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March 6, 2019

Mr. Brian Helland, RPM
BRAC PMO, East
4911 South Broad Street
Philadelphia, Pennsylvania 19112

Reference: **CLEAN Contract No. N62470-11-D-8013**
Contract Task Order (CTO) No. WE27

Subject: **Final Operable Unit/Site 7, Former Sewage Treatment Plan Record of Decision Amendment**
Former Sewage Treatment Plant
Former NAS South Weymouth, Massachusetts

Dear Mr. Helland:

Resolution Consultants is pleased to submit the following document: the Final Operable Unit/Site 7, Former Sewage Treatment Plan Record of Decision Amendment.

If you have any questions, or require additional information beyond what is provided in this document, please contact me at 978.905.2409.

Sincerely,

Michelle Snyder, CHMM
NAS South Weymouth Task Order Manager

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RECORD OF DECISION AMENDMENT

OPERABLE UNIT/SITE 7
FORMER SEWAGE TREATMENT PLANT

FORMER NAVAL AIR STATION
SOUTH WEYMOUTH
WEYMOUTH, MASSACHUSETTS

BRAC PMO EAST
U.S. NAVY

FEBRUARY 2019

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ACRONYMS

bgs	below ground surface
BRAC	Base Realignment and Closure
CDI	chronic daily intake
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	chemical of concern
COPC	chemical of potential concern
CSF	cancer slope factor
CTE	central tendency exposure
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
Eco-SSL	ecological Soil Screening Level
EE/CA	Engineering Evaluation/Cost Analysis
EEQ	Ecological Effects Quotient
EPA	United States Environmental Protection Agency
EPC	exposure point concentration
ERA	ecological risk assessment
ESL	ecological screening level
FFA	Federal Facility Agreement
FFS	Focused Feasibility Study
HHRA	human health risk assessment
HI	Hazard Index
HQ	Hazard Quotient
ILCR	incremental lifetime cancer risk
IR	Installation Restoration
LEDPA	least environmentally damaging practicable alternative
LHA	Lifetime Health Advisory
LOAEL	lowest-observed-adverse-effect level
MassDEP	Massachusetts Department of Environmental Protection
MCL	maximum contaminant level
mg/kg	milligram per kilogram
msl	mean sea level
NAS	Naval Air Station

NAVFAC	Naval Facilities Engineering Command
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NOAEL	no-observed-adverse-effect level
NPL	National Priorities List
O&M	operation and maintenance
OU	Operable Unit
PCB	polychlorinated biphenyl
PFAS	Per- and Polyfluoroalkyl Substance
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
PMO	Program Management Office
PRG	preliminary remediation goal
RAB	Restoration Advisory Board
RAO	Remedial Action Objective
RfD	reference dose
RG	remedial goal
RI	Remedial Investigation
RME	reasonable maximum exposure
ROD	Record of Decision
RSL	Regional Screening Level
SARA	Superfund Amendments and Reauthorization Act
SSL	Soil Screening Level
TRC	Technical Review Committee
TRV	toxicity reference value
UCL	upper confidence limit
USC	United States Code
UST	Underground Storage Tank
VISL	Vapor intrusion screening levels

1.0 DECLARATION

1.1 SITE NAME AND LOCATION

Naval Air Station South Weymouth
1134 Main Street
Weymouth, Massachusetts 02190

U.S. Environmental Protection Agency (EPA) Identification Number - MA2170022022

Operable Unit (OU)/Site 7- Former Sewage Treatment Plant

1.2 STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) Amendment documents the amended remedy for Operable Unit/Site 7, the Former Sewage Treatment Plant (STP), at the former Naval Air Station (NAS) South Weymouth (see **Figure 1**). This decision document amends the existing ROD that was signed on April 30, 2008, which was modified by an Explanation of Significant Differences (ESD) dated August 30, 2010, and will be included in the Administrative Record. The amended remedy adds revised Applicable or Relevant and Appropriate Requirements (ARARs) and polychlorinated biphenyl (PCB) cleanup standards to the remedy, and includes the implementation of Land Use Controls (LUCs) to restrict access to impacted subsurface soil, maintaining a protective cover over contaminated subsurface soil, and Five Year Reviews. This amended remedy has been selected by the Navy in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) 300 et seq., as amended. The regulatory program performed under the context of these combined laws and regulations is commonly referred to as "Superfund."

This decision is based on information contained in the Administrative Record for the Site. The Massachusetts Department of Environmental Protection (MassDEP) concurs with the amended remedy, as documented in **Appendix A**.

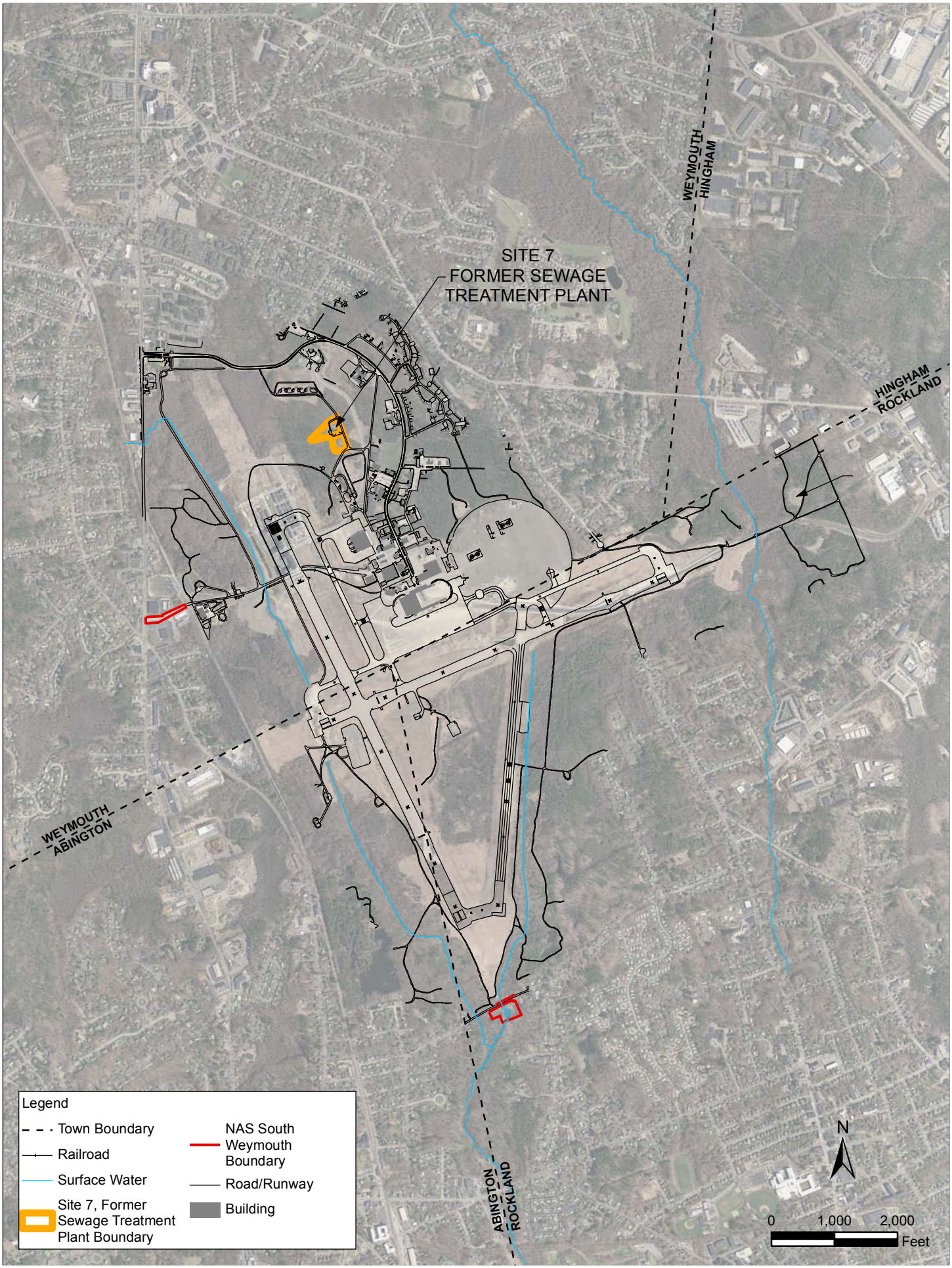
1.3 ASSESSMENT OF SITE

The amended remedy presented in this ROD Amendment is necessary to protect the public health and the environment from actual or threatened releases of hazardous substances, pollutants, or contaminants into the environment. A CERCLA action is required because concentrations of polycyclic aromatic hydrocarbons (PAHs), PCB Aroclor-1260 and Aroclor-1016, pesticides 4,4'-DDT and 4,4'-DDD, and arsenic in Site subsurface soil would pose unacceptable risks to the environment and human health if the existing soil cover over the contaminated subsurface soils is disturbed or under future residential land use scenarios.

The remedy selected in the 2008 ROD included the following items as part of the Remedial Action:

- Completion of a Pre-design Investigation to further delineate the extent of chemicals of concern (COCs) requiring remediation in soil and sediment.
- Excavation of approximately 1,100 cubic yards (CY) of soil and sediment to a depth of 1 foot below ground surface (bgs)

Figure 1 -- Site Map



- Collection of post excavation confirmatory soil and sediment samples.
- Offsite Disposal or Recycling (Asphalt Batching)
- A monitoring program (to verify that post-remediation COC concentrations do not rebound in sediment); and,
- Pre- and post-remediation groundwater monitoring (to confirm that groundwater is not a medium of concern).

The ROD was modified by an ESD dated August 30, 2010. The ESD modified the disposal component of the remedy and noted that the volume of excavated material had increased to 3,700 cubic yards. The excavated soils and sediments were beneficially reused in the construction of the subgrade layer for the West Gate Landfill cover system rather than disposed of or recycled offsite.

In 2009, The Navy initiated a Remedial Action that included the removal of the impacted surface soils and sediments. During the implementation of the Remedial Action and associated investigations, additional impacted surface soil, sediment, and deeper subsurface soil was identified. During the investigations, subsurface soil concentrations of PCB Aroclor 1016 and 1260 were discovered at depths of 11 to 14 feet. The ROD had not designated PCBs as COCs or established remediation goals for PCBs, so preliminary remediation goals (PRGs) were developed for the PCB Aroclors in soil in a 2016 Focused Feasibility Study (FFS). The Navy re-mobilized to complete the remedial action in 2014-2015. This mobilization expanded upon the 2009 mobilization and included the excavation of additional impacted surface soils, sediments, unsaturated subsurface soils, structures and piping. The Navy completed the Remedial Action with the exception of post remedy groundwater and sediment monitoring in June of 2015. In total, approximately 6,100 CY of impacted soil and sediment, approximately 5,000 CY above what was estimated in the ROD, were excavated and disposed of. The excavated areas were backfilled with clean material. In the wetland restoration area, the wetland was backfilled with wetland soil and seeded with native wetland herbaceous plants. Impacted subsurface soil remains and will be addressed by the amended remedy. The delineated wetland boundary also changed after the initial ROD was issued, and now extends further east into the former STP area where significant soils were excavated.

1.4 DESCRIPTION OF AMENDED REMEDY

The amended remedy adds revised ARARs and PCB cleanup standards to the remedy and adds LUCs to the selected remedy. The LUCs address potential unacceptable ecological and human health risks associated with exposure to COCs through direct contact or incidental ingestion. The amended remedy will limit access to contaminants in subsurface soil through the implementation of LUCs and operation and maintenance (O&M) of the existing soil cover. Execution of the amended remedy is expected to achieve long-term risk reduction and will allow for future recreational, commercial, and industrial site uses as consistent with the LUCs.

No unacceptable risks associated with exposure to Site groundwater or surface water were identified at the Site. Per- and Polyfluoroalkyl Substances (PFAS) in groundwater is being addressed under a Basewide PFAS OU (OU27). The expanded Remedial Action successfully reduced sediment concentrations to below Remedial Goals (RGs); therefore, there is no longer unacceptable risk associated with exposure to Site sediment.

The amended remedy for the Site includes the implementation of LUCs to restrict access to the deeper impacted subsurface soils that remain onsite. The main components of the amended remedy include the following:

- Apply LUCs restricting access to impacted subsurface soils below 9 feet bgs in the upland area and subsurface soils below two feet bgs in the wetland by maintaining a soil cover. Upland soil impacts begin at 11 feet. The upland soil access restriction includes a two-foot buffer from 9 feet to 11 feet to allow for a margin of error during potential construction. The LUC will also prohibit residential land use within the LUC boundaries. The LUC will be designed in a Land Use Control Implementation Plan (LUCIP). The LUCIP will present LUC boundaries correlated to known horizontal and vertical survey datums.
- A provision of the LUC will require that the property owner develop a soil management plan, on behalf of the Navy, to ensure impacted soils are managed properly and that any future construction work in these areas is completed by properly trained workers. The LUC will require that the Navy submit the soil management plan to EPA, and MassDEP for approval, prior to the commencement of construction activities.
- Annual Inspection/Certifications and five-year reviews will be completed to evaluate the remedy.
- Long term monitoring (LTM) and operation and maintenance (O&M) of the soil cover.
- The amended remedy updates ARARs identified in the 2008 ROD to add revised and newly promulgated State and Federal standards.
- The amended remedy adds PCBs as a contaminant of concern; incorporates PCB cleanup levels into the remedy; describes how PCBs encountered during the initial remedial action, post-ROD, were addressed; and describes how PCBs remaining in the subsurface will be addressed in the amended remedy.
- The amended remedy will change the cost of the remedy from the $587,077 cited in the ROD (actual cost of removing the contaminated surface soil and disposing of it at the West Gate Landfill, as the remedy was modified by the ESD, was approximately $700,000) to $2,685,000.

This decision has been selected by the U.S. Navy and the U.S. Environmental Protection Agency (EPA). The MassDEP statement on the selected remedy is presented in **Appendix A**.

1.5 STATUTORY DETERMINATIONS

Protection of Human Health and the Environment- The selected amended remedy will protect human health and the environment through maintenance of soil covers and the application of LUCs to prevent exposure to the remaining, impacted subsurface soils.

Compliance with ARARs and TBC Criteria- The selected amended remedy complies with federal and state ARARs and considers TBCs identified in **Appendix B**. Navy has determined that the selected remedy is the least environmentally damaging practicable alternative (LEDPA) under Section 404 of the Clean Water Act, because it provides the best balance of addressing contaminated soil within and adjacent to

wetlands by minimizing both temporary and permanent alteration of wetlands and aquatic habitats on site. Navy has also determined that the selected remedy would be in compliance with Relevant and Appropriate TSCA protectiveness standards, as all soil exceeding identified PCB cleanup levels will remain inaccessible through the installation and O&M of soil covers, along with long-term monitoring and LUCs.

Cost-Effectiveness - The selected amended remedy is the most cost-effective remedy that meets the Remedial Action Objective (RAO). The selected remedy meets the RAO and will prevent potential future exposure to the deep, impacted subsurface soil for a low cost. The estimated net present worth cost of the selected remedy is $2,685,000.

The Selected Remedy Utilizes Permanent Solutions and Alternative Treatment or Resource Recovery Technologies to the Maximum Extent Practicable – The selected amended remedy uses maintenance of a soil cover over contaminated subsurface soils and LUCs as permanent solutions to achieve the RAO and protect human health and the environment. While the Navy owns the property it will maintain LUC restrictions and ensure they are incorporated into any lease or other agreement for occupancy of the property by third parties. Before any property transfer by the Navy, the LUC restrictions will be incorporated into any property deed, in a form compliant with State recording requirements, so that the LUC restrictions apply to the transferee and all subsequent title holders to the property. The selected amended remedy ranked the highest in protection of human health and the environment, compliance with ARARs, short term effectiveness, implementability, cost, and state and community acceptance.

Preference for Treatment as a Principal Element- The selected Remedy does not satisfy the preference for treatment as a principal element. The selected amended remedy best satisfied the nine NCP evaluation criteria, but does not include treatment as a principal element. Impacted soils are located at depth and/or within a wetland area. The selected remedy will not disturb the wetland, is more cost-effective than treatment or removal, and provides long-term effectiveness with the least amount of short-term impact or disruption to the community and the environment.

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

1.6 AUTHORIZING SIGNATURES

This ROD amendment documents the amended remedy for Operable Unit/Site 7, the Former Sewage Treatment Plant, at the former Naval Air Station (NAS) South Weymouth. MassDEP's statement on the selected decision is presented in **Appendix A**.

For the reasons documented herein, by my signature below, I approve this ROD amendment and the changes stated therein.

By: _____ Date: 2/14/19

David A. Barney
BRAC Environmental Coordinator
Naval Air Station South Weymouth
U.S. Navy

By: _____ Date: 03/01/19

Bryan Olson
Director, Office of Site Remediation and Restoration
Region 1 – New England
U.S. Environmental Protection Agency

2.0 DECISION SUMMARY

2.1 SITE NAME, LOCATION, AND DESCRIPTION

The former NAS South Weymouth (the Base) is comprised of approximately 1,444 acres located approximately 20 miles southeast of Boston. The Base is located primarily in the Town of Weymouth, Norfolk County, Massachusetts. Portions of the Base also extend into the adjacent towns of Abington and Rockland, Massachusetts; the town of Hingham forms the northeast boundary of the Base. The Base is located in an urban area, with primary access from Route 18 in Weymouth. The base location is presented on **Figure 1**.

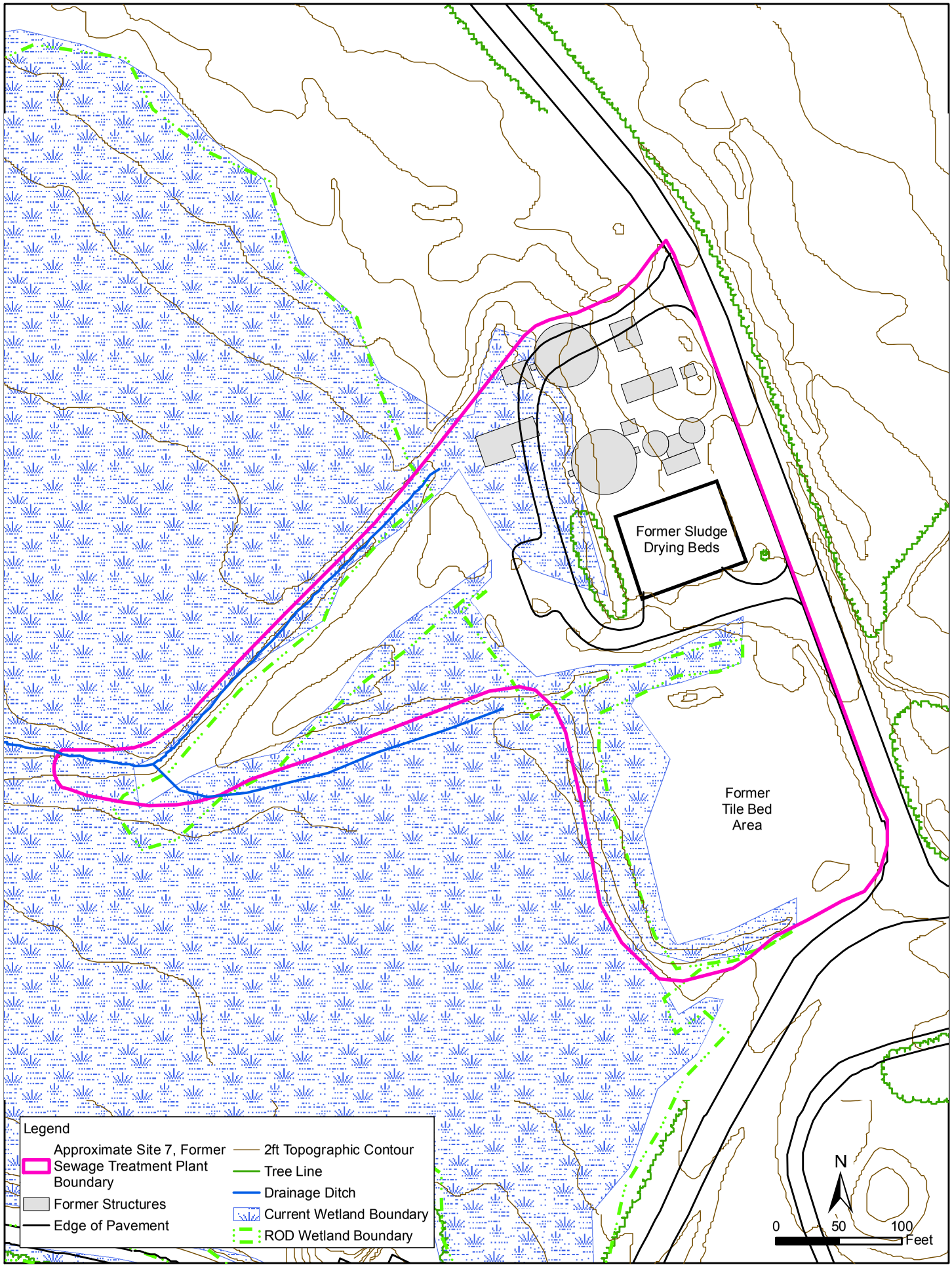
NAS South Weymouth was commissioned during the 1940s to support dirigible aircraft used to patrol the North Atlantic during World War II. The facility was closed in 1949 and then reopened in 1953 as a naval air station for aviation training. NAS South Weymouth was designated for closure under the Base Realignment and Closure Act of 1990 (BRAC), as part of the BRAC Commission's 1995 Base Closure List. In September 1996, operational closure of NAS South Weymouth began with the transfer of aircraft to other Navy facilities, and through personnel reduction. Between 1996 and 1997, NAS South Weymouth provided facilities for limited ground training to Marine and Naval reserve units. NAS South Weymouth was closed administratively under BRAC on September 30, 1997. Because of the closure, the facility was placed in caretaker status under the supervision of Naval Facilities Engineering Command (NAVFAC) and is currently under the supervision of the NAVFAC BRAC Program Management Office (PMO) East. Portions of the Base property have been transferred by the Navy to the local redevelopment authority and are undergoing redevelopment.

The former STP presented on **Figure 2**, is comprised of two main areas encompassing approximately 3.3 acres: the former Tile Bed Area and the adjacent former sewage treatment plant area. The Site is unpaved and relatively flat with a gentle slope to the west, toward an adjacent drainage channel and wetland area. A small segment of the adjacent, downgradient/downstream wetland area is also included as part of the Site. The Site's ground surface is covered by grasses, shrubs, and mixed upland forest. A forested wetland, which contains several small intermittent stream channels, bounds the Site to the west. Forested areas bound the Site to the north, whereas paved roads bound the Site to the east and south.

The Tile Bed Area was part of the original wastewater treatment system installed in the 1940s during construction of the Base. The Tile Bed Area was the leaching field for the treatment system. The wastewater from the Base, mainly comprised of wash water from sink and shower drains, restrooms, and sanitary sewer inlets, received primary treatment at Building 7, the Sewage Lift Station, located south of the Site near Hangar 1. The partially-treated wastewater was piped from the Sewage Lift Station to the subsurface gravel layer in the Tile Bed Area for final treatment (i.e., filtration and biodegradation) and disposal (i.e., infiltration to groundwater). Building 7 and the Tile Bed Area were used by the Navy from about 1940 to 1941 until sometime later a settling tank and trickling filter (southernmost) was added.

In 1953, the Navy expanded the STP facility adjacent (north) of the Tile Bed Area. Use of the Tile Bed Area was discontinued and the STP was used as the wastewater treatment facility for the Base from 1953 to 1978. The STP initially consisted of a settling tank for primary (physical) treatment and a "trickling filter" for

Figure 2 -- Site Layout



secondary (biological) treatment of wastewater. The treated wastewater was discharged through an outfall to a drainage ditch leading west. During the plant's 25 years of operation, the Navy completed various upgrades, including expansion of the secondary treatment system and construction of covered sludge drying beds for aerobic digestion (composting) of the wastewater sludge. Dried sludge from the drying beds was reportedly disposed at various remote locations on the west side of the Base, primarily north of Trotter Road. In 1978, the Navy decommissioned the STP and the Base wastewater was discharged to the municipal sanitary sewer system. From the 1980s until 2005, the covered sludge drying bed area was used by Navy for storage of road salt and sand. A more complete description of the STP can be found in Chapter 3 of the *Remedial Investigation (RI) Phase II Report* (TtNUS, 2002).

The Navy removed the above-grade portions of tanks and associated structures of the STP Site in 1992. Structures that remained on the Site include the digesters, primary and secondary settling tank foundations, and concrete walls of the former sludge drying bed area, an inactive transformer (polychlorinated biphenyls [PCB]-free), the clay tiles and riser pipes of the former Tile Bed Area, and the various groundwater monitoring wells installed as part of the Navy's investigations of the Site. During the 2009 mobilization, it was confirmed that the floors of the digesters had been broken up. Following the removal of material from primary and secondary settling tanks during the 2014-2015 mobilization of the Remedial Action, the primary and secondary settling tank foundations were broken prior to backfilling the excavations. The Site is still owned by Navy, and has not yet been transferred.

The former NAS South Weymouth is a closed facility, and environmental investigations and remediation at the Base are funded under the Department of Defense BRAC program. The Navy is the lead agency and the EPA is the lead regulatory agency for CERCLA activities at the former NAS South Weymouth.

2.2 SUMMARY OF PREVIOUS INVESTIGATIONS AND THE REMEDIAL ACTION

A number of environmental investigations, pre-design investigations, and a remedial action have been completed at the Site. Summaries are provided below.

Preliminary Assessment (PA), Argonne National Laboratory 1988. The PA included a records search, interviews, and a site walkover. The purposes of the PA were to identify and evaluate past waste practices at NAS South Weymouth and make an assessment of the associated potential for environmental contamination. As a result of the study, five sites (not including the STP Site) were identified for further environmental study.

Site Investigation (SI), Baker Environmental 1991. The SI included site walkovers, geophysical surveys, installation of groundwater monitoring wells, and the collection of soil, sediment, surface water, and groundwater samples at eight sites at the NAS South Weymouth property. The SI was conducted for screening purposes to assess the potential for contaminant migration, provide data for Hazard Ranking System (HRS) scoring, and to provide the information necessary to develop a comprehensive work plan for further study. The SI included a site visit and literature review at the STP Site, but no sampling. Further investigation of the STP Site was recommended.

Phase I RI Study, Brown & Root Environmental 1998. The Phase I RI included a literature search, a geophysical survey; a soil-vapor survey; immunoassay testing; an ecological assessment; test pit excavation; installation of monitoring wells, well points, and piezometers; hydraulic conductivity testing;

groundwater gauging and water level measurements; stream gauging; sampling of surface soil, subsurface soil, groundwater, sediment, surface water, and leachate; and a human health risk assessment.

Phase II RI, Tetra Tech NUS (TtNUS) 2002. The Phase II RI was conducted to address data gaps from the previous investigations. During the Phase II RI, the Tile Bed Area was incorporated into the sampling and investigation programs along with the STP area. The Phase II RI included further ecological assessment; groundwater gauging; water level measurements; sampling of surface soil, subsurface soil, groundwater, sediment, and surface water; and a human health risk assessment.

Supplemental Sampling Event and Risk Assessment Addendum, TtNUS 2006. The additional field investigation and associated risk calculations included sampling and analysis of soil and groundwater beneath the former sludge drying beds and calculating risk to evaluate the potential risks to future residents from exposure to Site surface soils. This supplemental field investigation and additional risk calculations were incorporated into the Final Feasibility Study (TtNUS 2007).

Feasibility Study (FS), TtNUS 2007. The FS identified the RAOs that would be protective of human health and the environment at the Site and developed and evaluated various cleanup alternatives to achieve those objectives.

Record of Decision (ROD), US Navy April 2008. The ROD set forth the selected remedy for the Site and included the following components:

- A pre-design investigation (PDI) (to further delineate the types and extents of COCs [i.e. arsenic, 4,4'-DDT, dieldrin, benz(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene in surface soils and arsenic, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, dieldrin, and potentially methyl mercury in sediments]);
- Excavation of contaminated soil and sediment (containing COC concentrations exceeding RGs);
- Off-site disposal or recycling by asphalt batching;
- A monitoring program (to verify that post-remediation COC concentrations do not rebound in sediment); and,
- Pre- and post-remediation groundwater monitoring (to confirm that groundwater is not a medium of concern).

Since the ROD assumed that the Site would be remediated to levels that would render the Site suitable for unlimited use and unrestricted exposure (because residual risks for current and future use scenarios would be within acceptable ranges), no groundwater restrictions, land use restrictions, or five-year reviews were required. The ROD was executed on April 30, 2008 and selected excavation and off-site disposal (or recycling by asphalt batching) of contaminated soils and sediments.

Pre-Design Investigation (PDI), LFR 2009. The PDI was conducted to further delineate the types and extent of contaminants of concern in soil and sediment requiring remediation, to verify that surface water is not a medium of concern, to evaluate groundwater flow and to inspect and determine whether there are potential migration pathways that have not been adequately investigated. The PDI field activities were completed in February 2008; the final PDI Report was issued in February 2009 (LFR, 2009).

2009 Mobilization of the Remedial Action (RA), TetraTech, EC (TtEC) 2009. Based on results of the PDI, a remedial design was completed and the RA was initiated in 2009 to address COCs in surface soil and sediment in accordance with the 2008 ROD. The RA was conducted to reduce the levels of the contaminants of concern in surface soil and sediment to below the RGs per the selected remedy identified in the ROD (Navy 2008). The PDI scope of work was presented in the Final Remedial Action Work Plan for Soil Excavation at Site 7, Former Sewage Treatment Plant Location, (TtEC 2009). Following removal of the impacted material, confirmatory samples were collected to document the remaining levels of the contaminants of concern. Confirmatory sampling results revealed COC contamination beyond the planned limits of excavation and a supplemental PDI effort was recommended to address data gaps and further delineate the extent of soil contamination. The work completed during the 2009 mobilization was summarized in the Interim Remedial Action Completion Report for Soil Excavation at Site 7, Former Sewage Treatment Plant Location (TtEC 2011).

Explanation of Significant Differences, U.S. Navy, August 2010. The ROD remedy was modified in 2010, through the ESD, to permit use of the excavated materials from OU7 as subgrade fill in the construction of the West Gate Landfill cover system rather dispose of it off-site. The ESD also noted that the volume of excavated material had increased to 3,700 cubic yards from the 1,100 cubic yards estimated in the ROD.

Supplemental PDI, TtNUS 2012. The Final Supplemental PDI Project Report was issued in May 2012 that presented results of the field effort performed in April and May 2011. Based on the findings, the list of COCs, media of concern, and exposure scenarios had to be expanded from those originally identified in the ROD. A human health risk screening evaluation was performed, consistent with the process used for risk screenings previously completed for other sites at the former NAS South Weymouth, to support the selection of COCs and development of PRGs. Based on results of the risk screening (that identified potential health impacts for a hypothetical resident or industrial worker at the Site), additional CERCLA actions such as focused excavation or institutional controls were recommended. During the investigation, subsurface concentrations of PCB Aroclor 1016 and 1260 were discovered at depths of 11 to 14 feet. The 2008 ROD did not designate PCBs as COCs or establish RGs for PCBs.

Additional Soil Delineation Investigation, TtNUS 2014. In 2013, an Additional Soil Delineation investigation was performed to follow up on the 2009 RA mobilization and the 2011 Supplemental PDI results, which showed areas that needed further investigation. The investigation and report were completed between July 2013 and February 2014. Sample results indicated that contaminants of concern remained. The contaminants of concern for soil included arsenic, 4,4'-DDT, dieldrin, benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene. The contaminants of concern for sediment included arsenic, 4,4'-DDD, 4,4'-DDE, 4,4'- DDT, and dieldrin. An evaluation of prior remedial actions at STP Site 7 led to the determination that additional surface and subsurface contamination were present and that additional surface soils, discharge piping (and piping content), and associated contaminated soil and sediment needed to be removed to meet the RAOs for the Site identified in the ROD (Navy 2008), allowing unlimited land use and unrestricted exposure following implementation of the remedy.

Test Pit Report, TtEC 2014b. A test pit investigation was completed to investigate former STP subgrade structures. The investigation consisted of the advancement of 11 test pits that targeted piping, connections, vaults, trickling filters, and tanks of the former sewage treatment system. The investigation identified

impacted piping and structures with elevated concentrations of arsenic and polycyclic aromatic hydrocarbons (PAHs). The test pit report recommended that additional pipes be removed and that chambers that contain elevated levels of arsenic, along with material in the Former Primary Settling Tanks (TP-10) be removed or cleaned.

Additional 2014-2015 RA Mobilization, TtEC 2015. The Navy completed implementation of the 2014-2015 mobilization of the Remedial Action that included additional excavation of impacted surface soil, unsaturated subsurface soil, structures, and piping in the upland previously remediated upland area; excavation of headwall soils and piping; and sediment within the wetland and drainage ditch. The scope of the 2014-2015 Remedial Action mobilization was detailed in the Final Addendum to Remedial Action Work Plan, Soil Excavation at Site 7 Former STP Location (TtEC 2014a).

Approximately 6,100 CY of impacted surface soils and sediments, approximately 5,000 CY above what was estimated in the ROD, were excavated and disposed of offsite. Wetland areas impacted by the Remedial Action were restored. The Navy completed the Remedial Action in June of 2015. The completed Remedial Action was summarized in the Remedial Action Completion Report (TtEC, 2015).

Focused Feasibility Study, Resolution Consultants 2016. The Navy completed a FFS to evaluate remedial alternatives to address impacted subsurface soils that remained onsite upon conclusion of the Remedial Action. PRGs were developed for compounds detected at the site in 2011-2014 that did not have RGs established in the 2008 ROD.

Basewide Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA) LUCIP, 2018a. During 2016, sampling of Per- and Polyfluoroalkyl Substances (PFAS) conducted at the Site identified the presence of PFOS and PFOA at the STP site above U.S. EPA Lifetime Health Advisories' (LHA) values in two monitoring wells. As part of investigations under the Basewide PFAS OU (not part of this remedial action), the Navy issued a Basewide PFOS and PFOA LUCIP. The main purpose of the LUCIP is to restrict groundwater use within the Basewide PFAS OU and to protect the Navy's ability to conduct its PFAS investigation as part of a separate CERCLA action. The LUCIP encompasses the portion of the STP site where PFAS have been detected. Going forward, PFAS impacts at the Site will be managed under a new OU 'Basewide PFAS', and are not addressed in this ROD.

2018 Long Term Monitoring Report, Resolution Consultants 2018b. The Navy completed three years of post-excavation groundwater monitoring and one post-excavation sediment sampling event to verify that groundwater and sediment were not impacted from the disturbances caused by the implementation of the Remedial Action. The initial groundwater monitoring event was also used to assess the potential for vapor intrusion in future buildings in the vicinity of a former underground storage tank (UST).

The results of the April 2016 groundwater sampling event confirmed that volatile and extractable petroleum hydrocarbons were not present at detectable concentrations in the vicinity of the former UST; therefore, the vapor intrusion pathway is not a pathway of concern at the Site. Concentrations of COCs detected during the Spring 2016, Spring 2017, and Spring 2018 groundwater sampling events do not pose an unacceptable risk/hazard associated with exposure to Site groundwater under a non-potable groundwater use scenario in which groundwater is used for irrigation or other outdoor use. The sediment sampling event conducted in June 2017 confirmed that COC concentrations in sediment were reduced to below RGs.

Groundwater Human Health Risk Assessment Technical Memorandum, Resolution Consultants 2018c. A human health risk assessment (HHRA) was performed based on a non-potable groundwater use scenario in which Site groundwater may be contacted by future construction workers, on-site workers, or residents while using groundwater for non-potable/irrigation purposes. In November 2017, MassDEP issued an amendment to the basewide Groundwater Use and Value Determination for the former NAS South Weymouth, which removed the Potential Drinking Water Source Area designation from the aquifer underlying the STP Site and determined that groundwater at the Site has low or medium use and value. Therefore, groundwater underlying the Site is no longer considered a suitable source of public drinking water and drinking water would not be an anticipated potential future use.

The HHRA was completed in 2018 to evaluate the potential carcinogenic risk and non-carcinogenic hazard associated with a potential non-potable groundwater use scenario and a potentially complete vapor intrusion pathway. The conclusions of the groundwater HHRA indicate that concentrations of the ROD COCs detected in Site groundwater during the 2016, 2017 and 2018 groundwater sampling events, which are considered representative of current conditions, do not pose a cancer risk or noncancer hazard above MassDEP or EPA target risk/hazard levels. These results indicate that there is no unacceptable risk/hazard associated with exposure to Site groundwater under a non-potable groundwater use scenario in which groundwater is used for irrigation or other outdoor use only. A comparison of groundwater concentrations of ROD COCs to U.S. EPA groundwater screening levels protective of the vapor intrusion pathway (i.e., U.S. EPA vapor intrusion screening levels [VISLs]) indicated that the vapor intrusion pathway is not a pathway of concern at the Site.

2.3 2008 ROD REMEDY IMPLEMENTATION

The remedy specified in the ROD as modified by the ESD consisted of the removal of impacted soil and sediment to achieve the selected RGs. The excavated material was beneficially re-used as subgrade fill in the construction of the West Gate Landfill cover system. The intent of the remedy was to return the Site to unlimited use and unrestricted exposure. The specific components and current status are as follows:

Pre-Design Investigation

The remedy presented in the ROD included a PDI intended to further delineate the types and extent of COCs requiring remediation. The PDI was conducted to further delineate the types and extent of contaminants of concern in soil and sediment requiring remediation, to verify that surface water was not a medium of concern, to evaluate groundwater flow and to inspect and determine whether there were potential migration pathways that had not been adequately investigated. The PDI field activities were completed in February 2008; the final PDI Report was issued in February 2009 (LFR, 2009).

Excavation

The remedy presented in the ROD included the excavation of surface soil and sediment containing COCs at concentrations exceeding RGs. In the ROD, the total area of soils requiring excavation and off-site disposal was estimated to be approximately 23,000 square feet and the total area of sediment requiring remedial action was estimated to be approximately 6,400 square feet. The required excavation depth for the sediment and soil and was estimated to be 1 foot. In total, it was estimated that approximately 1,100 CY of surface soil and sediment would be excavated.

During the pre-design investigation and post ROD investigations, additional impacted surface soil, sediment, and subsurface soil was identified. The Navy expanded the excavation work to include the excavation of the additional impacted surface soil, unsaturated subsurface soil, sediment, the contents of impacted former structures, and piping. Approximately 6,100 CY of impacted surface soils and sediments, approximately 5,000 CY above what was estimated in the ROD, were excavated and disposed of offsite. Wetland areas impacted by the Remedial Action were restored. The excavated areas were backfilled with clean material. In the wetland restoration area, the wetland was backfilled with wetland soil and seeded with native wetland herbaceous plants. The Navy completed the Remedial Action in June of 2015. The completed Remedial Action was summarized in the Remedial Action Completion Report (TtEC, 2015).

Post-Remediation Sediment Monitoring

In order to verify that post-remediation COC concentrations do not rebound in Site sediment, the remedy included a monitoring program. The sediment sampling event conducted in June 2017 confirmed that COC concentrations in sediment were reduced to below RGs.

Pre- and Post-Remediation Groundwater Monitoring

The remedy presented in the ROD included additional groundwater characterization activities that were to be conducted prior to, and following implementation of the soil and sediment remedy, to verify that groundwater is not a medium of concern for the Site. The pre-remediation event was completed and confirmed that groundwater was not a media of concern. The results of this investigation were documented in the final PDI Report that was issued in February 2009 (LFR, 2009).

The post remedy groundwater monitoring was conducted in Spring 2016, Spring 2017, and Spring 2018 and confirmed that groundwater was not a media of concern. The results of this investigation were documented in the Long Term Monitoring Report that was issued in August 2018.

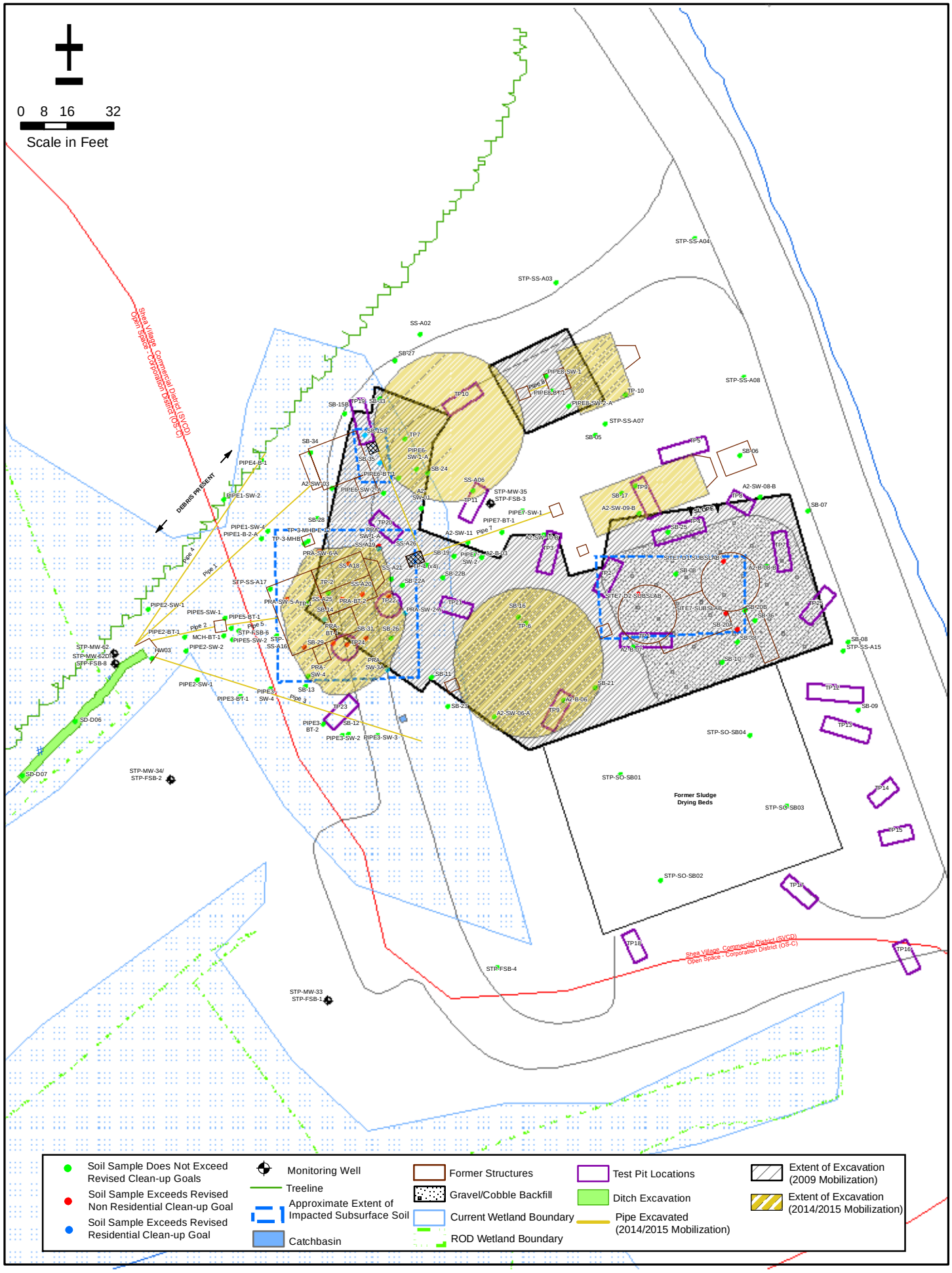
2.4 REMAINING CONTAMINATION & BASIS FOR AMENDMENT

COCs at Site 7 have been identified and remain in subsurface soils following the conclusion of the Remedial Action. Impacted surface soil and sediments were excavated from the Site during the Remedial Action. Upon completion of the Remedial Action, no COC concentrations remained above RGs in surface soil or sediment. The following COCs have been identified above the subsurface soil RGs developed for the Site (**Appendix C**).

- 4,4'-DDD
- 4,4'-DDT
- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Dibenz(a,h)anthracene
- Aroclor 1016
- Aroclor 1260
- Arsenic

Impacted subsurface soil remains at depths below 11 feet below ground surface (bgs) in the eastern upland area in the vicinity of former STP structures as shown on **Figure 3**. Impacted subsurface soil also remains in the wetland area at depths below two feet bgs. The amended remedy will address these impacts.

Figure 3 -- Summary of Remaining Impacted Soil



Conceptual Site Model

Groundwater, surface water, sediment, surface soil, and subsurface soil were sampled as part of various site investigations. The RI/FS characterized the nature and extent of contamination at the Site, included a HHRA and an Ecological Risk Assessment, and evaluated remedial alternatives to address unacceptable human health and ecological risks associated with potential exposures to COCs identified in Site surface soil and sediment where concentrations above the historical PRGs were found. A ROD was signed by stakeholders in 2008 (Navy, 2008). The Navy recently implemented a Remedial Action that included the excavation of impacted surface soil, unsaturated subsurface soil and sediment. Impacted soil within former STP structures and piping were also excavated as part of the Remedial Action. The delineated wetland boundary changed after the ROD was issued, and now extends further east into the former STP area. The updated wetland boundary is shown on Figure 2 and Figure 3. To avoid significant impacts to the wetland area, it was decided that subsurface wetland soils would not be excavated.

At the conclusion of the 2014-2015 mobilization, all impacted surface soil and sediment was remediated to unrestricted levels. Impacted subsurface soils below 11 feet bgs in the upland area and soils greater than two feet bgs in the intermittently wet area (wetland) remain under a clean backfill cover and are considered media of concern.

Groundwater and surface water were studied during previous investigations and were determined to not be media of concern[1]. This determination was documented in the 2008 ROD, which included a provision for pre and post remedy sampling of groundwater and pre-remedy sampling of surface water to confirm that groundwater and surface water are not media of concern. The ROD also included a provision for post remedy sediment monitoring to verify that post remediation COC concentrations do not rebound in Site sediment. The Navy completed the pre remedy surface water sampling event which confirmed that surface water was not a media of concern. Results were presented in the 2009 PDI Report (LFR, 2009). Post remedy groundwater and sediment sampling were conducted between 2016 and 2018 and confirmed that groundwater and sediment are not media of concern.

2.5 SUMMARY OF REMAINING RISK

The original human health risk assessment was summarized as part of the 2007 Feasibility Study (2012 TtNUS). This study was updated in the 2012 Supplemental PDI Report (2012 TtNUS). The Remedial Action removed impacted surface soils and eliminated the risk associated with contact to impacted surface soils. Potential human receptors for contaminants in subsurface soil include potential future residents and future construction workers during potential hypothetical excavation or other invasive activities. Future construction workers were not identified as potential receptors within the original risk assessment; however, the residential exposure scenario is also protective of future construction workers.

[1] The Navy has determined pursuant to EPA letter of July 7, 2016, that additional investigation is required within OU7 for PFOS and PFOA (constituents that were not identified as COCs in the ROD). PFAS in groundwater is being addressed under a Basewide PFAS OU (OU27).

The results of the original HHRA showed that potential carcinogenic risks and non-carcinogenic risks under the current use scenarios were within or below the acceptable risk benchmarks at the Site. However, potential risks under the future scenarios were above acceptable carcinogenic and non-carcinogenic risk benchmarks for the future residential and recreational child receptors. The primary contributor to the non-cancer risk was dieldrin in surface soils. The dieldrin-impacted surface soils were addressed via excavation as part of the Remedial Action.

In April-May 2011, the human health risk was re-evaluated as part of the Supplemental PDI, and new Post-ROD PRGs were developed since it was recognized that some of the COCs, media, and exposure scenarios were different from those in the 2008 ROD; however these changes were never adopted as they were rendered obsolete by additional data gathered more recently. The 2014 Five Year Review (2014b TtNUS) indicated that contamination existed outside of the previously defined excavation boundary, noting that PAH concentrations exceeding the Post-ROD PRGs were widespread within Excavation Area A-2. Remaining concentrations of arsenic, pesticides, and PCBs were also found to exceed the Post-ROD PRGs.

The 2014 Five Year Review indicated that there were potential health impacts for a hypothetical resident or industrial worker due to the remaining impacted subsurface soil. Due to these potential human health impacts, additional actions such as excavation, implementation of institutional controls, confirmation sampling, and LTM were recommended for soil.

The 2014 Five-Year Review also identified remaining sediment impacted with COCs exceeding the ROD-specified RGs. Further sediment excavation was conducted as part of the 2014-2015 mobilization of the Remedial Action near location SD-05, which is near the headwall.

The HHRA was updated in 2016 as part of the FFS since additional investigative work conducted during and after the Supplemental PDI discovered that some of the COCs, media, and exposure scenarios were different from those evaluated in the original HHRA. This HHRA update consisted of the development of updated human health soil PRGs, and was limited to impacted subsurface soils because other media (i.e., surface soil and sediment) were addressed as part of the Remedial Action. The 2016 PRG update included a subset of PCB Aroclors as subsurface soil COCs. PCBs were not identified as surface soil or sediment COCs in the 2008 ROD. At the time of the 2016 HHRA update, groundwater had not been sampled or identified as a media of concern.

An HHRA was conducted in 2018 to evaluate the potential carcinogenic and non-carcinogenic risks associated with a potential non-potable groundwater use scenario based on the results of the 2016-2018 groundwater sampling events. The 2018 groundwater HHRA concluded that the potential health risk associated with all of the non-potable groundwater use scenarios evaluated do not exceed the MCP or EPA target risk levels. These results indicate that there is no unacceptable risk/hazard associated with exposure to Site groundwater under a non-potable groundwater use scenario in which groundwater is used for irrigation or other outdoor use only. A comparison of groundwater concentrations of ROD COCs to EPA groundwater screening levels protective of the vapor intrusion pathway (i.e., U.S. EPA VISLs) indicated that the vapor intrusion pathway is not a pathway of concern at the Site. In addition, concentrations of ROD COCs in post-remedy groundwater confirmation samples collected in 2016-2018 do not exceed the EPA maximum contaminant levels (MCLs) (2018), where available.

The subsurface soil PRGs developed in the 2016 FFS were updated in 2018 for use as RGs that reflect the most currently recommended toxicity values for soil COCs. The revised PRGs were developed for the same human exposure scenarios, and using the same approach, as were used in the derivation of the PRGs developed in the 2016 FFS. The revised soil PRGs were developed to be protective of human health, and not ecological receptors, due to the removal of impacted surface soil from the Site during the Remedial Action and there not being complete exposure pathways to subsurface soil for ecological receptors.

In addition to the HHRA described above, the Navy performed a Tier II Ecological Risk Assessment (ERA) for the Site. The ERA evaluated potential risks to ecological receptors that may occur in the presence of chemical stressors in environmental media. The study was presented in the *Phase II Remedial Investigation Sewage Treatment Plant, South Weymouth Naval Air Station* (TtNUS, 2002) and the following text was presented in the 2008 ROD (Navy 2008).

> The ERA results indicated acceptable risks for terrestrial plants, terrestrial invertebrates, amphibians, wetland plants, and wetland invertebrates and indicated potential unacceptable risks for vertebrates from exposure to COCs in surface soil and sediment at the Site. Unacceptable risks were found for terrestrial vertebrates (birds and mammals) associated with exposure to several pesticides in surface soil and food items at the Site. 4,4'-DDE, 4,4'-DDT, arsenic, and dieldrin in terrestrial soil were identified as posing potential risk to birds (American Robin) and mammals (Short-tailed Shrew).
>
> Potential unacceptable risks were found for birds and small mammals associated with exposure to pesticides and metals in sediment and food items at the Site. 4,4'-DDT, 4,4'-DDD, 4,4'-DDE, arsenic, and methyl mercury in sediment were identified as posing potential risk to birds (American Robin and Carolina Wren) and mammals (Short-tailed Shrew and Star-nosed Mole). Refer to Chapter 7 of the Phase II RI (TtNUS, 2002) for a comprehensive ERA presentation.

Similar to the HHRA, the ERA used assumptions that have uncertainties associated with them, which influence the results and conclusions of the risk assessment. Some of the assumptions may underestimate potential risk, some have an unknown effect on potential risk, while some assumptions tend to overestimate potential risk. Uncertainties in the ecological risk assessment process for the Site are summarized in Table 7-39 of the Phase II RI (TtNUS, 2002). While these uncertainties generally tend to overestimate the potential ecological risks at the Site, the use of limited site-specific toxicity testing data results in fewer uncertainties than are often contained in ecological risk assessments.

After further evaluation of Site data during the FS, the Navy, with input from EPA, concluded that 4,4'-DDE, dieldrin, and arsenic in soil did not pose risk to populations of birds and mammals and should not be considered ecological COCs. The sediment and surface soil impacted above RGs were addressed via excavation as part of the Remedial Action, reducing risk to potential ecological receptors to acceptable levels. There are no complete exposure pathways to subsurface soil for ecological receptors. Maintenance of the soil cover will prevent contaminated subsurface soil from being moved to the surface, which could complete an exposure pathway to ecological receptors.

2.6 REMEDIAL ACTION OBJECTIVES

This section presents the ARARs, RAOs, identifies the media of concern, and presents the estimated remaining contaminated soil volume that is applicable to the amended remedy.

Applicable or Relevant and Appropriate Requirements

The 2008 ROD presented a summary of the chemical-, location-, and action-specific ARARs. These ARARs have been updated and are presented in summary tables included as **Appendix B**.

Remedial Action Objectives

RAOs are statements that define the extent to which sites require cleanup to protect human health and the environment and comply with ARARs. The ROD identified the following RAOs:

- Eliminate potential human and ecological receptor exposure to COCs present in Site soil at concentrations above the selected RGs.
- Eliminate potential human and ecological receptor exposure to COCs present in Site sediment at concentrations above the selected RGs.

The remedial action conducted post-ROD accomplished the first RAO by removing all contaminated sediment that exceeded the remedy's cleanup goals. The ROD remedy was also able to remove all of the contaminated surface soil that exceeded cleanup standards, but left contaminated subsurface soil in place. Therefore the following revised soil RAO has been developed for the amended remedy:

- Eliminate potential human and ecological exposure to COCs present in Site subsurface soil at concentrations above the selected RGs.

Remedial Goals

The original HHRA was completed as part of the original RI/FS process and focused on risks associated with contact to impacted surface soils. The PRGs from the original HHRA, which were formalized in the 2008 ROD as Remedial Goals, focused on the residential land use scenario. Additional PRGs were developed in the 2012 Supplemental PDI Report (2012 TtNUS) as additional COCs and additional potential exposure pathways were identified; however the update was never fully adopted as it was rendered obsolete by additional data gathered more recently.

In the FFS (Resolution Consultants, 2015a), updated human health PRGs were developed for unrestricted/residential use and non-residential (Recreational, Commercial/Industrial, Construction Worker) uses. The updated PRGs were based on recent changes to EPA guidance on risk assessment methods and toxicological vales, as well as an inclusion of the additional future construction worker exposure scenario. These PRGs differ from the Remedial Goals identified in the 2008 ROD and the PRGs identified in the 2012 Supplemental Pre-Design Investigation. The PRGs were updated again in 2018 to reflect the most current toxicity information available. The current maximum detected concentrations were compared to the revised PRGs in **Appendix C**. Benzo(k)fluoranthene is no longer identified as a COC due to the maximum concentration being less than the revised PRG. **Appendix C** presents a technical memorandum that documents the development of the RGs. The updated residential PRGs have been selected as the RGs. The RGs are presented in **Table 1**.

Table 1
Subsurface Soil RGs
Site 7, Sewage Treatment Plant
Former NAS South Weymouth, MA

COC	ROD RG	UPDATED RG	Maximum Concentration	Unit	UPDATED RG Basis
Aroclor 1016	NE	4,110	9,400	µg/kg	Human Health
Aroclor 1260	NE	2,410	6,600	µg/kg	Human Health
Benz[a]anthracene	14,500	11,300	24,600	µg/kg	Human Health
Benzo[a]pyrene	1,800	1,829	10,000	µg/kg	Background
Benzo[b]fluoranthene	14,500	11,500	27,000	µg/kg	Human Health
Dibenz[a,h]anthracene	NE	1,150	20,800	µg/kg	Human Health
4,4'- DDD	NE	1,900	89,000	µg/kg	Human Health
4,4'- DDT	2,800	18,900	17,000	µg/kg	Human Health
Arsenic	9.1	6.8	11.8	mg/kg	Human Health

Notes:
µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
COC = Chemical of Concern
NE = Not Established
RG = Remedial Goal
Remedial Goals for dieldrin were presented in the ROD, as dieldrin was identified as a COC in surface soil and sediment. Dieldrin was not identified as a COC in subsurface soil; therefore RGs were not developed in the FFS for dieldrin in subsurface soil.

Media of Concern

The remedy presented in this ROD amendment will address impacted subsurface soil that was not addressed by the original remedy. In the upland area, impacts remain in the saturated subsurface soil, starting at approximately 11 feet bgs. In the wetland area, impacted soil remains below two feet bgs. The Remedial Action addressed impacted surface soils and unsaturated subsurface soils within the upland area as well as the top two feet of sediment in the wetland area. After excavation all areas were backfilled with clean soil. As such, surface soils and sediments are not considered media of concern.

Groundwater and surface water were not identified as media of concern in the 2008 ROD; however the ROD included a provision for pre- and post-remedy sampling of groundwater and pre-remedy sampling of surface water to confirm that groundwater and surface water were not media of concern. The ROD also included a provision for post-remedy sediment monitoring to verify that post-remediation COC concentrations do not rebound in Site sediment. The Navy completed the pre-remedy surface water sampling event which confirmed that surface water was not a medium of concern. Results were presented in the 2009 PDI Report (LFR, 2009). Post remedy groundwater and sediment sampling were conducted between 2016 and 2018 and confirmed that groundwater and sediment are not media of concern. Results were presented in the August 2018 Long Term Monitoring Report. The groundwater data also confirmed that indoor air is not a medium of concern in the vicinity of a former underground storage tank.

Contaminated Volume Estimates

Impacted subsurface soils are present at three locations shown on **Figure 3**. One area is located in the upland portion of the Site and two areas are located in the wetland.

Laterally, approximately 4,190 square feet of the subsurface soil is impacted with COC concentrations above the Residential and Non-Residential PRGs. The depths of these impacts vary depending upon the

area. Approximately 1,430 cubic yards of impacted saturated subsurface soils remain onsite. Details related to these calculations can be found in the FFS.

Impacted subsurface soils in the upland area have been observed as shallow as 11 feet bgs (SB-20A) and as deep as 20 feet bgs (three sub slab locations). Impacted subsurface soils in the northern wetland area have been observed in the 12 to 14 feet bgs interval (SB-15A and SB-35). In the southern wetland area, impacted subsurface soils have been observed in the 1-3 feet bgs (which was excavated to 2 feet bgs as part of the Remedial Action) sample interval (SS-A20) and as deep as 12 feet (SB-14).

2.7 DESCRIPTION OF ALTERNATIVES

Remedial technologies were screened and selected for the development of remedial alternatives in the FFS. Technologies that passed the screening process were grouped into three remedial alternatives. These three alternatives were evaluated as part of the FFS. A summary of each alternative is provided in the sections below. For specific details on the technology screening process, please refer to the FFS (Resolution Consultants, 2015a).

2.7.1 Alternative 1 — No Action

As required by CERCLA, Alternative 1 — No Action alternative was evaluated as part of the FFS. Under this alternative, no remedial action would be taken.

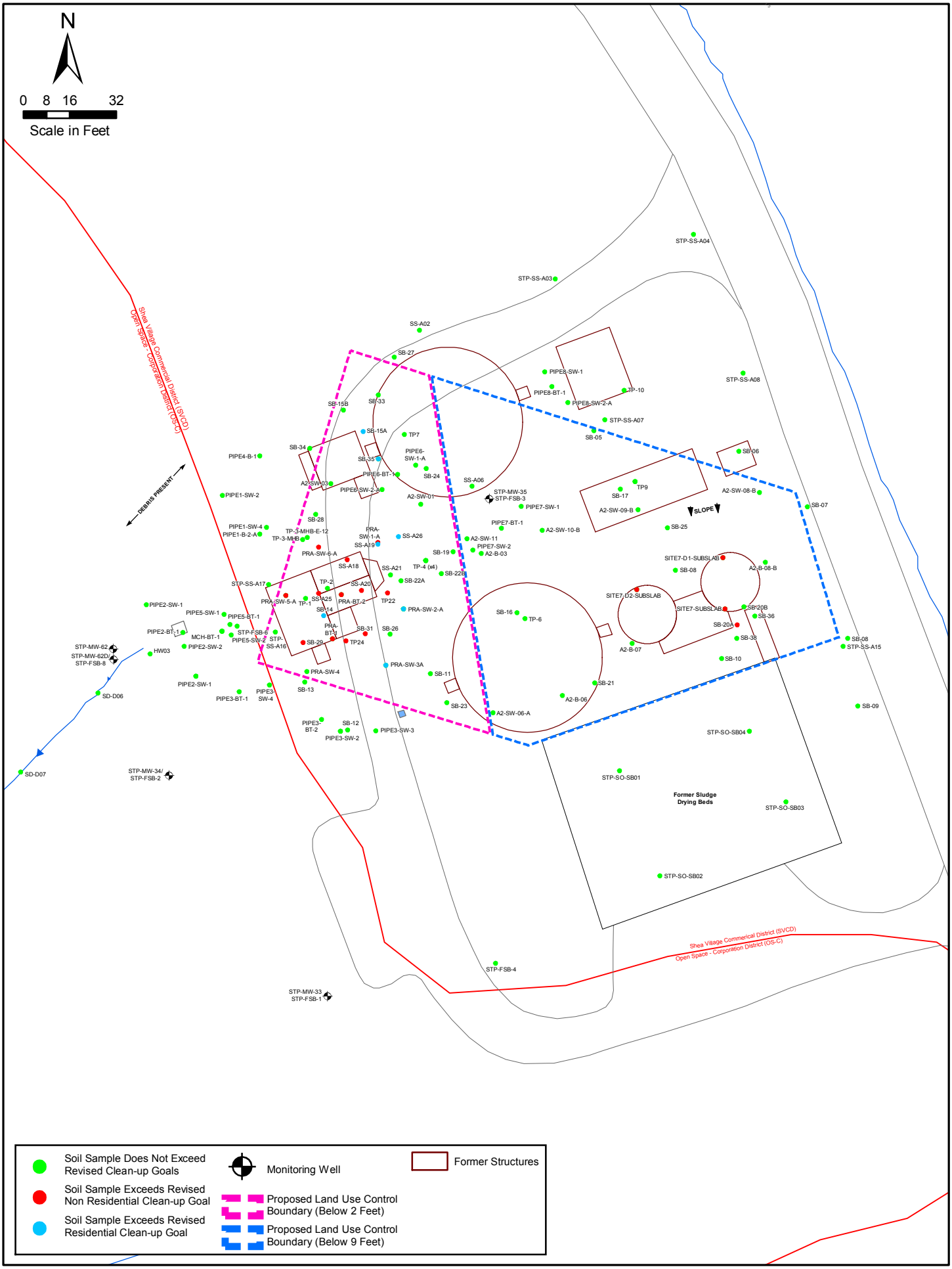
2.7.2 Alternative 2 — LUCs, LTM and Five-Year Reviews

Alternative 2 is considered a Limited Action alternative as no active remedial activity would be completed as part of this alternative. This alternative would achieve the RAO by restricting access to the impacted subsurface soils by maintaining and monitoring the existing soil cover and implementing LUCs to restrict access to the remaining impacted subsurface soils. Long Term Monitoring would be conducted to verify that groundwater and sediment do not become impacted from the disturbances caused by the implementation of the remedial action. Monitoring will ensure that native vegetation becomes established on the soil cover within wetland areas and that measures will be taken, if required, to prevent non-native species from becoming established on the wetland soil cover.

The main components of this alternative include the following:

- Apply LUCs restricting access to subsurface soil below 9 feet bgs in the upland area and subsurface soils below two feet bgs in the wetland by maintaining a soil cover. Upland soil impacts begin at 11 feet. The upland soil access restriction includes a two-foot buffer from 9 feet to 11 feet to allow for a margin of error during potential construction. The LUC would also prohibit residential land use within the LUC boundaries. The proposed boundary of the LUC is shown on **Figure 4**. The LUC will be designed in a LUCIP. The LUCIP will present LUC boundaries correlated to known horizontal and vertical survey datums.
- A provision of the LUC would require that the property owner develop a soil management plan, on behalf of the Navy, to ensure impacted soils are managed properly and that any future construction work in these areas is completed by properly trained workers. The LUC will require that the Navy submit the soil management plan to EPA and MassDEP for approval, and monitoring of the wetland restoration to ensure that native vegetation becomes established and that measures will be taken, if required, to prevent non-native species from becoming established on the wetland soil cover.

Figure 4 -- Proposed LUC Boundary



- Annual Inspection/Certifications and five-year reviews would be completed to evaluate the remedy.
- Long term monitoring of groundwater and sediment which will include up to three annual groundwater and sediment sampling events to verify that groundwater is not a medium of concern and COC concentrations do not rebound in sediment.
- Long term monitoring and O&M of the soil cover.

As part of the Remedial Action, impacted surface soils, sediments, and unsaturated subsurface soils were excavated. A limited amount of water generated from soil/sediment dewatering was treated at an off-site facility. The excavated areas were backfilled using clean fill. In the wetland restoration area, the wetland was backfilled with wetland soil and seeded with native wetland herbaceous plants. This clean fill and the native, non-impacted subsurface soils will act as a soil cover which will restrict access to the remaining impacted subsurface soils under existing conditions. If the property were to be developed in the future, the LUC would be in place to ensure that redevelopment activity is completed in accordance with the soil management plan. Before development of the parcel could occur in the area of the LUC, the future property owner would be responsible for preparing a soil management plan, on behalf of the Navy. Navy would then submit the soil management plan to U.S EPA and MassDEP for approval, prior to the commencement of construction activities.

Alternative 2 will allow for recreational, commercial and light industrial use; however, residential use of the parcel will be restricted. This alternative changes the ROD remedy in that rather than removing all contaminated soil exceeding ROD cleanup levels, it would leave contaminated soil in place under a minimum two foot cover in accordance with the LUC. The cover will require O&M and long-term monitoring.

2.7.3 Alternative 3 — Additional Deep Excavation

Alternative 3 is a removal alternative that includes excavating the remaining impacted subsurface soils. This alternative would achieve the RAO by excavating the remaining subsurface soils that exceed the Residential and Non-Residential RGs. The main components of this alternative include the following:

- Pre-excavation soil sampling/pre-design investigation.
- Excavation of soils that exceed the RGs.
- Excavation support and dewatering to achieve the excavation depth of 15 feet bgs.
- Confirmation Sampling.
- Off-site disposal/reuse/recycling of excavated soils.
- Site backfill and restoration to existing grade.
- Wetland restoration.

Alternative 3 includes the excavation and offsite disposal of approximately 1,430 CY of impacted subsurface soil. There may also be some limited treatment of water generated from soil/sediment dewatering. This alternative will provide for unlimited use/unrestricted exposure on the parcel; however, the wetland would be disturbed.

2.8 EVALUATION OF ALTERNATIVES

The EPA has established criteria for use in comparing the advantages and disadvantages of each alternative. Nine criteria were used to evaluate the different remedial alternatives individually and against each other to select an amended remedy. The nine criteria fall into three groups: threshold criteria, primary balancing criteria, and modifying criteria. These nine criteria are identified below. For the complete "Comparative Analysis of Alternatives," refer to the FFS Report (Resolution Consultants, 2015a).

Threshold Criteria

- Overall protection of human health and the environment
- Compliance with Applicable or Relevant and Appropriate Requirements

Primary Balancing Criteria

- Long-term effectiveness and permanence
- Reduction of toxicity, mobility or volume through treatment
- Short-term Effectiveness
- Implementability
- Cost

Modifying Criteria

- State Acceptance
- Community Acceptance

The two modifying criteria were evaluated after receipt of state and public comments on the FFS and Proposed Plan. The public comment period began on August 9, 2018 and ended on September 8, 2018. No state or public comments were received. **Table 2** presents an analysis of each alternative against these criteria.

Sustainability

In accordance with Navy policy, the sustainability of each alternative was evaluated as part of the FFS. The sustainability evaluation is completed to better understand the environmental footprint of each remedial alternative. Factors that are considered include the amount of greenhouse gas emissions, the amount of water used, and the amount of energy consumed. Sustainability of each alternative was evaluated qualitatively as only one Alternative (Alternative 3) has a significant negative environmental impact. Alternative 1 has no environmental footprint as no action would be taken. Alternative 2 has a minimal environmental footprint as only administrative action would be taken, with minimal site monitoring that would include annual travel to and from the Site. Alternative 3 would have a substantial environmental footprint as it would remove all impacted subsurface soils from the Site. Alternative 3 would include the use of heavy machinery to excavate approximately 2,310 CY of soil. Approximately 1,430 CY of this soil would be transported by truck to an offsite disposal facility. Approximately 90 trips would be made to dispose of the

soil. An additional 90 truckloads of clean soil would need to be brought in for backfill. Machinery would also be used to install excavation support and for dewatering activities. Alternative 3 would also disturb the onsite wetland.

Table 2
Comparison of Alternatives
Site 7, Sewage Treatment Plant
Former NAS South Weymouth, MA

Evaluation Criteria	Remedial Alternative		
	1 – No Action	2 – LUCs & LTM	3 – Additional Deep Excavation
Protection of Human Health and the Environment	○	●	●
Compliance with Applicable or Relevant and Appropriate Requirements	○	●	●
Long-term Effectiveness and Permanence	○	◐	●
Reduction of Toxicity, Mobility, or Volume through Treatment	○	○	○
Short-term Effectiveness	○	●	◐
Implementability	○	●	◐
Cost	$0	$2,685M	$4.445M
State Acceptance	○	●	●
Public Acceptance	○	●	●

○ Does not meet criteria ◐ Partially meets criteria ● Meets criteria

2.9 SUMMARY OF THE AMENDED REMEDY

The Navy and the EPA have selected Alternative 2 – LUCs (including soil cover), LTM and Five-Year Reviews as the final amended remedy for the Site. The Navy has concluded that this amended remedy is protective of human health and the environment, complies with ARARs, and achieves the new RAO established for the Site. This alternative will achieve the RAO by restricting access to the impacted subsurface soils by utilizing the existing soil cover, and implementing LUCs to restrict access to the remaining impacted subsurface soils. Note that since the FFS was issued in 2015, three years of post-remedy monitoring have been completed, and no further sampling is necessary. Therefore the LTM of groundwater and sediment component of Alternative 2 will not be included as part of the selected remedy, although there will be LTM of the soil cover. The implementation of LTM and O&M of the soil cover, LUCs, and Five-Year Reviews will work in conjunction with the completed Remedial Action, to form one, comprehensive remedy for the Site. Therefore the groundwater and sediment LTM component of Alternative 2 will not be included as part of the selected remedy. The implementation of LUCs and Five-Year Reviews will work in conjunction with the completed Remedial Action, to form one, comprehensive remedy for the Site. The main components of the amended remedy include the following:

- Apply LUCs restricting access to subsurface soil below 9 feet bgs in the upland area and subsurface soil below two feet bgs in the wetland by maintaining a soil cover. Upland soil impacts begin at 11 feet. The upland soil access restriction includes a two-foot buffer from 9 feet to 11 feet to allow for a margin of error during potential construction. The LUC will also prohibit residential land use within the LUC boundaries. The proposed boundary of the LUC is shown on **Figure 4**. The LUC will be designed in a LUCIP. The LUCIP will present LUC boundaries correlated to known horizontal and vertical survey datums.
- A provision of the LUC will require that the property owner develop a soil management plan, on behalf of Navy, to ensure impacted soils are managed properly and that any future construction work in these areas is completed by properly trained workers. The LUC will require that the Navy submit the soil management plan to EPA and MassDEP for approval, prior to the commencement of construction activities.
- Annual Inspection/Certifications and five-year reviews will be completed to evaluate the remedy.
- Long term monitoring and operation and maintenance (O&M) of the soil cover and monitoring of the wetland restoration to ensure that native vegetation becomes established and that measures will be taken, if required, to prevent non-native species from becoming established on the wetland soil cover.

As part of the previously completed Remedial Action, impacted surface soils, sediments, and unsaturated subsurface soils were excavated. A limited amount of water generated from soil/sediment dewatering was treated at an off-site facility. The excavated areas were backfilled using clean fill. Monitoring will ensure that native vegetation becomes established on the soil cover within wetland areas and that measures will be taken, if required, to prevent non-native species from becoming established on the wetland soil cover. In the wetland restoration area, the wetland was backfilled with wetland soil and seeded with native wetland herbaceous plants. This clean fill and the native, non-impacted subsurface soils will act as a soil cover which will restrict access to the remaining impacted subsurface soils under existing conditions. If the property is developed in the future, the LUC will be in place to ensure that redevelopment activity is completed in accordance with a soil management plan. Before development of the parcel can occur in the area of the LUC, the future property owner will be responsible for preparing a soil management plan on behalf of the Navy. Navy would then submit the soil management plan to U.S EPA and MassDEP for approval, prior to the commencement of construction activities.

The Navy is responsible for implementing, inspecting, monitoring, reporting and enforcing the LUCs. Although the Navy may later transfer one or more of these procedural responsibilities to another party by contract, property transfer agreement, or through other means, the Navy shall retain ultimate responsibility for remedy integrity.

The LUCs will be enforceable for as long as they are required to prevent unacceptable exposure to contaminated subsurface soil and to prevent other unacceptable ecological and human health risk.

MassDEP will be provided the right, through the LUC document, to review the draft LUC document and to enforce the LUC. The form of the LUC document shall comply with M.G.L. c. 21E and 310 CMR 40.0000.

When completed, the amended remedy will be protective of human health and the environment, comply with all state and federal regulations, provide long-term effectiveness with the least amount of short-term impact

or disruption to the community and the environment, and provide a cost-effective, sustainable action that can be easily implemented and will not disturb the wetland.

While Alternative 3 would also achieve the RAO, this alternative has the greatest short-term impact to the community and the environment, disturbs the wetland, is the least sustainable, and carries a significant cost.

Comparison of 2008 ROD Remedy and the Amended Remedy

Table 3 below presents a side by side comparison of the original remedy presented in the 2008 ROD, and the amended remedy as described in this document.

Table 3
Comparison of 2008 Remedy and the Amended Remedy
Site 7, Sewage Treatment Plant
Former NAS South Weymouth, MA

Criteria	2008 Remedy	2010 ESD	Amended Remedy
Description	Completion of a Remedial Action that included the excavation of approximately **1,100 CY** of impacted surface soil and sediment in the top 1 foot.	Permitted use of the excavated materials from OU7 as subgrade fill in the construction of the West Gate Landfill cover system, rather than disposing of it off-site. Increased volume of excavated material to **3,700 CY.**	LTM and O&M of the soil cover over contaminated subsurface soil left in place and implementation of LUCs, in addition to completion of the Remedial Action that expanded to include the excavation of approximately **6,100 CY** of impacted surface soil, unsaturated subsurface soil, structures, piping and sediment.
Land Use Upon Completion	Unlimited/Unrestricted	Unlimited/Unrestricted	Recreational/Commercial/Industrial
Cost	**Remedial Action = $700,000**	**Remedial Action = $700,000**	Expanded Remedial Action = $2.2 Million Implementation of LUCs = $485,000 **Total Remedy Cost = $2.685 Million**
Post Remedy Monitoring	1) A monitoring program to verify that post-remediation COC concentrations do not rebound in sediment. 2) Pre- and post-remediation groundwater monitoring to confirm that groundwater is not a medium of concern.	No changes to the Post Remedy Monitoring Requirements.	Groundwater and sediment LTM not required since completed before this ROD Amendment. Monitoring and O&M of soil cover will be conducted.
Land Use Control	Not Required	Not Required	Required
Five Year Review	Not Required	Not Required	Required
Soil Management Plan	Not Required	Not Required	Required

Criteria	2008 Remedy	2010 ESD	Amended Remedy
Remediation Goals	RGs were established for arsenic, 4,4'-DDT, dieldrin, benz(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene in surface soil and for arsenic, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, dieldrin, and potentially methyl mercury in sediment.	No changes to the RGs.	RGs were established for arsenic, PCB Aroclor 1016, PCB Aroclor 1260, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, 4,4'-DDD, and 4,4'-DDT in subsurface soil (see **Appendix C**).
ARARs	ARARs for the ROD remedy are identified in Appendix F of the ROD.	No change in the ARARs from the ROD.	The ROD ARARs were revised in the ROD Amendment (see **Appendix B**) to add standards to address PCBs identified post-ROD and to add ARAR requirements that pertain to leaving contaminated subsoil in place under a soil cover.
Statutory Findings	The ROD included the determination that under Section 404 of the federal Clean Water Act removing all contaminated sediment and soil exceeding cleanup standards was the LEDPA.	No change in the LEDPA determination.	The ROD Amendment revised the LEDPA determination to find that the amended remedy, which leaves contaminated subsurface soil beneath a protective cover subject to LTM, O&M and LUCs, was now the LEDPA.

2.10 DOCUMENTATION OF SIGNIFICANT CHANGES

CERCLA Section 117(b) requires an explanation of significant changes from the selected remedy presented in the Proposed Plan (Resolution Consultants, 2018d) that was published for public comment. No public comments were received during the public meeting held on August 16, 2018, nor were any written comments received during the public comment period initiated by the release of the Proposed Plan, so no significant changes have been made to the remedy based on public comment. The public meeting transcript is included in **Appendix D**. There have been no significant changes to the remedy, as originally identified in the Proposed Plan.

3.0 RESPONSIVENESS SUMMARY

The Responsiveness Summary is a concise and complete summary of significant comments received from the public and includes responses to these comments. In addition, this summary provides the decision makers with information about the views of the community. It also documents how the Navy, EPA, and MassDEP considered public comments during the decision-making process, and provides answers to significant comments.

The Proposed Plan, as presented to the public, identified LUCs and Five-Year Reviews (Alternative 2) as the proposed amended remedy and preferred alternative for the STP. This alternative was selected because it is protective of human health and the environment, attains all ARARs, and was considered by the Navy, EPA, and MassDEP as the alternative that provided the best balance of the evaluation criteria.

3.1 BACKGROUND ON COMMUNITY INVOLVEMENT

The public comment period for the Proposed Plan for the STP began on August 9, 2018 and ended on September 8, 2018. A public meeting was held on August 16, 2018 at the Southfield Redevelopment Authority facility, Shea Memorial Drive, South Weymouth, Massachusetts to accept verbal comments on the proposed remedy. A legal notice was placed in three local community newspapers notifying the public of the comment period and of the public meeting, prior to the opening of the comment period. The transcript from the public meeting is included in **Appendix D**.

3.2 STAKEHOLDER COMMENTS AND LEAD AGENCY RESPONSES

Participants in the public meeting held August 16, 2018 included members of the public and representatives of the Navy, EPA, and MassDEP. No comments were received during the public comment period.

3.3 TECHNICAL AND LEGAL ISSUES

No technical or legal issues associated with the STP ROD Amendment were identified.

REFERENCES

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- February 2018a. *PFOS and PFOA Land Use Control Implementation Plan, Naval Air Station South Weymouth, Weymouth, Massachusetts.*
- August 2018b. *2018 Long Term Monitoring Report, Operable Unit/Site 7 – Former Sewage Treatment Plant, Naval Air Station South Weymouth, Weymouth, Massachusetts.*
- August 2018c. *Groundwater Human Health Risk Assessment Technical Memorandum, Operable Unit/Site 7 – Former Sewage Treatment Plant, Naval Air Station South Weymouth, Weymouth, Massachusetts.*
- August 2018d. *Proposed Plan, Operable Unit/Site 7 – Former Sewage Treatment Plant, Naval Air Station South Weymouth, Weymouth, Massachusetts.*

Tetra Tech EC, Inc. *Final Remedial Action Work Plan for Soil Excavation at Site 7, Former Sewage Treatment Plant Location*, Former Naval Air Station South Weymouth, South Weymouth, Massachusetts. 15 July 2009.

- May 2011. *Interim Remedial Action Completion Report for Soil Excavation at Site 7, Former Sewage Treatment Plant Location*
- July 2014. *Final Addendum to Remedial Action Work Plan, Soil Excavation at Site 7 Former STP Location*
- October 2014. *Sewage Treatment Plant Site 7 Test Pit Report, Former NAS South Weymouth MA,*
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— 2007. *Feasibility Study for Former Sewage Treatment Plant*, Naval Air Station South Weymouth.

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— 2014. *Second Five-Year Review Report for Former Naval Air Station South Weymouth*.

United States Navy. *Record of Decision, Operable Unit 7 — Former Sewage Treatment Plant, Former Naval Air Station, South Weymouth, Weymouth, Massachusetts.* April 2008

Appendix A

MassDEP Concurrence Letter

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection
One Winter Street Boston, MA 02108 • 617-292-5500

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Matthew A. Beaton
Secretary

Martin Suuberg
Commissioner

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

Re: Record of Decision Amendment
Sewage Treatment Plant Site (OU 7)
Former South Weymouth NAS
MassDEP RTN 4-3002621
Date: February 27, 2019

Dear Mr Olson:

The Massachusetts Department of Environmental Protection (MassDEP) reviewed the *Record of Decision Amendment, Sewage Treatment Plant Site, Operable Unit 7, Naval Air Station South Weymouth*, dated February 2019. The Record of Decision Amendment: (1) summarizes the results from the post-Record of Decision site investigations, removal actions, and feasibility studies conducted to characterize and develop cleanup options for contaminated subsurface soil, and (2) documents the Navy's rationale for selecting remedial Alternative S-2: Land Use Controls, Long-Term Monitoring, and Five-Year Reviews. MassDEP concurs with the selected remedy amendment.

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,

Paul W. Locke
Assistant Commissioner
MassDEP Bureau of Waste Site Cleanup

cc: D. Barney, USN-S. Weymouth
L. O'Connor, USEPA
SRA Board of Directors
RAB Members

Appendix B

Applicable or Relevant and Appropriate Requirements

Table B-2a
Chemical-Specific ARARs and TBCs
Site 7 — Former Sewage Treatment Plant Feasibility Study
NAS South Weymouth, Weymouth, Massachusetts Alternative 2: LUCs and LTM

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement	Change from 2008 ROD
Federal					
Human Health Assessment Cancer Slope Factors (CSFs)	None	To Be Considered	CSFs are estimates of the upper-bound probability of an individual developing cancer as a result of a lifetime exposure to a particular concentration of a potential carcinogen.	Used to compute the potential carcinogenic risks caused by exposure to contaminants in subsurface soil. Soil cover, operations and/or maintenance (O&M), long-term monitoring (LTM) and land use controls (LUCs) will prevent exposure to site contaminants exceeding risk-based preliminary remediation goals (PRGs).	Cited in ROD. Used in the ROD to develop risk-based standards calculated using the guidance; achieved by removing all contamination exceeding the risk-based standards.
EPA Risk Reference Doses (RfDs)	None	To Be Considered	Guidance used to compute human health hazard resulting from exposure to non-carcinogens in site media. RfDs are considered to be the levels unlikely to cause significant adverse health effects associated with a threshold mechanism of action in human exposure for a lifetime.	Used to calculate potential non-carcinogenic hazards caused by exposure to contaminants in subsurface soil. Soil cover, O&M, LTM and LUCs will prevent exposure to site contaminants exceeding risk-based PRGs.	Cited in ROD. Used in the ROD to develop risk-based standards calculated using the guidance; achieved by removing all contamination exceeding the risk-based standards.
Guidelines for Carcinogenic Risk Assessment	EPA/630/P-03/001F (March 2005)	To Be Considered	These guidelines provide guidance on conducting risk assessments involving carcinogens.	Used to calculate potential carcinogenic risks caused by exposure to contaminants in subsurface soil. Soil cover, O&M, LTM and LUCs will prevent exposure to site contaminants exceeding risk-based PRGs.	Cited in ROD. Used in the ROD to develop risk-based standards calculated using the guidance; achieved by removing all contamination exceeding the risk-based standards.

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement	Change from 2008 ROD
Federal					
Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens	EPA/630/R-03/003F (March 2005)	To Be Considered	This provides guidance on assessing risk to children from carcinogens.	Used to calculate potential carcinogenic risks to children caused by exposure to contaminants in subsurface soil. Soil cover, O&M, LTM and LUCs will prevent exposure to site contaminants exceeding risk-based PRGs.	Cited in ROD. Used in the ROD to develop risk-based standards calculated using the guidance; achieved by removing all contamination exceeding the risk-based standards.
EPA Carcinogenic Assessment Group Potency Factors		To Be Considered	These factors are used to evaluate an acceptable risk from a carcinogen.	Used to calculate potential carcinogenic risks caused by exposure to contaminants in subsurface soil. Soil cover, O&M, LTM and LUCs will prevent exposure to site contaminants exceeding risk-based PRGs.	Not cited in ROD.
Guidance on Remedial Actions for Superfund Sites with Polychlorinated Biphenyl (PCB) Contamination	EPA-540- G-90-007 (August 1990)	To Be Considered	EPA Guidance for evaluating risks posed by PCBs at Superfund sites. Used to develop risk-based cleanup standards.	Used to calculate potential risks caused by exposure to PCBs in subsurface soil. Soil cover, O&M, LTM and LUCs will prevent exposure to PCBs exceeding risk-based PRGs.	Not cited in ROD.
Issuance of Final Guidance: Ecological Risk Assessment and Risk Management Principles for Superfund Sites	OSWER Directive 9285.7-28P (September 1999)	To Be Considered	EPA guidance intended to help Superfund risk managers make ecological risk management decisions .	Used to support the general basis for the derivation and selection of ecological PRGs.	Not cited in ROD.

Table B-2b
Location-Specific ARARs and TBCs
Site 7 — Former Sewage Treatment Plant
Feasibility Study
NAS South Weymouth, Weymouth, Massachusetts
Alternative 2: LUCs and LTM

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement	Change from 2008 ROD
Federal					
Floodplain Management and Protection of Wetlands	44 C.F.R. Part 9	Relevant and Appropriate	FEMA regulations that set forth the policy, procedure and responsibilities to implement and enforce Executive Order 11988 (Floodplain Management) and Executive Order 11990 (Protection of Wetlands). Prohibits activities that adversely affect a federally-regulated wetland unless there is no practicable alternative and the proposed action includes all practicable measures to minimize harm to wetlands that may result from such use. Requires the avoidance of impacts associated with the occupancy and modification of federally-designated 100-year and 500-year floodplain and to avoid development within floodplain wherever there is a practicable alternative. An assessment of impacts to 500-year floodplain is required for critical actions – which includes siting hazardous waste facilities in a floodplain. Requires public notice when proposing any action in or affecting floodplain or wetlands.	O&M of the 2-foot cover, with LTM and LUCs will ensure the protection of wetland resources. The wetland will be restored with native vegetation on top of the cover. The soil cover and wetland covers within 500-year floodplain will be maintained to prevent any release of subsurface contamination in the event of up to a 500-year storm event. Covers were restored to grade so there was no loss of flood storage volume from the covers. Floodplain habitat will be restored with native vegetation to the extent practicable. Public comment was solicited through the Proposed Plan concerning the proposed alteration to wetlands and floodplain by the remedial action. No comments were received.	ROD cited federal Wetland Protection and Floodplain Management regulations at 40 C.F.R. § 6.302(a)&(b), Appendix A that no longer exist. The proposed ROD remedy would have achieved compliance with these former regulations by removing all soil and sediment contamination exceeding cleanup levels from floodplain and wetland areas within the OU. The revised remedy removed all surface soil and sediment contamination while covering remaining subsurface contaminated soil with a 2-foot soil cover.

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement	Change from 2008 ROD
Federal					
Fish and Wildlife Coordination Act; Protection of Wildlife Habitats	16 U.S.C. § 661	Applicable	Requires consultation with federal and state conservation agencies during planning and decision-making processes that may impact water bodies, including wetlands.	The Navy will consult with U.S. Fish and Wildlife Service since remedial activities (wetland excavation, installing/ maintaining cover over contaminated subsurface material) involve the modification of wetlands or waterways.	Cited in ROD. The Navy was required to consult with U.S. Fish and Wildlife Service since remedial activities (wetland excavation/ restoration) involved the modification of wetlands or waterways.
Clean Water Act, Guidelines for Specification of Disposal Sites for Dredged or Fill Material,	33 U.S.C. § 1344; § 404(b)(1); 40 C.F.R. Parts 230, 231 and 33 C.F.R. Parts 320-323.	Applicable	Controls discharges of dredged or fill material to protect aquatic ecosystem. This alternative includes work to be performed in a wetland. Under this requirement, no activity that adversely affects a wetland shall be permitted if a practicable alternative with lesser effects is available. If activity takes place, impacts must be minimized to the maximum extent. Sets standards for restoration and mitigation required as a result of unavoidable impacts to aquatic resources. EPA must determine which alternative is the "Least Environmentally Damaging Practicable Alternative" (LEDPA) to protect wetland and aquatic resources	The Navy has revised its LEDPA determination due to practicable difficulties in removing all contamination in the subsurface. The Navy solicited public comment through the Proposed Plan that its limited removal of 2 feet of surface contamination in wetland areas and installation of a 2-foot cover, along with O&M and LTM of the cover is now the LEDPA. No public comments were received on this change. The wetland resource areas altered were restored with native vegetation on top of the cover.	Cited in the ROD. The ROD included a finding that the removal of all contamination from the wetland with restoration was the LEDPA because contamination exists in wetlands and waterways, and it is the least costly method and uses technologies most certain to achieve PRGs. Mitigation of altered wetlands will follow applicable standards.
Fish and Wildlife Coordination Act; Protection of Wildlife Habitats	16 U.S.C. § 661	Applicable	Requires consultation with federal and state conservation agencies during planning and decision-making processes that may impact water bodies, including wetlands.	The Navy will consult with U.S. Fish and Wildlife Service since remedial activities (wetland excavation, installing/ maintaining cover over contaminated subsurface material) involve the modification of wetlands or waterways.	Cited in ROD. The Navy was required to consult with U.S. Fish and Wildlife Service since remedial activities (wetland excavation/ restoration) involved the modification of wetlands or waterways.

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement	Change from 2008 ROD
Federal					
Management of Undesirable Plants on Federal Lands	7 USC 2814	Relevant and Appropriate	Requires federal agencies to establish integrated management systems to control or contain undesirable plant species on federal lands under the agency's jurisdiction.	Monitoring will ensure that native vegetation becomes established on the soil cover within wetland areas and that measures will be taken, if required, to prevent non-native species from becoming established on the wetland soil cover.	Not cited in the ROD.
State					
Wetlands Protection Act	Wetlands Protection Act, 310 Chapters 10.51 – 10.60, specifically: § 10.54: Banks, § 10.55: Bordering Vegetated Wetlands, § 10.57: Land Subject to Flooding.	Applicable	These regulations set performance standards for work within state-regulated wetland resources and their buffer zones (including within the 100-year floodplain, within 100 feet of a bordering vegetated wetland, and within 200 feet of a waterway).	O&M of the 2-foot cover, along with LTM and LUCs, will ensure the protection of state regulated wetland resources. The wetland resource areas were restored with native vegetation on top of the cover.	Cited in ROD. Potential impacts to state-regulated wetland resources from the excavation or site restoration actions will be avoided to the extent possible. Unavoidable impacts to wetlands from remedial actions will be mitigated. Impacts to banks, bordering vegetated wetlands and land subject to flooding will be managed in accordance with these regulations.
Massachusetts Endangered Species Act	321 C.M.R. § 10.00	Applicable	Prohibits the "taking" of any rare plants or animals listed as Endangered, Threatened, or Special Concern by the Massachusetts Division of Fisheries and Wildlife. This also protects designated endangered/threatened species populations	No state-listed endangered species have been identified at the site. However, appropriate measures must be taken during remedial actions (particularly O&M of the covers) to ensure that a state-listed "species of special concern" identified in other areas of the base (eastern box turtle,) and habitat are not adversely affected by the remedial action.	No state-listed endangered species have been identified at the site. However, appropriate measures must be taken during remedial actions to ensure that a state- listed "species of special concern" identified in other areas of the base (eastern box turtle,) and habitat are not adversely affected by the remedial action.

Table B-2c
Action-Specific ARARs and TBCs
Site 7 — Former Sewage Treatment Plant Feasibility Study
NAS South Weymouth, Weymouth, Massachusetts
Alternative 2: LUCs and LTM

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement	Change from 2008 ROD
Federal					
Toxic Substances Control Act (TSCA); PCB Remediation Waste	15 U.S.C. 2601 *et seq.;* 40 C.F.R. 761.61(c)	Relevant and Appropriate	This section of the TSCA regulations provides risk-based cleanup and disposal options for PCB remediation waste based on the risks posed by the concentrations at which the PCBs are found.	PCBs have been detected at low concentrations, but above risk-based standards in subsurface site soils. This amended remedy establishes a PCB cleanup standard of 2,490_ug/kg for Aroclor 1260 and 4,110 ug/kg for Aroclor 1016, which are protective for unrestricted use. All soil exceeding identified PCB cleanup levels will remain inaccessible through the installation and O&M of soil covers, along with LTM and LUCs in order to meet TSCA protectiveness standards that require the remedy's soil PCB cleanup levels, along with the installation and O&M of soil covers, LTM and LUCs, will not pose an unreasonable risk to human health or the environment.	Cited in the ROD as a conditional Applicable ARAR. PCBs were not identified as a Contaminant of Concern at the Site. However, the ROD required if the Pre-design Investigation revealed the presence of PCB contamination in soils that posed a risk to human health or the environment, these standards would be used. A written decision would have been required by the Regional Administrator, EPA New England, that the post-ROD activities to address PCB remediation waste would not pose an unreasonable risk of injury to health or the environment. However, after consulting with EPA's TSCA Program, it was determined that because the PCBs likely had been disposed of before April 18, 1979, the TSCA regulations were not Applicable and no TSCA Determination was required. For this ROD Amendment, the Status of these regulations has been changed to Relevant and Appropriate.
Resource Conservation and Recovery Act (RCRA) Subtitle C; Hazardous Waste Identification and Listing Regulations; Generator and Handler Requirements, Closure and PostClosure	42 U.S.C. §6901 *et seq.*; 40 C.F.R. Parts 260-262 and 264	Applicable	Federal standards used to identify, manage, and dispose of hazardous waste. Massachusetts has been delegated the authority to administer these RCRA standards through its state hazardous waste management regulations. These provisions have been adopted by the State.	Any wastes generated during monitoring or future O&M of the cover will be characterized as hazardous or non-hazardous. If determined to be hazardous waste, then it will be stored, transported, and disposed in accordance with these standards. Please refer to enforceable state standards below under Massachusetts' Hazardous Waste Management Rules.	Cited in the ROD. Waste generated as part of excavation or monitoring activities will be characterized as hazardous or non-hazardous. If determined to be hazardous waste, then it will be stored, transported, and disposed in accordance with these standards. Please refer to enforceable state standards below under Massachusetts' Hazardous Waste Management Rules.

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement	Change from 2008 ROD
Federal					
Clean Air Act (CAA), Hazardous Air Pollutants; National Emission Standards for Hazardous Air Standards Pollutants (NESHAPS)	42.U.S.C. §112(b)(1); 40 C.F.R. Part 61	Applicable	The regulations establish emissions standards for 189 hazardous air pollutants set for dust and other release sources.	Remedial activities, including future O&M of the covers will be implemented in accordance with these rules. No air emissions from remedial activities will cause air quality standards to be exceeded. Dust standards will be complied with during excavation and management of materials within the Operable Unit (OU).	Cited in the ROD. Remedial activities, including excavation and management of soil and sediment was implemented in accordance with these rules. No air emissions from remedial activities caused air quality standards to be exceeded.
National Recommended Water Quality Criteria)	33 U.S.C.§ 1314(a), 40 C.F.R. Part 122.44	Applicable	NRWQC include (1) criteria for protection of human health from toxic properties of contaminants ingested through consumption of water and aquatic organisms, and (2) criteria for protection of aquatic life.	The standards will be used for monitoring surface water and sediment as part of LTM of the soil cover. They will also be used for monitoring standards if any maintenance of the covers is required.	Cited in the ROD. Contaminant concentrations in the wetlands will be measured during short-term monitoring to determine whether or not water quality is being impacted by site activities, and to ensure that water quality criteria are being met. Any discharge to surface waters during remedial activities will be designed and operated so that it will not cause or contribute to an exceedance of the NRWQC. Engineering controls would be used during excavation in and near drainage ditches to limit migration/ runoff of sediment into surface water. Dewatering is not anticipated to be necessary since soils are to be excavated to a depth of 1 foot, and discharge of collected water to surface water is not anticipated. Post excavation sampling will determine that all contaminated sediments have been removed from the Site.
Generation of investigation derived waste.	USEPA OSWER Publication 9345.3-03 FS (January 1992)	To Be Considered	Guidance on the management of Investigation-Derived Waste (IDW) in a manner that ensures protection of human health and the environment.	IDW generated as part of this remedial alternative will be managed based on guidance standards.	Not cited in the ROD.

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement	Change from 2008 ROD
Federal					
Clean Water Act; National Pollution Discharge Elimination System (NPDES)	33 U.S.C. § 1251 *et seq.*; 40 C.F.R. §§ 122-125, 131	Applicable	These standards address water discharges that may be directed to surface water. Federal standards that are health-based and ecologically-based criteria developed for numerous carcinogenic and non-carcinogenic compounds. Also, includes stormwater standards for activities disturbing more than one acre.	If any future maintenance of the covers generates water requiring discharge to surface water, these discharge standards will be met. Also, if any future remedial activity results in over an acre of disturbance applicable stormwater standards will be met.	Cited in the ROD, except for the stormwater requirements. The disposal of any water waste generated during the remedial action (including dewatering of excavations) that is discharged to surface waters was conducted consistent with this section, including discharge limitations, monitoring requirements and best management practices, as necessary.
Contaminated Sediment Remediation Guidance for Hazardous Waste Sites	EPA-540-R-05-012 OSWER 9355.0-85 (December 2005)	To Be Considered	Guidance for making remedy decisions for contaminated sediment sites. Some of the relevant sections of the guidance address Remedial Investigations (Ch. 2), FS Considerations (Ch. 3), *In Situ* Capping (Ch. 5), and Dredging and Excavation (Ch. 6).	The excavation and off-site disposal of contaminated sediments meets guidance standards for addressing contaminated sediments in the drainage ditch.	Not cited in the ROD. However, the excavation and off-site disposal of contaminated sediment meets guidance standards for addressing contaminated sediments in the drainage ditch.
State					
Hazardous Waste Regulations; Waste Identification and Listing	310 C.M.R. § 30.100	Relevant and Appropriate	These regulations establish requirements for determining whether wastes are hazardous.	Any wastes generated during monitoring or future O&M of the cover will be characterized as hazardous or non-hazardous.	Cited in the ROD. Waste generated as part of excavation or monitoring activities will be characterized as hazardous or non-hazardous.
Hazardous Waste Management Rules; Requirements for Generators,	310 C.M.R. § 30.300	Applicable	These regulations contain requirements for generators of hazardous waste. The regulations apply to generators of sampling waste and also apply to the accumulation of waste prior to offsite disposal.	Any hazardous wastes generated from the remedial action will be managed and disposed of in accordance with these standards.	Cited in the ROD. Any hazardous wastes generated from the implementation of the ROD remedy would have been managed and disposed of in accordance with these standards.

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement	Change from 2008 ROD
State					
Hazardous Waste Regulations - Use of Containers	310 C.M.R. § 30.680	Applicable	Establishes requirements for the management of containers, such as drums, that would hold field- generated hazardous wastes.	To the extent any hazardous waste containers are used during the remedial action, the containers would comply with these requirements.	Cited in the ROD. Any hazardous waste containers used during the remedial action would comply with these requirements.
Hazardous Waste Management Rules, Management, Storage, and Treatment in Tanks	310 C.M.R. § 30.690	Applicable	These regulations establish requirements for the use and management of tanks at hazardous waste facilities.	To the extent any hazardous waste tanks are used during the remedial action the tanks would comply with these requirements.	Cited in the ROD. Any hazardous waste tanks used during the remedial action would comply with these requirements.
Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas		To Be Considered	Massachusetts Guidance that sets standards for preventing erosion and sedimentation.	Remedial actions will be managed to prevent erosion and sedimentation.	Cited in the ROD.
Massachusetts Clean Water Act; Surface Water Discharge Permit Regulations	MGL Ch 21 §§ 26-53; 314 C.M.R. 3.04	Applicable	These regulations limit or prohibit discharges of pollutants to surface waters to ensure that the surface water quality standards of the receiving waters are protected and maintained or attained. Discharges to waters of the Commonwealth shall not result in exceedances of MA Surface Water Quality Standards (MSWQS).	If any future maintenance of the covers generates water requiring discharge to surface water, these discharge standards will be met.	Cited in the ROD. The disposal of any water waste generated during the remedial action (including dewatering of excavations) that is discharged to surface waters was conducted consistent with this section, including discharge limitations, monitoring requirements and best management practices, as necessary.
Massachusetts Standard References for Monitoring Wells	WSC–310- 91	To Be Considered	Guidance on locating, drilling, installing, sampling and decommissioning monitoring wells.	Monitoring wells will be installed, maintained and decommissioned based on guidance standards, based on LTM requirements for the remedy.	Not cited in the ROD, because groundwater LTM not required.

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement	Change from 2008 ROD
State					
Massachusetts Clean Water Act; MA Surface Water Quality Standards (MSWQS)	M.G.L. ch 21, §§ 26-53; 314 C.M.R. 4.00	Relevant and Appropriate	These standards designate the most sensitive uses for which the various waters of the Commonwealth shall be enhanced, maintained, or protected. Minimum water quality criteria required to sustain the designated uses are established.	The standards will be used for monitoring sediment as part of LTM of the soil cover. They will also be used for monitoring standards if any maintenance of the covers is required.	Not cited in the ROD.
Massachusetts Ambient Air Quality Standards	310 C.M.R. § 6.00	Applicable	These regulations set primary and secondary standards for emissions of certain contaminants, including particulate matter.	Remedial activities, including future O&M of the covers will be implemented in accordance with these rules. No air emissions from remedial activities will cause air quality standards to be exceeded. Dust standards will be complied with during excavation and management of materials within the OU.	Cited in the ROD. Remedial activities, including excavation and management of soil and sediment were implemented in accordance with these rules. No air emissions from remedial activities caused air quality standards to be exceeded.
Massachusetts Air Pollution Control Regulations, 310 C.M.R. § 7.00	310 C.M.R. § 6.00	Applicable	These regulations set emission limits necessary to attain ambient air quality standards, including standards for visible emissions (310 C.M.R. § 7.06), dust, odor and demolition (310 C.M.R. § 7.09 0, and noise (310 C.M.R. § 7.10).	Remedial activities, including future O&M of the covers will be implemented in accordance with these rules. No air emissions from remedial activities will cause air quality standards to be exceeded. Dust standards will be complied with during excavation and management of materials within the OU.	Cited in the ROD. Remedial activities, including excavation and management of soil and sediment were implemented in accordance with these rules. No air emissions from remedial activities caused air quality standards to be exceeded.
Massachusetts Contingency Plan, Implementation of Activity and Use Limitations	310 CMR 40.0111(8), 310 CMR 40.1070 and 310 CMR 40.1074	Applicable	State standards for recordable LUCs at CERCLA sites in Massachusetts.	LUCs will be established consistent with State standards for enforceable restrictions on contaminated property.	Not cited in the ROD because no contamination was to be left in place.

Appendix C

Revised Preliminary Remediation Goals
Site 7, Sewage Treatment Plant
Naval Air Station South Weymouth, Massachusetts

(Updated in October 2018 from Appendix C presented in the 2015 Focused Feasibility Study)

Introduction

This appendix updates the Preliminary Remediation Goals (PRGs) developed during the Focused Feasibility Study (FFS) for Site 7, the Sewage Treatment Plant (STP), at Naval Air Station (NAS) South Weymouth. Historically, PRGs used were based on residential land use. Land Use Controls (LUCs) are being considered, so other land use scenarios might be applicable. Consequently, additional scenarios have been included in this appendix. Revised human health PRGs incorporate current U.S. Environmental Protection Agency (U.S. EPA) guidance on risk assessment methods and toxicological vales cited below. The previous ecological PRGs based on food web models for mammals and birds are no longer relevant due to the removal of surface soil, which eliminates the previously identified unacceptable risk to ecological receptors. There are no complete exposure pathways to subsurface soil for ecological receptors; therefore, ecological PRGs have been removed from this appendix. .

As reported in the Record of Decision (ROD), a human health risk assessment (HHRA) was completed as part of the original RI/FS process and focused on risks associated with contact to impacted surface soils. Historical PRGs focused on the residential land use scenario (Tetra Tech NUS, 2008). This study was updated in the 2012 Supplemental Pre-Design Investigation Report (Tetra Tech NUS, 2012); however the update was not finalized. This appendix documents the development of PRGs to clarify the administrative record and to facilitate future remedial decisions.

Site Background and Historical Land Use

The STP was constructed in 1953 and was used for treatment and disposal of Naval Base sanitary wastewater until it was decommissioned in 1978, after which effluent was discharged into the Town of Weymouth municipal sanitary sewer system (Tetra Tech NUS, 2014). The STP consisted of a primary settling tank that employed a trickling filter for physical treatment and secondary settling tanks for biological treatment. Treated effluent was discharged through an outfall to a drainage ditch that slopes towards the west (Tetra Tech NUS, 2014). A biological treatment system and covered sludge drying beds for aerobic digestion of wastewater sludge were added over the course of 25 years. Covered sludge drying beds were used as storage area for road salt and sand after 1978 until 2005 (Tetra Tech NUS, 2014). The above ground structures and buildings were demolished in 1992.

Groundwater, surface water, sediment, surface soil, and subsurface soil were sampled as part of various site investigations. The RI/FS characterized the nature and extent of contamination at the Site, included a HHRA and an Ecological Risk Assessment, and evaluated remedial alternatives to

address unacceptable human health and ecological risks associated with potential exposures to COCs identified in Site surface soil and sediment where concentrations above the historical PRGs were found. A ROD was signed by stakeholders in 2008 which included Remedial Action Objectives to eliminate potential human and ecological receptor exposure to Chemicals of Concern (COCs) identified in Site surface soil and sediment where concentrations above the historical PRGs were found (Tetra Tech NUS, 2008). The Navy's proposed remedy was removal and off-site disposal of COC-impacted surface soil and sediment.

A Remedial Action Work Plan for the STP was finalized in July 2009 and Remedial Action was implemented at that time until it saw completion in September 2010 (Tetra Tech NUS, 2014). Confirmatory samples were collected to document the remaining levels of the COCs. Several post-excavation investigations were conducted to assess the extent of contamination remaining at the Site. The Navy completed implementation of an additional remedial action that included additional excavation of impacted surface soil, unsaturated subsurface soil, structures, piping, and sediment. The scope of the 2014-2015 remedial action was detailed in the *Final Addendum to Remedial Action Work Plan, Soil Excavation at Site 7 Former STP Location* (TtEC 2014) and included removal of surface soil impacted COCs at concentrations above PRGs.

Physical Characteristics and Current Land Use

Site 7 is comprised of two main areas encompassing approximately 3.3 acres: the former Tile Bed Area and the adjacent former sewage treatment plant area. The Site is unpaved and relatively flat with a gentle slope to the west, toward an adjacent drainage channel and wetland area. A small segment of the adjacent, downgradient/downstream wetland area is also included as part of the Site. Topographically, the Site is unpaved and relatively flat with a gentle slope to the west, toward an adjacent drainage channel and wetland area. The Site's ground surface is covered by grasses, shrubs, and mixed upland forest. A forested wetland, which contains several small intermittent stream channels, bounds the Site to the west. Forested areas bound the Site to the north, whereas paved roads bound the Site to the east and south.

Groundwater flow throughout the STP area is influenced by the fracture orientation and morphology of the underlying bedrock, resulting in a relatively uniform groundwater flow towards the southwest, in the direction of French Stream (Tetra Tech NUS, 2014; Tetra Tech NUS, 2000). Water levels generally range from 4 to 6 feet below ground surface (as of February 2008), and the monitoring well network present at STP consists of 18 monitoring wells and 7 piezometers (Tetra Tech NUS, 2014). Wetlands area adjacent to the west of the TBA are forested and pocked with small hillocks and depressions (Tetra Tech NUS, 2007). Groundwater is outside the scope of this appendix and was evaluated separately.

The STP area has been zoned for a combination of open space and village commercial use purposes (STTDC, 2005). Open Space-Corporation District's promotes the preservation of wetland areas and open spaces for parks, active and passive recreation, community gardens, rivers, and streams with the vision of protecting these open space resources to enhance the quality of life for local residents and visitors. The commercial use zoning allows uses for light industry, biopharmaceutical commercial uses, and parking areas. Several constructed drainage ditches run through and along the borders of the area, and these generally drain westward towards the wetland area adjacent to the TBA in the southwestern portion of the Site (Tetra Tech NUS, 2014).

Two issues and recommendations pertaining to the Site 7 remedy were identified in the Five-Year Review of NAS South Weymouth (Tetra Tech NUS, 2014).

1. Shallow soil and sediment results exceed post-ROD cleanup goals and recommends additional remedial action to remove shallow soil/sediment.

2. Additional investigations conducted post-ROD indicate that soil contamination was found in deep subsurface soil and recommends the implementation Land Use Controls (LUCs) by an amendment to the ROD or Explanation of Significant Differences.

The Five-Year review recommended soil and sediment excavation as a remedy protective of both human health and the environment in the short-term and indicated that longer term protective measures should include additional LUCs and/or changes to the Long-Term Monitoring plan (Tetra Tech NUS, 2014).

Future Land Use

Future land use could be a combination of open space and commercial/industrial use. The STP area has been zoned for a combination of open space and village commercial use purposes, and the preservation of wetland areas and open spaces for parks, active and passive recreation, community gardens, rivers, and streams with the vision of protecting these open space resources to enhance the quality of life for local residents and visitors is promoted for the area (STTDC, 2005). The commercial use zoning allows uses for light industry, biopharmaceutical commercial uses, and parking areas. Consequently, LUCs could be implemented in the future at Site 7 to prevent residential land use, so other scenarios and PRGs might be more appropriate, depending upon future risk management decisions regarding LUCs. Land use scenarios for the revised PRGs include the following:

- Hypothetical residential (unrestricted) land use
- Commercial/Industrial land use
- Construction worker (excavation) land use
- Recreational land use

Revised human health PRGs were developed based on current EPA guidance on risk assessment methods and toxicological values, including the U.S. EPA *Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors* (U.S. EPA, 2014). Additionally, U.S. EPA and Oak Ridge National Laboratory Risk Assessment Information System (RAIS) exposure models and online tools were used, which reference current methods and current toxicological values. PRGs were developed for the following compounds previously identified as soil COCs:

- 4,4'-DDD
- 4,4'-DDT
- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Dibenz(a,h)anthracene
- Aroclor 1016
- Aroclor 1260
- Arsenic

Exposure model input parameters are documented in the Attachment, which includes model output files from the RAIS to show the information used for each land use scenario. The Code of Massachusetts Regulations (CMR) Massachusetts Contingency Plan (MCP) Subpart I: Risk Characterization, 310 CMR 0902(2)(b), indicates that the target cancer risk of 1-in-100,000 and target hazard index threshold of 1 should be used. Exposure pathways included incidental ingestion, dermal contact, and inhalation. Bioavailability of arsenic in soil was addressed by RAIS using U.S. EPA's recommended 60 percent relative bioavailability of arsenic in soil for arsenic ingestion calculations. PRGs were calculated using the RAIS and are documented in the Attachment. Each land use scenario is discussed below.

Hypothetical Residential Land Use

Residential (unrestricted) land use was built on the premise that Site 7 would be replaced with dwellings. For this scenario, potential receptors include both adults and children. Residential exposure factors from the U.S. EPA *Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors* were used (U.S. EPA, 2014).

Hypothetical Commercial/Industrial Land Use

Hypothetical commercial/industrial Site workers are possible future human receptors if Site 7 is developed for commercial or industrial use. Site workers could frequently be exposed to soil. For this scenario, the potential receptor is the adult Site worker. Industrial land use exposure factors were used in accordance with U.S. EPA's supplemental guidance (U.S. EPA, 2014).

Hypothetical Construction Worker (Excavation) Land Use

Exposure to subsurface soil could occur if the current or a future owner conducts construction and/or excavation projects, repairs or installs new underground utilities, or performs some other invasive activity. This assumption was built on the premise that exposure to subsurface soil could occur during a hypothetical construction project, so future construction workers are potential human receptors for contaminants in subsurface soil during hypothetical excavation or other invasive activities and were therefore added when revising PRGs. Excavation worker exposure factors from the RAIS and U.S. EPA were used in accordance with U.S. EPA's supplemental guidance to represent this land use scenario (U.S. EPA, 2014).

Hypothetical Recreational Land Use

As previously discussed, plans for the area include a portion of Site 7 and indicate that future land use might be open land or some other recreational scenario (STTDC, 2005). Consequently, hypothetical recreational use is possible for future human receptors. This assumption was built on the premise that the area would be maintained as an open area for walking and recreational use. For this scenario, the exposure population was assumed to include both adults and children. Recreational exposure factors from the RAIS and U.S. EPA were used in accordance with U.S. EPA's supplemental guidance (U.S. EPA, 2014).

Revised Soil Preliminary Remediation Goals

Table C-1 shows PRGs calculated for hypothetical residential land use, commercial/industrial land use, construction worker (excavation) land use, and recreational land use. The PRGs summarized in Table C-1 were developed using the MCP target risk of 1E-5 and a target hazard quotient of 1.0, as documented in the Attachment.

Table C-2 includes revised human health risk based PRGs and background values identified in the *Supplement to Final Summary Report of Background Data Summary Statistics for NAS South Weymouth (Stone & Webster 2002)*. If residential (unrestricted) land use is determined to be a goal for

Table C-1
Revised PRGs Based on Human Health Risk
NAS South Weymouth

		Resident		Industrial Composite Worker		Excavation Worker		Recreator	
Chemical	CAS Number	Carcinogenic PRG TR=1E-5[a] (mg/kg)	Noncarcinogenic Child PRG HI=1 (mg/kg)	Carcinogenic PRG TR=1E-5[a] (mg/kg)	Noncarcinogenic PRG HI=1 (mg/kg)	Carcinogenic PRG TR=1E-5[a] (mg/kg)	Noncarcinogenic PRG HI=1 (mg/kg)	Carcinogenic PRG TR=1E-5[a] (mg/kg)	Noncarcinogenic Child PRG HI=1 (mg/kg)
Aroclor 1016	12674-11-2	66.9	4.11	276	51.3	29,900	214	332	19.2
Aroclor 1260	11096-82-5	2.41	NA	9.93	NA	1,060	NA	11.6	NA
Arsenic, Inorganic	7440-38-2	6.8	35.0	30.0	482	2970	1910	31.6	163
Benz[a]anthracene	56-55-3	11.3	NA	207	NA	21,700	NA	53.6	NA
Benzo[a]pyrene	50-32-8	1.15	17.9	21.1	226	2,190	936	5.36	83.7
Benzo[b]fluoranthene	205-99-2	11.5	NA	211	NA	21,900	NA	53.6	NA
Benzo[k]fluoranthene	207-08-9	115	NA	2,110	NA	219,000	NA	536	NA
DDD	72-54-8	22.6	1.90	95.7	24.6	9,770	101	106	8.85
DDT	50-29-3	18.9	36.5	85.4	518	8,310	2,020	88.0	170
Dibenz[a,h]anthracene	53-70-3	1.15	NA	21.1	NA	2,190	NA	5.36	NA

Notes:
[a] Code of Massachusetts Regulations Subpart I: 310 CMR 0902(2)(b).
NA indicates not applicable
Arsenic PRGs adjusted by RAIS using USEPA's *Recommendations for Default Value for Relative Bioavailability of Arsenic in Soil, OSWER 9200.1.113.*

Table C-2
Unrestricted Land Use PRG Summary
NAS South Weymouth

Chemical	CAS Number	Units	Ecological Risk-Based PRGs, Soil[a]	Background Value[a]	Revised PRG[b]	Basis for Revised Human Health PRG[b]	Revised Cleanup Goal[c]	Basis[c]
Aroclor 1016	12674-11-2	µg/kg	NA	NA	4,110	Residential, noncancer child target hazard index = 1.0	4,110	Revised PRG
Aroclor 1260	11096-82-5	µg/kg	NA	106	2,410	Residential, cancer target risk = 1E-5	2,410	Revised PRG
Arsenic, Inorganic	7440-38-2	mg/kg	NA	5	6.8	Residential, cancer target risk = 1E-5	6.8	Revised PRG
Benz[a]anthracene	56-55-3	µg/kg	NA	810	11,300	Residential, cancer target risk = 1E-5	11,300	Revised PRG
Benzo[a]pyrene	50-32-8	µg/kg	NA	1,829	1,150	Residential, cancer target risk = 1E-5	1,829	Background
Benzo[b]fluoranthene	205-99-2	µg/kg	NA	770	11,500	Residential, cancer target risk = 1E-5	11,500	Revised PRG
Benzo[k]fluoranthene	207-08-9	µg/kg	NA	NA	115,000	Residential, cancer target risk = 1E-5	115,000	Revised PRG
DDD	72-54-8	µg/kg	NA	730	1,900	Residential, noncancer child target hazard index = 1.0	1,900	Revised PRG
DDT	50-29-3	µg/kg	2,800	290	18,900	Residential, cancer target risk = 1E-5	18,900	Revised PRG
Dibenz[a,h]anthracene	53-70-3	µg/kg	NA	NA	1,150	Residential, cancer target risk = 1E-5	1,150	Revised PRG

Notes:
[a] FS Former Sewage Treatment Plant NAS South Weymouth Massachusetts, Tetra Tech NUS, 2007
[b] Revised PRG for residential land use from Table C-1
[c] Revised Cleanup Goal for residential land use considering the revised PRG and background value
NA indicates not applicable
Highlighting indicates the selected cleanup goal

remedial planning in the future, the revised residential PRGs and background may be relevant. Corresponding PRGs are summarized for the residential scenario in Table C-2.

Revised human health soil PRGs were compared to the background value, and the human health-based PRG was identified as the revised cleanup goal unless the background value was greater than the PRG. If the background value was greater than the PRG, the background value was identified as the revised cleanup goal instead of the PRG.

If LUCs are implemented to prevent future residential use, PRGs from the remaining non-residential scenarios (industrial, construction [excavation], and recreational) may be more relevant and applicable for remedial planning and evaluating data. Table C-3 summarizes revised PRGs for non-residential land use. The commercial/industrial worker and recreational scenarios resulted in the most conservative non-residential PRGs and would therefore be protective for other non-residential land use scenarios.

As shown in Table C-2, the background value is greater than the corresponding residential PRG for benzo(a)pyrene, so Table C-2 indicates that the background value for benzo(a)pyrene is relevant for remedial decisions.

Table C-4 shows historical PRGs, cites their sources and includes revised cleanup goals identified in Tables C-2 and C-3 for comparison purposes.

Table C-3
Non-Residential PRG Summary
NAS South Weymouth

Chemical	CAS Number	Units	Ecological Risk-Based PRGs, Soil[a]	Background Value[a]	Revised PRG[b]	Basis for Revised Human Health PRG[b]	Revised Cleanup Goal[c]	Basis[c]
Aroclor 1016	12674-11-2	µg/kg	NA	NA	19,200	Recreator, noncancer child target hazard index = 1.0	19,200	Revised PRG
Aroclor 1260	11096-82-5	µg/kg	NA	106	9,930	Industrial Composite Worker, cancer target risk = 1E-5	9,930	Revised PRG
Arsenic, Inorganic	7440-38-2	mg/kg	NA	5	30	Industrial Composite Worker, cancer target risk = 1E-5	30	Revised PRG
Benz[a]anthracene	56-55-3	µg/kg	NA	810	53,600	Recreator, cancer target risk = 1E-5	53,600	Revised PRG
Benzo[a]pyrene	50-32-8	µg/kg	NA	1829	5,360	Recreator, cancer target risk = 1E-5	5,360	Revised PRG
Benzo[b]fluoranthene	205-99-2	µg/kg	NA	770	53,600	Recreator, cancer target risk = 1E-5	53,600	Revised PRG
Benzo[k]fluoranthene	207-08-9	µg/kg	NA	NA	536,000	Recreator, cancer target risk = 1E-5	536,000	Revised PRG
DDD	72-54-8	µg/kg	NA	730	8,850	Recreator, noncancer target child hazard index = 1.0	8,850	Revised PRG
DDT	50-29-3	µg/kg	2,800	290	85,400	Industrial Composite Worker, cancer target risk = 1E-5	85,400	Revised PRG
Dibenz[a,h]anthracene	53-70-3	µg/kg	NA	NA	5,360	Recreator, cancer target risk = 1E-5	5,360	Revised PRG

Notes:
[a] FS Former Sewage Treatment Plant NAS South Weymouth Massachusetts, Tetra Tech NUS, 2007
[b] Revised PRG for non-residential land use from Table C-1
[c] Revised Cleanup Goal for non-residential land use considering the revised PRG and background value
NA indicates not applicable
Highlighting indicates the selected cleanup goal

Table C-4
PRG Values, Historical and Current
NAS South Weymouth

Chemical	CAS Number	Units	2007 FS Eco PRGs, Soil[a]	2007 FS HH PRGs, Soil[a]	Historical Hypothetical Resident PRG[b]	2015 Revised Residential Land Use Cleanup Goal[c] and Basis		2015 Revised Non-Residential Land Use Cleanup Goal[d] and Basis		Revised Residential Land Use Cleanup Goal[c] and Basis		Revised Non-Residential Land Use Cleanup Goal[d] and Basis	
Aroclor 1016	12674-11-2	µg/kg	NA	NA	3,900	4,110	THQ	19,200	Recreator THQ	4,110	THQ	19,200	Recreator THQ
Aroclor 1260	11096-82-5	µg/kg	NA	NA	2,200	2,490	TCR	10,300	Industrial Worker TCR	2,410	TCR	9,930	Industrial Worker TCR
Arsenic, Inorganic	7440-38-2	mg/kg	NA	9	4	7	TCR	30	Industrial Worker TCR	6.8	TCR	30	Industrial Worker TCR
Benz[a]anthracene	56-55-3	µg/kg	NA	14,500	1,500	1,570	TCR	7,340	Recreator TCR	11,300	TCR	53,600	Recreator TCR
Benzo[a]pyrene	50-32-8	µg/kg	NA	1,450	150	1,829	BKG	1,829	BKG	1,829	BKG	5,360	Recreator TCR
Benzo[b]fluoranthene	205-99-2	µg/kg	NA	14,500	1,500	1,570	TCR	7,340	Recreator TCR	11,500	TCR	53,600	Recreator TCR
Benzo[k]fluoranthene	207-08-9	µg/kg	NA	NA	15,000	15,700	TCR	73,400	Recreator TCR	115,000	TCR	536,000	Recreator TCR
DDD	72-54-8	µg/kg	NA	NA	20,000	22,600	TCR	95,700	Industrial Worker TCR	1,900	THQ	8,850	Recreator THQ
DDT	50-29-3	µg/kg	2,800	40,100	17,000	2,800	Ecological PRG	2,800	Industrial Worker TCR	18,900	TCR	85,400	Industrial Worker TCR
Dibenz[a,h]anthracene	53-70-3	µg/kg	NA	NA	150	157	TCR	734	Recreator TCR	1,150	TCR	5,360	Recreator TCR

Notes:
[a] FS Former Sewage Treatment Plant NAS South Weymouth Massachusetts, Tetra Tech NUS, 2007
[b] Supplemental Pre-Design Investigation Report, Former Sewage Treatment Plant, NAS South Weymouth, Naval Facilities Engineering Command, Mid-Atlantic, 2012
[c] Revised cleanup goal for residential (unrestricted) land use from Table C-2
[d] Revised cleanup goal for non-residential land use from Table C-3
BKG – Background
THQ indicates a noncancer Target Hazard Quotient = 1.0
TCR indicates a Target Cancer Risk = 1E-5
NA indicates not applicable

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Attachment
Documentation of Oak Ridge National Laboratory
Risk Assessment Information System
Preliminary Remedial Goal Calculations

Site-Specific
Resident Equation Inputs for Soil

Variable	Value
THQ (target hazard quotient) unitless	1
TR (target risk) unitless	1.0E-5
LT (lifetime) years	70
ET_{res} (exposure time) hours/day	24
ET_{res-c} (child exposure time) hours/day	24
ET_{res-a} (adult exposure time) hours/day	24
ET_{0-2} (mutagenic exposure time) hours/day	24
ET_{2-6} (mutagenic exposure time) hours/day	24
ET_{6-16} (mutagenic exposure time) hours/day	24
ET_{16-26} (mutagenic exposure time) hours/day	24
ED_{res} (exposure duration) years	26
ED_{res-c} (exposure duration - child) years	6
ED_{res-a} (exposure duration - adult) years	20
ED_{0-2} (mutagenic exposure duration) years	2
ED_{2-6} (mutagenic exposure duration) years	4
ED_{6-16} (mutagenic exposure duration) years	10
ED_{16-26} (mutagenic exposure duration) years	10
BW_{res-c} (body weight - child) kg	15
BW_{res-a} (body weight - adult) kg	80
BW_{0-2} (mutagenic body weight) kg	15
BW_{2-6} (mutagenic body weight) kg	15
BW_{6-16} (mutagenic body weight) kg	80
BW_{16-26} (mutagenic body weight) kg	80
SA_{res-c} (skin surface area - child) cm^2/day	2373
SA_{res-a} (skin surface area - adult) cm^2/day	6032
SA_{0-2} (mutagenic skin surface area) cm^2/day	2373
SA_{2-6} (mutagenic skin surface area) cm^2/day	2373
SA_{6-16} (mutagenic skin surface area) cm^2/day	6032
SA_{16-26} (mutagenic skin surface area) cm^2/day	6032
EF_{res} (exposure frequency) days/year	350

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Site-Specific
Resident Equation Inputs for Soil

Variable	Value
EF_{res-c} (exposure frequency - child) days/year	350
EF_{res-a} (exposure frequency - adult) days/year	350
EF_{0-2} (mutagenic exposure frequency) days/year	350
EF_{2-6} (mutagenic exposure frequency) days/year	350
EF_{6-16} (mutagenic exposure frequency) days/year	350
EF_{16-26} (mutagenic exposure frequency) days/year	350
$IFS_{res-adj}$ (age-adjusted soil ingestion factor) mg/kg	36750
$IFSM_{res-adj}$ (mutagenic age-adjusted soil ingestion factor) mg/kg	166833.3
IRS_{res-c} (soil intake rate - child) mg/day	200
IRS_{res-a} (soil intake rate - adult) mg/day	100
IRS_{0-2} (mutagenic soil intake rate) mg/day	200
IRS_{2-6} (mutagenic soil intake rate) mg/day	200
IRS_{6-16} (mutagenic soil intake rate) mg/day	100
IRS_{16-26} (mutagenic soil intake rate) mg/day	100
AF_{res-a} (skin adherence factor - adult) mg/cm ^{2}	0.07
AF_{res-c} (skin adherence factor - child) mg/cm ^{2}	0.2
AF_{0-2} (mutagenic skin adherence factor) mg/cm ^{2}	0.2
AF_{2-6} (mutagenic skin adherence factor) mg/cm ^{2}	0.2
AF_{6-16} (mutagenic skin adherence factor) mg/cm ^{2}	0.07
AF_{16-26} (mutagenic skin adherence factor) mg/cm ^{2}	0.07
$DFS_{res-adj}$ (age-adjusted soil dermal factor) mg/kg	103390
$DFSM_{res-adj}$ (mutagenic age-adjusted soil dermal factor) mg/kg	428260
AT_{res} (averaging time - resident carcinogenic)	365
$City_{PEF}$ (Climate Zone) Selection	Hartford, CT (8)
A_s (PEF acres)	0.5
Q/C_{wind} (g/m^2-s per kg/m^3)	73.95044952840081
PEF (particulate emission factor) m ^{3}/kg	10982401741.557863
A (PEF Dispersion Constant)	12.5907
B (PEF Dispersion Constant)	18.8368
C (PEF Dispersion Constant)	215.4377

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Site-Specific
Resident Equation Inputs for Soil

Variable	Value
V (fraction of vegetative cover) unitless	0.5
U_m (mean annual wind speed) m/s	3.84
U_t (equivalent threshold value)	11.32
F(x) (function dependent on U_m/U_t) unitless	0.0345
$City_{VF}$ (Climate Zone) Selection	Hartford, CT (8)
A_s (VF acres)	0.5
Q/C_{vol} (g/m^2-s per kg/m^3)	73.95044952840081
foc (fraction organic carbon in soil) g/g	0.006
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
n (total soil porosity) L_{pore}/L_{soil}	0.43396
θ$_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
θ$_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
T (exposure interval) s	819936000
A (VF Dispersion Constant)	12.5907
B (VF Dispersion Constant)	18.8368
C (VF Dispersion Constant)	215.4377
$City_{VF\ mass\text{-}loading}$ (Climate Zone) Selection	Hartford, CT (8)
VF_{ml} (volitization factor - mass limit) m^3/kg	0
Q/C_{vol} (g/m^2-s per kg/m^3)	73.95044952840081
A_s (VF mass-limit acres)	0.5
T (exposure interval) yr	26
p_b (dry soil bulk density - mass limit) g/cm^3	1.5
A (VF Dispersion Constant - Mass Limit)	12.5907
B (VF Dispersion Constant - Mass Limit)	18.8368
C (VF Dispersion Constant - Mass Limit)	215.4377
T_w (groundwater temperature) Celsius	25

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Site-Specific

Resident PRG for Soil

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat

Chemical	CAS Number	Mutagen?	VOC?	Chronic RfD (mg/kg-day)	Chronic RfD Ref	Chronic RfC (mg/m^3)	Chronic RfC Ref	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	ABS_{derm}	ABS_{gi}
Aroclor 1016	12674-11-2	No	Yes	7.00E-05	I	-		7.00E-02	S	2.00E-05	S	0.14	1
Aroclor 1260	11096-82-5	No	Yes	-		-		2.00E+00	S	5.71E-04	S	0.14	1
Arsenic, Inorganic	7440-38-2	No	No	3.00E-04	I	1.50E-05	C	1.50E+00	I	4.30E-03	I	0.03	1
Benz[a]anthracene	56-55-3	Yes	Yes	-		-		1.00E-01	W	6.00E-05	W	0.13	1
Benzo[a]pyrene	50-32-8	Yes	No	3.00E-04	I	2.00E-06	I	1.00E+00	I	6.00E-04	I	0.13	1
Benzo[b]fluoranthene	205-99-2	Yes	No	-		-		1.00E-01	W	6.00E-05	W	0.13	1
Benzo[k]fluoranthene	207-08-9	Yes	No	-		-		1.00E-02	W	6.00E-06	W	0.13	1
DDD, p,p`- (DDD)	72-54-8	No	No	3.00E-05	P	-		2.40E-01	I	6.90E-05	C	0.1	1
DDT	50-29-3	No	No	5.00E-04	I	-		3.40E-01	I	9.70E-05	I	0.03	1
Dibenz[a,h]anthracene	53-70-3	Yes	No	-		-		1.00E+00	W	6.00E-04	W	0.13	1

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Site-Specific

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Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat

Volatilization Factor (m^3/kg)	K_d (cm³/g)	K_{oc} (cm^3/g)	Particulate Emission Factor (m^3/kg)	Soil Saturation Concentration (mg/kg)	Solubility (mg/L)	RBA	HLC (atm-m^3/mole)	Henry's Law Constant (unitless)	H` and HLC Ref	Henry's Law Constant Used in Calcs (unitless)
7.74E+05	286.2	4.77E+04	1.10E+10	-	0.42	1	0.0002	8.18E-03	EPI	0.0081766
1.43E+06	2098.2	3.50E+05	1.10E+10	-	0.0144	1	0.000336	1.37E-02	PHYSPROP	0.0137367
-	29	-	1.10E+10	-	-	0.6	-	-		-
4.78E+06	1061.4	1.77E+05	1.10E+10	-	0.0094	1	0.000012	4.91E-04	PHYSPROP	0.0004906
-	-	5.87E+05	1.10E+10	-	0.00162	1	4.57E-7	1.87E-05	PHYSPROP	0.0000187
-	-	5.99E+05	1.10E+10	-	0.0015	1	6.57E-7	2.69E-05	PHYSPROP	0.0000269
-	-	5.87E+05	1.10E+10	-	0.0008	1	5.84E-7	2.39E-05	PHYSPROP	0.0000239
-	-	1.18E+05	1.10E+10	-	0.09	1	6.6E-6	2.70E-04	PHYSPROP	0.0002698
-	-	1.69E+05	1.10E+10	-	0.0055	1	8.32E-6	3.40E-04	PHYSPROP	0.0003401
-	-	1.91E+06	1.10E+10	-	0.00249	1	1.41E-7	5.76E-06	EPI	5.7645E-6

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Site-Specific

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Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat

Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	DA	Ingestion PRG TR=1.0E-5 (mg/kg)	Inhalation PRG TR=1.0E-5 (mg/kg)	Dermal PRG TR=1.0E-5 (mg/kg)	Carcinogenic PRG TR=1.0E-5 (mg/kg)
613.85	EPI	894.225	Approx. from Tcrit=1.5xTBoil	1.71E-02	4.16E-06	2.6111E-8	9.93E+01	1.09E+03	2.52E+02	6.69E+01
688.75	EPI	987.225	Approx. from Tcrit=1.5xTBoil	2.20E-02	5.61E-06	7.6985E-9	3.48E+00	7.00E+01	8.83E+00	2.41E+00
888.15	PHYSPROP	1673	CRC89	-	-	-	7.72E+00	7.17E+04	5.49E+01	6.77E+00
710.75	PHYSPROP	979	YAWS	2.61E-02	6.75E-06	6.834E-10	1.53E+01	8.08E+02	4.59E+01	1.13E+01
768.15	PHYSPROP	-		4.76E-02	5.56E-06	-	1.53E+00	1.86E+05	4.59E+00	1.15E+00
715.9	EPI	-		4.76E-02	5.56E-06	-	1.53E+01	1.86E+06	4.59E+01	1.15E+01
753.15	PHYSPROP	-		4.76E-02	5.56E-06	-	1.53E+02	1.86E+07	4.59E+02	1.15E+02
623.15	PHYSPROP	934.725	Approx. from Tcrit=1.5xTBoil	4.06E-02	4.74E-06	-	2.90E+01	4.47E+06	1.03E+02	2.26E+01
533.15	PHYSPROP	799.725	Approx. from Tcrit=1.5xTBoil	3.79E-02	4.43E-06	-	2.04E+01	3.18E+06	2.42E+02	1.89E+01
797.15	PHYSPROP	-		4.46E-02	5.21E-06	-	1.53E+00	1.86E+05	4.59E+00	1.15E+00

Site-Specific

Resident PRG for Soil

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ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat

Child Ingestion PRG HQ=1 (mg/kg)	Child Inhalation PRG HQ=1 (mg/kg)	Child Dermal PRG HQ=1 (mg/kg)	Noncarcinogenic Child PRG HI=1 (mg/kg)	Adult Ingestion PRG HQ=1 (mg/kg)	Adult Inhalation PRG HQ=1 (mg/kg)	Adult Dermal PRG HQ=1 (mg/kg)	Noncarcinogenic Adult PRG HI=1 (mg/kg)	Adjusted Ingestion PRG HQ=1 (mg/kg)	Adjusted Inhalation PRG HQ=1 (mg/kg)	Adjusted Dermal PRG HQ=1 (mg/kg)	Noncarcinogenic Adjusted PRG HI=1 (mg/kg)
5.48E+00	-	1.65E+01	4.11E+00	5.84E+01	-	9.88E+01	3.67E+01	1.81E+01	-	4.59E+01	1.30E+01
-	-	-	-	-	-	-	-	-	-	-	-
3.91E+01	1.72E+05	3.30E+02	3.50E+01	4.17E+02	1.72E+05	1.98E+03	3.44E+02	1.29E+02	1.72E+05	9.18E+02	1.13E+02
-	-	-	-	-	-	-	-	-	-	-	-
2.35E+01	2.29E+04	7.61E+01	1.79E+01	2.50E+02	2.29E+04	4.56E+02	1.60E+02	7.75E+01	2.29E+04	2.12E+02	5.66E+01
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
2.35E+00	-	9.89E+00	1.90E+00	2.50E+01	-	5.93E+01	1.76E+01	7.75E+00	-	2.75E+01	6.05E+00
3.91E+01	-	5.49E+02	3.65E+01	4.17E+02	-	3.29E+03	3.70E+02	1.29E+02	-	1.53E+03	1.19E+02
-	-	-	-	-	-	-	-	-	-	-	-

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Site-Specific
Composite Worker Equation Inputs for Soil

Variable	Value
THQ (target hazard quotient) unitless	1
TR (target risk) unitless	1.0E-5
AT_w (averaging time - composite worker)	365
EF_w (exposure frequency - composite worker) day/yr	250
ED_w (exposure duration - composite worker) yr	25
ET_w (exposure time - composite worker) hr	8
LT (lifetime) yr	70
BW_w (body weight - composite worker)	80
IR_w (soil ingestion rate - composite worker) mg/day	100
SA_w (surface area - composite worker) cm^2/day	3527
AF_w (skin adherence factor - composite worker) mg/cm^2	0.12
$City_{PEF}$ (Climate Zone) Selection	Hartford, CT (8)
A_s (PEF acres)	0.5
Q/C_{wind} (g/m^2-s per kg/m^3)	73.95044952840081
PEF (particulate emission factor) m^3/kg	10982401741.557863
A (PEF Dispersion Constant)	12.5907
B (PEF Dispersion Constant)	18.8368
C (PEF Dispersion Constant)	215.4377
V (fraction of vegetative cover) unitless	0.5
U_m (mean annual wind speed) m/s	3.84
U_t (equivalent threshold value)	11.32
F(x) (function dependent on U_m/U_t) unitless	0.0345
$City_{VF}$ (Climate Zone) Selection	Hartford, CT (8)
A_s (VF acres)	0.5
Q/C_{vol} (g/m^2-s per kg/m^3)	73.95044952840081
foc (fraction organic carbon in soil) g/g	0.006
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
n (total soil porosity) L_{pore}/L_{soil}	0.43396
θ$_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396

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Site-Specific
Composite Worker Equation Inputs for Soil

Variable	Value
θ $_{w}$ (water-filled soil porosity) L $_{water}$ /L $_{soil}$	0.15
T (exposure interval) s	819936000
A (VF Dispersion Constant)	12.5907
B (VF Dispersion Constant)	18.8368
C (VF Dispersion Constant)	215.4377
City $_{VF\ mass\text{-}loading}$ (Climate Zone) Selection	Hartford, CT (8)
VF $_{ml}$ (volitization factor - mass limit) m ^{3}/kg	0
Q/C $_{vol}$ (g/m ^{2}-s per kg/m ^{3})	73.95044952840081
A $_{s}$ (VF mass-limit acres)	0.5
T (exposure interval) yr	26
p_{b} (dry soil bulk density - mass limit) g/cm ^{3}	1.5
A (VF Dispersion Constant - Mass Limit)	12.5907
B (VF Dispersion Constant - Mass Limit)	18.8368
C (VF Dispersion Constant - Mass Limit)	215.4377
T $_{w}$ (groundwater temperature) Celsius	25

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Site-Specific

Composite Worker PRG for Soil

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat

Chemical	CAS Number	Mutagen?	VOC?	Chronic RfD (mg/kg-day)	Chronic RfD Ref	Chronic RfC (mg/m^3)	Chronic RfC Ref	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	ABS_{derm}	ABS_{gi}	Volatilization Factor (m^3/kg)
Aroclor 1016	12674-11-2	No	Yes	7.00E-05	I	-		7.00E-02	S	2.00E-05	S	0.14	1	7.74E+05
Aroclor 1260	11096-82-5	No	Yes	-		-		2.00E+00	S	5.71E-04	S	0.14	1	1.43E+06
Arsenic, Inorganic	7440-38-2	No	No	3.00E-04	I	1.50E-05	C	1.50E+00	I	4.30E-03	I	0.03	1	-
Benz[a]anthracene	56-55-3	Yes	Yes	-		-		1.00E-01	W	6.00E-05	W	0.13	1	4.78E+06
Benzo[a]pyrene	50-32-8	Yes	No	3.00E-04	I	2.00E-06	I	1.00E+00	I	6.00E-04	I	0.13	1	-
Benzo[b]fluoranthene	205-99-2	Yes	No	-		-		1.00E-01	W	6.00E-05	W	0.13	1	-
Benzo[k]fluoranthene	207-08-9	Yes	No	-		-		1.00E-02	W	6.00E-06	W	0.13	1	-
DDD, p,p`- (DDD)	72-54-8	No	No	3.00E-05	P	-		2.40E-01	I	6.90E-05	C	0.1	1	-
DDT	50-29-3	No	No	5.00E-04	I	-		3.40E-01	I	9.70E-05	I	0.03	1	-
Dibenz[a,h]anthracene	53-70-3	Yes	No	-		-		1.00E+00	W	6.00E-04	W	0.13	1	-

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Site-Specific

Composite Worker PRG for Soil

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ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat

K_d (cm^3/g)	K_{oc} (cm^3/g)	Particulate Emission Factor (m^3/kg)	Soil Saturation Concentration (mg/kg)	Solubility (mg/L)	RBA	HLC (atm-m^3/mole)	Henry's Law Constant (unitless)	H` and HLC Ref	Henry's Law Constant Used in Calcs (unitless)	Normal Boiling Point T_{boil} (K)	BP Ref
286.2	4.77E+04	1.10E+10	-	0.42	1	0.0002	8.18E-03	EPI	0.0081766	613.85	EPI
2098.2	3.50E+05	1.10E+10	-	0.0144	1	0.000336	1.37E-02	PHYSPROP	0.0137367	688.75	EPI
29	-	1.10E+10	-	-	0.6	-	-		-	888.15	PHYSPROP
1061.4	1.77E+05	1.10E+10	-	0.0094	1	0.000012	4.91E-04	PHYSPROP	0.0004906	710.75	PHYSPROP
-	5.87E+05	1.10E+10	-	0.00162	1	4.57E-7	1.87E-05	PHYSPROP	0.0000187	768.15	PHYSPROP
-	5.99E+05	1.10E+10	-	0.0015	1	6.57E-7	2.69E-05	PHYSPROP	0.0000269	715.9	EPI
-	5.87E+05	1.10E+10	-	0.0008	1	5.84E-7	2.39E-05	PHYSPROP	0.0000239	753.15	PHYSPROP
-	1.18E+05	1.10E+10	-	0.09	1	6.6E-6	2.70E-04	PHYSPROP	0.0002698	623.15	PHYSPROP
-	1.69E+05	1.10E+10	-	0.0055	1	8.32E-6	3.40E-04	PHYSPROP	0.0003401	533.15	PHYSPROP
-	1.91E+06	1.10E+10	-	0.00249	1	1.41E-7	5.76E-06	EPI	5.7645E-6	797.15	PHYSPROP

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Composite Worker PRG for Soil

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Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat

Critical Temperature T_{crit} (K)	T_{crit} Ref	Ingestion PRG TR=1.0E-5 (mg/kg)	Inhalation PRG TR=1.0E-5 (mg/kg)	Dermal PRG TR=1.0E-5 (mg/kg)	Carcinogenic PRG TR=1.0E-5 (mg/kg)	Ingestion PRG HQ=1 (mg/kg)	Inhalation PRG HQ=1 (mg/kg)	Dermal PRG HQ=1 (mg/kg)	Noncarcinogenic PRG HI=1 (mg/kg)
894.225	Approx. from Tcrit=1.5xTBoil	4.67E+02	4.75E+03	7.88E+02	2.76E+02	8.18E+01	-	1.38E+02	5.13E+01
987.225	Approx. from Tcrit=1.5xTBoil	1.64E+01	3.06E+02	2.76E+01	9.93E+00	-	-	-	-
1673	CRC89	3.63E+01	3.13E+05	1.72E+02	3.00E+01	5.84E+02	7.22E+05	2.76E+03	4.82E+02
979	YAWS	3.27E+02	9.78E+03	5.94E+02	2.07E+02	-	-	-	-
-		3.27E+01	2.24E+06	5.94E+01	2.11E+01	3.50E+02	9.62E+04	6.37E+02	2.26E+02
-		3.27E+02	2.24E+07	5.94E+02	2.11E+02	-	-	-	-
-		3.27E+03	2.24E+08	5.94E+03	2.11E+03	-	-	-	-
934.725	Approx. from Tcrit=1.5xTBoil	1.36E+02	1.95E+07	3.22E+02	9.57E+01	3.50E+01	-	8.28E+01	2.46E+01
799.725	Approx. from Tcrit=1.5xTBoil	9.62E+01	1.39E+07	7.58E+02	8.54E+01	5.84E+02	-	4.60E+03	5.18E+02
-		3.27E+01	2.24E+06	5.94E+01	2.11E+01	-	-	-	-

Output generated 30OCT2018:13:54:11

Site-Specific
Excavation Worker Equation Inputs for Soil

Variable	Value
TR (target cancer risk) unitless	1.0E-5
THQ (target hazard quotient) unitless	1
AT_{ew} (averaging time - excavation worker)	365
EF_{ew} (exposure frequency - excavation worker) day/yr	20
ED_{ew} (exposure duration - excavation worker) yr	1
ET_{ew} (exposure time - excavation worker) hr	8
LT (lifetime) yr	70
BW_{ew} (body weight - excavation worker) kg	80
IR_{ew} (soil ingestion rate - excavation worker) mg/day	330
SA_{ew} (surface area - excavation worker) cm^2/day	3527
AF_{ew} (skin adherence factor - excavation worker) mg/cm^2	0.3
$City_{PEF}$ (Climate Zone) Selection	Hartford, CT (8)
A_s (PEF acres)	0.5
Q/C_{wind} (g/m^2-s per kg/m^3)	73.95044952840081
PEF (particulate emission factor) m^3/kg	10982401741.557863
A (PEF Dispersion Constant)	12.5907
B (PEF Dispersion Constant)	18.8368
C (PEF Dispersion Constant)	215.4377
V (fraction of vegetative cover) unitless	0.5
U_m (mean annual wind speed) m/s	3.84
U_t (equivalent threshold value)	11.32
F(x) (function dependent on U_m/U_t) unitless	0.0345
$City_{VF}$ (Climate Zone) Selection	Hartford, CT (8)
A_s (VF acres)	0.5
Q/C_{vol} (g/m^2-s per kg/m^3)	73.95044952840081
foc (fraction organic carbon in soil) g/g	0.006
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
n (total soil porosity) L_{pore}/L_{soil}	0.43396
θ$_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396

Output generated 02NOV2018:10:06:05

Site-Specific
Excavation Worker Equation Inputs for Soil

Variable	Value
θ $_{w}$ (water-filled soil porosity) L $_{water}$ /L $_{soil}$	0.15
T (exposure interval) s	819936000
A (VF Dispersion Constant)	12.5907
B (VF Dispersion Constant)	18.8368
C (VF Dispersion Constant)	215.4377
City $_{VF\ mass\text{-}loading}$ (Climate Zone) Selection	Hartford, CT (8)
VF $_{ml}$ (volitization factor - mass limit) m ^{3}/kg	0
Q/C $_{vol}$ (g/m ^{2}-s per kg/m ^{3})	73.95044952840081
A $_{s}$ (VF mass-limit acres)	0.5
T (exposure interval) yr	26
p $_{b}$ (dry soil bulk density - mass limit) g/cm ^{3}	1.5
A (VF Dispersion Constant - Mass Limit)	12.5907
B (VF Dispersion Constant - Mass Limit)	18.8368
C (VF Dispersion Constant - Mass Limit)	215.4377
T $_{w}$ (groundwater temperature) Celsius	25

Output generated 02NOV2018:10:06:05

Site-Specific

Excavation Worker PRG for Soil

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat

Chemical	CAS Number	Mutagen?	VOC?	Chronic RfD (mg/kg-day)	Chronic RfD Ref	Chronic RfC (mg/m^3)	Chronic RfC Ref	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	ABS_{derm}	ABS_{gi}	Volatilization Factor (m^3/kg)
Aroclor 1016	12674-11-2	No	Yes	7.00E-05	I	-		7.00E-02	S	2.00E-05	S	0.14	1	7.74E+05
Aroclor 1260	11096-82-5	No	Yes	-		-		2.00E+00	S	5.71E-04	S	0.14	1	1.43E+06
Arsenic, Inorganic	7440-38-2	No	No	3.00E-04	I	1.50E-05	C	1.50E+00	I	4.30E-03	I	0.03	1	-
Benz[a]anthracene	56-55-3	Yes	Yes	-		-		1.00E-01	E	6.00E-05	E	0.13	1	4.78E+06
Benzo[a]pyrene	50-32-8	Yes	No	3.00E-04	I	2.00E-06	I	1.00E+00	I	6.00E-04	I	0.13	1	-
Benzo[b]fluoranthene	205-99-2	Yes	No	-		-		1.00E-01	E	6.00E-05	E	0.13	1	-
Benzo[k]fluoranthene	207-08-9	Yes	No	-		-		1.00E-02	E	6.00E-06	E	0.13	1	-
DDD, p,p`- (DDD)	72-54-8	No	No	3.00E-05	P	-		2.40E-01	I	6.90E-05	C	0.1	1	-
DDT	50-29-3	No	No	5.00E-04	I	-		3.40E-01	I	9.70E-05	I	0.03	1	-
Dibenz[a,h]anthracene	53-70-3	Yes	No	-		-		1.00E+00	E	6.00E-04	E	0.13	1	-

Output generated 02NOV2018:10:06:05

Site-Specific

Excavation Worker PRG for Soil

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat

K_d (cm^3/g)	K_{oc} (cm^3/g)	Particulate Emission Factor (m^3/kg)	Soil Saturation Concentration (mg/kg)	Solubility (mg/L)	RBA	HLC (atm-m^3/mole)	Henry's Law Constant (unitless)	H` and HLC Ref	Henry's Law Constant Used in Calcs (unitless)	Normal Boiling Point T_{boil} (K)	BP Ref
286.2	4.77E+04	1.10E+10	-	0.42	1	0.0002	8.18E-03	EPI	0.0081766	613.85	EPI
2098.2	3.50E+05	1.10E+10	-	0.0144	1	0.000336	1.37E-02	PHYSPROP	0.0137367	688.75	EPI
29	-	1.10E+10	-	-	0.6	-	-		-	888.15	PHYSPROP
1061.4	1.77E+05	1.10E+10	-	0.0094	1	0.000012	4.91E-04	PHYSPROP	0.0004906	710.75	PHYSPROP
-	5.87E+05	1.10E+10	-	0.00162	1	4.57E-7	1.87E-05	PHYSPROP	0.0000187	768.15	PHYSPROP
-	5.99E+05	1.10E+10	-	0.0015	1	6.57E-7	2.69E-05	PHYSPROP	0.0000269	715.9	EPI
-	5.87E+05	1.10E+10	-	0.0008	1	5.84E-7	2.39E-05	PHYSPROP	0.0000239	753.15	PHYSPROP
-	1.18E+05	1.10E+10	-	0.09	1	6.6E-6	2.70E-04	PHYSPROP	0.0002698	623.15	PHYSPROP
-	1.69E+05	1.10E+10	-	0.0055	1	8.32E-6	3.40E-04	PHYSPROP	0.0003401	533.15	PHYSPROP
-	1.91E+06	1.10E+10	-	0.00249	1	1.41E-7	5.76E-06	EPI	5.7645E-6	797.15	PHYSPROP

Site-Specific

Excavation Worker PRG for Soil

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat

Critical Temperature T_{crit} (K)	T_{crit} Ref	Ingestion PRG TR=1.0E-5 (mg/kg)	Inhalation PRG TR=1.0E-5 (mg/kg)	Dermal PRG TR=1.0E-5 (mg/kg)	Carcinogenic PRG TR=1.0E-5 (mg/kg)	Ingestion PRG HQ=1 (mg/kg)	Inhalation PRG HQ=1 (mg/kg)	Dermal PRG HQ=1 (mg/kg)	Noncarcinogenic PRG HI=1 (mg/kg)
894.225	Approx. from Tcrit=1.5xTBoil	4.42E+04	1.48E+06	9.86E+04	2.99E+04	3.10E+02	-	6.90E+02	2.14E+02
987.225	Approx. from Tcrit=1.5xTBoil	1.55E+03	9.56E+04	3.45E+03	1.06E+03	-	-	-	-
1673	CRC89	3.44E+03	9.79E+07	2.15E+04	2.97E+03	2.21E+03	9.02E+06	1.38E+04	1.91E+03
979	YAWS	3.10E+04	3.05E+06	7.43E+04	2.17E+04	-	-	-	-
-		3.10E+03	7.02E+08	7.43E+03	2.19E+03	1.33E+03	1.20E+06	3.18E+03	9.36E+02
-		3.10E+04	7.02E+09	7.43E+04	2.19E+04	-	-	-	-
-		3.10E+05	7.02E+10	7.43E+05	2.19E+05	-	-	-	-
934.725	Approx. from Tcrit=1.5xTBoil	1.29E+04	6.10E+09	4.02E+04	9.77E+03	1.33E+02	-	4.14E+02	1.01E+02
799.725	Approx. from Tcrit=1.5xTBoil	9.11E+03	4.34E+09	9.47E+04	8.31E+03	2.21E+03	-	2.30E+04	2.02E+03
-		3.10E+03	7.02E+08	7.43E+03	2.19E+03	-	-	-	-

Output generated 02NOV2018:10:06:05

Site-Specific
Recreator Equation Inputs for Soil/Sediment

Variable	Value
ED_{rec} (exposure duration - recreator) years	26
ED_{rec-c} (exposure duration - child) years	6
BW_{rec-a} (body weight - adult) kg	80
BW_{rec-c} (body weight - child) kg	15
SA_{rec-a} (skin surface area - adult) cm^2/day	6032
SA_{rec-c} (skin surface area - child) cm^2/day	2373
THQ (target hazard quotient) unitless	1
TR (target risk) unitless	1.0E-5
LT (lifetime - recreator) years	70
IRS_{rec-a} (soil intake rate - adult) mg/day	100
IRS_{rec-c} (soil intake rate - child) mg/day	200
AF_{rec-a} (skin adherence factor - adult) mg/cm^2	0.07
AF_{rec-c} (skin adherence factor - child) mg/cm^2	0.2
$IFS_{rec-adj}$ (age-adjusted soil ingestion factor) mg/kg	7875
$DFS_{rec-adj}$ (age-adjusted soil dermal factor) mg/kg	22155
$IFSM_{rec-adj}$ (mutagenic age-adjusted soil ingestion factor) mg/kg	35750
$DFSM_{rec-adj}$ (mutagenic age-adjusted soil dermal factor) mg/kg	91770
AF_{0-2} (skin adherence factor) mg/cm^2	0.2
AF_{2-6} (skin adherence factor) mg/cm^2	0.2
AF_{6-16} (skin adherence factor) mg/cm^2	0.07
AF_{16-30} (skin adherence factor) mg/cm^2	0.07
BW_{0-2} (body weight) kg	15
BW_{2-6} (body weight) kg	15
BW_{6-16} (body weight) kg	80
BW_{16-30} (body weight) kg	80
ED_{0-2} (exposure duration) year	2
ED_{2-6} (exposure duration) year	4
ED_{6-16} (exposure duration) year	10
ED_{16-30} (exposure duration) year	10
EF_{rec} (exposure frequency) days/year	75

Output generated 30OCT2018:12:56:57

Site-Specific
Recreator Equation Inputs for Soil/Sediment

Variable	Value
EF_{rec-c} (exposure frequency - child) days/year	75
EF_{rec-a} (exposure frequency - adult) days/year	75
EF_{0-2} (exposure frequency) days/year	75
EF_{2-6} (exposure frequency) days/year	75
EF_{6-16} (exposure frequency) days/year	75
EF_{16-30} (exposure frequency) days/year	75
ET_{rec} (exposure time - recreator) hours/day	1
ET_{rec-c} (child exposure time) hours/day	1
ET_{rec-a} (adult exposure time) hours/day	1
ET_{0-2} (exposure time) hours/day	1
ET_{2-6} (exposure time) hours/day	1
ET_{6-16} (exposure time) hours/day	1
ET_{16-30} (exposure time) hours/day	1
IRS_{0-2} (soil intake rate) mg/day	200
IRS_{2-6} (soil intake rate) mg/day	200
IRS_{6-16} (soil intake rate) mg/day	100
IRS_{16-30} (soil intake rate) mg/day	100
SA_{0-2} (skin surface area) cm^2/day	2373
SA_{2-6} (skin surface area) cm^2/day	2373
SA_{6-16} (skin surface area) cm^2/day	6032
SA_{16-30} (skin surface area) cm^2/day	6032
AT_{rec} (averaging time)	365
$City_{PEF}$ (Climate Zone) Selection	Hartford, CT (8)
A_s (PEF acres)	0.5
Q/C_{wind} (g/m^2-s per kg/m^3)	73.95044952840081
PEF (particulate emission factor) m^3/kg	10982401741.557863
A (PEF Dispersion Constant)	12.5907
B (PEF Dispersion Constant)	18.8368
C (PEF Dispersion Constant)	215.4377
V (fraction of vegetative cover) unitless	0.5

Output generated 30OCT2018:12:56:57

Site-Specific
Recreator Equation Inputs for Soil/Sediment

Variable	Value
U_m (mean annual wind speed) m/s	3.84
U_t (equivalent threshold value)	11.32
F(x) (function dependent on U_m/U_t) unitless	0.0345
$City_{VF}$ (Climate Zone) Selection	Hartford, CT (8)
A_s (VF acres)	0.5
Q/C_{vol} (g/m^2-s per kg/m^3)	73.95044952840081
foc (fraction organic carbon in soil) g/g	0.006
p_b (dry soil bulk density) g/cm^3	1.5
p_s (soil particle density) g/cm^3	2.65
n (total soil porosity) L_{pore}/L_{soil}	0.43396
θ$_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396
θ$_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15
T (exposure interval) s	819936000
A (VF Dispersion Constant)	12.5907
B (VF Dispersion Constant)	18.8368
C (VF Dispersion Constant)	215.4377
$City_{VF\ mass\text{-}loading}$ (Climate Zone) Selection	Hartford, CT (8)
VF_{ml} (volitization factor - mass limit) m^3/kg	0
Q/C_{vol} (g/m^2-s per kg/m^3)	73.95044952840081
A_s (VF mass-limit acres)	0.5
T (exposure interval) yr	26
p_b (dry soil bulk density - mass limit) g/cm^3	1.5
A (VF Dispersion Constant - Mass Limit)	12.5907
B (VF Dispersion Constant - Mass Limit)	18.8368
C (VF Dispersion Constant - Mass Limit)	215.4377
T_w (groundwater temperature) Celsius	25

Output generated 30OCT2018:12:56:57

Site-Specific

Recreator PRG for Soil/Sediment

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat

Chemical	CAS Number	Mutagen?	VOC?	Chronic RfD (mg/kg-day)	Chronic RfD Ref	Chronic RfC (mg/m^3)	Chronic RfC Ref	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	ABS_{derm}	ABS_{gi}
Aroclor 1016	12674-11-2	No	Yes	7.00E-05	I	-		7.00E-02	S	2.00E-05	S	0.14	1
Aroclor 1260	11096-82-5	No	Yes	-		-		2.00E+00	S	5.71E-04	S	0.14	1
Arsenic, Inorganic	7440-38-2	No	No	3.00E-04	I	1.50E-05	C	1.50E+00	I	4.30E-03	I	0.03	1
Benz[a]anthracene	56-55-3	Yes	Yes	-		-		1.00E-01	W	6.00E-05	W	0.13	1
Benzo[a]pyrene	50-32-8	Yes	No	3.00E-04	I	2.00E-06	I	1.00E+00	I	6.00E-04	I	0.13	1
Benzo[b]fluoranthene	205-99-2	Yes	No	-		-		1.00E-01	W	6.00E-05	W	0.13	1
Benzo[k]fluoranthene	207-08-9	Yes	No	-		-		1.00E-02	W	6.00E-06	W	0.13	1
DDD, p,p`- (DDD)	72-54-8	No	No	3.00E-05	P	-		2.40E-01	I	6.90E-05	C	0.1	1
DDT	50-29-3	No	No	5.00E-04	I	-		3.40E-01	I	9.70E-05	I	0.03	1
Dibenz[a,h]anthracene	53-70-3	Yes	No	-		-		1.00E+00	W	6.00E-04	W	0.13	1

Output generated 30OCT2018:12:56:57

Site-Specific

Recreator PRG for Soil/Sediment

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat

Volatilization Factor (m^3/kg)	K_d (cm³/g)	K_{oc} (cm^3/g)	Particulate Emission Factor (m^3/kg)	Soil Saturation Concentration (mg/kg)	Solubility (mg/L)	RBA	HLC (atm-m^3/mole)	Henry's Law Constant (unitless)	H` and HLC Ref	Henry's Law Constant Used in Calcs (unitless)
7.74E+05	286.2	4.77E+04	1.10E+10	-	0.42	1	0.0002	8.18E-03	EPI	0.0081766
1.43E+06	2098.2	3.50E+05	1.10E+10	-	0.0144	1	0.000336	1.37E-02	PHYSPROP	0.0137367
-	29	-	1.10E+10	-	-	0.6	-	-		-
4.78E+06	1061.4	1.77E+05	1.10E+10	-	0.0094	1	0.000012	4.91E-04	PHYSPROP	0.0004906
-	-	5.87E+05	1.10E+10	-	0.00162	1	4.57E-7	1.87E-05	PHYSPROP	0.0000187
-	-	5.99E+05	1.10E+10	-	0.0015	1	6.57E-7	2.69E-05	PHYSPROP	0.0000269
-	-	5.87E+05	1.10E+10	-	0.0008	1	5.84E-7	2.39E-05	PHYSPROP	0.0000239
-	-	1.18E+05	1.10E+10	-	0.09	1	6.6E-6	2.70E-04	PHYSPROP	0.0002698
-	-	1.69E+05	1.10E+10	-	0.0055	1	8.32E-6	3.40E-04	PHYSPROP	0.0003401
-	-	1.91E+06	1.10E+10	-	0.00249	1	1.41E-7	5.76E-06	EPI	5.7645E-6

Output generated 30OCT2018:12:56:57

Site-Specific

Recreator PRG for Soil/Sediment

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat

Normal Boiling Point T_{boil} (K)	BP Ref	Critical Temperature T_{crit} (K)	T_{crit} Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	DA	Ingestion PRG TR=1.0E-5 (mg/kg)	Inhalation PRG TR=1.0E-5 (mg/kg)	Dermal PRG TR=1.0E-5 (mg/kg)	Carcinogenic PRG TR=1.0E-5 (mg/kg)
613.85	EPI	894.225	Approx. from Tcrit=1.5xTBoil	1.71E-02	4.16E-06	2.6111E-8	4.63E+02	1.22E+05	1.18E+03	3.32E+02
688.75	EPI	987.225	Approx. from Tcrit=1.5xTBoil	2.20E-02	5.61E-06	7.6985E-9	1.62E+01	7.84E+03	4.12E+01	1.16E+01
888.15	PHYSPROP	1673	CRC89	-	-	-	3.60E+01	8.03E+06	2.56E+02	3.16E+01
710.75	PHYSPROP	979	YAWS	2.61E-02	6.75E-06	6.834E-10	7.15E+01	9.05E+04	2.14E+02	5.36E+01
768.15	PHYSPROP	-		4.76E-02	5.56E-06	-	7.15E+00	2.08E+07	2.14E+01	5.36E+00
715.9	EPI	-		4.76E-02	5.56E-06	-	7.15E+01	2.08E+08	2.14E+02	5.36E+01
753.15	PHYSPROP	-		4.76E-02	5.56E-06	-	7.15E+02	2.08E+09	2.14E+03	5.36E+02
623.15	PHYSPROP	934.725	Approx. from Tcrit=1.5xTBoil	4.06E-02	4.74E-06	-	1.35E+02	5.01E+08	4.81E+02	1.06E+02
533.15	PHYSPROP	799.725	Approx. from Tcrit=1.5xTBoil	3.79E-02	4.43E-06	-	9.54E+01	3.56E+08	1.13E+03	8.80E+01
797.15	PHYSPROP	-		4.46E-02	5.21E-06	-	7.15E+00	2.08E+07	2.14E+01	5.36E+00

Site-Specific

Recreator PRG for Soil/Sediment

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat

Child Ingestion PRG HQ=1 (mg/kg)	Child Inhalation PRG HQ=1 (mg/kg)	Child Dermal PRG HQ=1 (mg/kg)	Noncarcinogenic Child PRG HI=1 (mg/kg)	Adult Ingestion PRG HQ=1 (mg/kg)	Adult Inhalation PRG HQ=1 (mg/kg)	Adult Dermal PRG HQ=1 (mg/kg)	Noncarcinogenic Adult PRG HI=1 (mg/kg)	Adjusted Ingestion PRG HQ=1 (mg/kg)	Adjusted Inhalation PRG HQ=1 (mg/kg)	Adjusted Dermal PRG HQ=1 (mg/kg)	Noncarcinogenic Adjusted PRG HI=1 (mg/kg)
2.56E+01	-	7.69E+01	1.92E+01	2.73E+02	-	4.61E+02	1.71E+02	8.44E+01	-	2.14E+02	6.05E+01
-	-	-	-	-	-	-	-	-	-	-	-
1.83E+02	1.92E+07	1.54E+03	1.63E+02	1.95E+03	1.92E+07	9.22E+03	1.61E+03	6.03E+02	1.92E+07	4.28E+03	5.28E+02
-	-	-	-	-	-	-	-	-	-	-	-
1.10E+02	2.57E+06	3.55E+02	8.37E+01	1.17E+03	2.57E+06	2.13E+03	7.54E+02	3.62E+02	2.57E+06	9.88E+02	2.65E+02
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
1.10E+01	-	4.61E+01	8.85E+00	1.17E+02	-	2.77E+02	8.21E+01	3.62E+01	-	1.29E+02	2.82E+01
1.83E+02	-	2.56E+03	1.70E+02	1.95E+03	-	1.54E+04	1.73E+03	6.03E+02	-	7.14E+03	5.56E+02
-	-	-	-	-	-	-	-	-	-	-	-

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Appendix D

Transcript of Public Hearing on the Proposed Plan

Naval Air Station , South Weymouth

Industrial Operations Area

Public Hearing

8:00 p.m.

Thursday, August 16, 2018

Southfield Town Hall

Shea Memorial Drive, Naval Air Station

South Weymouth, MA

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Hearings ◆ Conferences ◆ Legal Proceedings

PROCEEDINGS

MR. GOODRICH: All right. It's 8:00, so I'm going to open the public hearing. And if you would like to make a comment, just please state your name and if you're here in an official capacity, the organization you're here with.

Going once, going twice. Thank you. I think we will close the hearing. Thank you for coming.

(Whereupon the hearing was concluded at 8:01 p.m.)

C E R T I F I C A T E

COMMONWEALTH OF MASSACHUSETTS

COUNTY OF BRISTOL, ss.

I, Janet Chase, Certified Shorthand Reporter, do hereby certify that the foregoing record, pages one through two, is a complete, accurate, and true transcription of my stenographic notes taken in the aforementioned matter to the best of my skills and ability.

IN WITNESS WHEREOF, I have hereunto set my hand and seal this 28th day of August, 2018.

Janet Chase

Janet Chase
Notary Public

My commission expires: June 30, 2019