Coastal Hazardous Waste Site REVIEWS

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EDITORS

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Introduction

This report identifies uncontrolled hazardous waste sites that could pose a threat to natural resources for which the National Oceanic and Atmospheric Administration (NOAA) acts as a trustee. NOAA carries out responsibilities as a Federal trustee for natural resources under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan. As a trustee, NOAA is responsible for identifying sites that could affect natural resources, determining the potential for injury to the resources, evaluating cleanup alternatives, and carrying out restoration actions. NOAA works with the U.S. Environmental Protection Agency (EPA) when identifying and assessing risks to coastal resources from hazardous waste sites and developing strategies to minimize those risks.

NOAA regularly conducts evaluations of hazardous waste sites proposed for addition to the National Priorities List[1] (NPL) by EPA. The waste sites evaluated in this report are drawn from the list of all sites, including Federal facilities, proposed for inclusion on the NPL. The sites covered in this report were either proposed for inclusion on the National Priorities List by EPA in Update #11, or listed in earlier NPL updates but not covered in previous NOAA reports.

The sites of concern to NOAA are located in counties bordering the Atlantic Ocean, Pacific Ocean, and Gulf of Mexico, or are near inland water bodies that support anadromous fish populations. Not all sites in coastal states will affect NOAA trust resources. To select sites on the National Priorities List for initial investigation, only sites in coastal counties or sites bordering important anadromous fish habitat are considered to have potential to affect trust resources. This initial selection criteria works better in some states than in others. It is dependent on topography, hydrography, and the nature of political subdivisions.

The information in the hazardous waste site reports provides an overall guide to the potential for injury to NOAA trust resources resulting from a site. This information is used by NOAA to establish priorities for investigating sites. Sites that appear to pose ongoing problems will be followed by a NOAA Coastal Resource Coordinator (CRC) in the appropriate region. The CRC communicates concerns about ecological impact to EPA, reviews sampling and monitoring plans for the site, and participates in planning and setting objectives for remedial actions to clean up the site. NOAA works with other trustees to plan a coordinated approach for remedial action that protects all natural resources. Other Federal and state trustees can use the hazardous waste site reports to help determine the risk of injury to their trust resources. EPA uses the site reports to help identify the types of information that may be necessary to complete an environmental assessment of the site.

Coastal site reports are often NOAA's first examination of a site. Sites with potential to impact NOAA resources may be followed by a more in-depth Preliminary Natural Resource Survey.

Eleven coastal sites were identified in 1992 using this selection method. Further investigation showed that three of these sites were not likely to affect NOAA trust resources. Coastal hazardous waste site reports were completed for the remaining eight sites. A total of 244 coastal hazardous waste sites have been reviewed by NOAA since 1984 (published in April 1984,[2] June 1985,[3] April 1986,[4] June 1987,[5] March 1989[6], June 1990[7], and this report). A total of 109 PNRSs have been conducted since 1988 (see table below). The current reporting brings the total number of sites considered by NOAA to 571.

Year	NPL Reports	PNRS
1984	73	
1985	20	
1986	15	
1987	33	
1988		17
1989	71	33
1990	24	32
1991		16
1992	8	11

The 1992 coastal hazardous waste site reviews contain three major sections. The "Site Exposure Potential" section describes activities at the site that resulted in the release of contaminants, local topography, and contaminant migration pathways. The "NOAA Trust Habitats and Species" section describes the types of habitats and species potentially injured by releases from the site. The life stages of organisms using habitats near the site, and commercial and recreational fisheries, are discussed. The "Site-Related Contamination" section identifies contaminants of concern to NOAA, the partitioning of the contaminants in the environment, and the concentrations at which the contaminants are found.

Tables and Screening Values

Most of these reports contain tables of contaminants measured at the site. These tables were formulated to highlight contaminants that represent a potential problem, and to focus our concerns on only a few of the many contaminants normally present at a waste site. Data presented in tables were screened against standard comparison values, depending on the media of the sample. Screening values used are ambient water quality criteria[1], selected soil averages[2], and Effective Range-Low (ER-L) values[3]. Because releases to the environment from hazardous waste sites can span many years, we are concerned about chronic impacts. Therefore, we typically make comparisons with the lower standard value (i.e., chronic AWQC).

Very little information exists regarding the toxicity of contaminated soil or sediment. No criteria similar to the AWQC are available. Sediment concentrations were screened by comparison with the ER-L reported by Long and Morgan[10]. The ER-L value is the concentration equivalent to that reported at the lower 10 percentile of the screened sediment toxicity data. As such, it represents the low end of the range of concentrations at which effects were observed in the studies compiled by those authors. Although freshwater studies were included, predominantly marine and estuarine toxicity studies were used for generating ER-L values.

Soil samples were compared to selected average levels from Lindsay (1979) as reported by EPA in 1983 in Hazardous Waste Land Treatment. These values were averaged from a data set (selected by Lindsay) from soil throughout the entire U.S. Ideally, reference values for soil would be calculated on a regional basis, from a data set large enough to give a value representative of the area. In the absence of such data, the values from Lindsay were used as a reference for comparison purposes only.

All of the hazardous waste sites considered by NOAA in this review are contained in the Table of Contents, including the name and location of the site and the beginning page number of the site report. Table 1 lists all the sites at which

NOAA has been involved that have the potential to affect trust resources (571), as of September 1992. Table 2 lists acronyms, abbreviations, and terms commonly used in these waste site reports.

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[1]National Oil and Hazardous Substances Pollution Contingency Plan, *40 CFR Part 300.*

[2]Ocean Assessments Division. 1984. Coastal Hazardous Waste Site Review April 13, 1984. NOAA/OAD, Seattle, Washington.

[3]Pavia, R., et al. 1985. *Coastal Hazardous Waste Site Review June 1985.* NOAA/OAD, Seattle, Washington.

[4]Pavia, R., et al. 1986. *Coastal Hazardous Waste Site Review April 1986.* NOAA/OAD, Seattle, Washington.

[5]Pavia, R., et al. 1987. *Coastal Hazardous Waste Site Review June 1987.* NOAA/OAD, Seattle, Washington.

[6]Pavia, R., et al. 1989. *Coastal Hazardous Waste Site Review March 1989.* NOAA/OAD, Seattle, Washington.

[7]Hoff, R., et al. 1990. *Coastal Hazardous Waste Site Review June 1990.* NOAA/OAD, Seattle, Washington.

[8]U.S. Environmental Protection Agency. 1986. *Quality criteria for water.* Washington, D.C.

[9]Lindsay, W.L. 1979. *Chemical Equilibria in Soils.* New York: John Wiley & Sons.

[10]Long, E.R. and L.G. Morgan. 1990. The potential for biological effects of sediment-sorbed contaminants tested in the National Status and Trends Program. NOAA Technical Memorandum NOS OMA-52. Seattle: Coastal and Estuarine Assessment Branch, National Oceanic and Atmospheric Administration.

Table 1. Sites which NOAA has reviewed (571) as of September 1992, including those sites for which a Coastal Hazardous Waste Site Review (244) or Preliminary Natural Resource Survey (PNRS) (109) have been completed. (An asterisked site indicates that NOAA was not involved in the remedial process for that site.)

State	Cerclis	Site Name	Report Date Review	Report Date PNRS
Federal Region I				
CT	CTD980732333	Barkhamsted-New Hartford Landfill	1989	
CT	CTD072122062	Beacon Heights, Inc.	1984	
CT	CTD108960972	Gallup's Quarry	1989	
CT	CTD980670814	Kellogg-Deering Well Field	1987	
CT	CTD980521165	Laural Park, Inc.		1988
CT	CTD001153923	Linemaster Switch		
CT	CTD982747933	New London Submarine Base		
CT	CTD980669261	Nutmeg Valley Road		
CT	CTD980667992	O'Sullivans Island	1984	
CT	CTD980670806	Old Southington Landfill		
CT	CTD004532610	Revere Textile Prints Corps		
CT	CTD001449784	Sikorsky Aircraft Div UTC		
CT	CTD009717604	Solvents Recovery Service		
CT	CTD980906515	US Naval Submarine Base, New London	1990	
CT	CTD009774969	Yaworski Waste Lagoon	1985	1989
MA	MAD001026319	Atlas Tack Corp	1989	
MA	MAD001041987	Baird & McGuire, Inc.		
MA	MAD079510780	CE Bridgewater		1988
MA	MAD980525232	CE Plymouth	1984	1990
MA	MAD003809266	Charles George Land Reclamation	1987	1988
MA	MAD980520670	Fort Devens - Sudbury Training Annex		
MA	MA7210025154	Fort Devens		
MA	MAD980732317	Groveland Wells 1&2	1987	1988
MA	MAD980523336	Haverhill Municipal Landfill	1985	
MA	MAD980732341	Hocomonco Pond		
MA	MAD076580950	Industriplex	1987	1988
MA	MAD051787323	Iron Horse Park		
MA	MAD980731335	New Bedford	1984	
MA	MAD980670566	Norwood PCB's		
MA	MAD990685422	Nyanza Chemical	1987	
MA	MA2570024487	Otis Air National Guard/Camp Edwards		
MA	MAD980731483	PSC		
MA	MAD980520621	Resolve, Inc.		
MA	MAD980524169	Rose Disposal Pit		
MA	MAD980525240	Salem Acres		1991
MA	MAD980503973	Shpack Dump		
MA	MAD000192393	Silresim Chemical Corp.		
MA	MAD980731343	Sullivan's Ledge	1987	1989
MA	MAD001002252	W. R. Grace and Co.		
MA	MAD980732168	Well G & H		1990
ME	ME8170022018	Brunswick Naval Air Station	1987	1991
ME	ME9570024522	Loring Air Force Base		
ME	MED980524078	McKin Company	1984	
ME	MED980731475	O'Connor Company	1984	

State	Cerclis	Site Name	Report Date Review	Report Date PNRS
Federal Region 1, cont.				
ME	MED980732291	Pinettes Salvage Yard		
ME	MED980504393	Saco Municipal Landfill	1989	
ME	MED980520241	Saco Tannery Waste Pits		
ME	MED042143883	Union Chemical Company, Inc.		
ME	ME7170022019	U.S. Navy Portsmouth Naval Shipyard		
ME	MED980504435	Winthrop Town Landfill		
NH	NHD980524086	Auburn Road Landfill		1989
NH	NHD064424153	Coakley Landfill	1985	1989
NH	NHD980520191	Dover Municipal Landfill	1987	1990
NH	NHD001079649	Fletcher's Paint Works and Storage	1989	
NH	NHD069911030	Grugnale Waste Disposal Site	1985	
NH	NHD981063860	Holton Circle Ground Water Contamination		
NH	NHD062002001	Kearsarge Metallurgical		
NH	NHD092059112	Keefe Environmental Services		
NH	NHD980503361	Mottolo Pig Farm		
NH	NHD001091453	New Hampshire Plating Co.	1992	
NH	NHD990717647	Ottati & Goss Great Lakes Container Corp		
NH	NH7570024847	Pease Air Force Base	1990	
NH	NHD980671002	Savage Municipal Water Supply	1985	1991
NH	NHD980520225	Somersworth Sanitary Landfill		
NH	NHD980671069	South Municipal Water Supply		
NH	NHD099363541	Sylvester's	1985	
NH	NHD989090469	Tibbetts Road		
NH	NHD062004569	Tinkham Garage		
RI	RID980520183	Central Landfill (Johnston Site)		
RI	RID980731459	Davis GSR Landfill		
RI	RID980523070	Davis Liquid Waste Site	1987	
RI	RI6170022036	Davisville Naval Construction Battalion Ctr	1990	
RI	RID093212439	Landfill and Resource Recovery (L&RR)		
RI	RI6170085470	Newport Naval Education/Training Center	1990	
RI	RID055176283	Peterson/Puritan, Inc.	1987	1990
RI	RID980579056	Picillo Farm	1987	1988
RI	RID980521025	Rose Hill Regional Landfill	1989	
RI	RID980731442	Stamina Mills	1987	1990
RI	RID009764929	Western Sand and Gravel	1987	
RI	RID981063993	West Kingston Town Dump/URI Disposal Area	1992	
VT	VTD981064223	Bennington Municipal Landfill		
VT	VTD980520092	BFI Sanitary Landfill	1989	
VT	VTD003965415	Burgess Brothers Landfill		
VT	VTD980520118	Darling Hill Dump		
VT	VTD000860239	Old Springfield Landfill	1987	1988
VT	VTD981062441	Parker Sanitary Landfill		
VT	VTD980523062	Pine Street Canal		
VT	VTD000509174	Tansitor Electronics, Inc		
Federal Region 2				
NJ	NJD000525154	Albert Steel Drum	1984	
NJ	NJD002173276	American Cyanamid	1985	
NJ	NJD030253355	AO Polymer		
NJ	NJD980654149	Asbestos Site		

State	Cerclis	Site Name	Report Date Review	PNRS
Federal Region 2, cont.				
NJ	NJD063157150	Bog Creek Farm	1984	1992
NJ	NJD980505176	Brick Township Landfill	1984	
NJ	NJD053292652	Bridgeport Rental & Oil Services (BROS)		1990
NJ	NJD078251675	Brook Industrial Park	1989	
NJ	NJD980504997	Burnt Fly Bog		1992
NJ	NJD048798953	Caldwell Trucking Co.		
NJ	NJD000607481	Chemical Control	1984	
NJ	NJD980484653	Chemical Insecticide Corp	1990	1992
NJ	NJD047321443	Chemical Leaman		1989
NJ	NJD980528889	Chemsol, Inc.		
NJ	NJD980528897	Chipman Chemical	1985	
NJ	NJD001502517	Ciba-Geigy Corp.	1984	1989
NJ	NJD980785638	Cinnaminson		
NJ	NJD094966611	Combe Fill South Landfill		
NJ	NJD000565531	Cosden Chemical	1987	
NJ	NJD002141190	CPS Chemical/Madison Industries		1990
NJ	NJD011717584	Curcio Scrap Metal	1987	
NJ	NJD980529002	Delilah Landfill		
NJ	NJD046644407	Denzer and Schafer X-Ray	1984	1992
NJ	NJD980761373	Derewal Chemical Co.	1985	
NJ	NJD980528996	Diamond Alkali/Diamond Shamrock	1984	
NJ	NJD980529416	D'Imperio Property		
NJ	NJD980529085	Ellis Property		
NJ	NJD980654222	Evor Phillips Leasing		
NJ	NJD980761365	Ewan		
NJ	NJ9690510020	FAA Tech Center	1990	
NJ	NJ2210020275	Fort Dix		
NJ	NJD041828906	Fried Industries		
NJ	NJD053280160	Garden State Cleaners	1989	
NJ	NJD980529192	Gems Landfill		
NJ	NJD063160667	Global Sanitary Landfill	1989	1991
NJ	NJD980530109	Goose Farm		
NJ	NJD980505366	Helen Kramer Landfill		1990
NJ	NJD002349058	Hercules, Inc.	1984	
NJ	NJD053102232	Higgins Disposal Service Inc.	1989	
NJ	NJD981490261	Higgins Farm	1989	
NJ	NJD980663678	Horseshoe Road Dump	1984	
NJ	NJD980532907	Ideal Cooperage	1984	
NJ	NJD980654099	Imperial Oil Co. Inc./Chamption Chemicals		
NJ	NJD981178411	Industrial Latex	1989	
NJ	NJD980505283	Jackson Township Landfill	1984	
NJ	NJ0141790006	Jamaica Bay		
NJ	NJD097400998	JIS Landfill		
NJ	NJD002493054	Kauffman and Minteer	1989	
NJ	NJD049860836	Kin-Buc Landfill	1984	1990
NJ	NJD980505341	King of Prussia		
NJ	NJD002445112	Koppers Company	1984	
NJ	NJD980529838	Krysowaty Farm	1985	
NJ	NJD980505416	Lipari Landfill		
NJ	NJD980505424	Lone Pine Landfill		1992

State	Cerclis	Site Name	Report Date Review	PNRS
Federal Region 2, cont.				
NJ	NJD085632164	M&T Delisa		
NJ	NJD980654180	Mannheim Avenue Dump		
NJ	NJD980529762	Maywood Chemical Co.		
NJ	NJD002517472	Metaltec/Aerosystems		
NJ	NJ0210022752	Military Ocean Terminal		
NJ	NJD000606756	Mobil Chemical Company	1984	
NJ	NJD980505671	Monroe Township Landfill		
NJ	NJD980654198	Myers Property		
NJ	NJD061843249	N.L. Industries	1984	1992
NJ	NJD002362705	Nascolite		
NJ	NJ7170023744	Naval Air Engineering Center, Lakehurst		
NJ	NJ0170022172	Naval Weapons Station, Earle - Site A		
NJ	NJD980529598	Pepe Field		
NJ	NJD980653901	Perth Amboy's PCB's	1984	
NJ	NJD980505648	PJP Landfill	1984	1990
NJ	NJD981179047	Pohatcong Valley Groundwater Cont.		
NJ	NJD980769350	Pomona Oaks		
NJ	NJD070281175	Price Landfill	1984	
NJ	NJD980582142	Pulverizing Services Inc.		
NJ	NJD000606442	Quanta Resources (Allied, Shady Side)		
NJ	NJD980529713	Reich Farms		
NJ	NJD070415005	Renora		
NJ	NJD980529739	Ringwood Site		
NJ	NJD073732257	Roebling Steel Company	1984	1990
NJ	NJD030250484	Roosevelt Drive-In	1984	
NJ	NJD980754733	Sayerville Pesticide	1984	
NJ	NJD980505754	Sayreville Landfill	1984	1990
NJ	NJD070565403	Scientific Chemical Processing, Inc.	1984	1989
NJ	NJD980505762	Sharkey Landfill		1990
NJ	NJD002365930	Shield Allow Corporation		
NJ	NJD980766828	South Jersey Clothing Co.	1989	
NJ	NJD041743220	Swope Oil & Chemical Co.		
NJ	NJD064263817	Syncon Resins	1984	1992
NJ	NJD980769475	T. Fiore Demolition, Inc.	1984	
NJ	NJD980761357	Tabernacle Drum		
NJ	NJD002005106	Universal Oil Products, Inc.	1984	
NJ	NJD980761399	Upper Deerfield Township Slf		
NJ	NJD980529879	Ventron/Velsicol	1984	
NJ	NJD002385664	Vineland Chemical		1990
NJ	NJD054981337	Waldick Aerospace Devices		1990
NJ	NJD001239185	White Chemical Company	1984	
NJ	NJD980529945	Williams Property	1984	1992
NJ	NJD980532824	Wilson Farm		
NJ	NJD045653854	Witco Chemical Corporation		
NJ	NJD980505887	Woodland Township Route 532		
NJ	NJD980505879	Woodland Township Route 72		
NY	NYD072366453	Action Anodizing Site	1989	
NY	NYD980506232	ALCOA Oil and Wastewater Lagoons		

State	Cerclis	Site Name	Report Date Review	PNRS
Federal Region 2, cont.				
NY	NYD002066330	American Thermostat		
NY	NYD001485226	Anchor Chemical		
NY	NYD980535652	Applied Environmental Services	1985	1991
NY	NYD980507693	Batavia Landfill		
NY	NYD980768675	BEC Trucking		1990
NY	NYD980768683	Bioclinical Laboratories		
NY	NYD980652275	Brewster Wellfield		
NY	NY7890008975	Brookhaven National Lab	1990	
NY	NYD980780670	Byron Barrel and Drum		
NY	NYD981561954	C and J Disposal Site	1989	
NY	NYD010968014	Carrol and Dubies	1989	
NY	NYD981184229	Circuitron Corp. Site		
NY	NYD002044584	Claremont Polychemical		
NY	NYD000511576	Clothier Disposal		
NY	NYD980768691	Colesville Municipal Landfill		
NY	NYD980528475	Cortese Landfill		
NY	NYD980508048	Croton Point Sanitary Landfill		
NY	NYD980780746	Endicott Village Wellfield		
NY	NYD981560923	Forest Glen Subdivision		
NY	NYD002050110	Genzale Plating Site		
NY	NYD091972554	GM Foundry		1989
NY	NYD980768717	Goldisc Site		
NY	NY4571924451	Griffiss AFB		
NY	NYD980785661	Haviland		
NY	NYD980780779	Hertel Landfill		
NY	NYD002920312	Hooker/Ruco		
NY	NYD980763841	Hudson River PCBs (GE)		1989
NY	NYD000813428	Jones Chemicals, Inc.		
NY	NYD980534556	Jones Sanitation	1987	
NY	NYD980780795	Katonah Municipal Well		
NY	NYD986882660	Li Tungsten	1992	
NY	NYD053169694	Liberty Heat Treating Co., Inc.		
NY	NYD000337295	Liberty Industrial Finishing	1985	
NY	NYD013468939	Ludlow Sanitary Landfill		
NY	NYD010959757	Marathon Battery	1984	1989
NY	NYD000512459	Mattiace Petrochemical	1989	1990
NY	NYD980763742	MEK		
NY	NYD002014595	Nepera Site		
NY	NYD980506810	Niagara 102nd Street		
NY	NYD000514257	Niagara County Refuse		
NY	NYD980664361	Niagara Mohawk Power Corp.		
NY	NYD980780829	Ninety-Third Street School		
NY	NYD980762520	North Sea Municipal Landfill	1985	1989
NY	NYD991292004	Pasley Solvents		
NY	NYD980641047	Pennsylvania Ave. Landfill		
NY	NYD000511659	Pollution Abatement Services		

State	Cerclis	Site Name	Report Date Review	PNRS
Federal Region 2, cont.				
NY	NYD980654206	Port Washington Landfill	1984	1989
NY	NYD980768774	Preferred Plating Corp.		
NY	NYD002245967	Reynolds Metal Co.		
NY	NYD980507735	Richardson Landfill		
NY	NYD980535124	Rocket Fuel Site - MALTA		
NY	NYD981486954	Rowe Industries	1987	1991
NY	NYD980507677	Sidney Landfill	1989	
NY	NYD980535215	Sinclair Refinery Site		
NY	NYD980421176	Solvent Savers		
NY	NYD980780878	Suffern Wellfield Site		
NY	NYD000511360	Syosset Landfill		
NY	NYD002059517	Tronic Plating		
NY	NYD980509376	Volney		
NY	NYD980535496	Wallkill Wellfield		
NY	NYD980506679	Warwick Landfill Site		
NY	NYD000511733	York Oil		
PR	PRD090416132	Clear Ambient Service	1984	
PR	PRD980640965	Frontera Creek	1984	1991
PR	PRD090282757	GE Wiring		
PR	PRD980512362	Juncos Landfill		
PR	PR4170027383	Naval Security Group Activity Sabana Seca	1989	1991
PR	PRD980301154	Upjohn		
PR	PRD980763775	Vega Alta Public Supply Wells		
Federal Region 3				
DE	DED980494496	Army Creek Landfill	1984	
DE	DED980714141	Chem-Solv, Inc.		
DE	DED980704860	Coker's Sanitation Services Landfills	1986	1990
DE	DED980551667	*Delaware City PVC	1984	
DE	DED000605972	Delaware Sand & Gravel Landfill	1984	
DE	DE8570024010	Dover Air Force Base	1987	1989
DE	DED980693550	Dover Gas and Light Company	1987	
DE	DED980555122	E.I. Du Pont - Newport Landfill	1987	1991
DE	DED980830954	Halby Chemical Company	1986	1990
DE	DED980713093	*Harvey & Knott Drum		
DE	DED980705727	Kent Co. Landfill	1989	
DE	DED980552244	Koppers Company Facilities site	1990	
DE	DED043958388	National Cash Register Corp., Millsboro	1986	
DE	DED058980442	New Castle Spill Site	1984	1989
DE	DED980705255	New Castle Steel	1984	
DE	DED980704894	*Old Brine Sludge	1984	
DE	DED980494603	*Pigeon Point Landfill	1987	
DE	DED981035520	Sealand	1989	
DE	DED041212473	Standard Chlorine of Delaware, Inc.	1986	
DE	DED980494637	Sussex Co. Landfill	1989	
DE	DED000606079	Tybouts Corner Landfill	1984	
DE	DED980705545	Tyler Refrigeration Pit Site		
DE	DED980704951	Wildcat Landfill	1984	
MD	MDD980504187	Aberdeen, Michaelsville Landfill	1986	

State	Cerclis	Site Name	Report Date Review	PNRS
Federal Region 3, cont.				
MD	MDD980705057	Anne Arundel County Landfill	1989	
MD	MDD980504195	Bush Valley Landfill	1989	
MD	MDD030321178	*Joy Reclamation Co.	1984	
MD	MDD980705164	Sand Gravel & Stone Site	1984	1990
MD	MDD064882889	Mid-Atlantic Wood Preservers		
MD	MDD980704852	Southern Maryland Wood Treating	1987	
MD	MD2210020036	USAAberdeen - Edgewood	1986	
MD	MDD980504344	Woodlawn Co Landfill	1987	
PA	PAD004351003	A.I.W. Frank/Mid-County Mustang		
PA	PAD000436436	Ambler Asbestos Piles		
PA	PAD009224981	American Electronics		
PA	PAD980693048	AMP, Inc.		
PA	PAD061105128	Bally Township		
PA	PAD980705107	*Bell Landfill		
PA	PAD003047974	*Bendix Flight Systems Site		
PA	PAD980538649	*Berkley Products Dump		
PA	PAD000651810	*Berks Landfill		
PA	PAD047726161	Boarhead Farms	1989	
PA	PAD980508402	*Bridesburg Dump	1984	
PA	PAD980831812	Brown's Battery		1991
PA	PAD980508451	Butler Mine Tunnel	1987	
PA	PAD981034705	*Butz Landfill		
PA	PAD093730174	*Commodore Semiconductor Group		
PA	PAD981035009	Croydon TCE	1986	
PA	PAD981038052	Delta Quarries/Stotler		
PA	PAD002384865	Douglassville Disposal Site	1987	
PA	PAD003058047	Drake Chemical		
PA	PAD980830533	Eastern Diversified		
PA	PAD980539712	*Elizabethtown Landfill	1989	
PA	PAD980552913	Enterprise Avenue	1984	
PA	PAD002338010	Havertown PCP		
PA	PAD980829329	*Hebelka Auto Salvage		
PA	PAD002390748	Hellertown Manufacturing Company	1987	
PA	PAD009862939	Henderson Road		1989
PA	PAD980829493	Jacks Creek/Sitkin Smelting & Refining	1989	
PA	PAD981036049	*Keyser Ave. Borehole	1989	
PA	PAD980508667	*Lackawanna Refuse		
PA	PA2210090054	Letterkenny-Property Disposal Area		
PA	PA6213820503	Letterkenny-Southeast Industrial Area		
PA	PAD046557096	Metal Bank of America	1984	1990
PA	PAD980538763	Middletown Air Field		
PA	PAD980539068	Modern Sanitation Landfill		
PA	PAD980691372	MW Manufacturing		
PA	PA6170024545	Naval Air Develop.		
PA	PAD096834494	North Penn-Area I		
PA	PAD980229298	Occidental Chemical/Firestone	1989	
PA	PAD002395887	Palmerton Zinc Pile		
PA	PAD980692594	Paoli Railyard	1987	1991
PA	PAD063766828	*Picco Resins		
PA	PAD981939200	Publicker Industries/Cuyahoga Wrecking Plant	1990	

State	Cerclis	Site Name	Report Date Review	PNRS
Federal Region 3, cont.				
PA	PAD039017694	Raymark		
PA	PAD002353969	Recticon/Allied Steel	1989	
PA	PAD980829261	*Reeser's		
PA	PAD051395499	Revere Chemical Company	1986	
PA	PAD091637975	Rohm and Haas Landfill	1986	
PA	PAD980692487	*Saegertown Industrial Area		
PA	PAD002498632	Spra-Fin, Inc.		
PA	PAD014269971	Stanley Kessler		
PA	PAD000441337	*Strasburg Landfill		
PA		Textron-Lycoming		
PA	PA6143515447	Tinicum National Environmental Center	1986	
PA	PAD073613663	*Tonolli Corp.		
PA	PAD980692024	Tysons Dump #1	1985	
PA	PAD980539407	*Wade (ABM) Site	1984	
PA	PAD980829527	*Welsh/Barkman Landfill		
PA	PAD980537773	William Dick Lagoons		
VA	VAD980551683	Abex Corp.	1989	
VA	VAD042916361	Arrowhead Assoc/Scovill Corp	1989	
VA	VAD990710410	Atlantic Wood Industries	1987	1990
VA	VAD049957913	C&R Battery Co., Inc.	1987	
VA	VAD980712913	Chisman Creek	1984	
VA	VAD007972482	Clarke, L.A. & Son		
VA	VA3971520751	Defence General Supply Center		
VA	VAD003125374	*Greenwood Chemical Site		
VA	VAD980539878	H & H Inc.		
VA	VAD071040752	Rentokil Inc.		
VA	VAD980831796	Rhinehart tire fire		
VA	VAD003127578	*Saltville		
VA	VAD003117389	Saunders Supply Co.	1987	
VA	VAD980917983	Suffolk City Landfill		
VA	VA3971520751	U.S. Defense General Supply Center		
VA	VAD980705404	*U.S. Titanium		
WV	WVD004336749	*Follansbee		
Federal Region 4				
AL	ALD001221902	Ciba-Geigy Corp	1990	
AL	ALD008188708	Olin Corp. McIntosh Plant	1990	
AL	ALD980844385	Redwing Carriers Inc./Sara.	1989	
AL	ALD095688875	Stauffer Chemical Co. Cold Creek Plt./Lemoyne		1990
AL	ALD007454085	T.H. Agriculture Nutrition Co.		
FL	FLD980728877	62nd Street Dump/Kassouf-Kimerling	1984	1989
FL	FLD980221857	Agrico Chemical Site	1989	
FL	FLD008161994	American Creosote Works	1984	1989
FL	FLD088783865	Bay Drum/Tampa		
FL	FLD980494660	Beulah Landfill		
FL	FLD981930506	Broward County - 21st Manor Dump	1992	
FL	FL5170022474	Cecil Field Naval Air Station	1990	
FL	FLD080174402	Chem-Form Inc.	1990	
FL	FLD050432251	Florida Steel Corporation		

State	Cerclis	Site Name	Report Date Review	PNRS
Federal Region 4, cont.				
FL	FLD000827428	Gardinier, Inc.		
FL	FLD000602334	Harris Corporation/General Development U	1986	1990
FL	FLD980709802	Hipps Road Landfill		
FL	FLD004119681	Hollingsworth Solderless Terminal Co.		
FL	FL7570024037	Homestead AFB		
FL	FL6170024412	Jacksonville Naval Air Station	1990	
FL	FLD084535442	Munisport Landfill	1984	
FL	FLD004091807	Peak Oil Co.		
FL	FL9170024567	Pensacola Naval Air Station	1990	
FL	FLD980556351	Pickettville Road Landfill	1984	1990
FL	FLD004054284	Piper Aircraft Corp Vero Beach		
FL	FLD000824888	Reeves SE Corp		
FL	FLD980602882	Sapp Battery Salvage		1989
FL	FLD062794003	Schuylkill Metal Corp		
FL	FLD004126520	Standard Auto Bumper Corp.	1989	
FL	FLD010596013	Stauffer Chemical Co.		
FL	FLD000648055	Sydney Mine Sludge Ponds		1989
FL	FL1690331300	USCG Station Key West		
FL	FL6170029952	USN Air Station Key West		
FL	FLD980602767	Whitehouse Waste Oil Pits		
FL	FLD041184383	Wilson Concepts of Florida		
FL	FLD981021470	Wingate Road Municipal Incinerator Dump		
FL	FLD004146346	Woodbury Chemical Co.	1989	
FL	FLD980844179	*Yellow Water Road		
GA	GAD095840674	Cedartown Industries Inc.		
GA	GAD990741092	Diamond Shamrock Corp. Landfill		
GA	GAD990855074	Firestone Tire & Rubber Co. Inc.		
GA	GAD004065520	Hercules Inc.		
GA	GAD980556906	Hercules 009 Landfill		
GA	GAD000827444	International Paper Co.		
GA	GAD099303182	LCP Chemicals - Georgia, Inc.		
GA	GA7170023694	Marine Corps Logistics Base		
GA	GAD001700699	Monsanto Co.		
GA	GAD042101261	T.H. Agriculture & Nutrition Co. Inc.		
GA	GA1570024330	USAF Robins Air Force Base		
GA	GAD003269578	Woolfolk Chemical Works, Inc.		
MS	MSD098596489	Gautier Oil Co. Inc.	1989	
NC	NCD024644494	ABC One Hour Cleaners	1989	
NC	NCD980840409	Charles Macon Lagoon & Drum Storage		
NC	NCD980840342	Dockery Property		
NC	NCD981475932	FCX (Washington Plant)	1989	
NC	NCD981021157	New Hanover Cty Airport Burn Pit	1989	
NC	NCD981023260	Potter's Septic Tank Service Pits	1989	
NC	NC1170027261	USMC Air Station Cherry Point		
NC	NC6170022580	USMC Camp Lejuene, Site 21	1989	
SC	SCD980844260	Beaufort County Landfill		
SC	SCD980711279	Geiger (C&M Oil)	1984	
SC	SCD058753971	Helena Chemical Co.	1989	
SC	SCD055915086	International Paper/Sampit River		

State	Cerclis	Site Name	Report Date Review	PNRS
Federal Region 4, cont.				
SC	SCD980310239	Koppers Ashley River		
SC	SC8170022620	Naval Weapons Station - Charleston		
SC	SC1890008989	Savannah River Site (USDOE)	1990	
SC	SCD037405362	Wamchem Inc.	1984	
Federal Region 6				
LA	LAD000239814	American Creosote		
LA	LAD980745632	Bayou Bonfouca		
LA	LAD980745541	Bayou Sorrell	1984	
LA	LAD980501423	Calcasieu Parish Landfill		
LA	LAD057482713	Petro-Processors of Louisiana, Inc.		
LA	LA6170022788	U.S. Navy New Orleans Naval Air Station		
TX	TXD008123168	Aluminum Company of America (Lavaca Bay)		
TX	TXD980864649	Bailey Waste Disposal	1985	1989
TX	TXD980625453	Brio Refining , Inc.	1989	1989
TX	TXD990707010	Crystal Chemical Company	1989	1989
TX	TXD089793046	Dixie Oil Processors	1989	1989
TX	TXD980514814	French Limited	1989	1989
TX	TXD980748453	Geneva Industries/Fuhrmann Energy Corp		
TX	TXD980745582	Harris (Farley Street)		
TX	TXD980514996	Highlands Acid Pit	1989	
TX	TXD980625636	Keown Supply Co.		
TX	TXD980629851	Motco Corp.	1984	
TX	TXD980873343	North Cavalcade		
TX	TXD980873350	Petro-Chemical Systems, Inc.		
TX	TXD980513956	Sikes Disposal Pits	1989	
TX	TXD980873327	Sol Lynn/Industrial Transf		
TX	TXD980810386	South Cavalcade		
TX	TXD062113329	Tex-Tin Corporation	1989	
TX	TXD055143705	Triangle Chemical Company		
Federal Region 9				
AS	ASD980637656	Taputimu Farm, Tutuila Isl.	1984	
CA	CA2170023236	Alameda Naval Air Station	1989	
CA	CAD052384021	Brown & Bryant, Inc. (Arvin Plant)		
CA	CA2170023533	Camp Pendleton Marine Corps Base	1990	1992
CA	CAD009114919	Chevron USA Richmond Refinery		
CA	CAD063015887	Coast Wood Preserving	1984	
CA	CAD980498455	Crazy Horse Sanitary Landfill		
CA	CAD009212838	CTS Printex, Inc.	1989	
CA	CAD029544731	Del Amo	1992	
CA	CAD000626176	Del Norte County Pesticide Storage Area	1984	
CA	CA6170023208	El Toro Marine Corps Air Station	1989	
CA	CAD981159585	Farallon Islands Radioactive Waste Dumps		1990
CA	CA7210020676	Fort Ord	1990	1992
CA	CAD980636914	Fresno Municipal Sanitary Landfill		
CA	CAD980498562	GBF and Pittsburg Dumps	1989	
CA	CA3570024288	Hamilton Air Force Base		
CA	CAD980884209	Hewlett-Packard (620-40 Page Mill Rd)	1989	

State	Cerclis	Site Name	Report Date Review	PNRS
Federal Region 9, cont.				
CA	CAD058783952	Hexcel Corp. - Livermore		
CA	CA1170090087	Hunters Point Annex	1989	1989
CA	CAD041472341	Intersil Inc./Siemens Components	1989	
CA	CAD980498612	Iron Mountain Mine	1989	1989
CA	CAD000625731	J.H. Baxter		
CA	CAD009103318	Jasco Chemical Corp.	1989	
CA	CAD008274938	Kaiser Steel Corp. (Fontana Plant)		
CA	CAD981429715	Kearney - KPF		
CA	CAD981436363	Levin Richmond Terminal Corp.		
CA	CAT000646208	Liquid Gold	1984	
CA	CAD065021594	Louisiana Pacific Corp		
CA	CA717002475	Mare Island Naval Shipyard		
CA	CAD000074120	MGM Brakes	1984	
CA	CAD982463812	Middlefield-Ellis-Whisman		
CA	CAD981997752	Modesto Ground Water Contamination		
CA	CA2170090078	Moffett Field Naval Air Station	1986	
CA	CAD008242711	Montrose Chemical Corp.	1985	
CA	CA7170024528	Naval Weapons Station, Concord	1989	1990
CA	CAD981434517	Newmark Ground Water Contamination		
CA	CA7170090016	North Island Naval Air Station		
CA	CA4170090027	Oakland Naval Supply Center		
CA	CAD980636781	Pacific Coast Pipelines	1989	
CA	CA9170027271	Pacific Missile Test Center		
CA	CA1170090236	Point Loma Naval Complex		
CA	CAD982462343	Redwood Shore Landfill		
CA	CAT000611350	Rhone-Poulenc, Inc. - Zoecon	1985	
CA	CA7210020759	Riverbank Army Ammunition Plant	1989	
CA	CAD009452657	Romic Chemical Corp		
CA	CA0210020780	Sacramento Army Depot		
CA	CAD009164021	Shell Oil Co., Martinez Manufact. Complex		
CA	CAD980637482	Simpson - Shasta Ranch		
CA	CAD981171523	Sola Optical USA, Inc.	1989	
CA	CAD059494310	Solvent Service, Inc.		
CA	CAD980894885	South Bay Asbestos Area - Alviso	1985	
CA	CAD009138488	Spectra-Physics, Inc.		
CA	CAD980893275	Sulphur Bank Mercury Mine		
CA	CAD990832735	Synertek, Inc. - Building 1		
CA	CA5570024575	Travis Air Force Base	1990	
CA	CAD009159088	TRW Microwave, Inc. - Building 825		
CA	CAD981436363	United Heckathorn		
CA	CAD981995947	Westminster Tract #2633		
GU	GU7170027323	Naval Station Guam		
HI	HID981581788	Hawaiian Western Steel Limited		
HI	HID980497184	Kailua Landfill		
HI	HID980497226	Kewalo Incinerator Ash Dump		
HI	HI6170022762	MCAS Kanehoe Landfill		
HI	HID980497176	Kapaa Landfill		
HI		Kapalama Canal/Honolulu Harbor		
HI	HI3170024340	Naval Submarine Base		
HI	HID980585178	Pearl City Landfill	1984	

State	Cerclis	Site Name	Report Date Review	PNRS
Federal Region 9, cont.				
HI	HI2170024341	Pearl Harbor Naval Complex	1992	
HI	HID982400475	Waiakea Pond/Hawaiian Cane Products		1990
Federal Region 10				
AK	AKD009252487	Alaska Pulp Corporation		
AK	AK8570028649	Elmendorf AFB	1990	1990
AK	AK6210022426	Fort Wainwright		
AK	AKD980978787	Standard Steel & Metals Salvage Yard (USDOT)	1990	1990
AK	AK7170090099	U.S. Navy - Adak Naval Air Station		
ID	IDD000643122	Noranda Mining Inc. (Blackbird Mine)		
OR	ORD009051442	Allied Plating	1987	1988
OR	ORD095003687	Gould Inc.	1984	1988
OR	ORD068782820	Joseph Forest Products		
OR	ORD052221025	Martin Marietta Aluminum	1987	1988
OR	ORD009020603	McCormick-Baxter Creosoting		
OR	ORD009025347	Stauffer Chemical Co	1984	
OR	ORD009042532	Taylor Lumber and Treating, Inc.		1991
OR	ORD050955848	Teledyne Wah Chang Albany	1985	1988
OR	ORD009049412	Union Pacific, The Dalles	1990	1990
WA	WAD009045279	ALCOA (Vancouver Smelter)	1989	1989
WA	WAD057311094	American Crossarm & Conduit Co.	1989	1988
WA	WA7170027265	Bangor Ordnance Disposal(Site A)		1991
WA	WA1891406349	Bonneville Power Admin. Ross Complex (USDOE)	1990	1990
WA	WAD980836662	Centralia Landfill	1989	1989
WA	WAD980726301	*Commencement Bay - South Tacoma Channel	1984[1]	
WA	WAD980726368	Commencement Bay Nearshore/Tideflats	1984[1]	1988
WA	WA3890090076	Hanford - 100 Area (DOE)		
WA	WA2890090077	Hanford - 300 Area (DOE)		
WA	WAD980722839	Harbor Island - Lead	1984	1989
WA	WA5170090059	NAS Whidbey Island - Ault Field	1986	1989
WA	WA6170090058	NAS Whidbey Island - Seaplane Base	1986	1989
WA	WA1170023419	Naval Undersea Warfare (4 Areas)		1989
WA	WA2170023426	Manchester Naval Supply Center		
WA	WAD027315621	Northwest Transformer (South Harkness)	1989	1988
WA	WAD009422411	Pacific Wood Treating		
WA	WAD980639215	Quendall Terminals	1985	
WA	WAD980639462	Seattle Municipal Landfill (Kent Highlands)	1989	1988
WA	WAD980976328	Strandley/Manning Site		
WA	WA5170027291	Subase Bangor	1990	1991
WA	WAD980639256	Tulalip Indian Tribe - Marine Disposal	1992	1991
WA	WA5210890096	USACOE-Hamilton Island Landfill	1992	1991
WA	WA7890008967	USDOE-Hanford Site	1989	1988
WA	WA3170090044	U.S. Navy - Jackson Park Landfill		
WA	WA2170023426	U.S. Navy - Naval Supply Center Puget Sound		
WA	WA4170090001	U.S. Navy - Naval Undersea Warfare Engin. Stn		1989
WA	WA2170023418	U.S. Navy - Puget Sound Naval Shipyard		
WA	WAD009487513	Western Processing	1984	
WA	WAD009248295	Wyckoff Company/Eagle Harbor	1986	1988
WA	WAD009248287	Wyckoff Co./West Seattle (Puget Snd Resources)		1992

[1] A single site report was done for both of these sites.

Table 2. Acronyms and abbreviations used in Coastal Hazardous Waste Site Reviews

Acronyms

AWQC	Ambient water quality criteria
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
COE	U.S. Army Corps of Engineers
CRC	Coastal Resource Coordinator
DOD	U.S. Department of Defense
DOI	U.S. Department of the Interior
EPA	U.S. Environmental Protection Agency
ER-L	Effects range-low
HRS	Hazard Ranking System
IRM	Immediate Removal Measure
LOEL	Lowest Observed Effects Level
NATO	North Atlantic Treaty Organization
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
OU	Operable Unit
PCP	pentachlorophenol
PNA, PAH	polynuclear aromatic hydrocarbon
ppb	parts per billion
ppm	parts per million
ppt	parts per thousand
PCB	polychlorinated biphenyl
PRP	Potential Responsible Party
PVC	polyvinyl chloride
RCRA	Resource Conservation and Recovery Act
RD/RA	Remedial Design/Remedial Action
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
TPH	total petroleum hydrocarbons
VOC	volatile organic compound

Abbreviations

kg	kilogram
km	kilometer
l	liter
m	meter
mg	milligram
μg/g	micrograms per gram
μg/l	micrograms per liter
mg/kg	milligrams per kilogram
mg/l	milligrams per liter
mR/hr	milliroentgens per hour
pCi/g	pico Curies per gram (1 pico Curie=10^{-12} Curie)

1

New Hampshire Plating Co., Inc.

Merrimack, New Hampshire

Cerclis #NHD001091453

Site Exposure Potential

The 1.2-hectare New Hampshire Plating Company, Inc., in Merrimack, New Hampshire (Figure 1), is approximately 200 m west of the Merrimack River within the 100-year floodplain. Electroplating operations were conducted at the site from 1962 to 1985. Spent plating bath solutions and sludge from the electroplating process were discharged to an unlined infiltration lagoon north of the electroplating facility (Figure 2). In addition, two unlined ponds north of the infiltration lagoon received effluent from the lagoon during periods of high flow. An underground fuel storage tank is also located on the site. In 1987, cyanide salts and various other materials associated with the electroplating process were removed from the on-site building, and an estimated 115,000 kg of lime and 3,000 l of sodium hypochloride solution were discharged to the infiltration lagoon (Site Inspection Reports 1989, 1990).

Surface water runoff and groundwater are the potential pathways of contamination from the site to NOAA resources and associated habitats. On-site surface water features include the unlined infiltration lagoon and two ponds (Figure 2). The lagoon and ponds have been classified as palustrine wetlands. Surface water from these wetlands discharges north to an unidentified drainage system, which reportedly discharges to the Merrimack River (Listing Site Inspection Report 1990). The Merrimack River is about

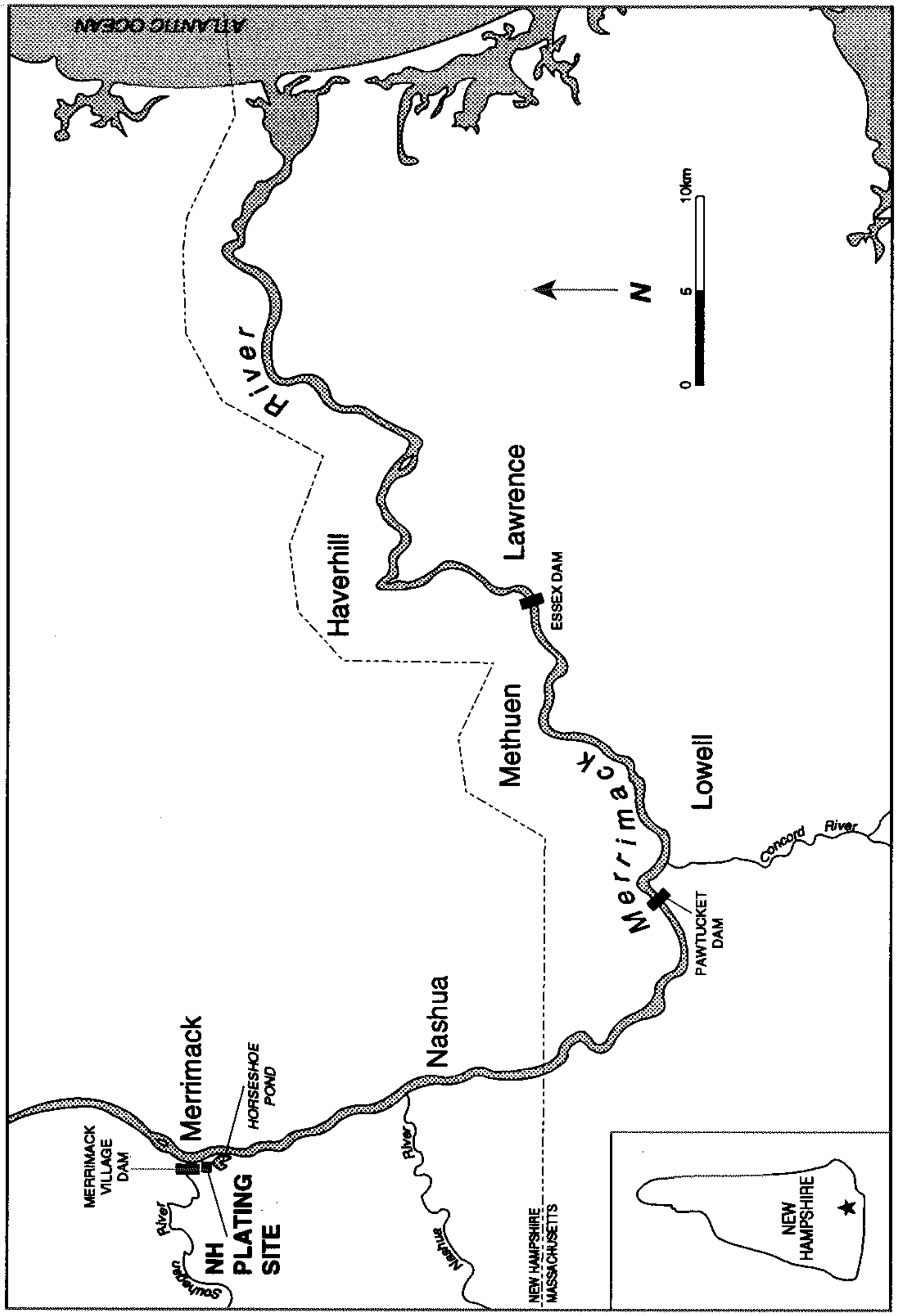

Figure 1. The New Hampshire Plating site in Merrimack, New Hampshire.

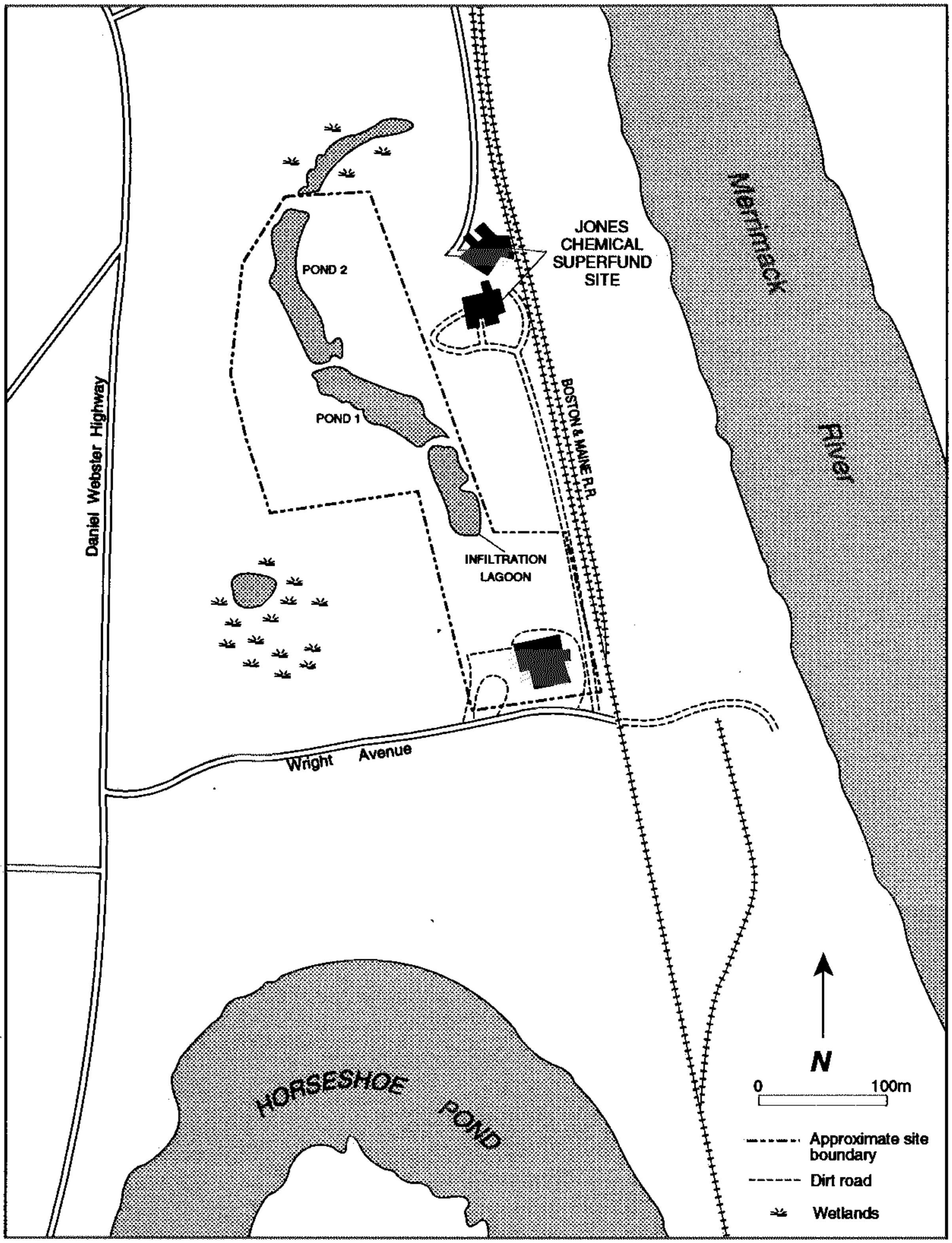

Figure 2. Features at the NH Plating site.

200 m wide near the site and flows south, discharging directly to the Atlantic Ocean 72 km downstream of the site. Groundwater occurs in two aquifers beneath the site. However, the confining silt/clay layer between them is discontinuous. The average depth to shallow groundwater is 4.5 m below ground surface. Information on the depth to the deeper aquifer was not available. Groundwater in both aquifers flows east toward the Merrimack River and south toward Horseshoe Pond, which is located approximately 450 m south of the site. Although a groundwater divide reportedly exists between Horseshoe Pond and the Merrimack River, surface water from the pond discharges to the river via Naticook Brook.

At least six other Superfund sites were identified within an 800-m radius of the site: Harcros Chemical, Inc.; Jones Chemical, Inc.; Louis/Chung Property; New England Circuits/Electropac; and New England Pole and Wood Treating Corporation. The Jones Chemical Superfund site borders New Hampshire Plating to the east (Figure 2). The Savage Well Superfund site, is 13 km upstream of New Hampshire Plating on the Souhegan River; other Superfund sites are downstream on the Merrimack River or associated tributaries.

NOAA Trust Habitats and Species

The Merrimack River and Horseshoe Pond are the habitats of primary concern to NOAA. There are six species of anadromous and catadromous fish in the Merrimack River near the site (Table 1; Greenwood, personal communication 1992; McKeon, personal communication 1992). American shad, alewife, and blueback herring use the lower portion of the Souhegan River and the mainstream of the Merrimack River for spawning, nursery, and adult habitat. Out-migrating juvenile Atlantic salmon use the Merrimack River near the site for nursery habitat (Greenwood, personal communication 1992). Sea lamprey occur primarily in the mainstream of the channel of the Merrimack River. No special habitats or endangered fish species have been identified near the site (The Cadmus Group, 1990).

Horseshoe Pond, 450 m south of the site and encompassing approximately 1.3 hectares, is an oxbow lake created by a former Merrimack River meander. Naticook Brook flows south-southeast from the pond for approximately 0.7 km before discharging to the Merrimack River. Although limited data were available regarding resource use in Horseshoe Pond, its proximity to the Merrimack River and the lack of any physical obstructions suggest that American shad, blueback herring, and American eel may occur periodically in the pond (J. McKeon, personal communication 1992).

Table 1. Species, habitat use, and recreational fisheries in the Merrimack River near the site.

Species		Habitat			Fisheries	
Common Name	Scientific Name	Spawning	Nursery	Adult Forage	Comm.[1]	Recr.
ANADROMOUS SPECIES						
American shad	*Alosa sapidissima*	♦	♦	♦		♦
blueback herring	*Alosa aestivalis*	♦	♦	♦		♦
Atlantic salmon	*Salmo salar*		♦			♦
alewife	*Alosa pseudoharengus*	♦	♦	♦		♦
sea lamprey	*Petromyzon marinus*			♦		
CATADROMOUS SPECIES						
American eel	*Anguilla rostrata*		♦	♦		♦

1 There are no commercial fisheries on the Merrimack River or its tributaries.

The Merrimack Village Dam in Merrimack is approximately 0.5 km upstream of the confluence of the Souhegan and the Merrimack rivers (Figure 1). The dam now contains fish passage facilities which allow the out-migration of juvenile salmon from the upper reaches of the Souhegan River, where intensive State stocking of salmon fry occurs annually (Greenwood, personal communication 1992).

Adult Atlantic salmon migrating upstream from the Atlantic Ocean are trapped at the Essex Dam and used for brood stock at the Federal Nashua Fish Hatchery (Tisa, personal communication 1990; Greenwood, personal communication 1992). Although incidental escapes have occurred in the past, these numbers of escaping salmon were considered insignificant. The New Hampshire Department of Fish and Game is developing plans to allow increased upstream migration of adult Atlantic salmon by 1993 (Greenwood, personal communication, 1992).

The Pawtucket and Essex dams in the lower reaches of the Merrimack River at Lowell and Lawrence, respectively, operate fish passage facilities that extend upstream fish migration within range of the site.

There is no commercial fishing in the Merrimack River watershed. There is sport fishing predominantly for warm-water species and trout upstream of the Merrimack Village Dam on the Souhegan River. There is considerable sport fishing for American shad, blueback herring, and alewife in the Merrimack River (Table 1). There are no restrictions on size, limit, or season for these three anadromous species. Horseshoe Pond maintains a history of boating, fishing, and swimming activities (Toxicological/Health Risk Evaluation, undated).

Site-Related Contamination

Data collected during preliminary investigations indicate that the sludge in the lagoon, groundwater, and surface water is contaminated. Trace elements are the primary contaminants of concern to NOAA. Maximum concentrations of these inorganic substances are presented in Table 2, along with applicable screening criteria (U.S. EPA, 1986; Listing Site Inspection Report, 1990). Volatile organic compounds were measured in on- and off-site media, but at concentrations less than those known to threaten NOAA resources.

Sludge samples collected from the infiltration lagoon in 1981 indicated concentrations of cadmium and chromium one order of magnitude higher than in subsequent sampling. In addition, high concentrations of copper (62,000 mg/kg), lead (860 mg/kg), nickel (15,000 mg/kg), and silver (1.67 mg/kg) were detected in the lagoon sludge samples collected in 1981. Between 1984 and 1989, high concentrations of cadmium, chromium, zinc, and cyanide were detected in sludge samples collected from the infiltration lagoon and the two ponds. The concentrations of these elements were not reported in the data collected from the site between 1984 and 1989 (Listing Site Inspection Report, 1990).

Concentrations of cadmium, chromium, and cyanide exceeded applicable screening criteria [ten-times ambient water quality criteria (AWQC)] for the protection of freshwater organisms (U.S. EPA, 1986) in less than 50 percent of

Table 2. Maximum concentrations of contaminants of concern at the site.

	Water			Sludge
	Groundwater µg/l	Surface Water µg/l	AWQC[1] µg/l	Lagoon mg/kg
INORGANIC SUBSTANCES				
Trace Elements				
cadmium	500	4,000	1.1*	2,500
chromium	180	8,300	11	2,400
copper	100	1,400	12*	NR
lead	20	<100	3.2*	NR
nickel	140	500	160*	NR
silver	<30	<100	0.12	NR
zinc	530	NR	110*	20,000
Other				
Cyanide	610	6,400	5.2	1,300

1: Ambient water quality criteria for the protection of aquatic organisms. Marine chronic criteria presented (EPA, 1986).
*: Hardness-dependent criteria (100 mg/l $CaCO_3$ used).
NR: Data not reported.

the groundwater samples collected from on- and off-site groundwater monitoring wells between 1983 and 1989. The maximum concentrations of cadmium and cyanide were measured in groundwater wells in the vicinity of the infiltration lagoon and the first pond. The maximum concentration of chromium was detected in an off-site groundwater well located between the site and the Merrimack River. In addition, groundwater samples collected in 1981 from at least three monitoring wells of unknown location indicated concentrations of copper, lead, and silver exceeding AWQC.

Surface water samples were collected from the infiltration lagoon and the two on-site ponds between 1984 and 1989. Concentrations of cadmium, chromium, copper, nickel, and cyanide measured in surface water from the lagoon exceeded applicable AWQC. Cyanide was also measured at high concentrations in the two ponds, but these samples were not analyzed for trace elements. In surface water samples previously collected from the lagoon in 1981 and 1982, concentrations of cadmium, chromium, and silver were one to two orders of magnitude greater than those measured in subsequent sampling. Lead (20 µg/l) and zinc (95,000 µg/l) were also measured in lagoon surface water during the 1981 sampling.

Concentrations of cadmium (28 µg/l), chromium (40 µg/l), and cyanide (580 µg/l) exceeded applicable AWQC in a surface water sample collected from Horseshoe Pond during the 1981 site investigation. There was no additional sampling for trace elements in the pond.

No sampling of surface water or sediments for trace elements was conducted in the Merrimack River in the vicinity of the site.

References

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1

Kingston Dump/ URI Disposal Area

South Kingston, Rhode Island

Cerclis# RID981063993

Site Exposure Potential

The West Kingston Town Dump/URI Disposal Area site is located along the eastern side of the Chipuxet River Valley in South Kingston, Rhode Island. The 2.6-hectare site is on land that had been part of a sand and gravel quarry since the 1930s and is surrounded on all sides by property at a higher elevation. The West Kingston Town Dump was used as a solid waste dump from 1951 to 1978. Household, commercial, institutional, and industrial wastes were disposed of at the dump. The URI Disposal Area includes at least three separate disposal areas which operated from 1945 to 1987. Wastes disposed of included empty paint cans, oil containers, pesticide containers, lab wastes, lab equipment, machinery, drums, and old tanks (U.S. EPA, 1991).

Surface water in the site vicinity includes Hundred Acre Pond, 500 m west of the site, and Thirty Acre Pond, immediately south of Hundred Acre Pond. The Chipuxet River flows south from Thirty Acre Pond, entering Worden Pond 5.6 km downstream of the site. The Pawcatuck River drains Worden Pond and flows east, entering Little Narragansett Bay approximately 60 km downstream of Worden Pond (Figure 1).

The site lies within the Chipuxet River Basin, a major groundwater reservoir that includes 21 m of discontinuous silt, sand, and gravel above the underlying bedrock. The water table is 6 m below ground surface; the overburden and bedrock are treated as a single aquifer due to the absence of any confining layers within a 6.5-km radius of the site (U.S. EPA, 1991).

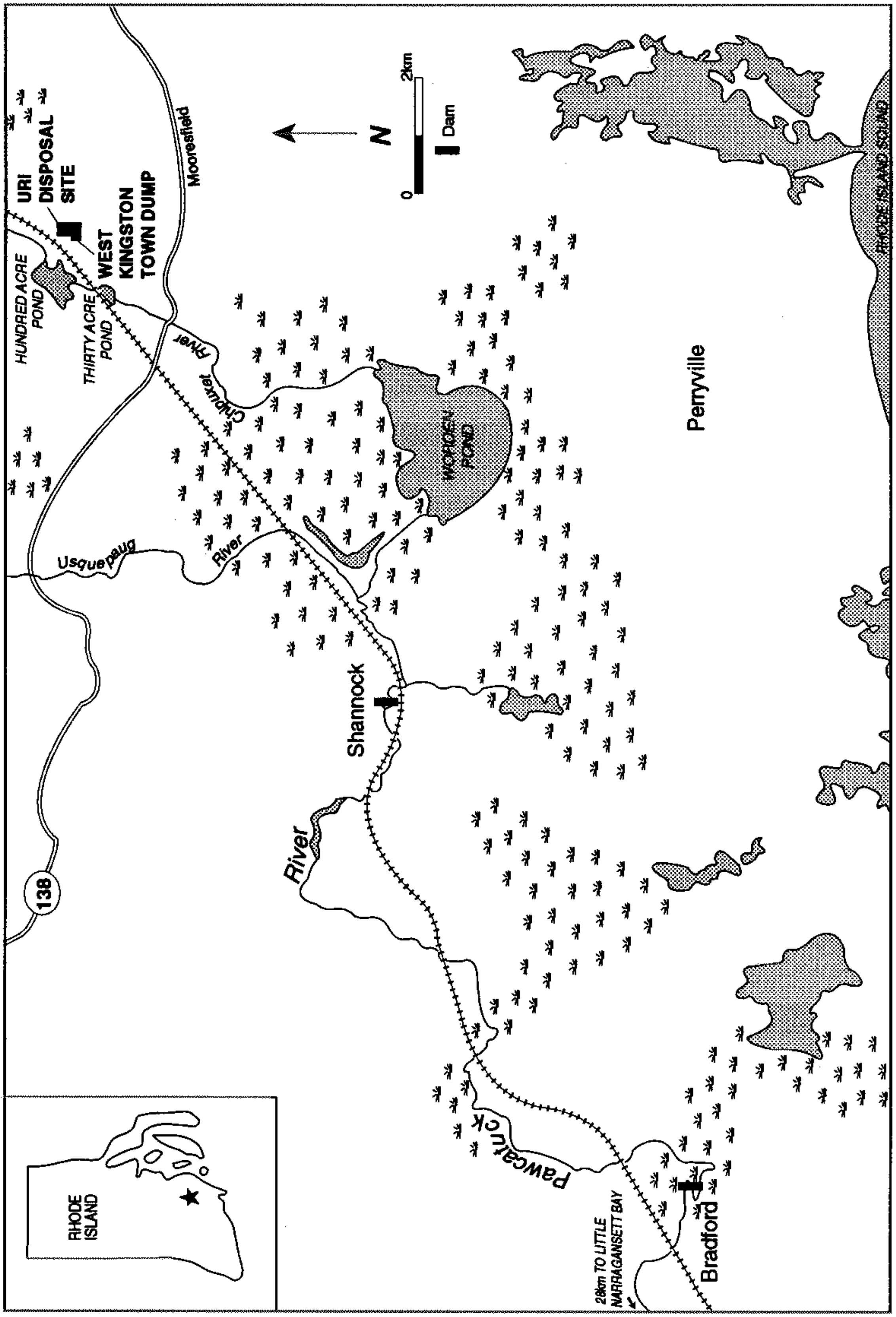

Figure 1. Location of the West Kingston Town Dump/URI Disposal Area in West Kingston, Rhode Island.

Groundwater is the major pathway by which site-related contaminants can migrate to trust habitats. Regionally, groundwater flows southwest while local flow is west toward Hundred Acre Pond. Due to a history of sand and gravel excavation, the majority of the site is lower in elevation than the surrounding area. Therefore, it is not possible for hazardous substances to migrate offsite via surface water flow (U.S. EPA, 1991).

NOAA Trust Habitats and Species

American eel is the only NOAA trust resource in Hundred Acre Pond, Thirty Acre Pond, and the Chipuxet River, the habitats potentially affected by the site. There are four dams on the Pawcatuck River: Potter Hill dam, approximately 32 km downstream of the site; Bradford dam, approximately 25 km downstream of the site; and two dams at Shannock, approximately 10 km downstream of the site. The dams at Potter Hill and Bradford are equipped with fish passage facilities. The first dam at Shannock is low enough to permit fish passage. The second dam, Horseshoe Dam, is approximately 2 m high and does not have fish passage facilities. This dam limits all upstream fish migration. Although fish passage facilities have been proposed, restoration plans are not definite (Gibson, personal communication 1992). Hundred Acre Pond, Thirty Acre Pond, and the Chipuxet River are natural, shallow, freshwater habitats. The upper reaches of the Pawcatuck River provide non-tidal freshwater habitat. The lower reaches provide low-salinity estuarine habitat (Gibson, personal communication 1992; Gold, personal communication 1992).

The upper reaches of the Pawcatuck River below Horseshoe Dam provide spawning, nursery, and adult habitat for NOAA trust species (Table 1; Lapin, personal communication 1992). American eel is the only trust species known to migrate beyond Horseshoe Dam (Gibson, personal communication 1992). Atlantic salmon are trapped at the Potter Hill dam and relocated to the Perryville State Trout Hatchery in Perryville, 10 km south of the site. Fingerlings are later reintroduced in Usquepaug River, a tributary that joins the Pawcatuck River just below Worden Pond, and other smaller unnamed tributaries of these two rivers. Atlantic salmon are known to escape occasionally and could conceivably use the Pawcatuck River for spawning and nursery habitat, but this remains undocumented (Gibson, personal communication, 1992).

The Pawcatuck River, Worden Pond, the Chipuxet River, Thirty Acre Pond, and Hundred Acre Pond are used for freshwater recreational fisheries. There is no commercial fishing in these waterbodies (Gibson, personal communication 1992).

Table 1. Species, habitat use, and fisheries in the Pawcatuck River below Horseshoe Dam.

Species		Habitat			Fisheries	
Common Name	Scientific Name	Spawning	Nursery	Adult Forage	Comm.	Recr.
ANADROMOUS SPECIES						
American shad	*Alosa sapidissima*	♦	♦	♦		♦
Atlantic sturgeon[1]	*Acipenser oxyrhynchus oxyrhynchus*	♦	♦	♦		♦
Atlantic salmon[2]	*Salmo salar*			♦		♦
alewife	*Alosa pseudoharengus*	♦	♦	♦		♦
rainbow smelt	*Osmerus mordax*					
CATADROMOUS SPECIES						
American eel	*Anguilla rostrata*		♦	♦		

1 Rare and infrequent in the Pawcatuck River.
2 Atlantic salmon are relocated to hatcheries for spawning.

Site-Related Contamination

Data collected during preliminary site investigations at the site have focused on groundwater sampling. No soil samples have been collected, nor has offsite surface water, sediment, or biota sampling been conducted.

In 1987, five VOCs were detected in groundwater sampled from private wells near the site. The same VOCs were detected in surface water from an on-site pond. Groundwater monitoring conducted in 1989 detected several VOCs and lead in groundwater flowing west towards Hundred Acre Pond at concentrations exceeding those in groundwater collected upgradient of the site (Table 2; U.S. EPA, 1991). Lead was the only contaminant detected in groundwater that exceeded the ambient water quality criterion (AWQC; U.S. EPA, 1986) for the protection of aquatic life. However, the maximum concentration of lead did not exceed the screening criterion (ten-times AWQC).

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Gold, A., Professor of Natural Resources Science, University of Rhode Island, Kingston, personal communication, February 26, 1992.

Table 2. Maximum concentrations of contaminants detected in groundwater at the Kingston Dump/ URI Disposal Area site.

	Water		
	Groundwater		AWQC[1]
	Upgradient µg/l	On-site µg/l	µg/l
ORGANIC SUBSTANCES			
Volatile Organic Compounds			
1,1 dichloroethane	<1	4	20,000*
1,2 dichloroethene	<1	30	N/D
tetrachloroethene	<1	52	840*
1,1,1 trichloroethane	<1	12	9,400*
trichloroethylene	<1	95	21,900*
INORGANIC SUBSTANCES			
Trace Elements			
lead	<1.1	12	3.2+

1: Ambient water quality criteria for the protection of aquatic organisms. Freshwater chronic criteria presented (U.S. EPA, 1986).
*: Insufficient data to develop criteria; value presented is the Lowest Observed Effects Level.
+: Hardness-dependent criteria (100 mg/l $CaCO_3$ used).
NA: Screening level not available.

Lapin, B., Fisheries Biologist, Rhode Island Department of Environmental Management, Division of Fish and Wildlife, Wakefield, personal communication, March 4, 1992.

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2

Li Tungsten

Glen Cove, New York

Cerclis # NYD986882660

Site Exposure Potential

The 11-hectare Li Tungsten site is in Glen Cove, New York adjacent to the Mattiace Petrochemical Superfund Site (Figure 1). The site is within the one hundred-year floodplain of Glen Cove Creek which borders the site to the south. Glen Cove Creek discharges to Hempstead Harbor 1 km west of the site. Hempstead Harbor is connected directly to Long Island Sound and the Atlantic Ocean.

From the 1940s to the early 1980s, tungsten ore smelting operations were conducted at the site. Waste materials from the smelting operations, including radioactive compounds, were stored in piles, wooden crates, tanks, and drums throughout the property. Several of the crates and drums were crushed and opened during disposal. In addition, the northeastern portion of the site was used as a landfill for various site-generated wastes. In 1990, 38 electrical transformers and an unspecified number of drums were removed from the site. However, over 15 million kg of solid wastes and 1.4 million l of liquid wastes remain on the site (NUS, 1990).

There is groundwater in two aquifers beneath the site: the shallow Upper Glacial Aquifer and the deeper Lloyd Sand Aquifer. These aquifers are shared by the Mattiace Petrochemical Superfund site to the west. The average depth to shallow groundwater beneath the Li Tungsten site is 2.4 m below ground surface. Shallow groundwater flows south-southwest toward Glen Cove Creek. Perched water table conditions occur in some areas of the site. The deeper, confined aquifer is located approximately 70 m below

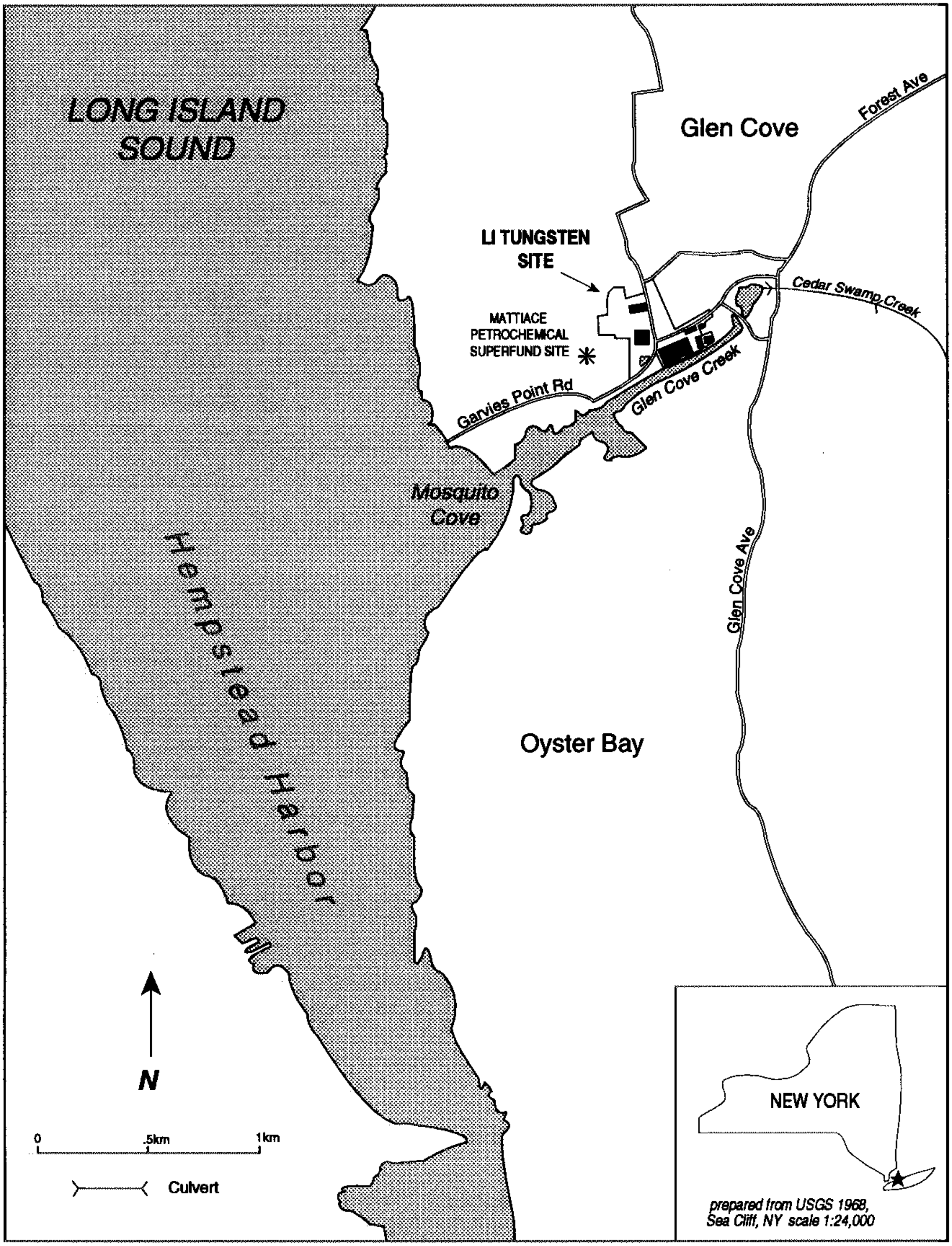

Figure 1. Location of the Li Tungsten site in Glen Cove, New York.

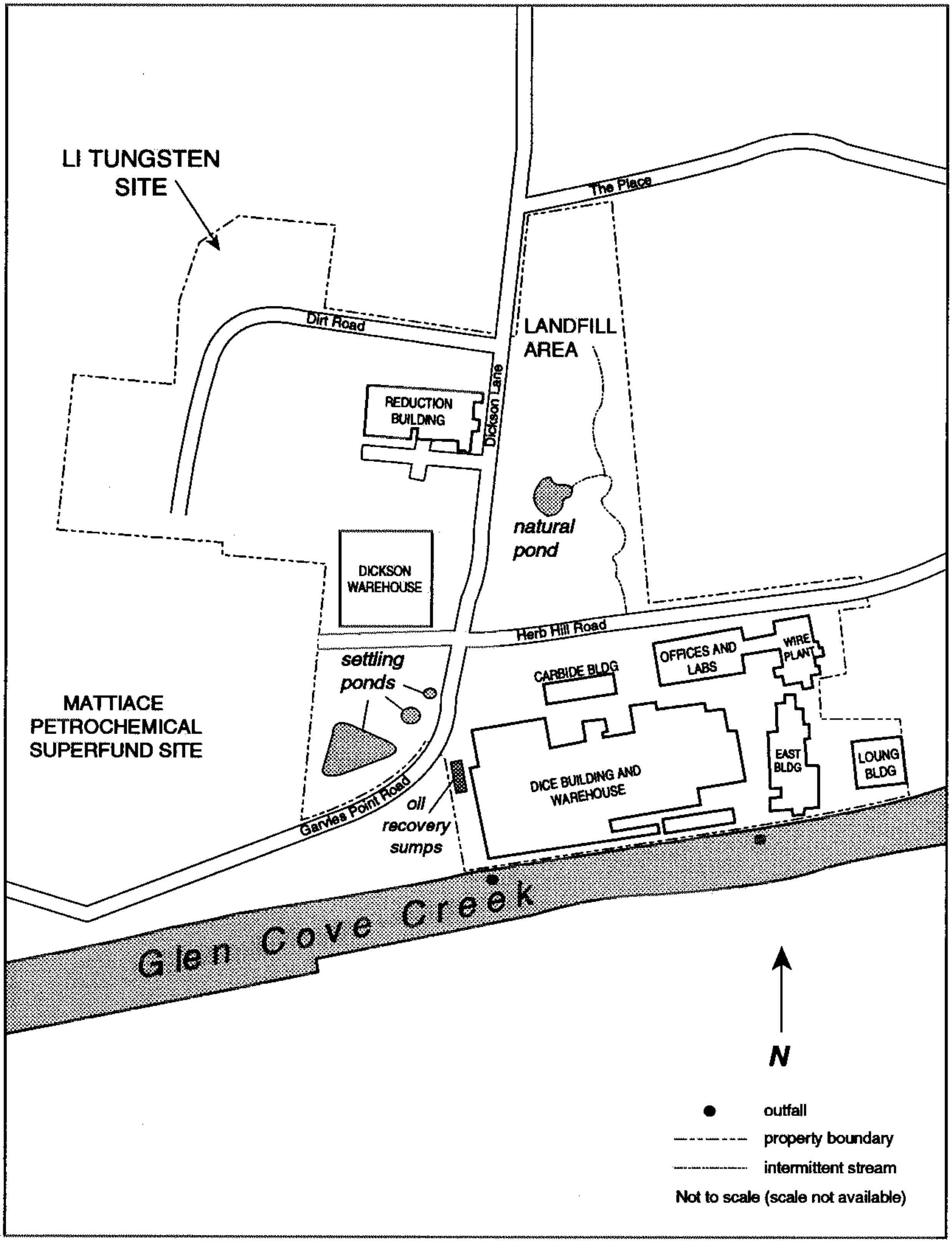

Figure 2. Features of the Li Tungsten site.

ground surface and generally flows from north to south. On-site surface water features include three wastewater settling ponds in the southwestern corner of the site, a natural pond, an intermittent stream in the northeastern portion of the site, and a storm drainage system of unknown location (Figure 2). Only one of the three settling ponds was lined, but its liner is no longer intact, and therefore all three ponds are discharging to shallow groundwater. In addition, at least two drainage outfalls discharge directly to Glen Cove Creek (RTP, 1988; NUS, 1990]. Groundwater, surface water, and direct discharge are the potential pathways of contamination from the site to NOAA resources and associated habitats.

NOAA Trust Habitats and Species

Habitats of primary concern to NOAA are the surface water and associated bottom substrates of Glen Cove Creek and Hempstead Harbor. Glen Cove Creek is tidally influenced along its entire 1.5 km length. Freshwater input to Glen Cove Creek comes mainly from Cedar Swamp Creek (Mackay, personal communication 1990).

Surface water near the site provides spawning, nursery, and adult habitat for many species (Table 1; Beccasio et al., 1980; Freudenthal, personal communication 1990; Zawacki, personal communication 1990; Briggs, personal communication 1991; Hastback, personal communication 1991). Although limited data were available about the resource use of Glen Cove Creek, the tidal exchange in the creek and its proximity to Hempstead Harbor suggest that trustee species could occur periodically in the creek.

Anadromous blueback herring, alewife, American shad, and striped bass use Hempstead Harbor for spawning and nursery habitat. Catadromous American eel are ubiquitous. In addition, sensitive life stages of numerous marine fish occur in the harbor, including winter flounder, tautog, bluefish, and Atlantic menhaden. Bluefish have also been observed in Glen Cove Creek. American lobster, blue mussel, and hard- and soft-shell clams use Hempstead Harbor throughout their life cycles and are likely present in the general vicinity of the site. Blue crab are seen infrequently in the harbor (Zawacki, personal communication 1991), but are known to occur in Glen Cove Creek.

Northern Hempstead Harbor is subject to low-oxygen events that occur in Long Island Sound and can cause significant fish kills. There is a fish kill known locally as "The Jubilee" in Hempstead Harbor during July or August when northeast winds combine with upwelling currents. At high tide, deeper anoxic water pushes onto the shore. The anoxic water forces fish and invertebrates out of the water and onto the beach, causing large fish kills which include American eel, flounder, Atlantic menhaden, and bluefish (Freudenthal, personal communication 1990).

Table 1. Species, habitat use, and commercial and recreational fisheries in Hempstead Harbor.

Species		Habitat			Fisheries	
Common	Scientific Name	Spawning	Nursery	Adult Forage	Comm.	Recr.
ANADROMOUS SPECIES						
blueback herring	*Alosa aestivalis*	◆	◆			
alewife	*Alosa pseudoharengus*	◆	◆			
American shad[1]	*Alosa sapidissima*	◆	◆			
striped bass	*Morone saxatilis*	◆	◆			◆
CATADROMOUS SPECIES						
American eel	*Anguilla rostrata*		◆	◆		
RESIDENT SPECIES						
Fish						
Atlantic menhaden	*Brevoortia tyrannus*		◆	◆		
black sea bass[1]	*Centropristis striata*		◆			
weakfish[1]	*Cynoscion regalis*	◆	◆			
mummichog	*Fundulus heteroclitus*	◆	◆	◆		
striped killifish	*Fundulus majalis*	◆	◆	◆		
Atlantic silversides	*Menidia menidia*	◆	◆	◆		
northern kingfish[1]	*Menticirrhus spp.*	◆	◆			
summer flounder[1]	*Paralichthys dentatus*	◆	◆	◆		◆
bluefish	*Pomatomus saltatrix*			◆		◆
winter flounder	*Pseudopleuronectes americanus*	◆	◆	◆		◆
windowpane	*Scophalmus aquosus*	◆	◆	◆		
northern puffer[1]	*Sphoeroides maculatus*			◆		
scup	*Stenotomus chrysops*	◆	◆			◆
tautog	*Tautoga onitis*	◆	◆	◆	◆	◆
oyster toadfish	*Upsanus tau*	◆	◆	◆		
red hake	*Urophycis chuss*	◆	◆			
white hake	*Urophycis tenuis*	◆	◆			
Invertebrate						
blue crab[1]	*Callinectes sapidus*	◆	◆	◆		◆
sand shrimp	*Crangon septemspinosa*	◆	◆	◆		
American lobster	*Homarus americanus*	◆	◆	◆	◆	◆
hard shell clam[2]	*Mercenaria mercenaria*	◆	◆	◆	◆	◆
soft shell clam	*Mya arenaria*	◆	◆	◆		
blue mussel	*Mytilis edulis*	◆	◆	◆		◆
grass shrimp	*Palaemonetes pugiio*	◆	◆	◆		
manta shrimp	*Squilla empusa*	◆	◆	◆		

1 Rare or infrequent in Hempstead Harbor .
2 Hard shell clams harvested west of Matinicock Point (including Hempstead Harbor) must be transferred to certified waters in eastern Long Island Sound for depuration lasting at least 21 days.

Hempstead Harbor supports important commercial and recreational fisheries for American lobster, tautog, and hard-shell clam (Zawacki, personal communication 1990; Briggs, personal communication 1991). The harbor also supports significant recreational fisheries for striped bass, winter flounder, and bluefish. There is a recreational fishery for blue crab in Glen Cove Creek

(Briggs, personal communication 1991). All of these species are subject to human health advisories because of contamination by fecal coliform bacteria or PCBs. Since 1970, the New York Department of Environmental Conservation has required depuration in certified waters of all shellfish harvested commercially from Hempstead Harbor (Hastback, personal communication 1991).

Site-Related Contamination

Data from preliminary site investigations indicate that groundwater, soils, surface water, and sediments are contaminated at the site (RTP, 1988; Aschwanden, 1990; NUS, 1990). The primary contaminants of concern to NOAA are trace elements, pesticides, and PCBs. Maximum concentrations of these inorganic substances and organic compounds are summarized in Table 2, along with applicable screening criteria. Secondary contaminants of concern at the site include cyanide, tetrachloroethene (PCE), PAHs, and radioactive compounds (e.g., thorium and uranium).

Concentrations of copper, lead, mercury, and nickel exceeded applicable ambient water quality criteria (AWQC; U.S. EPA, 1986) in over 60 percent of the groundwater monitoring wells sampled at the site. Arsenic and zinc were detected less frequently in on-site groundwater at concentrations greater than screening criteria. Surface water samples were collected from the on-site natural and settling ponds, the intermittent stream, waste oil sumps, and two unidentified surface water features. Concentrations of copper, lead, and nickel in surface water samples from over 50 percent of the sampling locations exceeded screening criteria. High concentrations of arsenic, cadmium, chromium, mercury, silver, and zinc were detected less frequently in on-site surface waters. Trace element concentrations in surface water samples collected near two outfalls in Glen Cove Creek did not exceed screening criteria.

Elevated concentrations of arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc were detected in soils throughout the site. These metals were also detected in sediment samples collected from the on-site surface water features at concentrations exceeding screening criteria. Except for arsenic and chromium, these elements were also detected at high concentrations in sediments collected near the outfalls in Glen Cove Creek.

High concentrations of tungsten were measured in groundwater, soils, surface waters, and sediments collected throughout the site. Data on the toxicity of tungsten are not available.

DDE and DDT were measured in soil samples collected near the settling ponds and the intermittent stream. DDD and DDE were detected in sediments collected from the natural pond in

Table 2. Maximum concentrations of contaminants of concern at the site.

	Water			Soil		Sediment		
	Ground-water	Surface Water	AWQC[1]	Soil	Average[2] U.S. Soil	On site	Glen Cove Creek	ER-L[3]
	µg/l	µg/l	µg/l	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
INORGANIC SUBSTANCES								
Trace Elements								
arsenic	2,800	150	36	3,700	5	1,800	20	33
cadmium	54	15	9.3	49	0.06	10	8.3	5
chromium	50	66	50	170	100	88	47	80
copper	2,100	1,600	2.9	4,200	30	990	280	70
lead	210	200	5.6	16,000	10	5,100	350	35
mercury	13	0.84	0.025	13	0.03	9	0.53	0.15
nickel	530	76,000	8.3	9,100	40	3,300	82	30
silver	ND	35	2.3+	160	0.05	140	38	1
tungsten	150,000	41,000	NA	43,000	NA	20,000	1,000	NA
zinc	6,200	1,500	86	3,000	50	620	1,700	120
ORGANIC COMPOUNDS								
PCBs								
Aroclor 1248	ND	2.6	0.03*	4.7	NA	50	ND	0.05*
Aroclor 1254	ND	2.2	0.03*	2.9	NA	1.6	ND	0.05*
Pesticides								
DDD	ND	0.17	NA	ND	NA	0.15	0.07	0.002
DDE	ND	ND	14+	0.034	NA	0.17	ND	0.002
DDT	ND	ND	0.001	0.071	NA	ND	ND	0.001

1: Ambient water quality criteria for the protection of aquatic organisms. chronic criteria presented (U.S. EPA, 1986).
2: Lindsay (1979).
3: Effects range-low; the concentration representing the lowest 10 percentile value for the data in which effects were observed or predicted in studies compiled by Long and Morgan (1990).
+: Acute criteria presented; chronic criteria not available.
*: Criteria presented is for total PCBs.
NA: Screening level not available.
ND: Not detected at method detection limit.

the northern portion of the site at concentrations exceeding screening criteria. DDD was also detected in one sediment sample collected near the easternmost outfall in Glen Cove Creek at a concentration greater than the screening criterion. DDD was detected in one surface water sample collected from the natural pond, but AWQC are not available for comparison. Pesticides were not detected in groundwater at concentrations exceeding screening criteria.

PCBs (Aroclors 1248 and 1254) were detected in soil samples collected in the northeastern portion of the site. These mixtures were also measured in surface water and sediment samples from the on-site settling ponds at concentrations exceeding the screening criterion. PCBs were not detected in groundwater at concentrations exceeding the screening criterion.

Concentrations of cyanide exceeding screening criteria were measured infrequently in on-site groundwater and surface water. High concentrations of PCE (19,000 μg/l) were measured in groundwater south of the natural pond. A plume of PCE contamination extends southwest from this area. However, the PCE contamination is considered to be the result of dry-cleaning operations previously conducted upgradient of this area, and therefore was not attributed to activities at the Li Tungsten site. Concentrations of total PAHs in sediments near the two outfalls in Glen Cove Creek (up to a maximum of 25 mg/kg) were higher than the ER-L concentration of 4.0 mg/kg.

In 1989, a survey for the presence and extent of radionuclide contamination was conducted at the Li Tungsten site. High levels of radiation (up to a maximum of 1,000 pCi/g were frequently detected in soils and equipment. New York State background soil radiation levels are 55 pCi/g for thorium and 180 pCi/g for uranium (NUS, 1990). In a separate study, sediment samples were collected from Glen Cove Creek and Hempstead Harbor in the vicinity of the site for radionuclide analysis. Results indicated that sediments did not contain elevated levels of radionuclides (Linsalata and Cohen, 1989).

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4

Broward County/ 21st Manor Dump

Fort Lauderdale, Florida

Cerclis # FLD981930056

Site Exposure Potential

The Broward County/21st Manor Dump is on 21st Manor Street between SW 46th Avenue and SW 43rd Way in Fort Lauderdale, Florida (Figure 1). The North and South New River canals converge approximately 3 km downstream of the site to form the South Fork of the New River. This river discharges into the Intracoastal Waterway and later joins the Atlantic Ocean approximately 16 km downstream of the site.

The site, approximately 340 m long by 76 m wide, is on the southern end of Meadowbrook Elementary School property. The dump was originally either a natural depression or a borrow pit. Its depth is unknown, as is the depth at which wastes were disposed. The dump was used from the 1950s to the late 1960s. Upon closure, the depression was filled and brought up to grade with the surrounding area. In 1971, 21st Manor Street was moved southward and now passes over the middle of the site. There is no record of the materials disposed of in the dump (NUS, 1990).

Groundwater discharge to surface water is a potential pathway of contaminant transport from the site to NOAA trust resources and associated habitats. The unconfined Biscayne aquifer is the sole aquifer in the county. The upper sediments of this shallow, surficial aquifer are exposed at land surface. The aquifer thins westward, extending 65 km inland, and is up to 60 m thick in eastern Broward County. Groundwater generally

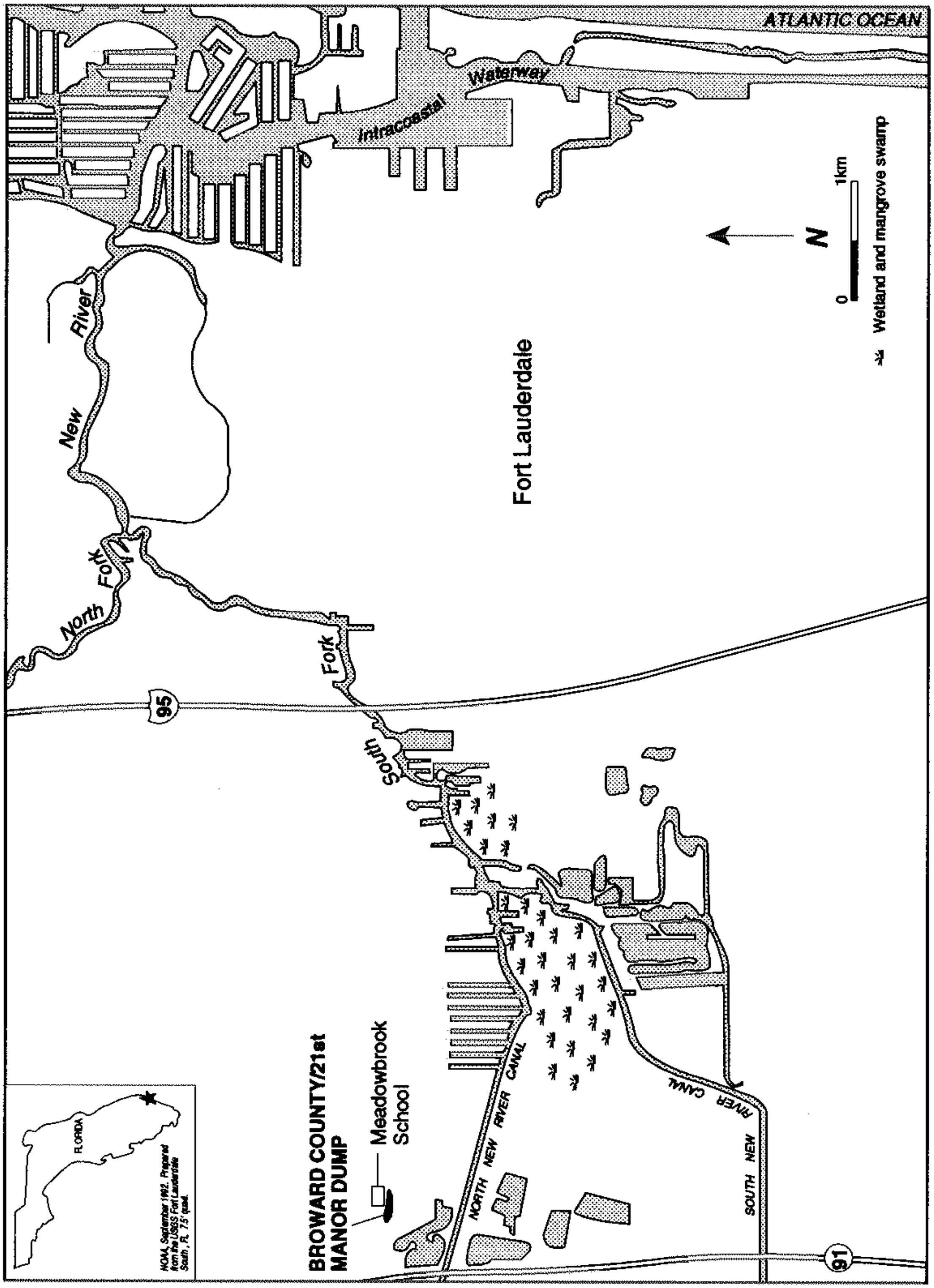

Figure 1. The Broward County/21st Manor Dump site.

flows toward the south and southeast. Though discharge points of the aquifer are unknown, the water level in the region is between 0.25 and 1 m above mean sea level (msl). No information was presented on potential tidal influences on groundwater (NUS, 1990).

Surface water runoff was not considered to be a viable contaminant pathway due to the lack of an overland runoff migration route. Discharge points and flow patterns of surface water were not well-defined in the data presented (NUS, 1990).

NOAA Trust Habitats and Species

Trust habitats potentially at risk include surface water and associated bottom substrates of the North New River Canal and the South Fork of the New River. A salinity control structure is situated approximately 1 km upstream from the site (Stone, personal communication 1992). Average salinities below the control structure generally range from 1.7-3.0 ppt, but may decrease dramatically during heavy rains. Salinity increases considerably (up to 10 ppt) at the confluence of the North and South New River canals. Waterway floodplains have been modified significantly to accommodate flood control, recreational navigation, and urban development (Somerville, personal communication 1992).

The South Fork of the New River provides habitat to numerous trust resources, including several estuarine fish and invertebrate species (Table 1; Beccasio et al, 1980; King, personal communication 1992). At the confluence of the North and South New River canals, patches of mangrove swamp remain and offer spawning and nursery areas for several fish and invertebrate species, including snook, a State-protected estuarine game fish. Catadromous American eel are considered likely to occur in the area (King, personal communication 1992). In addition, the federally endangered West Indian manatee (*Trichechus manatus*) uses these waterways. Manatees commonly migrate as far upstream as the salinity control structure on the North New River Canal (Stone, personal communication, 1992). The North New River Canal contains sea grass beds consisting largely of turtle grass (*Thalassia testudinum*) and manatee grass (*Syringodium filiforme*), which are important forage vegetation for manatees. The New River is designated as a manatee protection zone (Florida Power and Light Company, 1989; King, personal communication 1992).

There are no commercial finfish fisheries in the North New River Canal. Although there may be recreational crabbing, the intensity and location of this fishery is unknown (U.S. Fish and Wildlife Service, 1980; King, personal communication 1992). Recreational boating and fishing are major activities in the region. Rivers and canals are fished year-round, although the intensity of fishing near the site is unknown. The recreational snook fishery is the most popular and is aggressively managed by the State. Generally, all species in the area are fished for by sport anglers. Species typically sought are tarpon, drum, bluefish, and snapper. There are no restrictions on these fisheries other than general regulations regarding catch limit and minimum size. A health advisory regarding the limited consumption of fish from the Fort Lauderdale area has been imposed due to excessive levels of mercury contamination originating from upstream locations (King, personal communication 1992).

Table 1. NOAA trust fish and invertebrate species which utilize the North New River Canal and the South Fork of the New River in Fort Lauderdale, Florida.

Species		Habitat			Fisheries	
Common	Scientific Name	Spawning Ground	Nursery Ground	Adult Forage	Comm.	Recr.
CATADROMOUS SPECIES						
American eel	*Anguilla rostrata*			♦		
MARINE/ESTUARINE SPECIES						
bay anchovy	*Anchoa mitchilli*		♦	♦	♦	
sheepshead	*Archosargus probatocephalus*		♦			♦
sea catfish	*Arius felis*		♦			♦
yellowfin menhaden	*Brevoortia smithi*		♦		♦	♦
jack	*Carangidae*		♦			♦
snook [1]	*Centropomus undecimalis*	♦	♦	♦		♦
spotted sea trout	*Cynoscion nebulosus*		♦	♦		♦
weakfish	*Cynoscion regalis*		♦	♦	♦	♦
gizzard shad	*Dorosoma cepedianum*		♦	♦		
threadfin shad	*Dorosoma petenense*		♦	♦		
ladyfish	*Elops saurus*		♦			♦
pinfish	*Langodon rhomboides*		♦		♦	♦
lane snapper	*Lutjanus synagris*		♦			♦
gray snapper	*Lutjanus griseus*		♦			♦
tarpon	*Megalops atlanticus*	♦	♦			♦
mullet	*Mugilidae* spp	♦	♦	♦	♦	♦
Atlantic croaker	*Micropongonias undulatus*		♦	♦	♦	♦
pigfish	*Orthopristis chrysoptera*		♦			♦
bluefish	*Pomatomus saltatrix*		♦	♦	♦	♦
red drum	*Sciaenops ocellatus*	♦	♦	♦	♦	♦
Florida pompano	*Trachinotus goodei*		♦	♦		♦
INVERTEBRATE SPECIES						
ornate crab	*Callinectes ornatus*	♦	♦	♦		
blue crab	*Callinectes sapidus*	♦	♦	♦	♦	♦
brown shrimp	*Penaeus aztecus*		♦	♦		
pink shrimp	*Penaeus duorarum*		♦	♦		
white shrimp	*Penaeus setiferus*		♦	♦		

1. This species is currently protected in Florida.

Site Related Contamination

Data collected during the preliminary site investigation indicated that soil and groundwater at the Broward County/21st Manor Dump contain elevated concentrations of trace elements and pesticides. Maximum concentrations of these contaminants in soil and in groundwater from on-site, off-site, and site background locations are summarized in Tables 2 and 3, respectively, along with screening guidelines (Lindsay, 1979; U.S. EPA, unpublished). No surface water or sediment samples were collected.

Not all media were analyzed for all contaminants of concern. Soils were analyzed for selected trace elements and pesticides, but the analytes list was not consistent between sampling sites. Groundwater was analyzed for selected trace elements and volatile organic compounds (VOCs). Some trace elements and pesticides that were detected in soil were not analyzed for in groundwater.

Table 2. Maximum concentrations (μg/l) of trace elements detected in groundwater at the Broward County/21st Manor Dump.

Trace Elements	On-site	Off-site	Site Background	AWQC[1]
Cadmium	13	ND	ND	9.3
Chromium	300	11	ND	50
Lead	120	7	39	8.5
Mercury	1.9	ND	ND	0.025
Nickel	110	ND	ND	8.3
Zinc	590	510	ND	86

1: Ambient water quality criteria for the protection of aquatic organisms. Marine chronic criteria presented (U.S. EPA, unpublished).
ND: Not detected at method detection limit.

Table 3. Maximum concentrations (mg/kg) of contaminants detected in soils at the Broward County/21st Manor Dump.

	On-site	Off-site	Site Background	U.S. Average[1]
INORGANIC SUBSTANCES				
Trace Elements				
Chromium	13	3.3	4.8	100
Lead	130	19	44	10
Zinc	120	22	ND	50
ORGANIC COMPOUNDS				
Pesticides				
Dieldrin	0.065	0.011	ND	NA
4,4'DDE	0.26	0.0069	0.0022	NA
4,4'DDD	0.75	ND	ND	NA
4,4'DDT	0.04	0.0059	ND	NA

1: Lindsay (1979).
ND: Not detected at method detection limit.
NA: Screening level not available.

Of the trace elements analyzed in soil, only concentrations of lead and zinc exceeded average U.S. soils concentrations (Lindsay, 1979). Pesticide concentrations were highest in on-site soil (Table 3). The concentrations of lead, mercury, and nickel measured in groundwater collected on-site exceeded their respective marine chronic ambient water quality criteria (AWQC) by factors greater than ten. These trace elements were not detected in off-site or site background groundwater samples at concentrations exceeding screening criteria.

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9

Del Amo

Los Angeles, California

Cerclis #CAD029544731

Site Exposure Potential

The Del Amo site, located next to the Montrose Chemical site in Los Angeles, California, is 2.4 km west of the Dominguez Channel (Figure 1). The Del Amo site produced synthetic rubber for the U.S. during World War II. From 1945 until the plant closed in 1969, a variety of organic wastes from former styrene, butadiene, and synthetic rubber production facilities were disposed of in eight excavated unlined pits on the site.

The wastes vary in composition, but are generally characterized as hydrocarbon wastes with high concentrations of volatile aromatic compounds and/or PAHs. There is a six-meter wide underground pipeline right-of-way just inside the site boundary. For the last 50 years, up to 8 different petroleum companies have used pipelines within this right-of-way to transmit a wide range of refined petroleum and chemical products (Dames & Moore, 1990). Groundwater and surface water are potential pathways of contamination from the site to NOAA resources and associated habitats.

Groundwater occurs in four aquifers beneath the site. Shallow groundwater lies approximately 18 m below ground surface and flows southeast. The upper aquifer is separated from the lower aquifers by fine-grained sandy silts and clays and is not hydraulically connected to the three underlying confined aquifers. Groundwater in the deepest aquifer lies thirty meters below ground surface and flows northeast (Dames & Moore, 1990).

Surface drainage near the Del Amo site follows topography and flows southeast. A drainage

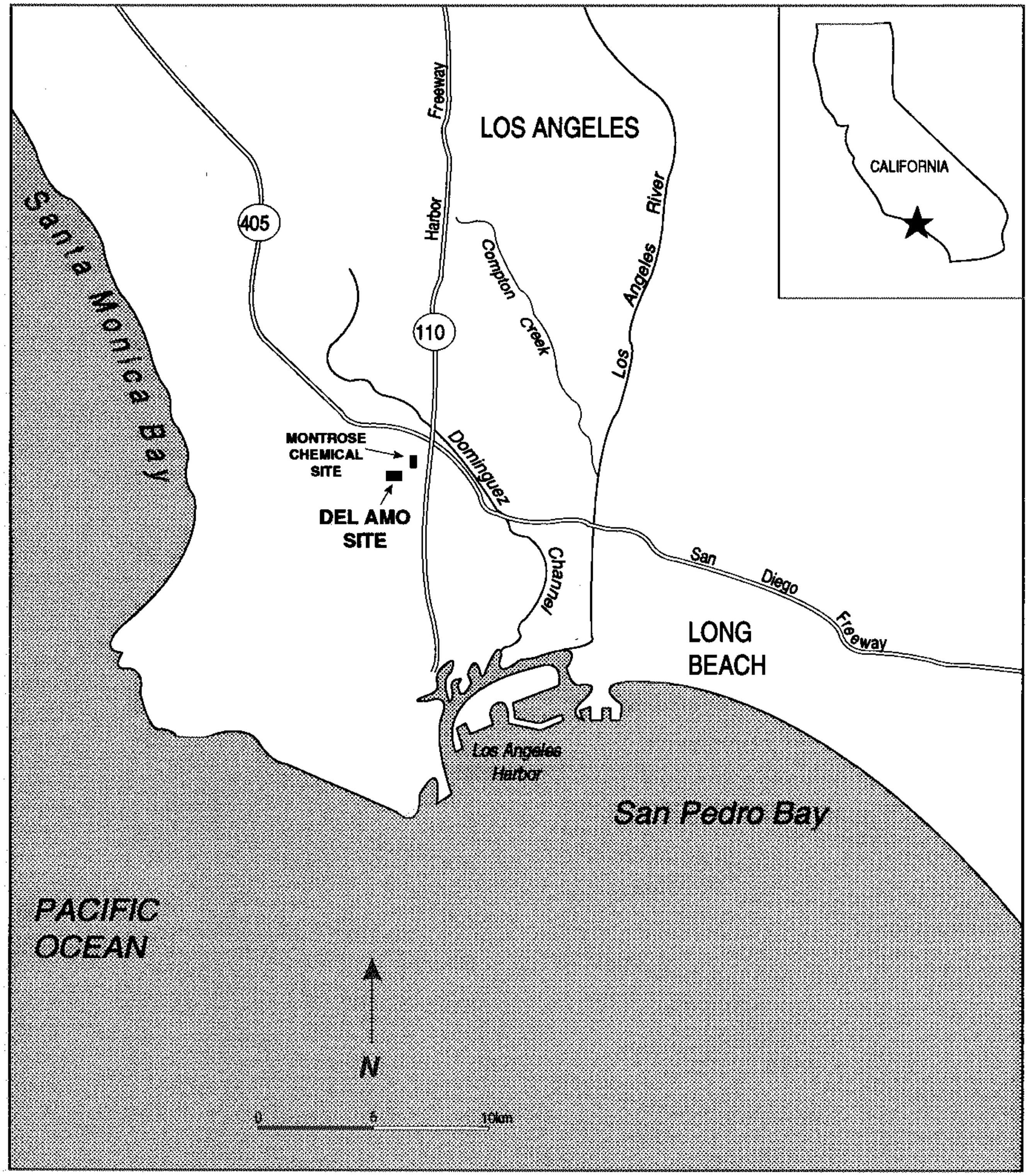

Figure 1. General vicinity of the Del Amo site, Los Angeles, California.

ditch along the northern edge of the site stops surface runoff from entering the site from the north. A drainage channel formed by a railroad embankment along the southern border of the site intercepts any site runoff and conducts it to the east towards a storm drain. Surface drainage has been artificially improved by channelization of Dominguez Creek (Dames & Moore, 1990), which is a modified ancestral coastal river functioning as a flood control and industrial discharge channel for the South Bay area of Los Angeles. The Channel discharges to Los Angeles Harbor in San Pedro Bay 10 km downstream of the site. San Pedro Bay is directly connected to the Pacific Ocean.

NOAA Trust Habitats and Species

The primary habitats of concern to NOAA are the surface waters and associated bottom habitats of Los Angeles Harbor and San Pedro Bay, and to a lesser degree tidal waters and substrates in Dominguez Channel. Dominguez Channel discharges into the east basin of Los Angeles Harbor and is tidally influenced 13 km upstream of its mouth (Helvey, personal communication 1991). In the vicinity of the site, the channel is an unimproved, clay-lined, rip-rap waterway 5 m wide and 25 m deep (Nakahara, personal communication 1991). Composition of substrate in the channel is unknown (Helvey, personal communication 1991).

San Pedro Bay and Los Angeles Harbor are considered important spawning, nursery, and adult habitats for trust resources (Johansen, personal communication 1991).

Species diversity and abundance is greater in San Pedro Bay than in Los Angeles Harbor. Over 130 different fish and invertebrate species have been sampled in San Pedro Bay (Table 1; Allen, 1976; Hagner, personal communication 1991; Crooke, personal communication 1991; Helvey, personal communication 1991; Cross, personal communication 1991). Species utilization of Dominguez Channel is unknown. Sampling conducted at the mouth of Dominguez Channel indicates the presence of fish found in Los Angeles Harbor (Cross, personal communication 1991). During low flow periods, fish may access Dominguez Channel and may utilize it for spawning or nursery habitat (Cross, personal communication 1991). There are no known endangered or threatened trust species in the vicinity of the site (Johnson, personal communication 1991).

No commercial fishing occurs in Dominguez Channel, and sport fishing is minimal due to limited public access along the industrialized channel (Cross, personal communication 1991). San Pedro Bay supports significant year-round recreational fishing, but little commercial fishing. Species regularly caught by anglers include: kelp bass, sand bass, queenfish, white croaker, rockfish, surfperch, California halibut, and diamond turbot. Spiny lobster and rock crab are invertebrate species caught regularly by sport fisherman near Los Angeles Harbor. A commercial bait

Table 1. Species, habitat use, and commercial and recreational fisheries in Los Angeles Harbor and inner San Pedro Bay.

Species		Habitat			Fisheries	
Common Name	Scientific Name	Spawning	Nursery	Adult Forage	Comm	Recr.
RESIDENT SPECIES						
Fish						
poacher	*Agonidae*			◆		
silverside	*Atherinidae*	◆	◆	◆	◆	◆
blenny	*Blennidae*	◆	◆	◆		
left-eye flounder	*Bothidae*	◆	◆	◆		◆
clinid	*Clinidae*	◆	◆	◆		
sculpin	*Cottidae*	◆	◆	◆		◆
surfperch	*Embiotocidae*	◆	◆	◆	◆	◆
anchovy	*Engraulidae*	◆	◆	◆	◆	◆
flying fish	*Exocoetidae*			◆		
goby	*Gobiidae*	◆	◆	◆		
striped mullet	*Mugil cephalus*		◆	◆		
smoothhound	*Mustelus* spp.			◆		
sea bass	*Paralabra* spp.		◆	◆		◆
right eye flounder	*Pleuronectidae*	◆	◆	◆		◆
damselfish	*Pomacentridae*		◆	◆		
midshipmen	*Porichthy* spp.	◆	◆	◆		
skate	*Rajidae*		◆	◆		
guitarfish	*Rhinobatidae*		◆	◆		
drum	*Sciaenidae*	◆	◆	◆	◆	◆
mackerel	*Scombridae*		◆	◆	◆	◆
scorpionfish	*Scorpaenidae*	◆	◆	◆		◆
rockfish	*Sebastes* spp.	◆	◆	◆		◆
California barracuda	*Sphyraena argentea*			◆		◆
pipefish	*Syngnathidae*	◆	◆	◆		
Invertebrate						
rock crab	*Cancer anternnarius*	◆	◆	◆	◆	◆
abalone	*Halioti* spp.	◆	◆	◆		
bay mussel	*Mytilis edulis*	◆	◆	◆		
spiny lobster	*Panulirus interruptus*	◆	◆	◆	◆	◆
littleneck clam	*Protothaca staminea*	◆	◆	◆		
kelp	*Pugettia producta*	◆	◆	◆		
octopus	*Octopodidae*	◆	◆	◆		◆
platform mussel	*Septifer bifurcatus*	◆	◆	◆		
urchins	*Strongylocentro* spp.	◆	◆	◆		
tunicates	*Styel* spp.	◆	◆	◆		
Pismo clam	*Tivela stultorum*	◆	◆	◆		◆
gaper clam	*Tresus nuttali*	◆	◆	◆		◆

fishery exists in San Pedro Bay for northern anchovy, topsmelt, mackerel, and queenfish.

No significant recreational or commercial fishing occurs in Los Angeles Harbor, due to a combination of advisories, closures, and commercial shipping traffic (Crooke, personal communication 1991).

A ban is in effect for commercial and recreational harvesting of white croaker from the San Pedro Bay area due to DDT and PCB contamination (Pollock, personal communication 1991). A related advisory is in effect for the Palos Verdes/ San Pedro Bay area, warning people to limit consumption of fish taken from these waters (Pollock, personal communication 1991). A health advisory is in effect for consuming shellfish from San Pedro Bay; likely due to fecal coliform (Crooke, personal communication 1991).

Site-Related Contamination

Data from previous investigations indicate that soils are contaminated beneath the former waste disposal pits and shallow groundwater in the vicinity of the site. Benzene is the most widespread contaminant, but ethylbenzene, toluene, naphthalene, and mercury have also been found at relatively high concentrations (Table 2; Dames & Moore, 1990).

Benzene and ethylbenzene were major contaminants in waste sampled from the eight on-site hazardous waste disposal pits. High concentrations of PAHs (up to 30,210 ppm) and VOCs (up to 100,000 ppm) were also reported in the waste samples. Concentrations of trace elements in the waste samples collected from the disposal pits were described as generally "low," but the actual data were not available for review (Dames & Moore, 1990).

Benzene, ethylbenzene, and toluene were the dominant VOCs found in soil samples from below the waste pits. Several PAHs were also found in soils below the disposal pits. Soils were not analyzed for trace elements.

Concentrations of benzene, chlorobenzene, and ethylbenzene in groundwater exceeded the LOEL reported by EPA by two to three orders of magnitude. The maximum concentration of mercury in groundwater samples exceeded the ambient water quality criteria by two orders of magnitude. No pesticides or PCBs were detected in groundwater samples (Dames & Moore, 1990).

Lead was found in a ponded surface water sample at a maximum concentration of 300 µg/l, exceeding the ambient water quality criteria by more than a factor of ten. Concentrations of VOCs were reported to be "low," but analytical results for other trace elements and organics were not provided (Dames & Moore, 1990).

EPA signed a Consent Decree with the Potentially Responsible Party in May 1992. The PRP's

Table 2. Maximum concentrations of selected contaminants of concern at the Del Amo site.

	Water			Soil	
	Groundwater µg/l	Surface Water µg/l	AWQC[1] µg/l	Soil mg/kg	Average[2] U.S. Soil mg/kg
INORGANIC SUBSTANCES					
Trace Elements					
lead	<8.4	300	5.6*	NR	10
mercury	6.5	NR	0.025	NR	0.03
zinc	45	80	86**	NR	50
ORGANIC COMPOUNDS					
VOCs					
benzene	1,600,000	NR	700*	66,000	NA
chlorobenzene	300,000	NR	129*	NR	NA
ethylbenzene	300,000	NR	430*	50,000	NA
toluene	2,600	NR	5,000*	940	NA
SVOCs					
acenaphthene	40	NR	55*	9,900	NA
phenanthrene/ anthracene	64	NR	NA	3,900	NA
naphthalene	66	NR	2,350*	5,800	NA

1: Ambient water quality criteria for the protection of aquatic organisms. Freshwater chronic presented (EPA, 1986).

2: Lindsay (1979).

NR: Data not reported.

NA: Screening level not available.

*: Insufficient data to develop Criteria. Value presented is the Lowest Observed Effects Level (L.O.E.L.).

**: Hardness-dependent criteria, 100 µg/l $CaCo_3$ assumed.

site investigation, to be conducted over the next eighteen months, will provide additional information on site-related contaminants.

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9

Pearl Harbor Naval Complex

Oahu, Hawaii

Cerclis # HI4170090076

Site Exposure Potential

The Pearl Harbor Naval Complex is midway along the southern coast of the island of Oahu in Hawaii (Figure 1). The Naval Complex was established in 1901 and development of the station continued through the 1940s. Today, Pearl Harbor is a major fleet homeport for nearly forty warships, service vessels, and submarines with their associated support, training, and repair facilities (Grovhoug, 1991). The Naval Complex includes six major facilities: the Naval Shipyard, the Naval Supply Center, the Naval Station, the Submarine Base, the Public Works Center, and the Inactive Ship Maintenance Facility (Table 1). A seventh facility, the Naval Magazine, is also being considered for inclusion in the Naval Complex.

The Naval Complex includes the East, West, Middle, and Southeast lochs of Pearl Harbor (Figure 1). Several streams cross the Base and transport fresh water into the harbor. These streams drain agricultural and newly urbanized areas before passing through the highly industrialized areas near the harbor. The streams are brackish for short distances upstream of their mouths (Grovhoug, 1991).

Two aquifers underlie the complex: an unconfined caprock aquifer of low permeability which ranges from 8.5 to 440 m deep, and a deeper, highly permeable basalt aquifer. Groundwater in both aquifers flows toward Pearl Harbor (Ecology and Environment, 1989).

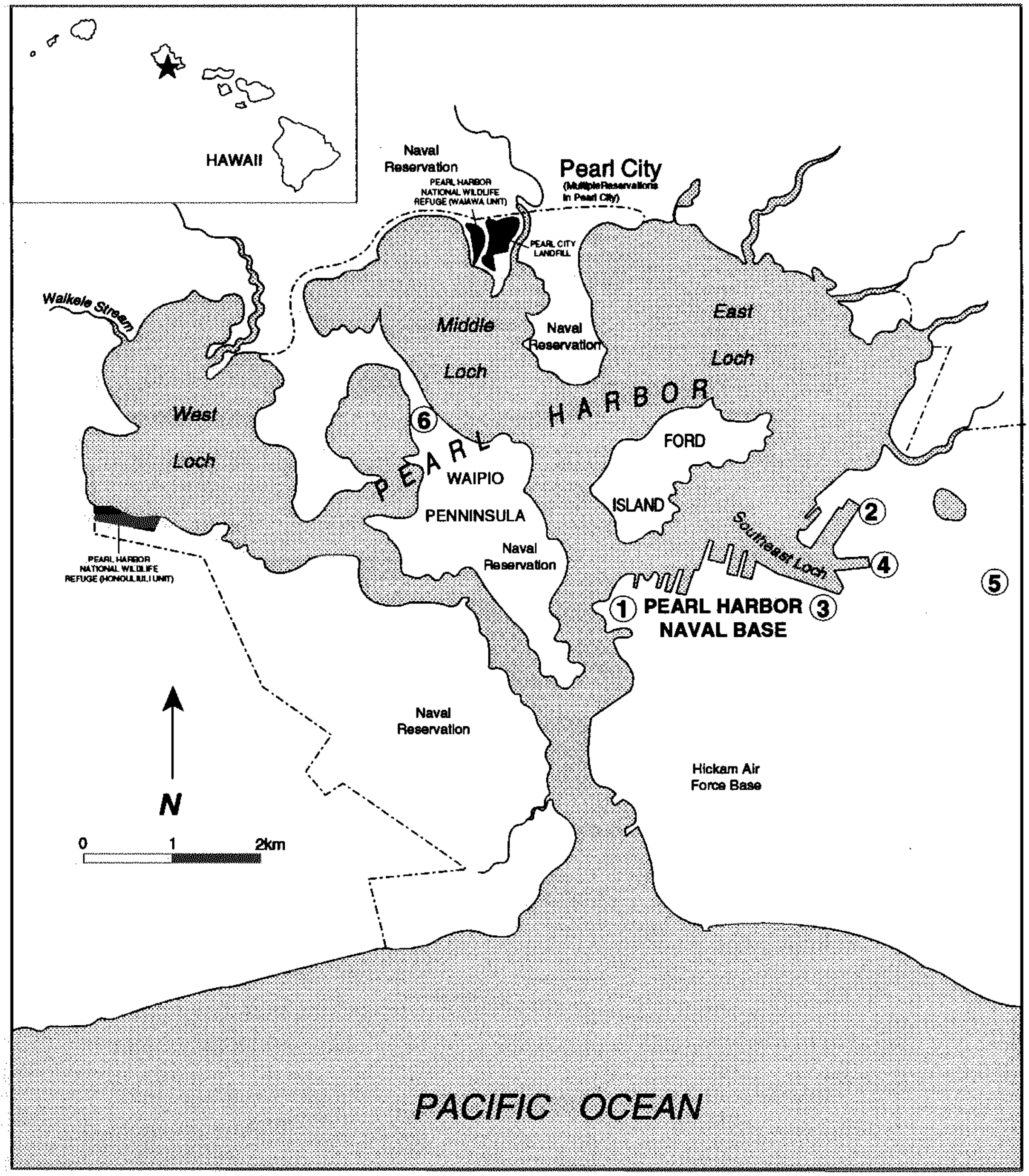

Figure 1. Pearl Harbor Naval Complex, Pearl Harbor, Hawaii. Numbers correspond to the six naval facilities of concern listed in Table 1.

Table 1. Major activities and associated wastes at the six facilities at the site.

	Activity	Types of Waste	Disposal Methods
1	Naval Shipyard major ship repair and overhaul	heavy metals and sulfates, battery acid waste, lead salts, metallic mercury waste, plating waste, PCBs, chromic acid, caustic and steam cleaning compounds, diesel fuel, solvents	1910-1982: runoff, storm drain to harbor, leaking tanks
2	Naval Supply Center fuel farms and storage warehouses	waste oils, tank bottom sludges, fuel, battery acid, lead	1940-1979: dumped, disposal pits
3	Naval Station maintenance and operation of harbor and shore based support facilities	PCBs, metal scraps, acid, oil based cleaning solvents, fuels, solid waste	1920s-1949: dumped to storm drains to harbor 1968: transformer spill
4	Naval Submarine base Homeport for almost 20 nuclear and conventional submarines of the Pacific Fleet; Maintains and operates facilities to support training and experimental operations of the submarine force	Unknown	Unknown
5	Public Works Center Contains a materials department, environmental and industrial laboratory, plumbing shop, paint shop, machine shop, refrigeration shop, electrical shop, transformer shop, pest control shop, and the Pearl City Landfill.	pesticides, PCBs, solvents, corrosives, paint, oils, fuel	1950-1978: dumped in disposal pit, buried drums
6	Inactive Ships Maintenance Depot Includes radiological operations, a machine shop, paint shop, and an automotive grease rack	battery acid, lead, radium	1947-1980: poured onto weeds 1982-present: left onboard ships

Contaminant transport to the Pearl Harbor ecosystem could occur via surface water pathways, groundwater, and sediment. Contaminant releases to both groundwater and surface water routes at the Pearl Harbor Naval Base have been documented, as have direct releases to the nearshore zone of the harbor (Ecology and Environment, 1989). Contaminated sediments have also been remobilized by dredging or vessel movement. Mobile biota can transfer contamination to other locations after accumulating contaminants from the water column, sediment, or from other biota. In addition, bioturbation can mobilize sediment contamination (Grovhoug, 1991).

NOAA Trust Habitats and Species

The habitats of primary concern to NOAA are surface water and sediments of Pearl Harbor. Pearl Harbor is an extremely complex habitat which supports substantial biological productivity (Naughton, personal communication 1991). Mean annual tidal range is approximately 0.5 m. Circulation in the harbor is primarily tidally driven and is generally weak. Water temperature, depth, and salinity are variable (Grovhoug, 1991).

Pearl Harbor provides valuable spawning, nursery, and forage habitats for a rich diversity of trust species; over ninety different fish species have been identified in Pearl Harbor. Most nearshore species known from Hawaii can be found in Pearl Harbor (Naughton, personal communication 1992); selected species are listed in Table 2. Species diversity and abundance in Pearl Harbor is generally greater near its mouth and ocean inlet than in its northern, more brackish areas (Naughton, personal communication 1991). Hawaiian anchovy is the most abundant species. Mullet (amaama, anae), jack (papio, ulua), surgeonfish (manini), Hawaiian tarpon (awa'aua), and goby are also widely distributed (Grovhoug, 1979). Butterfly fish, goatfish, blenny, shark, and barracuda are abundant in more saline waters (Gosline and Brock, 1960). Most of the undeveloped periphery of Pearl Harbor is colonized by mature red mangrove swamps which provide excellent juvenile fish and invertebrate habitat (Eilerts, personal communication 1991). Such brackish habitats are likely utilized by euryhaline fish species such as gobies, striped mullet, bonefish, tilapia, Hawaiian anchovy (nehu), threadfish (moi), needlefish (aha'aha), and milkfish (awa), and by invertebrate species, specifically Hawaiian crab, white crab, and stone crab (Gosline and Brock, 1960). Three species of bivalves are found in Pearl Harbor, none of them native to Hawaii (Oishi, personal communication 1991).

Echinoderm (sea urchin) and hermatypic (stony) coral families are found throughout most bays and harbors on Oahu but are absent in Pearl Harbor. The reason for their absence is unknown; however, both stony corals are relatively sensitive to siltation, freshwater, and industrial pollution (Grovhoug, 1991). Echinoderms are ubiquitous throughout Hawaii and ought to occur in Pearl Harbor (Naughton, personal communication 1991).

A bait fishery for Hawaiian anchovy is the only large-scale commercial fishery in Pearl Harbor (Grovhoug, 1991) and occurs in locations authorized by the U.S. Navy. Milkfish, jack, and mullet are fished commercially on a much smaller scale (Naughton, personal communication 1992). Along the periphery of Pearl Harbor, some low-level sport and subsistence fishing is allowed for people with access to the naval reservation (Oishi, personal communication 1991). All other commercial and sport fishing is prohibited for security reasons (Oishi, personal communication 1991).

There are no threatened or endangered mammal, fish, or invertebrate species reported to be present in Pearl Harbor, although the Hawaiian goby

Table 2. Selected NOAA trust species found in Pearl Harbor, Hawaii.

Species			Habitat			Fisheries	
Common Name	Scientific Name	Hawaiian Name	Spawning	Nursery	Adult Forage	Comm	Recr./Subsist.
RESIDENT SPECIES							
Marine/Estuarine fish							
Surgeonfish	*Acanthuridae*	Manini	◆	◆	◆		◆
Eagle ray	*Aetobatus narinari*	Hihimanu	◆	◆	◆		◆
Bonefish	*Albula vulpes*	'O'io	◆	◆	◆		◆
Cardinalfish	*Apogonidae*	Upapalu	◆	◆	◆		◆
Soft puffer	*Arothron hispidus*		◆	◆	◆		◆
Sleeper goby	*Asterropteryx*		◆	◆	◆		◆
Parrotfish	*Calotomus spinidens*	Uhu	◆	◆	◆		◆
Jack	*Carangidae*	Papio[2], Ulua[3]	◆	◆	◆	◆	◆
Black tip	*Carcharhinus limbatus*	Mano	◆	◆	◆		◆
Butterflyfish	*Chaetodontidae*		◆	◆	◆		◆
Milkfish	*Chanos chanos*	Awa	◆	◆	◆	◆	◆
Conger	*Conger cinreus*	Puhi uha	◆	◆	◆		◆
Porcupinefish	*Diodontidae*		◆	◆	◆		◆
Hawaiian tarpon	*Elops hawaiensis*	Awa'aua	◆	◆	◆		◆
Hawaiian anchovy	*Encrasicholina purpurea*	Nehu	◆	◆	◆	◆	◆
Goby	*Gobiidae*	O'opu	◆	◆	◆		◆
Moray	*Gymnothorax undulatus*	Puhi	◆	◆	◆		◆
Halfbeak	*Hemiramphus depauperatus*		◆	◆	◆		◆
Squirrelfish	*Holocentridae*	U'u	◆	◆	◆		◆
Mountain bass	*Kuhlia sandvicensis*		◆	◆	◆		◆
Black-tail snapper[1]	*Lutjanus fulvus*	To'au	◆	◆	◆		◆
Striped mullet[1]	*Mugil cephalus*	Amaama[2], Anae[3]	◆	◆	◆	◆	◆
Goatfish	*Mullidae*	Weke	◆	◆	◆		◆
Blenny	*Omobranchus*		◆	◆	◆		◆
Boxfish	*Ostracion meleagris camurum*		◆	◆	◆		◆
Threadfish	*Polydactylus sexfilis*	Moi	◆	◆	◆		◆
Damselfish	*Pomacentrida*	Mamo	◆	◆	◆		◆
Lizardfish	*Saurida gracilis*	Ulae	◆	◆	◆		◆
Hammerhead shark	*Sphyrna lewini*	Mano kihikihi	◆	◆	◆		◆
Barracuda	*Sphyraena barracuda*	Kaku	◆	◆	◆		◆
Wrasse	*Stethojulis balteata*	Hinalea	◆	◆	◆		◆
Silvery tilapia[1]	*Tilapia melanotheron*		◆	◆	◆		◆
Mosambique tilapia[1]	*Tilapia mossambica*		◆	◆	◆		◆
Needlefish	*Tylosurus crocodilus*	Aha'aha	◆	◆	◆		◆
Invertebrates							
Japanese oyster[1]	*Crassostrea gigas*		◆	◆	◆		◆
Eastern oyster[1]	*Crassostrea virginica*		◆	◆	◆		◆
Hawaiian crab	*Podophthalmus vigil*		◆	◆	◆		◆
White	*Portunus sanguinolentus*		◆	◆	◆		◆
Common littleneck[1]	*Protothaca staminea*		◆	◆	◆		◆
Samoan crab[1]	*Scylla serrata*						
Blue claw crab							
Stone crab	*Thalamita*		◆	◆	◆		◆
Reptiles							
Green sea turtle[4]	*Chelonia mydas*				◆		

1: Species is not indigenous to Hawaii.
2: Juvenile
3: Adult
4: Federally threatened species

(*Lentipes concolor*) is under consideration by the USFWS as a threatened species (Eilerts, personal communication 1991). This goby is known to migrate through Pearl Harbor. Two species of endangered sea turtles commonly use nearshore habitat outside of Pearl Harbor (Eilerts, personal communication 1991); the federally threatened green sea turtle has been observed in Pearl Harbor (Naughton, personal communication 1992). The Pearl City Peninsula Landfill, one of the potential sites of concern at the Public Works Center, borders the Waiawa Unit of the Pearl Harbor National Wildlife Refuge, which was set aside for federally endangered water birds (Ecology and Environment, 1989).

Site-Related Contamination

During an Initial Assessment Study at the Pearl Harbor Naval Complex in October 1983, thirty potential sites were identified. Soil and groundwater samples were collected on the base; water and sediments were collected in the harbor. On the base, areas (and contaminants) of concern include a battery acid disposal area and former battery acid pit (lead), a storm drain used for disposal of transformer fluid (PCBs), and past sludge disposal areas (PAHs) (Ecology and Environment, 1989). High concentrations of several organic and inorganic contaminants have been reported in soil and groundwater samples collected from potential sources throughout the naval complex (Ecology and Environment, 1989). Maximum concentrations of selected contaminants reported during preliminary investigations are presented in Table 3.

Several trace elements were detected in surface water samples collected from the east end of Ford Island and the Southeast Loch within Pearl Harbor. Cadmium, lead, and mercury exceeded their respective ambient water quality criteria for the protection of marine life (Table 3).

Sediment contamination varies throughout the harbor. The highest concentrations were generally found in Southeast Loch sediment. The concentrations of chromium, copper, lead, mercury, silver, PCBs, and total PAHs exceeded their respective ER-L concentrations, levels at which biological effects are expected to occur (Table 2). The maximum concentrations of chromium (340 mg/kg) and mercury (9.5 mg/kg) were detected in harbor sediments collected near base storm drain outfalls (Ecology and Environment, 1989).

In a single 1979 sampling, chlordane was detected in fish (milkfish and mullet), hammerhead shark, blue claw crab, and Hawaiian crab caught in Middle Loch. Chromium was detected in blue claw crab, and mercury was observed in two fish species, milkfish and jack from the same area. Base activities may have caused elevated concentrations of chromium and mercury in 1979 catches of blue claw crab, Hawaiian crab, mullet, milkfish, or jack (Ecology and Environment, 1989).

Table 3. Maximum concentrations of selected contaminants detected during preliminary investigations at the Pearl Harbor Naval Complex.

	Soil		Water			Sediment	
	Soils mg/kg	Avgerage[1] U.S.Soil mg/kg	Ground-water µg/l	Surface Water µg/l	AWQC[2] µg/l	Sediment mg/kg	ER-L[3] mg/kg
ORGANIC COMPOUNDS							
Total PAHs	93,000	N/D	3,120	NA	300*	1000	4.0
PCBs	1,800	N/D	0.52	NA	0.03	1.1	0.05
Pesticides							
DDT	1,500	N/D	NA	NA	0.001	<0.03	0.003
chlordane	735	N/D	NA	NA	0.004	<0.3	0.0005
INORGANIC SUBSTANCES							
Trace Elements							
cadmium	7.5	0.06	NA	3.3	1.1+	1.5	5
chromium	1,370	100	100,000	1.7	11	340	80
copper	391	30	NA	3.0	12+	79	70
lead	395,000	10	NA	3.3	3.2+	55	35
mercury	0.66	0.03	NA	1.0	0.012	9.5	0.15
nickel	177	40	NA	53	160+	NA	30
silver	5	0.05	NA	0.3	N/D	3.7	1.0
zinc	6,680	50	NA	30	110+	107	120

1: Lindsay (1979)
2: Chronic Ambient Water Quality Criteria for the protection of marine aquatic life (EPA 1986).
3: Effects range-low; the concentration representing the lowest 10 percentile value for the data in which effects were observed or predicted in studies compiled by Long and Morgan (1990).
N/D: Not Determined
NA: Screening level not available.
*: Insufficient data to develop criteria; value presented is the Lowest Observed Effects Level (LOEL).
+: Hardness-dependent criteria; 100 mg/l assumed.

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10

Hamilton Island Landfill

North Bonneville, Washington

Cerclis #WA5210890096

Site Exposure Potential

The Hamilton Island Landfill site encompasses 97 hectares on Hamilton Island in the Columbia River, adjacent to North Bonneville, Washington (Figure 1). The site is located within the one hundred-year flood plain of the Columbia River. There are emergent wetlands along the southern shore of the peninsula and along Hamilton Slough, which forms 1.3 km of the western boundary of the site. Hamilton Slough joins the Columbia River at the western toe of the peninsula. The Columbia River, which flows along the eastern and southern boundaries of the site, discharges to the Pacific Ocean 260 km downstream.

From 1977 to 1982, the site was used as a disposal area for construction and demolition debris generated during construction of the second powerhouse at the Bonneville Dam. The waste materials were reportedly disposed of in four spoils areas on the site. Two of these areas, one of which was the main disposal area (Area A), were located on the island proper. The remaining two spoils areas were located on the filled portion of Hamilton Slough and north of the filled slough. Materials disposed of at the site included scrap steel, sheet metal, bentonite, concrete and concrete curing compounds, pentachlorphenol-treated lumber, solvents, paints, degreasers, plastics, and gear and lubricating oils. In 1982, the site was closed and the landfill disposal areas were seeded and fertilized (USACOE, 1990).

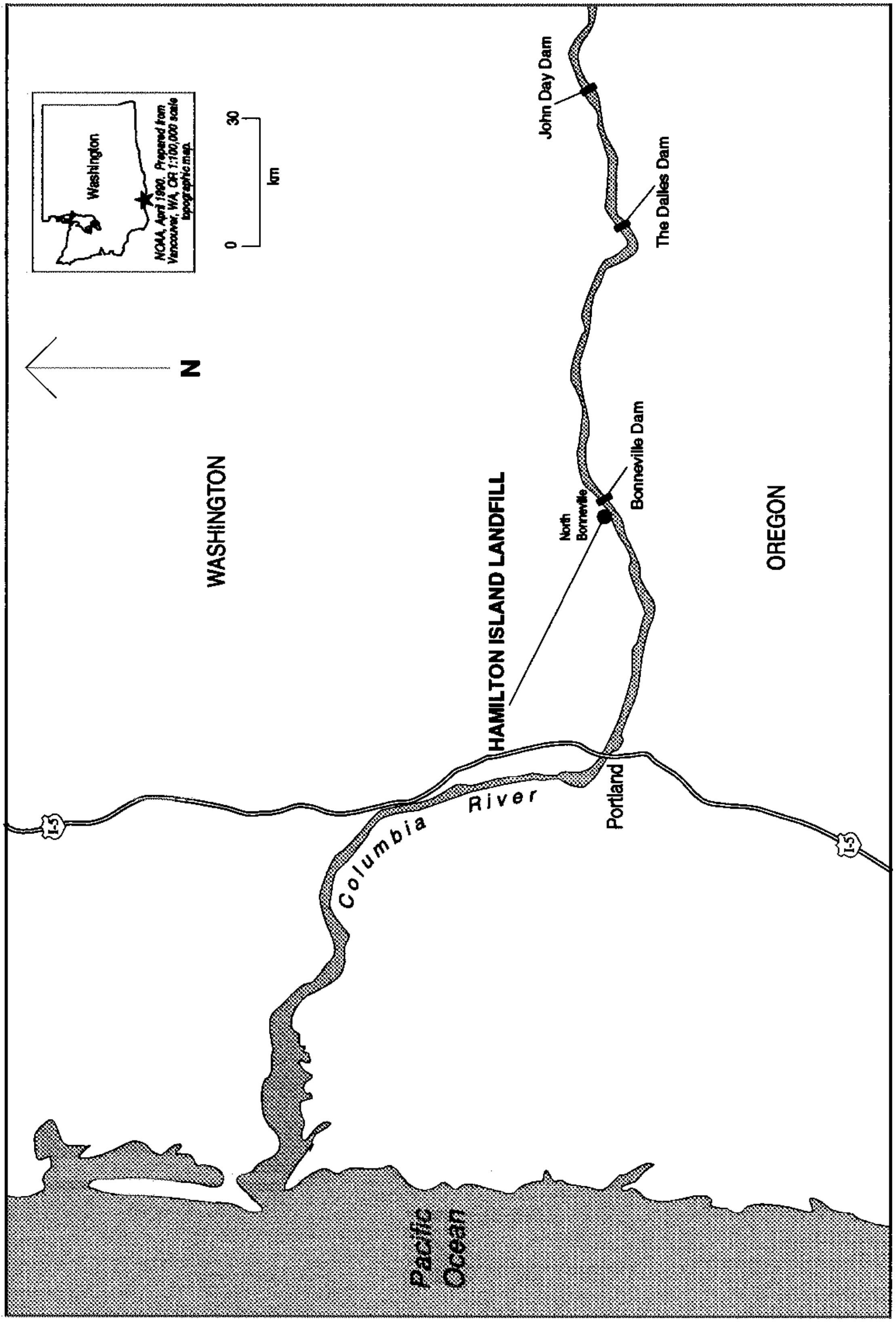

Figure 1. General location of the Hamilton Island Landfill site in North Bonneville, Washington.

There is groundwater in two aquifers beneath the site, but information on the depths below land surface to the aquifers was not available. Shallow groundwater at the site tends to follow the topographic contours and discharges to Hamilton Slough and the Columbia River. Groundwater in the deeper aquifer flows south beneath the landfill and is recharged by the Columbia River. The Bonneville Hatchery, located across the river at Tanner Creek, uses groundwater from the deeper aquifer for hatchery operations. Surface water runoff from the site discharges to Hamilton Slough and the Columbia River via drainage ditches, culverts, and overland flow. Numerous leachate seeps also discharge to the wetlands, Hamilton Slough, and the Columbia River (USACOE, 1990). Groundwater, surface water, and leachate discharge are potential pathways of contamination from the site to NOAA resources and associated habitats.

NOAA Trust Habitats and Species

The habitats of primary concern to NOAA are the surface waters and associated bottom substrates of Hamilton Slough, the Columbia River, and the emergent wetlands adjacent to the site. Secondary habitats of concern include Hardy and Greenleaf sloughs, which are within 2 km of the site. The Columbia River is tidal fresh water in the vicinity of the site. The Bonneville Dam, 3 km upstream of the landfill, is the upstream limit of tidal influence (Willis, personal communication 1991). The upstream limit of estuarine water in the river is about 220 km downstream of the site.

The emergent wetlands and low-velocity sloughs near the site provide spawning, nursery, and adult habitat for numerous species (Table 1; ODFW and WDF, 1989; Dehart and Karr, 1990; USACOE, 1990; Dammers, personal communication 1991; Nielson, personal communication 1991; Willis, personal communication 1991). Hamilton, Hardy, and Greenleaf sloughs also link the Columbia River to perennial spawning tributaries (Hamilton, Hardy, and Greenleaf creeks).

The Columbia River in the vicinity of the site is an important congregation area during upstream and downstream anadromous fish migrations, particularly for several runs of salmon (Willis, personal communication 1991). All anadromous fish that spawn in the vicinity of and above the Bonneville Dam pass by the site at some point. In 1989, an estimated 3.2 million fish passed through the Bonneville Dam during outmigration (USACOE, 1990).

Hardy and Hamilton creeks are recognized as the most valuable of the Bonneville-area salmon production locations and support runs of wild chum and coho salmon (Fiscus, 1991). NOAA has been petitioned to give Federal threatened and endangered status to these remnant natural runs of chum salmon and lower Columbia River wild coho salmon. These salmon, along with

Table 1. Species, habitat use, and commercial and recreational fisheries in the Columbia River in proximity of Bonneville Pool.

Species		Habitat				Fisheries	
Common Name	Scientific Name	Spawning	Nursery	Migration Route	Adult Forage	Comm.	Recr.
ANADROMOUS SPECIES							
green sturgeon	*Acipenser medirostris*			♦	♦		♦
white sturgeon	*Acipenser transmontanus*	♦	♦	♦	♦	♦	♦
American shad	*Alosa sapidissima*	♦	♦	♦	♦		♦
Pacific lamprey	*Lampetra tridentatus*				♦		
steelhead trout	*Oncorhynchus mykiss*	♦	♦	♦	♦		♦
chum salmon	*Oncorhynchus keta*	♦	♦	♦		♦	♦
coho salmon	*Oncorhynchus kisutch*	♦	♦	♦		♦	♦
sockeye salmon	*Oncorhynchus nerka*			♦		♦	♦
chinook salmon	*Oncorhynchus tshawytscha*			♦		♦	♦
cutthroat trout	*Oncorhynchus clarki*	♦	♦	♦	♦		♦
eulachon	*Thaleichthys pacificus*	♦	♦	♦		♦	♦
NON-ANADROMOUS SPECIES							
3-spine stickleback	*Gasterosteus aculeatus*	♦	♦		♦		
rainbow trout	*Oncorhychus mykiss*				♦		♦
walleye	*Stizostedion vitreum*	♦	♦		♦		♦

chinook and sockeye salmon and steelhead trout, form 11 major runs and 51 different stock groups, the majority of which pass by the Hamilton Island Landfill site (Columbia River Fish and Wildlife Authority, 1990).

Other species of significance or occurrence in the vicinity of the site include white sturgeon, sea-run cutthroat trout, American shad, and eulachon. These species are known to use habitat near the site for spawning and nursery grounds.

The Columbia River supports important commercial and recreational fisheries for salmon, steelhead trout, white sturgeon, and American shad. Although the commercial fishing effort in the vicinity of the site is small, sport fisheries are extremely popular, and may be the predominant recreational use in the area (Neilson, personal communication 1991; Willis, personal communication 1991). There is bank fishing on the shoreline of Hamilton Island. Six salmon hatcheries are located near the site, but only the Bonneville Hatchery (across the Columbia River on Tanner Creek) is in the immediate vicinity. Chum and coho salmon smolts and jacks released from this hatchery use the habitat around the vicinity of the landfill for nurseries.

Site-Related Contamination

Data collected during preliminary site investigations indicate that trace elements have contaminated groundwater, leachate seeps, surface water, soils, and sediments at the Hamilton Island Landfill site (USACOE, 1990). A single soil sample also indicated that PCBs may be present. However, surface water and sediment samples have not been collected from Hamilton Slough or the Columbia River, which are the principal habitats of concern to NOAA. Maximum concentrations of trace elements detected at the site are summarized in Table 2, along with applicable screening levels.

Concentrations of chromium, copper, lead, nickel, silver, and zinc measured in groundwater and seeps exceeded applicable ambient water quality criteria (U.S. EPA, 1986) by one to three orders of magnitude. Cadmium and mercury were also detected in groundwater or seeps at concentrations exceeding screening criteria. Surface water samples were collected from on-site drainage ditches and a pond. Copper and lead were the only trace elements detected at concentrations exceeding screening criteria in surface waters from a culvert discharging directly to the Columbia River.

Elevated concentrations of arsenic, cadmium, copper, lead, mercury, silver, and zinc were

Table 2. Maximum concentrations of contaminants of concern at the Hamilton Island Landfill site.

	Water				Soil		Sediment	
	Ground-water	Seeps	Surface Water	AWQC[1]	Surface Soil	Average[2] U.S. Soil	Sediment	ER-L[3]
	µg/l	µg/l	µg/l	µg/l	mg/kg	mg/kg	mg/kg	mg/kg
INORGANIC SUBSTANCES								
arsenic	540	48	<5	190	16	5	4.7	33
cadmium	7.3	670	0.6	0.8+	15	0.06	12	5
chromium	1,600	1,500	ND	11	32	100	32	80
copper	8,000	7,900	26	8.5+	89	30	52	70
lead	3,100	200	2.9	1.9+	61	10	9.4	35
mercury	3.1	<0.2	ND	0.012	1.1	0.03	ND	0.15
nickel	2,500	2,200	ND	110+	26	40	29	30
silver	17	66	ND	0.12	8.2	0.05	10	1
zinc	14,000	29,000	62	76+	260	50	96	120

1: Ambient water quality criteria for the protection of aquatic organisms. Freshwater chronic criteria presented (EPA, 1986).
2: Lindsay (1979).
3: Effects range-low; the concentration representing the lowest 10 percentile value for the data in which effects were observed or predicted in studies compiled by Long and Morgan (1990).
+: Hardness-dependent criteria (68 mg/l $CaCO_3$ used).
NA: Screening level not available.
ND: Not detected at method detection limit.

detected in soils throughout the landfill. Cadmium and silver were the only elements measured at elevated concentrations in sediments collected from a pond in an on-site wetland.

PCBs were measured in one soil sample from the landfill. Aroclor 1260 was detected at a concentration of 0.08 mg/kg in a soil sample collected from the southern face of the main disposal area. PCBs were not detected in leachate seep, surface water, or sediment samples. On-site groundwater was not analyzed for PCBs.

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10

Tulalip Landfill

Marysville, Washington
Cerclis # WAD980369256

Site Exposure Potential

The Tulalip Landfill site covers 60 hectares on North Ebey Island at the mouth of the Snohomish River, 1 km southwest of Marysville, Washington (Figure 1). The site is located within the 100-year floodplain of the Snohomish River, and the landfill is surrounded by low-lying tidal wetlands. Two tributaries of the Snohomish River, Ebey and Steamboat sloughs, border the site to the north and south, respectively. The sloughs discharge to Possession Sound 2 km west of the site. The confluence of these sloughs and the Snohomish River in Possession Sound forms the Snohomish River delta.

From 1964 to 1979, approximately 3.1 million m^3 of domestic and industrial wastes were disposed of at the site. The waste materials were delivered to the site via barges, which reached the landfill via on-site canals, and were buried in unlined cells dredged below the water table in tidal wetlands. Waste materials were also used to fill these canals. Materials disposed of at the site included construction debris, paper and printing wastes, utility company wastes, hospital and laboratory materials, and fertilizers (Tetra Tech, 1987; Ecology & Environment, 1988). In 1979, the site was closed and the landfill was diked and capped (Ecology & Environment, 1988). However, open disposal of construction debris was observed at the site in 1990 (Stuart, personal communication 1990).

Groundwater at the site ranges from 1.5 to 10 m below ground surface, and generally flows southwest, discharging to the Snohomish River delta. Numerous leachate seeps are discharging to the

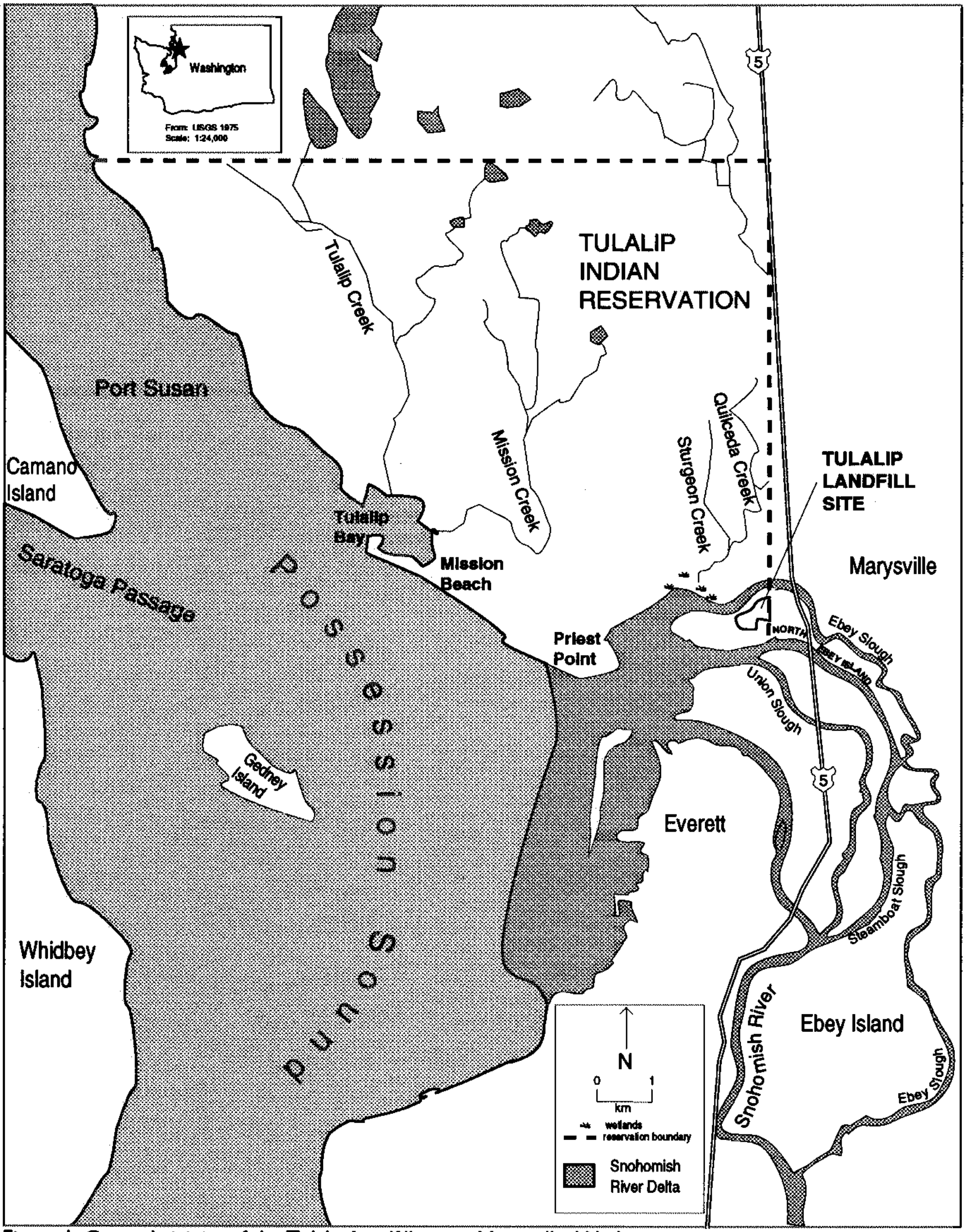

Figure 1. General vicinity of the Tulalip Landfill site in Marysville, Washington

surrounding wetlands and the sloughs. Pooled water was also observed in areas across the site (Ecology & Environment, 1988; Stuart, personal communication 1990). Surface water, leachate, and groundwater discharge represent potential pathways of contamination from the site to NOAA resources and associated habitats.

NOAA Trust Habitats and Species

The surface waters and associated bottom substrates of the Snohomish River delta are the primary habitats of concern to NOAA. The tidal mudflats and emergent marshes near the site provide spawning, nursery, and adult habitat for numerous species (Table 1; English, 1976; Moore, 1976; Roetcisoender and English, 1976; Shapiro and Associates, 1978; City of Everett, 1982; Jones & Stokes, 1984; Hoynes, personal communication 1990; Mead, personal communication 1990; Sekulich, personal communication 1990). During high tide periods, the channels in the wetlands surrounding the landfill may also be used by trustee species for adult forage.

Pacific salmon use the delta as a congregating area during upstream migration. The outmigrating juvenile salmon use the nearshore areas for nurseries. Young shad use the delta as a spring nursery. Juveniles and adults of English sole, the most abundant demersal species, likely forage in intertidal areas near the site during flood tides. Dungeness crab are abundant and ubiquitous throughout the delta.

There are important commercial and recreational fisheries in the delta for pink, chum, coho, and chinook salmon; steelhead and cutthroat trout; American shad; English sole; and Dungeness crab. There are salmon hatcheries northwest of the Tulalip Landfill site in Tulalip Bay, and 85 km upstream of the site in Skykomish, Washington.

Site-Related Contamination

Data collected during preliminary site investigations indicate that groundwater, leachate, surface water, soils, and sediments are contaminated (Ecology & Environment, 1988; PTI Environmental Services and Tetra Tech, 1988). Primary contaminants of concern to NOAA are the trace elements, PCBs, fecal coliforms, and antibiotic-resistant pathogens. Maximum concentrations of trace elements detected at the site are summarized in Table 2, as are applicable screening levels.

Concentrations of chromium, copper, lead, mercury, nickel, silver, and zinc were highly elevated in groundwater and leachate and exceeded applicable ambient water quality criteria (U.S. EPA, 1986) by one to two orders of magnitude. Except for silver, these trace elements were also detected at high concentrations

Table 1. Species and habitat use in the Snohomish River delta.

Species		Habitat			Fisheries	
Common	Scientific Name	Spawning	Nursery	Adult Forage	Comm.	Recr.
ANADROMOUS SPECIES						
American shad	*Alosa sapidissima*	♦	♦	♦	♦	
Pacific lamprey	*Entosphenus tridentatus*			♦		
pink salmon	*Oncorhynchus gorbuscha*		♦		♦	♦
chum salmon	*Oncorhynchus keta*		♦		♦	♦
coho salmon	*Oncorhynchus kisutch*		♦		♦	♦
chinook salmon	*Oncorhynchus tshawytscha*		♦		♦	♦
cutthroat trout	*Oncorhynchus clarki*		♦			♦
steelhead trout	*Oncorhynchus mykiss*		♦			♦
Dolly varden	*Salvelinus malma*		♦			♦
longfin smelt	*Spirinchus thaleichthys*	♦	♦	♦	♦	♦
eulachon	*Thaleichthus pacificus*	♦	♦	♦		
RESIDENT SPECIES						
Fish						
Pacific sand lance	*Ammodytes hexapterus*	♦	♦	♦		
sablefish	*Anoplopoma fimbria*		♦		♦	
arrow goby	*Clevelandia ios*	♦	♦	♦		
Pacific herring	*Clupea harengus pallasi*					
shiner perch	*Cymatogaster aggregata*		♦	♦		
striped sea perch	*Embiotoca lateralis*		♦	♦		
buffalo sculpin	*Enophyrs bison*	♦	♦	♦		
Pacific cod	*Gadus macrocephalus*		♦	♦	♦	♦
3 spine stickleback	*Gasterosteus aculeatus*	♦	♦	♦		
P. staghorn sculpin	*Leptocottus armatus*	♦	♦	♦		
Pacific hake	*Merluccius productus*	♦	♦		♦	
Pacific tomcod	*Microgadus proximus*		♦	♦	♦	
Dover sole	*Microstomus pacificus*	♦	♦	♦	♦	
English sole	*Parophrys vetulus*	♦	♦	♦	♦	♦
starry flounder	*Platichthys stellatus*	♦	♦	♦	♦	♦
sand sole	*Psettichthys melanostictus*	♦	♦			
Invertebrates						
pink mud shrimp	*Callianassa californiensis*	♦	♦	♦		
Dungeness crab	*Cancer magister*	♦	♦	♦	♦	♦
bent-nosed clam	*Macoma nasuta*	♦	♦	♦		
sand clam	*Macoma secta*	♦	♦	♦		
soft shell clam	*Mya arenaria*	♦	♦	♦		♦
edible mussel	*Mytilis edulis*	♦	♦	♦		♦
marine crayfish	*Upogebia pugettensis*	♦	♦	♦		
Marine mammals						
killer whale	*Orcinus orca*			♦		
harbor seal	*Phoca vitulina*			♦		
Dall porpoise	*Phocoenoides dallii*			♦		
California sea lion	*Zalophus californicus*			♦		

in surface waters from the wetlands adjacent to the landfill. Copper and lead were the only trace elements measured at concentrations exceeding applicable screening criteria in surface waters from the sloughs.

Arsenic, copper, lead, and zinc were consistently detected at concentrations greater than screening criteria in on-site, leachate-stained soils and sediments from the wetlands surrounding the landfill. Elevated concentrations of chromium, nickel, and silver were measured in sediments from the sloughs and Priest Point, approximately 2 km west of the site.

PCBs were measured at high concentrations in leachate and leachate-stained soils. PCBs were also detected in tissue samples of fish collected from Ebey and Steamboat sloughs. Concentrations in tissues ranged from 10 to 120 µg/kg (Lane, 1986).

Little significance is attached to the presence of total coliform bacteria in non-drinking waters except at concentrations greater than 2,000 organisms/100 ml. Total coliform bacteria were detected at concentrations exceeding this level in leachate, pooled water, and surface water in the wetlands adjacent to the landfill. Comparison values for opportunistic mammalian pathogens are not available, but high concentrations of three opportunistic antibiotic-resistant pathogens were measured in leachate and pooled water at the site. Concentrations of the pathogens and coliform bacteria decreased in surface waters away from the landfill.

Table 2. Maximum concentrations of contaminants of concern at the site.

	Water				Soil		Sediment	
	Ground-water µg/l	Leachate µg/l	Surface Water µg/l	AWQC[1] µg/l	Surface Soil mg/kg	Average[2] U.S. Soil mg/kg	Sediment mg/kg	ER-L[3] mg/kg
INORGANIC SUBSTANCES								
arsenic	200	35	13	36	44	5	76	33
cadmium	38	14	13	9.3	ND	0.06	ND	5
chromium	1,300	1,000	180	50	170	100	170	80
copper	1,600	480	94	2.9	74	30	180	70
cyanide	17	ND	ND	1	ND	NA	ND	NA
lead	6,300	410	120	5.6	340	10	140	35
mercury	1.3	2.1	ND	0.025	ND	0.03	ND	0.15
nickel	1,300	500	98	8.3	74	40	120	30
silver	61	34	ND	NA	ND	0.05	1.7	1
zinc	2,500	1,500	210	86	310	50	1,100	120

1: Ambient water quality criteria for the protection of aquatic organisms. Marine chronic criteria presented (EPA, 1986).
2: Lindsay (1979).
3: Effects range-low; the concentration representing the lowest 10 percentile value for the data in which effects were observed or predicted in studies compiled by Long and Morgan (1990).
NA: Screening level not available.
ND: Not detected at method detection limit.

As part of an EPA Puget Sound Estuary Program study, bioassays using *Rhepoxynius abronius* were conducted using sediment samples collected from Ebey and Steamboat sloughs (PTI Environmental Services and Tetra Tech, 1988). Toxicity ranged from 0 to 25 percent for sediments from Ebey Slough, 0 to 10 percent for sediments from Steamboat Slough, and 0 to 10 percent for control sediments. The results of the bioassays indicated that sediments in Ebey Slough may be toxic to some marine organisms.

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