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## Ordnance Products, Inc.

North East, Maryland  
CERCLIS #MDD982364341

### ■ Site Exposure Potential

The Ordnance Products, Inc. site covers approximately 40 hectares, 3 km northeast of the town of North East, Maryland. The site is bisected by an unnamed tributary that flows east and southeast for approximately 180 m before discharging to Little North East Creek (O'Brien & Gere 1990). Little North East Creek flows for about 3 km to North East Creek, which continues south for three more kilometers before discharging to the North East River, a wide, estuarine arm of upper Chesapeake Bay (Figures 1 and 2).

From 1960 to 1973, Ordnance Products, Inc. manufactured, tested, stored, and packed ammunition products for the U.S. Department of Defense. The site has both wooded and open

terrain, 58 buildings, and several truck and house trailers. Plating wastes were disposed in five unlined surface-water impoundments on the site. In 1989, a field inventory noted six burn or disposal pits with nearly a metric ton of grenade fuses and slag, many discarded drums containing non-halogenated solvents, bags of ammonium sulfate and ammonium chloride, electrical transformers; and unknown sludges. Source-area soils are contaminated with trace elements at concentrations well above average background levels (O'Brien & Gere 1990).

Substances may migrate off-site via groundwater within overburden and bedrock, and via surface

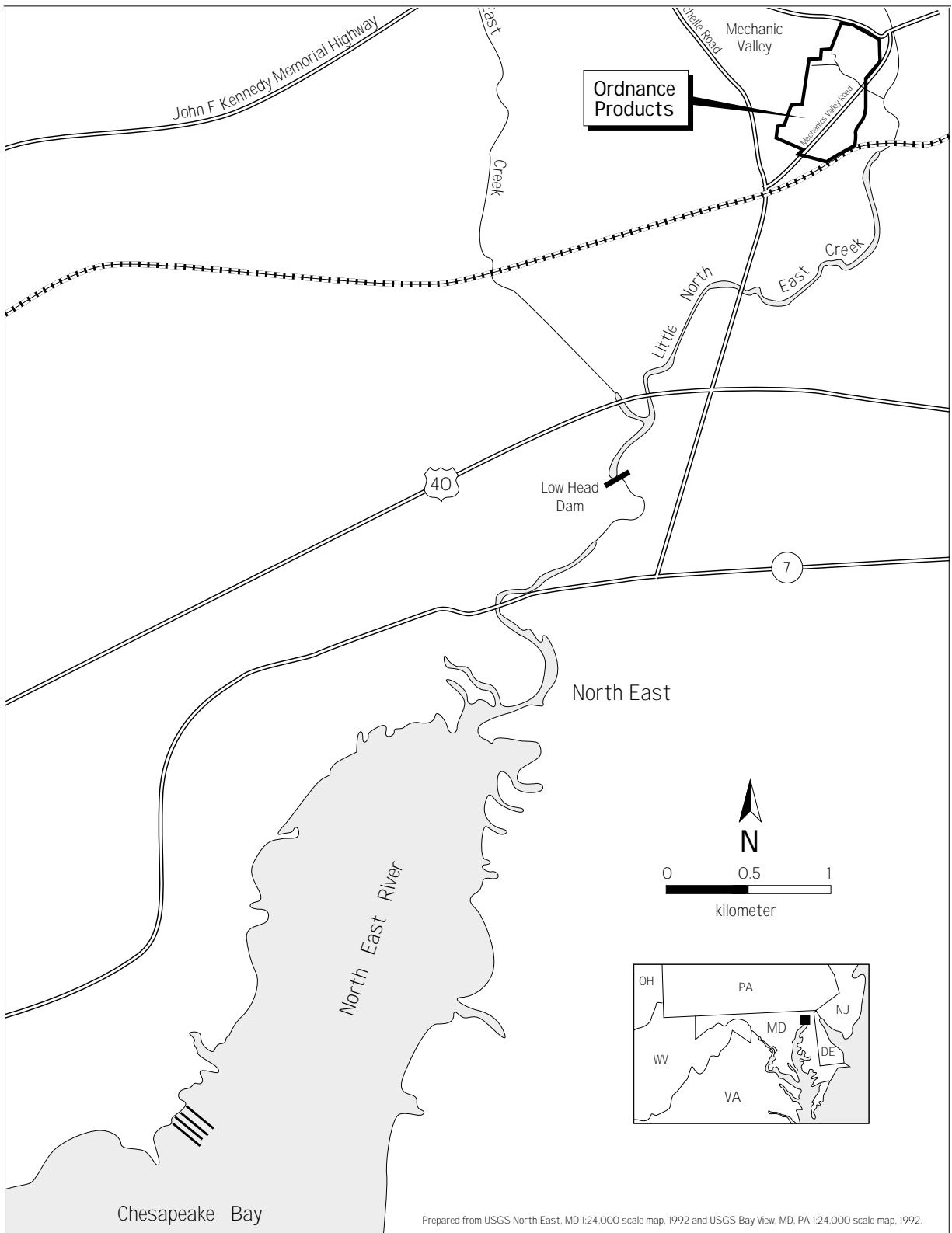


Figure 1. The Ordnance Products study area.

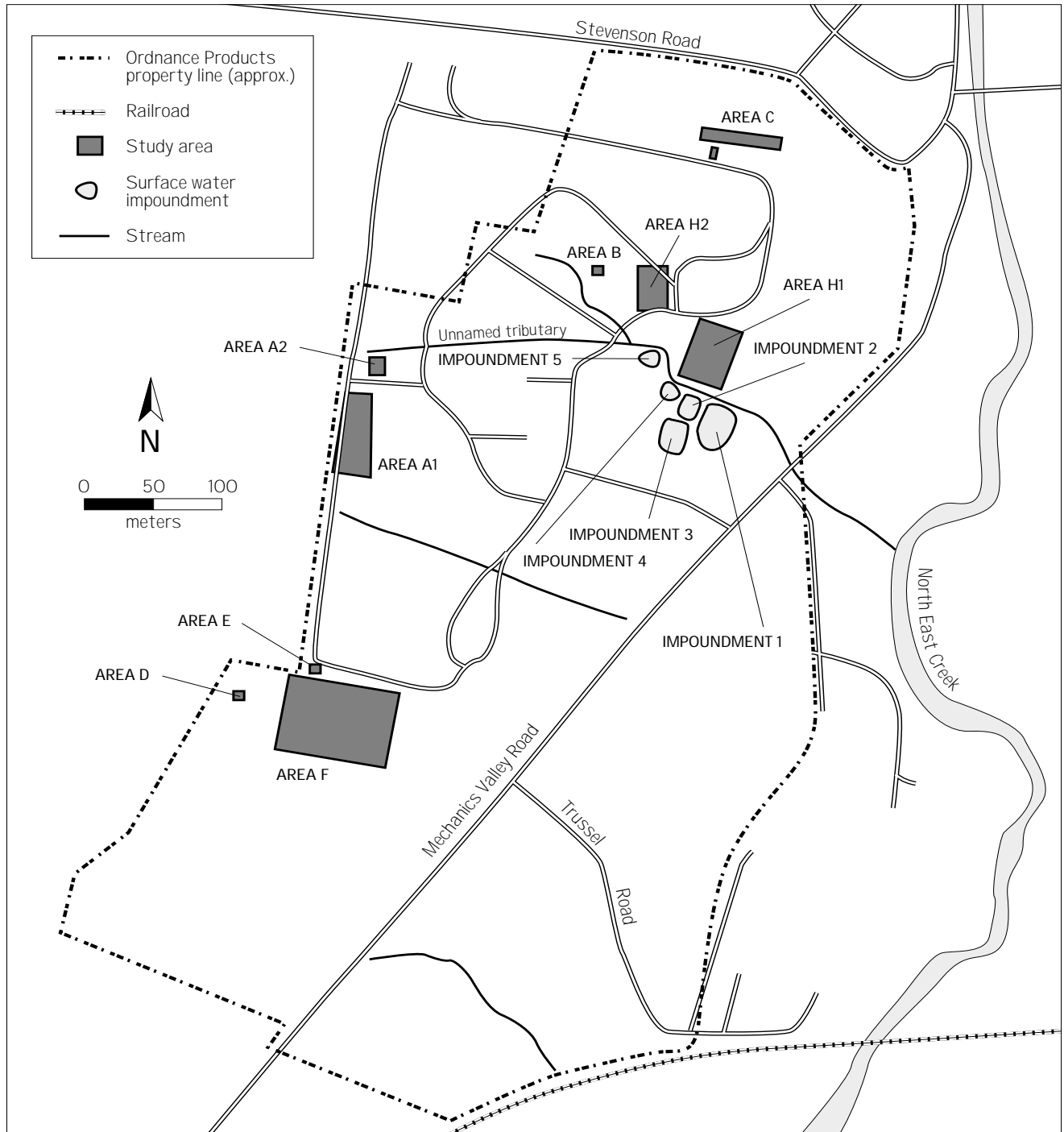


Figure 2. The Ordnance Products site, North East, MD (O'Brien and Gere 1990).

water to an unnamed tributary, which flows past the five impoundments and a large source area before discharging to North East Creek, 180 m east of the site boundary. The overburden aquifer is shallow, encountered during site investigations at depths between 4 and 18 m below ground surface. The deeper bedrock aquifer was encountered between 30 and 90 m below ground surface. Geohydraulic studies indicate a potential for vertical flow between the aquifers, and found that both aquifers flow east, probably discharging to Little North East Creek (O'Brien & Gere 1990).

## ■ NOAA Trust Habitat and Species

Habitats of concern to NOAA are the surface water and bottom substrates of Little North East and North East creeks, and the North East River (Figure 2). The North East River drainage provides substantial nursery and adult forage habitat for numerous NOAA trust species (Table 1). Little North East Creek, near the site, and North East Creek, downstream of the site, are freshwater, non-tidal, low-gradient streams. They are generally fast-flowing with boulders forming high walls along the bank. Substrate composition varies from rock rubble to silt in the runs and pools. Overall, the streams are mostly hard bottom with some clay. Little North East Creek is approximately 6 m wide near the site. Approximately 5 km downstream of the site in the town of North East, North East Creek becomes tidal; tidal amplitude can fluctuate as

much as 0.9 m (Heft personal communication 1994). The North East River is actually a shallow, estuarine embayment of upper Chesapeake Bay. The embayment is fairly shallow (approximately 1.5 m deep throughout the river); tidal amplitude is approximately 0.3 m. Subtidal substrate composition is primarily sand and mud, but gravel predominates along the beaches. Aquatic vegetation along the banks has increased in recent years, dominated by hydrilla (*Hydrilla verticillata*), Eurasian milfoil (*Myriophyllum heterophyllum*), and wild celery (*Valisneria americana*; Cosden personal communication 1994). Salinities in this portion of Chesapeake Bay are generally below 5 ppt, due to the large freshwater inputs of the Susquehanna River (Schubel and Pritchard 1987).

Anadromous species in the North East River include American shad, blueback herring, alewife, white perch, and striped bass (Table 1). The catadromous American eel is found throughout the area (Heft personal communication 1994). NOAA trust species that use the very low-salinity habitats of the North East River include mummichog, banded killifish, and silverside. There is a population of blue crab in the North East River though it is not large. Blueback herring, alewife, white perch, and striped bass use the lower tidal section of North East Creek approximately 5 km below the Ordnance Products site for nursery and adult forage habitat (Cosden personal communication 1994). It is not known whether anadromous fish use the upper reaches near the site because access is limited by a low dam in a state of disrepair about 4 km downstream of the site. This dam creates a small blockage that probably

Table 1. NOAA trust resources that use the Little North East Creek, North East Creek, and the North East River near the site.

Species		Habitat			Fisheries	
Common Name	Scientific Name	Spawning Area	Nursery Area	Adult Forage	Recr.	Comm.
ANADROMOUS /CATADROMOUS SPECIES						
Alewife	<i>Alosa pseudoharengus</i>	◆	◆	◆	◆	
American shad	<i>Alosa sapidissima</i>	◆	◆	◆		
Blueback herring	<i>Alosa aestivalis</i>	◆	◆	◆	◆	
American eel	<i>Anguilla rostrata</i>		◆	◆		
Striped bass	<i>Morone saxatilis</i>	◆	◆	◆	◆	◆
White perch	<i>Morone americana</i>	◆	◆	◆	◆	◆
ESTUARINE SPECIES						
Mummichog	<i>Fundulus heteroclitus</i>	◆	◆	◆	◆	
Banded killifish	<i>Fundulus diaphanus</i>	◆	◆	◆	◆	
Silverside	<i>Menidia</i> sp.	◆	◆	◆	◆	
Blue crab	<i>Callinectes sapidus</i>		◆	◆	◆	◆

does not prevent passage. As part of a statewide program, Maryland fish passages are being built to span blockages in historical spawning streams, although it is not known whether this dam will be modified.

Commercial fisheries in the North East River are dominated by white perch, with some striped bass also harvested. There are no commercial fisheries in Little North East and North East creeks.

However, recreational fishing is popular in the area, including around the Ordnance Products site. Popular recreational species include striped bass, white perch, and some blue crab. Striped bass is the only regulated species in the area, with a 45-day season extending from October through mid-November. There are no health advisories or restrictions for the consumption of fish from Little North East Creek or the North East River (Cosden personal communication 1994).

## Site-Related Contamination

Trace elements are the primary contaminants identified by preliminary site investigations (Interim Technical Memoranda) that pose a threat to NOAA trust resources. Data collected during a preliminary investigation in 1990 indicate that soils in several areas on-site and sediments within the surface water impoundments contain elevated concentrations of trace elements. Lower concentrations appear associated with surface water and sediments of the tributary stream draining the site. Little North East Creek has not been sampled (O'Brien & Gere 1990).

Site investigations also found relatively low concentrations of several VOCs in environmental media on the site (O'Brien & Gere, 1990). It is unlikely that ecologically substantial impacts would occur due to the VOC concentrations observed in site investigations. However, the

history of the site suggests that other, more toxic substances of concern, such as PCBs, SVOCs, and ordnance compounds may be present in source areas. Because these substances have not been measured, their presence has not been confirmed. The distribution and maximum concentrations of trace elements in soil, sediment, and surface water are presented in Table 2 along with applicable screening guidelines.

The greatest degree of contamination was observed in soil at Areas A1 and F. Each of these areas had measurable concentrations of seven trace elements that exceeded the U.S. average in soils by up to 30 times. Areas A2 and C had measurable concentrations of three trace elements that exceeded background levels, while each of the remaining areas generally exceeded background for one element (Table 2; Figure 2). Sediments in Impoundments 2, 3, and 4 were highly contaminated. Concentrations of five trace elements exceeded their respective ERLs by over an order of magnitude. Lower concentrations were observed in the sediment of Impoundments 1 and 5, although cadmium, nickel, and zinc in both impoundments slightly exceeded their sediment screening guidelines (Table 2; O'Brien & Gere 1990).

Site-related substances observed in the groundwater did not exceed screening guidelines (ten times the chronic AWQC). However, several VOCs were observed in the groundwater beneath the site in both the overburden and bedrock aquifers. Groundwater has not been sampled between the site and Little North East Creek to determine

whether a contaminant plume is migrating toward the stream.

Sediment contamination was not observed in the unnamed tributary; however, no sediment stations were located in the stream next to the five surface-water impoundments. Rather, four stations were positioned upstream of the impoundments and one station downstream. One other station located in an on-site drainage south of the impoundments near Area A1 (see Figure 2) contained a measurable concentration of lead that exceeded average soil concentrations by over an order of magnitude. Sediment screening guidelines were also exceeded. Concentrations of chromium, nickel, and silver at this station also exceeded average soil concentrations (though within an order of magnitude) and sediment screening guidelines (Table 2; O'Brien & Gere 1990).

Contamination observed in the impoundments' surface water and in tributary streams was not as extensive as that found in sediment (O'Brien & Gere 1990). Concentrations of zinc in Impoundments 3, 4, and 5 ranged from 270 to 800 µg/l, exceeding the freshwater chronic AWQC. Copper was observed in Impoundment 5 at a concentration exceeding aquatic screening guidelines. Zinc, measured in one sample, was the only trace element that exceeded its AWQC in the unnamed tributary (Table 2).

Table 2. Maximum concentrations of trace elements observed in surface water, sediment, and soil at the Ordnance Products site.

TRACE ELEMENTS	Surface Water (µg/l)			Sediment (mg/kg)			Soil (mg/kg)										Ave. U.S.*
	On-site Drainage	Impound.	AWQC <sup>1</sup> (µg/l)	On-site Drainage	Impound.	ERL <sup>2</sup> (mg/kg)	Study Area										
							A1	A2	B	C	D	E	F	H1	H2		
Antimony	ND	ND	30	<19	41	NA	29	<15	<14	4.1	<13	<17	<13	<14	<13	<14	NA
Arsenic	ND	ND	190	4.1	4.1	8.2	6.1	7.4	5.7	5.0	4.4	9.3	4.1	4.9	4.1	4.9	5
Cadmium	ND	ND	1.1 <sup>+</sup>	<1.9	900	1.2	35	<1.5	<1.4	<1.4	1.3	<1.7	<1.3	<1.4	<1.3	<1.4	0.06
Chromium	ND	ND	11	99	39,000	81	200	55	57	530	34	89	1,900	76	82	82	100
Copper	ND	ND	12 <sup>+</sup>	17	88	34	150	29	70	29	12	27	92	38	14	30	30
Lead	ND	20	3.2 <sup>+</sup>	380	820	47	2,070	310	35	53	9.0	52	3,300	13	47	10	40
Nickel	ND	ND	160 <sup>+</sup>	32	73	21	330	36	23	670	14	41	1,000	21	17	40	40
Mercury	ND	ND	0.01	<0.5	3.0	0.15	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.03
Selenium	ND	ND	5	<9.5	<18	NA	<6.4	2.0	<6.6	<6.5	<6.4	<7.0	<6.5	<6.5	<6.6	<6.5	NA
Silver	ND	ND	0.12	<1.9	<3.7	1.0	<1.4	<1.4	<1.4	<1.4	<1.3	<1.7	5.0	1.3	<1.4	<1.4	0.05
Zinc	100	800	110 <sup>+</sup>	140	51,000	150	15,000	130	150	850	44	330	2,800	64	400	50	50

1: Ambient water quality criteria for the protection of aquatic organisms. Freshwater chronic criteria presented (EPA 1993).  
 2: 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 MacDonald (1992).  
 ND: Not detected; detection limit not available.  
 NA: Guideline not available.  
 <: Not detected at detection limit shown.  
 +: Value is dependent on hardness, 100 mg/l CaCO<sub>3</sub> used.  
 \*: Lindsay (1979).

## ■ Summary

Preliminary site investigations that tested soils on the site and sediments in unlined surface water impoundments found high concentrations of several trace elements. Although site history suggests that the persistent organic contaminants, such as PCBs, SVOCs, and ordnance compounds, may also be present, these substances were not analyzed in preliminary studies. A tributary stream that drains the site and flows past the surface impoundments was sampled primarily upgradient of the contaminated impoundments. Because only one station was located downstream of the contaminated areas, the extent of off-site contaminant migration is not known. The tributary stream flows to Little North East Creek 180 m east of the site. Little North East Creek has not been sampled.

Anadromous American shad, white perch, striped bass, alewife, and blueback herring use the lower reaches of the North East Creek drainage (about 5 km downstream of the site) for juvenile rearing and adult forage habitat. These species have access to the site via an unnamed tributary to North East Creek. A low-head dam 4 km downstream of the site may allow passage of migratory fish, but no documented observations are available. Little North East Creek contains catadromous American eel throughout its system and in areas near the site.

## ■ References

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