

**U.S. DEPARTMENT OF THE NAVY
INSTALLATION RESTORATION PROGRAM**

**NAVAL AIR STATION BRUNSWICK
BRUNSWICK, MAINE**

REMEDIAL DESIGN SUMMARY REPORT

**SITES 1, 3, 5, 6, 8, AND
THE EASTERN PLUME**

MAY 1993

REMEDIAL DESIGN SUMMARY REPORT

**SITES 1, 3, 5, 6, 8, AND THE EASTERN PLUME
NAS BRUNSWICK
BRUNSWICK, MAINE**

Prepared for:

**U.S. Department of the Navy
Northern Division
Naval Facilities Engineering Command
Contract: N62472-84-C-1108**

Prepared by:

**ABB Environmental Services, Inc.
Portland, Maine
Project No. 7120-00**

May 1993

**REMEDIAL DESIGN SUMMARY REPORT
SITES 1, 3, 5, 6, 8, AND THE EASTERN PLUME
NAS BRUNSWICK, BRUNSWICK, MAINE**

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GLOSSARY OF ACRONYMS AND ABBREVIATIONS

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1.0 INTRODUCTION

The U.S. Naval Air Station (NAS) Brunswick is a National Priorities List site in Brunswick, Maine. There are currently 13 areas (Sites) within NAS Brunswick under investigation. This Remedial Design concerns the remedial activities to be undertaken at Sites 1, 3, 5, 6, 8, and the Eastern Plume. These sites were grouped together for remediation based on their proximity, common historical land use, complementary remedial activities such as the need for fill materials at Sites 1 and 3, and common groundwater remedial activities.

1.1 PURPOSE

The purpose of this Remedial Design Summary Report is to define the design basis for the Remedial Design at Sites 1, 3, 5, 6, 8, and the Eastern Plume at NAS Brunswick. This summary report refers to other documents related to the remedial design for the above sites. These documents are as follows:

Draft Remedial Design Work Plan, Sites 1 and 3 and Eastern Plume. July 1992.

Remedial Design Schematic Submission, Sites 1 and 3 and Eastern Plume. September 1992.

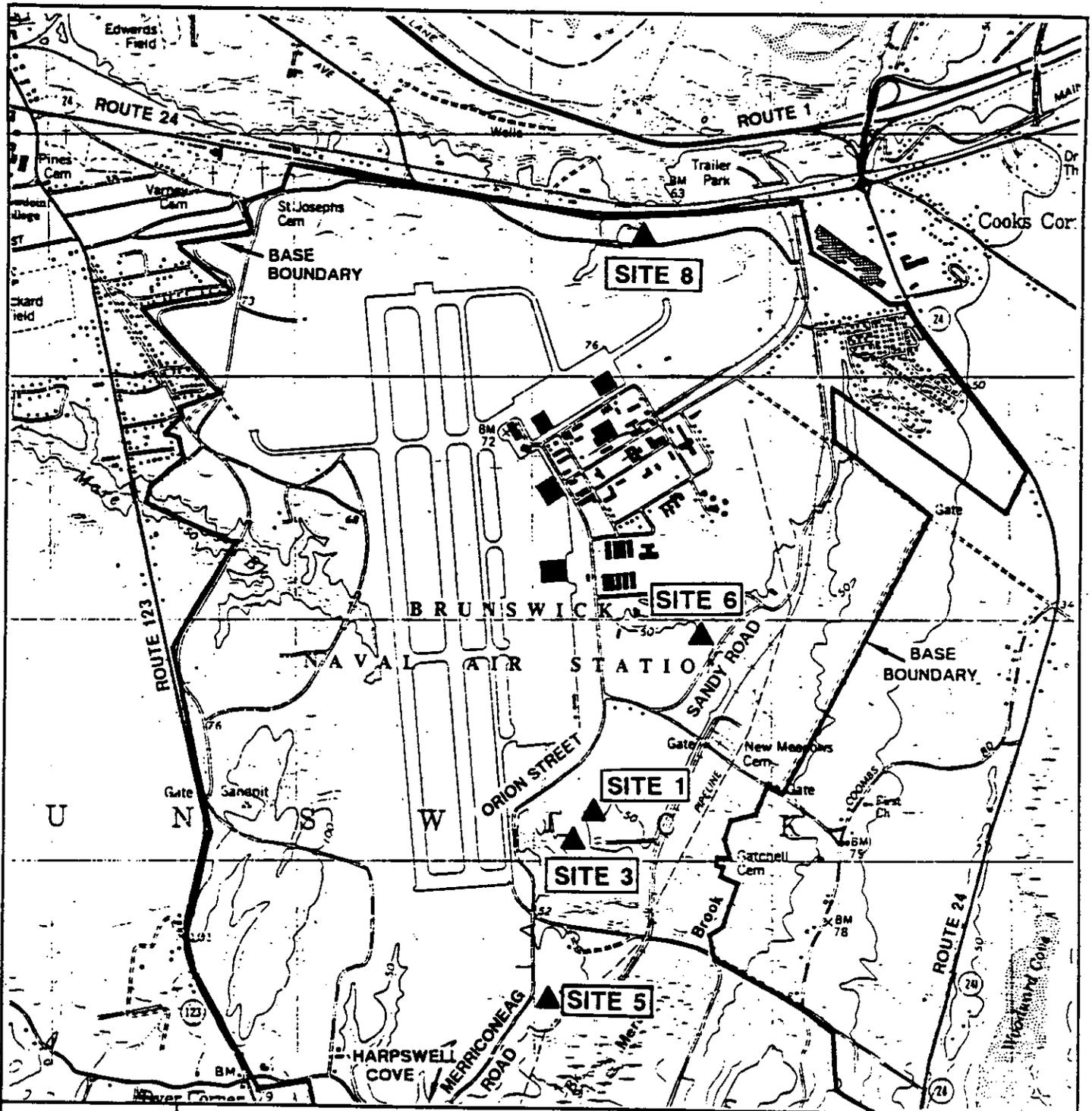
Numerical Modeling Report. January 1993.

Draft Final Remedial Investigation Report, NAS Brunswick. August 1990.

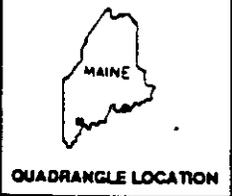
Draft Final Supplemental Remedial Investigation Report, NAS Brunswick. August 1991.

1.2 SITE NAME, LOCATION, AND DESCRIPTION

NAS Brunswick is located south of the Androscoggin River between Brunswick and Bath, Maine, south of Route 1 and between Routes 24 and 123 (Figure 1). Undisturbed topography at NAS Brunswick is characterized by low, undulating hills



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



	NAVAL AIR STATION BRUNSWICK SITE LOCATION MAP	
	REMEDIAL DESIGN	
INSTALLATION RESTORATION PROGRAM NAVAL AIR STATION BRUNSWICK, MAINE	7120-00	FIGURE 1

with deeply incised brooks; ground surface elevations range from mean sea level (MSL) in lowland drainage areas and the Harpswell Cove estuary, to over 100 feet MSL west and southeast of the southern end of the runways. Topography in the developed areas of the base has been modified by construction, with ground surface elevations generally ranging from 50 to 75 feet above MSL.

NAS Brunswick is located on 3,094 acres. The operations area (138 acres) lies east of the two parallel runways and consists of numerous office buildings, a steam plant, fuel farm, barracks, recreational facilities, base housing, hangars, repair shops, and other facilities to support NAS Brunswick aircraft. Forested areas (approximately 48 percent), grasslands (approximately 28 percent), and paved areas (approximately 12 percent) comprise most of the base property. Paved areas are mostly flight ramps and runways. The remaining 12 percent of the base includes the operations area (approximately 5 percent) and miscellaneous shrubland, marsh, and open water. The southern edge of the base borders coves and estuaries of Harpswell Cove.

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.

1.2.1 Sites 1 and 3

The general area of Site 1 covers more than 60 acres, although the specific area of documented refuse disposal is much smaller, approximately 8.5 acres. Site 3, contiguous to Site 1, occupies approximately 1.5 acres (Figure 2). The 8.5-acre disposal area at Site 1 is an open, slightly rolling, grass-covered field bordered to the north, west, and east by woodlands, and to the south by the Weapons Compound and steep embankments bordering Mere Brook. Site 3 is next to Site 1 to the southwest, and consists of a small knoll covered with grass and a pine grove.

Lowland areas along Mere Brook are heavily wooded. The slopes along portions of the brook are typically very steep in areas next to the landfill. Leachate seeps have been consistently observed at the base of slopes next to Site 3, as well as south of Site 1 (see Figure 2).

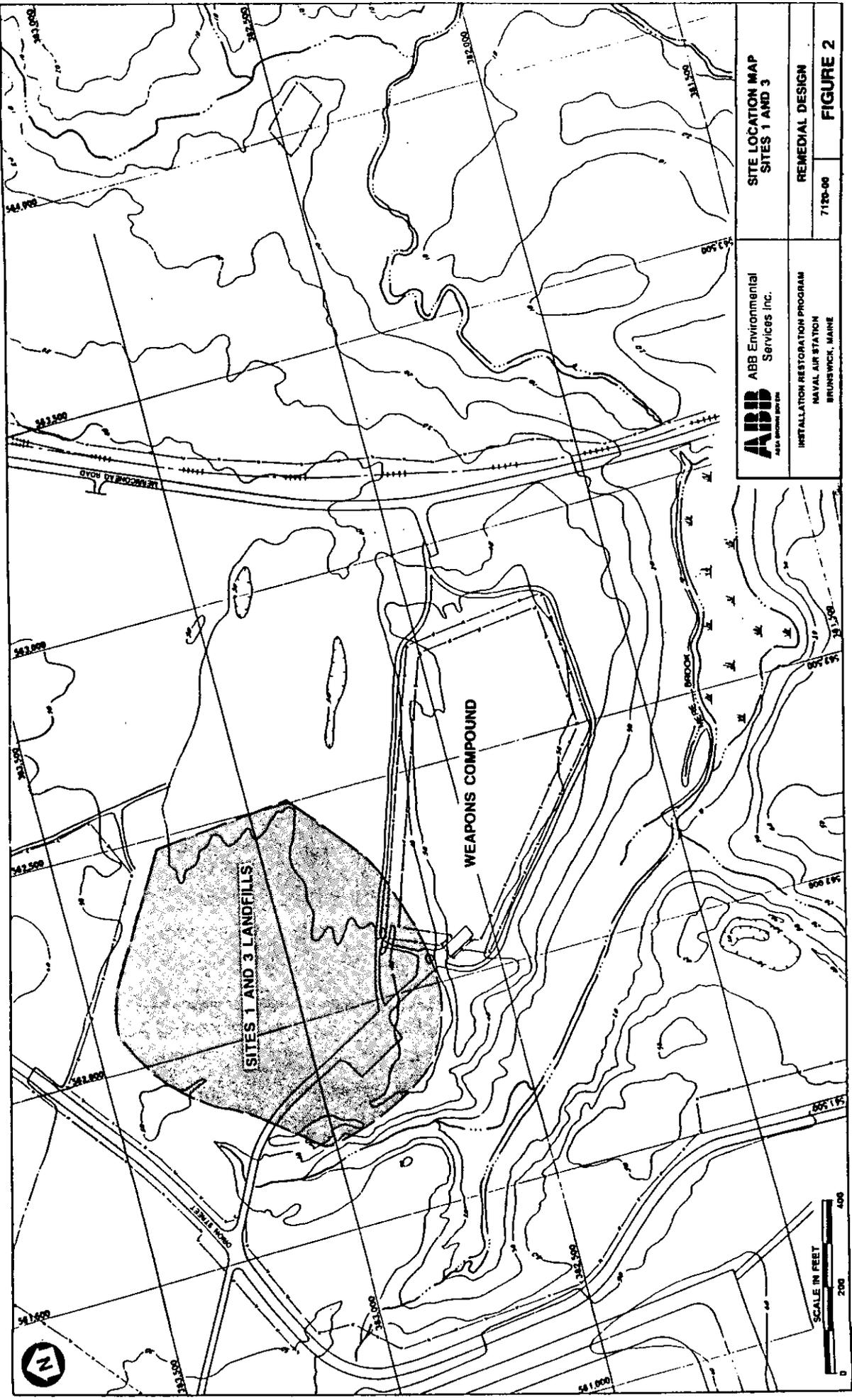


ABB Environmental Services Inc. <small>AN ISO 9001:2000 CERTIFIED FIRM</small>	SITE LOCATION MAP SITES 1 AND 3
	REMEDIAL DESIGN 7120-00
INSTALLATION RESTORATION PROGRAM NAVAL AIR STATION BRUNSWICK, MAINE	FIGURE 2

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Groundwater associated with the site is not used for potable or any other purposes. The base, except for the golf course, is connected to a public water supply administered by the Brunswick-Topsham Water District. The golf course area is distant from Sites 1 and 3 and is not affected by groundwater flow from Sites 1 and 3. Mere Brook, south of Sites 1 and 3, receives drainage from the runways as well as runoff and leachate from the landfills. The brook is not used for recreational activities in the reaches near Sites 1 and 3 because access to the area is restricted for base security. Mere Brook flows into the Atlantic Ocean at Harpswell Cove, which is designated as a potential aquaculture area by the State of Maine. Harpswell Cove supports various commercially important fish species. For more information concerning natural resources at Sites 1 and 3, refer to Appendix Q of the Draft Final Remedial Investigation (RI) Report (E.C. Jordan Co., 1990).

1.2.2 Sites 5 and 6

Sites 5 and 6 are being considered together based on their shared geologic and hydrogeologic conditions and historical use as disposal sites for asbestos.

Site 5, located off Merriconeag Road south of the main runway, apparently was used briefly in 1979 to dispose of asbestos-lined pipe from a building being demolished on base (Figure 3). A facility engineer inspected the site in 1980 and described it as consisting of two trenches. One trench (measuring 3 by 20 by 7 feet deep) contained six 1-inch diameter asbestos pipes ranging in length from 4 to 12 feet. A second parallel trench measuring 15 by 30 by 10 feet deep was found to contain up to eight pieces of corrugated pipe with smaller asbestos pipe inside. The asbestos material was left in the trenches and covered with soil. Site 5 is approximately 0.25 acre.

Site 6, the Sandy Road Rubble and Asbestos Disposal Site, is bordered by Sandy Road to the southeast and by a stream behind Building 516 to the north (Figure 4). It reportedly was used for general dumping of construction debris until the late 1970s. It appears the site was originally a small depression later filled with construction debris and other nonputrescible wastes. Aircraft parts reportedly were disposed of at this site and asbestos-lined pipes were seen protruding from the surface. The site is nearly level except for a large soil stockpile approximately 15 feet at its highest elevation on the eastern side. Empty pipes, concrete, asphalt, and other debris are visible at the site surface. In addition, steel dumpsters have been stored at the southwest corner of the site. Site 6 is approximately 1 acre.

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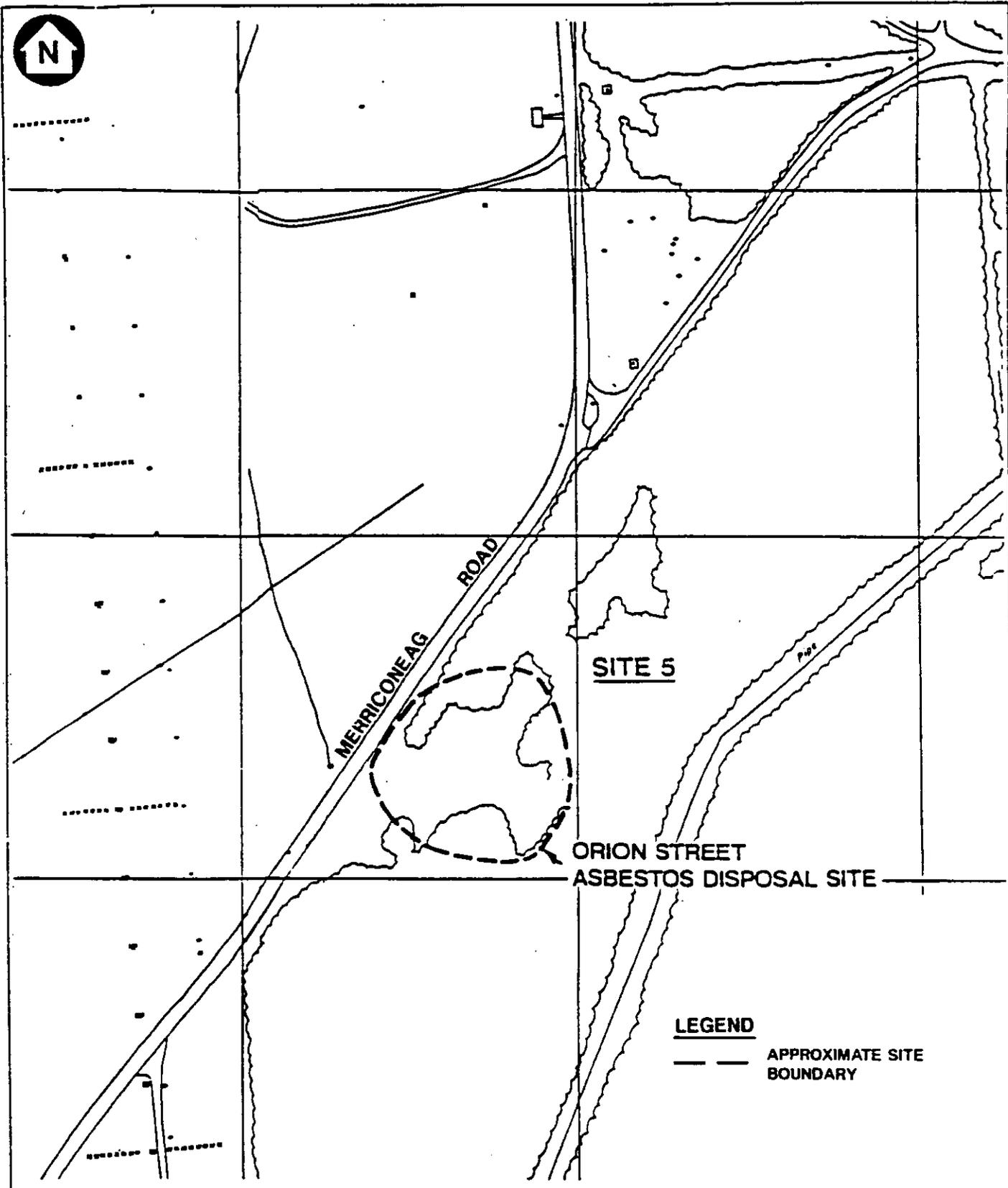
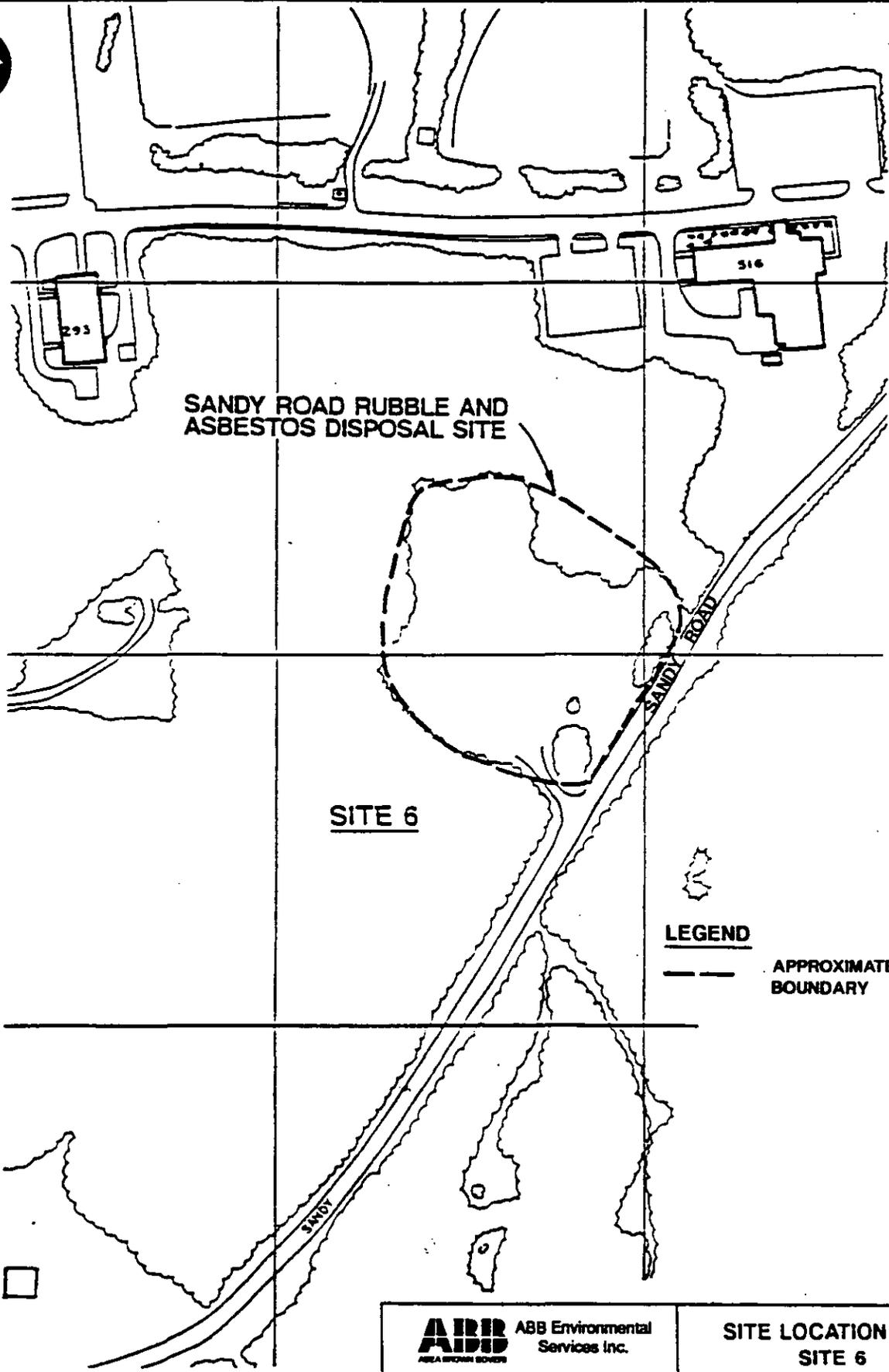


 ABB Environmental Services Inc.	SITE LOCATION MAP SITE 5	
	REMEDIAL DESIGN	
INSTALLATION RESTORATION PROGRAM NAVAL AIR STATION BRUNSWICK, MAINE	7120-00	FIGURE 3



SANDY ROAD RUBBLE AND
ASBESTOS DISPOSAL SITE

SITE 6

LEGEND

--- APPROXIMATE SITE
BOUNDARY



 ABB Environmental Services Inc.	SITE LOCATION MAP	
	SITE 6	
INSTALLATION RESTORATION PROGRAM NAVAL AIR STATION BRUNSWICK, MAINE	REMEDIAL DESIGN	
	7120-00	FIGURE 4

A more complete description of Sites 5 and 6 can be found in the Draft Final Supplemental RI Report (E.C. Jordan, Co., 1991).

1.2.3 Site 8

Site 8 is approximately 0.6 acre and is located in the northern portion of the base (Figure 5). Perimeter Road, which runs east to west on NAS Brunswick, is adjacent to the southern edge of Site 8. The site was a disposal area reportedly used from 1964 to 1974 to dispose of rubble, debris, and trash from the base. In addition, industrial solvents may have been disposed of at the site. The refuse disposal area was the natural ravine down to the stream northeast of the site. North of Perimeter Road, the site is a flat, open area with steep, wooded embankments down to two small tributaries that border the site on the northeast and northwest. Surface runoff from the northern 2,000 feet of the base drain into these tributaries, which flow approximately 1,800 feet to the north and discharge to the Androscoggin River. Seeps have been observed at the base of the slope of the embankment down to the northeastern tributary.

Groundwater associated with the site is not used for potable purposes or any other uses. The Jordan Avenue Wellfield, a municipal drinking water supply for the Town of Brunswick, is located 3,000 feet north-northwest of Site 8. Site 8 groundwater and the Jordan Avenue Wellfield are not considered hydrogeologically connected.

A more complete description of Site 8 can be found in the Draft Final RI Report (E.C. Jordan Co., 1990).

1.2.4 Eastern Plume

The **Eastern Plume**, shown on Figure 6, is the groundwater operable unit being addressed in this Remedial Design for contamination resulting from Sites 4, 11, and 13. Groundwater in the area of the plume is not currently used for drinking water or other purposes; therefore, there are no human receptors. The plume is predicted to discharge to Harpswell Cove in five years, potentially affecting many ecological receptors. The contamination of groundwater in the Eastern Plume has not affected the current use of natural resources. Use of surface water in this area is very limited; however, the presence of contaminated groundwater would prevent the use of this natural resource in the future.

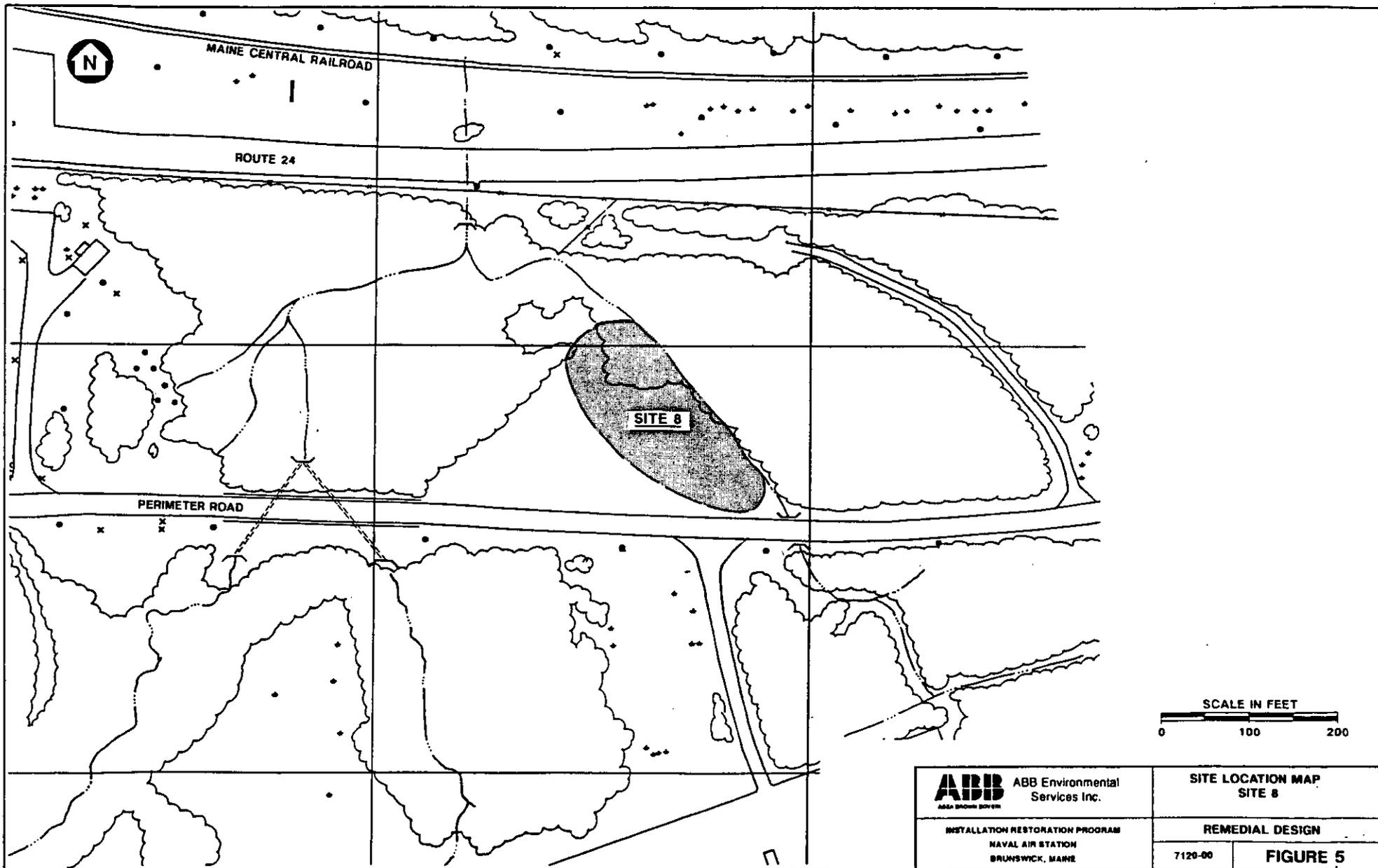
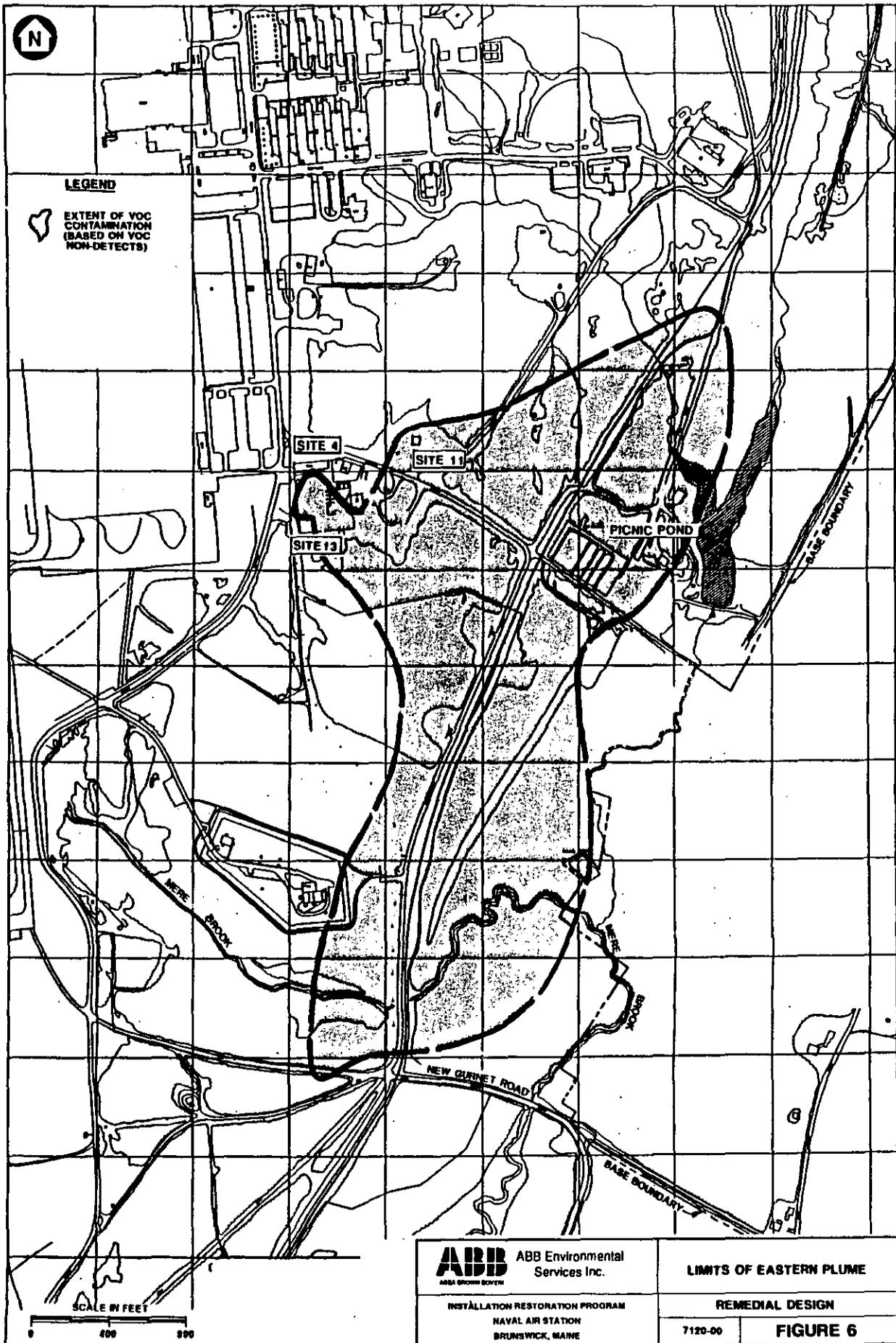


 ABB Environmental Services Inc. <small>AN ISO 9000 COMPANY</small>	SITE LOCATION MAP SITE 8	
	REMEDIAL DESIGN	
INSTALLATION RESTORATION PROGRAM NAVAL AIR STATION BRUNSWICK, MAINE	7120-00	FIGURE 5



2.0 DESIGN SUMMARY

2.1 RECORD OF DECISION REQUIREMENTS

A Record of Decision (ROD) document has been prepared and signed for Sites 1 and 3 (June 1992) and an interim ROD has been prepared and signed for the Eastern Plume (June 1992). These documents were developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act as amended by the Superfund Amendments and Reauthorization Act of 1986, and, to the extent practicable, the National Contingency Plan. The RODs present the selected remedial actions proposed by the Navy and accepted by the State of Maine Department of Environmental Protection (MEDEP) and the U.S. Environmental Protection Agency (USEPA). The following items are included in the Decision Summary of the selected alternative in the ROD for each site and are referenced here for additional information:

- Site Name, Location, and Description
- Site History and Enforcement Activities
- Community Participation
- Scope and Role of Response Action
- Summary of Site Characteristics
- Summary of Site Risks
- Development and Screening of Alternatives
- Description of Alternatives
- Summary of the Comparative Analysis of Alternatives
- The Selected Remedy
- Statutory Determinations
- Documentation of Significant Changes
- State Role

RODs for Sites 5, 6, and 8 were not finalized at the time this document was prepared. This Remedial Design incorporates the selected remedies for these sites described in the Proposed Plans and presented for public comment. The Navy is currently preparing separate RODs for Sites 5, 6, and 8. These RODs will be signed by the Navy and USEPA and accepted by the MEDEP.

2.1.1 Sites 1 and 3

For Sites 1 and 3, the selected remedy addresses the principal threat posed by Sites 1 and 3 by preventing endangerment of public health, welfare, or the environment through containment of the waste and recovery of contaminated groundwater to prevent further migration to Mere Brook.

The Remedial Design meets the requirements of the ROD by constructing a cap over the landfilled wastes and a slurry wall around the wastes to divert clean water away from the landfill. Contaminated groundwater contained by the cap and slurry wall will be pumped using extraction wells and treated by chemical oxidation, flocculation, clarification, and filtration to remove inorganic compounds, and ultraviolet/oxidation to destroy organic compounds before discharge. Eliminating leachate seeps will mitigate surface water and sediment contamination in Mere Brook. Contaminated groundwater from Sites 1 and 3 will be treated concurrently with groundwater extracted from the Eastern Plume.

The preferred discharge method for treated groundwater is to the local publicly owned treatment works (POTW). The treated water will meet the pretreatment standards established by the Brunswick Sewer District. Ultimate discharge is to the Androscoggin River via a National Pollutant Discharge Elimination System permit.

2.1.2 Eastern Plume

The interim Remedial Action for the Eastern Plume consists of groundwater extraction, treatment, and discharge of treated groundwater to the local POTW. As described, extracted groundwater will be combined with pretreated groundwater from Sites 1 and 3. Iron and manganese will be removed from the extracted groundwater by greensand filters to reduce interference with the treatment of the volatile organic compounds (VOCs). The VOCs will be removed using ultraviolet/oxidation treatment technology.

As required by the ROD for the Eastern Plume, before design of the treatment system, bench-scale treatability tests were performed to provide information on the compounds and concentrations likely to be present in the effluent. The results of the treatability tests were presented in the Remedial Design Schematic Submission (ABB-ES, 1992a).

2.1.3 Sites 5 and 6

For Sites 5 and 6, the selected remedy consists of the removal of contaminated soil, construction rubble, and asbestos-covered pipe. These materials are to be disposed of as subgrade material beneath the cap of the Sites 1 and 3 landfill. After excavation, the sites will be regraded and a vegetative cover established. The major components of the selected remedy include:

- Excavation of approximately 12 cubic yards (cy) of asbestos-contaminated soil and pipe from Site 5 and 18,700 cy of construction rubble and debris, including an assumed volume of 250 cy of asbestos-contaminated material from Site 6.
- Containerization of asbestos-contaminated material.
- Disposal of excavated material at Sites 1 and 3 as subgrade fill as part of the closure of the Sites 1 and 3 landfill.

2.1.4 Site 8

For Site 8 the selected remedy is removal of approximately 5,600 cy of contaminated soil, construction debris, and rubble and disposal of these materials as subgrade material at the Sites 1 and 3 landfill. The Remedial Design includes site preparation to prevent soil erosion from entering the unnamed tributary adjacent to the site. Major components of the selected remedy include excavation, transport, and disposal of Site 8 materials to the Sites 1 and 3 landfill, regrading, and vegetative cover establishment.

2.2 DESCRIPTION OF DESIGN COMPONENTS

The Remedial Design of Sites 1, 3, 5, 6, 8, and the Eastern Plume involves:

- The excavation, transport, and disposal of debris from Sites 6 and 8, and asbestos-containing materials from Sites 5 and 6, beneath the cap of the Sites 1 and 3 landfill. Sites 5, 6, and 8 will be regraded and revegetated following excavation.

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- The construction of a containment system consisting of a low-permeability cap and slurry wall at Sites 1 and 3. The purpose of the landfill cap and slurry wall is to minimize the amount of clean water coming in contact with the waste, and thereby minimize leachate production.
- Construction of a groundwater extraction and treatment system that will remove groundwater from within the Sites 1 and 3 landfilled wastes and that will control and prevent further migration of contaminated groundwater in the Eastern Plume. The Navy's preferred discharge alternative for treated groundwater is to the Brunswick POTW.

2.2.1 Landfill Cap and Slurry Wall

The Sites 1 and 3 landfill cap has been designed to meet the technical requirements for final cover of the State of Maine Solid Waste Management Regulations (Chapter 401.7) and to provide equivalent infiltration performance to that of a Resource Conservation and Recovery Act Subtitle C guidance cap (USEPA, 1991).

The cap design consists of: a topmost soil layer (12 inches) capable of supporting vegetative cover growth, overlying a soil filter layer (16 inches) designed to prevent clogging of an underlying drainage layer (12 inches) by fine soil particles in the vegetative layer. The drainage layer overlies the very low density polyethylene geomembrane (40-mil) and bentonite geocomposite liner (GCL) hydraulic barriers. Beneath the hydraulic barriers is a gas-venting layer (12 inches); common borrow underlies the gas-venting layer and is to be used to bring the landfill surface to the required grade. Debris and asbestos-containing materials removed from Sites 5, 6, and 8 will also be used as fill in conjunction with the clean common borrow material.

The drainage and gas-venting layer designs include collection and transport piping to facilitate movement of their respective media. The hydraulic conductivity of the drainage layer material is to be a minimum of 1×10^{-3} centimeters per second (cm/sec). USEPA guidance (USEPA, 1991) recommends that the drainage layer have a minimum hydraulic conductivity of 1×10^{-2} cm/sec however, natural soil deposits in this region, of suitable quantity, with this hydraulic conductivity are not considered readily available. An equivalency analysis was performed using the

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Hydrologic Evaluation of Landfill Performance (HELP) Model (Version 2) (Schroeder, et. al., 1988) to evaluate the performance of the design and compare it to the USEPA guidance cover system. The analysis is included in Appendix B.

Results of the analysis indicate that a design consisting of a 3 percent drainage slope, 100-foot drainage length, drainage layer hydraulic conductivity of 1×10^{-3} cm/sec and bentonite GCL hydraulic conductivity of 5×10^{-9} cm/sec is equivalent to the USEPA guidance Subtitle C cap.

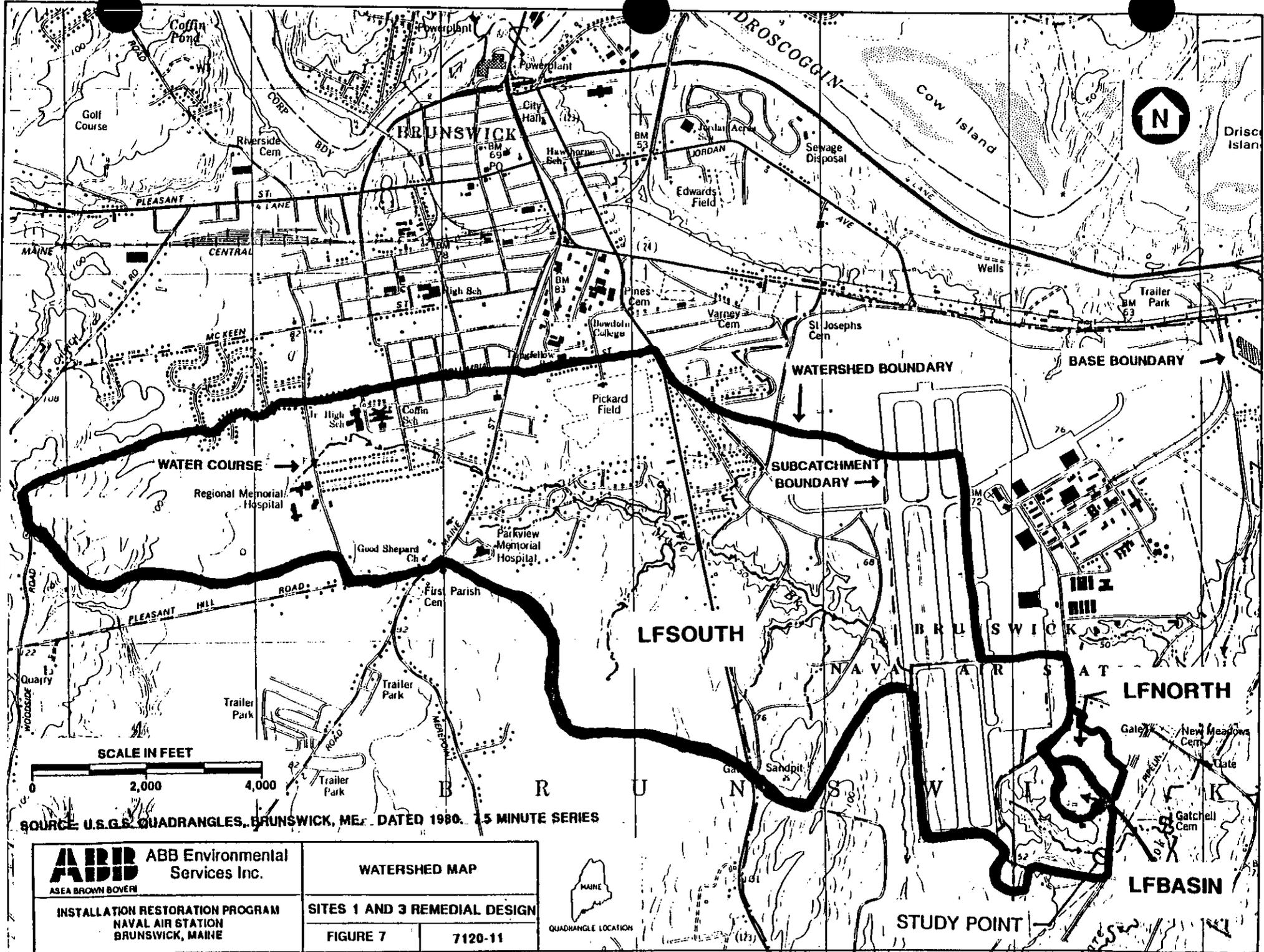
A 3 percent design slope is necessary to limit the height of the cap because of its proximity to the Weapons Compound and to meet the Navy's security requirements. MEDEP final cover requirements specify a minimum slope of 5 percent following consolidation. The minimum design slope of 3 percent has been accepted by MEDEP.

The effects on storm water runoff of landfill capping were evaluated using three watersheds (Figure 7). The first consists of 12 acres immediately north of the landfill. The second contains most of the landfill and is 18 acres in size. The third watershed is 1,747 acres and contains only a small portion of the landfill.

The northern watershed is bounded to the south by the landfill Perimeter Road. The road will create a barrier that prevents rainfall runoff from the landfill from entering this watershed. The result is that the northern watershed will receive no increase in flow and remain relatively unchanged. Runoff will drain to a low point in the southern region of the watershed and recharge into the ground as it did originally.

Most landfill runoff (70 percent) will discharge to a geomembrane-lined detention basin immediately east of the landfill. The detention basin has been sized to detain landfill runoff for the two-, 10-, 25-, and 100-year rainstorms. The basin has over 2 feet of freeboard for the 100-year condition. Discharge from the basin will be piped across Merriconeag Road where it will discharge and eventually drain to Mere Brook. The basin will additionally serve as a sedimentation basin during construction of the landfill and has been sized accordingly to handle the volume of potential sediment and runoff from the landfill. Sediment will be detained for a minimum period of 10 hours. Catch basins will be installed as part of the discharge line to provide additional settling points in the discharge system.

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SOURCE: U.S.G.S. QUADRANGLES, BRUNSWICK, ME. DATED 1980. 15 MINUTE SERIES

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 BRUNSWICK, MAINE

WATERSHED MAP	
SITES 1 AND 3 REMEDIAL DESIGN	
FIGURE 7	7120-11



STUDY POINT

The third watershed comprises four subareas: a small portion of the landfill, an area between the landfill and Merriconeag Road, a segment of the NAS Brunswick airfield runway, and a large area west of the runway. Within this 1,747-acre watershed, the developed area of the landfill makes up 5 acres. The watershed will drain to a 126-inch arch-shaped discharge pipe located in the southeast region of the watershed. The 126-inch discharge pipe has the capacity to handle more than 650 cubic feet per second (cfs) of flow. The developed area will increase peak flow by 3.7 cfs for the 25-year storm event. This peak flow represents a 1 percent increase relative to the original discharge peak. A 1 percent change is within the range of accuracy of the modeling procedure.

A soil bentonite slurry wall is to be constructed around the north, east, west, and a portion of the south sides of the Sites 1 and 3 landfill. The Numerical Modeling Report (ABB-ES, 1993) evaluated the performance of the slurry wall, with the southern area of the site occupied by the Weapons Compound and approximately 400 feet along the embankment of Mere Brook unconfined by the slurry wall, and found the hydrogeologic performance of the remedial action to be unaffected when compared to including the slurry wall along Mere Brook. The southern area will act as an outlet for any groundwater in the aquifer beneath the landfill waste and minimize a rise in water level within the limits of the slurry wall in the future.

The slurry wall is to be constructed using the slurry trench method of excavation. Excavated cuttings from the slurry wall trench or soil borrow will be mixed with bentonite, and bentonite water slurry to a homogeneous consistency with a very low permeability (1×10^{-7} cm/sec), and placed into the slurry filled trench in a controlled manner.

2.2.2 Groundwater Extraction and Treatment

The groundwater extraction and treatment system was designed based on the removal flow rates estimated by the Numerical Modeling Report (ABB-ES, 1993). Groundwater is to be extracted from the Sites 1 and 3 landfill through two extraction wells at a flow rate of approximately 10 gallons per minute (gpm) each. Groundwater from the Eastern Plume is to be extracted from five extraction wells at a flow rate of approximately 20 gpm each. Actual flow rates at each well will depend on field conditions to be established during construction and start-up. The groundwater extraction system's performance is to be monitored using water level

information from 16 new piezometers and 54 existing monitoring wells and piezometers, and analytical data from a water quality monitoring program to be implemented by the contractor.

Groundwater extracted from the Sites 1 and 3 landfill will be treated for inorganic metals removal by potassium permanganate oxidation and pH adjustment with caustic soda. The treated water will flow by gravity to a flash mix tank and flocculator, where polymer will be added to promote floc growth, followed by an inclined plate settler. The settled floc or sludge will be pumped to a sludge holding tank and the clarified liquid will flow to the greensand filter wet well. At this point, the treated water's pH will be adjusted with sulfuric acid. Acid addition will be controlled by pH monitoring. The clarified effluent will be fed potassium permanganate, controlled by oxidation-reduction potential, before being pumped to two greensand filters in parallel. Turbidity monitoring before and after the greensand filters will alert the operator if metals pretreatment is not operating properly. The greensand filters will filter out suspended particles and remove additional iron and manganese.

The greensand filter effluent will be combined with the Eastern Plume groundwater for final treatment in the ultraviolet/oxidation treatment system. Hydrogen peroxide will be added to supply the oxidant. The ultraviolet light acts to help break down chemical molecules. Thus, the VOCs will be reduced in concentration. The treated water will be stored in a backwash tank, which will overflow to the effluent wet well and from there be discharged to the NAS Brunswick sanitary sewer system, which is connected to the Brunswick POTW.

2.2.3 Site 5

The remedial action at Site 5 will include test pitting to confirm the location, alignment, and depth of asbestos materials buried at this site. Excavation shall continue until a visual determination of the depth to asbestos materials has been made. The overburden shall be machine-excavated to a depth of 1 foot above asbestos material; excavation shall then continue carefully by hand including overexcavation of a 1-foot circumference of soil surrounding the asbestos materials. This soil and the excavated pipes shall be containerized and transported to the designated asbestos material disposal area at Sites 1 and 3. Erosion control measures, including diversion on run-on and placement of silt fencing downgradient of the area of work, will be implemented.

2.2.4 Site 6

All debris will be excavated within the approximate limits shown on the drawing to a minimum depth of 2 feet, with excavation continuing as necessary until native soil is encountered. Any debris encountered that extends areally beyond the approximate limits shall also be excavated to native soil. Asbestos materials will be identified visually by the contractor and containerized. Construction debris shall be broken on site into pieces no larger than 4 feet in the largest dimension and 12 inches in other dimensions. All excavated materials will be transported to Sites 1 and 3, where it will be used as subgrade fill beneath the landfill cover system; the asbestos material shall be placed at the asbestos material disposal area, and the debris shall be placed in 2-foot lifts at the excavated debris and contaminated soil stockpile area. Erosion control measures will be implemented at this site, including diversion of run-on and placement of a silt fence along the adjacent stream bank.

2.2.5 Site 8

All debris will be excavated within the approximate limits shown on the drawing until native soil is encountered. Any debris encountered that extends areally beyond the approximate limits shall also be excavated to native soil. Construction debris shall be broken on site into pieces no larger than 4 feet in the largest dimension and 12 inches in other dimensions. The excavated material will be transported to Sites 1 and 3, where it will be placed in 2-foot lifts at the excavated debris and contaminated soil stockpile area. Erosion control measures will be implemented at this site, including diversion of run-on and placement of silt fence and stone check dams to protect the adjacent stream. A permanent diversion of the drainage swale from the 15-inch culvert will be constructed, including the construction of a level spreader to disperse storm water runoff and remove sediments. This work has been granted Permit By Rule status by the MEDEP.

2.3 PREDESIGN STUDIES

Pre-design studies were conducted to establish design criteria for the Remedial Design process and confirm the proposed treatment process for the groundwater treatment facility.

2.3.1 Sites 1 and 3 and the Eastern Plume

The scope of the predesign studies was described in the Draft Remedial Design Work Plan Sites 1 and 3 and the Eastern Plume (ABB-ES, 1992a). The predesign activities included:

- Site Survey
- Geotechnical Investigation
- Slurry Wall Evaluation
- Landfill Cap Settlement Analysis
- Groundwater Pipeline Evaluation
- Treatment Plant Evaluation
- Landfill Gas Assessment
- Effluent Routing Study
- Utility Survey
- Groundwater Treatability Study
- Eastern Plume Sampling
- Numerical Groundwater Modeling

The results of the predesign activities were presented in the Remedial Design Schematic Submission Sites 1 and 3 and Eastern Plume (ABB-ES, 1992a).

Since the preparation of the Remedial Design Schematic Submission, some predesign activities have continued and changes to the design criteria have been made:

- The long-term compatibility phase of the slurry wall evaluation is ongoing. Preliminary analytical data indicate the bentonite/soil slurry wall will be compatible with groundwater within Sites 1 and 3. Final results of the long-term slurry wall evaluation are anticipated to be available in June 1993 based on the rate of flux through the laboratory slurry samples.
- The treatment plant location has been changed since the Schematic Submission was prepared. The new location is approximately 1,500 feet north of Sites 1 and 3 and will be accessed from Old Gurnet Road. Two additional borings were completed at the new treatment plant site and data gathered

from those borings were used to design the building foundation. Boring logs for the new site are included in the Final Design Submission.

- The Numerical Modeling Report was submitted in January 1993. This version of the report incorporated regulatory review comments and final calibration of the model. This version included a revised slurry wall layout. The slurry wall was evaluated with the 400-foot section along the Mere Brook embankment removed. Shortening the slurry wall along Mere Brook did not adversely affect the remedial action and was incorporated into the design. The shortened slurry wall will reduce the impact of remedial construction activities on the Mere Brook embankment.

2.3.2 Sites 5, 6, and 8

Pre-design activities conducted at Sites 5, 6, and 8 are described below:

- Topographic surveys were conducted at Sites 5, 6, and 8. Base maps were prepared based on the survey information.
- Two composite soil samples were collected from the existing soil pile at Site 6 and analyzed using a polarized light microscope for the presence of asbestos material. Additionally, two trenches and five test pits were excavated at Site 6 within the area of a magnetic anomaly detected during the post-screening investigation in 1990. The purpose of the trenches and test pits was to establish the thickness and character of the fill material at the site and collect a number of samples for analysis. Two samples were collected from the test pits for off-site Toxicity Characteristic Leachate Procedure analysis. Two samples were collected from the test pits for asbestos analysis. Five samples were collected from the test pits for off-site Target Compound List (TCL) VOCs, TCL semivolatile organic compounds (SVOCs), TCL pesticides and polychlorinated biphenyls, and Target Analyte List inorganics.

No analytical results were available at the time this document was prepared.

- Two soil borings were completed at Site 8 close to the edge of the existing embankment to provide information about the depth of fill materials. Samples were collected at 5-foot intervals for visual observation until the borings were established to be below the fill. Fill material was observed to range in thickness from 11 to 17 feet below ground surface in the two borings. The volume of material requiring removal has been estimated based on the boring data as approximately 5,600 cy.

2.4 DESIGN ASSUMPTIONS

The following design assumptions were used to form the basis of the remedial design for Sites 1, 3, 5, 6, 8, and the Eastern Plume:

Sites 1 and 3.

- a. The slurry wall and the landfill cap will each have a maximum hydraulic conductivity of 1×10^{-7} cm/sec.
- b. Construction of the slurry wall and cap will lower the water table within the confines of the slurry wall to below the landfilled wastes as confirmed by groundwater modeling.
- c. Storm water management design is based on the 24-hour, 25-year storm event.

Site 5.

- a. The only material to be removed consists of asbestos-containing materials and 1 foot of surrounding soil.
- b. No additional fill material is required.

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- c. Excavated material from Site 5 will be disposed of in the designated asbestos material disposal area at Sites 1 and 3.

Site 6.

- a. The material to be removed consists of construction rubble, demolition debris, stumps, and a limited quantity of asbestos-containing material.
- b. Final grades shall be a minimum of 2 percent and a maximum of 33 percent.
- c. Excavated material, except for asbestos-containing material, will be disposed of in the designated contaminated soil and construction debris disposal area at Sites 1 and 3. Asbestos-containing material will be disposed of in the designated asbestos material disposal area at Sites 1 and 3.

Site 8.

- a. The material to be removed consists of construction rubble and demolition debris.
- b. Final grades shall be a minimum of 2 percent and a maximum of 33 percent.
- c. Excavated material will be disposed of in the designated contaminated soil and construction debris disposal area at Sites 1 and 3.
- d. Stream protection measures are to be implemented in accordance with MEDEP Permit by Rule requirements.

Eastern Plume

- a. The specified extraction well locations and pumping rates will prevent further migration of the Eastern Plume as confirmed by groundwater modeling.

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- b. Influent water analysis to the groundwater treatment system is based on the highest detected contaminant concentrations at Sites 1 and 3 and the average of the two highest concentrations in the deep wells of the Eastern Plume.
- c. Treated groundwater will be disposed of at the Brunswick POTW.

2.5 DESIGN CALCULATIONS

Design calculations have been prepared for the Final Design Submission and are referenced here.

2.6 COMPLIANCE WITH REGULATORY REQUIREMENTS

Appendix A contains tables identifying the Applicable or Relevant and Appropriate Requirements (ARARs) identified in the RODs for Sites 1 and 3 and the Eastern Plume, and a description of how the design complies with the ARARs. Appendix A includes similar tables for Sites 5, 6, and 8. The tables for Sites 5 and 6 and Site 8 were prepared based on the ARARS identified in the Draft Final Supplemental RI Report (E.C. Jordan, Co., 1991) and Draft Final RI Report (E.C. Jordan, Co., 1990), respectively.

3.0 CONSTRUCTION SCHEDULE

Figure 8 presents an estimated construction schedule for the Remedial Activities. This schedule assumes that the remedial construction contract will be awarded in September 1993 and that the contractor will begin construction in October 1993. The final construction schedule is to be prepared by the construction contractor per the contract specifications.

4.0 SUMMARY OF REQUIRED APPROVALS

Substantive requirements of regulations applicable to the remedial construction activities are to be met. However, permits are not required for the remedial action because the administrative permit requirements are waived for remedial activities conducted on site at federal Superfund sites.

The ARARs tables included in Appendix A identify the applicable regulations and how they have been addressed by the Remedial Design. Specific approval applications have been prepared to meet MEDEP requirements of the Maine Natural Resources Protection Act (38 MSRA, Sections 480-A through S) for work to be carried out adjacent to, but not in, a freshwater wetland, stream, or brook; and Maine Site Location Development Law and Regulations (38 MRSA, Sections 481-490): Part II. Submissions: Section 12, Surface Drainage and Runoff; Section 13, Stormwater Management; and Section 14, Temporary and Permanent Erosion and Sedimentation Control.

5.0 MONITORING REQUIREMENTS

Monitoring requirements for the groundwater extraction and treatment system are described in the technical specifications. The long-term monitoring requirements for Sites 1 and 3 and the Eastern Plume are to be prepared for review and comment by MEDEP and USEPA during the construction phase of the remedial action.

6.0 OPERATIONS AND MAINTENANCE REQUIREMENTS

The operations and maintenance requirements of the remedial action are to be prepared for MEDEP and USEPA review and comment during the construction phase of the remedial action. Integral to development of the plan are the specific maintenance requirements of the equipment supplied in the treatment facility. This information will become available throughout construction of the facility. Therefore,

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under the construction contract, the contractor will be required to prepare and submit an Operations and Maintenance Plan for the groundwater treatment facility.

The Operations and Maintenance Plan will include, at a minimum:

1. A description of expected operations and maintenance of the equipment and systems necessary to operate and maintain the extraction, treatment, and monitoring systems.
2. A description of the potential operational problems.
3. A description of routine process monitoring and analysis.
4. A description of contingency operation and monitoring.
5. An operational safety plan.
6. A description of equipment.
7. Recordkeeping and reporting requirements.

This plan will be reviewed by the Navy and combined with the Operations and Maintenance Plan prepared by the Navy for the Sites 1 and 3 landfill cap.

7.0 PROJECT OPERATIONS PLANS

Under the construction contract, the contractor will be required to prepare and submit a number of deliverables to the Navy for review. A list of the major deliverables, and the technical specification section describing their requirements in detail, is as follows:

- a. Construction Schedule - Section 01011
- b. Equipment Delivery Schedule - Section 01011
- c. Monthly Update to Construction and Equipment Delivery Schedule - Section 01011

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- d. Safety Plan - Section 01011
- e. Quality Control Plan - Section 01400
- f. Sampling and Analysis Plan - Section 01410
- g. Environmental Protection Plan - Section 01560
- h. One-year Water Quality Monitoring Program - Section 01660
- i. Preliminary Operation and Maintenance Plan (Treatment Facility) - Section 01680
- j. Operation and Maintenance Manual - Section 01680
- k. Demolition Plan - Section 02050
- l. Asbestos Hazard Abatement Plan - Section 02080
- m. Field Quality Control Plan (slurry wall) - Section 02214
- n. Borrow Source Quality Control Plan - Section 02220
- o. Work Plan - Section 02990
- p. Safety, Health, and Emergency Response Plan - Section 02995
- q. Spill Control Plan - Section 02995

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REFERENCES

- ABB Environmental Services, Inc. (ABB-ES), 1992a. "Draft Remedial Design Work Plan Sites 1 and 3 and Eastern Plume"; Portland, Maine; July.
- ABB Environmental Services, Inc. (ABB-ES), 1992b. "Remedial Design Schematic Submission Sites 1 and 3 and Eastern Plume"; Portland, Maine; September.
- ABB Environmental Services, Inc. (ABB-ES), 1993. "Numerical Modeling Report"; Portland, Maine; January.
- E.C. Jordan Co., 1990. "Draft Final Remedial Investigation Report NAS Brunswick"; Portland, Maine; August.
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- Schroeder, P.R., et. al., 1988. "Hydrologic Evaluation of Landfill Performance (HELP) Model: Vol. III. User's Guide for Version 2 Internal Working Document"; USAE Waterways Experiment Station; Vicksburg, MS; October.
- State of Maine, Department of Environmental Protection (MEDEP), Bureau of Solid Waste Management, 1989. Solid Waste Management Regulations; May.
- U.S. Environmental Protection Agency (USEPA), 1991. Seminar Publication, Design and Construction of RCRA/CERCLA Final Covers. EPA/625/4-91/025.

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

ARAR	Applicable or Relevant and Appropriate Requirements
cfs	cubic feet per second
cm/sec	centimeters per second
cy	cubic yard
GCL	geocomposite liner
gpm	gallons per minute
MEDEP	Maine Department of Environmental Protection
MSL	mean sea level
NAS	Naval Air Station
POTW	publicly owned treatment works
RI	Remedial Investigation
ROD	Record of Decision
SVOC	semivolatile organic compound
TCL	Target Compound List
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound

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APPENDIX A
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Installation Restoration Program

TABLE A-1
CHEMICAL-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

SITES 1 AND 3
NAS BRUNSWICK

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL PROCESS	CONSIDERATION IN DESIGN
<u>GROUNDWATER</u> <u>/ SURFACE</u> <u>WATER</u>	Federal SDWA - MCLs (40 CFR 141.11 - 141.16)	Relevant and Appropriate	MCLs have been promulgated for several common organic and inorganic contaminants. These levels regulate the concentration of contaminants in public drinking water supplies, but may also be considered relevant and appropriate for groundwater aquifers used for drinking water.	Groundwater at NAS Brunswick is not a current source of drinking water; therefore, MCLs are not applicable, but may be relevant and appropriate. To assess the potential risks to human health due to consumption of groundwater, contaminant concentrations were compared to their MCLs.	To be considered in monitoring long-term performance of remediation.
	SDWA - MCLGs (40 CFR 141.50 - 141.51)	Relevant and Appropriate	MCLGs are health-based criteria. As promulgated under SARA, MCLGs are to be considered for drinking water sources. MCLGs are available for several organic and inorganic contaminants.	The 1990 National Contingency Plan states that non-zero MCLGs are to be used as goals. Because groundwater at NAS Brunswick is not a current source of drinking water, MCLGs are not applicable, but may be relevant and appropriate. Contaminant concentrations in groundwater were compared to their MCLGs.	To be considered in monitoring long-term performance of remediation.
	RCRA - Subpart F Groundwater Protection Standards, Alternate Concentration Limits (40 CFR 264.94)	Relevant and Appropriate	This requirement outlines standards, in addition to background concentrations and MCLs, to be used in establishing clean-up levels for remediating groundwater contamination.	Most of the MCLs promulgated under RCRA are the same as SDWA MCLs. The standards set forth under RCRA do not reflect recent changes and additions to SDWA MCLs. Because groundwater is not a current source of drinking water; RCRA MCLs are not applicable, but may be relevant and appropriate.	To be considered in monitoring long-term performance of remediation.
	Federal AWQC	Applicable	Federal AWQC include (1) health-based criteria developed for 95 carcinogenic and noncarcinogenic compounds and (2) water quality parameters. AWQC for the protection of human health provide levels for exposure from drinking water and consuming aquatic organisms, and from consuming fish alone. Remedial actions involving contaminated surface water or groundwater must consider the uses of the water and the circumstances of the release or threatened release; this determines whether AWQC are relevant and appropriate.	AWQC will be applicable if treated groundwater is discharged to surface water. The Navy's preferred discharge option is to the Brunswick POTW, although the Navy has not yet received approval from the POTW. AWQC may be considered during development of pretreatment standards because the POTW discharges its effluent to the Androscoggin River.	Not directly considered in design, preferred discharge option is to the Brunswick POTW.

TABLE A-1
CHEMICAL-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

SITES 1 AND 3
NAS BRUNSWICK

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL PROCESS	CONSIDERATION IN DESIGN
<u>Federal Guidance and Criteria To Be Considered</u>	USEPA Risk Reference Doses (RfDs)	To Be Considered	RfDs are the levels considered unlikely to cause significant adverse health effects associated with a threshold mechanism of action in human exposure for a lifetime.	Because there are only a limited number of promulgated standards for contaminants in soil and water, USEPA RfDs were used to characterize risks due to noncarcinogens in various media.	Design addresses requirement by containment of contaminated materials and collection and treatment of contaminated groundwater at Sites 1 and 3.
	USEPA Human Health Assessment Group Cancer Slope Factors (CSFs)	To Be Considered	Carcinogenic effects present the most up-to-date information on cancer risk potency derived from USEPA's Human Health Assessment Group.	Because there are only a limited number of promulgated standards for contaminants in soil and water, USEPA CSFs were used to compute the individual incremental cancer risk resulting from exposure to certain compounds.	Design addresses requirement by containment of contaminated materials and collection and treatment of contaminated groundwater at Sites 1 and 3.
<u>State</u>	Maine Drinking Water Rules (10-144A CMR Chapters 231-233)	Relevant and Appropriate	Maine's Primary Drinking Water Standards are equivalent to federal MCLs. When state levels are more stringent than federal levels, the state levels may be used.	Groundwater at NAS Brunswick is not a current source of drinking water; therefore, State Drinking Water Standards are relevant and appropriate. Contaminant concentrations in groundwater were compared to State standards to assess the potential risks to human health due to consumption of groundwater.	Design addresses requirement by collection and treatment of contaminated groundwater and diversion of upgradient groundwater flow away from contaminated material at Sites 1 and 3.
	Maine Regulations Relating to Water Quality Criteria for Toxic Pollutants (MEDEP Regs, Chapter 584)	Applicable	This rule limits the concentrations of certain materials allowed in Maine waters to prevent the occurrence of pollutants in toxic amounts as required by state and federal law. Except if naturally occurring, ambient levels of toxic pollutants shall not exceed the Clean Water Act AWQC. Where AWQC do not exist, the Board of Environmental Protection shall adopt site-specific numerical criteria.	This rule will be applicable if treated groundwater is discharged to surface water. The Navy's preferred discharge option is to the Brunswick POTW, although the Navy has not yet received approval from the POTW. AWQC will be considered during development of pretreatment standards. This rule is potentially applicable in development of pretreatment standards if AWQC do not exist for any contaminants present in groundwater.	Not directly considered in design; preferred discharge option is to the Brunswick POTW.

TABLE A-1
CHEMICAL-SPECIFIC ARARs, CRITERIA, ADVISORIES, AND GUIDANCE

SITES 1 AND 3
NAS BRUNSWICK

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL PROCESS	CONSIDERATION IN DESIGN
<u>State Criteria and Guidance To Be Considered</u>	Rules Relating to Testing of Private Water Systems for Potentially Hazardous Contaminants (10-144A CMR Chapter 233, Appendix C)	To Be Considered	Appendix C outlines Maximum Exposure Guidelines (MEGs) for organic and inorganic compounds. MEGs include health advisories, which are maximum allowable concentrations of specific contaminants in drinking water.	MEGs have been considered for chemical compounds for which there are no promulgated standards. MEGs may be considered if treated groundwater is discharged back to groundwater. The Navy's preferred discharge option is to the Brunswick POTW; however, the Navy has not yet received approval from the POTW. MEGs may potentially be considered during development of discharge limits for reinjection of treated groundwater.	Not directly considered in design; preferred discharge option is to the Brunswick POTW.
<u>AIR</u>					
<u>Federal</u>	Clean Air Act - National Primary and Secondary Ambient Air Quality Standards (40 CFR 50)	Applicable	Primary ambient air quality standards define levels of air quality to protect public health. Secondary ambient air quality standards protect public welfare from known or anticipated adverse effects from pollutants.	Particulate standard for matter less than 10 microns is $150 \mu\text{g}/\text{m}^3$, 24-hour average concentration. This requirement is applicable to excavation and construction activities.	Design addresses requirement by requiring contractor to implement ambient air quality monitoring during invasive activities at Sites 1 and 3.
<u>State</u>	Maine Ambient Air Quality Standards (38 MRSA, Section 584; MEDEP Regs, Chapter 110)	Applicable	This Chapter establishes ambient air quality standards that are maximum levels of a particular pollutant permitted in the ambient air.	The standard for particulate matter is $150 \mu\text{g}/\text{m}^3$, 24-hour average concentration. This standard is applicable to excavation and construction activities.	Design addresses requirement by requiring contractor to implement ambient air quality monitoring during invasive activities at Sites 1 and 3.

Notes:

ARAR = Applicable or Relevant and Appropriate Requirement
 AWQC = Ambient Water Quality Criteria
 CFR = Code of Federal Regulations
 CMR = Code of Maine Rules
 CSF = cancer slope factor
 FS = feasibility study
 MCL = Maximum Contaminant Level
 MCLG = Maximum Contaminant Level Goal
 MEG = Maximum Exposure Guidelines
 MEDEP = Maine Department of Environmental Protection

MRSA = Maine Revised Statutes Annotated
 NAS = Naval Air Station
 RI = remedial investigation
 POTW = Publicly Owned Treatment Works
 RCRA = Resource Conservation and Recovery Act
 RfD = reference dose
 SARA = Superfund Amendments and Reauthorization Act
 SDWA = Safe Drinking Water Act
 USEPA = U.S. Environmental Protection Agency
 $\mu\text{g}/\text{m}^3$ = micrograms per cubic meter

TABLE A-2
LOCATION-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

SITES 1 AND 3
NAS BRUNSWICK

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL PROCESS	CONSIDERATION IN DESIGN
<u>WETLANDS/ FLOODPLAINS</u>					
<u>State</u>	Maine Natural Resources Protection Act (38 MRSA, Section 480-A through S)	Applicable	This act outlines requirements for certain activities adjacent to any freshwater wetland greater than 10 acres or with an associated stream, brook, or pond or adjacent to a coastal wetland. The activities must not unreasonably interfere with certain natural features, such as natural flow or quality of any waters, nor harm significant aquatic habitat, freshwater fisheries, or other aquatic life.	Because construction of the slurry wall is within 100 feet of Mere Brook, this regulation is applicable. Remedial activities will need to meet the substantive requirements of this Act.	Design addresses requirement by providing erosion control measures along top of slope of Mere Brook and establishing vegetative cover in disturbed areas of remedial construction.
	Natural Resources Protection Act, Permit by Rule Standards (MEDEP Regs, Chapter 305)	Applicable	This rule outlines prescribed standards for specific activities that may take place in or adjacent to wetlands and water bodies.	This regulation is applicable to construction of the slurry wall. Activities involving disturbance of soil material within 100 feet of the normal high water line, will be designed to incorporate all applicable standards.	Design addresses requirement by providing erosion control measures along top of slope of Mere Brook and establishing vegetative cover in disturbed areas of remedial construction.
<u>MERE BROOK</u>					
<u>State</u>	Maine Standards for Classification of Minor Drainages (38 MRSA, Section 468)	Applicable	Mere Brook is classified as a Class B water under the state water quality standards. Class B waters are defined as suitable for drinking water (after treatment), fishing, recreation in and on the water, and as habitat for fish and other aquatic life.	These regulations apply to activities conducted adjacent to Mere Brook. Remedial construction should not result in the degradation of water quality classification. These regulations may also potentially apply if treated groundwater is discharged to surface water. The Navy's preferred discharge option is to the Brunswick POTW; however, the Navy has not yet received approval from the POTW. The designated uses of the waters receiving either direct discharge or POTW effluent must be considered and protected in developing either discharge limits or pretreatment standards.	Design addresses requirement by providing erosion control measures along top of slope of Mere Brook and establishing vegetative cover in disturbed areas of remedial construction. Not directly considered in design, preferred discharge option is to the Brunswick POTW.

TABLE A-2
LOCATION-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

SITES 1 AND 3
NAS BRUNSWICK

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL PROCESS	CONSIDERATION IN DESIGN
	Maine Natural Resources Protection Act (38 MRSA, Section 480-A through S)	Applicable	A permit application must be submitted and approved by the Maine Bureau of Land Quality Control and Section 480-D performance standards met when conducting activities adjacent to any freshwater wetland greater than 10 acres or with an associated stream, brook, or pond.	Substantive requirements of this regulation apply to activities conducted adjacent to Mere Brook. However, a permit is not required for the selected remedy since administrative permit requirements are waived for remedial activities conducted on-site at federal Superfund sites.	Design addresses requirement by providing erosion control measures along top of slope of Mere Brook and establishing vegetative cover in disturbed areas of remedial construction.
<u>OTHER NATURAL RESOURCES</u>					
<u>State</u>	Maine Standards for Classification of Groundwater (38 MRSA, Section 470)	Applicable	This law requires the classification of the state's groundwater to protect, conserve, and maintain groundwater resources in the interest of the health, safety, and general welfare of the people of the state. Under the Maine standards, groundwater is classified as GW-A.	This regulation will apply if treated groundwater is discharged back to groundwater. The Navy's preferred discharge option is to the Brunswick POTW; however, the Navy has not yet received approval from the POTW. If discharge to groundwater is employed, the classification and uses of groundwater will be evaluated during development of discharge limits.	Not directly considered in design; discharge option is to the preferred Brunswick POTW.

TABLE A-2
LOCATION-SPECIFIC ARARs, CRITERIA, ADVISORIES, AND GUIDANCE

SITES 1 AND 3
NAS BRUNSWICK

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL PROCESS	CONSIDERATION IN DESIGN
	Maine Site Location Development Law and Regulations (38 MRSA Sections 481-490; MEDEP Regs, Chapters 371-377)	Applicable	This act and associated regulations govern new developments, including those that handle hazardous waste. New developments cannot adversely affect existing uses, scenic character, or natural resources in the municipality or neighboring municipality.	Those regulations concerning No Adverse Environmental Impact (i.e., Chapter 375) are applicable to implementation of the selected remedy. In particular standards for protection of groundwater would apply to construction and groundwater treatment activities. However, any licenses required, by reference, will not need to be obtained since permits are not required for actions conducted on-site at federal Superfund sites.	Design addresses requirement by meeting the substantive applicable requirements of the regulation concerning air emissions, surface drainage and runoff, stormwater management, temporary and permanent erosion and sedimentation control, and groundwater.

Notes:

- ARAR = Applicable or Relevant and Appropriate Requirements
- MRSA = Maine Revised Statutes Annotated
- MEDEP = Maine Department of Environmental Protection
- NAS = Naval Air Station
- POTW = Publicly Owned Treatment Works
- RI/FS = Remedial Investigation/Feasibility Study

**TABLE A-3
ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS**

**SITES 1 AND 3
NAS BRUNSWICK**

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL PROCESS	CONSIDERATION IN DESIGN
Federal				
RCRA - General Facility Standards (40 CFR 264.10-264.18)	Relevant and Appropriate	General facility requirements outline general waste analysis, security measures, inspections, and training requirements.	<p>The waste material at Sites 1 and 3 has not been formally defined as a RCRA-regulated waste; therefore, only sections of the facility standards are relevant and appropriate. Because of Navy security concerns, Sites 1 and 3 are fenced and access to the waste is effectively restricted.</p> <p>All other relevant general requirements will be incorporated into the construction and operation of the groundwater treatment plant.</p>	Design addresses requirements regarding access restriction, inspection requirements, personnel training, location standards, and construction quality assurance.
RCRA - Preparedness and Prevention (40 CFR 264.30-264.37)	Relevant and Appropriate	This regulation outlines requirements for safety equipment and spill-control for hazardous waste facilities. Part of the regulation includes a requirement that facilities be designed, maintained, constructed, and operated to minimize the possibility of an unplanned release that could threaten human health or the environment.	Because toxic constituents are present at Sites 1 and 3, preparedness and prevention requirements are relevant and appropriate to the implementation of the selected remedy. During the remedial construction safety and communication equipment will be installed at the site, and local authorities will be familiarized with site operations.	Design addresses requirement by requiring contractor to develop and be prepared to implement contingency plan during remedial construction activities.
RCRA - Contingency Plan and Emergency Procedures (40 CFR 264.50-264.56)	Relevant and Appropriate	This regulation outlines the requirements for emergency procedures to be used following explosions, fires, etc.	Because toxic constituents are present at Sites 1 and 3, contingency plans and emergency procedures are relevant and appropriate to the implementation of the selected remedy. Plans will be developed and implemented during site work including installation of extraction wells, and implementation of site remedies. Copies of the plans will be kept on-site.	Design addresses requirement by requiring contractor to develop and be prepared to implement contingency plan during remedial construction activities.
RCRA - Releases from Solid Waste Management Units (40 CFR 264.90-264.109)	Relevant and Appropriate	This regulation details groundwater monitoring requirements for hazardous waste treatment facilities. The regulation outlines general groundwater monitoring standards, as well as standards for detection monitoring, compliance monitoring, and corrective action monitoring.	Because toxic constituents are present in the wastes at Sites 1 and 3, and since those wastes will be left in place, groundwater monitoring requirements are relevant and appropriate to the selected remedy. Long-term groundwater monitoring is included as part of the selected remedy proposed action.	The long-term groundwater monitoring plan is to be developed during remedial construction.

**TABLE A-3
ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS**

**SITES 1 AND 3
NAS BRUNSWICK**

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL PROCESS	CONSIDERATION IN DESIGN
RCRA - Closure and Post-closure (40 CFR 264.110-264.120)	Relevant and Appropriate	This regulation details general requirements for closure and post-closure of hazardous waste facilities, including installation of a groundwater monitoring program.	Because the waste materials at Sites 1 and 3 will be left in place, those parts of this regulation concerning long-term monitoring and maintenance of the site are relevant and appropriate to the selected remedy.	The long-term operations and maintenance plan for Sites 1 and 3 is to be developed during remedial construction.
RCRA - Miscellaneous Units (40 CFR 264.600-264.999)	Relevant and Appropriate	These standards are applicable to miscellaneous units not previously defined under existing RCRA regulations. Subpart X outlines performance requirements that miscellaneous units be designed, constructed, operated, and maintained to prevent releases to the subsurface, groundwater, surface water, and wetlands that may have adverse effects on human health and the environment.	Because the selected remedy includes a groundwater treatment plant, the general design, performance, and operating requirements of Subpart X are relevant and appropriate. However, a permit is not required for remedial actions conducted on-site at federal Superfund sites.	The design addresses requirement by requiring the Contractor to prepare and implement a long-term operation and maintenance plan for the treatment facility and monitor system performance
RCRA Land Disposal Restrictions (40 CFR 268)	To be determined	Land disposal of RCRA hazardous wastes is restricted without specified treatment. It must be determined that the waste, beyond a reasonable doubt, meets the definition of one of the specified restricted wastes and the remedial action must constitute "placement" for the land disposal restrictions to be considered applicable. For each hazardous waste, the LDRs specify that the waste must be treated either by a treatment technology or to a concentration level prior to disposal in a RCRA Subtitle C permitted facility.	During treatment of groundwater, sludge containing hazardous constituents will be generated. The selected remedy includes provisions for analysis of this sludge, including Toxicity Characteristic Leachate Procedure (TCLP) testing. LDRs are potentially applicable if the sludge fails TCLP. The selected remedy does address handling and disposal of the sludge as a hazardous waste, if necessary.	The design addresses requirement by requiring the Contractor to sample and analyze sludge for TCLP constituents and, based on the results, dispose of the sludge in an appropriate facility.
OSHA - General Industry Standards (29 CFR Part 1910)	Applicable	These regulations specify the 8-hour time-weighted average concentration for various organic compounds. Training requirements for workers at hazardous wastes operations are specified in 29 CFR 1910.120.	Because toxic constituents are present at Sites 1 and 3, OSHA regulations are applicable. Proper respiratory equipment will be worn if it is impossible to maintain the work atmosphere below designated concentrations. Workers performing activities would be required to have completed specific training requirements.	The design addresses the requirement by requiring the Contractor to prepare and follow a Health and Safety plan meeting applicable OSHA regulations, including 29 CFR Part 1910.

TABLE A-3
ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

SITES 1 AND 3
NAS BRUNSWICK

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL PROCESS	CONSIDERATION IN DESIGN
OSHA - Safety and Health Standards (29 CFR Part 1926)	Applicable	This regulation specifies the type of safety equipment and procedures to be followed during site remediation.	Because toxic constituents are present at Sites 1 and 3, OSHA regulations are applicable. All appropriate safety equipment will be on-site. In addition, safety procedures would be followed during on-site activities.	The design addresses the requirement by requiring the Contractor to prepare and follow a Health and Safety Plan meeting applicable OSHA regulations including 29 CFR 1926.
OSHA - Recordkeeping, Reporting, and Related Regulations (29 CFR 1904)	Applicable	This regulation outlines the recordkeeping and reporting requirements for an employer under OSHA.	Because toxic constituents are present at Sites 1 and 3, OSHA regulations are applicable. These requirements will apply to all site contractors and subcontractors, and must be followed during all site work.	The design addresses the requirement by requiring the Contractor to prepare and follow a Health and Safety Plan meeting applicable OSHA regulations including 29 CFR 1904.
CWA - NPDES Regulations (40 CFR Parts 122, 125)	Applicable	This requirement implements the NPDES program that specifies the applicable effluent standards, monitoring requirements, and standard and special conditions for direct discharge.	NPDES requirements will be applicable if treated groundwater is discharged to surface water. The Navy's preferred discharge option is to the Brunswick POTW; however, the Navy has not yet received approval from the POTW. Both on- and off-site discharges from CERCLA sites to surface waters are required to meet the substantive CWA NPDES requirements, including discharge limitations, monitoring requirements, and best management practices. Brunswick POTW has a current NPDES permit. A permit would be required if treated groundwater is discharged on-site.	Discharge to POTW does not require an NPDES permit. The discharge for the surface water runoff detection basin at Sites 1 and 3 will require the preparation of a Notice of Intent and a pollution prevention plan in accordance with regulations.
Underground Injection Control Program (40 CFR 144, 146, 147, 1000)	Applicable	These regulations outline minimum program and performance standards for underground injection programs. Technical criteria and standards for siting, operation and maintenance, and reporting and recordkeeping as required for permitting are set forth in Part 146.	This regulation will be applicable if treated groundwater is discharged back to groundwater. The Navy's preferred discharge option is to the Brunswick POTW; however, the Navy has not yet received approval from the POTW. Discharge of treated groundwater, by well injection, must be in accordance with all the criteria and standards in these federal regulations, as well as meet all state Underground Injection Control Program requirements. Treated groundwater must meet all SDWA standards prior to well injection.	Not directly considered in design; preferred discharge option is to the Brunswick POTW.

TABLE A-3
ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

SITES 1 AND 3
NAS BRUNSWICK

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL PROCESS	CONSIDERATION IN DESIGN
CWA - Pretreatment Standards for POTW Discharge (40 CFR Part 403)	Applicable	This regulation specifies pretreatment standards for discharges to a POTW. If treated groundwater is discharged to a POTW, the POTW must have mechanisms available to meet the requirements of the National Pretreatment Program - Introduction of Pollutants which cause pass through or interference are prohibited. Discharges must also comply with any local POTW regulations. If hazardous waste is discharged to the POTW, the POTW may be subject to RCRA permit-by-rule.	This regulation is applicable since the Navy's preferred discharge option is to the Brunswick POTW; however, the Navy has not yet received approval from the POTW. If treated groundwater is discharged to a POTW, the treated water must meet all discharge limitations imposed by the POTW.	Discharge to the Brunswick POTW will meet the requirements of the Brunswick POTW.
<u>State</u>				
Maine Landfill Disposal Regulations (MEDEP Regs, Chapter 401)	Relevant and Appropriate	These regulations outline the permitting requirements for waste disposal by landfill. Chapter 401 specifies closure and post-closure maintenance requirements.	Because Sites 1 and 3 encompass a former landfill, these requirements are relevant and appropriate. Design of a cover system will have to meet minimum standards and specifications (401.7[c]).	Design addresses requirements of Maine Landfill Disposal Regulations.
Maine Rules to Control the Subsurface Discharge of Pollutants by Well Injection (MEDEP Regs, Chapter 543)	Applicable	This regulation prohibits the injection of hazardous waste into or above water-bearing formations via a new Class IV well. The subsurface discharge into or through a Class IV well that would cause or allow the movement of fluid into an underground source of drinking water that may result in a violation of any Maine Primary Drinking Water Standard, or which may otherwise adversely affect public health, is prohibited.	These regulations will be applicable if treated groundwater is discharged back to groundwater. The Navy's preferred discharge option is to the Brunswick POTW; however, the Navy has not yet received approval from the POTW. For discharge to the subsurface, groundwater must be treated to a target clean-up levels less than or equal to the Maine MEGs to be recharged to the aquifer.	Not directly considered in design; preferred discharge option is to the Brunswick POTW.
Maine Hazardous Waste Management Rules (MEDEP Regs, Chapters 800-802, 850, 851, 853-857)	Relevant and Appropriate	The rules provide a comprehensive program for handling, storage, and recordkeeping at hazardous waste facilities. They supplement the RCRA regulations.	Because these requirements supplement RCRA hazardous waste regulations, they are relevant and appropriate.	Design addresses requirement by requiring contractor to handle, store, dispose and maintain records of hazardous wastes in accordance with applicable state and federal regulations.

TABLE A-3
ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
SITES 1 AND 3
NAS BRUNSWICK

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL PROCESS	CONSIDERATION IN DESIGN
Maine Water Pollution Control Law: Conditions of Licenses (38 MRSA, Section 414-A)	Applicable	Regulates the discharge of any pollutants. Specifies that the discharge, either by itself or combined with other discharges, will not lower the quality of any classified body of water below such classification. The discharge will be subject to effluent limitations that require application of the best practicable treatment.	The substantive requirements of this regulation will apply if treated groundwater is discharged to surface water. The Navy's preferred discharge option is to the Brunswick POTW; however, the Navy has not yet received approval from the POTW. If treated water is discharged directly to surface water the effluent must receive the best practicable treatment before discharge.	Not directly considered in design; preferred discharge option is to the Brunswick POTW.
Maine Water Pollution Control Law: Certain Deposits and Discharges Prohibited (38 MRSA, Section 420)	Applicable	No person, firm, corporation, or other legal entity shall place, deposit, discharge, or spill mercury or toxic or hazardous substances, either directly or indirectly, into the inland groundwater or surface waters, tidal waters, on the ice, or on the banks thereof, so that the same may flow or be washed into such waters, or in such manner that the drainage therefrom may flow into such waters.	This regulation will apply if treated groundwater is discharged to surface water. The Navy's preferred discharge option is to the Brunswick POTW; however, the Navy has not yet received approval from the POTW. If discharge to surface water is employed, Best Management Practices will be used when handling wastes.	Not directly considered in design; preferred discharge option is to the Brunswick POTW.

TABLE A-3
ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

SITES 1 AND 3
NAS BRUNSWICK

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL PROCESS	CONSIDERATION IN DESIGN
<u>State Guidance and Criteria To Be Considered</u>				
MEDEP, Bureau of Water Quality Control, Policy Number 10, "The Discharge of Hazardous Substances to Groundwaters of the State"	To Be Considered	The Bureau will deny applications for waste discharge licenses for the discharge to groundwaters of substances designated by the Board to be hazardous when such substances are present in concentrations exceeding groundwater levels which occur naturally in the area. Exemption may be granted if the groundwater is treated to reduce the concentrations of pollutants discharged to below the level considered safe for drinking water.	This policy will need to be considered if treated groundwater is discharged back to groundwater. The Navy's preferred discharge option is to the Brunswick POTW; however, the Navy has not yet received approval from the POTW. If treated water is discharged to the subsurface, the minimum level of groundwater treatment would be required to provide adequate protection if no other means of disposal is feasible. This policy would only be considered after application of federal and state underground injection control regulations.	Not directly considered in design; preferred discharge option is to the Brunswick POTW.

Notes:

CFR	=	Code of Federal Regulations
CWA	=	Clean Water Act
LDRs	=	Land Disposal Restrictions
MEDEP	=	Maine Department of Environmental Protection
MEG	=	Maximum Exposure Guidelines
MRSA	=	Maine Revised Statutes Annotated
NAS	=	Naval Air Station
NPDES	=	National Pollutant Discharge Elimination System
OSHA	=	Occupational Safety and Health Administration
POTW	=	publicly owned treatment works
RCRA	=	Resource Conservation and Recovery Act
SDWA	=	Safe Drinking Water Act
TCLP	=	Toxicity Characteristic Leachate Procedure

TABLE A-1
 CHEMICAL-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

EASTERN PLUME
 NAS BRUNSWICK

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL PROCESS	CONSIDERATION IN DESIGN
<u>GROUNDWATER/ SURFACE WATER</u>					
<u>Federal</u>	SDWA - MCLs (40 CFR 141.11 - 141.16)	Relevant and Appropriate	MCLs have been promulgated for several common organic and inorganic contaminants. These levels regulate the concentration of contaminants in public drinking water supplies, but may also be considered relevant and appropriate for groundwater aquifers used for drinking water.	Groundwater at NAS Brunswick is not a current source of drinking water; therefore, MCLs are not applicable, but may be relevant and appropriate. To assess the potential risks to human health due to consumption of groundwater, contaminant concentrations were compared to their MCLs.	To be considered in monitoring long-term performance of remediation.
	SDWA - MCLGs (40 CFR 141.50 - 141.51)	Relevant and Appropriate	MCLGs are health-based criteria. As promulgated under SARA, MCLGs are to be considered for drinking water sources. MCLGs are available for several organic and inorganic contaminants.	The 1990 National Contingency Plan states that non-zero MCLGs are to be used as goals. Because groundwater at NAS Brunswick is not a current source of drinking water, MCLGs are not applicable, but may be relevant and appropriate. Contaminant concentrations in groundwater were compared to their MCLGs.	To be considered in monitoring long-term performance of remediation.
	RCRA - Subpart F Groundwater Protection Standards, Alternate Concentration Limits (40 CFR 264.94)	Relevant and Appropriate	This requirement outlines standards, in addition to background concentrations and MCLs, to be used in establishing clean-up levels for remediating groundwater contamination.	Most of the MCLs promulgated under RCRA are the same as SDWA MCLs. The standards set forth under RCRA do not reflect recent changes and additions to SDWA MCLs. Because groundwater is not a current source of drinking water; RCRA MCLs are not applicable, but may be relevant and appropriate.	To be considered in monitoring long-term performance of remediation.

TABLE A-1
CHEMICAL-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

EASTERN PLUME
NAS BRUNSWICK

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL PROCESS	CONSIDERATION IN DESIGN
	Federal AWQC	Applicable	Federal AWQC include (1) health-based criteria developed for 95 carcinogenic and noncarcinogenic compounds and (2) water quality parameters. AWQC for the protection of human health provide levels for exposure from drinking water and consuming aquatic organisms, and from consuming fish alone. Remedial actions involving contaminated surface water or groundwater must consider the uses of the water and the circumstances of the release or threatened release; this determines whether AWQC are relevant and appropriate.	AWQC will be applicable if treated groundwater is discharged to surface water. The Navy's preferred discharge option is to the Brunswick POTW, although the Navy has not yet received approval from the POTW. AWQC may be considered during development of pretreatment standards because the POTW discharges its effluent to the Androscoggin River.	Not directly considered in design, preferred discharge option is to the Brunswick POTW.
<u>Federal Guidance and Criteria To Be Considered</u>	USEPA Risk Reference Doses (RfDs)	To Be Considered	RfDs are the levels considered unlikely to cause significant adverse health effects associated with a threshold mechanism of action in human exposure for a lifetime.	Because there are only a limited number of promulgated standards for contaminants in soil and water, USEPA RfDs were used to characterize risks due to noncarcinogens in various media.	Design addresses requirement by collection and treatment of contaminated groundwater of the Eastern Plume.
	USEPA Human Health Assessment Group Cancer Slope Factors (CSFs)	To Be Considered	Carcinogenic effects present the most up-to-date information on cancer risk potency derived from USEPA's Human Health Assessment Group.	Because there are only a limited number of promulgated standards for contaminants in soil and water, USEPA CSFs were used to compute the individual incremental cancer risk resulting from exposure to certain compounds.	Design addresses requirement by collection and treatment of contaminated groundwater of the Eastern Plume.

TABLE A-1
CHEMICAL-SPECIFIC ARARs, CRITERIA, ADVISORIES, AND GUIDANCE

EASTERN PLUME
NAS BRUNSWICK

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL PROCESS	CONSIDERATION IN DESIGN
<u>State</u>	Maine Drinking Water Rules (10-144A CMR Chapters 231-233)	Relevant and Appropriate	Maine's Primary Drinking Water Standards are equivalent to federal MCLs. When state levels are more stringent than federal levels, the state levels may be used.	Groundwater at NAS Brunswick is not a current source of drinking water; therefore, State Drinking Water Standards are relevant and appropriate. Contaminant concentrations in groundwater were compared to State standards to assess the potential risks to human health due to consumption of groundwater.	Not directly considered in design, preferred discharge option is to the Brunswick POTW.
	Maine Regulations Relating to Water Quality Criteria for Toxic Pollutants (MEDEP Regs, Chapter 584)	Applicable	This rule limits the concentrations of certain materials allowed in Maine waters to prevent the occurrence of pollutants in toxic amounts as required by state and federal law. Except if naturally occurring, ambient levels of toxic pollutants shall not exceed the Clean Water Act AWQC. Where AWQC do not exist, the Board of Environmental Protection shall adopt site-specific numerical criteria.	This rule will be applicable if treated groundwater is discharged to surface water. The Navy's preferred discharge option is to the Brunswick POTW, although the Navy has not yet received approval from the POTW. AWQC will be considered during development of pretreatment standards. This rule is potentially applicable in development of pretreatment standards if AWQC do not exist for any contaminants present in groundwater.	Not directly considered in design, preferred discharge option is to the Brunswick POTW.

continued

TABLE A-1
CHEMICAL-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

EASTERN PLUME
NAS BRUNSWICK

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL PROCESS	CONSIDERATION IN DESIGN
<u>State Criteria and Guidance To Be Considered</u>	Rules Relating to Testing of Private Water Systems for Potentially Hazardous Contaminants (10-144A CMR Chapter 233, Appendix C)	To Be Considered	Appendix C outlines Maximum Exposure Guidelines (MEGs) for organic and inorganic compounds. MEGs include health advisories, which are maximum allowable concentrations of specific contaminants in drinking water.	MEGs have been considered for chemical compounds for which there are no promulgated standards. MEGs may be considered if treated groundwater is discharged back to groundwater. The Navy's preferred discharge option is to the Brunswick POTW; however, the Navy has not yet received approval from the POTW. MEGs may potentially be considered during development of discharge limits for reinjection of treated groundwater.	Not directly considered in design, preferred discharge option is to the Brunswick POTW.

Notes:

- ARAR = Applicable or Relevant and Appropriate Requirement
- AWQC = Ambient Water Quality Criteria
- CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
- CFR = Code of Federal Regulations
- CMR = Code of Maine Rules
- CPF = carcinogenic potency factor
- FS = feasibility study
- MCL = Maximum Contaminant Level
- MCLG = Maximum Contaminant Level Goal
- MEG = Maximum Exposure Guidelines
- MEDEP = Maine Department of Environmental Protection
- MRSA = Maine Revised Statutes Annotated
- NAS = Naval Air Station
- OSWER = Office of Solid Waste and Emergency Response
- POTW = Publicly Owned Treatment Works
- RI = remedial investigation
- RCRA = Resource Conservation and Recovery Act
- RfD = reference dose
- SARA = Superfund Amendments and Reauthorization Act
- SDWA = Safe Drinking Water Act
- USEPA = U.S. Environmental Protection Agency

TABLE A-2
LOCATION-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

EASTERN PLUME
NAS BRUNSWICK

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL PROCESS	
<u>WETLANDS/FLOOD PLAINS</u>					
<u>State</u>	Maine Natural Resources Protection Act (38 MRSA, Section 480-A through S)	Applicable	This act outlines requirements for certain activities adjacent to any freshwater wetland greater than 10 acres or with an associated stream, brook, or pond or adjacent to a coastal wetland. The activities must not unreasonably interfere with certain natural features, such as natural flow or quality of any waters, nor harm significant aquatic habitat, freshwater fisheries, or other aquatic life.	Because piping will need to be extended across Mere Brook, this regulation is applicable. Remedial activities will need to meet the substantive requirements of this Act.	Design addresses requirement by providing erosion control measures and establishing vegetative cover in areas disturbed by remedial activities.
	Natural Resources Protection Act, Permit by Rule Standards (MEDEP Regs, Chapter 305)	Applicable	This rule outlines prescribed standards for specific activities that may take place in or adjacent to wetlands and water bodies.	Because piping will need to be extended across Mere Brook, this regulation is applicable. Activities involving disturbance of soil material within 100 feet of the normal high water line, will be designed to incorporate all applicable standards.	Design addresses requirement by providing erosion control measures and establishing vegetative cover in areas disturbed by remedial activities.
<u>MERE BROOK</u>					
	Maine Standards for Classification of Minor Drainages (38 MRSA, Section 468)	Applicable	Mere Brook is classified as a Class B water under the state water quality standards. Class B waters are defined as suitable for drinking water (after treatment), fishing, recreation in and on the water, and as habitat for fish and other aquatic life.	These regulations apply to activities conducted adjacent to Mere Brook. Remedial construction should not result in the degradation of water quality classification.	Design addresses requirement by providing erosion control measures and establishing vegetative cover in areas disturbed by remedial activities.

TABLE A-2
LOCATION-SPECIFIC ARARs, CRITERIA, ADVISORIES, AND GUIDANCE

EASTERN PLUME
NAS BRUNSWICK

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL PROCESS	
	Maine Natural Resources Protection Act (38 MRSA, Section 480-A through S)	Applicable	A permit application must be submitted and approved by the Maine Bureau of Land Quality Control and Section 480-D performance standards met when conducting activities adjacent to any freshwater wetland greater than 10 acres or with an associated stream, brook, or pond.	These regulations may also potentially apply if treated groundwater is discharged to surface water. The Navy's preferred discharge option is to the Brunswick POTW; however, the Navy has not yet received approval from the POTW. The designated uses of the waters receiving either direct discharge or POTW effluent must be considered and protected in developing either discharge limits or pretreatment standards.	Not directly considered in design, preferred discharge option is to the Brunswick POTW.
<u>OTHER NATURAL RESOURCES</u>					
<u>State</u>	Maine Standards for Classification of Groundwater (38 MRSA, Section 470)	Applicable	This law requires the classification of the state's groundwater to protect, conserve, and maintain groundwater resources in the interest of the health, safety, and general welfare of the people of the state. Under the Maine standards, groundwater is classified as GW-A.	This regulation will apply if treated groundwater is discharged back to groundwater. The Navy's preferred discharge option is to the Brunswick POTW; however, the Navy has not yet received approval from the POTW. If discharge to groundwater is employed, the classification and uses of groundwater will be evaluated during development of discharge limits.	Not directly considered in design, preferred discharge option is to the Brunswick POTW.

TABLE A-2
LOCATION-SPECIFIC ARARs, CRITERIA, ADVISORIES, AND GUIDANCE

EASTERN PLUME
NAS BRUNSWICK

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL PROCESS
	Maine Site Location Development Law and Regulations (38 MRSA Sections 481-490; MEDEP Regs, Chapters 371-377)	Applicable	This act and associated regulations govern new developments, including those that handle hazardous waste. New developments cannot adversely affect existing uses, scenic character, or natural resources in the municipality or neighboring municipality.	Those regulations concerning No Adverse Environmental Impact (i.e., Chapter 375) are applicable to implementation of the interim remedy. In particular, standards for protection of groundwater would apply to construction and groundwater treatment activities. However, any licenses required, by reference, will not need to be obtained since permits are not required for actions conducted on-site at federal Superfund sites.

Notes:

- ARAR = Applicable or Relevant and Appropriate Requirements
- CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
- CFR = Code of Federal Regulations
- CWA = Clean Water Act
- MRSA = Maine Revised Statutes Annotated
- MEDEP = Maine Department of Environmental Protection
- NAS = Naval Air Station
- POTW = Publicly Owned Treatment Works
- RI/FS = Remedial Investigation/Feasibility Study
- RCRA = Resource Conservation and Recovery Act

**TABLE A-3
ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS**

**EASTERN PLUME
NAS BRUNSWICK**

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL PROCESS	CONSIDERATION IN DESIGN
Federal				
RCRA - General Facility Standards (40 CFR 264.10-264.18)	Relevant and Appropriate	General facility requirements outline general waste analysis, security measures, inspections, and training requirements.	The waste material at Sites 4, 11, and 13 have not been formally defined as a RCRA-regulated waste; therefore, only sections of the facility standards are relevant and appropriate. All other relevant general requirements will be incorporated into the construction and operation of the groundwater treatment plant.	Design addresses requirements regarding access restriction, inspection requirements, personnel training, location standards, and construction quality assurance.
RCRA - Preparedness and Prevention (40 CFR 264.30-264.37)	Relevant and Appropriate	This regulation outlines requirements for safety equipment and spill-control for hazardous waste facilities. Part of the regulation includes a requirement that facilities be designed, maintained, constructed, and operated to minimize the possibility of an unplanned release that could threaten human health or the environment.	Because toxic constituents are present within the Eastern Plume groundwater, preparedness and prevention requirements are relevant and appropriate to the implementation of the selected remedy. During remedial construction, safety and communication equipment will be installed at the site, and local authorities will be familiarized with site operations.	Design addresses requirement by requiring contractor to develop and be prepared to implement contingency plan during remedial construction activities.
RCRA - Contingency Plan and Emergency Procedures (40 CFR 264.50-264.56)	Relevant and Appropriate	This regulation outlines the requirements for emergency procedures to be used following explosions, fires, etc.	Because toxic constituents are present in Eastern Plume groundwater, contingency plans and emergency procedures are relevant and appropriate to the implementation of the selected remedy. Plans will be developed and implemented during site work including installation of extraction wells, and implementation of site remedies. Copies of the plans will be kept on-site.	Design addresses requirement by requiring contractor to develop and be prepared to implement contingency plan during remedial construction activities.

**TABLE A-3
ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS**

**EASTERN PLUME
NAS BRUNSWICK**

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL PROCESS	CONSIDERATION IN DESIGN
RCRA - Miscellaneous Units (40 CFR 264.600-264.999)	Relevant and Appropriate	These standards are applicable to miscellaneous units not previously defined under existing RCRA regulations. Subpart X outlines performance requirements that miscellaneous units be designed, constructed, operated, and maintained to prevent releases to the subsurface, groundwater, surface water, and wetlands that may have adverse effects on human health and the environment.	Because the selected remedy includes a groundwater treatment plant, the general design, performance, and operating requirements of Subpart X are relevant and appropriate. However, a permit is not required for remedial actions conducted on-site at federal Superfund sites.	Design addresses requirement by containing collecting and treating contaminated groundwater from the Eastern Plume. Additionally, a long-term monitoring program is to be conducted as part of the remedial action.
RCRA Land Disposal Restrictions (40 CFR 268)	To be determined	Land disposal of RCRA hazardous wastes is restricted without specified treatment. It must be determined that the waste, beyond a reasonable doubt, meets the definition of one of the specified restricted wastes and the remedial action must constitute "placement" for the land disposal restrictions to be considered applicable. For each hazardous waste, the LDRs specify that the waste must be treated either by a treatment technology or to a concentration level prior to disposal in a RCRA Subtitle C permitted facility.	During treatment of groundwater, sludge containing hazardous constituents will be generated. The selected remedy includes provisions for analysis of this sludge, including Toxicity Characteristic Leachate Procedure (TCLP) testing. LDRs are potentially applicable if the sludge fails TCLP. The selected remedy does address handling and disposal of the sludge as a hazardous waste, if necessary.	The design addresses requirement by requiring the Contractor to sample and analyze sludge for TCLP constituents and, based on the results, disposed of the sludge in an appropriate facility.
OSHA - General Industry Standards (29 CFR Part 1910)	Applicable	These regulations specify the 8-hour time-weighted average concentration for various organic compounds. Training requirements for workers at hazardous wastes operations are specified in 29 CFR 1910.120.	Because toxic constituents are present in Eastern Plume groundwater, OSHA regulations are applicable. Proper respiratory equipment will be worn if it is impossible to maintain the work atmosphere below designated concentrations. Workers performing activities would be required to have completed specific training requirements.	The design addresses the requirement by requiring the Contractor to prepare and follow a Health and Safety plan meeting applicable OSHA regulations, including 29 CFR Part 1910.
OSHA - Safety and Health Standards (29 CFR Part 1926)	Applicable	This regulation specifies the type of safety equipment and procedures to be followed during site remediation.	Because toxic constituents are present in Eastern Plume groundwater, OSHA regulations are applicable. All appropriate safety equipment will be on-site. In addition, safety procedures would be followed during on-site activities.	The design addresses the requirement by requiring the Contractor to prepare and follow a Health and Safety Plan meeting applicable OSHA regulations including 29 CFR 1926.

**TABLE A-3
ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS**

**EASTERN PLUME
NAS BRUNSWICK**

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL PROCESS	CONSIDERATION IN DESIGN
OSHA - Recordkeeping, Reporting, and Related Regulations (29 CFR 1904)	Applicable	This regulation outlines the recordkeeping and reporting requirements for an employer under OSHA.	Because toxic constituents are present in Eastern Plume groundwater, OSHA regulations are applicable. These requirements will apply to all site contractors and subcontractors, and must be followed during all site work.	The design addresses the requirement by requiring the Contractor to prepare and follow a Health and Safety Plan meeting applicable OSHA regulations including 29 CFR 1904.
CWA - NPDES Regulations (40 CFR Parts 122, 125)	Applicable	This requirement implements the NPDES program that specifies the applicable effluent standards, monitoring requirements, and standard and special conditions for direct discharge.	NPDES requirements will be applicable if treated groundwater is discharged to surface water. The Navy's preferred discharge option is to the Brunswick POTW; however, the Navy has not yet received approval from the POTW. Both on- and off-site discharges from CERCLA sites to surface waters are required to meet the substantive CWA NPDES requirements, including discharge limitations, monitoring requirements, and best management practices. Brunswick POTW has a current NPDES permit. A permit would be required if treated groundwater is discharged on-site.	Discharge to POTW does not require a NPDES permit.
Underground Injection Control Program (40 CFR 144, 146, 147, 1000)	Applicable	These regulations outline minimum program and performance standards for underground injection programs. Technical criteria and standards for siting, operation and maintenance, and reporting and recordkeeping as required for permitting are set forth in Part 146.	This regulation will be applicable if treated groundwater is discharged back to groundwater. The Navy's preferred discharge option is to the Brunswick POTW; however, the Navy has not yet received approval from the POTW. Discharge of treated groundwater, by well injection, must be in accordance with all the criteria and standards in these federal regulations, as well as meet all state Underground Injection Control Program requirements. Treated groundwater must meet all SDWA standards prior to well injection.	Not directly considered in design, preferred discharge option is to the Brunswick POTW.

TABLE A-3
ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

EASTERN PLUME
NAS BRUNSWICK

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL PROCESS	CONSIDERATION IN DESIGN
CWA - Pretreatment Standards for POTW Discharge (40 CFR Part 403)	Applicable	This regulation specifies pretreatment standards for discharges to a POTW. If treated groundwater is discharged to a POTW, the POTW must have mechanisms available to meet the requirements of the National Pretreatment Program - Introduction of Pollutants which cause pass through or interference are prohibited. Discharges must also comply with any local POTW regulations. If hazardous waste is discharged to the POTW, the POTW may be subject to RCRA permit-by-rule.	This regulation is applicable since the Navy's preferred discharge option is to the Brunswick POTW; however, the Navy has not yet received approval from the POTW. If treated groundwater is discharged to a POTW, the treated water must meet all discharge limitations imposed by the POTW.	Discharge to the Brunswick POTW will meet the requirements of the Brunswick POTW.
<u>State</u>				
Maine Rules to Control the Subsurface Discharge of Pollutants by Well Injection (MEDEP Regs, Chapter 543)	Applicable	This regulation prohibits the injection of hazardous waste into or above water-bearing formations via a new Class IV well. The subsurface discharge into or through a Class IV well that would cause or allow the movement of fluid into an underground source of drinking water that may result in a violation of any Maine Primary Drinking Water Standard, or which may otherwise adversely affect public health, is prohibited.	These regulations will be applicable if treated groundwater is discharged back to groundwater. The Navy's preferred discharge option is to the Brunswick POTW; however, the Navy has not yet received approval from the POTW. For discharge to the subsurface, groundwater must be treated to a target clean-up level less than or equal to the Maine MEGs to be recharged to the aquifer.	Not directly considered in design, preferred discharge option is to the Brunswick POTW.
Maine Hazardous Waste Management Rules (MEDEP Regs, Chapters 800-802, 850, 851, 853-857)	Relevant and Appropriate	The rules provide a comprehensive program for handling, storage, and recordkeeping at hazardous waste facilities. They supplement the RCRA regulations.	Because these requirements supplement RCRA hazardous waste regulations, they are relevant and appropriate.	Design addresses requirement by requiring contractor to handle, store, dispose and maintain records of hazardous wastes in accordance with applicable state and federal regulations.

**TABLE A-3
ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS**

**EASTERN PLUME
NAS BRUNSWICK**

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL PROCESS	CONSIDERATION IN DESIGN
Maine Water Pollution Control Law: Conditions of Licenses (38 MRSA, Section 414-A)	Applicable	Regulates the discharge of any pollutants. Specifies that the discharge, either by itself or combined with other discharges, will not lower the quality of any classified body of water below such classification. The discharge will be subject to effluent limitations that require application of the best practicable treatment.	The substantive requirements of this regulation will apply if treated groundwater is discharged to surface water. The Navy's preferred discharge option is to the Brunswick POTW; however, the Navy has not yet received approval from the POTW. If treated water is discharged directly to surface water the effluent must receive the best practicable treatment before discharge.	Not directly considered in design; preferred discharge option is to the Brunswick POTW.
Maine Water Pollution Control Law: Certain Deposits and Discharges Prohibited (38 MRSA, Section 420)	Applicable	No person, firm, corporation, or other legal entity shall place, deposit, discharge, or spill mercury or toxic or hazardous substances, either directly or indirectly, into the inland groundwater or surface waters, tidal waters, on the ice, or on the banks thereof, so that the same may flow or be washed into such waters, or in such manner that the drainage therefrom may flow into such waters.	This regulation will apply if treated groundwater is discharged to surface water. The Navy's preferred discharge option is to the Brunswick POTW; however, the Navy has not yet received approval from the POTW. If discharge to surface water is employed, Best Management Practices will be used when handling wastes.	Not directly considered in design; preferred discharge option is to the Brunswick POTW.

**TABLE A-3
ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS**

**EASTERN PLUME
NAS BRUNSWICK**

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL PROCESS	CONSIDERATION IN DESIGN
<u>State Guidance and Criteria To Be Considered</u>				
MEDEP, Bureau of Water Quality Control, Policy Number 10, "The Discharge of Hazardous Substances to Groundwaters of the State"	To Be Considered	The Bureau will deny applications for waste discharge licenses for the discharge to groundwaters of substances designated by the Board to be hazardous when such substances are present in concentrations exceeding groundwater levels which occur naturally in the area. Exemption may be granted if the groundwater is treated to reduce the concentrations of pollutants discharged to below the level considered safe for drinking water.	This policy will need to be considered if treated groundwater is discharged back to groundwater. The Navy's preferred discharge option is to the Brunswick POTW; however, the Navy has not yet received approval from the POTW. If treated water is discharged to the subsurface, the minimum level of groundwater treatment would be required to provide adequate protection if no other means of disposal is feasible. This policy would only be considered after application of federal and state underground injection control regulations.	Not directly considered in design, preferred discharge option is to the Brunswick POTW.

Notes:

- AHERA = Asbestos Hazard Emergency Response Act
- CAA = Clean Air Act
- CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
- CFR = Code of Federal Regulations
- CMR = Code of Maine Regulations
- CWA = Clean Water Act
- DOT = Department of Transportation (U.S.)
- LDRs = Land Disposal Restrictions
- FS = feasibility study
- MEDEP = Maine Department of Environmental Protection
- MEG = Maximum Exposure Guidelines
- MRSA = Maine Revised Statutes Annotated
- NAS = Naval Air Station
- NESHAP = National Emission Standards for Hazardous Air Pollutants
- NPDES = National Pollutant Discharge Elimination System
- OSHA = Occupational Safety and Health Administration
- POTW = publicly owned treatment works
- RACT = Reasonably Available Control Technology
- RI = remedial investigation
- RCRA = Resource Conservation and Recovery Act
- SDWA = Safe Drinking Water Act
- TCLP = Toxicity Characteristic Leachate Procedure
- µg/m³ = micrograms per cubic meter
- VOC = volatile organic compound

TABLE A-1
 CHEMICAL-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

SITES 5 AND 6
 NAS BRUNSWICK

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
GROUNDWATER/SURFACE WATER					
<u>Federal</u>	Safe Drinking Water Act (SDWA) - Maximum Contaminant Levels (MCLs) (40 CFR Part 141.11 - 141.16)	Relevant and Appropriate	MCLs have been promulgated for several common organic and inorganic contaminants. These levels regulate the concentration of contaminants in public drinking water supplies, but may also be considered relevant and appropriate for groundwater aquifers used for drinking water.	To assess the potential risks to human health due to consumption of groundwater, contaminant concentrations were compared to their MCLs.	Removal of potentially contaminated debris and asbestos-containing materials will be protective of groundwater at Sites 5 and 6.
	SDWA - Maximum Contaminant Level Goals (MCLGs) (40 CFR Part 141.50 - 141.51)	Relevant and Appropriate	MCLGs are health-based criteria to be considered for drinking water sources as a result of the Superfund Amendments and Reauthorization Act. MCLGs are available for several organic and inorganic contaminants.	The 1990 National Contingency Plan states that non-zero MCLGs are to be used as goals. Contaminant concentrations in groundwater were compared to their MCLGs.	Removal of potentially contaminated debris and asbestos-containing materials will be protective of groundwater at Sites 5 and 6.
	Resource Conservation and Recovery Act (RCRA) - Subpart F Groundwater Protection Standards, Alternative Concentration Limits (40 CFR Part 264.94)	Not Applicable	This requirement outlines standards, in addition to background concentrations and MCLs, to be used in establishing clean-up levels for remediating groundwater contamination.	Use of RCRA Alternative Concentration Limits was evaluated as not appropriate for conditions at Sites 5 and 6.	Not Applicable

(continued)

TABLE A-1
CHEMICAL-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

SITES 5 AND 6
NAS BRUNSWICK

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
	Federal Ambient Water Quality Criteria (AWQC)	Not Applicable	Federal AWQC are health-based criteria developed for carcinogenic and noncarcinogenic compounds and parameters. AWQC for the protection of human health provide levels for exposure from drinking water and consuming aquatic organisms, and from consuming fish alone. Remedial actions involving contaminated surface water or groundwater must consider the uses of the water and the circumstances of the release or threatened release; this determines whether AWQC are relevant and appropriate.	This requirement is generally used for determining clean-up levels or potential discharge limits for treated groundwater. Because groundwater treatment is not an element of remediation at Sites 5 and 6, this requirement does not apply.	Not Applicable
<u>Federal Guidance and Criteria To Be Considered</u>	U.S. Environmental Protection Agency (USEPA) Risk Reference Doses (RfDs)	To Be Considered	RfDs are considered the levels unlikely to cause significant adverse health effects associated with a threshold mechanism of action in human exposure for a lifetime.	USEPA RfDs were used to characterize risks due to noncarcinogens in various media.	Design addresses requirement by removal of potentially contaminated debris and asbestos-containing materials and disposal beneath the Sites 1 and 3 cap.
	USEPA Cancer Slope Factors (CSFs)	To Be Considered	CSFs represent the most up-to-date information on cancer risk potency available from USEPA's Integrated Risk Information System.	USEPA CSFs were used to compute the individual incremental cancer risk resulting from exposure to certain compounds.	Design addresses requirement by removal of potentially contaminated debris and asbestos-containing materials and disposal beneath the Sites 1 and 3 cap.

(continued)

TABLE A-1
CHEMICAL-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

SITES 5 AND 6
NAS BRUNSWICK

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
<u>State</u>	Maine Drinking Water Rules (10-144A CMR Chapters 231-233)	Relevant and Appropriate	Maine's Primary Drinking Water Standards are equivalent to federal MCLs. Maine Maximum Exposure Guidelines have been promulgated for several contaminants. When state levels are more stringent than federal levels and have been legally and consistently applied, the state levels may be used.	Primary drinking water standards were used during the Remedial Investigation for purposes of comparison to groundwater analytical data and to evaluate the extent of groundwater contamination.	Design addresses requirement by removal of potentially contaminated debris and asbestos-containing materials and disposal beneath the Sites 1 and 3 cap.
	Maine Regulations Relating to Water Quality Criteria for Toxic Pollutants (Maine Department of Environmental Protection [MEDEP] Regulations, Chapter 584)	Not Applicable	This rule limits the concentrations of certain materials allowed in Maine waters to prevent the occurrence of pollutants in toxic amounts as required by state and federal law. Except if naturally occurring, ambient levels of toxic pollutants shall not exceed the Clean Water Act AWQC. Where AWQC do not exist, the Board of Environmental Protection shall adopt site-specific numerical criteria.	Parallel to federal AWQC, this requirement is generally used for determining potential discharge limits for treated groundwater. Because groundwater treatment is not an element of remediation at Sites 5 and 6, this requirement does not apply.	Not Applicable
<u>AIR</u>					
<u>Federal</u>	Clean Air Act (CAA) - National Primary and Secondary Ambient Air Quality Standards (40 CFR Part 50)	Applicable	Primary ambient air quality standards define levels of air quality to protect public health. Secondary ambient air quality standards protect public welfare from known or anticipated adverse effects from pollutants.	The particulate standard for matter less than 10 microns is 150 $\mu\text{g}/\text{m}^3$, 24-hour average concentration. This standard applies to excavation activities.	Design addresses requirement by requiring contractor to implement ambient air quality monitoring during invasive activities at Sites 5 and 6.

(continued)

TABLE A-1
CHEMICAL-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

SITES 5 AND 6
NAS BRUNSWICK

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
	CAA - National Emission Standards for Hazardous Pollutants (NESHAPs) (40 CFR Part 61)	Relevant and Appropriate	NESHAPs are promulgated for emissions of particular air pollutants for specific sources. NESHAPs are generally not applicable to Superfund activities because CERCLA sites do not usually contain one of the specific source categories regulated; however, they may be relevant and appropriate and should be considered during development of the final remedy.	The NESHAP requirements for notification, emission limits, and personnel training for the handling and disposal of asbestos (Subpart M) are relevant and appropriate to activities conducted at Site 6.	Design addresses requirement by requiring an experienced and qualified contractor to perform the asbestos removal.
<u>Federal Criteria and Guidance to be Considered</u>	Control of Air Emissions for Superfund Air Strippers at Superfund Groundwater Sites (OSWER Directive 9355.D-28)	Not Applicable	Controls on air strippers at sites located in attainment areas can be based on state ARARs, risk management, guidelines, and other requirements of CERCLA Section 121.	Because groundwater does not need to be treated at Sites 5 and 6, air strippers will not be a component of the final design and this guidance does not need to be considered.	Not Applicable
<u>State</u>	Establishment of Air Quality Regions (38 MRSA, Section 583; MEDEP Regulations, Chapter 114)	Relevant and Appropriate	The Metropolitan Portland Air Quality Region is Class II.	Remedial actions should not result in the degradation of air quality classification.	Design addresses requirement by requiring contractor to monitor ambient air quality and implement dust suppression methods.
	Maine Ambient Air Quality Standards (38 MRSA, Section 584; MEDEP Regulations, Chapter 110)	Applicable	This Chapter establishes ambient air quality standards that are maximum levels of a particular pollutant permitted in the ambient air.	The standard for particulate matter is $150 \mu\text{g}/\text{m}^3$, 24-hour average concentration, which applies to excavation activities.	Design addresses requirement by requiring contractor to monitor ambient air quality and implement dust suppression methods.

(continued)

TABLE A-1
CHEMICAL-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

SITES 5 AND 6
NAS BRUNSWICK

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
SOIL					
<u>Federal Criteria and Guidance to be Considered</u>	Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Site (OSWER Directive 9355.4-02)	Not Applicable	This guidance set forth interim soil cleanup levels for lead in lieu of any USEPA-verified toxicological values (i.e., RfDs, CSFs)	Lead has not been identified as a contaminant of concern at either Site 5 or 6; therefore, this guidance does not need to be considered.	Not Applicable

Notes:

- ARAR = Applicable or Relevant and Appropriate Requirement
- AWQC = Ambient Water Quality Criteria
- CAA = Clean Air Act
- CFR = Code of Federal Regulations
- CMR = Code of Maine Rules
- CSF = Cancer Slope Factor
- MCL = Maximum Contaminant Level
- MCLG = Maximum Contaminant Level Goal
- MEDEP = Maine Department of Environmental Protection
- MRSA = Maine Revised Statutes Annotated
- OSWER = Office of Solid Waste and Emergency Response
- NAS = Naval Air Station
- RCRA = Resource Conservation and Recovery Act
- RfD = reference dose
- SDWA = Safe Drinking Water Act
- USEPA = U.S. Environmental Protection Agency
- $\mu\text{g}/\text{m}^3$ = micrograms per cubic meter

TABLE A-2
LOCATION-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

SITES 5 AND 6
NAS BRUNSWICK

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
WETLANDS					
<u>Federal</u>	Clean Water Act (CWA) Section 404	Not Applicable	Section 404 of the CWA regulates the discharge of dredged or fill material into U.S. waters, including wetlands. The purpose of Section 404 is to ensure that proposed discharges are evaluated with respect to impact on the aquatic ecosystem. If a remedial alternative involves dredged or fill material discharge to a wetland, a permit must be obtained from the U.S. Army Corps of Engineers.	No wetlands are present in the area to be remediated.	Not Applicable
	U.S. Army Corps of Engineers Permit Program Regulations (33 CFR Parts 320-330)	Not Applicable	These regulations prescribe the statutory authorities, and general and special policies and procedures applicable to the review of applications for Department of Army permits for controlling certain activities in U.S. waters including discharge of dredged or fill material.	No dredging or filling of wetlands will occur during implementation of the final remedy.	Not Applicable
	Guidelines for Specification of Disposal Sites for Dredged or Fill Materials (40 CFR Part 230)	Not Applicable	These guidelines maintain that no dredged or fill material discharge will be permitted if there is a practicable alternative with less impact to the aquatic ecosystem. Discharge will also not be permitted unless steps are taken to minimize potential adverse impacts, or if it will cause or contribute to significant degradation of U.S. waters.	No dredging or filling of wetlands will occur during implementation of the final remedy.	Not Applicable

(continued)

TABLE A-2
LOCATION-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

SITES 5 AND 6
NAS BRUNSWICK

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
	Fish and Wildlife Coordination Act (16 USC 661)	Not Applicable	This act requires that any federal agency proposing to modify a body of water must consult with the U.S. Fish and Wildlife Service, National Marine Fisheries Service, and other related state agencies.	Notification is not required for actions taken on-site at a CERCLA site and actions will be taken to minimize impacts to the stream during excavation.	Not Applicable
FLOODPLAINS	Resource Conservation and Recovery Act (RCRA) - Location Standards (40 CFR Part 264.18)	Not Applicable	A facility located in a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout of any hazardous wastes by a 100-year flood.	A treatment facility is not a component of the final remedy.	Not Applicable
WETLANDS/FLOODPLAINS	40 CFR Part 6, Appendix A	Not Applicable	Sets forth USEPA policy for carrying out the provisions of the Wetlands Executive Order (EO 11990) and Floodplains Executive Order (EO 11988). Under this order, federal agencies are required to minimize the destruction, loss, or degradation of wetlands, and preserve and enhance natural and beneficial values of wetlands; and minimize potential harm to or within floodplains and to avoid the long- and short-term adverse impact with modifications to floodplains.	There are no mapped floodplains in the area to be remediated.	Not Applicable

(continued)

TABLE A-2
LOCATION-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

SITES 5 AND 6
NAS BRUNSWICK

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
<u>State</u>	Maine Natural Resources Protection Act (38 MRSA, Section 480-A through S)	Applicable	This act outlines requirements for certain activities adjacent to any freshwater wetland greater than 10 acres or with an associated stream, brook, or pond or adjacent to a coastal wetland. The activities must not unreasonably interfere with certain natural features, such as natural flow or quality of any waters, nor harm significant aquatic habitat, freshwater fisheries, or other aquatic life.	Remedial activities regulated under this act must meet activity standards. Substantive requirements of these regulations must be met by any action taken within 100 feet of a wetland or stream.	Design addresses requirement by providing erosion control measures along boundary of remedial activities and establishing vegetative cover in disturbed areas of remedial construction.
	Natural Resources Protection Act, Permit by Rule Standards (Maine Department of Environmental Protection [MEDEP] Regulations, Chapter 305)	Applicable	This rule outlines prescribed standards for specific activities that may take place in or adjacent to wetlands and water bodies.	Proposed activities involving disturbance of soil material within 100 feet of the normal high water line would be designed to incorporate all applicable standards.	Design addresses requirement by providing erosion control measures along boundary of remedial activities and establishing vegetative cover in disturbed areas of remedial construction.
	Maine Hazardous Waste Management Rules (MEDEP Regulations, Chapters 800-802, 850, 851, 853-857)	Not Applicable	These rules correspond to and supplement RCRA hazardous waste requirements and outline the criteria for the siting of a new facility. No portion of a treatment facility may be located within a wetland or within 300 feet of any 100-year floodplain.	An on-site treatment facility is not a component of the final remedy proposed for Sites 5 and 6.	Not Applicable

OTHER NATURAL RESOURCES

W049379T.1/8

(continued)

TABLE A-2
LOCATION-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

SITES 5 AND 6
NAS BRUNSWICK

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
<u>Federal</u>	Endangered Species Act	Not Applicable	This act requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or notification of their habitat.	A natural resources inventory was conducted at NAS Brunswick in 1988. No Endangered or threatened species were identified as having habitat in the area of Sites 5 and 6.	Not Applicable
<u>State</u>	Maine Standards for Classification of Groundwater (38 MRSA, Section 470)	Applicable	This law requires the classification of the state's groundwater to protect, conserve, and maintain groundwater resources in the interest of the health, safety, and general welfare of the people of the state.	Under the Maine standards, groundwater is classified as GW-A.	Removal of potentially contaminated debris and asbestos-containing materials will be protective of groundwater at Sites 5 and 6.
	Maine Standards for Classification of Minor Drainages (38 MRSA, Section 468)	Applicable	These requirements set forth the classifications of surface water bodies within the State of Maine. Best usage and associated standards for protection of those usages are established under this regulation.	Remedial actions should not result in the degradation of water quality classification.	Design addresses requirement by providing erosion control measures along boundary of remedial activities and establishing vegetative cover in disturbed areas of remedial construction.
	Maine Water Pollution Control Law: Solid Waste Disposal Areas; Location (38 MRSA, Section 421)	Relevant and Appropriate	No boundary of any public or private solid waste disposal area shall lie closer than 300 feet to any classified body of surface water; also known as the Three-Hundred-Foot Law.	Excavation and removal of Sites 5 and 6 waste materials will eliminate the solid waste disposal area on this site.	Removal of potentially contaminated debris and asbestos-containing materials will be protective of surface water in the area of Sites 5 and 6.

(continued)

TABLE A-2
LOCATION-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

SITES 5 AND 6
NAS BRUNSWICK

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
	Maine Site Location Development Law and Regulations (38 MRSA Sections 481-490; MEDEP Regulations, Chapters 371-377)	Applicable	This act and regulations govern drilling for natural resources and includes hazardous activities that consume, generate, or handle hazardous wastes and oil. Activities cannot adversely affect existing uses, scenic character, or natural resources in the municipality or neighboring municipality.	Remedial alternatives will be developed considering these regulations. A permit will not be required if the activity is on-site.	Design addresses requirement by meeting the substantive applicable requirements of the regulation concerning air emissions, surface drainage and runoff, stormwater management, temporary and permanent erosion and sedimentation control, and groundwater.
	Maine Solid Waste Management Rules: Landfill Disposal Facilities (38 MRSA, Section 1301 <u>et seq.</u> ; MEDEP Regulations, Chapters 400-406)	Applicable	These regulations outline landfill siting requirements including minimum distances to aquifers, bedrock, and geologic faults.	The standards outlined in Chapter 404, construction and demolition landfills, are applicable to the remediation of Sites 5 and 6. The requirements set forth under this chapter will be incorporated into the disposal of Sites 5 and 6 waste at Sites 1 and 3.	Sites 1 and 3 cap design meets requirements of regulators.

(continued)

TABLE A-2
LOCATION-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

SITES 5 AND 6
NAS BRUNSWICK

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
	Maine Inland Fisheries and Wildlife Laws and Regulations (12 MRSA Chapter 713, Section 7751)	Not Applicable	The state of Maine has authority to research, list, and protect any species deemed endangered or threatened. These species are listed as either endangered or threatened in the state regulations. The Maine Department of Inland Fisheries and Wildlife has also developed the following administrative categories for species not considered endangered or threatened but considered important for research and further evaluation: Maine Watch List, Special Concern List, and Indeterminate Category. The Department determines appropriate use(s) of various habitats on a case-by-case basis. The Maine lists may differ from the federal lists of endangered species.	A natural resources inventory was conducted at NAS Brunswick in 1988. No Endangered or threatened species were identified as having habitat in the area of Sites 5 and 6.	Removal of Sites 5 and 6 wastes will not impact protected species.
<u>State Guidance and Criteria To Be Considered</u>	Town Shoreland Zoning Ordinances and State Minimum Guidelines	To Be Considered	These minimum guidelines and town ordinances apply to activities proposed within 200 feet of a high-water mark of a stream or other body of water.	These guidelines will be considered in the siting of treatment facilities during the development and evaluation of remedial alternatives.	Removal of Sites 5 and 6 wastes are not addressed by this guidance.
	Maine Critical Areas Program and Maine Natural Heritage Program	To Be Considered	These state programs issue policies and regulations governing special habitats or communities.	Where such special areas exist, these state programs will become involved in the project and/or permit review process.	Sites 5 and 6 have not been identified as Critical Areas.

(continued)

TABLE A-2
LOCATION-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

SITES 5 AND 6
NAS BRUNSWICK

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
	Maine Critical Areas Act (5 MRSA 3310 through 3316)	To Be Considered	This nonregulatory legislation allows Maine agencies such as the Critical Areas Program and the Natural Heritage Areas Program to identify, research, and protect critical areas and endangered or threatened plants.	Where such special areas exist, these state programs will become involved in the project and/or permit review process.	Sites 5 and 6 have not been identified as Critical Areas.

Notes:

- ARAR = Applicable or Relevant and Appropriate Requirements
- CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
- CFR = Code of Federal Regulations
- CWA = Clean Water Act
- EO = Executive Order
- MRSA = Maine Revised Statutes Annotated
- MEDEP = Maine Department of Environmental Protection
- NAS = Naval Air Station
- RCRA = Resource Conservation and Recovery Act
- USC = United States Code

TABLE A-3
ACTION-SPECIFIC ARARs, CRITERIA, AND GUIDANCE

SITES 5 AND 6
NAS BRUNSWICK

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
<u>Federal</u>				
Resource Conservation and Recovery Act (RCRA) - General Facility Standards (40 CFR Parts 264.10-264.18)	Not Applicable	General facility requirements outline general waste analysis, security measures, inspections, and training requirements.	A treatment facility is not included as part of the final alternative; therefore, facility standards do not apply.	Not Applicable
RCRA - Preparedness and Prevention (40 CFR Parts 264.30-264.37)	Relevant and Appropriate	This regulation outlines requirements for safety equipment and spill-control requirements for hazardous waste facilities. Part of the regulation includes a requirement that facilities be designed, maintained, constructed, and operated to minimize the possibility of an unplanned release that could threaten human health or the environment.	Safety and communication equipment will be available at the site during implementation of the final remedy. Local authorities will be familiarized with site operations.	Design addresses requirement by requiring Contractor to prepare and implement a spill prevent plan.
RCRA - Contingency Plan and Emergency Procedures (40 CFR Parts 264.50-264.56)	Relevant and Appropriate	This regulation outlines the requirements for emergency procedures to be used following explosions, fires, etc.	Emergency plans will be developed and implemented during the final site remedy. Copies of the plans will be kept on-site.	Design addresses requirement by requiring Contractor to prepare and implement a Safety Plan.
RCRA - Releases from Solid Waste Management Units (40 CFR Parts 264.90-264.109)	Not Applicable	This regulation details groundwater monitoring requirements for hazardous waste treatment facilities. The regulation outlines general groundwater monitoring standards, as well as standards for detection monitoring, compliance monitoring, and corrective action monitoring.	It has been established that long-term groundwater monitoring is not required for Sites 5 and 6.	Not Applicable
RCRA - Closure and Post-closure (40 CFR Parts 264.110-264.120)	Relevant and Appropriate	This regulation details general requirements for closure and post-closure of hazardous waste facilities, including installation of a groundwater monitoring program.	Those parts of the regulation concerned with long-term monitoring and maintenance of the site will be considered during remedial design.	Design addresses requirement by removal of potentially contaminated debris and asbestos-containing materials. No wastes are to remain at Sites 5 and 6 and long-term monitoring will not be necessary.

TABLE A-3
ACTION-SPECIFIC ARARs, CRITERIA, AND GUIDANCE

SITES 5 AND 6
NAS BRUNSWICK

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
RCRA - Waste Piles (40 CFR Parts 264.250-264.269)	Not Applicable	This regulation details procedures, operating requirements, and closure and post-closure for waste piles. If removal or decontamination of all contaminated subsoils is not possible, closure and post-closure requirements for landfills must be attained.	No waste piles will be generated and temporary storage of solid waste is not required during implementation of the final remedy.	Not Applicable
RCRA - Landfills (40 CFR Parts 264.300-264.339)	Not Applicable	This regulation details the design, operation, monitoring, inspection, recordkeeping, closure, and permit requirements for a RCRA landfill. Two liners must be installed to prevent groundwater contamination. A leachate collection system must be placed above and between the liner systems.	Landfill requirements are not directly applicable to actions conducted at Sites 5 and 6. Although Sites 5 and 6 materials will be land-disposed, the applicable requirements will be addressed under the Sites 1 and 3 final remedy.	Not Applicable
RCRA - Incinerators (40 CFR Parts 264.340-264.599)	Not Applicable	This regulations specify the performance standards, operating requirements and monitoring, inspection, and closure guidance of any incinerator burning hazardous waste.	Incineration is not a component of the final remedy at either Site 5 or 6; therefore, this requirement does not apply.	Not Applicable
RCRA - Miscellaneous Units (40 CFR Parts 264.600-264.999)	Not Applicable	These standards are applicable to miscellaneous units not previously defined under existing RCRA regulations. Subpart X outlines performance requirements that miscellaneous units be designed, constructed, operated, and maintained to prevent releases to the subsurface, groundwater, surface water, and wetlands that may have adverse effects on human health and the environment.	No treatment is proposed as part of the Sites 5 and 6 remedy; therefore, the design and performance requirements set forth under this Subpart do not apply.	Not Applicable

TABLE A-3
ACTION-SPECIFIC ARARS, CRITERIA, AND GUIDANCE

SITES 5 AND 6
NAS BRUNSWICK

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
RCRA Land Disposal Restrictions (40 CFR Part 268)	Not Applicable	Land disposal of RCRA hazardous wastes is restricted without specified treatment. It must be determined that the waste, beyond a reasonable doubt, meets the definition of one of the specified restricted wastes and the remedial action must constitute "placement" for the land disposal restrictions to be considered applicable. For each hazardous waste, the LDRs specify that the waste must be treated either by a treatment technology or to a concentration level prior to disposal in a RCRA Subtitle C permitted facility.	The waste materials at Sites 5 and 6 have been evaluated as not subject to Land Disposal Restrictions.	Not Applicable
Occupational Safety and Health Act (OSHA) - General Industry Standards (29 CFR Part 1910)	Applicable	These regulations specify the 8-hour time-weighted average concentration for various organic compounds. Training requirements for workers at hazardous wastes operations are specified in 29 CFR Part 1910.120.	Proper respiratory equipment will be worn if it is impossible to maintain the work atmosphere below the concentration. Workers performing activities would be required to have completed specific training requirements.	The design addresses the requirement by requiring the Contractor to prepare and implement a safety plan meeting the requirements of 29 CFR Part 1910.
OSHA - Safety and Health Standards (29 CFR Part 1926)	Applicable	This regulation specifies the type of safety equipment and procedures to be followed during site remediation.	All appropriate safety equipment will be on-site. In addition, safety procedures will be followed during on-site activities.	The design addresses the requirement by requiring the Contractor to prepare and implement a safety plan meeting the requirements of 29 CFR Part 1926.
OSHA - Recordkeeping, Reporting, and Related Regulations (29 CFR Part 1904)	Applicable	This regulation outlines the recordkeeping and reporting requirements for an employer under OSHA.	These requirements apply to all site contractors and subcontractors, and must be followed during all site work.	The design addresses the requirement by requiring the Contractor to prepare and implement a safety plan meeting the requirements of 29 CFR Part 1904.

TABLE A-3
ACTION-SPECIFIC ARARs, CRITERIA, AND GUIDANCE

SITES 5 AND 6
NAS BRUNSWICK

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
Clean Water Act (CWA) - National Pollutant Discharge Elimination System (NPDES) Regulations (40 CFR Parts 122, 125)	Not Applicable	This requirement implements the NPDES program that specifies the applicable effluent standards, monitoring requirements, an standard and special conditions for direct discharge.	This requirement does not apply to remedial activities to be conducted at Sites 5 and 6 because there will be no discharge of treated water or effluent to surface water.	Not applicable
CWA - Pretreatment Standards for Publicly Owned Treatment Works (POTW) Discharge (40 CFR Part 403)	Not Applicable	This regulation specifies pretreatment standards for discharges to a POTW. If treated groundwater is discharged to a POTW, the POTW must have the mechanisms available to meet the requirement of the National Pretreatment Program - Introduction of Pollutant which cause pass through or interference are prohibited. Discharges must also comply with any local POTW regulations. If hazardous waste is discharged to the POTW, the POTW may be subject o RCRA permit-by-rule.	This requirement does not apply to remedial activities to be conducted at Sites 5 and 6 because there will be no discharge of treated water or effluent to a POTW.	Not applicable
Underground Injection Control Program (40 CFR Parts 144, 146, 147, 1000)	Not Applicable	These regulation outline ,minimum program and performance standards for underground injection program. Technical criteria and standards for site, operation and maintenance, and reporting and recordkeeping as required for permitting are set forth in Part 146.	This requirement does not apply to remedial activities to be conducted at Sites 5 and 6 because there will be no discharge of treated water or effluent via well injection.	Not applicable
RCRA - Standards Applicable to Generators of Hazardous Waste (40 CFR Part 262)	Not Applicable	This requirement sets standards for generators of hazardous waste that address (1) accumulating waste, (2) preparing hazardous waste for shipment, and (3) preparing the uniform hazardous waste manifest. These requirements are integrated with U S. Department of Transportation (DOT) regulations.	Waste materials are not being moved off-site; therefore, generator requirements do not apply.	Not applicable

**TABLE A-3
ACTION-SPECIFIC ARARS, CRITERIA, AND GUIDANCE**

**SITES 5 AND 6
NAS BRUNSWICK**

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
U.S. DOT Rules for Transportation of Hazardous Materials (49 CFR Parts 107, 171.1-172.558)	Not Applicable	This regulation outlines procedures for the packaging, labeling, manifesting, and transporting of hazardous materials.	Waste materials are not being moved off-site; therefore, generator requirements do not apply.	Not applicable
Clean Water Act (CWA) - Regulations on Disposal Site Determinations Under the CWA (40 CFR Part 231)	Not Applicable	These regulations apply to all existing, proposed, or potential disposal sites for discharges of dredged or fill material into U.S. waters, which include wetlands.	The final remedy at Sites 5 and 6 does not require discharge of dredged material.	Not applicable
National Emission Standards for Hazardous Air Pollutants - Asbestos Removal (40 CFR Part 61, Subpart M)	Applicable	This regulation describes the minimum standards, procedure or action taken or used for removal, enclosure, or encapsulation of asbestos-containing material or the renovation, demolition, maintenance, or repair of facilities with asbestos-containing material.	Disposal of asbestos material from Site 6 may be required to conform to disposal regulations including a soil cover, fencing, and warning signs.	Design addresses requirement by disposal of asbestos containing material in a specific cell beneath the Sites 1 and 3 cap.
Asbestos Hazardous Emergency Response Act - Asbestos Regulation for Schools, Training, and Transportation (40 CFR Part 763)	Relevant and Appropriate	This regulation requires school districts to identify any and all asbestos-containing materials in their facilities and to develop management plans to control or eliminate asbestos-containing material. Standards are also specified for protection of construction workers, training requirement, and transportation and disposal of asbestos.	Although these regulations are specific to schools, portions may be relevant and appropriate to implementation of the final remedy at Site 6. Workers who are in contact with asbestos material may be required to conform to training requirements. Management plans are to be submitted to the state.	Design addresses requirement by requiring an experienced and qualified Contractor to perform the asbestos removal.
Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) Regulations (40 CFR Part 165)	Not Applicable	FIFRA regulation include procedures for the storage and disposal of pesticides, pesticide-related wastes, and their containers.	Pesticides are not contaminants of concern at either Sites 5 and 6.	Not Applicable

TABLE A-3
ACTION-SPECIFIC ARARs, CRITERIA, AND GUIDANCE

SITES 5 AND 6
NAS BRUNSWICK

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
<u>State</u>				
Maine Landfill Disposal Regulations (Maine Department of Environmental Protection [MEDEP] Regulations, Chapter 401)	Not Applicable	These regulations outline the permitting requirements for solid waste disposal by landfill. Chapter 401 specifies closure and post-closure maintenance requirements.	Landfill requirements are not directly applicable to actions conducted at Sites 5 and 6. Although Sites 5 and 6 materials will be land-disposed, the applicable requirements will be addressed under the Sites 1 and 3 final remedy.	Not Applicable
Maine Landfill Disposal Regulations for Construction/Demolition Debris, Inert Fill, Land Clearing Debris, and Woodwaste (MEDEP Regulations, Chapter 404)	Applicable	These regulations outline requirements for permitting, siting, design, operation, and closure of landfills to be used for the disposal of construction/demolition debris, inert fill, land clearing debris, and woodwaste.	Sites 5 and 6 can be classified as a construction/ demolition debris landfill; therefore, the closure of the waste disposal area must meet the minimum specifications outlined in Chapter 404.	Design addresses requirement by removal of debris and asbestos-contaminated materials and disposal of those materials at Sites 1 and 3 beneath a final landfill cover meeting the Maine Landfill Disposal Regulations.
Management, Testing, and Disposal of Special Wastes (MEDEP Regulations, Chapter 405)	Applicable	Section 405.4 sets forth requirements that apply to the storage and disposal of asbestos wastes.	These requirements would pertain to activities conducted at Site 6.	Design addresses requirement by requiring confirmation sampling.
Maine Rules to Control the Subsurface Discharge of Pollutants by Well Injection (MEDEP Regulations, Chapter 543)	Not Applicable	This regulation prohibits the injection of hazardous waste into or above water-bearing formations via a new Class IV well. The prohibits include subsurface discharge into or through a Class IV well that would cause or allow the movement of fluid into an underground source of drinking water that may result in a violation of any Maine Primary Drinking Water Standard or would otherwise adversely affect public health.	This requirement does not apply to remedial activities to be conducted at Sites 5 and 6 because there will be no discharge of treated water or effluent via well injection.	Not Applicable

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ACTION-SPECIFIC ARARs, CRITERIA, AND GUIDANCE

SITES 5 AND 6
NAS BRUNSWICK

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
Maine Hazardous Waste Management Rules (MEDEP Regulations, Chapters 800-802, 850, 851, 853-857)	Relevant and Appropriate	The rules provide a comprehensive program for handling, storage, and recordkeeping at hazardous waste facilities. They supplement the RCRA regulations.	Only those regulations paralleling RCRA requirements identified above would pertain to the final remedy implemented at Sites 5 and 6. State requirements more stringent than federal requirements take precedence.	Hazardous wastes have not been identified at Sites 5 and 6. The design incorporates applicable handling, storage and recordkeeping for the debris and asbestos-containing materials to be removed.
Maine Emission License Regulations (38 MRSA, Section 585, 590; MEDEP Regulations, Chapter 115)	Not Applicable	These requirements specify who must obtain an air emissions license, application information, and standards and criteria that must be met.	The preferred alternative will not create a point-source of air emissions.	Not Applicable
Incinerator Particulate Emission Standard (38 MRSA Section 600; MEDEP Regulations, Chapter 104)	Not Applicable	Establishes limitation on the amount of particulate matter allowed to be emitted from several categories and sizes of incinerator, as well as a limitation on the capacity of emission from all incinerators.	Incineration is not a component of the final remedy at either Site 5 or 6; therefore, this requirement does not apply.	Not Applicable
Maine Growth Offset Regulations (38 MRSA, Section 590; MEDEP Regulations, Chapter 113)	Not Applicable	This rule applies to new licenses for facilities in non attainment areas. They require Reasonably Available Control Technology or better for the base case emission, and offset reductions from other facilities.	Treatment that would create an air emission source is not an element of the final remedy.	Not Applicable
Maine Water Pollution Control Law: Conditions of Licenses (38 MRSA, Section 414-A)	Not Applicable	Regulations the discharge of any pollutants. Specifies that the discharge, either by itself or combined with other discharges will not lower the quality of any classified body of water below such classification. The discharge will be subject to effluent limitations that require application of the best practicable treatment	This requirement does not apply to remedial activities to be conducted at Sites 5 and 6 because there will be no discharge of treated water or effluent to surface water.	Not Applicable

**TABLE A-3
ACTION-SPECIFIC ARARs, CRITERIA, AND GUIDANCE**

**SITES 5 AND 6
NAS BRUNSWICK**

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
Maine Water Pollution Control Law: Certain Deposits and Discharges Prohibited (38 MRSA, Section 420)	Not Applicable	No person, firm, corporation, or other legal entity shall place, deposit, discharge, or spill mercury or toxic or hazardous substances, either directly or indirectly, into the inland groundwater or surface waters, tidal waters, on the ice, or on the banks thereof, so that the same may flow or be washed into such waters, or in such manner that the drainage therefrom may flow into such waters.	No water discharges are required as part of the Sites 5 and 6 final remedy.	Not Applicable
Maine Asbestos Abatement Regulations (MEDEP Regulations, Chapter 136)	Applicable	These regulations define requirements for the licensing of asbestos abatement contractor, worker, project supervisor, evaluation specialist, and design consultants, and outlines training courses for each job category. These regulations also specify the minimum work practice requirements for asbestos abatement contractors.	These requirements will apply to work at Site 6.	Design addresses requirement by requiring an experienced and qualified contractor to perform the asbestos removal.

TABLE A-3
ACTION-SPECIFIC ARARs, CRITERIA, AND GUIDANCE

SITES 5 AND 6
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REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
<u>State Guidance and Criteria to be Considered</u>				
MEDEP, Bureau of Water Quality Control, Policy Number 10, "The Discharge of Hazardous Substances to Groundwater of the State"	Not Applicable	The Bureau will deny application of waste discharge licenses for the discharge to groundwater of substances designed by the Board to be hazardous when such substances are present in concentration exceeding groundwater levels which occur naturally in the area. Exemption may be granted if the groundwater is treated to reduce the concentrations of pollutants discharged to below the level considered safe for drinking water.	This guidance will not be considered for Sites 5 and 6 because there will be no discharge of treated water or effluent to groundwater.	Not Applicable

Notes:

- CFR = Code of Federal Regulations
- CMR = Code of Maine Regulations
- CWA = Clean Water Act
- DOT = Department of Transportation (U.S.)
- FIFRA = Federal Insecticide, Fungicide, and Rodenticide Act
- MEDEP = Maine Department of Environmental Protection
- MRSA = Maine Revised Statutes Annotated
- NAS = Naval Air Station
- NPDES = National Pollutant Discharge Elimination System
- OSHA = Occupational Safety and Health Administration
- POTW = publicly owned treatment works
- RCRA = Resource Conservation and Recovery Act
- $\mu\text{g}/\text{m}^3$ = micrograms per cubic meter

**TABLE A-1
CHEMICAL-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE**

**SITE 8
NAS BRUNSWICK**

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
GROUNDWATER/SURFACE WATER					
<u>Federal</u>	Safe Drinking Water Act (SDWA) - Maximum Contaminant Levels (MCLs) (40 CFR Parts 141.11 - 141.16)	Relevant and Appropriate	MCLs have been promulgated for several common organic and inorganic contaminants. These levels regulate the concentration of contaminants in public drinking water supplies, but may also be considered relevant and appropriate for groundwater aquifers used for drinking water.	To assess the potential risks to human health due to consumption of groundwater, contaminant concentrations were compared to their MCLs.	Removal of potentially contaminated debris will be protective of groundwater at Site 8.
	SDWA - Maximum Contaminant Level Goals (MCLGs) (40 CFR Parts 141.50 - 141.51)	Relevant and Appropriate	MCLGs are health-based criteria to be considered for drinking water sources as a result of the Superfund Amendments and Reauthorization Act. MCLGs are available for several organic and inorganic contaminants.	The 1990 National Contingency Plan states that non-zero MCLGs are to be used as goals. Contaminant concentrations in groundwater were compared to their MCLGs.	Removal of potentially contaminated debris will be protective of groundwater at Site 8.
	Resource Conservation and Recovery Act (RCRA) - Subpart F Groundwater Protection Standards, Alternative Concentration Limits (40 CFR Part 264.94)	Not Applicable	This requirement outlines standards, in addition to background concentrations and MCLs, to be used in establishing clean-up levels for remediating groundwater contamination.	Use of RCRA Alternative Concentration Limits was evaluated as not appropriate for conditions at Site 8.	Not Applicable

(continued)

TABLE A-1
CHEMICAL-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

SITE 8
NAS BRUNSWICK

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
	Federal Ambient Water Quality Criteria (AWQC)	Not Applicable	Federal AWQC are health-based criteria developed for carcinogenic and noncarcinogenic compounds and parameters. AWQC for the protection of human health provide levels for exposure from drinking water and consuming aquatic organisms, and from consuming fish alone. Remedial actions involving contaminated surface water or groundwater must consider the uses of the water and the circumstances of the release or threatened release; this determines whether AWQC are relevant and appropriate.	This requirement is generally used for determining clean-up levels or potential discharge limits for treated groundwater. Because groundwater treatment is not an element of remediation at Site 8, this requirement does not apply.	Not Applicable
<u>Federal Guidance and Criteria To Be Considered</u>	U.S. Environmental Protection Agency (USEPA) Risk Reference Doses (RfDs)	To Be Considered	RfDs are considered the levels unlikely to cause significant adverse health effects associated with a threshold mechanism of action in human exposure for a lifetime.	USEPA RfDs were used to characterize risks due to noncarcinogens in various media.	Design addresses requirement by removal of debris and disposal beneath the Sites 1 and 3 cap.
	USEPA Cancer Slope Factors (CSFs)	To Be Considered	CSFs represent the most up-to-date information on cancer risk potency available from USEPA' Integrated Risk Information System.	USEPA CSFs were used to compute the individual incremental cancer risk resulting from exposure to certain compounds.	Design addresses requirement by removal of debris and disposal beneath the Sites 1 and 3 cap.

(continued)

TABLE A-1
CHEMICAL-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

SITE 8
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MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
<u>State</u>	Maine Drinking Water Rules (10-144A CMR Chapters 231-233)	Relevant and Appropriate	Maine's Primary Drinking Water Standards are equivalent to federal MCLs. Maine Maximum Exposure Guidelines have been promulgated for several contaminants. When state levels are more stringent than federal levels and have been legally and consistently applied, the state levels may be used.	Primary drinking water standards were used during the Remedial Investigation for purposes of comparison to groundwater analytical data and to evaluate the extent of groundwater contamination.	Design addresses requirement by removal of debris and disposal beneath the Sites 1 and 3 cap.
	Maine Regulations Relating to Water Quality Criteria for Toxic Pollutants (Maine Department of Environmental Protection [MEDEP] Regulations, Chapter 584)	Not Applicable	This rule limits the concentrations of certain materials allowed in Maine waters to prevent the occurrence of pollutants in toxic amounts as required by state and federal law. Except if naturally occurring, ambient levels of toxic pollutants shall not exceed the Clean Water Act AWQC. Where AWQC do not exist, the Board of Environmental Protection shall adopt site-specific numerical criteria.	Parallel to federal AWQC, this requirement is generally used for determining potential discharge limits for treated groundwater. Because groundwater treatment is not an element of remediation at Site 8, this requirement does not apply.	Not Applicable

(continued)

TABLE A-1
CHEMICAL-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

SITE 8
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MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
AIR					
<u>Federal</u>	Clean Air Act - National Primary and Secondary Ambient Air Quality Standards (40 CFR Part 50)	Applicable	Primary ambient air quality standards define levels of air quality to protect public health. Secondary ambient air quality standards protect public welfare from known or anticipated adverse effects from pollutants.	The particulate standard for matter less than 10 microns is $150 \mu\text{g}/\text{m}^3$, 24-hour average concentration. This standard applies to excavation activities.	Design addresses requirement by requiring contractor to implement ambient air quality monitoring during invasive activities at Site 8.
<u>State</u>	Establishment of Air Quality Regions (38 MRSA, Section 583; MEDEP Regulations, Chapter 114)	Relevant and Appropriate	The Metropolitan Portland Air Quality Region is Class II.	Remedial actions should not result in the degradation of air quality classification.	Design addresses requirement by requiring contractor to monitor ambient air quality and implement dust suppression methods.

(continued)

TABLE A-1
CHEMICAL-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

SITE 8
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MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
	Maine Ambient Air Quality Standards (38 MRSA, Section 584; MEDEP Regulations, Chapter 110)	Applicable	This Chapter establishes ambient air quality standards that are maximum levels of a particular pollutant permitted in the ambient air.	The standard for particulate matter is 150 $\mu\text{g}/\text{m}^3$, 24-hour average concentration, which applies to excavation activities.	Design addresses requirement by requiring contractor to monitor ambient air quality and implement dust suppression methods.

Notes:

ARAR	=	Applicable or Relevant and Appropriate Requirement
AWQC	=	Ambient Water Quality Criteria
CFR	=	Code of Federal Regulations
CMR	=	Code of Maine Rules
CSF	=	Cancer Slope Factor
MCL	=	Maximum Contaminant Level
MCLG	=	Maximum Contaminant Level Goal
MEDEP	=	Maine Department of Environmental Protection
MRSA	=	Maine Revised Statutes Annotated
NAS	=	Naval Air Station
RCRA	=	Resource Conservation and Recovery Act
RfD	=	reference dose
SDWA	=	Safe Drinking Water Act
USEPA	=	U.S. Environmental Protection Agency
$\mu\text{g}/\text{m}^3$	=	micrograms per cubic meter

TABLE A-2
LOCATION-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

SITE 8
NAS BRUNSWICK

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
WETLANDS					
<u>Federal</u>	Clean Water Act (CWA) Section 404	Not Applicable	Section 404 of the CWA regulates the discharge of dredged or fill material into U.S. waters, including wetlands. The purpose of Section 404 is to ensure that proposed discharges are evaluated with respect to impact on the aquatic ecosystem. If a remedial alternative involves dredged or fill material discharge to a wetland, a permit must be obtained from the U.S. Army Corps of Engineers.	No wetlands are present in the area to be remediated.	Not Applicable
	U.S. Army Corps of Engineers Permit Program Regulations (33 CFR Parts 320-330)	Not Applicable	These regulations prescribe the statutory authorities, and general and special policies and procedures applicable to the review of applications for Department of Army permits for controlling certain activities in U.S. waters including discharge of dredged or fill material.	No dredging or filling of wetlands will occur during implementation of the final remedy.	Not Applicable
	Guidelines for Specification of Disposal Sites for Dredged or Fill Materials (40 CFR Part 230)	Not Applicable	These guidelines maintain that no dredged or fill material discharge will be permitted if there is a practicable alternative with less impact to the aquatic ecosystem. Discharge will also not be permitted unless steps are taken to minimize potential adverse impacts, or if it will cause or contribute to significant degradation of U.S. waters.	No dredging or filling of wetlands will occur during implementation of the final remedy.	Not Applicable

(continued)

TABLE A-2
LOCATION-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

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MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
	Fish and Wildlife Coordination Act (16 USC 661)	Not Applicable	This act requires that any federal agency proposing to modify a body of water must consult with the U.S. Fish and Wildlife Service, National Marine Fisheries Service, and other related state agencies.	Notification is not required for actions taken on-site at a CERCLA site and actions will be taken to minimize impacts to the stream during excavation.	Not Applicable
FLOODPLAINS	Resource Conservation and Recovery Act (RCRA) - Location Standards (40 CFR Part 264.18)	Not Applicable	A facility located in a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout of any hazardous wastes by a 100-year flood.	A treatment facility is not a component of the final remedy.	Not Applicable
WETLANDS/FLOODPLAINS	40 CFR Part 6, Appendix A	Not Applicable	Sets forth USEPA policy for carrying out the provisions of the Wetlands Executive Order (EO 11990) and Floodplains Executive Order (EO 11988). Under this order, federal agencies are required to minimize the destruction, loss, or degradation of wetlands, and preserve and enhance natural and beneficial values of wetlands; and minimize potential harm to or within floodplains and to avoid the long- and short-term adverse impact with modifications to floodplains.	There are no mapped floodplains in the area to be remediated.	Not Applicable

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TABLE A-2
LOCATION-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

SITE 8
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MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
<u>State</u>	Maine Natural Resources Protection Act (38 MRSA, Section 480-A through S)	Applicable	This act outlines requirements for certain activities adjacent to any freshwater wetland greater than 10 acres or with an associated stream, brook, or pond or adjacent to a coastal wetland. The activities must not unreasonably interfere with certain natural features, such as natural flow or quality of any waters, nor harm significant aquatic habitat, freshwater fisheries, or other aquatic life.	Remedial activities regulated under this act must meet activity standards. Substantive requirements of these regulations must be met by any action taken within 100 feet of a wetland or stream.	Design addresses requirement by providing erosion control measures along boundary of remedial activities and establishing vegetative cover in disturbed areas of remedial construction.
	Natural Resources Protection Act, Permit by Rule Standards (Maine Department of Environmental Protection (MEDEP) Regulations, Chapter 305)	Applicable	This rule outlines prescribed standards for specific activities that may take place in or adjacent to wetlands and water bodies.	Proposed activities involving disturbance of soil material and discharge of treatment water, within 100 feet of the normal high water line, would be designed to incorporate all applicable standards.	Design addresses requirement by providing erosion control measures along boundary of remedial activities and establishing vegetative cover in disturbed areas of remedial construction.
	Maine Hazardous Waste Management Rules (MEDEP Regulations, Chapters 800-802, 850, 851, 853-857)	Not Applicable	These rules correspond to and supplement RCRA hazardous waste requirements and outline the criteria for the siting of a new facility. No portion of a treatment facility may be located within a wetland or within 300 feet of any 100-year floodplain.	An on-site treatment facility is not a component of the final remedy proposed for Site 8.	Not Applicable

(continued)

TABLE A-2
LOCATION-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

SITE 8
NAS BRUNSWICK

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
OTHER NATURAL RESOURCES					
<u>Federal</u>	Endangered Species Act	Not Applicable	This act requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or notification of their habitat.	A natural resources inventory was conducted at NAS Brunswick in 1988. No Endangered or threatened species were identified as having habitat in the area of Site 8.	Not Applicable
<u>State</u>	Maine Standards for Classification of Groundwater (38 MRSA, Section 470)	Applicable	This law requires the classification of the state's groundwater to protect, conserve, and maintain groundwater resources in the interest of the health, safety, and general welfare of the people of the state.	Under the Maine standards, groundwater is classified as GW-A.	Removal of potentially contaminated debris will be protective of groundwater at Site 8.
	Maine Standards for Classification of Minor Drainages (38 MRSA, Section 468)	Applicable	These requirements set forth the classifications of surface water bodies within the State of Maine. Best usage and associated standards for protection of those usages are established under this regulation.	Remedial actions should not result in the degradation of water quality classification.	Design addresses requirement by providing erosion control measures along boundary of remedial activities and establishing vegetative cover in disturbed areas of remedial construction.
	Maine Water Pollution Control Law: Solid Waste Disposal Areas; Location (38 MRSA, Section 421)	Relevant and Appropriate	No boundary of any public or private solid waste disposal area shall lie closer than 300 feet to any classified body of surface water; also known as the Three-Hundred-Foot Law.	Excavation and removal of Site 8 waste materials will eliminate the solid waste disposal area on this site.	Removal of potentially contaminated debris will be protective of surface water in the area of Site 8.

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TABLE A-2
LOCATION-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

SITE 8
NAS BRUNSWICK

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
	Maine Site Location Development Law and Regulations (38 MRSA Sections 481-490; MEDEP Regulations, Chapters 371-377)	Applicable	This act and regulations govern drilling for natural resources and includes hazardous activities that consume, generate, or handle hazardous wastes and oil. Activities cannot adversely affect existing uses, scenic character, or natural resources in the municipality or neighboring municipality.	Remedial alternatives will be developed considering these regulations. A permit will not be required if the activity is on-site.	Design addresses requirement by meeting the substantive applicable requirements of the regulation concerning air emissions, surface drainage and runoff, stormwater management, temporary and permanent erosion and sedimentation control, and groundwater.
	Maine Solid Waste Management Rules: Landfill Disposal Facilities (38 MRSA, Section 1301 et seq.; MEDEP Regulations, Chapters 400-406)	Applicable	These regulations outline landfill siting requirements including minimum distances to aquifers, bedrock, and geologic faults.	The standards outlined in this Chapter 404, construction and demolition landfills, of these regulations are applicable to the remediation of Site 8. The requirements set forth under this chapter will be incorporated into the disposal of Site 8 wastes at Sites 1 and 3.	Sites 1 and 3 cap design meets requirements of regulation.

(continued)

TABLE A-2
LOCATION-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

SITE 8
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MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
	Maine Inland Fisheries and Wildlife Laws and Regulations (12 MRSA Chapter 713, Section 7751)	Not Applicable	The state of Maine has authority to research, list, and protect any species deemed endangered or threatened. These species are listed as either endangered or threatened in the state regulations. The Maine Department of Inland Fisheries and Wildlife has also developed the following administrative categories for species not considered endangered or threatened but considered important for research and further evaluation: Maine Watch List, Special Concern List, and Indeterminate Category. The Department determines appropriate use(s) of various habitats on a case-by-case basis. The Maine lists may differ from the federal lists of endangered species.	A natural resources inventory was conducted at NAS Brunswick in 1988. No Endangered or threatened species were identified as having habitat in the area of Site 8.	Not Applicable
<u>State Guidance and Criteria To Be Considered</u>	Town Shoreland Zoning Ordinances and State Minimum Guidelines	To Be Considered	These minimum guidelines and town ordinances apply to activities proposed within 200 feet of a high-water mark of a stream or other body of water.	These guidelines will be considered in the siting of treatment facilities during the development and evaluation of remedial alternatives.	Removal of Site 8 wastes is not affected by this guidance.
	Maine Critical Areas Program and Maine Natural Heritage Program	To Be Considered	These state programs issue policies and regulations governing special habitats or communities.	Where such special areas exist, these state programs will become involved in the project and/or permit review process.	Site 8 has not been identified as a critical area.

(continued)

TABLE A-2
LOCATION-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

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MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
	Maine Critical Areas Act (5 MRSA 3310 through 3316)	To Be Considered	This nonregulatory legislation allows Maine agencies such as the Critical Areas Program and the Natural Heritage Areas Program to identify, research, and protect critical areas and endangered or threatened plants.	Where such special areas exist, these state programs will become involved in the project and/or permit review process.	Site 8 has not been identified as a critical area.

Notes:

- ARAR = Applicable or Relevant and Appropriate Requirements
- CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
- CFR = Code of Federal Regulations
- CWA = Clean Water Act
- EO = Executive Order
- MRSA = Maine Revised Statutes Annotated
- MEDEP = Maine Department of Environmental Protection
- NAS = Naval Air Station
- RCRA = Resource Conservation and Recovery Act
- USC = United States Code

TABLE A-3
ACTION-SPECIFIC ARARs, CRITERIA, AND GUIDANCE

SITE 8
NAS BRUNSWICK

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
<u>Federal</u>				
Resource Conservation and Recovery Act (RCRA) - General Facility Standards (40 CFR Parts 264.10-264.18)	Not Applicable	General facility requirements outline general waste analysis, security measures, inspections, and training requirements.	A treatment facility is not included as part of the final alternative; therefore, facility standards do not apply.	Not Applicable
RCRA - Preparedness and Prevention (40 CFR Parts 264.30-264.37)	Relevant and Appropriate	This regulation outlines requirements for safety equipment and spill-control requirements for hazardous waste facilities. Part of the regulation includes a requirement that facilities be designed, maintained, constructed, and operated to minimize the possibility of an unplanned release that could threaten human health or the environment.	Safety and communication equipment will be available at the site during implementation of the final remedy. Local authorities will be familiarized with site operations.	Design addresses requirement by requiring Contractor to prepare and implement a spill prevent plan.
RCRA - Contingency Plan and Emergency Procedures (40 CFR Parts 264.50-264.56)	Relevant and Appropriate	This regulation outlines the requirements for emergency procedures to be used following explosions, fires, etc.	Emergency plans will be developed and implemented during the final site remedy. Copies of the plans will be kept on-site.	Design addresses requirement by requiring Contractor to prepare and implement a Safety Plan.

(continued)

TABLE A-3
ACTION-SPECIFIC ARARs, CRITERIA, AND GUIDANCE

SITE 8
NAS BRUNSWICK

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
RCRA - Releases from Solid Waste Management Units (40 CFR Parts 264.90-264.109)	Not Applicable	This regulation details groundwater monitoring requirements for hazardous waste treatment facilities. The regulation outlines general groundwater monitoring standards, as well as standards for detection monitoring, compliance monitoring, and corrective action monitoring.	It has been established that long-term groundwater monitoring is not required for Site 8.	Not Applicable
RCRA - Closure and Post-closure (40 CFR Parts 264.110-264.120)	Relevant and Appropriate	This regulation details general requirements for closure and post-closure of hazardous waste facilities, including installation of a groundwater monitoring program.	Those parts of the regulation concerned with long-term monitoring and maintenance of the site will be considered during remedial design.	Design addresses requirement by removal of potentially contaminated debris. No wastes are to remain at Site 8 and long-term monitoring will not be necessary.
RCRA - Waste Piles (40 CFR Parts 264.250-264.269)	Not Applicable	This regulation details procedures, operating requirements, and closure and post-closure for waste piles. If removal or decontamination of all contaminated subsoils is not possible, closure and post-closure requirements for landfills must be attained.	No waste piles will be generated and temporary storage of solid waste is not required during implementation of the final remedy.	Not Applicable

(continued)

TABLE A-3
ACTION-SPECIFIC ARARs, CRITERIA, AND GUIDANCE

SITE 8
NAS BRUNSWICK

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
RCRA - Landfills (40 CFR Parts 264.300-264.339)	Not Applicable	This regulation details the design, operation, monitoring, inspection, recordkeeping, closure, and permit requirements for a RCRA landfill. Two liners must be installed to prevent groundwater contamination. A leachate collection system must be placed above and between the liner systems.	Landfill requirements are not directly applicable to actions conducted at Site 8. Although Site 8 materials will be land-disposed, the applicable requirements will be addressed under the Sites 1 and 3 final remedy.	Not Applicable
RCRA - Miscellaneous Units (40 CFR Parts 264.600-264.999)	Not Applicable	These standards are applicable to miscellaneous units not previously defined under existing RCRA regulations. Subpart X outlines performance requirements that miscellaneous units be designed, constructed, operated, and maintained to prevent releases to the subsurface, groundwater, surface water, and wetlands that may have adverse effects on human health and the environment.	No treatment is proposed as part of the Site 8 remedy; therefore, the design and performance requirements set forth under this Subpart do not apply.	Not Applicable

(continued)

TABLE A-3
ACTION-SPECIFIC ARARS, CRITERIA, AND GUIDANCE

SITE 8
NAS BRUNSWICK

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
RCRA Land Disposal Restrictions (40 CFR Part 268)	Not Applicable	Land disposal of RCRA hazardous wastes is restricted without specified treatment. It must be determined that the waste, beyond a reasonable doubt, meets the definition of one of the specified restricted wastes and the remedial action must constitute "placement" for the land disposal restrictions to be considered applicable. For each hazardous waste, the LDRs specify that the waste must be treated either by a treatment technology or to a concentration level prior to disposal in a RCRA Subtitle C permitted facility.	The waste materials at Site 8 have been evaluated as not subject to Land Disposal Restrictions.	Not Applicable
Occupational Safety and Health Act (OSHA) - General Industry Standards (29 CFR Part 1910)	Applicable	These regulations specify the 8-hour time-weighted average concentration for various organic compounds. Training requirements for workers at hazardous wastes operations are specified in 29 CFR Part 1910.120.	Proper respiratory equipment will be worn if it is impossible to maintain the work atmosphere below the concentration. Workers performing activities would be required to have completed specific training requirements.	The design addresses the requirement by requiring the Contractor to prepare and implement a safety plan meeting the requirements of 29 CFR Part 1910.

(continued)

TABLE A-3
ACTION-SPECIFIC ARARS, CRITERIA, AND GUIDANCE

SITE 8
NAS BRUNSWICK

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
OSHA - Safety and Health Standards (29 CFR Part 1926)	Applicable	This regulation specifies the type of safety equipment and procedures to be followed during site remediation.	All appropriate safety equipment will be on-site. In addition, safety procedures will be followed during on-site activities.	The design addresses the requirement by requiring the Contractor to prepare and implement a safety plan meeting the requirements of 29 CFR Part 1926.
OSHA - Recordkeeping, Reporting, and Related Regulations (29 CFR Part 1904)	Applicable	This regulation outlines the recordkeeping and reporting requirements for an employer under OSHA.	These requirements apply to all site contractors and subcontractors, and must be followed during all site work.	The design addresses the requirement by requiring the Contractor to prepare and implement a safety plan meeting the requirements of 29 CFR Part 1904.
Clean Air Act - National Ambient Air Quality Standards (40 CFR Part 50)	Applicable	This regulation specifies maximum annual arithmetic mean and maximum 24-hour concentrations for particulate matter.	Fugitive dust emissions from site excavation activities will be maintained below the 24-hour maximum of 150 $\mu\text{g}/\text{m}^3$ and the annual arithmetic mean of 50 $\mu\text{g}/\text{m}^3$ by dust suppressants, if necessary.	

(continued)

TABLE A-3
ACTION-SPECIFIC ARARs, CRITERIA, AND GUIDANCE

SITE 8
NAS BRUNSWICK

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
RCRA - Standards Applicable to Generators of Hazardous Waste (40 CFR Part 262)	Not Applicable	This requirement sets standards for generators of hazardous waste that address (1) accumulating waste, (2) preparing hazardous waste for shipment, and (3) preparing the uniform hazardous waste manifest. These requirements are integrated with U.S. Department of Transportation regulations.	Waste materials are not being moved off-site; therefore, generator requirements do not apply.	Not Applicable
U.S. DOT Rules for Transportation of Hazardous Materials (49 CFR Parts 107, 171.1-172.558)	Not Applicable	This regulation outlines procedures for the packaging, labeling, manifesting, and transporting of hazardous materials.	Waste materials are not being moved off-site; therefore, generator requirements do not apply.	Not Applicable
Clean Water Act (CWA) - Regulations on Disposal Site Determinations Under the CWA (40 CFR Part 231)	Not Applicable	These regulations apply to all existing, proposed, or potential disposal sites for discharges of dredged or fill material into U.S. waters, which include wetlands.	The final remedy at Site 8 does not require discharge of dredged material.	Not Applicable

(continued)

TABLE A-3
ACTION-SPECIFIC ARARs, CRITERIA, AND GUIDANCE

SITE 8
NAS BRUNSWICK

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
<u>State</u>				
Maine Landfill Disposal Regulations (Maine Department of Environmental Protection [MEDEP] Regulations, Chapter 401)	Not Applicable	These regulations outline the permitting requirements for solid waste disposal by landfill. Chapter 401 specifies closure and post-closure maintenance requirements.	Landfill requirements are not directly applicable to actions conducted at Site 8. Although Site 8 materials will be land-disposed, the applicable requirements will be addressed under the Sites 1 and 3 final remedy.	Not Applicable
Maine Landfill Disposal Regulations for Construction/Demolition Debris, Inert Fill, Land Clearing Debris, and Woodwaste (MEDEP Regulations, Chapter 404)	Applicable	These regulations outline requirements for permitting, siting, design, operation, and closure of landfills to be used for the disposal of construction/demolition debris, inert fill, land clearing debris, and woodwaste.	Site 8 can be classified as a construction/demolition debris landfill; therefore, the closure of the waste disposal area must meet the minimum specifications outlined in Chapter 404.	Design addresses requirement by removal and disposal of Site 8 debris at Sites 1 and 3 beneath a final landfill cover meeting the Maine Landfill Disposal Regulations.
Management, Testing, and Disposal of Special Wastes (MEDEP Regulations, Chapter 405)	Not Applicable	Section 405.4 sets forth requirements that apply to the storage and disposal of asbestos wastes.	Asbestos is not present at Site 8.	Not Applicable

(continued)

TABLE A-3
ACTION-SPECIFIC ARARs, CRITERIA, AND GUIDANCE

SITE 8
NAS BRUNSWICK

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
Maine Hazardous Waste Management Rules (MEDEP Regulations, Chapters 800-802, 850, 851, 853-857)	Relevant and Appropriate	The rules provide a comprehensive program for handling, storage, and recordkeeping at hazardous waste facilities. They supplement the RCRA regulations.	Only those regulations paralleling RCRA requirements identified above would pertain to the final remedy implemented at Site 8. State requirements more stringent than federal requirements take precedence.	Hazardous wastes have not been identified at Site 8. The design incorporates applicable handling, storage and recordkeeping for the materials to be removed.
Maine Emission License Regulations (38 MRSa, Section 585, 590; MEDEP Regulations, Chapter 115)	Not Applicable	These requirements specify who must obtain an air emissions license, application information, and standards and criteria that must be met.	The preferred alternative will not create a point-source of air emissions.	Not Applicable
Maine Growth Offset Regulations (38 MRSa, Section 590; MEDEP Regulations, Chapter 113)	Not Applicable	This rule applies to new licenses for facilities in non attainment areas. They require Reasonably Available Control Technology or better for the base case emission, and offset reductions from other facilities.	Air treatment is not an element of the final remedy.	Not Applicable

(continued)

TABLE A-3
ACTION-SPECIFIC ARARS, CRITERIA, AND GUIDANCE

SITE 8
NAS BRUNSWICK

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE REMEDIAL RESPONSE PROCESS	CONSIDERATION IN DESIGN
Maine Water Pollution Control Law: Certain Deposits and Discharges Prohibited (38 MRSA, Section 420)	Not Applicable	No person, firm, corporation, or other legal entity shall place, deposit, discharge, or spill mercury or toxic or hazardous substances, either directly or indirectly, into the inland groundwater or surface waters, tidal waters, on the ice, or on the banks thereof, so that the same may flow or be washed into such waters, or in such manner that the drainage therefrom may flow into such waters.	No water discharges are required as part of the Site 8 final remedy.	Not Applicable

Notes:

- CFR = Code of Federal Regulations
- CMR = Code of Maine Regulations
- CWA = Clean Water Act
- DOT = Department of Transportation (U.S.)
- MEDEP = Maine Department of Environmental Protection
- MRSA = Maine Revised Statutes Annotated
- NAS = Naval Air Station
- OSHA = Occupational Safety and Health Administration
- RCRA = Resource Conservation and Recovery Act
- SDWA = Safe Drinking Water Act
- $\mu\text{g}/\text{m}^3$ = micrograms per cubic meter

APPENDIX B
EQUIVALENCY EVALUATION

Installation Restoration Program

TECHNICAL MEMORANDUM

**EQUIVALENCY EVALUATION SITES 1 AND 3
CAP DESIGN VS. USEPA GUIDANCE SUBTITLE C CAP**

Prepared for:

U.S. Department of the Navy
Northern Division
Naval Facilities Engineering Command
Contract: N62472-84-C-1108

Prepared by:

ABB Environmental Services, Inc.
Portland, Maine
Project No. 7120-00

APRIL 1993

TECHNICAL MEMORANDUM

An equivalency evaluation was performed to evaluate the performance of the Sites 1 and 3 landfill cap design and compare it to the performance of the minimum requirements of the USEPA guidance Subtitle C cap as described in "Design and Construction of RCRA/CERCLA Final Covers" (USEPA 1991). Performance was determined based on the reported average annual percolation through the composite hydraulic barrier.

Percolation through the composite hydraulic barrier was estimated using the Hydrologic Evaluation of Landfill Performance (HELP) Model, Version 2 (P. R. Schroeder, et. al., 1988) developed by the U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS, for the USEPA Hazardous Waste Engineering Research Laboratory, Cincinnati, OH. The HELP computer program is a quasi-two-dimensional hydrologic model of water movement in and out, through and across landfills. The model accepts climatologic, soil, and design data and utilizes a solution technique that accounts for the effects of surface storage, runoff, infiltration, percolation, evapotranspiration, soil moisture storage and lateral drainage.

The model provides default climatological data for a number of cities across the United States including Portland, Maine. For the purposes of this evaluation the default data for Portland were used. Five years of data were available from 1974 to 1978.

The model also provides default soil characteristics for a number of soil types. Default soil data were primarily used for this evaluation.

Both cap systems were evaluated using a low hydraulic conductivity composite layer, a drainage layer, and a top vegetation layer. Table 1 shows the thickness of the individual cap system layers and the HELP Model default soil values used in the evaluation. The following descriptions supplement the information provided in Table 1.

Subtitle C Cap

The minimum requirements of the Subtitle C cap consist of three layers; the vegetative layer (24 inches), the drainage layer (12 inches) and the composite hydraulic barrier layer (24 inches). The vegetative layer has no recommended hydraulic conductivity but must maintain vegetative growth. Therefore, the vegetative layer was modeled as a United States Department of Agriculture (USDA)

ABB Environmental Services, Inc.

TECHNICAL MEMORANDUM

soil classification FSL (fine sandy loam) soil type typical of topsoils in the Brunswick, Maine region. The drainage layer was modeled with a saturated hydraulic conductivity of 1×10^{-2} centimeters per second (cm/sec)(in accordance with USEPA guidance), a drainage slope of 3 percent (in accordance with USEPA guidance), and a drainage length of 300 feet (FT)(no length specified by USEPA guidance). The composite hydraulic barrier layer was modeled with a saturated hydraulic conductivity of 1×10^{-7} cm/sec(in accordance with USEPA guidance) and a liner leakage fraction of 0.01.

Each of the soil layers was specified to be uncompacted. If they were to have been identified as compacted the model would have automatically reduced the hydraulic conductivity.

Grass growth over the cap was specified as "good".

The model was allowed to suggest a Soil Conservation Service (SCS) runoff curve number. The same curve number was used to model both cap systems.

The USEPA guidance does not specify that drainage piping be included in the cap system. Therefore the drainage length was set at an average distance from the peak of the landfill to the limit of the cap.

Sites 1 and 3 Cap Design

The Sites 1 and 3 cap design, from cap surface to subgrade, consists of a vegetative layer (12 inches), filter layer (16 inches), drainage layer (12 inches), and a composite hydraulic barrier layer (0.75 inch). The vegetative layer was modeled as the same FSL soil type as the USEPA Subtitle C cap. The filter layer gradation is specified to prevent the clogging of the drainage layer by small soil particles in the topmost vegetative layer. The filter layer was modeled as a SL (sandy loam) soil type which is coarser than the FSL vegetative layer and finer than the underlying drainage layer. The drainage layer was modeled as a LFS (loamy fine sand) with a saturated hydraulic conductivity of 1×10^{-3} cm/sec, a drainage slope of 3 percent, and a drainage length of 100 FT. Drainage piping is included in the Sites 1 and 3 cap design. The spacing of the piping is 75 FT, however, the flow path from pipe to pipe is 100 FT due to the way the pipes cross the slope at a diagonal. The composite hydraulic barrier is to consist of a 40-mil (1 mil = 1/1,000 inches) very low density polyethylene (VLDPE) geomembrane overlying a bentonite geocomposite liner

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TECHNICAL MEMORANDUM

(GCL). Manufacturer's literature (Colloid Environmental Technologies Company) and an independent study (H. Shan, 1990) identify that the saturated hydraulic conductivity of the GCL exposed to water is 1×10^{-10} cm/sec. To be conservative the composite hydraulic barrier was modeled with a saturated hydraulic conductivity of 5×10^{-9} cm/sec. The HELP model does not have a default soil type with a saturated hydraulic conductivity of 5×10^{-9} cm/sec, therefore, the default soil type 17 representing a compacted clay liner soil was used with its conductivity changed to 5×10^{-9} cm/sec.

As with the Subtitle C guidance cap, the soil layers were uncompacted, grass growth was modeled as "good", and the liner leakage fraction was 0.01.

Results

Copies of the outputs of the two model runs are attached. The HELP model predicts that the percolation through the hydraulic barrier of the Subtitle C guidance cap is 0.022 inches/acre/year, versus the Sites 1 and 3 design cap rate of 0.019 inches/acre/year. Based on these results the Sites 1 and 3 cap design is considered to perform in an equivalent manner to the USEPA Subtitle C guidance cover system for percolation through the hydraulic barrier.

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TABLE 1
EQUIVALENCY EVALUATION
SITES 1 AND 3 CAP DESIGN VS. USEPA SUBTITLE C GUIDANCE CAP

	DESIGN		SUBTITLE C	
	Thickness	Default Soil Type	Thickness	Default Soil Type
Vegetative Layer	12 in	7	24 in	7
Filter Layer	16 in	6	—	—
Drainage Layer	12 in	5	12 in	1
Composite Hydraulic Barrier	0.75 in	17 (a)	24	16

Notes: a. Default soil characteristics were used except saturated hydraulic conductivity was modified to be 5×10^{-9} cm/sec.

HELP MODEL OUTPUT
USEPA SUBTITLE C GUIDANCE CAP

ABB Environmental Services, Inc.

NAS BRUNSWICK, MAINE
SITES 1 AND 3 CAP DESIGN 3% SLOPE/EPA GUIDANCE CAP
4-14-93, SHM

GOOD GRASS

LAYER 1

VERTICAL PERCOLATION LAYER

THICKNESS	=	24.00 INCHES
POROSITY	=	0.4730 VOL/VOL
FIELD CAPACITY	=	0.2217 VOL/VOL
WILTING POINT	=	0.1043 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2217 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.002183999866 CM/SEC

LAYER 2

LATERAL DRAINAGE LAYER

THICKNESS	=	12.00 INCHES
POROSITY	=	0.4170 VOL/VOL
FIELD CAPACITY	=	0.0454 VOL/VOL
WILTING POINT	=	0.0200 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0454 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.009999999776 CM/SEC
SLOPE	=	3.00 PERCENT
DRAINAGE LENGTH	=	300.0 FEET

LAYER 3

BARRIER SOIL LINER WITH FLEXIBLE MEMBRANE LINER

THICKNESS	=	24.00 INCHES
POROSITY	=	0.4300 VOL/VOL
FIELD CAPACITY	=	0.3663 VOL/VOL
WILTING POINT	=	0.2802 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4300 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000000100000 CM/SEC
LINER LEAKAGE FRACTION	=	0.01000000

GENERAL SIMULATION DATA

SCS RUNOFF CURVE NUMBER = 66.43
 TOTAL AREA OF COVER = 43560. SQ FT
 EVAPORATIVE ZONE DEPTH = 30.00 INCHES
 UPPER LIMIT VEG. STORAGE = 13.8540 INCHES
 INITIAL VEG. STORAGE = 9.1919 INCHES
 INITIAL SNOW WATER CONTENT = 0.0000 INCHES
 INITIAL TOTAL WATER STORAGE IN
 SOIL AND WASTE LAYERS = 16.1856 INCHES

SOIL WATER CONTENT INITIALIZED BY PROGRAM.

CLIMATOLOGICAL DATA

DEFAULT RAINFALL WITH SYNTHETIC DAILY TEMPERATURES AND
 SOLAR RADIATION FOR PORTLAND MAINE

MAXIMUM LEAF AREA INDEX = 3.30
 START OF GROWING SEASON (JULIAN DATE) = 143
 END OF GROWING SEASON (JULIAN DATE) = 273

NORMAL MEAN MONTHLY TEMPERATURES, DEGREES FAHRENHEIT

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
21.50	23.00	32.10	42.80	52.80	62.20
68.10	66.60	58.60	48.40	38.40	25.80

MONTHLY TOTALS FOR YEAR 74

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION (INCHES)	3.41	2.07	3.82	3.82	4.20	4.69
	3.66	1.45	5.43	1.74	4.85	4.41
RUNOFF (INCHES)	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION (INCHES)	0.606	0.974	1.718	3.296	4.654	4.150
	7.323	2.608	3.554	2.184	1.201	0.758
DRAINAGE FROM LAYER 2 (INCHES)	1.0429	1.0094	1.1764	1.2588	1.1950	1.0770
	0.9983	0.5383	0.4061	0.3467	0.3211	0.9013
PERCOLATION FROM LAYER 3 (INCHES)	0.0019	0.0019	0.0021	0.0023	0.0022	0.0020
	0.0018	0.0013	0.0012	0.0012	0.0012	0.0016

MONTHLY SUMMARIES FOR DAILY HEADS

AVG. DAILY HEAD ON	18.21	22.81	24.77	29.12	25.48	22.57
LAYER 3 (INCHES)	15.89	5.95	4.35	3.34	3.19	13.01
STD. DEV. OF DAILY HEAD	2.70	0.60	4.36	1.11	1.43	1.36
ON LAYER 3 (INCHES)	3.56	1.17	0.32	0.27	1.10	3.98

ANNUAL TOTALS FOR YEAR 74

	(INCHES)	(CU. FT.)	PERCENT
PRECIPITATION	43.55	158087.	100.00
RUNOFF	0.000	0.	0.00
EVAPOTRANSPIRATION	33.027	119887.	75.84
LATERAL DRAINAGE FROM LAYER 2	10.2712	37285.	23.58
PERCOLATION FROM LAYER 3	0.0205	75.	0.05
CHANGE IN WATER STORAGE	0.231	840.	0.53
SOIL WATER AT START OF YEAR	22.00	79849.	
SOIL WATER AT END OF YEAR	22.23	80689.	
SNOW WATER AT START OF YEAR	0.00	0.	
SNOW WATER AT END OF YEAR	0.00	0.	
ANNUAL WATER BUDGET BALANCE	0.00	0.	0.00

MONTHLY TOTALS FOR YEAR 75

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION (INCHES)	4.40	2.51	3.20	3.71	1.09	4.87
	2.06	3.89	4.34	4.50	6.01	8.14
RUNOFF (INCHES)	0.000	0.000	0.659	1.335	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.394	0.525	1.460	3.217	0.879	5.032

(INCHES)	7.411	2.351	3.696	1.962	1.134	0.379
LATERAL DRAINAGE FROM LAYER 2 (INCHES)	1.0374	0.9108	1.2592	1.3183	1.1629	1.1192
PERCOLATION FROM LAYER 3 (INCHES)	0.9081	0.4859	0.3883	0.3424	0.7024	1.0581
PRECIPITATION FROM LAYER 3 (INCHES)	0.0019	0.0016	0.0022	0.0023	0.0021	0.0021
	0.0016	0.0013	0.0012	0.0012	0.0014	0.0019

MONTHLY SUMMARIES FOR DAILY HEADS

AVG. DAILY HEAD ON LAYER 3 (INCHES)	18.13	15.65	26.20	30.95	24.34	24.18
	13.01	5.27	4.10	3.30	9.61	20.10
STD. DEV. OF DAILY HEAD ON LAYER 3 (INCHES)	0.29	0.67	9.53	2.87	1.40	2.13
	4.23	0.38	0.31	0.32	4.59	0.48

ANNUAL TOTALS FOR YEAR 75

	(INCHES)	(CU. FT.)	PERCENT
	-----	-----	-----
PRECIPITATION	48.72	176854.	100.00
OFF	1.995	7242.	4.09
EVAPOTRANSPIRATION	28.442	103244.	58.38
LATERAL DRAINAGE FROM LAYER 2	10.6929	38815.	21.95
PERCOLATION FROM LAYER 3	0.0208	76.	0.04
CHANGE IN WATER STORAGE	7.570	27477.	15.54
SOIL WATER AT START OF YEAR	22.23	80689.	
SOIL WATER AT END OF YEAR	23.11	83891.	
SNOW WATER AT START OF YEAR	0.00	0.	
SNOW WATER AT END OF YEAR	6.69	24276.	
ANNUAL WATER BUDGET BALANCE	0.00	0.	0.00

MONTHLY TOTALS FOR YEAR 76

JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC

PRECIPITATION (INCHES)	4.44	2.84	2.47	2.42	3.99	1.53
	7.48	4.87	1.86	5.37	0.90	3.22
(INCHES)	0.000	1.718	2.569	2.869	0.000	0.000
	0.000	0.001	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION (INCHES)	0.444	0.668	1.140	2.952	4.171	2.433
	7.901	6.518	2.524	1.921	1.237	0.388
LATERAL DRAINAGE FROM LAYER 2 (INCHES)	1.1961	1.4109	1.5194	1.3554	1.2082	1.0529
	0.8844	0.7451	0.5523	0.4386	0.4683	0.5124
PERCOLATION FROM LAYER 3 (INCHES)	0.0022	0.0024	0.0026	0.0024	0.0022	0.0019
	0.0016	0.0014	0.0013	0.0013	0.0012	0.0013

MONTHLY SUMMARIES FOR DAILY HEADS

AVG. DAILY HEAD ON LAYER 3 (INCHES)	25.60	35.60	35.93	32.14	25.98	21.30
	12.32	8.82	6.41	4.62	5.30	5.65
STD. DEV. OF DAILY HEAD ON LAYER 3 (INCHES)	3.83	0.54	0.31	3.18	1.37	1.66
	3.78	1.17	1.10	0.34	0.52	0.16

ANNUAL TOTALS FOR YEAR 76

	(INCHES)	(CU. FT.)	PERCENT
	-----	-----	-----
PRECIPITATION	41.39	150246.	100.00
RUNOFF	7.157	25980.	17.29
EVAPOTRANSPIRATION	32.296	117236.	78.03
LATERAL DRAINAGE FROM LAYER 2	11.3441	41179.	27.41
PERCOLATION FROM LAYER 3	0.0219	80.	0.05
CHANGE IN WATER STORAGE	-9.429	-34229.	-22.78
SOIL WATER AT START OF YEAR	23.11	83891.	
SOIL WATER AT END OF YEAR	18.50	67138.	
SNOW WATER AT START OF YEAR	6.69	24276.	
SNOW WATER AT END OF YEAR	1.87	6801.	
ANNUAL WATER BUDGET BALANCE	0.00	0.	0.00

 MONTHLY TOTALS FOR YEAR 77

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION (INCHES)	6.46	3.68	6.83	3.62	2.04	3.38
	2.83	2.79	4.63	8.30	6.28	6.79
RUNOFF (INCHES)	0.000	0.358	5.291	0.436	0.000	0.000
	0.000	0.000	0.000	0.000	0.419	4.718
EVAPOTRANSPIRATION (INCHES)	0.423	0.632	1.244	3.366	3.084	3.582
	7.637	2.826	1.765	1.947	1.144	0.383
LATERAL DRAINAGE FROM LAYER 2 (INCHES)	0.6480	1.0072	1.5137	1.3538	1.2092	1.0497
	0.8925	0.4868	0.3890	0.7841	1.2124	1.5038
PERCOLATION FROM LAYER 3 (INCHES)	0.0014	0.0018	0.0026	0.0024	0.0022	0.0019
	0.0016	0.0013	0.0012	0.0016	0.0022	0.0026

 MONTHLY SUMMARIES FOR DAILY HEADS

AVG. DAILY HEAD ON LAYER 3 (INCHES)	7.62	21.16	35.71	32.15	25.98	21.25
	12.27	5.28	4.11	12.63	27.57	35.41
STD. DEV. OF DAILY HEAD ON LAYER 3 (INCHES)	1.92	7.22	0.59	2.48	1.48	1.40
	3.70	0.39	0.31	7.84	4.23	0.68

 ANNUAL TOTALS FOR YEAR 77

	(INCHES)	(CU. FT.)	PERCENT
PRECIPITATION	57.63	209197.	100.00
RUNOFF	11.222	40737.	19.47
EVAPOTRANSPIRATION	28.034	101762.	48.64
LATERAL DRAINAGE FROM LAYER 2	12.0502	43742.	20.91
PERCOLATION FROM LAYER 3	0.0228	83.	0.04
CHANGE IN WATER STORAGE	6.301	22872.	10.93
SOIL WATER AT START OF YEAR	18.50	67138.	
WATER AT END OF YEAR	26.43	95957.	
SNOW WATER AT START OF YEAR	1.87	6801.	
SNOW WATER AT END OF YEAR	0.24	853.	

ANNUAL WATER BUDGET BALANCE 0.00 0. 0.00

MONTHLY TOTALS FOR YEAR 78

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION (INCHES)	6.91 1.67	0.87 2.24	4.19 0.71	4.46 3.23	4.16 1.91	2.62 3.45
RUNOFF (INCHES)	2.994 0.000	0.819 0.000	0.823 0.000	1.145 0.000	0.035 0.000	0.000 0.000
EVAPOTRANSPIRATION (INCHES)	0.546 7.525	0.845 1.881	2.135 1.117	3.330 1.395	3.313 1.258	3.517 0.624
LATERAL DRAINAGE FROM LAYER 2 (INCHES)	1.4909 0.8995	1.3385 0.4786	1.4108 0.3825	1.4173 0.3263	1.3342 0.2593	1.1837 0.2622
PERCOLATION FROM LAYER 3 (INCHES)	0.0026 0.0017	0.0023 0.0013	0.0025 0.0012	0.0025 0.0012	0.0024 0.0011	0.0022 0.0012

MONTHLY SUMMARIES FOR DAILY HEADS

AVG. DAILY HEAD ON LAYER 3 (INCHES)	35.02 13.36	34.72 5.17	32.56 4.01	34.20 3.06	30.14 2.27	26.43 2.23
STD. DEV. OF DAILY HEAD ON LAYER 3 (INCHES)	0.85 5.19	1.06 0.38	1.95 0.30	1.55 0.26	2.48 0.21	1.75 0.61

ANNUAL TOTALS FOR YEAR 78

	(INCHES)	(CU. FT.)	PERCENT
PRECIPITATION	36.42	132205.	100.00
RUNOFF	5.816	21110.	15.97
EVAPOTRANSPIRATION	27.485	99772.	75.47
LATERAL DRAINAGE FROM LAYER 2	10.7837	39145.	29.61
PERCOLATION FROM LAYER 3	0.0220	80.	0.06
CHANGE IN WATER STORAGE	-7.687	-27902.	-21.11

SOIL WATER AT START OF YEAR	26.43	95957.	
SOIL WATER AT END OF YEAR	18.98	68908.	
WATER AT START OF YEAR	0.24	853.	
SNOW WATER AT END OF YEAR	0.00	0.	
ANNUAL WATER BUDGET BALANCE	0.00	0.	0.00

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 74 THROUGH 78

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC

PRECIPITATION						

TOTALS	5.12	2.39	4.10	3.61	3.10	3.42
	3.54	3.05	3.39	4.63	3.99	5.20
STD. DEVIATIONS	1.49	1.04	1.66	0.74	1.44	1.41
	2.33	1.35	2.01	2.47	2.45	2.17

TOTALS	0.599	0.579	1.868	1.157	0.007	0.000
	0.000	0.000	0.000	0.000	0.084	0.944
STD. DEVIATIONS	1.339	0.720	2.136	1.098	0.015	0.000
	0.000	0.001	0.000	0.000	0.187	2.110

EVAPOTRANSPIRATION						

TOTALS	0.483	0.729	1.539	3.232	3.220	3.743
	7.560	3.237	2.531	1.882	1.195	0.506
STD. DEVIATIONS	0.090	0.179	0.400	0.166	1.455	0.951
	0.224	1.867	1.117	0.292	0.055	0.175

LATERAL DRAINAGE FROM LAYER 2						

TOTALS	1.0831	1.1354	1.3759	1.3407	1.2219	1.0965
	0.9166	0.5469	0.4237	0.4476	0.5927	0.8475
STD. DEVIATIONS	0.3050	0.2235	0.1534	0.0580	0.0655	0.0561
	0.0465	0.1133	0.0724	0.1932	0.3862	0.4829

PERCOLATION FROM LAYER 3						

TOTALS	0.0020	0.0020	0.0024	0.0024	0.0022	0.0020
	0.0017	0.0013	0.0012	0.0013	0.0014	0.0017
STD. DEVIATIONS	0.0004	0.0004	0.0002	0.0001	0.0001	0.0001
	0.0001	0.0001	0.0000	0.0002	0.0004	0.0006

GE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 74 THROUGH 78

	(INCHES)	(CU. FT.)	PERCENT
PRECIPITATION	45.54 (8.072)	165317.	100.00
RUNOFF	5.238 (4.410)	19014.	11.50
EVAPOTRANSPIRATION	29.857 (2.596)	108380.	65.56
LATERAL DRAINAGE FROM LAYER 2	11.0284 (0.6873)	40033.	24.22
PERCOLATION FROM LAYER 3	0.0216 (0.0009)	78.	0.05
CHANGE IN WATER STORAGE	-0.603 (7.798)	-2188.	-1.32

PEAK DAILY VALUES FOR YEARS 74 THROUGH 78

	(INCHES)	(CU. FT.)
PRECIPITATION	3.56	12922.8
RUNOFF	1.797	6523.4
LATERAL DRAINAGE FROM LAYER 2	0.0493	178.8
PERCOLATION FROM LAYER 3	0.0001	0.3
HEAD ON LAYER 3	36.4	
SNOW WATER	7.33	26602.9
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4618	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0874	

FINAL WATER STORAGE AT END OF YEAR 78

LAYER	(INCHES)	(VOL/VOL)
1	6.15	0.2563
2	2.51	0.2092
3	10.32	0.4300

SNOW WATER 0.00

HELP MODEL OUTPUT
SITES 1 AND 3 DESIGN CAP

ABB Environmental Services, Inc.

NAS BRUNSWICK, MAINE
SITES 1&3 CAP DESIGN 3% SLOPE/100FT SPACING/5x10-9 Kgcl/10-3 Kdrain
4-15-93, SHM

GOOD GRASS

LAYER 1

VERTICAL PERCOLATION LAYER

THICKNESS = 12.00 INCHES
POROSITY = 0.4730 VOL/VOL
FIELD CAPACITY = 0.2217 VOL/VOL
WILTING POINT = 0.1043 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.2217 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY = 0.002183999866 CM/SEC

LAYER 2

VERTICAL PERCOLATION LAYER

THICKNESS = 16.00 INCHES
POROSITY = 0.4530 VOL/VOL
FIELD CAPACITY = 0.1901 VOL/VOL
WILTING POINT = 0.0848 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.1901 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY = 0.000719999953 CM/SEC

LAYER 3

LATERAL DRAINAGE LAYER

THICKNESS = 12.00 INCHES
POROSITY = 0.4570 VOL/VOL
FIELD CAPACITY = 0.1309 VOL/VOL
WILTING POINT = 0.0580 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.1309 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY = 0.001000000047 CM/SEC
SLOPE = 3.00 PERCENT
DRAINAGE LENGTH = 100.0 FEET

LAYER 4

BARRIER SOIL LINER WITH FLEXIBLE MEMBRANE LINER

THICKNESS = 0.75 INCHES
 POROSITY = 0.4000 VOL/VOL
 FIELD CAPACITY = 0.3560 VOL/VOL
 WILTING POINT = 0.2899 VOL/VOL
 INITIAL SOIL WATER CONTENT = 0.4000 VOL/VOL
 SATURATED HYDRAULIC CONDUCTIVITY = 0.00000005000 CM/SEC
 LINER LEAKAGE FRACTION = 0.01000000

GENERAL SIMULATION DATA

SCS RUNOFF CURVE NUMBER = 66.43
 TOTAL AREA OF COVER = 43560. SQ FT
 EVAPORATIVE ZONE DEPTH = 30.00 INCHES
 UPPER LIMIT VEG. STORAGE = 13.8380 INCHES
 INITIAL VEG. STORAGE = 10.2722 INCHES
 INITIAL SNOW WATER CONTENT = 0.0000 INCHES
 INITIAL TOTAL WATER STORAGE IN SOIL AND WASTE LAYERS = 7.5728 INCHES

SOIL WATER CONTENT INITIALIZED BY PROGRAM.

CLIMATOLOGICAL DATA

DEFAULT RAINFALL WITH SYNTHETIC DAILY TEMPERATURES AND SOLAR RADIATION FOR PORTLAND MAINE

MAXIMUM LEAF AREA INDEX = 3.30
 START OF GROWING SEASON (JULIAN DATE) = 143
 END OF GROWING SEASON (JULIAN DATE) = 273

NORMAL MEAN MONTHLY TEMPERATURES, DEGREES FAHRENHEIT

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
21.50	23.00	32.10	42.80	52.80	62.20
68.10	66.60	58.60	48.40	38.40	25.80

MONTHLY TOTALS FOR YEAR 74

JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC

PRECIPITATION (INCHES) 3.41 2.07 3.82 3.82 4.20 4.69

	3.66	1.45	5.43	1.74	4.85	4.41
RUNOFF (INCHES)	0.000	0.000	0.003	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION (INCHES)	0.603	0.964	1.710	3.276	4.800	4.064
	7.324	3.018	3.537	2.164	1.185	0.746
LATERAL DRAINAGE FROM LAYER 3 (INCHES)	1.0544	1.2084	1.5265	1.7249	1.2391	0.9514
	0.6602	0.2865	0.2344	0.2197	0.2001	0.6785
PERCOLATION FROM LAYER 4 (INCHES)	0.0020	0.0020	0.0023	0.0024	0.0021	0.0019
	0.0015	0.0008	0.0007	0.0006	0.0006	0.0015

MONTHLY SUMMARIES FOR DAILY HEADS

AVG. DAILY HEAD ON LAYER 4 (INCHES)	27.42	30.75	31.97	34.20	29.74	26.74
	20.39	10.28	8.98	8.29	7.90	20.58
STD. DEV. OF DAILY HEAD ON LAYER 4 (INCHES)	2.95	1.06	3.68	1.16	1.44	1.64
	3.49	1.37	0.21	0.20	0.48	5.53

ANNUAL TOTALS FOR YEAR 74

	(INCHES)	(CU. FT.)	PERCENT
	-----	-----	-----
PRECIPITATION	43.55	158087.	100.00
RUNOFF	0.003	12.	0.01
EVAPOTRANSPIRATION	33.393	121218.	76.68
LATERAL DRAINAGE FROM LAYER 3	9.9842	36243.	22.93
PERCOLATION FROM LAYER 4	0.0183	67.	0.04
CHANGE IN WATER STORAGE	0.151	547.	0.35
SOIL WATER AT START OF YEAR	15.13	54907.	
SOIL WATER AT END OF YEAR	15.28	55455.	
SNOW WATER AT START OF YEAR	0.00	0.	
SNOW WATER AT END OF YEAR	0.00	0.	
ANNUAL WATER BUDGET BALANCE	0.00	0.	0.00

MONTHLY TOTALS FOR YEAR 75

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION (INCHES)	4.40	2.51	3.20	3.71	1.09	4.87
	2.06	3.89	4.34	4.50	6.01	8.14
RUNOFF (INCHES)	0.000	0.000	1.500	1.119	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION (INCHES)	0.393	0.525	1.451	3.193	0.884	5.023
	7.421	2.495	3.686	1.949	1.124	0.378
LATERAL DRAINAGE FROM LAYER 3 (INCHES)	0.9750	0.7583	1.7831	1.7384	1.0647	1.0218
	0.5309	0.2609	0.2283	0.2142	0.4583	1.0779
PERCOLATION FROM LAYER 4 (INCHES)	0.0019	0.0016	0.0024	0.0024	0.0020	0.0019
	0.0013	0.0007	0.0007	0.0006	0.0011	0.0020

MONTHLY SUMMARIES FOR DAILY HEADS

AVG. DAILY HEAD ON LAYER 4 (INCHES)	26.67	24.70	33.22	34.12	27.83	27.62
	17.02	9.54	8.79	8.11	15.37	28.04
EV. OF DAILY HEAD LAYER 4 (INCHES)	0.35	0.30	6.78	3.26	1.20	2.14
	4.27	0.24	0.21	0.19	6.88	0.56

ANNUAL TOTALS FOR YEAR 75

	(INCHES)	(CU. FT.)	PERCENT
PRECIPITATION	48.72	176854.	100.00
RUNOFF	2.620	9509.	5.38
EVAPOTRANSPIRATION	28.522	103536.	58.54
LATERAL DRAINAGE FROM LAYER 3	10.1118	36706.	20.75
PERCOLATION FROM LAYER 4	0.0186	68.	0.04
CHANGE IN WATER STORAGE	7.447	27034.	15.29
SOIL WATER AT START OF YEAR	15.28	55455.	
SOIL WATER AT END OF YEAR	16.04	58211.	
SNOW WATER AT START OF YEAR	0.00	0.	
SNOW WATER AT END OF YEAR	6.69	24278.	
ANNUAL WATER BUDGET BALANCE	0.00	0.	0.00

MONTHLY TOTALS FOR YEAR 76

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION (INCHES)	4.44 7.48	2.84 4.87	2.47 1.86	2.42 5.37	3.99 0.90	1.53 3.22
RUNOFF (INCHES)	0.000 0.000	1.587 0.002	1.247 0.000	2.566 0.000	0.000 0.000	0.000 0.000
EVAPOTRANSPIRATION (INCHES)	0.444 7.881	0.668 6.518	1.140 2.590	2.945 1.970	4.382 1.309	2.394 0.388
LATERAL DRAINAGE FROM LAYER 3 (INCHES)	1.6395 0.4911	2.3144 0.3590	2.4961 0.3059	1.9520 0.2550	1.1815 0.2782	0.8144 0.3338
PERCOLATION FROM LAYER 4 (INCHES)	0.0024 0.0012	0.0026 0.0009	0.0028 0.0008	0.0025 0.0007	0.0021 0.0008	0.0017 0.0009

MONTHLY SUMMARIES FOR DAILY HEADS

AVG. DAILY HEAD ON LAYER 4 (INCHES)	33.08 16.04	38.96 12.56	39.13 11.21	35.67 9.37	29.20 10.45	24.48 11.85
STD. DEV. OF DAILY HEAD ON LAYER 4 (INCHES)	3.26 3.89	0.72 1.93	0.88 1.44	3.57 0.21	1.20 1.18	1.47 0.07

ANNUAL TOTALS FOR YEAR 76

	(INCHES)	(CU. FT.)	PERCENT
PRECIPITATION	41.39	150246.	100.00
RUNOFF	5.402	19610.	13.05
EVAPOTRANSPIRATION	32.629	118442.	78.83
LATERAL DRAINAGE FROM LAYER 3	12.4210	45088.	30.01
PERCOLATION FROM LAYER 4	0.0194	70.	0.05
CHANGE IN WATER STORAGE	-9.081	-32965.	-21.94
SOIL WATER AT START OF YEAR	16.04	58211.	

SOIL WATER AT END OF YEAR	11.78	42774.	
SNOW WATER AT START OF YEAR	6.69	24278.	
WATER AT END OF YEAR	1.86	6749.	
ANNUAL WATER BUDGET BALANCE	0.00	0.	0.00

MONTHLY TOTALS FOR YEAR 77

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION (INCHES)	6.46 2.83	3.68 2.79	6.83 4.63	3.62 8.30	2.04 6.28	3.38 6.79
RUNOFF (INCHES)	0.000 0.000	1.498 0.000	4.496 0.000	0.039 0.000	0.000 0.713	0.000 3.818
EVAPOTRANSPIRATION (INCHES)	0.423 7.635	0.632 3.052	1.199 1.800	3.406 1.954	3.096 1.146	3.504 0.383
L DRAINAGE FROM LAYER 3 (INCHES)	0.4533 0.5013	1.4062 0.2613	2.5189 0.2286	1.8580 0.6167	1.1631 1.6490	0.7981 2.4496
PERCOLATION FROM LAYER 4 (INCHES)	0.0011 0.0012	0.0021 0.0007	0.0028 0.0007	0.0024 0.0013	0.0021 0.0023	0.0017 0.0028

MONTHLY SUMMARIES FOR DAILY HEADS

AVG. DAILY HEAD ON LAYER 4 (INCHES)	15.34 16.31	31.85 9.55	39.24 8.80	35.08 17.78	28.98 33.49	24.27 38.80
STD. DEV. OF DAILY HEAD ON LAYER 4 (INCHES)	3.20 3.71	5.54 0.24	0.83 0.21	2.72 9.28	1.29 3.58	0.98 1.15

ANNUAL TOTALS FOR YEAR 77

	(INCHES)	(CU. FT.)	PERCENT
PRECIPITATION	57.63	209197.	100.00
RUNOFF	10.564	38348.	18.33
EVAPOTRANSPIRATION	28.228	102469.	48.98

LATERAL DRAINAGE FROM LAYER 3	13.9040	50471.	24.13
PERCOLATION FROM LAYER 4	0.0212	77.	0.04
CHANGE IN WATER STORAGE	4.912	17831.	8.52
SOIL WATER AT START OF YEAR	11.78	42774.	
SOIL WATER AT END OF YEAR	18.32	66503.	
SNOW WATER AT START OF YEAR	1.86	6749.	
SNOW WATER AT END OF YEAR	0.23	852.	
ANNUAL WATER BUDGET BALANCE	0.00	0.	0.00

MONTHLY TOTALS FOR YEAR 78

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION (INCHES)	6.91 1.67	0.87 2.24	4.19 0.71	4.46 3.23	4.16 1.91	2.62 3.45
RUNOFF (INCHES)	1.944 0.000	0.363 0.000	0.187 0.000	0.481 0.000	0.018 0.000	0.000 0.000
EVAPOTRANSPIRATION (INCHES)	0.546 7.388	0.845 1.881	2.135 1.117	3.331 1.396	3.310 1.260	3.513 0.624
LATERAL DRAINAGE FROM LAYER 3 (INCHES)	2.3479 0.5240	2.0660 0.2578	1.9114 0.2257	2.1950 0.2118	1.6086 0.1868	1.1096 0.1773
PERCOLATION FROM LAYER 4 (INCHES)	0.0027 0.0012	0.0024 0.0007	0.0025 0.0006	0.0026 0.0006	0.0024 0.0006	0.0020 0.0005

MONTHLY SUMMARIES FOR DAILY HEADS

AVG. DAILY HEAD ON LAYER 4 (INCHES)	38.16 16.73	37.69 9.45	35.10 8.71	37.54 8.04	32.83 7.42	28.80 6.90
STD. DEV. OF DAILY HEAD ON LAYER 4 (INCHES)	1.35 5.05	1.66 0.23	2.35 0.20	1.65 0.19	2.51 0.17	1.36 0.14

ANNUAL TOTALS FOR YEAR 78

	(INCHES)	(CU. FT.)	PERCENT
PRECIPITATION	36.42	132205.	100.00
RUNOFF	2.994	10867.	8.22
EVAPOTRANSPIRATION	27.347	99270.	75.09
LATERAL DRAINAGE FROM LAYER 3	12.8220	46544.	35.21
PERCOLATION FROM LAYER 4	0.0190	69.	0.05
CHANGE IN WATER STORAGE	-6.762	-24545.	-18.57
SOIL WATER AT START OF YEAR	18.32	66503.	
SOIL WATER AT END OF YEAR	11.79	42810.	
SNOW WATER AT START OF YEAR	0.23	852.	
SNOW WATER AT END OF YEAR	0.00	0.	
ANNUAL WATER BUDGET BALANCE	0.00	0.	0.00

 AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 74 THROUGH 78

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	5.12 3.54	2.39 3.05	4.10 3.39	3.61 4.63	3.10 3.99	3.42 5.20
STD. DEVIATIONS	1.49 2.33	1.04 1.35	1.66 2.01	0.74 2.47	1.44 2.45	1.41 2.17
RUNOFF						
TOTALS	0.389 0.000	0.690 0.000	1.487 0.000	0.841 0.000	0.004 0.143	0.000 0.764
STD. DEVIATIONS	0.869 0.000	0.793 0.001	1.803 0.000	1.064 0.000	0.008 0.319	0.000 1.707
EVAPOTRANSPIRATION						
TOTALS	0.482 7.530	0.727 3.393	1.527 2.546	3.230 1.887	3.294 1.205	3.700 0.504
STD. DEVIATIONS	0.089 0.228	0.176 1.811	0.408 1.105	0.177 0.288	1.525 0.078	0.957 0.171
LATERAL DRAINAGE FROM LAYER 3						
TOTALS	1.2940 0.5415	1.5507 0.2851	2.0472 0.2446	1.8936 0.3035	1.2514 0.5545	0.9391 0.9434

STD. DEVIATIONS 0.7239 0.6354 0.4426 0.1924 0.2093 0.1337
 0.0683 0.0429 0.0344 0.1760 0.6214 0.9104

PERCOLATION FROM LAYER 4

TOTALS 0.0020 0.0021 0.0026 0.0025 0.0021 0.0018
 0.0013 0.0008 0.0007 0.0008 0.0011 0.0015

STD. DEVIATIONS 0.0006 0.0004 0.0002 0.0001 0.0001 0.0001
 0.0001 0.0001 0.0001 0.0003 0.0007 0.0009

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 74 THROUGH 78

	(INCHES)	(CU. FT.)	PERCENT
PRECIPITATION	45.54 (8.072)	165317.	100.00
RUNOFF	4.317 (3.983)	15669.	9.48
EVAPOTRANSPIRATION	30.024 (2.774)	108987.	65.93
LATERAL DRAINAGE FROM LAYER 3	11.8486 (1.7315)	43010.	26.02
PERCOLATION FROM LAYER 4	0.0193 (0.0011)	70.	0.04
CHANGE IN WATER STORAGE	-0.667 (7.169)	-2420.	-1.46

PEAK DAILY VALUES FOR YEARS 74 THROUGH 78

	(INCHES)	(CU. FT.)
PRECIPITATION	3.56	12922.8
RUNOFF	1.635	5935.8
LATERAL DRAINAGE FROM LAYER 3	0.0853	309.7
PERCOLATION FROM LAYER 4	0.0001	0.3
HEAD ON LAYER 4	40.6	
SNOW WATER	7.33	26618.9

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.4613
 MINIMUM VEG. SOIL WATER (VOL/VOL) 0.0908

FINAL WATER STORAGE AT END OF YEAR 78

LAYER	(INCHES)	(VOL/VOL)
1	2.98	0.2481
2	4.29	0.2678
3	4.23	0.3526
4	0.30	0.4000
SNOW WATER	0.00	

