Coastal and Estuarine

Hazardous Waste Site Reports

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Contents

Acronyms and abbreviations

AST	Above-ground Storage Tank
AWQC	Ambient water quality criteria for the protection of aquatic life
bgs	below ground surface
BHC	benzene hexachloride
BNA	base, neutral, and acid-extractable organic compounds
BOD	biological oxygen demand
BSL	brine sludge lagoon
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
cfs	cubic feet per second
cm	centimeter
COC	contaminant of concern
COD	chemical oxygen demand
COE	U.S. Army Corps of Engineers
CRC	Coastal Resource Coordinator
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DNAPL	dense non-aqueous phase liquid
DNT	dinitrotoluene
DOD	U.S. Department of Defense
DOI	U.S. Department of the Interior
EPA	U.S. Environmental Protection Agency
ERL	Effects Range - Low
ERM	Effects Range - Median
ft	foot
ha	hectare
HMX	cyclotetramethylene tetranitramine
HRS	Hazard Ranking System
HUC	Hydrologic Unit Code
kg	kilogram
km	kilometer
L	liter
LNAPL	light, non-aqueous phase liquid
LOEL	lowest observed effects level
m	meter
mi	mile
m³/second	cubic meter per second
µg/g	micrograms per gram (ppm)
µg/kg	micrograms per kilogram (ppb)
µg/L	micrograms per liter (ppb)
µR/hr	microroentgens per hour
mg	milligram
mg/kg	milligrams per kilogram (ppm)
mg/L	milligrams per liter (ppm)
mR/hr	milliroentgens per hour
NAPL	non-aqueous phase liquid
NFA	no further action
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
OU	operable unit
PAH	polycyclic (or polynuclear) aromatic hydrocarbon
PA/SI	Preliminary Assessment/Site Investigation
PCB	polychlorinated biphenyl
PCE	perchloroethylene (aka tetrachloroethylene)
pCi/g	picocuries per gram
PCP	pentachlorophenol
PNRS	Preliminary Natural Resource Survey
ppb	parts per billion
ppm	parts per million
ppt	parts per thousand or parts per trillion
PRP	Potentially Responsible Party
PVC	polyvinyl chloride
RCRA	Resource Conservation and Recovery Act

RD/RA Remedial Design/Remedial Action

RDX cyclonite

RI/FS Remedial Investigation/Feasibility Study

ROD Record of Decision

SARA Superfund Amendments and Reauthorization Act of 1986

SVOC semi-volatile organic compound

TCA 1,1,1-trichloroethane

TCE trichloroethylene

TCL Target Compound List

TNT trinitrotoluene

TPH total petroleum hydrocarbons

TSS total suspended solids

USFWS U.S. Fish and Wildlife Service

USGS U.S. Geological Survey

UST underground storage tank

VOC volatile organic compound

< less than

> greater than

Introduction

The National Oceanic and Atmospheric Administration (NOAA) regularly evaluates hazardous waste sites that are proposed for addition to the National Priorities List (NPL), a U.S. Environmental Protection Agency (USEPA) listing of sites that have undergone preliminary assessment and site inspection to determine which locations pose the greatest threat. The NPL is compiled under authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (United States Code, Title 42, Chapter 103). This volume identifies hazardous waste sites that could impact natural resources for which NOAA acts as a federal trustee under the National Oil and Hazardous Substances Pollution Contingency Plan (commonly referred to as the National Contingency Plan or NCP) (Code of Federal Regulations, Title 40, Part 300).

Waste site reports (WSRs) of the type included in this volume often represent NOAA's first examination of a site. Following completion of a WSR, some sites may require a more in-depth assessment called a Preliminary Natural Resource Survey (PNRS). NOAA has published 345 coastal and estuarine hazardous WSRs, 143 PNRS's, and three Air Force Reports (see Tables 1 and 2 in the appendix for a complete list).

Not all hazardous waste sites will affect NOAA trust resources; NOAA is concerned about sites located near trustee resources and their habitats in states along the Atlantic and Pacific oceans, the Gulf of Mexico, and the Great Lakes. NOAA works with the USEPA to identify and assess risks to natural resources and to develop strategies to minimize those risks. Trustee responsibilities also include evaluating cleanup alternatives and restoring habitats.

NOAA uses information from this volume to establish priorities for further site investigations. NOAA's regional Coastal Resource Coordinators (CRCs) will follow up on sites that appear to pose ongoing problems. The CRCs work with other agencies and trustees to communicate any concerns to the USEPA. The CRCs also review sampling and monitoring plans for the sites and help to plan and set objectives for site cleanups. This coordinated approach protects all natural resources, not just those for which NOAA is a steward. The USEPA can use the WSRs to help identify the types of information that may be needed to complete environmental assessments of the sites. Other federal and state trustees can use the reports to help evaluate the potential impacts to their resources.

Each WSR contains an executive summary and three distinct sections. The first section, Site Background, describes the site, previous site operations and disposal practices, and pathways by which contaminants could migrate to NOAA trust resources. The second section, NOAA Trust Resources, describes the species, habitats, and commercial and recreational fisheries near the site. The final section, Site-Related Contamination, identifies the contaminants of concern to NOAA and describes contaminant distribution at the site.

In addition to the WSRs, this volume contains a list of acronyms and abbreviations (p. vii) and a glossary of terms (p. 65) that commonly appear throughout the reports. Table 1 in the appendix lists the WSRs that NOAA has published to date, and Table 2 lists all of the sites as of June 2003 at which NOAA has been involved because of their potential to affect trust resources. Table 2 also lists the number and variety of hazardous waste reports that the Coastal Protection and Restoration Division has published since 1984, including PNRS's and Air Force Reports.

Chemical-Specific Screening Guidelines

Most WSRs contain a table that focuses on the contaminants in different media that have potential to degrade natural resources. These site-specific tables highlight only a few of the many contaminants often found at hazardous waste sites. We compare the chemical concentrations reported in the tables against published screening guidelines for surface water, groundwater, soil, and sediment. Because contaminant releases from hazardous waste sites to the environment can span many years, we are concerned about long-term effects to natural resources. This is why we compare site contaminant levels against screening guidelines for chronic effects rather than for short-term effects.

Ambient water quality criteria (AWQC) (USEPA 1993; USEPA 1999) are used for comparison to contaminant levels detected in surface water and groundwater; mean U.S. soil concentrations (Shacklette and Boerngen 1984; USEPA 1983; Lindsay 1979) are used for comparison to contaminant levels in soil; and effects range-low (ERL) values (Long and Morgan 1991) and threshold effects level (TEL) values (MacDonald 1993) are used for comparison to contaminant levels in sediment.

There are no national criteria for sediment comparable to the AWQC established for water. In the absence of national criteria, we compare sediment concentrations to several published screening guidelines (Long and Morgan 1991; MacDonald et al. 1996; MacDonald et al. 2000a; MacDonald et al. 2000b). Studies that associate contaminant concentrations in sediment with biological effects provide guidance for evaluating contaminant concentrations that could harm sediment-dwelling aquatic organisms. These studies include Kemble et al. 2000; Long et al. 1998; MacDonald et al. 1996; Smith et al. 1996; Long et al. 1995; and Long and MacDonald 1992. However, screening guidelines are often based on effects from individual chemicals. Their application may be difficult when evaluating biological effects that could be attributed to combined effects from multiple chemicals, unrecognized chemicals, or physical parameters that were not measured.

NOAA's National Status and Trends Program has used chemical and toxicological evidence from a number of modeling, field, and laboratory studies to determine the ranges of chemical concentrations associated with toxic biological effects (Long and Morgan 1991; Long and MacDonald 1992):

- No Effects Range — the range of concentrations over which toxic effects are rarely observed;
- Possible Effects Range — the range of concentrations over which toxic effects are occasionally observed; and
- Probable Effects Range — the range of concentrations over which toxic effects are frequently observed.

Two slightly different methods (Long and Morgan 1991; MacDonald 1993) were used to determine these chemical ranges. Long and Morgan (1991; see also Long et al. 1995) compiled chemical data associated with adverse biological effects. The data were ranked to determine where a chemical concentration was associated with an adverse effect (the ERL)—the lower 10^{th} percentile for the data set in which effects were observed or predicted. Sediment samples were not expected to be toxic when all chemical concentrations were below the ERL values.

MacDonald (1993) modified the approach used by Long and Morgan to include both the "effects" and "no effects" data, whereas Long and Morgan used only the "effects" data. TELs were derived by taking the geometric mean of the 15^{th} percentile of the "effects" data and the 50^{th} percentile of the "no effects" data.

Although different percentiles were used for these two methods, their results closely agree (Kemble et al. 2000). We do not advocate one method over the other, and we use both screening guidelines to help focus cleanup efforts in areas where natural resources may be at risk from site-related contaminants.

Chemical concentrations in soil that are elevated above background levels (for this purpose, the mean U.S. soil concentrations) can indicate a potential source of contamination. Ideally, screening guidelines for soils would be calculated from a regional data set. In the absence of such data, we compare soil concentrations to the national mean concentrations (Shacklette and Boerngen 1984), except for cadmium and silver, which we compare to average concentrations in the Earth's crust (USEPA 1983; Lindsay 1979). The soil values are based on averages calculated from soil data collected throughout the U.S. and are used as a reference only for comparison purposes.

References

Kemble, N.E., D.G. Hardesty, C.G. Ingersoll, B.T. Johnson, F.J. Dwyer, and D.D. MacDonald. 2000. An evaluation of the toxicity of contaminated sediments from Waukegan Harbor, Illinois, following remediation. Archives of Environmental Contamination and Toxicology 39:452-461.

Lindsay, W.L. 1979. Chemical Equilibria in Soils. New York, NY: John Wiley & Sons. 449 pp.

Long, E.R. and L.G. Morgan. 1991. The potential for biological effects of sediment-sorbed contaminants tested in the National Status and Trends Program. NOAA Technical Memorandum NOS OMA 52. Seattle: Office of Oceanography and Marine Assessment, National Oceanic and Atmospheric Administration. 175 pp.

Long, E.R. and D.D. MacDonald. 1992. National Status and Trends Program approach [in] sediment classification methods compendium, EPA 823-R-92-006, September 1992. Washington, DC: Office of Water, U.S. Environmental Protection Agency.

Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environmental Management 19 (1):81-97.

Long, E.R., L.J. Field, and D.D. MacDonald. 1998. Predicting toxicity in marine sediments with numerical sediment quality guidelines. Environmental Toxicology and Chemistry 17(4): 714-727.

MacDonald, D.D. 1993. Development of an approach to the assessment of sediment quality in Florida coastal waters, January 1993. Tallahassee: Florida Department of Environmental Regulation. 133 pp.

MacDonald, D.D., R.S. Carr, F.D. Calder, E.R. Long, and C.G. Ingersoll. 1996. Development and evaluation of sediment quality guidelines for Florida coastal waters. Ecotoxicology 5(4):253-278.

MacDonald, D.D., L.M. DiPinto, J. Field, C.G. Ingersoll, E.R. Long, and R.C. Swartz. 2000a. Development and evaluation of consensus-based sediment effect concentrations for polychlorinated biphenyls. Environmental Toxicology and Chemistry 19(5):1403-1413.

MacDonald, D.D., C.G. Ingersoll, and T.A. Berger. 2000b. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Archives of Environmental Contamination and Toxicology 39(1):20-31.

References, *cont.*

Shacklette, H.T. and J.G. Boerngen. 1984. Element concentrations in soils and other surficial materials of the conterminous United States. USGS Professional Paper 1270. Washington, DC: U.S. Geological Survey.

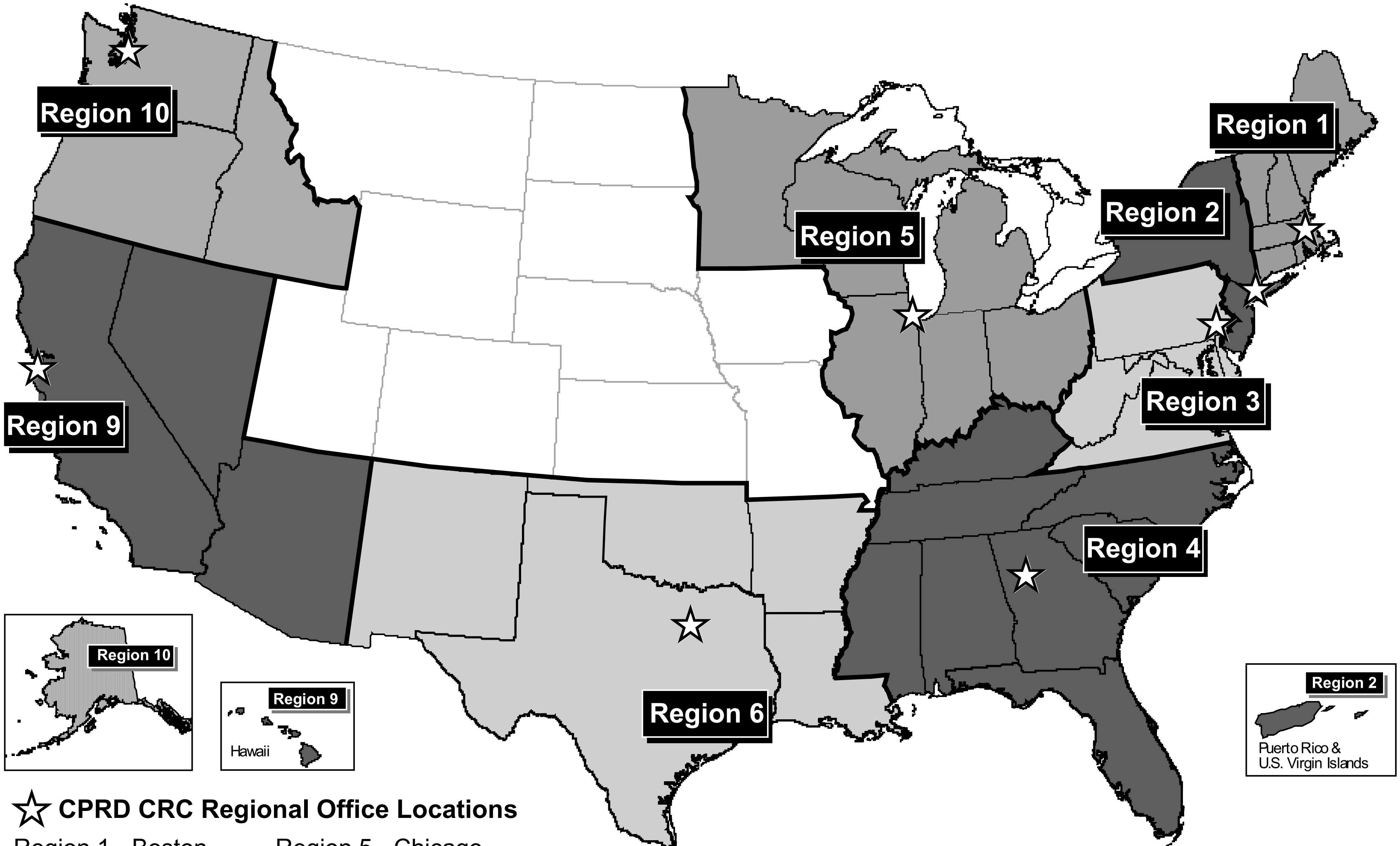
Smith, S.L., D.D. MacDonald, K.A. Keenleyside, C.G. Ingersoll, and L.J. Field. 1996. A preliminary evaluation of sediment quality assessment values for freshwater ecosystems. Journal of Great Lakes Research 22 (3):624-638.

U.S. Environmental Protection Agency (USEPA). 1983. Hazardous waste land treatment. EPA SW-874. Cincinnati: Solid and Hazardous Waste Division, Municipal Environmental Research Laboratory, 702 pp.

U.S. Environmental Protection Agency (USEPA). 1993. Water quality criteria. Office of Water, Health and Ecological Criteria Division, Washington, DC.

U.S. Environmental Protection Agency (USEPA). 1999. National recommended water quality criteria — correction. EPA 822-Z-99-001. Washington, DC: U.S. Environmental Protection Agency, Office of Water.

CPRD Coastal Resource Coordinators in EPA Regions



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Region 2 - New York
Region 3 - Philadelphia
Region 4 - Atlanta
Region 5 - Chicago
Region 6 - Dallas
Region 9 - San Francisco
Region 10 - Seattle

Broad Brook Mill

East Windsor, Connecticut

EPA Facility ID: CT0002055887

Basin: Lower Connecticut

HUC: 01080205

Executive Summary

The Broad Brook Mill site is in East Windsor, Connecticut, next to Broad Brook, a secondary tributary of the Connecticut River. The site has a history of industrial and manufacturing operations — including a grist mill, a saw mill, a tannery, and a wool mill, as well as coal gas, circuit board, and boron filament manufacturing — that dates to before 1835. This long-time use of the site for industrial and manufacturing operations has resulted in contamination; the contaminants of concern are primarily PAHs and other SVOCs, and inorganic compounds (metals). Broad Brook provides important habitat for several NOAA trust resources.

Site Background

The Broad Brook Mill (Broad Brook) site, formerly known as the Millbrook Condominiums site, is in the Broad Brook section of East Windsor, in Hartford County, Connecticut (Figure 1). The Broad Brook site encompasses two lots, identified on East Windsor's Tax Assessor Map 22 as Lots 8 and 8A (Figure 2). A residential condominium building, two garage units, and a former boiler house currently occupy Lot 8, which is approximately 3.5 ha (8.7 acres) in size. Lot 8A, approximately 0.8 ha (1.9 acres) in size, is occupied by a commercial complex and a two-story brick office building. The Broad Brook site is bounded to the north and west by Broad Brook, a tributary of the Scantic River, and to the east and south by named streets. The central area of the site is overgrown with wooded vegetation (USEPA 2000).

Prior to 1835, the property was developed as a grist mill, saw mill, and tannery. Between 1835 and 1954, a wool mill operated on the property. During operation of the wool mill, several primary processes were housed in on-site buildings; these processes included picking, carding, spinning, dressing, weaving, scouring, carbonizing, napping, shearing, and dyeing. Other buildings on the property were used as a machine shop and a coal gas manufacturing plant. From 1954 to 1967, United Technologies Corporation, Hamilton Standard Division (Hamilton), manufactured printed circuit boards on the site. Former Hamilton buildings include a machine shop for the fabrication of small parts needed in the manufacturing process; a parts cleaner station, where chlorinated solvents were used; a wastewater treatment plant to treat electroplating water; a paint spray booth; a boiler house; and a water treatment plant to provide quality water for manufacturing processes (USEPA 2000). From 1968 through 1977, boron filament was manufactured on the property.

Hamilton sold the property and associated mill buildings in 1977 to Broad Brook Center, Inc., James R. Testa, John Bartus, and Broad Brook Center Associates (collectively referred to as BBCI). Hazardous wastes containing methyl ethyl ketone (MEK or 2-butanone), paint liquids, flammable liquids, sodium hydroxide, freon, mercury, waste oil, and activated carbon were shipped off the Broad Brook site in 1984. In January 1986, the property was sold by BBCI to the Connecticut Building

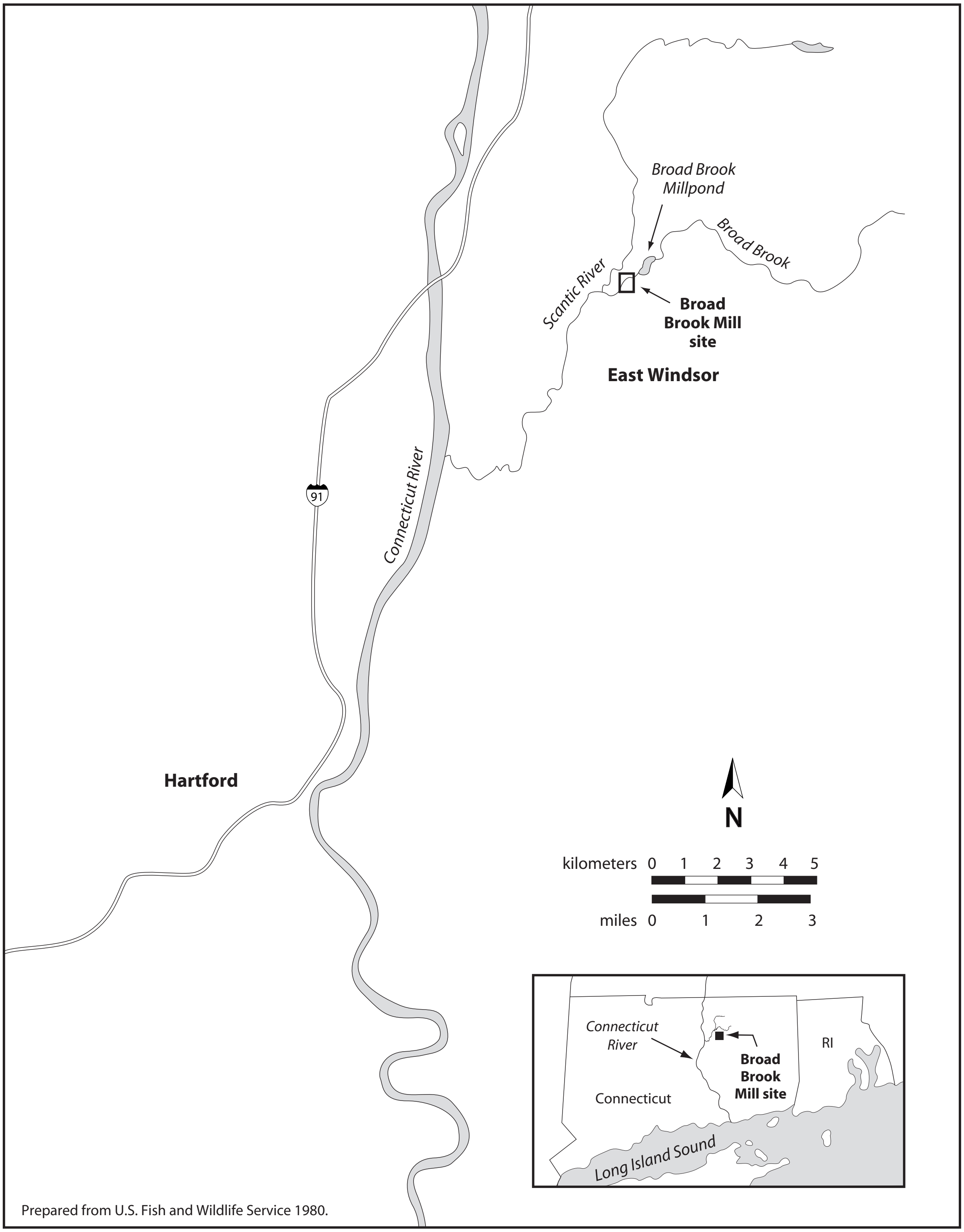

Figure 1. Location of Broad Brook Mill site, East Windsor, Connecticut.

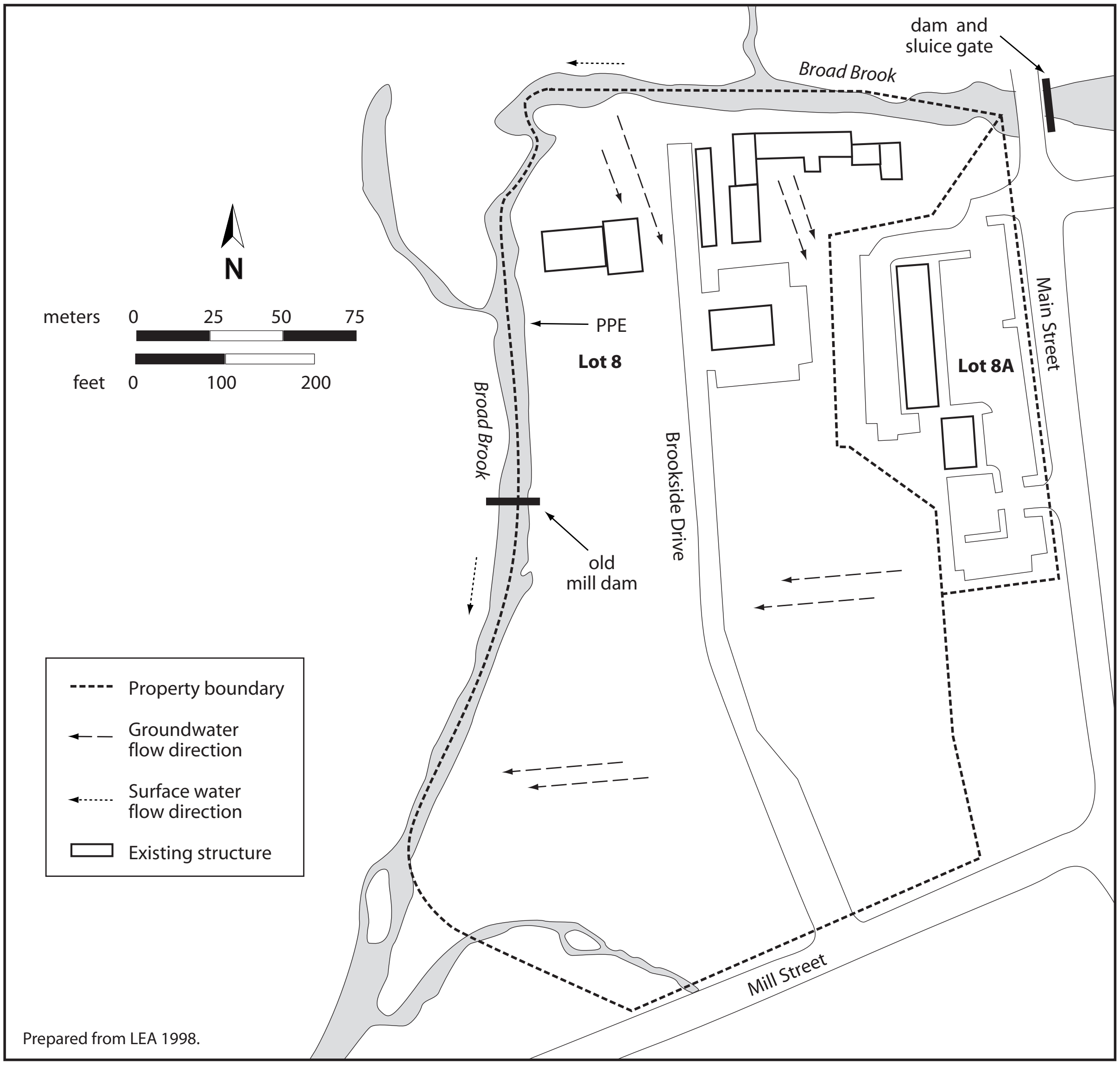

Figure 2. Detail of Broad Brook Mill site.

Corporation. In May of that year, a fire destroyed many of the mill buildings. In 1989, a commercial complex was developed from a former mill building that had survived the fire on Lot 8A. Between 1990 and 1993, residential condominiums were developed on Lot 8 (USEPA 2000).

Extensive surface and subsurface investigations have been conducted on the Broad Brook site. In August 1993, a limited phase II environmental assessment was performed, including the collection of soil gas, soil, and groundwater samples. In October 1994, the Connecticut Department of Environmental Protection (CTDEP) collected soil samples from 13 locations at the site. In October 1995, a second limited phase II environmental assessment was performed, including the collection of a round of soil and groundwater samples. Additional investigations conducted at the site between October 1996 and January 1997 included initial screening investigations, an environmental setting investigation, and an initial site characterization investigation (LEA 1998; Tetra Tech and Dynamac Corporation 2000). In 1997, the Connecticut Department of Public Health conducted a health risk assessment of the site and concluded that because of subsurface contamination, activities involving the soil should be avoided until the soil could be remediated. In 1998, the CTDEP removed mercury-contaminated soil from Lot 8 (Tetra Tech 2000).

The U.S. Environmental Protection Agency (USEPA) initiated a removal investigation in December 1999, which included soil and soil gas sampling. A hazard ranking system package was completed for the Broad Brook site in December 2000, and the site was proposed to the National Priorities List on December 1, 2000 (LEA 1998; Tetra Tech and Dynamac Corporation 2000). At the request of the USEPA, Hamilton performed an emergency removal, which included installing interim soil cover materials around the 21-unit condominium building and conducting asbestos abatement in the former boiler house. These activities were initiated in May 2001 and completed in July 2001 (USEPA 2001).

Contamination from the site migrates via surface water runoff, which enters Broad Brook either by overland flow or through discharge from catch basins. Groundwater enters the surface waters of Broad Brook, providing a second pathway for the migration of contaminants to NOAA trust resources (Tetra Tech and Dynamac Corporation 2000). Groundwater in the eastern and southern sections of the site flows west into Broad Brook, but in the northern section of the site the groundwater flow is south-southeast (Tetra Tech 2000).

NOAA Trust Resources

The NOAA trust habitats of concern are the surface waters and sediments of Broad Brook. Broad Brook flows approximately 1.6 km (1 mi) south-southwest to the Scantic River. The Scantic River continues southwest approximately 13 km (8.4 mi) to the Connecticut River. The Connecticut River flows approximately 93 river km (58 mi) before draining into Long Island Sound (Tetra Tech and Dynamac Corporation 2000).

There are no dams on the Scantic or Connecticut Rivers to impede the migration of diadromous fish to the vicinity of the site. There are two dams on Broad Brook: one adjacent to the site and one just upstream of the site. The dam adjacent to the site is an old mill dam approximately 1.8 m (6 ft) in height (Figure 2); this dam blocks anadromous fish passage. The dam just upstream of the Broad Brook site forms Broad Brook Millpond (Figure 1) behind it; this dam is also impassable to anadromous fish. There are no plans for near-future restoration of these dams (Gephard 2002).

Historically, the Scantic River has had healthy anadromous fish runs, including alewife, American shad, and blueback herring. Although these runs have been declining for several years as a result of habitat degradation, there are still anadromous fish that migrate into the Scantic River, as well as into Broad Brook. Broad Brook provides spawning and habitat for several NOAA trust resources and adult habitat for the American eel; NOAA trust resources present in the Scantic River and Broad Book are alewife, American eel, blueback herring, sea lamprey, and sea-run brown trout (Table 1). American shad are thought to be present as well; however, their low numbers make it difficult to confirm their presence. Upstream migration for these species is blocked by an old mill dam, except for American eel which can negotiate the dam and access the upper reaches of Broad Brook. There is no commercial fishing in the Scantic River and recreational fishing is closed for all anadromous species except sea-run brown trout, in an effort to restore the fish runs (Gephard 2002).

No fish consumption advisories are currently in effect for either the Scantic River or Broad Brook. A fish consumption advisory is in effect for the Connecticut River, which recommends that carp and catfish not be eaten by people in the high-risk group and that people in the low-risk group limit their consumption to no more than one meal per two months. This advisory is in effect because elevated levels of polychlorinated biphenyls (PCBs) have been detected in fish tissues (CTDPH 2002).

Table 1. NOAA trust resources found in the Scantic River and Broad Brook (Gephard 2002).

Species		**Habitat Use**			**Fisheries**	
Common Name	Scientific Name	Spawning Area	Nursery Area	Adult Habitat	Comm.	Rec.
ANADROMOUS FISH						
Alewife	*Alosa pseudoharengus*	◆				
American shad[a]	*Alosa sapidissima*	◆				
Blueback herring	*Alosa aestivalis*	◆				
Sea lamprey	*Petromyzon marinus*	◆				
Searun brown trout	*Salmo trutta*	◆				◆
CATADROMOUS FISH						
American eel	*Anguilla rostrata*			◆		

a: The presence of this species in the Scantic River and Broad Brook is uncertain (Gephard 2002).

Site-Related Contamination

The primary contaminants of concern are polynuclear aromatic hydrocarbons (PAHs) and other semivolatile organic compounds (SVOCs), and inorganic compounds, primarily metals. Soil, surface water, groundwater, and sediment samples have been collected from the Broad Brook site since at least 1993. The maximum contaminant concentrations detected are summarized in Table 2 and represent data collected in 1996 and 1998. A total of 131 soil locations, six surface water locations, 34 groundwater locations, and 12 sediment locations were sampled. The samples were analyzed for SVOCs, metals, and volatile organic compounds (VOCs) (LEA 2002a; LEA 2002b; Tetra Tech 2000; Tetra Tech and Dynamac Corporation 2000).

Several contaminants were detected in soil samples. PAHs were detected in the soil samples and maximum concentrations ranged from 1.4 mg/kg of dibenz(a,h)anthracene to 17 mg/kg of both phenanthrene and pyrene. Maximum concentrations of 9 of the 11 PAHs listed in Table 2 were detected in a sample collected from the northwest end of the property. No mean U.S. soil concentrations exist for comparison to the maximum concentrations of PAHs that were detected in soil samples. All metals analyzed for were detected in soil samples, several at concentrations that exceeded the mean U.S. soil concentrations. The maximum concentration of mercury exceeded the mean U.S. soil concentration by three orders of magnitude. The maximum concentration of silver exceeded the mean U.S. soil concentration by two orders of magnitude. Maximum concentrations of arsenic, lead, selenium, and zinc all exceeded their mean U.S. soil concentrations by at least one order of magnitude. Chromium, copper, and nickel were detected at maximum concentrations that exceeded the mean U.S. soil concentration by at least a factor of two. The maximum concentrations of arsenic, chromium, copper, lead, and selenium were all detected in samples collected from the east side of Lot 8.

Table 2. Maximum concentrations of contaminants of concern detected in soil, groundwater, surface water, and sediment samples collected from the Broad Brook Mill site (Tetra Tech 2000; Tetra Tech and Dynamac Corporation 2000; LEA 2002a, 2002b).

	Soil (mg/kg)		Water (µg/L)			Sediment (mg/kg)	
Contaminant	Soil	Mean U.S.[a]	Ground-water	Surface Water	AWQC[b]	Sediment	TEL[c]
INORGANIC COMPOUNDS							
Arsenic	280	5.2	9	<4.0	150	6.5	5.9
Cadmium	N/A	0.06	N/A	<1.0	2.2[d]	5.9	0.596
Chromium[h]	89	37	1900	<50	11	53	37.3
Copper	58	17	43	<30	9[d]	66	35.7
Lead	1000	16	N/A	<5.0	2.5[d]	32	35
Mercury	370	0.058	0.4	<0.40	0.77[e]	N/A	0.174
Nickel	29	13	N/A	<100	52[d]	33	18
Selenium	8.4	0.26	11	<100	5.0[e]	N/A	NA
Silver	21	0.05	N/A	<10	0.12[d,f]	N/A	NA
Zinc	860	48	68	<50	120[d]	170	123.1
PAHs							
Acenaphthene	1.5	NA	N/A	<10	520[g]	3.5	NA
Acenaphthylene	2.4	NA	15	<1.6	NA	1.0	NA
Anthracene	3.6	NA	N/A	<10	NA	4.6	NA
Benz(a)anthracene	9.3	NA	N/A	<0.82	NA	13	0.0317
Chrysene	8.6	NA	N/A	<10	NA	17	0.0571
Dibenz(a,h)anthracene	1.4	NA	N/A	<10	NA	1.6	NA
Fluoranthene	15	NA	N/A	<10	NA	29	0.111
Fluorene	4.7	NA	26	<10	NA	2.9	NA
Naphthalene	1.8	NA	100	<10	620[g]	2.6	NA
Phenanthrene	17	NA	29	<1.1	NA	25	0.0419
Pyrene	17	NA	N/A	<10	NA	20	0.053

a: Shacklette and Boerngen (1984), except for cadmium and silver which represent average concentrations in the Earth's crust from Lindsay (1979).

b: Ambient water quality criteria for the protection of aquatic organisms (USEPA 1993; USEPA 1999). Freshwater chronic criteria presented.

c: Threshold effects level is the geometric mean of the 15th percentile of the effects data and the 50th percentile of the no-effects data. The TEL is intended to represent the concentration below which adverse biological effects rarely occurred (Smith et al. 1996).

d: Criterion expressed as a function of total hardness; concentrations shown correspond to hardness of 100 mg/L $CaCO_3$.

e: Criterion expressed as total recoverable metal.

f: Chronic criterion not available; acute criterion presented.

g: Lowest Observable Effects Level (LOEL).

h: Screening guidelines represent concentrations for Cr^{+6}

NA: Screening guidelines not available.

N/A: Contaminant not analyzed for.

Groundwater samples were analyzed for selected PAHs and inorganic compounds. PAHs and inorganic compounds were detected in groundwater samples. The maximum concentration of chromium exceeded the ambient water quality criteria (AWQC) by two orders of magnitude, while the maximum concentrations of copper and selenium exceeded their AWQCs by factors of 4.5 and two, respectively. Arsenic, mercury, and zinc were detected, but maximum concentrations did not exceed their AWQCs. The PAHs acenaphthylene, fluorene, naphthalene, and phenanthrene were all detected in the groundwater samples. The maximum concentration of naphthalene did not exceed its AWQC; no AWQCs are available for comparison to the maximum concentrations of other PAHs detected in groundwater.

No contaminants of concern were detected in surface water samples collected from Broad Brook.

Sediment samples collected from Broad Brook contained elevated concentrations of PAHs. Eleven PAH compounds were detected at maximum concentrations that ranged from 1.0 mg/kg (acenaphthylene) to 29 mg/kg (fluoranthene). Maximum concentrations of benz(a)anthracene, chrysene, fluoranthene, phenanthrene, and pyrene exceeded their threshold effects levels (TELs) by at least two orders of magnitude. No TELs are available for comparison to the maximum concentrations of the other PAHs that were detected in sediment samples. The sediment samples collected from a pond upstream of the site have similar elevated PAH concentrations to those samples collected from an outfall just downstream of the old mill dam. After the sediment samples were normalized for total organic carbon (TOC) content the PAH concentrations in the sample from near the outfall were considerably greater than those collected from the upstream pond. Excepting acenaphthylene, all of the maximum PAH concentrations detected were collected a sediment sample collected near an outfall just downstream of the old mill dam. The maximum concentration of acenaphthylene was detected in a sediment sample collected upstream of the site boundary in a small pond adjacent to Broad Brook.

Several metals were detected in sediment samples collected from Broad Brook. The maximum concentration of cadmium exceeded the TEL by nearly one order of magnitude. The maximum concentrations of arsenic, chromium, copper, nickel, and zinc exceeded their respective TELs by factors of less than two. All of the maximum concentrations of metals detected in sediment were from samples collected just downstream of the probable point of entry in Broad Brook (Figure 2).

References

Connecticut Department of Public Health (CTDPH). 2002. If I catch it, can I eat it? A guide to safe eating of fish caught in Connecticut. Hartford, CT. 2 pp.

Gephard, S. Fisheries biologist for the Connecticut Department of Environmental Protection. Old Lyme, CT. Personal communication November 25, 2002.

Lindsay, W.L. 1979. Chemical Equilibria in Soils. New York, NY: John Wiley & Sons. 449 pp.

Loureiro Engineering Associates Inc. (LEA). 1998. Final site investigations report property of Millbrook Owner's Association, Inc.: Block 37 Lots 8 and 8A Tax Assessor's Map 22: East Windsor, Connecticut. LEA Comm. No. 88HS701. Plainville, CT: Prepared for United Technologies Corporation - Hamilton Standard Division.

References, *cont.*

Loureiro Engineering Associates Inc. (LEA). 2002a. Memorandum to Anni Loughlin, USEPA Region 1: Re: Broad Brook Mill Site, East Windsor, Connecticut, Sediment Sampling. Plainville, CT: USEPA. 16 pp.

Loureiro Engineering Associates Inc. (LEA). 2002b. Summary report of sediment sampling, United Technologies Corporation, Block 27, Lots 8, 8A, and portion of 18, Broad Brook, East Windsor, Connecticut. Plainville, CT: Prepared for United Technologies Corporation.

Shacklette, H.T. and J.G. Boerngen. 1984. Element concentrations in soils and other surficial materials of the conterminous United States. USGS Professional Paper 1720. Washington, DC: U.S. Geological Survey.

Smith, S.L, D.D. MacDonald, K.A. Keenleyside, C.G. Ingersoll, and L.J. Field. 1996. A preliminary evaluation of sediment quality assessment values for freshwater ecosystems. J. Great Lakes Res. 22(3):624-638.

Tetra Tech NUS Inc. (Tetra Tech). 2000. Draft site inspection report for Millbrook Condominiums: East Windsor, Connecticut. TtNUS Document No. RI00519. Wilmington, MA: Prepared for U.S. Environmental Protection Agency (USEPA). 39 pp.

Tetra Tech NUS Inc. (Tetra Tech) and Dynamac Corporation. 2000. Final hazard ranking system package for Broad Brook Mill: East Windsor, Connecticut. TtNUS Document No. RI00474F: Prepared for the U.S. Environmental Protection Agency (USEPA). 81 pp.

U.S. Environmental Protection Agency (USEPA). 1993. Water quality criteria. Washington, DC: Office of Water, Health and Ecological Criteria Division. 294 pp.

U.S. Environmental Protection Agency (USEPA). 1999. National recommended water quality criteria—correction: U.S. Environmental Protection Agency, Office of Water.

U.S. Environmental Protection Agency (USEPA). 2000. NPL Site Narrative at Listing Broad Brook Mill: East Windsor, Connecticut. Available: http://www.epa.gov/superfund/sites/npl/nar1613.htm.

U.S. Environmental Protection Agency: New England (USEPA). 2001. Community update: Broad Brook Mill Site: East Windsor, Connecticut. Boston, MA. 2 pp.

U.S. Fish and Wildlife Service (USFWS). 1980. Atlantic coast ecological inventory: Hartford, CONN. - MASS. - N.J. - N.Y. 1:250,000. U.S. Geological Survey. Reston, VA.

Ely Copper Mine

Vershire, Vermont

EPA Facility ID: VTD988366571

Basin: Waits

HUC: 01080103

Executive Summary

The Ely Copper Mine site is an abandoned mine located next to the Ompompanoosuc River in Vershire, Vermont. Activities at the mine ceased in 1920; left behind were ore dumps and tailings piles that contain approximately 90,700 metric tons (100,000 tons) of ore materials. The contaminants of concern at the Ely Copper Mine site are metals found in the site's surface water, groundwater, sediment, and soil. Contaminants from the Ely Copper Mine site are considered a threat to Atlantic salmon, a NOAA trust resource. The NOAA habitat of concern is the surface waters of the Ompompanoosuc River; the river and its tributaries are part of the Connecticut River Atlantic Salmon Restoration Program. Atlantic salmon are stocked along the Ompompanoosuc River as far north as Vershire, near the Ely Copper Mine site.

Site Background

The Ely Copper Mine site in rural Vershire, Vermont, encompasses approximately 728 ha (1,800 acres) (Figure 1). Copper mining activities occurred on approximately 142 ha (350 acres) of the site. These activities ceased in 1920, with the exception that dump-ore was removed from the property between 1949 and 1950 (USEPA 2001). Numerous ore dumps, including a mine tailing and slag pile, remain on the property. These dumps are estimated to contain approximately 90,700 metric tons (100,000 tons) of ore material (VDEC 1992). The area where mining activities occurred is barren of vegetation except near the entrance of the mine, flue, and adits. Ely Mine Forest, Inc., the current property owner, manages portions of the property as commercial timberland (USEPA 2001).

The Ely Copper Mine site extends from Ely Brook, a small tributary of the Ompompanoosuc River, along the top of a long ridge at elevations ranging from approximately 270 m (900 ft) above mean sea level (MSL) to approximately 400 m (1,300 ft) MSL (VDEC 1992). Two intermittent mine drainage streams, Stream A and Stream B, drain the property (Figure 2). Stream A flows adjacent to the west side of the tailings pile, while Stream B flows over the tailings pile. The tailings are rich in metals and sulfides. As water passes over and through the tailings, sulfuric acid is produced. The sulfuric acid dissolves and mobilizes the metals, causing acid mine drainage (Tetra Tech 2001). The acid mine drainage has stained the two drainage streams, which are orange, brown, and reddish in color (Tetra Tech 2001).

Stream A and Stream B join to form the Mine Drainage Stream, which flows southeast approximately 0.8 km (0.5 mi) to Ely Brook (Figure 2). From the confluence of the Mine Drainage Stream with Ely Brook, it is approximately 1.6 km (1 mi) to the confluence of Ely Brook and the Ompompanoosuc River, which is approximately 23 km (14 mi) upstream of the confluence of the Ompompanoosuc River and the Connecticut River (VDEC 1992) (Figure 1).

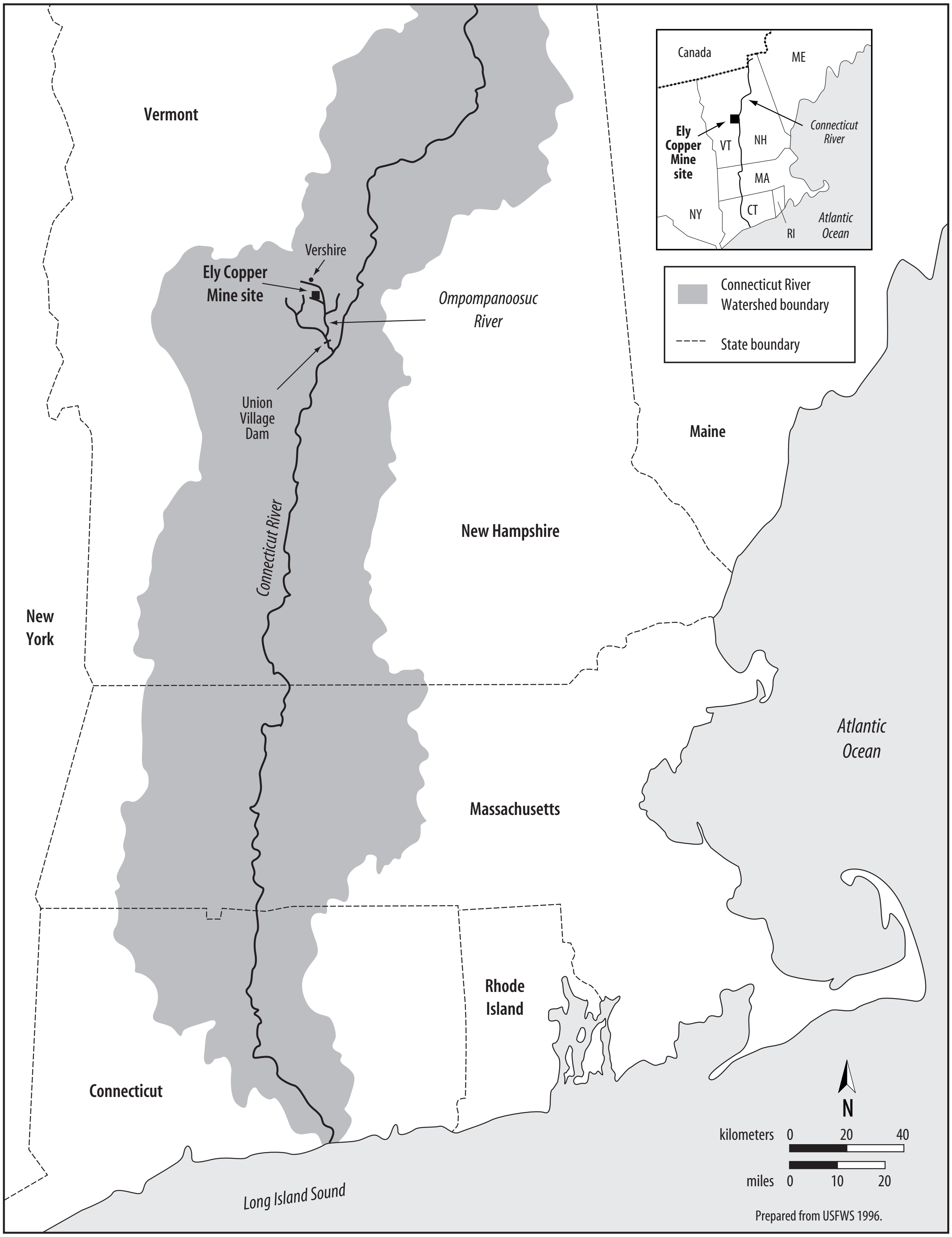

Figure 1. Location of Ely Copper Mine site, Vershire, Vermont.

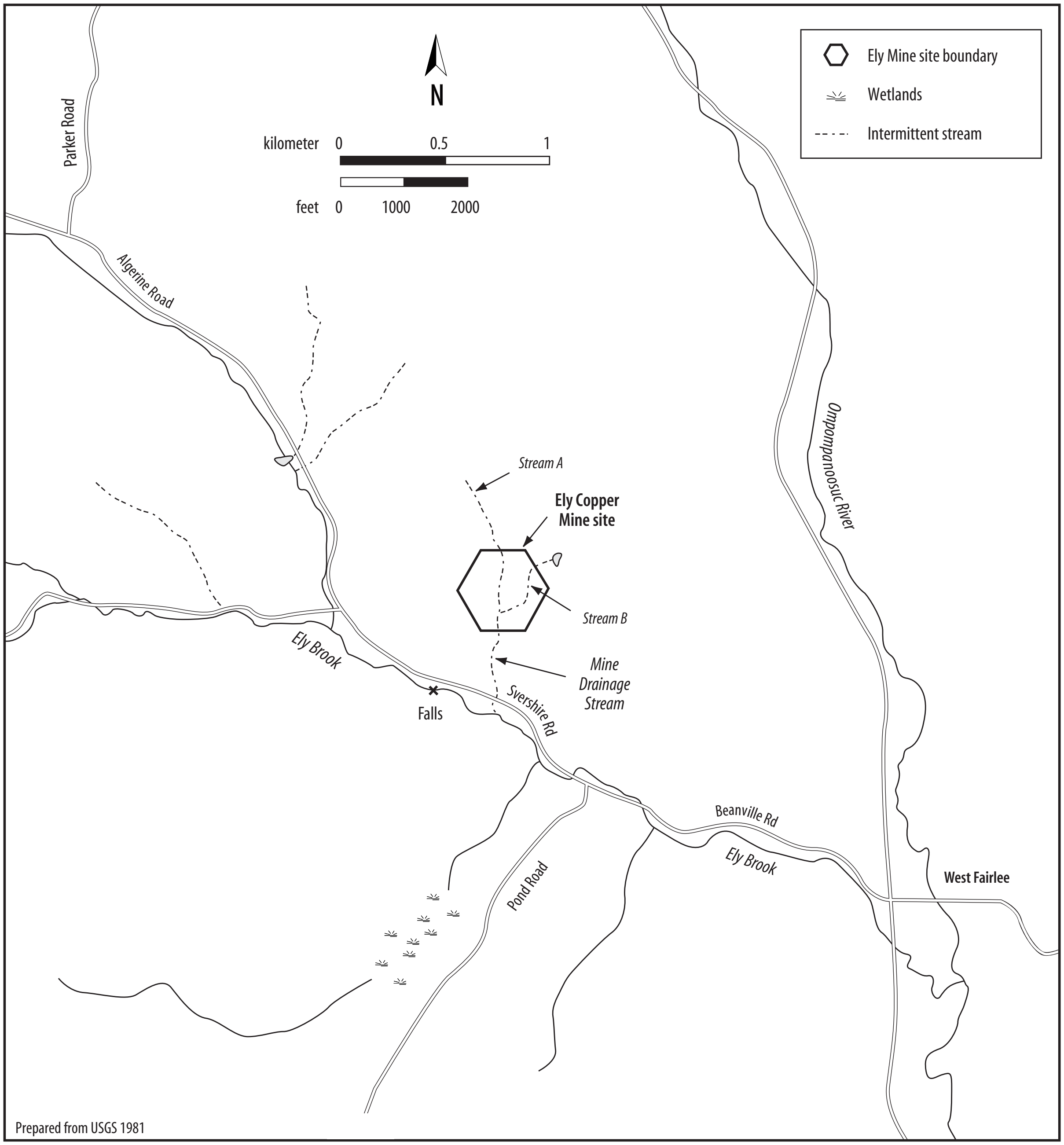

Figure 2. Detail of Ely Copper Mine site.

In July 1988, the Vermont Agency of Natural Resources collected water samples from Ely Brook and inventoried fish species found in the brook. Only one freshwater fish species was found below the confluence of the Mine Drainage Stream and Ely Brook, while five freshwater fish species were found above the confluence (VDEC 1992). In 1991, the Vermont Department of Environmental Conservation concluded that copper had impacted the macroinvertebrate community of Ely Brook downstream of its confluence with the Mine Drainage Stream. In 1995, the Bureau of Mines undertook a study to determine the impact of the discharge from the Ely Copper Mine site and concluded that mine drainage had impacted Ely Brook's water quality as demonstrated by physical and biological factors (Tetra Tech 2001). The U.S. Environmental Protection Agency placed the Ely Copper Mine site on the National Priorities List in September 2001.

NOAA Trust Resources

The NOAA trust resource of concern at the Ely Copper Mine site is Atlantic salmon. The NOAA trust habitat of concern is the surface waters of the Ompompanoosuc River; the river and its tributaries are part of the Connecticut River Atlantic Salmon Restoration Program.

The confluence of Ely Brook and the Ompompanoosuc River is approximately 15 km (9.5 mi) upstream of Union Village Dam (Figure 1). The dam has no upstream fish passage facilities, which limits fish migration from the Connecticut River to the Ompompanoosuc River to the first 5.6 km (3.5 mi) of the Ompompanoosuc River below the dam (Kirn 2002).

Although no Atlantic salmon were found among fish samples recently collected from below Union Village Dam, Atlantic salmon fry are stocked above and below the dam (Kirn 2002; Langdon 2002). Salmon fry are stocked above the dam as far north as Vershire for smolt production. In the Ompompanoosuc River, the majority of the habitat suitable for Atlantic salmon smolts is upstream of the Union Village Dam (Kirn 2002, 2003). Because Union Village Dam is used only for flood control, it is left open year-round. Juvenile salmon are able to pass through the dam, moving with the flow of the water, but the dam forms an impassable barrier to the upstream migration of returning adult salmon (McMenemy 2002). Restoration plans to allow upstream fish passage around Union Village Dam have been deferred until the numbers of adult salmon returning to the river basin increase (Covington 2002; Kirn 2003).

Ely Brook was stocked with Atlantic salmon on an experimental basis for one year. Because of extremely poor survival and growth of the fish, likely due to acid mine drainage, it was not restocked (McMenemy 2001). Stocking could be attempted again should the brook provide suitable habitat for fry in the future (Kirn 2002).

There is no commercial or recreational fishing of Atlantic salmon in the Ompompanoosuc River. A fish consumption advisory, which recommends reduced fish consumption, is currently in effect for all Vermont waters. The advisory is for resident fish species, including chain pickerel, lake trout, largemouth bass, northern pike, smallmouth bass, and walleye (VDH 2000).

Site-Related Contamination

Inorganic compounds, metals in particular, are the primary contaminants of concern at the Ely Copper Mine site. During a screening site inspection conducted by the Vermont Department of Environmental Conservation, seven surface water samples, three groundwater samples, seven sediment samples, and seven soil samples were collected. All samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals (arsenic, cadmium, chromium [assumed to represent hexavalent chromium], copper, lead, mercury, nickel, selenium, and zinc). Analytical results for the inorganic compounds are presented in Table 1. VOCs or SVOCs were not detected in any of the media sampled, but it is noted that detection limits were not available for comparison at the time of this report.

Table 1. Maximum concentrations of contaminants of concern to NOAA at the Ely Copper Mine site (VDEC 1992).

	Soil (mg/kg)		**Water (µg/L)**			**Sediment (mg/kg)**	
Contaminant	Soils	Mean U.S.[a] Soil	Ground-water	Surface Water	AWQC[b]	Sediment	TEL[c]
INORGANIC COMPOUNDS							
Arsenic	21	5.2	59	15	150	11	5.9
Cadmium	1	0.06	3	7	2.2[d]	<0.10	0.596
Chromium[f]	35	37	36	17	11	73	37.3
Copper	5600	17	1400	5800	9[d]	5500	35.7
Lead	304	16	<10	<10	2.5[d]	17	35
Mercury	1	0.058	<0.2	<0.2	0.77[e]	<0.070	0.174
Nickel	35	13	180	73	52[d]	26	18
Selenium	56	0.26	<5	<5	5.0[e]	28	NA
Zinc	1200	48	25000	1300	120[d]	160	123.1

a: Shacklette and Boerngen (1984), except for cadmium, which represents average concentrations in the Earth's crust from Lindsay (1979).

b: Ambient water quality criteria for the protection of aquatic organisms (USEPA 1993, 1999). Freshwater chronic criteria presented.

c: Threshold effects level (TEL) is the geometric mean of the 15th percentile of the effects data and the 50th percentile of the no-effects data. The TEL is intended to represent the concentration below which adverse biological effects rarely occurred (Smith et al. 1996).

d: Criterion expressed as a function of total hardness; concentrations shown correspond to hardness of 100 mg/L $CaCO_3$.

e: Criterion expressed as total recoverable metal.

f: Screening guidelines represent concentrations for Cr^{+6}.

NA: Screening guidelines not available.

Three of the seven surface water samples were collected from Ely Brook above, below, and downstream of its confluence with the drainage streams; three were collected at various locations within the mining operations area; and a background sample was collected upgradient of the site. Maximum concentrations of cadmium, chromium, copper, nickel, and zinc in surface water samples from the mining operations area exceeded ambient water quality criteria (AWQC) screening guidelines. The maximum concentration of copper exceeded the AWQC by more than two orders of magnitude. The maximum concentration of zinc exceeded the AWQC by one order of magnitude. The maximum concentrations of cadmium, chromium, and nickel exceeded the AWQC by factors of approximately three or less. Arsenic was detected, but at a maximum concentration below the AWQC; lead, mercury, and selenium were not detected. All maximum concentrations of metals were detected in a surface water sample taken from Stream A approximately 122 m (400 ft) upstream of the confluence of Streams A and B. Analysis of the surface water samples collected from Ely Brook showed copper (95 µg/L) to be the only metal detected at a maximum concentration above the AWQC.

Groundwater samples for metals analyses were taken from two of three well points; a sample could not be collected from the third well because the well did not recharge after other sampling. Maximum concentrations of cadmium, chromium, copper, nickel, and zinc all exceeded the AWQC. The maximum concentrations of copper and zinc exceeded the AWQC by two orders of magnitude. The maximum concentrations of cadmium, chromium, and nickel exceeded the AWQC by factors of approximately three or less. Arsenic was detected, but at a maximum concentration below the AWQC; lead, mercury, and selenium were not detected. The maximum concentrations of cadmium, copper, and zinc were detected in a sample collected from a well point in Stream A; the maximum concentrations of arsenic, chromium, and nickel were found in a sample collected from a well point in Stream B (VDEC 1992).

Analysis of sediment samples taken from the mining operations area showed that maximum concentrations of arsenic, chromium, copper, nickel, and zinc exceeded the threshold effects level (TEL) screening guidelines. The maximum concentration of copper exceeded the TEL by two orders of magnitude. The maximum concentrations of arsenic, chromium, nickel, and zinc exceeded TELs by factors of approximately two or less. Lead was detected, but at a maximum concentration below the TEL. Selenium was detected in sediment samples but there is no TEL available for comparison. Cadmium and mercury were not detected. The maximum concentrations of arsenic, chromium, and nickel were detected in a sample collected from an area of ponded water near an air shaft on the mine property. The maximum concentration of lead was detected in a sample collected from Stream B, while the maximum concentrations of copper, selenium, and zinc were found in a sample from Stream A (VDEC 1992). In sediment samples collected from Ely Brook, only copper (246 mg/kg) was detected at a maximum concentration above the TEL. All other maximum concentrations of metals in sediment from Ely Brook did not exceed the TEL screening guidelines (excepting a 0.6 mg/kg concentration of selenium, for which there is no TEL) (VDEC 1992).

Five of the seven soil samples were taken from waste material at the site; one was a background sample; and one was a sample of native soil. The soil samples were collected at depths ranging from approximately 0.15 m to 0.3 m (0.5 ft to 1.0 ft) (VDEC 1992). Maximum concentrations of arsenic, cadmium, copper, lead, mercury, nickel, selenium, and zinc in soil samples from the Ely Copper Mine site all exceeded the average concentrations found in U.S. soil (mean U.S. soil concentrations). The maximum concentrations of copper and selenium exceeded the mean U.S. soil concentrations by two orders of magnitude. The maximum concentrations of cadmium, lead, mercury, and zinc exceeded the mean U.S. soil concentrations by one order of magnitude. Maximum concentrations of arsenic and nickel exceeded the mean U.S. soil concentrations by factors of approximately four or less; chromium was detected, but at a concentration below the mean U.S. soil guideline. The maximum concentrations of cadmium, copper, and zinc were detected in a sample taken from an ash pile. The maximum concentrations of lead and mercury were detected in samples taken from slag piles, while the maximum concentration of selenium was found near some old roasting beds. Copper ore was roasted in the roasting beds to reduce the sulfur content and other impurities before it was smelted. (VDEC 1992).

References

Covington, S. Fisheries biologist for the State Fish and Wildlife Lab. Waterbury, VT. Personal communication February 6, 2002.

Kirn, R. District fisheries biologist for the State Fish and Wildlife Lab. Roxbury, VT. Personal communication February 8, 2002.

Kirn, R. District fisheries biologist for the State Fish and Wildlife Lab. Roxbury, VT. Personal communication March 3, 2003.

Langdon, R. Aquatic biologist for the Vermont Department of Environmental Conservation. Waterbury, VT. Personal communication February 7, 2002.

Lindsay, W.L. 1979. *Chemical Equilibria in Soils*. New York, NY: John Wiley & Sons. 449 pp.

McMenemy, J. District fisheries biologist for the Vermont Department of Fish and Wildlife. Waterbury, VT. Personal communication July 16, 2001.

McMenemy, J. District fisheries biologist for the Vermont Department of Fish and Wildlife. Waterbury, VT. Personal communication February 5, 2002.

Shacklette, H.T. and J.G. Boerngen. 1984. Element concentrations in soils and other surficial materials of the conterminous United States. USGS Professional Paper 1720. Washington, DC: U.S. Geological Survey.

Smith, S.L, D.D. MacDonald, K.A. Keenleyside, C.G. Ingersoll, and L.J. Field. 1996. A preliminary evaluation of sediment quality assessment values for freshwater ecosystems. *J. Great Lakes Res.* 22(3):624-638.

Tetra Tech NUS Inc. (Tetra Tech). 2001. Final hazard ranking system package for Ely Copper Mine, Vershire, Vermont. NPL-U36-2-1-R1. Wilmington, MA: Prepared for USEPA.

U.S. Environmental Protection Agency (USEPA). 1993. Water quality criteria. Washington, DC: Office of Water, Health and Ecological Criteria Division. 294 pp.

U.S. Environmental Protection Agency (USEPA). 1999. National recommended water quality criteria—correction: U.S. Environmental Protection Agency, Office of Water.

U.S. Environmental Protection Agency (USEPA). 2001. NPL site narrative at listing Ely Copper Mine, Vershire, Vermont. Available: http://www.epa.gov/superfund/sites/npl/nar1641.htm.

U.S. Fish and Wildlife Service (USFWS). 1996. Connecticut River watershed map. USFWS. Sunderland, MA.

U.S. Geological Survey (USGS). 1981. Vershire Quadrangle, Vermont, 7.5 minute series (topographic). 1:24,000. U.S. Geological Survey. Denver, CO.

Vermont Department of Environmental Conservation (VDEC). 1992. Ely Copper Mine, Beanville Road, Vershire, Orange County, Vermont: Screening site inspection. Waterbury, VT: Department of Environmental Conservation, Vermont Agency of Natural Resources. 20 pp.

Vermont Department of Health (VDH). 2000. Health alert: Vermont Department of Health recommends that people limit their consumption of some fish caught in Vermont waters. Available: http://www.healthyvermonters.info/hp/fish/fishalert.shtml.

Ellenville Scrap Iron and Metal

Ellenville, New York

EPA Facility ID: NYSFN0204190

Basin: Rondout

HUC: 02020007

Executive Summary

The Ellenville Scrap Iron and Metal site is an inactive facility in Ellenville, New York, where scrap iron and metal were formerly reclaimed. Waste remaining at the site includes piles of scrap metal and car batteries, as well as a landfill embankment composed of construction and demolition debris. The major contaminants of concern are metals and PCBs. Beer Kill, a secondary tributary of Rondout Creek, borders the site. American eel, a NOAA trust resource, are present in Beer Kill, Sandburg Creek, and upper Rondout Creek; those streams are the NOAA habitats of concern. Two dams on Rondout Creek prevent most other NOAA trust resources from passing upstream. Restoration of one of the dams is tentatively being considered.

Site Background

The Ellenville Scrap Iron and Metal (Ellenville) site is an inactive facility where scrap iron and metal were formerly reclaimed. The Ellenville site is in the rural village of Ellenville, Ulster County, New York (Figure 1). The site encompasses approximately 9.7 ha (24 acres) and is bordered by Cape Road to the north, Beer Kill (a small stream) to the south and west, and residential homes to the east (Figure 2). Waste remaining on the site includes scrap metal piles, a landfill embankment composed of construction and demolition debris, automobile battery piles, and brush piles. The landfill embankment, approximately 12 m (40 ft) in height, runs in a crescent along a northwesterly to southeasterly axis, bisecting and dividing the site into upper and lower sections. The Deteriorated drums are scattered throughout the site property, the majority of which are located in the lower portion of the site, adjacent to Beer Kill (USEPA 2001).

Operations at the Ellenville site began in 1950. The recycling of automobile batteries was the major function at the site and remained so until 1997, when the property changed hands. At that time, the new owner began using the site as a landfill and tire dump. Two major sources of contamination have been identified within the Ellenville site: contaminated soil within the facility's disposal area and the landfill embankment. Other areas of environmental concern at the site include piles of scrap metal, miscellaneous waste, waste tires, railroad ties, and automobile batteries (Weston 2001).

Neither of the Ellenville site's owners received a permit from the New York State Department of Environmental Conservation (NYSDEC) to operate a solid waste management facility or to store tires. In March 1987, owners of the facility proposed a Settlement of Claim with the NYSDEC; the proposed settlement included an acknowledgement by the owners that they had been operating a solid waste management facility without a NYSDEC permit and that the facility had improperly disposed of industrial waste. In addition, the owners agreed to close and cover the area where construction and demolition debris had been disposed of. A subsequent agreement between

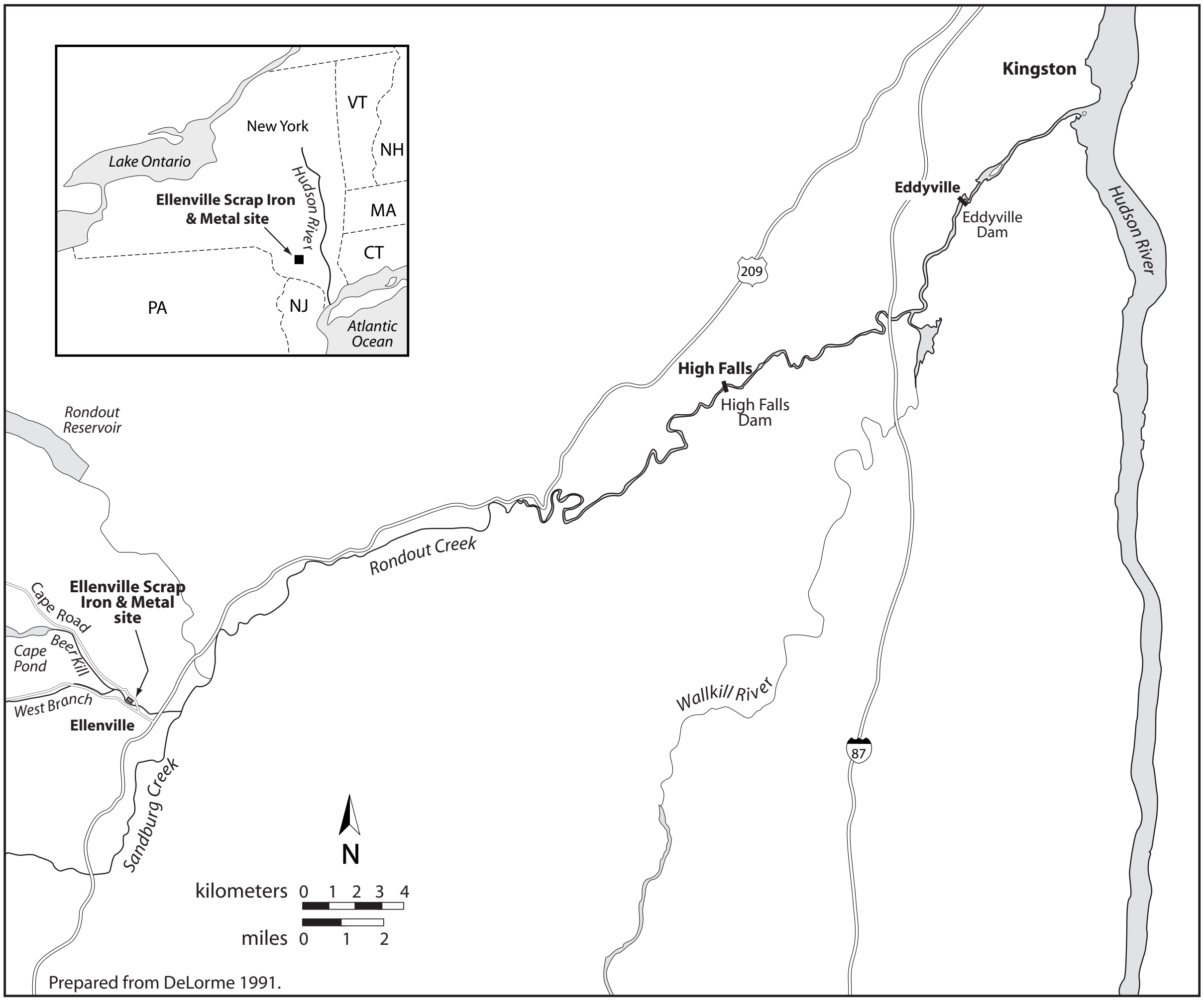

Figure 1. Location of Ellenville Scrap Iron and Metal site, Ellenville, New York.

owners of the Ellenville facility and the NYSDEC called for an evaluation of site conditions, as well as the removal of all debris that did not meet the criteria for exemption from state environmental law concerning construction and demolition. As of June 2000, the debris had not been removed from the site (Weston 2001).

Groundwater is one pathway for the migration of contaminants from the Ellenville site to NOAA trust resources. Leachate has been observed discharging from the landfill embankment, ponding at the base of the embankment, and then flowing to and disappearing beneath a pile of brush (Figure 2). This observation indicates that containment structures within the site are inadequate and allow contaminants to seep into groundwater, as well as run into surface water (Weston 2001). Groundwater beneath the site is part of the unconfined Sandburg Creek Valley Aquifer. It flows southeast from the site and discharges into Sandburg Creek at a rate of approximately 57 million liters (15 million gal) per day (Weston 2001).

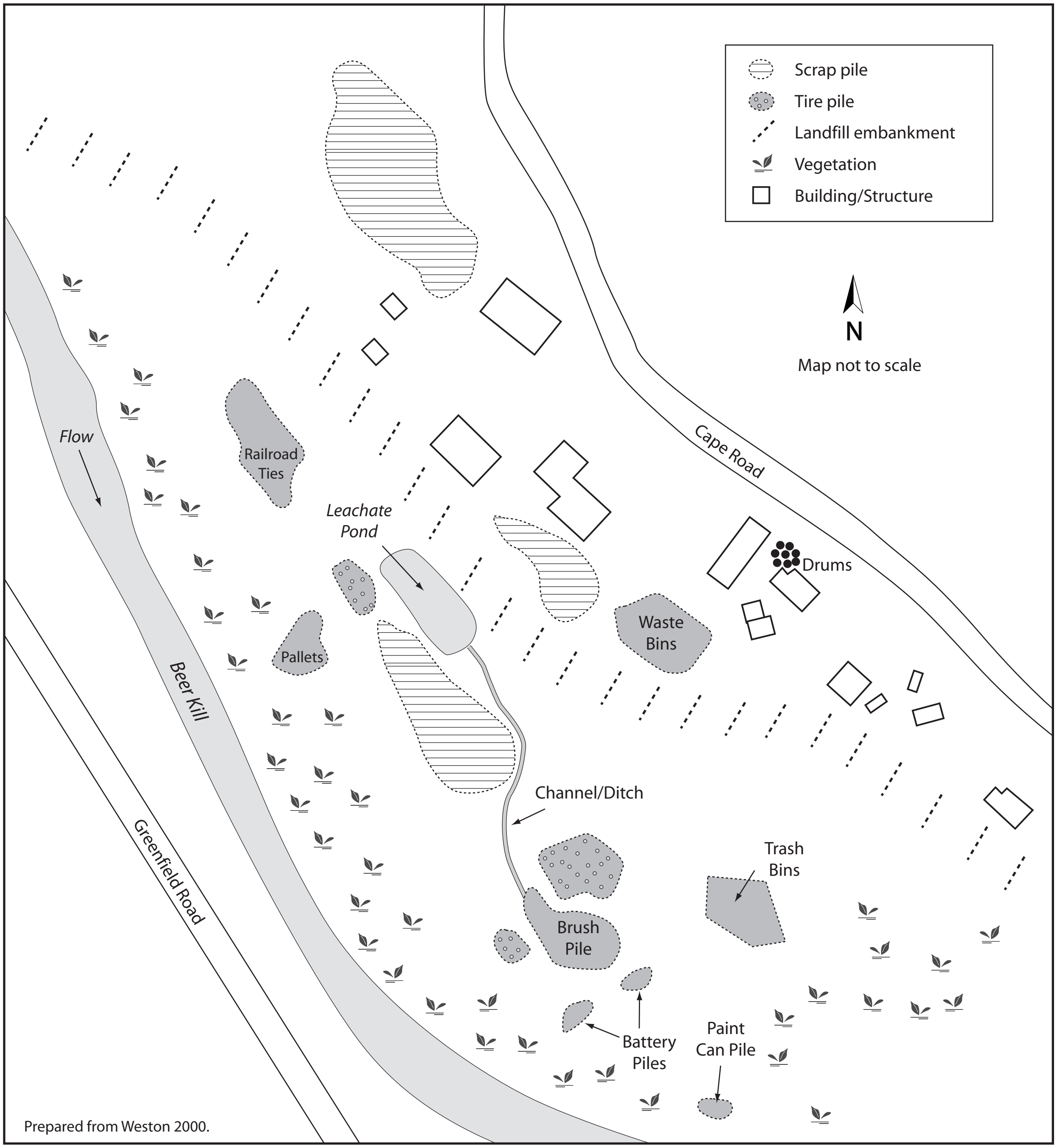

Figure 2. Detail of Ellenville Scrap Iron and Metal site.

Surface water is another pathway for the migration of contaminants from the Ellenville site to NOAA trust resources. Both contaminated soils and waste piles are situated on a hillside that slopes toward Beer Kill. Beer Kill is a tributary of Sandburg Creek, which is a tributary of Rondout Creek. Rondout Creek is a major tributary of the Hudson River, which eventually empties into the Atlantic Ocean. In addition, the lower section of the site, which is in the 100-year flood zone, is the location of contaminated soil, the base of the landfill embankment, and piles of scrap metal and automobile batteries. There is no containment of runoff in this area (Weston 2001).

A site inspection was conducted in March 2001, and a hazard ranking system package for the Ellenville site was completed on September 10, 2001. The Ellenville Scrap Iron and Metal site was proposed to the National Priorities List on September 13, 2001 (USEPA 2001).

NOAA Trust Resources

The surface waters of Beer Kill, Sandburg Creek, and Rondout Creek are the NOAA habitats of concern. The NOAA trust resources found in Rondout Creek are presented in Table 1. Two dams on Rondout Creek prevent most NOAA trust resources from passing upstream. However, American eel can negotiate the dams and are able to migrate upstream as far as Beer Kill.

Table 1. NOAA trust resources found in Rondout Creek and the Hudson River (Flaherty 2002; Kahnle 2002).

Species		**Habitat Use**				**Fisheries**	
Common Name	Scientific Name	Migratory Route	Spawning Area	Nursery Area	Adult Habitat	Comm.	Rec.
ANADROMOUS FISH							
Alewife	*Alosa pseudoharengus*	◆	◆			◆	◆
American shad	*Alosa sapidissma*	◆				◆	◆
Atlantic rainbow smelt*	*Osmerus mordax mordax*	◆	◆				
Blueback herring	*Alosa aestivalis*	◆	◆			◆	◆
Sea lamprey	*Petromyzon marinus*	◆					◆
Striped bass	*Morone saxatilis*	◆					◆
CATADROMOUS FISH							
American eel	*Anguilla rostrata*				◆		◆

* This species abundance has declined precipitously in all Hudson River tributaries, including Rondout Creek, over the last 10-20 years.

Beer Kill, which borders the Ellenville site to the south and west, flows downstream approximately 1.9 km (1.2 mi) from the probable point of entry to its confluence with Sandburg Creek. From there, Sandburg Creek flows approximately 1.6 km (1 mile) to its confluence with Rondout Creek. Approximately 56 km (35 mi) downstream, Rondout Creek joins the Hudson River, which flows approximately 150 km (90 mi) before it reaches the Atlantic Ocean (Weston 2001).

There are no dams along the Hudson River between its mouth and Rondout Creek; however, there are two dams on Rondout Creek: Eddyville Dam and High Falls Dam. Eddyville Dam is located within the tidal portion of Rondout Creek and is not equipped with fish passage facilities. High Falls Dam is a hydroelectric impoundment located approximately 19 km (12 mi) upstream of Eddyville Dam; it also does not have fish passage facilities (Elliot 2001). The possibility of restoration work on Eddyville Dam has been discussed, but there is no specific plan and no schedule for such work. There is currently no plan to restore fish passage at High Falls Dam (Flaherty 2002).

Several NOAA trust resources use Rondout Creek as a migratory corridor and spawning habitat (Table 1). The Eddyville Dam prevents all species except American eel and sea lamprey from migrating farther upstream. Both American eel and sea lamprey are able to traverse the Eddyville Dam, but only American eel can traverse High Falls Dam and migrate further upstream to Beer Kill.

There are currently no fish consumption advisories in effect for Beer Kill, Sandburg Creek, or upper Rondout Creek (Flaherty 2002). A fish consumption advisory is in effect for species in the Hudson River. The advisory includes the stretch of the Hudson River from Catskill (upstream of the confluence of the Hudson River and Rondout Creek) south to the Upper Bay of New York Harbor and the tidal portion of Rondout Creek. The advisory is in effect because of the concentrations of polychlorinated biphenyls (PCBs) detected in fish tissues, including American eel, Atlantic needlefish, bluefish, rainbow smelt, striped bass, and white perch. The consumption advisory recommends against eating more than one meal per month of those fish species. It also recommends that infants, children under 15, and women of childbearing age not eat any fish taken from the Hudson River (NYSDOH 2002).

Site-Related Contamination

The primary contaminants of concern to NOAA at the Ellenville site are inorganic compounds (primarily metals) and PCBs. In early June 2000, the Region II Superfund Technical Assessment and Response Team collected soil, sediment, and leachate water samples from the Ellenville site. Soil samples were collected from the Ellenville site as well as from adjacent residential properties. Sediment samples were collected from Beer Kill, and leachate samples were collected from the leachate pond and the channel leading from the leachate pond to the brush pile (Figure 2). All samples were analyzed for metals, pesticides, PCBs, volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs) (Weston 2000). The maximum concentrations of selected contaminants are summarized in Table 2. Surface water samples were not collected because of the high flow rate in Beer Kill at the time of sampling. Groundwater monitoring data was not available for review at the time of this report.

Several contaminants were detected in soil samples collected from the Ellenville site. Maximum concentrations of all metals exceeded the average concentrations found in U.S. soil (mean U.S. soil concentrations). The maximum concentration of lead exceeded the mean U.S. soil concentration by four orders of magnitude; the maximum concentration of silver exceeded the mean U.S. soil concentration by three orders of magnitude; and the maximum concentrations of cadmium, chromium, copper, and zinc exceeded the mean U.S. soil concentration by two orders of magnitude. The maximum concentrations of mercury and nickel exceeded the mean U.S. soil concentration by one order of magnitude, while the maximum concentrations of arsenic and selenium exceeded the mean U.S. soil concentration by factors of approximately four and seven, respectively. The maximum concentrations of copper, selenium, silver, and zinc were detected in a sample collected from an area without vegetation in the southeastern end of the site. The maximum concentrations of lead and arsenic were detected in a sample from one of the residences adjacent to the site, indicating possible migration of contaminants from the site. The maximum concentrations of chromium and nickel were detected in a sample collected northeast of the railroad ties. The maximum concentration of cadmium was detected in a sample from the south end of the site, and the maximum concentration of mercury was detected in a sample collected just east of the channel/ditch.

Table 2. Maximum concentrations of selected contaminants of concern found in soil, leachate water and sediment at the Ellenville Scrap Iron and Metal site and nearby properties (Weston 2000).

	Soil (mg/kg)		Water (µg/L)		Sediment (mg/kg)	
Contaminant	Soil	Mean U.S.[a]	Leachate Water	AWQC[b]	Sediment	TEL[c]
INORGANIC COMPOUNDS						
Arsenic	20	5.2	14	150	4.1	5.9
Cadmium	14	0.06	<0.30	2.2[d]	<0.080	0.596
Chromium[j]	12,000	37	130	11	8.8	37.3
Copper	10,000	17	550	9[d]	9.1	35.7
Lead	230,000	16	540	2.5[d]	13	35
Mercury	1.1	0.058	0.77	0.77[e]	<0.070	0.174
Nickel	480	13	40	52[d]	18	18
Selenium	1.8	0.26	<2.2	5.0[e]	<0.59	NA
Silver	61	0.05	<0.70	0.12[d,f]	<0.18	NA
Zinc	16,000	48	1200	120[d]	88	123.1
SEMIVOLATILE ORGANIC COMPOUNDS						
Acenaphthene	110	NA	57	520[h]	<0.42	NA
Acenaphthylene	1.9	NA	<11	NA	<0.42	NA
Anthracene	51	NA	4	NA	<0.42	NA
Benz(a)anthracene	110	NA	4	NA	<0.42	0.0317
Bis(2-ethylhexyl)phthalate	62	NA	4	NA	1.2	NA
Chrysene	99	NA	5	NA	<0.42	0.0571
Dibenz(a,h)anthracene	7.4	NA	1	NA	<0.42	NA
Fluoranthene	230	NA	11	NA	<0.42	0.111
Fluorene	28	NA	4	NA	<0.42	NA
Naphthalene	26	NA	4	620[h]	<0.42	NA
Pentachlorophenol	99	NA	130	15[k]	<1.1	NA
Phenanthrene	240	NA	11	NA	<0.042	0.0419
Pyrene	240	NA	69	NA	<0.042	0.053
PESTICIDES/PCBs						
Aldrin	0.021	NA	0.29	1.5[f]	<0.0021	NA
DDE	0.063	NA	0.61	NA	0.00029	0.00142[l]
DDT	0.23	NA	0.75	0.0005	0.0005	0.00698[g]
Dieldrin	0.12	NA	0.85	0.056	0.00025	0.00285
Endosulfan (alpha + beta)	0.016	NA	<0.16	0.028	<0.0064	NA
Endrin	0.049	NA	0.93	0.036	0.00022	0.00267
Gamma-BHC (Lindane)	0.028	NA	0.053	0.08	0.000092	0.00094
Heptachlor	0.022	NA	0.34	0.0019	<0.0021	NA
Heptachlor Epoxide	0.00015	NA	<0.053	0.0019	<0.0021	0.0006
PCBs (as Aroclors)	13	0.371[i]	0.54	0.014	<0.042	0.0341
Toxaphene	<410	NA	<5.3	0.0002	<0.22	NA

a: Shacklette and Boerngen (1984), except for cadmium and silver, which represent average concentrations in the earth's crust from Lindsay (1979).
b: Ambient water quality criteria for the protection of aquatic organisms (USEPA 1993, 1999). Freshwater chronic criteria presented.
c: Threshold effects level is the geometric mean of the 15th percentile of the effects data and the 50th percentile of the no-effects data. The TEL is intended to represent the concentration below which adverse biological effects rarely occurred (Smith et al. 1996).
d: Criterion expressed as a function of total hardness; concentrations shown correspond to hardness of 100 mg/L $CaCO_3$.
e: Criterion expressed as total recoverable metal.
f: Chronic criterion not available; acute criterion presented.
g: Expressed as total DDT.
h: Lowest observable effects level (LOEL).
i: Final preliminary remedial goal for the protection of wildlife (Efroymson et al. 1997).
j: Screening guidelines represent concentrations for Cr^{+6}
k: Chronic is pH dependent; concentration shown above corresponds to pH of 7.8.
l: Expressed as p,p-DDE.
<: Not detected above specified detection limit.
NA: Screening guidelines not available.

Several SVOCs were detected in soil samples at maximum concentrations ranging from 1.9 mg/kg (acenaphthylene) to 240 mg/kg (phenanthrene and pyrene). The maximum concentrations of 11 of the 13 SVOCs detected were in a soil sample collected at the base of the landfill embankment. No mean U.S. soil concentrations are currently available for comparison to the maximum concentrations of SVOCs. Several pesticides were also detected; DDT had the greatest concentration. Several of the maximum concentrations of pesticides and PCBs were detected in a sample collected on the banks of the leachate pond. Currently no mean U.S. soil concentrations are available for comparison to the maximum concentrations of pesticides. A final preliminary remediation goal for the protection of wildlife (Efroymson et al. 1997) is available for use as a screening guideline for PCBs. The maximum concentration of PCBs exceeded that screening guideline by one order of magnitude.

Four of seven metals detected in the three leachate samples exceeded ambient water quality criteria (AWQC) screening guidelines. The maximum concentration of lead exceeded the AWQC by two orders of magnitude, while the maximum concentrations of copper and chromium exceeded the AWQC by one order of magnitude, and the maximum concentration of zinc exceeded the AWQC by a factor of nine. Several SVOCs were detected at maximum concentrations ranging from 1 µg/L (dibenz(a,h)anthracene) to 130 µg/L (pentachlorophenol). The maximum concentration of pentachlorophenol exceeded the AWQC by a factor of approximately nine. Currently no AWQC are available for comparison to the maximum concentrations of the other detected SVOCs excepting acenaphthene and naphthalene, which did not exceed AWQC. Maximum concentrations of four of the detected pesticides (DDT, dieldrin, endrin, and heptachlor) exceeded AWQC by one to three orders of magnitude. PCBs were also detected; the maximum concentration exceeded the AWQC by one order of magnitude. All maximum concentrations of metals, SVOCs, pesticides, and PCBs were detected in a sample collected from the leachate pond.

Metals, pesticides, and one SVOC were detected in sediment samples collected from Beer Kill. Of the six metals detected, no maximum concentrations exceeded the threshold effects level (TEL) screening guidelines. The majority of the maximum concentrations of metals occurred in a sample collected approximately 0.6 m (200 ft) downstream of the site. Bis(2-ethylhexyl)phthalate was the only SVOC detected but no TEL is available for comparison to the maximum concentration. Five pesticides were detected in the sediment samples but concentrations did not exceed the TELs. PCBs were not detected in the sediment samples.

References

DeLorme. 1991. New York State atlas and gazetteer. 1:150,000. DeLorme. Freeport, ME.

Efroymson, R. A., G. W. Suter II, B. E. Sample, and D. S. Jones. 1997. Preliminary remediation goals for ecological endpoints. Available: http://www.esd.ornl.gov/programs/ecorisk/tm162r2.pdf.

Elliot, W. Fisheries biologist for the New York State Department of Environmental Conservation: Division of Fish, Wildlife, and Marine Resources. New Paltz, NY. Personal communication November 2, 2001.

Flaherty, M. Fisheries biologist for the New York State Department of Environmental Conservation: Division of Fish, Wildlife and Marine Resources: Region 3. New Paltz, NY. Personal communication May 20, 2002.

References, *cont.*

Kahnle, A. Fisheries biologist for the Hudson Fisheries Unit of the New York State Department of Environmental Conservation, Bureau of Fisheries. New Paltz, NY. Personal communication May 20, 2002.

Lindsay, W.L. 1979. Chemical Equilibria in Soils. New York, NY: John Wiley & Sons. 449 pp.

New York State Department of Health (NYSDOH). 2002. Health advisories: chemicals in sportfish and game. Albany, NY.

Roy F. Weston Inc. (Weston). 2000. Sampling trip report. Edison, NJ: prepared by START.

Roy F. Weston Inc. (Weston). 2001. Hazard ranking system documentation package: Ellenville Scrap Iron and Metal, Ellenville, Ulster County, New York. Edison, NJ: prepared for U.S. Environmental Protection Agency (USEPA).

Shacklette, H.T. and J.G. Boerngen. 1984. Element concentrations in soils and other surficial materials of the conterminous United States. USGS Professional Paper 1720. Washington, DC: U.S. Geological Survey.

Smith, S.L, D.D. MacDonald, K.A. Keenleyside, C.G. Ingersoll, and L.J. Field. 1996. A preliminary evaluation of sediment quality assessment values for freshwater ecosystems. J. Great Lakes Res. 22(3):624-638.

U.S. Environmental Protection Agency (USEPA). 1993. Water quality criteria. Washington, DC: Office of Water, Health and Ecological Criteria Division. 294 pp.

U.S. Environmental Protection Agency (USEPA). 1999. National recommended water quality criteria—correction: U.S. Environmental Protection Agency, Office of Water.

U.S. Environmental Protection Agency (USEPA). 2001. NPL site narrative at listing Ellenville Scrap Iron and Metal, Ellenville, New York. Available: http://www.epa.gov/superfund/sites/npl/nar1651.htm.

Brandywine DRMO

Brandywine, Maryland

EPA Facility ID: MD9570024803

Basins: Lower Potomac

HUCs: 02070011

Executive Summary

The Brandywine Defense Reutilization and Marketing Office facility in Brandywine, Prince George's County, Maryland, was used as a storage area for hazardous waste and electrical equipment. Substantial concentrations of PCBs and pesticides have been detected in soils and surface water at the site. Surface water runoff flows from the property into ditches that border the perimeter of the site; the ditches flow into a culvert that flows toward Timothy Branch. Groundwater in the surface aquifer beneath the site flows toward Timothy Branch and Mattawoman Creek. Data from sediment and surface water collected from wetland areas draining to Timothy Branch indicate that PCBs are migrating from the site toward NOAA trust resources. The NOAA trust habitats of concern are the headwater reaches of Timothy Branch, Mattawoman Creek, and Mataponi Creek. Mattawoman and Mataponi creeks contain American eel and suitable spawning habitat for anadromous blueback herring.

Site Background

The Brandywine Defense Reutilization and Marketing Office (DRMO) site occupies approximately 3 ha (8 acres) in Brandywine, Prince George's County, Maryland. The site is located on the groundwater divide between the Potomac River and Patuxent River basins, both of which flow into the Chesapeake Bay (Figure 1).

From 1955 until 1988, the Brandywine DRMO was used by the U.S. Department of Defense as a storage area for surplus electrical equipment and hazardous waste, including solvents and waste oil containing polychlorinated biphenyls (PCBs) (USEPA 1998). Waste material was stored in tanks, drums, warehouses, aboveground storage tanks, and underground storage tanks. Capacitors and transformers containing oil contaminated with PCBs were stored in concrete bins in the northeast portion of the site. Evidence indicates that burn pits were once used at the site. In 1993, approximately 14,500 metric tons (16,000 tons) of contaminated soil and debris were excavated and removed from the Brandywine DRMO site (USEPA 1998). The site was placed on the National Priorities List in May 1999 (USEPA 2000).

Surface water flow and groundwater migration are the primary pathways for transport of contaminants to NOAA trust resources. Surface water runoff at the site flows into ditches around the perimeter; the ditches flow north and west toward a culvert (Figure 2). Approximately 150 meters (500 ft) north of the site, the culvert discharges to a natural highly braided channel system. These channels eventually form a tributary to Timothy Branch, which joins Mattawoman Creek approximately 7.2 km (4.5 mi) downstream. Mattawoman Creek discharges to the Potomac River about 35 km (22 mi) west (Dames and Moore 1996; USEPA 1998).

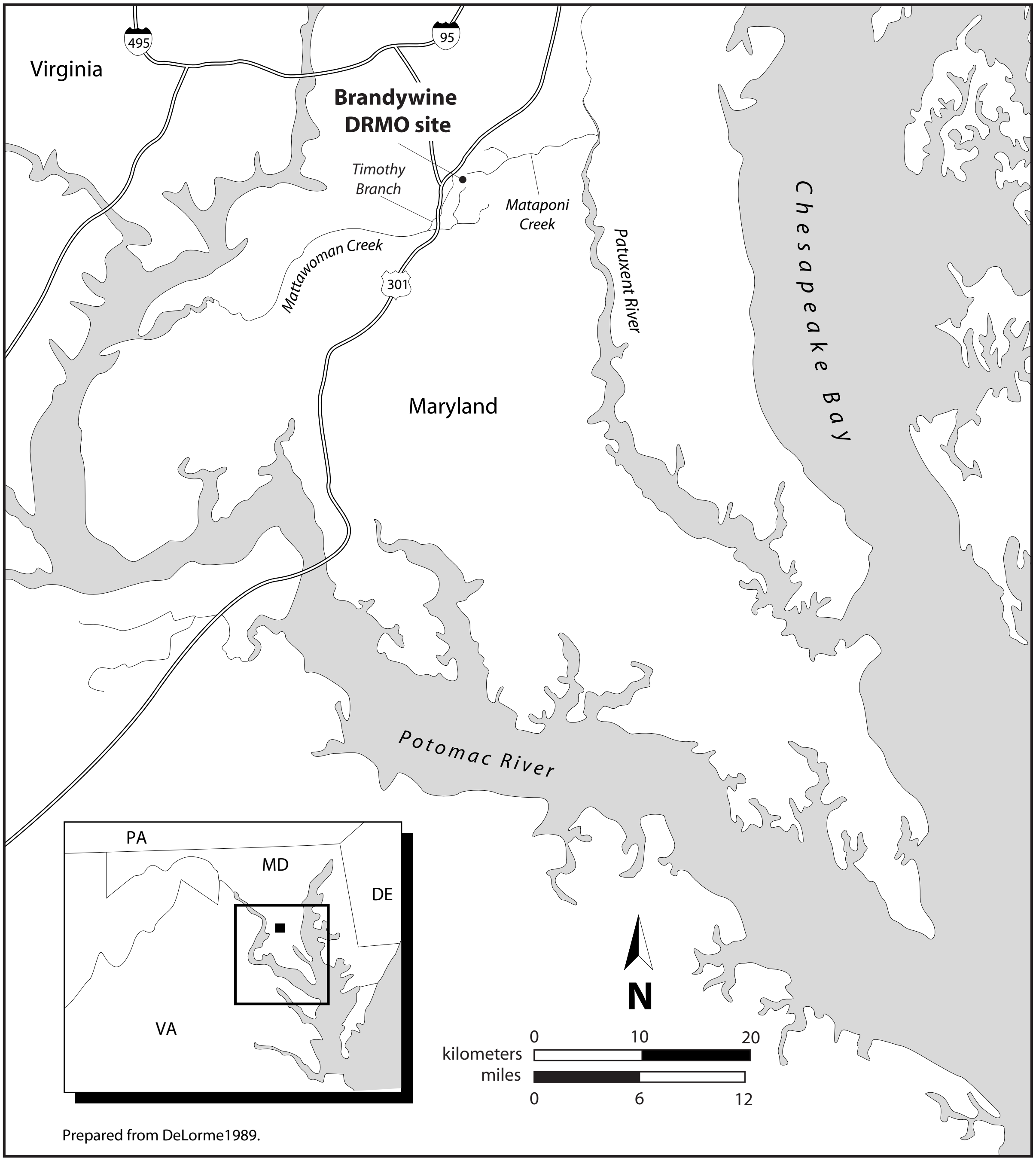

Figure 1. Location of Brandywine DRMO site, Brandywine, Maryland.

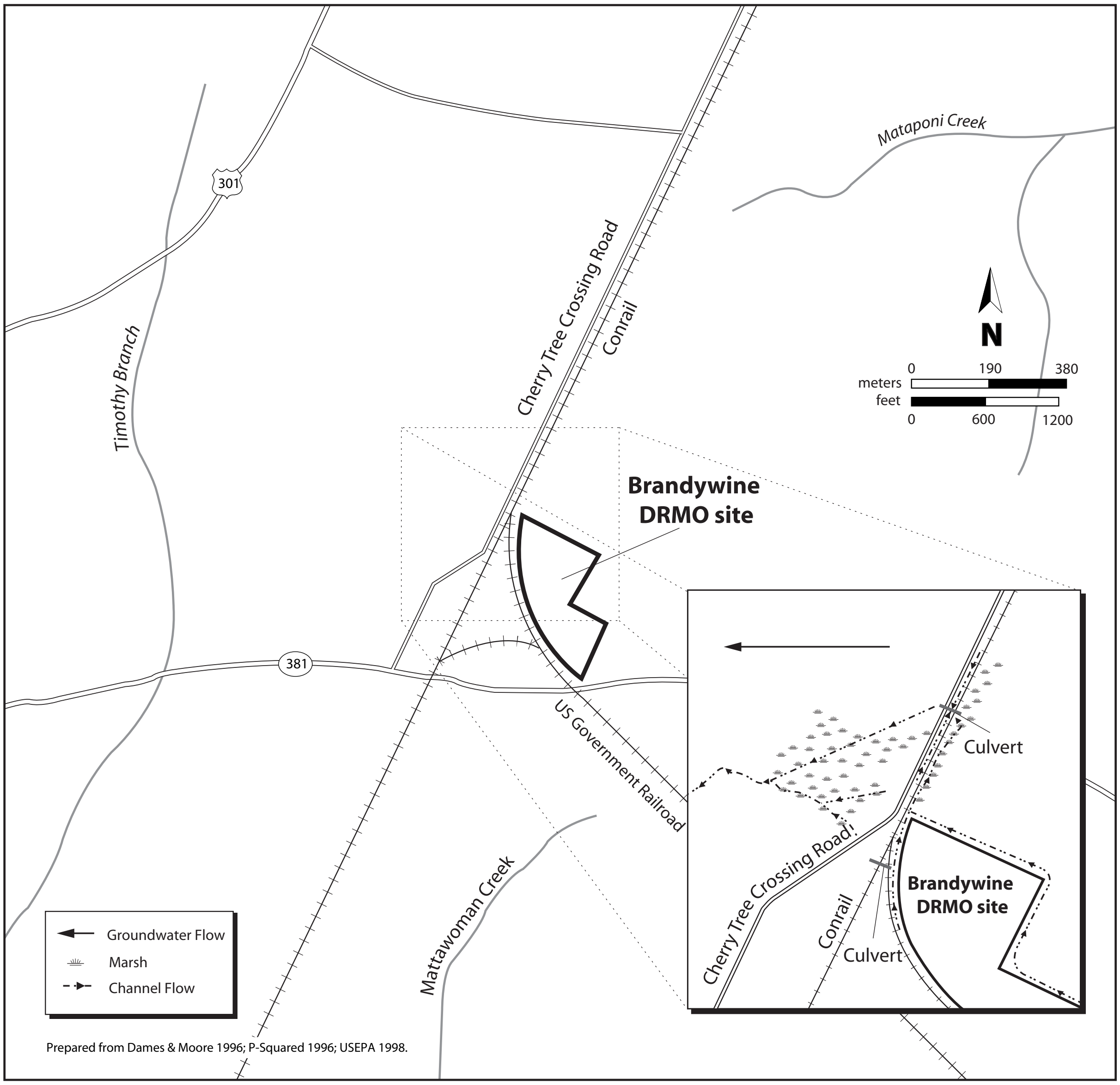

Figure 2. Detail of the Brandywine DRMO site.

The uppermost aquifer beneath the site is approximately 4 to 12 m (13 to 38 ft) thick and composed of silty clay overlying a sandy gravel layer. Beneath the surface aquifer lies the clay Calvert Formation, which acts as a barrier to downward groundwater flow. Groundwater flows from the surface aquifer to perennial streams near the site, which include Mattawoman Creek to the south and Timothy Branch to the west (Figure 2) (P-Squared 1996). The groundwater beneath the site is approximately 0.6 to 3 m (2 to 10 ft) below ground surface (Dames and Moore 1996).

NOAA Trust Resources

The NOAA trust habitats of concern are the headwater reaches of Timothy Branch, Mattawoman Creek, and Mataponi Creek (Figure 1). These streams generally range from 3 to 10 m (10 to 33 ft) in width, are shallow, and have low to moderate grades. Riffle, run, and pool environments predominate, so sediments range from silt in depositional pools to gravel in shallow riffles (Stribling et al. 1999).

NOAA trust resources found in the vicinity of the Brandywine DRMO site are listed in Table 1. The catadromous American eel is present in the headwater reaches of Mattawoman and Mataponi creeks. Catadromous eel enter streams as juveniles and spend most of their adult lives in fresh water (Mowrer 2003)

Table 1. NOAA trust resources found in the vicinity of the Brandywine DRMO site (MDNR 1999; Stribling et al. 1999; Mowrer 2003).

Species		**Habitat Use**			**Fisheries**	
Common Name	Scientific Name	Spawning Area	Nursery Area	Adult Habitat	Comm.	Rec.
CATADROMOUS FISH						
American eel	*Anguilla rostrata*		◆	◆		
ANADROMOUS FISH						
Alewife	*Alosa pseudoharengus*	◆	◆	◆		◆
Blueback herring	*Alosa aestivalis*	◆	◆	◆		◆
Hickory shad	*Alosa mediocris*	◆	◆	◆		
Striped bass	*Morone saxatilis*	◆	◆	◆		◆
White perch	*Morone americana*	◆	◆	◆		◆
Yellow perch	*Perca flavescens*	◆	◆	◆		◆

Several anadromous fish species including striped bass, blueback herring, white perch, alewife, and hickory shad spawn and rear their young in Mattawoman Creek in the vicinity of the Brandywine DRMO site (Mowrer 2003). White perch and striped bass are also present in the Potomac and Patuxent rivers, approximately 42 and 15 km (26 and 9 mi) downstream of the facility, respectively (MDNR 1999). No anadromous fish are present in Mataponi Creek in the vicinity of the site because numerous beaver dams keep them from migrating upstream of the creek mouth (Mowrer 2003)

Recreational fishing of several anadromous fish including striped bass, blueback herring, white perch, and alewife occurs in limited quantities in the upper reaches of Mattawoman Creek (Mowrer 2003). Recreational fishing is more substantial in tidal portions of Mattawoman Creek about 25 km (16 mi) downstream of the facility. Striped bass, white perch, and freshwater resident species are targeted in these areas (CCAM 2000). No commercial fishing takes place in the vicinity of the site.

A fish consumption advisory is in effect for the Patuxent and Potomac Rivers downstream of the site. The advisory recommends that no more than one meal per month of American eel be consumed. A second advisory is in effect for the Patuxent River, which recommends that no more than two meals per month of white perch be consumed (MDE 2003):

Site-Related Contamination

The primary contaminants of concern at the site are PCBs, pesticides, and polynuclear aromatic hydrocarbons (PAHs). Soil, groundwater, and surface water samples were collected from the Brandywine DRMO site during several investigations (Dames and Moore 1996; Halliburton NUS Corporation 1995). In 1991, surface water and sediment samples were collected from the wetland areas on each side of the culvert under Cherry Tree Crossing Road (USEPA 1998). Maximum concentrations of contaminants of concern detected in environmental media collected at the site are summarized in Table 2.

Table 2. Maximum concentrations of contaminants of concern detected in soil, groundwater, surface water, and sediment at the Brandywine DRMO site (Halliburton NUS Corporation 1995; Dames and Moore 1996; USEPA 1998).

	Soil (mg/kg)	Water (µg/L)			Sediment (mg/kg)	
Contaminant	Soil	Ground-water	Surface Water	AWQC[a]	Sediment	TEC[b]
PAHs/PHENOLS						
Total PAHs	29	N/A	ND	300[c,d]	N/A	1.61
PESTICIDES/PCBs						
Chlordane	10	ND	1.5	0.00215	N/A	0.00324
DDD	5.1	ND	<0.03	0.6[d,e]	N/A	0.00488
DDE	12	ND	<0.01	NA	N/A	0.00316
DDT	41	ND	<0.02	0.0005	N/A	0.00416
PCBs (as Aroclors)	2,300	ND	10	0.014	7.5	0.0598
VOLATILE ORGANIC COMPOUNDS						
Dichlorethylene 1,2-trans	N/A	12000	<2	11600[d,f]	N/A	NA
Tetrachloroethylene	N/A	150	<2	840[d]	N/A	NA
Trichloroethylene	N/A	65000	<1	12900[d]	N/A	NA

a: Ambient water quality criteria for the protection of aquatic organisms (USEPA 1993, 1999). Freshwater chronic criteria presented.

b: Threshold effects concentration (TEC). Concentration below which harmful effects are unlikely to be observed (MacDonald et al. 2000).

c: Value for the chemical class.

d: Lowest Observable Effects Level (LOEL).

e: Chronic criterion not available; acute criterion presented.

f: Value for summation of the isomers.

NA: Screening guidelines not available.

N/A: Analyte not analyzed for.

ND: Not detected.

In 1987, 50 soil samples were collected from across the site. PCB concentrations in soil samples ranged from 25 to 2,300 mg/kg. Fifteen of the 50 samples were analyzed for pesticides; one of those samples contained 12 mg/kg of DDE (the maximum concentration of DDE), 4.9 mg/kg of DDD, and 41 mg/kg of DDT (the maximum concentration of DDT). The pesticide chlordane was detected in several soil samples following soil remediation activities in 1993; the maximum concentration of chlordane was 10 mg/kg. In the one sample that was analyzed for dioxins, 2,3,7,8-TCDD was not detected above a detection limit of 0.0047 μg/kg. The maximum detected concentration of total PAHs was 29 mg/kg. No screening guidelines are available for comparison to the maximum concentrations of PCBs, pesticides, and PAHs in soil.

Pesticides and PCBs were not detected in groundwater samples collected from the site. Volatile organic compounds were detected in groundwater at concentrations that exceeded the ambient water quality criteria (AWQC) screening guidelines by less than one order of magnitude.

Four surface water samples collected from the Brandywine DRMO property contained PCBs at concentrations ranging from 2.1 to 10 μg/L. Surface water samples collected from the wetlands northwest of the facility contained PCB concentrations ranging from 1.5 to 3.0 μg/L. The maximum PCB concentration in surface water exceeded the AWQC screening guideline by two orders of magnitude. One sample contained chlordane at a maximum concentration that exceeded the AWQC by two orders of magnitude.

Sediment samples collected from the wetlands contained PCB concentrations ranging from 5.0 to 7.5 mg/kg. The maximum PCB concentration exceeded the threshold effects concentration (TEC) screening guideline by two orders of magnitude (USEPA 1998).

References

Coastal Conservation Association of Maryland (CCAM). 2000. Fishing reports. Available: www.ccamd.org.

Dames & Moore Inc. and Hazardous Waste Remedial Actions Program (Dames and Moore). 1996. Engineering evaluation/cost analysis (EE/CA) of the remediation of trichloroethene-contaminated groundwater at the Brandywine Defense Reutilization and Marketing Office site. Andrews Air Force Base, Maryland: U.S. Department of the Air Force.

DeLorme. 1989. Virginia atlas and gazetteer. 1:150,000. DeLorme. Freeport, ME.

Halliburton NUS Corporation. 1995. Remedial action report, soil and tank removal - Brandywine DRMO, Andrews Air Force Base, Camp Springs, Maryland. Brooks Air Force Base, TX: Air Force Center for Environmental Excellence.

MacDonald, D., C. Ingersoll, T. Berger. 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Archives of Environmental Contamination and Toxicology 39:20-31.

Maryland Department of Natural Resources (MDNR). 1999. State of the streams 1995–1997. Maryland biological stream survey results. Annapolis, MD: Chesapeake Bay and Watershed Programs.

Maryland Department of the Environment (MDE). 2003. Consumption advisories for only recreationally caught fish species. Available: http://www.mde.state.md.us/assets/document/fish/advisory_summary.pdf.

References, *cont.*

Mowrer, J. Fisheries biologist for the Maryland Department of Natural Resources. Baltimore, MD. Personal communication May 28, 2003.

P-SQUARED Technologies Inc. (P-Squared). 1996. Development of a calibrated groundwater flow model and evaluation of remediation alternatives at Brandywine Defense Reutilization and Marketing Office site, Andrews Air Force Base, Maryland. Oak Ridge, TN: Hazardous Waste Remedial Actions Program. 36.

Stribling, J., E. Leppo, and C. Daley. 1999. Biological assessment of the streams and watersheds of Prince George's County, Maryland. Spring index period 1999. Largo, MD: Prince George's County, Department of Environmental Resources, Programs and Planning Division.

U.S. Environmental Protection Agency (USEPA). 1993. Water quality criteria. Washington, DC: Office of Water, Health and Ecological Criteria Division. 294 pp.

U.S. Environmental Protection Agency (USEPA). 1998. HRS documentation record, Brandywine Defense Reutilization and Marketing Office. Philadelphia, PA: U.S. Environmental Protection Agency, Region 3. 84.

U.S. Environmental Protection Agency (USEPA). 1999. National recommended water quality criteria—correction: U.S. Environmental Protection Agency, Office of Water.

U.S. Environmental Protection Agency (USEPA). 2000. NPL site narrative at listing, Brandywine DRMO. Available: http://www.epa.gov/superfund/sites/npl/nar1512.htm.

Lower Darby Creek Area

Darby Township, Pennsylvania

EPA Facility ID: PASFN0305521

Basin: Lower Delaware

HUC: 02040202

Executive Summary

The Lower Darby Creek Area (Lower Darby Creek) site consists of two former landfills in Darby Township, Pennsylvania. One of those landfills, the Folcroft Landfill and Annex, is located in the John Heinz National Wildlife Refuge, which is owned by the U.S. Fish and Wildlife Service and is the largest marine tidal marsh in Pennsylvania. Several creeks near the Lower Darby Creek site, including Darby Creek, contain many NOAA trust resources, and are tributaries of the Delaware River. During an environmental investigation, the USEPA determined that heavy metals, solvents, petroleum products, VOCs, PAHs, and PCBs in sediment, soil, surface water, and groundwater pose a risk to aquatic resources near the Lower Darby Creek site.

Site Background

The Lower Darby Creek Area (Lower Darby Creek) site is in an industrialized section of Darby Township (which encompasses parts of both Delaware and Philadelphia Counties) in Pennsylvania. At the Lower Darby Creek site, hazardous materials were released into several creeks including Hermesprota, Cobbs, and Darby Creeks (Figure 1) and Thoroughfare Creek (Figure 2). Lower Darby Creek flows into the Delaware River approximately 4 km (2.5 mi) downstream of the site.

When the Lower Darby Creek site was proposed for placement on the USEPA National Priorities List (NPL) the six sources of contamination identified were 1) the Folcroft Landfill and Annex, 2) the former Delaware County Incinerator #2, 3) the former Delaware County Sewage Treatment Plant, 4) the Sun Oil-Darby Creek Tank Farm, 5) the Industrial Drive Properties, and 6) the Clearview Landfill (Figure 2). However, only the Clearview Landfill and the Folcroft Landfill and Annex were included as sources of contamination when the Lower Darby Creek site was placed on the final NPL (USEPA 2001).

The Folcroft Landfill and Annex are located in the tidal marsh of the John Heinz National Wildlife Refuge (NWR), the largest tidal marsh in Pennsylvania (Figure 2). Darby Creek and Thoroughfare Creek border the Folcroft Landfill to the south and east. Hermesprota Creek flows between the Folcroft Landfill and Annex. Photographs show that trash was being dumped at the landfill as early as 1953. In 1970, refuse was found on the banks of Darby Creek, with piles of oil-soaked materials and industrial wastes, and pools of leachate in direct contact with the creek. In 1972, a drum leaking methyl ethyl ketone was found on the property. In 1973, drums labeled methyl salicylate, rholex, epoxy, and dulux skins were identified. During a 1998 area-wide sampling event, it was observed that erosion caused by surface water runoff had exposed landfill materials along the creek banks (Weston 1999).

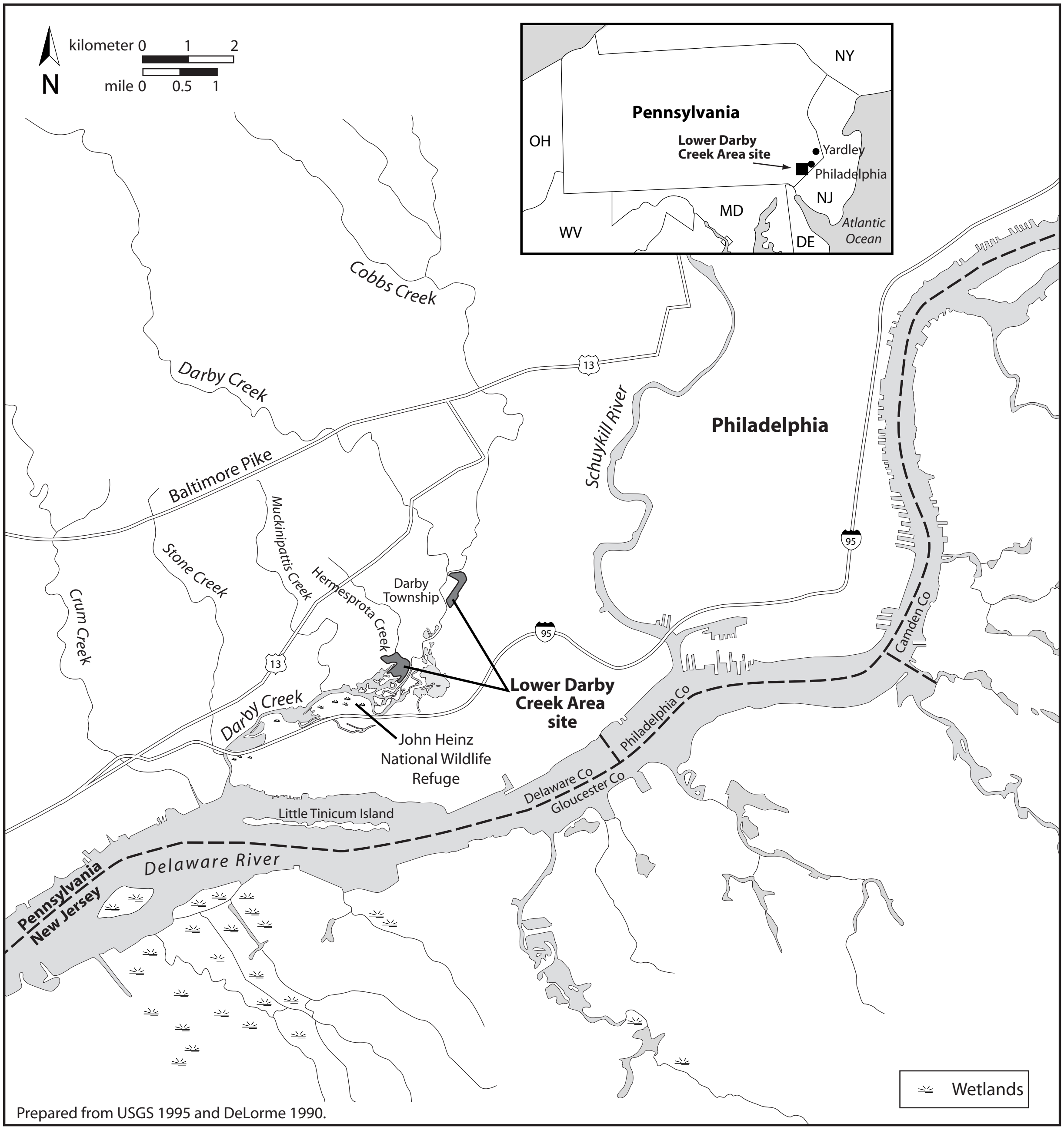

Figure 1. Location of the Lower Darby Creek Area site in Darby Township, Pennsylvania.

The Clearview Landfill forms a plateau on the east bank of Darby Creek immediately downstream of its confluence with Cobbs Creek. The landfill has been owned and operated by the Clearview Land Development Corporation since the 1950s. Originally used to dispose of municipal wastes from the city of Philadelphia and sections of Delaware County, the landfill was closed in 1973, capped with 0.6 m (2 ft) of fill material, and seeded. Erosion of the cap by surface water runoff was also observed here in 1998. The Clearview Landfill property is currently used by a trash hauling business to store trucks (Weston 2000).

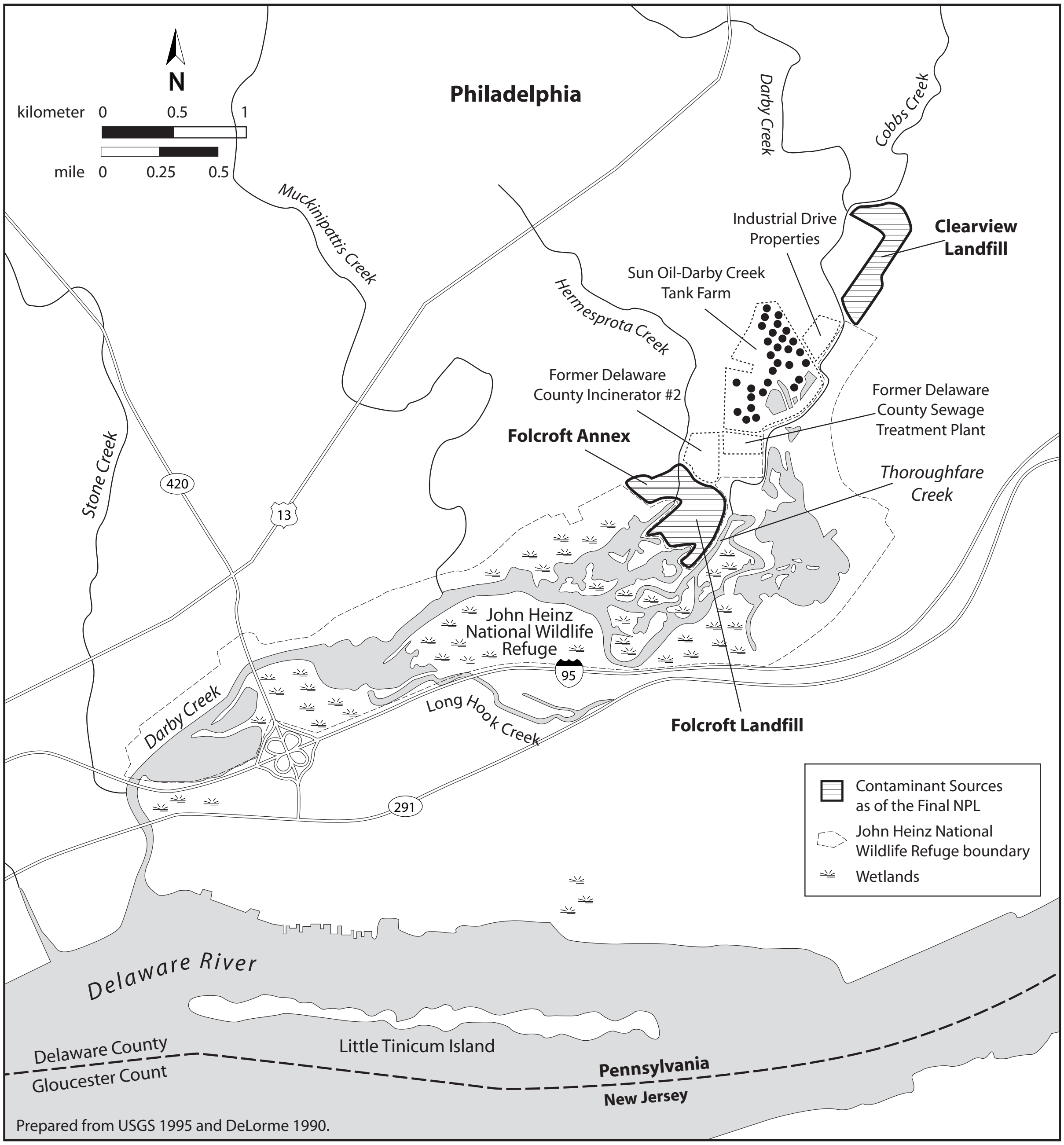

Figure 2. Detail of the Lower Darby Creek Area site.

Surface water runoff, erosion, and groundwater transport are the likely pathways for the migration of contaminants to NOAA trust resources. Gradients in the upstream reaches of Darby Creek and Cobbs Creek were estimated to be high enough to cause scouring of stream sediments. Waste deposits at the Folcroft Landfill extend below the depth at which groundwater is encountered. Beneath the Lower Darby Creek site groundwater generally flows to the southwest. The groundwater in the unconsolidated surface deposits at the site is unconfined and tidally influenced. Groundwater below the site likely discharges into Lower Darby and Hermesprota Creeks, however documentation confirming this discharge was not available at the time of this report. (Gannett 1989; Weston 1999).

A site inspection was completed at the Lower Darby Creek site in 1999 and, after a Hazard Ranking Score Package was completed in 2000, the site was placed on the NPL on June 14, 2001 (USEPA 2001). Information regarding further actions, if any, was not available at the time of this report.

NOAA Trust Resources

The NOAA trust habitats of concern are lower Darby Creek, Thoroughfare Creek, and Hermesprota Creek. Within the John Heinz NWR, Darby Creek ranges from 23 to 76 m (75 to 250 ft) in width and has an average low-tide depth of 1.8 m (6 ft). Years of industrialization and urbanization have reduced the tidal marsh from 230 km2 (5,700 acres) to less than 1.4 km2 (350 acres) (Gannett 1989). Tidal influence in Darby Creek extends to the confluence of Darby and Cobbs Creeks. Lower Darby Creek is free flowing; no dams are present to block the migration of anadromous fish (Tibbott 2002).

The John Heinz NWR is Pennsylvania's largest freshwater fish habitat. The estuarine habitat consists of supratidal and intertidal zones that support a wide range of aquatic species (Kaufmann 2002), many of which are NOAA trust resources (Table 1). Many juvenile fish are found in Darby Creek, including alewife, blueback herring, striped bass, and white perch (Weston 2000). Darby Creek is a spawning area, juvenile rearing, and adult habitat for the anadromous gizzard shad and white perch. Several estuarine species, including banded killifish, hogchoker, and mummichog, spend their entire lives in Darby Creek. None of the NOAA trust resources in Darby Creek are listed as federal or state threatened or endangered species. The red-bellied turtle, which is not a NOAA trust resource but is a state and federally listed threatened species, is present in Darby Creek (Kaufmann 2002).

The Pennsylvania Department of Environmental Protection (PADEP) has designated five creeks in the area as warm-water fisheries; as such, they have protected water-use status (Weston 1999). There are no commercial fisheries in Darby Creek. Recreational fishing occurs in Lower Darby Creek, Hermesprota Creek, and Thoroughfare Creek. Recreational fishers do not target particular fish species, although white perch and striped bass are the most abundantly fished of the NOAA trust resources (Kaufmann 2002).

A fish consumption advisory is in effect for the Delaware River and its tributaries downstream of Yardley, Pennsylvania, to the Delaware state line. This advisory recommends limited consumption of white perch, striped bass, carp, and channel catfish and recommends against consumption of American eel (PADEP 2002).

Site-Related Contamination

Elevated concentrations of inorganic compounds, polychlorinated biphenyls (PCBs), and polynuclear aromatic hydrocarbons (PAHs) were detected at the Lower Darby Creek site. Extensive sediment, soil, surface water, and groundwater sampling has been conducted at the Clearview Landfill, at the Folcroft Landfill and Annex, and in the surrounding surface waters. All media collected at the Lower Darby Creek site were analyzed for inorganic compounds, semivolatile organic compounds (SVOCs) including PAHs, volatile organic compounds (VOCs), pesticides, and PCBs. The maximum concentrations of selected contaminants of concern are summarized in Table 2.

Table 1. NOAA trust resources present in the vicinity of the Lower Darby Creek Area site (Gannett 1989; Kaufmann 2002)

Species		**Habitat Use**			**Fisheries**	
Common Name	Scientific Name	Spawning Area	Nursery Ground	Adult Forage	Comm.	Recr.
ANADROMOUS FISH						
Alewife	*Alosa pseudoharengus*	◆	◆			◆
Blueback herring	*Alosa aestivalis*	◆	◆			◆
Gizzard shad	*Dorosoma cepedianum*	◆	◆	◆		◆
Striped bass	*Morone saxatilis*		◆	◆		◆
White perch	*Morone americana*	◆	◆	◆		◆
MARINE/ESTUARINE FISH						
Atlantic menhaden	*Brevoortia tyrannus*			◆		
Banded killifish	*Fundulus diaphanus*	◆	◆	◆		◆
Hogchoker	*Trinectes masculatus*	◆	◆	◆		◆
Mummichog	*Fundulus heteroclitus*	◆	◆	◆		◆
Spot croaker	*Leiostomus xanthurus*			◆		◆
CATADROMOUS FISH						
American eel	*Anguilla rostrata*			◆		◆
INVERTEBRATES						
Asiatic clam	*Corbicula fluminea*	◆	◆	◆		◆
Blue crab	*Callinectes sapidus*			◆		◆
Grass shrimp	*Palaemonetes pugio*	◆	◆	◆		◆

Inorganic compounds, PAHs, pesticides, and PCBs were detected in soil from the Lower Darby Creek site. Maximum concentrations of cadmium, chromium, copper, lead, mercury, nickel, selenium, and zinc were detected in soil from the Clearview Landfill. The maximum concentrations of arsenic and silver were detected in soil samples from the Folcroft Landfill. Cadmium, copper, lead, and silver were detected at concentrations that exceeded the average concentrations found in U.S. soil (mean U.S. soil concentrations) by two orders of magnitude. Maximum PAH concentrations in soil samples ranged from 0.088 mg/kg (acenaphthylene) to 16 mg/kg (2-methylnaphthalene), in soil collected from throughout the Lower Darby Creek site. No mean U.S. soil concentrations are available for comparison to the maximum concentrations of PAHs detected in soil samples. The pesticides DDD, DDE, DDT, and dieldrin were detected in soil samples, as were Aroclor 1254 and 1260. No mean U.S. soil concentrations exist for comparison to the maximum concentrations of pesticides and PCBs detected in soil samples.

Metals and PAHs were detected in both groundwater and surface water samples. Maximum concentrations of eight metals were detected in a single groundwater sample from the Clearview Landfill. Copper, lead, mercury, nickel, and zinc were all detected in groundwater samples at concentrations exceeding the saltwater ambient water quality criteria (AWQC) by at least one order of magnitude. PAHs were detected in groundwater samples at maximum concentrations ranging from 1 ug/L (chrysene and benz(a)anthracene) to 32 ug/L (naphthalene). No groundwater samples from the Lower Darby Creek site had concentrations of PAHs in excess of the AWQC.

Table 2. Maximum concentrations of contaminants of concern in environmental media from the Lower Darby Creek Area site (Gannett 1989; Weston 1999; Weston 2000).

	Soil (mg/kg)		Water (µg/L)			Sediment (mg/kg)	
Contaminant	Soil	Mean U.S.[a]	Ground-water	Surface Water	AWQC[b]	Sediment	ERL[c]
INORGANIC COMPOUNDS							
Arsenic	51	5.2	170	10	36	51	8.2
Cadmium	13	0.06	21	16	9.3	3.7	1.2
Chromium[j]	150	37	390	140	50	120	81
Copper	5,500	17	580	180	3.1	130	34
Cyanide, free	2	NA	79	94	1	1.5	NA
Lead	3,000	16	2,100	240	8.1	640	46.7
Mercury	3.2	0.058	3	0.2	0.094[d]	1.6	0.15
Nickel	630	13	270	70	8.2	130	20.9
Selenium	130	NA	<4	<3	71	5.7	1.0[g]
Silver	13	0.05	3	18	0.95[e]	4.8	1
Zinc	3,400	48	3,100	260	81	810	150
PAHs							
Acenaphthene	1.2	NA	19	<10	710[f]	1.7	0.016
Acenaphthylene	0.088	NA	6	ND	300[e,f,i]	0.42	0.044
Anthracene	2.2	NA	3	ND	300[e,f,i]	5	0.0853
Benz(a)anthracene	3.6	NA	1	<10	300[e,f,i]	14	0.261
Chrysene	4.3	NA	1	<10	300[e,f,l]	13	0.384
Dibenz(a,h)anthracene	0.77	NA	ND	ND	300[e,f,i]	2.9	0.0634
Fluoranthene	11	NA	4	<10	16[f]	27	0.6
Fluorene	2.3	NA	16	<10	NA	3.4	0.019
2-Methylnaphthalene	16	NA	8	<10	300[e,f,i]	0.1	0.07
Naphthalene	7.9	NA	32	36	2350[e,f]	0.73	0.16
Phenanthrene	12	NA	29	<10	NA	23	0.24
Pyrene	8.3	NA	3	<10	300[e,f,i]	24	0.665
PESTICIDES/PCBs							
DDD	0.049	NA	ND	ND	NA	0.16	0.002
DDE	4.2	NA	ND	ND	NA	0.025	0.0022
DDT	0.24	NA	ND	ND	0.001	0.048	0.00158[h]
Dieldrin	0.17	NA	ND	ND	0.0019	0.12	0.00002
Aroclor-1254[k]	1.2	NA	2.5	ND	0.03	0.29	0.0227
Aroclor-1260[k]	3	NA	0.79	ND	0.03	0.44	0.0227

a: Shacklette and Boerngen (1984), except for cadmium and silver, which represent average concentrations in the earth's crust from Lindsay (1979).
b: Ambient water quality criteria for the protection of aquatic organisms (USEPA 1993). Marine chronic criteria presented.
c: Effects Range-Low represents the 10th percentile for the dataset in which effects were observed or predicted in studies compiled by Long et al. (1998).
d: Derived from inorganics but applied to total.
e: Chronic criterion not available; acute criterion presented.
f: Lowest Observable Effect Level (LOEL).
g: Marine Apparent Effects Threshold (AET) for amphipod bioassay. The AET represents the concentration above which adverse biological impacts would be expected.
h: Expressed as Total DDT.
i: Value for chemical class
j: Screening guidelines represent concentrations for Cr^{+6}
k: Screening guideline is for total PCBs as aroclors.
ND: Not detected; detection limit not available.
NA: Screening guidelines not available.

Copper, cyanide, lead, and silver were all detected in surface water samples from Darby Creek at concentrations that exceeded the AWQC by one order of magnitude. The one PAH detected in surface water, naphthalene, was at a maximum concentration below the AWQC.

Inorganic compounds, PAHs, pesticides, and PCBs were detected at elevated concentrations in sediment samples from the Lower Darby Creek site. Lead and mercury were detected at concentrations that exceeded the screening guidelines by an order of magnitude (Table 2). Maximum concentrations of lead, selenium, and zinc were detected in sediment collected from Hermesprota Creek near the Folcroft Landfill and Annex. Maximum concentrations of cadmium, chromium, copper, and cyanide were detected in sediment from Darby Creek. Maximum concentrations of eight PAHs were detected in sediment collected near the Clearview Landfill at concentrations that exceeded the screening guidelines by an order of magnitude. Several pesticides, including DDD, DDE, DDT, and dieldrin, were detected in sediment samples at concentrations that exceeded the screening guidelines by at least one order of magnitude. PCB Aroclors 1254 and 1260 were detected in sediment from Darby Creek at maximum concentrations that exceeded the screening guidelines by an order of magnitude.

References

DeLorme. 1990. Pennsylvania Atlas and Gazetteer. DeLorme. Yarmouth, ME.

Gannett Fleming Environmental Engineers Inc. (Gannett). 1989. Site investigation report for the Folcroft Landfill and Tinicum Marsh. Rockaway, NJ: Prepared for the U.S. Environmental Protection Agency.

Kaufmann, M. Area fisheries manager for the Pennsylvania Division of Fisheries Management. Philadelphia, PA. Personal communication June 11, 2002.

Lindsay, W.L. 1979. Chemical Equilibria in Soils. New York, NY: John Wiley & Sons. 449 pp.

Long, E.R., L.J. Field, and D.D. MacDonald. 1998. Predicting toxicity in marine sediments with numerical sediment quality guidelines. Environmental Toxicology and Chemistry 17(4):714-727.

Pennsylvania Department of Environmental Protection (PADEP). 2002. Public Health Advisory - Fish Consumption. Available: http://www.dep.state.pa.us/dep/deputate/watermgt/Wqp/WQStandards/FishAdvis/fishadvisory.htm.

Roy F. Weston Inc. (Weston). 1999. Sampling trip report of Lower Darby Creek Area. Delaware and Pennsylvania Counties, PA. 280 pp.

Roy F. Weston Inc. (Weston). 2000. 80th and Mars Place Site. Philadelphia, PA. 165 pp.

Shacklette, H.T. and J.G. Boerngen. 1984. Element concentrations in soils and other surficial materials of the conterminous United States. USGS Professional Paper 1720. Washington, DC: U.S. Geological Survey.

Tibbott, C. Environmental contaminant specialist for the U.S. Fish and Wildlife Service. State College, PA. Personal communication January 2, 2002.

U.S. Environmental Protection Agency (USEPA). 1993. Water quality criteria. Washington, DC: Office of Water, Health and Ecological Criteria Division. 294 pp.

References, *cont.*

U.S. Environmental Protection Agency (USEPA). 1999. National recommended water quality criteria—correction: U.S. Environmental Protection Agency, Office of Water.

U.S. Environmental Protection Agency (USEPA). 2001. CERCLIS Hazardous Waste Sites: Lower Darby Creek Area. Available: http://www.epa.gov/superfund/sites/cursites/c3pa/s0305521.htm.

U.S. Geological Survey (USGS). 1995. Bridgeport Quadrangle, Pennsylvania, 7.5 minute series (topographic). 1:24,000. U.S. Geological Survey. Denver, CO.

Fox River NRDA/PCB Releases, Wisconsin

EPA Facility ID: WI0001954841

Basin: Lower Fox River

HUC: 04030204

Executive Summary

The Fox River NRDA/PCB Releases site is a zone of contaminated sediment that starts in the Lower Fox River and extends into the southern end of Green Bay. The site has been contaminated with PCBs and mercury as a result of discharged waste from paper mills and other sources. Four sediment deposits that contain concentrations of PCBs and mercury in excess of screening guidelines have been identified; one of the four was dredged and removed in 1998 to 1999. This site poses a risk to the numerous freshwater fish species in the Lower Fox River and Green Bay. These species and the supporting ecosystem are examples of NOAA trust resources of interest. The NOAA trust habitats of concern are the freshwater environments of the Fox River downstream of Lake Winnebago, Green Bay, and Lake Michigan.

Site Background

The Fox River Natural Resources Damage Assessment (NRDA)/PCB Releases site is a zone of sediment contamination encompassing 63 km (39 mi) of the Fox River, from the Neenah Channel and Menasha Channel downstream to Green Bay, as well as a minimum of 35 km (22 mi) into the bay (Figure 1).

The Lower Fox River area has one of the highest concentrations of paper mills in the world; operations at these mills resulted in the contamination of sediments, primarily with polychlorinated biphenyls (PCBs). Between 1957 and 1971, PCBs were used in the manufacture of carbonless copy paper. The primary sources of PCBs into the Fox River were facilities that recycled carbonless copy paper, although PCBs have also been detected in the effluents of paper mills that did not process carbonless copy paper and the effluents of publicly owned treatment works that received wastewater from paper mills (GASA and SAIC 1996). The Wisconsin Department of Natural Resources (WDNR) has estimated that nearly all of the PCBs released into the Lower Fox River were discharged before 1971 from five facilities: Appleton Papers-Coating Mill, P.H. Glatfelter Company and associated Arrowhead Park Landfill, Fort James-Green Bay West Mill (formerly Fort Howard), Wisconsin Tissue, and Appleton Papers-Locks Mill (WDNR 1999).

Four sediment deposits have been identified as the most contaminated; these deposits are referred to as POG, D/E, N, and EE/GG/HH (Figure 2) (GASA and SAIC 1996). Deposit N was dredged and removed from the river in a remediation effort that took place from 1998 to 1999 (Retec 2002). The remaining sediment deposits serve as continuing sources of contamination to downstream reaches of the Fox River, Green Bay, and Lake Michigan. During periods of high river flow, sediments behind the De Pere Dam may be carried over the dam, and the major source of PCBs in Green Bay is contaminated sediments of the Lower Fox River (USEPA 2000).

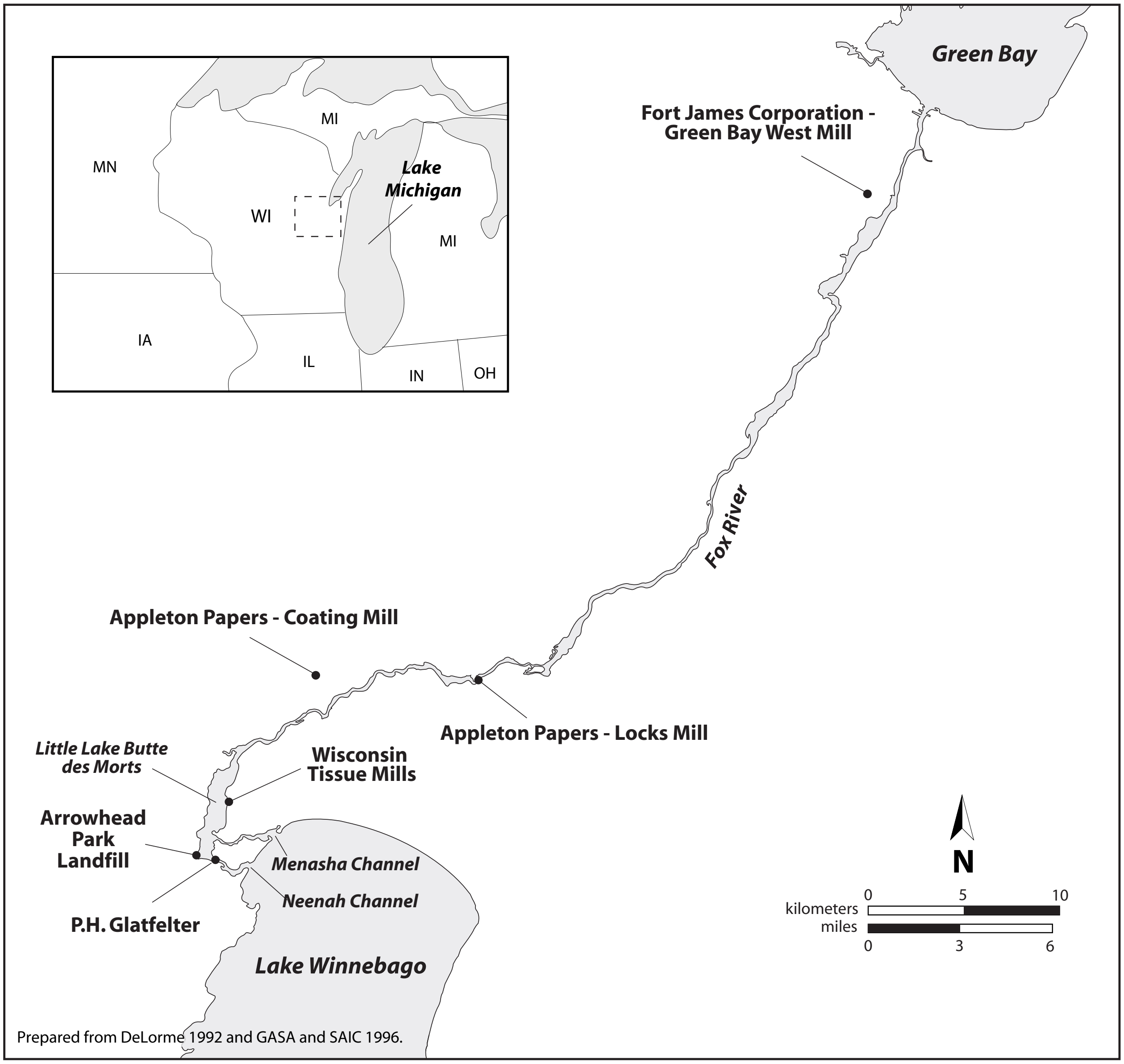

Figure 1. Locations of the Fox River NRDA/PCB releases site and major waste sources on the Lower Fox River, Wisconsin.

The Fox River NRDA/PCB Releases site is divided into five sections (Figure 2): the Little Lake Butte des Morts (LLBdM) Reach, the Appleton to Little Rapids Reach, the Little Rapids to De Pere Reach, the De Pere to Green Bay Reach, and Green Bay (Retec 2002).

The site was proposed for inclusion on the U.S. Environmental Protection Agency's (USEPA's) National Priorities List in July 1998 (USEPA 2000). A remedial investigation/feasibility study (RI/FS) of the contaminated sediment deposits was completed in 2002 (Retec 2002). A Record of Decision, which describes the cleanup decision, was signed for the LLBdM Reach and the Appleton to Little Rapids Reach of the site in December 2002 (USEPA 2003).

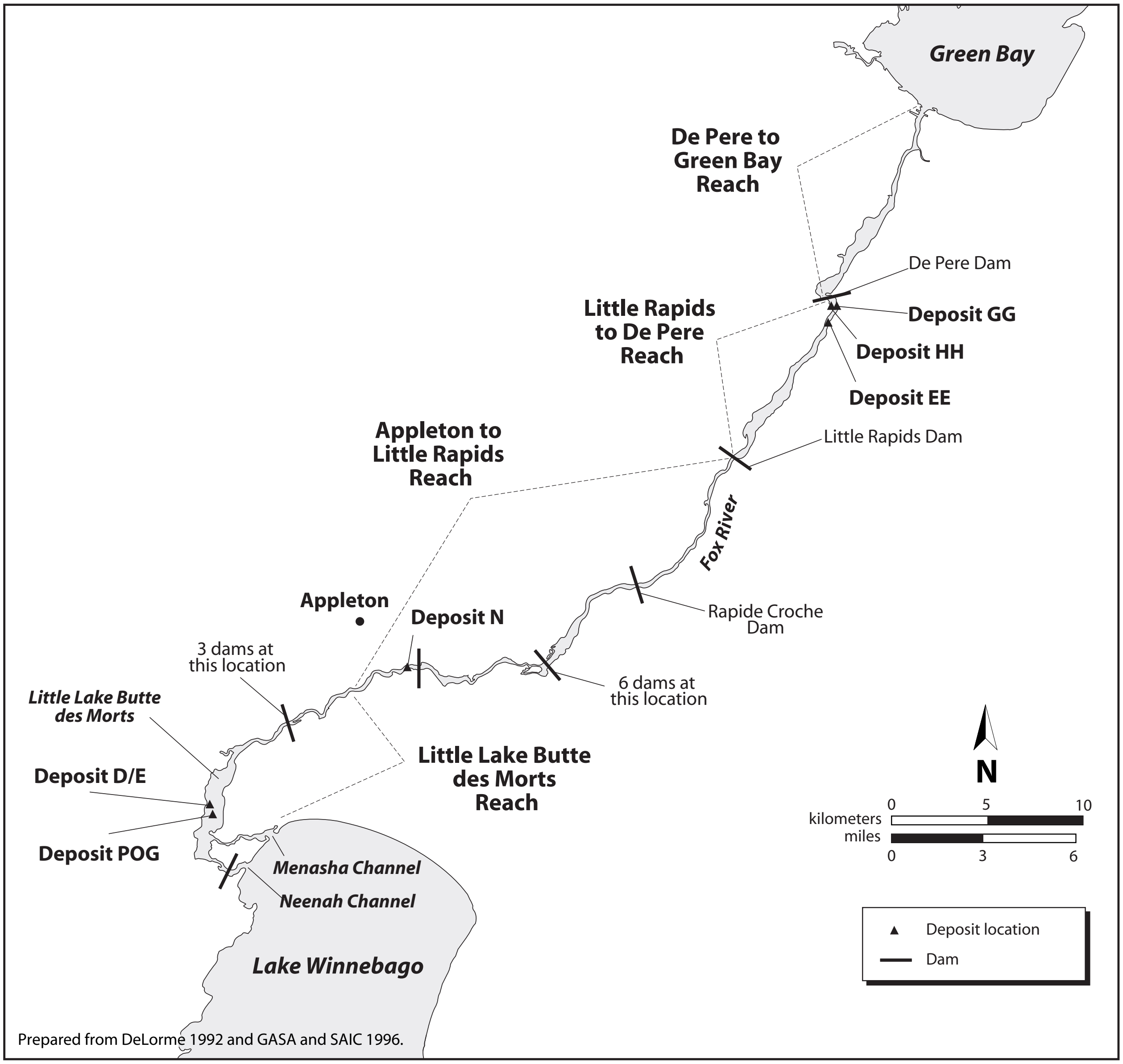

Figure 2. Locations of dams and contaminated sediment deposits on the Lower Fox River.

NOAA Trust Resources

The NOAA trust habitats of concern are the freshwater environments of the Fox River downstream of Lake Winnebago, Green Bay, and Lake Michigan. The Fox River is 322 km (200 mi) long; the area under investigation encompasses the lower 63 km (39 mi) of the river. The river ranges from 150 m (500 ft) to nearly 1,200 m (4,000 ft) in width and up to 8 m (26 ft) in depth, with substrates (bottom sediments) consisting of silts to sands (NOAA 1998). Fourteen dams are present on the river between Lake Winnebago and Green Bay; these dams modify the habitat into a series of slow-flowing impoundments (GASA and SAIC 1996). The Fox River flows into Green Bay, an embayment of Lake Michigan that measures approximately 190 km (119 mi) in length and 37 km (23 mi) in width and has an average depth of about 20 m (65 ft) (GASA and SAIC 1996).

Numerous freshwater fish species found in Lake Michigan are also present in the Fox River and Green Bay (Table 1). These species and the supporting ecosystem are examples of NOAA trust resources of interest. Periodic fish surveys conducted by the WDNR have identified at least 43 species of fish between Lake Winnebago and the De Pere Dam. These surveys indicate that the fish community in the Lower Fox River is dominated by only a few species. Carp is the most abundant fish species from LLBdM to the De Pere Dam. Other dominant fish species upstream of the De Pere Dam include walleye, white bass, yellow perch, and several species of bullhead. The most abundant fish species in the De Pere to Green Bay Reach of the river are carp, freshwater drum, quillback, and white sucker (Retec 2002).

The composition of fish species in Green Bay is similar to that in the Lower Fox River; additional species in Green Bay include several species of salmonids. WDNR fish surveys conducted in the Wisconsin waters of Green Bay from 1990 to 1998 indicate that walleye and yellow perch are the two most abundant fish species (Stratus Consulting 1999a).

The majority of fish species in the Lower Fox River spend their entire lives within or near the Fox River/Green Bay watershed. Although there is little migration outside of the watershed, several fish species, including lake sturgeon, northern pike, smallmouth bass, walleye, and yellow perch, have been documented to migrate between the waters of Green Bay and tributaries to Green Bay. Fish migration has also been documented between Green Bay and Lake Michigan and within Green Bay itself (Stratus Consulting 1999a).

When commercial fishing began in Green Bay in the 1800s, the important species in the north end of the bay were lake trout and lake whitefish. In the southern bay, prevalent species were lake herring, lake sturgeon, lake trout, lake whitefish, perch, pickerel, suckers, and walleye. Catfish and suckers, along with carp, crappies, muskellunge, shad, sunfish, and white bass, were also harvested in the southern bay and the Fox River. Data on average commercial fish harvests from the Wisconsin waters of Lake Michigan and Green Bay in 1998 showed a change in the fish species important in the Green Bay area. Chubs and lake whitefish made up the greatest portion of the harvest by weight (Stratus Consulting 1999a). Other important commercial fish species include alewife, rainbow smelt, and yellow perch (Retec 2002).

There is recreational fishing on the Lower Fox River; the most widely fished recreational species is walleye. Recreational fishing of northern pike, spotted muskellunge, walleye, and yellow perch occurs in southern Green Bay. Popular recreational species in northern Green Bay include lake whitefish, rainbow smelt, and walleye (Retec 2002). The most frequently caught recreational species in the Wisconsin waters of Green Bay from 1990 to 1998 was yellow perch (Stratus Consulting 1999b).

Fish consumption advisories are in effect for Green Bay and the Lower Fox River because of elevated concentrations of PCBs in edible fish tissue. Table 1 indicates which species are included in these advisories (Stratus Consulting 1999b; WDNR 2002).

Site-Related Contamination

The RI completed in 2002 compiled analytical data for samples collected from the Lower Fox River and Green Bay from 1989 to 2001. During that time, more than 18,000 combined sediment, tissue, surface water, pore water, and air samples were collected. This report focuses on test results for the sediment and surface water samples (Retec 2002).

Table 1. Fish and invertebrate species found in the Lower Fox River and Green Bay (Stratus 1999b; Retec 2002; WDNR 2002)

Species		**Fish Consumption Advisories**		**Fisheries**	
Common Name	Scientific Name	Lower Fox River	Green Bay	Comm.	Rec.
FISH					
Alewife	*Alosa pseudoharengus*			◆	
Atlantic salmon[a]	*Salmo salar*				◆
Black bullhead	*Ameiurus melas*				
Black crappie	*Pomoxis nigromaculatus*	◆		◆	◆
Bluegill	*Lepomis macrochirus*			◆	◆
Brook trout[a]	*Slavelinus fontinalis*				
Brown bullhead	*Ameiurus nebulosus*				◆
Brown trout[a]	*Salmo trutta*		◆		◆
Burbot	*Lota lota*				◆
Carp	*Cyprinus carpio*	◆	◆		◆
Channel catfish	*Ictalurus punctatus*	◆	◆		◆
Chinook salmon[a]	*Oncorhynchus tshawytscha*		◆		◆
Chubs[a]	Unknown			◆	
Coho salmon[a]	*Oncorhynchus kisutch*				◆
Emerald shiner	*Notropis atherinoides*				
Flathead catfish	*Pylodictis olivaris*				◆
Freshwater drum	*Aplodinotus grunniens*				◆
Gizzard shad	*Dorosoma cepedianum*				
Green sunfish	*Lepomis cyanellus*				◆
Lake sturgeon[a]	*Acipenser fulvescens*		◆		
Lake trout[a]	*Slavelinus namaycush*				
Lake whitefish[a]	*Coregonus clupeaformis*		◆	◆	◆
Longnose gar	*Lepisosteus osseus*				
Northern pike	*Esox lucius*	◆	◆	◆	◆
Pink salmon[a]	*Oncorhynchus gorbuscha*				◆
Quillback carpsucker	*Carpoides cyprinus*				
Rainbow smelt[a]	*Osmerus mordax dentex*			◆	◆
Rainbow trout[a]	*Salmo gairdneri*		◆		◆
Redhorses	*Moxostoma spp.*				
Rock bass	*Ambloplites rupestris*	◆		◆	◆
Sauger	*Stizostedion canadense*			◆	◆
Shortnose gar	*Lepisosteus platostomus*				
Smallmouth bass	*Micropterus dolomieui*	◆	◆	◆	◆
Splake[b]	*Merone americana*		◆	◆	
Spottail shiners	*Notropis hudsonius*				
Spotted muskellunge[a]	*Esox masquinongy*			◆	◆
Trout perch	*Percopsis omiscomaycus*				
Walleye	*Stizostedion vitreum*	◆	◆	◆	◆
White bass	*Morone chrysops*	◆	◆	◆	◆
White perch	*Morone americana*	◆	◆		
White sucker	*Catostomus commersoni*	◆	◆		
Yellow perch	*Perca flavescens*	◆	◆	◆	◆
INVERTEBRATES					
Chironomids	*Chironomid diptera spp.*				
Oligochaets	*Oligochacter spp.*				

a: These species are present in Green Bay but are not present in the lower Fox River according to fish surveys conducted from 1975 through 1998.

b: A hybrid fish produced in a hatchery by crossing a true lake trout female (*S. namaycush*) and a true brook trout male (*S. fontinalis*).

The primary contaminants of concern to NOAA in the Lower Fox River are PCBs and mercury, which were detected at maximum concentrations that exceeded screening guidelines. Several other inorganic and organic compounds exceeded guidelines to a lesser extent and are of secondary concern. Maximum concentrations of contaminants of concern in surface water and sediment samples are presented in Table 2.

Several inorganic compounds (metals), total PCBs, and the pesticide DDT were detected in surface water samples collected from the site. Mercury was detected in 71 percent of the surface water samples analyzed for mercury. The maximum mercury concentration was detected in a sample collected from the Little Rapids to De Pere Reach and exceeded the ambient water quality criteria (AWQC) screening guideline by a factor of three. Other inorganic compounds detected in surface water included cadmium, chromium, copper, lead, and zinc; maximum concentrations of these metals did not exceed the AWQC. Total PCBs were detected in 91 percent of the surface water samples analyzed for PCBs. The maximum total PCB concentration, which was detected in a sample from the De Pere to Green Bay Reach, exceeded the AWQC screening guideline by one order of magnitude. The maximum concentration of DDT detected in surface water did not exceed the AWQC.

Several inorganic compounds were detected at elevated concentrations in sediment samples collected from the site. Maximum concentrations of arsenic, cadmium, chromium, lead, mercury, and zinc exceeded the threshold effects level (TEL) screening guidelines by one order of magnitude. The maximum concentration of copper exceeded the TEL by a factor of six. The maximum concentration of arsenic was detected in sediment from the De Pere to Green Bay Reach. The maximum concentrations of chromium, lead, and mercury were detected in sediment samples from the Little Rapids to De Pere Reach. The maximum concentrations of cadmium, copper, and zinc were detected in sediment samples from the LLBdM Reach.

Total PCBs were detected in sediment samples from throughout the site at concentrations exceeding the TEL screening guideline. The maximum concentrations of total PCBs detected in sediment from each of the site's five sections ranged from 0.75 mg/kg in Green Bay to 710 mg/kg, which exceeded the TEL screening guideline by four orders of magnitude, in the De Pere to Green Bay Reach. Total PCBs were detected in 88 percent of the sediment samples analyzed for PCBs.

Several polynuclear aromatic hydrocarbons (PAHs) and pentachlorophenol were also detected in sediment samples. The maximum concentrations of benz(a)anthracene, phenanthrene, and pyrene exceeded the TEL screening guidelines by two orders of magnitude. Chrysene and fluoranthene were detected at maximum concentrations that exceeded the screening guidelines by one order of magnitude. Other PAHs were detected, but TELs are not available for comparison to the maximum concentrations of those compounds. The majority of the maximum PAH concentrations were detected in sediment from the LLBdM Reach. The maximum concentration of pentachlorophenol was detected in sediment from the Little Rapids to De Pere Reach.

DDT, heptachlor, and dioxins/furans were detected in sediment from the site. The maximum concentration of DDT exceeded the TEL screening guideline by a factor of seven. There is no TEL for heptachlor. The maximum concentrations of DDT and heptachlor were detected in sediment from the LLBdM Reach. The maximum concentrations of dioxins/furans were detected in sediment from the De Pere to Green Bay Reach. The maximum concentration of 2,3,7,8-TCDD in sediment was slightly less than twice the screening guideline.

Table 2. Maximum concentrations of the primary contaminants of concern detected in sediment and surface water in the Lower Fox River (GASA and SAIC 1996; Retec 2002).

	Water (µg/L)		Sediment (mg/kg)	
Contaminant	Surface Water	AWQC[a]	Sediment	TEL[b]
INORGANIC COMPOUNDS				
Arsenic	ND	150	390	5.9
Cadmium	0.019	2.2[c]	13	0.596
Chromium[h]	0.37	11	420	37.3
Copper	1.0	9[c]	210	35.7
Lead	0.12	2.5[c]	1400	35
Mercury	2.5	0.77[d]	11	0.174
Zinc	2.6	120[c]	2100	123.1
PAHs/PHENOLS				
Acenaphthylene	ND	NA	0.17	NA
Anthracene	ND	NA	1.4	NA
Benz(a)anthracene	ND	NA	3.3	0.0317
Chrysene	ND	NA	3.8	0.0571
Dibenz(a,h)anthracene	ND	NA	0.32	NA
Fluoranthene	ND	NA	6.5	0.111
Fluorene	ND	NA	0.58	NA
2-Methylnaphthalene	ND	NA	0.43	NA
Naphthalene	ND	620[g]	0.79	NA
Pentachlorophenol	ND	15[e]	1.1	NA
Phenanthrene	ND	NA	4.7	0.0419
Pyrene	ND	NA	7.0	0.053
PESTICIDES/PCBs				
DDT	0.00021	0.001	0.050	0.00698[f]
Heptachlor	ND	0.0038	0.0084	NA
PCBs (as Aroclors)	0.15	0.014	710	0.0341
DIOXINS/FURANS				
2,3,7,8-TCDD	ND	NA	1×10^{-5}	8.8×10^{-6} [i]
2,3,7,8-TCDF	ND	NA	1.7×10^{-4}	NA

a: Ambient water quality criteria for the protection of aquatic organisms (USEPA 1993, 1999). Freshwater chronic criteria presented.

b: Threshold effects level is the geometric mean of the 15th percentile of the effects data and the 50th percentile of the no-effects data. The TEL is intended to represent the concentration below which adverse biological effects rarely occurred (Smith et al. 1996).

c: Criterion expressed as a function of total hardness; concentrations shown correspond to hardness of 100 mg/L.

d: Criterion expressed as total recoverable metal.

e: Chronic is pH dependent; concentration shown above corresponds to pH of 7.8.

f: Expressed as total DDT.

g: Lowest Observable Effects Level (LOEL).

h: Screening guidelines represent concentrations for $Cr.^{+6}$

i: TEL not available; the freshwater upper effects threshold (UET) value is presented.

NA: Screening guidelines not available.

ND: Not detected.

References

DeLorme. 1992. Wisconsin Atlas and Gazetteer. 1:150,000. DeLorme. Freeport, ME.

Graef Anhalt Schloemer & Associates Inc. (GASA) and Science Applications International Corporation (SAIC). 1996. Remedial investigation report for contaminated sediment deposits on the Fox River (Little Lake Butte des Morts to the de Pere Dam): State of Wisconsin Department of Administration, Division of Facilities Development.

National Oceanic and Atmospheric Administration (NOAA). 1998. Recreation chart 14910 Lower Green Bay. U.S. Department of Commerce.

Smith, S.L, D.D. MacDonald, K.A. Keenleyside, C.G. Ingersoll, and L.J. Field. 1996. A preliminary evaluation of sediment quality assessment values for freshwater ecosystems. J. Great Lakes Res. 22(3):624-638.

Stratus Consulting. 1999a. Injuries to fishery resources, Lower Fox River. Boulder, CO: U.S. Fish and Wildlife Service, U.S. Department of the Interior, U.S. Department of Justice.

Stratus Consulting. 1999b. Recreational fishing damages from fish consumption advisories in the waters of Green Bay. Boulder, CO: U.S. Fish and Wildlife Service, U.S. Department of the Interior, U.S. Department of Justice.

The Retec Group (Retec). 2002. Remedial investigation report Lower Fox River and Green Bay, Wisconsin. St. Paul, MN: Wisconsin Department of Natural Resources (WDNR).

U.S. Environmental Protection Agency (USEPA). 1993. Water quality criteria. Washington, DC: Office of Water, Health and Ecological Criteria Division. 294 pp.

U.S. Environmental Protection Agency (USEPA). 1999. National recommended water quality criteria—correction: U.S. Environmental Protection Agency, Office of Water.

U.S. Environmental Protection Agency (USEPA). 2000. NPL site narrative at listing, Fox River NRDA/PCB Releases, Green Bay, Wisconsin. Available: www.epa.gov/superfund/sites/npl/nar1515.htm.

U.S. Environmental Protection Agency (USEPA). 2003. Upper river cleanup decision announced-Lower Fox River site. Chicago, IL: U.S. Environmental Protection Agency (USEPA).

Wisconsin Department of Natural Resources (WDNR). 1999. Compilation and estimation of historical discharges of TSS and PCBs from Fox River point sources. Technical Memorandum 2d. Madison, WI: Wisconsin Department of Natural Resources (WDNR).

Wisconsin Department of Natural Resources (WDNR). 2002. Choose wisely: A health guide for eating fish in Wisconsin. PUB-FH-824 2002. Madison, WI: Wisconsin Department of Natural Resources. 20 pp.

Patrick Bayou

Deer Park, Texas

EPA Facility ID: TX000605329

Basin: Buffalo-San Jacinto

HUC: 12040104

Executive Summary

Patrick Bayou, which is within the lower portion of the San Jacinto River Basin, is a small bayou of the Houston Ship Channel. Industrial facilities and nearby urban/residential areas have discharged permitted industrial wastewater, effluent from a municipal wastewater treatment plant, and stormwater runoff into Patrick Bayou for several years. These discharges are suspected to be the primary sources of pesticides, PAHs, inorganic compounds (metals), and PCBs found in bayou sediments. Sediments in wetlands bordering the bayou are also contaminated. These contaminants are considered a threat to downstream NOAA trust resources, such as shrimp, blue crab, and black drum, which use the surface water and sediments of Patrick Bayou, the NOAA habitat of concern.

Site Background

Patrick Bayou, which is within the lower portion of the San Jacinto River Basin near Deer Park, Texas, is a small tidal tributary of the Houston Ship Channel (Figure 1) (Broach and Crocker 1996; USEPA 2001). The bayou is on the south side of the ship channel, approximately 3.7 km (2.3 mi) upstream of its confluence with the San Jacinto River; it is shallow and approximately 4.8 km (3 mi) in length (Broach and Crocker 1996). The upper portion of the bayou, which flows through an industrial area of Deer Park, is lined with concrete. The lower section of Patrick Bayou has earthen banks and a soft mud bottom. The east fork of the bayou has more riparian vegetation than the main bayou and is more stream-like in its contour (Broach and Crocker 1996).

Contaminants primarily migrate into Patrick Bayou through direct discharges to the surface waters. For several years, Patrick Bayou has received permitted industrial wastewater discharges, effluent from the City of Deer Park wastewater treatment plant, and stormwater runoff from adjacent industrial facilities and nearby urban/residential areas (Broach and Crocker 1996; USEPA 2001).

Current permits allow facilities to discharge up to 530 million L (140 million gal) of treated wastewater and/or cooling water per day from eight different outfalls (not including outfalls that carry only stormwater). Occidental Chemical, Shell Chemical and Refinery, and Lubrizol (Figure 2) have outfalls discharging directly into Patrick Bayou. Occidental Chemical and Shell Chemical and Refinery are both chemical-manufacturing facilities. Lubrizol is a lubricant-manufacturing facility. In addition, the Deer Park wastewater treatment plant and Praxair, an air separation plant, both indirectly discharge wastewater into the bayou via drainage ditches. Rohm and Haas, another chemical-manufacturing facility, has an outfall that discharges into the Houston Ship Channel several hundred meters downstream of Occidental Chemical's discharge ditch. The Rohm and Haas discharge is thought to have possible effects within the bayou because of tidal influences (Broach and Crocker 1996).

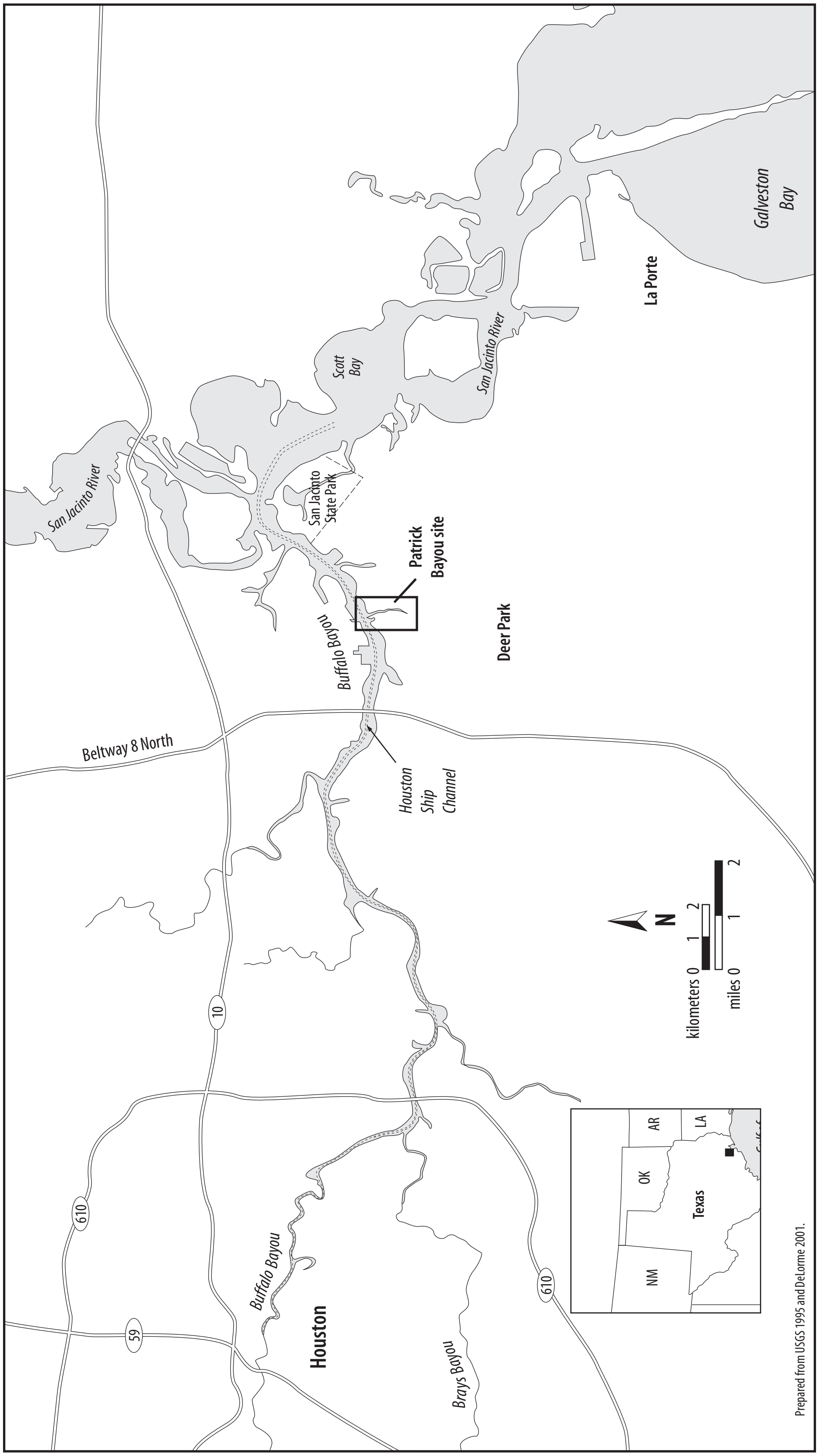

Figure 1. Location of Patrick Bayou site in Deer Park, Texas.

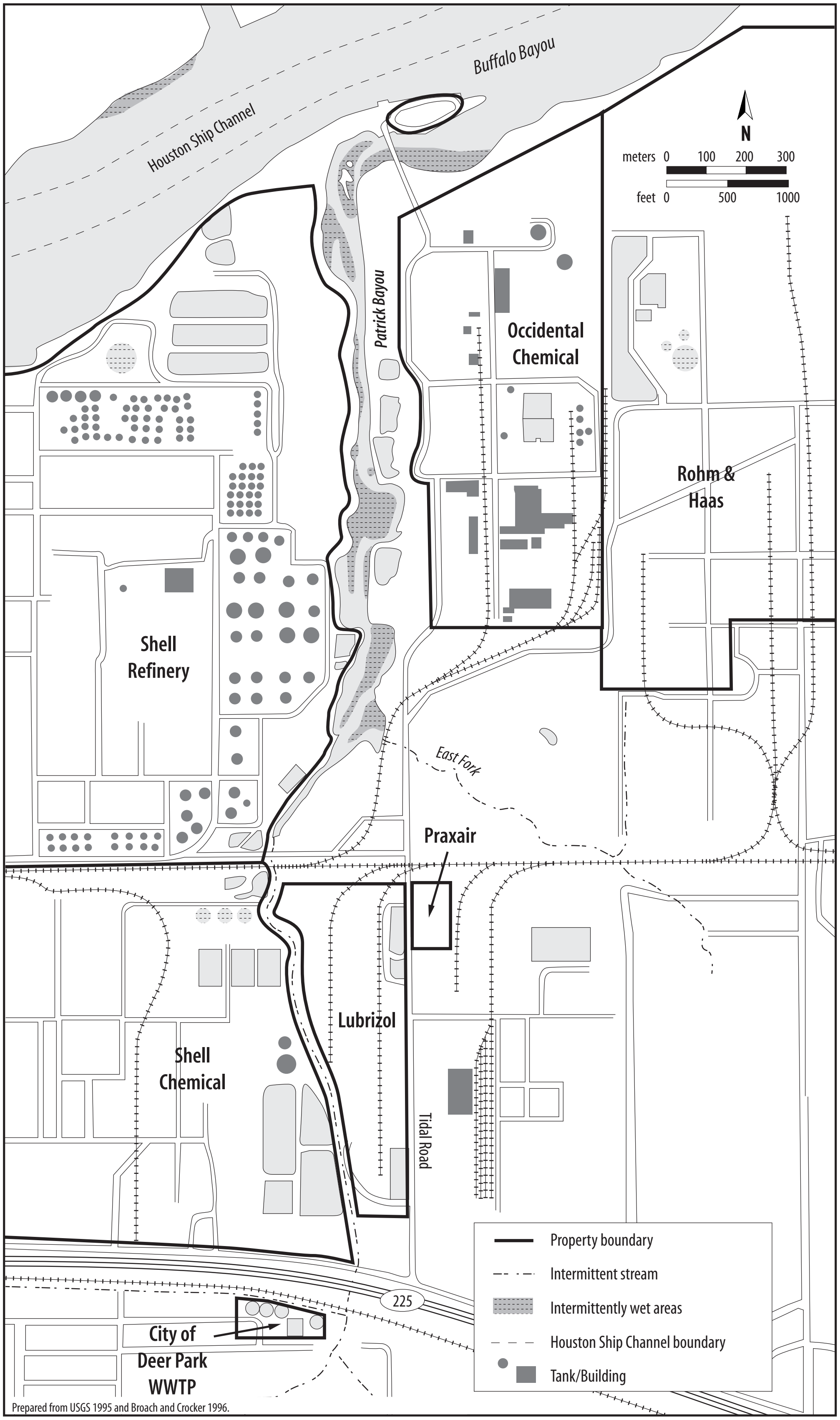

Figure 2. Detail of Patrick Bayou site.

In 1993, the Texas Natural Resource Conservation Commission (TNRCC) began monitoring a station near the mouth of Patrick Bayou after two unexplained fish kills occurred in 1990 (Broach and Crocker 1996). In 1993 to 1994, the City of Houston sponsored a large study to investigate toxic substances in the Houston Ship Channel and its tributaries. Results of that study showed Patrick Bayou to be the most contaminated of all the tributaries; bayou sediments were found to have high to moderate concentrations of pesticides, polynuclear aromatic hydrocarbons (PAHs), inorganic compounds (metals, including cadmium, chromium, mercury, nickel, and zinc), and polychlorinated biphenyls (PCBs) (Broach and Crocker 1996; USEPA 2001). A July 2000 site inspection showed elevated concentrations of mercury and PCBs in bayou sediments (USEPA 2001). Patrick Bayou was proposed for the National Priorities List on June 14, 2001.

NOAA Trust Resources

The NOAA trust habitat of concern is Patrick Bayou, including its surface water and bottom sediments. NOAA trust resources that use Patrick Bayou are listed in Table 1. The area is typical of oligohaline estuarine environment with brackish water species present (Seiler 2003). The results of fish sampling in Buffalo Bayou and in Scott and Galveston Bays were used to predict the species likely to be found in Patrick Bayou (Broach 2001; Robinson 2001). Brown shrimp and white shrimp likely use Patrick Bayou as both nursery and adult habitat, while blue crab likely use it only as nursery habitat. Black drum, sheepshead minnow, and Southern flounder likely use Patrick Bayou as both nursery and adult habitat (Broach 2001; Robinson 2001).

Table 1. NOAA trust resources present in Buffalo Bayou, Scott and Galveston Bay downstream of the Patrick Bayou site (EVS 1989; Broach 2001; Robinson 2001).

Species		**Habitat Use**				**Fisheries**	
Common Name	Scientific Name	Spawning Area	Nursery Area	Adult Habitat	Migratory Route	Comm.	Rec.
MARINE/ESTUARINE FISH							
Atlantic croaker	*Micropogonias undulatus*	◆	◆	◆		◆	◆
Atlantic menhaden	*Brevoortia*	◆	◆	◆	◆		
Black drum*	*Pogonias cromis*	◆	◆	◆	◆	◆	◆
Gulf kingfish	*Menticirrhus littoralis*			◆		◆	◆
Red drum	*Sciaenops ocellatus*	◆	◆	◆	◆	◆	
Sand seatrout	*Cynoscion arenarius*	◆	◆	◆		◆	
Sea catfish	*Arius felis*	◆	◆	◆		◆	◆
Sheepshead minnow*	*Cyprinodon variegatus*	◆	◆	◆		◆	◆
Southern flounder*	*Paralichthys lethostigma*	◆	◆	◆	◆	◆	◆
INVERTEBRATES							
Blue crab*	*Callinectes sapidus*	◆	◆	◆	◆	◆	◆
Brackish water clam	*Rangia cuneata*	◆	◆	◆			
Brown shrimp*	*Farfante penaeus aztecus*	◆	◆	◆	◆	◆	◆
Eastern oyster	*Crassostrea virginica*	◆	◆	◆		◆	◆
White shrimp*	*Litopenaeus setiferus*	◆	◆	◆	◆	◆	◆

* Fisheries information for these species is only valid for Scott Bay and Galveston Bay.

There is recreational fishing of blue crab and catfish in the Houston Ship Channel just downstream of Patrick Bayou (Broach and Crocker 1996). Lower Galveston Bay supports several important commercial fisheries including species listed in Table 1. The Texas Department Health has issued a consumption advisory for the Houston Ship Channel, all contiguous waters, and the Upper Galveston Bay area. The advisory includes blue crab and catfish and recommends consumption of no more than one meal per month for the general public and no consumption for children and women of childbearing age. This advisory has been issued because of elevated concentrations of dioxins in blue crabs and all species of catfish (TDH 2001; TNRCC 2001; USEPA 2001).

Site-Related Contamination

Contaminants of concern have been detected in both the sediment and surface water of Patrick Bayou. The TNRCC collected sediment and surface water samples from 11 stations, ten inside the bayou and one just upstream of the mouth of the bayou. No groundwater or soil samples were collected for the TNRCC study (Broach and Crocker 1996). The maximum concentrations of contaminants of concern and associated screening guidelines are listed in Table 2. Guidelines for a marine ecosystem were used in screening the analytical results because the bayou is tidally influenced and contains brackish water throughout much of its length.

Contaminants of concern detected in sediment samples from Patrick Bayou are inorganic compounds (metals), PAHs, and PCBs. Maximum concentrations of eight metals exceeded the effects range-low (ERL) marine sediment screening guidelines. Maximum concentrations of arsenic, chromium, copper, nickel, and zinc exceeded ERLs by factors of slightly less than two. Maximum concentrations of lead and selenium were approximately six to seven times the ERLs, and the maximum concentration of mercury exceeded the ERL by more than an order of magnitude. Cadmium and silver were also detected, but at maximum concentrations below the ERLs. Elevated concentrations of arsenic centered near the upper/middle portion of the bayou, with the maximum concentration detected at a station in the east fork of Patrick Bayou. Maximum concentrations of chromium and zinc occurred in samples from the middle section of the bayou. Lead concentrations exceeded the ERL screening guideline at several stations along the bayou. The maximum concentration of mercury was found near the mouth, or northern section, of Patrick Bayou. Maximum concentrations of copper, nickel, and selenium were detected in sediments collected from the middle to northern section of the bayou; the maximum concentration of selenium was detected near the center of the bayou.

Several PAHs were detected in bayou sediments at concentrations exceeding ERL screening guidelines; all the maximum concentrations occurred in samples from the bayou's north and south ends. Maximum concentrations of PAHs exceeded the ERLs by one to two orders of magnitude.

PCB (Aroclor 1248) was detected at five stations; all results exceeded the ERL screening guideline by at least an order of magnitude. The maximum concentration of Aroclor 1248, which exceeded the ERL by two orders of magnitude, occurred in a sample from the south end of the bayou.

Surface water samples collected from Patrick Bayou were analyzed only for metals. Maximum concentrations of copper and mercury exceeded the ambient water quality criteria (AWQC) screening guidelines by factors of approximately seven and eight, respectively. The maximum concentration of nickel was slightly more than twice the AWQC. Arsenic, lead, and zinc were also detected, but at maximum concentrations that did not exceed the AWQC. Cadmium, chromium, selenium, and silver were not detected.

Table 2. Maximum concentrations of primary contaminants of concern detected in samples collected from Patrick Bayou (Broach and Crocker 1996).

	Water (µg/L)		Sediment (mg/kg)	
Contaminant	Surface Water	AWQC[a]	Sediment	ERL[b]
INORGANIC COMPOUNDS				
Arsenic	30	36	13	8.2
Cadmium	ND	9.3	0.33	1.2
Chromium[h]	ND	50	129	81
Copper	22	3.1	60	34
Lead	5.1	8.1	269	46.7
Mercury	0.79	0.094[c]	8.3	0.15
Nickel	18	8.2	42	20.9
Selenium	ND	71	6.8	1.0[f]
Silver	ND	0.95[d]	0.9	1
Zinc	43	81	290	150
PAHs				
Acenaphthene	N/A	710[e]	6.86	0.016
Acenaphthylene	N/A	300[e,d,g]	7.89	0.044
Anthracene	N/A	300[e,d,g]	3.41	0.0853
Benz(a)anthracene	N/A	300[e,d,g]	14.2	0.261
Chrysene	N/A	300[e,d,g]	17.1	0.384
Fluoranthene	N/A	16[e]	44.1	0.6
Fluorene	N/A	NA	4.1	0.019
2-Methylnaphthalene	N/A	300[e,d,g]	2.65	0.07
Naphthalene	N/A	2350[e,d]	7.93	0.16
Phenanthrene	N/A	NA	53.6	0.24
Pyrene	N/A	300[e,d,g]	33.5	0.665
PCBs				
Aroclor 1248	N/A	0.03	4.15	0.0227

a: Ambient water quality criteria for the protection of aquatic organisms (USEPA 1993, 1999). Marine chronic criteria presented.
b: Effects range-low represents the 10th percentile for the dataset in which effects were observed or predicted in studies compiled by Long et al (1998).
c: Derived from inorganics but applied to total.
d: Chronic criterion not available; acute criterion presented.
e: Lowest observable effect level (LOEL).
f: Marine apparent effects threshold (AET) for amphipod bioassay. The AET represents the concentration above which adverse biological impacts would be expected.
g: Value for chemical class.
h: Screening guidelines represent concentrations for Cr^{+6}
NA: Screening guidelines not available.
N/A: Not analyzed for.
ND: Not detected.

References

Broach, L. Texas Natural Resource Conservation Commission, Field Operations Division, Region 12. Personal communication December 20, 2001.

Broach L. and P.A. Crocker. 1996. Contaminant assessment of Patrick Bayou. AS-122/sr. Houston and Dallas, TX: Texas Natural Resource Conservation Commission and U.S. Environmental Protection Agency. 62 pp.

DeLorme. 2001. Texas Atlas and Gazetteer. 1:400,000. DeLorme. Yarmouth, ME.

EVS Environment Consultants (EVS). 1989. Draft: Preliminary natural resource survey; Crystal Chemical Company. Seattle, WA: prepared for National Oceanic and Atmospheric Administration.

Long, E.R., L.J. Field, and D.D. MacDonald. 1998. Predicting toxicity in marine sediments with numerical sediment quality guidelines. Environmental Toxicology and Chemistry 17(4):714-727.

Robinson, L. Fisheries biologist, Texas Parks and Wildlife Department, Seabrook Marine Laboratory. Seabrook, TX. Personal communication December 10, 2001.

Seiler, R. Project Contact Texas Natural Resource Conservation Commission, Austin, Texas. Personal communication April, 2003.

Texas Department of Health (TDH). 2001. Safety Seafood Division: Listing of waterbodies with advisories or bans. Available: http://www.tdh.state.tx.us/bfds/ssd/map/waterbody.html.

Texas Natural Resource Conservation Commission (TNRCC). 2001. Hazard ranking system documentation record, Patrick Bayou site, Deer Park, Harris County, Texas. TX0000605329. Austin, TX: prepared in cooperation with the U.S. Environmental Protection Agency Region VI.

U.S. Environmental Protection Agency (USEPA). 1993. Water quality criteria. Washington, DC: Office of Water, Health and Ecological Criteria Division. 294 pp.

U.S. Environmental Protection Agency (USEPA). 1999. National recommended water quality criteria—correction: U.S. Environmental Protection Agency, Office of Water.

U.S. Environmental Protection Agency (USEPA). 2001. NPL site narrative at listing; Patrick Bayou, Deer Park, Texas. Available: http://www.epa.gov/superfund/sites/npl/nar1638.htm.

U.S. Geological Survey (USGS). 1995. LaPorte Quadrangle, Texas, 7.5 minute series (topographic). 1: 24,000. U.S. Geological Survey (USGS). Denver, CO.

Lower Duwamish Waterway

Seattle, Washington

EPA Facility ID: WA0002329803

Basin: Duwamish

HUC: 17110013

Executive Summary

The Lower Duwamish Waterway (LDW) site is a heavily industrialized stretch of the Duwamish River in Seattle, Washington. This section of the Duwamish River is a major shipping route and the shoreline has been altered and developed for industrial and commercial operations. Direct discharge, spills, groundwater migration, and surface water runoff from surrounding properties have contributed to the elevated concentrations of PAHs, PCBs, trace elements (metals), and dioxins found in Duwamish Waterway sediment. The NOAA trust habitat of concern is the Duwamish Waterway and associated bottom sediments. The Duwamish River is a migratory corridor for juvenile and adult Pacific salmon, including the federally threatened chinook salmon, and other NOAA trust resources. Commercial, recreational, and subsistence fishing for Pacific salmon and other NOAA trust resources occurs in the Duwamish River near the Lower Duwamish Waterway site.

Site Background

The Duwamish River originates at the confluence of the Black and Green Rivers near Tukwila, Washington. It then flows northeast for approximately 21 river km (13 river mi) before discharging into Elliott Bay. The Lower Duwamish Waterway (LDW) site, which was placed on the National Priorities List on September 13, 2001, is a contaminated segment of the Duwamish River that empties into Elliott Bay in Seattle, King County, Washington. Elliott Bay is located in the Puget Sound Estuary and is Seattle's major harbor (Figure 1). The current LDW site boundary extends from Harbor Island at approximately river km 2.5 (river mi 1.6) upstream to Turning Basin #3 at river km 11.5 (river mi 7.1) (Figure 2). This section of the Duwamish River is tidally influenced and maintained as a navigation channel.

The Duwamish Waterway has been a major shipping route for over one hundred years. As a result, the shorelines of the lower Duwamish River have been developed for industrial and commercial operations. Past and present operations include cargo handling and storage; food processing; marine construction; petroleum storage; boat manufacturing at dry docks; marina operations; paper and metals fabrication; and airplane parts manufacturing. In addition, storm drains, several combined sewer overflows (CSOs), and other outfalls discharge into the Duwamish Waterway (USEPA 2000). Four major property owners along the Duwamish Waterway with potential responsibility for the sediment contamination are the Port of Seattle, King County, the City of Seattle, and The Boeing Company (USEPA 2002).

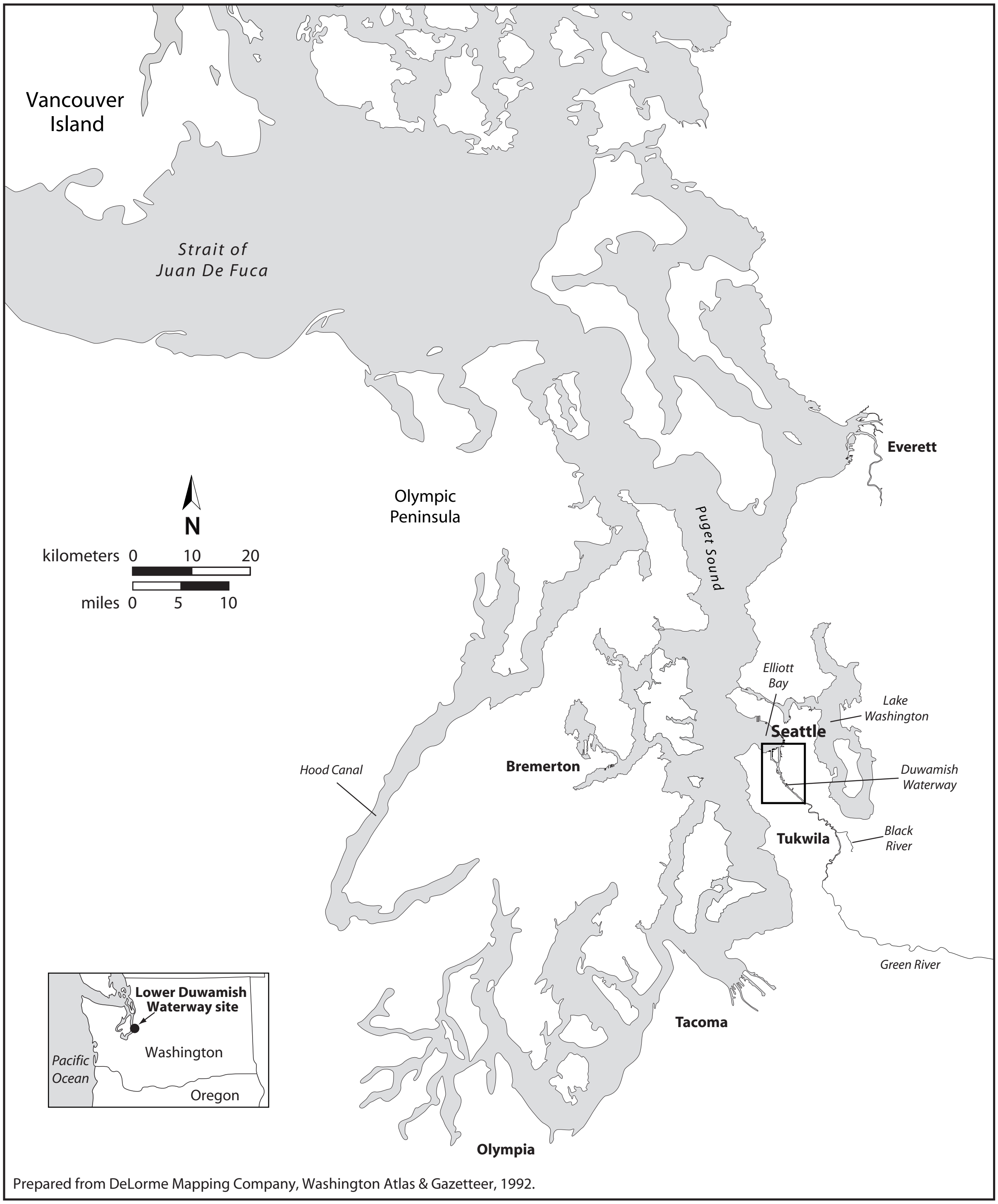

Figure 1. Location of Lower Duwamish Waterway, Seattle, Washington.

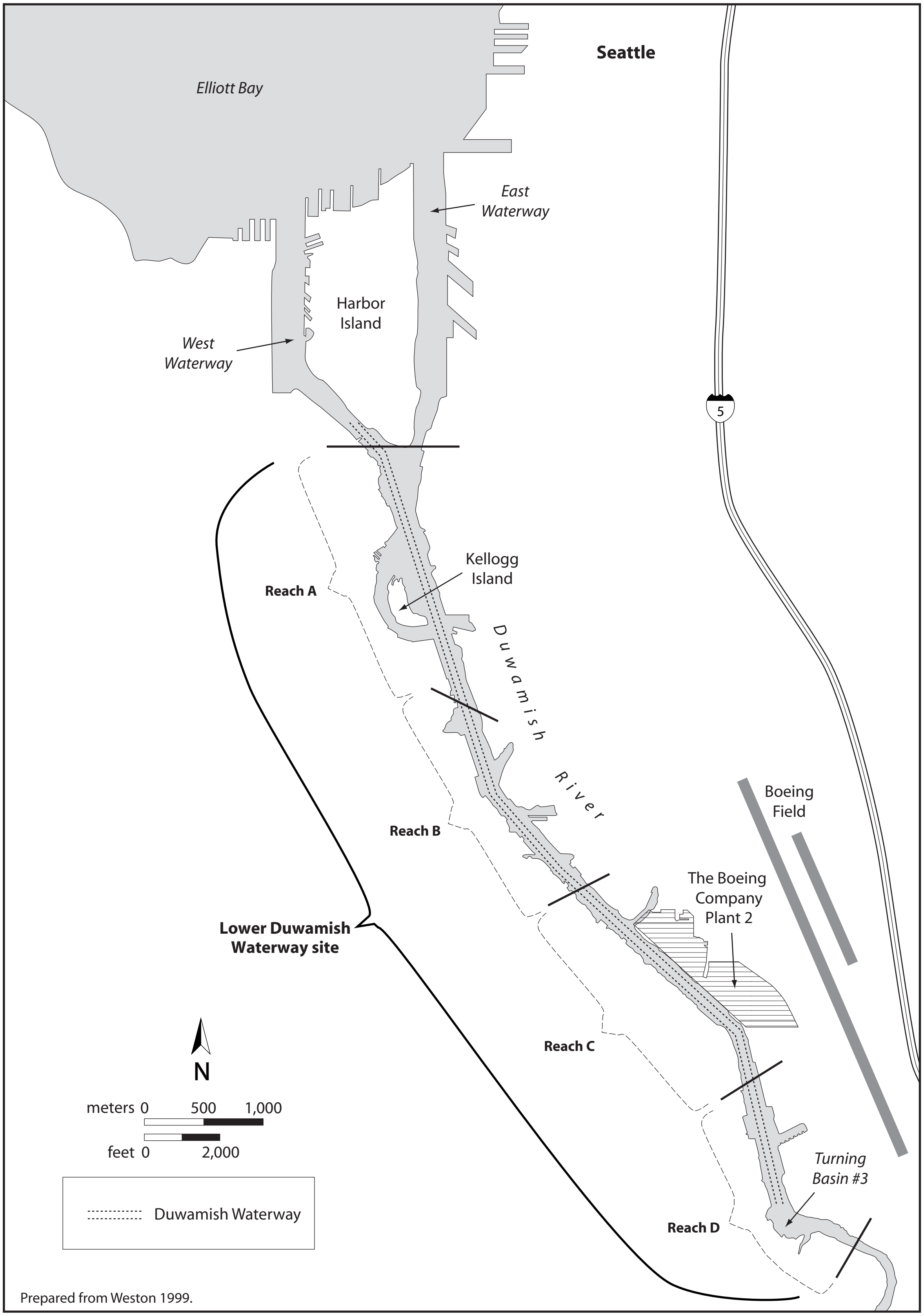

Figure 2. Detail of Lower Duwamish Waterway site.

The most likely sources of contamination at the LDW site include direct discharge, spillage during the loading of marine vessels, groundwater migration, and surface water runoff. Direct discharge includes discharge from storm drains, CSOs, and other outfalls. Approximately 1,210 million liters (318 million gallons) of raw untreated sewage are currently discharged annually into the Lower Duwamish Waterway via CSOs owned by King County and the City of Seattle. Groundwater flow near the LDW site is toward the Duwamish Waterway (Fabritz et al. 1998). Detailed information on spills at the Lower Duwamish Waterway site was unavailable at the time of this report.

NOAA Trust Resources

The NOAA trust habitat of concern is the Duwamish Waterway and associated bottom sediments. The Duwamish River is tidally influenced; the surface water is fresh to brackish, and the bottom water is more saline. Between 1910 and 1920, the Duwamish River delta and the surrounding tidelands were filled and graded to create a navigation channel. Although the lower Duwamish River has been altered and heavily industrialized, it still provides habitat for marine and anadromous fish species.

Composition of the bottom sediment varies throughout the Lower Duwamish Waterway. Medium-grained and coarse sands are present in areas near CSOs, storm drain discharges, riprap, and bridges. Silts and clays are present in mudflats, along channel sideslopes, and in portions of the navigation channel (Weston 1999).

The Duwamish River is a migratory route, nursery, and osmoregulatory transition zone for several anadromous fish (Table 1). These fish include coho, chinook, chum, pink, and sockeye salmon, as well as steelhead, cutthroat trout, and Pacific lamprey (Cropp 2002). Of these fish species, chinook and coho are the most common in the Duwamish River. Chinook salmon are a federally listed threatened species, and coho salmon are a federally listed candidate threatened species. These anadromous runs are a mixture of native and hatchery fish. The hatchery fish are from the State Hatchery Program located on the Green River (Weston 1999; USEPA 2000).

The mouth of the lower Duwamish River and the adjacent waters of Elliott Bay provide habitat for many marine fish species. Predominant marine species close to the LDW site include English sole, starry flounder, Pacific staghorn sculpin, shiner perch, and Pacific herring. Pacific herring, shiner perch, and threespine stickleback all spawn in or near the mouth of the lower Duwamish River (Parametrix Inc. 1980). All other marine species present near the LDW site use these surface waters mostly as juvenile nursery habitat (Monaco et al. 1990).

Commercial, recreational, and subsistence fishing occurs in the vicinity of the LDW site. Dominant commercial fisheries in the Duwamish River include chinook, coho, and chum salmon as well as steelhead. There is also recreational fishing for chinook and coho salmon, steelhead, and several marine species as well (Table 1). The Duwamish River is part of the traditional fishing grounds for the Muckleshoot and Squamish Indian tribes. Subsistence fishing of chinook salmon, chum salmon, and steelhead occurs in the Duwamish River (Cropp 2002; USEPA 2000).

No specific fish consumption advisories are currently in effect for the Duwamish River. There is, however, a general consumption advisory in effect for marine waters within King County. This advisory recommends against collecting and consuming bottom fish, shellfish, or seaweed from Puget Sound waters (WADOH 2002).

Table 1. NOAA trust resources present in the vicinity of the Lower Duwamish Waterway site (Parametrix 1980; Monaco et al. 1990; Bargman 1991; Weston 1999; Cropp 2002).

Species		**Habitat Use**				**Fisheries**		
Common Name	Scientific Name	Spawning Ground	Nursery Area	Migratory Route	Adult Habitat	Comm.	Rec.	Subsist.
ANADROMOUS FISH								
Chinook salmon	*Oncorhynchus tshawytscha*		◆	◆	◆	◆	◆	◆
Chum salmon	*Oncorhynchus keta*		◆	◆	◆	◆		
Coho salmon	*Oncorhynchus kisutch*		◆	◆	◆	◆	◆	◆
Cutthroat trout	*Oncorhynchus clarki*		◆	◆	◆			
Pacific lamprey	*Lampetra tridentata*			◆	◆			
Pink salmon	*Oncorhynchus gorbuscha*		◆	◆	◆			
Sockeye salmon	*Oncorhynchus nerka*			◆	◆			
Steelhead[a]	*Oncorhynchus mykiss*		◆	◆	◆	◆	◆	◆
ESTUARINE/MARINE FISH								
English sole	*Parophrys vetulus*		◆					
Pacific cod	*Gadus macrocephalus*		◆			◆	◆	
Pacific herring	*Clupea pallasi*	◆	◆			◆		
Pacific sand lance	*Ammodytes hexapterus*		◆				◆	
Pacific staghorn sculpin	*Leptocottus armatus*		◆					
Pacific tomcod	*Microgadus proximus*		◆					
Prickly sculpin	*Cottus asper*		◆					
Shiner perch	*Cymatogaster aggregata*	◆	◆		◆			
Starry flounder	*Platichthys stellatus*		◆			◆	◆	
Surf smelt	*Hypomesus pretiosus*		◆				◆	
Threespine stickleback	*Gasterosteus aculeatus*	◆	◆		◆			
Walleye pollock	*Theragra chalcogramma*		◆				◆	

a: The term steelhead is applied to a sea-run rainbow trout and some populations from lakes.

Site-Related Contamination

The primary contaminants of concern to NOAA that were detected in sediment at the LDW site include polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs), and trace elements (metals). The extent of the sediment contamination was documented during several environmental investigations, including a 1999 site investigation (SI) by the U.S. Environmental Protection Agency (USEPA) and focused investigations conducted on behalf of The Boeing Company. During the SI, 300 surface and 17 subsurface sediment samples were collected from 300 sampling stations at the LDW site and were analyzed for metals, semivolatile organic compounds (SVOCs) including PAHs, volatile organic compounds (VOCs), pesticides, PCBs, organotins, and dioxins (Weston 1999). Consultants for The Boeing Company collected sediment samples from 61 locations in the vicinity of Boeing Plant 2. These samples were analyzed for PCBs and metals (Pentec and FSM 2001a; Pentec and FSM 2001b). The maximum concentrations of selected contaminants are summarized in Table 2.

Table 2. Maximum concentrations of contaminants of concern detected in sediment from the Lower Duwamish Waterway site compared to screening guidelines (Weston 1999; Pentec and FSM 2001a; Pentec and FSM 2001b).

	Sediment (mg/kg)	
Contaminant	Site Sediment	ERL[a]
Trace Elements		
Arsenic	620	8.2
Cadmium	29	1.2
Chromium	300	81
Copper	800	34
Lead	630	46.7
Mercury	1.6	0.15
Nickel	96	20.9
Selenium	28	1.0[b]
Silver	7.3	1
Zinc	1,800	150
PAHs/SVOCs		
Acenaphthene	75	0.016
Acenaphthylene	5.1	0.044
Anthracene	87	0.0853
Benz(a)anthracene	250	0.261
Chrysene	220	0.384
Dibenz(a,h)anthracene	50	0.0634
Fluoranthene	1,100	0.6
Fluorene	98	0.019
2-Methylnaphthalene	31	0.07
Naphthalene	20	0.16
Pentachlorophenol	0.3	NA
Phenanthrene	920	0.24
Pyrene	770	0.665
Pesticides/PCBs		
Chlordane	0.026	0.0005
DDD	0.84	0.002
DDE	0.37	0.0022
DDT	1.7	0.00158[c]
Dieldrin	0.28	0.00002
Heptachlor Epoxide	0.002	NA
Total PCBs (as Aroclors)	12	0.0227
Aroclor 1242	2.5	NA
Aroclor 1254	16	NA
Aroclor 1260	51	NA
Dioxins/Furans		
Total TCDD	0.000075	NA
Total TCDF	0.00015	NA
TEQ	0.00022	NA

a: Effects Range-Low represents the 10th percentile for the dataset in which effects were observed or predicted in studies compiled by Long et al. (1998).

b: Marine Apparent Effects Threshold (AET) for amphipod bioassay. The AET represents the concentration above when adverse biological impacts would be expected.

c: Expressed as Total DDT.

NA: Screening guidelines not available.

PCBs were detected in sediment from all of the SI stations sampled and from many of the stations sampled during The Boeing Company investigations. In SI surface sediment samples, total PCB concentrations ranged from 0.02 to 12 mg/kg. Total PCBs were detected in SI subsurface sediment at concentrations ranging from 0.037 to 4 mg/kg. Aroclors 1242, 1254, and 1260 were the most frequently detected Aroclors at the LDW site. The maximum concentrations of total PCBs, Aroclor 1254, and Aroclor 1260 were all detected in sediment collected from Reach C (Figure 2). The maximum concentration of Aroclor 1242 was detected in a sample collected from Reach A. The maximum total PCB concentration exceeded the screening guidelines by two orders of magnitude (Table 2).

Several SVOCs were detected in sediment samples from throughout the LDW site during the SI. Detected SVOC concentrations in sediment ranged from 0.3 mg/kg (pentachlorophenol) to 1,100 mg/kg (fluoranthene). Maximum concentrations of SVOCs were detected in Reach A (eight compounds), Reach C (four compounds), and Reach B (one compound). The maximum concentrations of acenaphthene, anthracene, fluoranthene, fluorene, phenanthrene, and pyrene were all detected at three orders of magnitude greater than their screening guidelines (Table 2). All maximum concentrations of SVOCs were detected in the surface sediment samples except for 2-methylnaphthalene, which was detected in a subsurface sample.

Metals were detected in sediment from all stations sampled during both the SI and The Boeing Company investigations. Maximum concentrations of all metals listed in Table 2 except chromium, nickel, and silver exceeded their respective screening guidelines by at least one order of magnitude (Table 2). The majority of the maximum concentrations of metals were detected in samples collected from Reaches A and C. Cadmium, chromium, silver, and zinc were all detected at maximum concentrations near Boeing Plant 2 during The Boeing Company investigations.

Pesticides and dioxins were detected in sediment samples collected during the SI. The maximum concentrations of all detected pesticides were found in sediment from Reach C. The maximum concentrations of the pesticide DDT and its metabolites DDD and DDE, as well as of dieldrin, all exceeded their respective screening guidelines by at least two orders of magnitude (Table 2). Dioxins were detected at all of the SI surface sediment sampling stations. The maximum toxicity equivalent (TEQ), total TCDD, and total TCDF concentrations were detected in a sediment sample collected from Reach B.

References

Bargman, G. Resource Manager for the Washington State Department of Fisheries, Marine Fish and Shellfish Division. Personal communication July 10, 1991.

Cropp, T. Fisheries Biologist for the Washington Department of Fish and Wildlife. Personal communication May 23, 2002.

Fabritz, Jason, Joel Massman, and Derek Booth. 1998. Development of a three-dimensional, numerical groundwater flow model for the Duwamish River basin. Seattle, WA: University of Washington, Center for Urban Water Resource Management.

Long, E.R., L.J. Field, and D.D. MacDonald. 1998. Predicting toxicity in marine sediments with numerical sediment quality guidelines. Environmental Toxicology and Chemistry 17(4):714-727.

References, *cont.*

Monaco, M. E., D. M. Nelson, R. L. Emmett, and S. A. Hinton. 1990. Distribution and abundance of fishes and invertebrates in West Coast estuaries, Volume I: Data summaries. ELMR Rpt. No. 4. Rockville, MD: Strategic Assessment Branch, NOS/NOAA. 240 pp.

Parametrix Inc. 1980. Port of Seattle Terminal 107 Fisheries Study. Seattle, WA: prepared for the Port of Seattle. 52 pp.

Pentec Environmental and Floyd Snider McCarthy Inc. (Pentec and FSM). 2001a. Data Report, Design Data Collection, Southwest Bank Interim Measure, Boeing Plant 2: Seattle/Tukwila, Washington. Edmonds, WA: Prepared for The Boeing Company.

Pentec Environmental and Floyd Snider McCarthy Inc. (Pentec and FSM). 2001b. Data Report, DSOA Vertical Characterization and Outfall 12 Data Collection, Duwamish Sediment Other Area, Preferred Remedy Interim Measure, Boeing Plant 2: Seattle/Tukwila, Washington. Edmonds, WA: Prepared for The Boeing Company.

Roy F. Weston Inc. (Weston). 1999. Site Inspection Report, Lower Duwamish River (RK 2.5 to 11.5), Seattle, Washington, Volume 1 - Report and Appendices. Document Control No. 4000-19-38-AAAL. Seattle, WA: Prepared for the U.S. Environmental Protection Agency (USEPA).

U.S. Environmental Protection Agency (USEPA). 2000. NPL Site Narrative at Listing Lower Duwamish Waterway, Seattle, Washington. Available: http://www.epa.gov/superfund/sites/npl/nar1622.htm.

U.S. Environmental Protection Agency (USEPA). 2002. U.S. Environmental Protection Agency, Region 10: The Pacific Northwest. Available: http://yosemite.epa.gov/r10/cleanup.nsf/webpage/Lower+Duwamish+Waterway+Site.

Washington State Department of Health (WADOH). 2002. Fish and Shellfish Consumption Advisories in Washington State Due to Chemical Contamination. Available: http://www.doh.wa.gov/ehp/oehas/EHA_fish_adv.htm#King%20County.

Glossary of terms

Adit Horizontal entrance to a mine.

Adult habitat The environment where an aquatic resource lives after reaching physical and sexual maturity.

Ambient water quality criteria (AWQC) The U.S. Environmental Protection Agency's (USEPA) compilation of nationally recommended water quality criteria, based on data and scientific judgments on pollutant concentrations and how they affect the environment or human health.[1]

Anadromous Migrating from marine waters to breed in freshwater. Examples of anadromous fish include salmon, river herring (alewife), and striped bass.

Aquifer An underground geological formation, or group of formations, containing water. Are sources of groundwater for wells and springs.

Aroclor A trade name for a group of polychlorinated biphenyls (PCBs).

Artesian aquifer An aquifer in which groundwater is confined under pressure by impermeable rock layers.

Bioavailable The fraction of the total chemical in the surrounding environment that is available for uptake by organisms. The environment may include water, sediment, suspended particles, and food items.

Biotransformation Chemical alteration of a substance within the body.

Body burden The amount of a chemical stored in the body at a given time, especially a potential toxin in the body as the result of exposure.

Borehole A hole made with drilling equipment.

Brood To hatch eggs.

Capacitor An electric circuit element used to store charge temporarily.

Catadromous Living in fresh water but migrating to marine waters to breed. An example is the American eel.

Chemical affinity An attraction or force between particles that causes them to combine.

Confined aquifer An aquifer that is bounded above and below by impermeable rock layers.

Confluence The point where two or more streams meet or flow together.

Contaminants of concern Chemicals at a hazardous waste site that are likely to have an adverse effect on NOAA trust resources.

Contaminant partitioning In general, it is the tendency of a contaminant to be in the air, water, soil, or sediment based on the relative chemical affinities of that contaminant.

Decant To pour off without disturbing the sediment.

Demersal Dwelling at or near, sinking to, or deposited near the bottom of a body of water.

Depurate Elimination of a chemical from an organism by desorption, diffusion, excretion, egestion, biotransformation, or another route.

Desorption To remove an absorbed substance from.

Diadromous Fishes that migrate between fresh and salt water (e.g., salmon and American eel).

Effects range–low (ERL) NOAA sediment quality guidelines derived from the examination of a large number of individual contamination studies, all in salt water. The ERLs are indicative of contaminant concentrations below which adverse effects rarely occur.[2]

Egestion To discharge or excrete from the body.

Emergency Removal Action Steps taken to remove contaminated materials that pose imminent threats to local residents (e.g., removal of leaking drums or the excavation of explosive waste).[3]

Emergent wetland, emergent area A wetland in which vegetation is present for most of the growing season in most years and is dominated by plants that grow year round.[4]

Emergent wetland, subclass: non-persistent No obvious signs of emergent vegetation at certain seasons.

Emergent wetland, subclass: persistent Erect, rooted, herbaceous aquatic plants. Species that normally remain standing until the beginning of the next growing season.

Endangered species Animals, birds, fish, plants, or other living organisms threatened with extinction by anthropogenic (human-caused) or other natural changes in their environment.[3]

Endangered Species Act A 1973 act of Congress mandating that endangered and threatened species of fish, wildlife, and plants be protected and restored.

Environmental medium/media External conditions affecting the life, development, and survival of an organism, including air, water, and soil, which are the subject of regulatory concern and activities.

Estuary, estuarine Region of interaction between rivers and nearshore marine waters, where tidal action and river flow mix fresh and salt water. Such areas include bays, mouths of rivers, salt marshes, and lagoons. These brackish water ecosystems shelter and feed marine life, birds, and wildlife. See wetlands.

Fish passage Features of a dam that enable fish to move around, through, or over without harm. Generally an upstream fish ladder or a downstream bypass system.

Flue A tunnel or conduit that connects a furnace to a chimney stack.

Forage To search for food.

Groundwater The supply of fresh water found beneath the earth's surface, which supplies wells and springs.[3]

Groundwater monitoring well See monitoring well.

Groundwater plume A visible or measurable discharge of a contaminant from a given point of origin into groundwater.[3]

Habitat The place where a plant or animal species naturally lives and grows or characteristics of the soil, water, and biologic community (other plants and animals) that make this possible.

Habitat of concern The habitat that will be or is being affected by contaminants of concern from a hazardous waste site.

Hazard ranking system/hazard ranking system package The principal screening tool used by the USEPA to evaluate risks to public health and the environment associated with abandoned or uncontrolled hazardous waste sites.[3]

Heavy metals Metallic elements with high atomic weights (e.g., mercury, chromium, cadmium, arsenic, and lead).

Hectare 2.471 acres or 10,000 square meters (m^2).

Hydrologic Unit Code (HUC) The United States is divided into hydrologic units for water resource planning and data management. Hydrologic units represent natural and human-imposed areas. Each HUC is a unique eight-digit number. The first two digits indicate the major geographic area or region, the second two digits indicate the sub-region, the third two digits indicate the accounting units, and the fourth two digits indicate the cataloging units. Cataloging units are also called "watersheds."

Ingot A mass of metal that is cast in a standard shape for convenient storage or transportation.

Inorganic compounds Chemical substances of mineral origin, not of basically carbon structure.

Intertidal That area of the shore between the high and low water marks; the intertidal zone of oceans and estuaries is regularly covered and exposed by the tides.

Invertebrate An animal without a spinal column or backbone.

Isomers Different substances that have the same formula.

Juvenile habitat The environment in which an organism lives from one year of age until sexual maturity.

Lowhead dam Dams that range from a six-inch drop off to a 25- foot drop off.

Mainstem The principal channel of a drainage system into which other smaller streams or rivers flow.

Marine Of or relating to the sea.

Marsh A type of wetland that does not accumulate appreciable peat deposits (partially decomposed plants and other organic materials that can build up in poorly drained wetland habitats) and is dominated by plants with little or no woody tissue. See wetland.

Materiel The equipment, apparatus, and supplies of a military force.

Mean U.S. soil screening guidelines Average concentrations of inorganic compounds found in natural soils of the United States.

Metals Chemical elements with particular properties that include being good conductors of electricity and heat; in these reports, generally synonymous with inorganic compounds.

Migratory corridor, migratory route A body of water that adult fish travel through but do not remain in for any significant time.

Monitoring well (1) A well used to obtain water quality samples or measure groundwater levels. (2) A well drilled to collect groundwater samples for the purpose of physical, chemical, or biological analysis to determine the amounts, types, and distribution of contaminants beneath a site.

National Priorities List A list of hazardous waste sites, compiled by the USEPA, where hazardous wastes have been found and the initial evaluation shows a significant risk to human health or the environment. NPL sites are often called "Superfund sites" because Superfund money can be used by the USEPA to investigate and clean up these sites.

Neutralization Decreasing the acidity or alkalinity of a substance by adding alkaline or acidic materials, respectively.

NOAA trust resources Natural resources in coastal and marine areas, including the anadromous and catadromous fish that migrate between freshwater and coastal and marine areas.

Nursery habitat The habitat where larvae or juveniles settle, seek shelter, feed, and mature.

Oligohaline A low salinity region of an estuary, typically 0.5 to 5.0 parts per thousand salinity.

Order of magnitude A change in the value of a quantity or unit by a factor of 10.

Ordnance Military materiel, such as weapons, ammunition, artillery, combat vehicles, and equipment.

Organic compounds/chemicals/substances/materials Naturally occurring (animal- or plant-produced) or synthetic substances containing mainly carbon, hydrogen, nitrogen, and oxygen.[3]

Palustrine wetland a wetland beyond the influence of tidal brackish waters and typically dominated by persistent vegetation that remain standing into the next growing season; most inland wetlands fall into this classification; located in upland areas.

Pathway (for migration of contaminants) The physical course a chemical or pollutant takes from its source to the exposed organism.[5]

Pelagic Living or occurring in the open sea.

Pentachlorophenol A manufactured chemical that is not found naturally in the environment. It was used as a biocide and wood preservative, and was one of the most heavily used pesticides in the United States. Now, only certified applicators can purchase and use this chemical. It is still used in industry as a wood preservative for power line poles, railroad ties, cross arms, and fence posts.

Pesticides Substances or mixtures thereof intended for preventing, destroying, repelling, or mitigating any pest.[3]

Polychlorinated biphenyls (PCBs) A group of synthetic organic compounds that can cause a number of different harmful effects. There are no known natural sources of PCBs in the environment. PCBs are either oily liquids or solids and are colorless to light yellow.[5]

Polynuclear aromatic hydrocarbons (PAHs) A group of chemicals that are formed during the incomplete burning of coal, oil, gas, wood, garbage, or other organic substances, such as tobacco and charbroiled meat. Also referred to as polycyclic aromatic hydrocarbons (PAHs).[5]

Rearing habitat See nursery habitat.

Remediation Cleanup or other methods used to remove or contain a toxic spill or hazardous materials from a Superfund site.[3]

Rinsate The solution remaining after something is rinsed.

Runoff That part of precipitation, snowmelt, or irrigation water that runs off the land into streams or other surface-water. It can carry pollutants from the air and land into receiving waters.

Salinity A measurement of the amount (usually in parts per thousand) of salt in water.

Salmonid Fish of the family Salmonidae, which includes salmon and steelhead.

Sediment The organic material that is transported and deposited by wind and water.

Semivolatile organic compounds (SVOCs) Organic compounds that volatilize slowly at standard temperature (20°C and 1 atm pressure).

Spawning habitat The habitat where fish reproduce.

Steam (or boiler) blowdown To control solids in the boiler water

Storm sewer A system of pipes (separate from sanitary sewers) that carries water runoff from buildings and land surfaces.

Substrate The composition of a streambed, including either mineral or organic materials.[6]

Sump A low-lying place such as a pit, that receives drainage.

Superfund Money collected from a special tax on chemicals and raw petroleum that is appropriated by Congress. These funds are used to investigate, evaluate, and clean up the worst hazardous waste sites in the U.S. These sites are listed on the NPL.

Supratidal The area of the shore above the normal high-tide line.

Surface water All water naturally open to the atmosphere (rivers, lakes, reservoirs, ponds, streams, impoundments, seas, estuaries, etc.).

Surface water runoff Precipitation, snow melt, or irrigation water in excess of what can infiltrate the soil surface and be stored in small surface depressions.[3]

Tailings Residue of raw material or waste separated out during the processing of crops or mineral ores.[3]

Threatened species Plants and animals whose numbers are very low or decreasing rapidly. Threatened species are not endangered species yet, but are likely to become endangered in the future.[7]

Threshold effect level (TEL) The concentration of a contaminant below which negative biological effects are expected to occur only rarely.

Trace elements In these reports, generally synonymous with inorganic compounds.

Trust resources See NOAA trust resources.

Trustee (for natural resources) The party responsible for maintaining the original characteristics of our land, water, and the plants and animals that live there. NOAA is a federal trustee for natural resources that spend any portion of their life cycle in a marine or estuarine environment; and their habitats.

Unconfined aquifer An aquifer that is not confined under pressure and is bounded by permeable layers.

Uptake The transfer of a chemical into or onto an aquatic organism.

Volatile organic compounds (VOCs) Organic compounds that evaporate readily.[4]

Wastewater The spent or used water from a home, community, farm, or industry, which contains dissolved or suspended matter.

Water Quality Criteria Levels of water quality expected to render a body of water suitable for its designated use. Criteria are based on specific levels of pollutants that would make the water harmful if used for drinking, swimming, farming, fish production, or industrial processes.

Water table The level of groundwater.

Watershed The region draining into a river, river system, or other body of water.

Wetland An area that is saturated by surface or groundwater with vegetation adapted for life under those soil conditions including marshes, estuaries, swamps, bogs, and fens.

[1] http://www.epa.gov/waterscience/criteria/

[2] http://response.restoration.noaa.gov/cpr/sediment/SPQ.pdf

[3] http://www.epa.gov/OCEPAterms/

[4] USFWS. 1979. Classification of Wetlands and Deepwater Habitats of the United States. FWS/OBS-79/31.

[5] http://www.atsdr.cdc.gov/toxprofiles/

[6] http://www.streamnet.org/pub-ed/ff/Glossary/

[7] http://www.epa.gov/espp/coloring/especies.htm

Appendix

Appendix

Table 1. List of the 345 hazardous Waste Site Reports published by NOAA to date. Sites in bold italics are included in this volume.

Region 1

Connecticut	Date	EPA Facility ID
Barkhamsted-New Hartford Landfill	1989	CTD980732333
Beacon Heights Landfill	1984	CTD072122062
Broad Brook Mill	***2003***	***CT0002055887***
Gallup's Quarry	1989	CTD108960972
Kellogg-Deering Well Field	1987	CTD980670814
New London Submarine Base	1990	CTD980906515
O'Sullivans Island	1984	CTD980667992
Raymark Industries, Inc.	1996	CTD001186618
Yaworski Waste Lagoon	1985	CTD009774969

Massachusetts		
Atlas Tack Corp.	1989	MAD001026319
Blackburn and Union Privileges	1993	MAD982191363
Charles-George Reclamation Landfill	1987	MAD003809266
GE - Housatonic River	1999	MAD002084093
Groveland Wells	1987	MAD980732317
Hanscom Field/Hanscom Air Force Base	1995	MA8570024424
Haverhill Municipal Landfill	1985	MAD980523336
Industri-Plex	1987	MAD076580950
Materials Technology Laboratory (USArmy)	1995	MA0213820939
Natick Laboratory Army Research, D&E Center	1995	MA1210020631
New Bedford Site (Acushnet Estuary)	1984	MAD980731335
Nyanza Chemical Waste Dump	1987	MAD990685422
Plymouth Harbor/Cannon Engineering Corp.	1984	MAD980525232
South Weymouth Naval Air Station	1995	MA2170022022
Sullivan's Ledge	1987	MAD980731343

Region 1 *cont.*

Maine	Date	EPA Facility ID
Brunswick Naval Air Station	1987	ME8170022018
Eastland Woolen Mill	2002	MED980915474
McKin Company	1984	MED980524078
O'Connor Company	1984	MED980731475
Portsmouth Naval Shipyard	1995	ME7170022019
Saco Municipal Landfill	1989	MED980504393

New Hampshire		
Beede Waste Oil	1997	NHD018958140
Coakley Landfill	1985	NHD064424153
Dover Municipal Landfill	1987	NHD980520191
Fletcher's Paint Works & Storage	1989	NHD001079649
Grugnale Waste Disposal Site	1985	NHD069911030
New Hampshire Plating Co.	1992	NHD001091453
Pease Air Force Base	1990	NH7570024847
Savage Municipal Water Supply	1985	NHD980671002
Sylvester	1985	NHD099363541

Rhode Island		
Davis Liquid Waste	1987	RID980523070
Davisville Naval Construction Battalion Center	1990	RI6170022036
Newport Naval Education & Training Center	1990	RI6170085470
Peterson/Puritan, Inc.	1987	RID055176283
Picillo Farm	1987	RID980579056
Rose Hill Regional Landfill	1989	RID980521025
Stamina Mills, Inc.	1987	RID980731442
West Kingston Town Dump/URI Disposal	1992	RID981063993
Western Sand & Gravel	1987	RID009764929

Vermont		
BFI Sanitary Landfill (Rockingham)	1989	VTD980520092
Elizabeth Mine	2003	VTD988366621
Ely Copper Mine	***2003***	***VTD988366571***
Old Springfield Landfill	1987	VTD000860239

Region 2

New Jersey	Date	EPA Facility ID
Albert Steel Drum	1984	NJD000525154
American Cyanamid Co.	1985	NJD002173276
Atlantic Development 11	1984	NJD980528731
Bog Creek Farm	1984	NJD063157150
Brick Township Landfill	1984	NJD980505176
Brook Industrial Park	1989	NJD078251675
Chemical Control	1984	NJD000607481
Chemical Insecticide Corp.	1990	NJD980484653
Chipman Chemical Co.	1985	NJD980528897
Ciba-Geigy Corp.	1984	NJD001502517
Cornell Dubilier Electronics, Inc.	1999	NJD981557879
Cosden Chemical Coatings Corp.	1987	NJD000565531
Curcio Scrap Metal, Inc.	1987	NJD011717584
De Rewal Chemical Co.	1985	NJD980761373
Denzer & Schafer X-Ray Co.	1984	NJD046644407
Diamond Alkali Co.	1984	NJD980528996
Emmell's Septic Landfill	2002	NJD980772727
Federal Aviation Admin. Tech. Center	1990	NJ9690510020
Garden State Cleaners Co.	1989	NJD053280160
Global Sanitary Landfill	1989	NJD063160667
Hercules, Inc. (Gibbstown Plant)	1984	NJD002349058
Higgins Disposal	1989	NJD053102232
Higgins Farm	1989	NJD981490261
Horseshoe Road	1995	NJD980663678
Ideal Cooperage Inc.	1984	NJD980532907
Industrial Latex Corp.	1989	NJD981178411
Jackson Township Landfill	1984	NJD980505283
Kauffman & Minteer, Inc.	1989	NJD002493054
Kin-Buc Landfill	1984	NJD049860836
Koppers Co Inc/Seaboard Plant	1984	NJD002445112
Krysowaty Farm	1985	NJD980529838
LCP Chemicals, Inc.	1999	NJD079303020
Martin Aaron, Inc.	2003	NJD014623854

Region 2 *cont.*

New Jersey *cont.*	Date	EPA Facility ID
Middlesex Sampling Plant (DOE)	2002	NJ0890090012
Mobil Chemical Co.	1984	NJD000606756
NL Industries	1984	NJD061843249
Perth Amboy PCBs	1984	NJD980653901
PJP Landfill	1984	NJD980505648
Price Landfill	1984	NJD070281175
Puchack Well Field	1999	NJD981084767
PVSC Sanitary Landfill	1984	NJD980529671
Roebling Steel Co.	1984	NJD073732257
Roosevelt Drive-In	1984	NJD030250484
Route 561 Dump	2002	NJ0000453514
Sayreville Landfill	1984	NJD980505754
Scientific Chemical Processing	1984	NJD070565403
South Jersey Clothing Co.	1989	NJD980766828
Syncon Resins	1984	NJD064263817
United States Avenue Burn	2002	NJ0001120799
Universal Oil Products (Chemical Division)	1984	NJD002005106
Ventron/Velsicol	1984	NJD980529879
White Chemical Corp.	1984	NJD001239185
Williams Property	1984	NJD980529945
Zschiegner Refining Company	1999	NJD986643153

New York		
Action Anodizing, Plating, & Polishing Corp.	1989	NYD072366453
Applied Environmental Services	1985	NYD980535652
Brookhaven National Laboratory (USDOE)	1990	NY7890008975
C & J Disposal Leasing Co. Dump	1989	NYD981561954
Carroll & Dubies Sewage Disposal	1989	NYD010968014
Computer Circuits	2002	NYD125499673
Ellenville Scrap Iron and Metal	***2003***	***NYSFN0204190***
Jones Sanitation	1987	NYD980534556
Li Tungsten Corp.	1992	NYD986882660
Liberty Industrial Finishing	1985	NYD000337295
Marathon Battery Corp.	1984	NYD010959757

Region 2 *cont.*

New York *cont.*	**Date**	**EPA Facility ID**
Mattiace Petrochemical Co., Inc.	1989	NYD000512459
North Sea Municipal Landfill	1985	NYD980762520
Old Roosevelt Field Contaminated Groundwater Area	2003	NYSFN0204234
Peter Cooper	1999	NYD980530265
Port Washington Landfill	1984	NYD980654206
Rowe Industries Groundwater Contamination	1987	NYD981486954
Sidney Landfill	1989	NYD980507677
Smithtown Groundwater Contamination	2003	NY0002318889
Stanton Cleaners Area Groundwater Contamination	2002	NYD047650197

Puerto Rico		
Clear Ambient Services Co.	1984	PRD090416132
Frontera Creek	1984	PRD980640965
Naval Security Group Activity	1989	PR4170027383
V&M/Albaladejo Farms	1997	PRD987366101
Vega Baja Solid Waste Disposal	2002	PRD980512669

Virgin Islands		
Island Chemical Corp./V.I. Chemical Corp.	1996	VID980651095
Tutu Wellfield	1993	VID982272569

Region 3

Washington, D.C.	**Date**	**EPA Facility ID**
Washington Navy Yard	1999	DC9170024310

Delaware		
Army Creek Landfill	1984	DED980494496
Coker's Sanitation Service Landfills	1986	DED980704860
Delaware City PVC Plant	1984	DE0001912757
Delaware Sand & Gravel	1984	DED000605972
Dover Air Force Base	1987	DE8570024010
Dover Gas Light Co.	1987	DED980693550
E.I. Du Pont Newport Landfill	1987	DED980555122

Region 3 *cont.*

Delaware *cont.*	**Date**	**EPA Facility ID**
Halby Chemical	1986	DED980830954
Kent County Landfill	1989	DED980705727
Koppers Co. Facilities Site	1990	DED980552244
NCR Corp., Millsboro	1986	DED043958388
New Castle Spill Site	1984	DED058980442
New Castle Steel	1984	DED980705255
Old Brine Sludge Landfill	1984	DED980704894
Pigeon Point Landfill	1987	DED980494603
Sealand Limited	1989	DED981035520
Standard Chlorine Co.	1986	DED041212473
Sussex Co. Landfill #5	1989	DED980494637
Tybouts Corner Landfill	1984	DED000606079
Wildcat Landfill	1984	DED980704951

Maryland		
68th Street Dump/Industrial Enterprises	2002	MDD980918387
Andrews Air Force Base	2003	MD0570024000
Anne Arundel County Landfill	1989	MDD980705057
Brandywine DRMO	***2003***	***MD9570024803***
Bush Valley Landfill	1989	MDD980504195
Central Chemical Corporation	1999	MDD003061447
Indian Head Naval Surface Warfare Center	1984	MD7170024684
Joy Reclamation Co.	1984	MDD030321178
Ordnance Products, Inc.	1995	MDD982364341
Sand, Gravel & Stone Site	1984	MDD980705164
Southern Maryland Wood Treating	1987	MDD980704852
U.S. Agricultural Center Beltsville (2 Tenants)	1995	MD0120508940
USA Aberdeen - Edgewood	1986	MD2210020036
USA Aberdeen - Michaelsville	1986	MD3210021355
USA Fort George Meade	1997	MD9210020567
USN Patuxent Naval Air Station	1996	MD7170024536
Woodlawn Co. Landfill	1987	MDD980504344

Region 3 *cont.*

Pennsylvania	Date	EPA Facility ID
Austin Avenue Radiation Site	1993	PAD987341716
Boarhead Farms	1989	PAD047726161
Bridesburg Dump	1984	PAD980508402
Butler Mine Tunnel	1987	PAD980508451
Crater Resources, Inc./Keystone Coke Co./Alan Wood	1993	PAD980419097
Croydon TCE Spill	1986	PAD981035009
Douglassville Disposal	1987	PAD002384865
Elizabethtown Landfill	1989	PAD980539712
Enterprise Avenue	1984	PAD980552913
FMC Marcus Hook	1996	PAD987323458
Foote Mineral Co.	1993	PAD077087989
Hellertown Manufacturing Co.	1987	PAD002390748
Jack's Creek/Sitkin Smelting & Refining, Inc.	1989	PAD980829493
Keyser Ave. Borehole	1989	PAD981036049
Lower Darby Creek Area	***2003***	***PASFN0305521***
Metal Bank of America	1984	PAD046557096
Occidental Chemical Corp./Firestone Tire and Rubber Co.	1989	PAD980229298
Paoli Rail Yard	1987	PAD980692594
Publicker/Cuyahoga Wrecking Plant	1990	PAD981939200
Raymark	1996	PAD039017694
Recticon/Allied Steel	1989	PAD002353969
Revere Chemical Co.	1986	PAD051395499
Rohm and Haas Landfill	1986	PAD091637975
Salford Quarry	1997	PAD980693204
Tinicum National Environmental Center	1986	PA6143515447
Tysons Dump #1	1985	PAD980692024
UGI Corp. Gas Manufacturing Plant	1995	PAD980539126
USN Ships Parts Control Center	1996	PA3170022104
Wade (ABM)	1984	PAD980539407

Virginia		
Abex Corp.	1989	VAD980551683
Arrowhead Associates Inc./Scovill Corp.	1989	VAD042916361
Atlantic Wood Industries, Inc.	1987	VAD990710410

Region 3 *cont.*

Virginia *cont.*	**Date**	**EPA Facility ID**
C & R Battery Co., Inc.	1987	VAD049957913
Chisman Creek	1984	VAD980712913
Former Nansemond Ordnance Depot	2002	VAD123933426
Kim-Stan Landfill	2002	VAD077923449
Langley Air Force Base/NASA-Langley Research Center	1995	VA2800005033
Marine Corps Combat and Development Command	1995	VA1170024722
Naval Amphibious Base Little Creek	2002	VA5170022482
Naval Surface Warfare Center - Dahlgren	1993	VA7170024684
Naval Weapons Station - Yorktown	1993	VA8170024170
Saunders Supply Co.	1987	VAD003117389
USA Fort Eustis	1996	VA6210020321
USN Naval Shipyard Norfolk	1999	VA1170024813
USN Norfolk Naval Base	1997	VA6170061463

Region 4

Alabama	**Date**	**EPA Facility ID**
American Brass Inc.	2002	ALD981868466
Ciba-Geigy Corp. (McIntosh Plant)	1990	ALD001221902
Olin Corp. (McIntosh Plant)	1990	ALD008188708
Redwing Carriers, Inc. (Saraland)	1989	ALD980844385

Florida		
Agrico Chemical Co.	1989	FLD980221857
American Creosote Works (Pensacola Plant)	1984	FLD008161994
Broward County-21st Manor Dump	1992	FLD981930506
Chemform, Inc.	1990	FLD080174402
Harris Corp. (Palm Bay Plant)	1986	FLD000602334
Helena Chemical Co. (Tampa Plant)	1993	FLD053502696
MRI Corporation	1997	FLD088787585
Munisport Landfill	1984	FLD084535442
Pensacola Naval Air Station	1990	FL9170024567
Pickettville Road Landfill	1984	FLD980556351

Region 4 *cont.*

Florida *cont.*	**Date**	**EPA Facility ID**
Sixty-Second Street Dump	1984	FLD980728877
Solitron Microwave	2002	FLD045459526
Standard Auto Bumper Corp.	1989	FLD004126520
Stauffer Chemical Co. (Tampa Plant)	1993	FLD004092532
Stauffer Chemical Co. (Tarpon Springs)	1993	FLD010596013
USAF Tyndall Air Force Base	1997	FL1570024124
USN Air Station Cecil Field	1990	FL5170022474
USN NAS Jacksonville	1990	FL6170024412
USN Naval Air Station Whiting Field Site 5	1996	FL2170023244
Woodbury Chemical Co. (Princeton Plant)	1989	FLD004146346

Georgia		
Brunswick Wood Preserving	1997	GAD981024466
Camilla Wood Preserving Company	1999	GAD008212409
Terry Creek Dredge Spoil Areas/Hercules Outfall	1997	GAD982112658

Mississippi		
Chemfax, Inc.	1995	MSD008154486
Gautier Oil Co., Inc.	1989	MSD098596489

North Carolina		
ABC One Hour Cleaners	1989	NCD024644494
Camp Lejeune Military Res. (USNavy)	1989	NC6170022580
FCX, Inc. (Washington Plant)	1989	NCD981475932
New Hanover County Airport Burn Pit	1989	NCD981021157
Potter's Septic Tank Service Pits	1989	NCD981023260

South Carolina		
Geiger (C&M Oil)	1984	SCD980711279
Helena Chemical Co. Landfill	1989	SCD058753971
Koppers Co., Inc. (Charleston Plant)	1993	SCD980310239
Savannah River Site (USDOE)	1990	SC1890008989
Wamchem, Inc.	1984	SCD037405362

Region 5

Wisconsin	Date	EPA Facility ID
Fox River NRDA/PCB Releases	***2003***	***WI0001954841***

Region 6

Louisiana	Date	EPA Facility ID
Bayou Sorrel Site	1984	LAD980745541
Delatte Metals	2002	LAD052510344
Madisonville Creosote Works	1997	LAD981522998

Texas		
ALCOA (Point Comfort)/Lavaca Bay	1995	TXD008123168
Bailey Waste Disposal	1985	TXD980864649
Brio Refining, Inc.	1989	TXD980625453
Crystal Chemical Co.	1989	TXD990707010
Dixie Oil Processors, Inc.	1989	TXD089793046
French, Ltd.	1989	TXD980514814
Highlands Acid Pit	1989	TXD980514996
Malone Service Company, Inc.	2003	TXD980864789
Motco, Inc.	1984	TXD980629851
Patrick Bayou	***2003***	***TX0000605329***
Sikes Disposal Pits	1989	TXD980513956
State Marine	1999	TXD099801102
Tex-Tin Corp.	1989	TXD062113329

Region 9

American Somoa		
Taputimu Farm	1984	ASD980637656

California		
Alameda Naval Air Station	1989	CA2170023236
Camp Pendleton Marine Corps Base	1990	CA2170023533
Coast Wood Preserving	1984	CAD063015887
Concord Naval Weapons Station	1993	CA7170024528

Region 9 *cont.*

California *cont.*	**Date**	**EPA Facility ID**
Cooper Drum Co.	1993	CAD055753370
CTS Printex, Inc.	1989	CAD009212838
Del Amo Facility	1992	CAD029544731
Del Norte Pesticide Storage	1984	CAD000626176
El Toro Marine Corps Air Station	1989	CA6170023208
Fort Ord	1990	CA7210020676
GBF, Inc. Dump	1993	CAD980498562
Hewlett-Packard (620-640 Page Mill Road)	1989	CAD980884209
Hunters Point Naval Shipyard	1989	CA1170090087
Intersil Inc./Siemens Components	1989	CAD041472341
Iron Mountain Mine	1989	CAD980498612
Jasco Chemical Corp.	1989	CAD009103318
Liquid Gold Oil Corp.	1984	CAT000646208
McCormick & Baxter Creosoting Co.	1993	CAD009106527
MGM Brakes	1984	CAD000074120
Moffett Naval Air Station	1986	CA2170090078
Montrose Chemical Corp.	1985	CAD008242711
Pacific Coast Pipe Lines	1989	CAD980636781
Rhone-Poulenc, Inc./Zoecon Corp.	1985	CAT000611350
Riverbank Army Ammunition Plant	1989	CA7210020759
Sola Optical USA, Inc.	1989	CAD981171523
South Bay Asbestos Area	1985	CAD980894885
Travis Air Force Base	1990	CA5570024575

Guam		
Andersen Air Force Base	1993	GU6571999519

Hawaii		
Del Monte Corp. (Oahu Plantation)	1995	HID980637631
Pearl City Landfill	1984	HID980585178
Pearl Harbor Naval Station	1992	HI2170024341

Region 10

Alaska

Adak Naval Air Station	1993	AK4170024323
Elmendorf Air Force Base	1990	AK8570028649
Fort Richardson (US Army)	1995	AK6214522157
Klag Bay Site	2002	AK0002364768
Standard Steel & Metal Salvage Yard (USDOT)	1990	AKD980978787

Idaho

Blackbird Mine	1995	IDD980725832
Stibnite/Yellow Pine Mining Area	2003	IDD980665459

Oregon

Allied Plating, Inc.	1987	ORD009051442
Gould, Inc.	1984	ORD095003687
Martin-Marietta Aluminum Co.	1987	ORD052221025
McCormick & Baxter Creosoting Co. (Portland Plant)	1995	ORD009020603
Northwest Pipe & Casing Co.	1993	ORD980988307
Portland Harbor	2003	ORSFN1002155
Reynolds Metals Company	1996	ORD009412677
Rhone Poulenc Inc.	1984	ORD990659492
Teledyne Wah Chang	1985	ORD050955848
Union Pacific Railroad Co. Tie-Treating Plant	1990	ORD009049412

Washington

ALCOA (Vancouver Smelter)	1989	WAD009045279
American Crossarm & Conduit Co.	1989	WAD057311094
Bangor Naval Submarine Base	1990	WA5170027291
Bonneville Power Administration Ross Complex (USDOE)	1990	WA1891406349
Centralia Municipal Landfill	1989	WAD980836662
Commencement Bay, Near Shore/Tide Flats	1984	WAD980726368
Commencement Bay, South Tacoma Channel	1984	WAD980726301
Hamilton Island Landfill (USA/COE)	1992	WA5210890096
Hanford 100-Area (USDOE)	1989	WA3890090076
Harbor Island (Lead)	1984	WAD980722839
Jackson Park Housing Complex (USNavy)	1995	WA3170090044

Region 10 *cont.*

Washington *cont.*	**Date**	**EPA Facility ID**
Lower Duwamish Waterway	***2003***	***WA0002329803***
Naval Air Station, Whidbey Island (Ault Field)	1986	WA5170090059
Naval Air Station, Whidbey Island (Seaplane Base)	1986	WA6170090058
Northwest Transformer (South Harkness Street)	1989	WAD027315621
Oeser Company	1997	WAD008957243
Old Navy Dump/Manchester Lab (USEPA/NOAA)	1996	WA8680030931
Pacific Sound Resources (Wyckoff West Seattle)	1995	WAD009248287
Puget Sound Naval Shipyard Complex	1995	WA2170023418
Quendall Terminals	1985	WAD980639215
Seattle Municipal Landfill (Kent Highlands)	1989	WAD980639462
Tulalip Landfill	1992	WAD980639256
Western Processing Co., Inc.	1984	WAD009487513
Wyckoff Co./Eagle Harbor (2 areas)	1986	WAD009248295

Table 2. List of sites (938) and published reports, including Hazardous Waste Site Reports (WSR), Preliminary Natural Resource Surveys (PNRS'), U.S. Air Force reports (USAF), and hazardous waste sites that have been evaluated at the time of publication. Sites in bold italic are included in this volume.

Region 1

Connecticut	WSR	PNRS	USAF	EPA FACILITY ID
29 Pomperaug Road				CTD983884412
Army Engine Plant/Stratford				CT3213822924
Barkhamsted-New Hartford Landfill	1989			CTD980732333
Beacon Heights Landfill	1984			CTD072122062
Black Rock Shipyard				CT0001407865
Broad Brook Mill	***2003***			***CT0002055887***
Dexter Corp.				CTD001155761
Gallup's Quarry	1989			CTD108960972
Hamilton Standard				CTD001145341
Kellogg-Deering Well Field	1987			CTD980670814
Laurel Park, Inc.		1988		CTD980521165
Linemaster Switch Corp.				CTD001153923
New London Submarine Base	1990			CTD980906515
Nutmeg Valley Road				CTD980669261
Old Southington Landfill				CTD980670806
O'Sullivans Island	1984			CTD980667992
Pharmacia & Upjohn Company				CTD001168533
Precision Plating Corp.				CTD051316313
Raymark Industries, Inc.	1996			CTD001186618
Remington Arms Company Incorporated				CTD001453216
Revere Textile Prints Corp.				CTD004532610
Sikorsky Aircraft Division UTC				CTD001449784
Solvents Recovery Service of New England				CTD009717604
Yaworski Waste Lagoon	1985	1989		CTD009774969

Massachusetts				
Atlas Tack Corp.	1989			MAD001026319
Baird & McGuire				MAD001041987
Blackburn and Union Privileges	1993			MAD982191363

Region 1 *cont.*

Massachusetts *cont.*	**WSR**	**PNRS**	**USAF**	**EPA FACILITY ID**
Boston Gas Co. LNG Plt.				MAD087137329
Cannon Engineering Corp. (CEC)		1988		MAD079510780
Charles-George Reclamation Landfill	1987	1988		MAD003809266
Eastern Gas & Fuel				MAD981063142
Fort Devens				MA7210025154
Fort Devens-Sudbury Training Annex				MAD980520670
GE - Housatonic River	1999			MAD002084093
Groveland Wells	1987	1988		MAD980732317
Hanscom Field/Hanscom Air Force Base	1995			MA8570024424
Haverhill Municipal Landfill	1985			MAD980523336
Hocomonco Pond				MAD980732341
Holyoke Gas Works (Former)				MAD985298108
Industri-Plex	1987	1988		MAD076580950
Iron Horse Park				MAD051787323
Materials Technology Laboratory (USArmy)	1995			MA0213820939
Natick Laboratory Army Research, D&E Center	1995			MA1210020631
Naval Weapons Industrial Reserve Plant				MA6170023570
New Bedford Harbor				MA2690390024
New Bedford Site (Acushnet Estuary)	1984			MAD980731335
Norwood PCBs				MAD980670566
Nuclear Metals				MAD062166335
Nyanza Chemical Waste Dump	1987	1993		MAD990685422
Otis Air National Guard Base/Camp Edwards				MA2570024487
Plymouth Harbor/Cannon Engineering Corp.	1984	1990		MAD980525232
PSC Resources				MAD980731483
Re-Solve, Inc.				MAD980520621
Rose Disposal Pit				MAD980524169
Salem Acres		1991		MAD980525240
Shpack Landfill				MAD980503973
Silresim Chemical Corp.				MAD000192393
South Weymouth Naval Air Station	1995			MA2170022022
Sullivan's Ledge	1987	1989		MAD980731343
Sutton Brook Disposal Area				MAD980520696

Region 1 *cont.*

Massachusetts *cont.*	**WSR**	**PNRS**	**USAF**	**EPA FACILITY ID**
W. R. Grace and Co., Inc. (Acton Plant)				MAD001002252
Wells G&H		1990		MAD980732168
Zeneca Specialties				MAD051505477

Maine				
Brunswick Naval Air Station	1987	1991		ME8170022018
Eastern Surplus Co.				MED981073711
Eastland Woolen Mill	2002			MED980915474
Holtrachem				MED000242701
Loring Air Force Base				ME9570024522
Maine Yankee Atomic Power Company				MED071749329
McKin Company	1984			MED980524078
O'Connor Company	1984			MED980731475
O'Connor Company Main Office				MED018980227
Pinette's Salvage Yard				MED980732291
Portsmouth Naval Shipyard	1995			ME7170022019
Saco Municipal Landfill	1989			MED980504393
Saco Tannery Waste Pits				MED980520241
Union Chemical Co., Inc.				MED042143883
Winthrop Landfill				MED980504435

New Hampshire				
Auburn Road Landfill		1989		NHD980524086
Beede Waste Oil	1997			NHD018958140
Coakley Landfill	1985	1989		NHD064424153
Dover Municipal Landfill	1987	1990		NHD980520191
Fletcher's Paint Works & Storage	1989			NHD001079649
Gilson Road Tar Pit				NHD980503304
Grugnale Waste Disposal Site	1985			NHD069911030
Kearsarge Metallurgical Corp				NHD062002001
Keefe Environmental Services				NHD092059112
Mohawk Tannery				NHD981889629
Mottolo Pig Farm				NHD980503361

Region 1 *cont.*

New Hampshire *cont.*	**WSR**	**PNRS**	**USAF**	**EPA FACILITY ID**
New Hampshire Plating Co.	1992			NHD001091453
Ottati & Goss/Kingston Steel Drum				NHD990717647
Pease Air Force Base	1990	1991		NH7570024847
Savage Municipal Water Supply	1985			NHD980671002
Somersworth Sanitary Landfill				NHD980520225
South Municipal Water Supply Well				NHD980671069
Sylvester	1985			NHD099363541
Tibbetts Road				NHD989090469
Tinkham Garage				NHD062004569
Town Garage/Radio Beacon				NHD981063860

Rhode Island				
Central Landfill				RID980520183
Centredale Manor Restoration Project				RID981203755
Davis (GSR) Landfill				RID980731459
Davis Liquid Waste	1987			RID980523070
Davisville Naval Construction Battalion Center	1990	1994		RI6170022036
Landfill & Resource Recovery, Inc. (L&RR)				RID093212439
Newport Naval Education & Training Center	1990	1994		RI6170085470
Peterson/Puritan, Inc.	1987	1990		RID055176283
Picillo Farm	1987	1988		RID980579056
Rose Hill Regional Landfill	1989	1994		RID980521025
Stamina Mills, Inc.	1987	1990		RID980731442
West Kingston Town Dump/URI Disposal	1992			RID981063993
Western Sand & Gravel	1987			RID009764929

Vermont				
Bennington Municipal Sanitary Landfill				VTD981064223
BFI Sanitary Landfill (Rockingham)	1989			VTD980520092
Burgess Brothers Landfill				VTD003965415
Darling Hill Dump				VTD980520118
Elizabeth Mine	2003			VTD988366621
Ely Copper Mine	***2003***			***VTD988366571***

Region 1 *cont.*

Vermont *cont.*	**WSR**	**PNRS**	**USAF**	**EPA FACILITY ID**
Old Springfield Landfill	1987	1988		VTD000860239
Parker Sanitary Landfill				VTD981062441
Pine Street Canal				VTD980523062
Tansitor Electronics, Inc.				VTD000509174

Region 2

New Jersey	**WSR**	**PNRS**	**USAF**	**EPA FACILITY ID**
A.O. Polymer				NJD030253355
Albert Steel Drum	1984			NJD000525154
Allied Corp.				NJD980530604
American Cyanamid Co.	1985			NJD002173276
Asbestos Dump				NJD980654149
Atlantic Aviation Corp.				NJD011308988
Atlantic Development 11	1984			NJD980528731
Bog Creek Farm	1984	1992		NJD063157150
Brick Township Landfill	1984			NJD980505176
Bridgeport Rental & Oil Services		1990		NJD053292652
Brook Industrial Park	1989			NJD078251675
Burnt Fly Bog		1992		NJD980504997
Chemical Control	1984			NJD000607481
Chemical Insecticide Corp.	1990	1992		NJD980484653
Chemical Leaman Tank Lines, Inc.		1989		NJD047321443
Chemsol, Inc.				NJD980528889
Chipman Chemical Co.	1985			NJD980528897
Ciba-Geigy Corp.	1984	1989		NJD001502517
Cinnaminson Ground Water Contamination				NJD980785638
Combe Landfill South				NJD094966611
Cornell Dubilier Electronics, Inc.	1999			NJD981557879
Cosden Chemical Coatings Corp.	1987			NJD000565531
CPS/Madison Industries		1990		NJD002141190
Curcio Scrap Metal, Inc.	1987			NJD011717584
De Rewal Chemical Co.	1985			NJD980761373

Region 2 *cont.*

New Jersey *cont.*	**WSR**	**PNRS**	**USAF**	**EPA FACILITY ID**
Delilah Road				NJD980529002
Denzer & Schafer X-Ray Co.	1984	1992		NJD046644407
Diamond Alkali Co.	1984			NJD980528996
Diamond Head Oil Refinery Div.				NJD092226000
Diamond Shamrock Corp.				NJD002442408
D'Imperio Property				NJD980529416
E.I. Du Pont de Nemours				NJD002385730
Ellis Property				NJD980529085
Emmell's Septic Landfill	2002			NJD980772727
Evor Phillips Leasing		1992		NJD980654222
Ewan Property				NJD980761365
Federal Aviation Admin. Tech. Center	1990			NJ9690510020
Federal Creosote				NJ0001900281
Fort Dix (Landfill Site)				NJ2210020275
Franklin Burn Site				NJD986570992
Fried Industries				NJD041828906
GAF Corp.				NJD980771638
GAF Corp. - Gloucester City				NJD043292606
Garden State Cleaners Co.	1989			NJD053280160
Global Sanitary Landfill	1989	1991		NJD063160667
Goose Farm				NJD980530109
Grand Street Mercury				NJ0001327733
Helen Kramer Landfill		1990		NJD980505366
Hercules, Inc. (Gibbstown Plant)	1984	1993		NJD002349058
Higgins Disposal	1989			NJD053102232
Higgins Farm	1989			NJD981490261
Hopkins Farm				NJD980532840
Horseshoe Road	1984,1995			NJD980663678
Iceland Coin Laundry and Dry Cleaning				NJ0001360882
Ideal Cooperage Inc.	1984			NJD980532907
Imperial Oil Co., Inc./Champion Chemical				NJD980654099
Industrial Latex Corp.	1989			NJD981178411
ISP Environmental Services, Inc.				NJD002185973

Region 2 *cont.*

New Jersey *cont.*	**WSR**	**PNRS**	**USAF**	**EPA FACILITY ID**
Jackson Township Landfill	1984			NJD980505283
JIS Landfill				NJD097400998
Kauffman & Minteer, Inc.	1989			NJD002493054
Kin-Buc Landfill	1984	1990		NJD049860836
King of Prussia				NJD980505341
Koppers Co. Inc./Seaboard Plant	1984			NJD002445112
Krysowaty Farm	1985			NJD980529838
LCP Chemicals, Inc.	1999			NJD079303020
Lightman Drum Company				NJD014743678
Lipari Landfill				NJD980505416
Lone Pine Landfill		1992		NJD980505424
Lustrelon Inc.				NJD008388951
M&T Delisa Landfill				NJD085632164
Mannheim Avenue Dump				NJD980654180
Martin Aaron, Inc.	2003			NJD014623854
Matteo Brothers				NJD011770013
Maywood Chemical Co.				NJD980529762
McGuire Air Force Base				NJ0570024018
Metaltec/Aerosystems				NJD002517472
Middlesex Sampling Plant (DOE)	2002			NJ0890090012
Military Ocean Terminal (Landfill)				NJ0210022752
Mobil Chemical Co.	1984			NJD000606756
Monroe Township Landfill				NJD980505671
Myers Property				NJD980654198
Nascolite Corp.				NJD002362705
Naval Air Engineering Center				NJ7170023744
Naval Weapons Station Earle (Site A)				NJ0170022172
NL Industries	1984	1992		NJD061843249
Pepe Field				NJD980529598
Perth Amboy PCBs	1984			NJD980653901
PJP Landfill	1984	1990		NJD980505648
Pohatcong Valley Groundwater Contamination				NJD981179047

Region 2 *cont.*

New Jersey *cont.*	**WSR**	**PNRS**	**USAF**	**EPA FACILITY ID**
Pomona Oaks Residential Wells				NJD980769350
Price Landfill	1984	1993		NJD070281175
Puchack Well Field	1999			NJD981084767
Pulverizing Services				NJD980582142
PVSC Sanitary Landfill	1984			NJD980529671
Quanta Resources				NJD000606442
Raritan Arsenal				NJD986589190
Reich Farms				NJD980529713
Renora, Inc.				NJD070415005
Rhone-Poulenc Chemical Co.				NJD099293326
Ringwood Mines/Landfill				NJD980529739
Roebling Steel Co.	1984	1990		NJD073732257
Roosevelt Drive-In	1984			NJD030250484
Route 561 Dump	2002			NJ0000453514
Safety-Kleen (Rollins Environmental)				NJD053288239
Sayreville Landfill	1984	1990		NJD980505754
Scientific Chemical Processing	1984	1989		NJD070565403
Sharkey Landfill		1990		NJD980505762
Shield Alloy Corp.				NJD002365930
South Jersey Clothing Co.	1989			NJD980766828
Swope Oil & Chemical Co.				NJD041743220
Syncon Resins	1984	1992		NJD064263817
Tabernacle Drum Dump				NJD980761357
Troy Chemical				NJD002144517
United States Avenue Burn	2002			NJ0001120799
Universal Oil Products (Chemical Division)	1984			NJD002005106
Upper Deerfield Township Sanitary Landfill				NJD980761399
Ventron/Velsicol	1984			NJD980529879
Vineland Chemical Co., Inc.		1990		NJD002385664
W.R. Grace/Wayne Interim Storage (USDOE)				NJ1891837980
Waldick Aerospace Devices, Inc.		1990		NJD054981337
Welsbach & General Gas Mantle (Camden Radiation)				NJD986620995

Region 2 *cont.*

New Jersey *cont.*	WSR	PNRS	USAF	EPA FACILITY ID
White Chemical Corp.	1984			NJD001239185
White Chemical Corp.				NJD980755623
Williams Property	1984	1992		NJD980529945
Wilson Farm				NJD980532824
Witco Chemical Corp. (Oakland Plant)				NJD045653854
Woodland Route 72 Dump				NJD980505879
Woodland Route 532 Dump				NJD980505887
Zschiegner Refining Company	1999			NJD986643153

New York				
93rd Street School				NYD980780829
Action Anodizing, Plating, & Polishing Corp.	1989			NYD072366453
ALCOA Aggregation Site				NYD980506232
American Thermostat Co. Superfund Site				NYD002066330
Anchor Chemicals				NYD001485226
Applied Environmental Services	1985	1991		NYD980535652
BEC Trucking		1990		NYD980768675
Bioclinical Laboratories, Inc.				NYD980768683
Brewster Well Field				NYD980652275
Brookhaven National Laboratory (USDOE)	1990			NY7890008975
Byron Barrel & Drum				NYD980780670
C & J Disposal Leasing Co. Dump	1989			NYD981561954
Carroll & Dubies Sewage Disposal	1989			NYD010968014
Circuitron Corp.				NYD981184229
Claremont Polychemical				NYD002044584
Clothier Disposal				NYD000511576
Colesville Municipal Landfill				NYD980768691
Computer Circuits	2002			NYD125499673
Consolidated Iron and Metal				NY0002455756
Cornwall Lf.				NYD982276933
Croton Point Sanitary Landfill				NYD980508048
Dupont/Necco Park				NYD980532162
Ellenville Scrap Iron and Metal	***2003***			***NYSFN0204190***
Endicott Village Well Field				NYD980780746

Region 2 *cont.*

New York *cont.*	**WSR**	**PNRS**	**USAF**	**EPA FACILITY ID**
FMC Corp.				NYD000511857
Forest Glen Mobile Home Subdivision				NYD981560923
Fort Totten				NY2213720897
Fulton Terminals				NYD980593099
G.E. Moreau				NYD980528335
General Motors (Central Foundry Division)		1989		NYD091972554
Genzale Plating Co.				NYD002050110
Goldisc Recordings, Inc.				NYD980768717
Griffiss Air Force Base (Former)-AFBCA/OL-X				NY4571924451
Harbor at Hastings Associates				NY0001817097
Haviland Complex				NYD980785661
Hertel Landfill				NYD980780779
Hooker (102nd Street)				NYD980506810
Hooker Chemical/Ruco Polymer Corp.				NYD002920312
Hooker Hyde Park				NYD000831644
Hooker S Area				NYD980651087
Hudson Coal Tar				NYD987039104
Hudson River PCBs		1989		NYD980763841
Jackson Steel				NYD001344456
Johnstown City Landfill				NYD980506927
Jones Chemicals, Inc.				NYD000813428
Jones Sanitation	1987			NYD980534556
Lawrence Aviation Industries Inc				NYD002041531
Li Tungsten Corp.	1992	1993		NYD986882660
Liberty Heat Treating Co. Inc.				NYD053169694
Liberty Industrial Finishing	1985	1993		NYD000337295
Love Canal				NYD000606947
Ludlow Sand & Gravel				NYD013468939
Malta Rocket Fuel Area				NYD980535124
Marathon Battery Corp.	1984	1989		NYD010959757
Mattiace Petrochemical Co., Inc.	1989	1990		NYD000512459
Mercury Refining Inc.				NYD048148175
Nepera Chemical Co., Inc.				NYD002014595

Region 2 *cont.*

New York *cont.*	**WSR**	**PNRS**	**USAF**	**EPA FACILITY ID**
Newstead Site				NYD986883387
Niagara County Refuse				NYD000514257
Niagara Mohawk Power Co. (Saratoga Springs)				NYD980664361
North Sea Municipal Landfill	1985	1989		NYD980762520
Old Roosevelt Field Contaminated Groundwater Area	2003			NYSFN0204234
Pasley Solvents & Chemicals, Inc.				NYD991292004
Pennsylvania Ave. Municipal Landfill				NY6141790018
Peter Cooper	1999			NYD980530265
Pfohl Brothers Landfill				NYD986875979
Pollution Abatement Services				NYD000511659
Port Washington Landfill	1984	1989		NYD980654206
Preferred Plating Corp.				NYD980768774
Reynolds Metals Co.		1996		NYD002245967
Richardson Hill Road Landfill/Pond				NYD980507735
Rowe Industries Groundwater Contamination	1987	1991		NYD981486954
Sidney Landfill	1989			NYD980507677
Sinclair Refinery				NYD980535215
Smithtown Groundwater Contamination	2003			NY0002318889
Solvent Savers				NYD980421176
Stanton Cleaners Area Groundwater Contamination	2002			NYD047650197
Suffern Village Well Field				NYD980780878
Syosset Landfill				NYD000511360
Tri-Cities Barrel Co., Inc.				NYD980509285
Tronic Plating Co., Inc.				NYD002059517
Volney Municipal Landfill				NYD980509376
Wallkill Landfill				NYD980535496
Warwick Landfill				NYD980506679
Wide Beach Development				NYD980652259
York Oil Co.				NYD000511733

Region 2 *cont.*

Puerto Rico	WSR	PNRS	USAF	EPA FACILITY ID
Clear Ambient Services Co.	1984			PRD090416132
Frontera Creek	1984	1991		PRD980640965
GE Wiring Devices				PRD090282757
Juncos Landfill				PRD980512362
Naval Security Group Activity	1989	1991		PR4170027383
Upjohn Facility				PRD980301154
V&M/Albaladejo Farms	1997			PRD987366101
Vega Alta Public Supply Wells				PRD980763775
Vega Baja Solid Waste Disposal	2002			PRD980512669

Virgin Islands				
Island Chemical Corp./V.I. Chemical Corp.	1996			VID980651095
Tutu Wellfield	1993			VID982272569

Region 3

Washington, D.C.	WSR	PNRS	USAF	EPA FACILITY ID
Poplar Point Nursery				DCN000305662
Washington Gas Light Co.				DCD077797793
Washington Navy Yard	1999			DC9170024310

Delaware				
12th Street Landfill				DESFN0305510
Army Creek Landfill	1984			DED980494496
Chem-Solv, Inc.				DED980714141
Coker's Sanitation Service Landfills	1986	1990		DED980704860
Delaware City PVC Plant	1984			DE0001912757
Delaware Sand & Gravel	1984			DED000605972
Dover Air Force Base	1987	1989		DE8570024010
Dover Gas Light Co.	1987			DED980693550
E.I. Du Pont Newport Landfill	1987	1991,1992		DED980555122
Halby Chemical	1986	1990		DED980830954
Harvey & Knott Drum, Inc.				DED980713093

Region 3 *cont.*

Delaware *cont.*	**WSR**	**PNRS**	**USAF**	**EPA FACILITY ID**
Kent County Landfill	1989			DED980705727
Koppers Co. Facilities Site	1990			DED980552244
NCR Corp., Millsboro	1986			DED043958388
New Castle Spill Site	1984	1989		DED058980442
New Castle Steel	1984			DED980705255
NVF (Yorklyn)				DE0002014975
Old Brine Sludge Landfill	1984			DED980704894
Pigeon Point Landfill	1987			DED980494603
Sealand Limited	1989			DED981035520
Standard Chlorine Co.	1986			DED041212473
Sussex Co. Landfill #5	1989			DED980494637
Tybouts Corner Landfill	1984			DED000606079
Tyler Refrigeration Pit				DED980705545
Wildcat Landfill	1984			DED980704951

Maryland				
68th Street Dump/Industrial Enterprises	2002			MDD980918387
Allied Chemical				MDD069396711
Andrews Air Force Base	2003		1994	MD0570024000
Anne Arundel County Landfill	1989			MDD980705057
Bethlehem Steel Sparrows Point Plant				MDD053945432
Brandywine DRMO	***2003***			***MD9570024803***
Bush Valley Landfill	1989	1993		MDD980504195
Central Chemical Corporation	1999			MDD003061447
Chemical Metals Industries, Inc.				MDD980555478
Hawkins Pt / MD. Port Admin.				MDD000731356
Indian Head Naval Surface Warfare Center	1984	1997		MD7170024684
Joy Reclamation Co.	1984			MDD030321178
Kane & Lombard Street Drums				MDD980923783
Maryland Port Admin.				MDD030324073
Mid-Atlantic Wood Preservers, Inc.				MDD064882889
Naval Surface Warfare Center - White Oak				MD0170023444
Naval Training Center Bainbridge				MDD985397256

Region 3 *cont.*

Maryland *cont.*	**WSR**	**PNRS**	**USAF**	**EPA FACILITY ID**
Ordnance Products, Inc.	1995			MDD982364341
Sand, Gravel & Stone Site	1984	1990		MDD980705164
Southern Maryland Wood Treating	1987			MDD980704852
Spectron, Inc.		1997		MDD000218008
U.S. Agricultural Center Beltsville (2 Tenants)	1995			MD0120508940
USA Aberdeen - Edgewood	1986			MD2210020036
USA Aberdeen - Edgewood: Bush River Watershed		1994		MD2210020036
USA Aberdeen - Edgewood: Gun Powder River Watershed		1994		MD2210020036
USA Aberdeen - Michaelsville	1986			MD3210021355
USA Aberdeen - Michaelsville: Romney Creek Watershed		1994		MD3210021355
USA Fort George Meade	1997			MD9210020567
USN Patuxent Naval Air Station	1996			MD7170024536
Woodlawn Co. Landfill	1987			MDD980504344

Pennsylvania				
A.I.W. Frank/Mid-County Mustang				PAD004351003
Allied Signal Aerospace Co. Guidance and Control Systems				PAD003047974
Ambler Asbestos Piles				PAD000436436
American Electronic Lab, Inc.				PAD009224981
AMP Inc., Global Envir Services				PAD980693048
Austin Avenue Radiation Site	1993			PAD987341716
Bally Engineered Structure Incorporated				PAD061105128
Bell Landfill				PAD980705107
Berkley Products				PAD980538649
Berks Landfill Corp.				PAD000651810
Berks Sand Pit				PAD980691794
Boarhead Farms	1989			PAD047726161
Bridesburg Dump	1984			PAD980508402
Brodhead Creek				PAD980691760
Brown's Battery Breaking		1991		PAD980831812
Butler Mine Tunnel	1987			PAD980508451

Region 3 *cont.*

Pennsylvania *cont.*	**WSR**	**PNRS**	**USAF**	**EPA FACILITY ID**
Butz Landfill				PAD981034705
Crater Resources, Inc./Keystone Coke Co./ Alan Wood	1993			PAD980419097
Croydon TCE Spill	1986			PAD981035009
Delta Quarries & Disposal Inc./Stotler Landfill				PAD981038052
Douglassville Disposal	1987			PAD002384865
Drake Chemical				PAD003058047
Dublin TCE Site				PAD981740004
Eastern Diversified Metals				PAD980830533
Elizabethtown Landfill	1989			PAD980539712
Enterprise Avenue	1984			PAD980552913
FMC Marcus Hook	1996			PAD987323458
Foote Mineral Co.	1993			PAD077087989
GMT Microelectronics				PAD093730174
Hamburg Lead Site				PASFN0305567
Havertown PCP Site				PAD002338010
Hebelka Auto Salvage Yard				PAD980829329
Hellertown Manufacturing Co.	1987			PAD002390748
Henderson Road		1989		PAD009862939
Industrial Lane				PAD980508493
Jack's Creek/Sitkin Smelting & Refining, Inc.	1989			PAD980829493
Keyser Ave. Borehole	1989			PAD981036049
Kimberton				PAD980691703
Lackawanna Refuse				PAD980508667
Lansdowne Radiation Site				PAD980830921
Letterkenny Army Depot (PDO Area)				PA2210090054
Letterkenny Army Depot (SE Area)				PA6213820503
Lord-Shope Landfill				PAD980508931
Lower Darby Creek Area	***2003***			***PASFN0305521***
Malvern TCE				PAD014353445
Marjol Operation				PAD003041910
Metal Bank of America	1984	1990		PAD046557096
Metropolitan Mirror and Glass				PAD982366957

Region 3 *cont.*

Pennsylvania *cont.*	**WSR**	**PNRS**	**USAF**	**EPA FACILITY ID**
Middletown Air Field				PAD980538763
Mill Creek Dump				PAD980231690
Modern Sanitation Landfill				PAD980539068
Moyers Landfill				PAD980508766
MW Manufacturing				PAD980691372
National Vulcanized Fiber				PAD107214116
Naval Air Development Center (8 Areas)				PA6170024545
North Penn - Area 1				PAD096834494
North Penn - Area 2				PAD002342475
North Penn - Area 5				PAD980692693
North Penn - Area 6				PAD980926976
North Penn - Area 7				PAD002498632
North Penn - Area 12				PAD057152365
Novak Sanitary Landfill				PAD079160842
Occidental Chemical Corp./Firestone Tire and Rubber Co.	1989			PAD980229298
Old Wilmington Road GW Contamination				PAD981938939
Palmerton Zinc Pile				PAD002395887
Paoli Rail Yard	1987	1991		PAD980692594
Publicker/Cuyahoga Wrecking Plant	1990			PAD981939200
Raymark	1996			PAD039017694
Recticon/Allied Steel	1989			PAD002353969
Reeser's Landfill				PAD980829261
Revere Chemical Co.	1986			PAD051395499
Rohm and Haas Landfill	1986			PAD091637975
Sable Diamonds/US Metal & Coins				PAD982364234
Saegertown Industrial Area				PAD980692487
Salford Quarry	1997			PAD980693204
Shriver's Corner				PAD980830889
Stanley Kessler				PAD014269971
Strasburg Landfill				PAD000441337
Textron Lycoming				PAD003053709
Tinicum National Environmental Center	1986			PA6143515447

Region 3 *cont.*

Pennsylvania *cont.*	**WSR**	**PNRS**	**USAF**	**EPA FACILITY ID**
Tonolli Corp.				PAD073613663
Tysons Dump #1	1985			PAD980692024
UGI Corp. Gas Manufacturing Plant	1995			PAD980539126
USN Philadelphia Naval Shipyard				PA4170022418
USN Ships Parts Control Center	1996			PA3170022104
Wade (ABM)	1984			PAD980539407
Walsh Landfill				PAD980829527
Whitmoyer Laboratories				PAD003005014
Willow Grove Naval Air and Air Reserve Station				PAD987277837

Virginia				
Abex Corp.	1989			VAD980551683
Arrowhead Associates Inc./Scovill Corp.	1989			VAD042916361
Atlantic Wood Industries, Inc.	1987	1990		VAD990710410
C & R Battery Co., Inc.	1987			VAD049957913
Chisman Creek	1984			VAD980712913
Clarke L.A. & Son				VAD007972482
Former Nansemond Ordnance Depot	2002			VAD123933426
H & H Inc., Burn Pit				VAD980539878
Hampton Roads Welders Site				VAD988197133
Kim-Stan Landfill	2002			VAD077923449
Langley Air Force Base/ NASA Langley Research Center	1995	1997		VA2800005033
Marine Corps Combat and Development Command	1995			VA1170024722
NASA Wallops Island				VA8800010763
Naval Amphibious Base Little Creek	2002			VA5170022482
Naval Surface Warfare Center - Dahlgren	1993			VA7170024684
Naval Weapons Station - Yorktown	1993	1997		VA8170024170
NWS Yorktown - Cheatham Annex				VA3170024605
Rentokil, Inc. (Virginia Wood Preserving Division)				VAD071040752
Richmond, Fredericksburg & Potomac Railroad		1994		VAD020312013
Saunders Supply Co.	1987			VAD003117389

Region 3 *cont.*

Virginia *cont.*	**WSR**	**PNRS**	**USAF**	**EPA FACILITY ID**
St Juliens Creek Annex (U.S. Navy)				VA5170000181
Suffolk City Landfill				VAD980917983
U.S. Defense General Supply Center				VA3971520751
USA Fort Eustis	1996			VA6210020321
USA Woodbridge Research Facility				VA7210020981
USN Naval Shipyard Norfolk	1999			VA1170024813
USN Norfolk Naval Base	1997			VA6170061463
USN Radio Transmitting Facility				VA9170022488

Region 4

Alabama				
Alabama Wood Treating Corp Inc				ALD058221326
American Brass Inc.	2002			ALD981868466
Ciba-Geigy Corp. (McIntosh Plant)	1990			ALD001221902
Gulf Oil Co.				ALD000604249
Interstate Lead Co. (ILCO)				ALD041906173
Olin Corp. (McIntosh Plant)	1990			ALD008188708
Redwing Carriers, Inc. (Saraland)	1989			ALD980844385
Stauffer Chemical Co. (Cold Creek Plant)		1990		ALD095688875
Stauffer Chemical Co. (Lemoyne Plant)				ALD008161176
T.H. Agriculture & Nutrition (Montgomery)				ALD007454085
U.S. Naval Outlying Barin Field				AL2170024630
USAF Maxwell Air Force Base				AL0570024182

Florida				
Agrico Chemical Co.	1989			FLD980221857
Airco Plating Co.				FLD004145140
Alaric Area GW Plume				FLD012978862
American Creosote Works (Pensacola Plant)	1984	1989		FLD008161994
Anaconda Aluminum Co./Milgo Electronics				FLD020536538
Anodyne, Inc.				FLD981014368

Region 4 *cont.*

Florida *cont.*	**WSR**	**PNRS**	**USAF**	**EPA FACILITY ID**
B&B Chemical Co., Inc.				FLD004574190
Bay Drum				FLD088783865
Beulah Landfill				FLD980494660
BMI-Textron				FLD052172954
Broward County-21st Manor Dump	1992			FLD981930506
Cabot/Koppers				FLD980709356
Cascade Park Gasification Plant				FLD981931959
Chemform, Inc.	1990			FLD080174402
Chevron Chemical Co. (Ortho Division)				FLD004064242
Coleman-Evans Wood Preserving Co.				FLD991279894
Cypress Garden Skis				FLD029505161
Davie Landfill				FLD980602288
Dubose Oil Products Co.				FLD000833368
Florida Petroleum Processors				FLD984184127
Florida Steel Corp.				FLD050432251
Gardinier Inc./ Ft Meade Mine				FLD000827428
Harris Corp. (Palm Bay Plant)	1986	1990		FLD000602334
Helena Chemical Co. (Tampa Plant)	1993			FLD053502696
Hipps Road Landfill				FLD980709802
Hollingsworth Solderless Terminal				FLD004119681
Kassauf-Kimerling Battery Disposal		1989		FLD980727820
Madison County Sanitary Landfill				FLD981019235
MRI Corporation	1997			FLD088787585
Munisport Landfill	1984			FLD084535442
Normandy Park Apartments				FLD984229773
Peak Oil Co./Bay Drum Co.				FLD004091807
Peele-Dixie Wellfield Site				FLD984259374
Pensacola Naval Air Station	1990			FL9170024567
Pepper Steel & Alloys, Inc.				FLD032544587
Pickettville Road Landfill	1984	1990		FLD980556351
Piper Aircraft/Vero Beach Water & Sewer				FLD004054284
Pleasant Grove Landfill				FLD984169763
Reeves SE Corp Southeastern Wire Div.				FLD000824888

Region 4 *cont.*

Florida *cont.*	**WSR**	**PNRS**	**USAF**	**EPA FACILITY ID**
Reeves Southeastern Galvanizing Corp.				FLD000824896
Sapp Battery Salvage		1989		FLD980602882
Schuylkill Metals Corp.				FLD062794003
Sherwood Medical Industries				FLD043861392
Sixty-Second Street Dump	1984	1989		FLD980728877
Solitron Devices, Inc.				FLD032845778
Solitron Microwave	2002			FLD045459526
Southern Solvents, Inc				FL0001209840
St. Augustine Gas Company				FLD101835528
Standard Auto Bumper Corp.	1989			FLD004126520
Stauffer Chemical Co. (Tampa Plant)	1993			FLD004092532
Stauffer Chemical Co. (Tarpon Springs)	1993			FLD010596013
Sydney Mine Sludge Ponds		1989		FLD000648055
Taylor Road Landfill				FLD980494959
Trans Circuits, Inc.				FLD091471904
U.S. NASA Kennedy Space Center				FL6800014585
USAF Cape Canaveral AFB				FL2800016121
USAF Eglin AFB Armament Division				FL8570024366
USAF Homestead AFB				FL7570024037
USAF MacDill AFB				FL2971590003
USAF NAS Key West (Boca Chica)				FL6170022952
USAF Patrick AFB				FL2570024404
USAF Tyndall Air Force Base	1997			FL1570024124
USCG Station Key West				FL1690331300
USN Air Station Cecil Field	1990			FL5170022474
USN NAS Jacksonville	1990			FL6170024412
USN Naval Air Station Mayport				FL9170024260
USN Naval Air Station Whiting Field Site 5	1996			FL2170023244
USN Naval Coastal Systems Ctr.				FL8170023792
Whitehouse Oil Pits				FLD980602767
Wilson Concepts of Florida, Inc.				FLD041184383
Wingate Road Municipal Incinerator Dump				FLD981021470

Region 4 *cont.*

Florida *cont.*	**WSR**	**PNRS**	**USAF**	**EPA FACILITY ID**
Woodbury Chemical Co. (Princeton Plant)	1989			FLD004146346
Zellwood Ground Water Contamination				FLD049985302

Georgia				
Brunswick Wood Preserving	1997			GAD981024466
Camilla Wood Preserving Company	1999			GAD008212409
Cedartown Industries, Inc.				GAD095840674
Cedartown Municipal Landfill				GAD980495402
Diamond Shamrock Corp. Landfill				GAD990741092
Firestone Tire & Rubber Co. (Albany Plant)				GAD990855074
Hercules 009 Landfill				GAD980556906
Hercules Inc.				GAD004065520
International Paper Co.				GAD000827444
LCP Chemicals Georgia Inc		1995		GAD099303182
Marine Corps Logistics Base				GA7170023694
Mathis Brothers Landfill				GAD980838619
Monsanto Corp. (Augusta Plant)				GAD001700699
New Sterling Landfill				GAD980495451
Robins Air Force Base				GA1570024330
T.H. Agriculture & Nutrition (Albany)				GAD042101261
Terry Creek Dredge Spoil Areas/ Hercules Outfall	1997			GAD982112658
Woolfolk Chemical Works, Inc.				GAD003269578

Mississippi				
Chemfax, Inc.	1995			MSD008154486
Davis Timber Company				MSD046497012
Gautier Oil Co., Inc.	1989			MSD098596489
Naval Construction Battalion Center				MS2170022626
Southeast Mississippi Industrial Council				MSD980403240
Tennessee Gas Pipeline/CS 530				MSD991277542
USAF Keesler AFB				MS2570024164

Region 4 *cont.*

North Carolina	WSR	PNRS	USAF	EPA FACILITY ID
ABC One Hour Cleaners	1989			NCD024644494
Camp Lejeune Military Res. (U.S. Navy)	1989			NC6170022580
Charles Macon Lagoon & Drum Storage				NCD980840409
Cherry Point Marine Corps Air Station				NC1170027261
Dockery Property				NCD980840342
FCX, Inc. (Washington Plant)	1989			NCD981475932
Geigy Chemical Corp. (Aberdeen Plant)				NCD981927502
General Electric Co./Shepherd Farm				NCD079044426
Georgia-Pacific Corporation Hardwood Sawmill				NCD000813592
Koppers Co. Inc. (Morrisville Plant)				NCD003200383
National Starch & Chemical Corp.				NCD991278953
New Hanover County Airport Burn Pit	1989			NCD981021157
Old ATC Refinery				NCD986186518
Potter's Septic Tank Service Pits	1989			NCD981023260
Reasor Chemical Company				NCD986187094
Triangle Pacific Corp. IXL Division				NCD087336335
Weyerhaeuser Company Plymouth Wood Treating Plant				NCD991278540

South Carolina	WSR	PNRS	USAF	EPA FACILITY ID
Allied Terminals Incorporated				SC0000861054
Beaufort County Landfill				SCD980844260
Calhoun Park Area		1993		SCD987581337
Carolawn, Inc.				SCD980558316
Charleston Landfill				SCD980846034
Columbia Nitrogen				SC0001040393
Geiger (C&M Oil)	1984			SCD980711279
Helena Chemical Co. Landfill	1989			SCD058753971
International Paper Co.				SCD055915086
Kalama Specialty Chemicals				SCD094995503
Koppers Co., Inc. (Charleston Plant)	1993			SCD980310239
Leonard Chemical Co., Inc				SCD991279324
Lexington County Landfill Area				SCD980558043

Region 4 *cont.*

South Carolina *cont.*	**WSR**	**PNRS**	**USAF**	**EPA FACILITY ID**
Macalloy Corporation				SCD003360476
Naval Shipyard - Charleston				SC0170022560
Naval Weapons Station - Charleston				SC8170022620
Palmetto Recycling, Inc.				SCD037398120
Para-Chem Southern, Inc.				SCD002601656
Parris Island Marine Corps Recruit Depot		1995		SC6170022762
Savannah River Site (USDOE)	1990			SC1890008989
USDOI Charleston Harbor Site		1993		SCD987572674
Wamchem, Inc.	1984			SCD037405362

Region 5

Illinois	
Fort Sheridan	IL8214020838
Great Lakes Naval Training Center	NA
Outboard Marine Corp.	ILD000802827
Yeoman Creek Landfill	ILD980500102

Indiana	
Grand Calumet/IHC Area of Concern	IND980500573

Michigan	
Allied Paper/Portage Creek/Kalamazoo River	MID006007306
Cannelton Industries	MID980678627
Deer Lake	MID980679799
Ford Motor Co.	MID005057005
Hooker Montague Plant	MID006014906
Manistique River/Harbor, Area of Concern	MID981192628
Muskegon Chem Co.	MID072569510
Packaging Corp. of America	MID980794747
Shiawassee River	MID980794473
Thunder Bay	MID985640630
Torch Lake	MID980901946

Region 5 *cont.*

Minnesota	WSR	PNRS	USAF	EPA FACILITY ID
St Louis River/Interlake				MND039045430

Ohio				
Ashtabula River				NA
Fields Brook				OHD980614572

Wisconsin				
Ashland/NSP Lakefront Site				WISFN0507952
Boerke Site				WID981189632
Fort Howard Paper Co. Lagoons				WID006136659
Fort Howard Steel Incorporated				WID006141402
Fox River NRDA/PCB Releases	***2003***			***WI0001954841***
Kohler Co. Landfill				WID006073225
Moss-American (Kerr-McGee Oil Co.)				WID039052626
Sheboygan Harbor & River				WID980996367

Region 6

Louisiana				
American Creosote Works, Inc. (Winnfield Plant)				LAD000239814
Bayou Bonfouca				LAD980745632
Bayou d'Inde				LAD981916570
Bayou Sorrel Site	1984			LAD980745541
Bayou Trepagnier (Shell Oil Co./NORCO Mfg. Complex)				LAD008186579
Bayou Verdine, Occidental Chemical				LAD985195346
Calcasieu Estuary				LA0002368173
Calcasieu Parish Landfill				LAD980501423
Delatte Metals	2002			LAD052510344
Devil's Swamp Lake				LAD985202464
Gulf State Utilities-North Ryan Street				LAD985169317
Madisonville Creosote Works	1997			LAD981522998
Mallard Bay Landing Bulk Plant				LA0000187518

Region 6 *cont.*

Louisiana *cont.*	**WSR**	**PNRS**	**USAF**	**EPA FACILITY ID**
New Orleans Naval Air Station				LA6170022788
Petro-Processors of Louisiana, Inc.				LAD057482713
Ponchatoula Battery Company				LAD062644232
PPG Industries Inc.				LAD008086506
Southern Shipbuilding Corp.				LAD008149015

Texas				
ALCOA (Point Comfort)/Lavaca Bay	1995			TXD008123168
Bailey Waste Disposal	1985	1989		TXD980864649
Brio Refining, Inc.	1989	1989		TXD980625453
Chevron Products Co.				TXD008090409
Corpus Christi Naval Air Station				TX7170022787
Crystal Chemical Co.	1989	1989		TXD990707010
Dixie Oil Processors, Inc.	1989	1989		TXD089793046
French, Ltd.	1989	1989		TXD980514814
Geneva Industries/Fuhrmann Energy				TXD980748453
Harris (Farley Street)				TXD980745582
Highlands Acid Pit	1989			TXD980514996
International Creosoting				TXD980625636
Malone Service Company, Inc.	2003			TXD980864789
Motco, Inc.	1984			TXD980629851
North Cavalcade Street				TXD980873343
Palmer Barge Line				TXD068104561
Patrick Bayou	***2003***			***TX0000605329***
Petro-Chemical Systems (Turtle Bayou)				TXD980873350
Sheridan Disposal Services				TXD062132147
Sikes Disposal Pits	1989			TXD980513956
South Cavalcade Street				TXD980810386
Sprague Road Groundwater				TX0001407444
Star Lake Canal Site - Port Neches				TX0001414341
State Marine	1999			TXD099801102
Tex-Tin Corp.	1989			TXD062113329
Triangle Chemical Co.				TXD055143705

Region 9

American Somoa	WSR	PNRS	USAF	EPA FACILITY ID
Taputimu Farm	1984			ASD980637656

California				
AERA/SWEPI (Former Hercules Gas Plant)				NA
Aerojet General Corp.				CAD980358832
Alameda Naval Air Station	1989			CA2170023236
Bolsa Chica Lowlands				NA
Brown & Bryant, Inc. (Arvin Plant)				CAD052384021
Camp Pendleton Marine Corps Base	1990	1992		CA2170023533
Caretaker Site Office Treasure Island				CA7170023330
Casmalia Resources				CAD020748125
Chevron USA Richmond Ref.				CAD009114919
Coast Wood Preserving	1984			CAD063015887
Concord Naval Weapons Station	1989,1993	1990		CA7170024528
Cooper Drum Co.	1993			CAD055753370
Crazy Horse Sanitary Landfill				CAD980498455
CTS Printex, Inc.	1989			CAD009212838
Del Amo Facility	1992			CAD029544731
Del Norte Pesticide Storage	1984			CAD000626176
El Toro Marine Corps Air Station	1989			CA6170023208
Fairchild Semiconductor Corp. (Mt View)				CAD095989778
Farallon Islands		1990		CAD981159585
Fleet Industrial Supply Center Oakland				CA4170090027
Fort Ord	1990	1992		CA7210020676
Fresno Municipal Sanitary Landfill				CAD980636914
GBF, Inc. Dump	1989,1993			CAD980498562
Gray Eagle Mine				CAD000629923
Halaco Engineering Co.				CAD009688052
Hamilton Army Airfield				CA3570024288
Hewlett-Packard (620-640 Page Mill Road)	1989			CAD980884209
Hexcel Corporation				CAD058783952
Hunters Point Naval Shipyard	1989	1989		CA1170090087
Intersil Inc./Siemens Components	1989			CAD041472341
Iron Mountain Mine	1989	1989		CAD980498612

Region 9 *cont.*

California ***cont.***	**WSR**	**PNRS**	**USAF**	**EPA FACILITY ID**
J.H. Baxter & Co.				CAD000625731
Jasco Chemical Corp.	1989			CAD009103318
Jet Propulsion Laboratory (NASA)				CA9800013030
Kaiser Steel Corp. (Fontana Plant)				CAD008274938
Kearney-KPF				CAD981429715
Liquid Gold Oil Corp.	1984			CAT000646208
Long Beach Naval Station				CA2170023194
Louisiana-Pacific Corp.				CAD065021594
Mare Island Naval Shipyard				CA7170024775
McClellan Air Force Base (Western Parcels)				NA
McCormick & Baxter Creosoting Co.	1993			CAD009106527
McNamara & Peepe Sawmill				CA0001097088
M-E-W Study Area				CAD982463812
MGM Brakes	1984			CAD000074120
Modesto Ground Water Contamination				CAD981997752
Moffett Naval Air Station	1986			CA2170090078
Montrose Chemical Corp.	1985			CAD008242711
NASSCO/SW Marine Shipyard				NA
Naval Air Station Lemore				CA3170024381
Naval Shipyard Long Beach				CA1170090483
Naval Station San Diego				NA
Naval Supply Center Pt Molate Site				CA0170090021
Naval Training Center (Boat Channel)				NA
Newmark Ground Water Contamination				CAD981434517
North Island Naval Air Station				CA7170090016
Oakland Army Base				CA4210020661
Oakland Naval Supply Ctr./Alameda Fac				CA1170090012
Pacific Coast Pipe Lines	1989			CAD980636781
Pacific Missile Test Center				CA9170027271
Palos Verdes Shelf				NA
Playa Vista Development Project				CAD982418139
Point Loma Naval Complex				CA1170090236
Port Hueneme Naval Constr. Battalion Ctr.				CA6170023323

Region 9 *cont.*

California *cont.*	**WSR**	**PNRS**	**USAF**	**EPA FACILITY ID**
Presidio of San Francisco				CA7210020791
Ralph Gray Trucking Co.				CAD981995947
Redwood Shore Landfill				CAD982462343
Rhone-Poulenc, Inc./Zoecon Corp.	1985			CAT000611350
Riverbank Army Ammunition Plant	1989			CA7210020759
Romic Chem Corp.				CAD009452657
Sacramento Army Depot				CA0210020780
San Diego Naval Training Center				CA7170090057
Seal Beach Naval Weapons Station				CA0170024491
Shell Oil Co. Martinez				CAD009164021
Simpson-Shasta Ranch				CAD980637482
Sola Optical USA, Inc.	1989			CAD981171523
Solar Turbines, Inc.				CAD008314908
Solvent Service, Inc.				CAD059494310
South Bay Asbestos Area	1985			CAD980894885
Spectra-Physics, Inc.				CAD009138488
Sulphur Bank Mercury Mine				CAD980893275
Synertek, Inc. (Building 1)				CAD990832735
Tosco Corp Avon Ref.				CAD000072751
Travis Air Force Base	1990			CA5570024575
TRW Microwave, Inc (Building 825)				CAD009159088
United Heckathorn Co.				CAD981436363
Vandenberg AFB			1994	CA9570025149

Federated States of Micronesia				
PCB Wastes				FMD980637987

Guam				
Andersen Air Force Base	1993			GU6571999519
Apra Harbor Naval Complex				GU7170090008
Naval Air Station Agana				GU0170027320
Naval Sta. Guam				GU7170027323

Region 9 *cont.*

Hawaii	WSR	PNRS	USAF	EPA FACILITY ID
ABC Chem Corp.				HID033233305
Barbers Point Naval Air Station				HI1170024326
Bellows Air Force Station				HI3570028719
Chemwood Treatment Co., Inc.				HID981424138
Del Monte Corp. (Oahu Plantation)	1995			HID980637631
Hawaiian Western Steel Limited				HID981581788
Hickam Air Force Base				HI8570028722
Honolulu Skeet Club				HI0000768382
Kahoolawe Island				HI6170090074
Kailua-Kona Landfill				HID980497184
Kapaa Landfill				HID980497176
Kewalo Incin Ash Dump				HID980497226
Kure Atoll, U.S. Coast Guard				HID984470039
Marine Corps Base Hawaii				HI6170022762
Naval Submarine Base				HI3170024340
Pearl City Landfill	1984			HID980585178
Pearl Harbor Naval Complex				HI4170090076
Pearl Harbor Naval Station	1992	1993		HI2170024341
Tern Island				NA
USCG Base Honolulu				HID984469890
Waiakea Pond/Hawaiian Cane Prdts Plant		1990		HID982400475

U.S. Minor Outlying Islands	WSR	PNRS	USAF	EPA FACILITY ID
Johnston Atoll				UM4210090003
Midway Island Naval Air Station				UM6170027332
Wake Island Air Field				HI0570090001

Region 10

Alaska	WSR	PNRS	USAF	EPA FACILITY ID
Adak Naval Air Station	1993			AK4170024323
Alaska Pulp Corp.		1995		AKD009252487

Region 10 *cont.*

Alaska *cont.*	WSR	PNRS	USAF	EPA FACILITY ID
Dutch Harbor Sediment Site				AKSFN1002080
Elmendorf Air Force Base	1990	1990	1994	AK8570028649
Fort Richardson (US Army)	1995			AK6214522157
Fort Wainwright				AK6210022426
Kennicott Copper Mining Co.				AKD983073123
Ketchikan Pulp Co.		1998		AKD009252230
Klag Bay Site	2002			AK0002364768
Metlakatla Indian Community (Brownfield Site)				NA
Standard Steel & Metals Salvage Yard (USDOT)	1990	1990		AKD980978787
USAF Eareckson AFS				AK9570028705
USAF King Salmon Airport		1999		AK3570028669
USDOC NOAA National Marine Fisheries Service				AK0131490021
USNAVY Barrow Naval Arctic Research Lab				AK2170027245

Idaho				
Blackbird Mine	1995	1994		IDD980725832
Grouse Creek Mine				IDD000643254
St Maries Creosote				IDSFN1002095
Stibnite/Yellow Pine Mining Area	2003			IDD980665459

Oregon				
Allied Plating, Inc.	1987	1988		ORD009051442
East Multnomah County Ground Water Contamination				ORD987185030
Gould, Inc.	1984	1988		ORD095003687
Hoy's Marine LLC				ORD987190840
Joseph Forest Products				ORD068782820
Martin-Marietta Aluminum Co.	1987	1988		ORD052221025
McCormick & Baxter Creosoting Co. (Portland Plant)	1995	1995		ORD009020603
Northwest Pipe & Casing Co.	1993			ORD980988307
Port of Coos Bay - Charleston Boatyard				OR0001389972
Portland Harbor	2003	1999		ORSFN1002155
Reynolds Metals Company	1996			ORD009412677
Rhone Poulenc Inc.	1984			ORD990659492

Region 10 *cont.*

Oregon *cont.*	**WSR**	**PNRS**	**USAF**	**EPA FACILITY ID**
Taylor Lumber and Treating, Inc.		1991		ORD009042532
Teledyne Wah Chang	1985	1988		ORD050955848
Union Pacific Railroad Co. Tie-Treating Plant	1990	1990		ORD009049412

Washington				
ALCOA (Vancouver Smelter)	1989	1989		WAD009045279
American Crossarm & Conduit Co.	1989	1988		WAD057311094
Asarco Inc.				WAD010187896
Bangor Naval Submarine Base	1990	1991		WA5170027291
Bangor Ordnance Disposal (USNavy)		1991		WA7170027265
Boeing Company Plant 2				WAD009256819
Bonneville Power Administration Ross Complex (USDOE)	1990	1990		WA1891406349
Boomsnub/Airco				WAD009624453
Centralia Municipal Landfill	1989	1989		WAD980836662
Commencement Bay, Near Shore/Tide Flats	1984	1988		WAD980726368
Commencement Bay, South Tacoma Channel	1984			WAD980726301
Hamilton /Labree Roads GW Contamination				WASFN1002174
Hamilton Island Landfill (USA/COE)	1992	1991		WA5210890096
Hanford 100-Area (USDOE)	1989	1988		WA3890090076
Hansville Landfill				WAD000711804
Harbor Island (Lead)	1984	1989		WAD980722839
Jackson Park Housing Complex (USNavy)	1995			WA3170090044
Lower Duwamish Waterway	***2003***			***WA0002329803***
Naval Air Station, Whidbey Island (Ault Field)	1986	1989		WA5170090059
Naval Air Station, Whidbey Island (Seaplane Base)	1986	1989		WA6170090058
Naval Undersea Warfare Engineering Station (4 Waste Areas)				WA1170023419
Northwest Transformer (South Harkness Street)	1989	1988		WAD027315621
Oeser Company	1997			WAD008957243
Old Navy Dump/Manchester Lab (USEPA/NOAA)	1996	1995		WA8680030931
Olympic View Sanitary Landfill				WAD042804971
Pacific Sound Resources (Wyckoff West Seattle)	1995	1992		WAD009248287

Region 10 *cont.*

Washington *cont.*	**WSR**	**PNRS**	**USAF**	**EPA FACILITY ID**
Pacific Wood Treating				WAD009422411
Palermo Well Field Groundwater Contamination				WA0000026534
Puget Sound Naval Shipyard Complex	1995			WA2170023418
Quendall Terminals	1985			WAD980639215
Rayonier Inc Port Angeles Mill				WAD000490169
Seattle Municipal Landfill (Kent Highlands)	1989	1988		WAD980639462
South Tacoma Field				WAD980724173
Strandley/Manning Site		1992		WAD980976328
Tulalip Landfill	1992	1991		WAD980639256
United Marine Shipyards				WAD009264284
U.S. Navy Puget Sound FISC Dept.				WA2170023426
Vancouver Water Station #1 Contamination				WAD988519708
Washington Natural Gas - Seattle Plant		1996		WAD980639280
Western Processing Co., Inc.	1984			WAD009487513
Weyerhaeuser Co. Landfill				WAD009041450
WPNSTA Seal Beach Det. Port Hadlock		1989,1995		WA4170090001
Wyckoff Co./Eagle Harbor (2 areas)	1986	1988		WAD009248295

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