N60087.AR.000475
NAS BRUNSWICK
5090.3a

U.S. DEPARTMENT OF THE NAVY

INSTALLATION RESTORATION PROGRAM

NAVAL AIR STATION BRUNSWICK

BRUNSWICK, MAINE

SOURCE INVESTIGATION SAMPLING AND ANALYSIS PLAN

SITE 9

NEPTUNE DRIVE DISPOSAL SITE

JANUARY 1995

U.S. DEPARTMENT OF THE NAVY
INSTALLATION RESTORATION PROGRAM

NAVAL AIR STATION BRUNSWICK
BRUNSWICK, MAINE

SOURCE INVESTIGATION SAMPLING AND ANALYSIS PLAN

SITE 9
NEPTUNE DRIVE DISPOSAL SITE

Prepared for:

U.S. Department of the Navy
Northern Division
Naval Facilities Engineering Command
Contract N62472-91-C-1013

Prepared by:

ABB Environmental Services, Inc.
Portland, Maine 04112
Project No. 7462-01

JANUARY 1995

STATE OF MAINE
THOMAS D. LONGLEY
284
CERTIFIED GEOLOGIST

Program Manager
ABB Environmental Services, Inc.

Geologist
ABB Environmental Services, Inc.

SOURCE INVESTIGATION
SAMPLING AND ANALYSIS PLAN
SITE 9
NEPTUNE DRIVE DISPOSAL SITE
NAS BRUNSWICK

TABLE OF CONTENTS

Section	Title	Page No.
1.0	INTRODUCTION	1-1
1.1	OBJECTIVES	1-1
1.2	INSTALLATION RESTORATION PROGRAM HISTORY AT NAS BRUNSWICK	1-1
1.3	SITE DESCRIPTION	1-3
1.4	SUMMARY OF SITE CHARACTERISTICS	1-5
1.4.1	Results of the 1988 and 1990 Remedial Investigations	1-5
1.4.2	Results of 1993 Investigations	1-9
1.4.3	Summary	1-12
1.5	REGULATORY FRAMEWORK	1-13
2.0	PROJECT LOGISTICS	2-1
2.1	SAMPLING AND ANALYSIS PLAN	2-1
2.2	HEALTH AND SAFETY PLAN	2-1
2.3	SECURITY	2-1
2.4	COMMUNICATIONS	2-2
2.5	FIELD OPERATIONS	2-2
2.6	DECONTAMINATION FACILITIES	2-2
2.7	DISPOSAL OF INVESTIGATION-RELATED WASTES	2-2
3.0	FIELD PROGRAM	3-1
3.1	INITIAL PREPARATION ACTIVITIES	3-1
3.1.1	Site Reconnaissance	3-1
3.1.2	Site Preparation	3-1
3.1.3	Clearance Activities	3-1
3.2	EXPLORATION METHODS	3-6
3.2.1	Soil Borings	3-6
3.2.2	Monitoring Well Installation	3-7

SOURCE INVESTIGATION
SAMPLING AND ANALYSIS PLAN
SITE 9
NEPTUNE DRIVE DISPOSAL SITE
NAS BRUNSWICK

TABLE OF CONTENTS
(continued)

Section	Title	Page No.
3.2.3	Test Pitting	3-8
3.2.4	Soil and Groundwater Sampling	3-11
3.2.5	Survey of Explorations	3-14
4.0	LABORATORY ANALYTICAL PROGRAM	4-1
4.1	PROGRAM SUMMARY	4-1
4.2	DATA QUALITY OBJECTIVES	4-1
4.3	DATA VALIDATION	4-16
4.4	DATA QUALITY EVALUATION	4-17

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

REFERENCES

APPENDICES

APPENDIX A - SITE-SPECIFIC HEALTH AND SAFETY PLAN
APPENDIX B - SITE DESCRIPTION FROM INITIAL ASSESSMENT STUDY OF NAVAL AIR STATION, BRUNSWICK, MAINE
APPENDIX C - ANALYTICAL DATA - PREVIOUS INVESTIGATIONS
APPENDIX D - MW-916 BORING LOG
APPENDIX E - REGULATORY/TRC COMMENTS ON DRAFT DOCUMENT AND NAVY RESPONSES
APPENDIX F - REGULATORY/TRC COMMENTS ON DRAFT FINAL DOCUMENT AND NAVY RESPONSES

SOURCE INVESTIGATION
SAMPLING AND ANALYSIS PLAN
SITE 9
NEPTUNE DRIVE DISPOSAL SITE
NAS BRUNSWICK

LIST OF FIGURES

Figure	Title	Page No.
1-1	Site Location Map Site 9	1-2
1-2	Site Location Exploration Map: Site 9	1-6
3-1	Site Location and Proposed Exploration Location Map	3-2
3-2	Monitoring Well Installation Detail	3-9

SOURCE INVESTIGATION
SAMPLING AND ANALYSIS PLAN
SITE 9
NEPTUNE DRIVE DISPOSAL SITE
NAS BRUNSWICK

LIST OF TABLES

Table	Title	Page No.
3-1	Summary of Explorations	3-3
4-1	Exploration and Sample Information - Soil Samples	4-2
4-2	Exploration and Sample Information - Groundwater Samples	4-3
4-3	Summary of Proposed Laboratory Analytical Program - Soil Samples	4-6
4-4	Summary of Proposed Laboratory Analytical Program - Groundwater Samples	4-7
4-5	Container, Preservation, and Holding Time Requirements	4-8
4-6	Summary of Off-Site Analytical Methods	4-10

1.0 INTRODUCTION

1.1 OBJECTIVES

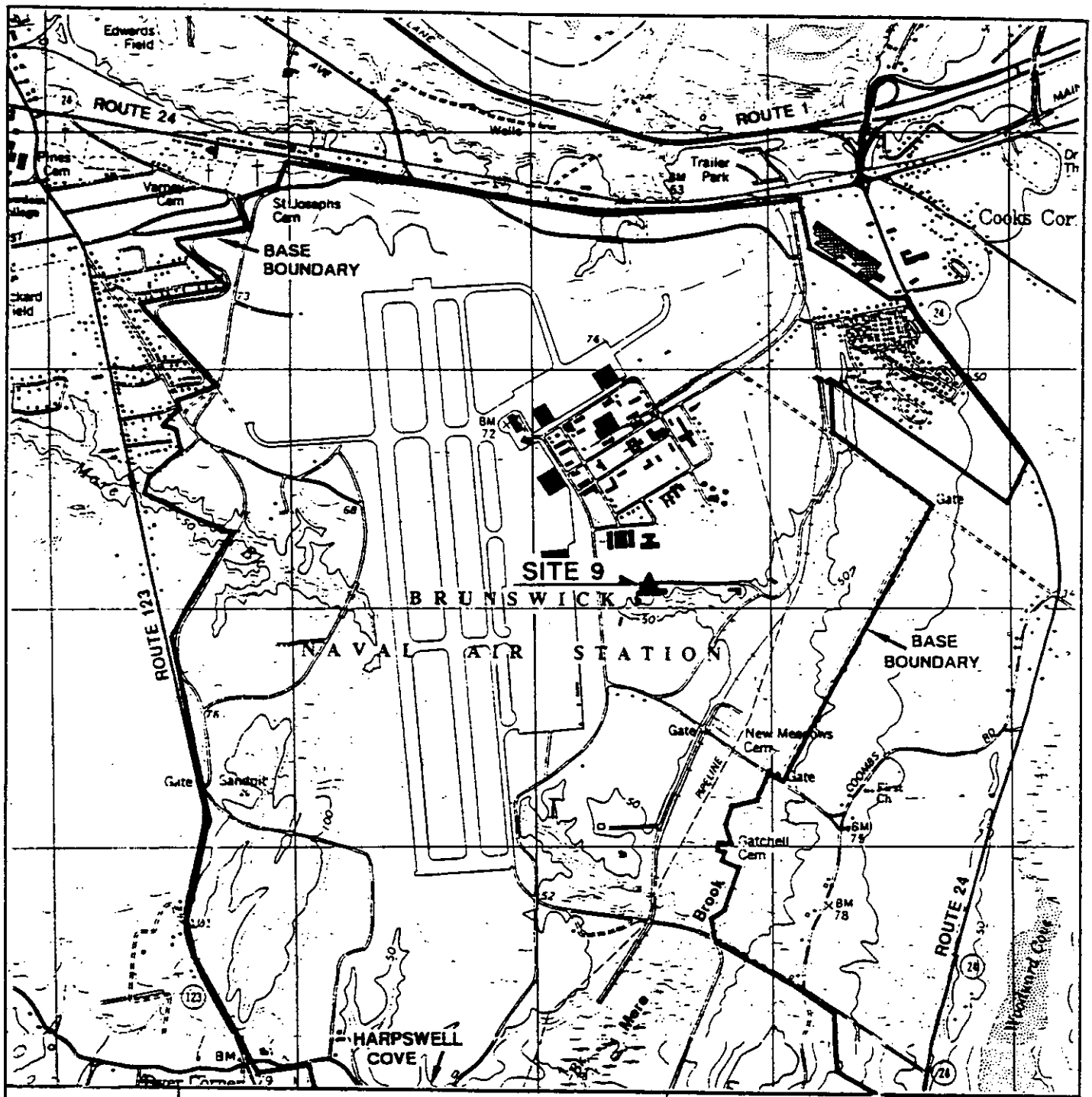
The objectives of this Sampling and Analysis Plan (SAP) are to present the site-specific activities for additional source investigation at Site 9, the Neptune Drive Disposal Site (Figure 1-1). Results of previous field investigations at this site have identified groundwater contaminants present at concentrations greater than drinking water standards; however, no current source area(s) of contamination has been identified. The field investigation described in this SAP is being conducted to evaluate potential source areas around Site 9. These results will be used to determine if additional remedial actions are required at this site. This SAP describes the scope of work and methodologies that ABB Environmental Services, Inc. (ABB-ES) will implement to collect information at this site.

This SAP consists of four sections, a supporting document incorporated as an appendix, and three documents incorporated by reference. Section 1.0 introduces the Navy Installation Restoration Program (IRP) and summarizes previous studies at the Naval Air Station (NAS) in Brunswick, Maine. Section 2.0 provides an overview of the field work, project logistics, including security, communications, field operations, decontamination, and the disposal of investigation-related wastes. Section 3.0 addresses the field program, including exploration techniques, and site-specific exploration programs. Section 4.0 outlines the analytical program and describes Data Quality Objectives (DQOs) and the data validation process.

The supporting document included as Appendix A to this report is the site-specific Health and Safety Plan (HASP). The documents incorporated by reference are ABB-ES' corporate HASP (ABB-ES, 1990), and the Quality Assurance Program Plan (QAPP) prepared for the Navy IRP (E.C. Jordan Co., 1988a).

1.2 INSTALLATION RESTORATION PROGRAM HISTORY AT NAS BRUNSWICK

NAS Brunswick, located in Brunswick, Maine, is included in the U.S. Department of the Navy's IRP, which was established to identify potential contamination at Navy and Marine Corps facilities resulting from past operations and, if needed, to institute corrective remedial measures. The U.S. Environmental Protection Agency (USEPA),



SOURCE: USGS QUADRANGLE, BRUNSWICK, AND ORRS ISLAND, ME, DATED 1980, 1978. 7.5 MINUTE SERIES.

QUADRANGLE LOCATION

N

SCALE IN FEET

0 2,000 4,000

ABB Environmental Services, Inc.	SITE LOCATION MAP SITE 9
INSTALLATION RESTORATION PROGRAM NAVAL AIR STATION BRUNSWICK, MAINE	SITE 9 SAP
	7462-01 FIGURE 1-1

in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan, placed NAS Brunswick on the National Priorities List in 1987. In accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the 1986 Superfund Amendments and Reauthorization Act (SARA), work on this project follows the *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (USEPA, 1988a). In addition, USEPA and the Maine Department of Environmental Protection (MEDEP) provide review and input throughout the Remedial Investigation/Feasibility Study (RI/FS) and CERCLA/ SARA processes, pursuant to a Federal Facility Agreement.

Based on the Navy's request, E.C. Jordan Co. (Jordan) of Portland, Maine (now ABB-ES), prepared an RI/FS work plan for NAS Brunswick (E.C. Jordan Co., 1988b) and conducted the first phase of RI fieldwork during the summer and fall of 1988. An additional Sampling Plan was developed and fieldwork was conducted in 1989 (E.C. Jordan Co., 1989). To address data gaps identified in the Draft Phase II FS screening report and Draft Final RI report, and as a continuation of the FS program, a Post-Screening Work Plan was developed and fieldwork was conducted in 1990 (E.C. Jordan Co., 1990a, 1990b, and 1990c). Based on the results of the Post-Screening fieldwork, a Supplemental RI report was developed. In 1993, the Navy conducted additional field investigations to support remedial designs for Site 9 and to better characterize the ash/dump area north of Neptune Drive. A Technical Memorandum was prepared summarizing the field program at Site 9 (ABB-ES, 1994).

1.3 SITE DESCRIPTION

Site 9 is located in the central portion of the base. Based on historical information, including aerial photographs and grading plans, Site 9 was originally defined as three areas of potential contamination: (1) the former location of an incinerator in the northeastern corner of the current site of Building 220, and an ash disposal/dump area in the current location of Buildings 218 and 219 (Marine barracks north of Neptune Drive); (2) a reported dumping area behind Building 201 (the enlisted men's club south of Neptune Drive); and (3) the two streams bordering the recreational area behind Building 201. Appendix B contains information on Site 9 from the Initial Assessment Study.

Former Incinerator and Ash Landfill

There is no precise information concerning the location of the incinerator and ash landfill or types of wastes handled or disposed of in these areas. The incinerator was apparently operated during a period commencing on or after April 1943, when the air station was commissioned, until the fall of 1946, when the air station was demobilized. The air station was recommissioned in 1951, but it is unknown if the incinerator resumed operation. The incinerator could have been used as late as 1953, when the barracks that now occupy the location of the former incinerator were built. Wastes disposed of at Site 9, presumably at the location of the ash landfill but not at the incinerator itself, reportedly included solvents which were burned on the ground, paint sludges, and possibly wastes from the Metal Shop.

Current land use at the former incinerator and inactive ash landfill is for military residences. The grading plans for the barracks (Buildings 212 through 220) constructed at this location show an oblong "dump area," approximately 125 by 75 feet, located around existing Building 219. The grading plans also show an old, 42-inch-diameter drain adjacent to the dump area. The drain ran from north of Orion Street, past the dump area, under Neptune Drive to the stream running between Buildings 201 and 293. The drain was reportedly removed during construction of the barracks.

Building 201

Historical information and aerial photographs indicate an area southeast of Building 201 as a potential source of contamination. This area, reportedly used as a dumping area, more recently has been used as a picnic area. A barbecue pit is located southeast of Building 201.

Unnamed Streams

Two unnamed streams border the area around Building 201; one to the north; one to the south. These streams receive runoff from the central portion of the base including the runways, parking lots, and paved roads. Groundwater seeps have been observed flowing into the northern unnamed stream.

1.4 SUMMARY OF SITE CHARACTERISTICS

The nature and distribution of contamination at Site 9 is summarized by field program and medium in the following paragraphs which have been excerpted from the *Interim Record of Decision for the Groundwater Operable Unit at Site 9, Naval Air Station, Brunswick, Maine* (ABB-ES, 1994b). A complete discussion of the site characteristics can be found in Section 10.0 of the Draft Final RI Report on pages 10-14 through 10-36 (E.C. Jordan Co., 1990a) and the Technical Memorandum (ABB-ES, 1994a).

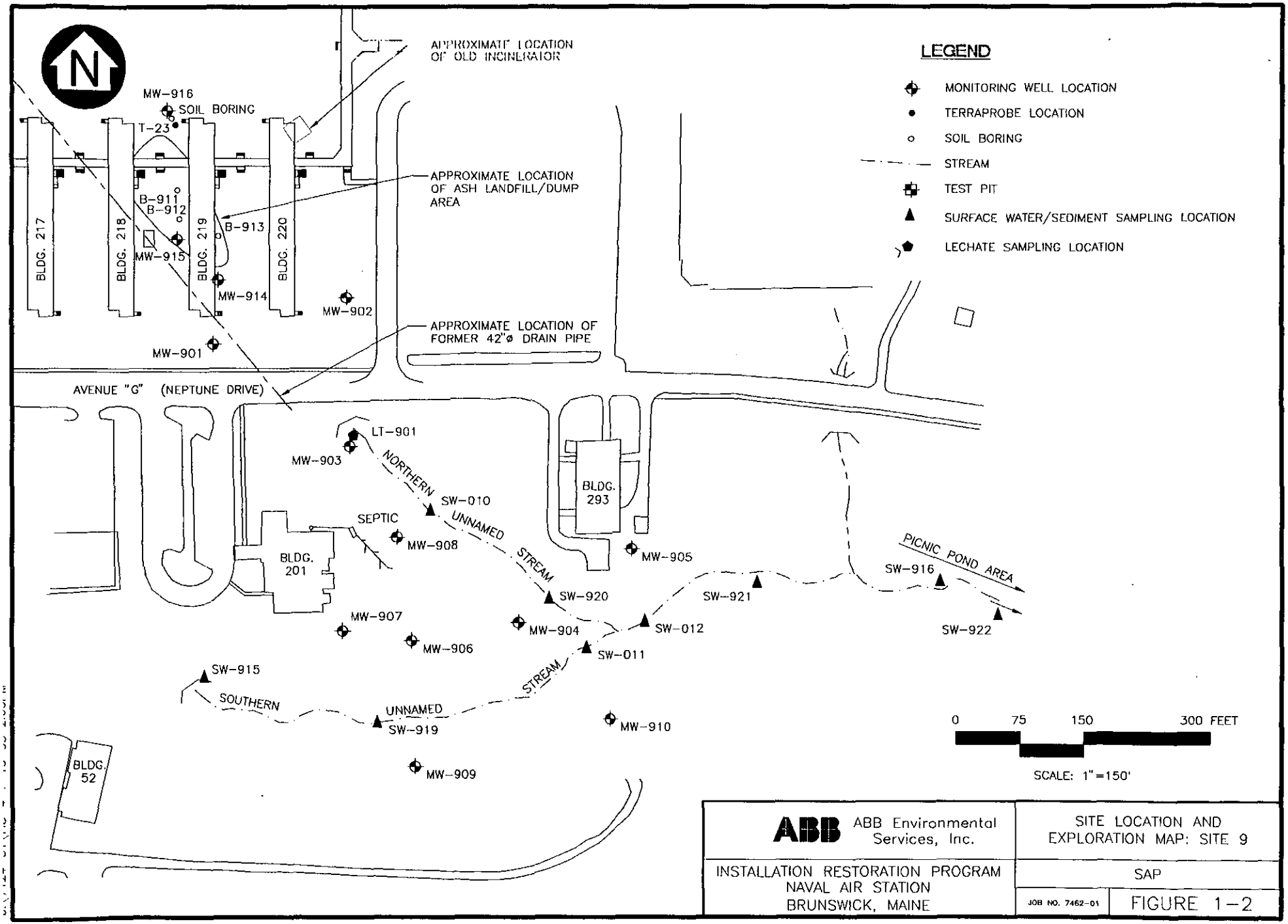
1.4.1 Results of the 1988 and 1990 Remedial Investigations

The RI fieldwork conducted in 1988 and 1990 was designed to assess the areal distribution of soil contamination at the site, monitor groundwater downgradient of Site 9, assess the significance of chemicals detected in the groundwater, and determine the impact of this site on surface water and sediment quality. Most of the RI fieldwork focused on the area south of Neptune Drive and included a soil gas survey; test pits; soil borings; installation of monitoring wells; sampling of soils, groundwater, surface water, sediment, and a leachate seep; and in situ aquifer permeability tests. Sampling locations are presented in Figure 1-2.

Groundwater Flow and Subsurface Geology

Groundwater flow at the site is to the south and southeast, discharging to the two streams. The calculated seepage velocities range from 26 feet per year throughout most of the site to 130 feet per year in the vicinity of the streams (E.C. Jordan Co., 1991).

Groundwater at Site 9 occurs in the overburden soil and varies in elevation between 10 and 14 feet below ground surface (bgs). Overburden soil at Site 9 is a stratified formation consisting of a sand layer, a transition layer, and a clay layer overlying bedrock. The elevation of ground surface at the site is approximately 40 to 50 feet MSL. The top of clay has been interpreted from boring logs to occur at a depth of about 20 feet bgs on the southern edge of the site.


N
APPROXIMATE LOCATION OF OLD INCINERATOR
MW-916
SOIL BORING
T-23
APPROXIMATE LOCATION OF ASH LANDFILL/DUMP AREA
B-911
B-912
B-913
MW-915
MW-914
MW-902
MW-901
BLDG. 217
BLDG. 218
BLDG. 219
BLDG. 220
APPROXIMATE LOCATION OF FORMER 42"ø DRAIN PIPE
AVENUE "G" (NEPTUNE DRIVE)
LT-901
MW-903
NORTHERN UNNAMED STREAM
SW-010
SEPTIC
MW-908
BLDG. 201
BLDG. 293
MW-905
PICNIC POND AREA
SW-916
SW-920
SW-921
SW-922
MW-907
MW-904
SW-012
MW-906
SW-011
SW-915
SOUTHERN UNNAMED STREAM
SW-919
MW-910
MW-909
BLDG. 52
LEGEND
MONITORING WELL LOCATION
TERRAPROBE LOCATION
SOIL BORING
STREAM
TEST PIT
SURFACE WATER/SEDIMENT SAMPLING LOCATION
LECHATE SAMPLING LOCATION
0 75 150 300 FEET
SCALE: 1"=150'
ABB ABB Environmental Services, Inc.
INSTALLATION RESTORATION PROGRAM
NAVAL AIR STATION
BRUNSWICK, MAINE
SITE LOCATION AND EXPLORATION MAP: SITE 9
SAP
JOB NO. 7462-01
FIGURE 1-2

Surface and Subsurface Soils

A soil gas survey was conducted to help identify potential areas of volatile organic compound (VOC) contamination. The survey included areas both north of Neptune Drive (two points between Buildings 218, 219, and 220, south of the ash landfill/ dump area), and south of Neptune Drive (18 points between Buildings 201 and 293). Two of 20 soil gas points detected low concentrations of VOCs. These points were located near Building 293, east of the site, and do not indicate a source of VOC contamination at Site 9. In subsequent subsurface soil sampling, one VOC, dichloroethene (DCE), was detected at 6 micrograms per kilogram (μg/kg) at a depth of 14 feet in one soil boring (i.e., MW-904) (E.C. Jordan Co., 1990a). No contaminants were detected in subsurface soil samples collected north of Neptune Drive.

Polynuclear aromatic hydrocarbons (PAHs) were detected in several surface soil and test pit soil samples south of Neptune Drive at concentrations up to 30.5 milligrams per kilogram (mg/kg). The location of the highest concentrations of PAHs near the barbecue pit suggests that PAHs may be the result of charcoal or ash disposal or deposits. The low levels of PAHs throughout Site 9 may also be attributable to base operations, including motor vehicle traffic and aircraft exhaust. Low levels (i.e., less than 0.50 mg/kg) of pesticides were detected in four test pit samples and three surface soil samples (E.C. Jordan Co., 1992). These pesticides are believed to be residues from basewide use of dichlorodiphenyltrichloroethane (DDT) in the 1960s and early 1970s.

Leachate Seeps and Sediments

One leachate seep was identified at Site 9 and sampled twice during the RI field program and again in 1993. The seep is located at the head of the northern stream and at the discharge of the historical drain. It is possible that the ash disposal area is the source of contaminants in the leachate. Pesticides were detected at low levels in both the leachate and sediment from this location. Other organic compounds were not detected in the leachate, but two organic compounds, butylbenzylphthalate, and 1,1-dichloroethane (DCA) were each detected in the sediment in one of the three sampling rounds at 820 μg/kg and 39 μg/kg (52 μg/kg in the duplicate sample), respectively. Inorganic contaminants detected in leachate and sediment samples include arsenic, lead, aluminum, manganese, and zinc.

Surface Water and Sediments

Sixteen surface water and sediment locations in the streams near Site 9 as well as downstream at the Picnic Area Pond (about 3,000 feet downstream of Site 9) were sampled four times during the RI field program. The fuel-related organic compounds benzene (6 to 18 micrograms per liter [μg/L]), toluene (12 to 22 μg/L), ethylbenzene (36 μg/L), xylenes (34 to 74 μg/L), naphthalene (26 μg/L), and methylnaphthalene (25 μg/L) were detected in surface water samples in the stream bordering the southern side of Site 9 (E.C. Jordan Co., 1990a). The maximum concentration of all compounds except toluene was detected in the upstream sample (i.e., SW-915) suggesting that nonpoint source runoff from parking lots, roadways and/or the runways, located upstream of the site, is the source of these contaminants. The source of toluene detected at SW-916 is not known. None of these compounds were detected above their respective freshwater Ambient Water Quality Criteria (AWQC). AWQC are contaminant concentrations in surface water that are considered protective of aquatic organisms.

Calcium, iron, magnesium, and sodium were detected in the streams bordering Site 9 at concentrations exceeding background levels of surface water samples collected in Mere Brook. In addition, iron concentrations exceeded the chronic AWQC for this metal in both upstream and on-site sampling locations. Concentrations of inorganics in surface water at the Picnic Area Pond did not exceed AWQCs. These concentrations were consistent with background values (E.C. Jordan Co., 1990a).

Site-related VOCs were not detected in sediment samples from the streams near Site 9; however, toluene was detected in two sediment samples from the Picnic Area Pond. Concentrations of inorganics in sediment samples were consistent with background concentrations in sand and clay soils (E.C. Jordan Co., 1990a).

PAHs were detected in the majority of sediment samples collected in most sampling rounds from the streams in the Site 9 vicinity, at concentrations up to 383 mg/kg. The highest concentration was detected at SD-011. Dibenzofuran was also detected at SD-011 at a concentration of 5.1 mg/kg. Two other organic compounds, bis(2-ethylhexyl)phthalate (up to 1,900 μg/kg) and butylbenzylphthalate (up to 1,000 μg/kg), were detected sporadically in sediment samples from the Site 9 streams. The highest concentrations were detected in the upstream sample at the culvert outfall (E.C. Jordan Co., 1990a).

Pesticides and polychlorinated biphenyls (PCBs) were not detected in surface water or sediment.

Groundwater

Up to five groundwater samples were collected from the wells at Site 9 during the RI and analyzed for Target Compounds List (TCL) VOCs, Semi Volatile Organic Compounds (SVOCs), Pesticides, and Target Analyte List (TAL) inorganics. VOCs were detected in three wells (i.e., MW-904, MW-906, and MW-907). These data are summarized in Table C-1 of Appendix C. Groundwater upgradient of the septic system and south of Neptune Drive did not contain VOCs. Vinyl chloride was detected twice in MW-904 (12 to 27 μg/L), once in MW-906 (31 μg/L), and once in MW-907 (18 μg/L). The federal Maximum Contaminant Level (MCL) for vinyl chloride is 2 μg/L. The federal Maximum Contaminant Level Goal (MCLG) is zero, because this compound is classified as a carcinogen. The state Maximum Exposure Guideline (MEG) for vinyl chloride is 0.15 μg/L. DCA was detected in four of five sampling rounds in MW-904 at concentrations ranging from 5 to 12 μg/L. DCA was detected in MW-906 at 36 μg/L in only one sampling round. DCA was also detected in two groundwater samples (i.e., CP-902 and CP-903) collected in 1991 downgradient of the septic system at 20 and 7 μg/L, respectively. There is neither an MCL nor an MCLG for DCA, but the MEG is 5 μg/L. DCE was detected in MW-904 in two sampling rounds at 6 μg/L, and in MW-906 at 79 μg/L. The MCL, MCLG, and MEG for 1,2-DCE are all 70 μg/L.

SVOCs were detected at some wells but at estimated concentration (i.e., below the contact required quantification limit [CRQL]). Inorganics detected in Site 9 groundwater were in the normal background range, except for sodium, calcium, iron, and magnesium (E.C. Jordan Co., 1990a). Mercury was detected in MW-904 in two sampling rounds in 1989, but has not been detected at the site since. Mercury concentrations were 0.22 and 0.23 μg/L, below its MCL, MCLG, and MEG of 2 μg/L.

1.4.2 Results of 1993 Investigations

In 1991, additional historical information was discovered, identifying the presence of a septic system east of Building 201. The septic system was installed in 1952 when Building 201 was built, and was used until 1972 when Building 201 was connected to the basewide sewer system (E.C. Jordan Co., 1991) It was speculated that the septic

system, located upgradient of the monitoring wells with the highest contaminant levels, was the primary source of groundwater contamination at Site 9, prompting further investigation of this area. In January through March of 1993, the Navy conducted additional investigations to evaluate the Building 201 septic system as a potential source of contamination south at Neptune Drive and to further evaluate the former incinerator and ash landfill/dump area north of Neptune Drive. The investigations included the installation of soil borings, additional groundwater monitoring wells, completion of a TerraProbe survey, and collection and analysis of groundwater, surface water, and leachate samples.

South of Neptune Drive - Septic System Investigation

In January 1993, borings were drilled through the septic tank and four of the five cesspools to determine if the septic system was the source of VOC contamination in groundwater east of Building 201. VOCs, if present, would likely be attached to the organic-rich soils within the septic tank and cesspools. Organic sediment in the septic tank and the organic layers in the cesspools were visually identified and five samples were collected and analyzed for contamination. Chlorobenzene was the only site-related contaminant detected in the subsurface soils around the septic system at a concentration of 16 μg/kg. No VOCs, PCBs or pesticides were detected above the CRQL. While the septic system cannot be ruled out as being a past source of VOC contamination detected in this area, results of these samples indicate that the septic system is not a current source of contamination.

Two monitoring wells were installed south of the southern unnamed stream (MW-909 and MW-910), and groundwater samples were collected from these new and from the four existing wells (MW-904, MW-906, MW-907, and MW-908) behind Building 201. Samples were sent for analysis for TCL VOCs, SVOCs, pesticides, PCBs, and TAL inorganics. No VOCs were detected above the CRQL. However, vinyl chloride (non-detect to 9J μg/L), DCA (non-detect to 2J μg/L), and toluene (non-detect to 1J μg/L), were observed in one or more samples and one SVOC (bis-2-ethylhexyl)phthalate at 12J μg/L in MW-906) was observed in the 1993 sampling event.

Only a few inorganics were observed in samples from MW-909 and MW-910 above background concentrations. Of these, only aluminum, iron, and manganese exceeded their respective MCLs, but these are secondary standards based on aesthetic qualities

and not on protection of human health. A summary of these data are presented in Tables C-2 and C-3 of Appendix C.

The groundwater sample results also indicate that contaminants are not migrating beneath the southern unnamed stream. These data support the assumption that contaminated groundwater discharges directly to the unnamed streams. To evaluate whether or not the former drain acts as a conduit for any contaminants that may be site-related, a leachate surface water and a sediment sample were collected on the south side of Neptune Drive at location LT-901. These samples were analyzed for the same analytes as those tested for in the groundwater samples. Detections of DCA, PAHs, and pesticides were noted in the sediment sample. Toluene (1J μg/L) and PAHs were detected in the LT-901 seep sample.

North of Neptune Drive - Former Incinerator and Disposal Area

A TerraProbe investigation consisting of 33 locations, and three monitoring wells were installed during the 1993 field investigation north of Neptune Drive. Results of these activities identified the distribution of ash in the former landfill/dump area. The ash extends on either side of Building 219. Ash, found from 6 to 16 feet below ground surface (bgs), was sampled and found to contain PAHs at concentrations from 3.8 to 33 mg/kg. The presence of PAHs is typical with burned materials observed in the borings.

Three monitoring wells were installed during this field investigation consisting of one upgradient well (MW-916), and two wells downgradient of the ash landfill/dump area (MW-914 and MW-915) and one groundwater sample from each well was collected for chemical analysis.

Groundwater samples collected immediately downgradient of the ash disposal area did not contain PAHs at concentrations that could be quantified. Sporadic low concentrations of DCA, DCE, and vinyl chloride were detected in the two downgradient monitoring wells. Except for vinyl chloride, all compounds were detected below their respective MCLs. Vinyl chloride was detected only in one monitoring well, MW-915, at a maximum concentration of 10J μg/L, which is above its MCL of 2 μg/L. Elevated inorganic concentrations were detected in the downgradient wells. However, only two analytes, cadmium and manganese, were detected above their respective MCLs. A summary of these data are presented in Tables C-2 and C-3 of Appendix C.

The groundwater sampling results from the downgradient monitoring wells do not indicate a significant source of VOC contamination that continuously impacts groundwater quality. Overall groundwater quality in the two downgradient wells indicate that, although the ash is below the water table, organic compounds are not leaching from the ash or migrating through groundwater flow at concentrations of concern to human health or the environment.

1.4.3 Summary

The results of the 1988, 1990, and 1993 field investigations at Site 9 indicate the presence of vinyl chloride and DCE in groundwater at concentrations in excess of their MCLs and vinyl chloride, DCE and DCA in excess of their MEGs. The septic system, originally thought to be the source of VOC contamination south of Neptune Drive, was sampled to evaluate residual contamination. Sampling results indicate that the septic system is not currently a source of groundwater contamination. The former ash landfill/dump area, north of Neptune Drive, was identified and characterized. PAHs were detected in the ash material; however, these compounds were not detected in groundwater immediately downgradient from this area. Vinyl chloride was detected in one monitoring well downgradient from the landfill/dump area but was not detected in ash or soil samples. Elevated concentrations of inorganics were detected in groundwater downgradient of the ash disposal area, and the presence of these analytes may be due to past disposal activities in this area. Inorganics and PAHs were detected in leachate and/or sediment samples. The presence of these contaminants may be due to the ash or to other non-point source runoff from the roadways or parking lots.

The Navy recommended an interim remedial action for the groundwater operable unit at Site 9 because no definitive source area was found. Despite the inability to determine the source of groundwater contamination, the previous investigations have concluded that the former incinerator and ash landfill/dump area and the septic system are not current sources of VOC contamination. The interim remedial action consists of long-term monitoring of groundwater, surface water, sediment and leachate at Site 9 to evaluate groundwater remediation by natural attenuation both north and south of Neptune Drive. Also, the Navy is proposing additional source investigations at Site 9. The final Proposed Plan and ROD for Site 9 will incorporate the results of the additional source investigations and address any other remedial actions that may be necessary to remediate the remainder of Site 9.

1.5 REGULATORY FRAMEWORK

As described above, Site 9 has been previously investigated in 1988, 1990, and 1993. Groundwater concentrations of several chemicals, notably vinyl chloride and DCE, occasionally exceeded their respective MCLs and/or MEGs. However, no distinct source area for these contaminants could be located. An Interim Record of Decision for groundwater remediation was signed in September 1994 (ABB-ES, 1994b). The remediation specified in the ROD consists of natural attenuation, long-term environmental monitoring, institutional controls to prevent exposure to contaminated groundwater, and five-year reviews.

The activities specified in this Sampling and Analysis Plan are those considered appropriate to identify and characterize any potential Site 9 sources of the groundwater contamination. Upon completion of these investigations, the Site 9 source operable unit will be re-evaluated in terms of known or potential threats to human health and the environment. It is anticipated that a Remedial Investigation/Feasibility Study, or equivalent, will be conducted based upon the results of this and previous source investigations. Ultimately, it is expected that a final remedy and subsequent ROD for Site 9, including both groundwater and source operable units, will be developed and released.

2.0 PROJECT LOGISTICS

2.1 SAMPLING AND ANALYSIS PLAN

The objectives of this SAP are to (1) outline the technical goals of the fieldwork, (2) outline procedures for conducting field activities, and (3) develop a site-specific HASP. The fieldwork for the Neptune Drive Disposal Site will take approximately two weeks to complete. The Navy will present the results from the study in an investigation report and will recommend whether further remedial action at Site 9 is necessary.

2.2 HEALTH AND SAFETY PLAN

A corporate HASP, developed by ABB-ES (formally E.C. Jordan Co.) addresses potential hazards that investigative activities may present to site investigation teams, base personnel, and the community. ABB-ES prepared a HASP for NAS Brunswick addressing site-specific contaminants, personnel, decontamination procedures, emergency procedures, and field equipment. The site-specific HASP has been updated to reflect current understanding of hazards and is included as Appendix A of this document.

2.3 SECURITY

For each individual participating in the field activities, a security pass will provide access to the base. The pass will be a photographic identification pass or contractor pass that covers the duration of the field program. Required information about personnel involved in the fieldwork will be provided to NAS Brunswick Public Works and Security as soon as project personnel are identified. Representatives from regulatory agencies are expected to arrange their own security clearances through the Public Works Officer, NAS Brunswick.

2.4 COMMUNICATIONS

While on base, ABB-ES personnel will use telephones to communicate with off-base parties. A list of emergency telephone numbers will be available at all times in the on-base ABB-ES office. Personnel conducting site work at NAS Brunswick will use two-way radios to maintain communications with supervisors and personnel working in other areas. Only specific radio frequencies (assigned by NAS Brunswick) will be used during the field program. This will enable Naval Security and Public Works to monitor on-base communications for security and worker safety.

2.5 FIELD OPERATIONS

Field exploration locations will be approved before the field program begins. Final clearance will be given by NAS Brunswick after sampling locations are identified in the field. Fieldwork will be conducted using a five-day work schedule.

2.6 DECONTAMINATION FACILITIES

Decontamination zones for personnel and equipment will be established at locations to be determined for each site. Contaminated materials and protective gear will either be disposed of in U.S. Department of Transportation (DOT)-approved, Spec 17, 55-gallon drums with locking ring lids, or be decontaminated before site personnel proceed into the clean zone. Drums will be provided by ABB-ES.

An equipment decontamination zone will be designated at each site. Sampling equipment and tools will be washed with Liquinox, rinsed with isopropyl alcohol, and rinsed with deionized water to decontaminate them between samples to prevent cross-contamination. All equipment will also be cleaned at the beginning and end of the field program. Additional decontamination requirements and procedures are detailed in the QAPP (E.C. Jordan Co., 1988a).

2.7 DISPOSAL OF INVESTIGATION-RELATED WASTES

Fluids generated during personnel and equipment decontamination will be disposed of at each exploration location within a designated contamination reduction area.

Contaminated items such as disposable clothing or sampling equipment that are non-hazardous will be double-bagged and placed in on-site dumpsters.

Fluids and soils generated during the fieldwork will be disposed of at the ground surface at respective exploration locations. Soils excavated during potential test pitting will be returned to the pit upon completion and logging of the excavated area. These procedures are consistent with USEPA guidance presented in "Management of Investigation-Derived Wastes During Site Inspections" (USEPA, 1991a). It is anticipated that very little, if any, excess fluids and soils will be generated during the field effort.

3.0 FIELD PROGRAM

This Work Plan describes the additional field activities to be conducted at Site 9. The objectives of these investigations are to evaluate the presence or absence of source contamination. The proposed sampling locations are shown on Figure 3-1 and described in Table 3-1. This section describes initial preparation activities, general methods of exploration, and site-specific descriptions and exploration programs.

3.1 INITIAL PREPARATION ACTIVITIES

Tasks to be performed prior to sampling and analysis activities include site reconnaissance and site preparation. These are described in this subsection.

3.1.1 Site Reconnaissance

The first activity of the field program will be to identify and physically mark exploration and sampling locations. This will require staking and flagging locations for the test pits and trench, monitoring wells and soil boring to be installed and sampled.

3.1.2 Site Preparation

Site preparation activities for the field program will be performed by ABB-ES personnel with the support of NAS Brunswick Public Works. Preparations may include establishing a base of operations with electricity and telephone service. Field and office equipment and supplies will be transported to the site and set up before fieldwork begins.

3.1.3 Clearance Activities

Because a ground penetrating radar survey was not useful in identifying underground utilities around the barracks area during previous investigations at Site 9, additional clearance activities will be conducted. These will include review of utilities drawings and the use of a line locator for detecting any potentially buried utilities. Coordination with Public Works and Engineering at NAS Brunswick will be required during this task. Clearing activities will be performed at each exploration location

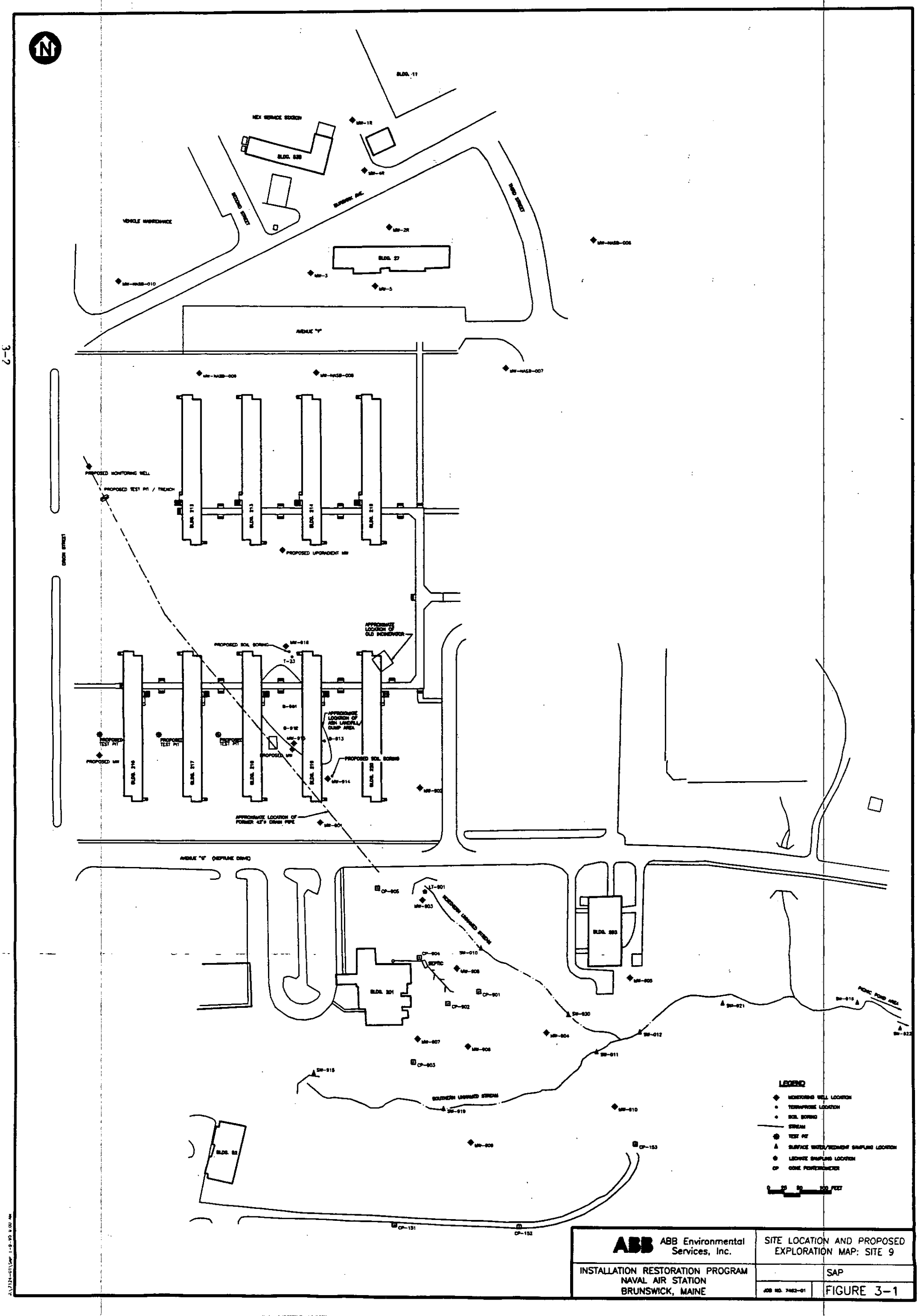

N
BLDG. 11
NEX SERVICE STATION
BLDG. 535
MW-1R
MW-4R
VEHICLE MAINTENANCE
SECOND STREET
BURBANK AVE.
THIRD STREET
MW-2R
BLDG. 27
MW-3
MW-5
MW-NASB-006
MW-NASB-010
AVENUE "F"
MW-NASB-007
MW-NASB-009
MW-NASB-008
PROPOSED MONITORING WELL
PROPOSED TEST PIT / TRENCH
BLDG. 212
BLDG. 213
BLDG. 214
BLDG. 215
PROPOSED UPGRADIENT MW
ORION STREET
APPROXIMATE LOCATION OF OLD INCINERATOR
PROPOSED SOIL BORING
MW-916
T-23
B-901
B-912
MW-913
B-913
APPROXIMATE LOCATION OF ASH LANDFILL DUMP AREA
PROPOSED TEST PIT
PROPOSED MW
BLDG. 216
BLDG. 217
BLDG. 218
BLDG. 219
BLDG. 220
PROPOSED SOIL BORING
MW-914
MW-902
APPROXIMATE LOCATION OF FORMER 42" DRAIN PIPE
MW-901
AVENUE "G" (NEPTUNE DRIVE)
CP-905
LT-901
MW-903
NORTHERN UNNAMED STREAM
BLDG. 383
CP-904
SW-910
SEPTIC
MW-908
MW-905
BLDG. 301
CP-901
CP-902
SW-920
SW-921
PICNIC POND AREA
SW-916
SW-922
MW-907
MW-906
MW-904
SW-912
SW-911
CP-903
SW-915
SOUTHERN UNNAMED STREAM
SW-919
MW-910
MW-909
CP-153
BLDG. 92
CP-151
CP-152
LEGEND
MONITORING WELL LOCATION
TERRAPROBE LOCATION
SOIL BORING
STREAM
TEST PIT
SURFACE WATER/SEDIMENT SAMPLING LOCATION
LEACHATE SAMPLING LOCATION
CP CONE PENETROMETER
0 25 50 100 FEET
ABB ABB Environmental Services, Inc.
SITE LOCATION AND PROPOSED EXPLORATION MAP: SITE 9
INSTALLATION RESTORATION PROGRAM
NAVAL AIR STATION
BRUNSWICK, MAINE
SAP
JOB NO. 7462-01
FIGURE 3-1

TABLE 3-1
SUMMARY OF EXPLORATIONS

NEPTUNE DRIVE DISPOSAL AREA - SITE 9
SOURCE INVESTIGATION
SAMPLING AND ANALYSIS PLAN
NAS BRUNSWICK

AREA OF CONCERN (MEDIA)	EXPLORATION TYPE AND IDENTIFICATION	RATIONALE	FIELD SCREENING	LABORATORY SAMPLE TYPE	PARAMETERS ANALYZED	COMMENTS
ASH LANDFILL/DEMO DEBRIS AREA						
TerraProbe T-23 (Subsurface Soil)	HSA Test Boring TB-917	Better characterize subsurface soils associated with "fuel odor" At 8'-10' in T-23	Continuous sampling - field screening using PI/headspace	1 Soil Sample	VOC, SVOC, Inorganics, Fuel Oil, Gasoline	Drilled to depth of 17 feet bgs
MW-914 (Subsurface Soil)	HSA Test Boring TB-918	Better characterize subsurface soils associated with "fuel soaked soil" observed at MW-914	Continuous sampling - field screening using PI/headspace	1 Soil Sample	VOC, SVOC, Inorganics, Fuel Oil, Gasoline	Drilled to depth of 20 feet bgs
Upgradient of Ash Landfill and MW-916 (Groundwater)	HSA Test Boring/ Monitoring Well TB(MW)-NASB-020	Evaluate background groundwater quality	Continuous sampling - field screening using PI/headspace	1 Soil Sample 1 Groundwater Sample	VOC, SVOC, Inorganics, Fuel Oil, Gasoline	Drilled to 30 feet bgs or to clay. Well screen at depth with high-est PI
Near MW-915 (Groundwater)	HSA Test Boring/ Monitoring Well TB(MW)-NASB-021	Characterize groundwater quality below depth of MW-915	Continuous sampling below 16 feet bgs	1 Soil Sample 1 Groundwater Sample	VOC, SVOC, Inorganics, Fuel Oil, Gasoline	Drilled to depth of clay (50 feet est.) Well screen at depth below 16 feet with high-est PI
POTENTIAL DUMP AREA						
Southwest of Bldg. 216 (Subsurface Soil, Groundwater)	HSA Test Boring/ Monitoring Well TB(MW)-NASB-022	Characterize groundwater flow west of Ash Landfill	Continuous sampling - field screening using PI/headspace	1 Soil Sample 1 Groundwater Sample	VOC, SVOC, Inorganics, Fuel Oil, Gasoline	Drilled to 30 feet bgs or to clay. Well screen at depth with high-est PI

(continued)

TABLE 3-1
SUMMARY OF EXPLORATIONS

NEPTUNE DRIVE DISPOSAL AREA - SITE 9
SOURCE INVESTIGATION
SAMPLING AND ANALYSIS PLAN
NAS BRUNSWICK

AREA OF CONCERN (MEDIA)	EXPLORATION TYPE AND IDENTIFICATION	RATIONALE	FIELD SCREENING	LABORATORY SAMPLE TYPE	PARAMETERS ANALYZED	COMMENTS
Potential Dump Area - Vicinity of Bldg. 216 (Subsurface Soil)	Test Pit TP-912	Assess for the presence or absence of landfill material	1-4 Soil samples field screening using PI/headspace	1 Soil Sample	VOC, SVOC, Inorganics, Fuel Oil, Gasoline	Excavated to depth of natural soil or groundwater
Potential Dump Area - Between Bldgs. 216 and 217 (Subsurface Soil)	Test Pit TP-913	Assess for the presence or absence of landfill material	1-4 Soil samples field screening using PI/headspace	1 Soil Sample	VOC, SVOC, Inorganics, Fuel Oil, Gasoline	Excavated to depth of natural soil or groundwater
Potential Dump Area - Between Bldgs. 217 and 218 (Subsurface Soil)	Test Pit TP-914	Assess for the presence or absence of landfill material	1-4 Soil samples field screening using PI/headspace	1 Soil Sample	VOC, SVOC, Inorganics, Fuel Oil, Gasoline	Excavated to depth of natural soil or groundwater
FORMER PIPE LINE						
Former 42" Drain Pipe - upgradient of Ash Landfill (Subsurface Soil, Groundwater)	Test Pit/Trench TP-915	Assess for the presence of pipe and assist in locating Monitoring Well	1-4 Soil Samples-Field Screening using PI/headspace	1 Soil Sample	VOC, SVOC, Pest./PCB, Inorganics, Fuel Oil, Gasoline	Excavated to depth of natural soil or groundwater

(continued)

TABLE 3-1
SUMMARY OF EXPLORATIONS

NEPTUNE DRIVE DISPOSAL AREA - SITE 9
SOURCE INVESTIGATION
SAMPLING AND ANALYSIS PLAN
NAS BRUNSWICK

AREA OF CONCERN (MEDIA)	EXPLORATION TYPE AND IDENTIFICATION	RATIONALE	FIELD SCREENING	LABORATORY SAMPLE TYPE	PARAMETERS ANALYZED	COMMENTS
	Test Boring/ Monitoring Well TB(MW)-NASB-023	Evaluate groundwater quality - potential preferential pathway for contamination migration	Continuous sampling - field screening using PI/headspace	1 Groundwater Sample 1 Soil Sample	VOC, SVOC, Pest./PCB, Inorganics, Fuel Oil, Gasoline	Drilled to 30 feet bgs or to clay. Well screen at depth with highest PI

Notes:

bgs = feet below ground surface (estimated)
MW = monitoring well
TB = test boring
TP = test pit
PI = photoionization
CLP = Contract Laboratory Program 3/90 Statement of Work (Revisions OLM 01.8 [8/91] and ILM 02.1 [10/91])
VOCs = Volatile Organic Compounds
SVOCs = Semivolatile Organic Compounds
PCBs = Polychlorinated biphenyls

by the Base environmental staff and IRP contractor prior to conducting invasive activities.

3.2 EXPLORATION METHODS

Because no source of groundwater contamination has been identified to date, the Navy is proposing to conduct additional field investigations. The exploration program for this site is designed to provide additional information regarding potential source area(s) of groundwater contamination at Site 9 and better characterize the ash landfill/dump area. The program will include the following tasks:

- installing test soil borings
- installing monitoring wells
- installing test pits
- performing conventional soil and groundwater sampling and laboratory analysis and
- conducting a survey

The techniques and site-specific explorations are described in this subsection.

3.2.1 Soil Borings

A total of six soil borings will be installed in the area around Site 9. Four of these borings will be used for monitoring wells and are discussed in more detail in the following section. Of the remaining two test borings, one will be placed within two feet of the existing sampling location T-23 and the other in the vicinity of MW-914 (see Figure 3-1 and Table 3-1). These soil borings are being located and samples collected to better characterize the subsurface soils associated with the "fuel odor" (i.e., at T-23) and "fuel soaked soil" (i.e., at MW-914) as noted by the rig geologist and reported in the Technical Memorandum (ABB-ES, 1994). Split spoon samples will be collected from all borings as described in Table 3-1, and the subsurface geology will be logged by a geologist.

The exploration method for the soil borings includes drilling with a 6-inch inside diameter (ID) (minimum) hollow-stem auger to a depth specified in Table 3-1. One soil sample will be collected at each of the soil borings based on the highest photoionization detector (PI) meter reading. If no PI meter readings above background are observed, then a sample will be collected between 8 to 10 feet bgs (in the boring near T-23) and at approximately 17 feet bgs in the boring near MW-914. The samples will be analyzed as indicated in Section 4.0.

The soil samples will be obtained by driving a 1 3/8-inch ID (or larger) split-spoon sampler with a 140 pound hammer dropped 30 inches. Blow counts will be recorded for the sample. Sufficient sample (i.e., 4 feet of sample) is expected at these boring locations based on previous sample recoveries from MW-914 and MW-916 (located near T-23). A reference sample will be collected from each split spoon and used to determine the sample for off site laboratory analysis. This determination will be based on PI meter readings from the head space of the reference sample. Once the reference sample has reached ambient temperature it will be vigorously shaken for 30 seconds and a PI meter reading taken immediately. If ambient temperatures are 60°F or lower, the sample shall be warmed to at least 60°F before the reading is taken. The reading will be recorded.

3.2.2 Monitoring Well Installation

Four monitoring wells will be installed in completed boreholes, and samples collected for chemical analysis to evaluate groundwater quality in the area of Site 9 (see Figure 3-1 and Table 3-1). One well will be located in each of the following locations:

- west of Building 212 (MW-NASB-023) (location dependent on result of test-pit (see Subsection 3.2.3) in the area of the old drain pipe to evaluate groundwater quality flowing through this potentially preferential pathway,
- southwest of Building 216 (MW-NASB-022) to characterize groundwater flow west of the ash landfill/dump area,
- adjacent to MW-915 (MW-NASB-021) to characterize deeper groundwater quality in the area of the ash landfill/dump area, and

- north of MW-916 (MW-NASB-020) to evaluate background groundwater quality.

[Note: These wells complement the wells installed as part of the Naval Air Station's investigation of the Naval Exchange (NEX) gas station located upgradient of Site 9 (see Figure 3-1).]

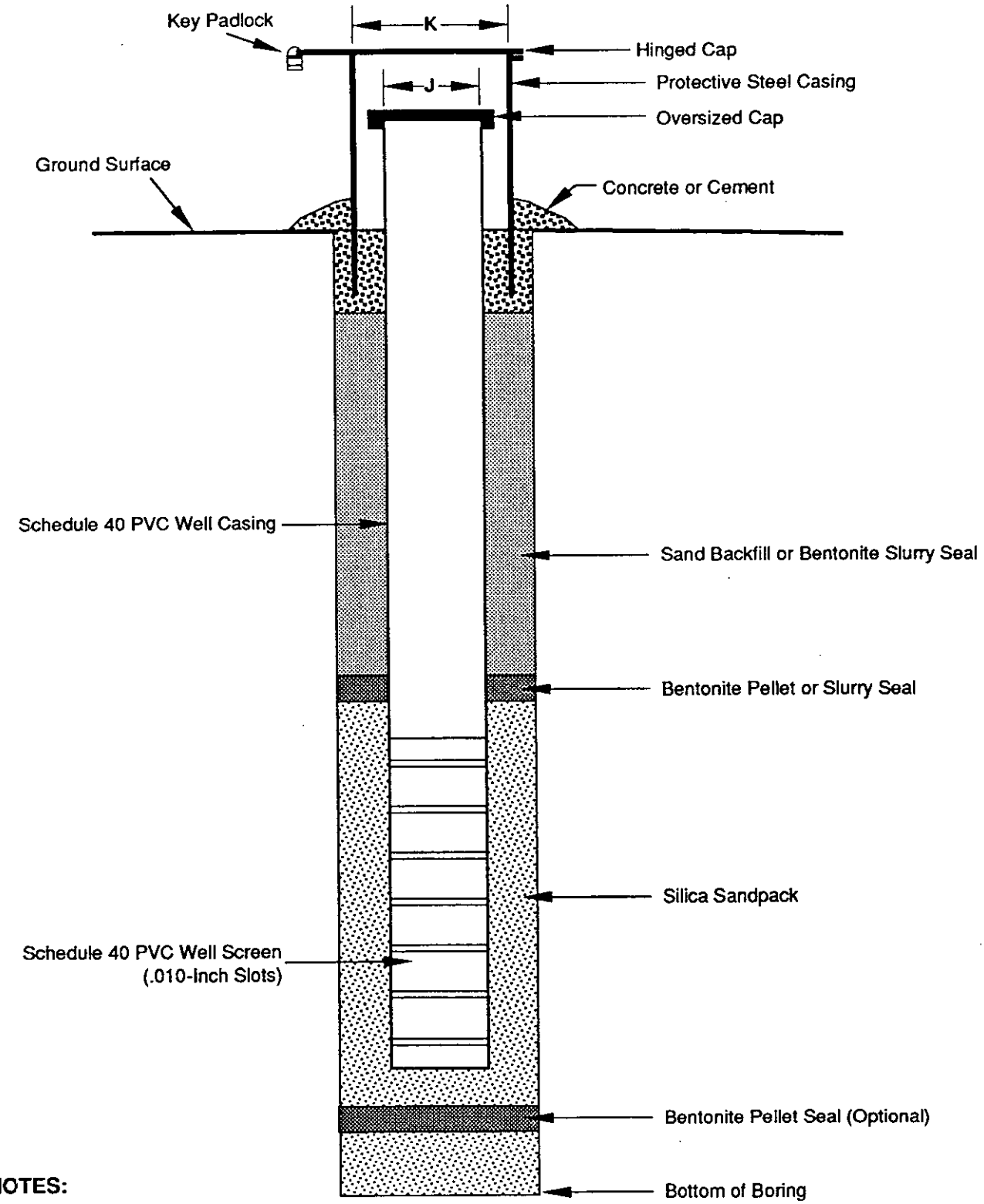
Groundwater monitoring wells will be installed in completed boreholes to permit collection of groundwater samples for laboratory analysis. The well screens will be placed at depths with the highest PI meter readings and will be 10 feet long to accommodate seasonal fluctuations in the water table in water table wells. These well screens will be set approximately 2 feet above/8 feet below the average anticipated water level at each location. Well screens installed completely below the water table will be 5 feet long. Monitoring wells installed during Spring 1993 (MW-914, 915 and 916) used 10 foot screens placed between 7 and 17 feet bgs.

Figure 3-2 shows details of a typical monitoring well installation. The wells will be constructed of 2-inch ID, flush-threaded, Schedule 40 polyvinyl chloride (PVC), generally with 10-foot sections of machine-slotted PVC well screen (with 0.010-inch slots). The annulus around the screen will be backfilled with silica sand to a minimum of 2 to 3 feet above the top of the screen. A 3-foot bentonite pellet seal or a bentonite slurry seal will be installed above the sandpack. Clean cuttings will be placed above the sandpack.

Aboveground protective steel casing will be installed and cemented into the ground over the well risers. Steel casings will be equipped with locking covers and keyed-alike padlocks. A convex cement seal over a layer of bentonite pellets will be placed at ground surface around each protective casing to secure the casing and prevent surface runoff from entering the borehole. Aboveground portions of both the well riser and protective casing will be vented. Wells will be clearly marked in the field.

3.2.3 Test Pitting

A total of four test pits will be installed to evaluate potential source areas of contamination, to examine subsurface soils, and collect soil samples for chemical analysis in the area around Site 9. Three test pits will be excavated in the potential "dump area." The "dump area" identified on an engineering drawing is larger than



NOTES:

J = 2" Inside Diameter Schedule 40 PVC

K = 4" Steel Protective Casing with Locking Cover

Not to Scale

ABB Environmental Services, Inc.	**MONITORING WELL INSTALLATION DETAIL**	
INSTALLATION RESTORATION PROGRAM NAVAL AIR STATION BRUNSWICK, MAINE	SITE 9 SAP	
	7462-01	**FIGURE 3-2**

the ash landfill delineated in earlier investigations. The purpose of these test pits is to determine the presence or absence of landfilled material. One test pit/trench will be excavated near the "old drain pipe" identified north of Neptune Drive on an engineering drawing. The drain pipe is thought to represent a preferential pathway of contaminant migration. The test pit/trench is proposed to determine if the pipe is still present and to assist in locating a monitoring well in this area. The excavations will be placed as follows (see Figure 3-1 and Table 3-1):

- between Orion Street and Building 216 (test pit)
- between Buildings 216 and 217 (test pit)
- between Buildings 217 and 218 (test pit) and
- west of Building 212 (test pit/trench in the area of the old drain pipe)

The four test pits will be excavated to either the depth of landfilled material or natural soil. However, no test pit will extend beyond 10 feet bgs or into groundwater even if natural soil has not been encountered. Previous investigations indicate that the top of the landfilled material is present between 6 and 8 feet bgs; and the old pipe drain is expected to be located between 4 and 8 feet bgs. Groundwater in this portion of Site 9 is approximately 9 feet bgs. Therefore, a maximum extent of test pitting activities of 10 feet bgs is sufficient to determine the presence/absence of landfilled material or the drain pipe.

Test pit locations will be cleared for utilities and other underground obstructions by the NAS. If obstructions are encountered during the excavation, the test pit will be abandoned, excavated soil will be replaced into the pit and the location moved.

Test pit soils and stratigraphy will be logged by a qualified ABB-ES geologist, soil scientist, or geotechnical engineer. Soil samples will be collected directly from the test pit face or with extendable hand tools. As many as four soil samples per test pit will be collected for PI meter/headspace screening. The selected soil sample will be submitted for laboratory analysis based on PI meter readings and/or visual evidence of contamination to represent the most contaminated material encountered. Soils will be analyzed as indicated in Section 4.0. A detailed field log of the test pit will be completed before backfilling. After backfilling, the area will be returned to original grade and resodded by the task subcontractor.

The test pits will also be documented photographically. Photographs will not be included in reports, but will supplement ABB-ES' logs. Air quality in the breathing zone will be continually monitored with a PI meter during test-pitting activities.

The backhoe bucket will be steam-cleaned between test pits to prevent cross-contamination. Steam-cleaning fluids that show no evidence of contamination, based on PI meter readings of less than 5 parts per million (ppm) above background, will be disposed of at the ground surface at respective exploration locations. Cleaning fluids that have PI readings exceeding 5 ppm above background will be contained, placed into DOT-approved, 55-gallon steel drums, and transported by the test pit subcontractor to Building 45, where the Navy will make arrangements for proper disposal.

In the event refuse or contaminated soils are excavated from a test pit, contaminated materials will be returned to the lower portion of the pit upon completion and covered with the original surface soil segregated during excavation.

Test pit sampling and documentation requirements are detailed in the QAPP (E.C. Jordan Co., 1988a).

3.2.4 Soil and Groundwater Sampling

Sampling protocols for soil and groundwater are described in this subsection. Additional procedural and documentation requirements are detailed in Appendix A of the QAPP for the Long Term Monitoring Plan for Building 95, Sites 1 and 3 and Eastern Plume and the original program QAPP (ABB-ES, 1994a and E.C. Jordan Co., 1988a).

Soil Sampling. Soil samples will be collected from soil borings and each soil boring and test pit to help characterize the presence or absence of contamination at Site 9. Sampling locations are described in the following sections (see Figure 3-1).

Deep soil samples (greater than 2 feet) will be collected from backhoe-excavated test pits. Sample material from test pits will be obtained directly from the face of the excavation, if possible, and placed into containers for off-site analysis. Otherwise, soil samples will be collected from the center of the backhoe bucket. A reference jar of soil will be collected with each sample and field screened. All samples will be described using the Unified Soil Classification System. One soil sample per test pit

and one soil sample from the soil boring will be sent off-site for laboratory analysis. The selected sample will be the one with the highest apparent potential for contamination, based on PI meter readings, visual indications of contamination, and/or proximity to cans or drums.

Groundwater Sampling. Groundwater samples will be collected from wells installed in this investigation, from existing wells installed at Site 9 as part of the IRP (i.e., MW-900 series), and from wells associated with the NEX gas station (see Figure 3-1). Because of the presence of vinyl chloride and other VOCs at Site 9, and because of technological advances in low-flow purging and sampling techniques, a different groundwater sampling procedure will be used during this field program from previous remedial investigations, as follows.

Well purging and sampling will be done in general accordance with current USEPA guidance (e.g. RCRA Ground-Water Monitoring: Draft Technical Guidance: EPA/530-R-93-001). Temperature, pH, turbidity, specific conductance, and dissolved oxygen of each sample will be measured in the field in accordance with EPA-600/4-79-020 March, 1983 using the following methods: temperature (method 170.1), pH (method 150.1), turbidity (method 180.1), specific conductance (method 120.1), and dissolved oxygen (method 360.1). Selection of containers is dependent on the types of analyses that are to be performed; appropriate containers, preservation, and holding time requirements are specified in Section 4.0.

Monitoring of groundwater wells will proceed from the upgradient or background wells to the downgradient or contaminated wells as best as can be determined. The protocol described below assumes that portable sampling equipment is used. If dedicated sampling equipment is in place, then the basic purging and sampling procedures will still be followed; however, decontamination and QC (e.g. equipment rinseates) requirements will change somewhat. The monitoring procedure is as follows:

1. Check the well for proper identification and location.

2. Measure and record the height of protective casing above the concrete pad. This reading is compared to that recorded during well installation as an indication of possible well damage or settling that may have occurred.

3. After unlocking the well and removing any well caps, measure and record the ambient and well-mouth organic vapor levels using the photoionization detector. If the ambient air quality at breathing level reaches 5 parts per million, the sampler shall utilize the appropriate safety protocols as described in the HASP.

4. Measure and record the distance between the top of the well and the top of the protective casing.

5. Using the electronic water level meter, measure and record the static water level in the well to the nearest 0.01 foot. The depth to well bottom is not measured because of the potential to stir up sediment at the bottom of the well.

Purging and sampling will be conducted as described in the sequence below:

1. Prepare the pump, by checking electrical connections, discharge tubing, and motor coolant fluid (Grundfos Redi-Flo II). Locate the generator (if applicable) downwind of the well; connect the power converter to the generator. Lower the submersible pump (e.g. Grundfos Redi-Flo II or equivalent) or bladder pump (e.g. GeoGuard bladder) into the well. For water table wells, the pump should be lowered to about two feet below the water table. For deeper wells, the pump should be lowered to the approximate top of the screened interval. The use of a packer is recommended in deeper wells with tall columns of standing water to reduce the amount of stagnant water that may need to be purged and to reduce the time to purge the well water to stability. If a packer is used, the manufacturer's instructions for its use should be followed.

2. Connect the instrumentation header to the pump discharge and begin flushing the well at 0.2 to 0.3 L/min, unless a different purge rate has been previously established for that well. Containerize and dispose of purge water in accordance with established procedures for treatment of investigation-derived wastes. Monitor the field parameters (pH, temperature, specific conductivity, turbidity, and dissolved oxygen) using either in-line sensors or a bottle filled from the pump discharge and measure the volume of groundwater being pumped. Record the field parameter values every three (3) to five (5) minutes. Establish that the water level has not dropped significantly such that

the pump is dry (bubbles in discharge) or water is heard cascading down the inside of the well. Using the water level meter, verify that the water level has not dropped significantly. If the water level drops significantly, reduce the purge rate until the purge rate and the well recovery rate are equal, as indicated by a stable water level. Purging of the standing well water is considered complete when three (3) consecutive readings of the field parameters agree to within approximately 10%. Turbidity readings consistently below 10 NTUs are considered to represent stabilization of discharge water for this parameter.

3. Record the field parameter values at the end of the purge.

4. Reduce the pump flow rate to the lowest practical setting, usually about 0.1 L/min. Remove the in-line sensor, if applicable. If the water discharged by the pump is silty, wait for the water to clear before sampling. Ensure that bubbles are not observed in the discharge tubing.

5. Begin filling sample containers from the pump discharge, allowing the water to fill the containers with as little agitation or aeration as possible. Collect the samples in the order below, as applicable:

   Volatile Organic Compounds
   Fuel oil and gasoline
   Semivolatile Organic Compounds (SVOCs, Pesticides, PCBs)
   Inorganics

6. Remove the pump from the well and decontaminate the pump and tubing by flushing with Liquinox solution and rinsing with isopropyl alcohol followed by DI water.

7. Complete Groundwater Sample Data Record after each well is sampled.

8. Secure the well cap and lock.

3.2.5 Survey of Explorations

The location and elevation of new explorations will be surveyed to the nearest 0.5 foot horizontally and 0.01 foot vertically and referenced to NAS Brunswick

datum. In addition, wells MW-914, MW-915, and MW-916 will be surveyed. All explorations will be tied into the existing control established for previous site exploration locations. The location of these explorations will be plotted on site base maps provided by the Navy.

4.0 LABORATORY ANALYTICAL PROGRAM

4.1 PROGRAM SUMMARY

Soil and groundwater samples will be sent off site for laboratory analysis to identify and quantify chemical contaminants present in these media. Samples collected for laboratory analyses will be analyzed as indicated in Tables 4-1 and 4-2. Tables 4-3 and 4-4 summarize the laboratory analytical program. Table 4-5 specifies the container, preservation, and holding time requirements. VOC analyses will be performed in accordance with the USEPA CLP October 1992 Statement of Work for low concentration VOCs in water. The most recent revision of the March 1990 Statement of Work will be used for SVOCs in water and VOCs, and SVOCs, in soil (Document Number OLM02.1) and for inorganics in water and soil (Document Number ILM03.0). The Contract Required Quantitation Limits (CRQLs) (organics) and Contract Required Detection Limits (inorganics) are listed in Table 4-6. CRDLs for inorganics are provided for reference. The CLP protocols require that inorganics be reported to the instrument detection limits (IDLs), which will be established once a laboratory is selected. Data collection, validation, and reporting will be consistent with the requirements of the Navy IRP (NEESA, 20.2-047B, 1988). Sample tracking and chain-of-custody will be maintained as detailed in the QAPP (E.C. Jordan Co., 1988a).

4.2 DATA QUALITY OBJECTIVES

DQOs are based on the premise that different data uses require different levels of data quality. Data quality refers to the degree of uncertainty of analytical measurements with respect to precision, accuracy, representativeness, completeness, and comparability (PARCC). Specific objectives for each characteristic are established to develop sampling protocols and to identify the applicable documentation, sample handling procedures, and measurement system procedures. These objectives are established based on site conditions, the objectives of the program, and the knowledge of the available measurement systems.

Data obtained during the NAS Brunswick field program will be used to evaluate the presence or absence of contaminants. The levels of data quality applicable to the

TABLE 4-1
EXPLORATION AND SAMPLE INFORMATION
SOIL SAMPLES

NEPTUNE DRIVE DISPOSAL AREA - SITE 9
SOURCE INVESTIGATION
SAMPLING AND ANALYSIS PLAN
NAS BRUNSWICK

EXPLORATION ID	SAMPLE DEPTH[1]	SAMPLE ID	LABORATORY ANALYSES						LABORATORY DATA PACKAGE[6]
			VOCs[3]	SVOCs[4]	PESTICIDES/ PCBs[4]	INORGANICS[5]	TPH FUEL OIL	TPH GASOLINE	
TB-917	8-10[2]	09SB917010X1XX	CLP	CLP	-	CLP	MEDEP 4.1.2	MEDEP 4.2.3	Level D
TB-918	16-18[2]	09SB918018X1XX	CLP	CLP	-	CLP	MEDEP 4.1.2	MEDEP 4.2.3	Level D
TB-NASB-020	TBD	09SB020???X1XX	CLP	CLP	-	CLP	MEDEP 4.1.2	MEDEP 4.2.3	Level D
TB-NASB-021	TBD	09SB021???X1XX	CLP	CLP	-	CLP	MEDEP 4.1.2	MEDEP 4.2.3	Level D
TB-NASB-022	TBD	09SB022???X1XX	CLP	CLP	CLP	CLP	MEDEP 4.1.2	MEDEP 4.2.3	Level D
TB-NASB-023	TBD	09SB023???X1XX	CLP	CLP	-	CLP	MEDEP 4.1.2	MEDEP 4.2.3	Level D
TP-912	TBD	09PS912???X1XX	CLP	CLP	-	CLP	MEDEP 4.1.2	MEDEP 4.2.3	Level D
TP-913	TBD	09PS913???X1XX	CLP	CLP	-	CLP	MEDEP 4.1.2	MEDEP 4.2.3	Level D
TP-914	TBD	09PS914???X1XX	CLP	CLP	-	CLP	MEDEP 4.1.2	MEDEP 4.2.3	Level D
TP-915	TBD	09PS915???X1XX	CLP	CLP	CLP	CLP	MEDEP 4.1.2	MEDEP 4.2.3	Level D

Notes:

1 feet below ground surface (estimated)
2 Unless indicated otherwise by PI readings
3 Target Compound List with tentatively identified compounds
4 Target Compound List
5 Target Analyte List
6 Level D data packages will be produced by the laboratory for CLP analyses

TB = test boring
TBD = to be determined
TP = test pit
TPH = total petroleum hydrocarbons
ID = identifier
PS = test pit soil sample
SB = test boring soil sample

CLP = Contract Laboratory Program 3/90 Statement of Work (Revisions OLM 01.8 [8/91] and ILM 02.1 [10/91])
VOCs = Volatile Organic Compounds
SVOCs = Semivolatile Organic Compounds
PCBs = Polychlorinated biphenyls
??? = to be replaced by the depth at which the sample is taken
- = no analysis

W0069436T/15

TABLE 4-2
EXPLORATION AND SAMPLE INFORMATION
GROUNDWATER SAMPLES

NEPTUNE DRIVE DISPOSAL AREA - SITE 9
SOURCE INVESTIGATION
SAMPLING AND ANALYSIS PLAN
NAS BRUNSWICK

EXPLORATION ID	SAMPLE ID	LABORATORY ANALYSES					TPH FUEL OIL	TPH GASOLINE	LABORATORY DATA PACKAGE[4]
		VOCs[1,2]	SVOCs[2]	PESTICIDES/ PCBs[2]	INORGANICS[3]	VINYL CHLORIDE			
MW-901	09MW901XXX08XX[5]	CLP	-	-	CLP	EPA 601	MEDEP 4.1.1	MEDEP 4.2.1	Level D
MW-902	09MW902XXX08XX	CLP	-	-	CLP	EPA 601	MEDEP 4.1.1	MEDEP 4.2.1	Level D
MW-903	09MW903XXX08XX	CLP	-	-	CLP	EPA 601	MEDEP 4.1.1	MEDEP 4.2.1	Level D
MW-904	09MW904XXX08XX	CLP	-	-	CLP	EPA 601	MEDEP 4.1.1	MEDEP 4.2.1	Level D
MW-905	09MW905XXX08XX	CLP	-	-	CLP	EPA 601	MEDEP 4.1.1	MEDEP 4.2.1	Level D
MW-906	09MW906XXX08XX	CLP	-	-	CLP	EPA 601	MEDEP 4.1.1	MEDEP 4.2.1	Level D
MW-907	09MW907XXX08XX	CLP	-	-	CLP	EPA 601	MEDEP 4.1.1	MEDEP 4.2.1	Level D
MW-908	09MW908XXX08XX	CLP	-	-	CLP	EPA 601	MEDEP 4.1.1	MEDEP 4.2.1	Level D
MW-909	09MW909XXX08XX	CLP	-	-	CLP	EPA 601	MEDEP 4.1.1	MEDEP 4.2.1	Level D
MW-910	09MW910XXX08XX	CLP	-	-	CLP	EPA 601	MEDEP 4.1.1	MEDEP 4.2.1	Level D
MW-914	09MW914XXX08XX	CLP	-	-	CLP	EPA 601	MEDEP 4.1.1	MEDEP 4.2.1	Level D
MW-915	09MW915XXX08XX	CLP	-	-	CLP	EPA 601	MEDEP 4.1.1	MEDEP 4.2.1	Level D
MW-916	09MW916XXX08XX[5]	CLP	-	-	CLP	EPA 601	MEDEP 4.1.1	MEDEP 4.2.1	Level D
MW-NASB-020	09MW020XXX08XX	CLP	CLP	CLP	CLP	EPA 601	MEDEP 4.1.1	MEDEP 4.2.1	Level D
MW-NASB-021	09MW021XXX08XX	CLP	CLP	-	CLP	EPA 601	MEDEP 4.1.1	MEDEP 4.2.1	Level D

W0069436T/16

(continued)

TABLE 4-2
EXPLORATION AND SAMPLE INFORMATION
GROUNDWATER SAMPLES

NEPTUNE DRIVE DISPOSAL AREA - SITE 9
SOURCE INVESTIGATION
SAMPLING AND ANALYSIS PLAN
NAS BRUNSWICK

EXPLORATION ID	SAMPLE ID	LABORATORY ANALYSES					TPH FUEL OIL	TPH GASOLINE	LABORATORY DATA PACKAGE[4]
		VOCs[1,2]	SVOCs[2]	PESTICIDES/ PCBs[2]	INORGANICS[3]	VINYL CHLORIDE			
MW-NASB-022	09MW022XXX08XX	CLP	CLP	-	CLP	EPA 601	MEDEP 4.1.1	MEDEP 4.2.1	Level D
MW-NASB-023	09MW023XXX08XX	CLP	CLP	-	CLP	EPA 601	MEDEP 4.1.1	MEDEP 4.2.1	Level D
MW-NEX-001R	09MW001XXX08XX	CLP	CLP	-	CLP	EPA 601	MEDEP 4.1.1	MEDEP 4.2.1	Level D
MW-NEX-002	09MW002XXX08XX	CLP	CLP	-	CLP	EPA 601	MEDEP 4.1.1	MEDEP 4.2.1	Level D
MW-NEX-003	09MW003XXX08XX	CLP	CLP	-	CLP	EPA 601	MEDEP 4.1.1	MEDEP 4.2.1	Level D
MW-NEX-004R	09MW004XXX08XX	CLP	CLP	-	CLP	EPA 601	MEDEP 4.1.1	MEDEP 4.2.1	Level D
MW-NEX-005	09MW005XXX08XX	CLP	CLP	-	CLP	EPA 601	MEDEP 4.1.1	MEDEP 4.2.1	Level D
MW-NASB-006	09MW006XXX08XX	CLP	CLP	-	CLP	EPA 601	MEDEP 4.1.1	MEDEP 4.2.1	Level D
MW-NASB-007	09MW007XXX08XX	CLP	CLP	-	CLP	EPA 601	MEDEP 4.1.1	MEDEP 4.2.1	Level D
MW-NASB-008	09MW008XXX08XX	CLP	CLP	-	CLP	EPA 601	MEDEP 4.1.1	MEDEP 4.2.1	Level D

(continued)

TABLE 4-2
EXPLORATION AND SAMPLE INFORMATION
GROUNDWATER SAMPLES

NEPTUNE DRIVE DISPOSAL AREA - SITE 9
SOURCE INVESTIGATION
SAMPLING AND ANALYSIS PLAN
NAS BRUNSWICK

EXPLORATION ID	SAMPLE ID	LABORATORY ANALYSES					TPH FUEL OIL	TPH GASOLINE	LABORATORY DATA PACKAGE[4]
		VOCs[1,2]	SVOCs[2]	PESTICIDES/ PCBs[2]	INORGANICS[3]	VINYL CHLORIDE			
MW-NASB-009	09MW009XXX08XX	CLP	CLP	-	CLP	EPA 601	MEDEP 4.1.1	MEDEP 4.2.1	Level D
MW-NASB-010	09MW010XXX08XX	CLP	CLP	-	CLP	EPA 601	MEDEP 4.1.1	MEDEP 4.2.1	Level D

Notes:

1 Target Compound List with tentatively identified compounds; liquid samples will be analyzed using "Superfund Analytical Methods for Low-Concentration Water for Organic Analysis," 6/91 Statement of Work
2 Target Compound List
3 Target Analyte List
4 Level D data packages will be produced by the laboratory for CLP analyses
5 This is the 8th sampling event at Site 9.

MW = monitoring well
TBD = to be determined
TPH = total petroleum hydrocarbons
ID = identifier
CLP = Contract Laboratory Program 3/90 Statement of Work (Revisions OLM 01.8 [8/91] and ILM 02.1 [10/91])
VOCs = Volatile Organic Compounds
SVOCs = Semivolatile Organic Compounds
PCBs = Polychlorinated biphenyls
??? = to be replaced by the depth at which the sample is taken
- = no analysis

TABLE 4-3
SUMMARY OF PROPOSED LABORATORY ANALYTICAL PROGRAM - SOIL SAMPLES

NEPTUNE DRIVE DISPOSAL AREA - SITE 9
SOURCE INVESTIGATION
SAMPLING AND ANALYSIS PLAN
NAS BRUNSWICK

	LABORATORY ANALYTICAL PROCEDURES					
	TCL VOCs	TCL SVOCs	TCL PEST./PCBs	TAL INORGANICS	FUEL OIL IN SOIL	GASOLINE IN SOIL
Subtotal	10	10	2	10	10	10
Field Duplicates	1	1	1	1	1	1
Sampler Blanks	1	1	1	1	1	1
Trip Blanks*	4	NA	NA	NA	NA	NA
Source Water Blanks**	2	2	2	2	2	2
MS/MSD Samples	1/1	1/1	1/1	1/1	1/1	1/1
Total	20	16	8	16	16	16

Notes:

VOC	=	Volatile Organic Compounds
TCL	=	USEPA Target Compound List
TAL	=	USEPA Target Analyte List
SVOCs	=	Semivolatile Organic Compounds
Pest	=	Pesticides
PCBs	=	Polychlorinated biphenyls
MS/MSD	=	Matrix spike/matrix spike duplicate
NA	=	Not applicable
*	=	Assumes 3 soil samples will be collected each day and sent off site in one cooler to the laboratory for analysis.
**	=	Assumes one laboratory water and one potable water for drilling.

TABLE 4-4
SUMMARY OF PROPOSED LABORATORY ANALYTICAL PROGRAM - GROUNDWATER SAMPLES

NEPTUNE DRIVE DISPOSAL AREA - SITE 9
SOURCE INVESTIGATION
SAMPLING AND ANALYSIS PLAN
NAS BRUNSWICK

	LABORATORY ANALYTICAL PROCEDURES						
	TCL VOCs	TCL SVOCs	TCL PEST./PCBs	VINYL CHLORIDE	TAL INORGANICS	TPH FUEL OIL IN WATER	TPH GASOLINE IN WATER
Subtotal	27	14	1	27	27	27	27
Field Duplicates	3	2	1	3	3	3	3
Sampler Blanks	3	2	1	3	3	3	3
Trip Blanks*	7	NA	NA	7	NA	NA	NA
Source Water Blanks	2	2	1	2	2	2	2
MS/MSD Samples	2/2	1/1	1/1	2/2	2/2	2/2	2/2
Total	46	22	6	46	39	39	39

Notes:

VOC = Volatile Organic Compounds
TCL = USEPA Target Compound List
TAL = USEPA Target Analyte List
SVOCs = Semivolatile Organic Compounds
Pest = Pesticides
PCBs = Polychlorinated biphenyls
MS/MSD = Matrix spike/matrix spike duplicate
NA = Not applicable
* = Assumes 4 water samples will be collected each day and sent off site in one cooler to the laboratory for analysis.

TABLE 4-5
CONTAINER, PRESERVATION, AND HOLDING TIME REQUIREMENTS

NEPTUNE DRIVE DISPOSAL SITE - SITE 9
SOURCE INVESTIGATION
SAMPLING AND ANALYSIS PLAN
NAS BRUNSWICK

MEDIA	PARAMETER	METHOD	REFERENCE	CONTAINER REQUIREMENTS	PRESERVATION REQUIREMENTS	HOLDING TIME[1] LIMITS
Soil	TCL VOCs	Purge & Trap GC/MS	3/90 SOW, OLM 01.8	4 oz, Glass, Teflon Cap	4°C	14 days
	TCL SVOCs	GC/MS	3/90 SOW, OLM 01.8	4 oz, Glass, Teflon Cap	4°C	7 days to Extraction, 40 days after Extraction
	TCL Pesticides/PCBs	GC/ECD	3/90 SOW, OLM 01.8	4 oz, Glass, Teflon Cap	4°C	7 days to Extraction, 40 days after Extraction
	TAL Inorganics	AAS/PES/CVAA	3/90 SOW, revised ILM 02.1 (9/91)	4 oz, Glass, Teflon Cap	4°C	6 months (28 days for mercury)
	Fuel Oil in Soil	Soxhlet/GC	MEDEP Method 4.1.2	40 ml Vial (2/3 full), Glass, Teflon Cap	4°C	14 days
	Gasoline in Soil	GC	MEDEP Method 4.2.3	40 ml Vial, (1/3 full), Glass, Teflon Cap	4°C	14 days
Groundwater	TCL VOCs	Purge & Trap GC/MS*	3/90 SOW Low Detection Limit (6/91)*	40 ml Vial (2), Glass Teflon-lined Septa	4°C, HCL	14 days (preserved)
	Vinyl Chloride	GC/Purge & Trap	EPA method 601	40 ml Vial, Glass, Teflon-lined Septa	4°C	14 days
	TCL SVOCs	GC/MS	3/90 SOW, OLM 01.8	1-liter Amber Glass	4°C	7 days to Extraction, 40 days after Extraction
	TCL Pesticides/PCBs	GC/ECD	3/90 SOW, OLM 01.8	1-liter Amber Glass	4°C	7 days to Extraction, 40 days after Extraction

(continued)

TABLE 4-5
CONTAINER, PRESERVATION, AND HOLDING TIME REQUIREMENTS

NEPTUNE DRIVE DISPOSAL SITE - SITE 9
SOURCE INVESTIGATION
SAMPLING AND ANALYSIS PLAN
NAS BRUNSWICK

MEDIA	PARAMETER	METHOD	REFERENCE	CONTAINER REQUIREMENTS	PRESERVATION REQUIREMENTS	HOLDING TIME[1] LIMITS
	TAL Elements	AAS/PES/CVAA	3/90 SOW, revised ILM 02.1 (9/91)	1-liter Plastic	4°C, HNO_3 pH<2	6 months (28 days for mercury)
	Fuel Oil in Water	GC	MEDEP 4.1.1	1-liter Amber Glass	4°C	7 days to extract/ 40 days to analyze
	Gasoline in Water	GC	MEDEP 4.2.1	40 ml Glass Vial, Teflon Cap	4°C	14 days
	Temperature (field)	Thermometric	USEPA Method 170.1	N/A	N/A	N/A
	pH (field)	Potentiometric	USEPA Method 150.1	N/A	N/A	N/A
	Specific Conductivity (field)	Electronometric	USEPA Method 120.1	N/A	N/A	N/A
	Turbidity (field)	Nephelometric	USEPA Method 180.1	N/A	N/A	N/A
	Dissolved Oxygen (field)	Membrane electrode	USEPA method 360.1	N/A	N/A	N/A

Notes:

GC/MS = Gas Chromatography/Mass Spectrometry
SOW = USEPA Contract Laboratory Program, Statement of Work
GC/ECD = Gas Chromatography/Electron Capture Detection
AAS = Atomic Absorption Spectroscopy
PES = Plasma Emission Spectroscopy
TCL = Target Compound List
TAL = Target Analyte List
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound
PCB = Polychlorinated Biphenyl
* = 6/91 Statement of Work, "Superfund Analytical Methods for Low-Concentration Water for Organics Analysis"; USEPA Contract Laboratory Program; USEPA, 1991.
(1) = Holding times from date of collection.
TCLP = Toxicity Characteristic Leachate Procedure
CVAA = Cold Vapor Atomic Absorption

W0069436T/22

TABLE 4-6
SUMMARY OF OFF-SITE ANALYTICAL METHODS

NEPTUNE DRIVE DISPOSAL AREA - SITE 9
SOURCE INVESTIGATION
SAMPLING AND ANALYSIS PLAN
NAS BRUNSWICK

PARAMETERS	SOIL DETECTION LIMIT (µg/kg)	LOW CONCENTRATION WATER DETECTION LIMIT (µg/L)
VOLATILES	CRQL	CRQL
Chloromethane	10	1
Bromomethane	10	1
Vinyl Chloride	10	1
Chloroethane	10	1
Methylene Chloride	10	2
Acetone	10	5
Carbon Disulfide	10	1
1,1-Dichloroethene	10	1
1,1-Dichloroethane	10	1
cis-1,2-Dichloroethene	NA	1
trans-1,2-Dichloroethene	NA	1
1,2-Dichloroethene (total)	10	1
Chloroform	10	1
1,2-Dichloroethane	10	1
2-Butanone	10	5
Bromochloromethane	NA	1
1,1,1-Trichloroethane	10	1
Carbon Tetrachloride	10	1
Bromodichloromethane	10	1
1,2-Dichloropropane	10	1
cis-1,3-Dichloropropene	10	1
Trichloroethene	10	1
Dibromochloromethane	10	1
1,1,2-Trichloroethane	10	1
Benzene	10	1
trans-1,3-Dichloropropene	10	1
Bromoform	10	1
4-Methyl-2-Pentanone	10	5
2-Hexanone	10	5
Tetrachloroethene	10	1
1,1,2,2-Tetrachloroethane	10	1
1,2-Dibromomethane	NA	1
Toluene	10	1
Chlorobenzene	10	1
Ethylbenzene	10	1
Styrene	10	1

(continued)

TABLE 4-6
SUMMARY OF OFF-SITE ANALYTICAL METHODS

NEPTUNE DRIVE DISPOSAL AREA - SITE 9
SOURCE INVESTIGATION
SAMPLING AND ANALYSIS PLAN
NAS BRUNSWICK

PARAMETERS	SOIL DETECTION LIMIT (µg/kg)	LOW CONCENTRATION WATER DETECTION LIMIT (µg/L)
VOLATILES (continued)	CRQL	CRQL
Total Xylenes	10	1
1,3-Dichlorobenzene	NA *	1
1,4-Dichlorobenzene	NA *	1
1,2-Dichlorobenzene	NA *	1
1,2-Dibromo-3-chloropropane	NA	1
	SOIL DETECTION LIMIT (µg/kg)	**WATER DETECTION LIMIT (µg/L)**
SEMIVOLATILES	CRQL	CRQL
Phenol	330	10
bis(2-Chloroethyl)ether	330	10
2-Chlorophenol	330	10
1,3-Dichlorobenzene	330	10
1,4-Dichlorobenzene	330	10
1,2-Dichlorobenzene	330	10
2-Methylphenol	330	10
bis(2-Chloroisopropyl)ether	330	10
4-Methylphenol	330	10
N-Nitroso-di-n-propylamine	330	10
Hexachloroethane	330	10
Nitrobenzene	330	10
Isophorone	330	10
2-Nitrophenol	330	10
2,4-Dimethylphenol	330	10
bis(2-Chloroethoxy)methane	330	10
2,4-Dichlorophenol	330	10
1,2,4-Trichlorobenzene	330	10
Naphthalene	330	10
4-Chloroaniline	330	10
Hexachlorobutadiene	330	10
4-Chloro-3-Methylphenol	330	10
2-Methylnaphthalene	330	10
Hexachlorocyclopentadiene	330	10
2,4,6-Trichlorophenol	330	10
2,4,5-Trichlorophenol	830	25

(continued)

TABLE 4-6
SUMMARY OF OFF-SITE ANALYTICAL METHODS

NEPTUNE DRIVE DISPOSAL AREA - SITE 9
SOURCE INVESTIGATION
SAMPLING AND ANALYSIS PLAN
NAS BRUNSWICK

PARAMETERS	SOIL DETECTION LIMIT (µg/kg)	WATER DETECTION LIMIT (µg/L)
SEMIVOLATILES (continued)	CRQL	CRQL
2-Chloronaphthalene	330	10
2-Nitroaniline	830	25
Dimethylphthalate	330	10
Acenaphthylene	330	10
2,6-Dinitrotoluene	330	10
3-Nitroaniline	830	25
Acenaphthene	330	10
2,4-Dinitrophenol	830	25
4-Nitrophenol	830	25
Dibenzofuran	330	10
2,4-Dinitrotoluene	330	10
Diethylphthalate	330	10
4-Chlorophenyl-phenylether	330	10
Fluorene	330	10
4-Nitroaniline	830	25
4,6-Dinitro-2-methylphenol	830	25
N-Nitrosodiphenylamine	330	10
4-Bromophenyl-phenylether	330	10
Hexachlorobenzene	330	10
Pentachlorophenol	830	25
Phenanthrene	330	10
Anthracene	330	10
Carbazole	330	10
Di-n-butylphthalate	330	10
Fluoranthene	330	10
Pyrene	330	10
Butylbenzylphthalate	330	10
3,3'-dichlorobenzidine	330	10
Benzo(a)Anthracene	330	10
Chrysene	330	10
bis(2-Ethylhexyl)phthalate	330	10
Di-n-octylphthalate	330	10
Benzo(b)Fluoranthene	330	10
Benzo(k)Fluoranthene	330	10
Benzo(a)Pyrene	330	10

(continued)

TABLE 4-6
SUMMARY OF OFF-SITE ANALYTICAL METHODS

NEPTUNE DRIVE DISPOSAL AREA - SITE 9
SOURCE INVESTIGATION
SAMPLING AND ANALYSIS PLAN
NAS BRUNSWICK

PARAMETERS	SOIL DETECTION LIMIT (µg/kg)	WATER DETECTION LIMIT (µg/L
SEMIVOLATILES (continued)	CRQL	CRQL
Indeno(1,2,3-c,d)Pyrene	330	10
Dibenz(a,h)Anthracene	330	10
Benzo(g,h,i)perylene	330	10
	SOIL DETECTION LIMIT (µg/kg)	LOW CONCENTRATION WATER DETECTION LIMIT (µg/L)
PESTICIDE/PCBs	CRQL	CRQL
alpha-BHC	1.7	0.01
beta-BHC	1.7	0.01
delta-BHC	1.7	0.01
gamma-BHC (Lindane)	1.7	0.01
Heptachlor	1.7	0.01
Aldrin	1.7	0.01
Heptachlor Epoxide	1.7	0.01
Endosulfan I	1.7	0.01
Dieldrin	3.3	0.02
4,4'-DDE	3.3	0.02
Endrin	3.3	0.02
Endosulfan II	3.3	0.02
4,4'-DDD	3.3	0.02
Endrin Aldehyde	3.3	0.02
Endosulfan Sulfate	3.3	0.02
4,4'-DDT	3.3	0.02
Methoxychlor	17	0.1
Endrin Ketone	3.3	0.02
alpha-Chlordane	1.7	0.01
gamma-Chlordane	1.7	0.01
Toxaphene	170	1
Aroclor-1016	33	0.2
Aroclor-1221	67	0.4
Aroclor-1232	33	0.2
Aroclor-1242	33	0.2
Aroclor-1248	33	0.2
Aroclor-1254	33	0.2
Aroclor-1260	33	0.2

(continued)

TABLE 4-6
SUMMARY OF OFF-SITE ANALYTICAL METHODS

NEPTUNE DRIVE DISPOSAL AREA - SITE 9
SOURCE INVESTIGATION
SAMPLING AND ANALYSIS PLAN
NAS BRUNSWICK

PARAMETERS	SOIL DETECTION LIMIT (mg/kg)	WATER DETECTION LIMIT (µg/L)
INORGANICS	CRDL	CRDL
Aluminum	40	200
Antimony	12	60
Arsenic	2	10
Barium	40	200
Beryllium	1	5
Cadmium	1	5
Calcium	1000	5000
Chromium	2	10
Cobalt	10	50
Copper	5	25
Iron	20	100
Lead	0.6	3
Magnesium	1000	5000
Manganese	3	15
Mercury	0.1	0.2
Nickel	8	40
Potassium	1000	5000
Selenium	1	5
Silver	2	10
Sodium	1000	5000
Thallium	2	10
Vanadium	10	50
Zinc	4	20
Cyanide	1	10
LOW DETECTION LIMIT		CRQL
Vinyl Chloride (EPA 601)	NA	0.17

(continued)

TABLE 4-6
SUMMARY OF OFF-SITE ANALYTICAL METHODS

NEPTUNE DRIVE DISPOSAL AREA - SITE 9
SOURCE INVESTIGATION
SAMPLING AND ANALYSIS PLAN
NAS BRUNSWICK

PARAMETERS	SOIL DETECTION LIMIT (mg/kg)	WATER DETECTION LIMIT (µg/L)
METPH		
Fuel Oil in Soil (MEDEP 4.1.2)	?	NA
Gasoline in Soil (MEDEP 4.2.3)	?	NA
Fuel Oil in Water (MEDEP 4.1.1)	NA	?
Gasoline in Water (MEDEP 4.2.1)	NA	?

Notes:

*	=	Analyzed under semivolatile analysis in SOW 3/90
CRDL	=	Contract Required Detection Limit
CRQL	=	Contract Required Quantitation Limit
MDL	=	Method Detection Limit
NA	=	not applicable
mg/kg	=	milligrams/kilogram
µg/kg	=	micrograms/kilogram
µg/L	=	micrograms/liter
?	=	detection limit to be established by laboratory

NAS Brunswick investigation are described in the following paragraphs and are consistent with requirements for the Navy IRP (NEESA, 20.2-047B, 1988).

Level A. Generated data provide information on the presence or absence of contamination and are generally qualitative rather than quantitative. Level A data (including PI meter readings, pH, temperature, and specific conductance measurements) will be collected to aid in the identification of sampling locations, health and safety monitoring, and characterization of samples.

Level C. These data are generated by an off-site analytical laboratory using non-CLP USEPA or MEDEP methods. This level is suitable for site characterization where the documentation of USEPA CLP procedures (Level D) is not required.

Level D. These data represent confirmational laboratory information generated using USEPA CLP methods and supported by rigorous quality control, documentation, and validation procedures. These data are typically used for site characterization, risk assessment, engineering alternative selection and design, and enforcement/litigation activities. Level D data closely correspond with USEPA Level IV data with additional quality assurance requirements.

Data from this field program will be used for several purposes, depending on the specific task and medium of concern. The following DQOs have been identified:

- Temperature, pH, specific conductance, and PI meter measurements will be conducted in the field, providing Level A data quality.

- Soil and groundwater samples collected during the field program will be analyzed for TCL VOCs, SVOCs, and TAL inorganics using USEPA CLP protocols to provide Level D data quality.

- Low level vinyl chloride will be analyzed using low level USEPA Method 601 laboratory protocols sufficient to support Level C data quality.

- Fuel oil and gasoline in soil and water will be analyzed using laboratory protocols sufficient to support Level C data quality.

4.3 DATA VALIDATION

Validation of Level D laboratory analytical data is a systematic process designed to provide assurance that the data are adequate for their intended use. The process includes the following activities:

- auditing measurement system calibration and calibration verification
- auditing quality control activities
- reviewing data for technical credibility with respect to the sample site setting
- auditing field sample data records and chain of custody
- checking intermediate calculations
- certifying the process

At a minimum, the Level D CLP analytical data will be validated by ABB-ES in accordance with the USEPA *Laboratory Data Validation, Functional Guidelines for Evaluating Organics Analyses* (USEPA, 1988b) and *Laboratory Data Validation, Functional Guidelines for Evaluating Inorganics Analyses* (USEPA, 1988c), as well as the appropriate USEPA Region I revisions (i.e., November 1988 and February 1989 for organics and inorganics, respectively, along with recent revisions [USEPA, 1991]). The data evaluation criteria will include method blank correction, evaluation of holding times, instrument performance (i.e., calibration), and surrogate recoveries. Validation of Level A data will not be performed.

4.4 DATA QUALITY EVALUATION

The purpose of data quality evaluation is to assure that data generated during the field program are consistent with the project objectives. The data validation results will be used to evaluate data utility and will include assessment of the PARCC parameters. Data quality assessment will be conducted as detailed in the QAPP (E.C. Jordan Co., 1988a).

ABB-ES	ABB Environmental Services, Inc.
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLP	Contract Laboratory Program
CRDL	Contract Required Detection Limit
CRQL	Contract Required Quantitation Limit
DOT	U.S. Department of Transportation
DQO	Data Quality Objective
FS	Feasibility Study
HASP	Health and Safety Plan
ID	Inner Diameter
IRP	Installation Restoration Program
MEDEP	Maine Department of Environmental Protection
MW	Monitoring Well
NAS	Naval Air Station
NEX	Naval Exchange
PARCC	precision, accuracy, representativeness, completeness, and comparability
PI	photoionization
ppm	parts per million
PVC	polyvinyl chloride
QAPP	Quality Assurance Program Plan
RI	remedial investigation
SAP	Sampling and Analysis Plan
SARA	Superfund Amendment and Reauthorization Act
SVOC	semivolatile organic compound

TAL	Target Analyte List
TCL	Target Compound List
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound

ABB Environmental Services, Inc., 1990. "Health and Safety Plan"; Portland, Maine; June 1990.

ABB Environmental Services, Inc., 1994. "Technical Memorandum Site 9: Neptune Drive Disposal Site"; NAS Brunswick; Portland, Maine; June 1994.

ABB Environmental Services, Inc., 1994a. "Long Term Monitoring Plan Building 95, Sites 1 and 3 and Eastern Plume"; NAS Brunswick; Portland, Maine; June 1994.

ABB Environmental Services, Inc., 1994b. "Interim Record of Decision for the Groundwater Operable Unit at Site 9"; NAS Brunswick; Portland, Maine; September 1994.

Beardsley, Nancy, 1993. Letter to Fred Evans, Northdiv Remedial Project Manager; regarding comments on additional source investigations at Site 9, NAS Brunswick. MEDEP Project Manager, Augusta, Maine; December 8, 1993.

E.C. Jordan Co., 1988a. "Quality Assurance Program Plan - U.S. Navy Installation Restoration Program"; Portland, Maine; February 1988.

E.C. Jordan Co., 1988b. "Remedial Investigation/Feasibility Study Work Plan NAS Brunswick"; Portland, Maine; April 1988.

E.C. Jordan Co., 1989. "Additional Sampling Plan, RI/FS Program NAS Brunswick"; Portland, Maine; August 1990.

E.C. Jordan Co., 1990a. "Draft Phase II Feasibility Study NAS Brunswick"; Portland, Maine; August 1990.

E.C. Jordan Co., 1990b. "Draft Final Remedial Investigation Report NAS Brunswick"; Portland, Maine; August 1990.

E.C. Jordan Co., 1990c. "Post-Screening Work Plan NAS Brunswick"; Portland, Maine; July 1990.

Evans, Fred, 1994. Letter to Nancy Beardsley, MEDEP Project Manager; regarding Source Investigation Work Plan for Site 9, NAS Brunswick and Response to

MEDEP's comments of December 8, 1993. Northdiv Remedial Project Manager; Lester, PA; July 19, 1994.

Naval Energy and Environmental Support Activity (NEESA), 20.2-047B, 1988. "Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program"; June 1988.

U.S. Environmental Protection Agency (USEPA), 1988a. "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA"; USEPA/540/G-89/004; Washington, D.C.; October 1988.

U.S. Environmental Protection Agency (USEPA), 1988b. "Region I Laboratory Data Validation: Functional Guidelines for Evaluating Organics Analysis"; prepared for the USEPA Hazardous Site Evaluation Division; February 1988; modified November 1988.

U.S. Environmental Protection Agency (USEPA), 1988c. "Region I Laboratory Data Validation: Functional Guidelines for Evaluating Inorganics Analysis"; prepared for the USEPA Hazardous Site Evaluation Division; EPA 68-01-7443; June 1988; modified February 1988.

U.S. Environmental Protection Agency (USEPA), 1991. "National Functional Guidelines for Organic Data Review"; Draft December 1990; revised June 1991.

U.S. Environmental Protection Agency (USEPA), 1991a. "Management of Investigation-Derived Wastes During Site Inspections"; Office of Research and Development; EPA/540/G-91/009; Washington D.C.; May 1991.

U.S. Environmental Protection Agency (USEPA), 1992. "RCRA Groundwater Monitoring: Draft Technical Guidance"; EPA/530-R-93-001; Washington D.C.

SITE-SPECIFIC HEALTH AND SAFETY PLAN

SITE-SPECIFIC HEALTH AND SAFETY PLAN
SITE 9

TABLE OF CONTENTS

Section	Title	Page No.
A.1	GENERAL	A.1-1
A.1.1	SCOPE AND PURPOSE	A.1-1
A.1.2	PROJECT PERSONNEL	A.1-1
A.1.2.1	Project Manager	A.1-1
A.1.2.2	Field Operation Leader	A.1-1
A.1.2.3	Health and Safety Manager	A.1-1
A.1.2.4	Health and Safety Supervisor	A.1-2
A.1.2.5	Health and Safety Officer	A.1-2
A.1.2.6	Training	A.1-2
A.1.2.7	Medical Surveillance	A.1-2
A.2	SITE CHARACTERIZATION AND ANALYSIS	A.2-1
A.2.1	SITE NAME, LOCATION, AND SIZE	A.2-1
A.2.2	SITE HISTORY	A.2-1
A.2.3	PREVIOUS INVESTIGATIONS	A.2-2
A.2.4	SCOPE OF WORK	A.2-3
A.3	TASK ANALYSIS	A.3-1
A.3.1	HAZARDOUS SUBSTANCES	A.3-1
A.3.2	SITE RISKS	A.3-1
A.3.2.1	Health Hazards	A.3-1
A.3.2.2	Safety Hazards	A.3-1
A.3.2.3	Conclusions/Risk Assessment	A.3-1
A.4	SITE CONTROL	A.4-1
A.4.1	ZONATION	A.4-1
A.4.1.1	Exclusion Zone	A.4-1
A.4.1.2	Contamination Reduction Zone	A.4-1
A.4.1.3	Support Zone	A.4-2
A.4.2	MEDICAL ASSISTANCE	A.4-2

SITE-SPECIFIC HEALTH AND SAFETY PLAN
SITE 9

TABLE OF CONTENTS
(continued)

Section	Title	Page No.
A.5	ENGINEERING CONTROLS, WORK PRACTICES, AND PERSONAL PROTECTIVE EQUIPMENT	A.5-1
	A.5.1 ENGINEERING CONTROLS	A.5-1
	A.5.2 WORK PRACTICES	A.5-1
	A.5.3 PERSONAL PROTECTIVE EQUIPMENT	A.5-3
	A.5.3.1 Levels of Protection	A.5-3
A.6	MONITORING	A.6-1
	A.6.1 AIR SAMPLING: EQUIPMENT, CALIBRATION, AND MAINTENANCE	A.6-1
	A.6.2 PERSONAL MONITORING: EQUIPMENT, MAINTENANCE, AND CALIBRATION	A.6-2
A.7	DECONTAMINATION/DISPOSAL	A.7-1
	A.7.1 PERSONNEL DECONTAMINATION	A.7-1
	A.7.2 SMALL EQUIPMENT DECONTAMINATION	A.7-2
	A.7.3 DISPOSAL OF DECONTAMINATION MATERIALS	A.7-3
A.8	DATA SHEETS	A.8-1
A.9	SITE CONTROL	A.9-1
A.10	EMERGENCY/CONTINGENCY PLANNING	A.10-1
	A.10.1 PERSONNEL ROLES, LINES OF AUTHORITY, AND COMMUNICATION	A.10-1
	A.10.2 EVACUATION	A.10-1
	A.10.3 EMERGENCY MEDICAL TREATMENT/FIRST AID	A.10-2
	A.10.4 ACCIDENT/INCIDENT REPORTING	A.10-2
A.11	ADMINISTRATION	A.11-1

SITE-SPECIFIC HEALTH AND SAFETY PLAN
SITE 9

TABLE OF CONTENTS
(continued)

Section	Title	Page No.
A.11.1	PERSONNEL AUTHORIZED DOWNRANGE	A.11-1
A.11.2	HEALTH AND SAFETY PLAN APPROVALS	A.11-3
A.11.3	FIELD TEAM REVIEW	A.11-4

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

APPENDICES

Appendix A-1	-	CHEMICAL HAZARD RESPONSE INFORMATION SYSTEM DATA SHEETS
Appendix A-2	-	EMERGENCY TELEPHONE NUMBERS AND DIRECTIONS TO MEDICAL FACILITIES
Appendix A-3	-	HEALTH AND SAFETY PLAN REVISION FORM
Appendix A-4	-	HEALTH AND SAFETY FORMS AND DATA SHEETS
Appendix A-5	-	LYME DISEASE INFORMATION SHEET
Appendix A-6	-	TEMPERATURE EXTREMES

SITE-SPECIFIC HEALTH AND SAFETY PLAN
SITE 9

LIST OF TABLES

Table	Title	Page No.
A-1	Summary of Soil Organic Analyses (1993)	A.2-4
A-2	Groundwater Contaminant Summary	A.2-5

A.1 GENERAL

A.1.1 SCOPE AND PURPOSE

ABB Environmental Services, Inc. (ABB-ES) has prepared this Project-Specific Health and Safety Plan (HASP) to support additional field investigations at Site 9 to be conducted at Naval Air Station (NAS) Brunswick, in Brunswick, Maine.

This HASP has been prepared in conformance with the ABB-ES Health and Safety Program and is intended to meet the requirements of 29 Code of Federal Regulations (CFR) 1910.120. As such, this HASP addresses those activities associated with field operations for this Project.

A.1.2 PROJECT PERSONNEL

A.1.2.1 Project Manager

The Project Manager (PM) is the individual with overall project management responsibilities. The PM for this project is Mr. Jeffrey Brandow. The PM's responsibilities, as they relate to health and safety, include provision for the development of this project-specific HASP, the allocation of necessary resources to meet requirements of this HASP, the coordination of staff assignments to ensure that personnel assigned to the project meet medical and training requirements; and the means and materials necessary to resolve any health and safety issues that are identified or that develop on the project.

A.1.2.2 Field Operation Leader

The Field Operations Leader is the PM's designee who is on-site and vested with the authority by the PM to carry out day-to-day site operations. The Field Operations Leader for this project is Mr. Thomas Longley.

A.1.2.3 Health and Safety Manager

The Health and Safety Manager (HSM) has final authority to resolve health and safety issues that are not resolved at the site or through the Health and Safety

Supervisor (HSS), and has overall responsibility for ensuring that the policies and procedures of this HASP are implemented by the Health and Safety Officer (HSO).

A.1.2.4 Health and Safety Supervisor

The HSS will be responsible for (1) approval of the individual chosen to serve as the site HSO for this field operation; (2) review and approval of the project-specific HASP developed by the HSO, as well as any significant changes made over time to the project HASP; (3) oversight of the daily efforts of the HSO; (4) resolution of the site disputes involving health and safety issues; and (5) implementation of the HASP by the HSO. The HSS will notify the HSM of any stop work orders issued by the HSO.

A.1.2.5 Health and Safety Officer

Mr. Nelson Breton has been designated by the PM as HSO for the Site 9 projects with concurrence of the HSM. The HSO will have at least an indirect line of reporting to the HSM for the duration of his assignment to the project. The HSO is responsible for developing and implementing this HASP in accordance with the ABB-ES Health and Safety Program. The HSO will also conduct safety briefings and project-specific training for on-site personnel. The HSO, in consultation with the HSM is responsible for updating and modifying this HASP as the site or environmental conditions change.

A.1.2.6 Training

All personnel entering potentially contaminated areas of this site must meet the requirements of 29 CFR 1910.120. Personnel without the required training will not be permitted in any area with potential for exposure to toxic substances or harmful physical agents (i.e., downrange).

A.1.2.7 Medical Surveillance

All personnel entering potentially contaminated areas of this site will be medically qualified for site assignment through a medical surveillance program outline in the ABB-ES Health and Safety Program. These procedures meet the requirements of 29 CFR 1910.120. Personnel who have not received medical clearance will not be

permitted in any area with potential for exposure to toxic substances or harmful physical agents (i.e., downrange).

A.2 SITE CHARACTERIZATION AND ANALYSIS

A.2.1 SITE NAME, LOCATION, AND SIZE

NAS Brunswick is located in the City of Brunswick, Cumberland County, Maine, about 25 miles northeast of Portland. The facility is located south of the Androscoggin River between Brunswick and Bath, Maine. NAS Brunswick an active base, owned and operated by the federal government through the Department of the Navy. The base property covers 3,091 acres. Property uses surrounding NAS Brunswick are primarily suburban and rural residential, with some commercial and light industrial uses along Routes 1, 24, and 123. An elementary school, a college, and a hospital are located within 1 mile of the western base boundary.

A.2.2 SITE HISTORY

Site 9 is located in the central portion of the base. Based on historical information, including aerial photographs and grading plans, Site 9 was originally defined as three areas of potential contamination: (1) the former location of an incinerator in the northeastern corner of the current site of Building 220, and a disposal area in the current location of Buildings 218 and 219 (Marine barracks north of Neptune Drive); (2) a reported dumping area behind Building 201 (the enlisted men's club south of Neptune Drive); and (3) the two streams bordering the recreational area behind Building 201.

Former Incinerator and Ash Landfill

Conflicting information exists regarding the dates of operation of the incinerator and inactive ash landfill, reportedly active during the 1940s and early 1950s. The incinerator was apparently operated during a period commencing on or after April 1943, when the air station was commissioned, until the fall of 1946, when the air station was demobilized. Although the station was leased to various occupants from 1947 through 1951, it is unknown if the incinerator was used during this period. The air station was recommissioned in 1951, but again, it is unknown if the incinerator resumed operation. The latest that it could have been used was 1953, when the barracks that now occupy the site of the former incinerator were built. The Initial Assessment Study (IAS) prepared in 1983 states that during the period of incinerator

operation, solid wastes were burned and the ash was placed in the dump. Wastes disposed of at the site reportedly included solvents, which were burned on the ground, paint sludge, and possibly wastes from the Metal Shop.

Current land use at the former incinerator and inactive ash landfill is military residential. The grading plans for the barracks (Buildings 212 through 220) constructed at this location show an oblong "dump area," approximately 125 by 75 feet, located around existing Building 219. The grading plans also show an old drain (42-inch diameter) adjacent to the dump area. The drain ran from north of Orion Street, past the dump area, under Neptune Drive to the stream running between Buildings 201 and 293. The drain was reportedly removed and filled in during construction of the barracks.

Building 201

The area behind Building 201 reportedly was used as a dumping area, and more recently as a picnic area. A barbecue pit is located southeast of Building 201.

Unnamed Streams

Two unnamed streams border the area around Building 201: one to the north (northern unnamed stream) and one to the south (southern unnamed stream). These streams receive runoff from the central portion of the base including the runways, parking lots, and paved roads. Leachate seeps and staining have been observed in these streams.

Groundwater associated with the site is not used for potable or any other purposes. The base is connected to a public water supply administered by the Brunswick-Topsham Water District.

A.2.3 PREVIOUS INVESTIGATIONS

In August 1990, the Navy completed the Draft Final Remedial Investigation (RI) report for nine sites at NAS Brunswick, including Site 9. The RI report described field sampling investigations, geology, and hydrogeology, and presented a contamination summary and risk assessment for Site 9 and other sites. In April 1991, the Navy submitted the Draft Final Supplemental RI report for regulatory review.

The Supplemental RI included results of additional investigations at Site 9, which focused on identifying a source area of groundwater contamination and included test pitting, and soil and groundwater sampling. Data from extensive sampling did not uncover evidence of a solvent burning area or disposal area near Building 201.

In 1991, plans were discovered identifying the presence of a septic system east of Building 201. This septic system was installed in 1952 when Building 201 was built, and was used until 1972 when Building 201 was connected to the basewide sewer system. The septic system, located upgradient of the most highly contaminated monitoring wells, was then speculated to be the primary source of groundwater contamination at Site 9, prompting further investigation of this area. In January through March of 1993, the Navy conducted additional investigations to evaluate the Building 201 septic system as a potential source of contamination and to address data gaps identified by the USEPA and the MEDEP in the northern portion of Site 9.

The results of all investigations conducted at Site 9 were summarized in a Technical Memorandum submitted by the Navy in May 1994 (ABB Environmental Services, Inc., 1994). A summary of the contaminants detected in subsurface soils is provided in Table A-1. The maximum concentration of contaminants detected in groundwater at Site 9 is summarized in Table A-2.

A.2.4 SCOPE OF WORK

During the field investigation, a number of invasive field activities (i.e., soil investigations and groundwater sampling) will be carried out by ABB-ES. Following is a listing of these activities with a brief description of how health safety hazards might be encountered.

Survey	Minimum health risk on site. Exposure to hazardous materials unlikely.
Sampling	Exposure to hazardous substances is possible while sampling soil, and groundwater, in and near the potential source area(s). Soil contaminants detected in the area north of Neptune Drive include selected VOCs, PAHs, and pesticides (Table A-1) PAHs. Groundwater contaminants include vinyl chloride detected at a maximum concentration of 31 μg/L,

TABLE A-1
SUMMARY OF SOIL ORGANIC ANALYSES (1993)

SITE 9 SITE-SPECIFIC HEALTH AND SAFETY PLAN
NAS BRUNSWICK

	CRQL	B-912(10') 1/18/93	B-912(16') 1/18/93	B-913(11') 1/17/93
VOCs (µg/kg)				
Acetone	10	ND	120	85J
Carbon Disulfide	10	1J	3J	2J
1,2-DCE	10	ND	1J	ND
1,1-DCA	10	ND	ND	ND
2-Butanone	10	ND	26	17
Chlorobenzene	10	ND	ND	ND
Toluene	10	1J	3J	ND
Total Xylenes	10	ND	2J	ND
SVOCs (µg/kg)				
PAHs (Total)		6054J	3768J	33360J
Pest/PCB (µg/kg)				
Lindane	1.7	ND	ND	ND
Aldrin	1.7	ND	ND	ND
Heptachlor Epoxide	1.7	19J	ND	ND
Endosulfan 1	1.7	ND	ND	ND
Dieldrin	3.3	57J	ND	ND
4,4'-DDE	3.3	8.6J	3.9J	11J
Endrin	3.3	ND	ND	ND
Endosulfan II	3.3	ND	ND	ND
4,4'-DDD	3.3	ND	9.4J	91J
4,4'-DDT	3.3	87J	2.3J	5.6J
Methoxychlor	17	ND	ND	ND
Endrin Ketone	3.3	ND	ND	ND
Alpha Chlordane	1.7	32	ND	ND
Aroclor 1260	33	ND	ND	ND
TCLP		NA	NA	NA

Notes:

Dates = Date of Collection
CRQL = Contract Required Quantitation Limit
J = Estimated Value
ND = not detected
SVOC = Semivolatile Organic Compound
TCLP = Toxicity Characteristic Leachate Procedure
µg/kg = micrograms per kilogram
VOC = Volatile Organic Compound

TABLE A-2
GROUNDWATER CONTAMINANT SUMMARY

SITE 9 SITE-SPECIFIC HEALTH AND SAFETY PLAN
NAS BRUNSWICK

COMPOUND	MAXIMUM CONCENTRATION DETECTED (μg/L)	WELL[1]	DATE[2]
Vinyl Chloride	31	MW-906	11/90
1,1-Dichloroethane	12	MW-904	9 & 12/88
1,2-Dichloroethylene	79	MW-906	11/90
2-Butanone	110	MW-903	10/89
Mercury	0.23	MW-904	12/88

Notes:

1 Well designations refer to sample location.
2 Dates shown refer to sample collection date

μg/L = microgram per liter

DCE detected at a maximum concentration of 79 μg/L, DCA detected at a maximum concentration of 12 μg/L, 2-butanone at a maximum concentration of 110 μg/L, and mercury at a maximum concentration of 0.23 μg/L. These four compounds are the contaminants of concern at Site 9. Use of appropriate safety measures including modified Level D personal protective equipment will be required.

Safety risks during soil sampling are those associated with the operation of heavy equipment (i.e., backhoe) and walking around an open excavation.

A.3 TASK ANALYSIS

Sampling conducted at Site 9 indicates the presence of volatile organic and semivolatile organic compounds and inorganic analytes present in soil and groundwater. Compounds detected include known and suspected human carcinogens (e.g., vinyl chloride).

A.3.1 HAZARDOUS SUBSTANCES

Site 9 will require Level D protection for site entry. Upgrades will depend on the immediate site conditions and will be based on field measurements with monitoring equipment. Upgrades greater than Level C are not expected based on previous site investigations. All ABB-ES personnel will wear their radiation badges on site.

A.3.2 SITE RISKS

A.3.2.1 Health Hazards

Health hazards exist from respiratory and/or dermal exposure to volatile and semivolatile organic compounds and inorganic analytes. These compounds include known and suspected human carcinogens. Field investigations will require exposure to various weather conditions. Personnel must take precautions against temperature extremes.

A.3.2.2 Safety Hazards

Safety hazards that generally exist on a field investigation program includes heavy equipment (.e.g., backhoes), overhead work (e.g., drilling rigs), power tools, and excavations. Care must be taken by ABB-ES personnel to be aware of their surroundings and footing and use caution when on site. The impact of weather will change site conditions.

A.3.2.3 Conclusions/Risk Assessment

The amount of health risks presented to field workers who will be on site during the field operations vary according to the activity to be performed. Specific health and

safety procedures for monitoring, levels of protection, and upgrades and downgrades of levels of protection are described in the following subsections.

Surveying and Clearance Activities

Surveying and clearance activities are non-intrusive. However, PI meter readings of ambient air during surveying will be required. No elevated ambient readings are anticipated.

Soil and Groundwater Sampling

Level D protection is required for this activity. If PI meter readings steadily exceed 5 ppm in the work zone, workers will back of and the situation will be reevaluated. Work may possibly proceed with the use of engineered controls or at Level C respiratory protection. Radiation monitor readings greater than background would be reported immediately by the HSO to the ABB-ES DHS to assess whether work conditions should be halted. No elevated PI meter readings or radiation monitor readings are anticipated.

Level D protection will worn at a minimum when on site.

A.4 SITE CONTROL

A.4.1 ZONATION

The site itself will normally be divided into three zones: the majority of the work area will be considered the Exclusion Zone, with limited areas serving as the Support Zone, and an area for decontamination called the Contamination Reduction Zone (CRZ).

A.4.1.1 Exclusion Zone

The Exclusion Zone isolates the area of contaminant generation and restricts (to the extent possible) the spread of contamination from active areas of the site to support areas and off-site locations. The Exclusion Zone is demarcated by the Hot Line (i.e., a tape line or physical barrier). Personnel entering the Exclusion Zone must (1) enter through the CRZ; (2) wear the prescribed level of protection; and (3) be otherwise authorized to enter the Exclusion Zone. Any personnel, equipment, or materials exiting the Exclusion Zone will be considered contaminated. Personnel will be subject to decontamination; equipment and materials will either be subject to decontamination or containerized in uncontaminated devices.

Within the Exclusion Zone, specific locations or restricted areas (clearly marked or identified) will be established as necessary for particular locations or around specific site operations. In the case of well drilling or excavation operations, a restricted area will be established that includes a minimum 30-foot radius from the drill rig or excavation operation. Other restricted areas may include drum areas, active site areas, sources of combustible gases or air contaminants, or other dangerous areas as they are identified. Specific access for emergency services to areas of specific site operations will be established.

A.4.1.2 Contamination Reduction Zone

Moving out from the Exclusion Zone, starting at the Hot Line and continuing to the Contamination Control Line, is the CRZ. The CRZ is a transition zone between contaminated and uncontaminated areas of the site. When "hot" or contaminated personnel, equipment, or materials cross the Hot Line, they are assumed to be as

"hot" or contaminated as they are going to be from site operations. Being subjected to the decontamination process, they become less contaminated; when they reach the Contamination Control Line, they are clean and can exit this zone without spreading contamination.

Within the CRZ is the Contamination Reduction Corridor (CRC), where materials necessary for full personnel and portable equipment decontamination are kept. A separate facility will be established for heavy equipment decontamination. In addition, certain safety equipment (e.g., emergency eye wash, fire extinguisher, stretcher, and first aid kit) are staged in this zone.

A.4.1.3 Support Zone

The Support Zone is the outermost zone of the site, separated from the CRZ by the Contamination Control Line; it is considered a clean area. Movement of personnel and materials from this zone into the CRZ is generally unrestricted, except as required through access points controlled for administrative purposes. However, only uncontaminated/decontaminated personnel or materials may enter this zone from the CRZ.

The Support Zone contains the necessary support facilities (including personal hygiene facilities) for site operations. It also serves as the communications center and source of emergency assistance for operations in the Exclusion Zone and CRZ. A log of all persons entering the site will be maintained by the HSO, the field operations leader, or the site designee.

A.4.2 MEDICAL ASSISTANCE

The primary source of medical assistance for the NAS Brunswick site is:

Parkview Memorial Hospital
Maine Street
Brunswick, ME
(207) 729-9941

The alternate source of medical assistance is:

Regional Memorial Hospital
Baribeau Drive
Brunswick, ME
(207) 729-0181

A.5 ENGINEERING CONTROLS, WORK PRACTICES, AND PERSONAL PROTECTIVE EQUIPMENT

A.5.1 ENGINEERING CONTROLS

No engineering controls are necessary for conducting work at NAS Brunswick unless otherwise indicated by air monitoring equipment (see A.3.2.3).

A.5.2 WORK PRACTICES

Workers are expected to adhere to established safe work practices for their respective specialties (e.g., Test Pit Investigations and sampling). The need to exercise caution in the performance of specific work tasks is made more acute due to (1) weather conditions; (2) restricted mobility and reduced peripheral vision caused by protective gear; and (3) the increased difficulty in communicating caused by respirators. Work at the site will be conducted according to established protocols and guidelines for the safety and health of all involved. Among the most important of these principles for working at a hazardous waste site are the following:

- In any unknown situation, always assume the worst conditions and plan responses accordingly.

- Use the buddy system. Under no conditions will any person be permitted to enter an Exclusion Zone alone. Establish and maintain communication. In addition to radio communications, it is advisable to develop a set of hand signals, because conditions may greatly impair verbal communications.

- Because no personal protective equipment is 100-percent effective, all personnel must minimize contact with excavated or contaminated materials. Plan work areas, decontamination areas, and procedures accordingly. Do not place equipment on drums or the ground. Do not sit on drums or other materials. Do not sit or kneel on the ground in the Exclusion Zone or CRZ. Avoid standing in or walking through puddles or stained soil.

- Smoking, eating, or drinking in the work area and before decontamination will not be allowed. Oral ingestion of contaminants is the second most likely means of introducing toxic substances into the body (inhalation is the first).

- Avoid heat and other work stresses related to wearing protective gear. Work breaks should be planned to prevent stress-related accidents or fatigue.

- To the extent feasible, handling of contaminated materials should be done remotely, particularly when drummed or other containerized hazardous waste materials are found on-site. Every effort should be made to identify the contents of containers found on-site before they are subject to material-handling applications.

- Personnel must be observant of not only one's own immediate surroundings, but also those of others. Everyone will be working under constraints; therefore, a team effort is needed to notice and warn of impending dangerous situations. Extra precautions are necessary when working near heavy equipment and while utilizing personal protective gear because vision, hearing, and communication can be restricted.

- Contact lenses are not allowed to be worn on-site; if corrosive or lachrymose substances enter the eyes, proper flushing is impeded.

- All facial hair that interferes with the face piece fit, must be removed prior to donning a respirator at all sites requiring Level C or B protection.

- Rigorous contingency planning and dissemination of plans to all personnel minimizes the impact of rapidly changing safety protocols in response to changing site conditions.

- Personnel must be aware that chemical contaminants may mimic or enhance symptoms of other illnesses or intoxication. Avoid excess use of alcohol or working while ill during field investigation assignments.

- The site leader, HSO, and sampling personnel will maintain project records in a bound notebook (e.g., daily activities, meetings, incidents, and data). Notebooks will remain on-site for the duration of the project so that replacement personnel may add information, thereby maintaining continuity. These notebooks and daily records will become part of the permanent project file.

A.5.3 PERSONAL PROTECTIVE EQUIPMENT

A.5.3.1 Levels of Protection

The following descriptions provide the basic composition of the generally recognized protective ensembles to be used for site operations. Specific components for any level of protection will be selected based on hazard assessment; additional elements will be added as necessary. Disposable protective clothing, gloves, and other equipment, exclusive of respirators, should be used when feasible to minimize risks during decontamination and possible cross-contamination during sample handling.

Level A

- pressure-demand full-face piece Atmosphere Supplying Respirator (ASR) (if ASR is an airline respirator, it must have an escape self-contained breathing apparatus [SCBA])
- fully encapsulating, chemical-resistant suit
- inner chemical-resistant gloves
- chemical-resistant safety boot/shoes
- two-way radio communications
- cooling unit*
- coveralls*
- hardhat*

- disposable gloves and boot covers*

Level B

- Pressure-demand full-face piece ASR (if ASR is an airline respirator, it must have an escape SCBA)
- chemical-resistant clothing (i.e., coveralls and long-sleeved jacket; hooded, one- or two-piece chemical-splash suit; disposable chemical-resistant one-piece suit)
- inner and outer chemical-resistant gloves
- chemical-resistant safety boots/shoes
- hardhat
- two-way radio communications
- coveralls*
- disposable boot covers*
- face shield*
- long cotton underwear*

Level C

- full-face piece; air-purifying respirator with appropriate sorbents
- chemical resistant clothing
- inner and outer chemical-resistant gloves
- chemical-resistant safety boots/shoes
- hardhat
- two-way radio communications
- coveralls

Level D

- coveralls
- safety boots/shoes
- safety glasses
- hardhat
- gloves

A.6 MONITORING

The work environment will be monitored to ensure that IDLH or other dangerous conditions are identified. At a minimum, monitoring will include evaluations for combustible atmospheres, oxygen-deficient environments, hazardous concentrations of airborne contaminants, and radioactivity.

A.6.1 AIR SAMPLING: EQUIPMENT, CALIBRATION, AND MAINTENANCE

To the extent feasible, the presence of airborne contaminants will be evaluated through the use of direct-reading instrumentation. Information gathered will be used to insure the adequacy of the levels of protection being employed at the site, and may be used as the basis for upgrading or downgrading levels of protection, at the discretion of the site HSO.

A Thermo-Environmental photoionization meter, Photovac TIP, or equivalent, will be used on a constant basis during exploration activities.

- Thermo Environmental 580A, 580B and Photovac TIP Photoionization Detector (PID). Like the OVA, the PID operates on the basis of ionization of the contaminant, which results in a meter deflection proportional to the concentration of the contaminant. In the PID, ionization is caused by a UV light source. The strength of the UV (measured in electron volts [eV] determines which contaminants can be ionized. The Thermo Environmental Model 580A and B PID can use two different UV sources, including 10.0, and 11.8 eV. The TIP operates using a UV light source of 10.6 eV. Calibration and maintenance will be performed in accordance with the manufacturer's instructions.

- ISD Dual Detector. This meter monitors for combustible gases and oxygen. It can be used to determine (1) if an area contains concentrations of combustible gases with readings in percentage of the lower explosive limit (LEL); and (2) the percentage of oxygen. This equipment is calibrated in accordance with manufacturer's instructions.

- Radiation Monitor 4. This meter monitors for the presence of ionizing radiation. If directly reads total alpha, beta, gamma, and X-ray radiation in mRem/hour. This meter is factory calibrated. The Radiation Monitor 4 senses ionizing radiation by means of a Geiger-Mueller tube with a thin mica end window. About 5 to 25 counts, at random intervals, can be expected every minute from naturally occurring radiation (e.g., 0.005 to 0.025 mRem/hour.)

A.6.2 PERSONAL MONITORING: EQUIPMENT, MAINTENANCE, AND CALIBRATION

Personal monitoring will be undertaken to characterize exposure of high-risk employees to hazardous substances encountered on-site.

In addition to the air monitoring equipment described in Section 5.1, all ABB-ES personnel will be wearing Dosimetry (TLD) Badges. These are nonmechanical devices used to monitor for x-ray, beta, and gamma radiation exposure. They are worn by employees and sent to Tech/Ops Landauer, Inc. for analysis on a quarterly basis.

A.7 DECONTAMINATION/DISPOSAL

All personnel and/or equipment leaving contaminated site areas are subject to decontamination in the CRZ.

A.7.1 PERSONNEL DECONTAMINATION

Decontamination procedures are followed by all personnel leaving hazardous waste sites. Under no circumstances (except emergency evacuation) will personnel be allowed to leave the site prior to decontamination. Generalized procedures for removal of protective clothing are as follows:

1. Drop tools, monitors, samples, and trash at designated drop stations (i.e., plastic containers or drop sheets).

2. Step into the designated shuffle pit area and scuff feet to remove gross amounts of dirt from outer boots.

3. Scrub outer boots and outer gloves with decon solution or detergent and water. Rinse with water.

4. Remove tape from outer boots and remove boots; discard in disposal container.

5. Remove tape from outer gloves and remove gloves; discard in disposal container.

6. If the worker has left the exclusion zone to change the air tank on his/her SCBA, or the canister on his/her air purifying respirator, this is the last step in the decontamination procedure. The tank or cartridge should be exchanged, new outer gloves and boot covers donned, the joints taped, and the worker returns to duty.

7. Remove outer garments and discard in disposal container.

8. Remove respirator and place or hang in the designated area.

9. Remove inner gloves and discard in disposal container.

10. If the site requires use of a decontamination trailer, all personnel must shower before leaving the site at the end of the work day.

NOTE: Disposal items (i.e., Tyvek coveralls, inner gloves, and latex overboots) will be changed on a daily basis unless there is reason to change sooner. Dual respirator canisters will be changed daily, unless more frequent changes are deemed appropriate by site surveillance data or personnel assessment.

Pressurized sprayers or other designated equipment will be available in the decontamination area for wash down and cleaning of personnel, samples, and equipment.

Respirators will be decontaminated daily and taken from the drop area. The masks will be dissembled, the cartridges set aside, and all other parts placed in a cleansing solution. Parts will be pre-coded (e.g., #1 on all parts of Mask #1). After an appropriate time in the solution, the parts will be removed and rinsed with tap water. Old cartridges will be marked to indicate length of usage (i.e., if means to evaluate the cartridges' remaining utility are available) or will be discarded in the contaminated trash container for disposal. In the morning, the masks will be reassembled and new cartridges installed, if appropriate. Personnel will inspect their own masks and readjust the straps for proper fit.

A.7.2 SMALL EQUIPMENT DECONTAMINATION

Small equipment will be protected from contamination as much as possible by draping, masking, or otherwise covering the instruments with plastic (to the extent feasible) without hindering operation of the unit. For example, the HNU meter can be placed in a clear plastic bag to allow reading the scale and operating the knobs. The HNU sensor can be partially wrapped, keeping the sensor tip and discharge port clear.

The contaminated equipment will be taken from the drop area and the protective coverings removed and disposed of an inappropriate containers. Any dirt or obvious contamination will be brushed or wiped with a disposable paper wipe. The units can

then be taken inside in a clean plastic tub, wiped off with damp disposable wipes, and dried. The units will be checked, standardized, and recharged as necessary for the next day's operation, and then prepared with new protective coverings.

A.7.3 DISPOSAL OF DECONTAMINATION MATERIALS

All decontamination fluids (for both personnel and sampling equipment) showing no evidence of contamination (i.e., PID readings less than 5 ppm) will be disposed on the ground surface at each exploration site or sampling location, or in a designated decontamination area. Decontamination fluids that have PI readings greater than 5 ppm above background will be contained and placed in a DOT-approved 55 gallon steel drum and transported to Building 45 for proper disposal at each site. Disposable personal protective equipment (e.g., gloves and Tyveks) will be bagged and disposed in site dumpsters.

A.8 DATA SHEETS

The Chemical Hazard Response Information System (CHRIS) Data Sheets for the contaminants of concern at Site 9 are included in Appendix A-1.

A.9 SITE CONTROL

Site control is the responsibility of the Navy's contractor and they will determine zonation and communications. ABB-ES personnel on site will need to comply with these items when working in their exclusion zone, however, work practices as stated in the ABB-ES Health and Safety Program will apply.

A.10 EMERGENCY/CONTINGENCY PLANNING

This section identifies the emergency contingency planning undertaken for operations at this site. Other sections provide further information to be used under emergency conditions. Refer to Appendix A-2 for emergency telephone numbers, routes to emergency medical facilities, and emergency signals.

A.10.1 PERSONNEL ROLES, LINES OF AUTHORITY, AND COMMUNICATION

The site HSO is the primary authority for directing site operations under emergency conditions. All communications both on- and off-site will be directed through the HSO.

A.10.2 EVACUATION

In the event that a site may have to be evacuated, contingency plans will be discussed by the HSO and workers before entry to that site is allowed.

Withdrawal Upwind

The work party will continually note general wind directions while on-site. (A windsock may be set up near the work site for visual determinations.) When conditions warrant moving away from the work site, the crew will relocate upwind a distance of approximately 100 feet or farther, as indicated by site monitoring instruments. Donning an SCBA and a safety harness and line, the HSO and a member of the crew (the buddy system must be used) may return to the work site to determine if the condition noted was transient or persistent. If persistent, an alarm should be raised to notify on-site personnel of the situation and the need to leave the site or don an SCBA. An attempt to decrease emissions should be made only if greater respiratory protection is donned. The HSS and client will be notified of conditions. When site access is restricted, this hindering escape, the crew may be instructed to evacuate the site rather than move upwind, especially if withdrawal upwind moves the crew away from escape routes.

Site Evacuation

When conditions warrant site evacuation, the work party will proceed upwind of the work site and notify the security force, HSO, and field office of site conditions. If decontamination area is upwind and greater than 500 feet from the work site, the crew will pass quickly through decontamination to remove contaminated outer suits. If the hazard is toxic gas, respirators will be retained. The crew will proceed to the field office to assess the situation. If the instrumentation indicates an acceptable condition, respirators may be removed. As more information is received from the field crew, it will be relayed to the appropriate agencies. The advisability and type of further response action will be coordinated and carried out by the HSO.

Evacuation of Surrounding Area

When the HSO determined that conditions warrant evacuation of downwind residences and commercial operations, local agencies will be notified and assistance requested. Designated on-site personnel will initiate evacuation of the immediate off-site area without delay.

A.10.3 EMERGENCY MEDICAL TREATMENT/FIRST AID

Any person injured will be rendered first aid as appropriate and transported to competent medical facilities for further examination and/or treatment. The preferred method of transport would be via professional emergency transportation; however, when this is not readily available or would result in excessive delay, other transport will be authorized. Under no circumstances will injured persons transport themselves to a medical facility for emergency treatment.

Appendix A-2 of this document lists emergency telephone numbers and contains routes to emergency medical facilities.

A.10.4 ACCIDENT/INCIDENT REPORTING

All accidents and injuries occurring during the project will be reported to the HSM or HSS. The accident report will be reviewed and signed by the HSO. The report will be submitted to the HSM, the HSS, and any other function required by the workers organization. The HSM/HSS will determine the need for further follow-up

actions. All exposure incident reports will be made available for review by the examining medical physician during medical monitoring.

A.11 ADMINISTRATION

A.11.1 PERSONNEL AUTHORIZED DOWNRANGE

Personnel authorized to participate in downrange activities at this site will be reviewed and certified for site operations by the HSO and the HSS. Certification involves the completion of appropriate training, medical examination, and review of this HASP. All persons entering the site must use the buddy system, and check in with the Site Manager and/or HSO before going downrange.

CERTIFIED ABB-ES TEAM PERSONNEL:

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

OTHER CERTIFIED PERSONNEL:

A.11.2 HEALTH AND SAFETY PLAN APPROVALS

By their signature, the undersigned certify that this HASP will be used for the protection of the health and safety of all persons entering this site.

Health and Safety Officer	Date
Mary MacFerrel	1-16-95
Health and Safety Manager	Date

A.11.3 FIELD TEAM REVIEW

I have read and reviewed the health and safety information in the HASP. I understand the information and will comply with the requirements of the HASP.

NAME: _____

DATE: _____

SITE/PROJECT: _____

CFR	Code of Federal Regulations
CHRIS	Chemical Hazard Response Information System
DDT	4,4'-dichlorodiphenyltrichloroethane
HASP	Health and Safety Plan
HSM	Health and Safety Manager
HSO	Health and Safety Officer
HSS	Health and Safety Supervisor
MEG	Maine Exposure Guidelines
NAS	Naval Air Station
SVOC	semivolatile organic compound
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound

CHEMICAL HAZARD RESPONSE INFORMATION SYSTEM

(CHRIS) DATA SHEETS

ACETONE

ACT

Common Synonyms	Watery liquid	Colorless	Sweet odor
Dimethyl ketone Propanone 2-Propanone	Floats and mixes with water. Flammable, irritating vapor is produced.		

Stay upwind and use water spray to "knock down" vapor.
Shut off ignition sources and call fire department. Keep people away.
Stop discharge if possible.
Isolate and remove discharged material.
Avoid contact with liquid and vapor.
Notify local health and pollution control agencies.

Fire	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
Exposure	CALL FOR MEDICAL AID. **VAPOR** Irritating to eyes, nose and throat. If inhaled, may cause difficult breathing or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. **LIQUID** Irritating to eyes. Not irritating to skin. IF IN EYES, hold eyelids open and flush with plenty of water.
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)
Issue warning-high flammability
Disperse and flush

2. LABEL

2.1 **Category:** Flammable liquid
2.2 **Class:** 3

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Ketone
3.2 **Formula:** CH_3COCH_3
3.3 **IMO/UN Designation:** 3.1/1090
3.4 **DOT ID No.:** 1090
3.5 **CAS Registry No.:** 67-64-1

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Sweetish; pleasant, resembling that of mint or fruit; pungent; sharp, penetrating residual; ketonic, pleasant, non-residual

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor canister or air-supplied mask; synthetic rubber gloves; chemical safety goggles or face splash shield.
5.2 **Symptoms Following Exposure:** INHALATION: vapor irritating to eyes and mucous membranes; acts as an anesthetic in very high concentrations. INGESTION: low order of toxicity but very irritating to mucous membranes. SKIN: prolonged excessive contact causes defatting of the skin, possibly leading to dermatitis.
5.3 **Treatment of Exposure:** INHALATION: if victim is overcome, remove to fresh air and call a physician; administer artificial respiration if breathing is irregular or stopped. INGESTION: if victim has swallowed large amounts and is conscious and not having convulsions, induce vomiting and get medical help promptly; no specific antidote known. SKIN: wash well with water. EYES: flush with water immediately for at least 15 min. Consult a physician.
5.4 **Threshold Limit Value:** 750 ppm
5.5 **Short Term Inhalation Limits:** 1000 ppm for 30 min.
5.6 **Toxicity by Ingestion:** Grade 1; LD_{50} = 5 to 15 g/kg (dog)
5.7 **Late Toxicity:** Not pertinent
5.8 **Vapor (Gas) Irritant Characteristics:** If present in high concentrations, vapors cause moderate irritation of the eyes or respiratory system. Effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin because it is very volatile and evaporates quickly from the skin.
5.10 **Odor Threshold:** 100 ppm
5.11 **IDLH Value:** 20000 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 4°F O.C.; 0°F C.C.
6.2 **Flammable Limits in Air:** 2.6%-12.8%
6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water in straight hose stream will scatter and spread fire and should not be used.
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 869°F
6.8 **Electrical Hazard:** Class I, Group D
6.9 **Burning Rate:** 3.9 mm/min.
6.10 **Adiabatic Flame Temperature:** Data not available
6.11 **Stoichiometric Air to Fuel Ratio:** Data not available
6.12 **Flame Temperature:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent
7.7 **Molar Ratio (Reactant to Product):** Data not available
7.8 **Reactivity Group:** 18

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
14,250 ppm/24 hr/sunfish/killed/tap water
13,000 ppm/48 hr/mosquito fish/TL_m/ turbid water
8.2 **Waterfowl Toxicity:** Not pertinent
8.3 **Biological Oxygen Demand (BOD):** (Theor) 122%, 5 days
8.4 **Food Chain Concentration Potential:** None noted

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** Technical: 99.5% plus 0.5% water Reagent: 99.5% plus 0.5% water
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Open (flame arrester) or pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)
A-P-O-R-S

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** Flammable liquid
11.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	0
Poisons	0
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	2
Self Reaction	0

11.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15 C and 1 atm:** Liquid
12.2 **Molecular Weight:** 58.08
12.3 **Boiling Point at 1 atm:** 133°F 56.1 C 329.3 K
12.4 **Freezing Point:** −138°F −94.7 C 178.5 K
12.5 **Critical Temperature:** 455°F 235°C 508°K
12.6 **Critical Pressure:** 682 psia 46.4 atm 4.70 MN/m^2
12.7 **Specific Gravity:** 0.791 at 20 C (liquid)
12.8 **Liquid Surface Tension:** Not pertinent
12.9 **Liquid Water Interfacial Tension:** Not pertinent
12.10 **Vapor (Gas) Specific Gravity:** 2.0
12.11 **Ratio of Specific Heats of Vapor (Gas):** 1.127
12.12 **Latent Heat of Vaporization:** 220 Btu/lb 122 cal/g 5.11×10^5 J/kg
12.13 **Heat of Combustion:** −12,250 Btu/lb −6808 cal/g -285.0×10^5 J/kg
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** 23.42 cal/g
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** 7.25 psia

NOTES

CARBON DISULFIDE

CBB

Common Synonyms	Watery liquid	Colorless to yellow	Rotten egg to sweet odor
Carbon bisulfide	Sinks in water. Flammable, irritating vapor is produced.		

Avoid contact with liquid and vapor. Keep people away.
Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves).
Shut off ignition sources and call fire department.
Stop discharge if possible.
Stay upwind and use water spray to "knock down" vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Extinguish with dry chemical or carbon dioxide.
Water and foam may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, vomiting, difficult breathing, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Issue warning-high flammability
Restrict access
Evacuate area

2. LABEL

2.1 **Category:** Flammable liquid
2.2 **Class:** 3

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Carbon disulfide
3.2 **Formula:** CS_2
3.3 **IMO/UN Designation:** 3.1/1131
3.4 **DOT ID No.:** 1131
3.5 **CAS Registry No.:** 75-15-0

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Faint sweetish; disagreeable; offensive, like that of decaying cabbage

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Only approved self-contained breathing mask with full face is recommended. If the vapor concentration exceeds 2% by volume or is unknown, supplied-air respiratory equipment of appropriate design with full face masks should be used by all persons entering contaminated area. Masks should be used only for emergency situations and should be located accordingly. Almost any type of industrial clothing is satisfactory. Splashes of small quantity are not harmful to fabrics, and evaporation from clothing is quite rapid. Clothing should, however, be removed and the skin washed with water. Goggles should be used when there is any danger of CS_2 splashes or spray.

5.2 **Symptoms Following Exposure:** ACUTE EXPOSURE: mild to moderate irritation of skin, eyes, and mucous membranes from liquid or concentrated vapors; headache, garlicky breath, nausea, vomiting, diarrhea (even after vapor exposures), and occasionally abdominal pain; weak pulse, palpitations; fatigue, weakness in the legs, unsteady gait, vertigo; mania, hallucinations of sight, hearing, taste, and smell in acute, massive vapor exposures; central nervous depression with respiratory paralysis; death may occur during coma or after a convulsion.

5.3 **Treatment of Exposure:** INHALATION: remove victim promptly from contaminated area. Administer oxygen and artificial respiration if needed. SKIN CONTACT: wash affected areas with copious quantities of water. INGESTION: induce vomiting and follow with gastric lavage and saline cathartics.

5.4 **Threshold Limit Value:** 10 ppm

5.5 **Short Term Inhalation Limits:** 200 ppm for 10 minutes, 100 ppm for 30 minutes and 50 ppm for 60 minutes.

5.6 **Toxicity by Ingestion:** Grade 2; rat LD_{50} = 0.1 - 0.99 g/kg

5.7 **Late Toxicity:** Non-specific liver cell damage in rats; higher incidence of upper respiratory disease in humans.

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

(Continued)

6. FIRE HAZARDS

6.1 **Flash Point:** —22°F C.C.
6.2 **Flammable Limits in Air:** 1.3%-50%
6.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide, or foam.
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective on fire.
6.5 **Special Hazards of Combustion Products:** Toxic gases are generated; wear self-contained breathing apparatus.
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 212°F
6.8 **Electrical Hazard:** Contact of the liquid or vapor with the surface of a lighted electric light bulb could result in ignition.
6.9 **Burning Rate:** 2.7 mm/min.
6.10 **Adiabatic Flame Temperature:** Data not available

(Continued)

7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent
7.7 **Molar Ratio (Reactant to Product):** Data not available
7.8 **Reactivity Group:** 38

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 35 ppm/48 hr/mosquito fish/TL_m/fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** Commercial; technical; USP
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** Inerted
9.4 **Venting:** Pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-X-Y

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** Flammable liquid

11.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	3
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	3
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

11.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** 76.14
12.3 **Boiling Point at 1 atm:** 115°F = 46.3°C = 319.5°K
12.4 **Freezing Point:** —168.9°F = —111.6°C = 161.6°K
12.5 **Critical Temperature:** 523°F = 273°C = 546°K
12.6 **Critical Pressure:** 1100 psia = 76 atm = 7.7 MN/m^2
12.7 **Specific Gravity:** 1.26 at 20°C (liquid)
12.8 **Liquid Surface Tension:** 32 dynes/cm = .032 N/m at 20°C
12.9 **Liquid Water Interfacial Tension:** 48.4 dynes/cm = .0484 N/m at 20°C
12.10 **Vapor (Gas) Specific Gravity:** 2.6
12.11 **Ratio of Specific Heats of Vapor (Gas):** 1.292
12.12 **Latent Heat of Vaporization:** 153 Btu/lb = 85 cal/g = 3.559×10^5 J/kg
12.13 **Heat of Combustion:** —5814 Btu/lb = —3230 cal/g = -135.2×10^5 J/kg
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** 13.80 cal/g
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** 10.3 psia

5. HEALTH HAZARDS (Continued)

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first-degree burns on short exposure and may cause secondary burns on long exposure.
5.10 **Odor Threshold:** 0.21 ppm
5.11 **IDLH Value:** 500 ppm

6. FIRE HAZARDS (Continued)

6.11 **Stoichiometric Air to Fuel Ratio:** Data not available
6.12 **Flame Temperature:** Data not available

1,1-DICHLOROETHANE

DCH

Common Synonyms			
Ethylidene chloride Ethylidene dichloride Chlorinated hydrochloric ether	Oily liquid	Colorless	Chloroform like ethereal
	Sinks and mixes with water.		

Wear goggles, self-contained breathing apparatus, and rubber overclothing
Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Avoid contact with liquid.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Flammable.
POISONOUS GAS MAY BE PRODUCED IN FIRE OR WHEN HEATED.
Containers may explode in fire.
Wear goggles and self-contained breathing apparatus.
Extinguish with alcohol foam, carbon dioxide, or dry chemical.
Water may be ineffective on fire.

Exposure

CALL FOR MEDICAL AID.

LIQUID
If swallowed may cause nausea, vomiting and faintness.
Irritating to skin and eyes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk and induce vomiting.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Issue warning-high flammability.
Restrict access.
Chemical and physical treatment.

2. LABEL

2.1 **Category:** None
2.2 **Class:** Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Halogenated hydrocarbon
3.2 **Formula:** $C_2H_4Cl_2$
3.3 **IMO/UN Designation:** Not listed
3.4 **DOT ID No.:** 2362
3.5 **CAS Registry No.:** 75-34-3

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Oily liquid
4.2 **Color:** Colorless
4.3 **Odor:** Chloroform

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** In areas of poor ventilation or high concentration, a self-contained breathing apparatus with full face mask should be worn. Chemical workers goggles, rubber gloves, and protective clothing should be worn.
5.2 **Symptoms Following Exposure:** INHALATION: Irritation of respiratory tract. Salivation, sneezing, coughing, dizziness, nausea, and vomiting. EYES: Irritation, lacrimation, and reddening of conjunctiva. SKIN: Irritation. Prolonged or repeated skin contact can produce a slight burn. INGESTION: Ingestion incidental to industrial handling is not considered to be a problem. Swallowing of substantial amounts could cause nausea, vomiting, faintness, drowsiness, cyanosis, and circulatory failure.
5.3 **Treatment of Exposure:** Call a doctor. INHALATION: Remove from contaminated area; keep warm and quiet. If breathing has stopped, give artificial respiration. Administer oxygen. EYES: Flush with large amounts of water or weak bicarbonate of soda solution. SKIN: Dilute with large amounts of water. Remove contaminated clothing. INGESTION: Attempt to empty stomach; dilute by administering fluids (tap water, soapy water, salt water, or milk).
5.4 **Threshold Limit Value:** 200 ppm.
5.5 **Short Term Inhalation Limits:** 250 ppm.
5.6 **Toxicity by Ingestion:** Grade 2; LD_{50} = 0.5 to 5 g/kg (rat).
5.7 **Late Toxicity:** Chronic exposure may cause liver damage and dermatitis. Animal experimentation has shown this compound to be slightly embryo-toxic and to retard fetal development.
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
5.10 **Odor Threshold:** Data not available
5.11 **IDLH Value:** 4,000 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 57°F O.C. = 22°F C.C.
6.2 **Flammable Limits in Air:** 5.6% to 11.4%
6.3 **Fire Extinguishing Agents:** Alcohol foam, water, foam, CO_2, dry chemical, carbon tetrachloride
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** When heated to decomposition emits highly toxic fumes to phosgene.
6.6 **Behavior in Fire:** Explosion hazard
6.7 **Ignition Temperature:** 856°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Data not available
6.10 **Adiabatic Flame Temperature:** Data not available
6.11 **Stoichiometric Air to Fuel Ratio:** Data not available
6.12 **Flame Temperature:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** Data not available
7.3 **Stability During Transport:** Data not available
7.4 **Neutralizing Agents for Acids and Caustics:** Data not available
7.5 **Polymerization:** Data not available
7.6 **Inhibitor of Polymerization:** Iable Data not available
7.7 **Molar Ratio (Reactant to Product):** Data not available
7.8 **Reactivity Group:** 36

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
TL_m (Manne pinperch) 250 to 275 mg/l
24-hour TL_m Brine shrimp: 320 mg/l
24-hour TL_m Pinperch: 160 mg/l
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Percent, 0.05 g/g for 10 days Percent, 0.002 g/g for 5 days
8.4 **Food Chain Concentration Potential:** Data not available

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** Data not available
9.2 **Storage Temperature:** Cool
9.3 **Inert Atmosphere:** Data not available
9.4 **Venting:** Data not available

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-P-Q-R-S

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** Not listed
11.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
11.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** 98.97
12.3 **Boiling Point at 1 atm:** 135.14°F = 57.3°C = 330.5°K
12.4 **Freezing Point:** —143.32°F = —97.4°C = 175.75°K
12.5 **Critical Temperature:** 502.7°F = 261.5°C = 534.65°K
12.6 **Critical Pressure:** 734.8 psia = 50 atm = 5.065 MN/m^2
12.7 **Specific Gravity:** 1.174 at 20°C
12.8 **Liquid Surface Tension:** 24.75 dynes/cm = 0.02475 N/m at 20°C
12.9 **Liquid Water Interfacial Tension:** Data not available
12.10 **Vapor (Gas) Specific Gravity:** 3.42
12.11 **Ratio of Specific Heats of Vapor (Gas):** 1.136 at 20°C (68°F)
12.12 **Latent Heat of Vaporization:** 131.6 Btu/lb = 73.1 cal/g = 3.06×10^4 J/kg
12.13 **Heat of Combustion:** —4,774 Btu/lb = —2,652 cal/g = -111×10^5 J/kg
12.14 **Heat of Decomposition:** Data not available
12.15 **Heat of Solution:** Data not available
12.16 **Heat of Polymerization:** Data not available
12.25 **Heat of Fusion:** Data not available
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** 7.35 psia

NOTES

1,2-DICHLOROETHYLENE

DEL

Common Synonyms	Liquid	Colorless	Sweet pleasant odor
Acetylene dichloride sym-dichloroethylene Dioform cis-1, 2-dichloroethylene trans-1, 2-dichloroethylene	Sinks in water. Flammable, irritating vapor is produced.		

- Wear goggles and self-contained breathing apparatus.
- Shut off ignition sources. Call fire department.
- Stop discharge if possible. Keep people away.
- Isolate and remove discharged material.
- Notify local health and pollution control agencies.

Fire

FLAMMABLE.
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Extinguish with dry chemicals, foam or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
If inhaled will cause dizziness, nausea, vomiting, or difficult breathing.

Move victim to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Harmful if swallowed.

IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

- Issue warning-high flammability
- Restrict access
- Evacuate area
- Should be removed
- Chemical and physical treatment

2. LABEL

2.1 **Category:** Flammable liquid
2.2 **Class:** 3

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Not listed
3.2 **Formula:** ClCH = CHCl
3.3 **IMO/UN Designation:** 3.2/1150
3.4 **DOT ID No.:** 1150
3.5 **CAS Registry No.:** 540-59-0

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Ethereal, slightly acrid; pleasant, chloroform-like

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves; safety goggles; air supply mask or self-contained breathing apparatus.
5.2 **Symptoms Following Exposure:** Inhalation causes nausea, vomiting, weakness, tremor, epigastric cramps, central nervous depression. Contact with liquid causes irritation of eyes and (on prolonged contact) skin. Ingestion causes slight depression to deep narcosis.
5.3 **Treatment of Exposure:** INHALATION: remove from further exposure; if breathing is difficult, give oxygen; if victim is not breathing, give artificial respiration, preferably mouth-to-mouth; give oxygen when breathing is resumed; call a physician. EYES: flush with water for at least 15 min. SKIN: wash well with soap and water. INGESTION: give gastric lavage and cathartics.
5.4 **Threshold Limit Value:** 200 ppm
5.5 **Short Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2; oral LD_{50} = 770 mg/kg (rat)
5.7 **Late Toxicity:** Produces liver and kidney injury in experimental animals
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available
5.11 **IDLH Value:** 4,000 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 37°F C.C.
6.2 **Flammable Limits in Air:** 9.7%-12.8%
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective.
6.5 **Special Hazards of Combustion Products:** Phosgene and hydrogen chloride fumes may form in fires.
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.
6.7 **Ignition Temperature:** 860°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** 2.6 mm/min.
6.10 **Adiabatic Flame Temperature:** Data not available

(Continued)

7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Will not occur under ordinary conditions of shipment. The reaction is not vigorous.
7.6 **Inhibitor of Polymerization:** None used
7.7 **Molar Ratio (Reactant to Product):** Data not available
7.8 **Reactivity Group:** Data not available

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** Commercial
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-X-Y

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** Flammable liquid
11.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
11.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	2

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** 97.0
12.3 **Boiling Point at 1 atm:**
cis: 140°F = 60°C = 333°K
trans: 118°F = 48°C = 321°K
12.4 **Freezing Point:**
cis: —114°F = —81°C = 192°K
trans: —58°F = —50°C = 223°K
12.5 **Critical Temperature:** Not pertinent
12.6 **Critical Pressure:** Not pertinent
12.7 **Specific Gravity:** 1.27 at 25°C (liquid)
12.8 **Liquid Surface Tension:** 24 dynes/cm = 0.024 N/m at 20°C
12.9 **Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C
12.10 **Vapor (Gas) Specific Gravity:** 3.34
12.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1468
12.12 **Latent Heat of Vaporization:** 130 Btu/lb = 72 cal/g = 3.0×10^5 J/kg
12.13 **Heat of Combustion:** —4,847.2 Btu/lb = —2,692.9 cal/g = -112.67×10^5 J/kg
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** Data not available
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** Data not available

6. FIRE HAZARDS (Continued)

6.11 **Stoichiometric Air to Fuel Ratio:** Data not available
6.12 **Flame Temperature:** Data not available

METHYL ETHYL KETONE

MEK

Common Synonyms	Liquid	Colorless	Sweet odor
MEK 2-Butanone Ethyl methyl ketone	Floats and mixes with water. Flammable, irritating vapor is produced.		

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to "knock down" vapor.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, alcohol foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Issue warning-high flammability
Disperse and flush

2. LABEL

2.1 **Category:** Flammable liquid
2.2 **Class:** 3

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Ketone
3.2 **Formula:** $CH_3COCH_2CH_3$
3.3 **IMO/UN Designation:** 3.2/1193
3.4 **DOT ID No.:** 1193
3.5 **CAS Registry No.:** 78-93-3

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Like acetone; pleasant; pungent

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic canister or air pack; plastic gloves; goggles or face shield.
5.2 **Symptoms Following Exposure:** Liquid causes eye burn. Vapor irritates eyes, nose, and throat; can cause headache, dizziness, nausea, weakness, and loss of consciousness.
5.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; if breathing is irregular or has stopped, start resuscitation and administer oxygen. EYES: wash with plenty of water for at least 15 min. and call physician.
5.4 **Threshold Limit Value:** 200 ppm
5.5 **Short Term Inhalation Limits:** 290 mg/m³ for 60 min.
5.6 **Toxicity by Ingestion:** Grade 2; LD_{50} = 0.5 to 5 g/kg (rat)
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** 10 ppm
5.11 **IDLH Value:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 20°F C.C.; 22°F O.C.
6.2 **Flammable Limits in Air:** 1.8%-11.5%
6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 961°F
6.8 **Electrical Hazard:** Class I, Group D
6.9 **Burning Rate:** 4.1 mm/min.
6.10 **Adiabatic Flame Temperature:** Data not available
6.11 **Stoichiometric Air to Fuel Ratio:** Data not available
6.12 **Flame Temperature:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent
7.7 **Molar Ratio (Reactant to Product):** Data not available
7.8 **Reactivity Group:** 18

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 5640 mg/l/48 hr/bluegill/TL_m/fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 214%, 5 days
8.4 **Food Chain Concentration Potential:** None

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** 99.5+%
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Open (flame arrester) or pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-P-Q-R-S

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** Flammable liquid
11.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

11.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** 72.11
12.3 **Boiling Point at 1 atm:** 175.3°F = 79.6°C = 352.8°K
12.4 **Freezing Point:** —123.3°F = —86.3°C = 186.9°K
12.5 **Critical Temperature:** 504.5°F = 262.5°C = 535.7°K
12.6 **Critical Pressure:** 603 psia = 41.0 atm = 4.15 MN/m²
12.7 **Specific Gravity:** 0.806 at 20°C (liquid)
12.8 **Liquid Surface Tension:** Not pertinent
12.9 **Liquid Water Interfacial Tension:** Not pertinent
12.10 **Vapor (Gas) Specific Gravity:** 2.5
12.11 **Ratio of Specific Heats of Vapor (Gas):** 1.075
12.12 **Latent Heat of Vaportization:** 191 Btu/lb = 106 cal/g = 4.44 X 10⁵ J/kg
12.13 **Heat of Combustion:** —13,480 Btu/lb = —7491 cal/g = —313.6 X 10⁶ J/kg
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** (est.) —9 Btu/lb = —5 cal/g = —0.2 X 10⁶ J/kg
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** Data not available
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** 3.5 psia

NOTES

TOLUENE

TOL

Common Synonyms	Watery liquid	Colorless	Pleasant odor
Toluol Methylbenzene Methylbenzol	Floats on water. Flammable, irritating vapor is produced.		

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to "knock down" vapor.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea, vomiting or loss of consciousness.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Dangerous to aquatic life in high concentrations.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)
Issue warning-high flammability
Evacuate area

2. LABEL

2.1 **Category:** Flammable liquid
2.2 **Class:** 3

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Aromatic Hydrocarbon
3.2 **Formula:** $C_6H_5CH_3$
3.3 **IMO/UN Designation:** 3.2/1294
3.4 **DOT ID No.:** 1294
3.5 **CAS Registry No.:** 108-88-3

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Pungent; aromatic, benzene-like; distinct, pleasant

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air-supplied mask; goggles or face shield; plastic gloves.
5.2 **Symptoms Following Exposure:** Vapors irritate eyes and upper respiratory tract; cause dizziness, headache, anesthesia, respiratory arrest. Liquid irritates eyes and causes drying of skin. If aspirated, causes coughing, gagging, distress, and rapidly developing pulmonary edema. If ingested causes vomiting, griping, diarrhea, depressed respiration.
5.3 **Treatment of Exposure:** INHALATION: remove to fresh air, give artificial respiration and oxygen if needed; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.
5.4 **Threshold Limit Value:** 100 ppm
5.5 **Short Term Inhalation Limits:** 600 ppm for 30 min.
5.6 **Toxicity by Ingestion:** Grade 2; LD_{50} = 0.5 to 5 g/kg
5.7 **Late Toxicity:** Kidney and liver damage may follow ingestion.
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** 0.17 ppm
5.11 **IDLH Value:** 2,000 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 40°F C.C.; 55°F O.C.
6.2 **Flammable Limits in Air:** 1.27%-7%
6.3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires, ordinary foam for large fires.
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.
6.7 **Ignition Temperature:** 997°F
6.8 **Electrical Hazard:** Class I, Group D
6.9 **Burning Rate:** 5.7 mm/min.
6.10 **Adiabatic Flame Temperature:** Data not available

(Continued)

7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent
7.7 **Molar Ratio (Reactant to Product):** Data not available
7.8 **Reactivity Group:** 32

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 1180 mg/l/96 hr/sunfish/TL_m/fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 0%, 5 days; 38% (theor), 8 days
8.4 **Food Chain Concentration Potential:** None

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** Research, reagent, nitration-all 99.8 + %; industrial: contains 94 + %, with 5% xylene and small amounts of benzene and nonaromatic hydrocarbons; 90/120: less pure than industrial.
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Open (flame arrester) or pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)
A-T-U

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** Flammable liquid
11.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

11.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** 92.14
12.3 **Boiling Point at 1 atm:** 231.1°F = 110.6°C = 383.6°K
12.4 **Freezing Point:** −139°F = −95.0°C = 178.2°K
12.5 **Critical Temperature:** 605.4°F = 318.6°C = 591.8°K
12.6 **Critical Pressure:** 596.1 psia = 40.55 atm = 4.108 MN/m^2
12.7 **Specific Gravity:** 0.867 at 20°C (liquid)
12.8 **Liquid Surface Tension:** 29.0 dynes/cm = 0.0290 N/m at 20°C
12.9 **Liquid Water Interfacial Tension:** 36.1 dynes/cm = 0.0361 N/m at 25°C
12.10 **Vapor (Gas) Specific Gravity:** Not pertinent
12.11 **Ratio of Specific Heats of Vapor (Gas):** 1.089
12.12 **Latent Heat of Vaporization:** 155 Btu/lb = 86.1 cal/g = 3.61×10^4 J/kg
12.13 **Heat of Combustion:** −17,430 Btu/lb = −9686 cal/g = -405.5×10^3 J/kg
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** 17.17 cal/g
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** 1.1 psia

6. FIRE HAZARDS (Continued)

6.11 **Stoichiometric Air to Fuel Ratio:** Data not available
6.12 **Flame Temperature:** Data not available

VINYL CHLORIDE

VCM

Common Synonyms	Gas	Colorless	Sweet odor
Chlorethylene VCL Vinyl C Monomer VCM	Liquid floats and boils on water. Flammable, irritating visible vapor cloud is produced.		

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to "knock down" vapor.
Evacuate area in case of large discharge.
Avoid contact with liquid and vapor.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
POISONOUS GAS IS PRODUCED IN FIRE.
Flashback along vapor trail may occur.
May explode if ignited in an enclosed area.
Wear self-contained breathing apparatus.
Cool exposed containers and protect men effecting shutoff with water.
Stop flow of gas if possible.
Let fire burn.
Extinguish small fires with dry chemical.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose, and throat.
If inhaled, will cause dizziness or difficult breathing.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.
LIQUID
Will cause frostbite.
Flush affected areas with plenty of water.
DO NOT RUB AFFECTED AREAS.

Water Pollution

Not harmful to aquatic life.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)
Issue warning-high flammability
Evacuate area

2. LABEL

2.1 **Category:** Flammable gas
2.2 **Class:** 2

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Vinyl halides
3.2 **Formula:** $CH_2=CHCl$
3.3 **IMO/UN Designation:** 2.0/1086
3.4 **DOT ID No.:** 1086
3.5 **CAS Registry No.:** 75-01-4

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquefied compressed gas
4.2 **Color:** Colorless
4.3 **Odor:** Pleasant, sweet

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves and shoes; gas-tight goggles; organic vapor canister or self-contained breathing apparatus.
5.2 **Symptoms Following Exposure:** INHALATION: high concentrations cause dizziness, anesthesia, lung irritation. SKIN: may cause frostbite; phenol inhibitor may be absorbed through skin if large amounts of liquid evaporate.
5.3 **Treatment of Exposure:** INHALATION: remove patient to fresh air and keep him quiet and warm; call a doctor; give artificial respiration if breathing stops. EYES AND SKIN: flush with plenty of water for at least 15 min.; for eyes, get medical attention; remove contaminated clothing.
5.4 **Threshold Limit Value:** 5 ppm
5.5 **Short Term Inhalation Limits:** 500 ppm for 5 min.
5.6 **Toxicity by Ingestion:** Not pertinent
5.7 **Late Toxicity:** Chronic exposure may cause liver damage.
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin. May cause frostbite.
5.10 **Odor Threshold:** 260 ppm
5.11 **IDLH Value:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** —110°F O.C.
6.2 **Flammable Limits in Air:** 4%-26%
6.3 **Fire Extinguishing Agents:** For small fires use dry chemical or carbon dioxide. For large fires stop flow of gas. Cool exposed containers with water.
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Forms highly toxic combustion products such as hydrogen chloride, phosgenic, and carbon monoxide.
6.6 **Behavior in Fire:** Container may explode in fire. Gas is heavier than air and may travel considerable distance to a source of ignition and flash back.
6.7 **Ignition Temperature:** 882°F
6.8 **Electrical Hazard:** Class I, Group D
6.9 **Burning Rate:** 4.3 mm/min.

(Continued)

7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Polymerizes in presence of air, sunlight, or heat unless stabilized by inhibitors.
7.6 **Inhibitor of Polymerization:** Not normally used except when high temperatures are expected. Then 40-100 ppm of phenol used.
7.7 **Molar Ratio (Reactant to Product):** Data not available
7.8 **Reactivity Group:** 35

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** None
8.2 **Waterfowl Toxicity:** None
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** Commercial or technical 99+%
9.2 **Storage Temperature:** Under pressure; ambient At atm. pressure; low
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Under pressure; safety relief At atm. pressure; pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)
A-B-C-D-E-F-G-Z

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** Flammable gas
11.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	0
Aesthetic Effect	0
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	2

11.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	1

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Gas
12.2 **Molecular Weight:** 62.50
12.3 **Boiling Point at 1 atm:** 7.2°F = 13.8°C = 259.4°K
12.4 **Freezing Point:** —244.8°F = —153.8°C = —119.4°K
12.5 **Critical Temperature:** 317.1°F = 158.4°C = 431.6°K
12.6 **Critical Pressure:** 775 psia = 52.7 atm = 5.34 MN/m^2
12.7 **Specific Gravity:** 0.969 at —13°C (liquid)
12.8 **Liquid Surface Tension:** 16.0 dynes/cm = 0.0160 N/m at 25°C
12.9 **Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.03 N/m at 20°C
12.10 **Vapor (Gas) Specific Gravity:** 2.2
12.11 **Ratio of Specific Heats of Vapor (Gas):** 1.186
12.12 **Latent Heat of Vaporization:** 160 Btu/lb = 88 cal/g = 3.7×10^5 J/kg
12.13 **Heat of Combustion:** —8136 Btu/lb = —4520 cal/g = -189.1×10^5 J/kg
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** —729 Btu/lb = —405 cal/g = 16.9×10^5 J/kg
12.25 **Heat of Fusion:** 18.14 cal/g
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** 75 psia

6. FIRE HAZARDS (Continued)

6.10 **Adiabatic Flame Temperature:** Data not available
6.11 **Stoichiometric Air to Fuel Ratio:** 5.490 (Est.)
6.12 **Flame Temperature:** Data not available

m-XYLENE

XLM

Common Synonyms	Watery liquid	Colorless	Sweet odor
1, 3-Dimethylbenzene Xylol	Floats on water. Flammable, irritating vapor is produced.		

Stop discharge if possible. Keep people away.
Call fire department.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Wear self-contained breathing apparatus.
Extinguish with foam, dry chemical, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose, and throat.
If inhaled, will cause headache, difficult breathing, or loss of consciousness.

Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea, vomiting, or loss of consciousness.

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
Fouling to shoreline.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Issue warning-high flammability
Evacuate area
Should be removed
Chemical and physical treatment

2. LABEL

2.1 **Category:** Flammable liquid
2.2 **Class:** 3

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Aromatic Hydrocarbon
3.2 **Formula:** m-$C_6H_4(CH_3)_2$
3.3 **IMO/UN Designation:** 3.2/1307
3.4 **DOT ID No.:** 1307
3.5 **CAS Registry No.:** 108-38-3

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Like benzene; characteristic aromatic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots.
5.2 **Symptoms Following Exposure:** Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma; can be fatal. Kidney and liver damage can occur.
5.3 **Treatment of Exposure:** INHALATION: remove to fresh air; administer artificial respiration and oxygen if required; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.
5.4 **Threshold Limit Value:** 100 ppm
5.5 **Short Term Inhalation Limits:** 300 ppm for 30 min.
5.6 **Toxicity by Ingestion:** Grade 3; LD_{50} = 50 to 500 g/kg
5.7 **Late Toxicity:** Kidney and liver damage.
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** 0.05 ppm
5.11 **IDLH Value:** 10,000 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 84°F C.C.
6.2 **Flammable Limits in Air:** 1.1%-6.4%
6.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective.
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.
6.7 **Ignition Temperature:** 986°F
6.8 **Electrical Hazard:** Class I, Group D
6.9 **Burning Rate:** 5.8 mm/min.
6.10 **Adiabatic Flame Temperature:** Data not available
6.11 **Stoichiometric Air to Fuel Ratio:** Data not available
6.12 **Flame Temperature:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent
7.7 **Molar Ratio (Reactant to Product):** Data not available
7.8 **Reactivity Group:** 32

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 22 ppm/96 hr/bluegill/TL_m/fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 0 lb/lb, 5 days; 0% (theor.), 8 days
8.4 **Food Chain Concentration Potential:** Data not available

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** Research: 99.99%; Pure: 99.9%; Technical: 99.2%
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Open (flame arrester) or pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-T-U

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** Flammable liquid
11.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Polution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

11.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** 106.16
12.3 **Boiling Point at 1 atm:** 269.4°F = 131.9°C = 405.1°K
12.4 **Freezing Point:** —54.2°F = —47.9°C = 225.3°K
12.5 **Critical Temperature:** 650.8°F = 343.8°C = 617.0°K
12.6 **Critical Pressure:** 513.8 atm = 34.95 psia = 3.540 MN/m²
12.7 **Specific Gravity:** 0.864 at 20°C (liquid)
12.8 **Liquid Surface Tension:** 28.6 dynes/cm = 0.0286 N/m at 20°C
12.9 **Liquid Water Interfacial Tension:** 36.4 dynes/cm = 0.0364 N/m at 30°C
12.10 **Vapor (Gas) Specific Gravity:** Not pertinent
12.11 **Ratio of Specific Heats of Vapor (Gas):** 1.071
12.12 **Latent Heat of Vaporization:** 147 Btu/lb = 81.9 cal/g = 3.43 X 10^5 J/kg
12.13 **Heat of Combustion:** —17,554 Btu/lb = —9752.4 cal/g = —408.31 X 10^5 J/kg
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** 26.01 cal/g
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** 0.34 psia

NOTES

EMERGENCY TELEPHONE NUMBERS AND DIRECTIONS TO MEDICAL FACILITIES

EMERGENCY TELEPHONE NUMBERS

(Local) Police Department		(207) 725-5521
(Local) Rescue Service		(207) 443-3300
Base Public Works		(207) 921-2661
On Base Hospital		(207) 921-2992
Parkview Memorial Hospital		(207) 729-9941
(Local) Fire Department	On Base (207) 921-2457	(207) 725-5521
Base Fire Department		(207) 921-3333
Off-site Emergency Services		(207) 443-3300
National Poison Control Center		(800) 492-2414
Maine Poison Control Center		(207) 871-2950
National Response Center		(800) 424-8802
Regional USEPA Emergency Response		(800) 424-8802
Chemical Manufacturers' Association Chemical Referral Center		(800) 262-8200
Ambulance		On Base: (207) 921-2222 Local: (207) 729-1477 and (207) 725-5521

DIRECTIONS TO EMERGENCY MEDICAL FACILITIES

1. Parkview Memorial Hospital
   Maine Street
   Brunswick, Maine
   (207) 729-0041

Directions:

Exit from gate, go left on Route 24, go one mile to Maine Street, take left on Maine Street, go one mile. Parkview Hospital is on the left.

2. Regional Memorial Hospital
   Baribeau Drive
   Brunswick, Maine
   (207) 729-0181

Directions:

Exit from gate, go left on Route 24, go one mile to Maine Street, take left on Maine Street, go one mile to Pleasant Hill Road, take right on Pleasant Hill Road, go one-quarter mile to Baribeau Drive, take a right on Baribeau Drive and go one-quarter mile. Regional Memorial Hospital is on the left.

HEALTH AND SAFETY PLAN REVISION FORM

HEALTH AND SAFETY PLAN REVISION FORM

Revision: _____

Date _____ Page: _____

ITEMS REQUIRING REVISION

Existing Text or Description:

Required Revision:

Rationale:

Approval: Health & Safety Officer: _____ Date: _____

Health & Safety Manager: _____ Date: _____

Note: Post approved revisions in front of Health and Safety Plan; use numbered continuation sheets as necessary.

HEALTH AND SAFETY FORMS AND DATA SHEETS

Health and Safety Plan Signature Sheet
Medical Data Sheet
Accident Report Form

HEALTH AND SAFETY PLAN SIGNATURE SHEET

Site/Project: _____

I have read and reviewed the HASP and understand the information contained therein and will comply.

Name	Date	Name	Date

MEDICAL DATA SHEET

Project _____

Name _____

Address _____

Home Telephone (___)_____ DOB _____ Height _____ Weight _____

In case of emergency, contact: _____

Address _____

Telephone (___)_____

Do you wear contact lenses? ( ) Yes ( ) No

Allergies_____

List medication taken regularly _____

Particular sensitivities _____

Provide a checklist of previous/recent illnesses or exposures to hazardous chemicals

_____

_____

Name of personal physician _____Telephone (___)_____

ABB ENVIRONMENTAL SERVICES, INC.
N.2 ACCIDENT REPORT

SITE INFORMATION:

Site:_____ Job Number:_____

Location:_____

Location of Accident (if different from above):_____

Did injury involve ABB–ES employee?:_____ Subcontractor?:_____ Other?:_____

PERSONAL INFORMATION:

Name of Injured Person:_____

Address of Injured Person:_____

SSN:_____ DOB:_____ Marital Status:_____

Department:_____ Date of Hire:_____

ACCIDENT INFORMATION:

Date of Accident:_____ Time of Accident:_____ Weather Conditions:_____

Name of Witness:_____ Telephone No.:_____

Address:_____

Accident Category:
- ☐ Chemical Exposure
- ☐ Physical Injury
- ☐ Motor Vehicle
- ☐ Fire
- ☐ Property Damage (list):_____
- ☐ Other:_____

Severity:
- ☐ Medical Treatment
- ☐ Non–disabling
- ☐ Disabling
- ☐ Fatality
- ☐ Estimated Amount of Property Damage:_____

Classification of Injury:
- ☐ Heat Burns
- ☐ Chemical Burns
- ☐ Radiation Burns
- ☐ Toxic–Respiratory
- ☐ Toxic–Dermal
- ☐ Toxic–Ingestion
- ☐ Allergic Reaction
- ☐ Bites
- ☐ Poison Ivy
- ☐ Heat Stroke
- ☐ Cold Exposure
- ☐ Blisters
- ☐ Lacerations
- ☐ Punctures
- ☐ Abrasions
- ☐ Sprains
- ☐ Bruises
- ☐ Concussion
- ☐ Fracture
- ☐ Dislocations
- ☐ Nausea
- ☐ Headache
- ☐ Faint/Dizzy
- ☐ Other:_____

If chemical exposure, list all possible contaminants of concern:_____

_____

_____

Part(s) of Body Affected:_____ Degree of Disability:_____

Date Medical Care Received:_____ Emergency Service:_____ Follow–up Examination Needed:_____

Name and Address of Medical Facility:_____

_____

Name of Attending Physician:_____ Telephone Number:_____

Date/Time Employee went back to work:_____ Employee on Restricted Duty?_____

Estimated Number of Days Away From Work:_____

CAUSE OF INJURY/ACCIDENT:

Causitive agent(s) most directly related to accident (e.g., object, substance, material, machinery, equipment, or weather):_____

_____

Were there unsafe mechanical/physical/environmental condition(s) at the time of the accident?:_____

_____

Did an unsafe act contribute to the accident? If yes, specify:_____

_____

Did personal factors contribute to the accident (e.g., improper attitude, lack of knowledge or skill, slow reaction, fatigue, inattention, or horseplay.):_____

_____

ACCIDENT PREVENTION:

Level of Personal Protective Equipment required in the HASP:_____

Was injured using required equipment?:_____. If not, how did actual equipment differ from what was required in the HASP. Describe:_____

_____

Was personal protective equipment required in the HASP adequate for site conditions?_____

If no, what additional equipment was needed?:_____

_____

What can be done to prevent a re-occurrence of this type of accident? (e.g., ventilation, machine modification/ guarding, modification of work practices, or additional training.):_____

_____

_____

NARRATIVE:

Provide a detailed description of how and why the accident occured. Include objects, equipment, tools, circumstances of assigned duties, weather, etc. Be specific.:_____

_____

_____

_____

_____

_____

_____

_____

_____

Signature of Preparer:_____ Date:_____

Signature of Site Manager:_____ Date:_____

SEND A COPY OF THE COMPLETED FORM TO THE MANAGER, HEALTH AND SAFETY – PORTLAND, ME.

LYME DISEASE INFORMATION SHEET

PUBLIC HEALTH
FACT SHEET

LYME DISEASE IN MAINE

Acknowledgements: Portions of this text are reproduced from Fact Sheets published by the Massachusetts and Maryland Departments of Public Health.

What is Lyme Disease?

Lyme Disease is an illness caused by bacteria that are transmitted to humans, dogs, horses and other animals by the bite of an infected deer tick (Ixodes dammini). While rarely life-threatening it is an important illness because of its potential to cause problems in the joints, nervous system, and heart.

Where is Lyme Disease Found?

Transmission of Lyme Disease has been documented in many parts of the world. It occurs over wide areas of the United States, but particularly along the east coast. It was first recognized in the U.S. in 1975 as the result of an investigation of a group of children with arthritis in Lyme, Connecticut.

Cases of Lyme Disease have occurred in Southern Maine. Deer ticks have been identified in coastal York and Cumberland counties and in a few other scattered areas, particularly along the coast. Investigations are continuing to determine the distribution of the tick and the extent of Lyme Disease transmission in Maine.

How is Lyme Disease Transmitted?

The bacteria that cause Lyme Disease are acquired by juvenile deer ticks (larvae) through feeding on an infected animal, usually a mouse. At a subsequent stage in development (nymph), the ticks cling to vegetation in brushy, wooded, or grassy areas and transfer by direct contact to the skin of passing animals and humans. The bite of the infected tick can then transmit the bacteria to the new host. This transmission of the infectous organism appears to require that the tick be attached for at least 24 hours.

The immature deer tick is very small, and when attached to the skin may not be immediately noticeable. The approximate size of the tick at various stages of development is illustrated below:

	Larva	Nymph	Adult		Engorged adult
Actual size					
	August September	June July	April, May September - December		

During its complex two-year life cycle the tick can infect a variety of hosts including white-footed mice, deer, and other wild and domestic animals as well as humans. Lyme Disease is most commonly acquired in the summer months, less often in early spring or late fall, and only rarely during the winter.

It is important to note that not all ticks carry Lyme disease. The common dog tick for example does not transmit the infection. Even a deer tick bite does not necessarily mean that disease will follow, because not all members of the species are infected. Prompt removal of a tick will greatly decrease the risk of disease transmission.

What are the symptoms of Lyme Disease?

Early Symptoms:

The first symptom of Lyme Disease is usually-but not always- a skin rash called Erythema Migrans (EM). While the tick may have gone undetected, the rash occurs at the site of the bite. It begins as a small red area 3 to 32 days after the bite, then gradually enlarges, often with partial clearing at the center, so that it resembles a doughnut. The rash may be accompanied by flu-like sumptoms such as fever, headache, stiff neck, sore and aching muscles and joints, fatigue, sore throat, and swollen glands. There may be multiple rashes in other areas of the body that develop after the rash that occurs at the site of the bite. These symptoms may disappear on their own over a period of weeks. However, the rash may recur in about 50% of untreated people and more serious problems may develop later. Treatment with appropriate antibiotics clears up the rash within days and may prevent complications.

Late Symptoms:

Three major organ systems-the joints, nervous system, and heart-can be affected weeks-months after the initial tick bite, although symptoms usually appear within four to six weeks. A small

number of people with Lyme Disease may develop symptoms during later stages without having had the early skin rash.

Arthritis in the large joints (primarily the knee, elbow, and wrist) occurs in more than one-half of untreated persons. The arthritis may move from joint to joint and can become chronic.

Nervous system complications occur in 10% - 20% of infected persons. These complications may take many forms, some quite serious. Treatment with intravenous antibiotics can be helpful.

Heart symptoms occur in 6% - 10% of infected persons. Electrical conduction in the heart may be affected and the heart muscle may become inflamed.

How is Lyme Disease Diagnosed?

Diagnosis is based primarily on recognition of the typical symptoms of Lyme Disease, especially the characteristic early rash and on the history of possible tick exposure, such as outdoor activity in a high-risk area. Atypical cases or cases with only later stage complications can be difficult to diagnose. Laboratory tests are helpful in some circumstances, but require very careful interpretation by a physician. In general, the lab tests are more useful in aiding the diagnosis of disease in later stages than in diagnosing early Lyme Disease.

What is the Treatment for Lyme Disease?

Oral antibiotic treatment is beneficial early in illness. Two commonly used medications in this settings are Tetracycline and Amoxicillin, although other antibiotics may be substituted. Prompt treatment of early Lyme Disease may prevent later and more serious complications. Treatment of joint and nervous system complications is often accomplished with antibiotics given intravenously or by injection.

How Can Lyme Disease be Prevented?

The only known way to get Lyme Disease is from the bite of an infected tick. Knowing where these ticks are found, avoiding such areas, and promptly removing the tick are the primary preventive measures. Persons living in or visiting high-risk areas should take the following precautions:

- Don't walk barelegged in woods, brush, or tall grass where ticks may be found.
- If you do walk in such areas, wear a long-sleeved shirt, long pants, high socks (with pants tucked into socks), and closed shoes or boots. Light colors will help you spot ticks on clothing.
- Apply a commercial tick repellant on clothing, shoes, and socks after reading label instructions carefully. Avoid applying high concentration products to the skin, particularly of children.
- Conduct daily "tick checks" on yourself, your children, companions and on pets when you get in from the field. Shower, if possible. The ticks are often found on the thigh, flank, arms, underarms, and legs, and may be very small. Prompt removal of the tick will prevent infection.
- To remove an embedded tick, use tweezers to grip its body as close to the skin as possible and pull gently but firmly until the tick lets go. If tweezers are unavailable, grasp the tick with piece of tissue. Do not handle the tick with bare hands.
- Know the symptoms of Lyme Disease. If you have been in an area where ticks are found, and you develop such symptoms, particularly the skin rash and/or "flu" symptoms, see a physician promptly for evaluation and treatment.

The Maine Lyme Disease Task Force is involved in efforts to determine the extent of Lyme Disease incidence and the distribution of deer ticks in Maine. Members of the group include community physicians, and representatives of the State government (Departments of Human Services, Conservation, Agriculture, Inland Fisheries and Wildlife) and of the Maine Medical Center Department of Research.

If you find ticks you would like to have identified, submit them to:

Insect and Disease Laboratory Maine Forestry Service 50 Hospital Street Augusta, ME 04330	OR	Maine Lyme Disease Project Maine Medical Center 22 Bramhall Street Portland, ME 04102

Place the whole tick in rubbing alcohol in a tightly sealed container, pack carefully to prevent breakage, and mail in a crush-proof container. Please enclose your name, address, and phone number, note the geographic location and the date on which the tick was found, and information as to whether the tick was found on a human or an animal.

PRODUCED BY THE MAINE LYME DISEASE TASK FORCE
Distributed By the Maine Department of Human Services, Bureau of Health
157 Capitol Street, Augusta, Me 04333 (207) 289-3591

PROTECTING YOURSELF FROM LYME DISEASE IN MAINE - 1990

Lyme disease is an illness caused by a corkscrew-shaped bacteria called a spirochete that is transmitted to people, dogs, horses and other animals by tick bites. If not treated, Lyme disease may lead to arthritis, neurological or cardiac problems, and possibly birth defects.

In Maine, although only a few cases of Lyme disease have been reported officially, the tick that spreads Lyme disease is fairly common in coastal York and Cumberland Counties. It is occasionally found in other scattered areas, particularly along the coast.

The tick that transmits Lyme disease in Maine is the deer tick, *Ixodes dammini*. The life cycle has three stages, each of which takes one blood meal.

	Larva	Nymph	Adult		Engorged adult
Actual size					
	August September	June July	April, May September-December		

June and July are peak months for Lyme disease when the inconspicuous nymphs are active. Adults can also transmit the Lyme disease spirochetes but larvae are rarely infected.

Not all deer ticks contain the spirochete. Although some infected ticks are found in Maine, the numbers vary with locality and are generally lower than in states to the south where Lyme disease is more established.

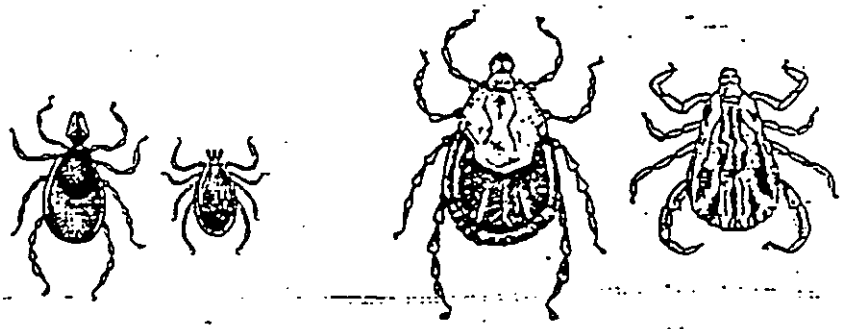
Other varieties of Maine ticks, some of which look very much like deer ticks, may bite people and domestic animals but are not thought to transmit Lyme disease effectively.

Ixodes cookei, the "woodchuck tick", which cannot reliably be distinguished from the deer tick without a microscope, is widely distributed in Maine. It usually feeds on wild animals such as woodchucks and racoons but will also feed readily on man and domestic animals.

Actual size

Dermacentor variabilis, the common American "dog tick", is often found in southern Maine in late spring and early summer. It is usually easily distinguished by its larger size and characteristic white markings.

The deer tick, *Ixodes dammini*, which transmits Lyme disease, and the common dog tick, enlarged for comparison. The dog tick is not thought to transmit Lyme disease.



female male — Adult Deer Tick (*Ixodes dammini*)

female male — Adult Dog Tick (*Dermacentor variabilis*)

Precautions to be taken when walking in woods, brush or tall grass where ticks may be found include:

- Tuck your pant legs into your socks and your shirt into your pants. Deer ticks attach to clothing and then walk up.
- Wear light-colored clothing so ticks may be seen more easily.
- Use a repellant containing DEET according to label directions - particularly on shoes, socks, pant legs. Avoid applying high concentration products to the skin, particularly of children.
- To protect pets, consult your veterinarian for dusts or sprays.
- Inspect yourself, your clothing, your children, your companion, and your pets for ticks when you get in from the field. Shower, if possible.

Mowing grass and cutting brush in yards may reduce tick habitat in problem areas.

If you find a tick that is attached, remove it promptly because it takes at least several hours of feeding before the spirochete is transmitted. Don't handle the tick with bare hands. Grasp the tick as close to the skin as possible, preferably with fine tweezers, and pull gently but firmly until the tick lets go. Do not squeeze the tick. Apply antiseptic. Save the tick in a small bottle of 70% alcohol or rubbing alcohol. Common tick removal methods, such as scorching with a match, are not recommended because they may cause infected body fluids to be expelled into the skin.

The first symptom of Lyme disease is usually an expanding red rash at the site of the tick bite which may occur a few days or several weeks later. The rash may be preceeded or accompanied by flu-like symptoms such as fever, headache, chills, nausea, facial paralysis, or pain in muscles and joints. If Lyme disease is suspected, call your doctor immediately. Early antibiotic treatment can avoid later, more serious complications. Not all patients develop the rash, however, and many do not recall a tick bite.

In most animals, the rash apparently does not occur. Lameness, loss of appetite, fever, and lethargy may be the first indications. As in people, animals usually respond to prompt antibiotic therapy.

Research in Maine. Up to this time, very few deer ticks have been found further than 20 miles from coastal Maine. Research continuing this year will follow any expansion of this range and seek to determine if ecologic variables may limit the spread of Lyme disease.

Tick identification. If you find ticks you would like to have identified, send them in a small vial of alcohol, along with information including the name and age if from a person, kind of animal or other source, the location acquired, and the date found to one of these two laboratories:

Maine Lyme Disease Project
Maine Medical Center
Research Department
22 Bramhall Street
Portland, ME 04102

Insect and Disease Laboratory
(Maine Forest Service)
50 Hospital Street
Augusta, ME 04330

Produced by the Maine Lyme Disease Task Force.

Lyme Disease Policy

Lyme disease is caused by a cork-screw shaped bacteria. The primary animal reservoirs for this organism are the white-tailed deer and the white-footed mouse. The most common vector of the disease is the deer tick. It is when people are bitten by the infected tick that human disease occurs.

While sporadic cases have been reported in many states, the disease does tend to occur largely in specific geographic areas. There are three such areas in the USA, 1. Wooded coastal portions of New York and New England; 2. Wisconsin and Minnesota; 3. Wooded and coastal areas of Northern California and Southwestern Oregon.

The signs and symptoms of acute Lyme disease are as follows:

History of a tick bite (recalled in 20% of cases)

Rash

a) Beginning at the point of the bite and becoming an expanding red ring which may exceed 6 inches in diameter.

b) Burning sensation rather than an itching.

c) Subsequent rings may appear inside the original ring.

d) Appears 3 days to 3 weeks after the bite.

Flu-like symptoms lasting 3 - 5 days (common symptoms)

a) Fever 100 - 103 degrees Fahrenheit

b) Headache

c) Sore throat

d) Nausea and vomiting

e) Backache

<u>If the acute symptoms go untreated</u> more severe symptoms develop days to months later. The more concerning of these symptoms are:

Nervous System

Bell's Palsy - facial muscles droop

Pain and weakness - usually shoulder and upper arms

Brain -
- Poor concentration
- Depression
- Seizures
- Temporary paralysis resembling Guillian-Barre disease

Heart -
- Slowing of heart rate
- Irregular heart beat
- Shortness of breath
- Chest pain

Joints - one or several (usually within 6 months)
- Inflamed and painful

Pregnancy - can lead to injury or death of the fetus.

The only positive proof of disease is culturing the bacteria from the tissue in the vicinity of the bite. Many of the reported cases have not been proven, but have been diagnosed based upon the symptoms (the epidemiological criteria).

The disease is effectively treated with antibiotics. While tetracyclines are the drugs of choice, penicillin and erythromycin are also effective. The more serious symptoms do not occur if treatment has been instituted and followed.

Lyme disease titer testing has become commercially available and popularized in the last 18 months. Regrettably, this testing is not perfected and is not standardized. The procedure is high in sensitivity, but lacks specificity. As a result, the incidence of false positives is extremely high. There are many cross reactions of the test with other bacteria. And in addition, other states of physiologic disturbance will regularly test positive for Lyme disease in unexposed persons. Because of these scientific factors, the Center for Disease Control (CDC - Lyme Disease Division, Fort Carson Colorado) does not recommend this procedure for general patient screening. In addition, the current testing method is very elaborate and thus very costly ($70 - $90/specimen).

The CDC's recommendation is that Lyme titer should be reserved for patients whose symptoms suggest Lyme disease. In that circumstance an acute serum should be collected and three weeks later a convalescent serum should be collected. Because of variability in the testing, both samples should be done together at the laboratory in the same batch of specimens.

EMR has reviewed the medical data and the position of the CDC. The policy of EMR is that routine or screening test for Lyme disease is inappropriate medically, and will ultimately be deleterious to our clients and their employees.

EMR recommends the first line of defense against this disease should be impervious clothing and the use of approved insect repellents. Beyond this, every employee potentially exposed should be made aware of the importance of examining the skin for evidence of the tick. Any tick found should be removed and <u>kept</u> in a plastic container or jar (identification of the type of tick may be important in diagnosis).

Lastly, but by no means least, every employee should be made aware of the symptoms and urged to seek medical attention if these symptoms manifest themselves. Lyme disease titer should only be used when symptoms suggest disease and then testing should be done as recommended by the CDC.

Prophylactic use of antibiotics is to be condemned.

Lyme Disease.

What is it?

Lyme disease is a bacterial infection spread by the bite of a tick. In the Eastern U.S., it is most commonly spread by the Deer tick, while in the Western U.S. it is carried by the Black Legged tick. A characteristic "bull's eye" skin rash usually occurs at the bite; subsequently the heart, nervous system and joints may become affected.

How common is it, and where is it found?

Lyme disease has been reported world wide and as of June 1988, 5000 cases had been reported in the U.S. It is felt by the medical profession that the number is grossly under reported because of the difficulty in diagnosis and the fact that not all states require the reporting of the disease to public health officials.

More than 90 percent of the 5000 reported cases have been in only seven states, including:

Connecticut Massachusetts Minnesota New Jersey

New York Rhode Island Wisconsin

In spite of that, infected ticks have been found in 32 of the 50 states, mainly in woodland type environments.

What are the symptoms of Lyme disease?

The medical profession has divided Lyme disease into three clinical stages.

Stage 1

Within 30 days of becoming infected, about 50 percent of the patients develop a characteristic bright red "bull's eye" skin rash. The rash is usually centered at the point of bite and may expands in size to between 4 and 20 inches in diameter. The rash is generally found on the thighs, in the groin or underarm areas. Other symptoms in this stage include fatigue, headache, stiff neck, muscle aches and pains along with a general malaise. In those cases where the characteristic skin rash does not develop, physicians have had greater difficulties in correctly diagnosing the disease.

Stage 2

Symptoms of the second stage of Lyme disease generally occur within the next several weeks and may include neurological and cardiac symptoms.

Neurological involvements appear to occur in about 15 percent of the patients, and consist of such things as inflammation of the brain and its membranes, inflammation of nerve roots, and possibly facial paralysis. The neurological symptoms have been reported to last several months and then in most cases spontaneously disappear.

Cardiac symptoms have been reported in about 8 percent of the reported cases and have included dizziness, shortness of breath and irregular heart beats. The cardiac symptoms have also reportedly disappeared after several weeks.

Stage 3

The main symptom of Lyme disease in this stage is arthritis which may appear as long as two years after the rash. Lyme arthritis has affected more than 50 percent of the patients of the disease. In general, it is the large joints that are involved and could include the knees, shoulders, elbows, ankles and wrists. In Lyme arthritis, the joints become swollen, red and hot while any movement causes pain. The initial attack of Lyme arthritis may only last a week, but such attacks have generally been recurrent in nature.

In addition to the arthritis, a small number of patients have also exhibited additional neurological symptoms that include loss of memory, mood swings and difficulty with concentration.

What can be done about Lyme disease?

The first thing that should be done is prevention, and there are a number of things that can be done to minimize the potential for exposure to the tick borne bacteria. The preventive measures include:

FREQUENT INSPECTION FOR AND REMOVAL OF TICKS. Once a tick is on the host, it may take up to a day to attach and feed. Early removal reduces the potential for the transmission of the bacteria.

USE OF CLOTHING THAT IS LIGHT COLORED AND TIGHT FITTING AT THE ANKLES AND WRISTS. The color improves the chance that a tick will be seen before it has an opportunity to attach, while the tight cuffs make it more difficult for the tick to reach a point of skin contact.

USE TICK REPELLENTS. The most recommended repellents contain either diethyl toluamide (also known as Deet) or permethrin. It is further recommended that these repellents be applied to clothing rather than to skin. Commercial products that contain Deet include "Deep Woods Off" and a number of others. Permethrin is contained in a product called "Permanone Tick Repellent" that is frequently available in hardware, lawn & garden, and sports stores.

BRUSH OFF and/or REMOVE TICK PROTECTIVE CLOTHING BEFORE ENTERING AN INDOOR ENVIRONMENT. This prevents ticks from getting into areas where you would not expect to have to use protective measures.

The second thing that can be done is treatment of those suspected of having been infected with the Lyme disease causing bacteria.

At all three stages, Lyme disease has been successfully treated through the use of broad spectrum antibiotics. Early treatment has reduced the potential for the development of neurological, cardiac or arthritic complications commonly encountered in the later stages. Even when left untreated until the later stages, antibiotic treatment of Lyme disease has still proven to be effective, however, hospitalization may be required for intravenous administration of the antibiotic rather than through oral administration.

TEMPERATURE EXTREMES

A.1 HEAT STRESS

Due to the increase in ambient air temperatures and the effects of protective outer wear decreasing body ventilation, there is increased potential for injury, specifically heat casualties. Site personnel will be instructed in the identification of a heat stress victim, the first-aid treatment procedures for the victim, and the prevention of heat stress casualties.

A.1.1 Identification and Treatment

A.1.1.1 Heat Exhaustion.

Symptoms. Heat exhaustion usually begins with muscular weakness, dizziness, nausea, and a staggering gait. Vomiting is frequent. The bowels may move involuntarily. The victim is very pale, the skin is clammy, and he or she may perspire profusely. The pulse is weak and fast; breathing is shallow. The victim may faint unless he or she lies down. This may pass; however, sometimes it persists and, while heat exhaustion is generally not considered life threatening, death could occur.

First Aid. Immediately remove the victim to the CRZ in a shady or cool area with good air circulation. Remove all protective outer wear. Call a physician. Treat the victim for shock (i.e., have the victim lie down, raise the feet 6 to 12 inches, and maintain body temperature but loosen all clothing). If the victim is conscious, it may be helpful to give sips of water. Transport the victim to a medical facility.

A.1.1.2 Heat Stroke.

Symptoms. This is the most serious of heat casualties because the body excessively overheats. Body temperatures often are between 107 and 110°F. The victim will have a red face and will not be sweating. First there is often pain in the head, dizziness, nausea, oppression, and dryness of the skin and mouth. Unconsciousness follows quickly and death is imminent if exposure continues. The attack will usually occur suddenly. Heat stroke is always serious.

First Aid. Immediately evacuate the victim to a cool and shady area in the CRZ. Remove all protective outer wear and all personal clothing. Lay the victim on his or her back with the head and shoulders slightly elevated. It is imperative that the body temperature be lowered immediately. This can be accomplished by applying cold wet towels or ice bags to the head and groin. Sponge off the bare skin with cool

water or rubbing alcohol, if available, or even place the victim in a tub of cool water. The main objective is to cool without chilling. Do not give stimulants. Transport the victim to a medical facility as soon as possible.

A.1.2 Prevention of Heat Stress

One of the major causes of heat casualties is the depletion of body fluids and salts through sweating. Fluids should be maintained in the Support Zone. Salts can be replaced by either a 0.1 percent salt solution, more heavily salted foods, or commercial mixes such as Gatorade. The commercial mixes are advised for personnel on low-sodium diets.

During warm weather, a work schedule will be established that allows most work to be conducted during the morning hours, before ambient air temperature levels reach highs.

A work/rest schedule will be implemented for personnel required to wear Level B or C protection (i.e., an impervious outer garment) with sufficient time allowed for personnel to "cool down" (this may require working in shifts). Two hours is the maximum time between breaks at Level B or C, regardless of temperature. At elevated temperatures, breaks should be scheduled as follows:

Ambient Temperatures	Maximum Time Between Cool Down Breaks
Above 90°F	¼ hour
85° to 90°F	½ hour
80° to 85°F	1 hour
70° to 80°F	1½ hours

A.1.3 Heat Stress Monitoring

Monitoring of personnel wearing impervious clothing should commence when the ambient temperature reaches 70°F, with increased frequency if ambient temperature increases or as slow recovery rates are indicated. When temperatures exceed 85°F, workers should be monitored for heat stress after every work period. As a screening mechanism of the body's recuperative ability to excess heat, one or more of the following techniques should be used.

1. Measure the heart rate (HR) for 30 seconds, by radial pulse, as early in the resting period as possible. At the beginning of the rest period, the HR should not exceed 110 beats per minute. If the HR is higher, the next work period should be shortened by 10 minutes (or 33 percent), with the length of the rest period staying the same. If the pulse rate is still above 110 beats per minute at the beginning of the next rest period, the following work cycle should again be shortened by 33 percent.

2. Measure oral body temperature with a clinical thermometer, as early as possible in the resting period. At the beginning of the rest period, oral temperature (OT) should not exceed 99°F. If OT exceeds 99°F, the next work period should be shortened by 10 minutes (or 33 percent), with the length of the rest period staying the same. If the OT again exceeds 99°F at the beginning of the next period, the following work cycle should be further shortened by 33 percent. OT should also be measured at the end of the rest period to ensure that it has dropped below 99°F.

3. Maintain good hygienic standards by changing clothes frequently, showering daily, and allowing clothing to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel.

A.2 COLD STRESS

Cold weather may often cause problems for personnel working outside, even at temperatures above freezing. As temperatures drop below freezing, the potential for cold weather injuries increases dramatically, as does the potential for equipment failure. Because of the considerable danger to personnel, outdoor work should be suspended if the ambient temperature drops below 0°F (-18°C) or if the windchill factor drops below -29°F (-34°C). These levels represent guidelines that should be used as an action level unless the HSO determines and documents otherwise. Table A-2, which shows equivalent temperatures (i.e., windchill) for a range of ambient conditions, should also be referred to.

Snow and ice increase the risks to personnel and operations through reduced visibility, increased potential for falling injuries, reduced on-site mobility, and the increased time required to access the site (or off-site support services).

In view of these factors, it is critical that the HSO establish site-specific safety and operating protocols, and that all on-site personnel be made aware of the risks.

A.2.1 Local Cold Injuries

Local cold injuries affect specific areas of the body (e.g., fingers, ears, or toes), including the more commonly recognized injuries described in the following subsections.

A.2.1.1 Chilblains. Chilblains is a chronic condition affecting the skin and peripheral capillary circulation, resulting from prolonged exposure of the bare skin, primarily in the extremities, to temperatures at or below 60°F. The best method of preventing and treating chilblains is to cover and protect the skin, thereby avoiding prolonged exposure to the cold.

A.2.1.2 Frostbite. Frostbite is freezing of the hands, feet, ears, and exposed parts of the face as a result of exposure to very low temperatures. Frostbite occurs when ice crystals form in the fluid in cells of the skin and tissue. As long as blood circulation remains good, frostbite will not occur.

There are three stages of frostbite: incipient frost bite (frostnip), superficial frostbite, and deep frostbite. The classification depends on severity and can range from incipient frostbite (frostnip), which affects the skin; to superficial frostbite, which involves the skin and the tissues immediately beneath it; to deep frostbite, which is much more serious with damage that may affect deeper tissue and even bone.

Symptoms. Symptoms for each of the three stages of frostbite are described as follows.

- Frostnip. Skin first turns red and then later becomes pale or waxy white. There may be tingling, stinging, aching, an uncomfortable sensation of coldness or numbness, or no noticeable symptoms.

COOLING POWER OF WIND ON EXPOSED FLESH EXPRESSED
AS AN EQUIVALENT TEMPERATURE (UNDER CALM CONDITIONS)

ESTIMATED WIND SPEED (in mph)	ACTUAL TEMPERATURE READING (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	EQUIVALENT CHILL TEMPERATURE (°F)											
calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148

(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER In <hour with dry skin. Maximum danger of false sense of security.	INCREASING DANGER Danger from freezing of exposed flesh within 1 minute.	GREAT DANGER Flesh may freeze within 30 seconds.

Trenchfoot and immersion foot may occur at any point on this chart.

Source: Developed by U.S. Army Research Institute of Environmental Medicine, Natick, Massachusetts.

3.88.94T
0002.0.0

- Superficial Frostbite. The skin turns white or gray-white and is waxy in appearance. It is firm to touch (i.e., does not move easily) and the tissue beneath the skin is soft and resilient. There is a lack of sensation in the area.

- Deep Frostbite. The tissue is pale, cold, and solid with possible blisters and swelling. The hands and feet are especially susceptible to deep frostbite.

Emergency Treatment of Frostbite. Frostnip is easily treated in the field by the application of body heat, which should be applied before the affected area becomes numb. If frostnip affects your fingers and hands, place them against the skin of your chest or in your armpits. To warm your face, hold a mitten or scarf over the lower part of your face and breathe into it. Thaw frozen spots immediately. Do not rub affected areas.

Superficial frostbite usually responds to the application of body heat, as described previously. If the skin does not respond to body heat or if it resembles the early stages of deep frostbite, follow the emergency treatments listed in the following paragraphs. DO NOT rub affected areas.

For deep frostbite, if possible, the injured person should be taken to a heated shelter to avoid further frostbite. If it can be done without the danger of further frostbite, remove all constricting items (e.g., boots, gloves, and socks) from the injured area. RAPID REWARMING WILL MINIMIZE TISSUE LOSS. If possible, warm the extremities in a carefully controlled water bath (104 to 106°F) until tips of the fingers or toes turn pink and feeling is restored. If a water bath is not available, either apply wet packs (100 to 112°F) to the person's body, or gently wrap frostbitten area in blankets or some other warm material.

DO NOT attempt to thaw the affected parts by exercising them or heating them in front of an open fire, heat lamp, radiator, or stove. The person could receive a heat injury as a result of sensation loss.

DO NOT use snow to thaw frostbite. DO NOT rub, massage, or use pressure on the affected areas. Keep the frostbitten parts elevated if possible. Watch to see if CPR is necessary. Give the victim warm drinks such as tea, coffee, or soup. DO NOT GIVE ALCOHOLIC BEVERAGES. Have the victim exercise fingers or toes as

soon as possible, but only after they are warmed. DO NOT allow a person with frostbitten feet to walk; walking may cause additional damage.

Medical Treatment of Frostbite.

- Frostnip. Usually does not require medical care.
- Superficial Frostbite. Blisters may require medical care.
- Deep Frostbite. EARLY MEDICAL TREATMENT IS URGENT! Transport the victim to medical care facilities at once.

Prevention of Frostbite. It is far easier to prevent or stop frostbite in earlier stages than to thaw and take care of badly frozen flesh. To protect the body against frostbite, the following precautions should be taken:

- Wear enough clothing to protect against the cold and wind.
- Wear warm gloves and boots.
- Pull a scarf or jacket flap over the lower part of the face or pull a hood tightly around the face.
- Occasionally exercise the face, fingers, and toes to keep them warm and to detect any areas that may have become numb.
- Crew members should watch each other closely, especially the face, for signs of frostbite.

A.2.1.3 Immersion Foot. Immersion foot (formerly called trenchfoot) is a cold injury resulting from prolonged exposure to near-freezing temperatures when standing or walking on wet or swampy ground.

Symptoms. In the early stages, the feet and toes are pale, cold, numb, and stiff, and walking is difficult. If preventive action is not taken, the feet will swell and ache; in extreme cases, this may result in irreversible damage to the tissues of the foot or leg.

Emergency Treatment of Immersion Foot. Handle feet very gently. DO NOT rub or massage. If necessary, clean feet carefully with soap and warm water, then dry, elevate, and expose to warm but not hot air.

Prevention of Immersion Foot. Because the early stages of immersion foot are not painful, crew members must be constantly on the alert and check feet often when working in cold, wet conditions. Keep feet dry by wearing waterproof footgear and changing socks frequently because perspiration, trapped inside waterproof boots or heavy footgear, can contribute to immersion foot symptoms. Avoid standing in wet areas. If feet get wet, dry them as soon as possible, warm them with your hands, then use foot powder, and change to dry socks. If you cannot change wet boots and socks, exercise your feet frequently by wriggling your toes and moving your ankles. Never wear tight boots.

A.2.2 Systemic Cold Injuries

Systemic injuries are those that affect the entire body system. Severe body cooling, known as systemic hypothermia, can occur at temperatures well above freezing. Hypothermia, which can be fatal, is the progressive lowering of body temperature accompanied by rapid, progressive mental and physical collapse. A large percentage of wilderness deaths are the result of hypothermia.

Hypothermia is caused by exposure to cold, and is aggravated by moisture, cold winds, fatigue, hunger, inadequate clothing or shelter, and excessive perspiration from strenuous exercise followed by too rapid cooling.

Hypothermia often occurs between temperatures of 30 to 50°F, which most people believe are not dangerous. Crew members should be alert for symptoms of hypothermia, especially when temperatures are dropping rapidly or when they must work in rain, snow, or ice.

Hypothermia may occur on land or following submersion in even moderately cold water (i.e., 65°F or lower). On land, hypothermia may take a full day or more of exposure to develop; however, if the conditions are extremely severe, death may occur within a few hours of initial symptoms.

In cold water, death may seem to be from drowning; in reality, it is usually the result of hypothermia. In water, skin and nearby tissues chill very fast; in 10 to 15 minutes, the temperature of the heart and brain may drop. When the core (i.e., internal body)

temperature reaches 90°F, unconsciousness may occur; when body temperature drops to 80°F, heart failure is possible.

A.2.2.1 Symptoms. In the early stages of hypothermia, the body begins to lose heat faster than it can be produced, making an effort to stay warm by shivering. When the body can no longer generate enough heat to overcome heat loss and the energy reserves of the body become exhausted, body temperature begins to drop. This affects the ability of the brain to make judgments and also results in loss of muscular control. As the body temperature drops, hypothermia symptoms become increasingly severe, as shown in the following table:

SYMPTOMS OF HYPOTHERMIA	APPROXIMATE CORE TEMPERATURE
Person is conscious, alert with increased respiration. Shivering may become uncontrollable as core temperature nears 95°F.	Above 95°
Person is conscious but disoriented and apathetic. Shivering is present but diminishes as temperature drops. Below 92°F, respiratory rate gradually diminishes and pupils being to dilate.	95° to 90°F
Person is semiconscious. Shivering is replaced by muscular rigidity. Pupils are fully dilated at about 86°F.	90° to 86°F
Unconscious; diminished respiration.	Below 86°F
Barely detectable or nondetectable respiration.	Below 80°F

A.2.2.2 Emergency Treatment of Hypothermia. Move hypothermia victim to shelter and warmth as rapidly as possible. In very mild cases, dry clothing and shelter may be all that is needed. Gently remove all of the victim's wet clothing (so energy is not expended by warming and drying wet clothing) and replace it with a dry set. Give the person something warm to drink. DO NOT GIVE ALCOHOLIC BEVERAGES.

ALL OTHER HYPOTHERMIA CASES SHOULD BE CONSIDERED MEDICAL EMERGENCIES. PROVIDE EXTERNAL HEAT IN ANY WAY POSSIBLE! A warm bath (with the water kept between 105° and 110°F) is the most effective way of warming a victim of hypothermia. NEVER put an UNCONSCIOUS VICTIM in a bathtub.

If it is not possible to give the person a warm bath, use one of the following ALTERNATE METHODS:

- Wrap warm moist towels (or other fabric) around the victim's head, neck, sides, and groin. As the packs cool, rewarm them by adding warm water (approximately 105°F). Check the temperature of the water with your elbow or the inside of your arm; it should be warm but not hot.

- If you are at a remote outdoor location and cannot use the other method, make a "human sandwich" by placing the unclothed victim in a sleeping bag (or between blankets) with two other undressed persons to provide body-to-body heat transfer. THIS WILL SAVE LIVES. Additional sleeping bags or blankets can be placed over and under the victim.

DO NOT wrap a hypothermia victim in a blanket without an auxiliary source of heat unless it is to protect against any further heat loss before treatment can begin, or you need to go for help and there is no other alternative.

Continue treatment once the victim has stabilized. Give warm liquids and nourishing food if the person is conscious. Check the person for symptoms of frostbite and if necessary, give treatment.

Handle the patient gently and do not allow him or her to walk. Exertion can circulate cold stagnant blood from extremities to the central body and cause "after-drop," in which the patient's core temperature drops below the level that will sustain life. ALCOHOL CONTRIBUTES TO AFTER-DROP.

A.2.2.3 Medical Care for Hypothermia. HYPOTHERMIA IS A SEVERE EMERGENCY. GET MEDICAL TREATMENT AS SOON AS POSSIBLE. Even persons with mild hypothermia should see a doctor.

A.2.2.4 Prevention of Hypothermia. In cold weather, never go into the field without wearing adequate clothing. Take a complete change of warm clothes and one or two extra pairs of socks (in plastic bags). Wear or carry a windproof, water-resistant outer jacket and, in rain or snow, wear adequate raingear.

Stay dry. If your clothing becomes wet from perspiration, rain, snow, or immersion in water, change it as soon as possible. If you start to shiver in a prolonged or violent way, seek shelter at once. Shivering may produce heat but it also uses up energy. Violent shivering may be an early sign of hypothermia.

Avoid accidental immersion in water. Practice boat safety and learn cold water survival techniques. If you fall into water and you are not very close to shore, remain quiet. Keep your head out of water, climb onto the boat, or hold or climb onto any other object that will support you and keep you up out of the water.

A.2.3 Safety/First Aid Equipment

In view of the causes, results, and appropriate treatment of cold weather injuries discussed previously, as a minimum, the following safety equipment should be included during cold weather operations:

- extra clothing for all personnel
- blankets and/or sleeping bag
- high-energy food and drinking water supply
- toboggan
- tow ropes

In extreme cold conditions, add the following safety items:

- electric blanket (if an electrical source is available)
- portable emergency generator (with fuel, oil, and cords)
- space heater and fuel

A.2.4 General Winter Operations

Cold weather conditions can severely affect winter operations. The Site Manager and HSO must plan work schedules and project tasks accordingly.

A.2.4.1 Preliminary Assessment. If you will be working outdoors in cold weather, assess the local weather conditions through the news media (i.e., radio, television, and newspapers) to determine whether work should progress and/or the amount of preparation needed. Carefully consider questions such as the following:

- What are the typical wind and weather conditions for the period in which you will be working?
- Are the areas in which you will work sheltered or open to the wind?
- Is there a place nearby for periodic warming breaks? Can you obtain or heat warm food and beverages there? Is there a source of drinking water?
- Are there ways to minimize the length of time that crew members will have to work outdoors in the cold?
- If you use a vehicle for a warming area or will use a heater in a closed room, how can you ensure there is adequate ventilation to prevent carbon monoxide poisoning?

A.2.4.2 Scheduling. Wherever possible, try to schedule work during the least severe weather. Rotate crew members to keep cold exposures short and allow sufficient time for frequent warming breaks. Remember that workers in heavy clothing often need more time to complete the tasks and may become fatigued more easily. Be aware that operations may have to be discontinued if winds increase or the temperature drops.

Because winter days are short, scheduling should allow time for taking care of equipment and supplies before nightfall. Once it becomes dark, it is more difficult to gauge terrain, and temperatures are likely to drop.

A.2.4.3 Site Access. Snow and ice could make travel on site access roads impossible, or treacherous at best. Personnel should not be allowed to work on-site if conditions could severely hamper the arrival or departure of emergency vehicles. If the route to off-site medical facilities is blocked by snow or ice, an otherwise minor injury could result in a major medical emergency. If conditions warrant, the following provisions should be made:

- snow removal/plowing services for site access roads
- a dependable, four-wheel-drive vehicle available to on-site personnel for transporting an injured person to an off-site medical facility
- sleeping bags, blankets, a food supply, and water kept on-site in the event a sudden storm requires personnel to remain overnight

The HSO is responsible for deciding when weather conditions make site access unsafe, thereby requiring work to stop until conditions improve.

A.2.4.4 Equipment and Supplies. Obtain equipment and supplies that will help prevent cold stress and will help in the treatment of cold stress disorders. Required equipment includes a reliable ambient temperature thermometer, a wind gauge, and a windchill chart. If the site is potentially windy due to a lack of natural or manmade windbreaks (e.g., trees, valleys, and structures), try to provide means of shielding workers from the wind. If working at a remote location, carry extra food and water because hunger and dehydration contribute to cold stress. If possible, make provisions for hot food and beverages. Ensure that emergency communication equipment is available and operational for crew members working in the cold, at heights, or in remote locations.

Close attention must be given to the effects of cold weather on field equipment. Batteries can be severely affected by cold resulting in disabled radios, air monitoring equipment, sampling pumps, and vehicles. A supply of fresh batteries, a sufficient number of charging units, and a set of automotive jumper cables should be maintained on-site. In addition, the electronics in many field instruments such as PI, LEL, and oxygen meters, as well as the chemical reactions in detector tubes (e.g., Draeger tubes) can also be adversely affected by the cold. The manufacturers' literature must be consulted for minimum operating temperatures.

If at all possible, monitoring well sampling tasks should not be scheduled during cold weather. These tasks generally require the use of relatively delicate pumps; long, uninsulated stretches of tubing; and significant quantities of decontamination solutions. Unless considerable effort is expended to prevent pumps, hoses, decontamination solutions, and sample containers from freezing, attempting to sample monitoring wells in cold weather may be counter-productive. Portable shelters should be considered if cold weather sampling is necessary.

SITE DESCRIPTION FROM INITIAL ASSESSMENT STUDY OF NAVAL AIR STATION BRUNSWICK

June 1983

INITIAL ASSESSMENT STUDY OF NAVAL AIR STATION, BRUNSWICK, MAINE

NEESA 13-031

NAVAL ENERGY AND ENVIRONMENTAL SUPPORT ACTIVITY

Port Hueneme, California 93043

RELEASE OF THIS DOCUMENT REQUIRES PRIOR NOTIFICATION OF THE CHIEF OFFICIAL OF THE STUDIED ACTIVITY.

INITIAL ASSESSMENT STUDY

NAVAL AIR STATION, BRUNSWICK, MAINE

UIC: 60087

Prepared by:

Roy F. Weston, Inc.
Weston Way
West Chester, Pennsylvania 19380

Contract No. N62474-82-C-C352

Initial Assessment Study Team Members

Raymond Kane, Project Manager
Katherine Sheedy, Team Leader
Kenneth Salamon, Biologist
John Gilbert, Chemical Engineer
Fred McGarry, Environmental Engineer
Patricia Saia, Technical Editor

NEESA Contract Coordinator

Kent D. Adams, Environmental Engineer

Prepared for:

NAVY ASSESSMENT AND CONTROL
OF INSTALLATION POLLUTANTS (NACIP) DEPARTMENT
Naval Energy and Environmental Support Activity (NEESA)
Port Hueneme, California 93043

June 1983

Table 8-5

Analysis Results -- Site 8

Parameter	Water Sample	Sediment Sample
Selenium	0.1 mg/l	1.43 mg/kg
Chromium	ND	17.22 mg/kg
Iron	1.5 mg/l	12,956 mg/kg
Copper	ND	11.07 mg/kg
pH	6.2	6.5

ND = None detected

Only the limited metals shown were analyzed as indicator parameters. However, this does not imply that the quality of the water is or is not in compliance with water quality standards. Further analysis will be required to make that determination. The concentration of iron and the pH suggest that the landfill may be impacting on water quality.

The results of the sediment analysis indicate that chromium and copper and, to a larger degree, iron, may be leaching out of the landfill. The results of the sediment analysis are not out of the range of naturally-occurring concentrations in soil. The stream in question is a relatively small, irregular stream with normally low flow. However, during storm events the stream flow increases substantially. Resuspension of the contaminants in the leachate may be occurring as the increased flow during storms may have a scouring effect on the sediments.

8.9.4.2 Receptors. The potential exists for leachate from this site to be transported throughout the tributary stream and ultimately into the Androscoggin River. The river is estuarine in this area, and as such is subject to natural tidal flushing. The potential for a small amount of leached metals to be detected in this system is therefore unlikely. The stream itself, however, probably contains diverse invertebrate fauna, as well as several small fish species typical of small streams. No obvious terrestrial or aquatic impact was noted at the site.

8.10 SITE 9, NEPTUNE DRIVE DISPOSAL SITE. The extent of this site is uncertain. There was a dumping area located under the Marine Barracks north of Neptune Road and a dumping area behind Building 201 south of Neptune Road. These two sites are considered to be contiguous and constitute a single site. The location of the site is shown on Figure 8-10.

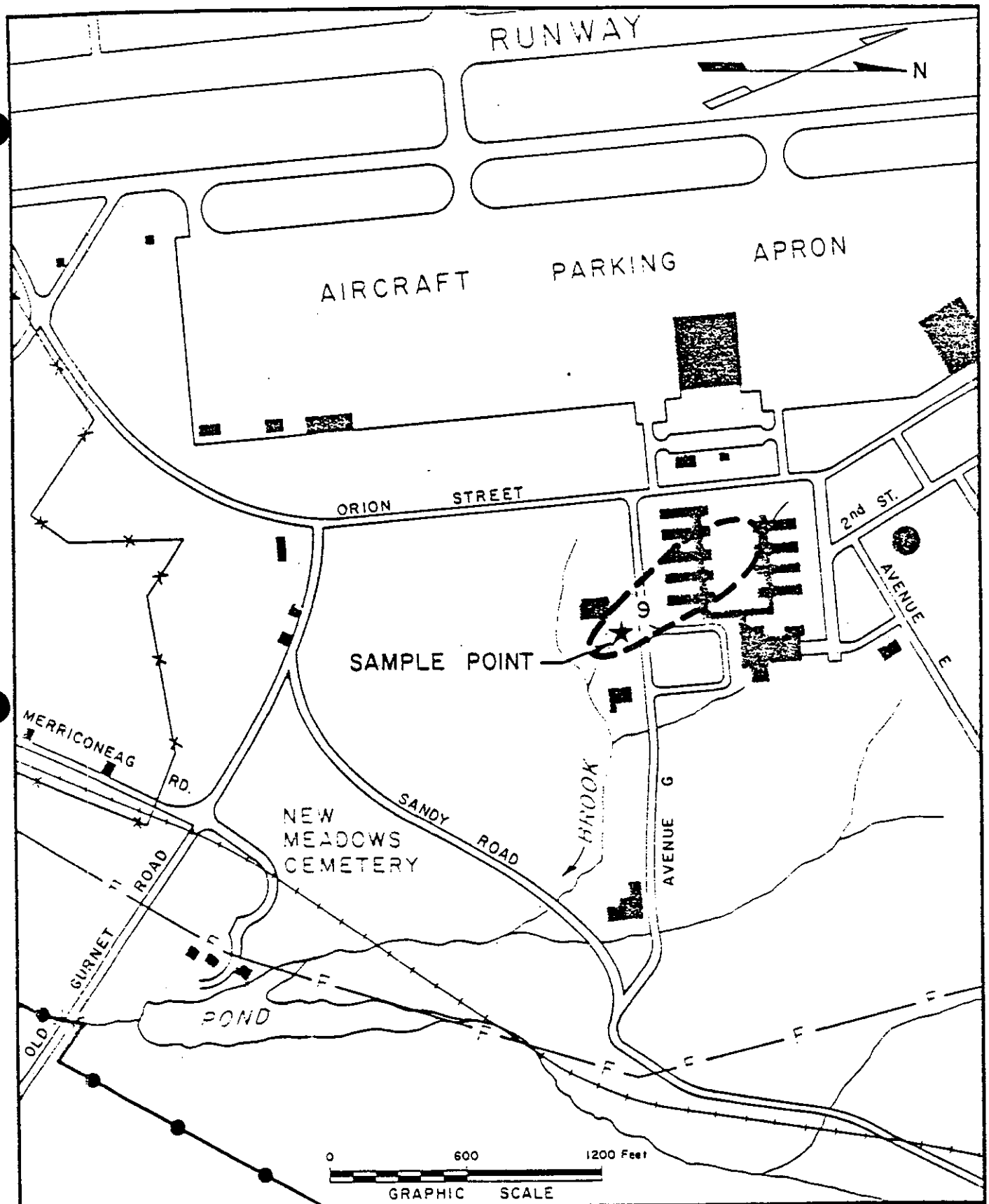


FIGURE 8-10
SITE 9-NEPTUNE DRIVE DISPOSAL SITE

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
BRUNSWICK

8.10.1 Site History. The site was reported to be in operation from 1951 to approximately 1960. For awhile it was the main Air Station disposal area. According to personnel interviews it was used before operations began at Site 1. As discussed previously, there is a conflict in the reported starting dates for Site 1. Another interviewee reported that Site 9 was used from 1943 to 1946 and from 1951 to 1952. It was indicated that this was the first dump area used at the Air Station, and the practice was to use only one dump area at a time. A 1946 Air Station map shows the area designated as a dump.

These conflicting data indicate that the site was used as the main Air Station dump for at least a short time in the early 1950's between the time the Air Station was reopened and Site 2 was put in use. The site may have also been used as a primary disposal area between 1955 and 1959, which would account for discrepancies in the startup date of Site 1.

8.10.1.1 Incinerator. An incinerator was located at the present location of Building 212. The incinerator was used prior to the Air Station's closure in 1946. Its later use is uncertain.

8.10.2 Site Operation. During the period the incinerator was in operation solid wastes were burned and the ash was placed in the dump. Solvents and other liquids were burned on the ground. At least some direct disposal of solid waste took place during the 1950's.

8.10.3 Hazardous Wastes Present. The wastes at the site would include solvents and paint sludges, although the quantity of waste is unknown. It has been reported that wastes from the Metal Shop were disposed of at this site for several years.

8.10.4 Migration Potential. The site is adjacent to two small streams that form an unnamed tributary to Merriconeag Stream. Both of these streams appear to sustain year-round flow. A culvert that comes from under the Marine Barracks area discharges to the northern stream. Examination of the banks of the northern stream shows heavy iron oxide staining, which is characteristic of leachate (Figure 8-11). Leachate appeared to be entering the stream from seeps in the stream bottom, from the bank behind Building 201, and from the culvert from the Marine Barracks area. A stream water sample was collected from near the bank on the south side of the stream. The sampling location was out of the influence of flow from the culvert.

8.10.4.1 Chemical Analysis. The results of water and sediment analysis are shown in Table 8-6. The sampling results are inconclusive.

8.10.4.2 Receptors. Based on the leachate seeps seen during the IAS and the position of the site, the primary migration pathway is to the two steams that flow into Merriconeag Stream and Harpswell Cove. For a discussion on the sensitivity of the cove see subsection 8.2.6.

8.10.4.3 Groundwater. The site has a shallow water table. Groundwater discharges to the two streams but it is not known if these streams are effective barriers to groundwater flow. There are no wells in the vicinity of the site.

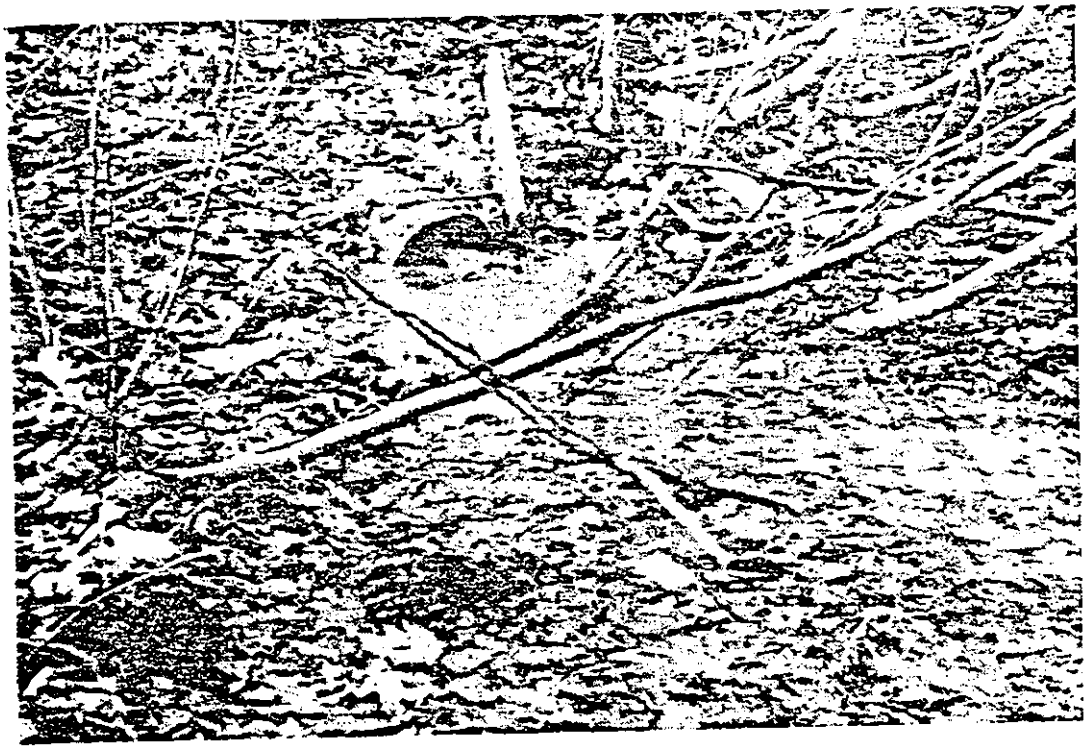


FIGURE 8-11
STREAM AT NEPTUNE
DRIVE DISPOSAL SITE

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
BRUNSWICK

Table 8-6

Analysis Results -- Site 9

Parameter	Sediment mg/kg	Water mg/L
Selenium	0.058	0.07
Chromium	35.96	ND
Iron	9,280	0.10
Copper	49.88	ND
pH	5.5	6.00

ND = None detected

8.11 SITE 10, HARPSWELL FUEL DEPOT. This site is a contractor-operated fuel depot located several miles south of the Air Station on Harpswell Neck (Figure 8-12). Figure 8-13 is a view from the inland part of the depot toward Middle Bay. The site topography is steep. The change in elevation is from 146 feet at the west (inland) boundary to sea level at the shoreline. The storage tanks are above-ground and are clustered near the shore. The tank area is bermed.

8.11.1 Site History. This site began operation in 1956. All of the tanks at the depot have been certified as lead free. Tank 3 has contained unleaded fuel since 1975; the other tanks have contained unleaded fuel since 1963. There have been a number of fuel spills at various times, and the soil is saturated with oil. Two recovery wells have been installed (in April 1982 and June 1982) to recover fuel from the subsurface. One pump is running all the time, and approximately 5 gallons of oil are recovered per day. The oil is collected in drums and removed by a contractor. A french drain system has been installed that carries runoff to the oil/water separator system.

8.11.2 Site Operation. Between 1956 and 1963 all of the tanks held leaded fuel. During this period when the tanks were cleaned the mainholes were opened near the bottom of the tanks and the scale was discharged near the tank inside the berm. The scale was buried in place.

8.11.3 Hazardous Wastes Present. The waste of concern is the lead contained in the tank scale that is buried inside the berms. The tanks were cleaned approximately every 4 years. Records of exact schedules were disposed of when the site operation was taken over by a contractor. In the 7-year period of leaded fuel use, tank cleaning was conducted at least once, and possibly twice. The quantity of lead that was discharged is unknown.

ANALYTICAL DATA

PREVIOUS INVESTIGATIONS

TABLE C-1
SUMMARY OF GROUNDWATER ORGANIC AND INORGANIC ANALYSIS (1989 - 1991)

INTERIM RECORD OF DECISION: SITE 9
NAS BRUNSWICK

SAMPLING ROUND REPORT DATE SAMPLE LOCATION	1 1/89 MW-904	1 1/89 MW-903	2 3/89 MW-904	2 3/89 MW-903	3 7/89 MW-904	4 1/90 MW-904	4 1/90 MW-903	4 1/90 MW-906	4 1/90 MW-907	4 1/90 MW-908	5 4/91 MW-904	5 4/91 MW-906	5 4/91 MW-907	5 4/91 CP-903	5 4/91 CP-902
Vinyl Chloride	12	ND	27	ND	ND	ND	ND	ND	18	ND	NA	31	NA	NA	NA
1,1-Dichloroethane	12	ND	12	ND	6J	5	ND	36	ND	ND	NA	ND	NA	20	20
1,2-Dichloroethylene	6	ND	6	ND	ND	ND	ND	ND	ND	ND	NA	79	NA	ND	ND
2-Butanone	ND	ND	ND	ND	68J	ND	110	ND	ND	ND	NA	ND	NA	NA	NA
Aluminum	ND	ND	ND	ND	1130	ND	ND	445J	ND	ND	NA	ND	NA	NA	NA
Calcium	18000	9700J	21100	7140	16800	18400	6650	12000	26600	18200	NA	10700	NA	NA	NA
Iron	ND	3600J	ND	3430	1950	ND	3700	ND	ND	ND	NA	115	NA	NA	NA
Magnesium	5700	ND	5960J	ND	5610	5730	ND	ND	5570	ND	NA	ND	NA	NA	NA
Manganese	160	240J	167	207	123	155	223	336	2500	823	NA	52.5	NA	NA	NA
Mercury	0.22J	ND	0.23	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	NA	NA
Sodium	7500	17000J	5410	14000	8040	ND	17800	36700	16100	10800	NA	35100	NA	NA	NA
Zinc	ND	ND	ND	ND	25.3	ND	ND	ND	ND	ND	NA	ND	NA	NA	NA
Bicarbonate	NA	NA	ND	ND	NA	NA	NA	NA	NA	NA	43	74	100	NA	NA
Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.3	29	24	NA	NA
Sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.9	8.8	6.2	NA	NA

Notes:

All concentrations in μg/L except bicarbonate, chloride, and sulfate which are in mg/L.
Sample locations are shown in Figure 1-2.

μg/L = micrograms per liter
mg/L = milligrams per liter
J = estimated concentration
ND = not detected
NA = not analyzed

W0069436T/3

TABLE C-2
SUMMARY OF GROUNDWATER ORGANIC ANALYSES (1993)

INTERIM RECORD OF DECISION: SITE 9
NAS BRUNSWICK

		SOUTH OF NEPTUNE DRIVE							NORTH OF NEPTUNE DRIVE		
	CRQL	*LT-901 3/18/93	MW-904 2/4/93	MW-906 2/4/93	MW-907 2/4/93	MW-908/DUP 2/4/93	MW-909 2/4/93	MW-910 2/4/93	MW-914 3/18/93	MW-915/DUP 3/18/93	MW-916 3/18/93
VOCs (µg/L)											
Vinyl Chloride	10	ND	8J	ND	9J	ND/2J	ND	ND	ND	10J/8J	ND
1,1-DCA	10	ND	ND	ND	2J	ND	ND	ND	ND	1J/1J	ND
1,2-DCE	10	ND	1J	4J	1J	ND	ND	ND	ND	ND	ND
Toluene	10	1J	ND	ND	ND	ND	ND	ND	ND	ND	ND
SVOCs (µg/L)											
PAHs (Total)		30J	5J	12J	1J	ND/ND	1J	ND	4J	3J/ND	ND
Pest/PCB (µg/L)		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

J = Estimated Value
LT = Leachate
DUP = Duplicate Sample
MW = Monitoring Well
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound
Pest/PCB = Pesticides/Polychlorinated Biphenyl
µg/L = micrograms per liter
ND = not detected
CRQL = Contract Required Quantitation Limit
* = LT-901 is a leachate water sample and not a monitoring well water sample

W0069436T/4

TABLE C-3
SUMMARY OF GROUNDWATER INORGANIC ANALYSES (1993)

INTERIM RECORD OF DECISION: SITE 9
NAS BRUNSWICK

		SOUTH OF NEPTUNE DRIVE									NORTH OF NEPTUNE DRIVE			
ANALYTE	CRDL (µg/L)	*MCL (µg/L)	**MEGS (µg/L)	*LT-901 3/18/93 (µg/L)	MW-904 2/4/93 (µg/L)	MW-906 2/4/93 (µg/L)	MW-907 2/4/93 (µg/L)	MW-908/DUP 2/4/93 (µg/L)	MW-909 2/4/93 (µg/L)	MW-910 2/4/93 (µg/L)	MW-914 3/18/93 (µg/L)	MW-915/DUP 3/18/93 (µg/L)	MW-916 3/18/93 (µg/L)	BKG. CONC. OF INORG./NASB (µg/L)
Aluminum	200	50-200 S	1,430	4,940	ND	ND	ND	ND	241J	ND	5,510	1,910/1,830	ND	652
Antimony	60	6	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-
Arsenic	10	50 R	-	9.4J	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.8
Barium	200	2,000	1,500	64.4J	ND	ND	ND	ND	ND	ND	229	443/441	46.4J	17
Beryllium	5	4	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-
Cadmium	5	5	5	ND	ND	ND	ND	ND	ND	ND	6.4	ND	ND	-
Calcium	5,000	-	-	16,700	18,400	14,100	40,300	24,100/25,700	2,140J	4,180J	33,800	51,300/51,300	22,000	18,000
Chromium	10	100	100	16.3	ND	ND	ND	ND	ND	ND	9.9J	ND/4.3J	ND	6.3
Cobalt	50	-	-	7.8J	ND	ND	ND	ND	ND	ND	ND	ND	ND	8
Copper	25	1,300 T	-	23.1J	ND	ND	ND	ND	ND	ND	ND	ND	ND	4
Iron	100	300S	-	7,190J	ND	314J	ND	ND	360J	ND	30,100J	12,000J/12,100J	220J	4,430
Lead	3	15 T	20	32.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Magnesium	5,000	-	-	2,180J	5,520	4,310J	5,530	3,000J/2,990J	775J	709J	3,050J	4,490J/4,500J	2,290J	8,300
Manganese	15	50 S	200	219	183	56.7	6,720	609/689	22.8	27.8	230	991/1010	14.7J	570
Mercury	0.2	2	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.11
Nickel	40	100	150	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-
Potassium	5,000	-	-	3,040J	ND	2,190J	2,460J	2,630J/2,470J	ND	ND	3,570J	7,430/7,430	3,920J	4,800
Selenium	5	50	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-
Silver	10	100 S	50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-
Sodium	5,000	-	-	711,000	6,240	35,400	16,200	15,100/16,200	4,030J	2,550J	4,100J	27,900/27,900	58,800	52,500

W0069436T/5

TABLE C-3
SUMMARY OF GROUNDWATER INORGANIC ANALYSES (1993)

INTERIM RECORD OF DECISION: SITE 9
NAS BRUNSWICK

				SOUTH OF NEPTUNE DRIVE							NORTH OF NEPTUNE DRIVE			
ANALYTE	CRDL (µg/L)	+MCL (µg/L)	++MEGS (µg/L)	*LT-901 3/18/93 (µg/L)	MW-904 2/4/93 (µg/L)	MW-906 2/4/93 (µg/L)	MW-907 2/4/93 (µg/L)	MW-908/DUP 2/4/93 (µg/L)	MW-909 2/4/93 (µg/L)	MW-910 2/4/93 (µg/L)	MW-914 3/18/93 (µg/L)	MW-915/DUP 3/18/93 (µg/L)	MW-916 3/18/93 (µg/L)	BKG. CONC. OF INORG./NASB (µg/L)
Thallium	10	2	0.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.1
Vanadium	50	-	-	11.0J	ND	ND	ND	ND	ND	ND	6.2J	ND	ND	9.2
Zinc	20	5,000 S	-	195	8.8J	6.9J	13.8J	ND/8.1J	10.4J	7.9J	ND	ND	ND	105
Cyanide	10	-	154	11.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	-

Notes:

CRDL = Contract Required Detection Limit
µg/L = micrograms per liter
MW = monitoring well
DUP = duplicate sample
ND = not detected
J = estimated value
LT = leachate
* = LT-901 is a leachate sample and not a monitoring well sample
+ = According to Safe Drinking Water Act (SDWA), U.S. Environmental Protection Agency (USEPA), 1992, Fact Sheet: Drinking Water Regulations and Health Advisories. Office of Water, Washington, D.C., December, 1992.
++ = Maximum Exposure Guideline, as established in the Maine Drinking Water Rules (10-144A CMR - Chapters 231-233).
R = Under Review
S = Secondary Drinking Water Standard
T = Based on Treatment Technique. Value given is an action level.
- = Value not available

MW-916 BORING LOG

NASB Field Boring Log

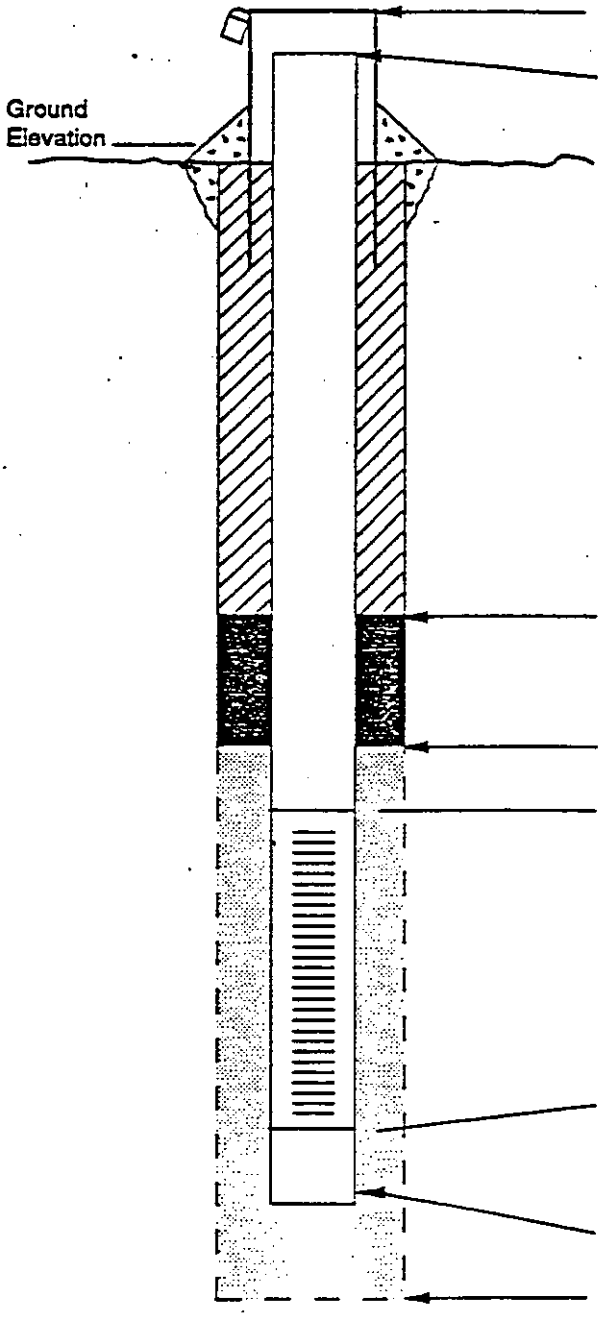
			Boring No.: MW-916
Client: U.S. Navy, Brunswick		Project No. 727-09	Protection: D
Contractor: NHB	Date Started: 3-4-93		Completed: 3-4-93
Method: HSA/~~CASING~~	Casing Size: (ID) 4.25" HSA		PI Meter: TE
Ground Elev.:	Soil Drilled: 17'		Total Depth: 17'
Logged by: TL	Checked by:		▽ Below Ground: ~9
Screen: 10 (ft.)	Riser: 9 (ft.)	Diam: 2 (ID)	Material: PVC	Page 1 of: 1

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	LAB ANALYSES	PEN/RECOVERY	PID (ppm)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN.	WELL DATA	ELEVATION (FT.)
2										
4	S-1	X		2.0/1.3	0	FILL OVER OLD TOPSOIL - BLACK TO TAN FILL, FINE SAND, LOOSE, MOIST TO DRY OVER BRIGHT ORANGE-YELLOW FINE CLEAN SAND, LOOSE, MOIST	SP	6 6 6 8		
6										
8										APPROX
10	S-2	X		2.0/1.1	0	OLIVE GRAY W/ RUSTY RED LENSES IN A SATURATED, FINE SAND, V. WELL SORTED, TRACE SILT, LOOKS NATURAL	SP	6 8 8 10		
12										
14	S-3	X		2.0/1.5	0	GRAY BROWN MICACEOUS SAND, SATURATED, VERY WELL SORTED, CLEAN	SP/SM	5 4 3 3		
16										
						B.O.B. @ 17'				

PROPORTIONS	(-) AMOUNT (+)	ABBREVIATIONS		
Trace (tr)	0-10%	f = fine	gr = gray	S = Split Spoon
Little (ll)	10-20%	m = medium	bn = brown	T = Thin Wall Tube Sample
Some (so)	20-35%	c = coarse	blk = black	V = Vane Shear Test
and	35-50%			

MONITORING WELL CONSTRUCTION DIAGRAM

Project NASB Site SITE 9 Driller NHB / J. MICHMUD
Project No. 7127-09 Boring No. MW-916 Drilling Method HSA
Elevation _____ Date Installed 3-4-93 Development Method DRILL PUMP



Elevation of Top of Surface Casing: _____
Stick-up of Casing Above Ground Surface: _____
Elevation of Top of Riser Pipe: _____
Type of Surface Seal: CONCRETE
Type of Surface Casing: STEEL

ID of Surface Casing: 4"

Diameter of Borehole: 4.25" HSA

Riser Pipe ID: 2"
Type of Riser Pipe: PVC

Type of Backfill: CONCRETE FROM 0'-3' BGS

Elevation of Top of Seal: _____
Depth of Top of Seal: 3'
Type of Seal: PURE GOLD BENT. CHIPS

Elevation of Top of Sand: _____
Depth of Top of Sand: 5'
Elevation of Top of Screen: 7'
Depth of Top of Screen: _____

Type of Screen: PVC
Slot Size x Length: 10' x 0.01"
ID of Screen: 2"

Type of Sandpack: POOL FILTER SAND

Elevation of Bottom of Screen: _____
Depth of Bottom of Screen: 17'
Depth of Sediment Sump with Plug: N/A

Sediment Sump with Plug

Elevation of Bottom of Borehole: _____
Depth of Bottom of Borehole: 17'

9301C2CO

ABB Environmental Services, Inc.

REGULATORY/TRC COMMENTS ON

DRAFT DOCUMENT AND NAVY RESPONSES

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
J.F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203-2211

August 3, 1994

Mr. Fred Evans
Department of the Navy
Northern Division
Naval Facilities Engineering Command
10 Industrial Highway, Mailstop 82
Lester, PA 19113-2090

Re: Draft Workplan Site 9 Neptune Drive Disposal Site
NAS Brunswick
June 1994

Dear Fred:

The United States Environmental Protection Agency (EPA) has reviewed the above referenced document. The EPA's comments are found in Attachment I of this letter.

The EPA would like to clarify that although this workplan does not cover or only briefly references additional work in the vicinity of Site 9 (i.e., Neptune Drive reconstruction and NEX monitoring), the Navy should ensure that any relevant additional information be incorporated into the forthcoming investigation report.

Should you have any questions regarding the EPA's comments, please feel free to call me at (617) 223-5521.

Sincerely,

Robert Lim

Robert Lim, Remedial Project Manager
Federal Facilities Superfund Section

Attachment

cc. Steve Mierzykowski/USFWS
Nancy Beardsley/MEDEP
Jim Caruthers/NASB
Elizabeth Walter/ABB-ES (w/ disk)
Susan Weddle/BASCE
Carolyn LePage/Gerber, Inc.
Sam Butcher/Harpswell Community Rep.
Rene Bernier/Topsham Community Rep.

PRINTED ON RECYCLED PAPER

ATTACHMENT I

The following are the EPA's comments pertaining to the document entitled Draft Workplan Site 9 Neptune Drive Disposal Site dated June 1994.

1. Page 3-2, Figure 3-1: Either in the final workplan or the investigation report documenting the fieldwork, the EPA suggests that this figure should be expanded and revised to present existing monitoring wells and sampling locations.

2. Page 3-6, ¶ 1: This paragraph states that the new groundwater monitoring wells will complement the wells installed as part of the Naval Air Station investigation of the Naval Exchange (NEX) gas station. The relationship between these wells needs to be expanded upon, and Figure 3-1 should show the gas station and the associated wells.

3. Page 3-8, Figure 3-2: The figure should state that either a Bentonite Slurry Seal or a Bentonite Pellet Seal will be used.

4. Page 3-8, Figure 3-2: Notes J and K need to be reversed.

5. Page 3-11, Section 3.2.4 Soil and Groundwater Sampling: For groundwater sampling, Appendix A in the QAPP of the LTMP for Bldg 95, Sites 1 and 3, and the Eastern Plume needs to be cross-referenced. As a matter of technically, the 900 series monitoring wells at Site 9 are part of the long-term monitoring program and the new wells are part of the additional investigations.

6. Page 3-13, ¶ 1: The text states that samples will be taken from the desired sampling depth. The text should be expanded to explain how the depth will be determined.

7. Page 4-1, Section 4.1: The listed analytical references are incorrect and inconsistent.
   a) The reference to the 3/90 CLP SOW as ILM02.0 is incorrect and should be reference as OLM01.0. However, several updates of this method have been released to correct problems with this initial version. It is recommended that a version more recent than the 3/90 CLP SOW be utilized for organics analysis.
   b) Does the reference to the October 1992 CLP SOW for volatile and PCB/pesticide analysis refer to the low concentration 10/92 CLP SOW?
   c) Provide method references for analysis of soils for VOCs or PCB/pesticides.
   d) Program summary contains incorrect references to CRQLs and CRDLs. CRDL only applies to inorganic analyses. CRQL only applies to organic analyses.

8. Page 4-2, Table 4-1:

a) The table does not provide CRQLs, CRDLS or reporting limits for soil samples.
b) The reference in the table to the inorganic 3/90 CLP SOW appears incorrect. Note that the CLP SOW methods require reporting inorganic results to the instrument detection limit (IDL) not just the CRDL which is listed in Table 4-1. The IDLs are laboratory and instrument specific. Due to this, IDLs cannot be readily listed in a table such as this. The text or table should indicate whether quantitation to the CRDL only will be required or whether the results will be reported to the IDL. By listing the CRDL only and with no reference to the IDL, it could be assumed that results would only be reported to the CRDL. It is recommended that results be reported down to the IDL with appropriate CLP qualifiers indicating results below the CRDL, but above the IDL.
c) The references to the vinyl chloride, fuel oil, and gasoline analysis methods do not provide sufficient detail since none of these methods can be considered routine as many of the CLP SOW analyses. For non-routine analyses, it is recommended that the workplan should provide some general information concerning the methods. The reference to the vinyl chloride method as "SIM & MOD.601" appears to combine two distinctly different methods. Low level vinyl chloride can be detected by GC/MS in the selected ion monitoring (SIM) mode and also by the GC/ELCD Method 601. However, the methods are distinctly different with completely different technical and quality control requirements. The references to "4.1.2" and "4.2.1" in relation to fuel oil and gasoline analysis, respectively, are not clear. Petroleum analysis methods are not standardized and are performed in various ways using different instrumentation based on the goals of the analysis, intended use of the data, and DQO level. Please provide complete references and additional detail of these methods.

9. Page 4-3, Section 4.2 Data Quality Objectives: The listing of DQOs Level A and D do not appear to include the low level vinyl chloride, fuel oil, or gasoline analyses included in Table 4-1 since the Level D definition specifies "USEPA CLP methods." Since no CLP methods are available for these analyses, the appropriate DQO level for these non-CLP methods should be included in this discussion.

RESPONSE TO USEPA'S COMMENTS DATED AUGUST 3, 1994

General Comment: The Navy will provide a detailed description of the site history and relevant additional investigations conducted near Site 9 in the investigation report that will be prepared following the additional work at this site.

1. Figure 3-1 has been revised to include the NEX wells. The Navy is in the process of having the NAS surveyed and the data placed onto a CADD system. Data regarding the monitoring wells and sampling locations at Site 9 and surrounding areas will be included in this database. The Navy anticipates that this information will be available for inclusion into the investigation report.

2. Figure 3-1 has been revised to include the NEX station.

3. Figure 3-2 has been modified to state that either a bentonite pellet or slurry seal will be used.

4. Notes J and K have been reversed on Figure 3-2.

5. Reference to the QAPP from the LTMP for Building 95, Sites 1 and 3 and Eastern Plume has been included in the text.

6. The Navy has received a copy of USEPA Region I Groundwater Sampling Procedures for Low Flow Purge and Sampling and is in the process of reviewing this document to determine its applicability to this workplan. If this procedure is determined to be applicable to conditions at NAS Brunswick, the Navy will adopt the guidance. Changes to the workplan will be reflected in the final document. There is no change to the current text.

7a. The reference has been corrected.

7b. The October 1992 CLP SOW does refer to the low concentration 10/92 CLP SOW.

7c. The method references have been provided.

7d. The CRDLs/CRQLs have been corrected.

8a. The CRQLs/CRDLs have been added to the table.

8b. The text has been corrected.

8c. Low level vinyl chloride analysis will be conducted using a GC/MS in the selected ion monitoring mode. The fuel oil analysis will be conducted using method MDEP 4.1.2. This information has been included in the text.

9. The DQO's for fuel oil and vinyl cholride have been added to the text.

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JOHN R. McKERNAN, JR.
GOVERNOR

DEAN C. MARRIOTT
COMMISSIONER

DEBRAH RICHARD
DEPUTY COMMISSIONER

August 2, 1994

Mr. Fred Evans
Project Manager, Code 1821
Department of the Navy, Northern Division
Naval Facilities Engineering Command
10 Industrial Highway, Mailstop 82
Lester, Penn. 19112-2090

RE: **Draft Work Plan Site 9 Neptune Drive Disposal Site, dated June 1994, Brunswick Naval Air Station, Brunswick, Maine**

Dear Fred:

The Department has received and reviewed the Draft Record of Decision for an Interim Remedial Action at Site 9 for NAS, Brunswick dated June 1994. The Department's comments are provided below.

General Comments

1. Please be reminded that a Maine Certified Geologist(MCG) must sign and stamp all reports and work plans that require geologic interpretation, i.e.; placement of monitoring wells, interpretation of analytical groundwater data, groundwater monitoring, plume delineation, source identification, etc.

Specific Comments

2. Page 1-4,¶ 2, last sentence: It is my understanding that the Navy did not conduct additional field investigations in 1993 to support remedial designs at Site 9. The investigations conducted in 1993 focused on delineating and characterizing the ash disposal area, which included placing monitoring wells north of Neptune Drive. Please rewrite this sentence.

3. Page 3-4, Exploration Methods: Please include a more complete description of the site history and provide the rationale for conducting the additional studies described in the Work plan. A good site history is included on pages A.2-1-2-3, and 2-5.

4. Page 3-4, Exploration Methods: The Department recommends that in addition to the proposed exploration methods, that

AUGUSTA
STATE HOUSE STATION 17
AUGUSTA, MAINE 04333-0017
(207) 287-7688 FAX: (207) 287-7826
OFFICE LOCATED AT RAY BUILDING, HOSPITAL STREET

PORTLAND
312 CANCO ROAD
PORTLAND, ME 04103
(207) 879-6300 FAX: (207) 879-6303

BANGOR
106 HOGAN ROAD
BANGOR, ME 04401
(207) 941-4570 FAX: (207) 941-4584

PRESQUE ISLE
1235 CENTRAL DRIVE, SKYWAY PARK
PRESQUE ISLE, ME 04769
(207) 764-0477 FAX: (207) 764-1507

printed on recycled paper

the Navy collect at least two additional groundwater samples near the landfill using a direct push method near MW-914 and 915, at discrete zones above the clay layer and below the bottom of the existing wells. The purpose of this request is to characterize the concentrations throughout the saturated zone. The Department does not believe that our comments regarding the characterization of the ash disposal area have been adequately addressed (Navy response to 12/8/93 letter, Responses 10A, 10D, 10E.). The Department agrees that the ash disposal area has been fully delineated, but not that it has been characterized. There is still a lingering concern that the existing monitoring wells may not be capturing groundwater contamination leaching from the disposal area. This concern is not based on the suspected presence of DNAPL in the disposal area.

5. Page 3-5, Section 3.2.1, Soil Boring(s): Three soil borings, detailed below, must be installed; one near MW-914, one near T-23, and one for the proposed background well north of MW-916.

A. The Navy stated in their responses to the Department's December 8, 1994 comments that they will place a soil boring at MW-914. The Navy must collect continuous split spoon samples from this boring. Soil analyses for all borings must include fuel oil in soil (MDEP 4.1.2).

B. The boring near T-23 should be placed within 2 feet of T-23. The soil boring must collect continuous split spoon samples from the surface to 17 feet below land surface. Seventeen feet is the total depth of MW-916. The purpose of this boring is to characterize all of the contaminants present in the subsurface near T-23. The proposed sampling interval will not meet this objective.

C. Since there will be no test pit dug near the proposed well north of MW-916, a soil boring must be installed at this location. Continuous split spoon sampling must be collected.

6. Page 3-5, Section 3.2.1, Soil Boring: The Navy must present clear Data Quality Objectives(DQOs) for the proposed subsurface soil sampling. The DQOs must include <u>minimum</u> sample recoveries required to meet the characterization objectives. The text must present alternative technologies for when the DQOs cannot be achieved. Previous split spoon samples within the ash material have had poor sample recoveries (B-911, 912, and 9-13). B-911 recovered 3.5 feet of sample from between 5 and 17 feet bgs. B-912 recovered 4.1 feet from between 7 and 16 feet bgs. B-913 recovered 4.4 feet of sample from between 7 and 15 feet bgs. Soil recoveries within the landfill were insufficient (41.38%) for characterization.

7. Page 3-5, Section 3.2.1: Petroleum products originating from the NEX gas station located upgradient of Site 9 are anticipated to be contaminants of concern north of Building 216. Laboratory testing of all samples for petroleum products should follow the State of Maine methods as approved by the Health and Environmental testing Laboratory for Chapter 691. Copies of these methods can be provided upon request.

8. Page 3-6, Section 3.2.2, Monitoring Well Installation: Describe the rationale for the monitoring well locations and the objectives for placing the wells in the proposed locations.

9. Page 3-6, Section 3.2.2: Although not clearly stated in the text, it is assumed that test pits are meant to replace borings for the monitoring well location west of Building 212 and southwest of Building 216. Apparently neither test pits nor borings are proposed for the monitoring well location north of MW-916. As stated in comment # above, a boring must be installed at the location north of MW-916. As for the other two proposed locations, test pits can be substituted for continuous split spoon sampling provided that three conditions are met. First, the monitoring well must be located within 25 feet of the test pit. Second, the testpits must allow for sampling and a description of the geology to a depth equal to the maximum depth of the proposed monitoring well. Third, because of the potential geologic variability present in a trench, for elongated testpits and trenches, the field geologist must clearly document lithologic changes along the trenches. The field geologist must note the strike of lithologic units and any contaminated zones.

10. Page 3-7, ¶ 1: Include the factors to be considered in chosing appropriate screen lengths. How will water table wells influence dissolved phase concentrations of highly volatile compounds?

11. Page 3-9, Section 3.2.3, Test Pitting: Describe the rationale for placing the test pits in the proposed locations. Include the objectives for installing these test pits.

12. Page 3-9, Section 3.2.3, Test Pitting: Further describe the "dump area" and "old drain pipe" and their histories, if known. Include an explanation as to why they are included as potential source areas.

13. Page 3-9,¶ 2: The workplan should include specific DQOs for the test pit excavation and sampling program. Describe the target depths for the excavations. Describe how the

sampling will proceed if obstructions are found. Describe how sampling will proceed if the testpits do not allow for discrete zone sampling. Describe how the presence of groundwater will affect sample recoveries and test pit depths.

14. Page 3-12, ¶ 2: Groundwater Samples: Field personnel must monitor the water level during purging to make sure screens are not de-watered.

15. Page 3-12, ¶ 2: The workplan must include DQOs for groundwater sampling procedures. The workplan must include stabilization criteria for pH, temperature, DO, turbidity, specific conductance, and water table level. The workplan must describe alternative purging techniques if the stabilization of each parameter is not achieved.

16. Page 3-13, ¶ 1, third sentence: Please include the proposed sampling depth for the groundwater samples. Will the sampler target the bottom of the well screen or the water table?

17. Page 4-3, Data Quality Objectives: DQOs apply to all aspects of the sampling program, not just to the chemical aspects of the laboratory analyses.

18. Page 4-3, last paragraph, first sentence: It's picayune, but "ion" should be "on".

19. Appendices, References: The list of referenced material must include the Department's December 8, 1993 letter and the Navy's responses to that letter, dated July 19, 1994.

Please call with any questions or comments.

Sincerely,

Nancy Beardsley

Nancy Beardsley
Project Manager, Federal Facilities Unit
Office of the Commissioner

pc: Robert Lim, USEPA
Jim Caruthers, NAS Brunswick
Carolyn Lepage, R.G. Gerber Inc.
Beth Walter, ABB ES
Rene Bernier, Topsham
Sam Butcher, Harpswell
Susan Weddle, Brunswick
Topsham Water District
Steven Mierzykowski, USFW
Mark Hyland, MDEP

RESPONSE TO MEDEP COMMENTS DATED AUGUST 2, 1994

1. A Maine Certified Geologist will stamp the final workplan.

2. The sentence has been rewritten to include "..and to better characterize the ash landfill/dump area north of Neptune Drive."

3. A summary of the site history has been included in this section which provides the Navy's rationale for conducting additional field investigations at this Site.

4. The Navy agrees to collect two groundwater samples near the landfill area. Each sample will be collected from the zone between the bottom of the existing well (i.e., MW-914 and MW-915) and above the clay layer. The water samples will be collected using a HydroPunch or similar type of device. This method uses a conventional drill rig and therefore, will enable the Navy to collect the sample without having to mobilize additional equipment.

5. A total of five soil borings will be installed as part of the additional source investigations; three associated with monitoring wells and two test borings to characterize subsurface conditions located near T-32 and MW-914.

5a. Continuous split spoon samples will be collected from each boring and subsurface conditions logged by a geologist. The Navy agrees to analyze all soil samples for fuel oil using MEDEP method 4.1.2 or equivalent. Please note that soil and water samples will not be analyzed for PCBs/pesticides.

5b. The soil boring to be installed near T-23 will be located within two feet of this sampling location and extend to 17 feet bgs.

5c. A soil boring will be installed at the location north of MW-916 as part of the installation of this new "upgradient" well. Continuous split spoon samples will be collected during the installation of this boring and subsurface conditions logged by a geologist.

6. Additional text has been provided stating the DQOs for sample recovery. However, the Navy expects to obtain sufficient sample for proper characterization based on sample recoveries from MW-914 and MW-916 (located near T-23).

7. Soil samples will be analyzed for TCL VOCs, SVOCs and TAL inorganics using stated USEPA methods and will be analyzed for fuel oil using MDEP method 4.1.2 or equivalent. Soil samples will not be analyzed for PCBs and pesticides.

8. The rationale and objectives for the three proposed monitoring wells have been included in the text.

9. Soil borings are proposed for each of the three monitoring wells. Continuous split-spoon samples will be collected from each boring and the subsurface conditions logged by a geologist. Test pits were not proposed to replace soil borings. The text has been clarified.

10. The Navy proposes water table wells at the three monitoring well locations. These will complement the NEX monitoring well network and are consistent with the monitoring wells installed as part of the IR Program. As stated in the text, it is anticipated that 5 to 10 foot well screens will be used and these screens will be placed based on PI reading and to accommodate seasonal fluctuations in the water table. The text has been changed to clearly identify that these are water table wells.

The sampling of these wells will have the same ability/inability to detect highly volatile compounds as all other wells at the site (i.e., the Navy is not proposing anything different for this work plan than was proposed and conducted as part of previous investigations). Please note that samples are collected only after purging is completed and therefore, samples should reflect in-situ conditions.

11. The objectives and rationale for the test pits have been added to the text.

12. The "dump area" and "old drain pipe" have been described in more detail.

13. Additional text has been added clarifying the DQOs for test pitting activities.

14. Monitoring water levels during purging has been included in the text.

15. The Navy has received a copy of USEPA Region I Groundwater Sampling Procedures for Low Flow Purge and Sampling and is in the process of reviewing this document to determine its applicability to this workplan. If this procedure is determined to be applicable to conditions at NAS Brunswick, the Navy will adopt the guidance. Changes to the workplan will be reflected in the final document. There is not change to the current text.

16. Please see response to Comment 15.

17. Comment noted. DQO's for sampling are included in the earlier portions of the workplan.

18. Comment noted. Spelling has been corrected.

19. The MEDEP's letter of December 8, 1993 and the Navy's response to this letter have been included in the reference section.

BACSE

Brunswick Area Citizens for a Safe Environment

P.O. Box 245 Brunswick, Maine 04011 (207)725-1330

August 6, 1994

To: Fred Evans
U.S. Navy Northern Division
Fax 610-595-0555

Dear Mr. Evans,

Please find enclosed Review of Draft Work Plan, Site 9, prepared by our Consultant Firm Robert G. Gerber, Inc.

Should you have questions regarding this material please contact Carolyn Le Page at 207-865-6138.

Sincerely,
Pookie Rafferie
Secretary

Our comments on the draft *Work Plan* are as follows:

1. **Page 1+.** It is not clear how the activities described in the subject document relate to the interim remedial action for groundwater at Site 9 or the investigations at the Naval Exchange (NEX) gasoline station. The Introduction (or other appropriate section) should provide an explanation of the various environmental investigations being conducted at Site 9 and the NEX, and how the data generated will be used to develop a final Record of Decision (ROD). We also recall that roadwork would be conducted along Neptune Drive this summer. At one of the TRC meetings we attended, it was suggested that the Navy take advantage of the opportunity to observe subsurface conditions in the middle of Site 9, but there is no mention of the Neptune Drive construction activities in the *Work Plan*.

2. **Page 1-3.** Why is ABB-ES' corporate *Health and Safety Plan* (HASP) incorporated by reference. The site-specific HASP should be a stand-alone document as any personnel, including non-ABB-ES people, intending to enter the exclusion zone during site investigations must sign off on the site-specific HASP, not the corporate HASP. As we do not have copies of either the ABB-ES corporate HASP or the 1988 *Quality Assurance Program Plan* (QAPP), we are not able to provide any comments relating to those two documents. Also, given the date of the QAPP, is it time to review and possibly revise the document.

3. **Page 1-5.** The sentence at the top of the page appears to be incomplete.

4. **Page 2-1.** The second *Work Plan* objective listed in Section 2.1 is to "summarize procedures for conducting field activities." Where will the details of the procedures be described.

5. **Page 2-1.** The date of the corporate HASP is given as 1990 on page 1-3 and 1985 on page 2-1. Which date is correct. Comment 2 also applies to Section 2.2 regarding referring to more than the site-specific HASP.

6. **Page 2-3.** Who will be responsible for approving the field exploration locations. Who will be responsible for notifying DigSafe.

7. **Page 2-5.** Where will the wastes placed in the on-site dumpsters be disposed. How will drill cuttings be handled.

8. **Page 3-3.** Who will be responsible for notifying DigSafe.

9. **Page 3-5.** The reference containing the documentation regarding the fuel odor at T-23 should be cited. Given the concerns with the fuel odors, split spoon sampling should be continuous at the soil boring proposed for this location. Soil samples should be field-screened for volatile organic compounds with the photoionization (PI) meter, and the sample with the highest reading

and/or the most visible signs of contamination should be sent to the laboratory for analysis. If there is no response with the PI meter and no visual evidence of contamination, the sample from 8 to 10 feet bgs (below ground surface) should be analyzed. Additional information concerning the PI meter field screening method should be provided. Are there any plans to install a monitoring well at the soil boring location described in Section 3.2.1. If not, why not.

10. Page 3-6. It is not clear how the three proposed wells will "complement" the Naval Exchange (NEX) wells. A map showing the locations of the monitoring wells installed as part of the NEX gasoline station investigation, along with the existing and proposed Site 9 monitoring wells would be very helpful. It is also not clear why the three new monitoring wells are in the locations proposed. What are the three wells intended to monitor. Additional information concerning the drilling method and soil sampling procedure is needed. While the final placement of the well screen will be decided in the field, are the proposed wells intended to monitor the phreatic surface.

11. Page 3-7. Additional information concerning the field screening with the PI meter that will be used to determine the placement of the well screen. The second paragraph should include information to clarify what material will be placed above the seal located above the sandpack. How will the well riser and protective casing be vented.

12. Page 3-9. As with comment 10 above, the rationale for excavating test pits at the four proposed locations is not clear. What is the goal of the test pitting. Additional information concerning the PI meter headspace screening method should also be presented.

13. Page 3-10. What happens to the drums of cleaning fluids with PI readings in excess of 5 ppm (parts per million) above background after they've been transported to the NAS Brunswick Defense Reutilization and Marketing Office.

14. Page 3-12. In order to minimize the loss of volatile organic compounds (VOCs) during the sampling process, the portion of the soil sample used for the PI meter headspace screening should have minimal exposure to the air. It appears that the process of "homogenizing" the soil sample will enhance the loss of VOCs. What are the criteria for selecting one soil sample per test pit for laboratory analysis.

15. Page 3-12. A map showing the Site 9 monitoring wells and the NEX gasoline station monitoring wells is needed. Will the point-source bailers also be used to purge the wells. What are the criteria for determining when in situ parameters monitored during purging are considered "stabilized".

16. Page 3-13. The well depth and condition should also be checked and recorded during the sampling event.

ROBERT G. GERBER, INC.

17. **Page A.1-3.** Who are the Health and Safety Manager and the Health and Safety Supervisor.

18. **Page A.1-4.** The meaning of the first part of the first sentence in Section A.1.2.6 is not clear.

19. **Page A.1-5.** The medical surveillance requirements should be described in detail, rather than by reference, so that personnel reviewing the HASP prior to entering the site will know if they are medically qualified.

20. **Page A.2-1 - A.2-4.** Section A.2, entitled "Site Characterization and Analysis" covers the site location and history, but not the results of earlier environmental investigations and analytical results. This data should be summarized to provide the necessary background concerning potential risks at Site 9.

21. **Page A.2-5.** The description of how health safety hazards might be encountered should include the hazards associated with soil boring, well installation, and test pit activities.

22. **Page A.3-3.** How much will PI meter readings have to exceed background readings before personnel upgrade to Level C. The Action Levels should be clearly described.

23. **Page A.4-3.** There appears to be a typo on the last sentence of the first paragraph. The second sentence of the second paragraph should be deleted.

24. **Page A.6-2.** Which UV source will be used with the HNU. How will background levels be determined.

25. **Page A.6-3.** How is the Radiation Monitor 4 meter calibrated. The results of the radiation monitoring should be included in the data report.

26. **Page A.7-5.** The disposal of decontamination fluids described in Section A.7.3 is not the same as the procedures outlined on page 3-10

27. **Page A.10-4.** There is no Appendix F in our copy of the HASP.

28. **General Comment.** A number of issues should be included or expanded upon in order to consider the subject document complete. Several of these issues have been discussed at TRC and technical meetings or have been addressed in earlier correspondence between the Navy and other parties. The topics that should be addressed in the *Work Plan* include: the rationale for the number and placement of test pits, the boring, and the wells; the additional tasks, such as review of historical air photos and evaluation of nearby building uses, to identify potential upgradient sources; and, the relationship of this work plan to the interim ROD and the NEX gas station investigation. In addition, the *Work Plan* should also provide more information concerning the

ROBERT G. GERBER, INC.

specific field methods to be employed, what will be included in the data presentation and interpretation report, and when the report will be available. An additional community concern is that contaminants detected in the stream sediments at Site 9 be addressed in a timely and appropriate fashion.

Please do not hesitate to give us a call if you have any questions on the comments above.

Sincerely,
Robert G. Gerber, Inc.

Carolyn A. Lepage

Carolyn A. Lepage, C.G.
Director of Operations

STATE OF MAINE
CAROLYN A. LEPAGE
#202
CERTIFIED GEOLOGIST

ROBERT G. GERBER, INC.

RESPONSE TO BACSE GROUP COMMENTS DATED JULY 27, 1994

1. The Navy is in the process of compiling this information and will provide a detailed description of the site history and relevant additional investigations conducted near Site 9 in the investigation report that will be prepared following the additional work at this site.

2. ABB-ES has prepared a corporate HASP and Health and Safety Procedure Manual that contains generic procedures that apply to all sites. The corporate HASP was revised in 1990. Because these documents refer to generic procedures they are only mentioned by reference in the workplan. The site-specific HASP is included as Appendix A to this workplan and will not be prepared as a stand alone document. The site-specific HASP will be located on-site. It will be the responsibility of any individual entering the exclusion zone to read and sign off on the site-specific HASP. Reference to the QAPP from the LTMP for Building 95, Sites 1 and 3 and Eastern Plume has also been included as a cross reference in Section 3 of the text.

The QAPP is available for review in the Administrative Record (Section 10 Volume I). Because the corporate HASP is a "generic" document that does not apply to the specific conditions at NAS Brunswick, it was not placed in the Administrative Record. A copy can be made available for review if requested.

3. This sentence has been reworded.

4. The word "summarize" has been replaced with "outline".

5. The phrase "and submitted to the Navy in September of 1985" has been deleted. ABB-ES updated its corporate HASP in 1990. The corporate HASP contains generic information and is therefore mentioned by reference only. The site-specific HASP is contained as Appendix A to the workplan.

6. The "approval" of the field sampling locations will occur with concurrence of the final workplan. Locations will be "cleared" by the NAS and DigSafe.

7. The wastes placed in the dumpsters are considered non-hazardous and as such will be disposed of by the NAS as part of their solid waste management program. Drill cuttings will be handled consistent with USEPA guidance "Management of Investigation-Derived Wastes During Site Inspections" and previous practices at NAS. In general, the cuttings will be placed back on or into the ground in a manner that does not worsen conditions.

8. The NAS will be responsible for notifying DigSafe.

9. The reference to the "fuel odors" is the Final Technical Memorandum and has been included in the text. Additional text has been added describing the field screening technique and process for selecting samples for off-site analysis.

Continuous split-spoon samples will be collected during the installation of each soil boring. Sample and reference samples will be collected and head space measurement will be collected using a PI meter to determine the sample for off-site analysis. This has been included in the text.

The Navy is not proposing to install a monitoring well at the soil boring near T-23. This location is immediately adjacent to the existing MW-916. The Navy is proposing to place a monitoring well north of MW-916.

10. Figure 3-1 has been revised to include the NEX wells. Additional information regarding the purpose and objective of the monitoring wells and sampling procedures have been included in the text. The proposed wells are intended to monitor the phreatic surface. The Navy is in the process of having the NAS surveyed and the data placed onto a CADD system. Data regarding the monitoring wells and sampling locations at Site 9 and surrounding areas will be included in this database. The Navy anticipates that this information will be available for inclusion into the investigation report.

11. The text has been clarified to state that the proposed wells are water table monitoring wells and therefore, the screens will be placed to straddle the water table which is approximately 9 feet bgs. Well screens on the monitoring wells installed as part of the IR Program were between 7 and 17 feet bgs. PI meter readings will be obtained and used to provide more precise screen placement, if necessary. The material to be placed above the sandpack is clean cuttings. This is the procedure that has been used at all the wells at NAS. The well riser has a vent hole and the protective casing is not air tight. This provides adequate ventilation.

12. The rationale and objectives for the test pits have been included in the text.

13. The drums will be transported to Building 45 and disposed of in accordance with the NAS RCRA disposal requirements.

14. The text has been changed to state: "Sample material will be obtained directly from the face of the excavation and placed in to containers for off-site analysis.". A reference sample will be collected and used for headspace measurements. The sample associated with the highest PI meter reading will be sent for off-site analysis.

15. Figure 3-1 has been revised to include the NEX wells.

The Navy has received a copy of USEPA Region I Groundwater Sampling Procedures for Low Flow Purge and Sampling and is in the process of reviewing this document to determine its applicability to this workplan. If this procedure is determined to be applicable to conditions at NAS Brunswick, the Navy will adopt the guidance. Changes to the workplan will be reflected in the final document. There is not change to the current text.

16. The well depth and condition of each well will be checked and recorded during each sampling event.

17. The HSM and HSS have not been identified at this time.

18. The first portion of this sentence has been deleted.

19. Reference to 29CFR1910.120 has been included in this section.

20. A new subsection titled "Previous Investigations" has been included within Section A.2. This subsection briefly summarizes the history of investigations at Site 9 and includes a summary of contaminants detected in the groundwater and soil.

21. Text has been added identifying the safety hazards associated with working around heavy equipment and open excavations.

22. PI meter reading that remain "steadily" above background is the action level for backing off and reevaluation site conditions. Reevaluation may include upgrade to Level C personal protection or implementation of engineering controls.

23. The typographical error has been corrected and the identified sentence deleted.

24. Reference to the HNU has been deleted. ABB-ES has been replacing HNU meters with Thermo Environmental Models 580A and 580B. Text has been revised to include reference to this meter. The TE uses both 10.0 and 11.8 eV lamps. The lamp strength of the meters will be established based on the availability of air monitoring equipment at the time of field sampling.

To establish background, the worker breathing zone at each sample site will be monitored before initiating any sampling activities. The initial reading will be considered background.

25. The Radiation Meter 4 is factory calibrated -- this is not an instrument that can be calibrated in the field. Any positive results of radiation monitoring will be included in the data report.

26. The text in Section A.7.3 has been revised to be consistent with the text on page 3-10.

27. The reference to Appendix F has been deleted from the text. The directions to the emergency medical facilities has been included in Appendix A.

28. Comment noted. Many of these issues have been addressed in the response to TRC comments. All data collected as part of this workplan will be submitted for TRC review. However, it is not possible at this time to provide additional information concerning the data presentation and/or report without having the data

available. A schedule for the investigation report will be prepared and submitted to the TRC.

REGULATORY/TRC COMMENTS ON DRAFT FINAL DOCUMENT

AND NAVY RESPONSES

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
J.F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203-2211

October 17, 1994

Mr. Fred Evans
Department of the Navy
Northern Division
Naval Facilities Engineering Command
10 Industrial Highway, Mailstop 82
Lester, PA 19113-2090

Re: Draft Final Workplan Site 9 Neptune Drive Disposal Site
NAS Brunswick
September 1994

Dear Fred:

The United States Environmental Protection Agency (EPA) has reviewed the above referenced document. The EPA's comments are found in Attachment I of this letter. Should you have any questions regarding the EPA's comments, please feel free to call me at (617) 223-5521.

Sincerely,

Robert Lim

Robert Lim, Remedial Project Manager
Federal Facilities Superfund Section

Attachments

cc. Steve Mierzykowski/USFWS
Nancy Beardsley/MEDEP
Jim Caruthers/NASB
Elizabeth Walter/ABB-ES (including guidance documents)
Susan Weddle/BACSE
Carolyn LePage/Gerber, Inc.
Sam Butcher/Harpswell Community Rep.
Rene Bernier/Topsham Community Rep.

PRINTED ON RECYCLED PAPER

ATTACHMENT I

The following are the EPA's comments pertaining to the document entitled **Draft Final Workplan Site 9 Neptune Drive Disposal Site** dated September 1994.

General Comments

1. The final workplan should identify the laboratory that will be conducting the laboratory analysis.

2. As presented in the workplan for the West Runway Area, this workplan should provide summary tables showing the laboratory analytical program. A copy of the summary table from the West Runway Area workplan is attached (see attachment II).

Specific Comments

3. Page 2-4, ¶ 2: For organic sample collection, isopropyl alcohol should also be used prior to the last deionized water rinse.

4. Page 3-18, ¶ 3: a) Regarding soil sampling from the backhoe bucket, the EPA suggests that the soil samples be collected from the center of the backhoe bucket to avoid contact with the bucket.

   b) Please specify the selection procedure for determining the "one soil sample per test pit and one soil sample from the soil boring" which will be sent for off-site laboratory analysis.

5. Page 3-19, ¶ 2: If a bailer will be used for groundwater sampling, text should identify material of support lines. In addition, support lines must not be constructed of any material that could cause contamination.

6. Page 3-20, ¶ 2: As well as in the summary table, please specify or reference in text the groundwater level measurement procedure.

7. Page 4-9, 2nd Bullet: The workplan specifies that vinyl chloride will be analyzed using a low level selective-ion-monitoring (SIM) method, however the EPA recommends the use of EPA Region 1 Special Analytical Services Method 524.2 and revisions for low concentration organics (see attachment III).

8. Page 4-10, ¶ 1: For your information and possible use, the EPA is providing the Navy and ABB-ES, Inc. with a copy of **Region I Tiered Organic and Inorganic Data Validation Guidelines**. This tiered approach has been recently developed by the region.

TABLE 3-1
LABORATORY ANALYTICAL PROGRAM

WEST RUNWAY STUDY AREA
SITE INSPECTION WORK PLAN
NAS BRUNSWICK

MEDIA	PARAMETER	METHOD	REFERENCE	CONTAINER REQUIREMENTS	PRESERVATION REQUIREMENTS	HOLDING TIME[1] LIMITS
Soil/Sediment	TCL VOCs	Purge & Trap GC/MS	3/90 SOW, OLM 01.8	4 oz, Glass, Teflon Cap	4°C	10 days
	TCL SVOCs	GC/MS	3/90 SOW, OLM 01.8	4 oz, Glass, Teflon Cap	4°C	10 days to Extraction, 40 days after Extraction
	TCL Pesticides/PCBs	GC/ECD	3/90 SOW, OLM 01.8	4 oz, Glass, Teflon Cap	4°C	10 days to Extraction, 40 days after Extraction
	TAL Elements	AAS/PES/CVAA	3/90 SOW, revised ILM 02.1 (9/91)	4 oz, Glass, Teflon Cap	4°C	6 months (30 days for mercury)
	TCLP VOCs	Purge & Trap GC/MS	USEPA Method 1311	4 oz, Glass, Teflon Cap	4°C	14 days
	TCLP SVOCs	GC/MS	USEPA Method 1311	4 oz, Glass, Teflon Cap	4°C	7 days to Extraction, 40 days after Extraction
	TCLP Pesticides/ Herbicides	GC/ECD	USEPA Method 1311	4 oz, Glass, Teflon Cap	4°C	7 days to Extraction, 40 days after Extraction
	TCLP Elements	AAS/PES	USEPA Method 1311	4 oz, Glass, Teflon Cap	4°C	6 months (28 days for mercury)
Seep/Surface Water	TCL VOCs	Purge & Trap GC/MS*	3/90 SOW Low Detection Limit (6/91)*	40 ml Vial (2), Glass Teflon-lined Septa	4°C, HCL	10 days (preserved)
	TCL SVOCs	GC/MS	3/90 SOW, OLM 01.8	1-liter Amber Glass	4°C	5 days to Extraction, 40 days after Extraction
	TCL Pesticides/PCBs	GC/ECD	3/90 SOW, OLM 01.8	1-liter Amber Glass	4°C	5 days to Extraction, 40 days after Extraction

continued

TABLE 3-1
LABORATORY ANALYTICAL PROGRAM

WEST RUNWAY STUDY AREA
SITE INSPECTION WORK PLAN
NAS BRUNSWICK

MEDIA	PARAMETER	METHOD	REFERENCE	CONTAINER REQUIREMENTS	PRESERVATION REQUIREMENTS	HOLDING TIME[1] LIMI
	TAL Elements	AAS/PES/CVAA	3/90 SOW, revised ILM 02.1 (9/91)	1-liter Plastic	4°C, HNO_3 pH<2	6 months (30 days f mercury)
	Temperature (field)	Thermometric	USEPA Method 170.1	N/A	N/A	N/A
	pH (field)	Potentiometric	USEPA Method 150.1	N/A	N/A	N/A
	Specific Conductivity (field)	Electronometric	USEPA Method 120.1	N/A	N/A	N/A
	Hardness	Colorimetric	USEPA Method 130.1	1-liter Glass	4°C, HNO_3 pH<2	6 months
	Turbidity (field)	Nephelometric	USEPA Method 180.1	N/A	N/A	N/A

Notes:

GC/MS = Gas Chromatography/Mass Spectrometry
SOW = USEPA Contract Laboratory Program, Statement of Work
GC/ECD = Gas Chromatography/Electron Capture Detection
AAS = Atomic Absorption Spectroscopy
PES = Plasma Emission Spectroscopy
TCL = Target Compound List
TAL = Target Analyte List
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound
PCB = Polychlorinated Biphenyl
* = 6/91 Statement of Work, "Superfund Analytical Methods for Low-Concentration Water for Organics Analysis"; USEPA Contract Laboratory Program; USEPA, 1991.
(1) = Holding times from date of receipt by the Laboratory (NEESA 20.2-047B, 1988)
TCLP = Toxicity Characteristic Leachate Procedure
CVAA = Cold Vapor Atomic Absorption

TABLE 3-2
SUMMARY OF PROPOSED LABORATORY ANALYTICAL PROGRAM

WEST RUNWAY STUDY AREA
SITE INSPECTION WORK PLAN
NAS BRUNSWICK

WEST RUNWAY STUDY AREA	LABORATORY ANALYTICAL PROCEDURES									
	SOIL/SEDIMENT SAMPLES					SEEP/SURFACE WATER SAMPLES				
	TCL VOCs	TCL SVOCs	TCL PEST./ PCBs	TAL INORGANICS	TCLP	TCL VOCs	TCL SVOCs	TCL PEST./ PCBs	TAL INORGANICS	HARDNESS
Subtotal	23	23	23	23	12	7	7	7	7	2
Field Duplicates	3	3	3	3	2	1	1	1	1	1
Sampler Blanks	3	3	3	3	N/A	1	1	1	1	1
Trip Blanks*	8	0	0	0	N/A	3	0	0	0	0
Source Water Blanks	3	3	3	3	N/A	1	1	1	1	1
MS/MSD Samples	2/2	2/2	2/2	2/2	2	2	2	2	2	2
Total	36	36	36	36	16	13	12	12	12	8

Notes:

VOC = Volatile Organic Compounds
TCL = USEPA Target Compound List
TAL = USEPA Target Analyte List
SVOCs = Semivolatile Organic Compounds
Pest = Pesticides
PCBs = Polychlorinated biphenyls
TCLP = Toxicity Characteristic Leachate Procedure
MS/MSD = Matrix spike/matris spike duplicate
N/A = Not applicable
* = Assumes up to three samples will be collected each day and sent off site in one cooler to the laboratory for analysis.

RESPONSE TO U.S. ENVIRONMENTAL PROTECTION AGENCY
COMMENTS DATED OCTOBER 17, 1994

General Comments

1. The laboratory cannot be selected until the Navy first establishes funding, awards the work to a contractor, and the analytical efforts are opened for competitive bids and subsequently awarded. This is the same process that has been followed for all prior IRP efforts at NAS Brunswick.

2. Summary tables for the laboratory analytical program will be generated and included in the final version of the Work Plan.

Specific Comments

3. Page 2-4, Para. 2: The decontamination procedure will be revised to include an isopropyl alcohol rinse prior to a final D.I. rinse.

4. Page 3-18, Para. 3: a) The text will be amended to note that at test pits dug with a backhoe, soil samples will be collected from the center of the bucket, if they cannot be obtained directly from the face of the excavation.

   b) The sample from each test pit or borehole selected for off-site laboratory analysis will be the one that has the highest apparent potential for contamination. This potential will be evaluated by PI meter readings, visual indications of contamination, odors, and/or proximity to any debris such as cans or drums.

5. Page 3-19, Para. 2: Bailer support lines will be either Teflon-coated steel or polypropylene. In either case, both the support line and bailer will be decontaminated after collection of each sample.

6. Page 3-20, Para. 2: The text will be expanded to specify that groundwater level measurements will be done with an electronic water level meter.

7. Page 4-9, 2nd Bullet: The reference to the SIM method has been changed to Method 524.2 in Table 4-1. This method will provide a detection limit for vinyl chloride of 0.17 ug/l.

8. Page 4-10, Para. 1: The Navy understands that the tiered approach is intended to save time and money, and appreciates notification of the existence of this guidance. At the time of this response letter, the Navy has not had sufficient time to complete a review of the procedure; however, this issue will be discussed with the TRC prior to validation of the samples to be collected under this Work Plan.

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JOHN R. McKERNAN, JR.
GOVERNOR

DEAN C. MARRIOTT
COMMISSIONER

DEBRAH RICHARD
DEPUTY COMMISSIONER

October 18, 1994

Mr. Fred Evans
Project Manager, Code 1821
Department of the Navy, Northern Division
Naval Facilities Engineering Command
10 Industrial Highway, Mailstop 82
Lester, Penn. 19112-2090

RE: **Draft Final Work Plan for Site 9, Naval Air Station, Brunswick.**

Dear Fred:

The Department has received and reviewed the Draft Final Work Plan for Site 9, dated September 1994. The Department's comments are provided below.

General Comments

1. A thorough discussion of the potential source areas should be included at the beginning of this work plan. Section 3 should perhaps be included at the start of the work plan rather than in the middle. Consider including more figures for easy reference to boring, monitoring well, and test pit locations.

Specific Comments

2. Figure 3-1:

This figure is not adequate. The printing on the figure is too small and is very difficult to read. This figure should include but does not show Building 201, the streams, the Flightline, and areas east of Building 215. In addition to making this figure readable, perhaps another figure should be included that provides a broader perspective.

3. Section 3.2 Exploration Methods, Page 3-5, Para 1, Sentence

"Waste disposed at this location (incinerator or ash landfill?) reportedly included solvents which were burned on the ground, paint sludges, and possibly wastes from the metal shop." Is there any information available to clarify if the "location" in the previous sentence refers to the

AUGUSTA
STATE HOUSE STATION 17
AUGUSTA, MAINE 04333-0017
(207) 287-7688 FAX: (207) 287-7826
OFFICE LOCATED AT: RAY BUILDING, HOSPITAL STREET

PORTLAND
312 CANCO ROAD
PORTLAND, ME 04103
(207) 879-6300 FAX: (207) 879-6303

BANGOR
106 HOGAN ROAD
BANGOR, ME 04401
(207) 941-4570 FAX: (207) 941-4584

PRESQUE ISLE
1235 CENTRAL DRIVE, SKYWAY PARK
PRESQUE ISLE, ME 04769
(207) 764-0477 FAX: (207) 764-1507

printed on recycled paper

incinerator or the ash land fill? Based on the Final Technical Memorandum[1], we are aware of only terra probes being performed at the alleged former incinerator location. Has any characterization of soil or groundwater quality been done here?

4. Section 3.2 Exploration Methods, Page 3-6, Building 201, Sentence 1

Provide the specific information included with the historical data and aerial photographs which indicates the potential source of contamination.

5. Section 3.2 Exploration Methods, Page 3-6, Unnamed Stream

Provide a qualitative summary of previous surface water, leachate, and sediment analytical results.

6. Section 3.2 Exploration Methods, Summary of Investigations, Page 3-7, Para 2

Is information available through the NAS waste water treatment facility which might indicate whether Building 201 has contributed organic solvents to the basewide sewer system since it was connected in 1972?

7. Section 3.2 Exploration Methods, Summary of Investigations, Page 3-8

The attached table summarizes the explorations proposed in this work plan. A reviewed and revised version of this table should be included in the final work plan to add clarification to the projects objectives.

Section 3.2.1 Soil Borings, Page 3-9
8. Para 1, Sentence 3

The proposed test boring associated with MW-914 is not shown of Figure 3-1.

9. Para 1, Sentence 4

Change "fuel soaked oil" to "fuel soaked soil" throughout report.

10. Para 2, Sentence 3

"If no PI meter readings are detected above background in soil collected from the test boring associated with T-23

[1]ABB Environmental Services, Inc., Final Technical Memorandum, Site 9 - Neptune Drive Disposal Site, May 1994,

then a sample will be collected between 8 to 10 feet bgs." However, field notes for T-23 included in Appendix A of the Final Technical Memorandum[2] read as follows,

> "fuel odor to sample at retrieval - very heavy odor; gray very well sorted fine sand - looks natural - no (8'-10' sample) gritty texture while pushing"

Does this mean that no sample was collected from the 8' to 10' interval? If so, at what interval was the "fuel odor" sample collected from?

Section 3.2.1 Soil Borings, Page 3-10

11. Para 1, Sentence 1

Fuel soaked soil was observed on the lead auger as it was removed from the test boring associated with MW-914. Lead augers are typically 5 to 6 feet in length which indicates the "fuel soaked soil" occurred at a depth between 11 and 17 feet bgs. Please clarify.

12. Para 1, Sentence 2

Soil samples will be analyzed using MDEP Method 4.1.2 or equivalent. Specify which equivalent method might be used in place of Method 4.1.2.

13. Para 1, Sentence 4

The boring log for MW-916 was not included in Appendix A of the Final Technical Memorandum[3].

14. 3.2.2 Monitoring Well Installation, Page 3-11, Bullet 3

In the interest of obtaining the most information possible, it makes sense to install the proposed background monitoring well at a location further upgradient (north) than is shown in Figure 3-1. Locating the well near the southern end of Buildings 213 and 214 would provide better spatial coverage for the assessment of groundwater flow patterns between the NEX service station and Site 9.

15. 3.2.2 Monitoring Well Installation, Page 3-12, Sentence 3

"The well screens will be placed at depths with the highest PI meter readings and will be long enough to accommodate seasonal fluctuations in the water table but short enough to allow discrete sampling." What does this mean? What range

---

[2]ABB Environmental Services, op. cit.
[3]ABB Environmental Services, Inc., op.cit.

of seasonal fluctuation is expected based on previous water level measurements? How short does a well screen have to be to allow for discrete sampling?

16. 3.2.3 Test Pitting, Page 3-14, Para 2, Sentence 3

"The "dump area" identified on an engineering drawing is larger than the ash landfill delineated in earlier investigations." Please provide a reference for this engineering drawing including (but not limited to) title, company responsible for the preparation of the drawing, and date.

3.2.3 Test Pitting, Page 3-15,
17. Para 1, Bullet 4

Will the location of the former drain pipe be identified using the engineering drawing only? Does it make sense to survey the area with a GPR prior to excavating to aid in locating the pipe or pipe trench?

18. Para 2, Sentence 1

What criteria will be used to determine the presence of natural soil?

19. 3.2.4 Soil and Groundwater Sampling, Page 3-18, Para 4

Please indicate the total number of MW-900 series wells being sampled including duplicate samples.

3.2.4 Soil and Groundwater Sampling, Page 3-19,
20. Para 1, Sentence 4

"At least three well volumes will be purged from the monitoring wells prior to sampling, and in situ parameters (i.e. pH, temperature, DO, turbidity, and specific conductance) will be monitored until each variable stabilizes." There is no indication of how the well purging will be performed. Groundwater must be purged using approved low-flow methods to properly perform measurement of the above mentioned in-situ parameters [4].

21. Para 2, Sentence 3

Please identify the criteria used for defining a "desired sample depth."

---

[4]EPA, RCRA Ground-Water Monitoring: Draft Technical Guidance, Office of Solid Waste, U.S. Environmental Protection Agency, 401 M. Street, S.W., Washington, DC. 20460, November 1992.

22. 4.1 Laboratory Analytical Program Summary, Page 4-1, Sentence 2.

Soils and groundwater collected from each new exploration need to be assessed for the presence of PCBs/Pesticides. Previous analytical results of leachate samples taken at the former discharge location of the 42"-drain pipe indicate the presence of 4,4-DDE, 4,4-DDD, and 4,4-DDT. Explorations upgradient of the leachate sample, in particular the test pit/trench and monitoring well located in the vicinity of the former pipe, need to be assessed for the presence of these pesticides.

23. Table 4-1, Summary of Off-Site Analytical Methods, METPH Fuel Oil in Soil 4.1.2

Groundwater samples collected from the MW-900 series and NEX service station wells must be analyzed for Total Fuel Oil in Water using MEDEP 4.1.1.

Please call with any questions or comments.

Sincerely,

Nancy Beardsley

Nancy Beardsley
Project Manager, Federal Facilities Unit
Office of the Commissioner

attachment: Site 9 Summary of Explorations

pc: Robert Lim, USEPA
Jim Caruthers, NAS Brunswick
Carolyn Lepage, R.G. Gerber Inc.
Beth Walter, ABB ES
Rene Bernier, Topsham
Sam Butcher, Harpswell
Susan Weddle, Brunswick
Topsham Water District
Steven Mierzykowski, USFW
Mark Hyland, MDEP
Richard Heath, MDEP
Marianne Hubert, MDEP

NEPTUNE DRIVE DISPOSAL AREA - SITE 9
SUMMARY OF EXPLORATIONS
DRAFT FINAL WORK PLAN - SEPTEMBER 1994

Area of Concern	Exploration	Rational	Field Screening	Laboratory Sample Type	Parameters Analyzed	Comments
Ash Landfill/Demo Debris Area						
Terraprobe T-23	(1) Test Boring	Better characterize subsurface soils associated with "fuel odor"	Continuous sampling - field screening using PID/headspace	(1) Soil	VOC, SVOC, Inorganics, Fuel Oil	Drilled to depth of 17 feet using HSA
MW-914	(1) Test Boring	Better characterize subsurface soils associated with "fuel soaked soil"	Continuous sampling - field screening using PID/headspace	(1) Soil	VOC, SVOC, Inorganics, Fuel Oil	Drilled to depth of 17 ft using HSA
	(1) Hydropunch	Assess groundwater quality beneath well screen and above clay layer		(1) Groundwater	VOC, SVOC, Inorganics, Fuel Oil	Collected at a depth greater than 17 ft bgs and above clay strata.
MW-915	(1) Hydropunch	Assess groundwater quality beneath well screen and above clay layer		(1) Groundwater	VOC, SVOC, Inorganics, Fuel Oil	Collected at a depth greater than 17 ft bgs and above clay strata.
Upgradient of Ash Landfill and MW-916	(1) Monitoring Well/ Test Boring	Evaluate background groundwater quality	Continuous sampling - field screening using PID/headspace	(1) Groundwater (1) Soil	VOC, SVOC, Inorganics, Fuel Oil	Well screen installed at depth with highest PID headspace value
Potential Dump Area						
Southwest of Bldg 216	(1) Monitoring Well/ Test Boring	Characterize groundwater flow west of Ash Landfill	Continuous sampling - field screening using PID/headspace	(1) Groundwater (1) Soil	VOC, SVOC, Inorganics, Fuel Oil	Well screen installed at depth with highest PID headspace value
Potential Dump Area - Vicinity of Bldgs. 216, 217, and 218	(3) Test Pits	Assess for the Presence or absence of landfill material	(4) Soil per Test Pit PID/headspace	(1) Soil per Test Pit	VOC, SVOC, Inorganics, Fuel Oil	Excavated to depth of natural soil or groundwater
Former Pipe Line						
Former 42" Drain Pipe - upgradinent of Ash Landfill	(1) Test Pit/Trench	Assess for the presence of pipe and assist in locating Monitoring Well	(4) Soil PID/headspace	(1) Soil	VOC, SVOC, Inorganics, Fuel Oil	Excavated to depth of natural soil or groundwater
	(1) Monitoring Well/ Test Boring	Evaluate groundwater quality - potential preferential pathway for contamination migration	Continuous sampling - field screening using PID/headspace	(1) Groundwater (1) Soil	VOC, SVOC, Inorganics, Fuel Oil	Well screen installed at depth with highest PID headspace value

Notes:

1) Groundwater samples will be collected from all (16) MW-900 series wells and 10 wells associated with the NEX gas station and analyzed for TCL VOCs, SVOCs, TAL inorganics, and Total Fuel Oil in Water (DEP 4.1.1).

2) The location and elevation of each new exploration will be surveyed and referenced to NAS Brunswick datum. In addition, the 10 wells installed at the NEX gas station will be surveyed as well as wells MW- 914, -915, and -916.

3) Stability will be monitored for pH, temperature, DO, turbidity, and specific conductivity while purging monitoring wells prior to collecting groundwater samples.

RESPONSE TO MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION COMMENTS DATED OCTOBER 18, 1994

General Comments

1. The Site 9 site history and description previously contained in Subsection 3.2 will be moved into (new) Subsection 1.3. Subsection 3.2 will contain information on exploration methods only.

Specific Comments

2. Figure 3-1: This figure will be replaced with Figure 1-2 of the Site 9 Long Term Monitoring Plan, modified as necessary to show proposed explorations. The Navy notes that CAD figures for the entire base should be available in the next few months and these could be used in the reporting of the Site 9 results.

3. Section 3.2, Page 3-5, Para. 1: The information cited is from the Initial Assessment Survey, which will be photocopied and included as an appendix in the final work plan. It is inferred from the IAS that the other wastes mentioned were disposed at the location of the ash landfill, not at the location of the incinerator itself. Text will be clarified.

4. Section 3.2, Page 3-6, Sentence 1: The IAS section addressing Site 9 will be added as an appendix in the Final Work Plan. Aerial photographs referenced in the IAS are available for review at NAS Brunswick. The aerial photographs referenced in the Navy's July 19, 1994 letter are not currently available for review because the Navy has contracted with Sewall to review and analyze these photographs. At this time, the Navy does not know when the review will be completed.

5. Section 3.2, Page 3-6: A brief summary of prior analytical results, and references to earlier documents, will be added to the Work Plan. The Navy also notes that the terminology "leachate seeps" will be replaced with "groundwater seeps", because the term "leachate", in environmental monitoring, is usually reserved for discussions of water percolating through landfills.

6. Section 3.2, Page 3-7, Para. 2: The Navy is not aware of any information which might indicate if Building 201 has contributed organic solvents to the basewide sewer system.

7. Section 3.2, Page 3-8: A table of proposed explorations will be added to the final version of the Work Plan, as requested.

8. Section 3.2.1,Page 3-9, Para 1, Sentence 3: The proposed boring will be added to (revised) Figure 3-1.

9. Section 3.2.1,Page 3-9, Para. 1, Sentence 4: The typographic error will be corrected. The text will also be revised to indicate it was the field geologist's observations, not analytical results, that form the basis of the interpretation of "fuel-soaked soil" at MW-914.

10. Section 3.2.1,Page 3-9, Para. 2, Sentence 3: The Terraprobe soil sampling effort reported in the Site 9 Technical Memorandum was conducted to delineate the boundary of the top of the former ash landfill. Therefore, samples were collected for geological characterization (i.e. presence of ash, debris) but were not submitted for chemical analysis. The "fuel odor" at T-23 was associated with the 8' - 10' bgs sample.

11. Section 3.2.1,Page 3-10, Para. 1, Sentence 1: As the comment notes, the "fuel-soaked soil" was observed on the lead augers upon their retrieval from the bottom of the exploration at 17 feet bgs. It is inferred from this observation and the lack of similar-appearing material in the 14 - 16 ft bgs sample that the "contamination" is at about 17 ft bgs. The Navy will revise the target completion depth of the proposed boring from 17 feet to 20 feet bgs. The text will be revised.

12. Para. 1, Sentence 2: As discussed at the September TRC meeting, the preferred method for analysis of soil samples for fuel oil is the California LUFT modified 8015 method or equivalent. An equivalent method might be used because of the analytical laboratory's specific capabilities, for example, and, as noted in the response to EPA comment 1, the analytical laboratory has not yet been selected. If another method needs to be selected, USEPA and MEDEP will be contacted for approval.

13. Section 3.2.1,Page 3-10, Para. 1, Sentence 4: As indicated in the Navy response letter of July 19, the MW-916 boring log was submitted as an attachment to a letter dated December 1993, because it had inadvertently been omitted from the final version of the Site 9 Technical Memorandum. A copy of the MW-916 boring log will be placed in an Appendix to the Work Plan.

14. Section 3.2.2,Page 3-11, Bullet 3: The primary purpose of the monitoring well is to characterize groundwater quality upgradient of the potential source areas within Site 9. Selection of that location should be based on the hydrogeologic data for this area. The Navy proposes that this topic be discussed at the upcoming technical meeting and resolution as to the exact location of this upgradient well be reached at that time. The Work Plan will be revised to reflect this location for the upgradient well.

15. Section 3.2.2,Page 3-12, Sentence 3: Well screens installed to span the water table will be 10' long and will be installed at a depth somewhat dependent upon the season. That is, if the well is installed during low water table conditions, the well screen will be installed about 4' above/6' below the water table. Water table wells

installed during high water table conditions will be installed 2' above/8' below the water table. These screen depths should accommodate the average seasonal water table fluctuation. This approach is similar to that used during earlier explorations at NAS Brunswick. Monitoring wells installed to sample below the water table will be 5' long. This information will be added to the text.

16. Section 3.2.3,Page 3-14, Para. 2, Sentence 3: The reference is to a 1952 engineering drawing, labeled "Barracks and Mess Facilities, General Layout, Section 4" and maintained by the base public works officer. A "dump area" is circled in by hand, and corresponds roughly, but not exactly, with the delineation made on the basis of the Terraprobe survey. Both the 1952 delineation of a dump and the Terraprobe results of the ash survey are shown in Figure 2-4 of the Site 9 Technical Memorandum. The Navy will forward a copy of the drawing to the MEDEP under separate cover.

17. Section 3.2.3,Page 3-15, Para. 1, Bullet 4: The existence of the drainpipe will be assessed by digging a test pit with the backhoe west of Building 212 (see Figure 3-1). The location is well-enough established by engineering plans to allow the test pit to be dug without a prior GPR survey.

18. Section 3.2.3,Page 3-15, Para. 2, Sentence 1: Visual observation by a geologist or other professional will be used to evaluate the presence of natural soil.

19. Section 3.2.4, Page 3-18, Para. 4: The number of groundwater samples will be provided on the table (see response to MEDEP comment 7).

20. Section 3.2.4,Page 3-19, Para 1, Sentence 4: The Navy proposes that appropriate purging and sampling techniques be discussed at the next TRC technical meeting. For example, purge rate and duration, sampling equipment, consistency with other IRP sampling on base, etc. need to be resolved.

21. Section 3.2.4,Page 3-19, Para. 2, Sentence 3: The text will be revised to indicate that bailers will be lowered to the depth of the well screen.

22. The soil sample collected from along the former drainline will be analyzed for pesticides/PCBs in addition to the other chemical classes listed in the draft final Work Plan.

23. The groundwater samples collected will be analyzed for TAL inorganics, VOCs, SVOCs, and fuel oil in water; both TCL and tentatively identified compounds (TICs) will also be reported.

Brunswick Area Citizens for a Safe Environment

P.O. Box 245 Brunswick, Maine 04011 (207)725-1330

BACSE

Oct. 17, 1994

To: Fred Evans
U.S. Navy Northern Division
Fax 610 - 595 - 0555

Dear Mr. Evans

Please find enclosed Review of Draft Final Work Plan - Site 9, prepared by Parsons LePage, Robert G. Gerber, Inc.

For possible questions please contact Parsons LePage at 207-865-6138 -

Sincerely,
Rookie Lafakis
Secretary

ROBERT G.
GERBER, INC.

Geoscience and Environmental Management Professionals

7 West Street • Freeport, Maine • 04032-1133 207-865-6138 • (FAX) 207-865-1071

October 14, 1994
File #965

Ms. Loukie Lofchie
Brunswick Area Citizens for a Safe Environment
P. O. Box 245
Brunswick, ME 04011

Subject: Review of *Draft Final Work Plan, Site 9, Neptune Drive Disposal Site*, September 1994.

Dear Ms. Lofchie:

As requested by the Brunswick Area Citizens for a Safe Environment (BACSE), Robert G. Gerber, Inc. (Gerber), has reviewed the *Draft Final Work Plan, Site 9, Neptune Drive Disposal Site*, dated September 1994. The document was prepared by ABB Environmental Services, Inc., (ABB-ES) for the U. S. Department of the Navy for the Naval Air Station Brunswick (NAS Brunswick) located in Brunswick, Maine. In the subject document, the Navy presents site-specific activities for conducting additional field investigations of potential source areas at Site 9.

Site 9, also known as the Neptune Drive Disposal Site, is located in the central portion of NAS Brunswick. The site initially included three areas of potential contamination: the location of a former incinerator and an associated ash disposal area; an area reportedly used for burning and disposal of solvents; and two streams exhibiting iron-staining characteristic of leachate. Results of earlier environmental investigations were reported in the August 1990 *Draft Final Remedial Investigation* (RI) and the April 1991 *Draft Final Supplemental RI* reports prepared by E. C. Jordan. The September 1993 *Draft Technical Memorandum for Site 9* presented a summary of investigations and analysis conducted through 1993, and recommendations for future activities at the site.

We reviewed July 1994 *Proposed Plan for Site 9* that presented the Navy's preferred alternative for an interim remedial action for groundwater at Site 9. We provided you with written comments on the *Proposed Plan* at the end of the public comment period in our letter dated August 10, 1994. We also reviewed the *Draft Final Long Term Monitoring Plan, Site 9*, and the *Draft Final Interim Record of Decision for an Interim Remedial Action at Site 9*, both dated August 1994, and provided our comments to you in our letters dated August 19, 1994 and September 1, 1994, respectively. We commented on an earlier version of the subject document, the *Draft Work Plan, Site 9, Neptune Drive Disposal Site* dated June 1994, in our letter to you dated July 27, 1994. While the subject document addresses a number of the questions, suggestions, and issues we

identified in our July 27, 1994 letter, several points remain outstanding. We would also like to point out that we have not reviewed two of the documents incorporated by reference in the subject document, ABB-ES' corporate *Health and Safety Plan* (HASP) and 1988 *Quality Assurance Program Plan* (QAPP), so we are not able to provide any comments relating to those two documents. Our comments on the *Draft Final Work Plan* are as follows:

1. Page 1+. This comment reiterates comment #1 in our July 27, 1994 letter concerning the June 1994 version of the subject document. A good deal of information has been added to the current version of the *Work Plan* to clarify the site-specific investigation methods and the rationale for method and location selection. Our intent in making this comment is to point out the need for a statement of the "big picture" for Site 9, and where the activities described in the *Work Plan* fit in the overall investigation and remediation "scheme" or scenario for Site 9.

It is not clear how the activities described in the subject document relate to the interim remedial action for groundwater at Site 9 or the investigations at the Naval Exchange (NEX) gasoline station. The Introduction (or other appropriate section) should provide an explanation of the various environmental investigations being conducted at Site 9 and the NEX, and how the data generated will be used to develop a final Record of Decision (ROD). We also recall that roadwork would be conducted along Neptune Drive this summer. At one of the TRC meetings we attended, it was suggested that the Navy take advantage of the opportunity to observe subsurface conditions in the middle of Site 9, but there is no mention of the Neptune Drive construction activities in the *Work Plan*.

2. Page 1-3. Given that the QAPP was prepared in 1988, does the Navy intend to review and possibly revise the document?

3. Page 2-1. How much time will elapse between the completion of the field work (estimated to take two weeks) and the submission of the investigation report for TRC review and comment?

4. Page 2-3. Will TRC representatives be consulted or informed if the Navy finds it necessary to deny clearance for the sampling locations proposed in the *Work Plan*?

5. Page 3-3. If DigSafe is to be notified, as the response to comments on the previous version of the *Work Plan* indicates, the procedure, including who will mark the investigation locations and notify DigSafe, should be described in Section 3.1.3.

6. Pages 3-4 - 3-8. The addition of the historical information in Section 3.2 is very helpful. However, there is no mention of the *Interim ROD* or the activities to be conducted under the *Interim ROD*, and how the additional investigations to be conducted in accordance with the *Work Plan* fit with the *Interim ROD*.

7. Page 3-9. Should the term "fuel soaked oil" used in the first paragraph in section 3.2.1 (and elsewhere in the document) read something like "fuel oil soaked soil"?

8. Page 3-10. What is an "equivalent" method that might be used in place of the DEP method 4.1.2 for total fuel oil in soil? Because the total fuel oil method will not detect the lighter or more volatile fuels that might be present, the soil samples should also be analyzed by the DEP's total gasoline method (4.2.3).

In addition, the procedures for collection and handling of the soil samples for headspace screening should be described more fully, and should be similar to those in Appendix Q of the Chapter 691 regulations pertaining to underground tanks. For example, soil samples should reach a temperature of 15 to 25 , rather than ambient air temperature, before a headspace reading is taken. A duplicate of the headspace sample should be collected in the appropriate container for laboratory analysis, as once a sample is used for headspace measurement, it is no longer suitable for chemical analysis.

The last sentence in the page should be revised to clarify what will happen if no sample yields a PI meter reading above background. Will the samples at a depth comparable to that where the "fuel odor" and "fuel soaked oil (soil?)" were observed be sent for laboratory analysis?

9. Page 3-12. The last sentence on the page states that "clean cuttings" will be placed above the sandpack during well installation. What are the criteria and the method for determining if cuttings are "clean"?

10. Page 3-16. The portion of comment 8 above regarding the "equivalent " to the DEP total fuel oil method and the need for consideration of the DEP's total gasoline method to address more volatile fuels also applies to the soil samples collected in test pits.

11. Page 3-19. What are the criteria for determining when in situ parameters monitored during purging are considered "stabilized"?

12. Page 3-20. How will the "desired depth" to drive the HydroPunch be determined? While the depth to the bottom of the well screens in MW-914 and MW-915 are known, how will the top of the clay be determined? What parameters will the groundwater samples collected with the HydroPunch and from monitoring wells be analyzed for?

13. Page 4-1. The second sentence in the first paragraph in section 4.1 states that all samples collected for laboratory analysis will be analyzed for fuel oil. The method number should be provided for the preferred and any "equivalent " method. In addition, analysis by a total gasoline

method to detect more volatile fuels should also be conducted. The next-to-last sentence on the page appears to be missing a word.

14. Pages 4-2 - 4-6. What does the heading in the right column of Table 4-1 mean and why does it change from "low concentration water detection limit" to "water detection limit" partway down page 4-3? The total fuel oil method for water, as well as the total gasoline methods for both soil and water, should be added to Table 4-1.

15. Page 4-9. The third bullet on the page should be revised to include the total fuel oil method for water, as well as the total gasoline methods for both soil and water.

16. Page A.2-6 - 2-9. The text mentions four contaminants of concern: PAHs, DCE, DCA, and vinyl chloride. However, Tables A-1 and A-2 include detections of other contaminants, such as chlordane and 2-butanone. Why aren't these other contaminants of concern for worker health and safety?

17. Page A.3-3. By how much will background PI meter readings be exceeded before work zone workers back of(f)? The Action Levels should be clearly described. How and where will background radiation readings be determined?

18. Page A.5-1. Section A.5.1 should be revised to reflect that engineering controls may become necessary to continue on-site investigations (see page A.3-3).

19. Page A.6-1 & 6-2. The last sentence on page 6-1 should be revised to reflect that Thermo Environmental, not HNU, meters will be used. Do the Thermo Environmental meters use the two different UV sources at the same time? If not, what are the criteria for selecting which source to use?

20. Page A.11-3. Because the HASP has been revised significantly since it was first submitted for review in June 1994, The Health and Safety Manager may need to review and approve the final version.

21. Appendix A-1. Comment 16 above also applies to the chemical data included in Appendix A-1. For example, should information concerning 2-butanone also be included?

22. General Comment. While many of the issues or suggestions we and others raised in our comments on the June 1994 version of the draft have been addressed by the inclusion of detailed information in the current *Work Plan*, a number of issues should be included or expanded upon. The topics that should be addressed in the *Work Plan* include: the additional tasks, such as review of historical air photos and evaluation of nearby building uses, to identify potential upgradient sources; what will be included in the data presentation and interpretation report, and when the

report will be available; and, the relationship of this work plan to the interim ROD and the NEX gas station investigation. The community also remains concerned that contaminants detected in the stream sediments at Site 9 be addressed in a timely and appropriate fashion.

Please do not hesitate to give us a call if you have any questions on the comments above.

Sincerely,
Robert G. Gerber, Inc.

Carolyn A. Lepage

STATE OF MAINE
CAROLYN A. LEPAGE
0202
CERTIFIED GEOLOGIST

Carolyn A. Lepage, C.G.
Director of Operations

Andrews L. Tolman, C.G.
Vice President & Chief Hydrogeologist

P:\95-9\965cl14.oo4

RESPONSE TO BRUNSWICK AREA CITIZENS FOR A SAFE ENVIRONMENT (BACSE) COMMENTS DATED OCTOBER 14, 1994

1. Page 1+: The activities described in the Work Plan are those considered necessary and appropriate to characterize environmental conditions at Site 9. A starting premise of this Work Plan, as stated in Section 1, is that concentrations of contaminants in groundwater have sporadically exceeded levels of concern. As a result, long-term monitoring of groundwater quality has been recognized and accepted as an appropriate course of action for the Site 9 groundwater operable unit, as specified in the Site 9 Groundwater Interim ROD. Further, the occasional detections of certain chemicals in the groundwater suggest that a source of these contaminants may still exist on the site. The efforts in this Work Plan are those considered appropriate to further characterize Site 9, especially in relation to the groundwater contaminants that have historically been observed. The process of site characterization, evaluation of remedial action alternatives, selection and approval of a selected alternative, etc. is the same as for other sites on the base.

   As noted in the September TRC meeting, NAS Brunswick environmental personnel had intended to witness the Neptune Drive construction, but because of schedule and communication problems were unavailable to do so. However, observation of this roadway construction was a "nice to have", whereas those activities specified in the Work Plan are those considered to be necessary to adequately characterize site conditions. As with any site, all information and data of appropriate quality can be used in support of a ROD. Data relevant to Site 9, and generated under separate field programs, will be summarized in the investigation summary report.

2. Page 1-3: The 1988 QAPP is a program-level reference document, which is superseded as necessary when methodologies, practices, etc. for a specific application change. The Navy does not believe that a new program-level QAPP is necessary.

3. Page 2-1: After completion of the field program, laboratory analysis, data validation, data assessment and synthesis of other data, report generation, Navy review, and document revision must be done prior to release of the draft report. At this time, it is estimated that the draft investigation summary report will be issued approximately 7 months after completion of the field program, assuming that funding is available. This schedule is similar to those previously followed at other sites. Schedules of IRP efforts will continue to be submitted at TRC meetings for comment.

4. Page 2-3: As with all previous field investigations, if a proposed sampling location cannot be cleared, then an alternative sampling location that still meets the original objective for that exploration is identified with the help of Base environmental and engineering departments, utility company, etc. which could not clear the original

location. In most cases the sampling location changes only enough to avoid a utility, such as an underground electrical cable. The investigation summary report documents any significant changes in sampling locations.

5. Page 3-3: As noted in the response to comments on the draft document, coordination with local utilities (i.e. DigSafe) will be done by the Navy on an as-needed basis. Clearly, the Navy IRP contractor is also involved in these efforts. Section 3.1.3 will be revised to be more explicit.

6. Pages 3-4 to 3-8: A very brief section will be added to the Work Plan which will summarize the regulatory framework within which this program will operate.

7. Page 3-9: The text should have read "fuel-soaked soil", as the comment notes. The text will also be revised to indicate that this characterization is based on the visual observation of material found on the lead auger upon its retrieval by a rig geologist.

8. Page 3-10: Please see the response to MEDEP comment 12. A more detailed description of the methodology for PI measurements of soil headspace will be added to the document. This methodology includes allowing the sample to warm, as necessary, as the comment notes. Separate containers are always used for off-site laboratory analyses when on-site PI headspace measurements are done.

   The text on the bottom of page 3-10 has been clarified to state that if no PI meter reading above background are recorded, samples will be collected from between 8 to 10 feet bgs near T-23 and approximately 17 feet bgs near MW-914.

9. Page 3-12: "Clean cuttings" are those with PI readings of 5 ppm or lower as measured at the soil surface.

10. Page 3-16: See the response to comment 8 above.

11. Page 3-19: In general, three consecutive readings of the in-situ parameters within +/- 10% are considered to represent stable conditions. Due to concerns regarding purging and sampling techniques for groundwater monitoring wells, the Navy proposes that this be an agenda item for the December TRC technical meeting. The Work Plan text will be revised as necessary once an approach acceptable to all parties is defined.

12. Page 3-20: The Navy has offered to take groundwater samples using HydroPunch to satisfy MEDEP's request for groundwater samples in this area. HydroPunch was selected by the Navy because it would not cause mobilization of additional equipment. The Navy suggests the sampling objectives in this area be discussed at the next Technical meeting on December 7,1994. Based on the sampling objectives, the Navy can determine if HydroPunch is the appropriate method for the sampling objective.

13. Page 4-1: The Navy's preferred fuel oil methodology specified is the California LUFT modified 8015 method. "Equivalent" laboratory practices do not necessarily have a different method number, as the deviation from the listed procedure may be minor and not expected to significantly impact results. Deviations, if any, will be documented in the investigation summary report. The California LUFT modified method will yield two results, one for the "lighter" fraction and one for the "heavier" fraction. Note that these samples will be analyzed for TCL VOCs and SVOCs as well. Water samples will be analyzed for "fuel oil" if the results of the VOC or SVOC analyses indicate the presence of significant concentrations of individual chemicals.

14. Pages 4-2 to 4-6: As explained on page 4-1, the EPA methodology for low-level detection of VOCs will be used. There is no equivalent low-level methodology for SVOCs.

15. Page 4-9: The text will be revised to indicate analyses that will be performed. Fuel oil/gasoline in water analyses will not be performed at this time.

16. Page A.2-6 to A.2-9: The appendix text and tables will be reviewed for accuracy and consistency. Contaminants historically detected on-site are contaminants of concern for health and safety.

17. Page A.3-3: Text will be revised to indicate that PI meter readings steadily above 5 ppm in the breathing zone will cause work to stop and evaluation of safety concerns before continuing. Background radiation readings are those from on base but away from any known or suspected areas of contamination.

18. Page A.5-1: Text will be revised as indicated.

19. Page A.6-1 and A.6-2: Text will be revised to indicate that Thermo-Environmental PI meters may be used. The two different UV sources cannot be used together; the instrument uses one or the other. The 10.2 eV is typically considered acceptable for health and safety monitoring.

20. Page A.11-3: The ABB Environmental Services, Inc. Health and Safety Supervisor will approve the revised HASP.

21. Appendix A-1: CHRIS data sheets will be included for every contaminant previously identified earlier in the HASP as contaminants of concern for health and safety of workers.

22. General Comment: The Navy's objectives for the Site 9 Work Plan are to : 1) confirm/deny existence of the former drain line; 2) confirm/deny existence of the former dump; 3) determine if contamination is coming from upgradient sources; 4) get a "snapshot" of all Site 9 and NEX wells to characterize groundwater flow and condition. Other tasks, although related to Site 9, are not considered part of this

work plan. Results of other work will be presented to the TRC as the information is received. The Final ROD for Site 9 will include all information used to develop the final action for Site 9.

Schedules, regulatory framework, and interrelationship with other documents are more appropriately discussed in a meeting and not in a work plan or investigative report. Although the NEX Gas Station is not an IR site (petroleum sites are exempt from CERCLA), the Navy still continues to provide updates on the NEX gas station investigation. The need to evaluate other areas outside of Site 9 will be determined when we analyze the data generated by this work plan.