PROPOSED PLAN

for Sediment at the U.S. Army Natick Soldier Systems Center

Introduction

The U.S. Army is releasing this *Proposed Plan*[1] to address sediment contamination along the Lake Cochituate shoreline at the U.S. Army Natick Soldier Systems Center (SSC) in Natick, Massachusetts. The Army's preferred cleanup approach at the Main Stormwater Outfall (MSO) in Pegan Cove is Alternative 8 which includes Hot Spot Dredging, Geotextile Tube Dewatering, Off-Site Disposal, and Backfilling. This recommendation is based on comprehensive investigations and risk analyses which indicate an unacceptable potential human health risk associated with fish ingestion in this area. The Army recommends *No Action* for sediment at the remaining shoreline areas associated with SSC that are outside of Pegan Cove, including the T-25 outfall and the Building 2/45 parking lot outfall. This *No Action* recommendation is based on comprehensive investigations and risk analyses indicating that there is no unacceptable human health or ecological risk associated with sediment in these areas.

The Cleanup Proposal

The Army developed this *Proposed Plan* in accordance with federal law to present its proposed cleanup approach for contaminated sediment at the Main Stormwater Outfall (MSO) within Pegan Cove on Lake Cochituate, which is Hot Spot Dredging, Geotextile Tube Dewatering, Off-Site Disposal, and Backfilling. The Army also proposes *No Action* for sediment at the remaining SSC shoreline areas that are outside of Pegan Cove. The *Proposed Plan* describes the Army's rationale for selecting these alternatives and provides the public with information so they may participate in the decision-making process.

Let Us Know What You Think

Public Comment Period

The Army is accepting public comments on this Proposed Plan during the 30-day public comment period from May 18, 2009 to June 16, 2009.

Please send comments via mail, email, or fax to:

Mr. James Connolly
Environmental and Health Office
U.S. Army Garrison Natick
Kansas Street
Natick, MA 01760-5049
Email: James.B.Connolly@us.army.mil
Fax: (508) 233-5393

Public Meeting and Hearing

The Army, US EPA, and MassDEP will hold a public meeting to explain the Proposed Plan on:

May 21, 2009
6:30 - 7:00 PM
Followed by a public hearing to accept formal comments, starting at 7:00 PM.

Lebowitz Meeting Hall (lower level)
Morse Institute Public Library
14 East Central Street
Natick, Massachusetts 01760

[1]Italicized terms are listed in the Glossary at the end of this Proposed Plan (page 18).

This *Proposed Plan* is intended to inform the community of the Army's rationale for the preferred cleanup approach and facilitate community participation in the decision-making process, and fulfills the requirements of the *Comprehensive Environmental Response, Compensation, and Liability Act* of 1980 (*CERCLA*) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The Army is issuing this *Proposed Plan* with the support of the *U.S. Environmental Protection Agency (US EPA)* and the *Massachusetts Department of Environmental Protection* (*MassDEP*) and has prepared this document in order to continue its community awareness efforts.

The purpose of this *Proposed Plan* is to:

- Provide background information;
- Identify the Army's recommendation;
- Explain the rationale for the Army's recommendation; and
- Solicit public comments and answer questions and concerns regarding the proposed actions.

The *Proposed Plan* summarizes key information from other documents that have been prepared for sediment at the SSC shoreline. These documents include *Remedial Investigation* (RI) Reports, Risk Assessments, Sediment Risk Management technical reports, and a *Feasibility Study* (FS). These and other documents are available for public review at information repositories located at SSC, *MassDEP*, and the Morse Institute Library in Natick, Massachusetts. The locations of these repositories are listed at the end of this *Proposed Plan.*

Site Background

The U.S. Army SSC facility is located approximately 17 miles west-southwest of Boston in Natick, Massachusetts. SSC is an active research and development facility encompassing approximately 78 acres on the eastern shoreline of the South Pond of Lake Cochituate (**Figure 1**). Lake Cochituate is composed of five interconnected ponds separated by several major roadways and surrounded by highly developed residential, commercial, and industrial areas. Lake Cochituate is under the control of the Lake Cochituate State Park [*Massachusetts Department of Conservation and Recreation* (*MassDCR*)] and is used for recreational purposes.

SSC is fenced and public access is restricted. SSC's mission includes research and development activities in food engineering, food science, clothing, equipment, materials engineering, and aeromechanical engineering.

In May 1994, the SSC facility was listed on the *Comprehensive Environmental Response, Compensation, and Liability Act* (*CERCLA*) *National Priorities List* (*NPL*). A Federal Facility Agreement (FFA) between the U.S. Army and the *US EPA*, signed in August 2006, governs environmental cleanup activities being conducted at the SSC by the U.S. Army.

To help organize and prioritize cleanup activities, the SSC facility has been classified into several *operable units (OU).* For the first *operable unit*, OU-1, the Army established a ground water extraction and treatment system to contain and clean up solvent-contaminated ground water associated with the T-25 Area. The *Record of Decision (ROD)* for OU-1 was signed in 2001, and the cleanup is ongoing. Ground water across the SSC facility is currently monitored on a routine basis in accordance with a facility-wide ground water monitoring plan. Additional on-site investigations are ongoing for other *OUs* at SSC, pursuant to *CERCLA.*

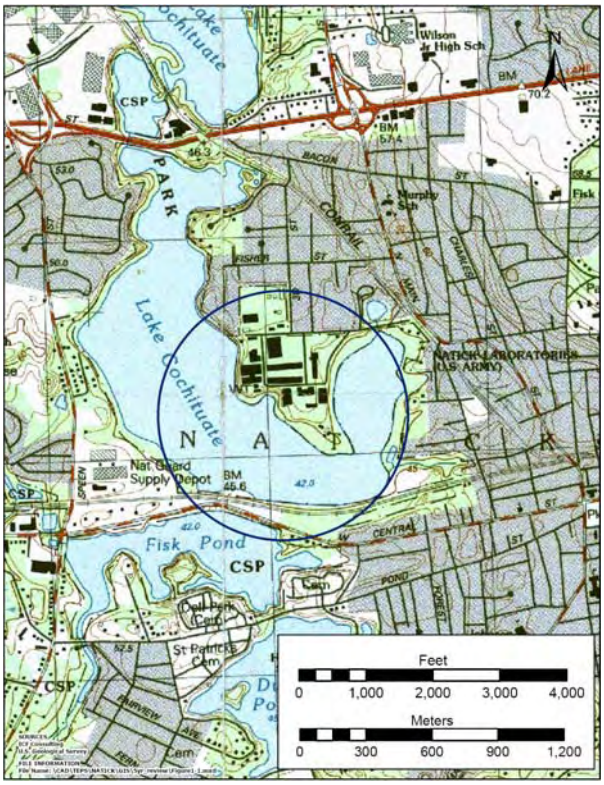

Figure 1. Site Location

Sediment Background

Sediment is one of the environmental *media* identified for investigation and potential cleanup under the *CERCLA* process. The sediment at the SSC shoreline was identified as an *operable unit* because a number of storm drains from the SSC property currently and/or historically drained directly into Lake Cochituate.

Most surface drainage at the SSC facility is controlled by a stormwater sewer system, which discharges to Lake Cochituate at two main locations (T-25 outfall and Main Stormwater Outfall) and at a number of other smaller outfalls.

Runoff to the lake also occurs in other areas not controlled by the storm sewer system. Many of the outfalls and the storm drainage systems were constructed in the mid-1950s to early 1960s for the collection and management of stormwater runoff and non-contact air conditioning cooling waters. In the late 1990s, all active outfalls were upgraded with new oil/water separators to improve stormwater quality and minimize future impacts to the lake.

Over the past 50 years, runoff from parking lots, unpaved surfaces, and equipment and chemical storage areas has contributed to the presence of various chemicals in the sediment adjacent to SSC. In addition, chemicals related to the storage of pesticides for termite and pest control, and PCBs from a mid-1980s transformer leak, entered the SSC stormwater drainage system and have been transported by the storm drains into Lake Cochituate.

Site Investigations and Risk Assessments

Numerous environmental investigations and risk assessments have been conducted on the SSC sediment since the early 1990s. The Army has performed extensive sampling and analysis of sediment, surface water, mussels, and fish from the SSC shoreline and across all the major ponds of Lake Cochituate (**Figure 2**). Sediment toxicity testing, surveys of sediment-dwelling organisms, and wildlife surveys have also been conducted. The key studies are summarized in the box entitled History of SSC Studies (see page 5), and the detailed reports are available for public review in the *Information Repository* maintained at the Morse Institute Library in Natick.

Using the data generated from the studies, comprehensive *human health* and *ecological risk assessments* have been completed to evaluate the potential risk to humans and the environment. The approaches and final reports for each site investigation and risk assessment were reviewed and approved by the *US EPA* and *MassDEP*. In addition, the federal Agency for Toxic Substances and Disease Registry (ATSDR, a division of the U.S. Centers for Disease Control) performed an independent health assessment in 1997 for the sediment and surface water associated with the T-25 outfall area of the SSC shoreline.

Chemicals Detected During Studies

The results of the studies conducted at SSC indicate that there are chemicals present in the sediment, surface water, mussels, and fish adjacent to SSC and across Lake Cochituate. Lake Cochituate is part of a highly developed suburban *watershed*, with a long history of industrial, residential, and major roadway development. The studies indicate that, in addition to SSC, there are numerous other potential current and historic sources of environmental contaminants to Lake Cochituate that are not related to SSC activities.

Sediment

The Army collected and analyzed over 200 sediment samples from numerous SSC and *reference* locations across Lake Cochituate. A number of chemicals were found in both the SSC-related and non-SSC-related sediment, and are discussed below. All detected compounds were evaluated to determine whether or not they could present a potential risk to human health or the environment.

Volatile Organic Compounds (VOCs): A limited number of VOCs were detected at very low levels. VOCs are organic chemical compounds that have high enough vapor pressures under normal conditions to significantly vaporize and enter the atmosphere. Some of the VOCs detected are recognized laboratory contaminants, and are not thought to be site-related.

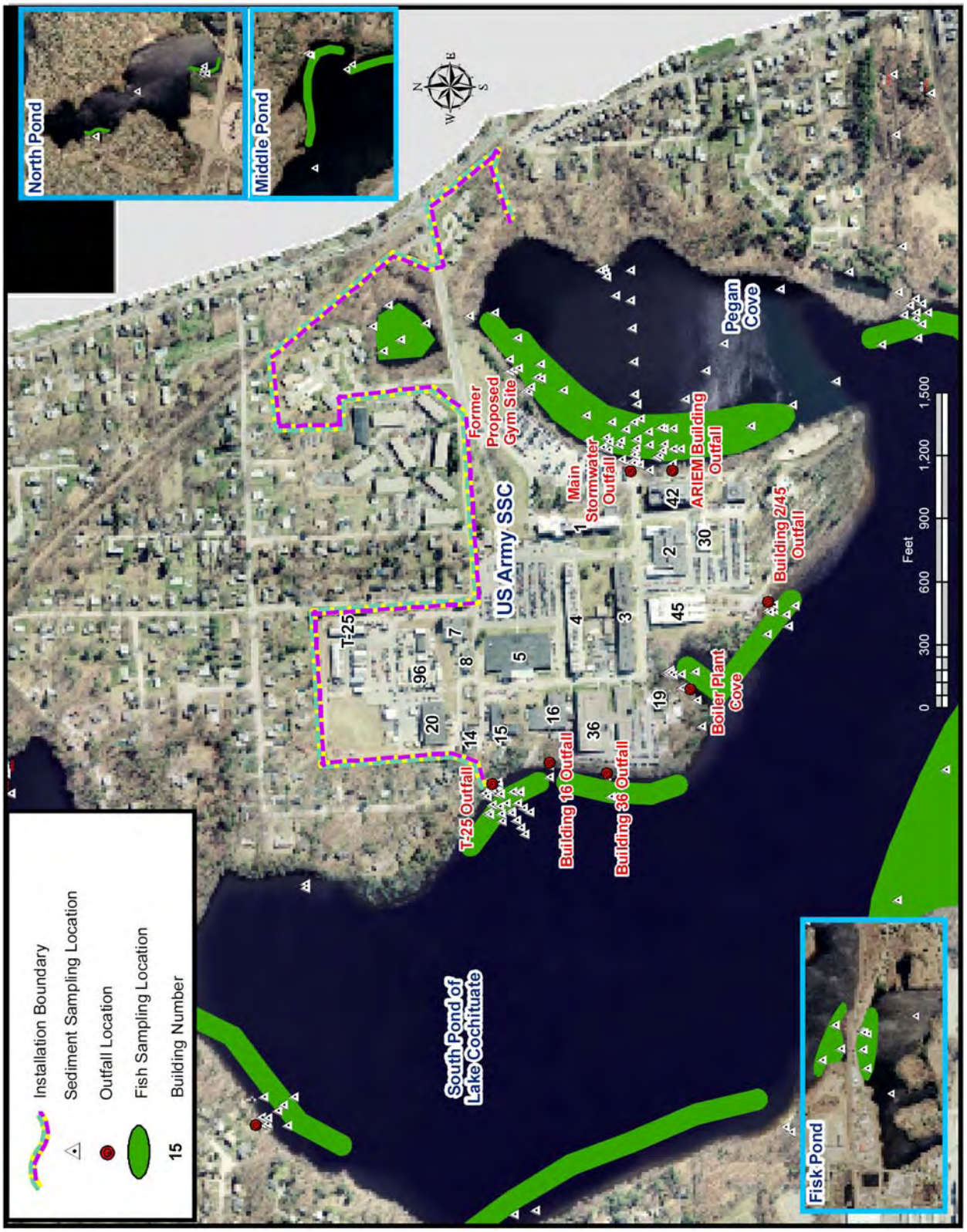

Figure 2. U.S. Army and Lake Cochituate Sampling Locations

History of SSC Studies

1996 – 1998: The Army completed a two-phased *Remedial Investigation* (*RI*) at the T-25 Area (Warehouse Area) that included sampling and analysis of surface water and sediment at the T-25 Area outfall and at 11 outfall and non-outfall locations across Lake Cochituate. Potential risks to human health and the environment were evaluated.

1997: The federal ATSDR performed an independent public health assessment at SSC, which included an evaluation of the potential human health risks from exposures during swimming, wading, or boating near the T-25 Area outfall. The ATSDR study concluded that potential exposures were not likely to result in adverse health effects.

1999: The Army conducted a *Remedial Investigation* at the Main Stormwater Outfall, Former Proposed Gymnasium Site, and Little Roundy Pond which included sampling and analysis of surface water and sediment from each of these areas. Potential risks to human health and the environment were evaluated.

1999: The Army conducted a *Remedial Investigation* at the SSC Water Supply Wells Site (Building 2/45 area) which included sampling and analysis of surface water and sediment at additional *reference* (or non-site-related) locations on Lake Cochituate and Fisk Pond, to further assess regional surface water and sediment quality.

2000: The Army conducted a Site Investigation at the SSC Boiler Plant, which included sampling and analysis of surface water and sediment in a small cove on Lake Cochituate adjacent to the Boiler Plant.

2001 – 2002: The Army conducted *Tier II ecological risk assessments* to further evaluate potential ecological risks associated with the sediment at the T-25 Area outfall and Main Stormwater Outfall (MSO), the two largest SSC outfalls discharging to Lake Cochituate. These *ecological risk assessments* included additional sediment/surface water sampling, sediment-dwelling organism surveys, sediment toxicity testing, and wildlife surveys.



2002: The Army collected surface water and sediment at four historical stormwater outfall locations at SSC, including the Building 2/45 outfall, and performed an ecological risk evaluation at each area.

2004: The Army conducted a *Remedial Investigation* for the Building 22 and 36 Areas at SSC, which included sampling and analysis of surface water and sediment samples in the cove south of Building 22 and along the shoreline west of Building 36. Potential risks to human health and the environment were evaluated for these areas.

2004: The Army performed a *Tier III ecological risk assessment* that included extensive fish, mussel, and sediment sampling across the major ponds of Lake Cochituate. Food chain modeling was performed to evaluate the potential risks to wildlife (mussels, fish, birds, and mammals) from SSC-related and *reference* sediment.

2004: Fish fillet data collected during the *Tier III ecological risk assessment* sampling program were used to assess the potential human health risks associated with the recreational consumption of a representative native, non-stocked fish species (largemouth bass) caught from Lake Cochituate near SSC.

2005: An angler survey was conducted to estimate fish ingestion rates for various populations of anglers who eat native fish (largemouth bass) caught from Lake Cochituate during the open water fishing season.

2007: The Army conducted a fish and sediment sampling program, including the collection of additional native fish samples to support a revised fish ingestion *human health risk assessment* (HHRA) and the collection of additional sediment samples to further characterize and delineate the extent of sediment polychlorinated biphenyl (PCB) contamination associated with the MSO.

2009: The Army completed a Sediment *Feasibility Study* (FS) which evaluated a range of cleanup alternatives designed to be protective of human health and the environment for the contaminated sediment along the SSC shoreline near the MSO within Pegan Cove.

Semi-Volatile Organic Compounds (SVOCs): SVOCs were detected in sediment at most of the SSC and *reference* locations. The detected SVOCs were primarily in a class of chemicals called polynuclear aromatic hydrocarbons, which are both naturally occurring in the environment and related to human activity (for example, from burning wood or fuel, and a component of asphalt). The highest concentrations associated with SSC were observed at the T-25 outfall and Main Stormwater Outfall (within Pegan Cove), which are the two stormwater outfalls at SSC that have drained large areas with high vehicular traffic for the past 50 years.

Polychlorinated Biphenyls (PCBs): Elevated levels of PCBs were detected in sediment, primarily at the Main Stormwater Outfall in Pegan Cove, as well as at *reference* locations across Fisk Pond and Lake Cochituate. PCBs are a mixture of synthetic chemicals, which are no longer manufactured in the United States but are persistent in the environment. The PCBs found in the Main Stormwater Outfall sediment are likely related to a transformer leak that occurred in the mid-1980s. PCBs released to the soil near the transformer have since been removed; however PCBs likely migrated into the stormwater drainage system and into Lake Cochituate at this outfall.

The average concentration of PCBs at the Main Stormwater Outfall within Pegan Cove is approximately 1.7 milligrams/kilogram (mg/kg). The average PCB concentration at SSC shoreline locations outside of Pegan Cove ranges from non-detect to 0.3 mg/kg. The average PCB concentration at other non-SSC-impacted *reference* locations on Fisk, South, Middle, North Ponds, ranges from non-detect to 1 mg/kg. Based on a statistical analysis, the Army determined that the PCB concentrations at the MSO shoreline area were statistically higher than *reference* locations; but that PCB concentrations at SSC shoreline areas outside of Pegan Cove were statistically similar to *reference* locations.

Pesticides: Pesticides were found in sediment at most of the SSC locations, as well as at *reference* locations. The highest SSC concentrations were observed at the T-25 outfall, and likely originated from the historic application and storage of pesticides for insect and pest control in the T-25 Area. Pesticides detected in sediment at other Lake Cochituate locations are also related to their widespread use for insect control throughout the *watershed*.

Inorganics: Inorganic chemicals (i.e., metals) were detected in SSC sediment, and are likely associated with the bulk storage of equipment and vehicle traffic. Similar levels of inorganics were detected at other locations on Lake Cochituate, and are likely associated with the highly-developed nature of the area surrounding the lake or are naturally occurring.

Surface Water

The Army collected and analyzed over 135 surface water samples from numerous SSC and *reference* locations across Lake Cochituate. In general, the chemicals detected in surface water from SSC were found at low concentrations. The detected chemicals were generally below risk-based screening levels, were similar to concentrations found in non-SSC-related samples, or were attributable to suspended sediment present in shallow water samples located near the SSC shoreline.

Fish and Mussels

The Army collected 16 fish species (native and stocked) during two fish sampling programs on Lake Cochituate. A subset of native fish was retained for chemical analysis; all others were released. The representative native fish species collected and analyzed to support the *ecological risk assessments* included largemouth bass, American eel, bluegill, and pumpkinseed. The fillets from legal-sized (greater than 12 inches long) largemouth bass were used to support the *human health risk assessment*. Freshwater mussels were also collected and analyzed to support the *ecological risk assessment*.

The principal chemicals detected in native fish and mussels from the SSC and *reference* locations included PCBs, pesticides, and metals. PCB concentrations were lowest for mussels and highest for eel and bass. This is expected because PCBs are known to *bioaccumulate* at

higher levels in the food chain. The data for mussels and whole body fish generally show higher PCB concentrations at SSC locations (particularly at the Main Stormwater Outfall) compared to non-SSC-related locations. Pesticides were also found at slightly higher concentrations in mussels and fish from SSC locations than from non-SSC-related locations. Metals concentrations (including mercury) in mussels and fish were similar for SSC and *reference* locations.

Potential Site Risks

The Army has completed risk assessments to estimate potential current and future human health and ecological risks associated with possible exposures to chemicals present in the sediment, surface water, and native fish along the shoreline of SSC. The estimated risks were considered in evaluating and recommending cleanup actions for sediment associated with SSC.

Human Health Risk Assessments

Human health risk assessments were conducted for recreational swimming exposures to surface water and sediment at numerous areas along the shoreline adjacent to SSC. In addition, at the request of *US EPA*, risks were estimated for adults and children eating recreationally caught fish. Contaminants in representative native (non-stocked) fish species caught near the SSC shoreline were used in the baseline risk estimate. The baseline risk is defined as the likelihood of health effects occurring due to the estimated potential exposures to surface water, sediment, or native fish if no cleanup action were taken. The baseline risk assessments were conducted as part of several *Remedial Investigation*s (as summarized in the box entitled History of SSC Studies); the risk assessment process and results are summarized below. The methodologies and final reports for each risk assessment were reviewed and approved by *US EPA* and *MassDEP*. To estimate the baseline risk for humans, a four-step process was used:

Step 1 - Identify Chemicals of Potential Concern

Chemicals of potential concern are chemicals found at the site at concentrations above federal and/or state risk screening levels. Chemicals with concentrations above these levels were used for site-specific risk calculations (i.e., Steps 2 through 4, described below).

Step 2 - Conduct an Exposure Assessment

In this step, potential human contact with surface water, sediment, and native fish were considered. The following routes of exposure were evaluated:

- Ingestion of and contact with surface water and sediment during swimming (adults and children)
- Consumption of legal-sized representative native fish species by recreational anglers (adults and children)

Consistent with *US EPA's* Risk Assessment Guidance for Superfund (RAGS), exposure assumptions were used to estimate potential risks for the reasonable maximum exposure that is expected to occur, as well as the average exposure. Current and potential future risks were evaluated. For example, for the swimming scenario, exposure was assumed to be 2 hours a day for 45 days a year exclusively at the area adjacent to the SSC. Under current conditions, however, use of the SSC area is prohibited, and thus, current exposure is highly unlikely.

A Fish Consumption Advisory due to PCBs found in fish samples was issued by the Massachusetts Department of Public Health in 1996 for all of Lake Cochituate, and remains in effect today. There are signs posted around Lake Cochituate and at SSC to inform anglers of the

advisory. The advisory specifies that (1) children younger than 12 years of age, pregnant women, women of childbearing age who may become pregnant, and nursing mothers should not eat any fish from this water body, and (2) the general public should not consume any American eel from this water body.

Step 3 - Complete a Toxicity Assessment

At this step, possible harmful effects from exposure to the individual chemicals of potential concern were evaluated. Generally, chemicals are separated into two groups: carcinogens (chemicals that may cause cancer) and noncarcinogens (chemicals that may cause adverse effects other than cancer). Toxicity values used in the risk assessment are derived by the *US EPA* using a variety of conservative assumptions in order to protect the most sensitive potentially exposed populations.

Step 4 – Characterize the Risk

Lastly, exposure and toxicity assessment results were combined to estimate overall risks from exposure to site chemicals. Risk characterization terms for the human health assessment are explained in the text box entitled *What's the Risk to Me?*

Results: For potential surface water and sediment contact during swimming at areas adjacent to SSC, the non-cancer and cancer risk estimates were below or within the range considered acceptable by the *US EPA* for all age groups. In addition to the Army studies, an independent health assessment performed by the ATSDR found that human health risks due to contact with surface water and sediment at the T-25 outfall were unlikely.

Risks were also evaluated for the potential ingestion of legal-sized (greater than 12 inches long) native fish species. The estimated incremental cancer risks for ingestion of native fish were below or within the range considered acceptable by the *US EPA* for all age groups. However, the estimated non-cancer *hazard indices* for ingestion of native fish from the SSC shoreline (*hazard index* = 2.7) for the reasonable maximum exposure scenario exceeded the *US EPA's* acceptable level (*hazard index* = 1). Similarly, the estimated non-cancer risk at non-SSC-impacted *reference* locations (*hazard index* = 3.8) also exceeded the *US EPA's* acceptable level.

Conservative assumptions are used in order to protect all potentially exposed populations and prevent underestimating the health risks to the public. However, the use of conservative assumptions in a *human health risk assessment* may overestimate site risks. Shore fishing from SSC is currently prohibited. In addition, the main public boat access to Lake Cochituate is on Middle Pond and many boats do not fit through the culverts between the lakes. The reasonable maximum exposure estimates assume an individual eats approximately 2 fish meals per

What's the Risk to Me?

In evaluating risks to humans, risk estimates for carcinogens (chemicals that may cause cancer), are expressed in terms of probability. For example, exposure to a particular carcinogenic chemical may present a 1 in 10,000 chance of causing cancer over an estimated lifetime of 70 years. Estimated cancer risks for a site are compared to acceptable risk ranges established by the *US EPA*; the acceptable risk range is within or below one in a million to one in ten thousand.

For non-carcinogens (chemicals that may cause adverse effects other than cancer), exposures are estimated and compared to a *reference dose*; this comparison is known as a *hazard index*. *Reference doses* are average daily exposure levels below which adverse effects are not likely. For potential non-cancer health effects, a *hazard index* greater than 1 suggests that adverse effects are possible, and *US EPA* may consider cleanup actions.

US EPA has established risk ranges in order to determine appropriate actions at a site. If estimated risks due to potential chemical exposures at a site are within or below the acceptable risk range, action is generally not required to protect public health. Estimated risks greater than *US EPA's* acceptable risk range may require risk management, such as clean up or site use restrictions. It is important to remember that there are uncertainties associated with each step of the risk assessment. Conservative assumptions were used in the risk calculations to prevent underestimating the health risks to the public.

month from Lake Cochituate. Risk could be underestimated if, for example, some individuals subsistence fish from Lake Cochituate. However, no subsistence fishing was found as part of the angler survey conducted in 2005.

Summary of Potential Human Health Risks

The results of the *human health risk assessment* for the outfalls located adjacent to SSC show that, using conservative exposure assumptions, the estimated risks for contaminants identified in surface water and sediment are within or below the cancer and non-cancer risk limits considered acceptable by *US EPA*. However, the estimated non-cancer risk associated with consumption of native fish from the SSC shoreline near the MSO exceeds the range considered acceptable by the *US EPA*, as does the non-cancer risk at non-SSC-related *reference* locations.

Ecological Risk Assessments

The objective of an *ecological risk assessment* is to determine if chemicals occurring in environmental *media* around a contaminated site pose unacceptable risks to the ecological resources of that area. *Ecological risk assessments* recognize that chemicals may move from the medium into which they are initially released and work their way into other *media* or the food chain.

At SSC, tiered *ecological risk assessments* were conducted to assess the risk to sediment-dwelling organisms, fish, birds, and mammals from exposure to surface water and sediment. Risks potentially attributable to surface water and sediment at outfalls along the SSC shoreline were also compared to risks calculated for *reference* (or non-SSC-related) locations on Lake Cochituate.

The tiered approach used a variety of assessment and measurement techniques, progressing from screening-level analyses (Tier I) to more sophisticated methods (*Tier III*). If screening-level procedures indicated that chemical concentrations in sediment or surface water posed a potential ecological risk, more sophisticated methods were used to enhance the precision of the *ecological risk assessment*.

Step 1 - Sampling and Laboratory Analyses

SSC surface water, sediment, mussel, and fish species likely to be consumed by local wildlife were sampled and analyzed. Surface water, sediment, mussel, and fish samples from *reference* locations were also sampled and analyzed to provide comparisons with the SSC data.

AMERICAN EEL

BELTED KINGFISHER

MINK

Figure 3: Examples of Ecological Receptors

Result: Most of the maximum sediment contaminant concentrations were detected in localized areas adjacent to each outfall.

Step 2 - Screening-Level Ecological Risk Assessment (Tier I)

Concentrations of contaminants identified in sediment and surface water were compared to published ecological screening benchmarks. The benchmarks were used to determine if the contaminants were present at concentrations that could cause ecological effects.

Result: Although there was no visible evidence of adverse impacts to *ecological receptors*, the Tier I ERA concluded that the sediment adjacent to SSC could potentially affect the local sediment-dwelling and/or aquatic communities, particularly at the T-25 Area outfall and the Main Stormwater Outfall. Potential risks were driven primarily by the presence of PCBs and pesticides. Potential surface water risks were minimal and similar to *reference* stormwater outfall locations.

Step 3 -Sediment Toxicity Tests and Wildlife Studies (*Tier II Ecological Risk Assessment*)

Laboratory testing was conducted on samples of sediment from the lake to evaluate possible toxicity to organisms living in the sediment. The Army also evaluated the overall health of the sediment-dwelling organisms, and the feeding habits of wildlife (such as birds and mammals) in the area.

Result: The *Tier II ERA* identified various degrees of toxicity and impairment for organisms living in the sediment. In some cases, the toxicity and impairment could be attributed to naturally-occurring conditions in certain zones of the outfall (e.g., low oxygen). A complete food chain pathway was confirmed.

Step 4 -Risk Assessment Based on Food Chain Models (*Tier III Ecological Risk Assessment*)

Food chain models, using conservative assumptions, were used to estimate the amount of contaminants potentially received by selected *ecological receptors* (**Figures 3 and 4**). A sensitivity analysis was also conducted to apply more realistic site-specific assumptions to selected model parameters, such as site use, diet fraction, and toxicity values, to assess the impact of uncertainties on the model results.

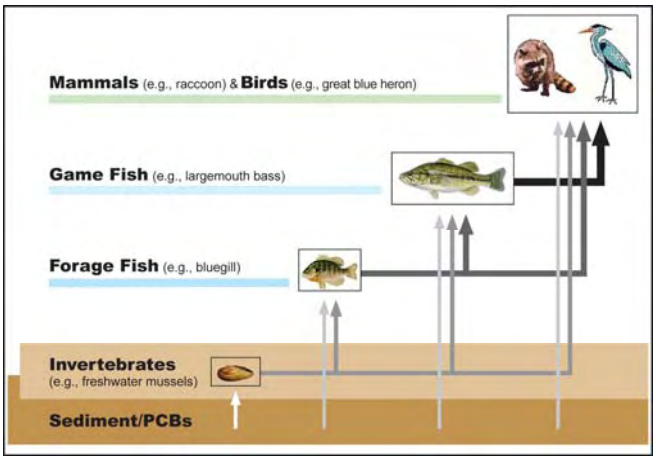

Figure 4: Schematic of Ecological Food Chain at Lake Cochituate

Result: The *Tier III ERA* calculated *residual risks*, which are defined as the estimated risk to an *ecological receptor* at SSC locations minus the estimated risk at the *reference* locations. Minimal potential *residual risk* was identified for sediment-dwelling organisms (e.g., mussels) and birds; low potential *residual risks* was identified for fish and mammals. The sensitivity analysis, which incorporated realistic site-specific assumptions, concluded that the low potential *residual risk* estimates for fish and mammals were acceptable for most chemicals. The only exception was for American eel (a species of fish) at one SSC location, where *residual risk* estimates for nickel and zinc were slightly higher than acceptable levels.

Summary of Potential Ecological Risks

Based on the tiered approach, the overall ecological risk due to contaminants associated with the SSC outfalls is low. Negligible to low SSC-related risk was estimated for various *ecological receptors*, and the SSC-related sediment contamination is highly localized. Therefore, there are likely no population-level effects on birds or mammals at SSC, and it is unlikely that fish near the SSC shoreline would be at risk.

Remedial Action Objectives

Remedial action objectives are narrative statements that define the extent to which sites require cleanup measures to meet the objective of protecting human health and the environment. A *sediment cleanup goal* is defined for this site as the concentration of PCBs in sediment that is protective of humans that may catch and eat fish from the SSC shoreline. The remedial action objectives and cleanup goals for the SSC sediment are:

- ***Human Health*:** Reduce the potential for sediment-associated human health risks due to PCBs in native fish caught near the SSC shoreline currently and in the future by reducing average PCB concentrations in sediment to less than 1 part per million.
- ***Environment:*** Based on *ecological risk assessment* results that show negligible to low ecological risks and/or ecological risks similar to *reference* locations, there are no remedial action objectives associated with *ecological receptors*.

The Army, *US EPA*, and *MassDEP* have selected a *sediment cleanup goal* of an average PCB concentration of less than 1 part per million because it is:

- Protective of humans who may catch and eat native fish from the SSC shoreline;
- Similar to existing sediment PCB concentrations at the upgradient non-SSC-impacted Fisk Pond *reference* location; and
- Consistent with the goals selected at other PCB sites in New England.

Based on the selected cleanup goal and the statistical analysis of sediment PCB concentrations, the PCBs in sediment associated with the Main Stormwater Outfall within Pegan Cove are the focus of the Army's cleanup actions.

Evaluation of Cleanup Alternatives

The Army developed and evaluated nine alternatives to determine the best way to reduce the risks associated with the SSC sediment. Each alternative was developed to meet the remedial action objectives, with the exception of the required "No Action" alternative. The alternatives include:

Alternative 1 - No Action: No response to contamination would be made, activities previously initiated would be abandoned, and no active human intervention would occur. Natural recovery over time is the only means by which sediment quality would improve, through biodegradation, diffusion, dilution, sorption, volatilization, and/or chemical and biochemical stabilization of contaminants. Consideration of a *No Action* alternative is required by the National Contingency Plan to serve as a baseline comparison for the other alternatives.

Alternative 2 - Limited Action/Institutional Controls: *Institutional controls* would be implemented to prevent or reduce human exposure to fish caught near the SSC shoreline and to ensure that the contaminated sediment is not disturbed over time. *Institutional controls* would include maintenance of current SSC shoreline access restrictions (fenced shoreline and security monitoring), the development and maintenance of signs prohibiting fishing near the shoreline of SSC, and prohibition of the disturbance of sediment within contaminated areas (e.g., anchoring, construction, dredging). Since the Commonwealth of Massachusetts has jurisdiction over Lake Cochituate and the sediment in the lake, the Army would need to develop an enforceable cooperative agreement with the appropriate Commonwealth agencies to implement and enforce any offshore *institutional controls*.

Alternative 3- Institutional Controls/ Environmental Monitoring: This alternative includes the *institutional controls* described in Alternative 2, along with long-term monitoring of sediment, fish, and water PCB concentrations

to assess whether natural recovery is occurring and if the sediment quality is improving.

Alternative 4 - Clay Capping/Monitoring/ Institutional Controls: The contaminated sediment would be covered with an engineered clay cap to physically isolate and immobilize it. Natural recovery would reduce the toxicity, mobility, and volume of the PCBs beneath the cap over time. This alternative would include *institutional controls* to reduce human exposure to fish caught near the SSC, as well as additional *institutional controls* required to prevent damage to the cap. A long-term monitoring and maintenance program would be implemented to ensure cap integrity and to track the natural recovery of the lake sediment and fish.

Alternative 5 - Composite Capping/Monitoring/ Institutional Controls: This alternative is the same as Alternative 4, except that an engineered composite capping system would be used instead of a clay cap. A composite cap would include a combination of synthetic geotextile fabrics and natural sand materials.

Alternative 6 - Mechanical Dry Dredging/Sediment Stabilization/Off-Site Disposal/Institutional Controls: This alternative would involve dewatering the lake in contaminated areas through the use of coffer dams; stabilizing the sediment with additives; removal of sediment that exceeds the 1 part per million cleanup goal using excavation equipment; and off-site disposal of contaminated sediment at a licensed facility. *Institutional controls* that would reduce human exposure to fish caught near SSC and a long-term monitoring program would be implemented.

Alternative 7: Hydraulic Dredging/Geotextile Tube Dewatering/Off-Site Disposal/Institutional Controls: This alternative would involve the removal of sediment that exceeds the 1 part per million cleanup goal using hydraulic dredging equipment that pumps the sediment to an on-shore location; dewatering the removed sediment using synthetic geotextile tubes; treatment and discharge of the water to the lake; and the off-site disposal of contaminated sediment at a licensed facility. *Institutional controls* that reduce human exposure to fish caught near SSC and a long-term monitoring program would be implemented.

Alternative 8: Hot Spot Hydraulic Dredging/Geotextile Tube Dewatering/Off-Site Disposal/Backfilling: This alternative would remove isolated areas of elevated PCB-contaminated sediment (or "hot spots") and replace it with clean fill materials to reduce the average PCB concentration within Pegan Cove to below the cleanup goal of 1 part per million. This alternative would use the same technologies as Alternative 7, including hydraulic dredging; geotextile tube dewatering; treatment and discharge of the water to the lake; and off-site disposal. Site control measures implemented during the cleanup action would include signs that limit boating in the dredging areas and signs that prohibit fishing from and near the SSC shoreline.

Alternative 9 - Hydraulic Dredging/Mechanical Dewatering/Off-Site Disposal/Institutional Controls: This alternative is similar to Alternative 7, except that the excavated sediment would be dewatered using a mechanical process, such as belt presses and recessed plate filters. *Institutional controls* that would reduce human exposure to fish caught near SSC and a long-term monitoring program would be implemented.

Evaluation Criteria for Cleanup Alternatives

The following nine criteria have been developed by the *US EPA* for the evaluation of cleanup alternatives.

1. Overall Protection of Human Health and the Environment: The alternative should ensure that there are no unacceptable risks to human health or the environment.

2. Compliance with *ARARs:* The alternative should meet all *Applicable or Relevant and Appropriate Requirements* (*ARARs*), which

include federal, state, and local environmental regulations, statutes, and requirements.

3. Long-Term Effectiveness and Permanence: The alternative should maintain reliable protection of human health and the environment over time.

4. Reduction of Toxicity, Mobility, or Volume: *CERCLA* contains a statutory preference that the selected alternative should use a treatment process to permanently reduce the level of toxicity of contaminants at a site, the spread of the contaminants away from the site, or the amount of contamination at the site.

5. Short-Term Effectiveness: The alternative should minimize the short-term hazards to site workers, residents, or the environment during the implementation of the cleanup.

6. Implementability: The alternative should be technically and administratively feasible, and the materials and services needed to implement the alternative should be readily available.

7. Cost: The alternative should provide the necessary protection at a reasonable cost. The cost of the selected alternative should be compared to its overall effectiveness to ensure cost-effectiveness.

8. State Acceptance: The preferred alternative should receive the approval of applicable state environmental agencies.

9. Community Acceptance: The preferred alternative should be acceptable to the community. Community acceptance is evaluated based on comments and suggestions received during the public meeting and public comment period.

Comparison of Alternatives

Table 1 (on page 16) summarizes the comparison of alternatives completed in the *Feasibility Study*. The *Feasibility Study* performed a detailed analysis and comparison for each alternative using the nine *US EPA* evaluation criteria. For simplification, **Table 1** compares each alternative against the criteria in general terms.

The Preferred Alternatives

The investigations and risk assessments completed at SSC have shown that estimated human health risks due to future potential exposures to sediment or surface water while swimming at SSC are within or below the ranges considered acceptable by *US EPA*. There are also no unacceptable risks to *ecological receptors*. However, human health risk estimates due to potential ingestion of native fish species caught at the SSC shoreline are slightly higher than the range considered acceptable by *US EPA*. The fish ingestion risks are associated with PCB-contaminated sediment at the Main Stormwater Outfall in Pegan Cove of Lake Cochituate.

While the SSC risks are similar to those calculated for *reference* locations on Fisk Pond, they are slightly greater than the acceptable *US EPA* risk levels. Therefore, the Army, with support from the *US EPA* and *MassDEP*, has identified Hot Spot Hydraulic Dredging, Geotextile Tube Dewatering, Off-Site Disposal, and Backfilling (Alternative 8) as the preferred cleanup alternative for SSC sediment at the Main Stormwater Outfall. The rationale for this selected alternative is further explained on page 15.

The Army has identified *No Action* as the preferred cleanup alternative for sediment at the SSC shoreline areas that are outside of Pegan Cove, including the T-25 and the Building 2/45 outfalls. This *No Action* recommendation is based on comprehensive investigations and risk assessments indicating that there is no unacceptable human health or ecological risk associated with sediment in these areas.

Alternative 8 involves the removal of localized "hot spot" areas of PCB-contaminated sediment associated with the Main Stormwater Outfall, and includes the following components:

- **Pre-Cleanup Survey** – A survey would be conducted to provide general characteristics of the lake bottom (bathymetry) and physical, chemical, and biological characteristics of the sediment prior to dredging. Additional sediment and surface water samples would be collected to establish baseline water conditions and to further refine the extent of sediment contamination.
- **Site Control Measures** - Site control measures would be implemented during the cleanup action, and include posting signs to limit boating in the dredging areas and prohibit fishing from and near the SSC shoreline. Signs would be installed along the Army's secured perimeter fence and maintained during the cleanup action. The Army would provide additional signs to the appropriate Commonwealth of Massachusetts agencies, if requested.
- **Silt Curtains –** A double silt curtain would be installed around the perimeter of each dredging area to minimize impacts to the lake system from possible resuspension of sediment during dredging.
- **Hydraulic Dredging** – A boat-mounted dredge would be used to remove the contaminated sediment from the lake bottom. Approximately 6 to 12 inches of sediment would be removed from four localized areas, as shown in **Figure 5**. The hydraulic dredge works by dislodging sediment with a cutterhead or auger, removing it by suction, and then pumping the water-sediment slurry through piping to an onshore dewatering facility.
- **Geotextile Tube Dewatering** – The removed sediment would be pumped into large geotextile tubes (as shown **Figure 6**), which are semi-permeable bags designed to retain solids while allowing water to pass through them. If necessary, the sediment slurry may be pretreated to remove debris (such as bark, vegetation, trash, rocks), may incorporate a *flocculent* (or thickener) to enhance the dewatering process, or may be amended with odor neutralizers.

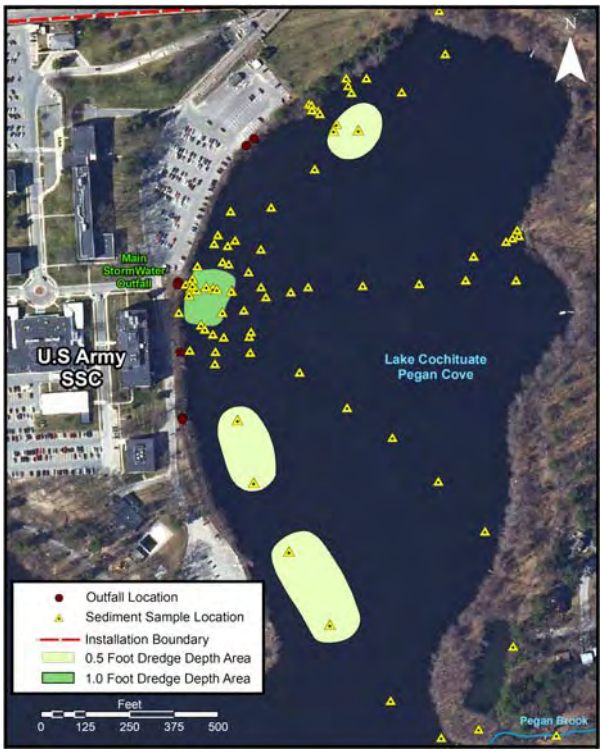

Figure 5: Proposed Hot Spot Dredging Locations

- **Water Treatment** – All water passing through the geotextile tubes would be contained and treated to remove PCBs and other contaminants. The water treatment would include a mixing basin, *flocculent* chamber, settling basin, and filters to remove solids and dissolved contaminants. Treated water would be tested to ensure it meets applicable criteria prior to its discharge back into Lake Cochituate. Based on the nature of the sediment, dewatering may take up to several weeks or months.

Figure 6: Geotextile Tube Dewatering

- **Off-Site Disposal –** Once the sediment is dewatered, the geotextile bag would be cut open and the sediment would be loaded onto trucks and shipped to a licensed off-site disposal or treatment facility. All sediment removal and disposal would comply with applicable federal, state, and local regulations for the storage, handling, and disposal of all PCB wastes.
- **Site Restoration and Backfilling** – Following sediment removal, clean fill consisting of silty sand would be backfilled into each sediment hot spot removal area to fill the voids produced from dredging. After each hot spot removal area has been backfilled, silt curtains would be removed, the dewatering area would be cleaned, and the banks of the shoreline would be restored, if necessary.
- **Cleanup Monitoring –** During the cleanup activities, a monitoring program including the sampling and analysis of lake water and treated discharge water would be performed to ensure that the lake water quality is not adversely impacted. If monitoring indicates that applicable discharge limits are exceeded, a contingency plan would be immediately implemented, such as temporarily shutting down dredging operations or the installation of alternative/ additional silt barriers. In addition, an air monitoring program would be conducted to ensure that potential air and odor impacts to workers, facility staff, and the community are prevented.

Why Was This Cleanup Plan Selected?

Alternative 8 - Hot Spot Hydraulic Dredging, Geotextile Tube Dewatering, Off-Site Disposal, and Backfilling was selected as the proposed cleanup plan for SSC sediment at the Main Stormwater Outfall because it would actively cleanup contaminated sediment, it would be protective of human health and the environment, and it would comply with all environmental laws and regulations. This alternative can be implemented easily since the technology is currently being used at similar sites.

Based on information currently available, the Army believes that the Alternative 8 provides the best balance of tradeoffs among the other alternatives with respect to the nine *CERCLA* criteria. This preferred alternative was selected over the other alternatives because the Army expects it to satisfy the statutory requirements in *CERCLA* Section 121(b) to: 1) be protective of human health and the environment; 2) comply with all *Applicable or Relevant and Appropriate Requirements* (*ARARs*); 3) be cost-effective; and 4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies, to the maximum extent practicable.

Alternative 1 – *No Action* was selected as the proposed cleanup plan for sediment at the SSC shoreline areas outside of Pegan Cove, including the T-25 and the Building 2/45 outfalls. Comprehensive investigations and risk analyses indicated that there are no unacceptable human health or ecological risks associated with sediment in these areas.

Table 1: Comparison of Cleanup Alternatives

Alternative	1	2	3	4	5	6	7	8	9
Evaluation Criteria	No Action	Limited Action/ Institutional Controls	Institutional Controls/ Environmental Monitoring	Clay Capping/ Monitoring/ Institutional Controls	Clay Capping/ Monitoring/ Institutional Controls	Mechanical Dredging/ Sediment Stabilization/ Off-Site Disposal/ Institutional Controls	Hydraulic Dredging/ Geotextile Tube Dewatering/ Off-Site Disposal/ Institutional Controls	Hot Spot Hydraulic Dredging/ Geotextile Tube Dewatering/ Off-Site Disposal/Backfilling	Hydraulic Dredging/ Mechanical Dewatering/Off-Site Disposal/ Institutional Controls
1. Overall Protection of Human Health and the Environment	○	●	●	●	●	●	●	●	●
2. Compliance with *ARARs*	●	●	●	●	●	●	●	●	●
3. Long-Term Effectiveness and Permanence	○	◖	◖	●	●	●	●	●	●
4. Reduction of Toxicity, Mobility, or Volume through Treatment	◖ *	◖ *	◖ *	◖	◖	●	●	●	●
5. Short-Term Effectiveness	●	●	●	●	●	◖	◖	◖	◖
6. Implementability	●	●	●	●	●	●	●	●	●
7. Capital Costs ($)	0	165,000	983,000	8,468,000	3,653,000	21,027,000	17,821,000	4,023,000	14,634,000
O&M Costs (PW) ($)	193,000	234,000	1,633,000	1,829,000	1,829,000	983,000	983,000	0	983,000
Total NPV ($)	193,000	399,000	2,616,000	10,297,000	5,482,000	22,010,000	18,804,000	4,023,000	15,617,000
8. State Acceptance	State acceptance will be evaluated after the public comment period.								
9. Community Acceptance	Community acceptance will be evaluated after the public comment period.								

Notes:

● Meets or exceeds criteria
◖ Partially meets criteria
○ Does not meet criteria
* Partially meets criteria due to natural reduction of chemical concentrations in sediment over time.
NPV Net Present Value
O&M Operation and Maintenance
PW Present Worth

Information in this table is taken from Section 6 of the *Final Sediment Feasibility Study, U.S. Army Soldier Systems Center (SSC), Natick, Massachusetts* (March 5, 2009).

Community Participation

Community input is an important part of the cleanup process for *NPL* sites. The public is encouraged to participate in the decision-making process. Comments provided by the public are valuable in helping the Army, *US EPA*, and *MassDEP* select the final cleanup approach for sediment at SSC.

The Army will accept written public comments on the *Proposed Plan* during a 30-day comment period from May 18, 2009 to June 16, 2009. Comment letters can be sent by mail, fax, or email and must be received or postmarked by June 16, 2009. The Army will also hold a Public Meeting on May 21, 2009 at 6:30 pm in the Lebowitz Meeting Hall, Morse Institute Public Library, followed by a Public Hearing from 7:00 pm until all comments are heard or provided in writing.

The Army, *US EPA*, and *MassDEP* will use these comments in determining the final decision about the sediment at the SSC that will be included in the cleanup plan, formally referred to as a *Record of Decision* (*ROD*). Answers to the public comments and concerns will be provided in the *Responsiveness Summary* portion of the *ROD* and will be made available to the public. Information about the Public Meeting and where to send your comments is provided on the front page of this *Proposed Plan*. You may use the last page of this *Proposed Plan* to submit written comments.

Information Repositories

Information repositories containing documents for public review are located at:

U.S. Army Natick Soldier Systems Center
Environmental and Health Office
55 Kansas Street
Natick, MA 01760
508 233-5550

Natick Board of Health
13 Central Street
Natick, MA 01760
508 647-6460

Morse Institute Library
Reference Section
14 East Central Street
Natick, MA 01760
508 647-6520

Information about the SSC facility from EPA may also be found at:

www.epa.gov/region1/superfund/sites/natticklab

Glossary

Applicable or Relevant and Appropriate Requirements (ARARs): Include federal, state, and local environmental regulations, statutes, and requirements.

Bioaccumulate: When a substance is taken up by a living organism from environmental sources such as sediment, water, air, or food. As the organism grows, it can accumulate increasing amounts of the substance from these sources because some substances are very slowly metabolized or excreted.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): A federal law passed in 1980 and amended in 1986 by the Superfund Amendments and Reauthorization Act (SARA). These laws are commonly referred to as the Superfund Program, which investigates and cleans up abandoned or uncontrolled hazardous waste sites. The Army's cleanup of sites regulated by CERCLA/SARA is funded by the Department of Army under the Defense Environmental Restoration Program.

Ecological Receptor: An ecological entity (i.e., plant or animal) potentially exposed to a contaminant.

Ecological Risk Assessment (ERA): A process that evaluates actual or potential impacts of contaminants on plants and animals.

Feasibility Study (FS): The feasibility study develops, screens, and evaluates alternative cleanup actions in detail.

Flocculent: A chemical which promotes the thickening or clumping of solids in water so they can be separated from the water.

Hazard Index (HI): The evaluation of non-cancer health effects is a comparison of the estimated daily chemical exposure levels at a site with the established *reference dose* for each chemical. The Hazard Index (HI) is computed by dividing the potential average daily dose, expressed in units of mass per unit of body weight per day (mg/kg-day) by the *reference dose*. If the HI is greater than one, unacceptable exposures may occur.

Human Health Risk Assessment (HHRA): A process that characterizes the potential current and future cancer risks and non-cancer health effects associated with exposure to chemicals at a site.

Information Repository: A public file containing site information, documents of on-site activities, and general information about a site.

Institutional Controls: Non-engineering methods intended to affect human activities in specific areas in such a way as to prevent or reduce exposure to hazardous substances (e.g., deed restrictions such as easements and covenants, deed notices, land use restrictions such as zoning and local permitting, ground-water use restrictions, and public health advisories).

Massachusetts Department of Conservation and Recreation (MassDCR): State agency with the responsibility for management of state parks, natural resources, and recreational resources, such as Lake Cochituate.

Massachusetts Department of Environmental Protection (MassDEP): State regulatory agency with oversight of hazardous waste site assessments and risk management decisions.

Media: Any substance that exists in the environment, such as sediment, surface water, groundwater, air, or soil.

National Priorities List (NPL): The US EPA's list of the nation's top priority hazardous waste sites.

No Action: The No Action option includes no controls for exposure and no long-term management measures. Because no cleanup activities would be implemented, long-term human health and environmental risks for the site essentially would be the same as those identified in the baseline risk assessment.

Operable Unit (OU): A site or sites being addressed collectively under the CERCLA process.

Proposed Plan: A non-technical document that presents the Preferred Alternative for a CERCLA site.

Record of Decision (ROD): A legal, technical, and public document that explains the rationale and ultimate cleanup decision for a site. It also summarizes the public's involvement in the cleanup decision.

Reference: Chemical concentrations in an environmental medium that have not been impacted by site-related sources.

Reference Dose: An estimate developed by US EPA of the amount of a chemical a person (including the most sensitive person) could be exposed to over a lifetime without developing adverse non-cancer health effects.

Remedial Investigation (RI): A step in the cleanup process that is completed to gather sufficient information to support selection of a cleanup approach to a site. The RI process characterizes the nature and extent of contamination at a site and determines whether the contamination presents a significant risk to human health or the environment.

Residual Risk: Ecological risk assessment term meaning the calculated risk to an ecological receptor at site-related locations minus the calculated risk at reference locations.

Responsiveness Summary: The Responsiveness Summary addresses comments received from the public. This document provides the lead agency with information about community preferences regarding both the cleanup alternatives and general comments about the site. It also demonstrates to members of the public how their comments were taken into account as an integral part of the decision-making process.

Sediment Cleanup Goal: The concentration of a contaminant in sediment that is protective of human health and the environment, based on potential exposures that may occur at a site.

Tier II Ecological Risk Assessment (ERA): A Tier II ERA is performed when a Tier I screening-level ERA indicates a potential for ecological risk to individual organisms. A Tier II ERA incorporates site-specific information including toxicity testing, the health of sediment-dwelling organisms, and the feeding habits of wildlife in the area. A Tier II ERA reduces data gaps and more clearly defines ecological risk.

Tier III Ecological Risk Assessment (ERA): A Tier III ERA is performed to evaluate risk to a higher level of the ecosystem, such as populations or communities. A Tier III ERA utilizes complex and/or long-term evaluation tools, including food chain models, to estimate the potential risk.

U.S. Environmental Protection Agency (US EPA): Federal agency that provides regulations and guidance for Superfund site assessments and selects Superfund site risk management decisions.

Watershed: The land area where rain or snowmelt drain into a body of water such as a lake, river, estuary, or ocean.

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We Welcome Your Comments

Your input on this *Proposed Plan* for sediment associated with the U.S. Army Natick SSC is important to the Army, *US EPA*, and *MassDEP*. Comments provided by the public are valuable in helping select the final cleanup approach for these sites.

For your convenience, you may use the space below to write your comments. Please remember that comments must be received or post-marked no later than June 16, 2009. Written comments can also be submitted at the Public Hearing to be held on May 21, 2009. Please send comments via mail, email, or fax to:

Mr. James Connolly
Environmental and Health Office
U.S. Army Garrison Natick
Kansas Street
Natick, MA 01760-5049
Email: James.B.Connolly@us.army.mil
Fax: 508 233-5393

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Please continue your comments on additional pages, as needed.

Comments provided by:

Your Name: _____

Address: _____

Fold on line, staple, stamp, and mail

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Mr. James Connolly
Environmental and Health Office
U.S. Army Garrison Natick
Kansas Street
Natick, MA 01760-5049