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United States Navy



Explanation of Significant Differences

Eastern Plume

Naval Air Station Brunswick, Maine

Change in Groundwater Treatment System and Addition of 1,4-Dioxane and Vinyl Chloride as Contaminants of Concern



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INTRODUCTION AND STATEMENT OF PURPOSE

An Explanation of Significant Differences (ESD) is required for the Eastern Plume at Naval Air Station (NAS) Brunswick, Brunswick, Maine, to modify the Record of Decision (ROD) in response to a change in the treatment technology used in the groundwater extraction and treatment system (GWETS). The modification is significant because it changes a component of the groundwater pumping and treatment remedy (i.e., the technology used to remove volatile organic contaminants) but does not fundamentally alter the overall cleanup approach documented in the ROD for No Further Action for Sites 4, 11, and 13 and a Remedial Action for the Eastern Plume signed on 10 February 1998. Also, this ESD documents the addition of 1, 4-dioxane and vinyl chloride to the list of Eastern Plume groundwater contaminants of concern (COCs) in the 1998 ROD.

The Navy is the lead agency, with oversight from the United States Environmental Protection Agency (U.S. EPA) and Maine Department of Environmental Protection (MEDEP), for cleanup of sites at NAS Brunswick in the Installation Restoration (IR) Program under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as modified by the Superfund Amendments and Reauthorization Act (SARA). The Navy is issuing this ESD for the Eastern Plume at NAS Brunswick as part of the public participation requirements under Section 117(c) of CERCLA, Section 300.435(c)(2)(i) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), and the Navy IR Program. In accordance with Section 300.825(a) (2) of the NCP, this ESD will become part of the Administrative Record for the facility. The Administrative Record also contains background information that was used in determining the original remedy, as documented in the Interim and final RODs, in determining the previous remedy modification, as documented in the 2000 ESD, and in preparing this ESD. The Administrative Record for NAS' Brunswick is included as part of the Information Repository, which is available for review at the following location:

> Curtis Memorial Library 23 Pleasant Street Brunswick, Maine 04011 (207) 725-5242 www.curtislibrary.com

Hours of Availability: September to May Monday to Thursday * 9:30 am to 8:00 pm Friday * 9:30 am to 6:00 pm Saturday * 9:30 am to 5:00 pm Monday to Thursday * 9:30 am to 8:00 pm Friday * 9:30 am to 6:00 pm June to August Monday to Thursday * 9:30 am to 8:00 pm Friday * 9:30 am to 6:00 pm Saturday * 9:30 am to 6:00 pm Saturday * 9:30 am to 1:00 pm Saturday * 9:30 am to 1:00 pm

This ESD documents the change in the Eastern Plume groundwater treatment technology from air stripping with subsequent vapor-phase and liquid-phase granular activated carbon (GAC) treatment to an advanced chemical oxidation treatment process that uses hydrogen peroxide and ozone to break down Eastern Plume volatile organic compound (VOC) contaminants and the organic compound 1,4-dioxane into non-hazardous end products. 1,4-Dioxane, which was not identified as an Eastern Plume groundwater COC in the 1998 ROD, has been detected at concentrations greater than the State of Maine's Maximum Exposure Guideline (MEG) of 32 parts per billion (ppb) and U.S. EPA's current risk-based level of 3.5 ppb in portions of the groundwater contaminant plume. Treated groundwater leaving the advanced oxidation treatment system will undergo a final treatment process by passing through the GWETS' existing liquid-phase GAC treatment. In addition to 1,4-dioxane, vinyl chloride, which was also not included as a COC in the 1998 ROD, has also been sporadically detected at concentrations greater than the MEG of 0.15ppb and the federal Maximum Contaminant Level (MCL) of 2 ppb. In addition to the change in treatment technology, this ESD documents the addition of 1,4-dioxane and vinyl chloride as COCs for the Eastern Plume and establishes interim cleanup goals for these COCs of 3.5 ppb (U.S. EPA risk-based value) and 0.15 ppb (1992 Maine MEG), respectively.

SITE HISTORY, CONTAMINATION, AND SELECTED REMEDY

The mission of NAS Brunswick, located in Brunswick, Cumberland County, Maine, has been to support the Navy's antisubmarine warfare operations in the Atlantic Ocean with several squadrons of P-3 maritime patrol aircraft. NAS

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Brunswick is currently an active base but was selected in 2005 by the Base Realignment and Closure (BRAC) Commission for closure and is scheduled to be deactivated in 2011. The base occupies approximately 3,094 acres, and the operational area covered approximately 138 acres east of the two parallel runways extending north to south in the northern portion of the facility. The operational area included numerous office buildings, barracks, recreational facilities, hangars, repair shops, and other facilities to support NAS Brunswick aircraft, although building demolition associated with base closure has begun. Forested areas, grasslands, shrubland, marsh, and open water comprise approximately 83 percent of the base, with the remaining 17 percent consisting of paved areas (primary flight ramps and runways) of the operations area. The southern edge of the base borders coves and estuaries of the Gulf of Maine.

The Eastern Plume, located along the central portion of the eastern NAS Brunswick boundary, previously consisted of an area of groundwater contamination approximately 3,500 feet long and up to 1,400 feet wide oriented approximately northsouth along Weapons Compound Road for approximately 0.6 mile. Figure 1 presents the historical footprint of the plume. Eastern Plume groundwater contaminants, mainly chlorinated VOCs, have been attributed to past activities at the following sites located north-northwest of the current plume:

- Site 4 a former acid and caustic pit approximately 4 feet square and 3 feet deep used from 1969 to 1974 for disposal of an unknown quantity of liquid wastes. Wastes, including transformer oil, battery acid, caustics, solvents [including trichloroethene (TCE)] and paint thinners, were poured into the pit for disposal. Building 584 was constructed over the eastern portion of the former pit.
- Site 11 a former fire training area used regularly over a 30-year period ending in 1990. As part of training operations, waste fuel, oil, solvents, and other miscellaneous combustible liquids were spread on the soil for fuel and ignited.
- Site 13 the Defense Reutilization and Marketing Office (DRMO) area, which included three (underground storage tank) USTs, one for diesel fuel and the other two for storing waste fuels, oils, and degreasing solvents. All three tanks were removed in the late 1980s.

Source removal activities in the early 1990s and subsequent natural attenuation appear to have effectively depleted nearly all the residual fuel and solvents in the source areas at Sites 4, 11, and 13; therefore, these areas no longer act as sources for the Eastern Plume. Contamination associated with Sites 4, 11, and 13 corresponds to the contaminants identified in the Eastern Plume, the sites are hydraulically upgradient of the plume, and migration pathways exist between the sites and the Eastern Plume. The current-day upgradient edge of the Eastern Plume occurs east of Sites 4, 11, and 13, and no other source(s) of Eastern Plume contaminants has been identified.

The Navy and U.S. EPA, in conjunction with MEDEP, selected the cleanup remedy for the Eastern Plume in the 1998 ROD. As presented in the ROD, the selected remedy included continued operation of an existing groundwater extraction and treatment system (which began operation in 1995 based on the 1992 Interim ROD entitled Record of Decision for an Interim Remedial Action at the Eastern Plume Operable Unit), continuation of a long-term groundwater monitoring program (that began in 1995 to monitor the performance of the GWETS), and five-year reviews. As discussed in the 1992 Interim ROD and 1998 ROD, the GWETS originally included the following components:

- Pretreatment to remove inorganics;
- Ultraviolet (UV) oxidation to destroy VOCs;
- Discharge of treated water to the local publically owned treatment works;
- Periodic disposal of filter press sludge from the inorganics treatment process.

The GWETS was designed to contain and remove dissolvedphase VOCs from groundwater. The site contaminants targeted by the system as originally designed included the chlorinated VOCs trichloroethane (TCA), tetrachloroethene (PCE), TCE, and their breakdown products. The GWETS in its original configuration operated from 1995 until early 2001 when the original VOC treatment equipment (UV oxidation) was replaced with an air stripping and GAC treatment process to improve VOC removal efficiency. In this process, air stripping was used to remove ("strip") VOCs from the liquid phase (groundwater) and transfer them to the vapor phase (air), and GAC was used to remove residual groundwater contaminants (via adsorption to the granular carbon medium) prior to discharge (originally to the POTW and then in 2002 to an on-site infiltration gallery). VOCs in the air phase were treated with vapor-phase GAC prior to release to the atmosphere. The changes to the GWETS implemented in 2001 were documented in a 2000 ESD, which also documented the addition of land use controls (LUCs) to the remedy to prevent use of contaminated groundwater associated with the Eastern Plume.

BASIS FOR THE DOCUMENT

Beginning in 2004, after design, installation, and modification of the GWETS, 1,4-dioxane was detected during long-term monitoring and was identified as an emerging chemical of concern in Eastern Plume groundwater. 1,4-Dioxane has historically been added to TCA during manufacturing as a stabilizer and corrosion inhibitor and has also been found at low levels in PCE and TCE. During subsequent investigations, 1,4-dioxane was detected in Eastern Plume groundwater at concentrations exceeding Maine's MEG of 32 ppb for drinking water and U.S. EPA's current risk-based level of 3.5 ppb. Although the GWETS has been effective at removing other VOCs from extracted groundwater, it is not effective for removing 1,4-dioxane because this compound is not readily removed during air stripping nor is it adsorbed by GAC. Based on detection of 1,4-dioxane at concentrations greater than the Maine MEG and because the air stripping and GAC treatment process is not effective at removing this compound from extracted groundwater, it was determined that the GWETS required modification to address 1,4-dioxane contamination.

The technology chosen to address 1,4-dioxane and the majority of other volatile COCs is a HiPOx® Hydraulic Control Unit (HCU) that uses a patented ozone and hydrogen peroxide advanced oxidation process to break down dissolved-phase VOCs into non-hazardous end products. The results of a 12-week pilot test of the HiPOx® system, conducted from November 2009 to January 2010, indicate that the system successfully reduced 1,4-dioxane concentrations to less than the system treatment (discharge) goal of 10 µg/L prior to discharge to the GWETS infiltration gallery, and GWETS effluent criteria were consistently achieved during the test period. Because the HiPOx® system is not as effective for removal of the chlorinated ethane COCs (TCA and its breakdown products), the existing liquid-phase GAC units will continue to operate (after HiPOx® treatment) to provide additional removal of residual chlorinated ethanes and chlorinated ethenes The Navy will conduct additional testing to further confirm that treated effluent from the combined HiPOx® and liquid phase GAC unit treatment train is meeting applicable federal and state groundwater discharge standards. The air stripper and associated vaporphase GAC units (used to remove VOCs transferred from groundwater to air by the air stripper) will be deactivated upon confirmation that the modified GWETS treatment system is successfully achieving groundwater discharge standards and criteria for reactivating the air stripper are developed and approved by the regulatory agencies.

DESCRIPTION OF SIGNIFICANT DIFFERENCES

This ESD documents modifications to the ROD for the Eastern Plume that significantly change, but do not fundamentally alter, the selected remedy. The significant differences in the remedy as detailed in the 1992 Interim ROD and 1998 ROD as modified by the 2000 ESD include modification of the ex-situ treatment process used to remove contaminants from extracted groundwater, addition of 1,4-dioxane and vinyl chloride as COCs, and establishment of interim cleanup goals of 3.5 ppb (U.S. EPA risk-based cleanup level) and 0.15 ppb (MEG), respectively. The previous groundwater treatment train consisted of air stripping and subsequent vapor-phase and liquid-phase GAC treatment (see Figure 2), and the treatment train modification documented in this ESD includes a HiPOx[®] HCU unit and subsequent liquid-phase GAC treatment (see Figure 3).

The GWETS in this modified configuration will have operational flexibility to put the air stripper back on line if it is

determined to be necessary, and monitoring will continue in accordance with regulator-approved plans to continue verify continued performance of the GWETS. The Navy will develop a standard operating procedure, to be included in the Operations and Maintenance (O&M) Plan for the GWETS that will establish triggers to ensure that the discharge groundwater standards are not exceeded and will include the process to be followed for reactivating the air stripper. Within 60-90 days after the signature of the ESD, the Navy will provide a draft version of the standard operating procedure for reactivating the air stripper to U.S. EPA and MEDEP for review and comment. While the GWETS is operating in the new configuration (HiPOx* and liquid-phase GAC treatment), the air stripper and vapor-phase GAC unit will continue to be maintained in inactive/stand-by status. Within one year after the signature of the ESD, the Navy will provide a revised draft O&M Plan for the GWETS to U.S. EPA and MEDEP for review and comment.

The other components of the remedy have not changed significantly, although optimization of the remedy (changes in the number and locations of extraction wells and changes to the long-term monitoring program), which does not require post-ROD documentation, has occurred as documented in other Eastern Plume documents available in the Administrative Record. Optimization of the Eastern Plume remedy will continue to be implemented on an ongoing basis as performance data continue to be collected and evaluated by the Navy to ensure that the remedy is meeting remedial objectives.

SUPPORT AGENCY COMMENTS

U.S. EPA and MEDEP representatives, as part of the NAS Brunswick IR Team, have had ongoing involvement in the decision-making process associated with the change in the Eastern Plume remedy. The Navy has obtained concurrence from the U.S. EPA and MEDEP on the modification to the cleanup remedy for the Eastern Plume.

STATUTORY DETERMINATIONS

The proposed change to the selected remedy will continue to satisfy the statutory requirements of CERCLA Section 121, and the modified remedy will remain protective of human health and the environment and will continue to comply with federal and state Applicable or Relevant and Appropriate Requirements (ARARs) and be cost effective.

PUBLIC PARTICIPATION

Public participation requirements as outlined in the NCP, Section 300.435 (c) (2) (i) have been met.

FOR MORE INFORMATION

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DEGLARATION

The issuance of this ESD for the Eastern Plume at NAS Brunswick is concurred with.

United States Department of the Navy:

Captain Will Fitzgerald

Commanding Officer, NAS Brunswick

25E8T10 Date James T. Owens Date Director

Office of Site Remediation and Restoration U.S. EPA Region 1

United States Environmental Protection Agency:



FIGURE 1 - EXTENT OF EASTERN PLUME BASED ON SEPTEMBER 2009 EXCEEDANCES OF MEGS/MCLS

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FIGURE 2 - GWETS WITH LIQUID- AND VAPOR-PHASE GAC

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FIGURE 3 - GWETS WITH HIPOX LIQUID-PHASE GAC

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