# Pease Air Force Base

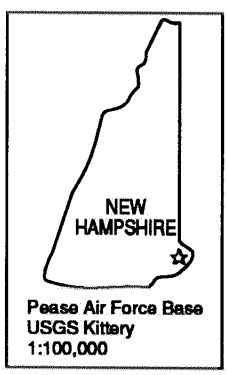
Portsmouth, New Hampshire
Region 1
NH7570024847

## Site Exposure Potential

Pease Air Force Base (Pease AFB) is located on a peninsula in the Piscataqua River drainage basin near the city of Portsmouth, New Hampshire (Figure 1). The base is bordered by Great Bay to the west and Little Bay to the northwest. The Piscataqua River is less than 1 km east of the base.

Past activities at Pease AFB supported aircraft maintenance operations and generated hazardous wastes, including degreasers, solvents, paint strippers, and jet fuels. Historically, these liquid wastes were burned during fire department training exercises or hauled off site by contractors. Since 1982, jet fuel has typically been reclaimed and returned to bulk storage on-site. Solid wastes generated from housing, administration, and maintenance activities were either hauled off-base by contractors, or disposed of at six landfills and two construction waste dumps located on the base (Weston 1989).

The site is transected by numerous small streams, ditches, and storm sewers that drain radially from the base's central plateau. These surface waters drain three main areas on the base and are defined by the receiving water body: Great Bay, Little Bay, and the Piscataqua River. Peverly and McIntyre Brooks drain into



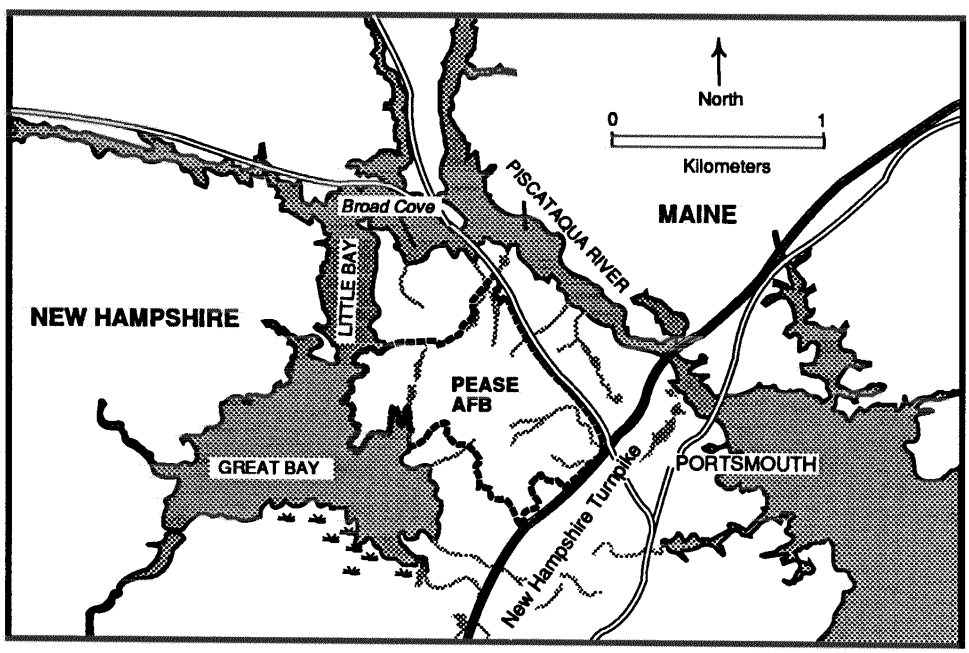




Figure 1. Pease Air Force Base, Portsmouth, New Hampshire.

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**Site Exposure Potential,** *cont.*

Great Bay. Pickering Brook and Railway Ditch enter Flagstone Brook, which discharges to Little Bay near its confluence with the Piscataqua River. Newfields and Grafton ditches and Harveys Creek enter Hodgson Brook, which flows into the North Mill Pond and, ultimately, the Piscataqua River. Pauls Brook drains directly to the Piscataqua River.

Regional groundwater hydrology is also defined by the maximum land elevation. Hydraulic low points are represented by Great Bay, Little Bay, and the Piscataqua River. Groundwater movement on the site reflects surface topography and flows towards the nearest downgradient surface water.

Based on site characteristics and historical practices, both surface water and groundwater movement represent potential pathways of contamination to NOAA resources and associated habitats.

**Site-Related Contamination**

Surface water, groundwater, soil, and sediment were analyzed during Stages I and II of the Installation Restoration Program (Weston 1989). Trace elements, cyanide, PAHs, DDT and its metabolites, total petroleum hydrocarbons, and some volatile organic compounds were detected in the matrices sampled. Contaminants found in surface water and groundwater that were considered a risk to NOAA resources are presented in Table 1 with applicable screening criteria (Weston 1989).

Trace elements were the major contaminants found in surface water samples. Copper, lead, mercury, nickel, and zinc concentrations exceeded their AWQC (EPA 1986) in all three major drainage areas. The highest levels of trace elements occurred in Harveys Creek and Newfields Ditch; cyanide levels were extremely high. Organic compounds were detected in few surface water samples with the exception of samples from Newfields Ditch. Concentrations of several semi-volatile organic compounds in these samples were measured at levels exceeding the lowest observed effect level. Bis(2-ethylhexyl)phthalate was also measured at high concentrations in samples from Newfields Ditch. DDT, DDD, and other pesticides were detected in surface water samples from the Little Bay and Piscataqua drainage areas at concentrations shown to be toxic in other studies.

## Site-Related Contamination, *cont.*

Table 1. Maximum concentrations of major contaminants in surface water and groundwater samples from drainage areas on the site.

| | Surface Water | | | Groundwater | | | Criteria |
|---|---|---|---|---|---|---|---|
| | Great Bay µg/l | Little Bay µg/l | Piscataqua River µg/l | Great Bay µg/l | Little Bay µg/l | Piscataqua River µg/l | AWQC[1] Marine µg/l |
| INORGANIC SUBSTANCES | | | | | | | |
| arsenic | 5.4 | <5 | <5 | 180 | NR | 500 | 36 |
| copper | <30 | 34 | 79 | 63 | NR | NR | 2.9 |
| cyanide | <20 | <20 | 440 | NR | NR | NR | 1 |
| lead | <5 | 400 | 19 | NR | NR | NR | 5.6 |
| mercury | 0.3 | <1 | <1 | 0.3 | <0.2 | NR | 0.025 |
| nickel | 29 | 150 | 220 | 72 | 45 | 33 | 8.3 |
| zinc | 110 | 130 | 180 | 220 | 100 | 170 | 86 |
| ORGANIC COMPOUNDS | | | | | | | |
| benzene | NR | NR | 2,800 | NR | NR | 1,100 | 700 |
| ethylbenzene | NR | NR | 480 | 1,400 | NR | 600 | 430 |
| xylenes | NR | NR | 2,600 | 5,500 | NR | 600 | NA |
| bis(2-ethyl hexyl) phthalate | NR | NR | 360 | 150 | NR | 1,300 | NA |
| trichloro-ethylene | NR | NR | NR | NR | NR | 10,000 | [a]2,000* |
| toluene | NR | NR | 4,300 | NR | NR | NR | 2,130* |
| DDD | NR | 0.13 | 0.19 | NR | NR | NR | NA |
| DDT | NR | 0.14 | <0.10 | NR | NR | NR | 0.001 |
| lindane | NR | NR | 0.25 | NR | NR | NR | [a]0.16 |
| chlordane | NR | NR | 0.12 | NR | NR | NR | 0.004 |

1: Ambient water quality criteria for the protection of aquatic organisms. marine chronic criteria presented (EPA 1986).
a: AWQC marine acute criteria, no chronic criteria available (EPA 1986).
*: Insufficient data to develop criteria. Value presented is the Lowest Observed Effect Level (LOEL).
NR: Results not reported
NA: Criteria not available

Arsenic, copper, and mercury concentrations measured in groundwater samples were high. These substances are of concern because groundwater discharges to habitats supporting NOAA resources. Copper, lead, mercury, nickel, and zinc in surface water exceeded their respective AWQC. Ethylbenzene, xylenes, bis-(2-ethylhexyl)phthalate, and trichloroethylene were detected in groundwater at levels greater than those measured in surface water.

Contaminants of concern occurring in sediments and soils are presented together with applicable comparison values in Table 2 (Weston 1989). Cadmium, mercury, and zinc were detected in soil at concentrations exceeding background levels in U.S. soil (Lindsay 1979). Organic compounds were also detected in on-site soil samples. PAHs and other semi-volatile organic compounds were above background levels in soil samples from the Piscataqua drainage area.

## Site-Related Contamination, *cont.*

Several inorganic substances, including arsenic, cadmium, mercury, nickel, and zinc, were measured in stream sediments at levels shown to be associated with deleterious biological effects (Long and Morgan 1990). Elevated concentrations of PAHs and several semi-volatile organic compounds were also found in sediment samples. Concentrations of DDT and its metabolites were high in sediment from all areas sampled.

Table 2. Maximum concentrations of contami-nants in soil and sediment from drainage areas at the site. (No results were reported for soil in Great Bay drainage).

| | Soil | | | Sediment | | | |
|---|---|---|---|---|---|---|---|
| | Little Bay | Piscataqua River | Average[1] U.S. Soil | Great Bay | Little Bay | Piscataqua River | ER-L[2] Levels |
| | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| INORGANIC SUBSTANCES | | | | | | | |
| antimony | NR | NR | 1 | NR | 35 | NR | 2 |
| arsenic | NR | NR | 5 | 15 | 56 | 16 | 33 |
| cadmium | 5.2 | 8.7 | 0.06 | NR | NR | <26 | 5 |
| mercury | 2.5 | NR | 0.03 | NR | NR | <0.18 | 0.15 |
| nickel | NR | NR | 40 | 52 | 31 | 70 | 30 |
| zinc | 140 | NR | 50 | 190 | 120 | 203 | 120 |
| ORGANIC COMPOUNDS | | | | | | | |
| 4,4 DDT | NR | NR | ND | 4.2 | 0.09 | <1.8 | 0.001 |
| 4,4 DDE | NR | NR | ND | <0.05 | 0.12 | <1.8 | 0.002 |
| 4,4 DDD | NR | 0.02 | ND | 0.10 | 0.21 | NR | 0.002 |

1: Lindsay (1979).
2: Effective 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).
NR: Results not reported
ND: Not detected at the method detection limit

## NOAA Trust Habitats and Species

The marine and estuarine habitats surrounding the site harbor numerous species of finfish and invertebrates (Table 3; New Hampshire Fish and Game 1981). Fifty-two species of marine finfish were identified in the Great Bay estuary by the New Hampshire Department of Fish and Game, including residents, anadromous species, and migrants. Of these, the most abundant species were Atlantic silverside, rainbow smelt, killifish, river herring, Atlantic tomcod, white perch, and smooth flounder (New Hampshire Fish and Game 1981). Great Bay is a planned National Estuarine Reserve (Fawcett personal communication 1990).

There is limited commercial fishing in the area for river herring, eel, smelt, and sea scallop. Striped bass, smelt, winter flounder, alewife, and coho salmon are important recreational fisheries. The Great Bay area also contains valuable invertebrate resources. Lobster and rock crab are harvested commercially, and soft-shell clams, mussels, and oysters are harvested in recreational fisheries.

**NOAA Trust Habitats and Species,** *cont.*

Major oyster beds are found in Great Bay, the Oyster River, the Bellamy River, and the Piscataqua River (Weston 1989).

Table 3. Species and habitat use in the Piscataqua River, Great Bay, and Little Bay.

| Species | | Habitat | | |
|---|---|---|---|---|
| Common name | Scientific name | Spawning | Nursery | Adult Forage |
| ANADROMOUS/CATADROMOUS FISH | | | | |
| Atlantic sturgeon | *Acipenser oxyrhynchus* | | | ◆ |
| blueback herring | *Alosa aestivalis* | | ◆ | ◆ |
| alewife | *Alosa pseudoharengus* | | ◆ | ◆ |
| American shad | *Alosa sapidissma* | | ◆ | ◆ |
| American eel | *Anguilla rostrata* | | ◆ | |
| Atlantic silverside | *Menidia menidia* | | | ◆ |
| striped bass | *Morone saxatilis* | | ◆ | ◆ |
| coho salmon | *Oncorhynchus kisutch* | | | ◆ |
| rainbow smelt | *Osmerus mordax* | | ◆ | ◆ |
| Atlantic salmon | *Salmo salar* | | | ◆ |
| MARINE/ESTUARINE | | | | |
| Fish | | | | |
| smooth flounder | *Liopsetta putnami* | | | ◆ |
| Atlantic tomcod | *Microgadus tomcod* | ◆ | ◆ | ◆ |
| white perch | *Morone americana* | | ◆ | ◆ |
| winter flounder | *Pseudopleuronectes americanus* | ◆ | ◆ | ◆ |
| Invertebrates | | | | |
| American oyster | *Crassostrea virginica* | ◆ | ◆ | ◆ |
| American lobster | *Homarus americanus* | ◆ | ◆ | ◆ |
| softshell clam | *Mya arenaria* | ◆ | ◆ | ◆ |
| blue mussel | *Mytilus edulis* | ◆ | ◆ | ◆ |
| sea scallop | *Placopecten magellanicus* | ◆ | ◆ | ◆ |
| Atlantic razor clam | *Siliqua costata* | ◆ | ◆ | ◆ |

**References**

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