

# Centredale Manor Restoration Project Superfund Site North Providence/Johnston, RI

U.S. EPA | HAZARDOUS WASTE PROGRAM AT EPA NEW ENGLAND



**THE SUPERFUND PROGRAM** protects human health and the environment by investigating and cleaning up often-abandoned hazardous waste sites and engaging communities throughout the process. Many of these sites are complex and need long-term cleanup actions. Those responsible for contamination are held liable for cleanup costs. EPA strives to return previously contaminated land and groundwater to productive use.

## SITE DESCRIPTION:

The Woonasquatucket River, which forms the border between Johnston and North Providence, Rhode Island, has widespread dioxin contamination resulting from the former operations of a chemical company and a drum recycler from the early 1940s to the early 1970s. The main part of the Centredale Manor Site, called the Source Area, is approximately 9 acres and is currently occupied by the Centredale Manor and Brook Village apartment complexes on Smith Street, North Providence. The site also includes free-flowing reaches and ponds of the Woonasquatucket River next to and downstream from the Source Area. Contamination was first found in fish in 1996. EPA has since documented elevated levels of contaminants including dioxin, PCBs, Volatile Organic Compounds (VOCs), semi-VOCs, and metals in soil, sediment, wetlands and surface water at the site. The Rhode Island Department of Health recommends that the public not eat fish caught from the Woonasquatucket below the Johnston/Smithfield town line.

The Superfund process, conducted in several steps over multiple years, leads to the ultimate goal of protecting the environment and health of those people living and working around the Centredale Manor site and using the Woonasquatucket River. Since becoming a federal Superfund site in 2000, EPA and the Potentially Responsible Parties have taken several short-term actions to control current exposure of residents and visitors to contaminants. These actions included capping of contaminated soil in the Source Area, installation of a fence to control access, removal of contaminated soil from residential properties along the river, reconstruction of the breached Allendale Dam, and the removal of contaminated soil to limit the movement of contamination through groundwater into the river.

## CLEANUP AREAS:

The site is organized into five cleanup areas:

### 1. Source Area Soil

The nearly 9 acre Source Area is the main part of the site where the contamination originally occurred and now includes two apartment buildings, paved and landscaped surfaces, and three temporary capped areas. These three temporary soil covers were constructed from the 1990s through mid-2000s in the area not occupied by buildings, parking lots, or roadways; soil was also removed under one of the parking lots in the late 2000s as part of the groundwater short-term cleanup. Most of the Source Area is located within the floodplain, and also includes riverbank wetlands.

### 2. Groundwater

Groundwater is the water that is found beneath the surface of the ground. The groundwater area contaminated in excess of cleanup levels is located underneath the Source Area that is bound by the river and streams. The 2009 short-term cleanup action addressed about 0.13 acres on the west side of the Brook Village parking lot where contaminated groundwater was flowing into the river.

### 3. Allendale Pond and Lyman Mill Pond Sediment

This area includes all contaminated sediment in Allendale Pond and Lyman Mill Pond and monitoring further downstream.

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## SITE CONTAMINANTS WHICH WARRANT ACTION

**Dioxins** are a class of chemical contaminants that are formed during some industrial processes such as disinfectant (anti-bacterial) or herbicide manufacturing as well as combustion such as waste incineration.

**Furans** are by-products usually created when herbicides or other products are made or burned.

**PCBs**, or Polychlorinated Biphenyls, are man-made chemicals that were used in electrical manufacturing and were banned in 1979.

**Pesticides** are substances used to destroy or repel insects, weeds, or other animal life that are considered to be pests.

**VOCs**, or Volatile Organic Compounds, include a variety of chemicals that are used in glue, paint, solvents, and other products and easily evaporate. Common VOCs include **TCE**, or Trichloroethylene, and **PCE**, or Tetrachloroethylene.

**SVOCs**, or Semivolatile Organic Compounds, are chemicals that may vaporize when exposed to temperatures above room temperature. SVOCs include phenols found in coal and wood tar, and polynuclear aromatic hydrocarbons (PAHs), a widespread pollutant from petroleum production and fuel emissions.

**Metals**, including lead, cadmium, copper, arsenic, zinc and others, occur naturally in the environment but high concentrations result from man-made activities such as smelting, fuel manufacturing, and electroplating.

### 4. Allendale Floodplain Soil

A floodplain is the flat or nearly flat land next to a river that floods easily. This cleanup area includes riverbank and floodplain areas next to the Woonasquatucket River along the Source Area and Allendale Pond.

### 5. Lyman Mill Stream Sediment and Floodplain Soil (including the Oxbow Area)

This cleanup area includes the stream channel and old mill raceway connecting Allendale Pond and Lyman Mill Pond, the Oxbow Area, and riverbank and floodplain areas along Lyman Mill Pond. The Oxbow Area is a large forested wetland area below the Allendale Dam.

## REMEDIAL INVESTIGATION FINDINGS:

EPA conducted a detailed study, the Remedial Investigation, to better understand the site's contamination and collect the kind and amount of information needed to identify any potential human health and ecological risks. It is used to make decisions regarding the long-term cleanup of the site. The Remedial Investigation concluded that past industrial opera-

tions resulted in the contamination of the site's sediment, soil, surface water, groundwater, and animal life. EPA's investigations have found:

- **Source Area Soil** contaminants include dioxin/furans, polychlorinated biphenyls (PCBs), selected pesticides, semi-volatile organic compounds (SVOCs), metals, and volatile organic compounds (VOCs);
- **Fish and Birds, Sediment and Floodplain Soil** contaminants include dioxin/furans, PCBs, selected pesticides, SVOCs, and metals;
- **Surface Water** contaminants include dioxin, PCBs, pesticides, VOCs, SVOCs and metals; and
- **Groundwater** contaminants at the Source Area include dioxin, PCBs, pesticides, SVOCs, VOCs [such as tetrachloroethylene (PCE) and trichloroethylene (TCE)], and metals.

**Source Area Soil** sampling data indicates widespread contamination above the state's residential direct exposure criteria for PCBs/pesticides, VOCs, SVOCs, and metals; the state's leachability

(movement of contaminants from soil into water) criteria for PCBs, pesticides, VOCs, and SVOCs; and EPA's recommended residential levels for dioxin and PCBs.

**Groundwater** sampling data at the Source Area indicates contamination is above federal cleanup levels at 25 out of 37 monitoring wells tested. The most common contaminant detected is tetrachloroethylene, followed by trichloroethylene. Dioxin has also been detected in groundwater.

**The Allendale Pond and Lyman Mill Pond Sediment area** data showed widespread sediment contamination. Dioxin levels were above cleanup levels in more than 90% of the surface sediment (top 1 foot) at Allendale Pond and Lyman Mill Pond. Contamination in sediment at depths of 2 to 2.5 feet was typically above cleanup levels. Other contaminants like PCBs, pesticides, SVOCs, and metals, were also present at levels above cleanup levels in surface and subsurface sediment.

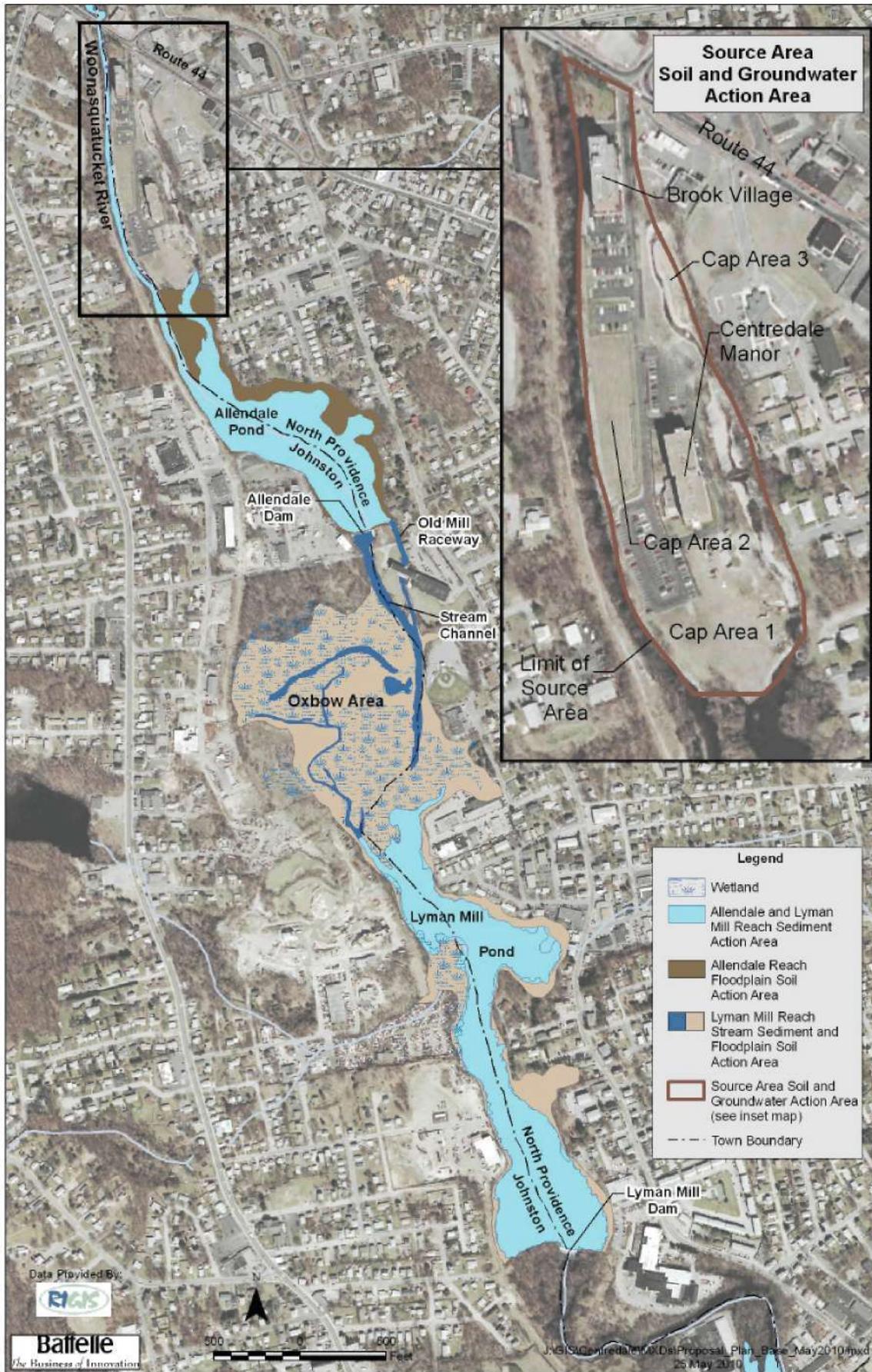
**In the Allendale Floodplain Soil area**, dioxin contamination was above cleanup levels in approximately 40% of the floodplain areas sampled. This suggests that low-lying areas next to the Woonasquatucket River and Allendale Pond have been impacted by contamination from the Source Area, especially during flooding and times of high water. SVOCs and lead at concentrations above the state residential direct exposure criteria were also found in this cleanup area.

**Lyman Mill Stream & Floodplain Soil (including the Oxbow Area) data** showed dioxin contamination above cleanup levels in more than 90% of the surface sediment and approximately 30% of the floodplain soil locations sampled. Other contaminants, including PCBs, pesticides, SVOCs, and metals, were also frequently measured at levels above cleanup levels. EPA investigations indicate that the low-lying areas in the Oxbow forested wetland area have been impacted by high water flow and by contamination from the Source Area. Based on sampling which occurred in 2010 and is still being analyzed, the above numbers and conclusions may change.

## EXPOSURE PATHWAYS & POTENTIAL RISK:

Just because contamination exists does not mean the environment or people are at risk. One has to have exposure to the contaminant to have a potential risk. Exposure occurs when people or other living organisms eat, drink, breathe or have direct

**Cleanup Action Areas  
Centredale Manor Restoration Project Superfund Site**



skin contact with a substance or waste material. Based on existing or reasonably anticipated future land use at a site, EPA develops different possible exposure scenarios to determine potential risk, appropriate cleanup levels for contaminants, and potential cleanup approaches.

Site human health and ecological risk assessments use a number of contamination exposure scenarios to determine if and where there are current or potential future unacceptable risks.

### THREATS TO HUMAN HEALTH:

People have the potential for exposure to the site's contaminants through eating fish from the river and having contact with site sediment and floodplain soil. Overall, the risk assessment determined that the following exposure pathways pose an unacceptable risk:

#### Allendale Pond:

- Eating contaminated fish may pose a 5 in 1,000 chance of causing cancer and may pose non-cancer health effects 30 times greater than the acceptable level of 1 for residents along the river and visiting recreational anglers;
- Having direct skin contact with or accidentally ingesting contaminated sediment may pose a 2 in 10,000 chance of causing cancer for residents along the river.

#### Lyman Mill Pond:

- Eating contaminated fish may pose a 6 in 1,000 chance of causing cancer and may pose non-cancer health effects 30 times greater than the acceptable level of 1 for residents along the river and visiting recreational anglers;
- Having direct skin contact with or accidentally ingesting contaminated sediment may pose a 3 in 10,000 chance of causing cancer for residents along the river.

#### Site Exposure Assumptions

EPA used the following exposure assumptions to figure out its risk results for the site:

- For eating fish, it is assumed that residents

along the river and visiting recreational anglers would eat 14 grams per day (adult), 9.3 grams per day (older child), or 4.7 grams per day (young child) for 350 days a year for a total of 30 years;

- For having direct skin contact with or accidentally ingesting contaminated sediment, it is assumed that a resident along the river would wade and swim 4 days a week between June and August for a total of 30 years.

### THREATS TO THE ENVIRONMENT:

Fish and wildlife are exposed to site contaminants in sediment on the bottom of the Woonasquatucket River and its ponds, or floodplain soil associated with wetlands immediately downstream of the site. Site contaminants are also in the tissue and organs of animals living in the contaminated river and its wetlands. Predatory fish and wildlife feed on contaminated animals or organisms such as forage fish, crayfish or larval stages of aquatic insects that live in the mud bottom (benthic macroinvertebrates) or small mammals, birds, amphibians or benthic macroinvertebrates in wetlands, and are at risk from their foraging activities (direct contact with contaminated sediment or floodplain soil) and feeding upon contaminated prey.

A high-level of exposure to site contaminants and a significant negative reproductive effect was measured in tree swallow populations (reduced egg hatchability) in ponds downstream of the site as this bird species preys upon emergent, flying aquatic insects that develop from benthic macroinvertebrates.

Threats to the environment from greater to lesser amounts exist for:

- Birds and mammals that use Allendale Pond aquatic and wetland habitats to forage for food (1,000 times greater than the acceptable level of 1);
- Birds and mammals that use Oxbow Area aquatic habitat in between Allendale Pond and Lyman Mill Pond to forage for food (100 times greater than the acceptable level of 1);

- Birds and mammals that use Lyman Mill Pond wetland habitats to forage for food (100 times greater than the acceptable level of 1).

### POTENTIAL CLEANUP APPROACHES:

Once possible exposure pathways and potential risk have been identified at a site, cleanup alternatives are developed to address the identified risks and achieve the site's cleanup objectives. A detailed description and analysis of each alternative developed to reduce risks from contaminated soil, sediment, and groundwater is presented in the 2010 Centredale Manor Restoration Project Superfund Site Feasibility Study (which EPA is in the process of amending).

The cleanup approaches for each action area detailed in the Feasibility Study can be generalized as follows.

For **Source Area Soil** the general options are:

- Take no action (an alternative that we are legally required to evaluate);
- Maintain existing caps or upgrade or reconstruct them.

For **Groundwater**, a cleanup action was performed in 2009/2010 while the Feasibility Study was nearing completion. At that time, EPA determined that a short-term cleanup was necessary to prevent contamination from this soil and groundwater moving into the Woonasquatucket River. This action included removal of nearly 2,300 tons of contaminated soil to limit the movement of contamination through groundwater into the river. Future long-term monitoring will be done to check that this action has been successful by confirming contaminated groundwater is not leaving the Source Area.

For **sediment and floodplain soil (cleanup areas 3-5)** the general options are:

- Take no action (an alternative that we are legally required to evaluate);
- Cap or cover contaminated soil and sediment in place;
- Excavate and dispose of contaminated

**ENVIRONMENTAL ACTIONS**

<b>1943 – 1970s</b>	Source Area used for chemical manufacturing activities. Metro Atlantic Chemical Company manufactured hexachlorophene around 1965 in a building on the eastern bank (currently Brook Village parking lot). Dioxin associated with process. Other manufacturing activities resulted in additional contamination.
<b>1952 – 1970s</b>	New England Container Company, Inc. operated incinerator-based drum reconditioning facility at Source Area. Chemical residues dumped or burned prior to and during drum reconditioning and are source of site dioxins, furans and other chemicals.
<b>1972</b>	Fire destroyed most structures.
<b>1977</b>	Brook Village apartment complex constructed.
<b>1982</b>	Centerdale Manor apartment complex constructed and approximately 400 drums and 6,000 cubic yards of contaminated soil removed and disposed of off-site under RIDEM supervision.
<b>1991</b>	Floodwaters breached Allendale Dam reducing pond surface water level and exposing bottom sediment. Dam breached again in 2001.
<b>1996</b>	EPA found dioxin and other contaminants in fish.
<b>1998</b>	RIDOH issued fish advisories for dioxin, mercury and PCBs.
<b>1996 to 2004</b>	EPA conducted numerous investigations to characterize nature and extent of site contamination.
<b>1999 to 2000</b>	First Source Area short-term cleanup to reduce immediate health threat to residents included: construction of two interim soil caps and installation of fencing to restrict access to potentially contaminated areas in Source Area and Allendale Pond. Repairs to fence were performed in 2005.
<b>2000 to 2003</b>	Second short-term cleanup included reconstruction of breached Allendale Dam, restoration of Allendale Pond to pre-1991 levels, and excavation and off-site disposal of contaminated floodplain soil from 11 residential properties and recreational access points along Allendale Pond and Lyman Mill Pond.
<b>2000</b>	Added to Superfund Program's National Priorities List.
<b>2003 to 2004</b>	Third short-term cleanup covered contaminated soil and sediment in Source Area's former tailrace (a narrow channel that moved away industrially used water).
<b>2005</b>	Remedial Investigation identifies extensive contamination in site soil, sediment, surface water, plants and animals and localized groundwater contamination at Source Area.
<b>2004 to 2005</b>	Baseline Human Health and Ecological Risk Assessments concluded current and future exposures pose elevated risks.
<b>2009 to 2010</b>	Fourth short-term cleanup addressed Source Area groundwater contamination by excavating and disposing off-site contaminated soil and installing a cap made to cover hazardous waste over the excavated area next to river.
<b>2010</b>	Feasibility Study identified long-term cleanup options for contaminated soil, groundwater, surface water and sediment.
<b>2010</b>	Additional investigations conducted in the Oxbow Area.
<b>2011</b>	Addendum to Feasibility Study to be issued.

soil and sediment using the following disposal approaches (with dams in place or replacing dams with smaller weirs):

- a. Consolidate and cap contamination within river or floodplain along shore;
- b. Consolidate and cap contamination in upland area next to river;
- c. Ship contamination off site to permitted facility;
- d. Incinerate contaminated soil and sediment using temporary facility at the site.

**NEXT STEPS:**

Based upon the Feasibility Study and Addendum, EPA will issue a Proposed Plan that will include the agency's preferred cleanup approach as well as other alternatives. The public will be invited to comment on the Proposed Plan and the preferred alternative during a 60-day comment period. Once the comment period closes, EPA will consider public comments received in making its cleanup decision. The cleanup plan ultimately selected is formalized in a Record of Decision and includes a Responsiveness Summary that reflects the public's input and the agency's response. EPA expects to issue the Proposed Plan in fall 2011.

**COMMUNITY INVOLVEMENT:**

Over the years, EPA and the Rhode Island Department of Environmental Management have held Dialogue Group meetings with interested stakeholders, including the Towns of North Providence and Johnston, the Woonasquatucket River Watershed Council, the Audubon Society, the Natural Resources Trustees, and the Potentially Responsible Parties. These meetings have provided a forum to exchange ideas and give stakeholders input into EPA's investigation and cleanup selection process.

Since January 2005, EPA has awarded \$125,000 to the Woonasquatucket River Watershed Council through a Superfund Technical Assistance Grant. This grant has been used to hire an independent expert to help the impacted communities better understand technical data and site hazards.

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