

**FINAL
EXPLANATION OF SIGNIFICANT DIFFERENCES
FOR THE
T-25 AREA GROUND WATER (OPERABLE UNIT 1)**

**CONTRACT NUMBER
W912CG-05-D-0007**



**U.S. ARMY NATICK SOLDIER SYSTEMS CENTER
NATICK, MASSACHUSETTS**

May 2013

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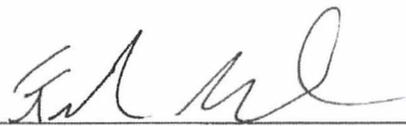
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I hereby certify that the enclosed Final Explanation of Significant Differences, shown and marked in this submittal, is that proposed to be incorporated with Contract Number W912CG-05-D-0007, Environmental Restorations Services, Soldier Systems Center, Natick, MA. This Explanation of Significant Differences is in compliance with the Contract requirements and specifications and is submitted for Government approval.

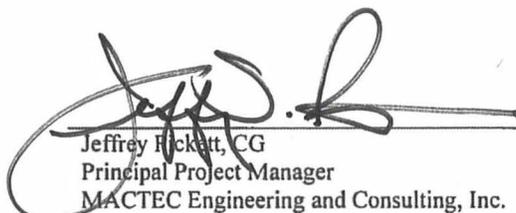
Reviewed and Approved by:



Fred Santos, PG, PMP
Project Manager
ECC

5/8/2013

Date



Jeffrey Hickett, CG
Principal Project Manager
MACTEC Engineering and Consulting, Inc.

5/8/2013

Date



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1.0 INTRODUCTION

This Explanation of Significant Differences (ESD) documents significant changes to portions of the remedy selected in the Record of Decision T-25 Area Ground Water (Operable Unit 1), U.S. Army Soldier Systems Center, Natick, Massachusetts. The Record of Decision was signed by the U.S. Department of the Army and the U.S. Environmental Protection Agency (USEPA) in September 2001.

Natick Soldier Systems Center (NSSC) is a Superfund site and was added to the USEPA National Priorities List (NPL) in May 1994. In August 2006, the U.S. Department of the Army and USEPA entered into a Federal Facility Agreement under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) relating to the remedial investigation and cleanup of hazardous substances, pollutants, or contaminants at NSSC.. The lead agency for sites at NSSC is the U.S. Department of the Army, and the support agency is the USEPA.

This ESD was prepared in accordance with Section 117(c) of the CERCLA (42 USC Section 9601 et seq.) and Section 300.435(c)(2)(i) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR 300), the Defense Environmental Restoration Program (DERP), applicable U.S. Army regulations, and "A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents" (USEPA, 1999). The statute and regulation require that the lead agency document changes made during a remedial action after adoption of a final remedial action plan when such action differs in any significant respect from the final plan. The lead agency is also required to consult with the support agency regarding the ESD and then make it available to the public. The CERCLIS ID number for the Site is MA1210020631.

This ESD will become part of the Administrative Record for the T-25 Area. The Administrative Record, which contains supporting documentation used to prepare this ESD, is available for public review at the following locations:

Environmental, Safety and Health Office
U.S. Army Soldier Systems Center
Kansas Street
Natick, Massachusetts 01760
(508) 233-5550

Morse Institute Library
14 East Central St.
Natick, MA 01760
(508) 647-6520
www.morseinstitute.org

Appendix A of this ESD contains an index to the Administrative Record.

The purpose of this ESD is to document the increase in flow to the T-25 Area Treatment Facility from the Buildings 22 and 36 Area, the Buildings 63, 2 and 45 Area, the MW114B-2 Area, and the ARIEM Building Area; as well as the removal of the air stripper from the treatment train, which is a significant change to the T-25 Area Groundwater remedy. This ESD also lowers the cleanup level for manganese contained in the Record of Decision to correspond to the USEPA Health Advisory Level, and adds a cleanup level for 1,4-dioxane based on Massachusetts Drinking Water Guidelines.

2.0 SITE HISTORY, CONTAMINATION, AND SELECTED REMEDY

The T-25 Area is one of several sites undergoing environmental cleanup at NSSC. The T-25 Area, so named because Building T-25 is located there, is a 15.6-acre rectangular area in the northwestern portion of NSSC (Figure 2-1). Most of the T-25 Area ground surface is covered by buildings or asphalt. The area is ringed by an unpaved road on an embankment approximately 10 feet above the base of the site. The embankment is topped by



a chain-linked fence. Open, uncovered areas include a baseball field for employee use and the unpaved perimeter road and embankment. The T-25 Area is bounded to the west, north, and east by residential properties; it is bounded to the south by the rest of NSSC. The T-25 Area is located approximately 2,500 feet southeast of the Town of Natick Springvale Municipal Water Supply Wells. A complete description of T-25 Area history and contamination can be found in the T-25 Phase II Remedial Investigation Report (Arthur D. Little, Inc., 1998).

2.1 T-25 AREA HISTORY

Present and past operations within the T-25 Area include the following: sand and gravel quarrying; indoor and outdoor storage of bulk items, wastes, petroleum, solvents, antifreeze, pesticides, and Freon 113; warehouse operations (shipping and receiving); laboratory research activities including the testing of petroleum, oil, and lubricant pumping equipment, refrigeration units, and various types of fuel in engines; clothing and textile research; drop-testing; waste incineration; and garage operations including spray painting, vehicle maintenance, insect and rodent control, metal parts and brush cleaning, battery charging, silk screening, and rubber adhesive thinning. Tetrachloroethene (PCE) and trichloroethene (TCE) have been used in the past for dry cleaning in the mobile dry cleaning machines in the T-25 Area.

2.2 T-25 AREA CONTAMINATION

The Record of Decision lists the volatile organic compounds (VOCs) PCE and TCE in groundwater as the primary chemicals of concern at the T-25 Area. The highest PCE and TCE concentrations have been found 30 to 65 feet below ground surface, above a clayey silt layer. PCE concentrations as great as 2,000 micrograms per liter ($\mu\text{g/L}$) and TCE concentrations as great as 1,100 $\mu\text{g/L}$ were measured in samples collected in the summer of 1994. TCE is more widespread than PCE, but is generally at lower concentrations. The contamination exists across most of the T-25 Area and extends off-installation at low concentrations. *cis*-1,2-Dichloroethene is also present to a much lesser degree. In the absence of remedial actions, contaminants within the T-25 Area would be expected to migrate slowly to the west-northwest with groundwater. A current, ongoing contaminant source has not been found, and contaminant concentrations are expected to decrease over time, due to mixing and dilution in the aquifer.

Secondary chemicals of concern listed in the Record of Decision consist of the metals chromium, lead, manganese, nickel, thallium, vanadium; the semivolatile organic compound bis(2-ethylhexyl)phthalate; and the pesticide DDT. While these secondary contaminants exceeded their regulatory drinking water standards, and/or caused some increases in site-related risks, it is unclear whether their presence is site-related. This uncertainty is due to questions about the sampling technique used during the investigation phases and/or whether the metals are present due to ambient conditions. These contaminants are monitored in accordance with the Long-term Monitoring Plan.

2.3 T-25 AREA SELECTED REMEDY

The selected remedy for the T-25 Area was Alternative 3: Groundwater Extraction with Air Stripping/Carbon Adsorption and Long-Term Monitoring, Institutional Controls, and Monitored Natural Attenuation. The groundwater extraction and treatment system contains T-25 Area groundwater contamination within NSSC boundaries and brings back off-installation contamination, while monitored natural attenuation will address on- and off-installation contamination not captured by the extraction and treatment system during its operation, as well as any contamination remaining after the system is shut off. Institutional controls enacted as required by the T-25 Record of Decision and contained in the NSSC Master Plan (R&K Engineering, Inc., 2004) prohibit potable use of T-25 Area groundwater, and Town of Natick Board of Health regulations prohibit potable water wells in



the area surrounding NSSC. Long-term monitoring and operations data are being used to assess whether the remedy continues to be effective. Institutional controls prohibit anyone from using the contaminated on- and off-installation groundwater. Extracted groundwater is treated by air stripping and activated carbon adsorption at a treatment facility constructed for that purpose at the T-25 area. Treated groundwater is delivered to a storage tank behind Building 10 that supplies the installation's non-potable water distribution system. Non-potable water is supplied to lawn sprinklers, cooling tower makeup, and restroom flushing water piping. Overflow from this system is discharged to the storm sewer system which discharges to Lake Cochituate. A detailed description of the selected remedy for the T-25 Area can be found in the Feasibility Study report (Arthur D. Little, 1999) and the Record of Decision signed in 2001. The T-25 Area groundwater extraction and treatment system has been in operation since November 1997.

3.0 BASIS FOR THIS DOCUMENT

This subsection presents a summary of the background and CERCLA elements that are the basis for this document.

The purpose of this ESD is to document the increase in flow to the T-25 Area Treatment Facility from the Buildings 22 and 36 Area, the Buildings 63, 2 and 45 Area, the MW114B-2 Area, and the ARIEM Building Area; as well as the removal of the air stripper from the treatment train, which is a significant change to the T-25 Area Groundwater remedy. This ESD also lowers the cleanup level for manganese contained in the Record of Decision to correspond to the USEPA Health Advisory Level, and adds a cleanup level for 1,4-dioxane based on Massachusetts Drinking Water Guidelines.

3.1 BACKGROUND

As part of ongoing environmental cleanup activities, NSSC has implemented a Groundwater Containment Pilot Study for contaminated groundwater at the Buildings 22 and 36 Area and the Buildings 63, 2, and 45 Area for the purpose of reducing migration of contaminated groundwater to Lake Cochituate. The Pilot Study containment system consists of groundwater extraction wells and pumps installed at each area and a buried force main. Extracted groundwater from the Buildings 22 and 36 Area and the Buildings 63, 2, and 45 Area is being pumped via a common force main to the T-25 Area treatment facility and combined with extracted groundwater from the T-25 Area for treatment and subsequent discharge (ECC and MACTEC, 2007). No changes to T-25 treatment processes are necessary to treat the additional PCE and TCE from the Buildings 22 and 36 Area and the Buildings 63, 2, and 45 Area. Some of the extraction wells and portions of the force main are located within the 100-foot wetland buffer zone at NSSC and are subject to Applicable or Relevant and Appropriate Requirements (ARARs) pertaining to protection of wetlands (Appendix B). Prior to beginning construction activities, these plans and specifications were made available to federal, state, and local agencies responsible for protection of wetlands for their review and comment, and requirements necessary for compliance were met.

The pilot groundwater extraction system began operation on August 22, 2007. The pilot containment system has been implemented in advance of the proposal of a preferred groundwater remedy. This ESD selects a final remedy for the Buildings 22 and 36 and Buildings 63, 2, and 45 Areas. Since the pilot containment system has been shown to be effective in shrinking the size of the plumes, and concentrations show a general decreasing trend, groundwater containment is intended to be part of the final remedy for these two sites. Operation is currently anticipated to continue until cleanup goals are reached or an alternate approach is implemented.

Buildings 22 and 36 are located in the southwestern portion of the facility adjacent to the Boiler Plant (Building 19) and the intersection of Turner Street with Wilkin Avenue (Figure 2-1). The primary site-related contaminant



at the Buildings 22 and 36 Area is PCE in groundwater. The PCE is present as a bi-lobed plume with its interpreted origin beneath Building 36 and one lobe migrating to the southeast and the other migrating to the west and northwest. Prior to the implementation of the Groundwater Containment Pilot Study, both lobes discharged to Lake Cochituate. The highest measured PCE concentration in the north lobe was 560 µg/L during direct-push groundwater characterization performed in 1998. The maximum observed concentrations of PCE in monitoring well samples at the Buildings 22 and 36 Area have been 230 µg/L in June 2002 and 300 µg/L in June 2001. Concentrations of PCE in monitoring well samples appear to be decreasing. Additional information pertaining to Buildings 22 and 36 history and contamination can be found in the Final Buildings 22 and 36 Remedial Investigation Report (Harding ESE, 2005), the Buildings 22 and 36 Feasibility Study Report (Harding ESE, 2008b), and in the quarterly/annual long-term monitoring reports prepared for NSSC.

Buildings 63, 2, and 45 are located several hundred feet east of Buildings 22 and 36, and south of Turner Street and the terminus of Wilkin Avenue. The primary site-related contaminant at the Buildings 63, 2, and 45 Area is TCE in groundwater. The majority of TCE exists as a plume with its interpreted origin in the vicinity of Buildings 2 and 45. The plume is migrating to the south and prior to the implementation of the Groundwater Containment Pilot Study is believed to have discharged to Lake Cochituate. The highest observed TCE concentration, as defined by direct-push groundwater characterization performed in 1997, was 140 µg/L. The maximum detected TCE concentration in monitoring well samples was 170 µg/L in September 2004, August 2005, and September 2006. Concentrations of TCE in monitoring well samples appear to be decreasing. Additional information pertaining to Buildings 63, 2, and 45 history and contamination can be found in the Buildings 63, 2, and 45 Site Investigation Report (Harding ESE, 2008a), and in the quarterly/annual long-term monitoring reports prepared for NSSC.

The extracted groundwater from the Buildings 22 and 36 Area and Buildings 63, 2, and 45 Area will increase the groundwater volume being treated at the T-25 Area Treatment Facility; however the volume will remain well within the capacity of the treatment facility. The capacity of the treatment facility is approximately 160 gallons per minute (gpm). In 2007, the average flow from the T-25 Area was 65 gpm, while the flow from the Buildings 22 and 36 and Buildings 63, 2, and 45 areas was approximately 15 gpm, resulting in a combined flow of 80 gpm. A wellhead treatment facility treats 1,4-dioxane in extracted Buildings 63, 2, and 45 Area groundwater prior to discharging that groundwater to the force main leading to the T-25 Area Treatment facility. A comparison of treatment costs presented in the Second Five-Year Review Report for NSSC (ECC and AMEC, 2012) indicates that the cost of treating the additional flow from the Buildings 22 and 36 Area and Buildings 63, 2, and 45 Area has been outweighed by recent optimization measures, and that operating costs have decreased over the last several years.

NSSC also plans to conduct periodic slug volume removal of contaminated groundwater from two interpreted localized areas outside of the capture zones for the extraction and treatment system for the T-25, Buildings 22 and 36, and Buildings 63, 2 and 45 Areas. These two localized areas are at the north end of the ARIEM Building [Building 42] at MW165B-2 and MW-181B-2; and at the east side of the parking lot east of Building 1 at MW114B-2. Since these two areas are outside of the capture zones of the extraction well system, the periodic slug volume removals will contain the contaminated groundwater. The slug volume removal system will consist of periodic pumping of the selected wells (MW165B-2, MW-181B-2 and MW114B-2) to remove a sufficient volume to prevent migration of contaminated groundwater into Pegan Cove. These slug volumes of groundwater will be transported to Building #94 where the water will be introduced to the treatment system.

The slug volumes of groundwater from the ARIEM Building Area will be approximately 960 gallons, equally divided between MW165B-2 and MW-181B-2, every 3 months, and from the MW114B-2 Area will be approximately 2,400 gallons every 3 months. These volumes will be fed into the T-25 Treatment Facility at



extremely low rates of flow (1 to 5 gpm) which will have a minor effect on the total treatment facility flow rate and will occur only a few times per year. The cost of treating this increase in volume, which is estimated to be approximately 0.03 percent of total treated flow, is not expected to be significant compared to current costs and original T-25 estimates.

The MW114B-2 Area is located directly east of Building 1. The associated parking lot runs adjacent to the shore of Pegan Cove for a distance of approximately 600 feet, is approximately 200 feet wide, and separates Building 1 from the cove. The primary contaminant in the small area surrounding MW114B-2 is PCE which has ranged in concentration between 54 µg/L in September 2006 and non-detect in May 2012. This small area of groundwater contamination is defined by contamination in only one well.

One additional well (MW-178B-2), out of a total of eleven new permanent wells installed for the MW114B-2 investigation, showed contamination exceeding the 5 µg/L cleanup goal for PCE. MW-178B-2 is located approximately 650 feet west of MW114B-2 and showed PCE contamination at 6.7 µg/L in October 2012. MW-178B-2 lies near the edge but inside of the predicted capture zone for the T-25 Area extraction wells MW-90B-4, MW-94B-4 and MW-95B-4. Extraction well MW-96B-4 will be restarted beginning early in 2013 and operated for a period of two years to evaluate its effect on reducing the contamination in MW-178B-2. If contamination is not reduced to below MCLs after the two years, slug volume removals from MW-178B-2 will be initiated similar to the slug removals planned for monitoring wells in the ARIEM Building Area and the MW114B-2 Area. Further information regarding groundwater conditions in the parking lot area can be found in the investigation report for the MW114B-2 area (ICF, 2009).

The ARIEM Building is located approximately 100 feet east of Building 2 on the east side of the peninsula along the shore of Pegan Cove. TCE has been found exceeding the MCL in a small triangular area north of the building. The maximum TCE concentration found was 23 µg/L in a monitoring well located 17 feet north of the building, and the area of groundwater contamination extends in a northerly and easterly direction toward Pegan Cove. The concentration of TCE in a monitoring well 40 feet from the shore of Pegan Cove has been found to be 10.3 µg/L. Further information regarding this contamination can be found in the ARIEM Building Investigation Report (ICF, 2012),

To promote the Army's Green and Sustainable policies, an analysis of the treatment plant processes was performed and revealed that groundwater treatment by liquid phase carbon alone is sufficient to remove the TCE/PCE concentrations to non-detectable concentrations. Therefore, in 2010 it was recommended that the air stripper be taken offline, which is anticipated to result in savings of electrical power consumption equal to 196,733 kilowatt-hours per year, an amount equivalent to 29 New England households or a reduction in annual emissions of 204,893 pounds of carbon dioxide, the primary global warming gas. The Green Initiative and its implications for reduced carbon emissions have been discussed with USEPA, Massachusetts Department of Environmental Protection (MassDEP), and the Restoration Advisory Board as of February 2012. The piping to bypass the air stripper has been constructed, and the bypass was in operation as of March 2012.

3.2 CERCLA ELEMENTS

Remedial investigations and feasibility studies were completed for both the Buildings 22 and 36 Area and the Buildings 63, 2, and 45 Area. Risks to human health and/or the environment were determined to exist as a result of existing contamination, and remedial alternatives were developed to address those risks. Consequently, it is appropriate and consistent with CERCLA to incorporate these areas into the decision document (i.e., Record of



Decision) previously developed for the T-25 Area groundwater. This will result in these areas being subject to five-year reviews to assess remedy protectiveness and as such is consistent with CERCLA and the NCP.

Groundwater containment will contribute to protection of human health and the environment by managing the migration of groundwater contaminants to Lake Cochituate. Groundwater flushing induced by the groundwater extraction may also reduce groundwater cleanup times compared to the no-extraction scenario.

The groundwater containment system has been designed and will be operated to comply with federal and state environmental and facility siting requirements that are applicable or relevant and appropriate to the proposed action. In addition, because these groundwater sources will be part of the T-25 Area Record of Decision, they will comply with applicable or relevant and appropriate requirements identified in the Record of Decision.

The long-term effectiveness of groundwater extraction and treatment will depend on the operation and maintenance of the extraction and treatment systems. Groundwater extraction will result in a permanent reduction in the mass of subsurface contaminants. The attainment of cleanup goals would be considered irreversible and permanent under this approach. Results of long-term environmental monitoring will be used to assess the effectiveness and permanence of the containment approach.

The containment system will reduce the potential for migration of groundwater contaminants to the lake, and regeneration of the activated carbon used at the T-25 treatment system will irreversibly destroy contaminants and thereby reduce their toxicity. If evaluated as part of a comprehensive CERCLA remedy, the proposed action would satisfy the statutory preference for treatment as a principal component of remedial action.

Construction activities associated with groundwater containment have not posed special risks to the community or to construction workers. The groundwater extraction and treatment system will require operation and maintenance by workers during the attainment period. Potential risks to workers include working around motorized machinery and potential to enter confined spaces (e.g., extraction well vaults and activated carbon contact tanks). Potential risks can be minimized by establishment of, and adherence to, safe-work practices. Operation of the treatment system does not require use or transport of materials that are likely to pose a hazard to the community. There are no short-term risks to the environment.

The key components of the proposed groundwater containment approach (i.e., groundwater characterization, groundwater extraction and treatment, and long-term monitoring) are routine environmental cleanup activities, and many qualified firms are available to implement them.

4.0 DESCRIPTION OF SIGNIFICANT DIFFERENCES

Significant differences between the remedy proposed in the Record of Decision and the actions now proposed consist of the following:

- Discharging an additional 15 gpm of extracted groundwater from the Buildings 22 and 36 Area and Buildings 63, 2, and 45 Area to the T-25 Area Treatment Facility for treatment.
- Periodically discharging slug volumes of 960 gallons and 2,400 gallons of extracted groundwater from the MW114B-2 Area and the ARIEM Building Area to the T-25 Area Treatment Facility for treatment.
- Removing the air stripper from the treatment train in the T-25 Treatment Facility as part of a Green and Sustainable Initiative.



- The extraction of groundwater from the Buildings 22 and 36 Area and Buildings 63, 2, and 45 Area required the installation of monitoring and extraction wells within the 100-foot wetland buffer zone, making these activities subject to the ARARS listed below and in Appendix B of this ESD:
 - Floodplain Management Executive Order 11988 [40 CFR Part 6, Appendix A]
 - Protection of Wetlands Executive Order 11990 [40 CFR Part 6, Appendix A]
 - Fish and Wildlife Coordination Act [16 USC 661 et seq.]
 - Massachusetts Wetland Protection Act Regulations [310 CMR 10.00]
 - Massachusetts Endangered Species Act Regulations [321 CMR 10.00]
- In May 2011, the MassDEP Office of Research and Standards issued a revised Drinking Water Guideline of 0.3 µg/L for 1,4-dioxane. This is To Be Considered guidance for the treatment of 1,4-dioxane (see Table B-2 in Appendix B).
- Based on the 2012 Five-Year Review, the Record of Decision cleanup level for manganese is reduced from 1700 µg/L to 300 µg/L to correspond to the USEPA Health Advisory Level. This is To Be Considered guidance for manganese (see Table B-2 in Appendix B).

5.0 SUPPORT AGENCY COMMENTS

The USEPA and MassDEP have reviewed this ESD and support the changes to the selected remedy for the T-25 Area. Appendix D contains a letter of concurrence from the MassDEP.

6.0 AFFIRMATION OF STATUTORY DETERMINATIONS

The selected remedy as modified in this ESD is protective of human health and the environment, complies with federal and state environmental and facility siting requirements that are applicable or relevant and appropriate to the remedial action, is cost effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. The remedy also satisfies the statutory preference for treatment as a principal element of the remedy.

7.0 PUBLIC PARTICIPATION COMPLIANCE

In accordance with the public participation requirements set out in the NCP at 40 CFR 300.435(c)(2)(i), NSSC published a notice of the intent to issue this ESD and a brief description of it in the MetroWest Daily News, a local newspaper, in May, 2013. A Restoration Advisory Board (RAB) meeting was scheduled on April 25, 2013 to present this ESD and accept input from the RAB. The ESD is scheduled to be issued to the public during the month of May 2013.

8.0 DECLARATION AND AUTHORIZING SIGNATURES

This section contains authorizing signatures for the U.S. Army Natick Soldier Systems Center and the U.S. Environmental Protection Agency, with concurrence by the Massachusetts Department of Environmental Protection.

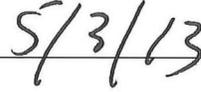


8.1 U.S. ARMY SOLDIER SYSTEMS CENTER AUTHORIZING SIGNATURE

For the foregoing reasons, the U.S. Army is issuing this Explanation of Significant Differences for the T-25 Area Ground Water (Operable Unit 1) at Soldier Systems Center, Natick, Massachusetts.

Concur and recommend for immediate implementation:

U.S. DEPARTMENT OF THE ARMY



By: FRANK K. SOBCHAK
LTC, SF
Commanding

Date



MACTEC

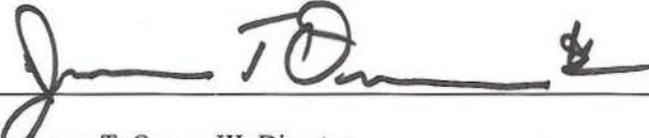


8.2 U.S. ENVIRONMENTAL PROTECTION AGENCY AUTHORIZING SIGNATURE

For the foregoing reasons, the U.S. Army is issuing this Explanation of Significant Differences for the T-25 Area Ground Water (Operable Unit 1) at Soldier Systems Center, Natick, Massachusetts.

Concur and recommend for immediate implementation:

U.S. ENVIRONMENTAL PROTECTION AGENCY



5.13.13

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

Date



ACRONYMS AND ABBREVIATIONS

ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CMR	Code of Massachusetts Regulations
DERP	Defense Environmental Restoration Program
ESD	Explanation of Significant Differences
gpm	gallons per minute
MassDEP	Massachusetts Department of Environmental Protection
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
PCE	tetrachloroethene
NSSC	U.S. Army Natick Soldier Systems Center
TCE	trichloroethene
µg/L	micrograms per liter
USC	United States Code
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound



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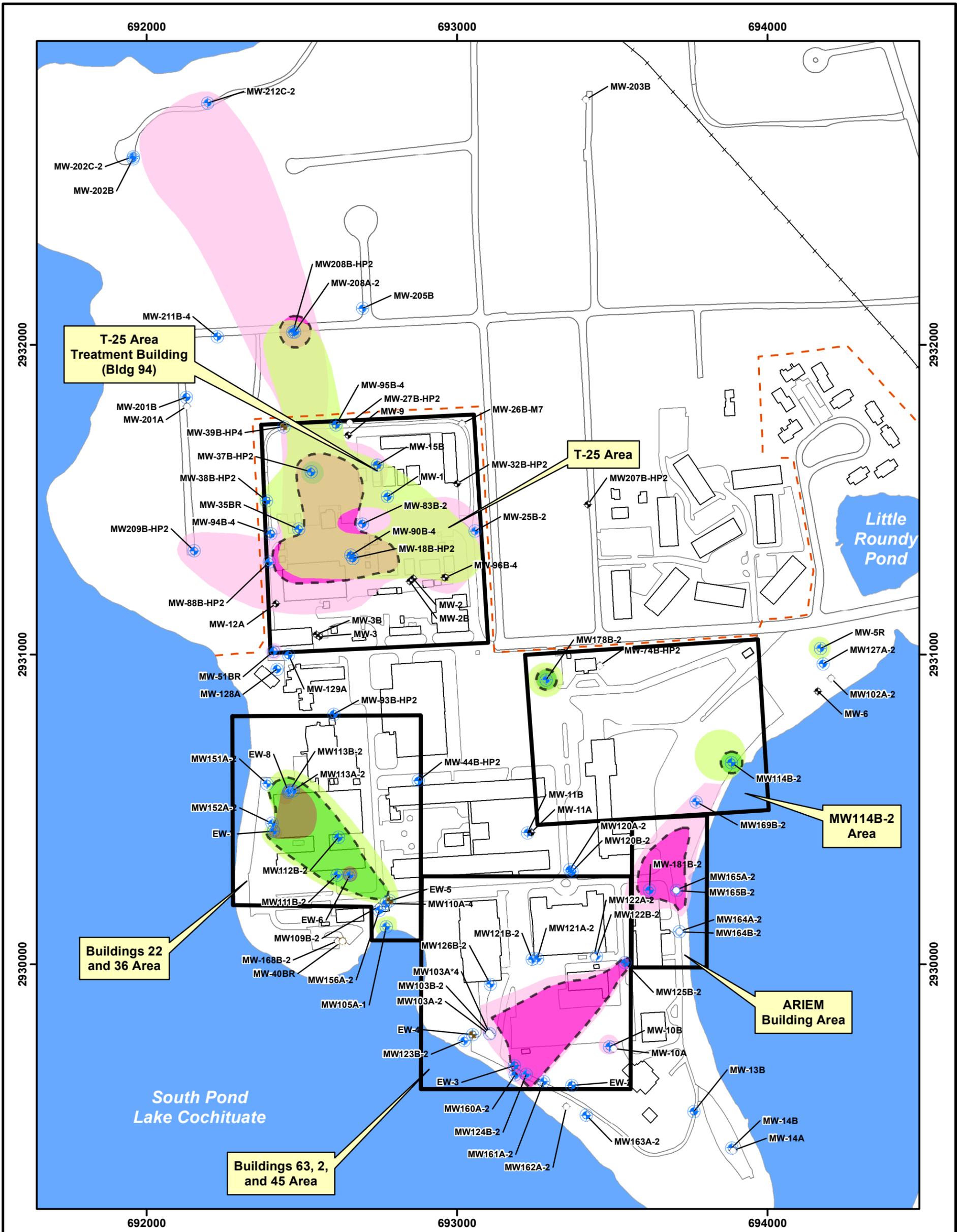
Record of Decision T-25 Area Ground Water (Operable Unit 1), U.S. Army Soldier Systems Center, Natick, Massachusetts. 2001.

USEPA, 1999. "A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents" EPA 540/R-98/031, OSWER 9200.1-23P, July.



FIGURES





Contract No.	W912CG-05-D-007			
Description	Distribution of TCE/PCE in Groundwater			
Coordinate system	NAD 1983, State Plane, Mass Mainland, in feet			
Sources	Boundaries, roads and buildings provided by MACTEC. 2008 aerial digital orthophotos provided by MassGIS.			
Date	8OCT2012	Rev.	Date	App. By
DB	C. Guido			
CB				
AB				



Legend

- Existing Extraction Well Location
- Monitoring Well Sampled for PCE and/or TCE
- Monitoring Well Not Sampled for PCE and TCE
- Installation Boundary
- USEPA MCL (ug/L)
- Area Boundary

PCE Concentration Contour

- 0.3-5 ug/L
- 5-25 ug/L
- > 25 ug/L

TCE Concentration Contour

- 0.3-5 ug/L
- 5-25 ug/L
- > 25 ug/L

Figure 2-1
Locations of T-25; Buildings 22 and 36; and Buildings 63, 2, and 45 Areas

Explanation of Significant Differences

U.S. Army Natick Soldier Systems Center
Natick, Massachusetts

ECC GIS Server
D:\OtherGIS\Natick\MapDocuments\ESD\ESD_Fig2-1_PCETCE.mxd

0 200 400 Feet

**APPENDIX A
Administrative Record Index**



Repository

DocID	Title	Author	Site	Status			
1	Analysis of Existing Facilities/Environmental Assessment Report, U.S. Army Natick Research and Development	Dames & Moore			11/1/1978		
2	Installation Assessment of U.S. Army Natick Research and Development Command, Report # 170	USATHAMA					
3	Phase II Petrix Gas Survey conducted at U.S. Army Natick Research, Development and Engineering Center	Northeast Research Institute					
4	Final Report Master Environmental Plan for the U.S. Army Natick Research, Development and Engineering	USAEC		Final			
5	Interim Remedial Action Study, Remedial Investigation/Feasibility Study (RI/FS) for T-25 Area at the U.S. Army Natick Research, Development, and	ADL	5		3/23/1993		
6	EPA Final Hazard Ranking System (HRS), U.S. Army Natick Research, Development and Engineering Center	USEPA			5/10/1993		
7	Draft Report, Assessment of Location-Specific Applicable or Relevant and Appropriate Requirements (ARARS) for the U.S. Army Natick Research, Development and	USAEC		Draft	6/15/1993		
8	Draft Feasibility Study Report, T-25 Area at the U.S. Army Natick Research, Development and Engineering Center	ADL	5	Draft			
9	Agency for Toxic Substances and Disease Registry, Department of Health and Human Services, Public Health Service Site Visit Summary for the U.S. Army Natick	ATSDR					
10	Draft Remedial Investigation (RI) Addendum T-25 Area and Water Supply Wells at the U.S. Army Natick	ADL	5	Draft			
11	Draft Geophysical Investigation, Natick Research and Development Engineering Center (NRDEC), Natick,	Weston		Draft			
12	Prepare Ground Water Model for Natick Research and Development and Engineering Center (NRDEC), Draft	ETA			3/10/1995		
13	Draft Work Plan Remedial Investigation/Feasibility Study (RI/FS) and Interim Remedial Alternatives (IRA) Study and Design for the T-25 Area at the U.S. Army Natick	ADL	5	Draft			
14	Draft Stepped Rate Aquifer Test Design, T-25 Area at the U.S. Army Soldier Systems Command (SSCOM), Natick,	ADL	5	Draft			
15	Final Health and Safety Plan, Remedial Investigation/Feasibility Study (RI/FS) for T-25 Area at U.S. Army Natick Research, Development and	ADL	5	Final			
16	Final Work Plan - Phase II Remedial Investigation (RI) for T-25 Area at the U.S. Army Soldier Systems Command	ADL	5	Final			

Repository

17	Final Quality Assurance Project Plan - Phase II Remedial Investigation (RI) for T-25 Area at the U.S. Army Soldier Systems Command (SSCOM) Natick, Massachusetts -	ADL	5	Final			
18	Final Quality Assurance Project Plan - Phase II Remedial Investigation (RI) for T-25 Area at the U.S. Army Soldier Systems Command (SSCOM) Natick, Massachusetts -	ADL	5	Final			
19	Final Quality Assurance Project Plan Remedial Investigation/Feasibility Study (RI/FS) and Interim Remedial Alternatives (IRA) Study and Design for T-25	ADL	5	Final			
20	Draft Final Community Relations Plan - U.S. Army Soldier Systems Command (SSCOM) Natick, Massachusetts	ADL		Draft			
21	Draft Final Letter Report Survey of Local Properties - Remedial Investigation/Feasibility Study (RI/FS) for T-25 Area at the U.S. Army Natick Research, Development	ADL	5	Draft			
22	Phase I Final Work Plan - Remedial Investigation/Feasibility Study (RI/FS) and Interim Remedial Alternatives (IRA) Study and Design for T-25	ADL	5				
23	Final Phase I Remedial Investigation (RI) Report Volume I of III Sections 1.0 through 8.0 - T-25 Area at the U.S. Army Natick Research, Development and Engineering	ADL	5	Final			
24	Final Phase I Remedial Investigation (RI) Report Volume II of III Appendices - T-25 Area at the U.S. Army Natick Research, Development and Engineering Center	ADL	5	Final			
25	Final Phase I Remedial Investigation (RI) Report Volume III of III Appendices - T-25 Area at the U.S. Army Natick Research, Development and Engineering Center	ADL	5	Final			
26	Draft Final Quarterly Ground Water Monitoring Report (Summer and Fall 1995) - T-25 Area, Water Supply Well Area, and Former Proposed Gymnasium Area at the U.S.	ADL	5	Draft			
27	DRAFT Action Memorandum Storage Area, U.S. Army Soldier Systems Command (SSCOM) Natick,	ADL	15	Draft	11/1/1996		
28	Draft Quarterly Ground Water Monitoring Report (Winter 1996 and Spring 1996) - T-25 Area, Water Supply Well Area, and Former Proposed Gymnasium Area, and Boiler Plant Area at the U.S. Army Soldier Systems Command	ADL		Draft	12/1/1996		
29	Phase II Field Investigation Data, Remedial Investigation (RI) of the T-25 Area at the U.S. Army Soldier Systems	ABB ES	5				
30	Draft Quality Assurance Project Plan-Addendum, Sections 1.0 - 15.0, U.S. Army Soldier Systems	ABB ES		Draft			

Repository

31	Draft Health and Safety Plan-Addendum Former Proposed Gymnasium Site, SSCOM Water Supply Wells	ABB ES	6	Draft			
32	Draft Final Work Plan, Former Proposed Gymnasium Site, SSCOM Water Supply Wells Remedial Investigation	ABB ES	6	Draft			
33	Final Report Ground Water Model for Soldier Systems Command (SSCOM), Natick, Massachusetts	ETA		Final			
34	Draft Quarterly Ground Water Monitoring Report (Summer 1996, Fall 1996 and Winter 1996\1997) - T-25 Area, Water Supply Well Area, and Former Proposed Gymnasium Area, and Boiler Plant Area at the U.S. Army	ADL		Draft			
35	Agency for Toxic Substance and Disease Registry Public Health Assessment for Natick Laboratory Army Research a/k/a U.S. Army Soldier Systems Command (SSCOM),	ATSDR					
36	Final Site Safety and Health Plan for Storage Area Removal Action T-25 Area, U.S. Army Soldier Systems	Weston	5	Final			
37	Final Removal Action Work Plan for Storage Area Removal Action T-25 Area, U.S. Army Soldier Systems	Weston	5	Final			
38	Final Treatability Study Work Plan - T-25 Area at the U.S. Army Soldier Systems Command (SSCOM), Natick,	ADL	5	Final	10/15/1997		
39	Final Work Plan Former Proposed Gymnasium Site, Soldier Systems Command (SSCOM) Water Supply	ABB ES	6	Final	12/1/1997		
40	Draft Final Quarterly Groundwater Sampling Report Event 14 (July 1997) at the U.S. Army Soldier Systems	ABB ES	5	Draft			
41	Public Health Assessment for the U.S. Army Soldier Systems Command (SSCOM), Natick, Massachusetts	ATSDR					
42	Health Consultation for the U.S. Army Soldier Systems Command (SSCOM), Natick, Massachusetts	ATSDR					
43	Draft Technical Work Plan, Groundwater Modeling at the U.S. Army Soldier Systems Command (SSCOM), Natick,	Hydro Geologic	5	Draft			
44	Draft Final Quarterly Groundwater Sampling Report Event 15 (January 1997) at the U.S. Army Soldier Systems	ABB ES	5	Draft			
45	Draft Work Plan for Site Investigation for Boiler Plant, Former Hazardous Materials Storage Building, Former Piggery, and Building T-23, U.S. Army Environmental	HLA	14	Draft			
46	Storm Water Sampling Report, Contract No. DAAK60-97-P-4847, prepared for Soldier Systems Command	Scilab					
47	Draft Final Work Plan for Site Investigation for Boiler Plant, Former Hazardous Materials Storage Building, Former Piggery, and Building T-23, U.S. Army Soldier	HLA	14	Draft			

Repository

48	Draft Final Quarterly Groundwater Sampling Report Event 16 (April 1998) at the U.S. Army Soldier Systems Center	HLA	5	Draft	10/1/1998		
49	Tier II Ecological Risk Assessment Work Plan, T-25 Area at the U.S. Army Soldier Systems Center (SSC), Natick,	ADL	5		11/1/1998		
50	Draft Addendum to Quality Assurance Project Plan, Tier II Ecological Risk Assessment and Treatability Study Operation and Maintenance for T-25 Area at the U.S.	ADL	5	Draft	11/1/1998		
51	Final Phase II Remedial Investigation (RI) Report Volume I sections 1.0 through 4.0 - T-25 Area at the U.S. Army	ADL	5	Final	12/1/1998		
52	Final Phase II Remedial Investigation (RI) Report Volume II sections 5.0 through 9.0 - T-25 Area at the U.S. Army	ADL	5	Final	12/1/1998		
53	Draft Remedial Investigation Report (RI), Former Proposed Gymnasium Site, Data Item A013, Volume I of	HLA	6	Draft			
54	Draft Remedial Investigation Report (RI), Former Proposed Gymnasium Site, Data Item A013, Volume II of	HLA	6	Draft			
55	Final Removal Action Report, Storage Area Removal Action T-25 Area at the U.S. Army Soldier Systems	Weston	5	Final			
56	Draft Final Quarterly Groundwater Sampling Report Event 17 (August 1998) U.S. Army Soldier Systems Center	HLA		Draft			
57	Draft Remedial Investigation (RI) Report Soldier Systems Center (SSC) Water Supply Wells Site, Volume I of II:	HLA	11	Draft			
58	Draft Remedial Investigation (RI) Report Soldier Systems Center (SSC) Water Supply Wells Site, Volume II of II:	HLA	11	Draft			
59	Draft Final Quarterly Groundwater Sampling Report Event 18 (December 1998) U.S. Army Soldier Systems Center	HLA		Draft			
60	Draft Final Quarterly Groundwater Sampling Report Event 19 (March 1999) U.S. Army Soldier Systems Center	HLA		Draft			
61	Final Focused Feasibility Study/Treatability Study, T-25 Area at the U.S. Army Soldier Systems Center (SSC),	ADL	5	Final			
62	Transcript of Public Hearing, Re: U.S. Army Soldier Systems Center (SSC), Natick, Massachusetts Proposed	ADL	5		9/23/1999		
63	Tier II Ecological Risk Assessment Work Plan, Main Storm water Outfall (MSO) Area, U.S. Army Soldier	ADL			10/1/1999		
64	Draft Final Quarterly Groundwater Sampling Report Event 20 (July 1999) U.S. Army Soldier Systems Center (SSC),	ADL		Draft			
65	1999 Storm Water Sampling Report; U.S. Army Soldier Systems Center (SSC), Natick, Massachusetts	ADL		Final			
66	Working Draft, Interim Technical Memorandum, T-25 Area Storm water Outfall, Tier II Ecological Risk	ADL	5				

Repository

67	Draft Preliminary Phase II Site Investigation Report, Boiler Plant Site, Soldier Systems Center (SSC), Natick,	HLA	14	Draft			
68	Draft, Quarterly Groundwater Monitoring Report Event 21 (October 1999), Soldier Systems Center (SSC), Natick,	HLA		Draft			
69	Draft, T-25 Area Tier II Ecological Risk Assessment Report for the U.S. Army Soldier Systems Center (SSC),	ADL	5	Draft			
70	Draft Technical Memorandum, Building 22, Soldier Systems Center (SSC), Natick, Massachusetts	HLA	16	Draft			
71	Draft Work Plan, Building 22 Remedial Investigation (RI), Soldier Systems Center (SSC), Natick, Massachusetts	HLA	16	Draft			
72	Water Resources Investigation Report, Pond-Aquifer Interaction at South Pond of Lake Cochituate, Natick, Massachusetts, prepared in cooperation with the U.S.	USGS					
73	Draft Final, Revised Quality Assurance Project Plan, Soldier Systems Center (SSC), Natick, Massachusetts,	HLA		Draft			
74	Draft, Final Revised Quality Assurance Project Plan, Soldier Systems Center (SSC), Natick, Massachusetts, Volume II Appendix H Laboratory Quality Assurance Plan	HLA		Draft			
75	Draft, Final Revised Quality Assurance Project Plan, Soldier Systems Center (SSC), Natick, Massachusetts, Volume III Appendix I Laboratory Quality Assurance Plan	HLA		Draft			
76	Draft Final, Quarterly Groundwater Monitoring Report Event 26 (June 2001), Soldier Systems Center (SSC),	Harding ESE		Draft			
77	Draft Final Quarterly Groundwater Monitoring Report, Event 22 (January 2000) U.S. Army Soldier Systems	Harding ESE		Draft			
78	Draft Final Quarterly Groundwater Monitoring Report, Event 23 (May 2000), Soldier Systems Center (SSC),	Harding ESE		Draft			
79	Record of Decision, T-25 Area Ground Water (Operable Unit 1), U.S. Army Soldier Systems Center (SSC), Natick,	ADL	5				
80	Draft Report Groundwater Flow and Transport Modeling Results for the T-25 Area at Soldier Systems Center	Hydro Geologic	5	Draft			
81	Draft Tier III Ecological Risk Assessment Work Plan, U.S. Army Soldier Systems Center (SSC), Natick,	ADL		Draft			
82	Draft Quality Assurance Project Plan Addendum, Tier III Ecological Risk Assessment, U.S. Army Soldier Systems	ADL		Draft			
83	Draft Letter Report Historic Outfalls, U.S. Army Soldier Systems Center (SSC), Natick, Massachusetts	ADL		Draft			
84	Draft Main Storm Water Outfall (MSO) Tier II Ecological Risk Assessment Report for the U.S. Army Soldier	ADL		Draft			
85	Draft Feasibility Study (FS) Report, Former Proposed	Harding ESE	6	Draft			

Repository

86	Draft Final Remedial Investigation (RI) Report, Soldier Systems Center (SSC) Water Supply Wells Site, Volume	Harding ESE	11	Draft			
87	Draft Final Remedial Investigation (RI) Report, Soldier Systems Center (SSC) Water Supply Wells Site, Volume	Harding ESE	11	Draft			
88	Final Work Plan, Buildings 22 and 36 Remedial Investigation (RI), Soldier Systems Center (SSC), Natick,	Harding ESE	16	Final			
89	Final Revised Quality Assurance Project Plan, U.S. Army Soldier Systems Center (SSC), Natick, Massachusetts, Volume I, Sections 1.0-14.0 and Appendices A through G	Harding ESE		Final			
90	Draft Quarterly Groundwater Monitoring Report, Event 24 (October 2000), Soldier Systems Center (SSC)	Harding ESE		Draft			
91	Draft Final Quarterly Groundwater Monitoring Report, Event 24 (October 2000), Soldier Systems Center (SSC)	Harding ESE		Draft			
92	NPDES Permit Exclusion - Chemical Data, July 1, 2001 to September 30, 2001, U.S. Army Soldier Systems	ADL			10/1/2001		
93	Draft Storm Water Sampling Report, U.S. Army Soldier Systems Center (SSC), Natick, Massachusetts	ADL		Draft	10/1/2001		
94	Final, T-25 Area Tier II Ecological Risk Assessment Report, U.S. Army Soldier Systems Center (SSC), Natick,	ADL	5	Final	12/1/2001		
95	Final Report, Development and Application of a Calibrated Ground Water Flow and Transport Model for the T-25 Area at Soldier Systems Center (SSC), Natick,	Hydro Geologic	5	Final			
96	Draft Final, Quarterly Groundwater Monitoring Report, Event 25 (March 2001), Soldier Systems Center (SSC),	Harding ESE		Draft			
97	Draft Revised Risk Assessment Approach Technical Memorandum, Soldier Systems Center (SSC), Natick,	Harding ESE	1017	Draft			
98	Draft Final Quarterly Groundwater Monitoring Report, Event 27 (August 2001), Soldier Systems Center (SSC),	Harding ESE		Draft			
99	Letter Report titled Natick Tier III Fish Data - Human Health Screening Comparisons prepared by ICF	ADL	1017		7/18/2002		
100	Interim Technical Memorandum, Tier III Ecological Risk Assessment, U.S. Army Soldier Systems Center (SSC)	ICF Consulting, Inc.					
101	Final Draft, Storm water Sampling Report 2001 Sampling Event, U.S. Army Soldier Systems Center (SSC), Natick,	ICF Consulting, Inc.		Final			
102	Final Tier III Ecological Risk Assessment Work Plan, U.S. Army Soldier Systems Center (SSC), Natick,	ICF Consulting, Inc.		Final			
103	Final Quality Assurance Project Plan Addendum, Tier III Ecological Risk Assessment, U.S. Army Soldier Systems	ICF Consulting, Inc.		Final			
104	Final Letter Report, Historic Outfalls, U.S. Army Soldier Systems Center (SSC), Natick, Massachusetts August	ICF Consulting, Inc.		Final			

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105	Final Main Stormwater Outfall (MSO), Tier II Ecological Risk Assessment Report for the U.S. Army Soldier	ICF Consulting, Inc.	10	Final			
106	Draft, Quality Assurance Project Plan Addendum - Building 14 and Former Building 13 Site Investigation/Remedial Investigation and Feasibility	ICF Consulting, Inc.	912	Draft			
107	Draft Work Plan, Building 14 and Former Building 13 Site Investigation/Remedial Investigation and Feasibility Study	ICF Consulting, Inc.	912	Draft			
108	Draft Remedial Investigation Report, Buildings 22 and 36, Soldier Systems Center (SSC), Natick, Massachusetts, Volume I of II, Text, Figures, and Tables November 2002	Harding ESE	16	Draft	11/1/2002		
109	Draft Remedial Investigation Report, Buildings 22 and 36, Soldier Systems Center (SSC), Natick, Massachusetts,	Harding ESE	16	Draft	11/1/2002		
110	Final, Stormwater Sampling Report - 2001 Sampling Event, U.S. Army Soldier Systems Center (SSC), Natick,	ICF Consulting, Inc.		Final	11/1/2002		
111	Draft Final, Quarterly Groundwater Monitoring Report, Event 29 (March 2002), Soldier Systems Center (SSC),	ICF Consulting, Inc.	5	Draft	12/1/2002		
112	Augmentation of the Ground-Water Monitoring Well Network in the Vicinity of the T-25 Area, U.S. Army	ICF Consulting, Inc.	5				
113	Draft Final Quarterly Groundwater Sampling Report Event 28 (December 2001) U.S. Army Soldier Systems Center	Harding ESE	5	Draft	8/13/2002		
114	Quality Assurance Project Plan Addendum Building 14 and Former Building 13 Site Investigation/Remedial Investigation and Feasibility Study, U.S. Army Soldier	ICF Consulting, Inc.	9	Final			
115	Work Plan Building 14 and Former Building 13 Site Investigation/Remedial Investigation and Feasibility Study	ICF Consulting, Inc.	12	Final	3/21/2003		
116	Draft Work Plan Buildings 2 and 45 Site Investigation Soldier Systems Center, Natick, Massachusetts	Harding ESE	17	Draft			
117	NPDES Permit Exclusion - Chemical Data January 1,	ICF Consulting, Inc.		Final	4/15/2003		
118	Draft Final Quarterly Groundwater Sampling Report Event 30 (June 2002) U.S. Army Soldier Systems Center	Harding ESE	5	Draft			
119	Draft Final Remedial Investigation Report Buildings 22 and 36, U.S. Army Soldier Systems Center Natick,	Harding ESE	16	Draft	6/20/2003		
120	Draft Final Remedial Investigation Report Buildings 22 and 36, U.S. Army Soldier Systems Center Natick,	Harding ESE	16	Draft	6/20/2003		
121	NPDES Permit Exclusion - Chemical Data April 1, 2003 to	ICF Consulting, Inc.	0	Final	7/18/2003		
122	Tier III Deterministic Ecological Risk Assessment Report	ICF Consulting, Inc.	7	Final	3/23/2004		
123	Draft Final Quarterly Groundwater Sampling Report Event 31 (September 2002) U.S. Army Soldier Systems Center	Harding ESE	0	Draft	8/18/2003		
124	Draft Final Quarterly Groundwater Sampling Report Event 32 (December 2002) U.S. Army Soldier Systems Center	Harding ESE	0	Draft	8/18/2003		

Repository

125	Method 2 Risk Characterization and Class A-2 Response	Harding ESE	14	Final		
126	Final Phase II Site Investigation Report, Volume I - Boiler	Harding ESE	14	Final		
127	Final Phase II Site Investigation Report, Volume II	Harding ESE	14	Final		
128	Final Work Plan Building 2 & 45 Site Investigation U.S. Army Soldier Systems Center Natick, Massachusetts	Harding ESE	11	Final		
129	Draft Final Quarterly Groundwater Sampling Report Event	Harding ESE	0	Draft	1/12/2004	
130	Draft Final Site Investigation Work Plan, Buildings 62 &	Harding ESE	3	Draft	1/20/2004	
131	Draft Final Quarterly Groundwater Sampling Report Event	Harding ESE	0	Draft	2/20/2004	
132	NPDES Permit Exclusion Chemical Data October 1 2003-	ICF Consulting, Inc.	0	Final	2/24/2004	
133	New Long-Term Monitoring Well Letter Report T-25 Area U.S. Army Soldier Systems Center Natick,	ICF Consulting, Inc.	5	Final	2/23/2004	
134	Long-Term Monitoring Plan T-25 Area (OU-1) Ground Water Treatment System U.S. Army Soldier Systems	ICF Consulting, Inc.	5	Final	3/23/2004	
135	Draft Site Investigation Report, Building 14 and Former Building 13, U.S. Army Soldier Systems Center (SSC)	ICF Consulting, Inc.	9	Draft	3/26/2004	
136	New Extraction Well Letter Report T-25 Area U.S. Army Soldier Systems Center Natick, Massachusetts	ICF Consulting, Inc.	5	Final	4/22/2004	
137	T-25 Area (OU-1) Ground Water Treatment System Operation and Maintenance Manual Volume 1 of 2	ICF Consulting, Inc.	5	Final		
138	T-25 Area (OU-1) Ground Water Treatment System Operation and Maintenance Manual Volume 2 of 2	ICF Consulting, Inc.	5	Final		
139	Draft Buildings 22 & 36 Feasibility Study Work Plan	Harding ESE	16	Draft		
140	Draft Final Quarterly Groundwater Sampling Report Event	Harding ESE	5	Draft	7/22/2004	
141	Draft Final Quarterly Groundwater Sampling Report Event	Harding ESE	5	Draft	8/20/2004	
142	Final Letter Work Plan, Additional HHRA and ERA Activities to Support Sediment Risk Management at the	ICF Consulting, Inc.	0	Final	8/23/2004	
143	Final Work Plan Addendum - Building 14 and Former	ICF Consulting, Inc.	912	Final	9/27/2004	
144	Building 14 and Former Building 13 Site Investigation	ICF Consulting, Inc.	912	Final	9/30/2004	
145	Draft T-25 Area Groundwater Treatment System January - June 2004 Semi Annual Report	ICF Consulting, Inc.	5	Draft	10/7/2004	
146	Draft Buildings 22 & 36 Feasibility Study Report	Harding ESE	11	Draft	10/22/2004	
147	Draft Quarterly Assurance Project Plan Addendum	ICF Consulting, Inc.	5	Draft	11/19/2004	
148	Draft Final Quarterly Groundwater Sampling Report Event	Harding ESE	5	Draft	11/23/2004	
149	Safety and Health Plan	ICF Consulting, Inc.	5	Draft	11/24/2004	
150	Draft Final Sediment Risk Management Technical Memorandum: Additional Assessment Activities to Support Sediment Risk Management at the U. S. Army	ICF Consulting, Inc.	7	Draft	12/9/2004	
151	Draft Study Area 2 Record Review Memorandum	Harding ESE	4	Draft	2/21/2005	
152	Final Quality Assurance Project Plan Addendum, Quarterly Groundwater Monitoring Program - U.S. Army	ICF Consulting, Inc.	5	Final		

Repository

153	Draft Buildings 62 and 68 Removal Action Work Plan	Harding ESE	313	Draft			
154	Application of an Updated Regional Groundwater Flow Model and an Updated T-25 Area Transport Model	ICF Consulting, Inc.	5	Final			
155	Numerical Simulations of Remedial Alternatives for the PCE Plume Near Buildings 36 and 22	ICF Consulting, Inc.	5	Final			
156	Draft Final Quarterly Groundwater Sampling Report Event	Harding ESE	5	Draft	2/17/2005		
157	Final Record Review Memorandum SA2 Waste Oil Underground Storage Tank, SSC Natick, MA	Harding ESE	4	Final			
158	U.S. Army Natick Laboratories The Science Behind the	Arcadia Publishing	0	Final	4/27/2005		
159	Final Removal Action Closure Report Soil Excavation and Off-Site Treatment/Disposal at the Former Proposed	Nobis Engineering, Inc.	6	Final	5/30/2003		
160	T-25 Area Ground Water Treatment System Semi-Annual Report January through June 2004 U.S. Army Soldier	ICF Consulting, Inc.	5	Final			
161	T-25 Area Ground Water Treatment System 2003 Annual Report U.S. Army Soldier Systems Center (SSC) Natick,	ICF Consulting, Inc.	5	Final	4/13/2005		
162	Draft Final Quarterly Groundwater Monitoring Report Event 39 (September 2004) Soldier Systems Center	Harding ESE, Inc.	5	Draft			
163	Draft Final Quarterly Groundwater Monitoring Report Event 40 (December 2004) U.S. Army Soldier Systems	ICF Consulting, Inc.	5	Draft	5/27/2005		
164	Final Action Memorandum Building 62 and 68 Soldier	MACTEC Engineering and Consulting, Inc.	313	Final			
165	Draft Site Investigation Report Building 63, 2, and 45 U.S. Army Soldier Systems Center Natick, MA (2 Volumes)	Harding ESE, Inc.	11	Draft	6/23/2005		
166	Final Site Investigation Report Addendum Building 14 and Former Building 13 U.S. Army Soldier Systems Center	ICF Consulting, Inc.	912	Final	7/27/2005		
167	Final Remedial Investigation Report Buildings 22 and 36 Soldier Systems Center Natick, MA (3 Volumes)	Harding ESE, Inc	16	Final			
168	Draft Final Quarterly Groundwater Monitoring Report Event 41 (April 2005) U.S. Army Soldier Systems Center	ICF Consulting, Inc.	5	Draft	9/21/2005		
169	Final Action Memorandum Building 14 and Former Building 13 U.S. Army Soldier Systems Center (SSC)	ICF Consulting, Inc.	912	Final	9/27/2005		
170	Draft Final Quarterly Groundwater Monitoring Report Event 42 (August 2005) U.S. Army Soldier Systems	ICF Consulting, Inc.	5	Draft	12/9/2005		
171	Final Removal Action Completion Report Buildings 62 and 68 Soldier Systems Center Natick, MA	MACTEC Engineering and Consulting, Inc.	313	Final			
172	T-25 Area Ground Water Treatment System 2004 Annual Report U.S. Army Soldier Systems Center (SSC) Natick,	ICF Consulting, Inc.	5	Final			
173	Final T-25 Area Ground Water Treatment System Semi-Annual Report January through June 2005 U.S. Army	ICF Consulting, Inc.	5	Final	3/21/2006		
174	Final Work Plan for First Five-Year Review U.S. Army Soldier Systems Center (SSC) Natick, MA	ICF Consulting, Inc.	0	Final	3/15/2006		

Repository

175	Final Work Plan Ground Water Remedial Optimization Study at the T-25 Area U.S. Army Soldier Systems Center	ICF Consulting, Inc.	5	Final			
176	Final Remedial Investigation Report Former Proposed Gymnasium Site Data Item A013 Volume I of II Text,	MACTEC Engineering	6	Final	12/15/2006		
177	Final Remedial Investigation Report Former Proposed Gymnasium Site Data Item A013 Volume II of II	MACTEC Engineering	6	Final	12/15/2006		
178	Draft Final Remedial Investigation Report Former Proposed Gymnasium Site Data Item A013 Volume I of II	MACTEC Engineering	6	Draft			
179	Draft Final Remedial Investigation Report Former Proposed Gymnasium Site Data Item A013 Volume II of II	MACTEC Engineering	6	Draft			
180	Final Buildings 22 and 36 Feasibility Study Report	Harding ESE	16	Final			
181	Final Site Investigation Report Building 63, 2, and 45 US Army Soldier Systems Center Natick, MA Volume I of II	Harding ESE	11	Final	6/25/2008		
182	Final Site Investigation Report Building 63, 2, and 45 US Army Soldier Systems Center Natick, MA Volume II of II	Harding ESE	11	Final	6/25/2008		
183	Final Supplemental Remedial Investigation Report	MACTEC Engineering	6	Final	12/1/2006		
184	Final Pilot Study Work Plan Groundwater Containment at Building 22 and 36 and Buildings 63, 2, and 45	ECC	16	Final	1/18/2007		
185	Draft Final Supplemental Remedial Investigation Report Former Proposed Gymnasium Site	MACTEC Engineering	6	Draft			
186	Draft Pilot Study Work Plan Groundwater Containment at Buildings 22 and 36 and Buildings 63,2, and 45	ECC	16	Draft	4/20/2006		
187	Draft Final Explanation of Significant Differences for the T-25 Area Groundwater (Operable Unit 1)	ECC	5	Draft	8/21/2006		
188	Draft Sediment Feasibility Study Work Plan	ICF Consulting, Inc.	1017	Draft	10/12/2006		
189	Draft Final Pilot Work Plan Groundwater Containment at Buildings 22 and 36 and Buildings 63,2, and 45	ECC	1116	Draft	8/21/2006		
190	Draft Final Sediment Feasibility Study Work Plan	ICF Consulting, Inc.	1017	Draft	11/30/2006		
191	Final Removal Action Work Plan Building 14 and Former	ICF Consulting, Inc.	912	Final	7/27/2006		
192	Final Sediment Feasibility Study Work Plan	ICF Consulting, Inc.	1017	Final	1/16/2007		
193	Draft Sediment Feasibility Study	ICF Consulting, Inc.	1017	Draft	1/12/2007		
194	Draft Focused Feasibility Study Former Proposed	MACTEC Engineering	6	Draft			
195	Technical Specifications for Groundwater Containment Pilot Study Soldier Systems Center Natick, MA	MACTEC Engineering	5	Final	10/5/2006		
196	First Five-Year Review Report for U.S. Army Soldier	ICF Consulting, Inc.		Final	1/31/2007		
197	Draft Final Quarterly Groundwater Monitoring Report	ICF Consulting, Inc.	5	Draft			
198	Draft Final Quarterly Groundwater Monitoring Report	ECC	5	Draft	8/12/2006		
199	Draft Final Quarterly Groundwater Monitoring Report	ECC	15	Draft			
200	Draft Final Quarterly Groundwater Sampling Report Event	ECC	5	Draft	3/15/2007		

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201	Draft Record of Decision for Former Proposed Gymnasium Site and Buildings T-62 and T-68	MACTEC	6313	Draft	6/23/2007		
202	Groundwater Remedial Optimization Study at the T-25 Area Summary of Event 02 Post HRC-A Injection	ICF	5	Draft	6/28/2007		
203	Final Quarterly Groundwater Monitoring Report Event 44	ECC	5	Final	5/17/2007		
204	Final Sediment Feasibility Study	ICF	1017	Final			
205	Final Soil Excavation and Off-Site Treatment/Disposal, and Installation of Oil Water Separator at Boiler Plant Site	Nobis	14	Final			
206	Draft T-25 Area Supplemental Remedial Investigation	ICF	5	Draft			
207	Final Work Plan, T-25 Area Supplemental Remedial	ICF	5	Final			
208	Draft 2007 Fish/Sediment Sampling Work Plan	ICF	1017	Draft	7/19/2007		
209	Draft Removal Action Completion Report, Building 14 and	ICF	912	Draft	7/23/2007		
210	Draft Final T-25 Area Supplemental Remedial	ICF	5	Draft	7/23/2007		
211	Draft Final T-25 Area Groundwater Treatment System	ECC	5	Draft Final	3/28/2008		
212	Draft Final T-25 Area Groundwater Treatment System	ECC	5	Draft Final			
213	Draft Final 2007 Fish/Sediment Sampling Work Plan	ICF	1017	Draft Final			
214	Draft Final Quarterly Groundwater Monitoring Report	ECC	5	Draft Final	3/26/2008		
215	Final Record of Decision for Former Proposed Gymnasium Site and Buildings T-62 and T-68	MACTEC	3613	Final	9/28/2007		
216	Draft Final Quarterly Groundwater Monitoring Report	ECC	5	Draft Final	10/16/2007		
217	Final 2007 Fish/Sediment Sampling Work Plan	ICF	1017	Final	10/22/2007		
218	Draft Final Explanation of Significant Differences for T-25 Area Groundwater (Operable Unit 1)	MACTEC	5	Draft Final	11/1/2007		
219	Final Feasibility Study for Buildings 63, 2, and 45	MACTEC	11	Final			
220	Draft Final Quarterly Groundwater Monitoring Data Transmittal - Event 49 (Second Quarter 2007)	ECC	5	Draft Final	12/18/2008		
221	Draft Final Quarterly Groundwater Monitoring Report -	ECC	5	Draft Final	11/20/2007		
222	Draft Final Record of Decision for Soil at the T-25 Area, Building 14 and Former Building 13, and Boiler Plant	ICF	912	Draft Final	7/16/2008		
223	Final Removal Action Completion Report, Building 14 and	ICF	912	Final	1/17/2008		
224	Memorandum - Groundwater Remedial Optimization Study at the T-25 Area Summary of Event 04 Post HRC-	ICF	5	Final	1/25/2008		
225	Final Proposed Plan for Soils at the T-25 Area, Building 14 and Former Building 13, and Boiler Plant	ICF	912	Final	4/17/2008		
226	Draft Final Quarterly Groundwater Monitoring Data Transmittal, Event 48 (First Quarter 2007)	ECC	5	Draft Final	3/27/2008		
227	Draft Remedy Optimization Report for the T-25 Area	ICF	5	Draft	3/14/2008		
228	Final Fall 2007 Fish and Sediment Sampling Program	ICF	5	Final	8/22/2008		
229	Final Groundwater Containment Demonstration Report for the Buildings 22 and 36 and Buildings 63, 2 and 45	MACTEC	5	Final			

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230	Draft Long Term Monitoring Plan T-25 Area, Buildings 22 and 36 Area and Buildings 63, 2 and 45 Area	ECC	5	Draft	6/30/2008		
231	Final MW-114B Investigation Work Plan and Quality Assurance Project Plan (QAPP) Addendum	ICF	5	Final	10/22/2008		
232	Draft Final Quarterly Groundwater Monitoring Report	ECC	5	Draft Final			
233	Draft Final Quarterly Groundwater Monitoring Data Transmittal, Event 50 (Third Quarter 2007)	ECC	5	Draft Final	12/19/2008		
234	Final Work Plan Lake Cochituate Angler Survey, U.S. Army Soldier Systems Center (SSC), Natick, MA	ICF	1017	Draft	7/22/2005		
235	Draft Lake Cochituate Angler Survey Report, U.S. Army Soldier Systems Center (SSC), Natick, MA	ICF	1017	Draft			
236	Draft Technical Memorandum Work Plan extraction Well Installation at Existing MW-40B Monitoring Well	ECC	19	Draft	10/15/2008		
237	Final Record of Decision for Soil at the T-25 Area, Building 14 and Former Building 13, and Boiler Plant -	ICF	5	Final	9/29/2008		
238	Draft Proposed Plan for Sediment at the T-25 and	ICF	1017	Draft	9/19/2008		
239	Draft T-25 Area Groundwater Treatment System 2007	ECC	5	Draft	5/30/2009		
240	Draft Final Quarterly Groundwater Monitoring Data Transmittal - Event 52 (First Quarter 2008)	ECC	5	Draft	2/24/2009		
241	Draft Final Quarterly Groundwater Monitoring Data Transmittal - Event 53 (Second Quarter 2008)	ECC	5	Draft	2/26/2009		
242	Draft Final Quarterly Groundwater Monitoring Data Transmittal - Event 54 (Third Quarter 2008)	ECC	5	Draft			
243	Draft Final Long-Term Monitoring Plan	ECC	5	Draft			
244	Draft Final Annual Groundwater Monitoring Data Transmittal - Event 55 (Fourth Quarter 2008)	ECC	5	Draft			
245	Draft Final Investigation Report: MW-114B Area	ICF	5	Draft Final	9/10/2010		
246	Draft Quarterly Groundwater Monitoring Data Transmittal -	ECC	5	Draft	7/10/2009		
247	Final Proposed Plan for Sediment at the U.S. Army Natick	ICF	1017	Final	5/18/2009		
248	Final Record of Decision for Sediment - Operable Unit 2	ICF	1017	Final	9/29/2009		
249	Draft Final 2007 Annual T-25 Area Groundwater	ECC	5	Final	10/5/2009		
250	Draft Final Quarterly Groundwater Sampling Data	ECC	5	Final	10/5/2009		
251	Draft Quarterly Groundwater Monitoring Data Transmittal - Event 57 (Second Quarter 2009)	ECC	5	Draft	10/6/2009		
252	Draft Technical Memorandum Extraction Well at Former	ECC	5	Draft	10/7/2009		
253	Capture Zone Assessment for Groundwater Plumes at Buildings 22 and 36 and Buildings 63, 2, and 45 Areas	ECC	1116	Final	10/27/2009		
254	Response to USEPA Comments dated May 30, 2008 Final Groundwater Containment Demonstration Report	ECC	1116	Final	10/27/2009		
255	Draft Final T-25 Area Groundwater Treatment System	ECC	5	Draft Final			

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256	LTMP Ammendment - Semi-Annual Sampling	ECC	5	Draft	1/29/2010		
257	Final Memo Ground Water Remedial Optimization Study at the T-25 Area Summary of 3DMe and BDI Injections	ICF	5	Final	9/10/2010		
258	Draft Quarterly Groundwater Monitoring Data Transmittal - Event 58 (Third Quarter 2009)	ECC	5	Draft			
259	Draft Final Investigation Report MW-114B Area	ICF	0	Draft Final	2/22/2010		
260	Draft Final Operations and Maintenance Manual OU-1 T-25 Area, Buildings 22 and 36 Area, and the Buildings 63, 2, and 45 Area Groundwater Treatment System and 1,4-	ECC	1116	Draft Final			
261	Draft Final Sediment Remedial Design	Charter/ICF	7	Final			
262	Draft Final Sediment Remediation Work Plan	Charter/ICF	7	Final			
263	Draft technical memorandum Work Plan, extraction Well at Existing MW-39B-HP4 Monitoring Well Tie-in	ECC	5	Draft			
264	Draft Technical Memorandum Work Plan Extraction Well	ECC	5	Draft			
265	Sediment Remediation Program Iron Pretreatment	ICF	1017	Final	6/15/2010		
266	Draft Quarterly Groundwater Monitoring Data Transmittal - Event 59 (Fourth Quarter 2009)	ECC	5	Draft	5/18/2010		
267	Draft Final Semi-Annual Groundwater Monitoring Data Transmittal - Event 60 (Semi-Annual Spring 2010)	ECC	5	Draft Final	9/17/2010		
268	Draft Final Groundwater Treatment System 2009 Annual	ECC	5	Draft Final	9/28/2010		
269	Draft Memo - Summary of Event 08 Post HRC-A Injection Groundwater Monitoring Groundwater Remedial	ICF	5	Draft	9/10/2010		
270	Draft Memo - Summary of Event 09 Post HRC-A Injection Groundwater Monitoring Groundwater Remedial	ICF	5	Draft	11/1/2010		
271	Final Sediment Remedial Action Completion Report	Charter/ICF	10	Final	4/27/2011		
272	Ocober 2010 Draft Final Long Term Monitoring Plan	ECC	5	Draft Final	2/28/2011		
273	Draft Final Annual Groundwater Monitoring Report, Event	ECC	5	Draft Final			
274	Response to USEPA (EPA Region I) Review of the Ground Water Remedial Optimization Study at the T-25 Area - Draft Summary of Event 09 HRC-A Injection	ICF		Final	8/16/2011		
275	Draft Final T-25 Area Groundwater Treatment System	ECC		Draft Final	9/28/2011		
276	Final Sediment Dewatering Area Investigation Work Plan	ICF		Final	4/23/2012		
277	Final Sediment Dewatering Area Investigation Quality Assurance Project Plan Addendum	ICF		Final	4/23/2012		
278	Response to Comments on Draft ARIEM Building Investigation Work Plan and QAPP Addendum	ICF		Final	12/1/2011		
279	Final ARIEM Building Investigation Work Plan	ICF		Final			
280	Final ARIEM Building Investigation Quality Assurance	ICF		Final			
281	Draft Final Semi-Annual Groundwater Sampling Data Transmittal Event 62 (Spring 2011)	ECC		Draft Final	12/12/2011		

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282	Final Second Five-Year Review Report for U.S. Army	ECC		Final	3/31/2012		
283	Draft Final Annual Groundwater Monitoring Report Event	ECC		Draft Final	4/17/2012		

APPENDIX B
Location-Specific and Chemical-Specific ARARs



**TABLE B-1
LOCATION-SPECIFIC AND WETLAND PROTECTION ARARS
ESD FOR THE T-25 AREA GROUNDWATER (OPERABLE UNIT 1)
NATICK SOLDIER SYSTEMS CENTER
NATICK, MASSACHUSETTS**

Regulatory Authority	Location Characteristic	Requirement	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Federal	Surface Waters, Endangered Species, Migratory Species	Fish and Wildlife Coordination Act [16 USC 661 et seq.]	Applicable	<p>Actions that affect species/habitat require consultation with U.S. Department of the Interior, U.S. Fish and Wildlife Service, and National Marine Fisheries Service, and/or state agencies, as appropriate, to ensure that proposed actions do not jeopardize the continued existence of the species or adversely modify or destroy critical habitat. The effects of water-related projects on fish and wildlife resources must be considered. Action must be taken to prevent, mitigate, or compensate for project-related damages or losses to fish and wildlife resources.</p> <p>Consultation with the responsible agency is also strongly recommended for on-site actions. Under 40 CFR Part 300.38, these requirements apply to all response activities under the National Contingency Plan.</p>	To the extent necessary, actions will be taken to prevent, mitigate, or compensate for project related impacts to habitat and wildlife. The U.S. Fish and Wildlife Service, acting as a review agency for the USEPA, will be kept informed of proposed remedial activities.

**TABLE B-1
LOCATION-SPECIFIC AND WETLAND PROTECTION ARARS
ESD FOR THE T-25 AREA GROUNDWATER (OPERABLE UNIT 1)
NATICK SOLDIER SYSTEMS CENTER
NATICK, MASSACHUSETTS**

Regulatory Authority	Location Characteristic	Requirement	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Federal	Floodplains	Floodplain Management Executive Order 11988	TBC	Federal agencies are required to avoid adverse impacts associated with the occupancy and modification of floodplains and to avoid support of floodplain development wherever there is a practicable alternative. If no practicable alternative exists, the federal agency is required to design or modify its action to minimize potential harm to or within the floodplain.	Activities are not expected to occur in floodplain areas or adversely affect them. If remedial activities occur within floodplain areas, measures will be taken to minimize alteration/destruction of the floodplain area. Floodplains affected by remedial activities will be restored to maintain natural and beneficial values.
Federal	Wetlands	Protection of Wetlands Executive Order 11990	TBC	Federal agencies are required to avoid adverse impacts associated with the destruction, loss, or degradation of wetlands and to avoid support of new construction in wetlands wherever there is a practicable alternative.	Activities are not expected to occur in wetland areas or adversely affect them. If remedial activities occur within or affect wetland areas or surface waters, measures will be taken to minimize alteration/destruction of the area. Wetlands affected by remedial activities will be restored to maintain natural and beneficial values.

**TABLE B-1
LOCATION-SPECIFIC AND WETLAND PROTECTION ARARS
ESD FOR THE T-25 AREA GROUNDWATER (OPERABLE UNIT 1)
NATICK SOLDIER SYSTEMS CENTER
NATICK, MASSACHUSETTS**

Regulatory Authority	Location Characteristic	Requirement	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
State	Floodplains, Wetlands, Surface Waters	Massachusetts Wetland Protection Act Regulations [310 CMR 10.00]	Applicable	<p>These regulations include standards on removing, dredging, filling, or altering inland wetlands and protected areas (including any banks, bordering vegetated wetlands, land under water bodies and waterways, land subject to flooding, or riverfront area). Activities carried out within 100 feet of these areas (i.e., the buffer zone) which may alter an area subject to protection are also subject to regulation.</p> <p>Minor activities within the buffer zone which are temporary in nature and have negligible impacts (e.g., installation of monitoring wells and exploratory borings, sediment sampling, surveying) are not subject to regulation.</p>	<p>Activities involving removal, dredging, filling, or altering of wetlands or protected areas, or adversely affecting them, are not expected. If remedial activities occur within protected areas, measures will be taken to minimize alteration/destruction of the area. Wetlands affected by remedial activities will be restored to maintain natural and beneficial values. All work to be performed within wetlands and the 100-foot buffer zone will be in accordance with the substantive requirements of these regulations.</p> <p>The municipal conservation commission will be apprised of site activities that will affect wetlands or protected areas.</p>

**TABLE B-1
LOCATION-SPECIFIC AND WETLAND PROTECTION ARARS
ESD FOR THE T-25 AREA GROUNDWATER (OPERABLE UNIT 1)
NATICK SOLDIER SYSTEMS CENTER
NATICK, MASSACHUSETTS**

Regulatory Authority	Location Characteristic	Requirement	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
State	Endangered Species	Massachusetts Endangered Species Act Regulations [321 CMR 10.00]	Applicable	Actions must be conducted in a manner that minimizes the impact to Massachusetts-listed rare, threatened, or endangered species, and species listed by the Massachusetts Natural Heritage Program.	The protection of state listed endangered species, including the boreal turret snail, will be considered during the design and implementation of this alternative.

Prepared by/ Date: SWR 01/22/07
Checked by/ Date: RB 01/22/07
Revised by/ Date: SWR 02/27/13

Notes:

ARAR = Applicable or Relevant and Appropriate Requirement
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
TBC = To Be Considered
USC = United States Code
USEPA = U.S. Environmental Protection Agency

**TABLE B-2
CHEMICAL-SPECIFIC ARARs AND TBCs**

**ESD FOR THE T-25 AREA GROUNDWATER (OPERABLE UNIT 1)
NATICK SOLDIER SYSTEMS CENTER
NATICK, MASSACHUSETTS**

Regulatory Authority	Media	Requirement	Status	Requirement/Synopsis	Action To Be Taken To Attain ARAR
Federal	Groundwater	<i>Drinking Water Health Advisory for Manganese</i> , EPA-822-R-04-003 (January 2004)	To Be Considered	Health Advisories are estimates of risk resulting from consumption of contaminated drinking water; they consider noncarcinogenic effects only. Health Advisories are to be considered for contaminants in groundwater that may be used for drinking water where the standard is more conservative than either federal or state statutory or regulatory standards. The Health Advisory for manganese is 0.3 ppm.	The health advisory for manganese will be used to evaluate the noncarcinogenic risk resulting from exposure to manganese in groundwater. Exposure to groundwater containing manganese at concentrations greater than the Massachusetts Drinking Water Guideline will be managed through institutional controls that prohibit potable groundwater use. Groundwater use restrictions will be maintained until these standards are achieved.
State	Groundwater	Massachusetts Drinking Water Guidelines	To Be Considered	Massachusetts Office of Research and Standards issues guidance for chemicals in drinking water other than those with Massachusetts MCLs. Concentrations of chemicals having evidence of carcinogenicity are minimized as much as feasible; therefore, guidelines are set at a target excess lifetime cancer risk of one in one million (1x10 ⁻⁶) or at the lowest practical quantitation limit (PQL) if the concentration at 1x10 ⁻⁶ is below the PQL. The Drinking Water Guideline for 1,4-dioxane is 0.3 µg/L.	Exposure to groundwater containing 1,4-dioxane at concentrations greater than the Massachusetts Drinking Water Guideline will be managed through institutional controls that prohibit potable groundwater use. Groundwater extraction will manage the in-situ migration of contaminants, and ex-situ treatment of extracted groundwater will manage ex-situ migration of, and exposure to, 1,4-dioxane. Groundwater use restrictions will be maintained until these guidelines are achieved.

Notes:

ARAR = Applicable or Relevant and Appropriate Requirement

RfD = Reference dose

MCL = Maximum Contaminant Level

Prepared by/ Date: SWR 01/22/07

Checked by/ Date: RB 01/22/07

Revised by/Date: SWR 05/08/13

APPENDIX C
Remediation by Periodic Slug Volume Removal



Remediation by Periodic Slug Volume Removal

The term “slug volume removal” was chosen to be descriptive of the actual proposed actions to be implemented at selected monitoring wells at the ARIEM Building and Parking Lot locations. It is derived from the concept of “Pulsed Pumping” which has been discussed in many pump-and-treat documents over the last two decades. Two documents that discuss this concept are EPA Ground Water Issue papers, EPA/540/4-89/005 and EPA/540/S-97/504. The first is entitled “Performance Evaluations of Pump-and-Treat Remediations” by Joseph Keely (1989). In this document, Mr. Keely describes pulsed pumping as an innovation in pump-and-treat systems that can “remove the minimum volume of contaminated ground water at the maximum possible concentrations for the most efficient treatment”. The second is entitled “Design Guidelines for Conventional Pump-and-Treat Systems” by Cohen, Mercer, Greenwald and Beljin (1997) in which they report on the effectiveness of pulsed pumping.

Among the many documents that have been published is a 1994 PhD dissertation by Jeffrey L. Caspers at Wright State University, entitled “Modeling of Ground Water Aquifer Remediation by Pulsed Pumping When Contaminant Transport is Affected by Physical, Non-Equilibrium Sorption and Desorption” which is an extensive investigation “to show the efficiency of pulsed pumping methods in cleanup mass extraction per pumped volume for a contaminated aquifer pump-and-treat remediation activity versus more conventional, continuous pumping methods.”

Other publications are “Aquifer Remediation: A Method for Estimating Mass Transfer Rate Coefficients and an Evaluation of Pulsed Pumping” by Harvey, Haggerty and Gorelick (1994), and “Comparison of Continuous and Pulsed Pump-and-Treat for Mass Transfer-Limited Aquifers” by Alsoy and Culver (2004) in which comprehensive comparisons of pulsed pumping to continuous pumping are documented.

Calculations for the slug volumes to be removed from the Parking Lot well MW114B-2 and from the two wells, MW165B-2 and MW-181B-2, near the ARIEM Building are shown below:

Natick Summary: MW-114B-2 Area Slug Volume Removal & Monitoring

1. Characteristics from ICF report
 - a. Hydraulic Conductivity, $K = 4.82 \text{ fpd} - 11 \text{ fpd}$
 - b. Porosity, $n = 0.25$
 - c. Hydraulic Gradient, $I = 0.00052 - 0.0026$
 - d. Seepage Velocity, $v = 0.01 - 0.11 \text{ fpd}$
 - e. MW-114B screen length, $b = 10 \text{ ft}$
2. Specific Capacity from purging during sampling episodes
 - a. Use data from last 5 sampling episodes
 - b. Average Specific Capacity = $0.723 \text{ gpm/ft of drawdown}$
 - c. For a pumping rate of 10 gpm, we will have $10/0.723 = 13.8 \text{ ft drawdown}$
 - d. MW-114B is screened from 25 – 35 ft below water table, so 10 gpm OK
 - e. If pumped at 10 gpm for 4 hours will remove $V = 2400 \text{ gallons}$
3. Calculate the volume of aquifer removed
 - a. Take a cylinder (diameter = D) that is 10 ft (screen length = b) high in the aquifer around screen at MW-114B with porosity of 25%, and calculate D for the 2400 gallons
 - b. $V = (\pi/4)D^2bn$ or $D = [4V/(\pi bn)]^{1/2} = [4 \times (2400/7.48)/(3.1416 \times 10 \times 0.25)]^{1/2} = 12.8 \text{ ft}$



- c. A cylinder 12.8 ft in diameter and 10 ft thick in the aquifer will be removed by pumping out 2400 gallons of groundwater
 - d. This will take 4 hrs of pumping at 10 gpm
 - e. Minimum Time for gw to move $D = 12.8$ ft to refill; $t = D/v = 12.8/0.11 = 116$ days
 - f. Use 120 days (4 months) as time lag before removing another slug (see 4.f.)
4. Schedule for this slug remediation effort at MW-114B
- a. Day 1 – Sample MW-114B
 - b. Day 2 – Remove the slug of 2400 gallons of groundwater by pumping at 10 gpm
 - c. Day 3 – Sample MW-114B
 - d. Day 30 – Sample MW-114B
 - e. Day 120 – Sample MW-114 B
 - f. Day 121 – Remove another 2400 gallon slug of groundwater (get sample result first)
 - g. Continue as above, and repeat the cycle for 1 to 2 years depending on results

Natick Summary: MW-165B/181B Area Slug Volume Removal & Monitoring

1. Characteristics from ICF report on ARIEM Bldg #42
 - a. Hydraulic Conductivity, no K testing done
 - b. Porosity, $n = 0.25$ not measured for report, assumed by ECC
 - c. Hydraulic Gradient, $i = 0.0018$ to 0.0140 ft/ft from ARIEM report
 - d. MW-165B/181B screen lengths, $b = 10$ ft
 - e. Seepage velocity assumed to be similar to that calculated for MW-114B-2 ($K = 4.82$ fpd from slug test) where the gradient is flatter but the K value is estimated to be 3 to 4 times greater based on specific capacity values from low flow sampling ($SpCap$ for 114B = 0.723 gpm/ft); seepage velocity, $v = Ki/n = (4.82/3.5)(0.014)/0.25 = 0.077$ fpd
2. Specific Capacity from purging during sampling episodes at MW-165B-2
 - a. Use data from last 2 sampling episodes at MW-165B-2
 - b. Average Specific Capacity = 0.200 gpm/ft of drawdown
 - c. For 10 ft of drawdown, we will have a pumping rate of 2 gpm
 - d. Assume that MW-181B-2 has same yield, total yield = 4 gpm
 - e. If pumped both wells at 4 gpm total for 4 hours will remove $V = 960$ gallons, 480 gallons from each well
3. Calculate the volume of aquifer removed around each well
 - a. Take a cylinder (diameter = D) that is 10 ft (screen length = b) high in the aquifer around the screen with porosity of 25%, and calculate D for the 480 gallons
 - b. $V = (\pi/4)D^2bn$ or $D = [4V/(\pi bn)]^{1/2} = [4 \times (480/7.48)/(3.1416 \times 10 \times 0.25)]^{1/2} = 5.72$ ft
 - c. A cylinder 5.72 ft in diameter and 10 ft thick in the aquifer around each well will be removed by pumping out 480 gallons of groundwater from each well
 - d. This will take 4 hrs of pumping at a combined 4 gpm simultaneously from both wells
 - e. Minimum Time for gw to move $D = 5.72$ ft to refill; $t = D/v = 5.72/0.077 = 74$ days
 - f. Use 70 days (10 weeks) as time lag before removing another slug (see 4.f.)



4. Schedule for this slug remediation effort at MW-114B
 - a. Day 1 – Sample MW-165B-2 and MW-181B-2
 - b. Day 2 – Remove the slug of 480 gallons of groundwater from each monitoring well by pumping at 2 gpm simultaneous from both wells
 - c. Day 3 – Sample MW-165B-2 and MW-181B-2
 - d. Day 30 – Sample both wells again
 - e. Day 70 – Sample both wells again
 - f. Day 71 – Remove another 480 gallon slug of groundwater from each well
 - g. Continue as above, and repeat the cycle for 1 to 2 years depending on results

References

1. Aksoy, A. and Culver, T. B., “Comparison of Continuous and Pulsed Pump-and-Treat for Mass Transfer-Limited Aquifers,” Turkish J. Eng. Env. Sci., 28(2004), 307-316.
2. Caspers, J. L., “Modeling of Ground Water Aquifer Remediation by Pulsed Pumping When Contaminant Transport is Affected by Physical, Non-Equilibrium Sorption and Desorption,” Thesis, Air Force Institute of Technology, CLASS: AFIT/GEE/ENC/94S-01, August, 1994.
3. Cohen, R. M., Mercer, J. W., Greenwald, R. M. and Beljin, M. S., “Design Guidelines for Conventional Pump-and-Treat Systems,” Ground Water Issue, EPA/540/S-97/504, September, 1997.
4. Harvey, C. F., Haggerty, R. and Gorelick, S. M., “Aquifer Remediation: A Method for Estimating Mass Transfer Rate Coefficients and an Evaluation of Pulsed Pumping,” Water Resources Research, vol 30, no 7, July, 1994.
5. Keely, J. F., “Performance Evaluations of Pump-and-Treat Remediations,” Ground Water Issue, EPA/540/4-89/005.



APPENDIX D

Concurrence Letter from Massachusetts Department of Environmental Protection





Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

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

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lieutenant Governor

RICHARD K. SULLIVAN JR.
Secretary

KENNETH L. KIMMELL
Commissioner

May 10, 2013

Ms. Christine Williams
U.S. Environmental Protection Agency
New England – Region 1
5 Post Office Square, Suite 100
Mail Code OSRR 07-03
Boston, MA 02109-3912

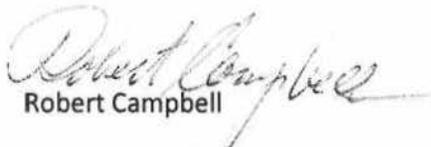
Re: State Concurrence with Explanation of Significant Differences for T-25 Area Groundwater (OU-1)
U.S. Army Natick Soldier Systems Center (Natick Labs)
Natick, MA

Dear Ms. Williams,

MassDEP has reviewed the Final Explanation of Significant Differences for the T-25 Area Groundwater (Operable Unit 1) Report. MassDEP agrees with the findings of the report and concurs with the opinion of U.S. Environmental Protection Agency in this regard.

If you have any questions regarding this concurrence, please contact the Project Manager, Robert Campbell at 617-292-5732, or the Federal Facilities Section Chief, Anne Malewicz at 617-292-5659.

Sincerely,



Robert Campbell

Environmental Analyst IV
Bureau of Waste Site Cleanup
MassDEP

APPENDIX E
Response to USEPA Comments



**RESPONSE TO USEPA COMMENTS
ON
DRAFT EXPLANATION OF SIGNIFICANT DIFFERENCES
FOR THE
T-25 AREA GROUND WATER (OPERABLE UNIT 1)**

**U.S. ARMY SOLDIER SYSTEMS CENTER
NATICK, MASSACHUSETTS**

February 2013

**RESPONSE TO USEPA COMMENTS
ON
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USEPA Comments Dated January 28, 2013, on December 2012 Draft ESD

GENERAL COMMENTS

Comment No. 1. By incorporating these additional impacted areas into the Record of Decision (ROD) for T-25, Army needs to consider that remedial components, i.e., extraction wells have been located in close proximity to Lake Cochituate and Pegan Cove, and within the wetland buffer zone. Therefore, additional location-specific ARARs need to be included in this ESD because for the T-25 Area ROD no remedy components existed within the wetland buffer zone. Please use the location specific ARARs noted on table 4-6 of the final 63, 2, & 45 Feasibility Study, April 2010.

Response: A bullet has been added on page 6, Subsection 4.0, to reference the following wetland-protection and location-specific ARARs:

- Floodplain Management Executive Order 11988 [40 CFR Part 6, Appendix A]
- Protection of Wetlands Executive Order 11990 [40 CFR Part 6, Appendix A]
- Fish and Wildlife Coordination Act [16 USC 661 et seq.]
- Massachusetts Wetland Protection Act Regulations [310 CMR 10.00]
- Massachusetts Endangered Species Act Regulations [321 CMR 10.00]

These ARARs are summarized in Appendix B of the ESD.

Comment No. 2. In addition, a new contaminant was added to the cleanup when Army discovered 1,4-Dioxane at the 63,2&45 Area. The inline treatment system should be described and the clean up criteria and associated ARARs should also be included in this ESD. Please use the ARAR on page 3 of Table 4-7, of the final 63, 2, & 45 Feasibility Study, April 2010.

Response: A bullet has been added on page 6, Subsection 4.0, to reference the following ARAR:

- MassDEP Office of Research and Standards, Massachusetts Drinking Water Guideline for 1,4-dioxane.

Comment No. 3. Please reference the document or include as an appendix the document used to calculate the slug volumes needed to reduce the contaminants at the proposed wells. In addition, the ESD does not indicate how the 960 gallons slug pumped from the ARIEM area will be divided between the two wells MW165B-2 and MW181B-2, please clarify.

Response: The term “slug removal” was chosen to be descriptive of the actual proposed actions to be implemented at the monitoring wells. It is derived from the concept of “Pulsed Pumping” which has been discussed in many pump-and-treat documents over the last two decades. Two documents that discuss this concept are EPA Ground Water Issue papers, EPA/540/4-89/005 and EPA/540/S-97/504. The first, by Joseph Keely in 1989, is entitled “Performance Evaluations of Pump-and-Treat Remediations.” In this document, Mr. Keely describes pulsed pumping as an innovation in pump-and-treat systems that can “remove the minimum volume of contaminated ground water at the maximum possible concentrations for the most efficient treatment”. The second, by Richard M. Cohen, James M. Mercer, Robert M. Greenwald and Milovan S. Beljin in 1997, is entitled “Design Guidelines for Conventional Pump-and-Treat Systems” in which they report on the effectiveness of pulsed pumping.

Among the many documents that have been published is a 1994 PhD dissertation by Jeffrey L. Caspers at Wright State University, entitled “Modeling of Ground Water Aquifer Remediation by Pulsed Pumping

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When Contaminant Transport is Affected by Physical, Non-Equilibrium Sorption and Desorption". This describes an extensive investigation "to show the efficiency of pulsed pumping methods in cleanup mass extraction per pumped volume for a contaminated aquifer pump-and-treat remediation activity versus more conventional, continuous pumping methods."

Another 1994 publication is presented in Water Resources Research by Harvey, Haggerty and Gorelick entitled "Aquifer Remediation: A Method for Estimating Mass Transfer Rate Coefficients and an Evaluation of Pulsed Pumping" in which a comprehensive comparison of pulsed pumping to continuous pumping is documented.

Appendix C has been added to show the derivation of the flows for MW114B (2400 gal/event) and for MW165B-2 and MW-181B-2 (960 gal/event, 480 gal/well).

SPECIFIC COMMENTS

Comment No. 4: p. i. 2.1 T-25 Area History is missing from the Table of Contents. Please add it.

Response: Subsection 2.1 has been added to the TOC.

Comment No. 5: p. 3, §3.1. Please correct the seventh sentence in the third paragraph to reference TCE rather than PCE. To improve readability and continuity, please move the remaining text in this paragraph beginning with the partial sentence at the bottom of this page and incorporate it into the first paragraph in this section which also discusses the pilot study.

Response: The suggested changes have been made.

Comment No. 6: p. 4, 1st full paragraph. the second last sentence should refer to MW114B-2 not MW14B-2.

Response: MW14B has been changed to MW114B-2.

Comment No. 7: p. 4, §3.1. Please edit the last sentence in the second full paragraph on this page to read: "... 1,4-dioxane in extracted groundwater in the Buildings 63,2, and 45 Area prior to" In the fourth full paragraph please edit the first sentence to refer to "the 5 µg/L cleanup goal for PCE" rather than "standards". Edit the second sentence to read: "... and showed PCE contamination at 6.7 µg/L in October 2012." Please edit the second last sentence in the fourth full paragraph to read:"... from MW-178B-2 will be initiated similar to the slug removals planned for monitoring wells"

Response: These changes have been made as suggested.

Comment No. 8: p. 5, §3.2. Please supplement the discussion in the first paragraph in this section to state that remedial investigations and feasibility studies were completed for both the Buildings 22 and 36 Area and the Buildings 63, 2, and 45 Area. Risks to human health and/or the environment were determined to exist as a result of existing contamination and remedial alternatives were developed to address those risks. Consequently, it is appropriate and consistent with CERCLA to incorporate these areas into the decision document previously developed for the T-25 Area.

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Response: The suggested language has been incorporated.

Comment No. 9: Page 6,§4. Please include a new bullet: Include the current MassDEP Massachusetts Drinking Water Guidelines for 1,4-Dioxane is 0.3 ug/L updated May 2011. As explained at the following website: <http://www.mass.gov/dep/water/drinking/standards/14dioxan.htm>

Response: Please refer to the response to Comment No. 2.

Comment No. 10: Page 6,§4. Please include a new bullet: Include the location specific ARARs for the extraction and monitoring well installation in the shoreline buffer zone.

Response: Please refer to the response to Comment No. 1.

Comment No. 11: ESD, Page 7, §8. Please note that our director will not be signing the ESD on the same page as with the Army. Please provide a separate signature page.

Response: A separate signature page has been provided.

Comment No. 12: Figure 2-1. should include the location of MW181B-2 on the figure as this is an ARIEM well to be slug pumped.

Response: Figure 2-1 has been revised to include MW181B-2.