Click here to return to document Index

1.0 INTRODUCTION

The Navy, in conjunction with the United States Environmental Protection Agency (USEPA) Region I and Connecticut Department of Environmental Protection (CTDEP), has conducted the first five-year review of the remedial actions implemented at the Naval Submarine Base-New London (NSB-NLON) in New London County, Connecticut. The National Superfund electronic database identification number for NSB-NLON is CTD980906515. This review has been prepared by Tetra Tech NUS, Inc. (TtNUS) under Contract Task Order 816, as part of the United States Navy Installation Restoration Program (IRP) for the Department of the Navy (DON), Engineering Field Activity Northeast (EFANE) Naval Facilities Engineering Command, under Contract Number N62467-94-D-0888. TtNUS was formerly known as Brown and Root Environmental (BRE or B&RE) and Halliburton NUS Corporation (HNUS). TtNUS conducted the five-year review of the pending, completed, and ongoing remedial actions implemented at 23 Installation Restoration (IR) sites at NSB-NLON from April 2001 through June 2001. A general site location map of NSB-NLON is shown on Figure 1-1 and the locations of the sites are shown on Figure 1-2.

1.1 PURPOSE

The purpose of the five-year review is to determine whether the remedies for sites are protective of human health and the environment. The methods, findings, and conclusions of the reviews are documented in five-year review reports. In addition, five-year review reports identify deficiencies found during the review, if any, and provide recommendations to address them.

This review is required by statute. The Navy must implement five-year reviews consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA Section 121(c), as amended, states

> If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented.

The NCP part 300.430(f)(4)(ii) of the Code of Federal Regulations (CFR) states

> If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead

agency shall review such action no less often than every five years after the initiation of the selected remedial action.

This is the first five-year review of NSB-NLON. The triggering action for this review is the initiation of the remedial action for Site 2 - Area A Landfill and Wetlands (soil), which began in December 1996. Because hazardous substances remain at the site above levels that allow for unrestricted use and unlimited exposure, subsequent five-year reviews will be required.

As discussed in the USEPA Comprehensive Five-Year Review Guidance (USEPA, 1999b), a five-year review determines whether the remedy at a site is protective of human health and the environment. Where a remedial action is still under construction, a five-year review determines whether immediate threats have been addressed and whether the remedy is expected to be protective when all remedial actions are completed. In addition, a five-year review identifies any deficiencies and recommends steps to correct them. To do this, the technical assessment conducted during a five-year review examines the three questions shown below.

- Question 1: Is the remedy functioning as intended by the decision documents?
- Question 2: Are the assumptions used at the time of the remedy selection still valid?
- Question 3: Has any other information come to light that could call into question the protectiveness of the remedy?

These questions will be answered for the sites at NSB-NLON where a remedy has been implemented or is currently being implemented in Sections 2.0 through 24.0. To answer these questions, this five-year review included several steps. The review included a review of documents, interviews with personnel associated with the sites, and a site inspection for each site at NSB-NLON. This report also includes the findings of a review of newly promulgated standards, and changes in the standards that were identified as applicable or relevant and appropriate requirements (ARARs) at the time the Record of Decision (ROD), to be considereds (TBCs), and the factors used to develop site-specific, risk-based levels. This information was reviewed for sites where RODs were signed and where changes since the time of the ROD may call into question the protectiveness of the remedy. It was determined that recalculation of risk or a risk assessment was not necessary to determine whether a remedy protects human health and the environment, as will be discussed in later sections. Where applicable, monitoring and sampling data and the documentation of operation and maintenance (O&M) are also examined and included in the subsequent site-specific sections.

1.2 OVERVIEW OF NSB-NLON

NSB-NLON currently provides base command for submarine activities in the Atlantic Ocean. It also provides housing for Navy personnel and their families and supports submarine training facilities, military offices, medical facilities, and facilities for submarine maintenance, repair, and overhaul. The following sections provide the physical and geologic conditions at NSB-NLON as well as a history and chronology.

1.2.1 Land Use

NSB-NLON is located in southeastern Connecticut in the towns of Ledyard and Groton. NSB-NLON is situated on the east bank of the Thames River, approximately 6 miles north of Long Island Sound. It is bordered on the east by Connecticut Route 12, on the south by Crystal Lake Road, and on the west by the Thames River. The northern border is a low ridge that trends approximately east-southeast from the Thames River to Baldwin Hill.

Currently, NSB-NLON consists of over 300 buildings on 576 acres of land (Atlantic, 1992). The density of buildings is high along the central bedrock high, in the southern valley, and along the Thames River. In the northern valley are streams, a wetland, and a golf course. The northern bedrock high is not heavily developed except along the southern face at the Area A Weapons Center and the Torpedo Shops. The top and northern faces of the northern ridge are wooded, undeveloped areas.

Land use adjacent to the base is residential and commercial. Residential development along Military Highway, Sleepy Hollow, Long Cove Road, and Pinelock Drive borders the site to the north and extends northward into the Gales Ferry section of Ledyard. Property along Route 12 east of the base consists of widely spaced private homes and open, wooded land. Development is mixed commercial and residential farther south on Route 12. This area includes a church, automobile sales and repair facilities, convenience stores, restaurants, and a gas station. Private residences, an automobile service station, and a dry cleaners are located along the southern side of Crystal Lake Road. Housing for Navy personnel exists farther south of Crystal Lake Road.

1.2.2 History and Site Chronology

Important NSB-NLON historical events and relevant dates in the site chronology are listed in the following table. The identified events are illustrative, not comprehensive.

Event	Date
State of Connecticut donates 112-acres on the east bank of the Thames River to the Navy	1867
Navy officially designates property as a Navy Yard	1868
Navy designates site as a Submarine Base	1916
Six piers and 81 buildings were added	World War I
Submarine school established	1917
Submarine Medical Center founded	1918
180 buildings built and land acquired adjacent to site	1935 to 1945
Medical Research Laboratory was established	1946
Submarine School became largest tenant	1968
Naval Submarine Support Facility established	1974
Naval Undersea Medical Institute established	1975
First environmental study for investigation of oil contamination of groundwater	1979
Navy initiated the Naval Assessment and Control of Installation Pollutants (NACIP) Program	1980
Initial Assessment Study completed	1983
U.S. Department of Defense (DOD) developed the IR Program which was the catalyst for environmental investigations at NSB-NLON	1986
Inclusion of NSB-NLON on the Federal Agency Hazardous Waste Compliance Docket	1988
USEPA proposes that NSB-NLON be added to the National Priorities List (NPL)	1989
Placed on the NPL	August 1990
Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) completed	1992
Phase I Remedial Investigation (RI) completed	1992
Federal Facilities Agreement (FFA) signed	1995
Phase II RI completed	1997

Investigations were initiated at NSB-NLON by the Navy Environmental Support Office (NESO) in 1979 to identify the source and extent of oil that was found in soils along the Thames River at three sites on the Lower Subase. NESO drilled and sampled 16 soil borings and piezometers. Envirodyne Engineers, Inc. completed an Initial Assessment Study (IAS) in 1982, as part of the NACIP program. The IAS recommended that various actions and studies be conducted at several sites for further characterization. A Phase I RI was completed in 1992 by Atlantic Environmental Services, Inc. for 11 sites.

Additional investigations, including but not limited to, a Phase II RI (B&RE, 1997a), Lower Subase RI (TtNUS, 1999), Focused Feasibility Study (FFS), Engineering Evaluation/Cost Analysis (EE/CA), and draft final Basewide Groundwater OU RI (TtNUS, 2001e), have been completed to further evaluate sites

at NSB-NLON. Additional information on these investigations are discussed in Sections 2.0 through 24.0, where appropriate. The following paragraphs further discuss the current state of the IR sites at NSB-NLON in addition to the five-year review rationale.

1.2.3 Site Information

This five-year review report addresses all of the IR sites at NSB-NLON undergoing CERCLA investigations. Although some sites do not require a five-year review at this time, this report includes all sites to streamline future reporting requirements. The sites included in the review and the rationale for including them is provided below.

The CERCLA remedial process continued through approval of final RODs and Decision Documents for the following.

- Site 1 - Construction Battallion Unit (CBU) Drum Storage Unit
- Site 2 - Area A Landfill and Wetland
- Site 3 - Area A Downstream/Overbank Disposal Area (OBDA)
- Site 4 - Rubble Fill Area at Bunker A-86
- Site 6 - Defense Reutilization and Marketing Office (DRMO)
- Site 8 - Goss Cove Landfill
- Site 15 - Spent Acid Storage and Disposal Area (SASDA)

A No Further Action (NFA) decision document for soil was completed for Site 1 in July 1996. A fully executed ROD for soil at Site 15 was completed in September 1997. A NFA ROD for soil at Site 4 was completed in June 1998 after a removal action was completed in 1997. A removal action ROD for soil and sediment at Site 3 was completed in March 1998. A five-year review was conducted as a matter of policy at these sites since no hazardous substances remain in the soil OUs at these sites that would limit use or restrict exposure, but the groundwater OUs associated with the sites are still under investigation. RODs were completed for soil at Site 2 in September 1995, for soil and groundwater at Site 6 in March 1998, and for soil and sediment at Site 8 in September 1999. A statutory five-year review was conducted at these sites since, upon completion of the remedial actions, hazardous substances, pollutants, or contaminants remained above levels that allow for unlimited use and unrestricted exposure. The groundwater OUs for these sites are also still under investigation

Five-year reviews were also conducted at the following sites as a matter of policy because only removal actions or interim remedial actions (IRAs) have been or will be completed at these sites and all of the sites are still under evaluation as part of CERCLA.

- Site 9 – Oil Tank (OT)-5
- Site 10 – Fuel Storage Tanks and Tank 54-H
- Site 11 – Power Plan Oil Tanks
- Site 13 – Building 79 Waste Oil Pit
- Site 14 – Overbank Disposal Area Northeast (OBDANE)
- Site 17 – Hazardous Materials/Solvent Storage Area – Building 31
- Site 20 – Area A Weapons Center
- Site 23 – Tank Farm

For Site 14, an Action Memorandum was completed and a non-time-critical removal action was completed in May 2001. For Site 20, a ROD was completed for soil and sediment in June 2000 and a Remedial Design Work Plan is currently in production.

Additionally, at the request of the USEPA, five-year reviews were also conducted at the following sites, which have had no decision documents prepared and, where investigation activities are still being conducted under CERCLA:

- Site 7 – Torpedo Shops
- Site 16 – Hospital Incinerators
- Site 18 – Solvent Storage Area – Building 33
- Site 19 – Solvent Storage Area – Building 316
- Site 21 – Berth 16
- Site 22 – Pier 33
- Site 24 – Central Point Accumulation Area – Building 174
- Site 25 – Classified Material Incinerator

The USEPA has assigned OU designations to some of the above sites and/or site-specific media at NSB-NLON. A cross-reference list of OUs and sites is provided below.

- OU1 - Area A Landfill (Site 2) soil media
- OU2 - DRMO (Site 6) soil and groundwater media
- OU3 – Area A Downstream/OBDA (Site 3) soil and sediment media
- OU4 – Lower Submarine Base
- OU5 – Goss Cove Landfill (Site 8) soil, sediment and groundwater media
- OU6 – Spent Acid Storage and Disposal Area (Site 15) soil media
- OU7 – Area A Weapons Center (Site 20) soil and sediment media

- OU8 – Torpedo Shops (Site 7)
- OU9 – Basewide Groundwater
- OU10 – Rubble Fill at Bunker A-86 (Site 4) soil media

Because these OU designations are not used in historical project documents and OU designations have not been given to all sites and media, they are not used through the remainder of this report.

1.3 FIVE-YEAR REVIEW PROCESS

The NSB-NLON five-year review was led by Mark Evans, the DON Remedial Project Manager. The following team members assisted in the review:

- Kymberlee Keckler, EPA Region I Remedial Project Manager
- Mark Lewis, CTDEP Remedial Project Manager
- Michael Fohner, DON EFANE Technical Lead
- Richard Conant, NSB-NLON IRP Coordinator
- Corey Rich, TtNUS Project Manager
- Brian Conelly, Foster Wheeler Project Manager

This five-year review consisted of the following activities: a review of relevant documents (see Appendix C), site inspections, and limited interviews. This final report will be placed in the Information Repositories and Administrative Record File for NSB-NLON. Most project documentation can be found at the following Information Repository locations:

- Groton Public Library (860) 441-6750
  52 Route 117, Groton, CT 06340

- Bill Library (860) 464-9912
  718 Colonel Ledyard Highway, Ledyard, CT 06399

Notice of the preparation of a Five-Year Review Report for NSB-NLON was provided to the Restoration Advisory Board (RAB) at the August 2001 meeting. A summary of the draft Five-Year Review report was also provided to the RAB at the meeting. Minutes from the meeting are provided in Appendix D.

A notice of availability of the draft Five-Year Review report was provided to the public in the Norwich Bulletin and New London The Day newspapers. The notices were published in the Bulletin on October 20 and 21, 2001 and in The Day on October 19 and 20, 2001. Copies of the notices are

provided in Appendix D. As indicated in the notices, the Navy made available draft copies of the report in the Information Repositories listed above and gave the public the opportunity to review and comment on the report during a 30-day review period. The Navy did not receive any public comments during the period.

1.4 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS AND SITE-SPECIFIC ACTION LEVEL CHANGES

The five-year review is being conducted for two purposes:

- To determine if the remedial actions are being implemented as specified in the RODs to protect human health and the environment.

- To determine if there have been changes in the ARARs or site-specific action levels that call into question the protectiveness of the remedy.

The chemical-specific ARARs that were identified in each of the RODs were reviewed, as were new federal and state regulations that have been promulgated. This section describes the overall impacts of the new or changed ARARs on the risk posed to human health or the environment. It was determined that recalculation of risk or risk assessments was not necessary to determine whether a remedy protects human health and the environment.

The human health risk assessments (HHRAs) for the sites were conducted primarily following USEPA guidance documents from 1989 [Risk Assessment Guidance for Superfund - Volume I - Human Health Evaluation Manual (Part A) - Interim Final], 1991 (Risk Assessment Guidance for Superfund - Volume I: Human Health Evaluation Manual - Supplemental Guidance - “Standard Default Exposure Factors” - Interim Final); and 1992 (Dermal Exposure Assessment: Principles and Applications) and USEPA Region I guidance documents (Risk Updates, Numbers 2, 3, 4, and 5). There have been no significant revisions in the methodology for human health risk assessments in the last five years.

The benchmarks used to select chemicals of potential concern (COPCs) for direct contact with soil and sediment included USEPA Region III Risk-Based Concentrations (RBCs), USEPA Region IX Preliminary Remedial Goals (PRGs), and Connecticut Remediation Standard Regulations (RSRs). In addition, USEPA Soil Screening Levels for the protection of migration from soil to groundwater and soil to air and Connecticut RSRs for pollutant mobility and volatilization from soil to indoor air were used to select COPCs for soil migration pathways. The USEPA Region III RBCs are usually updated twice a year and the USEPA Region IX PRGs are usually updated once a year. The CTDEP RSRs were issued in 1996 and additional RSRs were issued in 1999.

The benchmarks used to select COPCs for groundwater included USEPA Region III RBCs, USEPA Region IX PRGs, USEPA Maximum Contaminant Levels (MCLs), Connecticut MCLs, and CTDEP Groundwater Protection Criteria. In addition, CTDEP RSRs for surface water protection and migration from groundwater to indoor air were used to select COPCs for groundwater migration pathways.

The benchmarks used to select COPCs for surface water included USEPA Ambient Water Quality Criteria (AWQC) and Connecticut Water Quality Standards (WQS). The USEPA AWQC were last updated in April 1999, and the Connecticut WQS were last updated in April 1997.

The ecological risk assessments for the sites were conducted primarily following using USEPA Ecological Risk Assessment (ERA) guidance documents from 1992 (Framework for Ecological Risk Assessment) and 1994 (Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Review Draft). The 1994 ERA guidance did not change significantly when it was updated in 1997 as an interim final document (USEPA, 1997). The risk assessments also re-evaluated some of the conservative assumptions used to obtain a "screening-level" risk, which corresponds to the Step 3a evaluation in the Navy Policy for Conducting Ecological Risk Assessments (DON, 1999). Therefore, the risk assessment methodology has not changed significantly over the last five years.

At sites where food-chain modeling was conducted, exposure factors were obtained from the Wildlife Exposure Factors Handbook (USEPA, 1993b). This document is still the primary source for exposure factors in current ecological risk assessments. Also, many of the wildlife toxicity data were obtained from the Toxicological Benchmarks for Wildlife: 1994 Revision (Opresko et al., 1994). This document was updated in 1996 (Sample et al., 1996); however, many of the values did not change. Some of the uncertainty factors that were applied to the toxicity data are currently not standard practice, but most of the uncertainty factors were removed when the less conservative exposure scenarios were presented.

The benchmarks that were used to select ecological contaminants of concern (ECOCs) were obtained from different sources because there is no single document that contains criteria for all the chemicals that are typically detected in the media. The following paragraphs briefly discuss the primary sources of benchmarks that were used in the ERAs and whether or not they have been updated.

The primary source of surface water benchmarks was the Connecticut chronic AWQC. These criteria were last updated in April 1997 (CTDEP, 1997). Many of the AWQC are based on the USEPA water quality criteria (WQC), which were updated in April 1999 (USEPA, 1999a). Therefore, it is likely that the Connecticut AWQC will be updated in the near future to reflect the changes in the USEPA WQC. Also,

the USEPA WQC (before their update in 1999) were used for some chemicals. Other surface water benchmarks were based on the Ecotox Thresholds (USEPA, 1996a). Several of the values in the Ecotox Thresholds were updated (Suter and Tsao, 1996) since the publication of the Ecotox Thresholds. Toxicity data from the literature were used as benchmarks for chemicals that were not listed in the above documents.

The primary sources of sediment benchmarks were site-specific benchmarks that were based on equilibrium partitioning, using site-specific total organic carbon values, surface water benchmarks, and chemical-specific organic carbon partition coefficient (Koc) values. Because some of the surface water benchmarks were updated, some of the sediment benchmarks will change. Other sediment benchmarks that were used included the Effects Range-Low (ER-L) values from Long et al., (1995), the Sediment Quality Guidelines from the Ontario Ministry of Environment (OME, 1992), and the Washington State Freshwater Apparent Effects Thresholds (Washington State, 1994). The ER-L values have not been updated and are still being used as sediment benchmarks in current ERAs. The OME (1992) and Washington State (1994) documents were updated in 1993 (OME, 1993) and 1997 (Cubbage et al., 1997), respectively. Several of the values were revised in the updates.

For soil, benchmarks for plants were primarily obtained from Will and Suter (1994), and benchmarks for soil invertebrates were primarily derived from ECOSAR (USEPA, 1994). The Will and Suter document was updated by Efroymson et al., (1997a). Also, Efroymson et al., (1997b) developed a screening benchmark document for earthworms that is currently being used for soil benchmarks. The plant benchmarks in Efroymson et al. (1997a) are very similar to those in Will and Suter (1994). Efroymson et al. (1997b) has some earthworm benchmarks for chemicals that did not have values for ECOSAR.

In general, most of the changes in the updated documents are not expected to significantly change the overall conclusions of the ERAs. Some of the benchmarks are lower in the updated documents, and some of the values are higher. Therefore, different chemicals may be retained as ECOCs during the screening if it was conducted at present. However, the decision to remediate a site is typically not based on screening benchmarks, because of the conservative nature of the benchmarks. A decision to remediate a site or decision on cleanup levels typically consists of other factors such as the collection of site-specific biological data (i.e., toxicity tests, biological surveys). The site-specific data would not be changed because of updates in the screening benchmarks.

1.5 REPORT ORGANIZATION

This report has been organized with the intent of meeting the general format requirements specified in the Comprehensive Five-Year Review Guidance document (USEPA, June 2001), and summarizing the results of the five-year review for the 23 IR sites in a cohesive and comprehensive manner.

Section 1.0 gives an overview of the NSB-NLON and five-year review process conducted for the Base, as well as a discussion of changes in ARARs and site-specific action levels. Sections 2.0 through 24.0 focus on the five-year reviews conducted for each of the individual sites. Section 25.0 provides a general summary, conclusions, and protectiveness statement for NSB-NLON. This section also identifies when the next five-year review is required and the other tasks that should be performed as part of that five-year review. Five appendices are included in this report. Appendix A contains photographs of each of the sites. Appendix B contains the five-year review inspection checklists for the statutory reviews that were conducted. Appendix C contains the list of documents that were reviewed. Appendix D includes the meeting minutes for the August 2001 RAB meeting and the Public Notice information Appendix E contains the NSB-NLON Land Use Restriction Instruction [SOPA (ADMIN) New London Instruction 5090.18 (Navy, 2000)].

Click here to go to Figure 1-1 (3.5 MB)