, et al. (1992b)
2,4-Dichlorophenoxyacetic acid	0.05	Wester, et al. (1996)
DDT	0.03	Wester, et al. (1990)
TCDD and other dioxins -if soil organic content is >10%	0.03 0.001	U.S. EPA (1992a)
Lindane	0.04	Duff and Kissel (1996)
Benzo(a)pyrene and other PAHs	0.13	Wester, et al. (1990)
Aroclors 1254/1242 and other PCBs	0.14	Wester, et al.(1993b)
Pentachlorophenol	0.25	Wester, et al. (1993c)
Semivolatile organic compounds	0.1	—

¹ The values presented are experimental mean values.

The “staged” activity of children playing in wet soil for 20 minutes under controlled conditions (i.e., all subjects were clothed similarly, the duration of soil contact was controlled, and the soil properties were characterized) is a high-end soil contact activity because: (1) the children were in direct contact with soil for the full duration of the activity; and (2) the children played in wet soil, which is known to have higher AFs than dry soil, for the duration of the activity. The 50th percentile weighted AF for children playing in wet soil is a central tendency estimate of a high-end soil contact activity.

Use of the 95th percentile weighted AF for children playing at a day care center (0.3 mg/cm²) or the 50th percentile for children playing in wet soil (0.2 mg/cm²) as a recommended weighted AF for a child resident (<1 to <6 years old) is consistent with recommending a high-end of a mean for contact rates.

While this value (0.2 mg/cm²) is at the lower end of the range of soil adherence factors reported in DEA and based on Lepow et al. (1975) and Roels et al. (1980) studies, those studies were not designed to study soil adherence and only allowed calculation of soil adherence to hands. In addition, the central-tendency adherence factor of 0.2 mg/cm² estimated here is based on soil adherence studies for all of the relevant body parts (i.e., head, hands, forearms, lower-legs, and feet). Kissel et al. (1998) reports soil adherence factors for children’s hands of 0.5-3 mg/cm² (median of 1 mg/cm²) for relatively moist soil, which is comparable to the range of values previously reported for soil adherence to children’s hands (0.5-1.5 mg/cm²; U.S. EPA, 1997a). Exhibit C-2 contains data used to calculate the central tendency and high end AFs for children.

Commercial/industrial adult worker. Given that there were data available for a wide variety of activities that a commercial/industrial adult worker may engage in, a high-end soil contact activity was selected and the central tendency weighted AF (50th percentile) derived for that activity. In so doing, the recommended weighted AF for a commercial/industrial adult worker is 0.2 mg/cm² and is based on the 50th percentile weighted AF for utility workers (the activity determined to represent a high-end contact activity). The bases for this recommendation are as follows: (1) although no single activity would be representative of activities a commercial/industrial adult worker engages

in, a comparison of the utility worker 50th percentile weighted AF with other commercial/industrial-type activities (Exhibit 3-3) shows that the utility worker represents a high-end soil contact activity (i.e., grounds keepers, landscaper/rockery, irrigation installers, gardeners, construction workers); (2) a combination of common sense and data on the weighted AFs supports the assumption that utility worker activities represent a high-end soil contact activity, whereas, determining which of other measured activities might represent a reasonable, central tendency (i.e., typical) soil contact activity would be difficult; and (3) selecting the central tendency weighted AF (i.e., 50th percentile) of a high-end soil contact activity is consistent with a RME for contact rates.

Recreational. No specific default values are being recommended for a recreational scenario since many site-specific concerns will impact the choice of exposure variables, such as, climate, geography, location, and land-use. The risk assessors, in consultation with the project team, should reach consensus on the need to evaluate this scenario and the inputs before incorporating this into the risk assessment. The EFH should be consulted to obtain appropriate exposure estimates.

3.2.2.4 Dermal Absorption Fraction from Soil

DEA (Chapter 6) presents a methodology for evaluating dermal absorption of soil-borne contaminants. In that document, ORD reviewed the available experimental data for dermal absorption from contaminated soil and presented recommendations for three compounds/classes. Recommendations were presented as ranges to account for uncertainty which may arise from different soil types, loading rates, chemical concentrations, and other conditions. In RAGS Part E, selection of a single value is based on recommended ORD ranges to simplify this risk calculation. In addition, recommended values for other compounds according to review of literature and default values for classes of compounds are provided. For tetrachlorodibenzo-p-dioxin (TCDD), sufficient data allow specific recommendations based on organic content of the soil.

Values in Exhibit 3-4 have been determined to be applicable using the Superfund default human exposure assumptions, and are average absorption values. Other

values will be added to this list as results of further research become available. However, as an interim method, dermal exposure to other compounds should be treated qualitatively in the uncertainty section or quantitatively using default values after presenting the relevant studies to the regional risk assessors so that absorption factors can be agreed upon on a site-specific basis before the start of the risk assessment. Particular attention should be given to dermally active compounds, such as benzo(a)pyrene, and they should be addressed fully as to their elevated risk by this route of exposure.

This guidance provides a default dermal absorption fraction for semivolatile organic compounds (SVOCs) of 10% as a screening method for the majority of SVOCs without dermal absorption fractions. This fraction is suggested because the experimental values in Exhibit 3-4 are considered representative of the chemical class for screening evaluations. If these are used quantitatively, they represent another uncertainty that should be presented and discussed in the risk assessment. There are no default dermal absorption values presented for volatile organic compounds nor inorganic classes of compounds. The rationale for this is that in the considered soil exposure scenarios, volatile organic compounds would tend to be volatilized from the soil on skin and should be accounted for via inhalation routes in the combined exposure pathway analysis. For inorganics, the speciation of the compound is critical to the dermal absorption and there are too little data to extrapolate a reasonable default value.

Although Equation 3.12 implies that the ABS_d is independent of AF, this independence may not be the case. Experimental evidence suggests that ABS_d may be a function of AF (Duff and Kissel, 1996 and Yang, 1989). Specifically, ABS_d has been observed to increase as the AF decreases below the quantity of soil necessary to completely cover the skin in a thin layer of soil particles, which is discussed in the DEA as the mono-layer concept. This mono-layer will vary according to physical characteristics of the applied soil, e.g., particle size. Most significantly, nearly all experimental determinations of ABS_d have been conducted at loading rates larger than required to completely cover the skin, while the recommended default values for AF for both adult and children are at or less than that required to establish a mono-layer. The absolute effect of soil loading on these parameters is

not sufficiently understood to warrant adjustment of the experimentally determined values. Consequently, actual ABS_d could be larger than experimentally determined and the effect of this uncertainty should be appropriately presented in the risk assessment.

Equation 3.12 includes no explicit effect of exposure time, which also adds to the uncertainty and consequently assumes exposure time is the same as in the experimental study that measured ABS_d . For values presented, the exposure time per event is 24 hours. Site-specific exposure scenarios should not adjust ABS_d per event but rather adjust the exposure frequency (EF) and exposure duration (ED) to account for site conditions.

A discussion of theoretical models that estimate DA_{event} on the basis of a soil permeability coefficient rather than ABS_d is presented in DEA. The permeability coefficient approach offers some advantages in that the partitioning coefficient from soil should remain constant over a wider range of conditions, such as the amount of soil on the skin and the concentration of the contaminant in the soil. However, as soil partitioning procedures are not well developed, the Workgroup recommends that the absorbed fraction per event procedures presented in this guidance be used to assess dermal uptake for soil.

3.2.2.5 Age-Adjusted Dermal Factor

An age-adjusted dermal exposure factor (SFS_{adj}) is used when dermal exposure is expected throughout childhood and into adult years. This accounts for changes in surface area, body weight and adherence factors over an extended period of time. The use of SFS_{adj} incorporates body weight, surface area, exposure duration and adherence factor parameters from the risk equation. To calculate SFS_{adj} , assumptions recommended above for the child (age 0-6 years) and adult (age 7-30 years) were calculated using data from the EFH and the methodology described for the residential child. The recommended age-adjusted dermal factor is calculated using Equation 3.21.

3.2.2.6 Event Time, Exposure Frequency, and Duration

This guidance assumes one event per day, during which a percentage of a chemical quantity is absorbed

Age-Adjusted Dermal Exposure Factor

$$SFS_{adj} = \frac{(SA_{1-6})(AF_{1-6})(ED_{1-6})}{(BW_{1-6})} + \frac{(SA_{7-31})(AF_{7-31})(ED_{7-31})}{(BW_{7-31})} \quad (3.21)$$

$$SFS_{adj} = \frac{(2800\text{cm}^2)(0.2\text{mg}/\text{cm}^2\text{-event})(6\text{yr})}{(15\text{kg})} + \frac{(5700\text{cm}^2)(0.07\text{mg}/\text{cm}^2\text{-event})(24\text{yr})}{(70\text{kg})}$$

$$SFS_{adj} = 360 \text{ mg-yrs/kg-event}$$

where:

<u>Parameter</u>	<u>Definition (units)</u>	<u>Default Value</u>
SFS _{adj}	= Age-adjusted dermal exposure factor (mg-yrs/kg-events)	-
AF ₁₋₆	= Adherence factor of soil to skin for a child (1 - 6 years) (mg/cm ² -event) (Referred to as contact rate in RAGS, Part A)	0.2 (EFH, EPA 1997a)
AF ₇₋₃₁	= Adherence factor of soil to skin for an adult (7 - 31 years) (mg/cm ² -event) (Referred to as contact rate in RAGS, Part A)	0.07 (EFH, EPA 1997a)
SA ₁₋₆	= Skin surface area available for contact during ages 1 - 6 (cm ²)	2,800
SA ₇₋₃₁	= Skin surface area available for contact during ages 7 - 31 (cm ²)	5,700
ED ₁₋₆	= Exposure duration during ages 1 - 6 (years)	6
ED ₇₋₃₁	= Exposure duration during ages 7 - 31 (years)	24
BW ₁₋₆	= Average Body weight during ages 1 - 6 (kg)	15
BW ₇₋₃₁	= Average Body weight during ages 7 - 31 (kg)	70

systemically, and exposure time is the same as in the experimental study that measured ABS_d (i.e., 24 hours), as recommended in Exhibit 3-4.

Limited data suggest that absorption of a chemical from soil depends on time. However, information is insufficient to determine whether that absorption is linear, sublinear or supralinear with time. Whether these assumptions would result in an over- or underestimate of exposure and risk is unclear. Site-specific exposure scenarios should not scale the dermal absorption factor of the event time. The exposure frequency for the RME is referenced from RAGS Part A (U.S. EPA, 1989) but may be adjusted to reflect site-specific conditions.

The recommended central tendency and RME values for exposure duration (Exhibit 3-5) are

referenced from RAGS Part A (U.S. EPA, 1989), but may be adjusted to reflect site-specific conditions.

3.3 ESTIMATION OF DERMAL EXPOSURES TO CHEMICALS IN SEDIMENT

Exposures to sediment will differ from exposures to soil due to potential differences in the chemical and physical properties between the two media and differing conditions under which these types of exposures occur. Since studies of dermal exposure to sediments are limited, it is recommended that the same risk assessment approach described in this document for soil exposures be used for sediments, with the following considerations:

EXHIBIT 3-5

**RECOMMENDED DERMAL EXPOSURE VALUES FOR CENTRAL TENDENCY AND RME
RESIDENTIAL AND INDUSTRIAL SCENARIOS – SOIL CONTACT**

Exposure Parameters		Central Tendency		RME Scenario	
		Residential	Industrial	Residential	Industrial
Concentration- C_{soil} (mg/kg)		site-specific values			
Event frequency (events/day)		1	1	1	1
Exposure frequency (days/yr)		site-specific	219	350	250
Exposure duration (yr)		9	9	30	25
Skin surface area (cm ²)	Adult	5,700	3,300	5,700	3,300
	Child	2,800	NA	2,800	NA
Soil adherence factor (mg/cm ²)	Adult	0.01	0.02	0.07	0.2
	Child	0.04	NA	0.2	NA
Dermal absorption fraction		chemical-specific values (Exhibit 3-4)			

NA: not applicable

- Sediment samples must be located in areas in which individuals are likely to come into direct contact with the sediments. For wading and swimming, this includes areas which are near shore and in which sediments are exposed at some time during the year. Sediments which are consistently covered by considerable amounts of water are likely to wash off before the individual reaches the shore.
- Since data are generally reported in dry weight, the impact of moisture content in the in situ sample (i.e., wet weight) on exposure and uptake should be considered and discussed in the Uncertainty Section. The greater the moisture content of a sediment sample, the greater the difference in dry vs. wet weight contaminant concentration. Measures of sediment adherence reflect wet weight, therefore dose estimations utilizing sediment concentration recorded in dry weight will serve to over-estimate risk in direct proportion to the moisture content of the sediment sample.
- When applying standard equations for DA_{event} (Eq. 3.12) and DAD (Eq. 3.11) to sediment scenarios, assumptions about surface area exposed, frequency, and duration of exposure will depend on site-specific conditions.
- The amount of chemical absorbed from sediment is dependent on a number of chemical, physical and biological factors. The relative importance of some of these factors on absorption may differ between soils and sediments. Until more information becomes available, the same dermal absorption fraction for soils (Exhibit 3-4) should be applied to sediments. The uncertainties associated with this approach should be discussed in the Uncertainty Section of the risk assessment.
- The adherence factor is perhaps, the most uncertain parameter to estimate for sediment exposures. Increasing moisture content will increase the ability of sediments and soils to adhere to skin, as demonstrated by comparing soil adherence for the same activity in wet and dry soil. The increased moisture content may also affect the relative percent absorbed.

-
- In addition, assumptions about soil loading (or adherence) will affect absorption estimates. For example, as soil loading increases, the fraction absorbed will be constant until a critical level is reached at which the skin surface is uniformly covered by soil (defined as the mono-layer) (Duff and Kissel, 1996). The soil loading at which a mono-layer exists is dependent on grain size. It is recommended that the value chosen for adherence be consistent with the activity and surface area

assumptions as well as the mono-layer concept. Exhibit C-4 presents upper bound estimates calculated for the Soil Conservation Service classifications using mean particle diameters and a simplified packing model. These values can be used as bounding estimates in constructing site-specific exposure parameters. The impact of the adherence factor assumptions on absorption should be discussed in the Uncertainty Section.

ATTACHMENT 3

**SKIN SURFACE AREAS FOR SMALL CHILD
AND ADOLESCENT RECEPTORS AS SPECIFIED
IN THE USEPA EXPOSURE FACTORS HANDBOOK**



Table 6-6. Total Body Surface Area of Male Children in Square Meters^a

Age (yr) ^b	Percentile								
	5	10	15	25	50	75	85	90	95
2 < 3	0.527	0.544	0.552	0.569	0.603	0.629	0.643	0.661	0.682
3 < 4	0.585	0.606	0.620	0.636	0.664	0.700	0.719	0.729	0.764
4 < 5	0.633	0.658	0.673	0.689	0.731	0.771	0.796	0.809	0.845
5 < 6	0.692	0.721	0.732	0.746	0.793	0.840	0.864	0.895	0.918
6 < 7	0.757	0.788	0.809	0.821	0.866	0.915	0.957	1.01	1.06
7 < 8	0.794	0.832	0.848	0.877	0.936	0.993	1.01	1.06	1.11
8 < 9	0.836	0.897	0.914	0.932	1.00	1.06	1.12	1.17	1.24
9 < 10	0.932	0.966	0.988	1.00	1.07	1.13	1.16	1.25	1.29
10 < 11	1.01	1.04	1.06	1.10	1.18	1.28	1.35	1.40	1.48
11 < 12	1.00	1.06	1.12	1.16	1.23	1.40	1.47	1.53	1.60
12 < 13	1.11	1.13	1.20	1.25	1.34	1.47	1.52	1.62	1.76
13 < 14	1.20	1.24	1.27	1.30	1.47	1.62	1.67	1.75	1.81
14 < 15	1.33	1.39	1.45	1.51	1.61	1.73	1.78	1.84	1.91
15 < 16	1.45	1.49	1.52	1.60	1.70	1.79	1.84	1.90	2.02
16 < 17	1.55	1.59	1.61	1.66	1.76	1.87	1.98	2.03	2.16
17 < 18	1.54	1.56	1.62	1.69	1.80	1.91	1.96	2.03	2.09
3 < 6	0.616	0.636	0.649	0.673	0.728	0.785	0.817	0.842	0.876
6 < 9	0.787	0.814	0.834	0.866	0.931	1.01	1.05	1.09	1.14
9 < 12	0.972	1.00	1.02	1.07	1.16	1.28	1.36	1.42	1.52
12 < 15	1.19	1.24	1.27	1.32	1.49	1.64	1.73	1.77	1.85
15 < 18	1.50	1.55	1.59	1.65	1.75	1.86	1.94	2.01	2.11

^a Lack of height measurements for children <2 years in NHANES II precluded calculation of surface areas for this age group.
^b Estimated values calculated using NHANES II data.
 Source: U.S. EPA, 1985.

Table 6-7. Total Body Surface Area of Female Children in Square Meters^a

Age (yr) ^b	Percentile								
	5	10	15	25	50	75	85	90	95
2 < 3	0.516	0.532	0.544	0.557	0.579	0.610	0.623	0.637	0.653
3 < 4	0.555	0.570	0.589	0.607	0.649	0.688	0.707	0.721	0.737
4 < 5	0.627	0.639	0.649	0.666	0.706	0.758	0.777	0.794	0.820
5 < 6	0.675	0.700	0.714	0.735	0.779	0.830	0.870	0.902	0.952
6 < 7	0.723	0.748	0.770	0.791	0.843	0.914	0.961	0.989	1.03
7 < 8	0.792	0.808	0.819	0.854	0.917	0.977	1.02	1.06	1.13
8 < 9	0.863	0.888	0.913	0.932	1.00	1.05	1.08	1.11	1.18
9 < 10	0.897	0.948	0.969	1.01	1.06	1.14	1.22	1.31	1.41
10 < 11	0.981	1.01	1.05	1.10	1.17	1.29	1.34	1.37	1.43
11 < 12	1.06	1.09	1.12	1.16	1.30	1.40	1.50	1.56	1.62
12 < 13	1.13	1.19	1.24	1.27	1.40	1.51	1.62	1.64	1.70
13 < 14	1.21	1.28	1.32	1.38	1.48	1.59	1.67	1.75	1.86
14 < 15	1.31	1.34	1.39	1.45	1.55	1.66	1.74	1.76	1.88
15 < 16	1.38	1.49	1.43	1.47	1.57	1.67	1.72	1.76	1.83
16 < 17	1.40	1.46	1.48	1.53	1.60	1.69	1.79	1.84	1.91
17 < 18	1.42	1.49	1.51	1.56	1.63	1.73	1.80	1.84	1.94
3 < 6	0.585	0.610	0.630	0.654	0.711	0.770	0.808	0.831	0.879
6 < 9	0.754	0.790	0.804	0.845	0.919	1.00	1.04	1.07	1.13
9 < 12	0.957	0.990	1.03	1.06	1.16	1.31	1.38	1.43	1.56
12 < 15	1.21	1.27	1.30	1.37	1.48	1.61	1.68	1.74	1.82
15 < 18	1.40	1.44	1.47	1.51	1.60	1.70	1.76	1.82	1.92

^a Lack of height measurements for children <2 years in NHANES II precluded calculation of surface areas for this age group.
^b Estimated values calculated using NHANES II data.
 Source: U.S. EPA, 1985.

ATTACHMENT 4

**CHEMICAL SPECIFIC GASTROINTESTINAL
AND DERMAL ABSORPTION FACTORS
AND SOIL ADHERENCE FACTORS**

EXHIBIT 4-1

SUMMARY OF GASTROINTESTINAL ABSORPTION EFFICIENCIES AND RECOMMENDATIONS FOR ADJUSTMENT OF TOXICITY FACTORS FOR SPECIFIC COMPOUNDS

Compound	GI Absorption			% Absorbed ABS _{GI}			IRIS Critical Toxicity Study				Adjust?
	Ref ¹	Species	Dosing Regimen	Species	Dosing Regimen	Species	Dosing Regimen	Toxicity Factor	Adjust?		
Organics											
Chlordane	Ewing, 1985 Ohno, 1986	Rats	assume aqueous gavage		assume aqueous gavage	Mice	diet		SF	No	
2,4-Dichlorophenoxyacetic acid (2,4-D)	Knopp, 1992 Pelletier, 1989	Rats	assume aqueous gavage	>90%	Rats	diet	inhalation		RfD	No	
									RfD	No	
DDT	Keller, 1980	Rats	vegetable oil	70-90%	Rats	dissolved in oil, mixed with diet			RfD	No	
Pentachlorophenol	Korte, 1978	Rats	diet	76%	Rats	diet			RfD	No	
	Meerman, 1983	Rats	water	100%							
Polychlorinated biphenyls (PCBs)	Albro, 1972	Rats	squalene	96%	Rats	diet			SF	No	
	Muhlebach, 1981	Rats	emulsion	80%							
	Tanabe, 1981	Rats	corn oil	81%							
Polycyclic aromatic hydrocarbons(PAHs)	Chang, 1943	Rats	starch solution	58%	Mice	diet			SF	No	
	Hecht, 1979	Rats	diet	89%							

EXHIBIT 4-1 (Continued)

SUMMARY OF GASTROINTESTINAL ABSORPTION EFFICIENCIES AND RECOMMENDATIONS FOR ADJUSTMENT OF TOXICITY FACTORS FOR SPECIFIC COMPOUNDS

Compound	GI Absorption			IRIS Critical Toxicity Study			Adjust?	
	Ref ¹	Species	Dosing Regimen	Species	Dosing Regimen	Toxicity Factor		
TCDD	Fries, 1975	Rats	diet	under review	under review		No	
	Piper, 1973	Rats	diet					
	Rose, 1976	Rats	corn oil					
Other Dioxins/ Dibenzofurans	ATSDR, 1994a	multiple studies					No	
All other organic compounds	multiple references			multiple studies		RfD or SF	No	
Inorganics								
Antimony	Waitz, 1965	Rats	water		Rat	water	RfD	Yes
Arsenic (arsenite)	Bettley, 1975	Human	assume aqueous		Human	water	SF	No
Barium	Cuddihy and Griffith, 1972 Taylor, 1962	Dog	water		Human	water	RfD	Yes
Beryllium	Reeves, 1965	Rats	water		Rat	water	RfD	Yes
Cadmium	IRIS, 1999	Human	diet		Human	diet and water	RfD	Yes
		Human	water					Yes
Chromium (III)	Donaldson and Barreras, 1996 Keim, 1987	Rats	diet/water		Rat	diet	RfD	Yes

EXHIBIT 4-1 (Continued)

SUMMARY OF GASTROINTESTINAL ABSORPTION EFFICIENCIES AND RECOMMENDATIONS FOR ADJUSTMENT OF TOXICITY FACTORS FOR SPECIFIC COMPOUNDS

Compound	GI Absorption			IRIS Critical Toxicity Study			Adjust?	
	Ref ¹	Species	Dosing Regimen	% Absorbed ABS _{GI}	Species	Dosing Regimen		Toxicity Factor
Chromium (VI)	Donaldson and Barreras, 1996 MacKenzie, 1959 Sayato, 1980	Rats	water	2.5%	Rat	water	RfD	Yes
Cyanate	Farooqui and Ahmed, 1982	Rats	assume aqueous	>47%	Rat	diet	RfD	No
Manganese	Davidsson, 1989 IRIS, 1999 Ruoff, 1995	Human	diet/water	4%	Human	diet/water	RfD	Yes
Mercuric chloride (other soluble salts)	IRIS, 1999	Rats	water	7%	Rat	oral gavage in water; 2X/week	RfD	Yes
Insoluble or metallic mercury	ATSDR, 1994b	Human	acute inhalation of Hg vapor	74-80%	Human	Inhalation	RfC	No
Methyl mercury	Aberg, 1969	Human	aqueous	95%	Human	diet	RfD	No
Nickel	Elakhovskaya, 1972	Human	diet/water	4%	Rat	diet	RfD	Yes
Selenium	Young, 1982	Human	diet	30-80%	Human	diet	RfD	No
Silver	Furchner, 1968 IRIS, 1999	Dogs	aqueous	4%	Human	i.v. dose	RfD (based on estimated oral dose)	Yes

EXHIBIT 4-1 (Continued)

SUMMARY OF GASTROINTESTINAL ABSORPTION EFFICIENCIES AND RECOMMENDATIONS FOR ADJUSTMENT OF TOXICITY FACTORS FOR SPECIFIC COMPOUNDS

Compound	GI Absorption				IRIS Critical Toxicity Study			Adjust?
	Ref ¹	Species	Dosing Regimen	% Absorbed ABS _{GI}	Species	Dosing Regimen	Toxicity Factor	
Thallium	Lie, 1960	Rats	aqueous	100%	Rat	water gavage	RfD	No
Vanadium	Conklin, 1982	Rats	gavage	2.6%	Rat	diet as V ₂ O ₅	RfD	Yes
Zinc	ATSDR, 1994c	Human	diet	highly variable	Human	diet supplement	RfD	No

¹ Literature references are listed here by first author. Complete citations are provided in Reference Section.

EXHIBIT 3-3

ACTIVITY SPECIFIC-SURFACE AREA WEIGHTED SOIL ADHERENCE FACTORS

Exposure Scenario	Age (years)	Weighted Soil Adherence Factor (mg/cm ²)	
		Geometric Mean	95 th Percentile
CHILDREN¹			
Indoor Children	1-13	0.01	0.06
Daycare Children (playing indoors and outdoors)	1-6.5	0.04	0.3
Children Playing (dry soil)	8-12	0.04	0.4
Children Playing (wet soil)	8-12	0.2	3.3
Children-in-Mud ⁵	9-14	21	231
RESIDENTIAL ADULTS²			
Grounds Keepers	>18	0.01	0.06
Landscaper/Rockery	>18	0.04	0.2
Gardeners	>16	0.07	0.3
COMMERCIAL/INDUSTRIAL ADULTS³			
Grounds Keepers	>18	0.02	0.1
Landscaper/Rockery	>18	0.04	0.2
Staged Activity: Pipe Layers (dry soil)	>15	0.07	0.2
Irrigation Installers	>18	0.08	0.3
Gardeners	>16	0.1	0.5
Construction Workers	>18	0.1	0.3
Heavy Equipment Operators	>18	0.2	0.7
Utility Workers	>18	0.2	0.9
Staged Activity: Pipe Layers (wet soil)	>15	0.6	13
MISCELLANEOUS ACTIVITIES⁴			
Soccer Players #1 (teens, moist conditions)	13-15	0.04	0.3
Farmers	>20	0.1	0.4
Rugby Players	>21	0.1	0.6
Archeologists	>19	0.3	0.5
Reed Gatherers	>22	0.3	27
Soccer Players #2 (adults)	>18	0.01	0.08

EXHIBIT 3-3 (continued)

ACTIVITY SPECIFIC-SURFACE AREA WEIGHTED SOIL ADHERENCE FACTORS

¹ Weighted AF based on exposure to face, forearms, hands, lower legs, & feet.

² Weighted AF based on exposure to face, forearms, hands, & lower legs.

³ Weighted AF based on exposure to face, forearms, & hands.

Note: this results in different weighted AFs for similar activities between residential and commercial/industrial exposure scenarios.

⁴ Weighted AF based on all body parts for which data were available.

⁵ Information on soil adherence values for the children-in-mud scenario is provided to illustrate the range of values for this type of activity.

However, the application of these data to the dermal dose equations in this guidance may result in a significant overestimation of dermal risk. Therefore, it is recommended that the 95th percentile AF values not be used in a quantitative dermal risk assessment.

See Exhibit C-4 for bounding estimates.

Children playing at a day care center represent a central tendency (i.e., typical) activity given that: (1) the children played both indoors and outdoors; (2) the clothing worn was not controlled (i.e., some subjects wore long pants, long-sleeve shirts, and/or shoes); and (3) soil conditions were not controlled (e.g., other soil types, moisture content, etc., could result in higher

AFs). The 95th percentile weighted AF for children playing at the day care center is a known, reasonable, "real-life" activity that represents the majority of the population, given that children 1 to 6 years old are either in day care or at home and are likely engaging in activities similar to those at the day care center, and represents a high-end of a typical activity.

EXHIBIT 3-4

RECOMMENDED DERMAL ABSORPTION FRACTION FROM SOIL

Compound	Dermal Absorption Fraction (ABS _d) ¹	Reference
Arsenic	0.03	Wester, et al. (1993a)
Cadmium	0.001	Wester, et al. (1992a) U.S. EPA (1992a)
Chlordane	0.04	Wester, et al. (1992b)
2,4-Dichlorophenoxyacetic acid	0.05	Wester, et al. (1996)
DDT	0.03	Wester, et al. (1990)
TCDD and other dioxins -if soil organic content is >10%	0.03 0.001	U.S. EPA (1992a)
Lindane	0.04	Duff and Kissel (1996)
Benzo(a)pyrene and other PAHs	0.13	Wester, et al. (1990)
Aroclors 1254/1242 and other PCBs	0.14	Wester, et al. (1993b)
Pentachlorophenol	0.25	Wester, et al. (1993c)
Semivolatile organic compounds	0.1	—

¹ The values presented are experimental mean values.

ATTACHMENT 5

SAMPLE CALCULATIONS

CALCULATION WORKSHEET

CLIENT: NCBC DAVISVILLE, RHODE ISLAND		JOB NUMBER: 1511
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH GROUNDWATER ADULT RECREATIONAL USERS - SHELL FISHING		
BASED ON: U.S. EPA, DECEMBER 1989, JULY 2004		
BY: R. JUPIN	CHECKED BY: <i>[Signature]</i>	DATE: 12/28/06

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from dermal contact with groundwater by an adult recreational user while shell fishing.

EQUATION:
$$DAD = \frac{DA_{event} \times EV \times ED \times EF \times A}{BW \times AT}$$

Where:

- DAD = dermally absorbed dose (mg/kg/day)
- DA_{event} = absorbed does per event (mg/cm²/event)
- EV = event frequency (events/day)
- EF = exposure frequency (days/year)
- ED = exposure duration (years)
- A = skin surface available for contact (cm²)
- BW = body weight (kg)
- AT = averaging time (days)
- CSF_o = oral carcinogenic slope factor ((mg/kg/day)⁻¹)
- RfD_o = oral noncarcinogenic reference dose (mg/kg/day)

RISKS:

ILCR (Carcinogens) = DAD (mg/kg/day) x CSF_d (mg/kg/day)⁻¹
 HQ (Noncarcinogens) = DAD (mg/kg/day) / RFD_d (mg/kg/day)

EQUATIONS for DA_{event}:

For Inorganics:

DA_{event} = K_p x C_w x CF x tevent

For Organics:

If tevent ≤ t', then: DA_{event} = 2 × FA × K_p × C_w × CF × $\sqrt{\frac{6 \times \text{tau} \times \text{tevent}}{\pi}}$

If tevent > t', then: DA_{event} = FA × K_p × C_w × CF × $\left[\frac{\text{tevent}}{1+B} + 2 \times \text{tau} \times \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right]$

CLIENT: NCBC DAVISVILLE, RHODE ISLAND		JOB NUMBER: 1511
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH GROUNDWATER ADULT RECREATIONAL USERS - SHELL FISHING		
BASED ON: U.S. EPA, DECEMBER 1989, JULY 2004		
BY: R. JUPIN	CHECKED BY: <i>T. C. Jackson</i>	DATE: 12/28/06

Where:

- Kp = permeability coefficient from water (cm/hr)
- Cgw = concentration of chemical in groundwater (mg/L)
- tevent = duration of event (hr/event)
- CF = conversion factor (0.001 L/cm³)
- t* = time it takes to reach steady-state (hr/event)
- τ = lag time (hr/event)
- B = Bunge Model Constant (dimensionless)

EXAMPLE CALCULATION OF DAevent

ASSUMPTIONS:

- Cgw = 0.0620 mg/L Chemical: Vinyl Chloride
- Kp = 5.60E-03 cm/hr
- FA = 1 unitless
- tevent = 2 hr/event
- CF = 0.001 L/cm³
- t* = 0.57 hr/event
- τ = 0.24 hr/event
- B = 0.017

tevent > t*, therefore,

$$DA_{event} = (0.0056 \text{ cm/hr}) (0.062 \text{ mg/L}) (0.001 \text{ L/cm}^3) \times$$

$$\left[\frac{2 \text{ hr/event}}{1 + 0.017} + 2 \times 0.24 \text{ hr/event} \times \frac{(1 + 3 \times 0.017 + 3 \times 0.017 \times 0.017)}{(1 + 0.017)^2} \right]$$

$$DA_{event} = 8.52E-07 \text{ mg/cm}^2\text{-event}$$

RISK CALCULATIONS

ASSUMPTIONS:

- A = 1800 cm²
- EV = 1 event/day
- ED = 15 years
- EF = 80 days/year
- BW = 70 kg
- ATc = 25550 days
- ATnc = 5475 days
- CSFd = 1.4E+00 (mg/kg/day)⁻¹
- RfDd = 3.0E-03 (mg/kg/day)

CLIENT: NCBC DAVISVILLE, RHODE ISLAND		JOB NUMBER: 1511
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH GROUNDWATER ADULT RECREATIONAL USERS - SHELL FISHING		
BASED ON: U.S. EPA, DECEMBER 1989, JULY 2004		
BY: R. JUPIN	CHECKED BY: <i>[Signature]</i>	DATE: 12/28/06

EXAMPLE CARCINOGENIC CALCULATION

$$\text{DADc} = \frac{8.52\text{E-}07 \text{ mg/cm}^2\text{-event} \times 1 \text{ event/day} \times 15 \text{ years} \times 80 \text{ days/year} \times 1800 \text{ cm}^2}{70 \text{ kg} \times 25550 \text{ days}}$$

$$\text{DADc} = 1.03\text{E-}06 \text{ mg/kg/day}$$

$$\text{DADc} = 1.03\text{E-}06 \text{ mg/kg/day} \times 1.40\text{E+}00 \text{ (mg/kg/day)}^{-1} = \text{Incremental Lifetime Cancer Risk}$$

$$\text{ILCR} = 1.44\text{E-}06$$

EXAMPLE NONCARCINOGENIC CALCULATION

$$\text{DADnc} = \frac{8.52\text{E-}07 \text{ mg/cm}^2\text{-event} \times 1 \text{ event/day} \times 15 \text{ years} \times 80 \text{ days/year} \times 1800 \text{ cm}^2}{70 \text{ kg} \times 5475 \text{ days}}$$

$$\text{DADnc} = 4.80\text{E-}06 \text{ mg/kg/day}$$

$$\text{HQ} = 4.80\text{E-}06 \text{ mg/kg/day} / 3.00\text{E-}03 \text{ (mg/kg/day)} = \text{Hazard Quotient}$$

$$\text{HQ} = 1.60\text{E-}03$$

CALCULATION WORKSHEET

CLIENT: NCBC DAVISVILLE, RHODE ISLAND		JOB NUMBER: 1511
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SURFACE WATER ADULT RECREATIONAL USER - SWIMMING		
BASED ON: USEPA, DEC. 1989		
BY: R. JUPIN	CHECKED BY: <i>[Signature]</i>	DATE: 12/28/06

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from incidental ingestion of surface water by an adult recreational user while swimming.

EQUATION:
$$IEX = \frac{C_{sw} \times CF \times CR_{sw} \times ET \times EF \times ED}{BW \times AT}$$

Where:

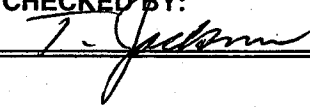
- IEX = estimated exposure intake (mg/kg/day)
- C_{sw} = exposure point concentration in surface water (ug/L)
- CF = conversion factor (1.0E-3 mg/ug)
- CR_{sw} = contact rate (L/hour)
- ET = exposure time (hours/day)
- EF = exposure frequency (days/year)
- ED = exposure duration (years)
- BW = body weight (kg)
- AT = averaging time (days)
- CSFo = oral carcinogenic slope factor ((mg/kg/day)⁻¹)
- RfDo = oral noncarcinogenic reference dose (mg/kg/day)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)⁻¹
 HQ (Noncarcinogens) = Intake (mg/kg/day) / RfDo (mg/kg/day)

ASSUMPTIONS:

- C_{sw} = 1.72 ug/L Chemical: Vinyl Chloride
- CR_{sw} = 0.05 L/hr
- CF = 1.0E-03 mg/ug
- ET = 2 hours/day
- EF = 80 days/year
- ED = 15 years
- BW = 70 kg
- ATc = 25550 days
- ATnc = 5475 days
- CSFo = 1.4E+00 (mg/kg/day)⁻¹
- RfDo = 3.0E-03 (mg/kg/day)

CLIENT: NCBC DAVISVILLE, RHODE ISLAND		JOB NUMBER: 1511
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SURFACE WATER ADULT RECREATIONAL USER - SWIMMING		
BASED ON: USEPA, DEC. 1989		
BY: R. JUPIN	CHECKED BY: 	DATE: 12/28/06

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{1.72 \text{ ug/L} \times 1.0E-03 \text{ mg/ug} \times 0.05 \text{ L/hr} \times 2 \text{ hours/day} \times 80 \text{ days/year} \times 15 \text{ years}}{70 \text{ kg} \times 25550 \text{ days}}$$

$$IEXc = 1.15E-07 \text{ mg/kg/day}$$

$$ILCR = 1.15E-07 \text{ mg/kg/day} \times 1.40E+00 \text{ (mg/kg/day)}^{-1} = \text{Incremental Lifetime Cancer Risk}$$

$$ILCR = 1.62E-07$$

EXAMPLE NONCARCINOGENIC CALCULATION

$$IEXnc = \frac{1.72 \text{ ug/L} \times 1.0E-03 \text{ mg/ug} \times 0.05 \text{ L/hr} \times 2 \text{ hours/day} \times 80 \text{ days/year} \times 15 \text{ years}}{70 \text{ kg} \times 5475 \text{ days}}$$

$$IEXnc = 5.39E-07 \text{ mg/kg/day}$$

$$HQ = \frac{5.39E-07 \text{ mg/kg/day}}{3.00E-03 \text{ (mg/kg/day)}} = \text{Hazard Quotient}$$

$$HQ = 1.80E-04$$

CALCULATION WORKSHEET

CLIENT: NCBC DAVISVILLE, RHODE ISLAND		JOB NUMBER: 1511
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SURFACE WATER ADULT RECREATIONAL USER - SWIMMING		
BASED ON: U.S. EPA, DECEMBER 1989, JULY 2004		
BY: R. JUPIN	CHECKED BY: <i>[Signature]</i>	DATE: 12/28/06

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from dermal contact with surface water by an adult recreational user while swimming.

EQUATION:
$$DAD = \frac{DA_{event} \times EV \times ED \times EF \times A}{BW \times AT}$$

Where:

- DAD = dermally absorbed dose (mg/kg/day)
- DA_{event} = absorbed does per event (mg/cm²/event)
- EV = event frequency (events/day)
- EF = exposure frequency (days/year)
- ED = exposure duration (years)
- A = skin surface available for contact (cm²)
- BW = body weight (kg)
- AT = averaging time (days)
- CSF_o = oral carcinogenic slope factor ((mg/kg/day)⁻¹)
- RfD_o = oral noncarcinogenic reference dose (mg/kg/day)

RISKS:

ICLR (Carcinogens) = DAD (mg/kg/day) x CSF_d (mg/kg/day)⁻¹
 HQ (Noncarcinogens) = DAD (mg/kg/day) / RFD_d (mg/kg/day)

EQUATIONS for DA_{event}:

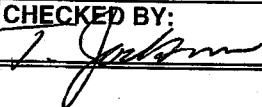
For Inorganics:

DA_{event} = K_p x C_w x CF x tevent

For Organics:

If tevent ≤ t', then: $DA_{event} = 2 \times FA \times K_p \times C_w \times CF \times \sqrt{\frac{6 \times \text{tau} \times \text{tevent}}{\pi}}$

If tevent > t', then: $DA_{event} = FA \times K_p \times C_w \times CF \times \left[\frac{\text{tevent}}{1+B} + 2 \times \text{tau} \times \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right]$

CLIENT: NCBC DAVISVILLE, RHODE ISLAND		JOB NUMBER: 1511
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SURFACE WATER ADULT RECREATIONAL USER - SWIMMING		
BASED ON: U.S. EPA, DECEMBER 1989, JULY 2004		
BY: R. JUPIN	CHECKED BY: 	DATE: 12/28/06

Where:

- Kp = permeability coefficient from water (cm/hr)
- Cgw = concentration of chemical in surface water (mg/L)
- tevent = duration of event (hr/event)
- CF = conversion factor (0.001 L/cm³)
- t* = time it takes to reach steady-state (hr/event)
- τ = lag time (hr/event)
- B = Bunge Model Constant (dimensionless)

EXAMPLE CALCULATION OF DAevent

ASSUMPTIONS:

- Cgw = 0.00172 mg/L Chemical: Vinyl Chloride
- Kp = 5.60E-03 cm/hr
- FA = 1 unitless
- tevent = 2 hr/event
- CF = 0.001 L/cm³
- t* = 0.57 hr/event
- τ = 0.24 hr/event
- B = 0.017

tevent > t*, therefore,

$$DA_{event} = (0.0056 \text{ cm/hr}) (0.00172 \text{ mg/L}) (0.001 \text{ L/cm}^3) \times \left[\frac{2 \text{ hr/event}}{1 + 0.017} + 2 \times 0.24 \text{ hr/event} \times \frac{(1 + 3 \times 0.017)}{(1 + 0.017)} \right]$$

$$DA_{event} = 2.37E-08 \text{ mg/cm}^2\text{-event}$$

RISK CALCULATIONS

ASSUMPTIONS:

- A = 18000 cm²
- EV = 1 event/day
- ED = 15 years
- EF = 80 days/year
- BW = 70 kg
- ATc = 25550 days
- ATnc = 5475 days
- CSFd = 1.4E+00 (mg/kg/day)⁻¹
- RfDd = 3.0E-03 (mg/kg/day)

CLIENT: NCBC DAVISVILLE, RHODE ISLAND		JOB NUMBER: 1511
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SURFACE WATER ADULT RECREATIONAL USER - SWIMMING		
BASED ON: U.S. EPA, DECEMBER 1989, JULY 2004		
BY: R. JUPIN	CHECKED BY: <i>T. Jackson</i>	DATE: 12/28/06

EXAMPLE CARCINOGENIC CALCULATION

$$DADc = \frac{2.37E-08 \text{ mg/cm}^2\text{-event} \times 1 \text{ event/day} \times 15 \text{ years} \times 80 \text{ days/year} \times 18000 \text{ cm}^2}{70 \text{ kg} \times 25550 \text{ days}}$$

$$DADc = 2.86E-07 \text{ mg/kg/day}$$

$$ICLR = 2.86E-07 \text{ mg/kg/day} \times 1.40E+00 \text{ (mg/kg/day)}^{-1} = \text{Incremental Lifetime Cancer Risk}$$

$$ICLR = 4.01E-07$$

EXAMPLE NONCARCINOGENIC CALCULATION

$$DADnc = \frac{2.37E-08 \text{ mg/cm}^2\text{-event} \times 1 \text{ event/day} \times 15 \text{ years} \times 80 \text{ days/year} \times 18000 \text{ cm}^2}{70 \text{ kg} \times 5475 \text{ days}}$$

$$DADnc = 1.34E-06 \text{ mg/kg/day}$$

$$HQ = 1.34E-06 \text{ mg/kg/day} / 3.00E-03 \text{ (mg/kg/day)} = \text{Hazard Quotient}$$

$$HQ = 4.46E-04$$

CALCULATION WORKSHEET

CLIENT: NCBC DAVISVILLE, RHODE ISLAND		JOB NUMBER: 1511
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SURFACE WATER ADULT RECREATIONAL USER - SHELL FISHING		
BASED ON: USEPA, DEC. 1989		
BY: R. JUPIN	CHECKED BY: <i>T. Jackson</i>	DATE: 12/28/06

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from incidental ingestion of surface water by an adult recreational user while shell fishing.

EQUATION:
$$IEX = \frac{C_{sw} \times CF \times CR_{sw} \times ET \times EF \times ED}{BW \times AT}$$

Where:

- IEX = estimated exposure intake (mg/kg/day)
- C_{sw} = exposure point concentration in surface water (ug/L)
- CF = conversion factor (1.0E-3 mg/ug)
- CR_{sw} = contact rate (L/hour)
- ET = exposure time (hours/day)
- EF = exposure frequency (days/year)
- ED = exposure duration (years)
- BW = body weight (kg)
- AT = averaging time (days)
- CSFo = oral carcinogenic slope factor ((mg/kg/day)⁻¹)
- RfDo = oral noncarcinogenic reference dose (mg/kg/day)

RISKS:

- ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)⁻¹
- HQ (Noncarcinogens) = Intake (mg/kg/day) / RfDo (mg/kg/day)

ASSUMPTIONS:

- C_{sw} = 1.72 ug/L Chemical: Vinyl Chloride
- CR_{sw} = 0.01 L/hr
- CF = 1.0E-03 mg/ug
- ET = 2 hours/day
- EF = 80 days/year
- ED = 15 years
- BW = 70 kg
- ATc = 25550 days
- ATnc = 5475 days
- CSFo = 1.4E+00 (mg/kg/day)⁻¹
- RfDo = 3.0E-03 (mg/kg/day)

CLIENT: NCBC DAVISVILLE, RHODE ISLAND		JOB NUMBER: 1511
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SURFACE WATER ADULT RECREATIONAL USER - SHELL FISHING		
BASED ON: USEPA, DEC. 1989		
BY: R. JUPIN	CHECKED BY: <i>T. Jackson</i>	DATE: 12/28/06

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{1.72 \text{ ug/L} \times 1.0E-03 \text{ mg/ug} \times 0.01 \text{ L/hr} \times 2 \text{ hours/day} \times 80 \text{ days/year} \times 15 \text{ years}}{70 \text{ kg} \times 25550 \text{ days}}$$

$$IEXc = 2.31E-08 \text{ mg/kg/day}$$

$$ILCR = 2.31E-08 \text{ mg/kg/day} \times 1.40E+00 \text{ (mg/kg/day)}^{-1} = \text{Incremental Lifetime Cancer Risk}$$

$$ILCR = 3.23E-08$$

EXAMPLE NONCARCINOGENIC CALCULATION

$$IEXnc = \frac{1.72 \text{ ug/L} \times 1.0E-03 \text{ mg/ug} \times 0.01 \text{ L/hr} \times 2 \text{ hours/day} \times 80 \text{ days/year} \times 15 \text{ years}}{70 \text{ kg} \times 5475 \text{ days}}$$

$$IEXnc = 1.08E-07 \text{ mg/kg/day}$$

$$HQ = \frac{1.08E-07 \text{ mg/kg/day}}{3.00E-03 \text{ (mg/kg/day)}} = \text{Hazard Quotient}$$

$$HQ = 3.59E-05$$

CALCULATION WORKSHEET

CLIENT: NCBC DAVISVILLE, RHODE ISLAND		JOB NUMBER: 1511
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SURFACE WATER ADULT RECREATIONAL USER - SHELL FISHING		
BASED ON: U.S. EPA, DECEMBER 1989, JULY 2004		
BY: R. JUPIN	CHECKED BY: <i>[Signature]</i>	DATE: 12/28/06

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from dermal contact with surface water by an adult recreational user while shell fishing.

EQUATION:
$$DAD = \frac{DA_{event} \times EV \times ED \times EF \times A}{BW \times AT}$$

Where:

- DAD = dermally absorbed dose (mg/kg/day)
- DA_{event} = absorbed does per event (mg/cm²/event)
- EV = event frequency (events/day)
- EF = exposure frequency (days/year)
- ED = exposure duration (years)
- A = skin surface available for contact (cm²)
- BW = body weight (kg)
- AT = averaging time (days)
- CSF_o = oral carcinogenic slope factor ((mg/kg/day)⁻¹)
- RfD_o = oral noncarcinogenic reference dose (mg/kg/day)

RISKS:

ICLR (Carcinogens) = DAD (mg/kg/day) x CSF_d (mg/kg/day)⁻¹
 HQ (Noncarcinogens) = DAD (mg/kg/day) / RFD_d (mg/kg/day)

EQUATIONS for DA_{event}:

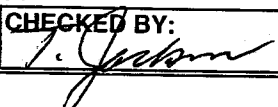
For Inorganics:

DA_{event} = K_p x C_w x CF x t_{event}

For Organics:

If t_{event} ≤ t', then: DA_{event} = 2 x FA x K_p x C_w x CF x $\sqrt{\frac{6 \times \text{tau} \times t_{event}}{\pi}}$

If t_{event} > t', then: DA_{event} = FA x K_p x C_w x CF x $\left[\frac{t_{event}}{1+B} + 2 \times \text{tau} \times \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right]$

CLIENT: NCBC DAVISVILLE, RHODE ISLAND		JOB NUMBER: 1511
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SURFACE WATER ADULT RECREATIONAL USER - SHELL FISHING		
BASED ON: U.S. EPA, DECEMBER 1989, JULY 2004		
BY: R. JUPIN	CHECKED BY: 	DATE: 12/28/06

Where:

- Kp = permeability coefficient from water (cm/hr)
- Cgw = concentration of chemical in surface water (mg/L)
- tevent = duration of event (hr/event)
- CF = conversion factor (0.001 L/cm³)
- t* = time it takes to reach steady-state (hr/event)
- τ = lag time (hr/event)
- B = Bunge Model Constant (dimensionless)

EXAMPLE CALCULATION OF DAevent

ASSUMPTIONS:

- Cgw = 0.00172 mg/L Chemical: Vinyl Chloride
- Kp = 5.60E-03 cm/hr
- FA = 1 unitless
- tevent = 2 hr/event
- CF = 0.001 L/cm³
- t* = 0.57 hr/event
- τ = 0.24 hr/event
- B = 0.017

tevent > t*, therefore,

$$DA_{event} = (0.0056 \text{ cm/hr}) (0.00172 \text{ mg/L}) (0.001 \text{ L/cm}^3) \times \left[\frac{2 \text{ hr/event}}{1 + 0.017} + 2 \times 0.24 \text{ hr/event} \times \frac{(1 + 3 \times 0.017)}{(1 + 0.017)} \right]$$

$$DA_{event} = 2.37E-08 \text{ mg/cm}^2\text{-event}$$

RISK CALCULATIONS

ASSUMPTIONS:

- A = 5940 cm²
- EV = 1 event/day
- ED = 15 years
- EF = 80 days/year
- BW = 70 kg
- ATc = 25550 days
- ATnc = 5475 days
- CSFd = 1.4E+00 (mg/kg/day)⁻¹
- RfDd = 3.0E-03 (mg/kg/day)

CLIENT: NCBC DAVISVILLE, RHODE ISLAND		JOB NUMBER: 1511
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SURFACE WATER ADULT RECREATIONAL USER - SHELL FISHING		
BASED ON: U.S. EPA, DECEMBER 1989, JULY 2004		
BY: R. JUPIN	CHECKED BY: <i>J. Jackson</i>	DATE: 12/28/06

EXAMPLE CARCINOGENIC CALCULATION

$$DADc = \frac{2.37E-08 \text{ mg/cm}^2\text{-event} \times 1 \text{ event/day} \times 15 \text{ years} \times 80 \text{ days/year} \times 5940 \text{ cm}^2}{70 \text{ kg} \times 25550 \text{ days}}$$

$$DADc = 9.45E-08 \text{ mg/kg/day}$$

$$ICLR = 9.45E-08 \text{ mg/kg/day} \times 1.40E+00 \text{ (mg/kg/day)}^{-1} = \text{Incremental Lifetime Cancer Risk}$$

$$ICLR = 1.32E-07$$

EXAMPLE NONCARCINOGENIC CALCULATION

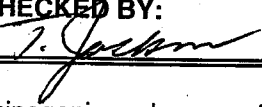
$$DADnc = \frac{2.37E-08 \text{ mg/cm}^2\text{-event} \times 1 \text{ event/day} \times 15 \text{ years} \times 80 \text{ days/year} \times 5940 \text{ cm}^2}{70 \text{ kg} \times 5475 \text{ days}}$$

$$DADnc = 4.41E-07 \text{ mg/kg/day}$$

$$HQ = 4.41E-07 \text{ mg/kg/day} / 3.00E-03 \text{ (mg/kg/day)} = \text{Hazard Quotient}$$

$$HQ = 1.47E-04$$

CALCULATION WORKSHEET

CLIENT: NCBC DAVISVILLE, RHODE ISLAND		JOB NUMBER: 1511
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SEDIMENT ADULT RECREATIONAL USER - SWIMMING		
BASED ON: USEPA, DEC. 1989		
BY: R. JUPIN	CHECKED BY: 	DATE: 12/28/06

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from incidental ingestion of sediment by an adult recreational user while swimming.

EQUATION:
$$IEX = \frac{CS \times IR \times EF \times ED \times FI \times CF}{BW \times AT}$$

Where:

- IEX = estimated exposure intake (mg/kg/day)
- Cs = exposure point concentration in soil/sediment (mg/kg)
- IR = incidental soil ingestion rate (mg/day)
- EF = exposure frequency (days/year)
- ED = exposure duration (years)
- FI = fraction ingested from contaminated source (unitless)
- CF = conversion factor (1.0E-6 kg/mg)
- BW = body weight (kg)
- AT = averaging time (days)
- CSFo = oral carcinogenic slope factor ((mg/kg/day)⁻¹)
- RfDo = oral noncarcinogenic reference dose (mg/kg/day)

RISKS:

ICLR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)⁻¹
 HQ (Noncarcinogens) = Intake (mg/kg/day) / RfDo (mg/kg/day)

ASSUMPTIONS:

- Cs = 3.1 mg/kg Chemical: Arsenic
- IR = 50 mg/day
- EF = 80 days/year
- ED = 15 years
- FI = 1
- CF = 1.0E-06 kg/mg
- BW = 70 kg
- ATc = 25550 days
- ATnc = 5475 days
- CSFo = 1.5E+00 (mg/kg/day)⁻¹
- RfDo = 3.0E-04 (mg/kg/day)

CLIENT: NCBC DAVISVILLE, RHODE ISLAND		JOB NUMBER: 1511
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SEDIMENT ADULT RECREATIONAL USER - SWIMMING		
BASED ON: USEPA, DEC. 1989		
BY: R. JUPIN	CHECKED BY: <i>T. Jackson</i>	DATE: 12/28/06

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{3.1 \text{ mg/kg} \times 50 \text{ mg/day} \times 80 \text{ days/year} \times 15 \text{ years} \times 1 \times 1.0E-06 \text{ kg/mg}}{70 \text{ kg} \times 25550 \text{ days}}$$

$$IEXc = 1.04E-07 \text{ mg/kg/day}$$

$$ICLR = 1.04E-07 \text{ mg/kg/day} \times 1.50E+00 \text{ (mg/kg/day)}^{-1} = \text{Incremental Lifetime Cancer Risk}$$

$$ICLR = 1.56E-07$$

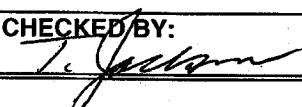
EXAMPLE NONCARCINOGENIC CALCULATION

$$IEXnc = \frac{3.1 \text{ mg/kg} \times 50 \text{ mg/day} \times 80 \text{ days/year} \times 15 \text{ years} \times 1 \times 1.0E-06 \text{ kg/mg}}{70 \text{ kg} \times 5475 \text{ days}}$$

$$IEXnc = 4.85E-07 \text{ mg/kg/day}$$

$$HQ = \frac{4.85E-07 \text{ mg/kg/day}}{3.00E-04 \text{ (mg/kg/day)}} = \text{Hazard Quotient}$$

$$HQ = 1.62E-03$$

CLIENT: NCBC DAVISVILLE, RHODE ISLAND		JOB NUMBER: 1511
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SEDIMENT ADULT RECREATIONAL USER - SWIMMING		
BASED ON: U.S. EPA, JULY 2004		
BY: R. JUPIN	CHECKED BY: 	DATE: 12/28/06

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from dermal contact with sediment by an adult recreational user while swimming.

EQUATION:
$$DEX = \frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

Where:

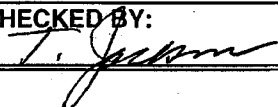
- DEX = estimated exposure intake (mg/kg/day)
- Cs = exposure point concentration in soil/sediment (mg/kg)
- CF = conversion factor (1.0E-6 kg/mg)
- SA = skin surface available for contact (cm²/day)
- ABS = absorption factor (unitless)
- AF = adherence factor (mg/cm²)
- EF = exposure frequency (days/year)
- ED = exposure duration (years)
- BW = body weight (kg)
- AT = averaging time (days)
- CSFd = dermal carcinogenic slope factor ((mg/kg/day)⁻¹)
- RfDd = dermal noncarcinogenic reference dose (mg/kg/day)

RISKS:

- ICLR (Carcinogens) = Intake (mg/kg/day) x CSFd (mg/kg/day)⁻¹
- HQ (Noncarcinogens) = Intake (mg/kg/day) / RfDd (mg/kg/day)

ASSUMPTIONS:

- Cs = 3.1 mg/kg Chemical: Arsenic
- CF = 1.0E-06 kg/mg
- SA = 4500 cm²/day
- AF = 0.335 mg/cm²
- ABS = 0.03
- EF = 80 days/year
- ED = 15 years
- BW = 70 kg
- ATc = 25550 days
- ATnc = 5475 days
- CSFd = 1.5E+00 (mg/kg/day)⁻¹
- RfDd = 3.0E-04 (mg/kg/day)

CLIENT: NCBC DAVISVILLE, RHODE ISLAND		JOB NUMBER: 1511
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SEDIMENT ADULT RECREATIONAL USER - SWIMMING		
BASED ON: U.S. EPA, JULY 2004		
BY: R. JUPIN	CHECKED BY: 	DATE: 12/28/06

EXAMPLE CARCINOGENIC CALCULATION

$$\text{DEXc} = \frac{3.1 \text{ mg/kg} \times 1.0\text{E-}06 \text{ kg/mg} \times 4500 \text{ cm}^2/\text{day} \times 0.335 \text{ mg/cm}^2 \times 0.03 \times 80 \text{ days/year} \times 15 \text{ years}}{70 \text{ kg} \times 25550 \text{ days}}$$

$$\text{DEXc} = 9.41\text{E-}08 \text{ mg/kg/day}$$

$$\text{ICLR} = 9.41\text{E-}08 \text{ mg/kg/day} \times 1.50\text{E+}00 \text{ (mg/kg/day)}^{-1} = \text{Incremental Lifetime Cancer Risk}$$

$$\text{ICLR} = 1.41\text{E-}07$$

EXAMPLE NONCARCINOGENIC CALCULATION

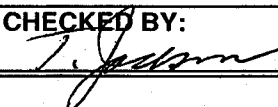
$$\text{DEXnc} = \frac{3.1 \text{ mg/kg} \times 1.0\text{E-}06 \text{ kg/mg} \times 4500 \text{ cm}^2/\text{day} \times 0.335 \text{ mg/cm}^2 \times 0.03 \times 80 \text{ days/year} \times 15 \text{ years}}{70 \text{ kg} \times 5475 \text{ days}}$$

$$\text{DEXnc} = 4.39\text{E-}07 \text{ mg/kg/day}$$

$$\text{HQ} = 4.39\text{E-}07 \text{ mg/kg/day} / 3.00\text{E-}04 \text{ (mg/kg/day)} = \text{Hazard Quotient}$$

$$\text{HQ} = 1.46\text{E-}03$$

CALCULATION WORKSHEET

CLIENT: NCBC DAVISVILLE, RHODE ISLAND		JOB NUMBER: 1511
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SEDIMENT ADULT RECREATIONAL USER - SHELL FISHING		
BASED ON: USEPA, DEC. 1989		
BY: R. JUPIN	CHECKED BY: 	DATE: 12/28/06

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from incidental ingestion of sediment by an adult recreational user while shell fishing.

EQUATION:
$$IEX = \frac{CS \times IR \times EF \times ED \times FI \times CF}{BW \times AT}$$

Where:

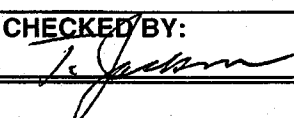
- IEX = estimated exposure intake (mg/kg/day)
- Cs = exposure point concentration in soil/sediment (mg/kg)
- IR = incidental soil ingestion rate (mg/day)
- EF = exposure frequency (days/year)
- ED = exposure duration (years)
- FI = fraction ingested from contaminated source (unitless)
- CF = conversion factor (1.0E-6 kg/mg)
- BW = body weight (kg)
- AT = averaging time (days)
- CSFo = oral carcinogenic slope factor ((mg/kg/day)⁻¹)
- RfDo = oral noncarcinogenic reference dose (mg/kg/day)

RISKS:

- ICLR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)⁻¹
- HQ (Noncarcinogens) = Intake (mg/kg/day) / RFDo (mg/kg/day)

ASSUMPTIONS:

- Cs = 3.1 mg/kg Chemical: Arsenic
- IR = 50 mg/day
- EF = 80 days/year
- ED = 15 years
- FI = 1
- CF = 1.0E-06 kg/mg
- BW = 70 kg
- ATc = 25550 days
- ATnc = 5475 days
- CSFo = 1.5E+00 (mg/kg/day)⁻¹
- RfDo = 3.0E-04 (mg/kg/day)

CLIENT: NCBC DAVISVILLE, RHODE ISLAND		JOB NUMBER: 1511
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SEDIMENT ADULT RECREATIONAL USER - SHELL FISHING		
BASED ON: USEPA, DEC. 1989		
BY: R. JUPIN	CHECKED BY: 	DATE: 12/28/06

EXAMPLE CARCINOGENIC CALCULATION

$$IEX_c = \frac{3.1 \text{ mg/kg} \times 50 \text{ mg/day} \times 80 \text{ days/year} \times 15 \text{ years} \times 1 \times 1.0E-06 \text{ kg/mg}}{70 \text{ kg} \times 25550 \text{ days}}$$

$$IEX_c = 1.04E-07 \text{ mg/kg/day}$$

$$ICLR = 1.04E-07 \text{ mg/kg/day} \times 1.50E+00 \text{ (mg/kg/day)}^{-1} = \text{Incremental Lifetime Cancer Risk}$$

$$ICLR = 1.56E-07$$

EXAMPLE NONCARCINOGENIC CALCULATION

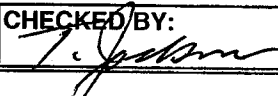
$$IEX_{nc} = \frac{3.1 \text{ mg/kg} \times 50 \text{ mg/day} \times 80 \text{ days/year} \times 15 \text{ years} \times 1 \times 1.0E-06 \text{ kg/mg}}{70 \text{ kg} \times 5475 \text{ days}}$$

$$IEX_{nc} = 4.85E-07 \text{ mg/kg/day}$$

$$HQ = \frac{4.85E-07 \text{ mg/kg/day}}{3.00E-04 \text{ (mg/kg/day)}} = \text{Hazard Quotient}$$

$$HQ = 1.62E-03$$

CALCULATION WORKSHEET

CLIENT: NCBC DAVISVILLE, RHODE ISLAND		JOB NUMBER: 1511
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SEDIMENT ADULT RECREATIONAL USER -SHELL FISHING		
BASED ON: U.S. EPA, JULY 2004		
BY: R. JUPIN	CHECKED BY: 	DATE: 12/28/06

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from dermal contact with sediment by an adult recreational user while shell fishing.

EQUATION:
$$DEX = \frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

Where:

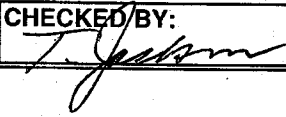
- DEX = estimated exposure intake (mg/kg/day)
- Cs = exposure point concentration in soil/sediment (mg/kg)
- CF = conversion factor (1.0E-6 kg/mg)
- SA = skin surface available for contact (cm²/day)
- ABS = absorption factor (unitless)
- AF = adherence factor (mg/cm²)
- EF = exposure frequency (days/year)
- ED = exposure duration (years)
- BW = body weight (kg)
- AT = averaging time (days)
- CSFd = dermal carcinogenic slope factor ((mg/kg/day)⁻¹)
- RfDd = dermal noncarcinogenic reference dose (mg/kg/day)

RISKS:

- ICLR (Carcinogens) = Intake (mg/kg/day) x CSFd (mg/kg/day)⁻¹
- HQ (Noncarcinogens) = Intake (mg/kg/day) / RfDd (mg/kg/day)

ASSUMPTIONS:

- Cs = 3.1 mg/kg Chemical: Arsenic
- CF = 1.0E-06 kg/mg
- SA = 6073 cm²/day
- AF = 0.335 mg/cm²
- ABS = 0.03
- EF = 80 days/year
- ED = 15 years
- BW = 70 kg
- ATc = 25550 days
- ATnc = 5475 days
- CSFd = 1.5E+00 (mg/kg/day)⁻¹
- RfDd = 3.0E-04 (mg/kg/day)

CLIENT: NCBC DAVISVILLE, RHODE ISLAND		JOB NUMBER: 1511
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SEDIMENT ADULT RECREATIONAL USER -SHELL FISHING		
BASED ON: U.S. EPA, JULY 2004		
BY: R. JUPIN	CHECKED BY: 	DATE: 12/28/06

EXAMPLE CARCINOGENIC CALCULATION

$$DEXc = \frac{3.1 \text{ mg/kg} \times 1.0E-06 \text{ kg/mg} \times 6073 \text{ cm}^2/\text{day} \times 0.335 \text{ mg/cm}^2 \times 0.03 \times 80 \text{ days/year} \times 15 \text{ years}}{70 \text{ kg} \times 25550 \text{ days}}$$

$$DEXc = 1.27E-07 \text{ mg/kg/day}$$

$$ICLR = 1.27E-07 \text{ mg/kg/day} \times 1.50E+00 \text{ (mg/kg/day)}^{-1} = \text{Incremental Lifetime Cancer Risk}$$

$$ICLR = 1.90E-07$$

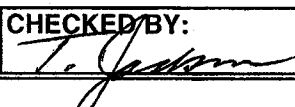
EXAMPLE NONCARCINOGENIC CALCULATION

$$DEXnc = \frac{3.1 \text{ mg/kg} \times 1.0E-06 \text{ kg/mg} \times 6073 \text{ cm}^2/\text{day} \times 0.335 \text{ mg/cm}^2 \times 0.03 \times 80 \text{ days/year} \times 15 \text{ years}}{70 \text{ kg} \times 5475 \text{ days}}$$

$$DEXnc = 5.92E-07 \text{ mg/kg/day}$$

$$HQ = 5.92E-07 \text{ mg/kg/day} / 3.00E-04 \text{ (mg/kg/day)} = \text{Hazard Quotient}$$

$$HQ = 1.97E-03$$

CLIENT: NCBC DAVISVILLE, RHODE ISLAND		JOB NUMBER: 1511
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF FISH/SHELLFISH ADULT RECREATIONAL USER		
BASED ON: USEPA, DEC. 1989		
BY: R. JUPIN	CHECKED BY: 	DATE: 12/28/06

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from incidental ingestion of shellfish.

EQUATION:
$$IEX = \frac{CF_{fish} \times IR \times EF \times ED \times FI}{BW \times AT}$$

Where:

- IEX = estimated exposure intake (mg/kg/day)
- CF_{fish} = exposure point concentration in fish tissue(mg/kg)
- IR = incidental soil ingestion rate (kg/meal)
- EF = exposure frequency (meals/year)
- ED = exposure duration (years)
- FI = fraction ingested from contaminated source (unitless)
- BW = body weight (kg)
- AT = averaging time (days)
- CSFo = oral carcinogenic slope factor ((mg/kg/day)⁻¹)
- RfDo = oral noncarcinogenic reference dose (mg/kg/day)

RISKS:

ICLR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)⁻¹
 HQ (Noncarcinogens) = Intake (mg/kg/day) / RfDo (mg/kg/day)

ASSUMPTIONS:

- CF_{fish} = 2.5 mg/kg Chemical: Arsenic
- IR = 0.026 kg/meal
- EF = 350 meals/year
- ED = 15 years
- FI = 0.5 unitless
- BW = 70 kg
- ATc = 25550 days
- ATnc = 5475 days
- CSFo = 1.5E+00 (mg/kg/day)⁻¹
- RfDo = 3.0E-04 (mg/kg/day)

CLIENT: NCBC DAVISVILLE, RHODE ISLAND		JOB NUMBER: 1511
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF FISH/SHELLFISH ADULT RECREATIONAL USER		
BASED ON: USEPA, DEC. 1989		
BY: R. JUPIN	CHECKED BY: <i>R. Jupin</i>	DATE: 12/28/06

EXAMPLE CARCINOGENIC CALCULATION

$$\text{IEXc} = \frac{2.5 \text{ mg/kg} \times 0.026 \text{ kg/meal} \times 350 \text{ meals/year} \times 15 \text{ years} \times 0.5}{70 \text{ kg} \times 25550 \text{ days}}$$

$$\text{IEXc} = 9.54\text{E-}05 \text{ mg/kg/day}$$

$$\text{ICLR} = 9.54\text{E-}05 \text{ mg/kg/day} \times 1.50\text{E+}00 \text{ (mg/kg/day)}^{-1} = \text{Incremental Lifetime Cancer Risk}$$

$$\text{ICLR} = 1.43\text{E-}04$$

EXAMPLE NONCARCINOGENIC CALCULATION

$$\text{IEXnc} = \frac{2.5 \text{ mg/kg} \times 0.026 \text{ kg/meal} \times 350 \text{ meals/year} \times 15 \text{ years} \times 0.5 \text{ unitless}}{70 \text{ kg} \times 5475 \text{ days}}$$

$$\text{IEXnc} = 4.45\text{E-}04 \text{ mg/kg/day}$$

$$\text{HQ} = 4.45\text{E-}04 \text{ mg/kg/day} / 3.00\text{E-}04 \text{ (mg/kg/day)} = \text{Hazard Quotient}$$

$$\text{HQ} = 1.5\text{E+}00$$

ATTACHMENT 6

REFERENCE SHELLFISH CONCENTRATIONS

TABLE 1
 CONCENTRATION OF ARSENIC IN NARRAGANSETT BAY SEDIMENTS
 PAGE 1 OF 2

Data Group	Sampling Year	Station Name	Sampling Collection Date	Latitude Decimal Degrees	Longitude Decimal Degrees	Analyte Name	Analyte Concentration	Units
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0001-B	8/18/2000	41.466	-71.417	Arsenic	4	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0003-A	8/1/2000	41.479	-71.326	Arsenic	6	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0007-A	8/1/2000	41.494	-71.324	Arsenic	7	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0009-B	7/25/2000	41.473	-71.199	Arsenic	2	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0011-A	8/1/2000	41.515	-71.366	Arsenic	2	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0013-A	7/25/2000	41.514	-71.202	Arsenic	2	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0015-B	8/18/2000	41.567	-71.422	Arsenic	6	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0017-B	8/18/2000	41.554	-71.314	Arsenic	9	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0019-A	7/24/2000	41.559	-71.213	Arsenic	1	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0021-A	8/17/2000	41.597	-71.366	Arsenic	9	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0023-A	7/27/2000	41.596	-71.239	Arsenic	7	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0025-A	8/9/2000	41.659	-71.444	Arsenic	11	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0027-A	8/17/2000	41.621	-71.358	Arsenic	9	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0029-A	7/24/2000	41.614	-71.24	Arsenic	2	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0031-A	8/17/2000	41.667	-71.372	Arsenic	3	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0033-A	7/19/2000	41.666	-71.242	Arsenic	3	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0035-A	8/9/2000	41.696	-71.451	Arsenic	10	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0037-A	8/16/2000	41.708	-71.355	Arsenic	2	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0039-A	8/11/2000	41.701	-71.22	Arsenic	10	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0041-A	8/16/2000	41.73	-71.379	Arsenic	4	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0043-C	8/11/2000	41.722	-71.262	Arsenic	6	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0045-A	7/31/2000	41.771	-71.319	Arsenic	7	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0047-A	8/16/2000	41.825	-71.385	Arsenic	2	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0002-A	8/2/2001	41.471	-71.409	Arsenic	4	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0004-B	8/1/2001	41.471	-71.206	Arsenic	6	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0006-A	7/31/2001	41.507	-71.358	Arsenic	8	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0008-A	8/1/2001	41.496	-71.222	Arsenic	4	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0010-A	7/30/2001	41.54	-71.409	Arsenic	3	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0012-A	7/31/2001	41.529	-71.319	Arsenic	10	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0014-A	7/30/2001	41.578	-71.441	Arsenic	0	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0016-A	7/20/2001	41.563	-71.359	Arsenic	4	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0018-A	7/12/2001	41.566	-71.214	Arsenic	5	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0020-A	7/30/2001	41.612	-71.407	Arsenic	9	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0022-A	7/20/2001	41.61	-71.299	Arsenic	8	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0024-A	7/12/2001	41.592	-71.21	Arsenic	3	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0026-A	7/30/2001	41.641	-71.402	Arsenic	7	ug/g

TABLE 1
 CONCENTRATION OF ARSENIC IN NARRAGANSETT BAY SEDIMENTS
 PAGE 2 OF 2

Data Group	Sampling Year	Station Name	Sampling Collection Date	Latitude Decimal Degrees	Longitude Decimal Degrees	Analyte Name	Analyte Concentration	Units
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0028-A	7/12/2001	41.644	-71.272	Arsenic	9	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0030-A	7/27/2001	41.667	-71.444	Arsenic	13	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0032-A	7/16/2001	41.677	-71.339	Arsenic	12	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0034-A	8/1/2001	41.683	-71.217	Arsenic	10	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0036-A	7/27/2001	41.691	-71.39	Arsenic	11	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0038-A	7/16/2001	41.701	-71.31	Arsenic	12	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0040-A	7/11/2001	41.762	-71.318	Arsenic	3	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0042-A	7/23/2001	41.801	-71.395	Arsenic	9	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0044-B	7/11/2001	41.761	-71.285	Arsenic	4	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0046-A	7/23/2001	41.81	-71.394	Arsenic	16	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0048-A	7/23/2001	41.846	-71.372	Arsenic	20	ug/g
EMAP Virginian Province	1990	VA90-070	7/28/1990	41.641	-71.3	Arsenic	6.65	ug/g
EMAP Virginian Province	1990	VA90-071	9/24/1990	41.498	-71.402	Arsenic	9.18	ug/g
EMAP Virginian Province	1991	VA91-417	8/11/1991	41.641	-71.216	Arsenic	5.3	ug/g
EMAP Virginian Province	1992	VA92-566	8/15/1992	41.583	-71.233	Arsenic	8.41	ug/g
EMAP Virginian Province	1993	VA93-718	8/14/1993	41.571	-71.351	Arsenic	2.96	ug/g
EMAP Virginian Province	1993	VA93-725	8/15/1993	41.812	-71.398	Arsenic	5.64	ug/g

Source: EPA's National Coastal Assessment Program at: <http://oaspub.epa.gov/coastal/coast.search>.

TABLE 2
 CONCENTRATION OF MERCURY IN NARRAGANSETT BAY SEDIMENTS
 PAGE 1 OF 2

Data Group	Sampling Year	Station Name	Sampling Collection Date	Latitude Decimal Degrees	Longitude Decimal Degrees	Analyte Name	Analyte Concentration	Units
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0001-B	8/18/2000	41.466	-71.417	Mercury	0.01	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0003-A	8/1/2000	41.479	-71.326	Mercury	0.2	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0007-A	8/1/2000	41.494	-71.324	Mercury	0.3	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0009-B	7/25/2000	41.473	-71.199	Mercury	0	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0011-A	8/1/2000	41.515	-71.366	Mercury	0.04	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0013-A	7/25/2000	41.514	-71.202	Mercury	0	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0015-B	8/18/2000	41.567	-71.422	Mercury	0.13	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0017-B	8/18/2000	41.554	-71.314	Mercury	0.16	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0019-A	7/24/2000	41.559	-71.213	Mercury	0	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0021-A	8/17/2000	41.597	-71.366	Mercury	0.25	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0023-A	7/27/2000	41.596	-71.239	Mercury	0.18	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0025-A	8/9/2000	41.659	-71.444	Mercury	1.82	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0027-A	8/17/2000	41.621	-71.358	Mercury	0.26	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0029-A	7/24/2000	41.614	-71.24	Mercury	0.04	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0031-A	8/17/2000	41.667	-71.372	Mercury	0.07	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0033-A	7/19/2000	41.666	-71.242	Mercury	0.17	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0035-A	8/9/2000	41.696	-71.451	Mercury	1.49	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0037-A	8/16/2000	41.708	-71.355	Mercury	0.05	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0039-A	8/11/2000	41.701	-71.22	Mercury	0.98	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0041-A	8/16/2000	41.73	-71.379	Mercury	0.22	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0043-C	8/11/2000	41.722	-71.262	Mercury	0.66	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0045-A	7/31/2000	41.771	-71.319	Mercury	0.27	ug/g
National Coastal Assessment-Northeast/Rhode Island	2000	RI00-0047-A	8/16/2000	41.825	-71.385	Mercury	0.1	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0002-A	8/2/2001	41.471	-71.409	Mercury	0.03	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0004-B	8/1/2001	41.471	-71.206	Mercury	0	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0006-A	7/31/2001	41.507	-71.358	Mercury	0.09	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0008-A	8/1/2001	41.496	-71.222	Mercury	0	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0010-A	7/30/2001	41.54	-71.409	Mercury	0.06	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0012-A	7/31/2001	41.529	-71.319	Mercury	0.15	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0014-A	7/30/2001	41.578	-71.441	Mercury	0.04	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0016-A	7/20/2001	41.563	-71.359	Mercury	0.07	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0018-A	7/12/2001	41.566	-71.214	Mercury	0.07	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0020-A	7/30/2001	41.612	-71.407	Mercury	0.26	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0022-A	7/20/2001	41.61	-71.299	Mercury	0.17	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0024-A	7/12/2001	41.592	-71.21	Mercury	0.06	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0026-A	7/30/2001	41.641	-71.402	Mercury	0.16	ug/g

TABLE 2
 CONCENTRATION OF MERCURY IN NARRAGANSETT BAY SEDIMENTS
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Data Group	Sampling Year	Station Name	Sampling Collection Date	Latitude Decimal Degrees	Longitude Decimal Degrees	Analyte Name	Analyte Concentration	Units
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0028-A	7/12/2001	41.644	-71.272	Mercury	0.4	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0030-A	7/27/2001	41.667	-71.444	Mercury	0.95	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0032-A	7/16/2001	41.677	-71.339	Mercury	0.52	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0034-A	8/1/2001	41.683	-71.217	Mercury	0.45	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0036-A	7/27/2001	41.691	-71.39	Mercury	0.4	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0038-A	7/16/2001	41.701	-71.31	Mercury	0.6	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0040-A	7/11/2001	41.762	-71.318	Mercury	0.04	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0042-A	7/23/2001	41.801	-71.395	Mercury	0.03	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0044-B	7/11/2001	41.761	-71.285	Mercury	0.09	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0046-A	7/23/2001	41.81	-71.394	Mercury	0.56	ug/g
National Coastal Assessment-Northeast/Rhode Island	2001	RI01-0048-A	7/23/2001	41.846	-71.372	Mercury	1.51	ug/g
EMAP Virginian Province	1990	VA90-070	7/28/1990	41.641	-71.3	Mercury	0.202	ug/g
EMAP Virginian Province	1990	VA90-071	9/24/1990	41.498	-71.402	Mercury	0.15	ug/g
EMAP Virginian Province	1991	VA91-417	8/11/1991	41.641	-71.216	Mercury	0.182	ug/g
EMAP Virginian Province	1992	VA92-566	8/15/1992	41.583	-71.233	Mercury	0.133	ug/g
EMAP Virginian Province	1993	VA93-718	8/14/1993	41.571	-71.351	Mercury	0.172	ug/g
EMAP Virginian Province	1993	VA93-725	8/15/1993	41.812	-71.398	Mercury	0.586	ug/g

Source: EPA's National Coastal Assessment Program at: <http://oaspub.epa.gov/coastal/coast.search>.

**TABLE 3
CONCENTRATIONS OF ARSENIC IN NARAFANSETT BAY SHELLFISH**

Location	Year	Sample ID	Concentration	Station Average	Latitude	Longitude
Dyer Island	1986	AAA134	11	11.29	41.60483	-71.3052
		AAA135	9.6		41.60483	-71.3052
		AAA133	11		41.60483	-71.3052
	1987	AAC242	12		41.60483	-71.3052
		AAC243	11		41.60483	-71.3052
		AAC244	12		41.60483	-71.3052
	1988	AAI060	10		41.60483	-71.3052
		AAI061	11		41.60483	-71.3052
		AAI062	10		41.60483	-71.3052
	1989	AAJ796	14		41.60483	-71.3052
		AAJ797	14		41.60483	-71.3052
		AAJ798	10		41.60483	-71.3052
	1990	MW0004529	8.73		41.60483	-71.3052
		MW0004530	8.93		41.60483	-71.3052
		MW0004531	8.45		41.60483	-71.3052
1993	MW008112	18	41.60483	-71.3052		
1994	MW009106	11.79	41.60483	-71.3052		
1995	K9569	11.532	41.60483	-71.3052		
1997	K10340	15.8	41.60483	-71.3052		
1999	K11191	10.5	41.60483	-71.3052		
2001	NST0843	7.68	41.60483	-71.3052		
Dutch Island	1986	AAA137	12	12.50	41.49117	-71.4002
		AAA138	11		41.49117	-71.4002
		AAA136	11		41.49117	-71.4002
	1987	AAC251	10		41.49117	-71.4002
		AAC252	12		41.49117	-71.4002
		AAC253	12		41.49117	-71.4002
	1989	AAJ793	13		41.49117	-71.4002
		AAJ794	11		41.49117	-71.4002
		AAJ795	14		41.49117	-71.4002
	1991	MW0005826	14		41.49117	-71.4002
		MW0005827	15		41.49117	-71.4002
		MW0005828	13		41.49117	-71.4002
	1992	MW006128	12.24		41.49117	-71.4002
	1993	MW008111	14		41.49117	-71.4002
	1994	MW009105	13.29		41.49117	-71.4002
1995	K9567	12.952	41.49117	-71.4002		
1996	K10023	12.5	41.49117	-71.4002		
1997	K10355	13.2	41.49117	-71.4002		
1999	K11122	11.1	41.49117	-71.4002		
2001	NST0840	12.8	41.49117	-71.4002		
Prudence Island	1989	AAJ800	8.6	9.57	41.65317	-71.3558
		AAJ801	7.1		41.65317	-71.3558
		AAJ799	7.4		41.65317	-71.3558
	1990	MW0004523	6.77		41.65317	-71.3558
		MW0004524	7.37		41.65317	-71.3558
		MW0004525	7.75		41.65317	-71.3558
	1991	MW0005832	11		41.65317	-71.3558
		MW0005833	10		41.65317	-71.3558
		MW0005834	9.5		41.65317	-71.3558
	1992	MW006045	11.02		41.65317	-71.3558
	1993	MW008110	14		41.65317	-71.3558
	1995	K9571	11.091		41.65317	-71.3558
	1996	K10035	12.2		41.65317	-71.3558
1997	K10342	11.7	41.65317	-71.3558		
1999	K11196	9.51	41.65317	-71.3558		
2001	NST0847	8.03	41.65317	-71.3558		
		Total Average =		11.23		

Source: NOAA Mussel Watch Program at:
<http://ccma.nos.noaa.gov/stressors/pollution/nsand/>