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FINAL RECORD OF DECISION BUILDING 82 HANGAR 2 NAS SOUTH WEYMOUTH MA

9/1/2012

TETRA TECH

RECORD OF DECISION

BUILDING 82 (HANGAR 2)

FORMER NAVAL AIR STATION SOUTH WEYMOUTH,
WEYMOUTH, MASSACHUSETTS
SEPTEMBER 2012

Naval Facilities Engineering Command

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ACRONYMS

AOC	Area of Concern
ARAR	Applicable or Relevant and Appropriate Requirement
AST	Above-ground Storage Tank
bgs	Below Ground Surface
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CDI	Chronic Daily Intake
CFR	Code of Federal Regulations
COC	Chemical of Concern
COPC	Chemical of Potential Concern
CSF	Cancer Slope Factor
CSM	Conceptual Site Model
DCA	Dichloroethane
DCE	Dichloroethene
DO	Dissolved Oxygen
DPT	Direct Push Technology
EBS	Environmental Baseline Survey
EPA	Environmental Protection Agency
EPC	Exposure Point Concentration
EPH	Extractable Petroleum Hydrocarbons
ERA	Ecological Risk Assessment
FDS	Floor Drain System
FFA	Federal Facility Agreement
FS	Feasibility Study
GTM	Gas Trap Manhole
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
ILCR	Incremental Lifetime Cancer Risk
IR	Installation Restoration
ISCO	In-situ Chemical Oxidation
IUR	Inhalation Unit Risk
LRA	Limited Removal Action
LUC	Land Use Control
MassDEP	Massachusetts Department of Environmental Protection

MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MCP	Massachusetts Contingency Plan
MSL	Mean Sea Level
MTBE	Methyl tert-butyl ether
NAPL	Non-Aqueous Phase Liquid
NAS	Naval Air Station
NCP	National Contingency Plan
NGVD	National Geodetic Vertical Datum
NNPA	N-nitroso-di-n-propylamine
NPW	Net Present Worth
NTCRA	Non-time critical removal action
O&M	Operation and Maintenance
ORP	Oxidation Reduction Potential
OU	Operable Unit
OWS	Oil-Water Separator
PA	Preliminary Assessment
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene
PDWSA	Potential Drinking Water Source Area
PRG	Preliminary Remediation Goal
RAB	Restoration Advisory Board
RAO	Remedial Action Objective
RD	Remedial Design
RfC	Reference Concentration
RfD	Reference Dose
RG	Remediation Goal
RI	Remedial Investigation
RIA	Review Item Area
RME	Reasonable Maximum Exposure
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SB	Soil Boring
SMP	Site Management Plan
SSTTDC	South Shore Tri-town Development Corporation
SVOC	Semi-Volatile Organic Compound

TACAN	Tactical Air Navigation
TCA	Trichloroethane
TCE	Trichloroethene
TPH	Total Petroleum Hydrocarbons
USGS	United States Geological Survey
UST	Underground Storage Tank
VCD	Village Center District
VOC	Volatile Organic Compound
VPH	Volatile Petroleum Hydrocarbons
µg/L	micrograms/liter

1.0 DECLARATION

1.1 SITE NAME AND LOCATION

The Building 82 Site, which is also known as Operable Unit (OU) 11 and Installation Restoration (IR) Site 10, is located at the former Naval Air Station (NAS) South Weymouth, Weymouth, Massachusetts. The former NAS South Weymouth has been assigned United States Environmental Protection Agency (EPA) ID number MA2170022022.

FIGURE 1-1. BUILDING 82 LOCATION MAP

1.2 STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) presents the Selected Remedy for the Building 82 Site, which was chosen by the Navy and EPA in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA) and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on information contained in the Administrative Record for the site. The Massachusetts Department of Environmental Protection (MassDEP) concurs with the Selected Remedy, as shown in Appendix A. Figure 1-1 depicts the location of Building 82 Site within former NAS South Weymouth.

1.3 ASSESSMENT OF SITE

The response action selected in this ROD is necessary to protect the public health and welfare or the environment from actual or threatened releases of hazardous substances into the environment. A CERCLA action is required because concentrations of chlorinated solvents and manganese in groundwater would pose unacceptable risks to human health if site groundwater were to be used as a production, supply, or irrigation water source.

1.4 DESCRIPTION OF SELECTED REMEDY

The major components of the selected remedy for the Building 82 Site include the following:

- In-situ chemical oxidation (ISCO) of volatile organic compounds (VOCs) in shallow and deep groundwater.
- Implementation of land use controls (LUCs) on an interim basis to prohibit the installation of groundwater extraction wells for production, supply, or irrigation at the Site and require that EPA and MassDEP approval of construction dewatering plans is obtained prior to conducting any construction dewatering activities at the Site.
- Performance monitoring to evaluate the progress of remediation and long-term monitoring for other analytes of interest.

The Selected Remedy eliminates potential unacceptable human health risks associated with extraction of site groundwater for production, supply or irrigation use by reducing site-wide contaminant concentrations to risk-based remediation goals (RGs). Implementation of this remedy is expected to achieve substantial long-term risk reduction and will allow for use of the site for all potential future uses consistent with the established zoning and the Reuse Plan. The Building 82 Site area is zoned for mixed uses including high-density housing, offices, commercial and retail spaces.

No unacceptable risks associated with site soil, sediment, or surface water were identified. No unacceptable risks associated with air are anticipated. The remediation at Building 82 will not adversely impact the current use and reasonably anticipated future use of the site. This ROD documents the final remedial action for the Building 82 Site and does not include or adversely impact any other sites at former NAS South Weymouth.

1.5 STATUTORY DETERMINATIONS

The Selected Remedy is protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate to the remedial action, satisfies the statutory requirements of CERCLA §121 and the regulatory requirements of the NCP, is cost-effective, and utilizes permanent solutions to the maximum extent practicable. This remedy also satisfies the statutory preference for treatment as a principal element of the remedy (i.e., reduces the toxicity, mobility, and/or volume of hazardous substances, pollutants, and contaminants as a principal element through treatment).

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on site in excess of levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within 5 years of initiation of the remedial action and every 5 years thereafter to ensure that the remedy is, or will be, protective of human health and the environment.

1.6 ROD DATA CERTIFICATION CHECKLIST

The locations in Section 2.0, Decision Summary, of the information required to be included in the ROD are summarized in Table 1-1. Additional information can be found in the Administrative Record file for former NAS South Weymouth.

TABLE 1-1. ROD DATA CERTIFICATION CHECKLIST	
DATA	**LOCATION IN ROD**
Chemicals of concern (COCs) and their respective concentrations	Sections 2.5 and 2.7
Baseline risk represented by the COCs	Section 2.7
Cleanup levels established for COCs and the basis for these levels	Section 2.7 and 2.8
How source materials constituting principal threats are addressed	Section 2.11
Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the risk assessment	Section 2.6
Potential land and groundwater uses that will be available at the site as a result of the Selected Remedy	Section 2.12.3
Estimated capital, operation and maintenance (O&M), and total net present worth (NPW) costs; discount rate; and number of years over which the remedy costs are projected	Appendix B
Key factors that led to the selection of the remedy	Section 2.12.1

1.7 AUTHORIZING SIGNATURES

9/27/12

David A. Barney
BRAC Environmental Coordinator
BRAC PMO Northeast
U. S. Navy

Date

9/28/12

James T. Owens, III
Director, Office of Site Reclamation and Restoration
Region 1 – New England
U. S. Environmental Protection Agency

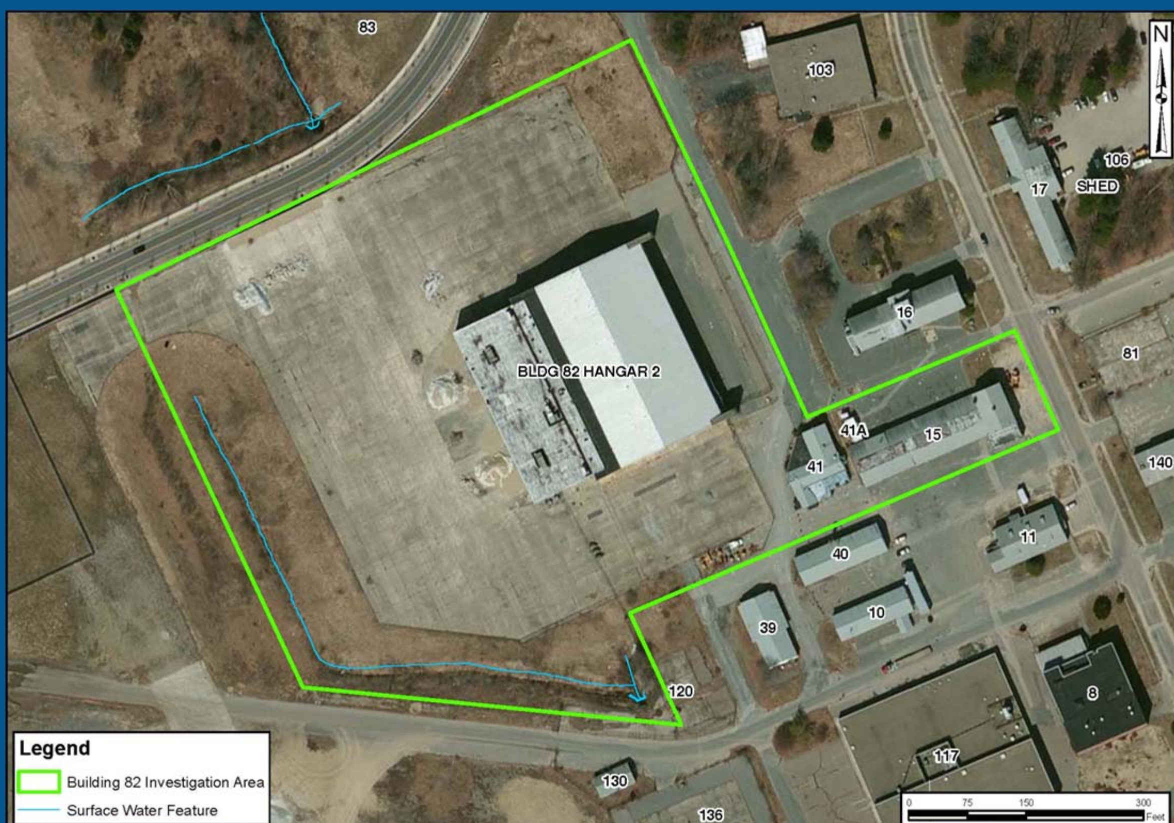
Date

2.0 DECISION SUMMARY

2.1 SITE NAME, LOCATION, AND BRIEF DESCRIPTION

The former NAS South Weymouth (the Base), EPA ID number MA2170022022, is located primarily in the Town of Weymouth, Massachusetts. Portions of the Base extend into the adjacent Towns of Abington and Rockland, Massachusetts. Building 82 (the Site) is located within the Weymouth portion of the Base. Figure 2-1 shows the layout of the site and the buildings within the Building 82 Investigation Area. The Building 82 Investigation Area includes the hangar and Buildings 15 and 41. The Base was developed during the 1940s for dirigible aircraft used to patrol the North Atlantic during World War II. The facility was closed at the end of the war and was reopened in 1953 as a Naval Air Station for aviation training. The Base was in continuous use from that time until it was operationally closed on September 30, 1996, and was administratively closed on September 30, 1997.

FIGURE 2-1. BUILDING 82 SITE PLAN



Building 82, also known as Hangar 2, was constructed in 1956 as an aircraft hangar (maintenance facility) for fixed wing aircraft. It was continuously used by the U.S. Marine Corps for that purpose from 1956 through 1996, when operations at the Base ceased. During that time, oils, lubricants, and solvents necessary for aircraft maintenance were used and stored in the building. Following Base closure Building 82 was used for the storage of miscellaneous Navy-owned vehicles (i.e., plows, backhoes, buses, etc.) until 2000. Building 82 is currently vacant but may be occasionally occupied by personnel during routine building maintenance inspections.

The Building 82 structure is comprised of two main areas, the aircraft hangar and the shop/office area. The aircraft hangar, located in the eastern portion of the building, is a large open area occupying the full height of the hangar building and was used for aircraft maintenance and storage. The shop/office area, located in the western portion of the building, consists of a main level, mezzanines, and an upper level; each level was subdivided into numerous smaller rooms or shops for particular operations. During its use, the main level housed several light industrial operations. The main level included a carburetor shop, plating shop, paint and dope (varnish used to seal aircraft fabric) shop, weld shop, machine shop, structures and hydraulics shop, engine shop, ordnance shop, radio shop, radar shop, electric shop, battery locker, and small arms stores. The mezzanines, which are located above portions of the shop area to the north, west, and south, consisted of office space, a motor generator room, and two transformer switch rooms. The upper level of the shop/office area consisted of office space and classrooms.

Building 41, the former Family Service Center, did not have any identified areas of interest or potential source areas. Building 15 was used as a transportation building and contained an above-ground storage tank (AST), a battery storage room, floor drains and associated piping (some of which originally connected to the storm sewer system), gas trap manhole (also referred to as the oil-water separator [OWS]), and hydraulic lifts.

The former NAS South Weymouth is a closed facility. The environmental investigations and remediation at the base are funded under the Base Realignment and Closure (BRAC) program. The Navy is the lead agency and EPA is the lead regulatory agency for CERCLA activities at the former NAS South Weymouth.

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

Table 2-1 provides brief summaries of previous investigations at the Building 82 Site. Results of these investigations indicated that VOCs are present in groundwater at concentrations exceeding federal maximum contaminant levels (MCL) and risk-based criteria, and manganese is present at concentrations exceeding risk-based criteria. The nature and extent of groundwater contamination is discussed further in Section 2.5.2.

TABLE 2-1. PREVIOUS INVESTIGATIONS AND SITE DOCUMENTATION

INVESTIGATION	DATE	ACTIVITIES
Preliminary Assessment (PA)	1983	The PA included a records search, interviews, and a site walkover. The purposes of the PA were to identity and evaluate past waste practices at former NAS South Weymouth and make an assessment of the associated potential for environmental contamination. As a result of the study, five sites (not including Building 82) were identified for further study.
Maintenance Action	1998	The four interior **floor drain systems** and four gas trap manholes (GTM) at Building 82 were emptied and cleaned. The OWS was disassembled, cleaned, and removed. All connections to the storm sewer system, which were originally believed to have been abandoned in 1977, were plugged with brick and hydraulic cement. Sludge in the gas traps was found to contain high concentrations of three VOCs and one polychlorinated biphenyl (PCB). Samples from five soil borings installed in the vicinity of the floor drains contained chlorinated VOCs, petroleum-related VOCs, and polycyclic aromatic hydrocarbons (PAHs).
Phase I Initial Site Investigation (SI)	1999	Based on the results of the 1998 removal action, seven soil borings were advanced in the area of the four gas traps and OWS, soil samples were collected, and three monitoring wells were installed under the Massachusetts Contingency Plan (MCP).
Maintenance Action for Floor Drain System Removal	2001	The floor drain systems inside Building 82 **were removed**, except for floor drains in the shop/office areas (because of access and structural issues). The stored equipment and hangar floor were decontaminated and asbestos

TABLE 2-1. PREVIOUS INVESTIGATIONS AND SITE DOCUMENTATION		
INVESTIGATION	**DATE**	**ACTIVITIES**
		removed prior to the work. Soil samples were collected for field screening for total petroleum hydrocarbon (TPH) analysis at regular intervals. Confirmatory samples were collected based on the field screening results and other field observations, and analyzed for VOCs, semi-volatile organic compounds (SVOCs), PCBs, metals, extractable petroleum hydrocarbons (EPH) and volatile petroleum hydrocarbons (VPH).
Phase II Environmental Baseline Survey (EBS), Review Item Area (RIA) 30B	2001	Ten soil borings were installed on the edge of the hangar apron and three co-located sediment samples were collected from the drainage ditch west and south of Building 82. Contaminants in the soils included PAHs and metals. RIA 30B soils along the edge of the hangar apron were included in the Building 82 Site; the RIA 30B sediment in the drainage ditch was included as part of Area of Concern (AOC) 61.
Phase II EBS, RIA 30A	2002	Spills on the Building 82 apron were evaluated as RIA 30A during the Phase II EBS program. Two borings were installed to collect soil samples and two monitoring wells were installed. The decision document for RIA 30A recommended that RIA 30A be **combined** with RIA 107 (also designated as spills on the Building 82 apron) and the Building 82 MCP site for further action under CERCLA.
Limited Due Diligence Assessment	2003	Surface **geophysical surveys** (ground-penetrating radar, electromagnetic, and seismic) were performed and four monitoring well pairs were installed. Nine soil borings, including 4 angled borings to reach beneath the building, were advanced to collect soil samples.
AOC 61 Removal Action	2004	A **non-time critical removal action** (NTCRA) was conducted in the drainage ditches and sewers at the Base, including in the vicinity of Building 82. The NTCRA included excavation of 700 linear feet of the drainage ditch south and west of Building 82, and inspection and cleaning of storm sewers crossing the site.
Maintenance Action for Additional Floor Drain System Removal	2007	The six remaining floor drains from the interior of the shop/office area of Building 82 were removed. Lead was detected at a concentration exceeding removal criteria in one area beneath the former floor drains. A 40-square foot area was excavated around the location to a depth of 3 feet below the base of the removed floor drain. Contaminant concentrations in soils were generally an order of magnitude lower than that of the sediment within the floor drains.
Access Road Excavation	2007	Soil in the grassy strip north and northeast of Building 82 was excavated to construct an access road. This work was performed under an easement granted by the Navy to LNR South Shore LLC. Soil from the area of two previous soil borings and surface samples was removed. Excavated soils were screened prior to replacement, and soil exceeding criteria was removed off-site for disposal.
Remedial Investigation (RI)	2010	Nine exposed and six unexposed (e.g. beneath the apron) surface soil samples and 70 subsurface soil samples were collected from 34 borings. The groundwater investigation included groundwater profiling (58 samples from 22 borings), groundwater monitoring well and piezometer installation, hydraulic conductivity testing of 25 wells, sampling of all new and existing monitoring wells, and five rounds of water level measurements. The surface water/sediment investigation included three collocated surface water and sediment samples in the drainage ditches, and four surface water samples collected from the storm sewers. All samples collected as part of the RI field program, plus samples collected from previous investigations, were **evaluated** to determine the nature and extent of contamination. A human health risk assessment (HHRA) and ecological risk assessment (ERA) were performed using data deemed suitable for risk assessment purposes.
RI Addendum	2011	A **supplemental investigation** was conducted to fill data gaps identified in the 2010 RI. The work included re-sampling specific monitoring wells to determine whether PCBs were detected and additional groundwater profiling and monitoring well sampling to determine the extent of the trichloroethene (TCE) plume identified in the RI. Twenty-nine groundwater profiling borings

TABLE 2-1. PREVIOUS INVESTIGATIONS AND SITE DOCUMENTATION		
INVESTIGATION	**DATE**	**ACTIVITIES**
		were advanced and 75 samples collected for VOC analysis. Samples from five monitoring wells were analyzed for VOCs, and samples from five wells were analyzed for total and filtered PCBs.
Maintenance Activities	2011	Additional maintenance activities were performed to mitigate contamination from **hot spots** identified in the RI and in previous maintenance activities. The work included: removal of asbestos-containing material (pavement caulking); removal of GTMs and associated piping; excavation of soil in the western concrete apron as part of a limited removal action (LRA); and excavation of soil from the northern drainage ditch as a maintenance action.
Feasibility Study (FS)	2012	Based on the results of the RI and subsequent sampling, **potential alternatives** to address contaminants were developed and evaluated.

There have been no cited violations under federal or state environmental law or any past or pending enforcement actions pertaining to the cleanup of the Building 82 Site.

2.3 COMMUNITY PARTICIPATION

The Navy has performed public participation activities in accordance with CERCLA and the NCP throughout the CERCLA site cleanup process at former NAS South Weymouth. The Navy released a Community Relations Plan in July 1998 to address community concerns and keep citizens informed about and involved in remediation activities. In September 1995, the Navy initiated a series of public meetings, at which the restoration advisory board (RAB) process was explained; community members were asked to join the RAB. A sufficient number of volunteers were assembled and RAB meetings commenced in March 1996. Since that time, RAB meetings have been held on a monthly or bimonthly basis to keep the RAB and local community informed of IR Program activities. The Navy has used these meetings to provide the public with updates of IR Program activities. RAB meetings held during January 2003, September 2006, November 2007, September 2010, and September 2011 included presentations specifically highlighting the Building 82 Site. Other RAB meetings included brief updates of Site activities as they occurred.

The Navy has generated an index of the Administrative Record to identify the documents used in the decision-making process for this Building 82 Site ROD. The index is attached to this ROD. The Administrative Record files are available for public review at several locations, including the Tufts Library in Weymouth, Massachusetts; the Abington Public Library in Abington, Massachusetts; the Hingham Public Library in Hingham, Massachusetts; the Rockland Memorial Library in Rockland, Massachusetts; and the U.S. Department of the Navy, Caretaker Site Office, South Weymouth, Massachusetts. Site documents and RAB meeting information are available on the Department of the Navy BRAC Program Management Office website, www.bracpmo.navy.mil.

In accordance with Sections 113 and 117 of CERCLA, the Navy provided a public comment period from August 1 to August 31, 2012, for the proposed alternative described in the Proposed Plan for the Building 82 Site. A public meeting to present the Proposed Plan was held on August 9, 2012, at the New England Wildlife Center, Weymouth. **Public notice** of the meeting and availability of documents was published in the *Patriot Ledger* and the *Weymouth News* on August 1, 2012 and in the *Rockland Mariner/Standard* on August 3, 2012.

2.4 SCOPE AND ROLE OF OPERABLE UNIT

The Building 82 Site is part of the Navy IR Program, a comprehensive environmental investigation and cleanup program currently being performed at former NAS South Weymouth under CERCLA authority pursuant to the Federal Facility Agreement (FFA) signed by the Navy and the EPA in April 2000. Eleven IR sites have been identified at former NAS South Weymouth. Building 82 is IR Site 10.

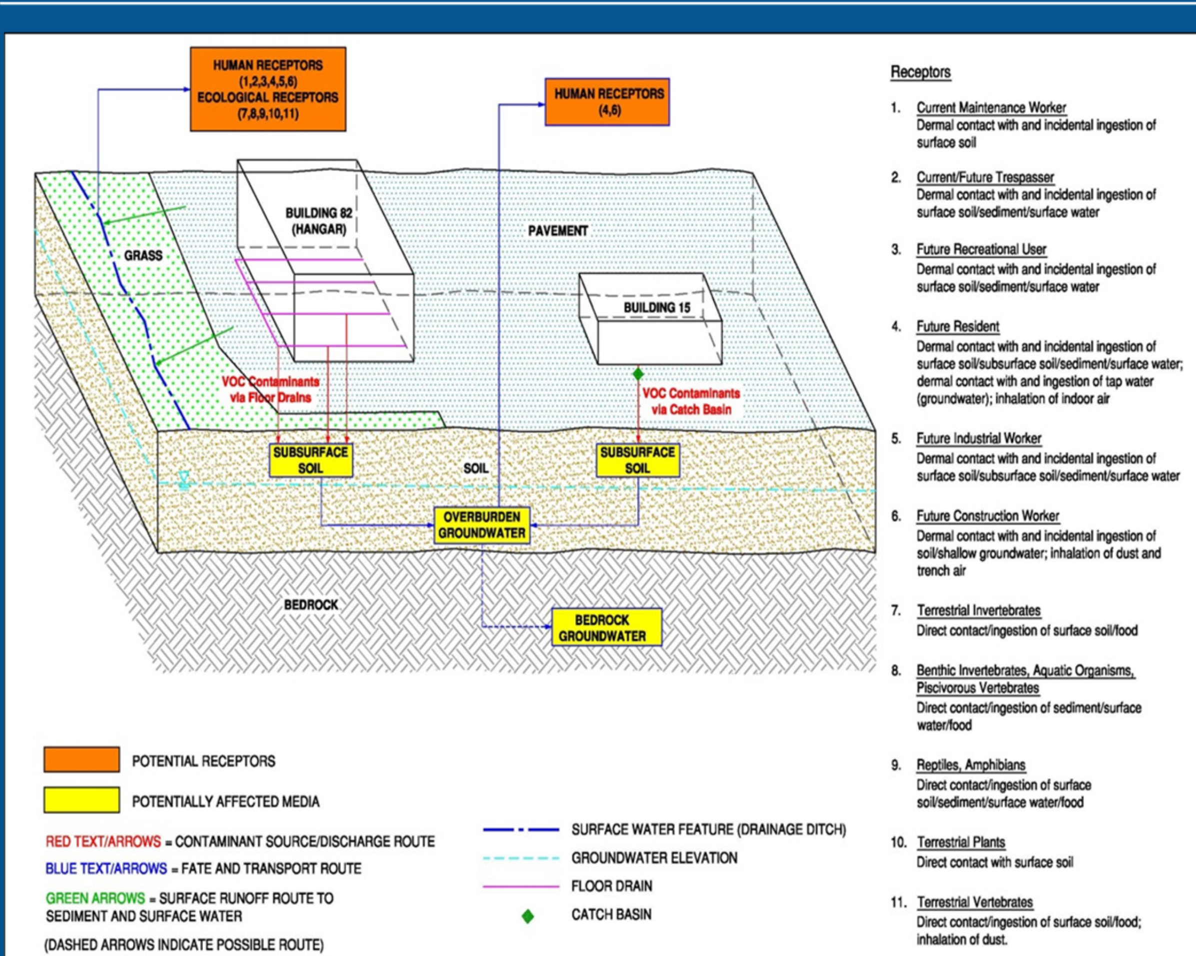
The RODs for IR Sites 1 through 5, 7 and 8 have been finalized and signed by the Navy and EPA. IR Site 6 was transferred out of the IR program and addressed as a petroleum site under the underground storage tank (UST) program, consistent with the MCP. IR Site 10 was initially identified as a basewide groundwater site but groundwater was included with the individual IR sites instead. Thus the Building 82 Site was designated as IR Site 10. IR Sites 9 and 11 are in the FS stage of development in the IR program. The Site Management Plan (SMP) for former NAS South Weymouth provides further details on the IR sites, ROD issuance dates (if applicable), and schedule for post-ROD activities. The SMP is updated by the Navy on an annual basis.

Investigations at the Building 82 Site indicated the presence of groundwater contamination from past operating practices that poses unacceptable human health risk to potential future receptors. Contaminants in subsurface soil and other potential sources of contamination have been removed in a series of maintenance and removal actions as described in Table 2-1. The remedy documented in this ROD will achieve the Remedial Action Objectives (RAOs) for the Building 82 Site, as listed in Section 2.8. Implementation of this remedy will allow future residential use of the Site which is consistent with the reasonably anticipated future use as a mixed-use zoning district as well as the overall cleanup strategy for former NAS South Weymouth.

2.5 SITE CHARACTERISTICS

Figure 2-2 presents the Building 82 Site conceptual site model (CSM), which identifies potential contaminant sources, contaminant release mechanisms, transport routes, and receptors under current

FIGURE 2-2. BUILDING 82 SITE CONCEPTUAL SITE MODEL

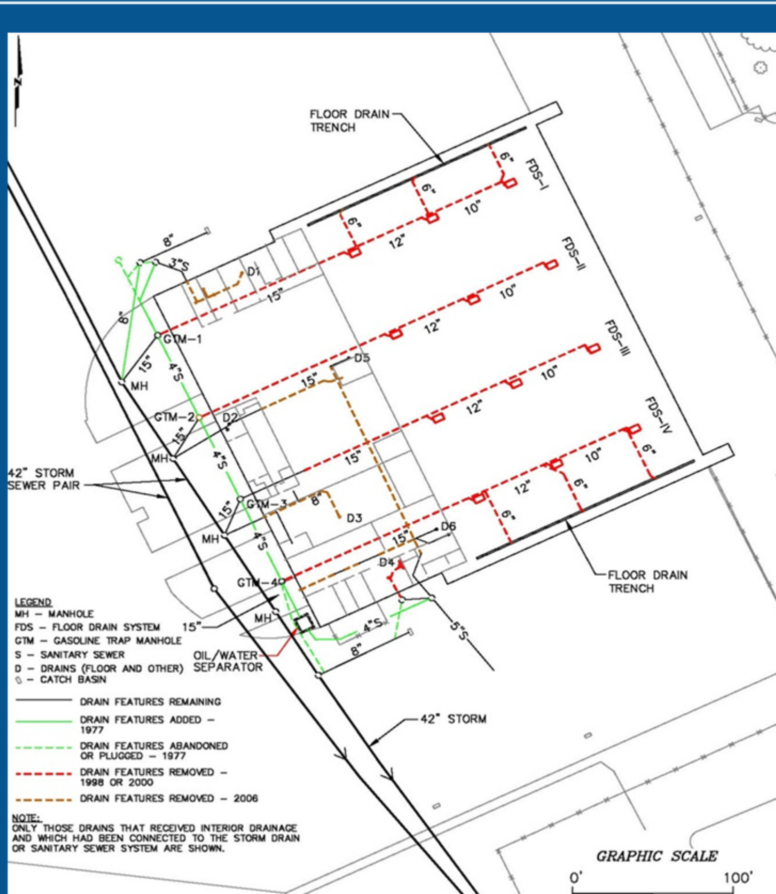


and future land use scenarios. The primary contaminant release and transport mechanisms include releases to the subsurface via the floor drain systems and the catch basins outside the building. Contaminants in the storm drain system may discharge directly to the drainage ditches and off-site surface water, or to the subsurface via leaks through the piping and bedding. Human health and ecological receptors are discussed in Sections 2.7.1 and 2.7.2, respectively.

2.5.1 Physical Characteristics

The Building 82 Site consists of the building itself, the concrete apron surrounding the building to the north, west, and south, and the area immediately surrounding the TCE plume southeast of the building. In addition to the operational areas associated with the building itself, there was a complex network of subsurface drainage structures and pre-construction features underneath the building and the concrete apron as illustrated in Figure 2-3. Many of these features are presumed to still exist, while other features have been altered or removed during Base decommissioning activities. As indicated on Figure 2-3, most of the subsurface drainage pipelines were either plugged or excavated in 1998, 2000, and 2006, as part of an overall Base decommissioning effort implemented by the Navy to position the property for transfer and re-use. The area east of the southern apron of the hangar, including Buildings 15 and 41 and the paved areas surrounding them, is part of the Building 82 Site, as shown in Figure 2-1.

FIGURE 2-3. BUILDING 82 FLOOR DRAIN SYSTEM AND STORM SEWERS



Surface water runoff around the hangar flows into catch basins located on the concrete apron and empties into drain pipes that discharge into the drainage ditches in grassy areas along the northwest and southwest perimeter of the site. The northwestern drainage ditch collects and routes surface water runoff into two parallel 42-inch storm sewers which cross the property in a north-south direction along the western side of the hangar as depicted in Figure 2-3. The southwestern drainage ditch and the 42-inch storm sewers merge south of Building 82 where the surface water empties into the base wide storm drainage system that flows via culverts toward the Tactical Air Navigation (TACAN) outfall drainage system and ultimately discharges into French Stream.

Runoff from the area around Buildings 15 and 41 is also directed to the storm drain system via catch basins that connect to the storm drains and eventually to the outfall south of the Hangar 2 apron. Most of the surface water runoff from the center of Building 15 west to the Building 82 drainage ditches appears to drain into the outfall. Storm drains and catch basins in the vicinity of Building 15 are situated primarily above the water table.

The topography of the Site is relatively level, with ground surface elevations ranging from 152 to 155 feet above mean sea level (MSL). However the elevation of the bottom of the drainage ditches is approximately 145 feet MSL (National Geodetic Vertical Datum (NGVD), 1929).

Three general geologic units have been identified at the Site: fill (artificially placed), overburden (undisturbed), and bedrock. The Site overburden, including the fill layer, consists of approximately 25 to 40 feet of unconsolidated materials. The native overburden materials consist predominately of sand and gravel with varying amounts of silt. The general groundwater **flow direction** is toward the southwest; however, in the southwestern portion of the site the localized overburden groundwater flow diverges from this general flow pattern due to the influence of the two 42-inch diameter storm sewers and a drainage ditch. The depth to groundwater ranges from 2 to 12 feet below ground surface (bgs) during low water conditions and is generally 1 to 2 feet higher during high water conditions.

2.5.2 Nature and Extent and Fate and Transport of Contamination

The results of the RI and RI Addendum are summarized below.

Numerous VOCs were detected in site soil and groundwater and to a lesser extent in surface water. The individual VOCs were generally detected at a low frequency and at relatively low concentrations. Groundwater was the only media which had VOC concentrations exceeding risk-based criteria in more than one sample, particularly TCE which exceeded its preliminary remediation goal (PRG) in 19 of 97 samples.

Numerous SVOCs, mainly PAHs, were detected in site soil and sediment. Fewer SVOCs were detected in groundwater and surface water. The predominant PAHs detected in soil and sediment were benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene. These compounds were most widely detected and present at the highest concentrations in exposed surface soil and sediment. Naphthalene was the most frequently detected PAH in groundwater (occurring in 10 of 84 samples) and was present at concentrations exceeding its PRG in 7 of the 10 samples. Naphthalene was present in groundwater mainly in two areas: downgradient from GTM-2 and floor drain D5.

Pesticides were detected in all media sampled at the Site. However, the pesticides were generally detected infrequently and at low concentrations.

PCBs were detected in all media sampled at the site. Aroclor-1260 was the only PCB detected in all media except deep groundwater and generally at low concentrations. Aroclor-1248 was detected in deep groundwater samples at concentrations exceeding the PRG in 4 of 12 samples, including the upgradient sample location.

Numerous metals were detected in all media sampled at the Site. Four metals (arsenic, manganese, vanadium, and iron) were present in all media at concentrations exceeding screening criteria. However, concentrations of these metals in most samples were less than Base background concentrations (where background values are available), and there was no apparent pattern of distribution of the elevated metals concentrations that would indicate a source of these metals.

The presence of generally low concentrations of VOCs, SVOCs, pesticides, PCBs, and metals in site soil, groundwater, surface water, and sediment appears to be a result of: past activities at the Site relating to its former use as an airplane hangar; the onsite migration of contaminants from off-site sources; and anthropogenic and natural background conditions. Five primary on-site sources of contaminants detected in site soil, groundwater, surface water, and sediment were identified in the RI and include:

- Releases of liquid waste (fuels and solvents) from GTM-2, located immediately west of Building 82 at the terminus of floor drain system (FDS) 2.
- Releases of liquid waste (fuels and solvents) from a section of floor drain D5 between FDS-2 and FDS-3 in the shop area of Building 82.
- Exhaust from aircraft operating at and near the Site.
- Historical leaching of contaminants (PCBs) from the drainage ditch along the western perimeter of the Site.
- Subsurface site features (former roadway and drainage ditches) that had been abandoned prior to construction of the current Hangar 2.

A maintenance action was performed in 2010 to address the GTM and FDS sources of soil contamination described in the RI Report. The GTMs and associated soil were removed, an LRA was performed, and additional sediment was removed from the drainage ditch north of the building. Data gaps identified in the RI Report included further characterization of the nature and extent of the groundwater TCE plume southwest of Building 82, potential leaching of contaminants from soil to groundwater in the vicinity of soil boring (SB) 112 west of Building 82, and determining the presence of PCB contamination in groundwater. The RI Addendum addressed these data gaps as summarized below.

The RI Addendum identified a deep overburden TCE plume, as defined by TCE concentrations greater than the federal drinking water standard or MCL of 5 micrograms/liter (µg/L), extending from the southwest corner of Building 15 toward the outfall where the storm sewer merges with the southwestern drainage ditch. The shallow overburden TCE plume is smaller and appears to be co-located with the storm sewer that transects the apron southwest of Building 82. No VOCs were detected in groundwater samples associated with SB-112. No PCBs were detected in groundwater in either filtered or unfiltered samples from the 2009 supplemental investigation documented in the RI Addendum.

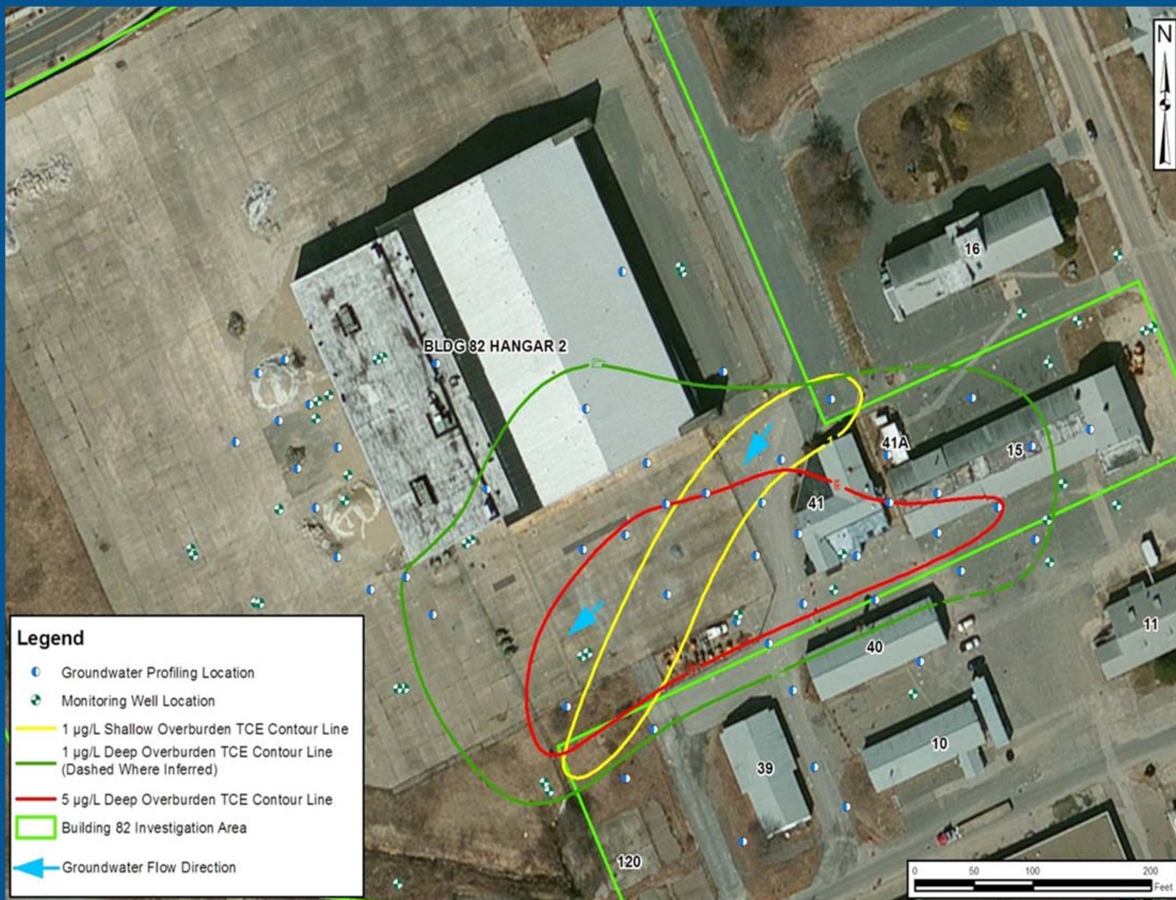
The absence of PCBs in the groundwater samples collected in 2009 suggests that the PCBs previously detected were either intermittent, sorbed onto soil particles in the groundwater (this appears unlikely, as no correlation was found with sample turbidity), or a result of cross-contamination (also unlikely, as two different congeners were found in different wells, and the samples with PCBs were collected over a period of at least 2 weeks).

Figure 2-4 shows the 1 µg/L contour delineating the shallow overburden groundwater TCE plume and the 1 µg/L and 5 µg/L contours delineating the deep overburden groundwater TCE plumes. The position of the TCE plumes strongly suggests that some amount of TCE was released in the catch basin closest to the south side of Building 15. A portion of the TCE may have penetrated through the brick walls or floor of the catch basin and moved with the flow of groundwater toward the west. Another portion of the TCE plume appears to have travelled within the storm sewer north and then west, causing a larger plume with concentrations below 1 µg/L. Shallow groundwater concentrations may have been greatly reduced over time by either preferential groundwater flow or water leaking from storm sewer pipes into the groundwater table. Alternately, TCE in the shallow groundwater may have been naturally degraded because of favorable geochemical conditions.

The absence of tetrachloroethene (PCE) in groundwater at the site and the absence of connecting preferential pathways between the Building 82 and Building 81 sites strongly indicate that the TCE concentrations are not associated with contamination from Building 81.

None of the groundwater concentrations detected are high enough to indicate potential non-aqueous phase liquid (NAPL) contamination.

FIGURE 2-4. SHALLOW AND DEEP OVERBURDEN GROUNDWATER TCE PLUMES



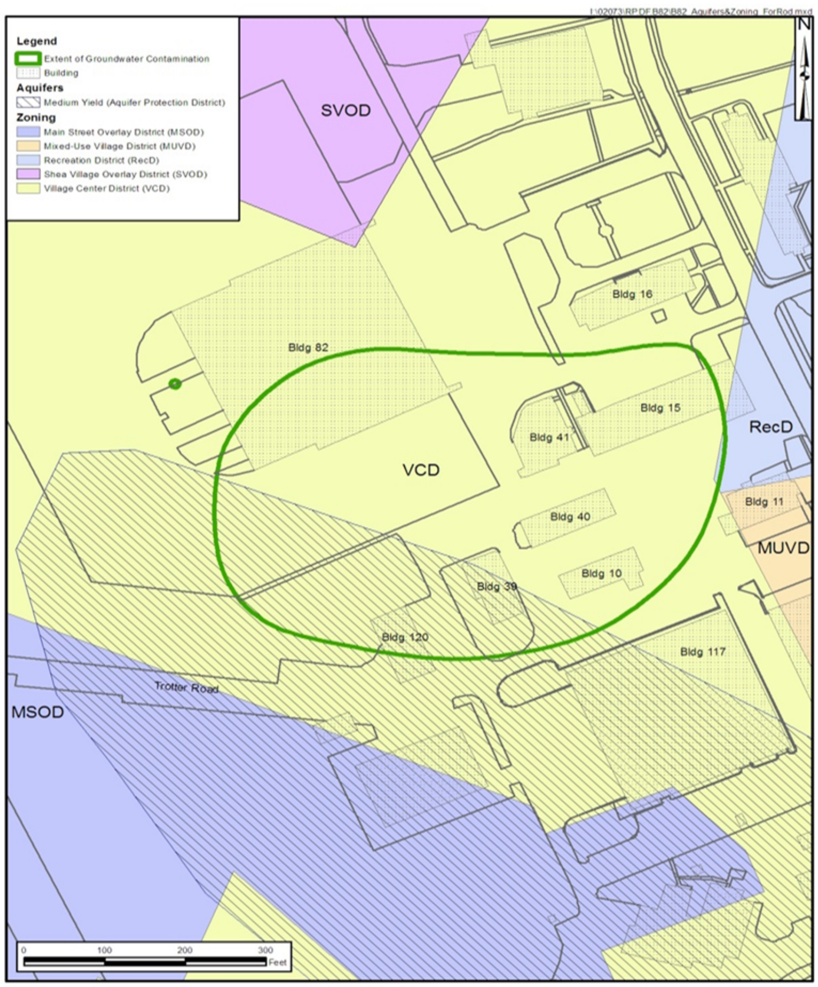
2.6 CURRENT AND POTENTIAL FUTURE SITE AND RESOURCES USES

Former NAS South Weymouth was designated for closure under the BRAC of 1990, as part of the BRAC Commission's 1995 Base Closure List (BRAC IV). Operational closure of former NAS South Weymouth began in September 1996 with the transfer of aircraft to other Navy facilities, and through personnel reduction. Former NAS South Weymouth was closed administratively under BRAC on September 30, 1997.

Currently, the Building 82 Site is vacant and remains part of the former NAS South Weymouth property owned by the Navy. The Navy plans to transfer the property as part of the redevelopment of the Base once the environmental cleanup is implemented and the property is determined to be suitable for transfer. The Site has been zoned as a Village Center District (VCD), which could include a range of future uses from residential to commercial and light industrial land uses, as shown in Figure 2-5. The anticipated future uses and established zoning were assessed during the RI risk assessments and FS evaluations.

All medium and high-yield aquifers mapped by the U.S. Geological Survey (USGS) are considered to be potential drinking water source areas (PDWSA) unless they have been specifically excluded as such by the MassDEP. A medium-yield aquifer underlies the southwest corner of the Building 82 Site, as illustrated in Figure 2-5. This aquifer, approximately 800 feet wide and 1,600 feet long, is known as the Building 82 Aquifer and is identified as an Aquifer Protection District in the Zoning and Land Use By-Laws for NAS South Weymouth prepared by the South Shore Tri-Town Development Corporation (SSTTDC). The SSTTDC is the local entity responsible for the re-development of the former NAS South Weymouth.

FIGURE 2-5. AQUIFER PROTECTION DISTRICT AND FUTURE ZONING



The rest of the Building 82 Site is underlain by a low-yield aquifer. Although a portion of the Building 82 site is located within a PDWSA, water beneath the Site is not currently used for domestic, commercial, or industrial purposes. At this time, there are no public water supply wells located on the Site. The Town of Weymouth currently supplies all municipal water to the Base and there is no current plan for future use of groundwater at the Base as a drinking water source.

2.7 SUMMARY OF SITE RISKS

The baseline risk assessment estimates what risks the site poses if no action was taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. A **human health risk assessment** and an **ecological risk assessment** (ERA) were performed as part of the RI using only validated analytical results. The risk assessments used data from multiple groundwater sampling rounds and the soil, sediment and surface water sampling conducted in 2006 and 2009 as part of the RI. In addition, soil analytical data from all investigations performed between 1998 and 2003 that represent current conditions were used. Soil data from areas where removals have been performed, e.g. the 2007 access road excavation, were excluded.

2.7.1 Summary of Human Health Risk

The quantitative HHRA was conducted using validated analytical results for surface and subsurface soil, groundwater, sediment, and surface water samples. Key steps in the risk assessment process included identification of chemicals of concern (**COCs**), exposure assessment, toxicity assessment, and risk characterization as discussed below. Tables summarizing the data used in the HHRA and associated results are presented in Appendix C. The exposure pathways used in the HHRA are presented in Appendix C, Figure C-1.

Identification of COCs

Tables C-1 through C-6 in Appendix C present exposure point concentrations (EPCs) for the COCs identified in currently exposed surface soil, surface soil that might be exposed in the future, subsurface soil, groundwater, surface water, and sediment, respectively. EPCs are the concentrations used in the risk assessment to estimate exposure and risk from each COC. The table for each medium includes the average and maximum detected concentration, EPC, and how the EPC was derived.

Exposure Assessment

During the **exposure assessment**, current and potential future exposure pathways through which humans might come into contact with the chemicals identified in the previous step were evaluated. The results of the exposure assessment were used to refine the CSM, as shown in Figure 2-2. Potential exposure routes for soil include ingestion (swallowing small amounts of soil), dermal contact (skin exposure), and/or inhalation (breathing) of airborne soil particulates. Potential exposure routes for sediment and surface water include inadvertent dermal contact and ingestion. Potential exposure routes for groundwater include ingestion of drinking (tap) water, dermal contact, and inhalation of volatile compounds in indoor air and while showering. The HHRA considered receptor exposure under industrial land use (maintenance, construction, and industrial workers), trespassing, and future hypothetical recreational and residential land use, as presented below in Table 2-2. Exposure parameters are summarized in Appendix C, Tables C-7 through C-14.

TABLE 2-2. RECEPTORS AND EXPOSURE ROUTES EVALUATED IN THE HHRA

RECEPTORS	EXPOSURE ROUTES
Current Maintenance Worker (adult)	• Inadvertent dermal contact (surface soil) • Inadvertent ingestion(surface soil) • Inhalation of fugitive dust (surface soil)
Current and Future Trespasser (adolescent)	• Inadvertent dermal contact (surface soil, sediment, surface water) • Inadvertent ingestion (surface soil, sediment, surface water) • Inhalation of fugitive dust (surface soil)
Future Recreational Visitor (child and adult)	• Inadvertent dermal contact (surface soil, sediment, surface water) • Inadvertent ingestion (surface soil, sediment, surface water) • Inhalation of fugitive dust (surface soil)
Future Resident (child and adult)	• Inadvertent dermal contact (surface and subsurface soil, surface water, sediment) • Inadvertent ingestion (surface and subsurface soil, surface water, sediment) • Inhalation of fugitive dust (surface and subsurface soil) • Ingestion of tap water (groundwater) • Dermal contact with tap water (groundwater) • Inhalation of vapors while showering (groundwater) • Inhalation of indoor air (groundwater)

TABLE 2-2. RECEPTORS AND EXPOSURE ROUTES EVALUATED IN THE HHRA

RECEPTORS	EXPOSURE ROUTES
Future Industrial/Commercial Worker (adult)	• Inadvertent dermal contact (surface soil, sediment, surface water) • Inadvertent ingestion (surface soil, sediment, surface water) • Inhalation of fugitive dust (surface and subsurface soil) • Inhalation of indoor air (groundwater)
Future Construction Worker (adult)	• Inadvertent dermal contact (surface and subsurface soil, shallow groundwater) • Inadvertent ingestion (surface and subsurface soil, shallow groundwater) • Inhalation of fugitive dust (surface and subsurface soil) • Inhalation of trench vapor (shallow groundwater)

Toxicity Assessment

Toxicity assessment involves identifying the types of adverse health effects caused by exposure to site COCs and determining the relationship between the magnitude of the exposure and the severity of adverse effects (i.e., dose-response relationship) for each COC. Based on the quantitative dose-response relationships determined, toxicity values for both cancer (cancer slope factor [CSF] and inhalation unit risk [IUR]) and non-cancer (reference dose [RfD] and reference concentration [RfC]) effects were derived and used to estimate the potential for adverse effects.

Tables C-15 and C-16 in Appendix C provide carcinogenic risk information relevant to the COCs for oral and dermal exposure and for inhalation exposure, respectively. Tables C-17 and C-18 provide non-carcinogenic hazard information relevant to the COCs for oral and dermal exposure and inhalation exposure, respectively.

Risk Characterization

During the risk characterization, the outputs of the exposure and toxicity assessments are combined to characterize the baseline risk (cancer risks and non-cancer hazards) at the site if no action was taken to address the contamination. Potential **cancer risks** and **non-cancer hazards** were calculated based on reasonable maximum exposure (RME). The RME scenario assumes the maximum level of human exposure that could reasonably be expected to occur and is used to make all risk decisions.

For carcinogens, risks are generally expressed as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to the carcinogen. Excess lifetime cancer risk is calculated from the following equation:

$$\text{Risk} = \text{CDI} \times \text{SF}$$

where: risk = a unitless probability (e.g., 2×10^{-5}) of an individual developing cancer
CDI = chronic daily intake averaged over 70 years (in mg/kg-day)
SF = slope factor (in $[\text{mg/kg-day}]^{-1}$)

These calculated risks are probabilities that are usually expressed in scientific notation (e.g., 1×10^{-6}). An excess lifetime cancer risk of 1×10^{-6} under an RME scenario indicates that an individual experiencing the reasonable maximum exposure estimate has an "excess lifetime cancer risk" because it would be in addition to the risks of cancer individuals face from other causes such as smoking or exposure to too much sun. The chance of an individual developing cancer from all other causes has been estimated to be as high as one in three. EPA's generally acceptable risk range for site-related exposures is 1×10^{-4} to 1×10^{-6}.

Table C-19 in Appendix C provides RME cancer risk estimates for the significant receptors and routes of exposure developed by taking into account various conservative assumptions about the frequency and duration of exposure for each receptor and also about the toxicity of the COCs. Total cancer risk estimates for all applicable exposure routes range from 3 x 10^{-6} for future construction workers to 4 x 10^{-4} for hypothetical future lifelong residents. These risk levels indicate that if no cleanup action was taken, the increased probabilities of developing cancer as a result of site-related exposure would range from approximately 1 x 10^{-7} to 4 x 10^{-4}.

The potential for non-carcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., a lifetime) to an RfD derived for a similar exposure period. An RfD represents a level to which an individual may be exposed that is not expected to cause any deleterious effect. The ratio of exposure to toxicity is called a hazard quotient (HQ). An HQ less than 1 indicates that a receptor's dose of a single contaminant is less than the RfD and that toxic non-carcinogenic effects from that chemical are unlikely. The hazard index (HI) is generated by adding the HQs for all chemicals that affect the same target organ (e.g., liver) or that act through the same mechanism of action within a medium or across all media to which a given individual may be reasonably exposed. An HI less than 1 indicates that based on the sum of all HQs from different contaminants and exposure routes toxic non-carcinogenic effects from all contaminants are unlikely. An HI greater than 1 indicates that site-related exposures may present a risk to human health. The HQ is calculated as follows:

$$\text{Non-cancer HQ} = \text{CDI} / \text{RfD}$$

where: CDI = chronic daily intake
RfD = reference dose

CDIs and RFDs are expressed in the same units and represent the same exposure period (i.e., chronic, sub-chronic, or short-term).

Table C-20 in Appendix C provides RME non-cancer HQs for the each receptor and route of exposure and total HIs for all routes of exposure. Total HIs for all applicable exposure routes range from 0.006 for hypothetical future recreational visitors to 31 for hypothetical future child residents.

Under the RME scenario, unacceptable non-cancer hazards were identified for hypothetical future residents (adult and child) and construction workers. No major sources of **uncertainty**, other than those typically associated with risk assessment estimates, were identified for the Building 82 HHRA. A risk summary is presented in Table 2-3 below.

TABLE 2-3. SUMMARY OF ESTIMATED POTENTIAL HUMAN HEALTH RISKS

RECEPTOR	MEDIUM	RME	
		CANCER RISK	NON-CANCER HI
Current Maintenance Workers	Exposed Surface Soil	4.3×10^{-6}	0.01
	Total	4×10^{-6}	0.01
Current/Future Trespassers	Exposed Surface Soil Sediment Surface Water	1.4×10^{-6} 6.1×10^{-6} 9.7×10^{-9}	0.006 0.002 0.01
	Total	8×10^{-6}	0.02
Future Adult Recreational Visitors	Future Surface Soil Sediment Surface Water	1.4×10^{-6} 9.6×10^{-7} 4.4×10^{-9}	0.003 0.0003 0.003
	Total	2×10^{-6}	0.006
Future Child Recreational Visitors	Future Surface Soil Sediment Surface Water	2.6×10^{-5} 4.9×10^{-5} 3.7×10^{-8}	0.1 0.02 0.05
	Total	8×10^{-5}	0.2

TABLE 2-3. SUMMARY OF ESTIMATED POTENTIAL HUMAN HEALTH RISKS

Receptor	Medium	RME Cancer Risk	RME Non-Cancer HI
Future Adult Residents	Future Surface Soil	1.3×10^{-5}	0.03
	0-8' bgs Soil	1.2×10^{-5}	0.05
	Tap Water (all groundwater)	**1.3×10^{-4}**	**8.8**
	Sediment	2.0×10^{-6}	0.0004
	Surface Water	4.4×10^{-9}	0.003
	Total	**1.6×10^{-4}**	**9**
Future Child Residents	Future Surface Soil	6.6×10^{-5}	0.3
	0-8' bgs Soil	6.4×10^{-5}	0.5
	Tap Water (all groundwater)	**1.2×10^{-4}**	**30**
	Sediment	4.9×10^{-6}	0.02
	Surface Water	3.7×10^{-8}	0.05
	Total	**2.5×10^{-4}**	**31**
Future Industrial Workers	Future Surface Soil	7.4×10^{-6}	0.02
	0-8' bgs Soil	6.7×10^{-6}	0.04
	Sediment	8.0×10^{-7}	0.0004
	Surface Water	3.9×10^{-9}	0.002
	Total	1.5×10^{-5}	0.06
Future Construction Workers	0-8' bgs Soil	3.4×10^{-7}	0.06
	Dust	1.6×10^{-8}	**2.2**
	Shallow Groundwater	1.4×10^{-8}	0.1
	Trench Air	2.4×10^{-6}	**2.0**
	Total	3×10^{-6}	**4**

2.7.2 Summary of Ecological Risk

As part of the RI, the ERA evaluated potential risks to ecological receptors that may occur in the presence of chemical stressors (i.e., COPCs) in environmental media at Building 82. Because the Site is primarily paved, the ERA evaluated the limited upland successional community in the non-paved portion of the site. The upland portion of the site is open and grassy, with drainage ditches that contain a limited, steep-banked scrub/shrub emergent wetland community. The ditches have only intermittent flow and provide poor aquatic habitat.

The ecological receptor groups evaluated in the ERA included terrestrial plants and invertebrates, sediment invertebrates, aquatic organisms, and terrestrial wildlife. The ecological exposure pathways evaluated included direct contact with and/or ingestion of surface soil by plants, soil invertebrates, mammals, birds, and reptiles, direct contact with and/or ingestion of sediment by aquatic receptors (benthic invertebrates, reptiles, and amphibians), consumption of sediment invertebrates, and direct contact and ingestion of surface water by aquatic and terrestrial wildlife. The exposure pathways used in the ERA are presented in Figure D-1 of Appendix D.

The ERA included three primary steps: (1) Screening-Level Problem Formulation (development of the ecological CSM), (2) Screening-Level Exposure Estimate and Risk Calculation, and (3) Step 3a: COPC Refinement. Tables D-1, D-2, and D-3 in Appendix D are the ERA COPC screening tables for soil, sediment, and surface water, respectively. Several COPCs were initially selected because they exceeded screening levels. However, no significant risk was found to ecological receptors. Risks to terrestrial plants were not great enough for any chemicals to warrant further evaluation. For sediment invertebrates, PAHs were detected at concentrations exceeding their respective probable effects concentrations, but the minimal aquatic habitat in the ditches indicate that any impacts would be expected to be minor. Risks to aquatic organisms were not sufficient to warrant further evaluation, or contaminant concentrations were similar to background for former NAS South Weymouth.

Tables D-4 and D-5 in Appendix D present the results of the average food chain models for soil and sediment receptors, respectively. Although several chemicals had HQs greater than 1.0 based on the conservative food chain models, only a few chemicals had HQs greater than 1.0 after the food chain model was refined in Step 3a using average exposure assumptions. During the Step 3a evaluation, it was determined that risks to wildlife were not great enough for any chemicals to warrant further evaluation at this Site. This was primarily because the concentrations of metals and one pesticide COPC were found to be below background levels for terrestrial receptors, and concentrations of one PCB COPC did not indicate potential significant risk because the ditches are intermittent and lack viable ecological habitat.

2.7.3 Basis for Action

Unacceptable human health risks were estimated for hypothetical future residential exposure to groundwater used as drinking water, including cancer risks for future child and lifelong residents and non-cancer hazards for future child residents. The major contributors to non-cancer risk are manganese and arsenic; for cancer risk the major contributors are arsenic, TCE, n-nitroso-di-n-propylamine (NNPA), Aroclor-1248, heptachlor epoxide, benzene, 1,1-dichloroethane (1,1-DCA), PCE, and chloroform. Since PCBs were not detected in groundwater sampled as part of the RI Addendum, PCBs were not retained as a COC. However, the monitoring program for the selected remedy will include chemical analysis for PCBs. While not contributing to the human health risk, the following chemicals were also identified as COCs: 1,1,1-trichloroethane (TCA) since its maximum concentration was greater than its MCL; and cis-1,2-dichloroethene (DCE) and vinyl chloride since they are daughter products of TCE.

While the HHRA found that there was a potential risk for future construction workers from inhalation of dust and volatiles in trench air, additional risk analysis performed since the time the HHRA was completed has shown that no construction worker risk is present at the Building 82 Site. The HHRA also concluded that no unacceptable risks to building occupants or residents exist from surface water, or from inhalation of volatile constituents in groundwater at the Building 82 Site. No COCs were identified in the ERA. In addition, the 2010 maintenance action removed sources of contamination in soils and sediment. A risk screening evaluation which was performed using the confirmation sample results from the maintenance action soil removals concluded that there is no unacceptable risk from soils for future residents or other allowable future uses in the mixed use zoning district.

Risks were identified for hypothetical future residential receptors, a response action is necessary to protect the public health and welfare from actual or threatened releases of hazardous substances into the environment that may present an imminent and substantial endangerment to public health or welfare.

2.8 REMEDIAL ACTION OBJECTIVES

RAOs are medium-specific goals that define the objective of remedial actions to protect human health and the environment. RAOs specify the COCs, potential exposure routes and receptors, and acceptable concentrations (i.e., cleanup levels) for a site and provide a general description of what the cleanup will accomplish. RAOs typically serve as the design basis for the remedial alternatives described in Section 2.9. The RAOs for the Building 82 Site are as follows:

- Prevent human exposure to groundwater containing concentrations of contaminants in excess of the remediation goals and that cause unacceptable risk.
- Prevent or minimize migration of contaminants in groundwater.
- Restore groundwater quality at the Building 82 Site such that there are no risks to human health preventing its permissible beneficial use.

The cleanup goals for site groundwater were selected from MCLs or non-zero maximum contaminant level goals (MCLGs), if available, since these are legally enforceable standards. MassDEP drinking water standards and EPA Health Advisories were also considered in selection of cleanup goals. If an MCL or non-zero MCLG was not available, or if the applicable or relevant or appropriate requirement (ARAR) alone would not be sufficiently protective in the given circumstances, the value representing the 10^{-5}

incremental lifetime cancer risk (ILCR) level or HI equal to 1 was selected as the cleanup goal. The selected cleanup goals, or remediation goals (RGs) are shown in Table 2-4.

TABLE 2-4. GROUNDWATER REMEDIATION GOALS

CHEMICAL OF CONCERN	CLEANUP LEVEL (µg/L)	BASIS FOR SELECTION
1,1-DCA	70	Mass MCL (ARAR)
NNPA	0.073	Human Health Cancer Risk (ILCR = 10^{-5})
TCE	5	MCL (ARAR)
Manganese	300	EPA Health Advisory (TBC)
1,1,1-TCA	200	MCL/MCLG (ARAR)
cis-1,2-DCE	70	MCL/MCLG (ARAR)
Vinyl chloride	2	MCL (ARAR)
Arsenic	10	MCL (ARAR)
Benzene	5	MCL (ARAR)
Chloroform	70	MCLG (ARAR)
PCE	5	MCL (ARAR)
Heptachlor Epoxide	0.2	MCL (ARAR)

2.9 DESCRIPTION OF ALTERNATIVES

To address the COCs and the associated human health risks in groundwater, a screening of **General Response Actions**, **remedial technologies**, and **process options** was conducted as part of the FS. The technologies and process options retained from the detailed screening were assembled into four remedial alternatives for Building 82. Consistent with the NCP, the No Action alternative was evaluated as a baseline for comparison with other alternatives during the comparative analysis. Table 2-5 summarizes the major components and provides estimated costs for each of the remedial alternatives developed for the Site.

TABLE 2-5. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED

ALTERNATIVE	COMPONENTS	DETAILS	COST	TIME TO CLEANUP
No Action (Alternative G-1)	None	No further actions would be taken. The only costs would be for 5-year reviews under CERCLA.	**Capital**: $8,000 **O&M:** $109,000 **30-Year NPW:** $117,000	Not Applicable
Chemical Oxidation, LUCs, and Monitored Natural Attenuation (Alternative G-2)	Chemical Oxidation	Injection of **Fenton's reagent,** a strong chemical oxidant, using a grid of direct-push points in the shallow groundwater and permanent injection points in the deep groundwater. The injections would be into the portion of the plume where TCE concentrations are greater than 10 µg/L and also at the 1,1-DCA and NNPA locations. A total of 148 injection points would be used in a single injection event.	**Capital**: $1,615,000 **O&M:** $1,111,000 **30-Year NPW:** $2,727,000	20 years
	LUCs	Interim LUCs would be implemented to prevent unacceptable exposure to groundwater until cleanup goals are achieved.		

TABLE 2-5. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED				
ALTERNATIVE	**COMPONENTS**	**DETAILS**	**COST**	**TIME TO CLEANUP**
	Monitored Natural Attenuation	Long-term monitoring (LTM) of COCs, daughter products, analytes of interest, and natural attenuation parameters would be performed to verify that concentrations are decreasing at an acceptable rate.		
Chemical Oxidation, LUCs, and Monitoring (Alternative G-2A)	Chemical Oxidation	Injection of a strong chemical oxidant such as Fenton's reagent using direct-push points in the shallow groundwater and permanent injection points in the deep groundwater. The injections would be into the portion of the plume where TCE concentrations are greater than 5 µg/L and also at the 1,1-DCA and NNPA locations. A total of 236 injection points would be used two phases of injection. Information from the first phase would be used to optimize the second phase.	**Capital**: $2,397,000 **O&M:** $875,000 **30-Year NPW:** $3,272,000	5 years
	LUCs	Same as for Alternative G-2		
	Monitoring	Performance monitoring of VOCs would be performed to verify that concentrations are decreasing at an acceptable rate. Monitoring for other COCs and analytes of interest.		
In-Situ Enhanced Bioremediation, LUCs, and Monitored Natural Attenuation (Alternative G-3)	In-situ Enhanced Bioremediation	Injection of **emulsified oil substrate** along lines perpendicular to the groundwater flow direction and/or apparent plume orientation. The shallow TCE plume may be treated with a single line at the downgradient edge of the plume. The deep TCE plume would require multiple lines along the length of the plume. 1,1-DCA (and 1,1,1-TCA) will be treated by locally-spaced injection points. The NNPA location would be treated with an oxygen releasing compound.	**Capital**: $1,164,000 **O&M:** $1,607,000 **30-Year NPW:** $2,771,000	20 years
	LUCs	Same as for Alternative G-2		
	Monitored Natural Attenuation	Same as for Alternative G-2		
Monitored Natural Attenuation with LUCs (Alternative G-4)	Monitored Natural Attenuation	Same as for Alternative G-2	**Capital**: $186,000 **O&M:** $1,111,000 **30-Year NPW:** $1,297,000	40+ years
	LUCs	Same as for Alternative G-2		

2.10 COMPARATIVE ANALYSIS OF ALTERNATIVES

Table 2-6 and subsequent text in this section summarize the comparison of the remedial alternatives with respect to the nine **CERCLA evaluation criteria** outlined in the NCP at 40 Code of Federal Regulations (CFR) 300.430(e)(9)(iii) and categorized as threshold, primary balancing, and modifying criteria. Further information on the detailed comparison of remedial alternatives is presented in the Building 82 FS.

TABLE 2-6. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

	Alternative G-1	Alternative G-2	Alternative G-2A	Alternative G-3	Alternative G-4
ALTERNATIVE DESCRIPTION/COMPONENTS					
Evaluation Criteria	No Further Action	Chemical Oxidation, LUCs and Monitored Natural Attenuation	Chemical Oxidation, LUCs, and Monitoring	In-Situ Enhanced Bioremediation, LUCS, and Monitored Natural Attenuation	Monitored Natural Attenuation and LUCs
ESTIMATED TIMEFRAMES FOR CLEANUP (YEARS)					
Time to achieve cleanup goals	Not Applicable	20	5	20	40+
***CRITERIA ANALYSIS:* Threshold Criteria – Selected alternative must meet these criteria**					
Overall Protection of Human Health	⦸	●	●	●	●
Compliance with ARARs	⦸	●	●	●	●
Primary Balancing Criteria – Used to differentiate between alternatives meeting threshold criteria					
Long-Term Effectiveness and Permanence	⦸	●	●	●	○
Reduction of Mobility, Toxicity, and Volume of Contaminants through Treatment	⦸	●	●	●	⦸
Short-Term Effectiveness	⦸	○	●	○	⦸
Implementability	●	●	●	●	○
Cost (30-Year Net Present Worth, see Table 2-5)	$117,000	$2,727,000	$3,272,000	2,771,000	$1,297,000
Modifying Criteria – May be used to modify recommended cleanup					
State Agency Acceptance			Yes		
Community Acceptance			Yes		

TABLE 2-6. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

Notes:

ARARs: Applicable or relevant and appropriate requirements
LUCs: Land Use Controls
O&M: Operation and Maintenance

● Good
○ Average
⦸ Poor

Threshold Criteria

Overall Protection of Human Health and the Environment. Alternatives G-2, G-2A, G-3, and G-4 would all provide protection to human health and the environment.

Alternative G-2A would provide the best protection because chemical oxidation would treat the entire VOC plume in the shortest amount of time. Alternative G-2 would provide the next best protection because chemical oxidation would treat the COC areas in a relatively short amount of time. Alternative G-3 would provide slightly less protection due to the relatively longer time required for COCs to pass through the treatment areas/barriers. In Alternative G-4, COCs would persist for the longest time due to the slower rate of natural attenuation.

Monitoring during Alternatives G-2, G-2A, G-3, and G-4 would be effective in detecting the potential migration of the plume and in monitoring the progress of the remediation. The natural attenuation component of Alternative G-4 would reduce contaminant concentrations. This would significantly reduce the risk from exposure to contaminated groundwater. LUCs would provide protection of human health by restricting the use of groundwater until RGs are met.

The No Action Alternative (G-1) would not achieve the RAOs and therefore does not protect human health and the environment.

Compliance with ARARs. ARARs include any federal or state standards, requirements, criteria, or limitations determined to be legally applicable or relevant and appropriate to the site or remedial action. Alternative G-2A would comply with chemical-specific ARARs and TBCs for VOCs shortly after chemical injection is completed. Alternatives G-2, G-3 and G-4 would not immediately comply with chemical-specific ARARs and TBCs, but these alternatives would eventually achieve compliance through active treatment and/or natural attenuation. Alternative G-1 would not comply with ARARs.

Primary Balancing Criteria

Long-Term Effectiveness and Permanence. Alternatives G-2, G-2A, G-3, and G-4 would provide long-term effectiveness and permanence. Alternatives G-2, G-2A, and G-3 provide essentially equal levels of long-term effectiveness and permanence through a combination of active treatment and LUCs. Alternative G-4 may be less permanent than Alternative G-2, G-2A and G-3 because sorption, dilution, and dispersion components of the remedy may leave a slightly larger mass of COCs at the site in comparison to alternatives involving active treatment. For all alternatives, LUCs could be maintained until RGs are met. Alternative G-1 would provide no protectiveness.

Reduction in Toxicity, Mobility, or Volume Through Treatment. Alternatives G-2, G-2A, and G-3 would achieve reductions in COC toxicity and volume through treatment. Alternatives G-2 and G-2A would permanently and irreversibly remove an estimated 0.35 pound of COCs (0.317 pound of TCE, 0.03 pound of 1,1,1-TCA, 0.005 pound of 1,1-DCA, and 2.0×10^{-5} pound of NNPA) through chemical oxidation. Alternative G-3 would permanently and irreversibly remove the same amount of COCs as Alternative G-2 through bioremediation. There is no active treatment in Alternatives G-1 and G-4.

Short-Term Effectiveness. Under Alternatives G-2, G-2A, G-3, and G-4, potential short-term risk to site workers from exposure to contaminated groundwater during the installation, maintenance, and sampling of new and existing monitoring wells and during active remediation would be effectively avoided by proper planning. Alternative G-4 would result in the lowest short-term risk to site workers, with the potential for exposure only during monitoring well installation and groundwater sampling. Alternative G-3 would result in a higher level of short-term exposure than Alternatives G-2 and G-2A, due to the extended timeframe of injection. During implementation of Alternatives G-2 and G-2A, workers would handle a strong oxidizer. Implementation of Alternatives G-2, G-2A, G-3, and G-4 would not adversely impact the surrounding community or environment.

Alternative G-4 is the most sustainable alternative, followed by Alternative G-3, Alternative G-2, and Alternative G-2A.

Alternatives G-2, G-2A, G-3, and G-4 would achieve groundwater RAO No. 1 immediately upon implementation of LUCs and monitoring. Construction activities associated with Alternatives G-2, G-2A, G-3, and G-4 would be completed in less than 3 months. For VOCs, groundwater RAO Nos. 2 and 3 would be attained in approximately 2 years within the treatment zone and 20 to 25 years for the balance of the plume for Alternative G-2, in approximately 5 years for Alternative G-2A, approximately 20 to 25 years for Alternative G-3, and approximately 40 to 60 years for the natural attenuation component of Alternative G-4. Monitoring for manganese is assumed to continue for 30 years for Alternatives G-2, G-2A, G-3, and G-4. Alternative G-1 would not achieve the RAOs.

Implementability. Alternative G-1 would be the easiest to implement since no activities are required. Alternative G-4 would be the next easiest to implement because of the minimal amount of fieldwork and monitoring that would be required. Alternative G-2 would be easier to implement than G-2A and G-3 since it is assumed that only one injection event will be required. Alternative G-2A would be easier to implement than Alternative G-3. For Alternative G-2 and G-2A, handling of the oxidizing agent adds to the difficulty of implementation. Contractors and equipment are readily available for each alternative.

The implementation of any of the alternatives will affect the extent to which the site can be developed. Any future development plans must work around or otherwise take into account the presence of the physical components of the remediation components. Alternatives G-2 and G-2A would have less impact than Alternative G-3, since oxidant injection will occur within a 1 to 2 year timeframe. Alternative G-3 would have the largest impact since EOS injection would occur over a 15 year period of time. The natural attenuation components of Alternatives G-2, G-3, and G-4 and monitoring for Alternative G-2A, would have the similar long-term effect as access to monitoring locations would be required for an extended period of time.

Use of the property may be minimally affected by the implementation of the alternatives. Alternatives G-2, G-2A, and G-3 would temporarily impact site use during injection well installation and reagent injection. LUCs would be required until RAO Nos. 2 and 3 are achieved for Alternatives G-2, G-2A, G-3, and G-4, although LUCs would be required for the longest time under Alternative G-4.

Cost. Alternative G-1 is the least expensive since there are no treatment or monitoring costs. Alternative G-4 is less expensive than Alternatives G-2, G-2A, and G-3 because source area COC concentrations would be reduced by augmenting the biodegradation processes that are already at work. Alternatives G-2 and G-3 have approximately equivalent costs which are lower than Alternative G-2A which would be the most expensive alternative.

Modifying Criteria

State Acceptance. State involvement has been solicited throughout the CERCLA process. MassDEP's statement on the selected remedy is presented in Appendix A.

Community Acceptance. During the public comment period the community expressed its support for Alternative G-2A. The verbal comments at the public hearing on August 9, 2012 and the written comments received during the public comment period were generally for clarification and informational purposes only; no objections to the proposed alternative were noted. These comments and the Navy's responses are discussed in Section 3.0.

2.11 PRINCIPAL THREAT WASTE

The NCP at 40 CFR 300.430(a)(1)(iii)(A) establishes an expectation that treatment will be used to address the principal threats posed at a site wherever practicable. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be contained in a reliable manner or that would present a significant risk to human health or the environment should exposure occur. A source material is a material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to groundwater, surface water, or air, or acts as a source for direct exposure. Principal threat wastes are **not** present at the Building 82 Site because the contamination primarily consists of dissolved-phase VOCs and manganese in groundwater that are not highly toxic (unacceptable risks are associated with long-term exposure) and are not highly mobile (due to the site-specific hydrogeological conditions). A current receptor of concern is not present. Since future development plans include residential use, the exposure pathway of concern can be prevented through a LUC that prohibits installation of production, supply or irrigation wells.

2.12 SELECTED REMEDY

2.12.1 Rationale for Selected Remedy

The selected remedy for the Building 82 Site is Alternative G-2A, Chemical Oxidation, LUCs, and Monitoring. This remedy was selected because it provides the best balance of tradeoffs with respect to the nine evaluation criteria. This remedy is expected to clean the groundwater concentrations to the RAOs described in this ROD in the shortest amount of time. The remedy will meet the RAOs by reducing COC concentrations through chemical oxidation and prohibiting the use of groundwater for production, supply or irrigation purposes through LUCs until the clean-up objectives of the selected remedy have been achieved.

The principal factors in the selection of this remedy included the following:

- Shortest time for ultimate clean-up to RAOs
- Phased approach to oxidation allows for better targeting of contamination
- The remedy is consistent with the future zoning uses of the site

2.12.2 Description of Selected Remedy

The selected remedy includes the following components, described below:

- Chemical Oxidation
- LUCs
- Monitoring
- Five-Year Reviews (as needed)

<u>Chemical Oxidation</u>

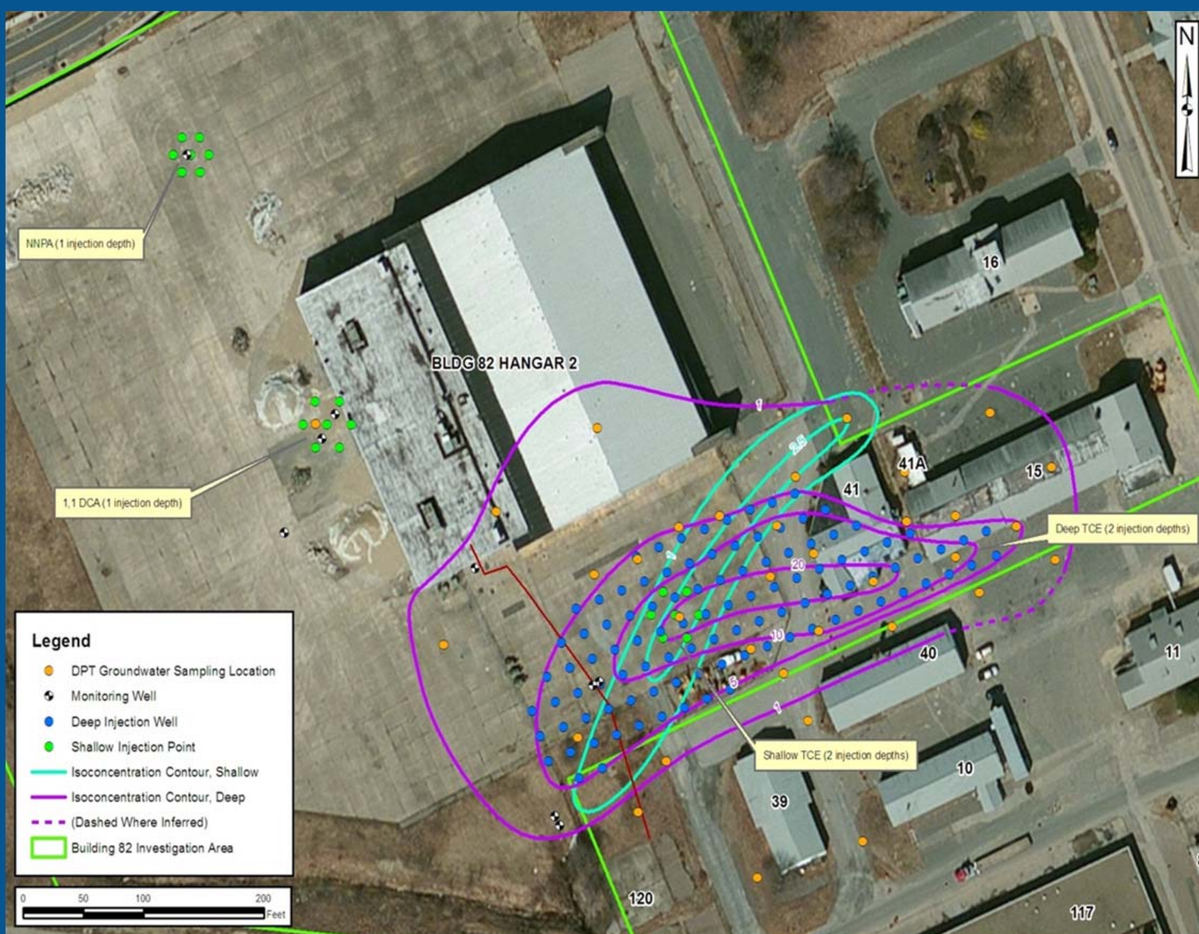
This component would consist of ISCO of the entire plume within the 5 µg/L TCE concentration contour and treatment of the 1,1-DCA and NNPA locations. The exact formulation of the oxidant will be determined during the remedial design but is assumed to be Fenton's reagent, a strong oxidizer. Oxidant injection will consist of direct push technology (DPT) borings within shallow groundwater and permanent injection wells within deep groundwater for chemical oxidation of the COCs.

The injection system will consist of a grid of DPT points in the shallow groundwater zone and a grid of permanent injection wells in the deep groundwater zone. The planned arrangements of the injection points are illustrated on Figure 2-6. In the deep TCE plume, the area within the 5 µg/L concentration contour will be treated. The estimated number of injection points and wells are summarized below.

Plume (Depth Interval, Feet bgs)	Locations	Points per location	No. of injection points
Shallow TCE Plume (5 to 25)	7	2	14
Deep TCE Plume (25 to 45)	104	2	208
Shallow 1,1,1-TCA and 1,1-DCA (10 to 20)	7	1	7
Shallow NNPA (10 to 20)	7	1	7

The injections will be in phases. The first phase will be in the higher concentrations in the center of the plume. Information from the first phase will be used to optimize the well spacing and injection rates and quantities for the second phase. The proposed injection well configuration is provided in Figure 2-6.

FIGURE 2-6. SELECTED REMEDY



Prior to the remedial design, groundwater samples will be collected from existing monitoring wells that have COC concentrations greater than the RGs, and possibly from wells downgradient of these wells, to determine the presence of groundwater contaminants. Monitoring of groundwater will be required to assess the performance of the chemical oxidation program. Performance monitoring will include collecting groundwater samples from existing monitoring wells located within the contaminant plumes to assess trends in concentrations of COCs and on the periphery of the plumes to evaluate potential migration of COCs. Generally groundwater elevations will be measured and samples will be analyzed for field parameters (pH, dissolved oxygen [DO], oxidation-reduction potential [ORP], specific conductivity, and turbidity), COCs (TCE, 1,1,1-TCA, 1,1-DCA, and NNPA) and COC daughter products.

Land Use Controls

LUCs would be implemented on an interim basis to prevent unacceptable risks from exposure to contaminants in groundwater until the RGs are achieved. The LUCs would: (1) prohibit the installation of groundwater production, supply, or irrigation wells at the Building 82 Site; and (2) require that EPA and MassDEP approval of construction dewatering plans be obtained prior to conducting any construction dewatering activities at the Building 82 Site.

Annual inspections of the site would be conducted to confirm compliance with the LUC objectives, and an annual compliance certificate would be prepared and provided to EPA and MassDEP. Prior to any property conveyance, EPA and MassDEP would be notified.

The LUCs will be maintained and enforceable for as long as they are required to prevent unacceptable exposure to contaminated groundwater and/or to preserve the integrity of the selected remedy. The LUCs, in accordance with Navy LUC Principles (DoD, 2003), will be implemented through a LUC Remedial Design (RD) that will be prepared as a component of the overall RD.

The Navy shall be responsible for implementing, inspecting, reporting and enforcing the LUCs described in the LUC RD. Should any LUC component of the selected remedy fail, the Navy shall ensure that appropriate actions are taken to reestablish the selected remedy's protectiveness. The Navy may transfer various LUC operational responsibilities to other parties by agreement. However, the Navy retains ultimate responsibility under CERCLA for the performance of any such transferred operational responsibilities.

If the remedial design provides that MassDEP has the right to enforce the LUCs, the form of LUCs shall be satisfactory to MassDEP, and, to the extent applicable, shall comply with 310 CMR 40.1070.

Monitoring

Performance monitoring will be used to evaluate the progress of remediation. Performance monitoring would be performed for 3 years at semiannual intervals to confirm that the VOC concentrations are less than RGs and that no rebound in contaminants has occurred. Other analytes of interest, such as manganese, PCBs, and methyl tert-butyl ether (MTBE), will also be monitored in select monitoring wells. Naturally occurring processes within the aquifer will reduce the concentrations of manganese primarily through dispersion, dilution through aquifer movement, and by precipitation of manganese into groundwater zones with oxidizing conditions. The time for manganese to reach its RG is uncertain, so monitoring will be required until the RGs are attained and RAO No. 3 is achieved.

The baseline sampling event will include collection of samples from selected monitoring wells for PCB and MTBE analysis. If PCBs are detected, further investigation or remedial action for PCBs in groundwater will be considered.

Five-Year Reviews

Five-year reviews will be conducted by the Navy, in conjunction with EPA and MassDEP, until groundwater conditions are restored such that the Site is suitable for unrestricted use and unlimited exposure in accordance with CERCLA. During such reviews, the Navy, EPA, and MassDEP will review site conditions and monitoring data to determine whether the continued implementation of the remedy is appropriate.

2.12.3 Expected Outcomes of Selected Remedy

The primary expected outcome of the selected remedy is that the groundwater will be restored to its permissible beneficial use and there is no longer unacceptable risk to humans and the interim LUCs can be lifted. The site poses no unacceptable ecological risks. LUCs will be immediately effective for addressing the human exposure pathway of concern until site cleanup is complete.

Within approximately 5 years of remedy implementation, ISCO is expected to decrease COC concentrations in the source area to acceptable levels. The time frames to achieve site cleanup are estimates based on the currently available information and will be further evaluated as part of the 5-year review process.

Groundwater beneath a portion of the Site is part of an aquifer protection district and is considered a potential source of drinking water. Therefore drinking water standards, consistent with the ARARs, must be attained in site groundwater. Upon achieving groundwater cleanup levels, the site will be suitable for unlimited use and unrestricted exposure. Complete site cleanup will be determined by additional rounds of groundwater monitoring with COC concentrations meeting cleanup levels in all wells sampled as part of the long-term monitoring program.

Table 2-7 describes how the selected remedy mitigates risk and achieves RAOs for the Site.

TABLE 2-7. HOW SELECTED REMEDY MITIGATES RISK AND ACHIEVES RAOS

RISK	RAO	COMMENTS
Ingestion of on-site groundwater as a drinking water source	Prevent human exposure to groundwater containing concentrations of contaminants in excess of the remediation goals and that cause unacceptable risk	LUCs will prevent the use of site groundwater for production, supply or irrigation purposes until groundwater COC concentrations are reduced to cleanup goals.
	Prevent or minimize migration of contaminants in groundwater	The ISCO delivery system will be designed to minimize groundwater displacement away from the treatment zone; the treatment will destroy contaminants on contact to minimize migration. COC concentrations will be monitored downgradient of the treatment zone to ensure that the subsurface conditions in the treatment zone are causing migration of groundwater COCs.
	Restore groundwater quality at the Building 82 Site such that there are no risks to human health preventing its permissible beneficial use.	ISCO will remove the organic contaminants, Manganese concentrations will be reduced to acceptable levels over time via natural processes.

2.13 STATUTORY DETERMINATIONS

In accordance with the NCP, the selected remedy meets the following statutory determinations:

- **Protection of Human Health and the Environment** – The selected remedy will be protective of human health and the environment through the reduction of COC concentrations in site groundwater to achieve cleanup levels. LUCs will be protective of human health during the interim time until site cleanup, by prohibiting installation of extraction wells for production, supply or irrigation purposes. Site conditions do not pose unacceptable risks to ecological receptors or to human receptors under current site use.

- **Compliance with ARARS** – The selected remedy will comply with all identified federal and state ARARs, as presented in Appendix E.

- **Cost-Effectiveness** – The selected remedy is a cost-effective means to achieve site remediation. The costs are proportional to the overall effectiveness during the remediation time frame. Detailed costs for the selected remedy are presented in Appendix B.
- **Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable** – The selected remedy will be an effective and permanent means of reducing COC concentrations in the source area through treatment. Multiple substrate injections or other system optimizations will be performed to ensure successful contaminant breakdown.

- **Preference for Treatment Which Permanently and Significantly Reduces the Toxicity, Mobility, or Volume of the Hazardous Substances as a Principal Element** – The selected remedy includes ISCO to break down COCs and associated VOC daughter products, thereby reducing the toxicity, mobility, and volume of the groundwater contamination.

- **Five-Year Review Requirement** – The Navy, in conjunction with EPA and MassDEP, will conduct a review within 5 years after initiation of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment. Five-year reviews will be required until site conditions are remediated to levels that allow for unlimited use and unrestricted exposure.

2.14 DOCUMENTATION OF SIGNIFICANT CHANGES

CERCLA Section 117(b) requires an explanation of significant changes from the remedy presented in the Proposed Plan that was published for public comment. Comments received during the public comment period and public hearing on August 9, 2011 were supportive of the Proposed Plan. Therefore, no changes to the remedy as originally identified in the Proposed Plan were necessary or appropriate. The comments received on the Proposed Plan during the public comment period are presented in Section 3.0.

3.0 RESPONSIVENESS SUMMARY

3.1 STAKEHOLDER COMMENTS AND LEAD AGENCY RESPONSES

Participants in the public meeting and public hearing held on August 9, 2011, included members of the public and representatives of the Navy, EPA, and MassDEP. Questions and concerns raised at the public hearing and other comments received from the public are addressed in Table 3-1. The public hearing transcript and comment letters received during the 30-day public comment period on the Proposed Plan are included in Appendix F.

TABLE 3-1. SUMMARY OF QUESTIONS FROM PUBLIC HEARING AND COMMENT PERIOD

Question	Response
Mr. James Cunningham, Restoration Advisory Board member from Weymouth commented that he agreed with the selection of Alternative G-2A. He also stated an interest in continuing land use controls (LUCs) and monitoring and also a desire to keep the Navy involved in the cleanup.	The Navy appreciates Mr. Cunningham's support. Alternative G-2A includes treatment of groundwater as well as LUCs and monitoring. The Navy will implement the selected remedy including monitoring to ensure the cleanup standards are achieved.
Mr. Harvey Welch, Weymouth, commented that he would like to make sure that there is no construction on the Building 82 site until the groundwater cleanup standards are achieved.	The Navy is responsible for implementation of the selected remedy for the Site and will continue to own the property until all necessary remedial actions are complete. A determination that the property is suitable to transfer can be made only after all remedial actions have been taken. Once the property is transferred, the developer can begin construction activities.

TABLE 3-1. SUMMARY OF QUESTIONS FROM PUBLIC HEARING AND COMMENT PERIOD

Question	Response
Ms. Mary Parsons, Rockland, provided some verbal comments on behalf of Advocates of Rockland, Abington, Weymouth and Hingham (ARAWH) from their consultant, Cambridge Environmental. She also provided a memorandum with additional comments to include in the record. • The LUCs developed as part of the selected remedy will presumably include consideration of construction dewatering activities. Will there be one station every place construction dewatering activities occur? • They suggest that arsenic should be added to the list of analytes for the groundwater monitoring component of the proposed remedy described in the Proposed Plan. • They commented that success in reducing the manganese concentrations in groundwater may depend on identifying and eliminating the factors that lead to reductive conditions in groundwater. A carefully planned pilot test designed to examine the behavior of manganese in groundwater might be a prudent measure. Additional comments included in the memorandum follow: • The memorandum indicated an apparent conflict in the discussion of potential future construction worker risk. • They suggest that a survey of PCB-containing materials be conducted prior to demolition of Building 41. The Feasibility Study noted the presence of asbestos-containing material in Building 41.	• The LUCs established as part of the remedial design (RD) will require that EPA and MassDEP approval of construction dewatering plans be obtained prior to conducting any construction dewatering activities on the site. • The suggestion will be taken into account when the groundwater monitoring program is developed as part of the RD. • The monitoring program will include field measurements such as pH, DO, ORP, to assess the oxidation/reduction conditions in the groundwater. Details will be developed during the RD. As noted in the Proposed Plan, the proposed remedy will use a phased approach for injections of the chemical oxidant. The first injection phase will provide information similar to that obtained during a pilot test. • While not stated explicitly, the additional risk analysis completed since the HHRA was completed showed that no future construction worker risk is present at the Site. • The need to demolish Building 41 to locate injection points will be determined during the RD. If demolition is required, the RD will identify the proper materials handling and demolition procedures for the potential hazards associated with the structure. Demolition of the hangar will not be considered since the groundwater treatment area will be located south of the Building 82 hangar.
Mr. Michael Smart, Weymouth stated he thinks Alternative G-2A is the best option to choose from. He noted that both monitoring and maintenance of the monitoring wells are very important. He feels that a maintenance plan is necessary so the monitoring wells aren't destroyed during Base re-development activities. He stated that the anticipated 5-year cleanup time is aggressive and he hopes the selected remedy results in a complete cleanup.	The RD will include details the chemical oxidant injections as well as the groundwater monitoring program, maintenance of the well network and land use controls.
Ms. Anne Hilbert, Weymouth, commented that before any part of this project moves forward the source of water should be identified.	The Navy assumes that Ms. Hilbert is referring to the water supply for the continued re-development of the Base. As this is not pertinent to the Proposed Plan for Building 82, the Navy suggests that this concern be addressed by SSTTDC and/or LNR. LUCs established as part of the Building 82 remedy will prohibit the extraction of groundwater for production, supply or irrigation purposes until the cleanup is completed.

TABLE 3-1. SUMMARY OF QUESTIONS FROM PUBLIC HEARING AND COMMENT PERIOD	
Question	**Response**
Ms. Mary Parsons, Rockland, stated that she does not want to see the Building 82 groundwater used for drinking water or irrigation water now or in the future.	The cleanup goals for the Navy's proposed remedy are the federal drinking water standards and EPA health advisories. Once the cleanup goals are achieved, the groundwater would be suitable for use as a drinking water and irrigation water supply. The developer has not to date indicated any plans to use the groundwater for those purposes in the future.
Mr. Harvey Welch, Weymouth, also provided written comments. He summarized the various contaminants detected in all media sampled during the RI and stated that given the years the contaminants have been at the site it would be almost impossible to clean up the contamination without a total removal action. He would like permanent LUCs implemented to prevent risks from use of groundwater for drinking or irrigation.	While a wide range of contaminants were detected in the groundwater, soil, surface water and sediment samples collected during the RI, many were detected infrequently and at low concentrations. The human health risk assessment concluded that there was an unacceptable risk to future residents if groundwater was used as drinking water. The contaminant concentrations found in soil, surface water and sediment do not result in any unacceptable risk to human health. The proposed remedy will address the unacceptable groundwater risks to future residents. The LUCs included in the proposed remedy will prohibit extraction of groundwater for production, supply or irrigation purposes. The LUCs will remain in place until the cleanup goals are achieved and no unacceptable risk remains.
Ms. Anne Hilbert, Weymouth, also provided written comments indicating her concern about exposure of nearby children, such as her grandchildren, to lead at the Site as well as long-term exposure of workers to chemicals. She mentioned a health study which was never released to residents of Weymouth, Rockland, and Abington, and noted that there are clusters of MS and a high cancer rate. She also commented favorably on the use of LUCs.	The future residential child exposure to lead was evaluated in the human health risk assessment using data collected during the RI. The EPA model used to estimate lead in children indicated the blood-lead concentration would be two orders of magnitude lower than the stated EPA goal for lead. There is thus no risk of exposure to lead either to future residential children or to children who live nearby. It appears that the health study referred to in the comment was one conducted by the Massachusetts Department of Public Health (MDPH). Any questions about the study, how and to whom it was released, should be directed to Suzanne Condon at MDPH. Various MDPH environmental health investigation publications can be found at: http://www.mass.gov/eohhs/consumer/community-health/environmental-health/investigations/.

3.2 TECHNICAL AND LEGAL ISSUES

No technical or legal issues associated with the Building 82 ROD were identified.

Administrative Record Reference Table

DETAILED ADMINISTRATIVE RECORD REFERENCE TABLE

ITEM	REFERENCE PHRASE IN ROD	LOCATION IN ROD	LOCATION OF INFORMATION IN ADMINISTRATIVE RECORD
1	**floor drain systems**	Table 2-1	Foster Wheeler Corporation (Foster Wheeler), 1999. Removal Action Report for Building 82. January.
2	**were removed**	Table 2-1	Foster Wheeler, 2001. Removal Action Report for Floor Drain System Removals Hangar 2 (Building 82). April.
3	**combined**	Table 2-1	Tetra Tech NUS (TtNUS), 2010. Remedial Investigation, Building 82. February.
4	**non-time critical removal action**	Table 2-1	Tetra Tech EC (TtEC), 2008. Closeout Report for RIA 61. August 25.
5	**geophysical surveys**	Table 2-1	ENSR, 2003. Summary Report, Near Surface Geophysical Survey. pages 1-7
6	**evaluated**	Table 2-17	TtNUS, 2010.
7	**supplemental investigation**	Table 2-1	RI Addendum: Section 2.4
8	**hot spot**	Table 2-1	TtEC, 2011. Final Maintenance Activities Completion Report, section 2.1-2.11
9	**potential alternatives**	Table 2-1	FS: Section 4.2
10	**public notice**	Section 2.3	PRAP
11	**flow direction**	Section 2.5	TtNUS, 2010. pages 3-10 through 3-13
12	**human health risk assessment**	Section 2.7	TtNUS, 2010. Section 6
13	**ecological risk assessment**	Section 2.7	TtNUS, 2010. Section 7
14	**COPCs**	Section 2.7.1	TtNUS, 2010. Section 6.2.1 (pages 6-5 through 6-19)
15	**exposure assessment**	Section 2.7.1	TtNUS, 2010. Section 6.3 (pages 6-21 through 6-50)
16	**cancer risks**	Section 2.7.1	TtNUS, 2010. Section 6.5.1.2 and 6.5.2.2
17	**non-cancer hazards**	Section 2.7.1	TtNUS, 2010. Section 6.5.1.1 and 6.5.2.1
18	**uncertainty**	Section 2.7.1	TtNUS, 2010. Section 6.6
19	**General Response Actions**	Section 2.9	FS: Section 3.1
20	**remedial technologies**	Section 2.9	FS: Section 3.1
21	**process options**	Section 2.9	FS: Section 3.1
22	**30-Year NPW**	Table 2-5	FS: Section 4.2
23	**Fenton's reagent**	Table 2-5	FS: Section 3.2.4.2
24	**emulsified oil substrate**	Table 2-5	FS: Section 3.2.4.1
25	**CERCLA evaluation criteria**	Section 2.10	FS: Section 4.1.1

Detailed site information referenced in this ROD in bold blue text is contained in the Administrative Record. For access to information contained in the Administrative Record for "Building 82 – IR Site 10" please contact the former NAS South Weymouth Caretaker Site Office, 1134 Main Street, Building 11, Weymouth, Massachusetts.

Appendix A
Massachusetts Department of Environmental Protection Concurrence Letter

MassDEP

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

One Winter Street Boston, MA 02108 • 617-292-5500

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lieutenant Governor

RICHARD K. SULLIVAN JR.
Secretary

KENNETH L. KIMMELL
Commissioner

Mr. James T. Owens, Director
U.S. Environmental Protection Agency
5 Post Office Square, Suite 100
Mail Code: OSRR07-03
Boston, MA 02114-2023

Re: Record of Decision
Building 82 Site (OU 11)
Former South Weymouth NAS
MassDEP RTN 4-3002621
Date: September 27, 2012

Dear Mr. Owens:

The Massachusetts Department of Environmental Protection (MassDEP) reviewed the *Record of Decision, Building 82 Site, Operable Unit 11, Naval Air Station South Weymouth*, dated September, 2012. The Record of Decision summarizes the results from the site investigations, interim removal actions, and feasibility study that were used to characterize and develop cleanup options for the site and documents the Navy's rationale for selecting remedial alternative G-2A: chemical oxidation, land use controls, and monitoring. MassDEP concurs with the selected remedy.

If you have any questions or comments, please contact David Chaffin, Project Manager (617-348-4005), or Anne Malewicz, Federal Facilities Section Chief (617-292-5659).

Sincerely,

Benjamin Ericson
Assistant Commissioner
Bureau of Waste Site Cleanup

cc: D. Barney, USN-S. Weymouth
C. Keating, USEPA
Chief Executive Officer, SSTTDC
RAB Members
J. Naparstek, MADEP-Boston

Appendix B
Cost Estimates

NAS SOUTH WEYMOUTH
Weymouth, Massachusetts
Building 82
Alternative G-2A: Full Plume In-Situ Chemical Oxidation, Monitoring, LUCs
Capital Cost

Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
1 PROJECT PLANNING & DOCUMENTS											
1.1 ISCO Design	1	ls	$4,000.00				$4,000	$0	$0	$0	$4,000
1.2 Prepare Documents & Plans	300	hr			$60.00		$0	$0	$18,000	$0	$18,000
1.3 Prepare LTM Plan	500	hr			$60.00		$0	$0	$30,000	$0	$30,000
1.4 Prepare LUC Documents	150	hr			$60.00		$0	$0	$9,000	$0	$9,000
2 MOBILIZATION AND DEMOBILIZATION											
2.1 Site Support Facilities (trailers, phone, electric, etc.	1	ls		$1,000.00		$3,500.00	$0	$1,000	$0	$3,500	$4,500
2.2 Equipment Mobilization/Demobilization	2	ea			$170.00	$522.00	$0	$0	$340	$1,044	$1,384
2.3 Mobilization/Demobilization DPT Sub	1	ea	$2,500.00				$2,500	$0	$0	$0	$2,500
2.4 Mobilization/Demobilization HSA Sub	2	ea	$1,000.00				$2,000	$0	$0	$0	$2,000
2.5 Mobilization/Demobilization ISCO Sub	2	ls	$15,000.00				$30,000	$0	$0	$0	$30,000
3 SITE SUPPORT											
3.1 Site Support Facilities (trailers, phone, electric, etc.	6	mo		$220.00	$370.00		$0	$1,320	$2,220	$0	$3,540
3.2 Equipment Decon Pad	1	ls		$1,850.00	$1,000.00	$300.00	$0	$1,850	$1,000	$300	$3,150
3.3 Underground Utility Clearances	1	ls	$7,500.00				$7,500	$0	$0	$0	$7,500
3.4 Construction Survey Support	1	ls	$5,000.00				$5,000	$0	$0	$0	$5,000
3.5 Site Superintendent	80	day		$167.00	$384.64		$0	$13,360	$30,771	$0	$44,131
3.6 Site Health & Safety/QC	30	day		$167.00	$356.25		$0	$5,010	$10,688	$0	$15,698
3.7 Site Labor, 2 each	50	day			$361.60		$0	$0	$18,080	$0	$18,080
4 DECONTAMINATION											
4.1 Decontamination Services	2	mo		$1,220.00	$2,247.00	$1,551.00	$0	$2,440	$4,494	$3,102	$10,036
4.2 Temporary Equipment Decon Pad	1	ls		$1,500.00	$2,000.00	$300.00	$0	$1,500	$2,000	$300	$3,800
4.3 Decon Water	3,000	gal		$0.20			$0	$600	$0	$0	$600
4.4 Decon Water Storage Tank, 6,000 gallon	3	mo				$730.00	$0	$0	$0	$2,190	$2,190
4.5 Clean Water Storage Tank, 4,000 gallon	3	mo				$660.00	$0	$0	$0	$1,980	$1,980
4.6 Disposal of Decon Waste (liquid & solid)	3	mo	$950.00				$2,850	$0	$0	$0	$2,850
5 BENCH TEST								$0	$0	$0	
5.1 Bench Test Sampling	40	hr			$37.50		$0	$0	$1,500	$0	$1,500
5.2 Bench Test Sampling ODC	1	ls		$500.00			$0	$500	$0	$0	$500
5.3 Bench Test Analysis	5	ea	$200.00				$1,000	$0	$0	$0	$1,000
6 PILOT STUDY (actually a phased approach will be used. Keep this for estimating purposes.)											
6.1 Work Plan	1	ls			$15,000.00		$0	$0	$15,000	$0	$15,000
-Injections											
6.2 Injection Well Installation	420	lf	$40.00				$16,800	$0	$0	$0	$16,800
6.3 Injection Well Heads	12	ea	$150.00				$1,800	$0	$0	$0	$1,800
6.4 Injection Labor/Equipment	2	day	$4,000.00				$8,000	$0	$0	$0	$8,000
6.5 ISCO Reagent	21,000	gal		$0.86			$0	$17,955	$0	$0	$17,955
6.6 ISCO Injection Water	17,000	gal		$0.20			$0	$3,400	$0	$0	$3,400
6.7 Water Tank Truck	2	day				$430.00	$0	$0	$0	$860	$860
6.8 IDW Disposal	24	drum	$200.00				$4,800	$0	$0	$0	$4,800
6.9 Pavement Coring & Repair	12	ea	$85.00				$1,020	$0	$0	$0	$1,020
-Post-Injection Sampling											
6.10 Post-Injection Sampling Labor	250	hr			$37.50		$0	$0	$9,375	$0	$9,375
6.11 Post-Injection Sampling ODC	5	ea		$500.00			$0	$2,500	$0	$0	$2,500
6.12 Post-Injection Analysis	5	ea	$1,000.00				$5,000	$0	$0	$0	$5,000
6.13 Post-Injection Report	250	hr			$60.00		$0	$0	$15,000	$0	$15,000

NAS SOUTH WEYMOUTH
Weymouth, Massachusetts
Building 82
Alternative G-2A: Full Plume In-Situ Chemical Oxidation, Monitoring, LUCs
Capital Cost

Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
7 FULL TREATMENT											
-Injections											
7.1 DPT Injection	4	day	$2,500.00				$10,000	$0	$0	$0	$10,000
7.2 Injection Well Installation	6,860	lf	$40.00				$274,400	$0	$0	$0	$274,400
7.3 Injection Well Heads	196	ea	$150.00				$29,400	$0	$0	$0	$29,400
7.4 Injection Labor/Equipment	14	day	$4,000.00				$56,000	$0	$0	$0	$56,000
7.5 ISCO Reagent	362,000	gal		$0.86			$0	$309,510	$0	$0	$309,510
7.6 ISCO Makeup Water	286,000	gal		$0.20			$0	$57,200	$0	$0	$57,200
7.7 Water Tank Truck	14	day				$430.00	$0	$0	$0	$6,020	$6,020
7.8 IDW Disposal	184	drum	$200.00				$36,800	$0	$0	$0	$36,800
7.9 Pavement Coring & Repair	152	ea	$85.00				$12,920	$0	$0	$0	$12,920
-Post-Injection Sampling											
7.10 Post-Injection Sampling Labor	250	hr			$37.50		$0	$0	$9,375	$0	$9,375
7.11 Post-Injection Sampling ODC	5	ea		$500.00			$0	$2,500	$0	$0	$2,500
7.12 Post-Injection Analysis	5	ea	$1,000.00				$5,000	$0	$0	$0	$5,000
7.13 Post-Injection Report	250	hr			$60.00		$0	$0	$15,000	$0	$15,000
8 PERFORMANCE SAMPLING (12 events)											
8.1 Sampling Labor	480	hr			$37.50		$0	$0	$18,000	$0	$18,000
8.2 Sampling ODC	12	ea		$2,000.00			$0	$24,000	$0	$0	$24,000
8.3 Sampling Analysis	12	ea	$600.00				$7,200	$0	$0	$0	$7,200
8.4 Sampling Report	1,200	hr			$37.50		$0	$0	$45,000	$0	$45,000
9 POST-CONSTRUCTION											
9.1 Contractor Completion Report	300	hr			$60.00		$0	$0	$18,000	$0	$18,000
9.2 Remedial Action Close-out Report	250	hr			$60.00		$0	$0	$15,000	$0	$15,000
Subtotal							$523,990	$444,645	$287,843	$19,296	$1,275,774
Overhead on Labor Cost @ 30%									$86,353		$86,353
G & A on Cost @ 10%							$52,399	$44,465	$28,784	$1,930	$127,577
Tax on Materials and Equipment Cost @ 6%								$26,679		$1,158	$27,836
Total Direct Cost							$576,389	$515,788	$402,980	$22,383	$1,517,540
Indirects on Total Direct Cost @ 25%											$379,385
Profit on Total Direct Cost @ 10%											$151,754
Total Field Cost											$2,048,679
Contingency on Total Field Costs @ 15%											$307,302
Engineering on Total Field Costs @ 2%											$40,974
TOTAL CAPITAL COST											**$2,396,955**

NAS SOUTH WEYMOUTH
Weymouth, Massachusetts
Building 82
Alternative G-2A: Full Plume In-Situ Chemical Oxidation, Monitoring, LUCs
Sampling Cost

Item	Item Cost year 1	Item Cost years 2 & 3	Item Cost years 4 - 30	Item Cost every 5 years	Notes
Site Inspection: Visit & Report	$4,570	$4,570	$4,570		One-day visit to verify LUC & report.
Sample Collection	$37,600	$18,800	$9,400		Labor and supplies for groundwater samples using a crew of two four times a year in year 1, twice a year in years 2 & 3, and once a year in years 4 through 30.
Analysis; Water	$1,600	$800	$400		Analyze groundwater samples for MTBE (1 well), PCBs (1 well), and Mn (6 wells)
Report	$48,000	$24,000	$12,000		
Site Review				$23,000	Five year review reports
Subtotal	$91,770	$48,170	$26,370	$23,000	
Contingency @ 10%	$9,177	$4,817	$2,637	$2,300	
TOTAL	**$100,947**	**$52,987**	**$29,007**	**$25,300**	

NAS SOUTH WEYMOUTH
Weymouth, Massachusetts
Building 82
Alternative G-2A: Full Plume In-Situ Chemical Oxidation, Monitoring, LUCs
Present Worth Analysis

Year	Capital Cost	Annual Cost	Total Year Cost	Annual Discount Rate 2.0%	Present Worth
0	$2,396,955		$2,396,955	1.000	$2,396,955
1		$100,947	$100,947	0.980	$98,968
2		$52,987	$52,987	0.961	$50,929
3		$52,987	$52,987	0.942	$49,931
4		$29,007	$29,007	0.924	$26,798
5		$54,307	$54,307	0.906	$49,188
6		$29,007	$29,007	0.888	$25,757
7		$29,007	$29,007	0.871	$25,252
8		$29,007	$29,007	0.853	$24,757
9		$29,007	$29,007	0.837	$24,272
10		$54,307	$54,307	0.820	$44,551
11		$29,007	$29,007	0.804	$23,329
12		$29,007	$29,007	0.788	$22,872
13		$29,007	$29,007	0.773	$22,423
14		$29,007	$29,007	0.758	$21,984
15		$54,307	$54,307	0.743	$40,351
16		$29,007	$29,007	0.728	$21,130
17		$29,007	$29,007	0.714	$20,716
18		$29,007	$29,007	0.700	$20,310
19		$29,007	$29,007	0.686	$19,911
20		$54,307	$54,307	0.673	$36,547
21		$29,007	$29,007	0.660	$19,138
22		$29,007	$29,007	0.647	$18,763
23		$29,007	$29,007	0.634	$18,395
24		$29,007	$29,007	0.622	$18,034
25		$54,307	$54,307	0.610	$33,102
26		$29,007	$29,007	0.598	$17,334
27		$29,007	$29,007	0.586	$16,994
28		$29,007	$29,007	0.574	$16,661
29		$29,007	$29,007	0.563	$16,334
30		$54,307	$54,307	0.552	$29,981
				TOTAL PRESENT WORTH	**$3,271,667**

Appendix C
Human Health Risk Assessment Summary Tables

FIGURE C-1

HUMAN HEALTH CONCEPTUAL SITE MODEL FROM THE HHRA
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

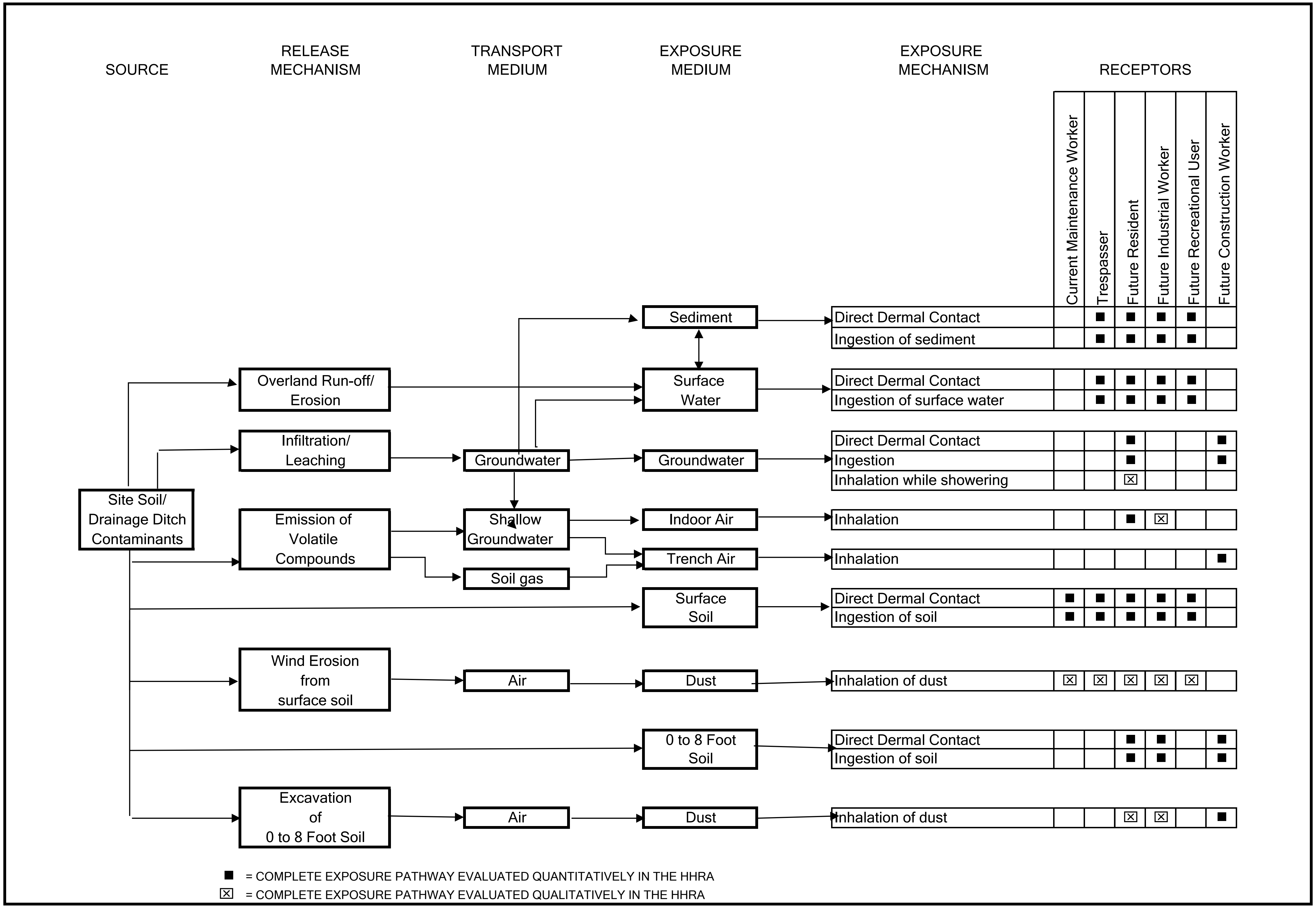


TABLE C-1
EXPOSURE POINT CONCENTRATION SUMMARY FROM THE HHRA
REASONABLE MAXIMUM EXPOSURE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
	Benzo(a)pyrene Equivalents	mg/kg	1	1	2.0	1	mg/kg	95% Student's T	Pro UCL 4.00.04
	Arsenic	mg/kg	3.5	5.6	6.8	5.6	mg/kg	95% Student's T	Pro UCL 4.00.04
	Manganese	mg/kg	204	261	328	261	mg/kg	95% Student's T	Pro UCL 4.00.04

For duplicate sample results, the average value was used in the calculation.

Exposure point concentration is the value recommended by USEPA's ProUCL.

The same exposed surface soil EPCs were used for both the RME and CTE scenarios.

TABLE C-2
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE FROM THE HHRA
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
	Benzo(a)pyrene Equivalents	mg/kg	0.6	1	2.0	1	mg/kg	95% Student's t	Pro UCL 4.00.04
	Arsenic	mg/kg	2.3	4.2	6.8	4.2	mg/kg	95%H	Pro UCL 4.00.04
	Manganese	mg/kg	250	304	447	304	mg/kg	95% Student's t	Pro UCL 4.00.04

Foor duplicate sample results, the average value was used in the calculation.

Exposure point concentration is the value recommended by USEPA's ProUCL.

The same future surface soil EPCs were used for both the RME and CTE scenarios.

TABLE C-3
EXPOSURE POINT CONCENTRATION SUMMARY FROM THE HHRA
REASONABLE MAXIMUM EXPOSURE
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Medium: 0-8 ft. Soil
Exposure Medium: 0-8 ft. Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
	Benzo(a)pyrene Equivalents	mg/kg	0.3	1	2.0	1	mg/kg	99% KM (Chebyshev)	Pro UCL 4.00.04
	Aroclor 1260	mg/kg	0.041	0.07	0.50	0.07	mg/kg	95% KM (T)	Pro UCL 4.00.04
	Arsenic	mg/kg	1.9	2.9	6.8	2.9	mg/kg	95% KM(Chebyshev)	Pro UCL 4.00.04
	Lead	mg/kg	34.9	158	631.0	34.9	mg/kg	Mean	(1)
	Manganese	mg/kg	434	1290	7020	1290	mg/kg	95% KM(Chebyshev)	Pro UCL 4.00.04
	Vanadium	mg/kg	16.2	17.9	41	17.9	mg/kg	95% KM(BCA)	Pro UCL 4.00.04

For duplicate sample results, the average value was used in the calculation.

Exposure point concentration is the value recommended by USEPA's ProUCL.

1 - As per USEPA guidance for lead, the mean concentration is used as the exposure point concentration.

TABLE C-4
EXPOSURE POINT CONCENTRATION SUMMARY FROM THE HHRA
REASONABLE MAXIMUM EXPOSURE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Medium: Combined Groundwater
Exposure Medium: Combined Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
	Arsenic	ug/L	1	2.9	5.32	5.32	ug/L	Maximum	USEPA, 1995
	Manganese	ug/L	771	2070	6020	6020	ug/L	Maximum	USEPA, 1995
	N-nitroso-di-n-propylamine	ug/L	--	--	0.29	0.29	ug/L	Maximum	One Detected Concentration
	Napthalene	ug/L	1.2	5	68	68	ug/L	Maximum	USEPA, 1995
	Nitrobenzene	ug/L	--	--	3	3	ug/L	Maximum	One Detected Concentration
	1,1,1-Trichloroethane	ug/L	4.2	34	360	360	ug/L	Maximum	USEPA, 1995
	1,1-Dichloroethane	ug/L	1.6	4.7	99	99	ug/L	Maximum	USEPA, 1995
	1,1-Dichloroethene	ug/L	--	--	14	14	ug/L	Maximum	Two Detected Concentrations
	1,2,4-Trimethylbenzene	ug/L	1.2	10.2	36	36	ug/L	Maximum	USEPA, 1995
	1,3,5-Trimethylbenzene	ug/L	0.72	3.5	11	11	ug/L	Maximum	USEPA, 1995
	Benzene	ug/L	--	--	1.3	1.3	ug/L	Maximum	Three Detected Concentrations
	Chloroform	ug/L	0.45	1.5	4.6	4.6	ug/L	Maximum	USEPA, 1995
	Tetrachloroethene	ug/L	0.39	0.17	0.4	0.4	ug/L	Maximum	USEPA, 1995
	Trichloroethene	ug/L	0.88	0.98	9	9	ug/L	Maximum	USEPA, 1995
	Aroclor 1248	ug/L	0.28	0.38	0.635	0.635	ug/L	Maximum	USEPA, 1995
	Heptachlor Epoxide	ug/L	0.007	0.01	0.02	0.02	ug/L	Maximum	USEPA, 1995

For duplicate sample results, the average value was used in the calculation.

Exposure point concentration is the value recommended by USEPA's ProUCL.

For groundwater used as a drinking source (combined shallow and deep groundwater), the maximum concentration was used in the RME scenario, and the average concentration (when available) was used in the CTE scenario (USEPA, 1995).

TABLE C-5
EXPOSURE POINT CONCENTRATION SUMMARY FROM THE HHRA
REASONABLE MAXIMUM EXPOSURE
Former NAS South Weymouth

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

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
	Benzo(a)pyrene Equivalents	mg/kg	0.03	--	4.37	4.37	mg/kg	Maximum	Three Samples
	Aroclor 1260	mg/kg	0.2	--	0.665	0.665	mg/kg	Maximum	Three Samples
	Arsenic	mg/kg	1.4	--	2.28	2.28	mg/kg	Maximum	Three Samples
	Manganese	mg/kg	183	--	278	278	mg/kg	Maximum	Three Samples

For duplicate sample results, the average value was used in the calculation.

Exposure point concentration is the value recommended by USEPA's ProUCL.

Because there was an insufficient number of samples to calculate the 95% UCL, the maximum concentration was used as the EPC for the RME scenario, and the mean concentration was used as the EPC for the CTE scenario.

TABLE C-6
EXPOSURE POINT CONCENTRATION SUMMARY FROM THE HHRA
REASONABLE MAXIMUM EXPOSURE
Former NAS South Weymouth

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			
						Value	Units	Statistic	Rationale
	Arsenic	ug/L	0.313	--	0.584	0.584	ug/L	Maximum	Three Samples
	Manganese	ug/L	228	--	422	422	ug/L	Maximum	Three Samples

For duplicate sample results, the average value was used in the calculation.

Exposure point concentration is the value recommended by USEPA's ProUCL.

Because there was an insufficient number of samples to calculate the 95% UCL, the maximum concentration was used as the EPC for the RME scenario, and the mean concentration was used as the EPC for the CTE scenario.

TABLE C-7

VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE MAINTENANCE WORKER CONTACT WITH SURFACE SOIL FROM HHRA
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Exposed Surface Soil
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	See EPC	(a)	Intake (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1997	50	EPA, 1997	CS x IR-S x FI x EF x ED x CF1/(BW x AT)
	FI	Fraction Ingested From Contaminated Source	--	1	(b)	1	(b)	
	EF	Exposure Frequency	days/year	130	(b)	35	(b)	
	ED	Exposure Duration	years	25	EPA, 1997	9	EPA, 1997	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	
	BW	Body Weight	kg	70	EPA, 1997	70	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9125	EPA, 1989	3285	EPA, 1989	
Dermal	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	See EPC	(a)	Dermal Absorbed Dose (mg/kg-day) =
	SA	Surface Area	cm2	3300	(c)	3300	(c)	CS x SA x SSAF x DABS x EV x EF x ED x CF1/(BW x AT)
	SSAF	Soil-to-Skin Adherence Factor	mg/cm2	0.2	EPA, 2004	0.02	EPA, 2004	
	DABS	Dermal Absorption Factor (Solid)	--	Chemical-Specific	(d)	Chemical-Specific	(d)	
	EV	Event Frequency	events/day	1	(b)	1	(b)	
	EF	Exposure Frequency	days/year	130	(b)	35	(b)	
	ED	Exposure Duration	years	25	EPA, 1997	9	EPA, 1997	
	BW	Body Weight	kg	70	EPA, 1997	70	EPA, 1997	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9125	EPA, 1989	3285	EPA, 1989	

Notes/Sources:
NA - Not Applicable

(a). EPC = Calculated Exposure Point Concentration. EPCs represent the 95 UCL of the arithmetic mean, unless the 95 percent UCL is greater than the maximum detected concentration. If the 95 percent UCL is greater than the maximum, the maximum is selected as the EPC for the RME case and the arithmetic mean is selected as the EPC for the CTE case.
(b). Professional Judgment. Assumes RME 5 days/week, 6 months/year.
(c). Surface Area represented by hands, head, and forearms.
(d). Various sources as provided by EPA Region I

EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC.
EPA, 1994. EPA Region I, Risk Updates. August 1994, Volume II.
EPA, 1997. Exposure Factors Handbook. Volume I, Aug. 1997, EPA/600/P-25/002FA.
EPA, 2004. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part E). Supplemental Guidance for Dermal Risk Assessment.

TABLE C-8A

VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE ADOLESCENT TRESPASSER CONTACT WITH SURFACE SOIL FROM HHRA
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Exposed Surface Soil
Receptor Population: Trespasser
Receptor Age: Adolescent (6-16 years)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	See EPC	(a)	Intake (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1997	50	EPA, 1997	CS x IR-S x FI x EF x ED x CF1/(BW x AT)
	FI	Fraction Ingested From Contaminated Source	--	1	(b)	1	(b)	
	EF	Exposure Frequency	days/year	39	(b)	8	(b)	
	ED	Exposure Duration	years	10	Age 6 through 16	10	Age 6 through 16	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	
	BW	Body Weight	kg	39	EPA, 1997	39	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3650	EPA, 1989	3650	EPA, 1989	
Dermal	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	See EPC	(a)	Dermal Absorbed Dose (mg/kg-day) =
	SA	Surface Area	cm2	4184	(c)	4184	(c)	CS x SA x SSAF x DABS x EV x EF x ED x CF1/(BW x AT)
	SSAF	Soil-to-Skin Adherence Factor	mg/cm2	0.05	(e)	0.05	(e)	
	DABS	Dermal Absorption Factor (Solid)	--	Chemical-Specific	(d)	Chemical-Specific	(d)	
	EV	Event Frequency	events/day	1	(b)	1	(b)	
	EF	Exposure Frequency	days/year	39	(b)	8	(b)	
	ED	Exposure Duration	years	10	Age 6 through 16	10	Age 6 through 16	
	BW	Body Weight	kg	39	EPA, 1997	39	EPA, 1997	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3650	EPA, 1989	3650	EPA, 1989	

Notes/Sources:
NA - Not Applicable
(a). EPC = Calculated Exposure Point Concentration. EPCs represent the 95 UCL of the arithmetic mean, unless the 95 percent UCL is greater than the maximum detected concentration. If the 95 percent UCL is greater than the maximum, the maximum is selected as the EPC for the RME case and the arithmetic mean is selected as the EPC for the CTE case.
(b). Professional Judgment. Assumes 1 days/week during 9 months per year for RME; assumes 1 day/week during 2 months per year for CTE.
(c). Surface Area represented by hands, feet, forearms, and lower legs of 6 to <16 year old. EPA, 1997, Exposure Factor Handbook, Tables 6-6, 6-7, 6-8.
(d). Various sources as provided by EPA Region I
(e). Calculated in Appendix G-7.

EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC.
EPA, 1997. Exposure Factors Handbook. Volume I, Aug. 1997, EPA/600/P-25/002FA.
EPA, 2004. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part E). Supplemental Guidance for Dermal Risk Assessment.

TABLE C-8B

VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE ADOLESCENT TRESPASSER CONTACT WITH SEDIMENT FROM THE HHRA BUILDING 82 SITE FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Sediment
Receptor Population: Trespasser
Receptor Age: Adolescent (6-16 years)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Sediment	mg/kg	See EPC	(a)	See EPC	(a)	Intake (mg/kg-day) =
	IR-S	Ingestion Rate of Sediment	mg/day	50	(b)	25	(b)	CS x IR-S x FI x EF x ED x CF1/(BW x AT)
	FI	Fraction Ingested From Contaminated Source	--	1	(b)	1	(b)	
	EF	Exposure Frequency	days/year	39	(b)	8	(b)	
	ED	Exposure Duration	years	10	Age 6 through 16	10	Age 6 through 16	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	
	BW	Body Weight	kg	39	EPA, 1997	39	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3650	EPA, 1989	3650	EPA, 1989	
Dermal	CS	Chemical Concentration in Sediment	mg/kg	See EPC	(a)	See EPC	(a)	Dermal Absorbed Dose (mg/kg-day) =
	SA	Surface Area	cm2	4184	(c)	4184	(c)	CS x SA x SSAF x DABS x EV x EF x ED x CF1/(BW x AT)
	SSAF	Sediment-to-Skin Adherence Factor	mg/cm2	0.2	(e)	0.05	(e)	
	DABS	Dermal Absorption Factor (Solid)	--	Chemical-Specific	(d)	Chemical-Specific	(d)	
	EV	Event Frequency	events/day	1	(b)	1	(b)	
	EF	Exposure Frequency	days/year	39	(b)	8	(b)	
	ED	Exposure Duration	years	10	Age 6 through 16	10	Age 6 through 16	
	BW	Body Weight	kg	39	EPA, 1997	39	EPA, 1997	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3650	EPA, 1989	3650	EPA, 1989	

Notes/Sources:
NA - Not Applicable

(a). EPC = Calculated Exposure Point Concentration. EPCs represent the 95 UCL of the arithmetic mean, unless the 95 percent UCL is greater than the maximum detected concentration. If the 95 percent UCL is greater than the maximum, the maximum is selected as the EPC for the RME case and the arithmetic mean is selected as the EPC for the CTE case.
(b). Professional Judgment. Assumes 1 days/week during 9 months per year for RME; assumes 1 day/week during 2 months per year for CTE. Ingestion rate = 1/2 soil ingestion rate, EPA, 1997.
(c). Surface Area represented by hands, feet, forearms, and lower legs of 6 to <16 year old. EPA, 1997, Exposure Factor Handbook, Tables 6-6, 6-7, 6-8.
(d). Various sources as provided by EPA Region I
(e). EPA, 2004: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. September 2004. Table 3-3. For RME, Soil adherence rate mean value for children playing in wet soil. For CTE, Soil adherence factor used for sediment.

EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC.
EPA, 1994. EPA Region I, Risk Updates. August 1994, Volume II.
EPA, 1997. Exposure Factors Handbook. Volume I, Aug. 1997, EPA/600/P-25/002FA.
EPA, 2004. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part E). Supplemental Guidance for Dermal Risk Assessment.

TABLE C-8C

VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE ADOLESCENT TRESPASSER CONTACT WITH SURFACE WATER FROM THE HHRA
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Surface Water
Receptor Population: Trespasser
Receptor Age: Adolescent (6-16 years)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Surface Water	mg/L	See EPC	(a)	See EPC	(a)	Intake (mg/kg-day) =
	IR-SW	Ingestion Rate of Surface Water	ml/day	10	(b)	10	(b)	CW x IR-SW x EF x ED xCF/(BW x AT)
	EF	Exposure Frequency	days/year	39	(b)	8	(b)	
	ED	Exposure Duration	years	10	Age 6 through 16	10	Age 3 through 4	
	BW	Body Weight	kg	39	EPA, 1997	39	EPA, 1997	
	CF	Conversion Factor	L/ml	1.00E-03	--	1.00E-03	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3650	EPA, 1989	3650	EPA, 1989	
Dermal	CW	Chemical Concentration in Surface Water	mg/L	See EPC	(a)	See EPC	(a)	Dermal Absorbed Dose (mg/kg-day) =
	DA_{event}	Absorbed Dose per Event	mg/cm2-event	calculated		calculated		DAevent x SA x EV x EF x ED /(BW x AT)
	SA	Surface Area	cm2	4184	(c)	4184	(c)	
	Kp	Dermal Permeability Coefficients	cm/hr	Chemical-Specific	EPA, 2004	Chemical-Specific	EPA, 2004	for inorganics:
	ET	EventTime	hr	2	EPA, 2004	1	EPA, 2004	DAevent = CW x Kp x ET x CF
	EV	Event Frequency	events/day	1	(b)	1	(b)	for organics; the equation selected for DA event is dependent on
	EF	Exposure Frequency	days/year	39	(b)	8	(b)	t event. See below for the equations.
	ED	Exposure Duration	years	10	Age 6 through 16	10	Age 3 through 4	
	BW	Body Weight	kg	39	EPA, 1997	39	EPA, 1997	
	CF	Conversion Factor	L/cm^3	1.00E-03	--	1.00E-03	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3650	EPA, 1989	3650	EPA, 1989	

Notes/Sources:
NA - Not Applicable

(a). EPC = Calculated Exposure Point Concentration. EPCs represent the 95 UCL of the arithmetic mean, unless the 95 percent UCL is greater than the maximum detected concentration. If the 95 percent UCL is greater than the maximum, the maximum is selected as the EPC for the RME case and the arithmetic mean is selected as the EPC for the CTE case.
(b). Professional Judgment. Assumes 1 days/week during 9 months per year for RME; assumes 1 day/week during 2 months per year for CTE. Ingestion Rate = 1/5 swimming scenario ingestion rate, EPA, 1989.
(c). Surface Area represented by hands, feet, forearms, and lower legs of 6 to <16 year old. EPA, 1997, Exposure Factor Handbook, Tables 6-6, 6-7, 6-8.

EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC.
EPA, 1994. EPA Region I, Risk Updates. August 1994, Volume II.
EPA, 1997. Exposure Factors Handbook. Volume I, Aug. 1997, EPA/600/P-25/002FA.
EPA, 2004: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. September 2004.

Equations for DAevent for organics:

If ET < t*

$$DA_{event} = 2FA\ x\ Kp\ x\ CW\ x\ CF\ \sqrt{\frac{6\ x\ T\ x\ ET}{\pi}}$$

[If ET > t*]

$$DA_{event} = FA\ x\ Kp\ x\ CW\ x\ CF\ x\left[\frac{ET}{1+B} + 2\ x\ T\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

TABLE C-9A

VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE ADULT RECREATIONAL VISITOR CONTACT WITH SURFACE SOIL FROM THE HHRA BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	See EPC	(a)	Intake (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1997	50	EPA, 1997	CS x IR-S x FI x EF x ED x CF1/(BW x AT)
	FI	Fraction Ingested From Contaminated Source	--	1	(b)	1	(b)	
	EF	Exposure Frequency	days/year	39	(b)	12	(b)	
	ED	Exposure Duration	years	24	EPA, 1997	7	EPA, 1997	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	
	BW	Body Weight	kg	70	EPA, 1997	70	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	2555	EPA, 1989	
Dermal	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	See EPC	(a)	Dermal Absorbed Dose (mg/kg-day) =
	SA	Surface Area	cm2	5700	(c)	5700	(c)	CS x SA x SSAF x DABS x EV x EF x ED x CF1/(BW x AT)
	SSAF	Soil-to-Skin Adherence Factor	mg/cm2	0.07	EPA, 2004	0.01	EPA, 2004	
	DABS	Dermal Absorption Factor (Solid)	--	Chemical-Specific	(d)	Chemical-Specific	(d)	
	EV	Event Frequency	events/day	1	(b)	1	(b)	
	EF	Exposure Frequency	days/year	39	(b)	12	(b)	
	ED	Exposure Duration	years	24	EPA, 1997	7	EPA, 1997	
	BW	Body Weight	kg	70	EPA, 1997	70	EPA, 1997	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	2555	EPA, 1989	

Notes/Sources:
NA - Not Applicable
(a). EPC = Calculated Exposure Point Concentration. EPCs represent the 95 UCL of the arithmetic mean, unless the 95 percent UCL is greater than the maximum detected concentration. If the 95 percent UCL is greater than the maximum, the maximum is selected as the EPC for the RME case and the arithmetic mean is selected as the EPC for the CTE case.
(b). Professional Judgment. RME: one day per week for 9 months. CTE: one day per month for 12 months.
(c). Surface Area represented by hands, head, forearms, and lower legs.
(d). Various sources as provided by EPA Region I

EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC.
EPA, 1997. Exposure Factors Handbook. Volume I, Aug. 1997, EPA/600/P-25/002FA.
EPA, 2004. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part E). Supplemental Guidance for Dermal Risk Assessment.

TABLE C-9B

VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE ADULT RECREATIONAL VISITOR CONTACT WITH SEDIMENT FROM THE HHRA BUILDING 82 SITE FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Sediment
Receptor Population: Recreational Visitor
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Sediment	mg/kg	See EPC	(a)	See EPC	(a)	Intake (mg/kg-day) =
	IR-S	Ingestion Rate of Sediment	mg/day	50	(b)	25	(b)	CS x IR-S x FI x EF x ED x CF1/(BW x AT)
	FI	Fraction Ingested From Contaminated Source	--	1	(b)	1	(b)	
	EF	Exposure Frequency	days/year	12	(b)	6	(b)	
	ED	Exposure Duration	years	24	EPA, 1997	7	EPA, 1997	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	
	BW	Body Weight	kg	70	EPA, 1997	70	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	2555	EPA, 1989	
Dermal	CS	Chemical Concentration in Sediment	mg/kg	See EPC	(a)	See EPC	(a)	Dermal Absorbed Dose (mg/kg-day) =
	SA	Surface Area	cm2	5700	(c)	5700	(c)	CS x SA x SSAF x DABS x EV x EF x ED x CF1/(BW x AT)
	SSAF	Sediment-to-Skin Adherence Factor	mg/cm2	0.2	EPA, 2004	0.01	EPA, 2004	
	DABS	Dermal Absorption Factor (Solid)	--	Chemical-Specific	(d)	Chemical-Specific	(d)	
	EV	Event Frequency	events/day	1	(b)	1	(b)	
	EF	Exposure Frequency	days/year	12	(b)	6	(b)	
	ED	Exposure Duration	years	24	EPA, 1997	7	EPA, 1997	
	BW	Body Weight	kg	70	EPA, 1997	70	EPA, 1997	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	2555	EPA, 1989	

Notes/Sources:
NA - Not Applicable

(a). EPC = Calculated Exposure Point Concentration. EPCs represent the 95 UCL of the arithmetic mean, unless the 95 percent UCL is greater than the maximum detected concentration. If the 95 percent UCL is greater than the maximum, the maximum is selected as the EPC for the RME case and the arithmetic mean is selected as the EPC for the CTE case.
(b). Professional Judgment. RME: one day per month for 12 months. CTE: one day per month for 6 months. Ingestion rate = 1/2 soil ingestion rate, EPA, 1997.
(c). Surface Area represented by hands, head, forearms, and lower legs.
(d). Various sources as provided by EPA Region I

EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC.
EPA, 1997. Exposure Factors Handbook. Volume I, Aug. 1997, EPA/600/P-25/002FA.
EPA, 2004. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part E). Supplemental Guidance for Dermal Risk Assessment.

TABLE C-9C

VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE ADULT RECREATIONAL VISITOR CONTACT WITH SURFACE WATER FROM THE HHRA
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Surface Water
Receptor Population: Recreational Visitor
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Surface Water	mg/L	See EPC	(a)	See EPC	(a)	Intake (mg/kg-day) =
	IR-SW	Ingestion Rate of Surface Water	ml/day	10	(b)	10	(b)	CW x IR-SW x EF x ED xCF/(BW x AT)
	EF	Exposure Frequency	days/year	12	(b)	6	(b)	
	ED	Exposure Duration	years	24	EPA, 1997	7	EPA, 1997	
	BW	Body Weight	kg	70	EPA, 1997	70	EPA, 1997	
	CF	Conversion Factor	L/ml	1.00E-03	--	1.00E-03	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	2555	EPA, 1989	
Dermal	CW	Chemical Concentration in Surface Water	mg/L	See EPC	(a)	See EPC	(a)	Dermal Absorbed Dose (mg/kg-day) =
	DA_{event}	Absorbed Dose per Event	mg/cm2-event	calculated		calculated		DAevent x SA x EV x EF x ED /(BW x AT)
	SA	Surface Area	cm2	5700	(c)	5700	(c)	
	Kp	Dermal Permeability Coefficients	cm/hr	Chemical-Specific	EPA, 2004	Chemical-Specific	EPA, 2004	for inorganics:
	ET	EventTime	hr	2	EPA, 2004	1	EPA, 2004	DAevent = CW x Kp x ET x CF
	EV	Event Frequency	events/day	1	(b)	1	(b)	for organics; the equation selected for DA event is dependent
	EF	Exposure Frequency	days/year	12	(b)	6	(b)	on t event. See below for the equations.
	ED	Exposure Duration	years	24	EPA, 1997	7	EPA, 1997	
	BW	Body Weight	kg	70	EPA, 1997	70	EPA, 1997	
	CF	Conversion Factor	L/cm^3	1.00E-03	--	1.00E-03	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	2555	EPA, 1989	

Notes/Sources:
NA - Not Applicable

(a). EPC = Calculated Exposure Point Concentration. EPCs represent the 95 UCL of the arithmetic mean, unless the 95 percent UCL is greater than the maximum detected concentration. If the 95 percent UCL is greater than the maximum, the maximum is selected as the EPC for the RME case and the arithmetic mean is selected as the EPC for the CTE case.
(b). Professional Judgment. RME: one day per month for 12 months. CTE: one day per month for 6 months. Ingestion Rate = 1/5 swimming scenario ingestion rate, EPA, 1989.
(c). Surface Area represented by hands, head, forearms, and lower legs.
EPA, 1985. Development of Statistical Distributions of Ranges of Standard Factors Used in Exposure Assessments. EPA 600/8-85/010. Office of Research and Development.
EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC.
EPA, 1994. EPA Region I, Risk Updates. August 1994, Volume II.
EPA, 1997. Exposure Factors Handbook. Volume I, Aug. 1997, EPA/600/P-25/002FA.
EPA, 2004: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. September 2004.

Equations for DAevent for organics:

If ET < t*

$$DA_{event} = 2 FA \, x \, Kp \, x \, CW \, x \, CF \sqrt{\frac{6 \, x \, T \, x \, ET}{\pi}}$$

[If ET > t*]

$$DA_{event} = FA \, x \, Kp \, x \, CW \, x \, CF \, x \left[\frac{ET}{1+B} + 2 \, x \, T \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right]$$

TABLE C-10A

VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE RECREATIONAL VISITOR CHILD CONTACT WITH SURFACE SOIL FROM THE HHRA
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Recreational Visitor
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	See EPC	(a)	Intake (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	200	EPA, 1997	100	EPA, 1997	CS x IR-S x FI x EF x ED x CF1/(BW x AT)
	FI	Fraction Ingested From Contaminated Source	--	1	(b)	1	(b)	
	EF	Exposure Frequency	days/year	141	EPA, 1997	104	(b)	
	ED	Exposure Duration	years	6	Age 1 through 6	2	Age 3 through 4	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	
	BW	Body Weight	kg	15	EPA, 1997	15	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2190	EPA, 1989	730	EPA, 1989	
Dermal	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	See EPC	(a)	Dermal Absorbed Dose (mg/kg-day) =
	SA	Surface Area	cm2	2800	(c)	2800	(c)	CS x SA x SSAF x DABS x EV x EF x ED x CF1/(BW x AT)
	SSAF	Soil-to-Skin Adherence Factor	mg/cm2	0.2	EPA, 2004	0.04	EPA, 2004	
	DABS	Dermal Absorption Factor (Solid)	--	Chemical-Specific	(d)	Chemical-Specific	(d)	
	EV	Event Frequency	events/day	1	(b)	1	(b)	
	EF	Exposure Frequency	days/year	141	EPA, 1997	104	(b)	
	ED	Exposure Duration	years	6	Age 1 through 6	2	Age 3 through 4	
	BW	Body Weight	kg	15	EPA, 1997	15	EPA, 1997	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2190	EPA, 1989	730	EPA, 1989	

Notes/Sources:
NA - Not Applicable

(a). EPC = Calculated Exposure Point Concentration. EPCs represent the 95 UCL of the arithmetic mean, unless the 95 percent UCL is greater than the maximum detected concentration. If the 95 percent UCL is greater than the maximum, the maximum is selected as the EPC for the RME case and the arithmetic mean is selected as the EPC for the CTE case.
(b). Professional Judgment. assumes 2 days/week for CTE
(c). Surface Area represented by hands, head, feet, forearms, and lower legs of child (age 1-6).
(d). Various sources as provided by EPA Region I

EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC.
EPA, 1997. Exposure Factors Handbook. Volume I, Aug. 1997, EPA/600/P-25/002FA.
EPA, 2004. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part E). Supplemental Guidance for Dermal Risk Assessment.

TABLE C-10B

VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE RECREATIONAL VISITOR CHILD CONTACT WITH SEDIMENT FROM THE HHRA BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Sediment
Receptor Population: Recreational Visitor
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Sediment	mg/kg	See EPC	(a)	See EPC	(a)	Intake (mg/kg-day) =
	IR-S	Ingestion Rate of Sediment	mg/day	100	(b)	50	(b)	CS x IR-S x FI x EF x ED x CF1/(BW x AT)
	FI	Fraction Ingested From Contaminated Source	--	1	(b)	1	(b)	
	EF	Exposure Frequency	days/year	104	(b)	26	(b)	
	ED	Exposure Duration	years	6	EPA, 1997	2	EPA, 1997	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	
	BW	Body Weight	kg	15	EPA, 1997	15	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2190	EPA, 1989	730	EPA, 1989	
Dermal	CS	Chemical Concentration in Sediment	mg/kg	See EPC	(a)	See EPC	(a)	Dermal Absorbed Dose (mg/kg-day) =
	SA	Surface Area	cm2	2800	(c)	2800	(c)	CS x SA x SSAF x DABS x EV x EF x ED x CF1/(BW x AT)
	SSAF	Sediment-to-Skin Adherence Factor	mg/cm2	0.2	EPA, 2004	0.04	EPA, 2004	
	DABS	Dermal Absorption Factor (Solid)	--	Chemical-Specific	(d)	Chemical-Specific	(d)	
	EV	Event Frequency	events/day	1	(b)	1	(b)	
	EF	Exposure Frequency	days/year	104	(b)	26	(b)	
	ED	Exposure Duration	years	6	EPA, 1997	2	EPA, 1997	
	BW	Body Weight	kg	15	EPA, 1997	15	EPA, 1997	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2190	EPA, 1989	730	EPA, 1989	

Notes/Sources:
NA - Not Applicable

(a). EPC = Calculated Exposure Point Concentration. EPCs represent the 95 UCL of the arithmetic mean, unless the 95 percent UCL is greater than the maximum detected concentration. If the 95 percent UCL is greater than the maximum, the maximum is selected as the EPC for the RME case and the arithmetic mean is selected as the EPC for the CTE case.
(b). Professional Judgment. RME: two days per week for 12 months. CTE: one day per week for 6 months. Ingestion rate = 1/2 soil ingestion rate, EPA, 1997.
(c). Surface Area represented by hands, head, feet, forearms, and lower legs ages 1-6.
(d). Various sources as provided by EPA Region I

EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC.
EPA, 1997. Exposure Factors Handbook. Volume I, Aug. 1997, EPA/600/P-25/002FA.
EPA, 2004. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part E). Supplemental Guidance for Dermal Risk Assessment.

TABLE C-10C

VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE CHILD RECREATIONAL VISITOR CONTACT WITH SURFACE WATER FROM THE HHRA BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Surface Water
Receptor Population: Recreational Visitor
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Surface Water	mg/L	See EPC	(a)	See EPC	(a)	Intake (mg/kg-day) =
	IR-SW	Ingestion Rate of Surface Water	ml/day	10	(b)	10	(b)	CW x IR-SW x EF x ED x CF/(BW x AT)
	EF	Exposure Frequency	days/year	104	EPA, 1994	26	EPA, 1994	
	ED	Exposure Duration	years	6	Age 1 through 6	2	Age 3 through 4	
	BW	Body Weight	kg	15	EPA, 1997	15	EPA, 1997	
	CF	Conversion Factor	L/ml	1.00E-03	--	1.00E-03	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2190	EPA, 1989	730	EPA, 1989	
Dermal	CW	Chemical Concentration in Surface Water	mg/L	See EPC	(a)	See EPC	(a)	Dermal Absorbed Dose (mg/kg-day) =
	DA_{event}	Absorbed Dose per Event	mg/cm2-event	calculated		calculated		DAevent x SA x EV x EF x ED /(BW x AT)
	SA	Surface Area	cm2	2800	EPA, 2004	2800	EPA, 2004	
	Kp	Dermal Permeability Coefficients	cm/hr	Chemical-Specific	EPA, 2004	Chemical-Specific	EPA, 2004	for inorganics:
	ET	EventTime	hr	2	EPA, 2004	1	EPA, 2004	DAevent = CW x Kp x ET x CF
	EV	Event Frequency	events/day	1	(b)	1	(b)	for organics; the equation selected for DA event is dependent
	EF	Exposure Frequency	days/year	104	EPA, 1994	26	EPA, 1994	on t event. See text for the equations.
	ED	Exposure Duration	years	6	Age 1 through 6	2	Age 3 through 4	
	BW	Body Weight	kg	15	EPA, 1997	15	EPA, 1997	
	CF	Conversion Factor	L/cm^3	1.00E-03	--	1.00E-03	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2190	EPA, 1989	730	EPA, 1989	

Notes/Sources:
NA - Not Applicable
(a). EPC = Calculated Exposure Point Concentration. EPCs represent the 95 UCL of the arithmetic mean, unless the 95 percent UCL is greater than the maximum detected concentration. If the 95 percent UCL is greater than the maximum, the maximum is selected as the EPC for the RME case and the arithmetic mean is selected as the EPC for the CTE case.
(b). Professional Judgment. Assumes 2 days/week 12 months/year for RME; 1 day/week 6 months/year for CTE. Ingestion Rate = 1/5 swimming scenario ingestion rate, EPA, 1989.

EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC.
EPA, 1997. Exposure Factors Handbook. Volume I, Aug. 1997, EPA/600/P-25/002FA.
EPA, 2004: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. September 2004.

TABLE C-11A

VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE ADULT RESIDENT CONTACT WITH SOIL FOR THE HHRA
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil or All Soil 0-8 foot
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	See EPC	(a)	Intake (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1997	50	EPA, 1997	CS x IR-S x FI x EF x ED x CF1/(BW x AT)
	FI	Fraction Ingested From Contaminated Source	--	1	(b)	1	(b)	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1991	
	ED	Exposure Duration	years	24	EPA, 1997	7	EPA, 1997	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	
	BW	Body Weight	kg	70	EPA, 1997	70	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	2555	EPA, 1989	
Dermal	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	See EPC	(a)	Dermal Absorbed Dose (mg/kg-day) =
	SA	Surface Area	cm2	5700	(c)	5700	(c)	CS x SA x SSAF x DABS x EV x EF x ED x CF1/(BW x AT)
	SSAF	Soil-to-Skin Adherence Factor	mg/cm2	0.07	EPA, 2004	0.01	EPA, 2004	
	DABS	Dermal Absorption Factor (Solid)	--	Chemical-Specific	(d)	Chemical-Specific	(d)	
	EV	Event Frequency	events/day	1	(b)	1	(b)	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1991	
	ED	Exposure Duration	years	24	EPA, 1997	7	EPA, 1997	
	BW	Body Weight	kg	70	EPA, 1997	70	EPA, 1997	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	2555	EPA, 1989	

Notes/Sources:
NA - Not Applicable
(a). EPC = Calculated Exposure Point Concentration. EPCs represent the 95 UCL of the arithmetic mean, unless the 95 percent UCL is greater than the maximum detected concentration. If the 95 percent UCL is greater than the maximum, the maximum is selected as the EPC for the RME case and the arithmetic mean is selected as the EPC for the CTE case.
(b). Professional Judgment.
(c). Surface Area represented by hands, head, forearms, and lower legs.

EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC.
EPA, 1991. Human Health Evaluation Manual. Supplemental Guidance. Standard Default Exposure Factors. OSWER Directive 9285.6-03.
EPA, 1994. EPA Region I, Risk Updates. August 1994, Volume II.
EPA, 1997. Exposure Factors Handbook. Volume I, Aug. 1997, EPA/600/P-25/002FA.
EPA, 2004. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part E). Supplemental Guidance for Dermal Risk Assessment.

TABLE C-11B

VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE ADULT RESIDENT CONTACT WITH GROUNDWATER FROM THE HHRA BUILDING 82 SITE FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Tap Water
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Groundwater	mg/L	See EPC	(a)	See EPC	(a)	Intake (mg/kg-day) =
	IR-GW	Ingestion Rate of Groundwater	ml/day	2000	EPA, 1997	1400	EPA, 1997	CW x IR-GW x EF x ED xCF/(BW x AT)
	EF	Exposure Frequency	days/year	350	EPA, 1994	350	EPA, 1994	
	ED	Exposure Duration	years	24	EPA, 1997	7	EPA, 1997	
	BW	Body Weight	kg	70	EPA, 1997	70	EPA, 1997	
	CF	Conversion Factor	L/ml	1.00E-03	--	1.00E-03	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	2555	EPA, 1989	
Dermal	CW	Chemical Concentration in Groundwater	mg/L	See EPC	(a)	See EPC	(a)	Dermal Absorbed Dose (mg/kg-day) =
	DA_{event}	Absorbed Dose per Event	mg/cm2-event	calculated		calculated		DAevent x SA x EV x EF x ED /(BW x AT)
	SA	Surface Area	cm2	18000	EPA, 2004	18000	EPA, 2004	
	Kp	Dermal Permeability Coefficients	cm/hr	Chemical-Specific	EPA, 2004	Chemical-Specific	EPA, 2004	for inorganics:
	ET	EventTime	hr	0.58	EPA, 2004	0.25	EPA, 2004	DAevent = CW x Kp x ET x CF
	EV	Event Frequency	events/day	1	(b)	1	(b)	for organics; the equation selected for DA event is dependent on t event. See below for the equations.
	EF	Exposure Frequency	days/year	350	EPA, 1994	350	EPA, 1994	
	ED	Exposure Duration	years	24	EPA, 1997	7	EPA, 1997	
	BW	Body Weight	kg	70	EPA, 1997	70	EPA, 1997	
	CF	Conversion Factor	L/cm^3	1.00E-03	--	1.00E-03	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	2555	EPA, 1989	

Notes/Sources:
NA - Not Applicable

(a). EPC = Calculated Exposure Point Concentration. EPCs represent the maximum detected concentration for the RME case and the arithmetic mean for the CTE case.
(b). Professional Judgment.

EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC.
EPA, 1994. EPA Region I, Risk Updates. August 1994, Volume II.
EPA, 1997. Exposure Factors Handbook. Volume I, Aug. 1997, EPA/600/P-25/002FA.
EPA, 2004: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. September 2004.

Equations for DAevent for organics:

If ET < t*

$$DA_{event} = 2FA\ x\ Kp\ x\ CW\ x\ CF\ \sqrt{\frac{6\ x\ T\ x\ ET}{\pi}}$$

[If ET > t*]

$$DA_{event} = FA\ x\ Kp\ x\ CW\ x\ CF\ x\left[\frac{ET}{1+B} + 2\ x\ T\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

TABLE C-11C

VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE ADULT RESIDENT CONTACT WITH SEDIMENT FROM THE HHRA
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Sediment	mg/kg	See EPC	(a)	See EPC	(a)	Intake (mg/kg-day) =
	IR-S	Ingestion Rate of Sediment	mg/day	50	(b)	25	(b)	CS x IR-S x FI x EF x ED x CF1/(BW x AT)
	FI	Fraction Ingested From Contaminated Source	--	1	(b)	1	(b)	
	EF	Exposure Frequency	days/year	12	(b)	6	(b)	
	ED	Exposure Duration	years	24	EPA, 1997	7	EPA, 1997	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	
	BW	Body Weight	kg	70	EPA, 1997	70	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	2555	EPA, 1989	
Dermal	CS	Chemical Concentration in Sediment	mg/kg	See EPC	(a)	See EPC	(a)	Dermal Absorbed Dose (mg/kg-day) =
	SA	Surface Area	cm2	5700	(c)	5700	(c)	CS x SA x SSAF x DABS x EV x EF x ED x CF1/(BW x AT)
	SSAF	Sediment-to-Skin Adherence Factor	mg/cm2	0.2	EPA, 2004	0.01	EPA, 2004	
	DABS	Dermal Absorption Factor (Solid)	--	Chemical-Specific	(d)	Chemical-Specific	(d)	
	EV	Event Frequency	events/day	1	(b)	1	(b)	
	EF	Exposure Frequency	days/year	12	(b)	6	(b)	
	ED	Exposure Duration	years	24	EPA, 1997	7	EPA, 1997	
	BW	Body Weight	kg	70	EPA, 1997	70	EPA, 1997	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	2555	EPA, 1989	

Notes/Sources:
NA - Not Applicable

(a). EPC = Calculated Exposure Point Concentration. EPCs represent the 95 UCL of the arithmetic mean, unless the 95 percent UCL is greater than the maximum detected concentration. If the 95 percent UCL is greater than the maximum, the maximum is selected as the EPC for the RME case and the arithmetic mean is selected as the EPC for the CTE case.
(b). Professional Judgment. RME: 2 days per month for 6 months. CTE: one day per month for 6 months. Ingestion rate = 1/2 soil ingestion rate, EPA, 1997.
(c). Surface Area represented by hands, head, forearms, and lower legs.

EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC.
EPA, 1997. Exposure Factors Handbook. Volume I, Aug. 1997, EPA/600/P-25/002FA.
EPA, 2004. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part E). Supplemental Guidance for Dermal Risk Assessment.

TABLE C-11D

VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE ADULT RESIDENT CONTACT WITH SURFACE WATER FROM THE HHRA
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Surface Water	mg/L	See EPC	(a)	See EPC	(a)	Intake (mg/kg-day) =
	IR-SW	Ingestion Rate of Surface Water	ml/day	10	(b)	10	(b)	CW x IR-SW x EF x ED xCF/(BW x AT)
	EF	Exposure Frequency	days/year	12	(b)	6	(b)	
	ED	Exposure Duration	years	24	EPA, 1997	7	EPA, 1997	
	BW	Body Weight	kg	70	EPA, 1997	70	EPA, 1997	
	CF	Conversion Factor	L/ml	1.00E-03	--	1.00E-03	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	2555	EPA, 1989	
Dermal	CW	Chemical Concentration in Surface Water	mg/L	See EPC	(a)	See EPC	(a)	Dermal Absorbed Dose (mg/kg-day) =
	DA_{event}	Absorbed Dose per Event	mg/cm2-event	calculated		calculated		DAevent x SA x EV x EF x ED /(BW x AT)
	SA	Surface Area	cm2	5700	EPA, 2004	5700	EPA, 2004	
	Kp	Dermal Permeability Coefficients	cm/hr	Chemical-Specific	EPA, 2004	Chemical-Specific	EPA, 2004	for inorganics:
	ET	EventTime	hr	2	EPA, 2004	1	EPA, 2004	DAevent = CW x Kp x ET x CF
	EV	Event Frequency	events/day	1	(b)	1	(b)	for organics; the equation selected for DA event is dependent
	EF	Exposure Frequency	days/year	12	(b)	6	(b)	on t event. See below for the equations.
	ED	Exposure Duration	years	24	EPA, 1997	7	EPA, 1997	
	BW	Body Weight	kg	70	EPA, 1997	70	EPA, 1997	
	CF	Conversion Factor	L/cm^3	1.00E-03	--	1.00E-03	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	2555	EPA, 1989	

Notes/Sources:
NA - Not Applicable

(a). EPC = Calculated Exposure Point Concentration. EPCs represent the 95 UCL of the arithmetic mean, unless the 95 percent UCL is greater than the maximum detected concentration. If the 95 percent UCL is greater than the maximum, the maximum is selected as the EPC for the RME case and the arithmetic mean is selected as the EPC for the CTE case.
(b). Professional Judgment. RME: 2 days per month for 6 months. CTE: one day per month for 6 months. Ingestion Rate = 1/5 swimming scenario ingestion rate, EPA, 1989.

EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC.
EPA, 1994. EPA Region I, Risk Updates. August 1994, Volume II.
EPA, 1997. Exposure Factors Handbook. Volume I, Aug. 1997, EPA/600/P-25/002FA.
EPA, 2004: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. September 2004.

Equations for DAevent for organics:

If ET < t*

$$DA_{event} = 2FA\ x\ Kp\ x\ CW\ x\ CF\ \sqrt{\frac{6\ x\ T\ x\ ET}{\pi}}$$

[If ET > t*]

$$DA_{event} = FA\ x\ Kp\ x\ CW\ x\ CF\ x \left[\frac{ET}{1+B} + 2\ x\ T\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

TABLE C-12A

VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE CHILD RESIDENT CONTACT WITH SOIL FROM THE HHRA
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil or All Soil 0-8 foot
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	See EPC	(a)	Intake (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	200	EPA, 1997	100	EPA, 1997	CS x IR-S x FI x EF x ED x CF1/(BW x AT)
	FI	Fraction Ingested From Contaminated Source	--	1	(b)	1	(b)	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	(b)	
	ED	Exposure Duration	years	6	Age 1 through 6	2	Age 3 through 4	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	
	BW	Body Weight	kg	15	EPA, 1997	15	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2190	EPA, 1989	730	EPA, 1989	
Dermal	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	See EPC	(a)	Dermal Absorbed Dose (mg/kg-day) =
	SA	Surface Area	cm2	2800	(c)	2800	(c)	CS x SA x SSAF x DABS x EV x EF x ED x CF1/(BW x AT)
	SSAF	Soil-to-Skin Adherence Factor	mg/cm2	0.2	EPA, 2004	0.04	EPA, 2004	
	DABS	Dermal Absorption Factor (Solid)	--	Chemical-Specific	(d)	Chemical-Specific	(d)	
	EV	Event Frequency	events/day	1	(b)	1	(b)	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	(b)	
	ED	Exposure Duration	years	6	Age 1 through 6	2	Age 3 through 4	
	BW	Body Weight	kg	15	EPA, 1997	15	EPA, 1997	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2190	EPA, 1989	730	EPA, 1989	

Notes/Sources:
NA - Not Applicable

(a). EPC = Calculated Exposure Point Concentration. EPCs represent the 95 UCL of the arithmetic mean, unless the 95 percent UCL is greater than the maximum detected concentration. If the 95 percent UCL is greater than the maximum, the maximum is selected as the EPC for the RME case and the arithmetic mean is selected as the EPC for the CTE case.
(b). Professional Judgment. assumes 2 days/week for CTE
(c). Surface Area represented by hands, head, feet, forearms, and lower legs of child (age 1-6).
(d). Various sources as provided by EPA Region I

EPA, 1985. Development of Statistical Distributions of Ranges of Standard Factors Used in Exposure Assessments. EPA 600/8-85/010. Office of Research and Development.
EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC.
EPA, 1991. Human Health Evaluation Manual. Supplemental Guidance. Standard Default Exposure Factors. OSWER Directive 9285.6-03.
EPA, 1994. EPA Region I, Risk Updates. August 1994, Volume II.
EPA, 1997. Exposure Factors Handbook. Volume I, Aug. 1997, EPA/600/P-25/002FA.
EPA, 2004. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part E). Supplemental Guidance for Dermal Risk Assessment.

TABLE C-12B

VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE CHILD RESIDENT CONTACT WITH GROUNDWATER FROM THE HHRA
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Tap Water
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Groundwater	mg/L	See EPC	(a)	See EPC	(a)	Intake (mg/kg-day) =
	IR-GW	Ingestion Rate of Groundwater	ml/day	1500	EPA, 1997	740	EPA, 1997	CW x IR-GW x EF x ED xCF/(BW x AT)
	EF	Exposure Frequency	days/year	350	EPA, 1994	350	EPA, 1994	
	ED	Exposure Duration	years	6	Age 1 through 6	2	Age 3 through 4	
	BW	Body Weight	kg	15	EPA, 1997	15	EPA, 1997	
	CF	Conversion Factor	L/ml	1.00E-03	--	1.00E-03	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2190	EPA, 1989	730	EPA, 1989	
Dermal	CW	Chemical Concentration in Groundwater	mg/L	See EPC	(a)	See EPC	(a)	Dermal Absorbed Dose (mg/kg-day) =
	DA_{event}	Absorbed Dose per Event	mg/cm2-event	calculated		calculated		DAevent x SA x EV x EF x ED /(BW x AT)
	SA	Surface Area	cm2	6600	EPA, 2004	6600	EPA, 2004	
	Kp	Dermal Permeability Coefficients	cm/hr	Chemical-Specific	EPA, 2004	Chemical-Specific	EPA, 2004	for inorganics:
	ET	EventTime	hr	1	EPA, 2004	0.33	EPA, 2004	DAevent = CW x Kp x ET x CF
	EV	Event Frequency	events/day	1	(b)	1	(b)	for organics; the equation selected for DA event is dependent
	EF	Exposure Frequency	days/year	350	EPA, 1994	350	EPA, 1994	on t event. See below for the equations.
	ED	Exposure Duration	years	6	Age 1 through 6	2	Age 3 through 4	
	BW	Body Weight	kg	15	EPA, 1997	15	EPA, 1997	
	CF	Conversion Factor	L/cm^3	1.00E-03	--	1.00E-03	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2190	EPA, 1989	730	EPA, 1989	

Notes/Sources:
NA - Not Applicable

(a). EPC = Calculated Exposure Point Concentration. EPCs represent the maximum detected concentration for the RME case and the arithmetic mean for the CTE case.
(b). Professional Judgment.
EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC.
EPA, 1994. EPA Region I, Risk Updates. August 1994, Volume II.
EPA, 1997. Exposure Factors Handbook. Volume I, Aug. 1997, EPA/600/P-25/002FA.
EPA, 2004: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. September 2004.

Equations for DAevent for organics:

If ET < t*

$$DA_{event} = 2 FA\ x\ Kp\ x\ CW\ x\ CF\ \sqrt{\frac{6\ x\ T\ x\ ET}{\pi}}$$

[If ET > t*]

$$DA_{event} = FA\ x\ Kp\ x\ CW\ x\ CF\ x\left[\frac{ET}{1+B} + 2\ xT\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

TABLE C-12C

VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE CHILD RESIDENT CONTACT WITH SEDIMENT FROM THE HHRA BUILDING 82 SITE FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Sediment
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Sediment	mg/kg	See EPC	(a)	See EPC	(a)	Intake (mg/kg-day) =
	IR-S	Ingestion Rate of Sediment	mg/day	100	(b)	50	(b)	CS x IR-S x FI x EF x ED x CF1/(BW x AT)
	FI	Fraction Ingested From Contaminated Source	--	1	(b)	1	(b)	
	EF	Exposure Frequency	days/year	104	(b)	26	(b)	
	ED	Exposure Duration	years	6	EPA, 1997	2	EPA, 1997	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	
	BW	Body Weight	kg	15	EPA, 1997	15	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2190	EPA, 1989	730	EPA, 1989	
Dermal	CS	Chemical Concentration in Sediment	mg/kg	See EPC	(a)	See EPC	(a)	Dermal Absorbed Dose (mg/kg-day) =
	SA	Surface Area	cm2	2800	(c)	2800	(c)	CS x SA x SSAF x DABS x EV x EF x ED x CF1/(BW x AT)
	SSAF	Sediment-to-Skin Adherence Factor	mg/cm2	0.2	EPA, 2004	0.04	EPA, 2004	
	DABS	Dermal Absorption Factor (Solid)	--	Chemical-Specific	(d)	Chemical-Specific	(d)	
	EV	Event Frequency	events/day	1	(b)	1	(b)	
	EF	Exposure Frequency	days/year	104	(b)	26	(b)	
	ED	Exposure Duration	years	6	EPA, 1997	2	EPA, 1997	
	BW	Body Weight	kg	15	EPA, 1997	15	EPA, 1997	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2190	EPA, 1989	730	EPA, 1989	

Notes/Sources:

NA - Not Applicable

(a). EPC = Calculated Exposure Point Concentration. EPCs represent the 95 UCL of the arithmetic mean, unless the 95 percent UCL is greater than the maximum detected concentration. If the 95 percent UCL is greater than the maximum, the maximum is selected as the EPC for the RME case and the arithmetic mean is selected as the EPC for the CTE case.

(b). Professional Judgment. RME: 2 days per week for 12 months. CTE: one day per week for 6 months. Ingestion rate = 1/2 soil ingestion rate, EPA, 1997.

(c). Surface Area represented by hands, head, feet, forearms, and lower legs.

(d). Various sources as provided by EPA Region I

EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC.

EPA, 1997. Exposure Factors Handbook. Volume I, Aug. 1997, EPA/600/P-25/002FA.

EPA, 2004. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part E). Supplemental Guidance for Dermal Risk Assessment.

TABLE C-12D

VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE CHILD RESIDENT CONTACT WITH SURFACE WATER FROM THE HHRA
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Surface Water	mg/L	See EPC	(a)	See EPC	(a)	Intake (mg/kg-day) =
	IR-SW	Ingestion Rate of Surface Water	ml/day	10	(b)	10	(b)	CW x IR-SW x EF x ED x CF/(BW x AT)
	EF	Exposure Frequency	days/year	104	(b)	26	(b)	
	ED	Exposure Duration	years	6	Age 1 through 6	2	Age 3 through 4	
	BW	Body Weight	kg	15	EPA, 1997	15	EPA, 1997	
	CF	Conversion Factor	L/ml	1.00E-03	--	1.00E-03	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2190	EPA, 1989	730	EPA, 1989	
Dermal	CW	Chemical Concentration in Surface Water	mg/L	See EPC	(a)	See EPC	(a)	Dermal Absorbed Dose (mg/kg-day) =
	DA_{event}	Absorbed Dose per Event	mg/cm2-event	calculated		calculated		DAevent x SA x EV x EF x ED /(BW x AT)
	SA	Surface Area	cm2	2800	(c)	2800	(c)	
	Kp	Dermal Permeability Coefficients	cm/hr	Chemical-Specific	EPA, 2004	Chemical-Specific	EPA, 2004	for inorganics:
	ET	EventTime	hr	2	EPA, 2004	1	EPA, 2004	DAevent = CW x Kp x ET x CF
	EV	Event Frequency	events/day	1	(b)	1	(b)	for organics; the equation selected for DA event is dependent
	EF	Exposure Frequency	days/year	104	(b)	26	(b)	on t event. See text for the equations.
	ED	Exposure Duration	years	6	Age 1 through 6	2	Age 3 through 4	
	BW	Body Weight	kg	15	EPA, 1997	15	EPA, 1997	
	CF	Conversion Factor	L/cm^3	1.00E-03	--	1.00E-03	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2190	EPA, 1989	730	EPA, 1989	

Notes/Sources:
NA - Not Applicable
(a). EPC = Calculated Exposure Point Concentration. EPCs represent the 95 UCL of the arithmetic mean, unless the 95 percent UCL is greater than the maximum detected concentration. If the 95 percent UCL is greater than the maximum, the maximum is selected as the EPC for the RME case and the arithmetic mean is selected as the EPC for the CTE case.
(b). Professional Judgment. RME: 2 days per week for 12 months. CTE: one day per week for 6 months. Ingestion Rate = 1/5 swimming scenario ingestion rate, EPA, 1989.
(c). Surface Area represented by hands, head, feet, forearms, and lower legs.
EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC.
EPA, 1997. Exposure Factors Handbook. Volume I, Aug. 1997, EPA/600/P-25/002FA.
EPA, 2004: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. September 2004.

TABLE C-13A

VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE FUTURE INDUSTRIAL WORKER CONTACT WITH SOIL FROM THE HHRA
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil or All Soil 0-8 foot
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	See EPC	(a)	Intake (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1997	50	EPA, 1997	CS x IR-S x FI x EF x ED x CF1/(BW x AT)
	FI	Fraction Ingested From Contaminated Source	--	1	(b)	1	(b)	
	EF	Exposure Frequency	days/year	250	EPA, 2004	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1997	9	EPA, 1997	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	
	BW	Body Weight	kg	70	EPA, 1997	70	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9125	EPA, 1989	3285	EPA, 1989	
Dermal	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	See EPC	(a)	Dermal Absorbed Dose (mg/kg-day) =
	SA	Surface Area	cm2	3300	(c)	3300	(c)	CS x SA x SSAF x DABS x EV x EF x ED x CF1/(BW x AT)
	SSAF	Soil-to-Skin Adherence Factor	mg/cm2	0.2	EPA, 2004	0.02	EPA, 2004	
	DABS	Dermal Absorption Factor (Solid)	--	Chemical-Specific	(d)	Chemical-Specific	(d)	
	EV	Event Frequency	events/day	1	(b)	1	(b)	
	EF	Exposure Frequency	days/year	250	EPA, 2004	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1997	9	EPA, 1997	
	BW	Body Weight	kg	70	EPA, 1997	70	EPA, 1997	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9125	EPA, 1989	3285	EPA, 1989	

Notes/Sources:
NA - Not Applicable

(a). EPC = Calculated Exposure Point Concentration. EPCs represent the 95 UCL of the arithmetic mean, unless the 95 percent UCL is greater than the maximum detected concentration. If the 95 percent UCL is greater than the maximum, the maximum is selected as the EPC for the RME case and the arithmetic mean is selected as the EPC for the CTE case.
(b). Professional Judgment.
(c). Surface Area represented by hands, head, and forearms.
(d). Various sources as provided by EPA Region I

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and RME-Draft. Working Draft, November 1993.
EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC.
EPA, 1997. Exposure Factors Handbook. Volume I, Aug. 1997, EPA/600/P-25/002FA.
EPA, 2004. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part E). Supplemental Guidance for Dermal Risk Assessment.

TABLE C-13B

VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE FUTURE INDUSTRIAL WORKER CONTACT WITH SEDIMENT FROM THE HHRA BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Sediment
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Sediment	mg/kg	See EPC	(a)	See EPC	(a)	Intake (mg/kg-day) =
	IR-S	Ingestion Rate of Sediment	mg/day	50	(b)	25	(b)	CS x IR-S x FI x EF x ED x CF1/(BW x AT)
	FI	Fraction Ingested From Contaminated Source	--	1	(b)	1	(b)	
	EF	Exposure Frequency	days/year	12	(b)	6	(b)	
	ED	Exposure Duration	years	25	EPA, 1997	9	EPA, 1997	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	
	BW	Body Weight	kg	70	EPA, 1997	70	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9125	EPA, 1989	3285	EPA, 1989	
Dermal	CS	Chemical Concentration in Sediment	mg/kg	See EPC	(a)	See EPC	(a)	Dermal Absorbed Dose (mg/kg-day) =
	SA	Surface Area	cm2	3300	(c)	3300	(c)	CS x SA x SSAF x DABS x EV x EF x ED x CF1/(BW x AT)
	SSAF	Sediment-to-Skin Adherence Factor	mg/cm2	0.2	EPA, 2004	0.02	EPA, 2004	
	DABS	Dermal Absorption Factor (Solid)	--	Chemical-Specific	(d)	Chemical-Specific	(d)	
	EV	Event Frequency	events/day	1	(b)	1	(b)	
	EF	Exposure Frequency	days/year	12	(b)	6	(b)	
	ED	Exposure Duration	years	25	EPA, 1997	9	EPA, 1997	
	BW	Body Weight	kg	70	EPA, 1997	70	EPA, 1997	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9125	EPA, 1989	3285	EPA, 1989	

Notes/Sources:
NA - Not Applicable

(a). EPC = Calculated Exposure Point Concentration. EPCs represent the 95 UCL of the arithmetic mean, unless the 95 percent UCL is greater than the maximum detected concentration. If the 95 percent UCL is greater than the maximum, the maximum is selected as the EPC for the RME case and the arithmetic mean is selected as the EPC for the CTE case.
(b). Professional Judgment. RME: one day per month for 12 months. CTE: one day per month for 6 months. Ingestion rate = 1/2 soil ingestion rate, EPA, 1997.
(c). Surface Area represented by hands, head, and forearms.
(d). Various sources as provided by EPA Region I

EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC.
EPA, 1997. Exposure Factors Handbook. Volume I, Aug. 1997, EPA/600/P-25/002FA.
EPA, 2004. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part E). Supplemental Guidance for Dermal Risk Assessment.

TABLE C-13C

VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE FUTURE INDUSTRIAL WORKER CONTACT WITH SURFACE WATER FROM THE HHRA
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Surface Water
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Surface Water	mg/L	See EPC	(a)	See EPC	(a)	Intake (mg/kg-day) =
	IR-SW	Ingestion Rate of Surface Water	ml/day	10	(b)	10	(b)	CW x IR-SW x EF x ED x CF/(BW x AT)
	EF	Exposure Frequency	days/year	12	(b)	6	(b)	
	ED	Exposure Duration	years	25	EPA, 1997	9	EPA, 1997	
	BW	Body Weight	kg	70	EPA, 1997	70	EPA, 1997	
	CF	Conversion Factor	L/ml	1.00E-03	--	1.00E-03	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9125	EPA, 1989	3285	EPA, 1989	
Dermal	CW	Chemical Concentration in Surface Water	mg/L	See EPC	(a)	See EPC	(a)	Dermal Absorbed Dose (mg/kg-day) =
	DA_{event}	Absorbed Dose per Event	mg/cm2-event	calculated		calculated		DAevent x SA x EV x EF x ED /(BW x AT)
	SA	Surface Area	cm2	3300	(c)	3300	(c)	
	Kp	Dermal Permeability Coefficients	cm/hr	Chemical-Specific	EPA, 2004	Chemical-Specific	EPA, 2004	for inorganics:
	ET	EventTime	hr	2	EPA, 2004	1	EPA, 2004	DAevent = CW x Kp x ET x CF
	EV	Event Frequency	events/day	1	(b)	1	(b)	for organics; the equation selected for DA event is dependent
	EF	Exposure Frequency	days/year	12	(b)	6	(b)	on t event. See below for the equations.
	ED	Exposure Duration	years	25	EPA, 1997	9	EPA, 1997	
	BW	Body Weight	kg	70	EPA, 1997	70	EPA, 1997	
	CF	Conversion Factor	L/cm^3	1.00E-03	--	1.00E-03	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9125	EPA, 1989	3285	EPA, 1989	

Notes/Sources:
NA - Not Applicable
(a). EPC = Calculated Exposure Point Concentration. EPCs represent the 95 UCL of the arithmetic mean, unless the 95 percent UCL is greater than the maximum detected concentration. If the 95 percent UCL is greater than the maximum, the maximum is selected as the EPC for the RME case and the arithmetic mean is selected as the EPC for the CTE case.
(b). Professional Judgment. RME: one day per month for 12 months. CTE: one day per month for 6 months. Ingestion Rate = 1/5 swimming scenario ingestion rate, EPA, 1989.
(c). Surface Area represented by hands, head, and forearms.

EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC.
EPA, 1997. Exposure Factors Handbook. Volume I, Aug. 1997, EPA/600/P-25/002FA.
EPA, 2004: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. September 2004.

Equations for DAevent for organics:

If ET < t*

$$DA_{event} = 2 FA \; x \; Kp \; x \; CW \; x \; CF \sqrt{\frac{6 \; x \; T \; x \; ET}{\pi}}$$

[If ET > t*]

$$DA_{event} = FA \; x \; Kp \; x \; CW \; x \; CF \; x \left[\frac{ET}{1+B} + 2 \; x T \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right]$$

TABLE C-14A

VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE CONSTRUCTION WORKER CONTACT WITH SOIL FROM THE HHRA
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: All Soil 0-8 foot
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	See EPC	(a)	Intake (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	330	EPA, 2002	165	(b)	CS x IR-S x FI x EF x ED x CF1/(BW x AT)
	FI	Fraction Ingested From Contaminated Source	--	1	(b)	1	(b)	
	EF	Exposure Frequency	days/year	130	(b)	26	(b)	
	ED	Exposure Duration	years	1	(b)	1	(b)	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	
	BW	Body Weight	kg	70	EPA, 1997	70	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	
Dermal	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	See EPC	(a)	Dermal Absorbed Dose (mg/kg-day) =
	SA	Surface Area	cm2	5729	(c)	5729	(c)	CS x SA x SSAF x DABS x EV x EF x ED x CF1/(BW x AT)
	SSAF	Soil-to-Skin Adherence Factor	mg/cm2	0.13	(e)	0.13	(e)	
	DABS	Dermal Absorption Factor (Solid)	--	Chemical-Specific	(d)	Chemical-Specific	(d)	
	EV	Event Frequency	events/day	1	(b)	1	(b)	
	EF	Exposure Frequency	days/year	130	(b)	26	(b)	
	ED	Exposure Duration	years	1	(b)	1	(b)	
	BW	Body Weight	kg	70	EPA, 1997	70	EPA, 1997	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	1E-06	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

Notes/Sources:
NA - Not Applicable

(a). EPC = Calculated Exposure Point Concentration. EPCs represent the 95 UCL of the arithmetic mean, unless the 95 percent UCL is greater than the maximum detected concentration. If the 95 percent UCL is greater than the maximum, the maximum is selected as the EPC for the RME case and the arithmetic mean is selected as the EPC for the CTE case.
(b). Professional Judgment. Assumes RME 5 days/week for 6 months; CTE 1 day/week for 6 months. CTE ingestion rate = one half RME.
(c). Surface Area represented by hands, forearms, lower legs, and feet.
(d). Various sources as provided by EPA Region I
(e). Calculated in Appendix G-7.

EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC.
EPA, 1994. EPA Region I, Risk Updates. August 1994, Volume II.
EPA, 1997. Exposure Factors Handbook. Volume I, Aug. 1997, EPA/600/P-25/002FA.
EPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites.
EPA, 2004. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part E). Supplemental Guidance for Dermal Risk Assessment.

TABLE C-14B

VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE CONSTRUCTION WORKER CONTACT WITH SOIL*/DUST FROM THE HHRA BUILDING 82 SITE FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Particulates
Exposure Point: Inhalation of Particulates in Surface and Subsurface Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Chemical Concentration in Air	Calculated	mg/m3	EPA, 2002	EPA, 2002	mg/m3	
	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	See EPC	(a)	Exposure Concentration (mg/m^3) =
	PEF	Particulate Emission Factor from Soil	m3/kg	1.40E+06	EPA, 2001	1.40E+06	EPA, 2001	
	ET	Exposure Time	hr/day	8	(b)	8	(b)	
	CF	Conversion Factor	hr/day	24	--	24	--	CA x ET x EF x ED
	EF	Exposure Frequency	days/year	130	(b)	26	(b)	AT x CF
	ED	Exposure Duration	years	1	(b)	1	(b)	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	CA = (1/PEF + 1/VF) x CS
	VF	Volitalization Factor	m3/kg	Chemical-specific	EPA, 2002	Chemical-specific	EPA, 2002	

Notes/Sources:
NA - Not Applicable
*Soil 0 to 8 feet below ground surface.
(a). EPC = Calculated Exposure Point Concentration. EPCs represent the 95 UCL of the arithmetic mean, unless the 95 percent UCL is greater than the maximum detected concentration. If the 95 percent UCL is greater than the maximum, the maximum is selected as the EPC for the RME case and the arithmetic mean is selected as the EPC for the CTE case.
(b). Professional Judgment. Exposure based on time at site.

EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC.
EPA, 1997. Exposure Factors Handbook. Volume I, Aug. 1997, EPA/600/P-25/002FA.
EPA, 2001: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, August 2001, calculation for construction worker PEF provided in Appendix G-8.
EPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24.

TABLE C-14C

VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE CONSTRUCTION WORKER CONTACT WITH GROUNDWATER FROM THE HHRA
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Shallow Groundwater
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Groundwater	mg/L	See EPC	(a)	See EPC	(a)	Intake (mg/kg-day) =
	IR-GW	Ingestion Rate of Groundwater	ml/day	10	(e)	10	(e)	CW x IR-GW x EF x ED x CF/(BW x AT)
	EF	Exposure Frequency	days/year	65	(b)	13	(b)	
	ED	Exposure Duration	years	1	(b)	1	(b)	
	BW	Body Weight	kg	70	EPA, 1997	70	EPA, 1997	
	CF	Conversion Factor	L/ml	1.00E-03	--	1.00E-03	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	
Dermal	CW	Chemical Concentration in Groundwater	mg/L	See EPC	(a)	See EPC	(a)	Dermal Absorbed Dose (mg/kg-day) =
	DA_{event}	Absorbed Dose per Event	mg/cm2-event	calculated		calculated		DAevent x SA x EV x EF x ED /(BW x AT)
	SA	Surface Area	cm2	5749	(c)	5749	(c)	
	Kp	Dermal Permeability Coefficients	cm/hr	Chemical-Specific	EPA, 2004	Chemical-Specific	EPA, 2004	for inorganics:
	ET	EventTime	hr	2	(d)	1	(d)	DAevent = CW x Kp x ET x CF
	EV	Event Frequency	events/day	1	(b)	1	(b)	for organics; the equation selected for DA event is dependent on
	EF	Exposure Frequency	days/year	65	(b)	13	(b)	t event. See below for the equations.
	ED	Exposure Duration	years	1	(b)	1	(b)	
	BW	Body Weight	kg	70	EPA, 1997	70	EPA, 1997	
	CF	Conversion Factor	L/cm^3	1.00E-03	--	1.00E-03	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

Notes/Sources:
NA - Not Applicable

(a). EPC = Calculated Exposure Point Concentration. EPCs represent the 95 UCL of the arithmetic mean, unless the 95 percent UCL is greater than the maximum detected concentration. If the 95 percent UCL is greater than the maximum, the maximum is selected as the EPC for the RME case and the arithmetic mean is selected as the EPC for the CTE case.
(b). Professional Judgment. Assumes 2.5 days/week 6 months/year for RME; 1 day/week 3 months/year for CTE.
(c). Surface Area represented by hands, forearms, lower legs, and feet.
(d). Various sources as provided by EPA Region I.
(e). Assumed exposure to 1/5 the amount assumed for swimming in Risk Assessment Guidance for Superfund, Vol. I. Human Health Evaluation Manual (Part A). U.S. EPA, 1989.

EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC.
EPA, 1997. Exposure Factors Handbook. Volume I, Aug. 1997, EPA/600/P-25/002FA.
EPA, 2004: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. September 2004.

Equations for DAevent for organics:

If ET < t*

$$DA_{event} = 2FA\,x\,Kp\,x\,CW\,x\,CF\,\sqrt{\frac{6\,x\,T\,x\,ET}{\pi}}$$

[If ET > t*]

$$DA_{event} = FA\,x\,Kp\,x\,CW\,x\,CF\,x\left[\frac{ET}{1+B}+2\,xT\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

TABLE C-14D

JES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE CONSTRUCTION WORKER CONTACT WITH VAPORS FROM SHALLOW GROUNDWATER FROM THE H
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Excavation Trenches
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CW	Chemical Concentration Water	ug/L	See EPC	(a)	See EPC	(a)	Exposure Concentration (mg/m3) =
	CA	Modeled Chemical Concentration in Air	mg/m3	Calculated	VDEQ, 2004	Calculated	VDEQ, 2004	
	ET	Exposure Time	hr/day	8	(b)	8	(b)	
	CF1	Conversion Factor	mg/ug	0.001	--	0.001	--	
	EF	Exposure Frequency	days/year	65	(b)	13	(b)	CA x ET x EF x ED
	CF2	Conversion Factor	hr/day	24	--	24	--	AT x CF2
	ED	Exposure Duration	years	1	(b)	1	(b)	
	BW	Body Weight	kg	70	EPA, 1997	70	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	CA = CW x CF1 x VF
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	
	VF	Volatilization Factor	(mg/m3)/(mg/L)	Chemical Specific	VDEQ, 2004	Chemical Specific	VDEQ, 2004	

Notes/Sources:
NA - Not Applicable

(a). EPC = Modeled Exposure Point Concentration based on maximum shallow groundwater concentration.
(b). Professional Judgment. Assumes RME 5 days/week for 6 months; CTE 1 day/week for 6 months.
EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC.
EPA, 1997. Exposure Factors Handbook. Volume I, Aug. 1997, EPA/600/P-25/002FA.
EPA, 2001: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, August 2001, calculation for construction worker PEF provided in Appendix E.

VDEQ, 2004. Voluntary Remediation Program Risk Assessment Guidance. Www.deq.virginia.gov/vrprisk/raguide.html

TABLE C-15

CANCER TOXICITY DATA -- ORAL/DERMAL FROM THE HHRA
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Chemical of Potential Concern	Oral Cancer Slope Factor (1)	GI Absorption in Toxicity Study	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence Narrative Descriptor	Source	Date (MM/DD/YYYY)	Dermal Absorption Factor for Soils (DABS)
Arsenic	1.5E+00	1.0E+00	1.5E+00	1/(mg/kg-day)	(3)	IRIS	7/10/2007	0.03
Lead	NA	N/A	NA	NA	(4)	IRIS	7/10/2007	NA
Manganese	NA	0.04	NA	NA	(6)	IRIS	7/10/2007	NA
Vanadium	NA	0.026	NA	NA	(8)	IRIS	7/10/2007	NA
Benzo(a)pyrene Equivalents	7.3E+00	1.0E+00	7.3E+00	1/(mg/kg-day)	(4)	IRIS	7/10/2007	0.13
N-Nitroso-di-n-propylamine	7.0E+00	1.0E+00	7.0E+00	1/(mg/kg-day)	(4)	IRIS	7/10/2007	0.1
Naphthalene	NA	NA	NA	NA	(5)	IRIS	7/10/2007	0.13
Nitrobenzene	NA	NA	NA	NA	(4)	IRIS	7/07/2009	0.1
1,1,1-Trichloroethane	NA	NA	NA	NA	(6)	IRIS	7/10/2007	NA
1,1-Dichloroethane	5.7E-03	1.0E+00	5.7E-03	1/(mg/kg-day)	(4)	IRIS	7/10/2007	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	NA	NA	NA	NA	(8)		7/10/2007	NA
1,3,5-Trimethylbenzene	NA	NA	NA	NA	(8)		7/10/2007	NA
Benzene	5.5E-02	1.0E+00	5.5E-02	1/(mg/kg-day)	(3)	IRIS	7/10/2007	NA
Chloroform	0.031	1.0E+00	3.1E-02	1/(mg/kg-day)	(5)	IRIS	7/10/2007	NA
Tetrachloroethene	0.54	1.0E+00	5.4E-01	1/(mg/kg-day)	(8)	IRIS	7/10/2007	NA
Trichloroethene	1.3E-02	1.0E+00	1.3E-02	1/(mg/kg-day)	(8)	EPA	4/15/2009	NA
Gamma-Chlordane	3.5E-01	1.0E+00	3.5E-01	1/(mg/kg-day)	(4)	IRIS	7/10/2007	0.04
Heptachlor epoxide	9.1E+00	1.0E+00	9.1E+00	1/(mg/kg-day)	(4)	IRIS	7/10/2007	NA
Aroclor-1248	2.0E+00	1.0E+00	2.0E+00	1/(mg/kg-day)	(4)	USEPA	9/1996	0.14
Aroclor-1260	2.0E+00	1.0E+00	2.0E+00	1/(mg/kg-day)	(4)	USEPA	9/1996	0.14

IRIS = Integrated Risk Information System
EPA = Environmental Protection Agency Regional Screening Level Table (EPA, April 2009).
(1) To be used for oral pathway only. Based on administered dose.
(2) Adjusted slope factor (SF) = oral SF x GI absorption value in toxicity study upon which the SF is based. To be used for dermal pathway only.

Weight of Evidence Narrative Descriptions:
(3) - Carcinogenic to Humans
(4) - Likely to be Carcinogenic to Humans
(5) - Suggestive of Carcinogenic Potential
(6) - Inadequate Information to Assess Carcinogenic Potential
(7) - Not Likely to be Carcinogenic to Humans
(8) - Not assessed under the IRIS program

USEPA = USEPA, PCBs: Cancer Dose-Response Assessment and Applications to Environmental Mixtures, September 1996, EPA/600/P-96/001F.

TABLE C-16

CANCER TOXICITY DATA -- INHALATION FROM THE HHRA
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Chemical of Potential Concern	Unit Risk	Units	Adjustment	Inhalation Cancer Slope Factor (1)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (2) (MM/DD/YYYY)
Arsenic	4.3E-03	$(ug/m^3)^{-1}$	NA	1.5E+01	$(mg/kg\text{-}d)^{-1}$	(3)	IRIS	7/10/2007
Lead	NA	NA	NA	NA	NA	(4)	IRIS	7/10/2007
Manganese	NA	NA	NA	NA	NA	(6)	IRIS	7/10/2007
Vanadium	NA	NA	NA	NA	NA	(8)	IRIS	7/10/2007
Benzo(a)pyrene Equivalents	1.1E-03	$(ug/m^3)^{-1}$	NA	3.9E+00	$(mg/kg\text{-}d)^{-1}$	(4)	EPA	4/15/2009
N-Nitroso-di-n-propylamine	2.0E-03	$(ug/m^3)^{-1}$	NA	7.0E+00	$(mg/kg\text{-}d)^{-1}$	(4)	EPA	4/15/2009
Naphthalene	3.4E-05	$(ug/m^3)^{-1}$	NA	1.2E-01	$(mg/kg\text{-}d)^{-1}$	(5)	EPA	4/15/2009
Nitrobenzene	4.0E-05	$(ug/m^3)^{-1}$	NA	1.4E-01	$(mg/kg\text{-}d)^{-1}$	(4)	IRIS	7/7/2009
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	(6)	IRIS	7/7/2009
1,1-Dichloroethane	1.6E-06	$(ug/m^3)^{-1}$	NA	5.6E-03	$(mg/kg\text{-}d)^{-1}$	(5)	IRIS	7/10/2007
1,1,-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	NA	NA	NA	NA	NA	(8)	IRIS	7/10/2007
1,3,5-Trimethylbenzene	NA	NA	NA	NA	NA	(8)	IRIS	7/10/2007
Benzene	7.8E-06	$(ug/m^3)^{-1}$	NA	2.7E-02	$(mg/kg\text{-}d)^{-1}$	(3)	IRIS	7/10/2007
Chloroform	2.3E-05	$(ug/m^3)^{-1}$	NA	8.1E-02	$(mg/kg\text{-}d)^{-1}$	(4)	IRIS	7/10/2007
Tetrachloroethene	5.9E-06	$(ug/m^3)^{-1}$	NA	2.1E-02	$(mg/kg\text{-}d)^{-1}$	(8)	EPA	4/15/2009
Trichloroethene	2.0E-06	$(ug/m^3)^{-1}$	NA	7.0E-03	$(mg/kg\text{-}d)^{-1}$	(8)	EPA	4/15/2009
Heptachlor epoxide	2.6E-03	$(ug/m^3)^{-1}$	NA	9.1E+00	$(mg/kg\text{-}d)^{-1}$	(4)	EPA	4/15/2009
Aroclor-1248	5.7E-04	$(ug/m^3)^{-1}$	NA	2.0E+00	$(mg/kg\text{-}d)^{-1}$	(4)	EPA	4/15/2009
Aroclor-1260	5.7E-04	$(ug/m^3)^{-1}$	NA	2.0E+00	$(mg/kg\text{-}d)^{-1}$	(4)	EPA	4/15/2009

IRIS = Integrated Risk Information System
HEAST= Health Effects Assessment Summary Tables
NCEA=National Center for Exposure Assessment
EPA = Environmental Protection Agency Regional Screening Level Table (EPA, April 2009).
(1) InhalationCSF= Inhalation Unit risk x 70kg x 1/20 m3/day x 1000 ug/mg
(2) For IRIS values, the date IRIS was searched.

Weight of Evidence Narrative Descriptions:
(3) - Carcinogenic to Humans
(4) - Likely to be Carcinogenic to Humans
(5) - Suggestive of Carcinogenic Potential
(6) - Inadequate Information to Assess Carcinogenic Potential
(7) - Not Likely to be Carcinogenic to Humans
(8) - Not assessed under the IRIS program

TABLE C-17

NON-CANCER CHRONIC TOXICITY DATA -- ORAL/DERMAL FROM THE HHRA
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value (1)	Oral RfD Units	GI Absorption in Toxicity Study	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YYYY)	Dermal Absorption Factor for Soils (DABS)
Arsenic	Chronic	3.0E-04	mg/kg-day	1.0E+00	3.0E-04	mg/kg-day	Skin, blood	3	IRIS	7/10/2007	0.03
Lead	NA	NA	NA	N/A	NA	NA	NA	NA	NA	NA	NA
Manganese (Soil)[3]	Chronic	7.0E-02	mg/kg-day	1	7.0E-02	mg/kg-day	CNS	1	IRIS	7/07/2009	0.01
Manganese (Water)[3]	Chronic	2.4E-02	mg/kg-day	4.0E-02	9.6E-04	mg/kg-day	CNS	1	IRIS	7/07/2009	0.01
Vanadium	Chronic	5.0E-03	mg/kg-day	0.026	1.3E-04	mg/kg-day	Hair	100	IRIS	7/07/2009	NA
Benzo(a)pyrene Equivalents	NA	NA	NA	1.0E+00	NA	NA	NA	NA	NA	NA	0.13
N-Nitroso-di-n-propylamine	NA	NA	NA	1.0E+00	NA	NA	NA	NA	NA	NA	0.1
Naphthalene	Chronic	2.0E-02	mg/kg-day	1.0E+00	2.0E-02	mg/kg-day	Body Weight	3000	IRIS	7/10/2007	0.13
Nitrobenzene	Chronic	2.0E-03	mg/kg-day	1.0E+00	2.0E-03	mg/kg-day	Blood, adrenal, kidney, liver	10000	IRIS	7/10/2007	0.1
1,1,1-Trichloroethane	Chronic	2.0E+00	mg/kg-day	1.0E+00	2.0E+00	mg/kg-day	Body Weight	1000	IRIS	7/07/2009	NA
1,1-Dichloroethane	Chronic	2.0E-01	mg/kg-day	1.0E+00	2.0E-01	mg/kg-day	Kidney, CNS	NA	PPRTV	2006	NA
1,1-Dichloroethene	Chronic	5.0E-02	mg/kg-day	1.0E+00	5.0E-02	mg/kg-day	Liver	NA	IRIS	7/07/2009	NA
1,2,4-Trimethylbenzene	Chronic	NA	NA	1.0E+00	NA	NA	NA	NA	NA	2004	NA
1,3,5-Trimethylbenzene	Chronic	5.0E-02	mg/kg-day	1.0E+00	5.0E-02	mg/kg-day	Body Weight, Kidney, Liver	NA	PPRTV	2003	NA
Benzene	Chronic	4.0E-03	mg/kg-day	1.0E+00	4.0E-03	mg/kg-day	Blood	300	IRIS	7/10/2007	NA
Chloroform	Chronic	1.0E-02	mg/kg-day	1.0E+00	1.0E-02	mg/kg-day	Liver	100	IRIS	7/10/2007	NA
Tetrachloroethene	Chronic	1.0E-02	mg/kg-day	1.0E+00	1.0E-02	mg/kg-day	Liver, body weight	1000	IRIS	7/10/2007	NA
Trichloroethene	Chronic	NA	NA	1.0E+00	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	Chronic	1.3E-05	mg/kg-day	1.0E+00	1.3E-05	mg/kg-day	Liver	1000	IRIS	7/10/2007	NA
Aroclor-1248	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1260	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

IRIS = Integrated Risk Information System
PPRTV = Provisional Peer Reviewed Toxicity Values
NA = Not Applicable
(1) To be used for oral pathway only. Based on administered dose.
(2) Adjusted RfD = oral RfD x GI absorption value in toxicity study upon which the RfD is based. To be used for dermal pathway only.
(3) Values for manganese (soil) and manganese (water) correspond with those advocated in the EPA Region I Risk Updates, September 1999.

TABLE C-18

NON-CANCER TOXICITY DATA -- INHALATION FROM THE HHRA
BUILDING 82
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Adjusted Inhalation RfD (1)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC:RfD: Target Organ	Dates (2) (MM/DD/YYYY)
Arsenic	Chronic	1.5E-05	mg/m^3	4.3E-06	mg/kg-day	NA	NA	EPA	04/15/2009
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	Chronic	5.0.E-05	mg/m^3	1.4E-05	mg/kg-day	CNS	1000	IRIS	7/10/2007
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene Equivalents	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	Chronic	3.0E-03	mg/m^3	8.6E-04	mg/kg/day	Nasal	3,000	IRIS	7/10/2007
Nitrobenzene	Chronic	9.0E-03	mg/m^3	2.6E-03	mg/kg/day	NA	NA	EPA	04/15/2009
1,1,1-Trichloroethane	Chronic	5.0E+00	mg/m^3	1.4E+00	mg/kg/day	NA	NA	EPA	04/15/2009
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	Chronic	2.0E-01	mg/m^3	5.7E-02	mg/kg/day	Liver	NA	IRIS	7/07/2009
1,2,4-Trimethylbenzene	Chronic	7.0E-03	mg/m^3	2.0E-03	mg/kg/day	Blood	NA	EPA	04/15/2009
1,3,5-Trimethylbenzene	Chronic	6.0E-03	mg/m^3	1.7E-03	mg/kg/day	CNS	NA	EPA	04/15/2009
Benzene	Chronic	3.0E-02	mg/m^3	8.6E-03	mg/kg/day	Blood	300	IRIS	7/10/2007
Chloroform	Chronic	9.8E-02	mg/m^3	2.8E-02	mg/kg/day	Liver	NA	EPA	04/15/2009
Tetrachloroethene	Chronic	2.7E-01	mg/m^3	7.7E-02	mg/kg/day	Liver	NA	EPA	04/15/2009
Trichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1248	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1260	NA	NA	NA	NA	NA	NA	NA	NA	NA

NA = Not Applicable
IRIS = Integrated Risk Information System
EPA = Environmental Protection Agency Regional Screening
Level Table (EPA, April 2009).
(1) InhalationRfD= Inhalation RfC x 20 m3/day x 1/70kg
(2) For IRIS values, the date IRIS was searched.

TABLE C-19

SUMMARY OF CANCER RISKS FROM HHRA
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Exposure Scenario			Incremental RME Case
Current Maintenance Workers	(Adult)	Exposed Surface Soil	4.3E-06
		Total	4E-06
Current/Future Trespassers	(Adolescents)	Exposed Surface Soil	1.4E-06
		Sediment	6.1E-06
		Surface Water	9.7E-09
		Total	8E-06
Future Recreational Visitors	(Adult)	Future Surface Soil	1.4E-06
		Sediment	9.6E-07
		Surface Water	4.4E-09
		Total	2E-06
	(Child)	Future Surface Soil	2.6E-05
		Sediment	4.9E-05
		Surface Water	3.7E-08
		Total	8E-05
	(Lifetime)	**Total**	8E-05
Future Residents*	(Adult)	Future Surface Soil	1.3E-05
		Tap Water (All groundwater)	**1.3E-04**
		Sediment	2.0E-06
		Surface Water	4.4E-09
		Total	**1E-04**
	(Child)	Future Surface Soil	6.6E-05
		Tap Water (All groundwater)	**1.2E-04**
		Sediment	4.9E-05
		Surface Water	3.7E-08
		Total	**2E-04**
	(Lifetime)	**Total**	**4E-04**
Future Residents*	(Adult)	0 to 8 foot Soil	1.2E-05
		Tap Water (All groundwater)	**1.3E-04**
		Sediment	2.0E-06
		Surface Water	4.4E-09
		Total	**1E-04**
	(Child)	0 to 8 foot Soil	6.4E-05
		Tap Water (All groundwater)	**1.2E-04**
		Sediment	4.9E-05
		Surface Water	3.7E-08
		Total	**2E-04**
	(Lifetime)	**Total**	**4E-04**
Future Industrial Workers*	(Adult)	Future Surface Soil	7.4E-06
		Sediment	8.0E-07
		Surface Water	3.9E-09
		Total	8E-06
Future Industrial Workers*	(Adult)	0 to 8 foot Soil	6.7E-06
		Sediment	8.0E-07
		Surface Water	3.9E-09
		Total	7E-06
Future Construction Workers	(Adult)	0 to 8 foot Soil	3.4E-07
		Dust	1.6E-08
		Shallow Groundwater	1.4E-08
		Trench air	2.4E-06
		Total	3E-06

Notes:

Bold value indicates individual media cancer risk > $1x10^{-4}$

Bold and shaded value indicates total receptor cancer risk > $1x10^{-4}$

*Future residents and future industrial workers are presented twice to present 1) total cancer risks from all media including future surface soil and 2) total cancer risks from all media including 0 to 8 foot bgs soil.

TABLE C-20

SUMMARY OF HAZARD INDICES FROM THE HHRA
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Exposure Scenario			Hazard Index RME Case
Current Maintenance Workers	(Adult)	Exposed Surface Soil	0.01
		Total	0.01
Current/Future Trespassers	(Adolescents)	Exposed Surface Soil	0.006
		Sediment	0.002
		Surface Water	0.01
		Total	0.02
Future Recreational Visitors	(Adult)	Future Surface Soil	0.003
		Sediment	0.0003
		Surface Water	0.003
		Total	0.006
	(Child)	Future Surface Soil	0.1
		Sediment	0.02
		Surface Water	0.05
		Total	0.2
Future Residents*	(Adult)	Future Surface Soil	0.03
		Tap Water (All groundwater)	**8.8**
		Sediment	0.0004
		Surface Water	0.003
		Total	**9**
	(Child)	Future Surface Soil	0.3
		Tap Water (All groundwater)	**30**
		Sediment	0.02
		Surface Water	0.05
		Total	**31**
Future Residents*	(Adult)	0 to 8 foot Soil	0.05
		Tap Water (All groundwater)	**8.8**
		Sediment	0.0004
		Surface Water	0.003
		Total	**9**
	(Child)	0 to 8 foot Soil	0.5
		Tap Water (All groundwater)	**30**
		Sediment	0.02
		Surface Water	0.05
		Total	**31**
Future Industrial Workers*	(Adult)	Future Surface Soil	0.02
		Sediment	0.0004
		Surface Water	0.002
		Total	0.02
Future Industrial Workers*	(Adult)	0 to 8 foot Soil	0.04
		Sediment	0.0004
		Surface Water	0.002
		Total	0.04
Future Construction Workers	(Adult)	0 to 8 foot Soil	0.06
		Dust	**2.2**
		Shallow Groundwater	0.1
		Trench air	**2.0**
		Total	**4**

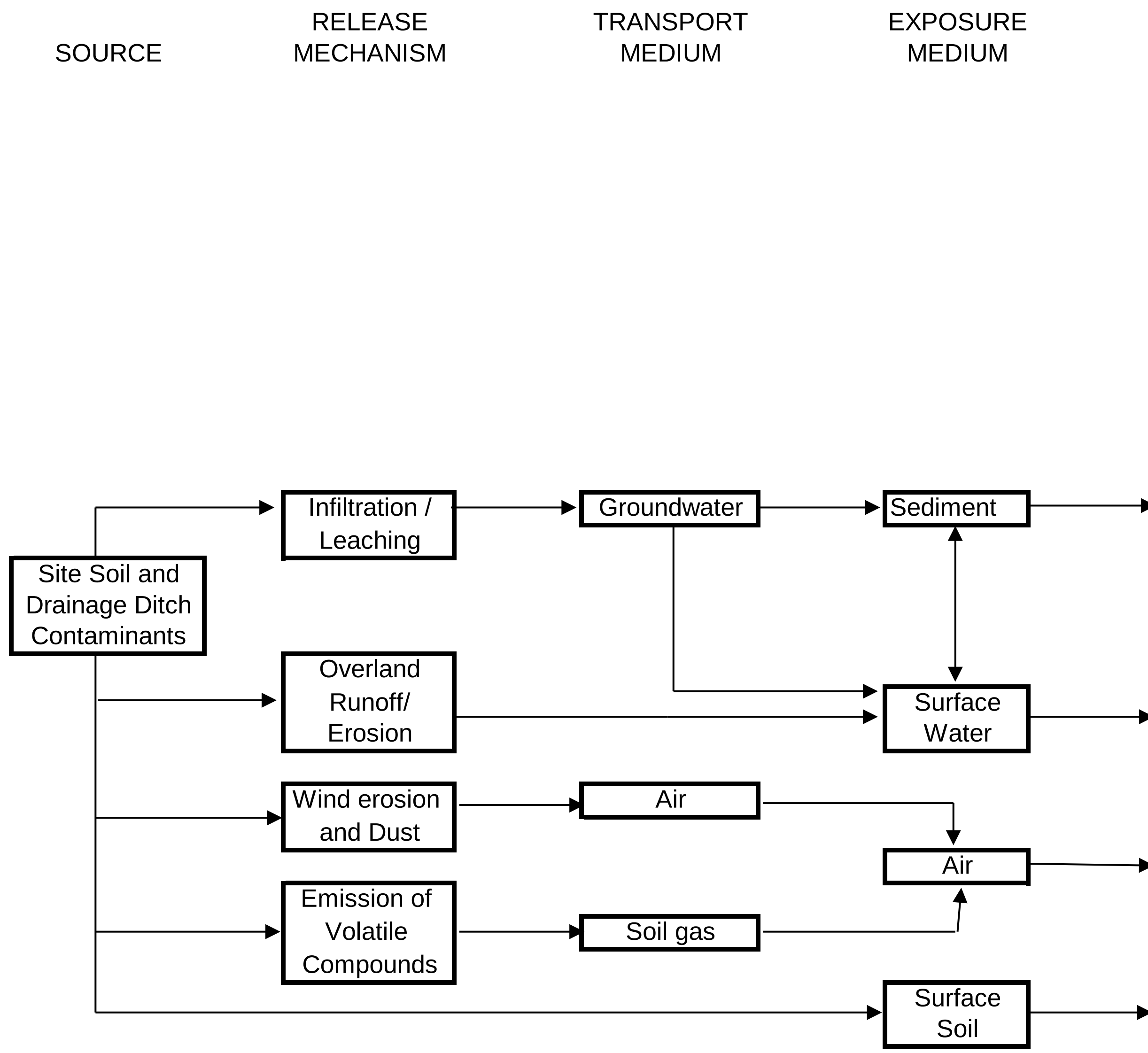
Notes:

Bold value indicates individual media HI > 1.0
Bold and shaded value indicates total receptor HI > 1.(
* Future residents and future industrial workers are presented twice to present 1) total hazard indices from all media including future surface soil and 2) total hazard indices from all media including 0 to 8 foot bgs soil.

Appendix D
Ecological Risk Assessment Summary Tables

FIGURE D-1

ECOLOGICAL CONCEPTUAL SITE MODEL FROM THE ERA
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHESETTS



EXPOSURE MECHANISM	Terrestrial Invertebrates	Benthic invertebrates	Aquatic Organisms	Terrestrial Plants	Terrestrial Vertebrates	Piscivorous Vertebrates[(1)]	Reptiles and amphibians
Direct Contact		■	■			■	■
Ingestion of Sediment		■	■			■	■
Ingestion of Food		■	■			■	■
Direct contact		■	■			■	■
Ingestion of Water		■	■			■	■
Inhalation					■	■	■
Direct Contact	■			■	■		■
Ingestion of Soil	■				■		■
Ingestion of Food	■				■		■

■ = COMPLETE EXPOSURE PATHWAY

[1] - Piscivorous wildlife will not have a significant exposure and were not evaluated in the ERA.

TABLE D-1

OCCURENCE, DISTRIBUTION, AND SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN - EXPOSED SURFACE SOIL FROM THE ERA
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Chemical	Minimum Concentration(1)	Maximum Concentration(1)	Sample of Maximum Concentration	Average of All Samples (2)	Average of Positive Detections (3)	95% UCL Concentration (4)	Frequency of Detection	Ecological Risk Screening				
								Screening Level	Source of Screening Level	Hazard Quotient (5)	Retained as COPC (yes/no)	Rationale
VOLATILE ORGANIC COMPOUNDS (ug/kg)												
2-BUTANONE	4	4	B82-SS-120-0002-AVG	2	4	NA	1/6	NA	NA	NA	Yes	NTX
ACETONE	16	130	B82-SS-120-0002-AVG	25.5	73	130	2/6	NA	NA	NA	Yes	NTX
SEMIVOLATILE ORGANIC COMPOUNDS (ug/kg)												
1,1-BIPHENYL	46 J	46 J	B82-SS-118-0002	163	46	NA	1/5	NA	NA	NA	Yes	NTX
2-METHYLNAPHTHALENE	4.6	220 J	SB08019-NSO-121198-0	69.2	96.1	143.4	5/7	29000	EPA ECO-SSL	0.01	No	BSL
ACENAPHTHENE	15	1200	B82-SS-119-0002	282	299	995.4	6/7	29000	EPA ECO-SSL	0.04	No	BSL
ACENAPHTHYLENE	7.1 J	220	B82-SS-119-0002	96.2	82.2	143.1	6/7	29000	EPA ECO-SSL	0.01	No	BSL
ANTHRACENE	65	1500	B82-SS-119-0002	348	376	1203	6/7	29000	EPA ECO-SSL	0.05	No	BSL
BENZALDEHYDE	47 J	76 J	B82-SS-120-0002-AVG	116	60	78.13	3/5	NA	NA	NA	Yes	NTX
BENZO(A)ANTHRACENE	320 J	1700	B82-SS-119-0002	689	773	1075	6/7	1100	EPA ECO-SSL	1.55	Yes	ASL
BENZO(A)PYRENE	5.5 J	1300	B82-SS-119-0002	611	611	925.5	7/7	1100	EPA ECO-SSL	1.18	Yes	ASL
BENZO(B)FLUORANTHENE	380 J	1500	B82-SS-119-0002	877	993	1266	6/7	1100	EPA ECO-SSL	1.36	Yes	ASL
BENZO(G,H,I)PERYLENE	120 J	650 J	B82-SS-119-0002	384	418	533.8	6/7	1100	EPA ECO-SSL	0.59	No	BSL
BENZO(K)FLUORANTHENE	200 J	820	B82-SS-119-0002	431	473	619.5	6/7	1100	EPA ECO-SSL	0.75	No	BSL
BIS(2-ETHYLHEXYL)PHTHALATE	160 J	160 J	B82-SS-MW202D-0002	220	160	NA	1/7	NA	NA	NA	Yes	NTX
CARBAZOLE	72 J	910	B82-SS-119-0002	266	298	786.7	5/7	NA	NA	NA	Yes	NTX
CHRYSENE	370 J	1900	B82-SS-119-0002	880	997	1361	6/7	1100	EPA ECO-SSL	1.73	Yes	ASL
DI-N-BUTYL PHTHALATE	46 J	46 J	B82-SS-MW202D-0002	172	46	NA	1/7	200000	REGION IV	0.0002	No	BSL
DIBENZO(A,H)ANTHRACENE	3.6 J	310	B82-SS-119-0002	142	142	217.1	7/7	1100	EPA ECO-SSL	0.28	No	BSL
DIBENZOFURAN	240 J	260 J	B82-SS-119-0002	201	250	NA	2/7	NA	NA	NA	Yes	NTX
FLUORANTHENE	500	7000 J	B82-SS-119-0002	2211	2550	3984	6/7	29000	EPA ECO-SSL	0.24	No	BSL
FLUORENE	12	930 J	B82-SS-119-0002	238	238	787.7	6/7	29000	EPA ECO-SSL	0.03	No	BSL
INDENO(1,2,3-CD)PYRENE	120 J	620 J	B82-SS-119-0002	360	390	498.6	6/7	1100	EPA ECO-SSL	0.56	No	BSL
NAPHTHALENE	5.4	90 J	SB08019-NSO-121198-0	26.2	30.4	50.42	6/7	29000	EPA ECO-SSL	0.003	No	BSL
PHENANTHRENE	190	10000 J	B82-SS-119-0002	2294	2647	8328	6/7	29000	EPA ECO-SSL	0.34	No	BSL
PHENOL	7.7	11	B82-SS-119-0002	31.7	9.7	10.23	4/7	50	REGION IV	0.2	No	BSL
PYRENE	500	6700	B82-SS-119-0002	1930	2222	5678	6/7	1100	EPA ECO-SSL	6	Yes	ASL

TABLE D-1

OCCURENCE, DISTRIBUTION, AND SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN - EXPOSED SURFACE SOIL FROM THE ERA
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Chemical	Minimum Concentration(1)	Maximum Concentration(1)	Sample of Maximum Concentration	Average of All Samples (2)	Average of Positive Detections (3)	95% UCL Concentration (4)	Frequency of Detection	Ecological Risk Screening				
								Screening Level	Source of Screening Level	Hazard Quotient (5)	Retained as COPC (yes/no)	Rationale
PESTICIDES/PCBs (ug/kg)												
4,4'-DDE	1.9	5.9 J	B82-SS-119-0002	2.6	3.5	4.3	4/6	21	EPA ECO-SSL	0.3	No	BSL
4,4'-DDT	2.6	18 J	B82-SO-114-0002-AVG	9.9	11.7	15.6	5/6	21	EPA ECO-SSL	0.9	No	BSL
AROCLOR-1260	22	140	B82-SS-120-0002-AVG	56.8	79.8	111	4/6	**20**	REGION IV	7	Yes	ASL
ENDRIN ALDEHYDE	2.8 J	3.2 J	B82-SS-119-0002	2.9	3	NA	2/6	**1**	REGION IV	3	Yes	ASL
ENDRIN KETONE	6.6 J	10 J	B82-SS-115-0002-AVG	3.7	8.3	NA	2/6	**1**	REGION IV	10	Yes	ASL
GAMMA-CHLORDANE	3 J	3 J	B82-SS-115-0002-AVG	1.2	3	NA	1/5	NA	NA	NA	Yes	NTX
HEPTACHLOR EPOXIDE	5.2	5.2	B82-SS-120-0002-AVG	1.7	5.2	NA	1/6	NA	NA	NA	Yes	NTX
METALS (mg/kg)												
ALUMINUM	5950	8920 J	B82-SS-MW202D-0002	7705	7705	8684	6/6	pH	EPA ECO-SSL(6)	NA	Yes	NTX
ARSENIC	1.24 J	6.75	B82-SS-118-0002	3.5	3.5	5.62	6/6	18	EPA ECO-SSL	0.4	No	BSL
BARIUM	20.5	31.2	B82-SO-114-0002-AVG	26	26	29.22	5/6	330	EPA ECO-SSL	0.1	No	BSL
BERYLLIUM	0.259 J	0.37 J	B82-SS-MW202D-0002	0.33	0.33	0.36	6/6	21	EPA ECO-SSL	0.02	No	BSL
CADMIUM	0.496	1.44	B82-SO-114-0002-AVG	0.73	0.73	1.1	6/6	**0.36**	EPA ECO-SSL	4.0	Yes	ASL
CALCIUM	969 J	2310	B82-SO-114-0002-AVG	1765	1765	2143	6/6	NA	NA	NA	No	NUT
CHROMIUM	6.19 J	15.6 J	B82-SS-MW202D-0002	10.4	10.4	13.2	6/6	26	EPA ECO-SSL	0.6	No	BSL
COBALT	1.86 J	4.68	B82-SO-114-0002-AVG	3	3	4	6/6	13	EPA ECO-SSL	0.4	No	BSL
COPPER	7.98	18.3	B82-SS-115-0002-AVG	11.9	11.9	15.6	6/6	28	EPA ECO-SSL	0.7	No	BSL
CYANIDE	0.18 J	0.36 J	B82-SS-115-0002-AVG	0.15	0.27	NA	2/6	0.9	REGION IV	0.4	No	BSL
IRON	9370	17000	B82-SO-114-0002-AVG	11910	11910	14286	6/6	pH	EPA ECO-SSL(6)	NA	Yes	NTX
LEAD	12.8 J	39.5	B82-SS-119-0002	24.5	24.5	34.2	6/6	**11**	EPA ECO-SSL	3.6	Yes	ASL
MAGNESIUM	975 J	2200 J	B82-SS-MW202D-0002	1569	1569	1935	6/6	NA	NA	NA	No	NUT
MANGANESE	114	328	B82-SO-114-0002-AVG	204	204	261	6/6	**220**	EPA ECO-SSL	1.5	Yes	ASL
MERCURY	0.0075 J	0.0363	B82-SO-114-0002-AVG	0.013	0.018	0.025	4/6	0.1	REGION IV	0.4	No	BSL
NICKEL	5.09	11.5 J	B82-SO-114-0002-AVG	7.4	7.4	9.4	6/6	38	EPA ECO-SSL	0.3	No	BSL
POTASSIUM	131 J	657	B82-SS-MW202D-0002	371	371	547	3/6	NA	NA	NA	No	NUT
SELENIUM	0.0906 J	0.358	B82-SO-114-0002-AVG	0.16	0.18	0.261	5/6	0.52	EPA ECO-SSL	0.7	No	BSL

TABLE D-1

OCCURENCE, DISTRIBUTION, AND SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN - EXPOSED SURFACE SOIL FROM THE ERA BUILDING 82 SITE FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Chemical	Minimum Concentration[1]	Maximum Concentration[1]	Sample of Maximum Concentration	Average of All Samples [2]	Average of Positive Detections [3]	95% UCL Concentration [4]	Frequency of Detection	Ecological Risk Screening				
								Screening Level	Source of Screening Level	Hazard Quotient [5]	Retained as COPC (yes/no)	Rationale
METALS (mg/kg) (cont.)												
SILVER	0.0452 J	0.131 J	B82-SO-114-0002-AVG	0.07	0.07	0.1	6/6	4.2	EPA ECO-SSL	0.03	No	BSL
SODIUM	60.4 J	60.4 J	B82-SS-118-0002	35.9	60.4	NA	1/6	NA	NA	NA	No	NUT
THALLIUM	0.0254 J	0.0511	B82-SS-120-0002-AVG	0.03	0.03	0.042	6/6	1	REGION IV	0.1	No	BSL
VANADIUM	13.5 J	27.5	B82-SO-114-0002-AVG	17.9	17.9	22.4	6/6	**7.8**	EPA ECO-SSL	3.5	Yes	ASL
ZINC	32.5 J	64.5	B82-SS-119-0002	47	47	57.2	6/6	**46**	EPA ECO-SSL	1.4	Yes	ASL

Notes:

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

2 - Average of all analytical results are calculated using half of the detection limit for nondetects.

3 - Average of positive analytical results only.

4 - 95% UCL is the UCL recommended by Pro UCL 4.00.04; a 95% UCL was not calculated for chemicals with less than 3 positive detections.

5 - The hazard quotient is the maximum detected concentration divided by the screening level.

6 - Eco SSL is based on the soil pH. The soil pH at the site is not known so aluminum and iron are initially selected as COPCs.

UCL = Upper Confidence Limit

COPC = Chemical of Potential Concern

EPA Eco SSL – EPA Ecological Soil Screening Levels (U.S. EPA, 2003, 2005, 2006, 2007)

Region IV – EPA Region IV soil screening levels (U.S. EPA, 2001b)

NA = Not Available or Not Applicable.

Shaded chemicals are those retained as COPCs.

Shaded screening levels indicates that the maximum detected concentration exceeds the screening level.

Rationale Codes:

For Selection as a COPC or for Further Evaluation:

ASL = Above COPC Screening Level

BSL = Below COPC Screening Level

NTX = No Toxicity Data Available/Screening Level not Available

NUT = Essential Nutrient

TABLE D-1

OCCURENCE, DISTRIBUTION, AND SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN - EXPOSED SURFACE SOIL FROM THE ERA BUILDING 82 SITE FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Chemical	Minimum Concentration (1)	Maximum Concentration (1)	Sample of Maximum Concentration	Average of All Samples (2)	Average of Positive Detections (3)	95% UCL Concentration (4)	Frequency of Detection	Ecological Risk Screening: Screening Level	Source of Screening Level	Hazard Quotient (5)	Retained as COPC (yes/no)	Rationale

SURFACE SOIL NUTRIENT SCREEN

Nutrient	Screening Benchmarks		Sediment Screen			
	Maximum Tolerable Dietary Conc. (mg/kg)*	Maximum Tolerable Ingestion Rate (mg/kg BW/day)**	Surface Soil Maximum Concentration (mg/kg)		Ingestion Rate for Maximum Sed. Conc.*** (mg/kg BW/day)	Maximum Ingestion Rate > Maximum Tolerable Ingestion Rate ?
Calcium	10000	150	2310		10.395	no
Magnesium	3000	45	2200		9.9	no
Potassium	30000	450	657		2.9565	no
Sodium	20000	300	60		0.2718	no

Notes:

* - Maximum tolerable nutrient concentration for swine and other animals (NRC, 1980)

** - Max. tolerable intake rate = Max. tolerable dietary conc. (mg/kg diet) X Dietary intake (kg diet/day) / Body Weight (kg).
Values for swine (3.41 kg diet/day, 227 kg body weight) from Kenaga, 1972.

*** - Max. Soil Ingestion Rate = Soil conc. (mg/kg soil) X Fraction diet as soil (0.3) X Dietary Intake (kg diet/day)/Body Weight (kg).

Nutrient screening conducted as presented in TtNUS (1999).

TABLE D-2

OCCURENCE, DISTRIBUTION, AND SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN - SEDIMENT FROM THE ERA BUILDING 82 SITE FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Chemical	Minimum Concentration[1]	Maximum Concentration[1]	Sample of Maximum Concentration	Average of All Samples [2]	Average of Positive Detections [3]	Frequency of Detection	Minimum Range of Nondects[2]	Maximum Range of Nondects[2]	Ecological Risk Screening					
									Screening Level	Source of Screening Level[5]	Number of Sample Locations where the Screening Level was Exceeded	Hazard Quotient [4]	Retained as COPC (yes/no)	Rationale
VOLATILE ORGANIC COMPOUNDS (ug/kg)														
ACETONE	3.8 J	20 J	B82-SD-102-1106	13	13	3/3	NA	NA	9	SCV	2	2	Yes	ASL
SEMIVOLATILE ORGANIC COMPOUNDS (ug/kg)														
1,1-BIPHENYL	99 J	99 J	B82-SD-100-1106	167	99	1/3	395	410	1100	SCV	0	0.1	No	BSL
2-METHYLNAPHTHALENE	250 J	290 J	B82-SD-100-1106	182	272	2/3	4.1	4.1	65	ER-L	2	4	Yes	ASL
2-METHYLPHENOL	8 J	8 J	B82-SD-100-1106	4.11	8.3	1/3	3.95	4.1	12	SCV	0	0.7	No	BSL
4-METHYLPHENOL	57 J	57 J	B82-SD-100-1106	153	57	1/3	395	410	12	SCV	1	5	Yes	ASL
ACENAPHTHENE	290 J	2200 J	B82-SD-100-1106	831	1240	2/3	4.1	4.1	150	ER-L	2	15	Yes	ASL
ACENAPHTHYLENE	7	190 J	B82-SD-100-1106	83.4	83.4	3/3	---	---	150	ER-L	1	1	Yes	ASL
ANTHRACENE	18	2800 J	B82-SD-100-1106	1080	1080	3/3	---	---	57	TEC	2	49	Yes	ASL
BENZALDEHYDE	110 J	110 J	B82-SD-100-1106	178	110	1/3	410	435	NA	NA	NA	NA	Yes	NTX
BENZO(A)ANTHRACENE	100	3800 J	B82-SD-100-1106	1570	1570	3/3	---	---	108	TEC	2	35	Yes	ASL
BENZO(A)PYRENE	63	3100 J	B82-SD-100-1106	1280	1280	3/3	---	---	150	TEC	2	21	Yes	ASL
BENZO(B)FLUORANTHENE	110	4400 J	B82-SD-100-1106	1880	1880	3/3	---	---	1800	NOAA	1	2	Yes	ASL
BENZO(G,H,I)PERYLENE	40	1400	B82-SD-100-1106	587	587	3/3	---	---	170	LEL	2	8	Yes	ASL
BENZO(K)FLUORANTHENE	40	1700 J	B82-SD-100-1106	722	722	3/3	---	---	240	LEL	2	7	Yes	ASL
BIS(2-ETHYLHEXYL)PHTHALATE	61 J	670	B82-SD-101-1106-AVG	273	273	3/3	---	---	890000	SCV	0	0.001	No	BSL
CARBAZOLE	350 J	2200 J	B82-SD-100-1106	917	1270	2/3	410	410	NA	NA	NA	NA	Yes	NTX
CHRYSENE	78	4400 J	B82-SD-100-1106	1850	1850	3/3	---	---	170	TEC	2	25.9	Yes	ASL
DI-N-BUTYL PHTHALATE	140 J	140 J	B82-SD-101-1106-AVG	193	140	1/3	410	470	11000	SVC	0	0.01	No	BSL
DIBENZO(A,H)ANTHRACENE	13	300 J	B82-SD-100-1106	125	125	3/3	---	---	33	TEC	2	9	Yes	ASL
DIBENZOFURAN	280 J	1500 J	B82-SD-100-1106	660	888	2/3	410	410	420	SCV	1	4	Yes	ASL
FLUORANTHENE	160	18000	B82-SD-100-1106	7450	7450	3/3	---	---	420	TEC	2	43	Yes	ASL
FLUORENE	320 J	2200 J	B82-SD-100-1106	839	1260	2/3	4.1	4.1	77.4	TEC	2	28	Yes	ASL
INDENO(1,2,3-CD)PYRENE	35	1300 J	B82-SD-100-1106	542	542	3/3	---	---	200	LEL	2	7	Yes	ASL
NAPHTHALENE	5	380 J	B82-SD-100-1106	144	144	3/3	---	---	176	TEC	1	2	Yes	ASL
PHENANTHRENE	36	22000	B82-SD-100-1106	8410	8410	3/3	---	---	204	TEC	2	108	Yes	ASL
PYRENE	120	13000	B82-SD-100-1106	5040	5040	3/3	---	---	195	TEC	2	67	Yes	ASL
TOTAL PAHS	830	81000	B82-SD-100-1106	32600	32600	3/3	---	---	1610	TEC	0	50.3	Yes	ASL

TABLE D-2

OCCURENCE, DISTRIBUTION, AND SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN - SEDIMENT FROM THE ERA
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Chemical	Minimum Concentration(1)	Maximum Concentration(1)	Sample of Maximum Concentration	Average of All Samples (2)	Average of Positive Detections (3)	Frequency of Detection	Minimum Range of Nondects(2)	Maximum Range of Nondects(2)	Ecological Risk Screening					
									Screening Level	Source of Screening Level(5)	Number of Sample Locations where the Screening Level was Exceeded	Hazard Quotient (4)	Retained as COPC (yes/no)	Rationale
PESTICIDES/PCBs (ug/kg)														
4,4'-DDT	3.5 J	6.4 J	B82-SD-101-1106-AVG	4	5	2/3	2.1	2.1	4.16	TEC	1	2	Yes	ASL
AROCLOR-1260	665 J	665 J	B82-SD-101-1106-AVG	229	665	1/3	21	23	59.8	TEC	1	11	Yes	ASL
DIELDRIN	1.5 J	1.5 J	B82-SD-101-1106-AVG	1	2	1/3	2.1	2.3	1.9	TEC	0	0.8	No	BSL
ENDOSULFAN SULFATE	6.1 J	6.1 J	B82-SD-100-1106	3	6	1/3	2	2.1	5.5	SCV	1	1	Yes	ASL
ENDRIN ALDEHYDE	7.1 J	7.1 J	B82-SD-101-1106-AVG	8	7	1/3	2.1	29	2.22	TEC	1	3	Yes	ASL
GAMMA-CHLORDANE	11 J	11 J	B82-SD-100-1106	4	11	1/3	1	1.1	3.24	TEC	1	3	Yes	ASL
METALS (mg/kg)														
ALUMINUM	3020 J	8650 J	B82-SD-102-1106	5260	5260	3/3	0	0	25500	NOAA	0	0.3	No	BSL
ARSENIC	0.565	2.28	B82-SD-101-1106-AVG	1	1	3/3	0	0	9.79	TEC	0	0.2	No	BSL
BARIUM	10.5 J	15.6 J	B82-SD-101-1106-AVG	13	13	3/3	0	0	48	NOAA	0	0.3	No	BSL
BERYLLIUM	0.234 J	0.307 J	B82-SD-102-1106	0.3	0.3	3/3	0	0	NA	NA	NA	NA	Yes	NTX
CADMIUM	0.302 J	0.731	B82-SD-101-1106-AVG	0.5	0.5	3/3	0	0	0.99	TEC	0	0.7	No	BSL
CALCIUM	736	1180 J	B82-SD-100-1106	916	916	3/3	0	0	NA	NA	NA	NA	No	NUT
CHROMIUM	5.19	9.96 J	B82-SD-102-1106	8	8	3/3	0	0	43.4	TEC	0	0.2	No	BSL
COBALT	2.04 J	3.97 J	B82-SD-102-1106	3	3	3/3	0	0	50	LEL	0	0.1	No	BSL
COPPER	4.77 J	11.4	B82-SD-101-1106-AVG	7	7	3/3	0	0	31.6	TEC	0	0.4	No	BSL
CYANIDE	0.055 J	0.076 J	B82-SD-102-1106	0.1	0.1	2/3	0.074	0.074	0.1	LEL	0	0.8	No	BSL
IRON	8250 J	16300 J	B82-SD-102-1106	11000	11000	3/3	0	0	20000	LEL	0	0.8	No	BSL
LEAD	6.76 J	51 J	B82-SD-101-1106-AVG	23	23	3/3	0	0	35.8	TEC	1	1	Yes	ASL
MAGNESIUM	1100 J	3160 J	B82-SD-102-1106	1890	1890	3/3	0	0	NA	NA	NA	NA	No	NUT
MANGANESE	92.8 J	278 J	B82-SD-102-1106	183	183	3/3	0	0	460	LEL	0	0.6	No	BSL
MERCURY	0.0138 J	0.052 J	B82-SD-101-1106-AVG	0.02	0.03	2/3	0.00662	0.00662	0.18	TEC	0	0.3	No	BSL
NICKEL	4.45 J	11.4 J	B82-SD-102-1106	7	7	3/3	0	0	22.7	TEC	0	0.5	No	BSL
POTASSIUM	248 J	305 J	B82-SD-100-1106	268	268	3/3	0	0	NA	NA	NA	NA	No	NUT
SELENIUM	0.133 J	0.133 J	B82-SD-100-1106	0.1	0.1	1/3	0.127	0.13	1	NOAA	0	0.1	No	BSL
SILVER	0.0348 J	0.0348 J	B82-SD-101-1106-AVG	0.03	0.03	1/3	0.0465	0.0479	0.5	LEL	0	0.1	No	BSL
SODIUM	25.9 J	38.1 J	B82-SD-102-1106	31	31	3/3	0	0	NA	NA	NA	NA	No	NUT
THALLIUM	0.02 J	0.02 J	B82-SD-100-1106	0.01	0.02	1/3	0.0116	0.0132	NA	NA	NA	NA	Yes	NTX
VANADIUM	10.9	15.4	B82-SD-102-1106	13	13	3/3	0	0	57	NOAA	0	0.3	No	BSL

TABLE D-2

OCCURENCE, DISTRIBUTION, AND SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN - SEDIMENT FROM THE ERA
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Chemical	Minimum Concentration(1)	Maximum Concentration(1)	Sample of Maximum Concentration	Average of All Samples (2)	Average of Positive Detections (3)	Frequency of Detection	Minimum Range of Nondects(2)	Maximum Range of Nondects(2)	Ecological Risk Screening					
									Screening Level	Source of Screening Level(5)	Number of Sample Locations where the Screening Level was Exceeded	Hazard Quotient (4)	Retained as COPC (yes/no)	Rationale
ZINC	30.2	56 J	B82-SD-101-1106-AVG	43	43	3/3	0	0	121	TEC	0	0.5	No	BSL

Notes:

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

2 - Average of all analytical results are calculated using half of the detection limit for nondetects.

3 - Average of positive analytical results only.

4 - The hazard quotient is the maximum detected concentration divided by the screening level.

COPC = Chemical of Potential Concern

TEC – Threshold Effects Concentration (MacDonald, et al., 2000)

LEL – Lowest Effects Level (Persaud, et al., 1993)

SCV – Secondary chronic value (Jones, et al., 1997)

NOAA – National Oceanographic and Atmospheric Administration sediment benchmarks

NA = Not Available or Not Applicable.

Shaded chemicals are those retained as COPCs.

Shaded screening levels indicates that the maximum detected concentration exceeds the screening level.

Rationale Codes:

For Selection as a COPC or for Further Evaluation:

ASL = Above COPC Screening Level

BSL = Below COPC Screening Level

NTX = No Toxicity Data Available/Screening Level not Available

NUT = Essential Nutrient (see nutrient screen below)

SEDIMENT NUTRIENT SCREEN

Nutrient	Screening Benchmarks		Sediment Screen		
	Maximum Tolerable Dietary Conc. (mg/kg)*	Maximum Tolerable Ingestion Rate (mg/kg BW/day)**	Sediment Maximum Concentration (mg/kg)	Ingestion Rate for Maximum Sediment Conc.*** (mg/kg BW/day)	Maximum Ingestion Rate > Maximum Tolerable Ingestion Rate ?
Calcium	10000	150	1180	5.31	no
Magnesium	3000	45	3160	14.22	no
Potassium	30000	450	305	1.3725	no
Sodium	20000	300	38	0.17145	no

Notes:

* - Maximum tolerable nutrient concentration for swine and other animals (NRC, 1980)

** - Max. tolerable intake rate = Max. tolerable dietary conc. (mg/kg diet) X Dietary intake (kg diet/day) / Body Weight (kg).

Values for swine (3.41 kg diet/day, 227 kg body weight) from Kenaga, 1972.

*** - Max. Soil Ingestion Rate = Soil conc. (mg/kg soil) X Fraction diet as soil (0.3) X Dietary Intake (kg diet/day)/Body Weight (kg).

Nutrient screening conducted as presented in TtNUS (1999).

TABLE D-3

OCCURRENCE, DISTRIBUTION, AND SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN - DITCH SURFACE WATER FROM THE ERA
BUILDING 82 SITE
FOREMR NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS
PAGE 1 OF 2

Chemical	Minimum Concentration(1)	Maximum Concentration(1)	Sample of Maximum Concentration	Average of All Samples (2)	Average of Positive Detections (3)	Frequency of Detection	Ecological Risk Screening					
							Screening Level	Source of Screening Level	Number of Sample Locations where the Screening Level was Exceeded	Hazard Quotient (4)	Retained as COPC (yes/no)	Rationale
VOLATILE ORGANIC COMPOUNDS (ug/L)												
CIS-1,2-DICHLOROETHENE	0.335 J	0.335 J	B82-SW-101-1106-AVG	0.278	0.335	1/3	590	SCV	0	0.001	No	BSL
CYCLOHEXANE	1.2	1.2	B82-SW-102-1106	0.567	1.2	1/3	NA	NA	NA	NA	Yes	NTX
DICHLORODIFLUOROMETHANE	1.9 J	1.9 J	B82-SW-100-1106	0.8	1.9	1/3	1100	LOEL	0	0.002	No	BSL
METHYL CYCLOHEXANE	0.56	0.56	B82-SW-102-1106	0.353	0.56	1/3	NA	NA	NA	NA	Yes	NTX
METHYL TERT-BUTYL ETHER	0.34 J	0.34 J	B82-SW-100-1106	0.28	0.34	1/3	NA	NA	NA	NA	Yes	NTX
TOTAL 1,2-DICHLOROETHENE	0.335	0.335	B82-SW-101-1106-AVG	0.278	0.335	1/3	590	SCV	0	0.001	No	BSL
SEMIVOLATILE ORGANIC COMPOUNDS (ug/L)												
BIS(2-ETHYLHEXYL)PHTHALATE	1.75 J	2 J	B82-SW-100-1106	1.42	1.88	2/3	3	SCV	0	0.7	No	BSL
FLUORANTHENE	0.1	0.1	B82-SW-101-1106-AVG	0.0667	0.1	1/3	6.16	FCV	0	0.02	No	BSL
PHENANTHRENE	0.09	0.09	B82-SW-101-1106-AVG	0.0633	0.09	1/3	6.3	FCV	0	0.01	No	BSL
PYRENE	0.08	0.08	B82-SW-101-1106-AVG	0.06	0.08	1/3	NA	NA	NA	NA	Yes	NTX
TOTAL PAHS	0.27	0.27	B82-SW-101-1106-AVG	0.123	0.27	1/3	NA	NA	NA	NA	Yes	NTX
METALS (ug/L)												
ALUMINUM	41 J	41 J	B82-SW-101-1106-AVG	24.3	41	1/3	87	NRWQC	0	0.5	No	BSL
ANTIMONY	0.248 J	0.248 J	B82-SW-102-1106	0.144	0.248	1/3	30	SCV	0	0.01	No	BSL
ARSENIC	0.156 J	0.584 J	B82-SW-101-1106-AVG	0.313	0.313	3/3	150	NRWQC	0	0.004	No	BSL
BARIUM	6.55 J	13.8	B82-SW-101-1106-AVG	9.33	9.33	3/3	4	SCV	3	3	Yes	ASL
BERYLLIUM	0.115 J	0.115 J	B82-SW-101-1106-AVG	0.0527	0.115	1/3	5.3	LOEL	0	0.02	No	BSL
CADMIUM	0.0951 J	0.0951 J	B82-SW-102-1106	0.063	0.0951	1/3	0.13	NRWQC(5)	0	0.7	No	BSL
CALCIUM	4210	15600	B82-SW-100-1106	10300	10300	3/3	116000	LCV	0	0.1	No	NUT
COPPER	0.622 J	1.6 J	B82-SW-101-1106-AVG	0.827	1.11	2/3	3.92	NRWQC(5)	0	0.4	No	BSL
IRON	644	5070	B82-SW-101-1106-AVG	2450	2450	3/3	1000	NRWQC	2	5	Yes	ASL
LEAD	0.391 J	0.414 J	B82-SW-101-1106-AVG	0.281	0.402	2/3	0.87	NRWQC(5)	0	0.5	No	BSL
MAGNESIUM	513	5210	B82-SW-100-1106	3130	3130	3/3	82000	LCV	0	0.1	No	NUT
MANGANESE	33.8	422	B82-SW-101-1106-AVG	228	228	3/3	120	SCV	2	4	Yes	ASL
NICKEL	0.759 J	1.02 J	B82-SW-101-1106-AVG	0.74	0.89	2/3	22.9	NRWQC(5)	0	0.04	No	BSL
POTASSIUM	886	1500	B82-SW-101-1106-AVG	1290	1290	3/3	53000	LCV	0	0.03	No	NUT
SODIUM	3600	10900 J	B82-SW-100-1106	7170	7170	3/3	680000	LCV	0	0.02	No	NUT

TABLE D-3

OCCURRENCE, DISTRIBUTION, AND SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN - DITCH SURFACE WATER FROM THE ERA
BUILDING 82 SITE
FOREMR NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Chemical	Minimum Concentration[1]	Maximum Concentration[1]	Sample of Maximum Concentration	Average of All Samples [2]	Average of Positive Detections [3]	Frequency of Detection	Ecological Risk Screening						
							Screening Level	Source of Screening Level	Number of Sample Locations where the Screening Level was Exceeded	Hazard Quotient [4]	Retained as COPC (yes/no)	Rationale
VANADIUM	0.0825 J	2.56	B82-SW-101-1106-AVG	0.935	1.32	2/3	20	SCV	0	0.1	No	BSL
DISSOLVED METALS (ug/L)												
ARSENIC	0.113 J	0.528 J	B82-SW-101-1106-AVG	0.299	0.299	3/3	150	NRWQC	0	0.0	No	BSL
BARIUM	6.7 J	13.6	B82-SW-101-1106-AVG	9.13	9.13	3/3	**4**	SCV	3	3.4	Yes	ASL
BERYLLIUM	0.115 J	0.115 J	B82-SW-101-1106-AVG	0.0527	0.115	1/3	5.3	LOEL	0	0.0	No	BSL
CADMIUM	0.0954 J	0.0954 J	B82-SW-102-1106	0.0631	0.0954	1/3	0.13	NRWQC[5]	0	0.7	No	BSL
CALCIUM	4090	15500 J	B82-SW-100-1106	10200	10200	3/3	116000	LCV	0	0.1	No	NUT
COBALT	1.33 J	2.26	B82-SW-102-1106	1.35	1.8	2/3	23	SCV	0	0.1	No	BSL
COPPER	0.597 J	1.18 J	B82-SW-101-1106-AVG	0.679	0.888	2/3	3.92	NRWQC[5]	0	0.3	No	BSL
IRON	416	4400	B82-SW-101-1106-AVG	1970	1970	3/3	**1000**	NRWQC	2	4.4	Yes	ASL
LEAD	0.24 J	0.46 J	B82-SW-101-1106-AVG	0.246	0.35	2/3	0.87	NRWQC[5]	0	0.5	No	BSL
MAGNESIUM	492	5200	B82-SW-100-1106	3100	3100	3/3	82000	LCV	0	0.1	No	NUT
MANGANESE	31.6	402	B82-SW-101-1106-AVG	214	214	3/3	**120**	SCV	2	3.4	Yes	ASL
NICKEL	0.778 J	1.58 J	B82-SW-100-1106	1.18	1.18	3/3	22.9	NRWQC[5]	0	0.1	No	BSL
POTASSIUM	858	1510	B82-SW-101-1106-AVG	1280	1280	3/3	53000	LCV	0	0.0	No	NUT
SODIUM	3460	10800	B82-SW-100-1106	7070	7070	3/3	680000	LCV	0	0.0	No	NUT
VANADIUM	0.0794 J	1.88 J	B82-SW-101-1106-AVG	0.685	0.98	2/3	20	SCV	0	0.1	No	BSL

Notes:

1 - Sample and duplicate are considered as one sample when determining the minimum and maximum detected concentrations and frequency of detection.
2 - Average of all analytical results are calculated using half of the detection limit for nondetects.
3 - Average of positive analytical results only.
4 - The hazard quotient is the maximum detected concentration divided by the screening level.
5 - The average hardness of 38 mg/L $CaCO_3$ was used to calculate these screening levels.

COPC = Chemical of Potential Concern
NRWQC - National Recommended Water Quality Criteria – criteria continuous concentration (CCC) for fresh water (U.S. EPA, 2006)
FCV – Final chronic values (U.S. EPA, 1993a, b) (ecological risk based value)
LCV – Lowest chronic values (Suter and Tsao, 1996)
LOEL – Lowest observed effects level (Buchman, 1999)
SCV – Secondary chronic value (Suter and Tsao, 1996)
NA = Not Available or Not Applicable.

Shaded chemicals are those retained as COPCs
Shaded screening levels indicates that the maximum detected concentration exceeds the screening level.

Rationale Codes:
For Selection as a COPC or for Further Evaluation:
ASL = Above COPC Screening Level
BSL = Below COPC Screening Level
NTX = No Toxicity Data Available/Screening Level not Available
NUT = Essential Nutrient

TABLE D-4

AVERAGE FOOD CHAIN MODEL - SOIL RECEPTORS FROM THE ERA
BUILDING 82
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

	Hazard Quotients					
	White-Footed Mouse		American Robin		Short-Tailed Shrew	
Chemical	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
Volatile Organic Compounds						
2-BUTANONE	6.6E-10	2.6E-10	NV	NV	5.2E-09	2.0E-09
ACETONE	1.2E-06	2.3E-07	NV	NV	9.2E-06	1.8E-06
CIS-1,2-DICHLOROETHENE	1.2E-06	1.2E-07	NV	NV	1.4E-06	1.4E-07
CYCLOHEXANE	NV	NV	NV	NV	NV	NV
DICHLORODIFLUOROMETHANE	NV	NV	NV	NV	NV	NV
METHYL CYCLOHEXANE	NV	NV	NV	NV	NV	NV
METHYL TERT-BUTYL ETHER	NV	NV	NV	NV	NV	NV
TOTAL 1,2-DICHLOROETHENE	1.2E-06	1.2E-07	NV	NV	1.4E-06	1.4E-07
Semivolatile Organic Compounds						
1,1-BIPHENYL	NV	NV	NV	NV	NV	NV
2-METHYLNAPHTHALENE	4.1E-05	7.6E-06	1.7E-02	1.7E-03	3.0E-04	5.6E-05
ACENAPHTHENE	8.1E-05	1.5E-05	4.0E-02	4.0E-03	7.8E-04	1.4E-04
ACENAPHTHYLENE	2.7E-04	5.0E-05	1.3E-01	1.3E-02	2.6E-03	4.7E-04
ANTHRACENE	2.5E-04	4.7E-05	1.0E-01	1.0E-02	1.8E-03	3.3E-04
BENZALDEHYDE	3.7E-05	3.7E-06	NV	NV	6.4E-05	6.4E-06
BENZO(A)ANTHRACENE	2.6E-02	4.1E-04	1.1E-01	1.1E-02	2.3E-01	3.7E-03
BENZO(A)PYRENE	2.0E-02	3.2E-04	8.1E-02	8.1E-03	1.6E-01	2.5E-03
BENZO(B)FLUORANTHENE	5.8E-02	9.3E-04	2.3E-01	2.3E-02	4.5E-01	7.2E-03
BENZO(G,H,I)PERYLENE	2.4E-02	3.8E-04	9.4E-02	9.4E-03	1.8E-01	2.9E-03
BENZO(K)FLUORANTHENE	2.3E-02	3.7E-04	1.0E-01	1.0E-02	2.0E-01	3.3E-03
BIS(2-ETHYLHEXYL)PHTHALATE	4.8E-05	4.8E-06	7.6E-03	7.6E-04	2.7E-04	2.7E-05
CARBAZOLE	7.8E-05	7.8E-06	1.6E-02	1.6E-03	2.8E-04	2.8E-05
CHRYSENE	4.1E-02	6.5E-04	1.8E-01	1.8E-02	3.8E-01	6.0E-03
DI-N-BUTYL PHTHALATE	4.3E-07	1.3E-07	NV	NV	2.5E-06	7.5E-07
DIBENZO(A,H)ANTHRACENE	5.5E-03	8.9E-05	2.4E-02	2.4E-03	4.8E-02	7.7E-04
DIBENZOFURAN	1.4E-04	1.4E-05	8.4E-03	8.4E-04	6.4E-04	6.4E-05
FLUORANTHENE	1.7E-03	3.2E-04	6.9E-01	6.9E-02	1.2E-02	2.3E-03
FLUORENE	4.7E-04	8.7E-05	2.4E-01	2.4E-02	4.7E-03	8.6E-04
INDENO(1,2,3-CD)PYRENE	1.8E-02	2.9E-04	8.0E-02	8.0E-03	1.6E-01	2.6E-03
NAPHTHALENE	4.4E-04	8.1E-05	8.6E-02	8.6E-03	7.6E-04	1.4E-04
PHENANTHRENE	1.4E-03	2.6E-04	4.9E-01	4.9E-02	8.0E-03	1.5E-03
PHENOL	2.2E-06	2.2E-07	NV	NV	1.9E-06	1.9E-07
PYRENE	1.4E-01	2.3E-03	4.4E-01	4.4E-02	7.4E-01	1.2E-02
Pesticides/PCBs						
4,4'-DDD	1.8E-02	9.8E-03	1.7E-01	1.4E-01	1.7E-01	9.3E-02
4,4'-DDE	5.0E-03	2.7E-03	4.8E-02	3.9E-02	4.8E-02	2.6E-02
4,4'-DDT	9.2E-03	5.0E-03	8.9E-02	7.2E-02	8.8E-02	4.7E-02
ENDRIN ALDEHYDE	8.6E-03	8.6E-04	1.2E+00	1.2E-01	8.5E-02	8.5E-03
ENDRIN KETONE	1.2E-02	1.2E-03	1.7E+00	1.7E-01	1.2E-01	1.2E-02
GAMMA-CHLORDANE	1.1E-04	5.3E-05	3.5E-03	7.0E-04	1.1E-03	5.3E-04
HEPTACHLOR EPOXIDE	1.3E-03	1.3E-04	NV	NV	1.3E-02	1.3E-03
METHOXYCHLOR	1.1E-03	5.4E-04	NV	NV	1.1E-02	5.3E-03
AROCLOR-1260	2.3E-02	4.5E-03	2.6E-01	2.6E-02	2.2E-01	4.5E-02
Inorganics						
ALUMINUM	4.4E+01	4.4E+00	1.2E+01	1.2E+00	4.3E+02	4.3E+01
ARSENIC	9.5E-03	2.2E-03	5.7E-02	2.8E-02	6.4E-02	1.5E-02
BARIUM	2.9E-03	1.8E-03	5.7E-02	2.9E-02	8.5E-03	5.3E-03
BERYLLIUM	1.2E-02	9.1E-03	NV	NV	1.2E-02	9.7E-03
CADMIUM	7.6E-02	8.5E-03	5.3E-01	1.2E-01	6.3E-01	7.0E-02
CHROMIUM	1.6E-02	6.5E-04	1.9E-01	3.3E-02	1.2E-01	4.9E-03
COBALT	7.4E-04	2.9E-04	1.0E-02	4.4E-03	5.9E-03	2.3E-03
COPPER	2.9E-02	1.9E-03	3.3E-01	3.8E-02	1.0E-01	6.9E-03
CYANIDE	1.5E-04	1.5E-05	NV	NV	1.1E-03	1.1E-04
IRON	8.3E-03	8.3E-04	9.6E-01	9.6E-02	7.3E-02	7.3E-03
LEAD	2.7E-02	6.8E-04	1.0E+00	3.7E-02	2.0E-01	5.0E-03
MANGANESE	1.3E-02	4.4E-03	3.4E-02	1.6E-02	5.0E-02	1.8E-02
MERCURY	6.6E-02	1.3E-02	5.0E+00	5.0E-01	6.5E-01	1.3E-01
NICKEL	4.4E-02	5.1E-03	1.6E-01	5.6E-02	3.8E-01	4.3E-02
SELENIUM	1.8E-02	1.1E-02	9.7E-02	4.9E-02	1.1E-01	6.5E-02
SILVER	3.3E-04	1.7E-05	1.5E-02	4.9E-04	3.2E-03	1.6E-04
THALLIUM	5.2E-02	5.2E-03	NV	NV	5.1E-01	5.1E-02
VANADIUM	4.2E-03	2.3E-03	8.3E-01	1.7E-01	3.3E-02	1.8E-02
ZINC	4.3E-02	1.1E-02	6.2E-01	2.4E-01	3.2E-01	8.2E-02

Cells are shaded if the hazard quotient is greater than 1.0

NV - No value could be calculated
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level

TABLE D-5

AVERAGE FOOD CHAIN MODEL - SEDIMENT RECEPTORS FROM THE ERA
BUILDING 82
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

	Hazard Quotients			
	Star-Nose Mole		Carolina Wren	
Chemical	NOAEL	LOAEL	NOAEL	LOAEL
Volatile Organics				
ACETONE	1.4E-05	2.8E-06	NV	NV
CIS-1,2-DICHLOROETHENE	8.2E-07	8.2E-08	NV	NV
CYCLOHEXANE	NV	NV	NV	NV
DICHLORODIFLUOROMETHANE	NV	NV	NV	NV
METHYL CYCLOHEXANE	NV	NV	NV	NV
METHYL TERT-BUTYL ETHER	NV	NV	NV	NV
TOTAL 1,2-DICHLOROETHENE	8.2E-07	8.2E-08	NV	NV
Semivolatile Organics				
1,1-BIPHENYL	NV	NV	NV	NV
2-METHYLNAPHTHALENE	2.9E-04	5.3E-05	1.9E-02	1.9E-03
2-METHYLPHENOL	1.1E-04	3.8E-05	NV	NV
4-METHYLPHENOL	1.6E-03	5.2E-04	NV	NV
ACENAPHTHENE	1.3E-03	2.4E-04	8.6E-02	8.6E-03
ACENAPHTHYLENE	1.3E-04	2.5E-05	8.7E-03	8.7E-04
ANTHRACENE	1.7E-03	3.2E-04	1.1E-01	1.1E-02
BENZALDEHYDE	3.1E-04	3.1E-05	NV	NV
BENZO(A)ANTHRACENE	2.6E-01	4.2E-03	1.6E-01	1.6E-02
BENZO(A)PYRENE	2.1E-01	3.4E-03	1.3E-01	1.3E-02
BENZO(B)FLUORANTHENE	3.2E-01	5.1E-03	2.0E-01	2.0E-02
BENZO(G,H,I)PERYLENE	1.0E-01	1.6E-03	6.1E-02	6.1E-03
BENZO(K)FLUORANTHENE	1.2E-01	1.9E-03	7.5E-02	7.5E-03
BIS(2-ETHYLHEXYL)PHTHALATE	1.6E-03	1.6E-04	5.3E-02	5.3E-03
CARBAZOLE	2.0E-03	2.0E-04	9.8E-02	9.8E-03
CHRYSENE	3.1E-01	5.0E-03	1.9E-01	1.9E-02
DI-N-BUTYL PHTHALATE	2.7E-05	8.1E-06	NV	NV
DIBENZO(A,H)ANTHRACENE	2.1E-02	3.4E-04	1.3E-02	1.3E-03
DIBENZOFURAN	5.6E-03	5.6E-04	7.1E-02	7.1E-03
FLUORANTHENE	1.2E-02	2.2E-03	7.7E-01	7.7E-02
FLUORENE	1.3E-03	2.4E-04	8.7E-02	8.7E-03
INDENO(1,2,3-CD)PYRENE	9.1E-02	1.5E-03	5.6E-02	5.6E-03
NAPHTHALENE	3.8E-04	7.1E-05	1.5E-02	1.5E-03
PHENANTHRENE	1.3E-02	2.5E-03	8.7E-01	8.7E-02
PYRENE	8.7E-01	1.4E-02	5.2E-01	5.2E-02
Pesticides/PCBs				
4,4'-DDT	3.1E-02	1.7E-02	4.4E-02	3.6E-02
AROCLOR-1260	5.1E+00	1.01E+00	8.5E+00	8.5E-01
DIELDRIN	6.4E-01	7.5E-03	3.0E-01	2.6E-02
ENDOSULFAN SULFATE	4.7E-02	4.7E-03	1.5E-03	1.5E-04
ENDRIN ALDEHYDE	6.0E-01	6.0E-02	1.2E+01	1.2E+00
GAMMA-CHLORDANE	1.0E-03	5.1E-04	4.8E-03	9.5E-04
Inorganics				
ALUMINUM	3.0E+02	3.0E+01	1.1E+01	1.1E+00
ARSENIC	3.3E-02	7.5E-03	2.3E-02	1.1E-02
BARIUM	2.9E-02	1.8E-02	1.4E-01	7.2E-02
BERYLLIUM	5.6E-02	4.5E-02	NV	NV
CADMIUM	4.7E-02	5.2E-03	4.5E-02	1.0E-02
CHROMIUM	7.2E-02	3.0E-03	8.7E-02	1.5E-02
COBALT	4.1E-02	1.6E-02	8.1E-02	3.4E-02
COPPER	2.1E-01	1.4E-02	6.0E-01	7.0E-02
CYANIDE	9.5E-05	9.5E-06	NV	NV
IRON	4.1E-01	4.1E-02	6.2E+00	6.2E-01
LEAD	8.8E-02	2.2E-03	3.0E-01	1.1E-02
MANGANESE	4.0E-01	1.4E-01	2.3E-01	1.1E-01
MERCURY	9.0E-02	1.8E-02	9.2E-01	9.2E-02
NICKEL	2.5E-01	2.8E-02	1.2E-01	4.3E-02
SELENIUM	4.9E-02	3.0E-02	4.9E-02	2.5E-02
SILVER	5.0E-04	2.6E-05	3.1E-03	1.0E-04
THALLIUM	1.6E-01	1.6E-02	NV	NV
VANADIUM	3.4E-01	1.8E-01	8.5E+00	1.7E+00
ZINC	1.2E-01	3.0E-02	2.8E-01	1.1E-01

Cells are shaded if the hazard quotient is greater than 1.0

NV - No value could be calculated
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level

Appendix E
ARARs and To Be Considered Guidance

TABLE E-1

FEDERAL AND STATE CHEMICAL-SPECIFIC ARARs – ALTERNATIVE G-2A
BUILDING 82 RECORD OF DECISION
FORMER NAVAL AIR STATION SOUTH WEYMOUTH
WEYMOUTH, MASSACHUSETTS

Requirement	Citation	Status	Synopsis	Evaluation/Action To Be Taken
Federal				
Cancer Slope Factors (CSFs)	US EPA, Integrated Risk Information System	To Be Considered	Guidance used to compute individual incremental cancer risk resulting from exposure to carcinogenic contaminants in site media	This alternative will meet the risk-based cleanup goals developed through the use of this guidance since treating groundwater that poses potential carcinogenic risks through chemical oxidation will address long-term risk, while land use controls will prevent short-term exposure to COCs in groundwater until risk-based cleanup goals are achieved.
Reference Doses (RfDs)	US EPA, Integrated Risk Information System	To Be Considered	Guidance used to compute human health hazard resulting from exposure to non-carcinogens in site media	This alternative will meet the risk-based cleanup goals developed through the use of this guidance since treating groundwater that poses potential non-carcinogenic risks through chemical oxidation will address long-term risk, while land use controls will prevent short-term exposure to COCs in groundwater until risk-based cleanup goals are achieved.

FEDERAL AND STATE CHEMICAL-SPECIFIC ARARs – ALTERNATIVE G-2A
BUILDING 82 RECORD OF DECISION
FORMER NAVAL AIR STATION SOUTH WEYMOUTH
WEYMOUTH, MASSACHUSETTS

Requirement	Citation	Status	Synopsis	Evaluation/Action To Be Taken
Federal (Continued)				
Guidelines for Carcinogen Risk Assessment	EPA/630/p-03/001F March 2005	To Be Considered	Guidelines for assessing cancer risk	This alternative will meet the risk-based cleanup goals developed through the use of this guidance since treating groundwater that poses potential carcinogenic risks through chemical oxidation will address long-term risk, while land use controls will prevent short-term exposure to COCs in groundwater until risk-based cleanup goals are achieved.
Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens	EPA.630/r-03/003F March 2005	To Be Considered	Guidance for assessing cancer risks in children	This alternative will meet the risk-based cleanup goals developed through the use of this guidance since treating groundwater that poses potential carcinogenic risks to children through chemical oxidation will address long-term risk, while land use controls will prevent short-term exposure to COCs in groundwater until risk-based cleanup goals are achieved.

TABLE E-1

FEDERAL AND STATE CHEMICAL-SPECIFIC ARARs – ALTERNATIVE G-2A
BUILDING 82 RECORD OF DECISION
FORMER NAVAL AIR STATION SOUTH WEYMOUTH
WEYMOUTH, MASSACHUSETTS

Requirement	Citation	Status	Synopsis	Evaluation/Action To Be Taken
Federal (Continued)				
Safe Drinking Water Act; National Primary Drinking Water Regulations, Maximum Contaminant Levels	42 USC § 300f *et seq.;* 40 CFR 141, Subpart B	Relevant and Appropriate	Establishes maximum contaminant levels (MCLs) for common organic and inorganic contaminants applicable to public drinking water supplies. Used as relevant and appropriate cleanup standards for aquifers and surface water bodies that are potential drinking water sources.	This alternative will achieve MCL standards through treatment of groundwater by chemical oxidation. Land use controls will prevent short-term exposure until MCL standards are reached.
Safe Drinking Water Act; National Primary Drinking Water Regulations, Maximum Contaminant Level Goals	42 USC § 300f *et seq.;* 40 CFR 141, Subpart F	Relevant and Appropriate for non-zero MCLGs only	Establishes maximum contaminant level goals (MCLGs) for public water supplies. Non-zero MCLGs are health goals for public drinking water sources. These unenforceable health goals are available for a number of organic and inorganic compounds. MCLGs are set at levels that would result in no known or expected adverse health effects with an adequate margin of safety. Non-zero MCLGs are to be used as cleanup goals when MCLs have not been established for a particular COC.	This alternative will achieve MCLG standards through treatment of groundwater by chemical oxidation. Land use controls will prevent short-term exposure until MCLG standards are reached.

FEDERAL AND STATE CHEMICAL-SPECIFIC ARARs – ALTERNATIVE G-2A
BUILDING 82 RECORD OF DECISION
FORMER NAVAL AIR STATION SOUTH WEYMOUTH
WEYMOUTH, MASSACHUSETTS

Requirement	Citation	Status	Synopsis	Evaluation/Action To Be Taken
Federal (Continued)				
Health Advisories	EPA Office of Drinking Water, EPA-822-R-04-003, January, 2004	TBC	Health Advisories are estimates of risk due to consumption of contaminated drinking water; they consider non-carcinogenic effects only. To be considered for contaminants which do not have chemical-specific ARARs where groundwater may be used for drinking water. The non-enforceable federal guideline Health Advisory for manganese is 0.3 mg/l.	This alternative will achieve these guidelines since non-carcinogenic risk resulting from exposure to compounds identified in the Health Advisory (e.g., manganese) will be addressed by natural attenuation. Land use controls will prevent short-term exposure until protective levels are reached. Would not be considered where background concentration is greater than HA value.
State				
Massachusetts Drinking Water Regulations	310 CMR 22.00	Relevant and Appropriate	Establish enforceable state MCLs for organic and inorganic contaminants that have been determined to adversely affect human health in public drinking water systems. Will be used where state standard is more stringent than federal standard. Also establishes state MCLGs which are non-enforceable health goals for public drinking water systems.	This alternative will achieve state MCL and MCLG standards through treatment of groundwater by chemical oxidation. Land use controls will prevent short-term exposure until state MCL and MCLG standards are reached.
Massachusetts Surface Water Quality Standards	314 CMR 4.00	To Be Considered	Establishes enforceable water quality standards for surface water.	Surface water monitoring will be performed for this alternative to ensure protection to surface water.

TABLE E-2

FEDERAL AND STATE LOCATION-SPECIFIC ARARs – ALTERNATIVE G-2A
BUILDING 82 RECORD OF DECISION
FORMER NAVAL AIR STATION SOUTH WEYMOUTH
WEYMOUTH, MASSACHUSETTS

Requirement	Citation	Status	Synopsis	Evaluation/Action to be Taken
Federal				
There are no federal location-specific ARARs.				
State				
Massachusetts Endangered Species Act	M.G.L. ch.,131A 321 C.M.R. 10.00	Applicable	Sets out authority to research, list, and protect any species deemed endangered, threatened, or of other special concern. Actions must be conducted in a manner that minimizes the effect on listed Massachusetts species.	A state-listed species of special concern (Eastern Box Turtle) has been observed at the Base, but not at the Building 82 site. Appropriate measures will be taken during remedial actions to ensure that the species is not harmed by the alternative

TABLE E-3

FEDERAL AND STATE ACTION-SPECIFIC ARARs – ALTERNATIVE G-2A
BUILDING 82 RECORD OF DECISION
FORMER NAVAL AIR STATION SOUTH WEYMOUTH
WEYMOUTH, MASSACHUSETTS

Requirement	Citation	Status	Synopsis	Evaluation/Action To Be Taken
Federal				
Resource Conservation and Recovery Act (RCRA)	42 USC § 6901 *et seq*.	Applicable	Federal standards used to identify, manage, and dispose of hazardous waste. Massachusetts has been delegated the authority to administer the RCRA standards through its state hazardous waste management regulations.	Specific state hazardous waste standards authorized under the Act would apply when determining whether or not a solid waste is hazardous, either by being listed or by exhibiting a hazardous characteristic, such as contaminated purge water from groundwater sampling or contaminated material generated from well installation or maintenance. Existing data do not indicate that any wastes will be hazardous.
Underground Injection Control	40 CFR 144, 146, 147.1100	Relevant and Appropriate	These regulations address the discharge of wastes, chemicals or other substances into the subsurface. The federal UIC program designates injection wells incidental to aquifer remediation and experimental technologies as Class V wells authorized by rule that do not require a separate UIC permit. State requirements apply in this case; see 310 CMR 27.00 below.	These standards regulate the injection of chemical substances into the groundwater. In-situ treatment using chemical oxidation will be conducted in compliance with these standards.
Clean Air Act National Emission Standards for Hazardous Air Pollutants	42 USC § 112(b)(1) et seq. 40 CFR Part 61	Applicable	Regulations establish emission standards for 189 hazardous air pollutants. Standards are set for fugitive emissions and other release sources.	If remedial activities generate regulated air pollutants, then measures will be implemented to meet the standards.

TABLE E-3

FEDERAL AND STATE ACTION-SPECIFIC ARARs – ALTERNATIVE G-2A
BUILDING 82 RECORD OF DECISION
FORMER NAVAL AIR STATION SOUTH WEYMOUTH
WEYMOUTH, MASSACHUSETTS

Requirement	Citation	Status	Synopsis	Evaluation/Action To Be Taken
State				
Hazardous Waste Rules for Identification and Listing of Hazardous Wastes	310 CMR 30.100	Applicable	Establish requirements for determining whether wastes are hazardous. Defines listed and characteristic hazardous wastes.	These regulations would apply when determining whether or not a solid waste that is generated as part of this remedial action is classified as hazardous, either by being listed or by exhibiting a hazardous characteristic, such as contaminated purge water from groundwater sampling or contaminated material generated from well installation or maintenance. Existing data do not indicate that any wastes will be hazardous.
Management Procedures for Remedial Wastewater and Remedial Additives	310 CMR 40.0040	Applicable	Establishes requirements and procedures for the management of remedial wastewater and/or remedial additives, and for the construction, installation, modification, operation and maintenance of treatment works for the management of remedial wastewater and/or remedial additives.	These regulations would apply to remedial actions involve underground injection, such as an oxidizer for in-situ chemical oxidation. To ensure that the remedial action complies with the substantive requirements of these regulations, the proposed quantities to be injected will be included in the design and submitted to EPA and MassDEP for comment and concurrence and the groundwater monitoring program will assess the impact of the injected compounds.

TABLE E-3

FEDERAL AND STATE ACTION-SPECIFIC ARARs – ALTERNATIVE G-2A
BUILDING 82 RECORD OF DECISION
FORMER NAVAL AIR STATION SOUTH WEYMOUTH
WEYMOUTH, MASSACHUSETTS

Requirement	Citation	Status	Synopsis	Evaluation/Action To Be Taken
State (Continued)				
Hazardous Waste Management Rules – Requirements for Generators	310 CMR 30.300	Applicable	These regulations contain requirements for generators of hazardous waste. The regulations apply to generators of sampling waste and to the accumulation of waste prior to off-site disposal.	Wastes generated during remedial actions that are determined to be hazardous will be handled in compliance with the substantive requirements of these regulations.
Underground Injection Control Program	310 CMR 27.00	Applicable	The federal Underground Injection Control program under the Safe Drinking Water Act has been delegated to the Commonwealth of Massachusetts. Establishes a State Underground Injection Control Program consistent with federal requirements to protect underground sources of drinking water.	The regulations apply to remedial actions involving underground injection, including use of an oxidizer for in-situ chemical oxidation. To ensure that the remedial action complies with the substantive requirements of these regulations, the proposed quantities to be injected will be included in the design and submitted to EPA and MassDEP for comment and concurrence and the groundwater monitoring program will assess the impact of the injected compounds.
Certification of Well Drillers and Filing of Well Completion Reports	313 CMR 3.~~03~~ 00 (predecessor regulations); 310 CMR 46.00	Applicable	Requirements relating to well abandonment	Well drillers will follow all regulatory requirements for drilling and decommissioning of wells.
Standard References for Monitoring Wells	WSC-310-91 MADEP April 1991	To Be Considered	This guidance describes the technical requirements for locating, drilling, installing, sampling and decommissioning monitoring wells.	Applies to wells installed for monitoring and/or groundwater treatment.

FEDERAL AND STATE ACTION-SPECIFIC ARARs – ALTERNATIVE G-2A
BUILDING 82 RECORD OF DECISION
FORMER NAVAL AIR STATION SOUTH WEYMOUTH
WEYMOUTH, MASSACHUSETTS

Requirement	Citation	Status	Synopsis	Evaluation/Action To Be Taken
State (Continued)				
Erosion and Sediment Control Guidance	-	To Be Considered	This guidance includes standards for preventing erosion and sedimentation.	Remedial actions, particularly installation and maintenance of wells and other components of the remedy, will be managed to control erosion and sedimentation.

Appendix F
Public Hearing Transcript and Comments Received on the Building 82 Site Proposed Plan

Former Naval Air Station South Weymouth, MA

Proposed Plan

Building 82 (Hangar 2) Operable Unit 11

Public Comments

New England Wildlife Center

500 Columbian Street

South Weymouth, MA

August 9, 2012

8:00 p.m.

P R O C E E D I N G S

MR. GOODRICH: I'm going to open the public hearing. If you would like to make a statement, please raise your hand and I'll call on you.

MS. CALL: If you make a statement, would you please pronounce your name clearly and spell it so that Carol can get it down for the record. Thank you.

MR. BARNEY: This is taking comments for comment on the Navy's Proposed Plan for the Building 82 Hanger 2 Site Operable Unit 11. The Navy's preferred remedial action is for chemical oxidation, land use controls, and monitoring.

MR. GOODRICH: Yes.

MR. CUNNINGHAM: Hello. I'm James Cunningham, and I'm a member of the Restoration Advisory Board for Weymouth. And I agree with the Navy with this proposed alternative G-2A. I'm especially interested in continuing the land use controls and the monitoring. I like the idea of keeping the Navy involved with this until it is actually cleaned up. And I want to have it cleaned up as we've all wanted all over these years, and I believe the Navy has been doing a good job.

And in the case of the monitoring, if the controls and the oxidation does not prove effective, perhaps by the time a few years come by there may be additional technologies that they can use to clean this place up.

But I do agree with the Navy, and I think it's a good idea, and I want to keep the Navy involved.

MR. GOODRICH: Yes.

MR. WELCH: Harry Welch. I would like to make sure that there will be no construction on that site where the plumes are found until it is totally cleaned up to the standards that Dave was talking about. And that's what I would like to say.

MR. GOODRICH: Yes.

MS. PARSONS: Mary Parsons. I'm from Rockland, and I have a few comments from our consultant Cambridge Environmental. Would you like me to read them? I am going to leave out the part about PCBs because you answered that question. But they have a few questions, issues with the feasibility study.

MR. GOODRICH: You can read them into the record or submit them in writing, and they'll be recorded.

MS. PARSONS: We'll be submitting more in writing as we go along. They talk about future risk to construction workers that needs to be managed through land use control developed as part of a selected remedy. These land use controls presumably also need to include consideration of the construction dewatering activities described on the FS.

Are they going to have one station every place where they do dewatering?

MR. BARNEY: We can't address that.

MS. PARSONS: That's right. Sorry. Forgot that. Page 1 through 20 of the Building 82 Feasibility Study states that manganese, arsenic, and iron found at elevated levels in groundwater are likely due to background conditions. On Page 1 through 13 reducing conditions are noted to be potentially responsible for the mobilization of these compounds. In some, the statements regarding elevation of these metals and groundwater is oriented toward absolving the responsibility from base activities. Missing from this discussion, however, is any investigation of the reasons for reducing conditions to be present in groundwater which could easily be due to activities at the base including its physical development. This issue of responsibility is moot so long as proper restrictions are put in place to prevent use of contaminated groundwater. Description of the preferred alternative within the Proposed Plan indicates that groundwater will be monitored for carcinogens of concern, COCs, and other analytes of interest such as magnesium, PCBs, and MTBE. Arsenic should be added to this list given its importance in the risk assessment result. Also depending on one's interpretation of the site, all of these chemicals should be considered to be carcinogens of concern. Success of the preferred alternative depends, among other things, upon the ability to decrease manganese concentration and groundwater. Based on experience at other sites, this might be difficult to accomplish as manganese once dissolved resists precipitation to its bound form through natural processes. Success may depend on identifying and eliminating the factors that lead to reductive conditions in groundwater. Carefully planned pilot test designed to examine manganese behavior might be a prudent measure.

And I'll pass these in to you.

MR. GOODRICH: Thank you. Yes.

MR. SMART: Dave, I think you know, from me being here all these years -- Michael Smart from Weymouth -- that I've always talked about cleaning up the parcels, the contaminants weren't there, and I always prefer the complete removal. But as this is not one of the options, I do think the G 2 A is the best option that is listed here that we have to choose from and comment on.

As it was previously mentioned, the monitoring is very important, the maintenance of the monitoring wells is also important. That there be a maintenance plan set up, not just, you know, show up every three months take a reading, and then take off. We need someone there to monitor those wells to make sure that they are being maintained well and not being destroyed from all the work going on around there.

The five-year clean-up table is aggressive. I hope it works. I know that we talked about it earlier before the meeting, that this method was used previously or similar method was used previously without the best outcome. Hopefully we have a better outcome on this one and a complete clean up. That's all I have right now. Thank you.

MR. GOODRICH: Any other statements for the record? If not, we'll close the public hearing.

Yes, Ann.

MS. HILBERT: I don't know if this belongs but I am going to say it anyway. Before any part of this project moves real forward we should know where the water is coming from.

MR. GOODRICH: Any other comments?

MS. PARSONS: I just want to reiterate that I would not want to see this water used as drinking water or irrigation water, now or in the future.

MR. GOODRICH: Hearing no other statements, we'll close the formal public hearing part. Thank you.

(The proceedings adjourned
at 8:18 p.m.)

CERTIFICATE

I hereby certify that the foregoing 9 pages contain a full, true and correct transcription of all my stenographic notes to the best of my ability taken in the above-captioned matter at said time and place.

____

Carol DiFazio
Registered Professional Reporter

MEMORANDUM

To: Advocates of Rockland, Abington, Weymouth and Hingham

From: Stephen Zemba, Ph.D., P.E. and Richard Lester

Subject: Comments on *Feasibility Study Report for Building 82*, July 2012 and Proposed Plan

Date: August 8, 2012

We have briefly reviewed the July 2012 Feasibility Study (FS) for Building 82 and the July 12 Proposed Plan developed by the Navy as a summary document. These documents summarize the investigation of Building 82 and the Navy's proposed approach to cleanup. The Preferred Alternative, if implemented, will include treatment of groundwater through chemical oxidation to reduce concentrations of volatile organic chemicals, land use controls (LUCs) to prevent unacceptable exposure to chemicals in groundwater and surface water, and long-term monitoring of groundwater and surface water. LUCs on groundwater include restrictions on its use for drinking water and irrigation, while surface water restrictions appear to be associated with construction dewatering activities (FS page 4-10). LUCs will be removed once the cleanup of groundwater is successful.

In terms of the alternatives evaluated, the Navy has selected the most aggressive and expensive option as its Preferred Alternative. Like many of the other recent feasibility study reports, the success of the Navy's plan will depend on the validity of the assumptions used to evaluate the remedial alternatives. Difficulties during the implementation phase may cause the Navy to adjust or reformulate their plans – only time will tell.

In going through these most recent Building 82 documents, we noted some potential concerns and inconsistencies that you may which to submit to the Navy as comments. Specifically:

- Page 1-21 of the Building 82 FS (also page 8 of the Proposed Plan) states that there are potential risks to *future* construction workers, but that "... additional risk analysis performed since the time of the HHRA has shown that no construction worker is present at the Building 82 site." The juxtaposition of these two statements is confusing, since a *future* use scenario does not depend on the *current* presence of a receptor. Presumably, future uses will include redevelopment of the area as it is located in the "Village Center District" zone. Future construction in this area is *highly likely*. Appendix B of the FS contains various tables from previous reports. Therein, Table 6-4 identifies an unacceptable non-cancer risk level for the construction worker scenario. Unless there are specific reasons for discounting the previous risk assessment calculations (*e.g.*, updated risk assessment calculations oriented toward construction workers, which consider residual soil and groundwater contamination), there remains a *future* risk to construction workers that needs to be managed through LUCs developed as part of the selected remedy. These LUCs presumably also need to include consideration of the construction dewatering activities described on FS page 4-10.

- A survey for PCB-containing materials should be added to the due diligence component of building demolition to supplement the present plans for handling asbestos-containing materials (as described on FS page 4-10). Erosion of and leaks from building materials such as caulking/sealants and fluorescent light ballasts in the Building 82 hangar could be the source of PCBs detected at low concentrations in all media. PCB-containing materials have been found in many buildings in recent years, and Kim Tisa and her colleagues at EPA Region 1 have been instrumental in demonstrating their widespread presence. If PCBs are present, they serve as a potential concern to either reuse (as a source of exposure) or demolition (for purpose of disposal/management).

- Page 1-20 of the Building 82 FS states that manganese, arsenic, and iron found at elevated levels in groundwater are likely due to background conditions. On page 1-13, reducing conditions are noted to be potentially responsible for the mobilization of these compounds. In sum, the statements regarding elevation of these metals in groundwater is oriented toward absolving responsibility from base activities. Missing from this discussion, however, is any investigation of the reason(s) for reducing conditions to be present in groundwater, which could easily be due to activities at the base, including its physical development. This issue of responsibility is moot so long as proper restrictions are put in place to prevent use of contaminated groundwater.

- Description of the Preferred Alternative within the Proposed Plan (page 11) indicates that groundwater will be monitored for COCs and "… other analytes of interest, such as manganese, PCBs, and MTBE." Arsenic should be added to this list given its importance in the risk assessment results. Also, depending on one's interpretation of the site, all of these chemicals should be considered to be COCs.

- Success of the Preferred Alternative depends (among other things) upon the ability to decrease manganese concentrations in groundwater. Based on experience at other sites, this might be difficult to accomplish, as manganese, once dissolved, resists precipitation to its bound form through natural processes. Success may depend on identifying and eliminating the factors that lead to reductive conditions in groundwater. Carefully planned pilot tests designed to examine manganese behavior might be a prudent measure.

Please call or write with questions, and thank you for the continued opportunity to work with you on SOWEY cleanup issues.

[redacted]

COMMENT SHEET – Proposed Plan for the Building 82 Site

Use this space to write your comments or to be added to the mailing list.

The Navy encourages your written comments on the Proposed Plan for the Building 82 Site, Former NAS South Weymouth, Weymouth, Massachusetts. You can use the form below to send written comments. If you have questions about how to comment, please contact Brian Helland at (215) 897-4912 or via email at brian.helland@navy.mil.

This form is provided for your convenience. Please mail this form or additional sheets of written comments, postmarked no later than August 31, 2012, to the address shown below:

Mr. Brian Helland
Remedial Project Manager
BRAC Program Management Office, Northeast
4911 South Broad Street
Philadelphia, PA 19112

The Remedial Investigation Results for the Building 82 (Hangen 2) Site show serious contamination by numerous volatile organic componds that were detected in soil and ground water, polycyclic aromatic hydrocarbons were found in all media, pesticides were found in all media, PCBs were found in all media, and four metals (arsenic, manganese, vanadium and iron) were found in all media.

The fact, the Building 82 Site has been contaminated over a fifty five year period with numerous carcinogens make it almost impossible to find then clean the contamination from the site without a total removal action. Land use controls should be implemented indefinately to prevent unacceptable risks, by using ground water from the site for drinking or irrigation.

Comment Submitted by: Harvey Welch

Address: 674 Pond St. Weymouth, MA 02190

Mr. Brian Helland
Remedial Project Manager
BRAC Program Management Office, Northeast
4911 South Broad Street
Philadelphia, PA 19112

August 29 2012

As a Weymouth resident the contamination at the South Weymouth Naval Air Station has always been a major concern of mine because of the effects it will cause to the residents.

Let me tell you one of my reasons amongst many others. I have seven grandchildren who live in close proximitey to the base, the oldest thirteen and the youngest one. These children have lived there all their lives.

On page seven in "How are the risks expressed" It states infants and young children are extremely susceptable to adverse effects from exposure to lead. Although EPA stated goal for lead is that individuals would have no more than five percent risk, can you tell me for certain this will not be my grandchildren? Is the outbreak of Cancer or MS, or other terminal illness worth developing on or near this building?

I am also concerned about the workers who will be exposed to these chemicals over the long term. The citizens of Weymouth were told many years ago that a health study was to be undertaken. The citizens assumed this was only the three towns of Abington, Rockland, and Weymouth. Only to find out this study was expanded to ten towns and was never released to these three communities, but of course you and i know this would have been distorted because of the increase in the number of towns.

Is this fair to the residents? It has been public information, residents of these three towns have clusters of "MS", also the cancer rate is very high in these communities.

I applaud the use of LUC'S to protect future residents if there is a zoning change to allow for residential development.

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