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Beede Waste Oil

Plaistow, New Hampshire
CERCLIS #NHD018958140

Site Exposure Potential

The Beede Waste Oil site comprises two parcels of land on about 16 ha in Plaistow, New Hampshire (Figure 1). Kelly Brook flows through the site for about 0.6 km and then flows into the Little River approximately 1.5 km downstream from Parcel 1 (Figure 2). From the confluence with Kelly Brook, the Little River flows about 7 km before entering the Merrimack River, which enters the Atlantic Ocean approximately 35 km downstream.

The site was a waste oil recycling and virgin fuel oil storage and distribution facility from 1926 until 1994. Parcel 1 was used for petroleum and waste storage and handling, and Parcel 2 was used primarily for commercial sand and gravel operations (Figure 2). There are numerous localized areas on the site where wastes were stored or disposed. The most contaminated areas include a former surface lagoon where waste oils were deposited, surface-water runoff pits where releases of petroleum products were documented, and two interceptor trenches (SH&A 1995; Figure 2). By 1978, 86 aboveground storage tanks (ASTs) with a total capacity of 4.9 million liters were in use; 38 of these tanks are documented to have contained waste oil, sludge, or water contaminated with PCBs and trace elements. There are numerous piles of contaminated soil and debris, with an estimated total

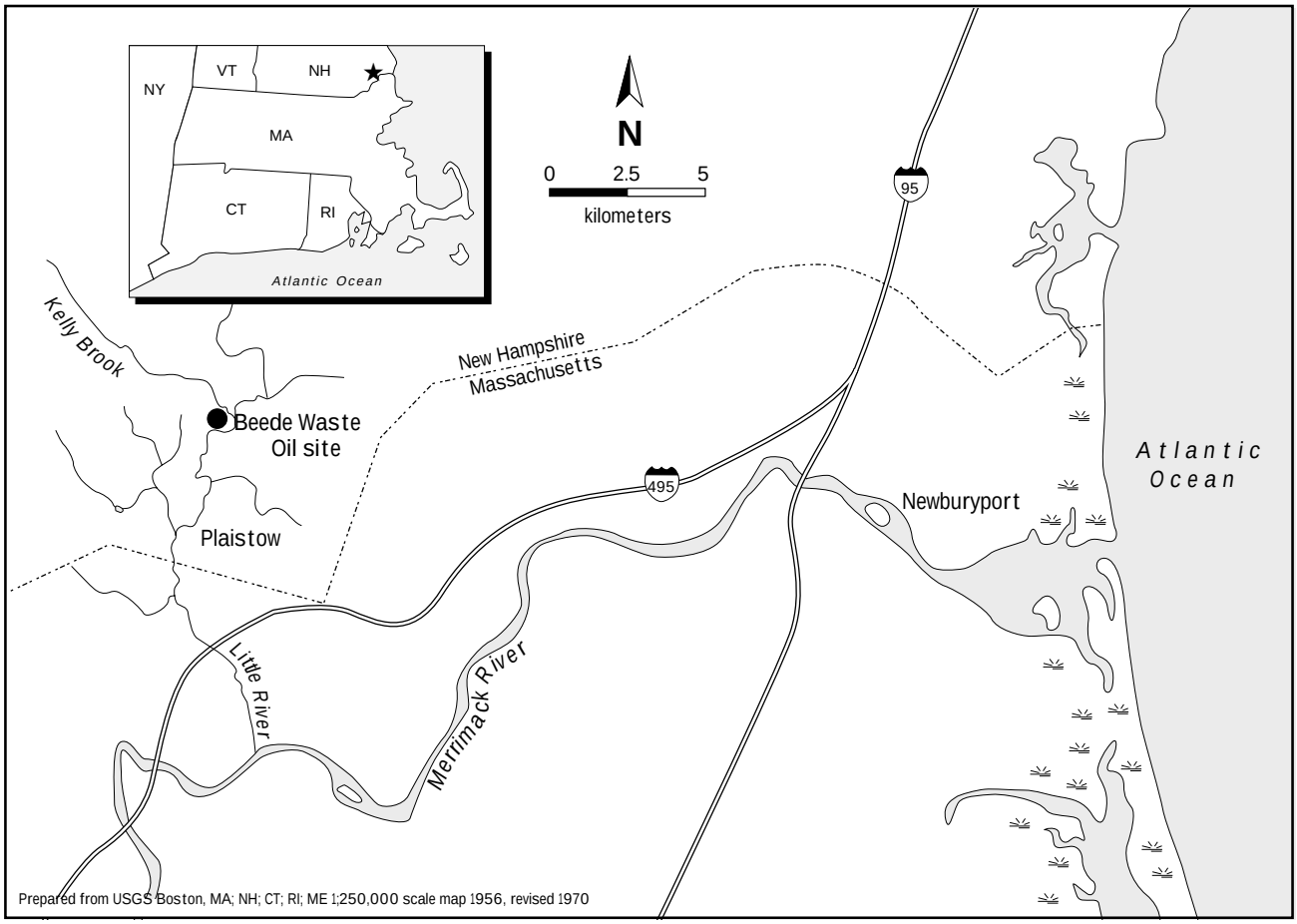

Figure 1. Location of Beede Waste Oil site in Plaistow, New Hampshire.

volume of 15,000 m^3, at the site. Although most of the contaminated soils are located on Parcel 1, PCB-contaminated soils are stockpiled on Parcel 2, also (SH&A 1995). In 1992, the New Hampshire Department of Environmental Services began maintaining oil-absorbent booms in Kelly Brook because free product oil was observed discharging into the brook east of the older site building. Free product oil samples analyzed from groundwater at the site contain combinations of lubricating oil, kerosene, weathered gasoline, light fuel oil, Fuel Oil No. 2, and diesel oil (SH&A 1995).

Groundwater and seeps of waste oils appear to be the primary pathways for migration of contaminants from the site to Kelly Brook. The available site documents did not discuss any drainage ditches on-site that lead to Kelly Brook, although this is a possible migration pathway. The topography of Parcel 1 is relatively flat but the northeastern portion slopes towards Kelly Brook. The

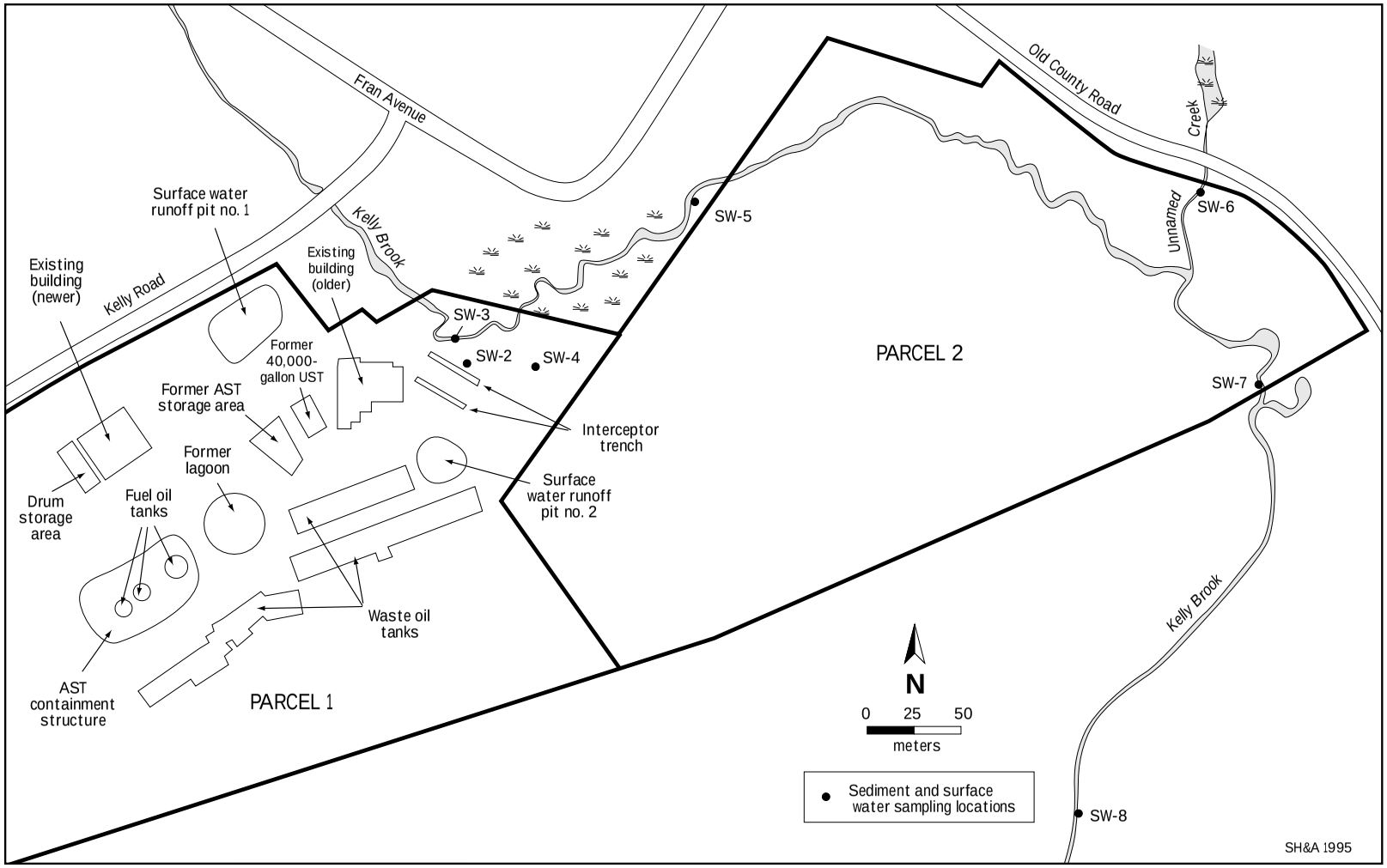

Figure 2. Detail of the Beede Waste Oil site in Plaistow, New Hampshire.

topography of Parcel 2 varies as a result of sand and gravel mining operations (SH&A 1995). The overburden geology in the region is characterized as primarily marine sand containing a few beds of silt and clayey silt with some surficial deposits of glacial sand and gravel, and till. Bedrock has been encountered at 20 to 23 m below the ground surface (bgs). Groundwater is typically found at depths ranging from approximately 1 to 7m bgs; aquifer thicknesses at the site range from approximately 15 to more than 25 m. Groundwater beneath Parcel 1 generally flows east and northeast. The principal zone of discharge for overburden groundwater flowing from the site is Kelly Brook. The average volumetric discharge of groundwater from the site to Kelly Brook is an estimated 240 m^3/day, or approximately 4% of the average stream flow (SH&A 1995).

NOAA Trust Habitats and Species

The primary habitats of concern to NOAA are surface water, stream channel bottom, and associated riparian zones of Kelly Brook, the Little River, and the Merrimack River. Anadromous and catadromous fish species that use the three streams are the resources of concern to NOAA (Table 1).

Kelly Brook is a small, spring-fed stream that flows from its headwaters for approximately 7 km to the Little River. The stream is high-gradient, cold-water with typical riffle-pool habitats for most of its length. Gravel substrates dominate riffle stretches of the stream with finer sands in pool environments. The Little River is a moderate-sized, short stream originating in Bayberry Pond, approximately 3 km upstream of the confluence of Kelly Brook, and discharging to the Merrimack River approximately 7 km downstream of the confluence. The Little River is lower gradient with a primarily warm-water fish assemblage. Substrates are likely composed of sands with finer sediments in ponded areas (Ingham personal communication 1997).

Kelly Brook and the Little River have populations of catadromous American eel throughout both streams. Anadromous species do not use these streams.

The Little River discharges into Reach I of the lower Merrimack River. Reach I is the lower 50 km of the river from the Essex Dam, in Lawrence, Massachusetts, to the mouth. The river in this reach is large, generally between 200 and 400 m wide with pools of 7 m or deeper. Sediments range from large rubble to silts with 65% of the bottom substrate classified as sand and gravel, and 14% as fine silts (USFWS 1982). The confluence of the Little and Merrimack rivers is near the transition between freshwater riverine and tidal estuarine habitat (Ingham pers. commun. 1997).

The Merrimack River has runs of seven anadromous species: Atlantic sturgeon, Atlantic salmon, American shad, alewife, blueback herring, rainbow smelt, and striped bass. In addition, the river is within the known distribution of the shortnose sturgeon, but verified collections of this

Table 1. Major NOAA trust species that use Kelly Brook, Little River, and lower Merrimack River near the site.

protected species have not been made. The catadromous American eel and the anadromous and parasitic sea lamprey are also found in the river. Atlantic sturgeon, rainbow smelt, and striped bass use non-tidal, freshwater segments of Reach I as a primary spawning ground and nursery area. Alewife, blueback herring, and American shad also spawn in Reach I and migrate above the Essex Dam. Atlantic salmon use Reach I as a migratory corridor to spawning grounds in the upper watershed (USFWS 1982).

In 1981, the States of Massachusetts and New Hampshire, the U.S. Fish and Wildlife Service, NOAA's National Marine Fisheries Service, and the U.S. Forest Service formed the Policy and Technical Committees for Anadromous Fishery Management of the Merrimack River. The goals of the committees are restoring anadromous fish populations within the basin and restoration of spawning habitat by developing fish passage facilities at key dams. Atlantic salmon and American shad are the target species; the other anadromous species also would benefit from this management program. Since the inception of the program, several formerly impassable dams upstream of the site have had fish passage facilities installed. A major stocking program of juvenile Atlantic salmon and American shad is underway, planting fish in several tributaries and the mainstem Merrimack upstream of the site (USFWS 1982).

There are no plans to stock the Little River with anadromous fish because of its small size. However, the New Hampshire Department of Fish and Game stocks and manages the river for recreational taking of brook trout, a non-NOAA trust species. Kelly Brook also contains a self-sustaining population of brook trout (Ingham pers. commun. 1997).

The habitat type and the presence of a recreational brook trout fishery in the Little River indicate that blueback herring and alewife could inhabit the river, although they have not been observed there. These species could use the Little River in the future if restoration activities on the Merrimack River enhance their overall populations in the watershed.

Site-Related Contamination

Data on site-related contamination for this report were obtained from the Site and Waste Characterization (SH&A 1995), which reported results from sampling conducted as part of the characterization in 1995, and briefly reviewed results from previous investigations. Based on the Site and Waste Characterization, PCBs and trace elements are the primary contaminants of concern to NOAA. VOCs and petroleum hydrocarbons reported as total petroleum hydrocarbon (TPH) were detected at elevated concentrations in soil and groundwater on-site, and in surface water and sediment of Kelly Brook. However, VOCs are of limited concern to NOAA at their detected concentrations, although their presence on- and off-site indicates that contaminants have migrated from the site. VOCs can facilitate environmental transport of other, less soluble organic contaminants, such as PCBs, but this is undocumented at the site. Petroleum hydrocarbons may pose a risk to trust resources but screening guidelines are not available for these compounds.

Soil and groundwater data indicate potential sources of contaminants to Kelly Brook and NOAA trust resources. VOCs and TPH in or near the water table were highest in soils near the former lagoon and Surface Water Runoff Pit No. 2 (up to 440 mg/kg total non-chlorinated aromatic VOCs, up to 210 mg/kg total chlorinated VOCs, and up to 35,000 mg/kg TPH) (SH&A 1995). Maximum concentrations of trace elements and PCBs detected in soils are presented in Table 2. Limited data were available for trace elements in soils. During the Site and Waste Characterization, total PCBs were detected in 10 of 14 soil samples at concentrations of 0.4 to 1.4 mg/kg. In earlier studies, total PCBs were typically detected in soils at concentrations of approximately 5 mg/kg or less, although PCB concentrations as high as 1500 mg/kg were reported (U.S. EPA 1994, as cited in SH&A; NHDES 1995, as cited in SH&A 1995).

A light, non-aqueous phase liquid (LNAPL) floating on the groundwater at ten monitoring wells affects an estimated 0.4 to 0.8 ha. PCBs have been detected in all LNAPL samples, at concentrations of 11 to 80 mg/kg. LNAPL thicknesses typically range from 0.3 to 1.5 m, with the greatest thicknesses found at the former

Table 2. Maximum concentrations of contaminants of concern to NOAA detected in soil and groundwater at the Beede Waste Oil site compared to NOAA screening guidelines.

lagoon and near the interceptor trenches (SH&A 1995).

Total non-chlorinated aromatic VOCs and total chlorinated VOCs were detected in groundwater at concentrations up to 4.4 and 7.2 mg/L, respectively (SH&A 1995). Table 2 presents maximum concentrations of trace elements detected in groundwater. Elevated concentrations of trace elements were correlated with the presence of LNAPL. PCBs were not analyzed in groundwater during the Site and Waste Characterization. During a previous investigation conducted by Haley and Aldrich in 1994, samples analyzed for PCBs were all non-detect, but detection limits were not reported (SH&A 1995).

In general, the highest concentrations of contaminants in surface water and sediment were found in samples collected from between the interceptor trench and Kelly Brook (colocated samples SW-2 and SS-2; see Figure 2). This area was flooded in April 1990. VOCs were detected in surface water at 9 µg/L in sample SW-2 and at 10 µg/L in Kelly Brook. The highest concentrations of petroleum hydrocarbons were detected in samples SW-2 and SS-2 (88 mg/L in surface water and 1600 mg/kg in sediment). Petroleum hydrocarbons were not detected within Kelly Brook in 1995, although discharges of free product into the brook had been observed in 1992.

Table 3 presents maximum concentrations of trace elements and PCBs detected in surface water and sediment. Trace elements were not detected in sediment during the Site and Waste Characterization, but both the specific trace elements analyzed and the detection limits were unclear. Concentrations of arsenic and lead exceeded their respective ERLs in sediment samples collected from a location in the floodplain of Kelly Brook during a previous study (NHDES 1995, as cited in SH&A 1995). During the Site and Waste Characterization, the only samples in which PCBs were detected were SW-2 (15 µg/L) and SS-2 (2.2 mg/kg). In previous studies, PCBs were detected at concentrations of up to 25 mg/kg in sediment and 3300 µg/L in surface water; elevated concentrations were found primarily in the floodplain of Kelly Brook. Contaminants were not detected at concentrations of concern in Kelly Brook at SW-8; however, sampling has not been conducted in depositional areas downstream of SW-8.

Summary

For nearly 70 years, the Beede Waste Oil site was used to store and handle petroleum products and waste oils. Kelly Brook flows through the site to the Little River which discharges to the Merrimack River. Catadromous American eel is the only NOAA trust resource observed in Kelly

Table 3. Maximum concentrations of contaminants of concern to NOAA detected in Kelly Brook and associated floodplain during investigations at the Beede Waste Oil site compared to NOAA screening guidelines.

Brook and the Little River. However, alewife and blueback herring may use the Little River in the future if anadromous fish restoration activities on the Merrimack River succeed at enhancing their populations in the watershed. Oily free product has been observed discharging into Kelly Brook from the site; and LNAPL floating on the groundwater contained elevated concentrations of PCBs. Very high concentrations of PCBs have been detected in Kelly Brook surface water.

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