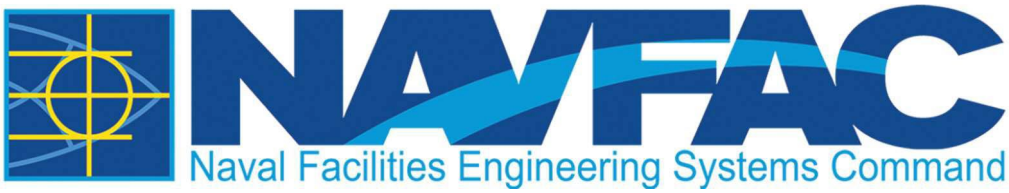
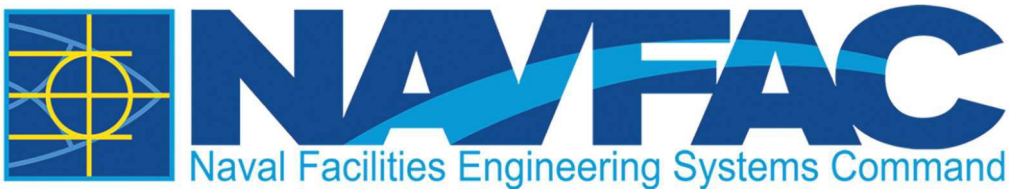


Naval Facilities Engineering Systems Command Mid-Atlantic
Norfolk, Virginia

Action Memorandum, Site 3 Time Critical Removal Action
Naval Weapons Industrial Reserve Plant
Bedford, Massachusetts

May 2023



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Naval Facilities Engineering Systems Command

ACTION MEMORANDUM FOR COMPLETION OF A TIME-CRITICAL REMOVAL ACTION AT SITE 3 CHLORINATED SOLVENT GROUNDWATER PLUME
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BEDFORD, MASSACHUSETTS

DATE: May 2023
SUBJECT: Approval of Time-Critical Removal Action
Naval Weapons Industrial Reserve Plant Bedford, Massachusetts
FROM: Eric Ross, Remedial Project Manager, Naval Facilities Engineering Systems Command, Mid-Atlantic
To: Commanding Officer, Naval Facilities Engineering Systems Command, Mid-Atlantic

The enclosed Action Memorandum documents approval to install a permeable reactive barrier in the water table to treat a groundwater plume underneath the northeastern portion of Site 3, at Naval Weapons Industrial Reserve Plant Bedford, Massachusetts. This Action Memorandum serves as the Decision Document for selection of this Time-Critical Removal Action (TCRA) in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, and is consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record for the Site. It is expected that the TCRA will mitigate risk to an adjacent residence by reducing the potential for chlorinated volatile compounds to migrate offsite in the uppermost groundwater bearing unit, thus mitigating risks of vapor intrusion.

Following completion of the TCRA, performance monitoring will be conducted by collecting confirmation groundwater samples to ensure effectiveness. Long-term groundwater conditions will be addressed through Site 3 source area actions onsite.

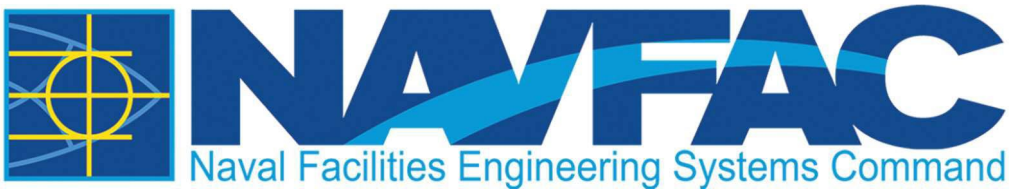
Conditions at Site 3 meet the NCP Section 300.415(b)(2) criteria for removal. On behalf of Naval Facilities Engineering Systems Command, Mid-Atlantic, I approve the proposed removal action. The total project ceiling, if approved will be $1,134,518.

Response actions will commence as soon as practical to eliminate the risks posed by the uncontained chlorinated solvent plume on the northeast portion of Site 3.

Approved by:

9 MAY 2023
Date

Commanding Officer, NAVFAC MIDLANT



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Tables

Appendices

Acronyms And Abbreviations

ARAR	Applicable or Relevant and Appropriate Requirement
CAC	Colloidal Activated Carbon
CFR	Code of Federal Regulations
Cis-1,2-DCE	Cis-1,2-Dichloroethene
CVOC	Chlorinated Volatile Organic Compound
ERP	Environmental Restoration Program
FFA	Federal Facility Agreement
GWETS	Groundwater Extraction Treatment System
LTM	Long Term Monitoring
MassDEP	Massachusetts Department of Environmental Protection
µg/L	micrograms per liter
MIDLANT	Mid-Atlantic
NAVFAC	Naval Facilities Systems Engineering Command
Navy	Department of the Navy
NCP	National Contingency Plan
NPL	National Priorities List
NWIRP	Naval Weapons Industrial Reserve Plant
PDI	Pre-Design Investigation
sZVI	sulfidated zero valent iron
TCE	Trichloroethene
TCRA	Time-Critical Removal Action
U.S. EPA	United States Environmental Protection Agency
VI	Vapor Intrusion

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1.0 Purpose

This Action Memorandum documents the Time Critical Removal Action (TCRA) to be performed at Site 3, Chlorinated Solvent Groundwater Plume, of the Naval Weapons Industrial Reserve Plant (NWIRP) in Bedford, Massachusetts (U.S. EPA ID: MA6170023570), which is shown on Figure 1-1 (included in Appendix A).

A TCRA is necessary to mitigate risk associated with potential receptor exposure to a chlorinated solvent plume in groundwater on the northeast portion of the property, by preventing migration of the plume toward residences. Performing an action other than a TCRA could require a planning period of at least 2 years during which time such residential receptors may be inadvertently exposed to solvents through vapor intrusion (VI) into residences.

This Action Memorandum serves as the decision document to install a permeable reactive barrier in the uppermost water bearing unit on the northeastern portion of the property to treat the plume and to collect periodic groundwater samples to evaluate PRB performance. The area of concern is groundwater within the property boundary as described in Section 2 and shown on Figure 1-2.

This Action Memorandum was prepared to be consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (Title 42 United States Code Sections 9601 et. seq.)), National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 Code of Federal Regulations [CFR] Part 300), and relevant United States Environmental Protection Agency (U.S. EPA) guidance (U.S. EPA 2009).

The Department of the Navy (Navy) has broad authority under CERCLA Section 104 and Executive Order 12580 to carry out response actions when the release is on a Navy installation, or when the sole source of the release is from a Navy installation. The Navy Environmental Restoration Program (ERP) was initiated to identify, assess, characterize, and cleanup or control contamination from past hazardous waste disposal operations and hazardous material spills at Navy activities. This Action Memorandum follows the guidelines published in the Environmental Restoration Program Manual (Navy 2018).

The purpose of the TCRA will be to reduce the potential for chlorinated volatile compounds (CVOCs) to migrate offsite in the uppermost groundwater bearing unit, thus mitigating risks of VI to an adjacent residence. Long-term groundwater conditions will be addressed through continued source area actions onsite.

2.0 Site Conditions and Background

A layout of the NWIRP Bedford facility is presented on Figure 1-2.

2.1 Site Description

NWIRP Bedford is a 46-acre parcel that is owned by the Navy and was previously used to design, fabricate, and test prototype weapons equipment, such as missile guidance and control systems. The Site consists of a Components Laboratory and multiple outbuildings, two large parking lots, and driveways.

2.1.1 Removal Site Evaluation

Site 3 is the location of a chlorinated solvent plume situated in the northern portion of the NWIRP property. The source of the Site 3 plume is on the north-northwest side of the Components Laboratory building loading dock area and flows predominantly north-northwest towards Elm Brook. Long-term site monitoring (LTM) has identified increasing trichloroethene (TCE) concentrations in the plume at the northeast property boundary; low levels of cis-1,2-dichloroethene (cis-1,2-DCE) are also present. The plume along the property boundary is in an area close to a residence.

2.1.2 Physical Location

The Site is on Hartwells Hill in the Town of Bedford, in Middlesex County, Massachusetts. The Site is adjoined to the north by a wooded area and wetlands; to the east by a wooded area, residences, and wetlands; to the south by the Lawrence G. Hanscom Field (Hanscom Field) and Hanscom Air Force Base; and to the west by a sports complex, Raytheon Electronic Systems Facility (a Patriot Missile Integration Test Facility), wetlands, and residences.

The TCRA area is in a wooded area along the northeastern property line, at the base of Hartwells Hill; a private residence to the east adjoins the area.

2.1.3 Site Characteristics

NWIRP Bedford is atop Hartwells Hill, which is primarily glacial till atop bedrock. Lacustrine sand and outwash lie above the till and these units dip to the east. Topography and the groundwater table also dip to the east toward Bagley Avenue. A Land Use Control was placed on the property to prevent unrestricted use of the Site, prevent the use of groundwater as a drinking supply until CVOC concentrations achieve the cleanup goals, and prevent occupancy of current and future structures at Site 3 prior to confirmation that VI does not present unacceptable vapor intrusion risks (Navy 2017).

Groundwater beneath the Site has been classified by the Town of Bedford as an Aquifer Protection District. The Massachusetts Department of Environmental Protection (MassDEP) completed a Groundwater Use and Value Determination and classified the groundwater as “high use and value” (MassDEP 1998).

2.1.4 Release or Threatened Release into The Environment of a Hazardous Substance Pollutant or Contaminant

LTM data indicated that TCE concentrations in groundwater have increased in concentrations on the northeastern property line (see Section 2.2.2). Concentrations in groundwater exceed the Massachusetts Contingency Plan Method 1 screening criterion for category GW-2 groundwater, as well as U.S. EPA Vapor Intrusion Screening Level (VISL) for groundwater-to-indoor air. Therefore, a TCRA is planned to reduce groundwater concentrations and therefore mitigate the potential for VI.

2.1.5 National Priorities List Status

NWIRP was placed on the National Priorities List on May 31, 1994, and prior actions at Site 3 are briefly summarized in Section 2.2. Select historical documents and references are identified in Appendix B.[1] Remedial actions are currently ongoing. The MW-26S area is currently addressed by LTM/monitored natural attenuation (MNA).

2.2 Other Actions to Date

2.2.1 Previous Actions

The Navy initiated investigation activities at NWIRP in the 1980s. The Hartwell Road Well Field, formerly part of the municipal water supply for the Town of Bedford, was closed in 1984 due to volatile organic compound contamination. A 1991 RI report prepared by the Town of Bedford concluded that NWIRP, 0.5 miles away, was a likely source of the well field contamination. Hanscom AFB is also a potential contributor to the groundwater contamination in this area.

A Record of Decision was signed for Site 3 in September 2010 (Navy 2010). The Site 3 remedial actions include plume containment, source bioremediation via injections of emulsified vegetable oil, LTM/MNA, land use controls, and 5-year reviews.

Plume capture at Site 3 is currently conducted on the western portion of the Site by extracting the groundwater from a line of 23 extraction wells and treating the contaminated groundwater using an onsite groundwater extraction treatment system (GWETS), which has been in operation since 1997. The GWETS was modified in 2021 to include treatment for 1,4-dioxane. The GWETS is successfully treating/reducing the CVOCs and 1,4-dioxane in the effluent before discharging.

[1] For more complete records, please see the online NWIRP Bedford Administrative Record, https://administrative-records.navfac.navy.mil/?ML6J_U3JG4XM3TL.

A Supplemental Response Action groundwater investigation of chlorinated solvents and 1,4-dioxane, was initiated in January 2020 to investigate the extent of CVOC and 1,4-dioxane contamination (Tetra Tech, August 2020). The Supplemental Response Action is evaluating the extent of CVOCs and 1,4-dioxane in the northern, eastern, and southeastern areas of the Site in the shallow, intermediate overburden, and bedrock stratigraphic units.

2.2.2 Current Actions/Current Conditions

As discussed above, LTM data have shown TCE concentrations in MW-26S have increased from non-detect (<10 micrograms per liter [µg/L] in the 1990s) to 18 µg/L in the 2020-2022 sampling period.[2] Concentrations in groundwater exceed Massachusetts Contingency Plan Method 1 screening criterion for category GW-2 groundwater, as well as the U.S. EPA VISL for groundwater-to-indoor air for a residential exposure scenario.[3]

Soil gas sampling (near-slab) was performed at a residential property from October 2021 through June 2022. In 2021, TCE was above near source soil gas VISL screening levels under a residential exposure scenario in one location; however, soil gas samples collected in 2022 were below VISL screening values. However, sub-slab soil gas and indoor air samples suggested VI was not occurring (Tetra Tech 2022a).

Building surveys were conducted by the Navy at the residential property in October 2021 and June 2022, prior to completing soil gas sampling. The property surveys determined that there are no water supply wells on the property (Tetra Tech 2022b).

2.3 Federal, State and Local Authorities' role

A Federal Facility Agreement (FFA) between the Navy and the U.S. EPA was signed in September 1999. The FFA was developed to enable the Navy to meet the provision of CERCLA and applicable state law, while implementing the Navy's ERP process. Among other requirements, the FFA outlines roles and responsibilities, establishes deadlines/schedules, and outlines work to be performed at the Site by both parties. The MassDEP is not party to the FFA, but participates in discussions and strategy sessions, and provides oversight and guidance through review of the Navy's Installation Restoration Program documents.

2.3.1 State and Local Actions to Date

The Navy is the lead agency with oversight by the U.S. EPA for performing cleanup of NWIRP Bedford sites under the ERP.

[2] Personal communication, P. Probasco, Tetra Tech, to R. McCarthy, Resolution Consultants.
[3] The U.S. EPA risk-based VISL for groundwater-to-indoor air under a residential scenario is 0.5 µg/L, assuming use of a target non-carcinogenic target hazard quotient threshold of 0.1.

Naval Facilities Engineering Systems Command (NAVFAC) Mid-Atlantic (MIDLANT) is the lead agency for implementing the response actions planned at the Site under CERCLA per Executive Order 12580 dated 23 January 1987, titled Superfund Implementation, and the NCP (40 CFR 300). The state and local authorities have not undertaken any removal actions at the Site. NAVFAC MIDLANT has contacted U.S. EPA Region 1 regarding NAVFAC MIDLANT's proposed response in compliance with the 1999 Federal Facility Agreement between the Navy and the U.S. EPA; MassDEP was also provided an opportunity to review the Action Memorandum.

In March 1996, a Restoration Advisory Board was established for NWIRP Bedford. The Restoration Advisory Board is composed of members of the community, local environment group members, and state and federal officials. The Restoration Advisory Board meets periodically and represents the primary method of communicating information to the community. Public notices announcing Restoration Advisory Board meetings, public meetings, public hearings, and the availability of documents are generally advertised in two local newspapers (*Bedford Minuteman* and *Lexington Minuteman*). (Final Second Five Year Review, September 2019).

2.3.2 Potential for continued State/local response

The Navy will continue to be the lead agency, and the Navy's ERP will continue to be the exclusive source of funding for remedial actions at NWIRP. U.S. EPA and MassDEP will continue to be consulted on remedial activities at this site until actions addressing the contaminated area are complete.

The local community will continue to have the opportunity to be apprised of and discuss future and ongoing activities through participation in the Restoration Advisory Board.

3.0 Threats to Public Health or Welfare or the Environment

As discussed in Section 2.2.2, TCE concentrations in MW-26S have increased, and concentrations in groundwater exceed Massachusetts Contingency Plan Method 1 screening criterion for category GW-2 groundwater, as well as the U.S. EPA VISL for groundwater-to-indoor air under a residential exposure scenario. Vapor intrusion sampling (near-slab sampling) was performed at the adjacent residential property from October 2021 through June 2022. In 2021, TCE was above near source soil gas VISL screening levels under a residential exposure scenario in one location; however, soil gas samples collected in 2022 were below VISL screening values. However, sub-slab soil gas and indoor air samples suggested VI was not occurring (Tetra Tech 2022b). As discussed above and in Section 2.2.2, conditions at the property line pose a VI threat to the adjacent residence. This area is shown in Figure 1-2.

4.0 Endangerment Determination

As discussed in Section 3, groundwater and soil gas concentrations above relevant screening criteria indicate the potential for VI along the northeast property line. The Navy has determined this meets the endangerment criterion consistent with NCP 300.415(b)(2)(i): "Actual or potential exposures to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants", therefore a TCRA is warranted. Actual or threatened release of hazardous substances from groundwater CVOC contamination, if not addressed by implementing the response action discussed in this Action Memorandum, may present an imminent and substantial endangerment to public health, welfare, and the environment. The Navy has determined that this threat can be mitigated by undertaking a removal action.

5.0 Proposed Actions and Estimated Costs

The proposed actions described in this section were presented to the U.S. EPA and MassDEP. Costs presented in this section are approximate based on currently available unit rates and lump sum estimates.

5.1 Proposed Actions

The proposed action will be taken to treat groundwater at the property line, thus mitigating offsite migration and the potential for vapor intrusion. The scope of the TCRA extends along the property line, approximately 50 feet north and south of MW-26S, based on current monitoring data. The TCRA includes additional data collection efforts and will also rely on ongoing data collection activities being performed by other Navy contractors for final design.

5.1.1 Proposed Action Description

An injectable colloidal activated carbon (CAC) barrier (CAC Barrier) is the proposed remedy for the MW-26S area. CAC (similar to Regenesis' PlumeStop™) will be injected upgradient of MW-26S to mitigate offsite migration of CVOCs. Because CVOC concentrations are very low, the selected co-substrate will be abiotic such as sulfidated zero valent iron (sZVI, similar to Regenesis' sulfidated micro-ZVI). CAC and sZVI are injected during the same mobilization.

The conceptual design is injection in the immediate upgradient area of MW-26S to capture (sequester) CVOCs on the soil matrix to prevent further downgradient migration. Abiotic degradation via sZVI (or similar) would then degrade TCE (in the absence of microbial activity, this would occur via beta elimination pathways). The conceptual approach for the MW-26S CAC Barrier is shown on Figures 5-1 and 5-2 and summarized in Table 1. Additional details regarding TCRA implementation can be found in the *Work Plan for Time Critical Removal Action* (Resolution Consultants, February 2023).

Table 1
Conceptual Design Parameters — MW-26S CAC Barrier

Parameter	Specification	Basis
Injection Material	CAC w/ possible co-substrates	Groundwater data from MW-26S, -26I, and surrounding area monitoring wells.
Barrier Location and assumed ROI	10 feet upgradient of MW-26S	Assumed ROI of 10 feet (ROI to be evaluated further during hydraulic testing and design verification testing); locations require tree removal/brush clearing in advance of installation
Length	100 feet	MW-97S, -98S, -99S
Number of Injection Points	18 (estimated)	Approximately 6 feet on-center; number of points and injection radius to be determined during design verification testing
Total Depth	40 feet	Total depth of MW-26I, 35 feet; assume injections will be completed 5 feet below base of MW-26I
Injection Intervals		
Zone 1 lacustrine sand	14-25 feet bgs ~18 µg/L TCE	MW-26S screened 10-20 feet bgs; shallowest depth to water ~14 feet bgs;
Zone 2 sandy till	25-40 feet bgs ~9 µg/L TCE	MW-26I screened 25-35 feet bgs; bedrock at 41 feet bgs;

Notes:
CAC = colloidal activated carbon
ROI = radius of influence
bgs = below ground surface
TCE = trichloroethene

The TCRA will include the following elements:

- A focused predesign investigation (PDI), which will be conducted to define the vertical profile of the plume, hydraulic properties of the target treatment zones and movement of the mass flux along the proposed barrier transect. These data will be used to refine design parameters prior to injections. In addition, monitoring wells will be installed in and around the CAC barrier location during PDI field activities and baseline sampling will be performed. The PDI is expected to be complete by 3Q2023.

- Injections, which include mobilization, injections, and associated set-up activities. Mobilization will include shipment of CAC/co-substrate to the Site. Injection media will need to be off-loaded, stored, and secured onsite. Security will be in the form of portable fencing and/or storage pods equipped with locks. A water source and water truck or tanks will be procured for use during injections. Staging and injection areas will be cleared of brush and trees as needed for access and implementation.

Following mobilization but prior to injections, the vendor will perform a test injection to assess pressures and volumes per point and field-optimize injection parameters. The CAC vendor and the driller will be onsite to manage materials and mix and prepare the product for application; the Navy's consultant will be onsite to coordinate field activities, oversee injection activities, and monitoring groundwater using field instrumentation to assess CAC distribution within the aquifer. Upon completion, injection borings will be grouted/abandoned in place. Injections are expected to be complete by 4Q2023.

- Performance monitoring, which will be used to assess performance of the CAC barrier remedy. Sampling will be performed every 6 months and gauging/water quality monitoring will be performed monthly during the first quarter and then quarterly thereafter. Each performance monitoring event will include a round of synoptic water levels. Performance monitoring will be coordinated with the Site 3 LTM program to the extent practical. Monitoring wells and sampling protocols are detailed in the *Work Plan for Time Critical Removal Action* (Resolution Consultants, February 2023). Performance monitoring will be completed for 1 year, through 4Q2024, at which time recommendations for ongoing monitoring will be prepared for U.S. EPA and MassDEP.

The following wastes are estimated to be generated during activities near MW-26S: soil cuttings from new monitoring wells and piezometers, well development water, and purge water from sampling events. Investigation derived wastes will be characterized for offsite disposal; or if possible, liquid IDW may be disposed via treatment in the onsite GWETS. Based on current analytical data from site wells, it is assumed that wastes will be managed as non-hazardous. Trash (e.g., gloves, plastic baggies, paper towels) generated during field activities will be disposed as general refuse.

5.1.2 Contribution to Remedial Performance

As discussed in Section 2.2.1, the 2010 Record of Decision for Site 3 specifies the following remedy: plume containment, source bioremediation via injections of emulsified vegetable oil, LTM/MNA, land use controls, and 5-year reviews. The TCRA on the northeast property boundary near MW-26S mitigates the VI threat and ongoing migration offsite in the short term through sequestration/abiotic treatment of TCE in groundwater. This remedy is compatible with plume containment and other remedies implemented at Site 3. Long-term, the Site 3 groundwater remedy will need to be evaluated to determine if further actions are required near MW-26S.

5.1.3 Applicable or Relevant and Appropriate Requirements

As required by Section 121 of CERCLA, remedial actions carried out under Section 104 or secured under Section 106 must attain the levels of standards of control for hazardous substances, pollutants, or contaminants specified by the applicable or relevant and appropriate requirements (ARARs) of federal and state environmental laws and state facility-siting laws, unless waivers are obtained. However, as required by 40 CFR Section 300.415(j), ARARs will be identified and attained for

removal actions to the extent practicable. Two factors will be applied to determine whether the identification and attainment of ARARs is practicable in a particular removal situation: (1) the urgency of the situation and (2) the scope of the removal action to be conducted.

ARARs are identified by the U.S. EPA as either being applicable to a situation or relevant and appropriate to it. These distinctions are critical to understanding the constraints imposed on response alternatives by environmental regulations other than CERCLA. The following definitions of ARARs are from the U.S. EPA guidance (U.S. EPA 1998).

- "Applicable" requirements are standards and other environmental protection requirements of federal or state law dealing with hazardous substance, pollutant, contaminant, action being taken, location, or other circumstance at a CERCLA site.

- "Relevant and Appropriate" requirements are standards and environmental protection criteria of federal or state law that, although not "applicable" to a hazardous substance, pollutant, contaminant, action being taken, location, or other circumstance, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. The procedure to determine if a requirement is relevant or appropriate is a two- step process. A requirement is "relevant" if it addresses problems or situations sufficiently similar to the circumstances of the proposed response action. A requirement is "appropriate" if it would also be well suited to the conditions of the Site.

  A requirement may be "relevant" to a particular situation by not "appropriate", given site- specific circumstances: such a requirement would not be an ARAR for the Site. A requirement that is relevant and appropriate must be met as if it were applicable.

ARARs identified for this TCRA are included in Appendix C.

The goal of the proposed TCRA is to reduce the potential for CVOCs to migrate offsite in the uppermost groundwater bearing unit, thus mitigating risks of vapor intrusion to adjacent residences. Table 2 identifies the remedial goals for the TCRA. TCE is the only analyte identified in this area of the Site which exceeds the TCRA goal.[4]

[4] The MassDEP cleanup goal for 1,4-dioxane is 0.3 µg/L. While 1,4-dioxane has been detected above this goal in other parts of the Site, it has not been identified above the MassDEP goal in MW-26S, MW-26I, or wells within the TCRA area. 1,4-Dioxane will be monitored during the performance monitoring program, but is not a target of the TCRA.

Table 2
TCRA Remedial Goals (units, µg/L)

Analyte	U.S. EPA MCL	U.S. EPA MCLG	MassDEP MCL	MCP Method 1 GW-2 Standard	TCRA Goal
1,1-Dichloroethene	7	7	7	80	7
1,1-Dichloroethane	—	—	70 [a]	2,000	70
1,2-Dichloroethane	5	—	5	5	5
Cis-1,2-Dichloroethene	70	70	70	20	20
1,1,2-Trichloroethane	5	3	5	900	3
Tetrachloroethene	5	—	5	50	5
Trichloroethene	5	—	5	5	5
Vinyl Chloride	2	—	2	2	2

Notes:
[a] Value is based on the Massachusetts Office of Research and Standards Guideline for drinking water (not a State MCL).
TCRA = Time Critical Removal Action
µg/L = micrograms per liter
U.S. EPA = United States Environmental Protection Agency
MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
MassDEP = Massachusetts Department of Environmental Protection
MCP = Massachusetts Contingency Plan

5.1.4 Implementation Schedule

PDI activities will be implemented during 2Q2023. Once data are collected, the CAC remedial design may be refined. Pending Navy approval of the final design, it is estimated that the CAC barrier installation can be implemented within 6 months of completion of the PDI and final design.

Table 3
TCRA Project Schedule

Activity	Dates (MM-DD-YY)	
	Start Date	Completion Date
Action Memorandum	01-03-23	05-09-23
Public Notice	05-18-23	05-18-23
Field Work — PDI [a]	05-19-23	07-30-23
Design Refinement	08-01-23	09-30-23
Additional Community Relations Activities	06-01-23	10-01-23
Field Work — CAC Injections	10-01-23	11-30-23
Construction Completion Report	01-03-24	04-30-24
Post Injection Performance Monitoring	12-01-23	11-30-24

Notes:
[a] Supporting plans (such as Uniform Federal Policy-Sampling and Analysis Plans, Accident Prevention Plans, etc.) will be prepared in parallel with TCRA Work Plan documents.
TCRA = Time Critical Removal Injection
PDI = Pre-Design Investigation
CAC = Colloidal Activated Carbon

Pursuant to the NCP CFR Part 300.415(n)(3), for removal actions where on-site action is expected to extend beyond 120 days from the initiation of on-site removal activities, the following additional community relations activities will be conducted: Prepare a formal Community Relations Plan, establish at least one local information repository, and conduct interviews with local officials, residents, public interest groups, or interested or affected parties to solicit concerns and information needs.

5.2 Estimated Costs

The NCP CFR Part 300.415 dictates statutory limits of $2 million and 12 months of U.S. EPA-fund-financed removal actions, with statutory exemption for emergencies and actions consistent with the removal action to be taken. This removal action will not be U.S. EPA-fund-financed. The Navy Environmental Restoration Program does not limit the cost or duration of the removal action (Navy 2018). The cost for the proposed TCRA is currently estimated at $1,134,518. The cost estimate is provided as Appendix D.

6.0 Expected Change in the Situation Should Action be Delayed or Not Taken

Failure to address the CVOCs in shallow groundwater, which are at levels above Federal MCLs and MassDEP standards, would result in continued migration toward a private residence and offsite areas to the east. Such migration-could pose unacceptable risk to potential receptors.

7.0 Outstanding Policy Issues

There are no outstanding policy issues regarding this action.

8.0 Recommendation

This Action Memorandum documents for the Administrative Record the selected removal action to implement a CAC barrier along the northeastern property line near MW-26S to mitigate potential VI at Site 3, NWIRP Bedford in Bedford, Massachusetts. This Action Memorandum has been developed in accordance with CERCLA, as amended, and is consistent with the NCP. This decision is based on the results of earlier investigations and evaluations documented in the Administrative Record file for NWIRP Bedford. Implementation of a CAC barrier will treat CVOCs in groundwater, and therefore reduce the potential for VI along the northeastern property line until a permanent remedy is selected and implemented.

Conditions at the Site meet the NCP section 300.415(b) criteria for a removal action and Approval of the proposed removal action is recommended.

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Appendix A
Figures

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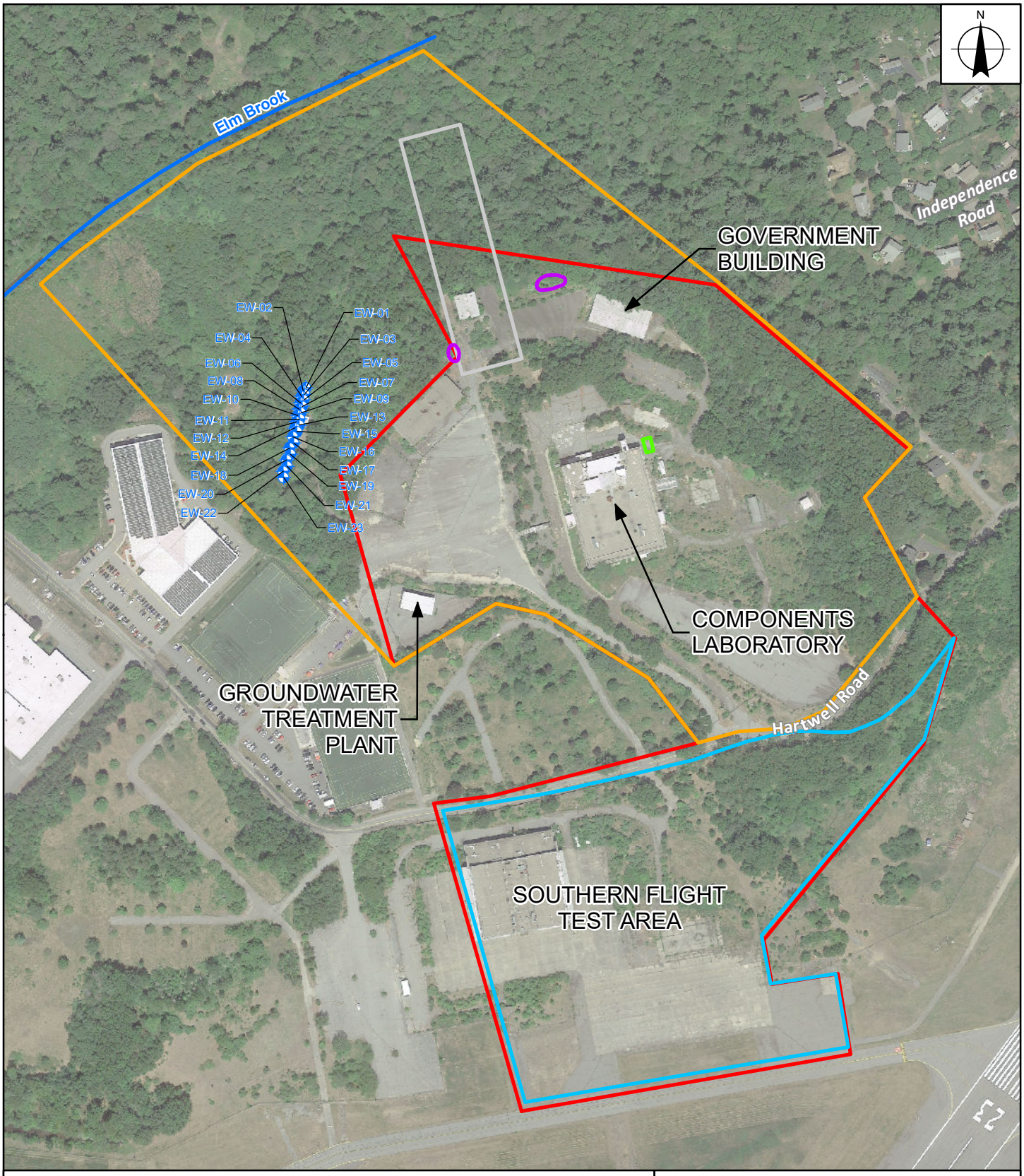

LEGEND

- STREAM
- SITE 1
- SITE 2
- SITE 3 - LAND USE CONTROL BOUNDARY
- SITE 4 - LAND USE CONTROL BOUNDARY
- NWIRP BEDFORD PROPERTY LINE
- SOUTHERN FLIGHT TEST AREA (SFTA) - LAND USE CONTROL BOUNDARY

NAD 1983 STATE PLANE MASSACHUSETTS MAINLAND FEET

0 170 340

SCALE IN FEET

FIGURE 1-1
SITE LOCATION MAP
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BEDFORD, MASSACHUSETTS

NAVFAC Naval Facilities Engineering Systems Command

REQUESTED BY:	RM	DATE:	2/17/2023
DRAWN BY:	MS	TASK ORDER #:	WE38

Source: Google Earth Pro Imagery - 06/2015

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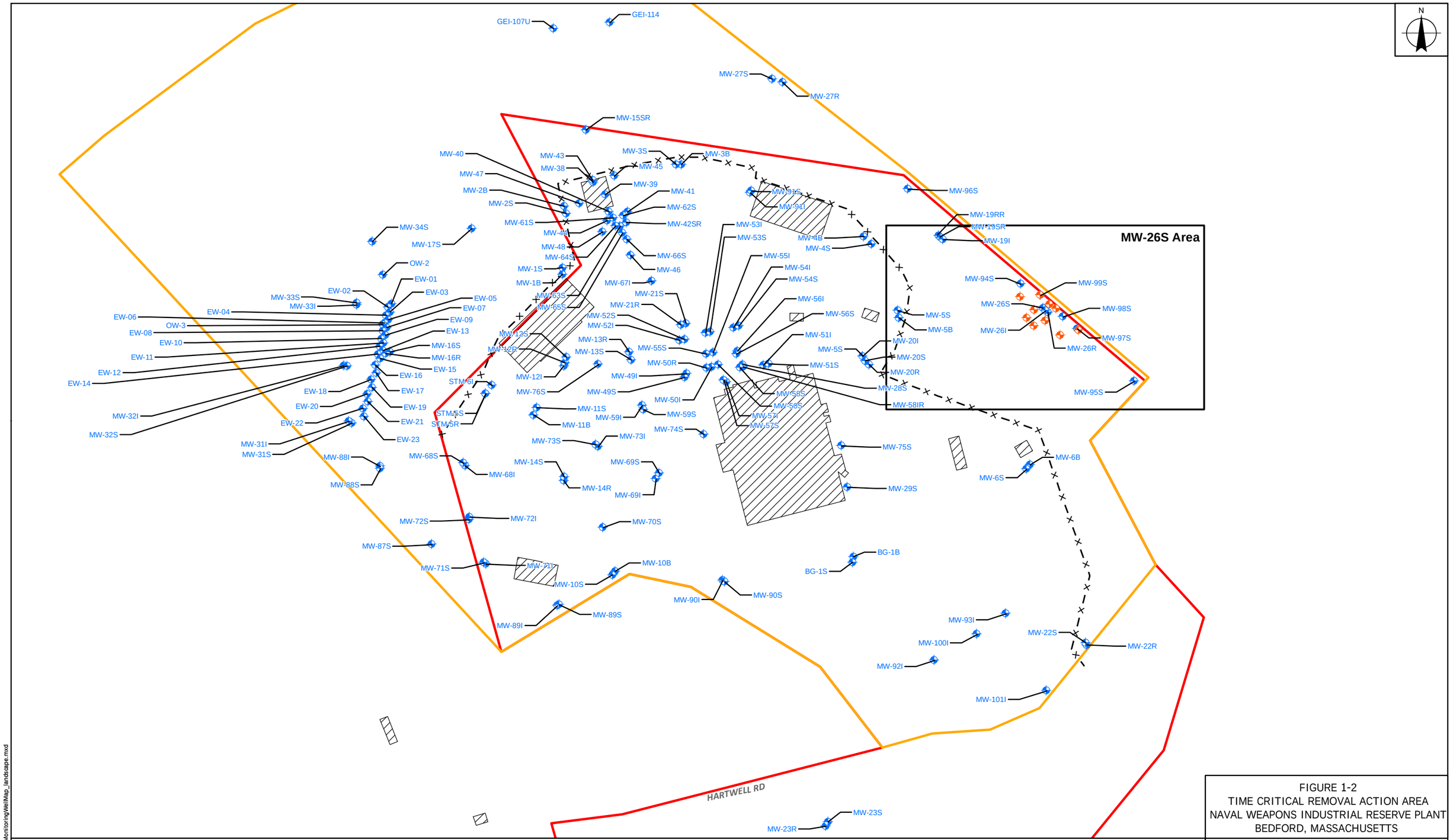

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LEGEND

- PROPOSED WELL CLUSTERS
- MONITORING WELL
- FENCE
- BUILDINGS
- NWIRP BOUNDARY
- SITE 3 LAND USE CONTROL BOUNDARY

NAD 1983 STATE PLANE
MASSACHUSETTS MAINLAND FEET

0 90 180

SCALE IN FEET

FIGURE 1-2
TIME CRITICAL REMOVAL ACTION AREA
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BEDFORD, MASSACHUSETTS

NAVFAC Naval Facilities Engineering Systems Command

REQUESTED BY:	RM	DATE:	2/17/2023
DRAWN BY:	MS	PROJECT #:	0888833480

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MW-19RR
MW-19SR
MW-19I
MW-4B
MW-4S
MW-5S
MW-5B
MW-20I
MW-20S
MW-20R
MW-51S
MW-51I
MW-75S
MW-25S
MW-94S
MW-99S
MW-26S
MW-26I
MW-26R
MW-98S
MW-97S
MW-95S
MW-6B
MW-6S

150
160
180
200
190
170
130
140

LEGEND

- PROPOSED MONITORING WELL CLUSTERS (S & I ZONES)
- MONITORING WELL
- × — × FENCE
- CONTOURS (2 FOOT INTERVAL)
- CAC BARRIER
- NWIRP BOUNDARY
- BUILDINGS

NOTE

- ALL WELL LOCATIONS WILL BE FIELD LOCATED BASED ON TOPOGRAPHY, UTILITIES/OBSTRUCTIONS, AND PROXIMITY TO FENCE LINE.

NAD 1983 STATE PLANE
MASSACHUSETTS MAINLAND FEET

0 30 60

SCALE IN FEET

FIGURE 5-1
MW-26S - TCRA AREA
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BEDFORD, MASSACHUSETTS

NAVFAC Naval Facilities Engineering Systems Command

REQUESTED BY:	RM	DATE:	2/17/2023
DRAWN BY:	MS	PROJECT #:	0888833480

Source: Contours - created from LiDAR point clouds from https://apps.nationalmap.gov/downloader

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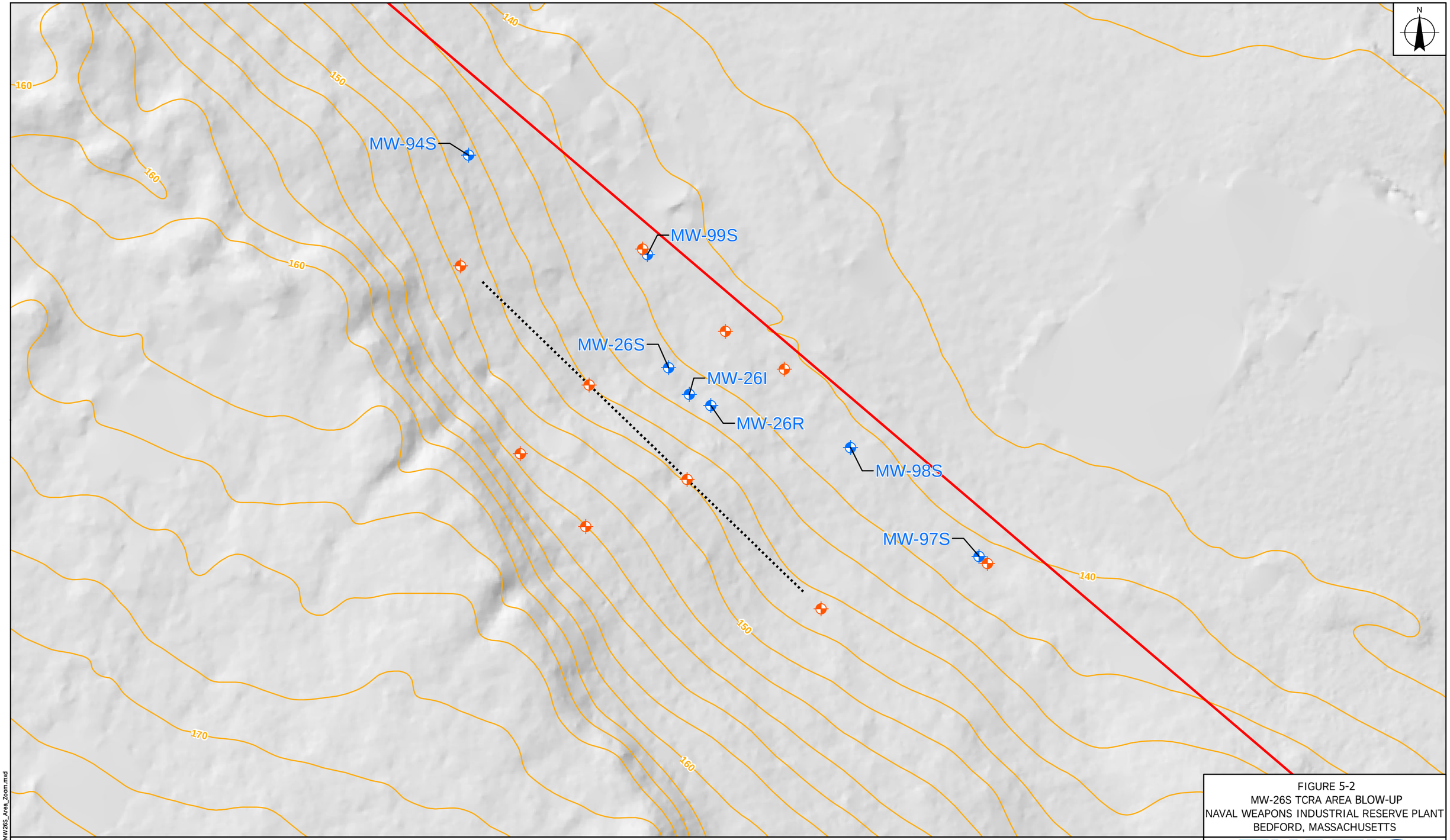

LEGEND

- PROPOSED MONITORING WELL CLUSTERS (S & I ZONES)
- MONITORING WELL
- CONTOURS (2 FOOT INTERVAL)
- CAC BARRIER
- NWIRP BOUNDARY

NOTE

- ALL WELL LOCATIONS WILL BE FIELD LOCATED BASED ON TOPOGRAPHY, UTILITIES/OBSTRUCTIONS, AND PROXIMITY TO FENCE LINE.

NAD 1983 STATE PLANE
MASSACHUSETTS MAINLAND FEET

0 10 20

SCALE IN FEET

FIGURE 5-2
MW-26S TCRA AREA BLOW-UP
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BEDFORD, MASSACHUSETTS

NAVFAC Naval Facilities Engineering Systems Command

REQUESTED BY:	RM	DATE:	2/17/2023
DRAWN BY:	MS	PROJECT #:	0888833480

Source: Contours - created from LiDAR point clouds from https://apps.nationalmap.gov/downloader

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Appendix B
References

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Appendix B — References

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Appendix C
ARARs

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Time-Critical Removal Action, MW-26S Area ARAR Summary NWIRP Bedford, Bedford, MA				
ARAR	**Citation**	**Requirement**	**Prerequisite**	**Determination**
Action-Specific ARARs				
Maximum Contaminant Levels	40 CFR 141.11-141.15 310 CMR 22.00	Establishes enforceable standards that regulate the concentration of specific organic and inorganic contaminants that have been determined to adversely affect human health in public drinking water supplies. They also may be considered relevant and appropriate for groundwater aquifers potentially used for drinking water.	Groundwater at Site 3 has been designated as high use and value by the MassDEP. Therefore, MCLs and non-zero MCLGs will be used to develop remediation goals.	Relevant and appropriate
Maximum Contaminant Level Goals	40 CFR 141.50 – 141.51	Non-enforceable health goals for public water supply systems. MCLGs are set at levels that would result in no known or expected adverse health effects with an adequate margin of safety. Non-zero MCLGs are to be used as cleanup goals when MCLs have not been established for a particular chemical of concern.		
MCP Identification of Applicable Groundwater Categories	310 CMR 40.0932	Groundwater shall be defined to be in category GW-2 if it is located within 30 feet of an existing or planned building or structure that is or will be occupied, and the average annual depth to groundwater in that area is 15 feet or less. Category GW-2 groundwater is considered to be a potential source of vapors of oil and/or hazardous material to indoor air.	Groundwater in the vicinity of the TCRA is defined as category GW-2.	Applicable
MCP, Identification of Applicable Groundwater Standards in Method 1	310 CMR 40.0974 (2), Table 1	This table presents MCP Method 1 Groundwater Standards for groundwater categories. The GW-2 Standards are applicable due to the potential for vapor intrusion from groundwater chemicals of concern. If the GW-2 Standards are more stringent than federal MCLs, the GW-2 Standards will be used.	GW-2 standards will be used to develop remediation goals if they are more stringent than the federal or state MCLs or non-zero MCLGs.	Applicable
Location-Specific ARARs				
MA Wellhead Protection Regulations	310 CMR 22.21	Requires protective zones around a wellhead be established that limit activities and land uses in the zones. Treatment works associated with treatment of groundwater and/or surface water are exempted from restrictions identified in this regulation (310 CMR 22.21(2)(a)(7)(d)).	MassMapper shows NWIRP Bedford is not within Zone II for the community wellfield northwest of Site 3; Site 3 is presumed to be in Zone III.	Applicable
Town of Bedford Zoning Bylaw	13. Aquifer Protection Districts	Codifies at the Town level the wellhead protection zones as described in 310 CMR 22.21.		Applicable

Time-Critical Removal Action, MW-26S Area ARAR Summary NWIRP Bedford, Bedford, MA				
ARAR	**Citation**	**Requirement**	**Prerequisite**	**Determination**
Action-Specific ARARs				
MCP, General Provisions for Permanent and Temporary Solutions, Migration Control	310 CMR 40.1003 (6)	Requires assessment and control (Permanent Solution) or mitigation (Temporary Solution) of subsurface migration of dissolved OHM in groundwater and vapor-phase OHM in the vadose zone.	Offsite groundwater migration.	Applicable
MA HWMR Groundwater Protection	310 CMR 30.660-30.679	These regulations require groundwater monitoring at specified regulated units that treat, store, or dispose of hazardous waste. Maximum concentration limits for the hazardous constituents are specified in 310 CMR 30.668.	Groundwater contamination and associated monitoring as part of TCRA implementation.	Relevant and appropriate
MA Underground Injection Control Program	310 CMR 27.00	These regulations address the discharge of wastes, chemicals, or other substances into the subsurface.	Injections performed as part of TCRA implementation.	Relevant and appropriate
Massachusetts Well Decommissioning Standards	313 CMR 3.03	These regulations provide standards to be followed when abandoning a well.	Well abandonment during/after TCRA implementation.	Applicable
Clean Water Act National Pollutant Discharge Elimination System	40 CFR Parts 122-125 and 131	U.S. EPA's General Construction Permit requirements for stormwater apply to construction projects that disturb over one acre. A Construction General Permit and a Stormwater Pollution Prevention Plan are required.	Any land disturbance greater than 1 acre.	Applicable
Characterization of solid waste	40 CFR 262.11(a) and (b) 310 CMR 30.100, 30.140-144	Must determine if solid waste is a hazardous waste using the following method: • Should first determine if waste is excluded from regulation under 40 CFR 261.4; and • Must then determine if waste is listed as a hazardous waste under subpart D 40 CFR Part 261.	Generation of solid waste as defined in 40 CFR 261.2	Applicable
	40 CFR 262.11(c) 310 CMR 30.100	Must determine whether the waste is (characteristic waste) identified in subpart C of 40 CFR part 261by either: (1) Testing the waste according to the methods set forth in subpart C of 40 CFR part 261, or according to an equivalent method approved by the Administrator under 40 CFR 260.21; or	Generation of solid waste which is not excluded under 40 CFR 261.4(a)	Applicable

Time-Critical Removal Action, MW-26S Area ARAR Summary NWIRP Bedford, Bedford, MA				
ARAR	**Citation**	**Requirement**	**Prerequisite**	**Determination**
		(2) Applying knowledge of the hazard characteristic of the waste in light of the materials or the processes used.		
	40 CFR 262.11(d) 310 CMR 30.100	Must refer to Parts 261, 262, 264, 265, 266, 268, and 273 of Chapter 40 for possible exclusions or restrictions pertaining to management of the specific waste.	Generation of solid waste which is determined to be hazardous waste	Applicable
Characterization of hazardous waste	40 CFR 264.13(a)(1) 310 CMR 30.120 310 CMR 30.151-157	Must obtain a detailed chemical and physical analysis on a representative sample of the waste(s), which at a minimum contains all the information that must be known to treat, store, or dispose of the waste in accordance with pertinent sections of 40 CFR 264 and 268.	Generation of RCRA hazardous waste for storage, treatment, or disposal	Applicable
Determinations for management of hazardous waste	40 CFR 268.9(a) 310 CMR 30.130	Must determine each EPA Hazardous Waste Number (waste code) applicable to the waste in order to determine the applicable treatment standar ds under 40 CFR 268 et seq. Note: This determination may be made concurrently with the hazardous waste determination required in Sec. 262.11 of this chapter.	Generation of hazardous waste for storage, treatment, or disposal	Applicable
	40 CFR 268.9(a) 310 CMR 30.302	Must determine the underlying hazardous constituents [as defined in 40 CFR 268.2(i)] in the characteristic waste.	Generation of RCRA characteristic hazardous waste (and is not D001 non–wastewaters treated by CMBST, RORGS, or POLYM of Section 268.42 Table 1) for storage, treatment, or disposal	Applicable
	40 CFR 268.7(a) 310 CMR 30.302	Must determine if the hazardous waste meets the treatment standards in 40 CFR 268.40, 268.45, or 268.49 by testing in accordance with prescribed methods or use of generator knowledge of waste. Note: This determination can be made concurrently with the hazardous waste determination required in 40 CFR 262.11.	Generation of hazardous waste for storage, treatment, or disposal	Applicable
	40 CFR 268.7(a) 310 CMR 30.302	Must comply with the special requirements of 40 CFR 268.9 in addition to any applicable requirements in CFR 268.7.	Generation of waste or soil that displays a hazardous characteristic of ignitability, corrosivity, reactivity, or toxicity for storage, treatment, or disposal	Applicable

Time-Critical Removal Action, MW-26S Area ARAR Summary NWIRP Bedford, Bedford, MA				
ARAR	**Citation**	**Requirement**	**Prerequisite**	**Determination**
Temporary on–site storage of hazardous waste in containers	40 CFR 262.34(a); 40 CFR 262.34(a)(1)(i); 40 CFR 262.34(a)(2) and (3) 310 CMR 30.680	A generator may accumulate hazardous waste at the facility provided that: • waste is placed in containers that comply with 40 CFR 265.171–173; and • the date upon which accumulation begins is clearly marked and visible for inspection on each container; container is marked with the words “hazardous waste”; or	Accumulation of RCRA hazardous waste on site as defined in 40 CFR 260.10	Applicable
	40 CFR 262.34(c)(1) 310 CMR 30.680	container may be marked with other words that identify the contents.	Accumulation of 55 gal. or less of RCRA hazardous waste or one quart of acutely hazardous waste listed in 261.33(e) at or near any point of generation	Applicable
Preparation of hazardous waste for disposal	310 CMR 30.603	Certain onsite processes used to stabilize waste (e.g., addition of adsorbent) shall not be considered treatment if performed at the site of generation to make the waste more amenable to treatment at a hazardous waste disposal facility.	Accumulation of hazardous waste requiring non-chemical stabilization prior to offsite disposal.	Applicable
Use and management of hazardous waste in containers	40 CFR 265.171 310 CMR 30.680	If container is not in good condition (e.g., severe rusting, structural defects) or if it begins to leak, must transfer waste from this container to a container that is in good condition.	Storage of RCRA hazardous waste in containers	Applicable
	40 CFR 265.172 310 CMR 30.341-342	Must use container made or lined with materials compatible with waste to be stored so that the ability of the container to contain is not impaired.		
	40 CFR 265.173(a) and (b) 310 CMR 30.680	Containers must be closed during storage, except when necessary to add/remove waste. Container must not be opened, handled, and stored in a manner that may rupture the container or cause it to leak.		

Time-Critical Removal Action, MW-26S Area ARAR Summary NWIRP Bedford, Bedford, MA				
ARAR	**Citation**	**Requirement**	**Prerequisite**	**Determination**
Disposal of RCRA hazardous waste in a land-based unit	40 CFR 268.40(a) 310 CMR 30.750	May be land disposed if it meets the requirements in the table "Treatment Standards for Hazardous Waste" at 40 CFR 268.40 before land disposal.	Land disposal, as defined in 40 CFR 268.2, of restricted RCRA waste	Applicable
	40 CFR 268.40(e) 310 CMR 30.750	All underlying hazardous constituents [as defined in 40 CFR 268.2(i)] must meet the UTS, found in 40 CFR 268.48 Table UTS prior to land disposal	Land disposal of restricted RCRA characteristic wastes (D001 – D043) that are not managed in a wastewater treatment system that is regulated under the CWA, that is CWA equivalent, or that is injected into a Class I nonhazardous injection well	Applicable
Disposal of RCRA *hazardous waste soil* in a land–based unit	40 CFR 268.49(b) 310 CMR 30.750	Must be treated according to the alternative treatment standards of 40 CFR 268.49(c) or according to the UTSs specified in 40 CFR 268.48 applicable to the listed and/or characteristic waste contaminating the soil prior to land disposal	Land disposal, as defined in 40 CFR 268.2, of restricted hazardous soils	Applicable
Disposal of RCRA hazardous waste in a land-based unit	40 CFR 268.34(f) 310 CMR 30.750	To determine whether a hazardous waste identified in this section exceeds the applicable treatment standards of 40 CFR 268.40, the initial generator must test a sample of the waste extract or the entire waste, depending on whether the treatment standards are expressed as concentration in the waste extract or waste, or the generator may use knowledge of the waste. If the waste contains constituents (including UHCs in the characteristic wastes) in excess of the applicable UTS levels in 40 CFR 268.48, the waste is prohibited from land disposal, and all requirements of part 268 are applicable, except as otherwise specified.	Land disposal of RCRA toxicity characteristic wastes (D004 – D011) that are newly identified (i.e., wastes, soil, or debris identified by the TCLP but not the Extraction Procedure)	Applicable
Disposal of RCRA hazardous waste debris in a land–based unit (i.e., landfill)	40 CFR 268.45(a) 310 CMR 30.750	Must be treated prior to land disposal as provided in 40 CFR 268.45(a)(1)–(5) unless EPA determines under 40 CFR 261.3(f)(2) that the debris no longer contaminated with hazardous waste, or the debris is treated to the waste –specific treatment standard provided in 40 CFR 268.40 for the waste contaminating the debris.	Land disposal, as defined in 40 CFR 268.2, of restricted RCRA hazardous debris	Applicable

Time-Critical Removal Action, MW-26S Area ARAR Summary NWIRP Bedford, Bedford, MA				
ARAR	**Citation**	**Requirement**	**Prerequisite**	**Determination**
Transportation of hazardous waste *onsite*	40 CFR 262.20(f) 310 CMR 30.304	The generator manifesting requirements of 40 CFR 262.20–262.32(b) do not apply. Generator or transporter must comply with the requirements set forth in 40 CFR 263.30 and 263.31 in the event of a discharge of hazardous waste on a private or public right–of–way.	Transportation of hazardous wastes on a public or private right–of–way within or along the border of contiguous property under the control of the same person, even if such contiguous property is divided by a public or private right–of–way	Applicable
Transportation of hazardous waste *offsite*	40 CFR 262.10(h); 310 CMR 30.305	Must comply with the generator standards of Part 262 including 40 CFR 262.20–23 for manifesting, Sect. 262.30 for packaging, Sect. 262.31 for labeling, Sect. 262.32 for marking, Sect. 262.33 for placarding,	Preparation and initiation of shipment of hazardous waste offsite	Applicable
Transportation of *hazardous materials*	49 CFR 171.1(c)	Shall be subject to and must comply with all applicable provisions of the HMTA and HMR at 49 CFR 171–180 related to marking, labeling, placarding, packaging, emergency response, etc.	Any person who, under contract with a department or agency of the federal government, transports “in commerce,” or causes to be transported or shipped, a hazardous material	Applicable
Transportation of samples (i.e. contaminated wastewaters)	40 CFR 261.4(d)(1)(i)–(iii) 310 CMR 30.104(3)	Are not subject to any requirements of 40 CFR Parts 261 through 268 or 270 when: • the sample is being transported to a laboratory for the purpose of testing; or • the sample is being transported back to the sample collector after testing; or • the sample is being stored by sample collector before transport to a lab for testing	Samples of solid waste or a sample of water, soil for purpose of conducting testing to determine its characteristics or composition	Applicable
	40 CFR 261.4(d)(2) 40 CFR 261.4(d)(2)(ii)(A) and (B) 310 CMR 30.104(3)	In order to qualify for the exemption in 40 CFR 261.4 (d)(1)(i) and (ii), a sample collector shipping samples to a laboratory must: • Comply with U.S. DOT, U.S. Postal Service, or any other applicable shipping requirements. • Assure that the information provided in (1) thru (5) of this section accompanies the sample. • Package the sample so that it does not leak, spill, or vaporize from its packaging. 310 CMR 30.104(3)(a)3. states that the exemption does not apply when the sample is discarded or if the laboratory determines the sample is hazardous, but the laboratory is no longer meeting any of the conditions outlined in the regulation.		

Notes:

ARAR	=	Applicable, relevant, or appropriate requirement
CFR	=	Code of Federal Regulations
CMR	=	Code of Massachusetts Regulations
MassDEP	=	Massachusetts Department of Environmental Protection
MCL	=	Maximum Contaminant Level
MCLG	=	Maximum Contaminant Level Goal
MCP	=	Massachusetts Contingency Plan
MA	=	Massachusetts
OHM	=	oil and/or hazardous material
HWMR	=	Hazardous Waste Management Rule
TCRA	=	Time Critical Removal Action
RCRA	=	Resource Conservation and Recovery Act
UTS	=	universal treatment standards
CWA	=	clean water act
UHC	=	underlying hazardous constituents
TCLP	=	toxicity characteristic leaching procedure
EPA	=	Environmental Protection Agency
HTMA	=	Hazardous Materials Transportation Act
HMR	=	Hazardous Materials Regulations
DOT	=	Department of Transportation

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Appendix D
Cost Estimate

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Cost Estimate Summary

Site: Site 3, MW26 Area

Location: NWIRP Bedford, Bedford MA

Date: February 2023

Description:

Pre-Design Investigation - installation of monitoring wells, sampling, and data review
Injection of colloidal activated carbon in an estimated 100 foot linear array
Performance monitoring and reporting

Description of Service/Item	Unit Price	Assumptions
Pre-Design Investigation		
Work Plans, Driling Oversight, Sampling, Update Design	$137,000.00	Labor for work plans, drilling and sampling
Drilling Contractor / Well Installation	$125,000.00	Installation of 20 monitoring wells utilizing sonic drilling method
Laboratory Analysis	$36,000.00	Baseline groundwater analysis for design optimization
Waste Disposal	$48,000.00	Soil and water from drilling and well development
Site Preparation, Materials, and Supplies	$45,000.00	Drilling and sampling support
	$391,000.00	Sub Total
Injections		
Injection Oversight, Field Documentation	$52,000.00	Labor for injection coordination and oversight
Injection Contractor and Material	$294,000.00	
Materials, Equipment, and Supplies	$16,000.00	Injection support
	$ 362,000.00	Sub Total
Performance Monitoring, through Q4 2024		
Sampling, Materials, Equipment	$80,000.00	Labor and materials for monitoring and sampling events
Laboratory Analysis	$63,000.00	Groundwater analysis for performance monitoring
	$143,000.00	Sub Total
Post-Construction Reporting		
Post Injection Report	$30,000.00	
Performance Monitoring Reports	$47,000.00	
	$ 77,000.00	
Subtotal:	$ 973,000.00	
Contingency 10%	$ 97,300.00	
Subtotal:	$ 1,070,300.00	
Project Management 6%	$ 64,218.00	
TOTAL CAPITAL COSTS:	**$ 1,134,518.00**	

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