

3

FMC Marcus Hook, aka East Tenth St. Industrial Area

Marcus Hook, Pennsylvania
CERCLIS #PAD980714505

■ Site Exposure Potential

The 16-hectare FMC Marcus Hook (FMC) site is in a highly industrialized area about 0.5 km northeast of the Delaware River (Figure 1). The site is bordered on the east by Marcus Hook Creek, which flows 0.6 km southeast to the Delaware River; the Delaware River then flows about 80 km to Delaware Bay. The site also is bordered by Route 13 to the north, by a lumber yard to the south, by a BP refinery to the southwest, and by Marcus Hook Elementary School to the west.

American Viscose Corporation used the site from the 1940s through 1954 to produce rayon. In 1954 rayon production was gradually replaced

with cellophane production, which became full-scale in 1958. Until 1945 American Viscose discharged acidic wastewater containing metal sulfides directly into Marcus Hook Creek. In 1945 the Sanitary Water Board ordered American Viscose to construct a wastewater treatment plant. The wastewater treatment plant treated approximately 330,000 l of raw waste per day containing 36,000 l of sulfuric acid, 20,000 l of glucose, 5,000 l of zinc sulfate, and 100,000 l of sodium sulfate, and produced a sludge of lead and zinc sulfides, organic matter, and colloidal sulfur. Treatment plant effluent was discharged to the creek. In 1957 a sludge dewatering unit

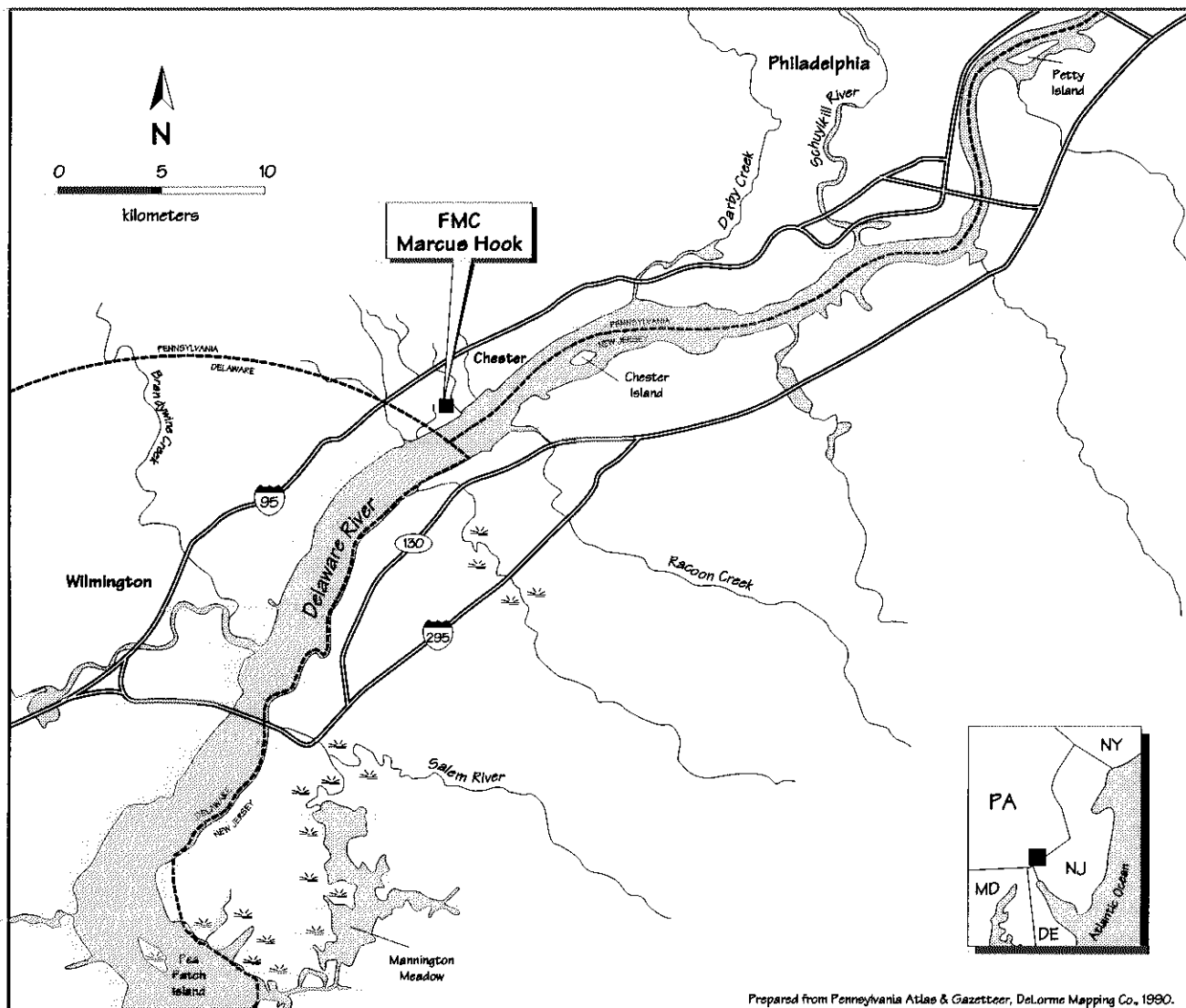


Figure 1. Location of the FMC Marcus Hook site in Pennsylvania.

was added and two unlined lagoons were excavated for sludge storage and consolidation. Ultimate disposal of the sludge removed from the lagoons is unknown (NUS 1991).

FMC Corporation bought the facility in 1963 and continued cellophane production using acids and solvents. Solvents were stored in 30 underground tanks with a total capacity of 300,000

liters. In 1977 solvents remaining in the underground tanks were removed and replaced with water (NUS 1991).

Marcus Hook Business & Commerce Center (MHBCC) purchased the facility in 1986 and demolished several buildings. K&S Processing bought a 1.2-hectare portion of the site, including an incinerator to operate as a hospital waste

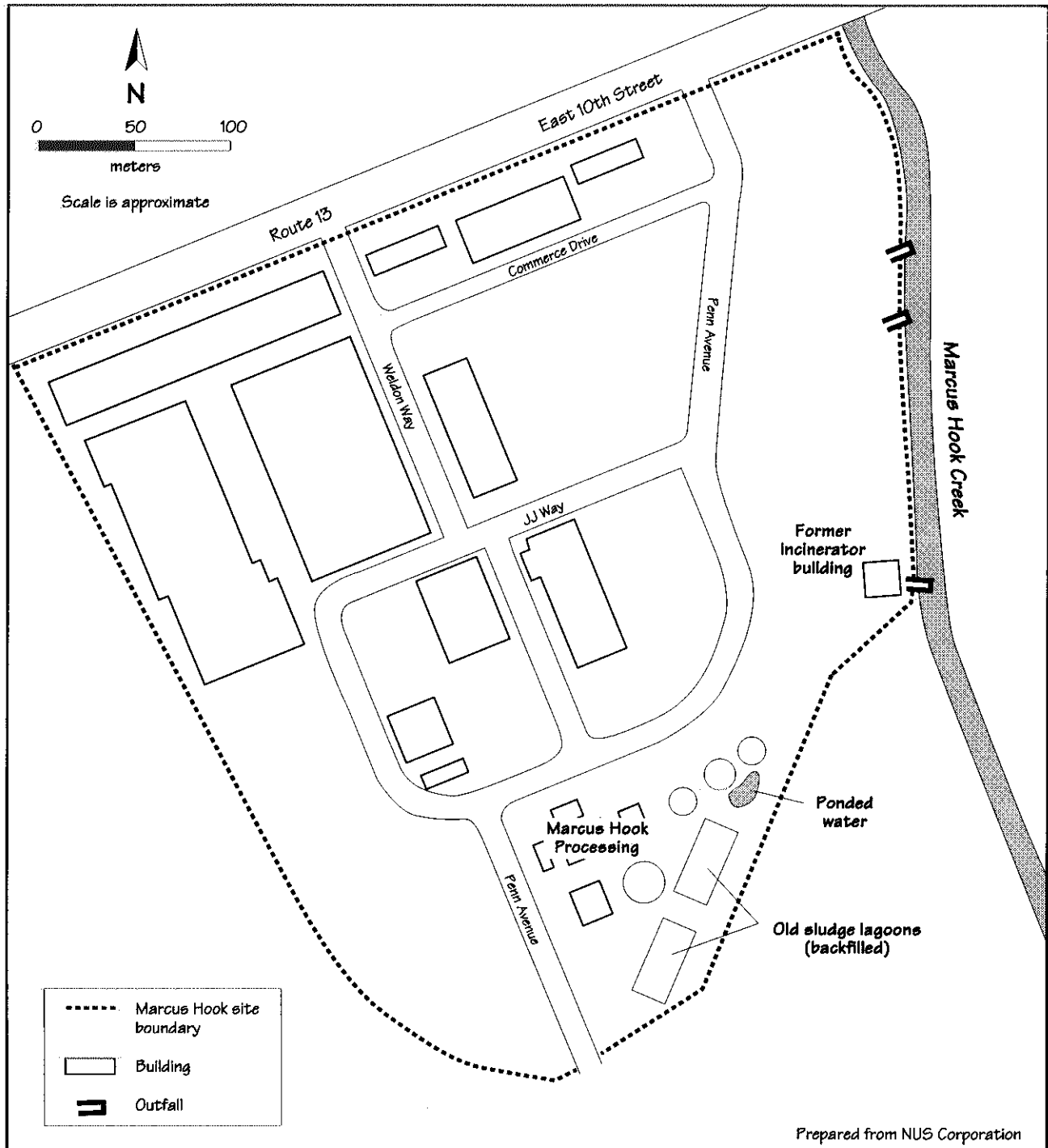


Figure 2. Detail of the FMC Marcus Hook site.

incinerator. Ash from the on-site incinerator and powerhouse had been dumped along the bank of Marcus Hook Creek until 1977. M.H. Processing purchased the existing wastewater treatment plant to operate as an interim hazardous waste treatment facility (NUS 1991). In late 1991, EPA and FMC agreed to an AOC for a site assessment on approximately 40% of the site, but did not include the wastewater treatment plant or medical waste incinerator (Roux Associates Inc. 1992).

Surface water runoff and groundwater migration are the potential pathways of contaminant transport from the site to NOAA trust resources and associated habitats. Surface water runoff flows directly, or indirectly via storm drains, into Marcus Hook Creek. While the manufacturing operations were active, FMC Corporation had NPDES permits for at least five outfalls that serviced the stormwater and sewer system (NUS 1991).

The site was filled with soils and demolition debris, including gravel and silty clay, brick, wood, and concrete, ranging from 1 to 4 m deep. Localized areas include layers of coal and/or ash that range up to 1.5 m thick (Roux Associates Inc. 1992). The Quaternary-age Trenton Gravel, a medium-to-coarse-grained, very gravelly sand that has high primary porosity and permeability, lies beneath the site. These deposits range from 1.5 to 6 m thick and grade into highly weathered schistose bedrock. The depth to bedrock ranges from 7 to 33 m (NUS 1991).

Groundwater investigations indicate groundwater depths of 1 to 4 m bgs and that the surficial

aquifer flows primarily east toward Marcus Hook Creek and secondarily south toward the Delaware River. The tidal range in Marcus Hook Creek near the site is 0.5 to 1.5 m, but groundwater levels measured in monitoring wells screened in native soils and bedrock were minimally influenced by tidal fluctuations (Roux Associates Inc. 1992).

■ NOAA Trust Habitats and Species

Habitats of concern to NOAA are surface waters and associated bottom substrates of the Delaware River and Marcus Hook Creek. At the mouth of the creek, the western shoreline of the Delaware River has extensive pier and piling structures, riprap, and a fully bulkheaded shoreline. The eastern shoreline of the river remains largely undisturbed and possesses broad mudflats extending approximately 300 m from the shoreline near the site.

Near the site the Delaware River is a low-gradient, tidal freshwater system with varying flow velocities, depending on the tide and freshwater discharge. The river is about 2 km wide here. Mean depth is 10 m; maximum depth is 13 m in a centrally located, dredged shipping channel. Salinity in this reach is low (1 to 3 ppt). Substrate composition is primarily silty sands, gravel, and mud.

The Delaware River historically has been identified as a spawning site for over 60 species of fish (Daiber 1988). Near the site, the river supports diverse and abundant populations of NOAA trust resources (Table 1; Daiber 1988; Kaufmann personal communication 1993; Miller personal communication 1993). Many species migrate close to the site and reside for extended periods during sensitive life stages. Eight species of migratory fish use the Delaware River. Species of

interest to NOAA due to their commercial importance or abundance in the area are alewife, Atlantic menhaden, American eel, American shad, bay anchovy, blueback herring, blue crab, striped bass, and white perch. The reach of the Delaware River near the site also supports migratory populations of shortnose sturgeon, a federally endangered species. This reach also supports populations of the New Jersey state-protected Atlantic

Table 1. Major species that use the Delaware River near the site.

Species		Habitat			Fisheries	
Common Name	Scientific Name	Spawning Ground	Nursery Ground	Adult Forage	Comm. Fishery	Recr. Fishery
<u>ANADROMOUS /CATADROMOUS SPECIES</u>						
Shortnose sturgeon ¹	<i>Acipenser brevirostrum</i>		♦	♦		
Atlantic sturgeon	<i>Acipenser oxyrinchus</i>			♦		
Alewife	<i>Alosa pseudoharengus</i>	♦	♦	♦		♦
American shad	<i>Alosa sapidissima</i>		♦		♦	
Blueback herring	<i>Alosa aestivalis</i>	♦	♦	♦	♦	♦
American eel ²	<i>Anguilla rostrata</i>		♦	♦		♦
Striped bass	<i>Morone saxatilis</i>		♦	♦		♦
Sea lamprey	<i>Petromyzon marinus</i>			♦		
<u>ESTUARINE/MARINE SPECIES</u>						
Bay anchovy	<i>Anchoa mitchilli</i>	♦	♦	♦		
Atlantic menhaden	<i>Brevoortia tyrannus</i>		♦	♦		
Weakfish	<i>Cynoscion regalis</i>		♦			
Banded killifish	<i>Fundulus diaphanus</i>	♦	♦	♦		
Mummichog	<i>Fundulus heteroclitus</i>	♦	♦	♦		
Spot	<i>Leiostomus xanthurus</i>		♦			♦
Inland silverside	<i>Menidia beryllina</i>			♦		
White perch ²	<i>Morone americana</i>	♦	♦	♦		♦
Striped mullet	<i>Mugil cephalus</i>			♦		
Atlantic croaker	<i>Micropogonias undulatus</i>		♦			
Bluefish	<i>Pomatomus saltatrix</i>		♦			
Hogchoker	<i>Trinectes maculatus</i>		♦	♦		
<u>INVERTEBRATE SPECIES</u>						
Blue crab ²	<i>Callinectes sapidus</i>		♦	♦		♦
1: Federally endangered species						
2: The Pennsylvania Bureau of Water Quality has an advisory in effect on human consumption of these species caught in the Delaware River due to high levels of PCBs and chlordane.						

sturgeon (Kaufmann personal communication 1993; O'Herron personal communication 1993).

In May 1995 the Pennsylvania Department of Environmental Resources conducted tissue sampling in Marcus Hook Creek at the Route 13 bridge near the site (Young 1995). Approximately 105 m of stream were sampled at this time, including the confluence with the Delaware River. Captured NOAA trust species included mummichog, banded killifish, American eel, and stickleback. In addition, alewife, American shad, blueback herring, spot, and striped bass are known to use habitat in Marcus Hook Creek, though none of these species was caught during sampling.

The Delaware Estuary is the world's largest freshwater port (Delaware River Basin Commission 1988). Because of the heavy marine traffic, there is little commercial fishing near the site, except for small harvests of blue crab, American shad, and blueback herring. Most commercial fishing takes place approximately 60 km south of the site where the river begins to widen into Delaware Bay and brackish conditions predominate (Lupine personal communication 1992).

There is significant sport fishing in the Delaware River, with striped bass the favored recreational species in the area. Recreational harvests for striped bass, alewife, and blueback herring are closed during spring spawning runs (Lupine personal communication 1992). The striped bass harvest is otherwise regulated by fish size and daily catch limits. In recent years, a sport fishery for the white perch has developed and is expected

to increase. Recreational crabbers harvest blue crab near the site from March through November (Delaware River Basin Commission 1988; Soldo personal communication 1992; Kaufmann personal communication 1993).

There are no hatcheries or supplemental stocking efforts for trust species in the Delaware River. However, in 1989 and 1990 the Delaware River Basin Commission released about 125,000 striped bass juveniles for mark and recapture studies to assess striped bass stock recruitment. These studies indicated that striped bass populations have grown in the Delaware River over the last decade (Miller personal communication 1993). There are no plans to build this effort into a supplemental stocking program (Lupine personal communication 1993; Miller personal communication 1993).

The Pennsylvania Bureau of Water Quality has issued an advisory against human consumption of several recreational fish species in the Delaware River due to elevated concentrations of PCBs and chlordane in edible tissue (Soldo personal communication 1992; Kaufmann personal communication 1993).

■ Site Related Contamination

A 1991 site investigation found soils throughout the site to be contaminated by asbestos, PCBs, trace elements, VOCs, and SVOCs (NUS 1991).

Marcus Hook Creek sediments were also contaminated (Table 2). Samples from the mixed ash and soil along the bank of the creek contained PCBs and elevated concentrations of PAHs (NUS 1991).

Soil samples collected from the lagoon area had elevated concentrations of lead (1,200 mg/kg), PCBs (1.3 mg/kg), and zinc (780 mg/kg; NUS 1991). An EPA removal assessment found an

old tunnel in the northeast section of the site containing ash mixed with sludge about 0.3 m deep over a 42-m² area. Chemical sample analysis found 2.5 mg/kg mercury (NUS 1991). Some trace element and organic compound concentrations in soil and sediment samples exceeded U.S. soil averages and ERL guidelines, respectively. The reported concentrations could significantly affect NOAA trust resources. Contaminants were found in groundwater collected from beneath the

Table 2. Maximum concentrations (mg/kg) of selected contaminants detected in soil from the site and sediment from Marcus Hook Creek.

CONTAMINANT	On-site soil	Average U.S. Soil ¹	Marcus Creek Sediment	ERL ²
INORGANIC SUBSTANCES				
<u>Trace Elements</u>				
Arsenic	147	NA	0.01	8.2
Cadmium	9.8	0.06	7.4	1.2
Chromium	118	100	92	81
Copper	1,630	17	NA	34
Lead	5,600	10	490	47
Mercury	28	0.03	1.3	0.15
Nickel	160	40	1,300	21
Zinc	7,500	50	350	150
pH	3.2	6.0-9.0	NA	NA
ORGANIC COMPOUNDS				
PCBs	430	NA	1,200	0.023
<u>YOCs/SVOCs</u>				
Acetone	NA	NA	0.12	NA
Anthracene	1.4	NA	0.20	0.09
Benzo(a)Anthracene	3.9	NA	0.58	0.26
Benzo(b)Fluoranthene	4.1	NA	0.50	NA
Benzo(k)Fluoranthene	3.9	NA	0.52	NA
Benzo(a)Pyrene	2.9	NA	0.30	0.43
Chrysene	4.5	NA	1.5	0.38
Fluoranthene	11	NA	0.66	0.60
Phenanthrene	5.7	NA	1.7	0.24
Pyrene	5.0	NA	0.94	0.67
Naphthalene	0.56	NA	1.4	0.16
1: EPA (1983).				
2: Effects Range-Low (Long and MacDonald 1992).				
NA: Data not available.				
<: Not detected at concentration given.				

site, surface water on site, and in Marcus Hook Creek next to the site (Table 3). Lead, chromium, copper, mercury, zinc, and nickel were found in groundwater at concentrations more than ten times their respective AWQC. Surface water samples from Marcus Hook Creek contained PCBs and trace elements at concentrations exceeding ERL screening guidelines by an order of magnitude. Concentrations in Marcus Hook Creek were not reported.

Table 3. Maximum concentrations ($\mu\text{g/l}$) of selected contaminants detected in groundwater from the site outfall discharges and surface water from Marcus Creek.

CONTAMINANTS	On-Site Groundwater	Marcus Creek Surface Water	Outfalls	AWQC ¹ Freshwater
INORGANIC SUBSTANCES				
<u>Trace Elements</u>				
Arsenic	58	ND	NA	190
Cadmium	8.8	ND	NA	1.1 ⁺
Chromium	1,200	19	NA	11
Cobalt	1,240	NA	NA	NA
Copper	265	130	NA	12 ⁺
Cyanide	NA	12	NA	5.2
Lead	338	17	NA	3.2 ⁺
Mercury	2.0	NA	NA	0.012
Nickel	1,030	39	NA	160 ⁺
Zinc	2,860	120	NA	110 ⁺
ORGANIC COMPOUNDS				
Acetone	NA		76	
2-butanone	NA	2,200		
Butylbenzylphthalate	NA	86		3 [*]
Carbon disulfide	18			
PCBs	0.36	2.1		0.014
1: EPA (1993). +: Hardness-dependent criteria (100 mg/l CaCO ₃ used). NA: Data not available. ND: Not detected *: Lowest Observed Effect Level				

Summary

The Delaware River is a spawning site for numerous species of fish. Near the FMC Marcus Hook site, the river supports a diverse, abundant population of NOAA trust resources. Many of these species migrate close to the site and reside for extended periods during sensitive stages of development. Marcus Hook Creek and surface waters near the site supply foraging grounds and intertidal habitats for various species. Mercury, nickel, and lead in sediment from Marcus Hook Creek exceeded the ERL by at least an order of magnitude. PCBs in both sediment and surface water exceeded screening guidelines by several

orders of magnitude. Contaminants within the surface water and sediment of Marcus Hook Creek are a probable risk to NOAA trust resources.

■ References

- Daiber, F.C. 1988. Finfish resources of the Delaware River Estuary. In: S.K. Mujumar, E. W. Miller, and E.L. Sage, ed. *Ecology and Restoration of the Delaware River Basin*. Easton, Pennsylvania: Pennsylvania Academy of Science. 431 pp.
- Delaware River Basin Commission. 1988. Fish Health and Contamination Study. DEL USA Project Element 10. West Trenton, New Jersey: Pennsylvania Coastal Zone Management Program, Delaware Estuary Use Attainability Project.
- Delorme Mapping. 1990. *Pennsylvania Atlas & Gazetteer. Third Edition*. Freeport, Maine.
- Kaufmann, M., Area Fisheries Manager, lower Delaware drainage and lower Susquehanna drainage, Pennsylvania Fish Commission, Revere, Pennsylvania., personal communication, March 8, 1993.
- Long, E.R. and D.D. MacDonald. 1992. National Status and Trends Program approach. In: *Sediment Classification Methods Compendium*. EPA 823-R-92-006. Washington, D.C.: U.S. Environmental Protection Agency, Office of Water.
- Lupine, A., Fisheries Biologist. Division of Freshwater Fisheries, Department of Environmental Protection. Lebanon, New Jersey, personal communications March 12, 1992; March 13, 1993.
- Miller, J., Coordinator, Delaware River Anadromous Fisheries Project, Delaware River Basin Commission, Trenton, New Jersey, personal communication, March 17, 1993.
- NUS Corporation. 1991. Site Inspection of FMC Marcus Hook. Philadelphia: Hazardous Site Control Division, U.S. Environmental Protection Agency.
- O'Herron, J., Fisheries Biologist, Tom Lloyd Associates, Burlington, New Jersey, personal communication, March 9, 1993.
- Roux Associates, Inc. 1992. Site Assessment Report, FMC Corporation, Former East Tenth Street Site, Marcus Hook, PA. Philadelphia: Hazardous Site Control Division, U.S. Environmental Protection Agency.
- Shirey, C., Fisheries Biologist, Division of Fish and Wildlife, Department of Natural Resources and Environmental Control, Smyrna, Delaware, personal communication, February 1, 1995.
- Soldo, J., Fisheries Biologist, Pennsylvania Fish Commission, Revere, Pennsylvania, personal communication, August 3, 1992.

U.S. Environmental Protection Agency (EPA).
1983. *Hazardous waste land treatment*. EPA/
530/SW-83/874. Cincinnati: Municipal Envi-
ronmental Research Laboratory. 702 pp.

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

U.S. Geological Survey. 1976. Wilmington: DE,
NJ, PA, MD. 1:250 Series. Reston, Virginia: U.S.
Government Printing Office.

Young, L., Fisheries Biologist, Pennsylvania
Division of Environmental Services, Harrisburg,
Pennsylvania, personal communication, May 18,
1995.