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Natick Research, Development, and Engineering Center

Natick, Massachusetts
CERCLIS #MA1210020631

Site Exposure Potential

The U.S. Army Natick Research, Development, and Engineering Center (NRDEC) is composed of two sites: the Natick Laboratory, in Natick, Middlesex County, Massachusetts, and the Sudbury Annex, to the north near the towns of Maynard, Stow, and Hudson. The Natick Laboratory has a greater potential to affect NOAA trust resources than the Sudbury Annex (Dames and Moore 1991).

The Natick Laboratory, a 30-hectare installation on a peninsula along the east shore of Lake Cochituate, is surrounded by the town of Natick (Figure 1). Lake Cochituate supplied water for the City of Boston from 1848 until about 1930. The outlet of Lake Cochituate, Cochituate Brook, flows approximately 1 km into the Sudbury River. Approximately 25.5 km further downstream, the Sudbury and Assabet rivers merge to form the Concord River, which flows 27 km to the Merrimack River. Sixty kilometers downstream, the Merrimack River discharges into the Atlantic Ocean.

The U.S. Army finished building Natick Laboratory in 1954. Activities at the site included food science and engineering; aero-mechanical engineering; and clothing, materials, and equipment engineering. Site operations included the use and storage of tetrachloroethylene, trichloroethane,

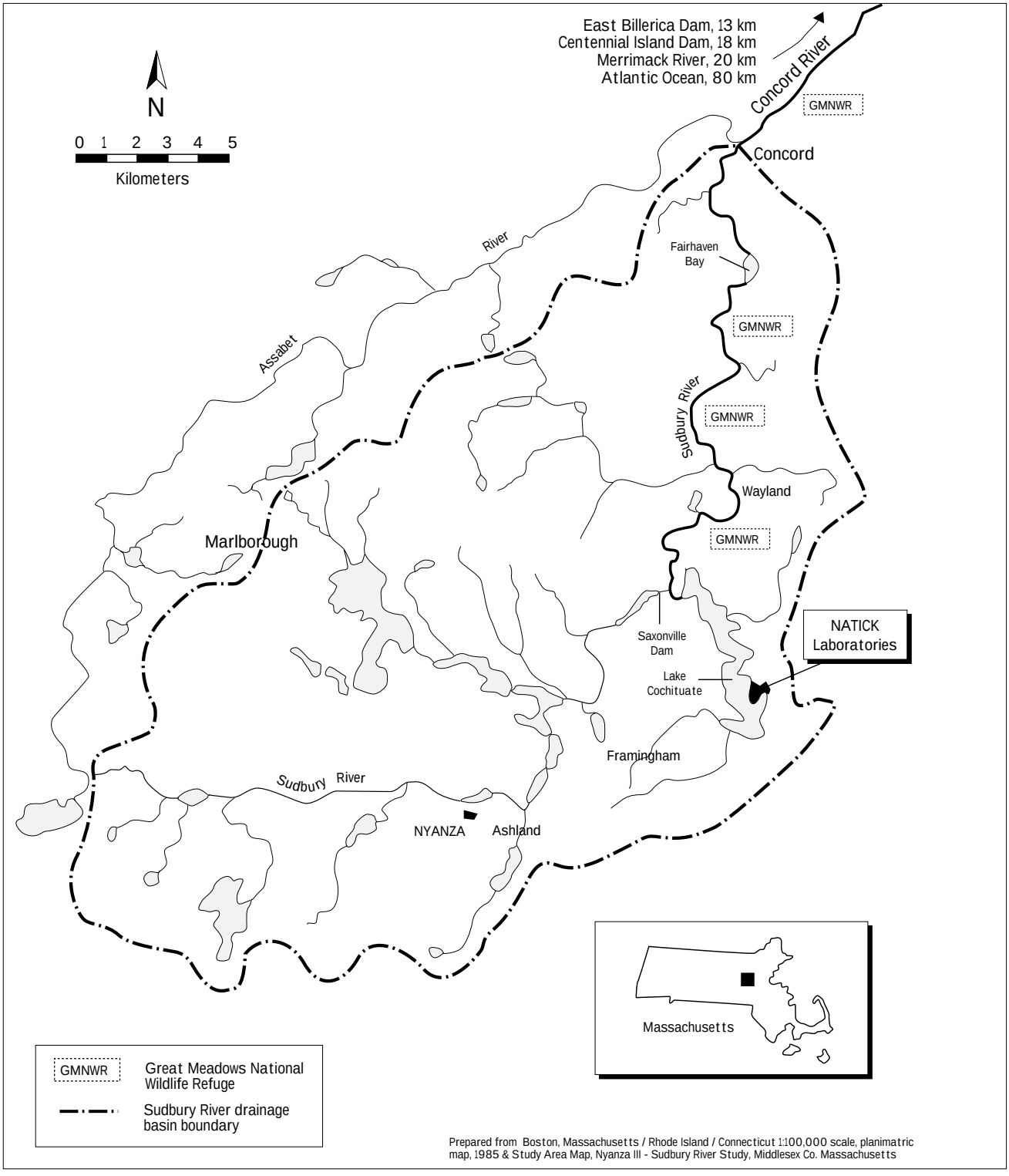

Figure 1. The Natick Laboratory site and the Sudbury River drainage basin in Middlesex County, Massachusetts.

carbon disulfide, benzene, chloroform, tetraethyl lead, acetone and other VOCs, solvents and thinners, paints and inks, lubricants, pesticides, metal dusts, and chemical waste. Although stored chemicals and wastes have been removed, specific information on the quantities, usage, and removal of site-related chemicals has not been reported. Two main sources of contamination remain on site: the Building T-25 Area and the Gymnasium Area (Figure 2). A third source, the Boiler House area, is contaminated with hydrocarbons from petroleum spills (Halliburton NUS 1993).

Groundwater and surface water runoff are potential pathways for migration of contaminants to NOAA trust habitats. Groundwater occurs at depths of 1 to 10 m near the Natick Laboratory facility. The unconfined alluvial aquifer consists of poorly sorted, coarse- to fine-grained sands that overlie moderately well-sorted silty sands, sandy silts, or silty clays. Bedrock probably occurs at 40 to 45 m. Groundwater is linked to Lake Cochituate and to the wetlands, streams, and ponds of the Lake Cochituate drainage basin, but flow is to the north-northwest, away from the lake. The Evergreen and Springvale municipal wells may influence the direction of flow so that Lake Cochituate may provide up to 75 percent of the recharge to the alluvial aquifer near these wells (USATHAMA 1992).

The laboratory site is relatively level, although there are steep slopes along the waterfront. Surface water on the Natick Laboratory site is mainly controlled by storm sewers that discharge directly into Lake Cochituate. All surface water from this site drains into the lake. A french drain along the shoreline in the Gymnasium Area discharges into Lake Cochituate. Overflow from a small pond northeast of the Gymnasium Area also drains into Lake Cochituate through a culvert. During storms Natick Laboratory personnel have observed an oil-like sheen near the Building T-25 (Dames and Moore 1991). Concentrations of contaminants in surface water runoff generated by storms have not been investigated.

NOAA Trust Habitats and Species

Habitats of concern to NOAA are surface water and bottom substrates of Lake Cochituate, Cochituate Brook, and the Sudbury, Concord, and Merrimack rivers. American eel is the only NOAA trust species known to inhabit Lake Cochituate (Miller personal communication 1993). Historically, American shad, blueback herring, alewife, and striped bass inhabited the Concord and Sudbury rivers. Atlantic salmon may also have used these rivers, although they prefer to spawn in faster-moving water. Information was not available about the historical use of Lake Cochituate and Cochituate Brook by anadromous fish species. However, adult and juvenile anadromous fish would possibly use the lake as habitat for foraging or migration pathways with unrestricted access (O'Leary personal communication 1992).

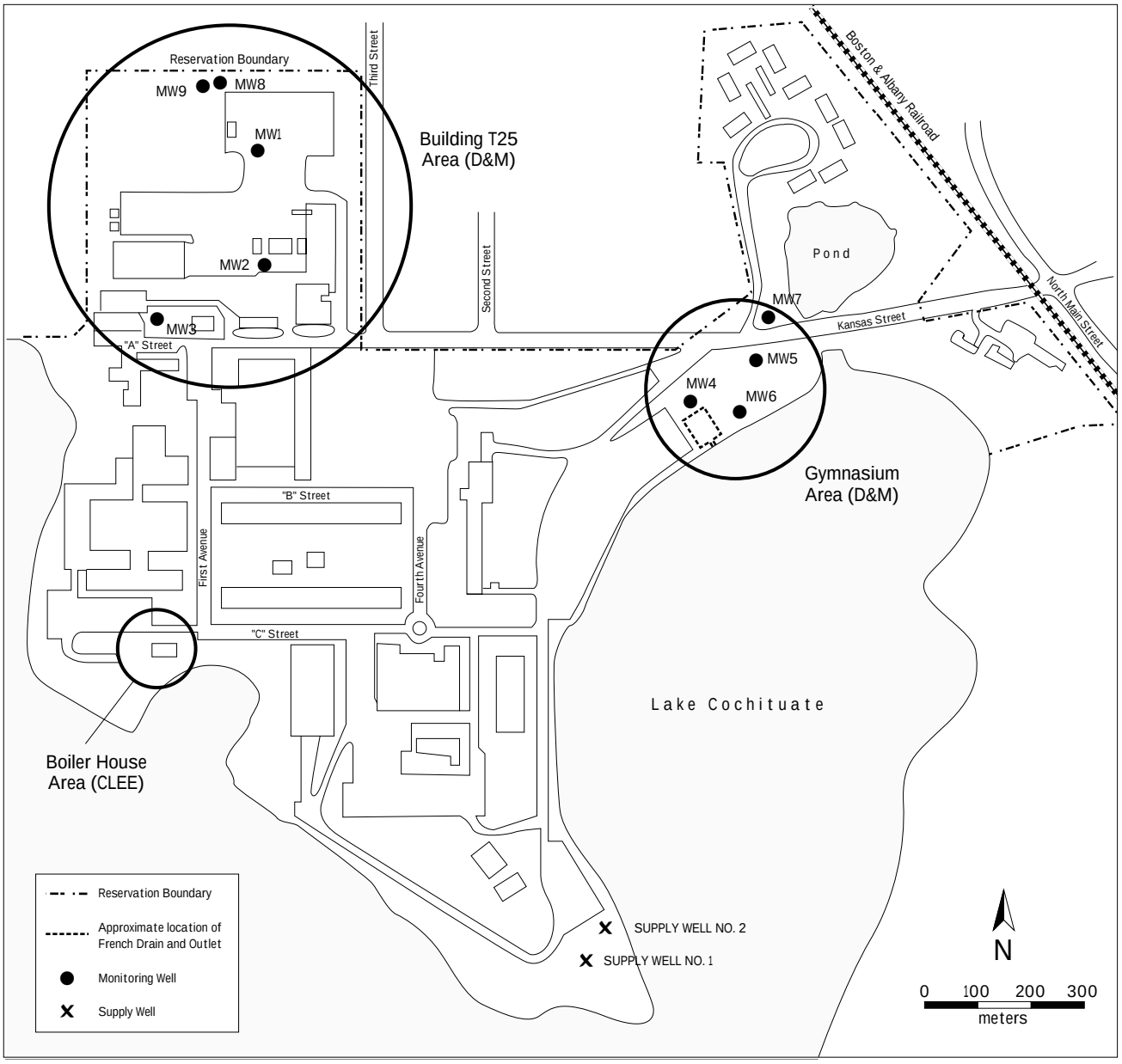

Figure 2. Detail of Natick Laboratory and areas of concern.

A dam on the Concord River and two dams on Cochituate Brook at the outlet of the lake restrict potential upstream migration of anadromous fish species to Lake Cochituate. The Centennial Island Dam, associated with a hydroelectric facility, is on the Concord River about 2 km upstream from the confluence with the Merrimack River. Fish passage facilities were opened at the dam in 1991. Fish passage is restricted at the Talbot Dam in Billerica, about 5 km farther upstream. However, as part of the Merrimack River Anadromous Fish Restoration Program,

facilities for fish passage are expected to be operational at the dam five years after 500 American shad pass the Centennial Island Dam (Merrimack River Policy and Technical Committees 1990). Plans for fish passage facilities are being developed by the operators of the hydropower plant at the Talbot Dam by the U.S. Fish and Wildlife Service, the Federal Energy Regulatory Commission, and the Massachusetts Division of Fisheries and Wildlife (Mass DFW). No official fish counts have been taken yet at the Centennial Island Dam because anadromous fish have not been observed near the dam and Mass DFW does not believe that fish use the passage facilities (O'Leary personal communication 1993). There are two dams on Cochituate Brook at the outlet of the lake. The first dam was built to raise the water level by 2.7 m and the second dam was built inside the first dam to raise the level an additional 1.2 m. It is unlikely that anadromous fish can pass these dams, which are not slated for restoration (Miller 1993).

The lake is about 20 m deep at its deepest and has a silty substrate with some sandy areas along the shoreline. Lake Cochituate is considered mesotrophic, and problematic algae blooms have occurred in recent years (Massachusetts Department of Environmental Protection 1992; Screpetis personal communication 1993). Lake Cochituate State Park owns a thin margin of land surrounding most of the lake. Land use in the watershed is a mixture of residential, industrial, and urban.

Recreational fishing for stocked trout is popular in Lake Cochituate (Miller personal communication 1993). Although there are no advisories for fish caught in the lake, the Massachusetts Department of Public Health did issue a catch and release advisory in 1986 for all fish caught along the Sudbury River from Ashland to the confluence of the Sudbury and Assabet rivers because of high concentrations of mercury in fish tissue. In May 1993 a massive fish kill from unknown causes involved several species of fish in the southern portion of Lake Cochituate near the Natick site (Miller personal communication 1993).

Site-Related Contamination

Data collected during several site investigations indicated that groundwater, soil, and surface water were contaminated to varying degrees with pesticides, trace elements, SVOCs, and VOCs. In 1989, soil samples from the Gymnasium Area were found to be contaminated by trace elements and organic compounds. During a soil gas survey conducted in 1989, VOC plumes were found at both the Building T-25 and Gymnasium Areas. During the 1991 Expanded Site Inspection, soil, groundwater, and surface water were sampled at locations based on site history and past investigations.

The pesticides BHC and lindane were detected in soil borings collected from the Gymnasium Area (Table 1). Soil and sediment criteria are not

available for these pesticides. Because the Gymnasium Area is close to Lake Cochituate and the measured soil concentrations are of concern, further sampling of soil and lake sediment in the Gymnasium Area is recommended.

Trace elements found in the soil were within their range of average U.S. soils as reported by Lindsay (1979), although some concentrations were above average (Table 1). Soil contained antimony, arsenic, chromium, lead, and mercury. Trace elements in groundwater include antimony, arsenic, chromium, copper, iron, lead, nickel, and zinc, but at concentrations less than ten times the applicable chronic AWQC. A set of surface water samples contained concentrations of lead above the AWQC, but the lead concentration was also high in the laboratory blank.

VOCs detected include benzene, toluene, xylene, freon, tetrachloroethylene, and trichloroethylene. 1,2-dichloroethylene (DCE) was detected in surface water samples from both the french drain and Lake Cochituate, east of the french drain outflow. VOC concentrations in groundwater samples were less than ten times the applicable AWQC. SVOCs detected in monitoring well samples of soil and groundwater from both the Building T-25 Area and the Gymnasium Area include bis(2-ethylhexyl) phthalate and various PAHs. VOC and SVOC concentrations were too low to threaten NOAA resources.

Table 1. Maximum trace element concentrations in Natick Laboratory soils and U.S. soils (Lindsay 1979).

	Soils (mg/kg)			Groundwater (µg/l)		
	Building T-25 Area	Gymnasium Area	U.S. Soils[1]	Building T-25 Area	Gymnasium Area	Chronic AWQC[2]
Trace Elements						
Antimony	5.9	ND	1	53.9	45.7	30
Arsenic	5.9	19.4	5	ND	7.7	NA
Chromium	49.4	34.0	100	6.6	ND	NA
Copper	ND	ND	30	57.6	14.9	12+
Lead	40.1	60.3	10	9.5	18.7	3.2+
Mercury	0.1	0.1	0.03	ND	ND	0.012
Nickel	ND	ND	40	12	ND	160+
Zinc	ND	ND	50	73.7	38.0	110+
Pesticides						
BHC	ND	23.8	NA	ND	ND	100*
Lindane	ND	2.2	NA	ND	ND	0.08

1: Lindsay, 1979.
2: AWQC for the protection of aquatic organisms. Freshwater criteria presented (EPA 1986).
ND: Not detected at method detection limit.
NA: Screening level not available.
+: Hardness-dependent criteria (100 mg/l $CaCO_3$ used).
*: Acute lowest observed effects level (LOEL).

Summary

Trace elements, VOCs, and SVOCs were detected at the Natick Laboratory site below levels of concern to NOAA. However, high concentrations of the pesticides BHC and lindane were found in soils on the site, close to Lake Cochituate. American eel is the only NOAA trust species now found in Lake Cochituate. Efforts are underway to restore runs of American shad in the Sudbury, Concord, and Merrimack rivers, which are fed by Lake Cochituate. Historically, these rivers supported spawning runs of American shad, blueback herring, alewife, striped bass and, possibly, Atlantic salmon.

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