

US EPA ARCHIVE DOCUMENT



Centredale Manor Restoration Project

North Providence, RI

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



THE SUPERFUND PROGRAM protects human health and the environment by locating, investigating, and cleaning up 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.

YOUR OPINION COUNTS: OPPORTUNITIES TO COMMENT ON THE PLAN

EPA, the lead agency for all site activities, will be accepting public comments on this proposed cleanup plan from November 14, 2011 through January 12, 2012. You don't have to be a technical expert to comment. If you have a concern, suggestion, or preference regarding this Pro-

posed Plan, EPA wants to hear from you before making a final decision on how to protect your community. EPA also is requesting public comment concerning its wetland and floodplain findings, its draft finding regarding the use of a risk-based polychlorinated biphenyls (PCB)

cleanup level, and its proposal to waive federal and state environmental requirements for hazardous waste in order to limit damage to the sensitive Oxbow Area wetland. See page 8 for more details. Comments can be sent by mail, email, or fax (see page 34 for details). People also can offer oral or written comments at the formal public hearings. If you have specific needs for the public meetings and hearings, questions about the meeting facilities and their accessibility, or questions on how to comment, please contact Stacy Greendlinger (see below).

SUMMARY OF THE PROPOSED PLAN

The Proposed Plan for the cleanup of sediment, soil, surface water and groundwater contamination generally includes:

continued on next page >

2011 Public Informational Meetings

Tues., Nov. 8 at 7 p.m.

North Providence Town Hall
2000 Smith Street

Wed., Nov. 9 at 7 p.m.

Johnston Senior Center
1291 Hartford Ave., Johnston

Thurs., Nov. 10 at 2 p.m.

Centredale Manor
2074 Smith St., N. Providence

Formal Public Hearings

Wed., Dec. 7 at 2 p.m.

Centredale Manor
2074 Smith St., N. Providence

AND at 7 p.m.

North Providence Town Hall
2000 Smith Street

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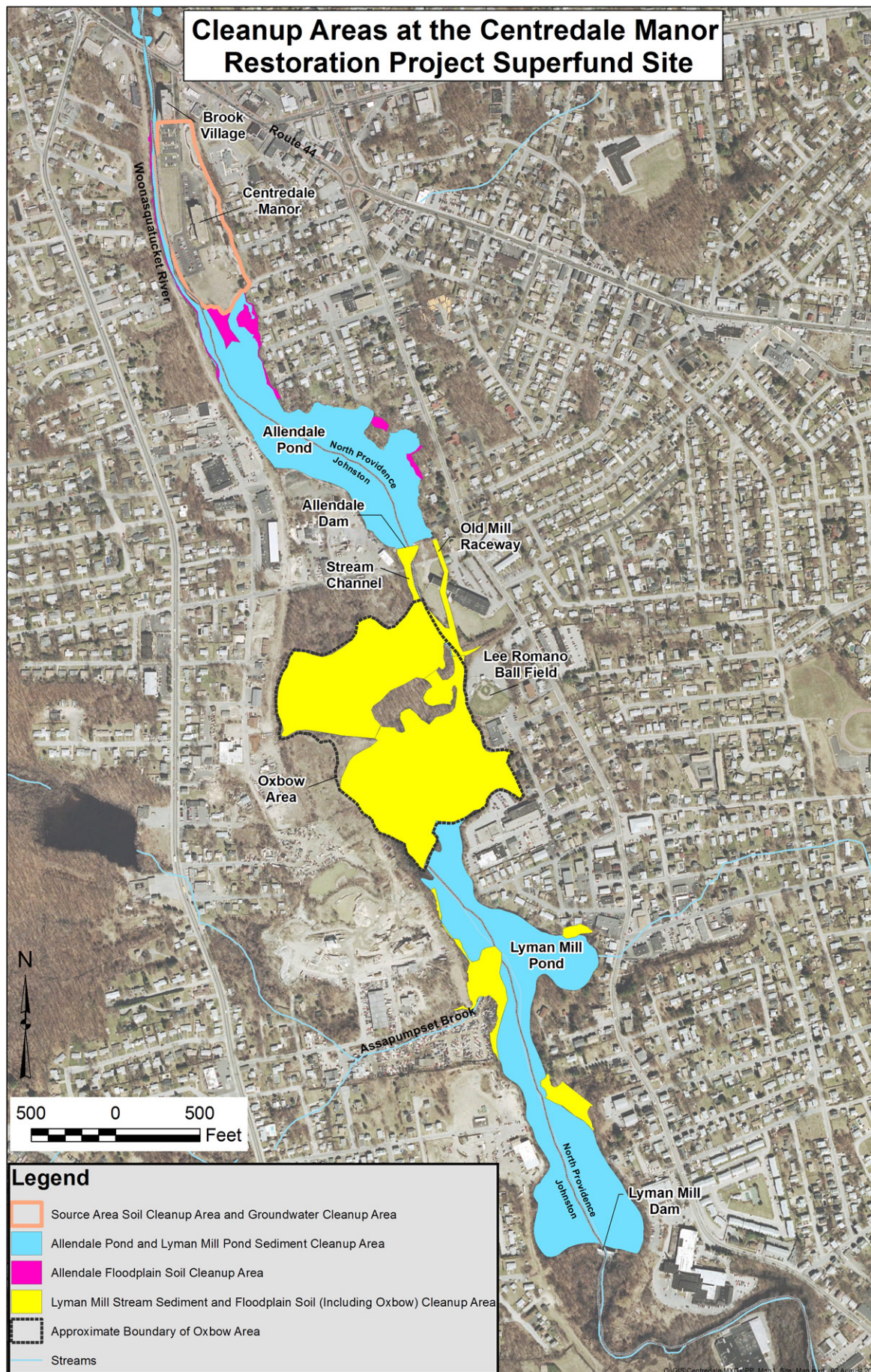
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sites/centredale

October 2011





Map 1

- Removing buried waste material from Source Area (where contamination originally occurred), and majority of contaminated Woonasquatucket River sediment and floodplain soil near and downstream of Source Area, using a combination of containment and treatment methods;
- Installing new hazardous waste isolation caps over remaining Source Area contaminated soil and placing thin soil covers over contaminated wetlands and floodplain areas to speed up natural recovery processes and preserve valuable habitat;
- Placing restrictions to permanently prevent use of groundwater and to temporarily prohibit eating fish, as well as restricting other activities that could potentially expose remaining contamination;
- Monitoring long-term to assess cleanup's effectiveness and recovery of Woonasquatucket River, its floodplain, and to evaluate potential need for other response actions in the downstream reaches beyond Lyman Mill Dam into Providence area;
- Complying with federal drinking water standards at Source Area; and
- Minimizing contribution of site contaminants to Woonasquatucket River's surface water.

EPA's proposed cleanup plan would be implemented through additional investigations, design, construction, maintenance and Five-Year Reviews. The estimated total present value for this proposed cleanup plan is about \$101 million.

SCOPE OF THIS PROPOSED PLAN

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 originated 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 2009/2010 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 9-acre Source Area which is bound by the Woonasquatucket River and streams. The 2009/2010 short-term cleanup focused on about 0.13 acres on the west side of the Brook Village parking lot where contaminated groundwater was flowing into the river. Future monitoring will be done to confirm that contaminated groundwater is not leaving the Source Area.

3. Allendale Pond and Lyman Mill Pond Sediment

This area includes all contaminated sediment in Allendale Pond, Lyman Mill Pond and the river channel that runs along the Source Area.

4. Allendale Floodplain Soil

A floodplain is the flat or nearly flat area 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 below Allendale Dam.

A Remedial Investigation report has been completed and summarizes the nature and extent of contamination at the Centredale Manor Restoration Project Superfund Site and was used to prepare the Centredale Manor Restoration Project Superfund Site Feasibility Study. The Feasibility Study evaluated different combinations of cleanup approaches to restrict access to, contain, remove, and/or treat contamination to protect human health and the environment from exposure to the site's contaminated soil, groundwater, surface water and sediment.

This Proposed Plan presents multiple long-term cleanup alternatives for each of the cleanup areas, except for Groundwater. The Groundwater cleanup, generally described in the Feasibility Study as Alternative 2E, was constructed in 2009/2010 while the Feasibility Study was nearing completion. At that time, EPA determined that a short-term cleanup was necessary to prevent further contamination from moving into the river. EPA is including the Groundwater cleanup in this Proposed Plan so that as part of

In accordance with Section 117 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the law that established the Superfund program, this document summarizes EPA's cleanup proposal. For detailed information on the cleanup options evaluated for use at the site, see the Centredale Manor Restoration Project Feasibility Study and other documents contained in the site's Administrative Record available for review at the site information repositories at the North Providence Union Free Library, 1810 Mineral Springs Ave., North Providence, RI, the Mohr Memorial Library, 1 Memorial Ave., Johnston, RI and the EPA New England Records Center, 5 Post Office Sq., First Floor, Boston, MA or online at www.epa.gov/region1/superfund/sites/centredale.

the final long-term cleanup plan it would continue to be addressed, and so that the public has the opportunity to comment on other possible groundwater alternatives should the public believe additional or different efforts should be taken. Other groundwater cleanup alternatives are discussed in more detail in the Feasibility Study.

This Proposed Plan also does not specifically propose a surface water cleanup alternative despite identified exceedances of surface water standards in the river. Instead, the proposed actions for soil, sediment and groundwater indirectly address this problem by minimizing the contribution of site contaminants to surface water, in order to meet a surface water quality standard of 0.5 parts per quadrillion for dioxin. All evaluated cleanup alternatives include long-term monitoring of the river below the Lyman Mill Dam into the Providence area to evaluate the potential need for other response actions.

A CLOSER LOOK AT EPA'S CLEANUP PROPOSAL

Based on the cleanup alternatives evaluated in the Feasibility Study, EPA is proposing the following long-term cleanup plan for the five cleanup areas of the Centredale Manor site:

- **Source Area Soil / Alternative 4E:** Targeted Excavation, Construct Caps Designed to Cover Hazardous Waste, and Off-site Disposal and/or Treatment of buried highly toxic or mobile waste material.
- **Groundwater/ Alternative 2E:** Compliance with Drinking Water Standards at the Source Area.
- **Allendale Pond and Lyman Mill Pond Sediment / Alternative 7A:** Excavation and On-site Containment in an Upland Confined Disposal Facility (an area located on higher land designed to

permanently and securely contain excavated contaminated sediment/soil). To meet regulatory requirements, the most highly contaminated sediment would be shipped off-site for treatment/disposal.

- **Allendale Floodplain Soil / Alternative 5A:** Excavation and On-site Containment in an Upland Confined Disposal Facility.
- **Lyman Mill Stream Sediment and Floodplain Soil (including Oxbow Area) / Alternative 3A:** Targeted Excavation and On-site Containment in an Upland Confined Disposal Facility and Enhanced Natural Recovery. To meet regulatory requirements, the most highly contaminated soil/sediment would be shipped off-site for treatment/disposal.

Each part of EPA's preferred cleanup plan is further outlined below and discussed in the Feasibility Study in even greater detail.

(1) Source Area Soil (Alternative 4E) consists of:

Contaminated Soil Cleanup

- Gathering additional information for the final cleanup design.
- Removing buried highly toxic or mobile waste material at the Source Area and backfilling with clean fill to restore the existing grade (see page 18 for approximate locations).
- Transporting this excavated highly toxic or mobile waste material off-site for treatment/disposal.
- Relocating the existing utilities into a clean utility corridor.
- Converting the existing surfaces (caps, parking lots, paved surfaces, and landscape areas) to caps made to cover hazardous waste.
- Regrading, repaving and restoring the Source Area.
- Restoring wetlands and floodplains.

In addition, the proposed Source Area Soil cleanup plan includes:

Land Use Controls

- Permanently prohibiting future excavation, restricting access for buried utilities, and preventing the construction of buildings with pilings or basements.

Long-Term Monitoring

- Periodically inspecting and maintaining cap areas.
- Periodically checking that contamination left in place remains contained and that no future releases occur.
- Periodic monitoring and maintenance activities to control invasive plants and to maximize restoration activities.

Five-Year Reviews

- Reviewing the cleanup plan's effectiveness every 5 years.

The estimated total present value for this portion of the preferred cleanup plan is approximately \$21.3 million.¹

(2) Groundwater (Alternative 2E) consists of:

This cleanup was performed by a Potentially Responsible Party as an EPA short-term cleanup at an estimated cost of approximately \$3 million.

Contaminated Groundwater Cleanup (completed 2010)

- A sheet pile wall was installed between the excavation area within the Brook Village parking lot and the river to prevent river water from flooding the excavation area during construction, as well as to reduce the movement of groundwater into the river in the long term.
- Highly toxic or mobile waste was excavated.
- Contaminated groundwater extracted from the excavation area was treated and returned to the river.

¹ "Present value" is the amount of money set aside today to ensure that enough money is available over the expected life of the project, assuming certain economic conditions (e.g., inflation).

- Excavation area was backfilled with clean fill and a cap made to cover hazardous waste was constructed over the area.
- Waste removed from the excavation area was transported off-site for treatment/disposal.
- Groundwater monitoring wells were installed.
- One round of monitoring was performed.

Additional parts of the Groundwater cleanup approach have not been implemented and are proposed to include:

Land Use Controls

- Permanently restricting the use of groundwater beneath the cap covering hazardous Source Area Soil.

Long-Term Monitoring

- Installing additional monitoring wells.
- Periodic testing to confirm that site-related groundwater contamination beyond the edge of the Source Area cap does not exceed federal drinking water standards and that contaminants are not moving into the river.

Five-Year Reviews

- Reviewing the cleanup plan's effectiveness every 5 years.

The estimated total present value for the proposed remaining parts of the Groundwater cleanup plan is approximately \$900,000.

(3) Allendale Pond and Lyman Mill Pond Sediment (Alternative 7A) consists of:

Contaminated Sediment Cleanup

- Gathering additional information to support the final cleanup design.
- Preparing temporary work areas, roads and access points for the sediment cleanup areas.
- Constructing an Upland Confined Dis-

posal Facility (an area located on higher land designed to permanently and securely contain excavated contaminated sediment/soil). See approximate possible locations on page 21.

- Draining Allendale Pond and then Lyman Mill Pond.
- Removing contaminated sediment above site-specific cleanup levels (approximate excavation areas are shown on pages 20 & 21).
- Removing excess water from contaminated sediment to reduce the volume and mass for disposal on-site in an Upland Confined Disposal Facility. To meet regulatory requirements, the most highly contaminated sediment would be shipped off-site for treatment/disposal.
- Treating the excess water extracted from the sediment.
- Collecting sediment following removal for confirmation sampling and placing a thin-layer sand cover (if required) over any residual contamination.
- Restoring Allendale Pond and Lyman Mill Pond similar to their pre-excavation conditions.
- Restoring floodplains and wetlands.

In addition, the proposed sediment cleanup approach includes:

Land Use Controls

- Permanently preventing excavation or other activities that could damage the Upland Confined Disposal Facility.

Long-Term Monitoring

- Periodically inspecting and maintaining the Upland Confined Disposal Facility.
- Periodically monitoring groundwater at the Upland Confined Disposal Facility to confirm that contaminants are not moving into the groundwater.
- Periodically monitoring sediment, surface water, and wildlife to assess recovery, determine when fish are safe to eat, and to assess the effectiveness of the cleanup

plan on downstream areas beyond Lyman Mill Dam into the Providence area.

- Periodic monitoring and maintenance activities to control invasive plants and to maximize restoration activities.

Five-Year Reviews

- Reviewing the cleanup plan's effectiveness every 5 years.

The estimated total present value for this portion of the preferred cleanup plan is approximately \$61 million.

(4) Allendale Floodplain Soil (Alternative 5A)

This part of the cleanup plan would be performed at Allendale Pond while the sediment cleanup activities (described above) are taking place. This alternative includes:

Contaminated Floodplain Soil Cleanup

- Gathering additional information to support the final cleanup design.
- Removing all floodplain soil contaminated above site-specific cleanup levels (approximate excavation areas are shown on page 20) and containing the soil on-site in an Upland Confined Disposal Facility (an area located on higher land designed to permanently and securely contain excavated contaminated sediment/soil). This would be the same disposal facility containing the excavated sediment from Alternative 7A.
- Restoring wetlands, floodplains, and excavated areas.

In addition, the proposed floodplain soil cleanup approach includes:

Long-Term Monitoring

- Periodic monitoring to assess recovery within the floodplain and /or wetland areas and maintenance to support restoration.
- Periodic monitoring and maintenance activities to control invasive plants and to maximize restoration activities.

Five-Year Reviews

- Reviewing the cleanup plan's effectiveness every 5 years.

The estimated total present value for this portion of the preferred cleanup plan is approximately \$1.4 million.

(5) Lyman Mill Stream Sediment and Floodplain Soil, including the Oxbow Area (Alternative 3A)

This part of the overall cleanup plan would be performed while the sediment cleanup activities (described on page 5) are taking place. This alternative includes:

Contaminated Stream Sediment and Floodplain Soil Cleanup

- Gathering additional information to support the final cleanup design.
- Removing soil from floodplain areas where contamination is above safe levels for residential/recreational exposure, removing sediment from erosional areas such as the stream channel where contamination is above cleanup levels (approximate excavation areas are shown on page 21), and containing the soil/sediment on-site in an Upland Confined Disposal Facility (an area located on higher land designed to permanently and securely contain excavated contaminated sediment/soil; the same disposal facility designated for excavated sediment from Allendale Pond and Lyman Mill Pond Sediment—Alternative 7A). To meet regulatory requirements, the most highly contaminated material will be shipped off-site for treatment/disposal.
- Placing a thin-layer soil cover over residual contaminated soil and sediment, reconstructing the stream, and installing flow control structures to divert water flow to the Oxbow Area to speed up the natural recovery processes and preserve the unique forested wetland habitat.
- Restoring wetlands and floodplains.

In addition, the proposed sediment/floodplain

soil cleanup approach includes:

Land Use Controls

- Temporarily preventing excavation or other activities that could damage the thin-layer soil cover.
- Temporarily restricting recreational access to provide additional protection to the public.

Long-Term Monitoring

- Periodically monitoring soil, surface water, sediment, plants and other living organisms and wildlife to assess recovery.
- Performing periodic monitoring and maintenance activities to control invasive plants and to maximize restoration activities.

Five-Year Reviews

- Reviewing the cleanup plan's effectiveness every 5 years.

The estimated total present value for this portion of the preferred cleanup plan is approximately \$16.4 million.

POTENTIAL COMMUNITY IMPACTS

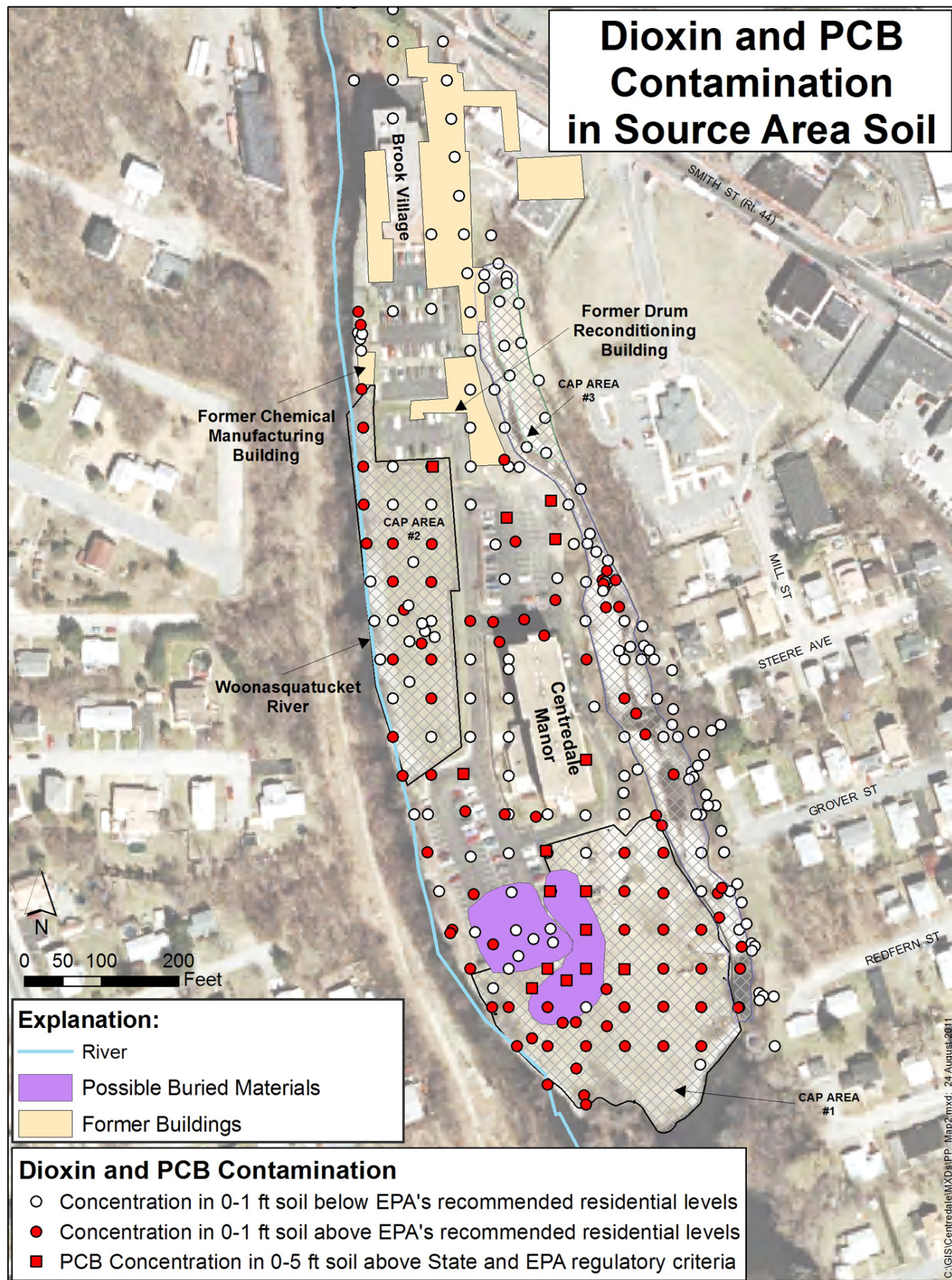
Given how close the cleanup areas are to residential neighborhoods, the proposed work would temporarily impact the surrounding community. Potential effects may include increased construction noise, traffic, dust, and odor. Different steps would be taken to reduce these possible impacts. For instance, instead of having all neighborhoods affected at once, the work would be done in phases working north to south (from Allendale to Lyman Mill ponds). Construction areas would be fenced to block public access. As each pond is drained, temporary haul roads would be built on the newly exposed pond bottoms to limit use of local roads and reduce construction traffic as much as possible. Trucks would be covered and would be washed before leaving the construction zone to make sure contamination would not spread and to reduce dust. Air (dust) monitoring would be conducted along the edge of the work area. If monitoring showed a problem, steps like spraying water could be taken to reduce

dust. Similarly if sediment odor became an issue, actions could be taken such as reducing the area of exposed sediment, covering sediment with geotextile materials or foam, or lime or other additives could be spread to reduce smells. Actions would also be taken to make sure contamination does not move downstream as cleanup work is underway. When the work is completed, the impacted areas would be restored. To ensure careful coordination and enhanced safety for residents, EPA would work closely with the appropriate North Providence and Johnston officials in developing a traffic management plan and a health and safety plan to guide the cleanup work. Additionally, EPA would work with the towns to ensure that the construction of any confined disposal facility to permanently contain contaminated materials would be done in a manner that would be consistent with community needs for the area.

SITE DESCRIPTION

The Centredale Manor Site includes portions of Johnston and North Providence, Rhode Island. The main part of the site, referred to as the Source Area, is located on Smith Street (Route 44), in North Providence, on approximately 9 acres where contamination was historically released to the environment. This area is now a residential area occupied by the Centredale Manor and Brook Village apartment complexes. The site also includes free-flowing reaches and ponds of the river next to and downstream of the Source Area (the approximate cleanup areas are shown on page 2).

EPA studies have identified the levels and locations of contaminants and developed ways to address the contamination problems. In the soil and sediment at the site, dioxin and PCBs are the most wide spread contaminants. In the Source Area, the highest levels of soil contamination were largely found at a depth of up to 5 feet below ground surface, beneath which are floodplain deposits, gravel, and finally bedrock at 40 to 60 feet below the surface (see page 7 for approximate locations). Elevated levels of



EPA IS ASKING FOR PUBLIC COMMENT ON THE FOLLOWING PROPOSED DETERMINATIONS:**Wetland Impacts**

The cleanup plan proposed by EPA includes activities that impact wetlands and U.S. waters. Before EPA can select a cleanup plan that will impact wetlands, Section 404 of the Clean Water Act and Executive Order 11990 (Protection of Wetlands) require that EPA make a determination that there is no practicable alternative to conducting work that will impact wetlands. EPA has determined that because significant levels of contamination exist in wetlands and sediment within the site's cleanup areas, there is no practicable alternative to conducting work in these areas.

For those areas that would be impacted by cleanup activities, EPA is also required to make a determination that the cleanup alternatives that are conducted are the least damaging practicable alternatives. EPA has determined that the proposed cleanup alternatives that impact wetlands and U.S. waters are the least damaging practicable alternatives.

EPA would minimize potential harm and avoid adverse impacts on wetland resources, to the extent practical, by using best management practices to minimize harmful impacts on the wetlands, wildlife or habitat. Wetlands would be restored and/or replicated nearby consistent with the requirements of federal and state wetlands protection laws.

A more detailed discussion of this determination is in the Wetlands/Floodplain Analysis that is part of the Administrative Record, see page 34.

Floodplain Impacts

The cleanup plan proposed by EPA includes activities that affect or result in the occupancy and modification of the floodplain. Before EPA can select such a cleanup alternative, Executive Order 11988 (Floodplain Management) requires EPA to make a determination that there is no practicable alternative to doing so. EPA has determined there is no practicable alternative to occupancy and modification of the floodplain in two cleanup areas: the Lyman Mill Stream Sediment and Floodplain Soil (including the Oxbow Area) and the Source Area Soil.

The proposed Alternative 3A for Lyman Mill Stream Sediment and Floodplain Soil (including the Oxbow Area) calls for a thin layer of soil cover which would occupy and modify the area's floodplain. Although excavation could also be conducted that would not have similar impacts, it is not a practicable alternative because extensive excavation would destroy a valuable and unique habitat.

The proposed Alternative 4E for Source Area Soil calls for caps that would occupy and modify the area's floodplain. Although excavation could also be conducted that would not have the same impacts on the floodplain, it is not a practicable alternative because extensive excavation would result in unacceptable impacts to residents.

EPA would avoid or minimize potential harmful impacts on floodplain resources to the extent practicable at both cleanup areas. In addition, any lost flood storage capacity from cleanup activities within the 100-year floodplain would be addressed as appropriate.

A more detailed discussion of this determination is in the Wetlands/Floodplain Analysis that is part of the Administrative Record, see page 34.

Waiver of Hazardous Waste Facility Requirements

The location and closure of facilities containing hazardous waste is regulated by federal and state hazardous waste laws that specify how hazardous waste should be covered and how hazardous waste located in a floodplain should be addressed.² Alternative 3A for the Lyman Mill Stream Sediment and Floodplain Soil includes the placement of a three-inch thin-layer of soil over contaminated floodplain soil that will remain in this area. This proposed soil cover in this area would not meet the requirements of federal and state environmental regulations—namely, the Subtitle C requirements of the Resource Conservation and Recovery Act (RCRA). EPA believes that meeting these requirements in this area of the site would result in greater risk to the environment. Therefore, EPA proposes waiving federal and state hazardous waste requirements for this alternative by using a "protectiveness waiver" under Section 121(d)(4)(B) of the Comprehensive Environmental Response, Compensation, and Liability Act. The cover proposed under Alternative 3A would allow for the preservation of a majority of the existing forested wetland that provides a regionally important habitat to a variety of bird and animals. If these regulations were not waived and a thicker, impermeable cap was required to cover hazardous waste and other actions were taken to prevent washout of hazardous substances, then one of the largest areas of forested habitat remaining along the riverbanks would be permanently eliminated.

Proposed Finding: PCB Cleanup Level is Protective

Consistent with Section 761.61(c) of the Toxic Substances Control Act (TSCA), EPA has made a

draft finding that the on-site disposal of PCB contaminated material as set out in this Proposed Plan does not result in an unreasonable risk of injury to human health or the environment as long as the following conditions are met:

1. If sediment excavated from the river contains PCB levels greater than 1 part per million, it shall be disposed of on-site in an Upland Confined Disposal Facility that complies with the requirements of Subtitle C of the Resource Conservation and Recovery Act (RCRA).

2. If contaminated soil from the Source Area contains PCB levels greater than 1 part per million, it shall be disposed of in place using a cap that complies with the requirements of Subtitle C of RCRA.

3. All excavated sediment is disposed of in accordance with TSCA based on in situ (pre-excavation) PCB levels and not subject to dilution.

4. Rules developed in accordance with TSCA, will be developed and followed for the decontamination of all equipment used when handling TSCA-contaminated material to avoid mixing with non-TSCA material.

5. Stockpiled material shall be covered and bermed while awaiting transport and any runoff shall be collected and disposed of, so that the requirements of TSCA are met.

6. Air monitoring and dust suppression measures for PCBs shall be maintained until excavation and transport of PCB contaminated sediment and capping of contaminated sediment and soil is complete.

7. Once capping is complete, the caps shall be monitored annually at a minimum to insure that their integrity is maintained. A plan shall be developed which details the long-term monitoring and maintenance activities for the caps.

8. Land use restrictions shall be put in place to insure the long-term effectiveness of the caps. These may include, but not be limited to, restricting future excavation, restricting access for buried utilities, preventing the construction of buildings with pilings or basements and maintaining the caps.

The Administrative Record, see page 34, contains more details about this proposed finding. A final determination will be made after considering all public comments received during the public comment period.

²Specifically: Sections 264.18, 264.301, 264.302 and 264.310 of the Subtitle C regulations of the Resource Conservation and Recovery Act, 40 CFR §§ 264.18, 264.301, 264.302 and 264.310, and the State of Rhode Island equivalent regulations.

contaminants were also found in groundwater beneath the Source Area. Groundwater beyond the Source Area is contaminated by similar contaminants from other industrial sources and is regulated as a non-drinkable water source by the State of Rhode Island. Over time, the Source Area contamination has entered the river and contaminated the sediment in the ponds and streams. The highest levels of dioxin and other contaminants found in sediment typically were in the top 1 to 2 feet. Dioxin and other contaminants were also found in soil and sediment within the Oxbow wetland area below Allendale Dam indicating that this forested wetland is impacted by site contaminants as well.

LAND USE

Historical Land Use

The Source Area was used from the early 1940s to the early 1970s to manufacture chemicals and to recondition drums. The primary sources of contamination included handling, storage and disposal of chemicals associated with these activities. Chemicals were apparently released directly to the ground, buried, and emptied directly to the river resulting in contamination of soil, groundwater, surface water and sediment in the adjacent and downstream river and ponds. Evidence indicates that buried waste material may still be present in a portion of the Source Area.

Areas of major historical importance at the site include the Allendale Mill, Allendale Historic District and Lyman Mill area, as well as potential undisturbed pre-colonial, colonial and industrial-area historic and archeological resources along the river.

Current & Future Land Use

Land use on the North Providence side of the river is primarily residential, with some commercial and light industrial properties. Much of the Source Area and some residential-use properties in North Providence are located within the floodplain of the river. The Johnston side of the river is characterized by mixed residential, commercial, and industrial use and is generally not located within the river's floodplain. Both sides

are densely populated and their future land use is not expected to change significantly. Land use restrictions currently are not in place to manage excavation for installing or repairing utilities or other activities at the site.

Although groundwater near the site is not used as drinking water and is classified by the state as not suitable as drinking water, under the federal groundwater classification system, EPA views the groundwater at the Source Area as a potential drinking water source.

The Rhode Island Department of Health (RIDOH) recommends that the public not eat fish caught from the river below the Johnston/Smithfield town line. The river is currently the focus of urban revitalization and watershed restoration efforts. The stated goal of the Rhode Island Rivers Council's Rivers Policy and Plan (Amended 2004) is to restore the river as a fishable and swimmable resource for its communities by 2020. In the meantime, EPA and the Rhode Island Department of Environmental

Management (RIDEM) recommend that the public heed the posted warning signs and follow the tips published in the "Do's and Don'ts for the Woonasquatucket River" on how to use the river responsibly.

WHY CLEANUP IS NEEDED

Contaminants

Past industrial operations 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, 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, SVOCs, VOCs,

SITE CONTAMINANTS

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 Trichloroethylene (TCE) and Tetrachloroethylene (PCE).

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 wide spread 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 productions such as smelting, fuel manufacturing, and electroplating.

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

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 (see page 7 for approximate locations).

Groundwater

Groundwater sampling data at the Source Area indicates contamination is above federal drinking water standards at 25 out of 37 monitoring wells tested. The most common contaminant detected is PCE, followed by TCE. Dioxin has also been detected in Source Area groundwater.

Allendale Pond and Lyman Mill Pond Sediment Area

The Allendale Pond and Lyman Mill Pond Sediment area data showed widespread sediment contamination. Dioxin levels were above site-specific cleanup levels in more than 90 percent of the surface sediment (top 1 foot) at Allendale Pond and Lyman Mill Pond (see pages 11 and 12 for approximate locations). 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.

Allendale Floodplain Soil Area

In the Allendale Floodplain Soil area, dioxin contamination was above cleanup levels in approximately 40 percent of the floodplain areas sampled (see page 13 for approximate locations). This suggests that low-lying areas

next to the 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 area.

Lyman Mill Stream and Floodplain Soil

Lyman Mill Stream and Floodplain Soil (including the Oxbow Area) data showed dioxin contamination above cleanup levels in approximately 87 percent of the surface sediment and approximately 33 percent of the floodplain soil locations sampled (page 17 shows approximate locations). 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.

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 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.

Human health and ecological risk assessments have been prepared for the site (detailed risk summaries can be found in the Feasibility Study). These assessments use a number of contamination exposure scenarios to determine if and where there are current or potential future unacceptable risks. In addition to risks identified below, contaminants in Source Area soil, floodplain soil, surface water, and groundwater exceed levels established by federal/state law

and/or guidance.

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.

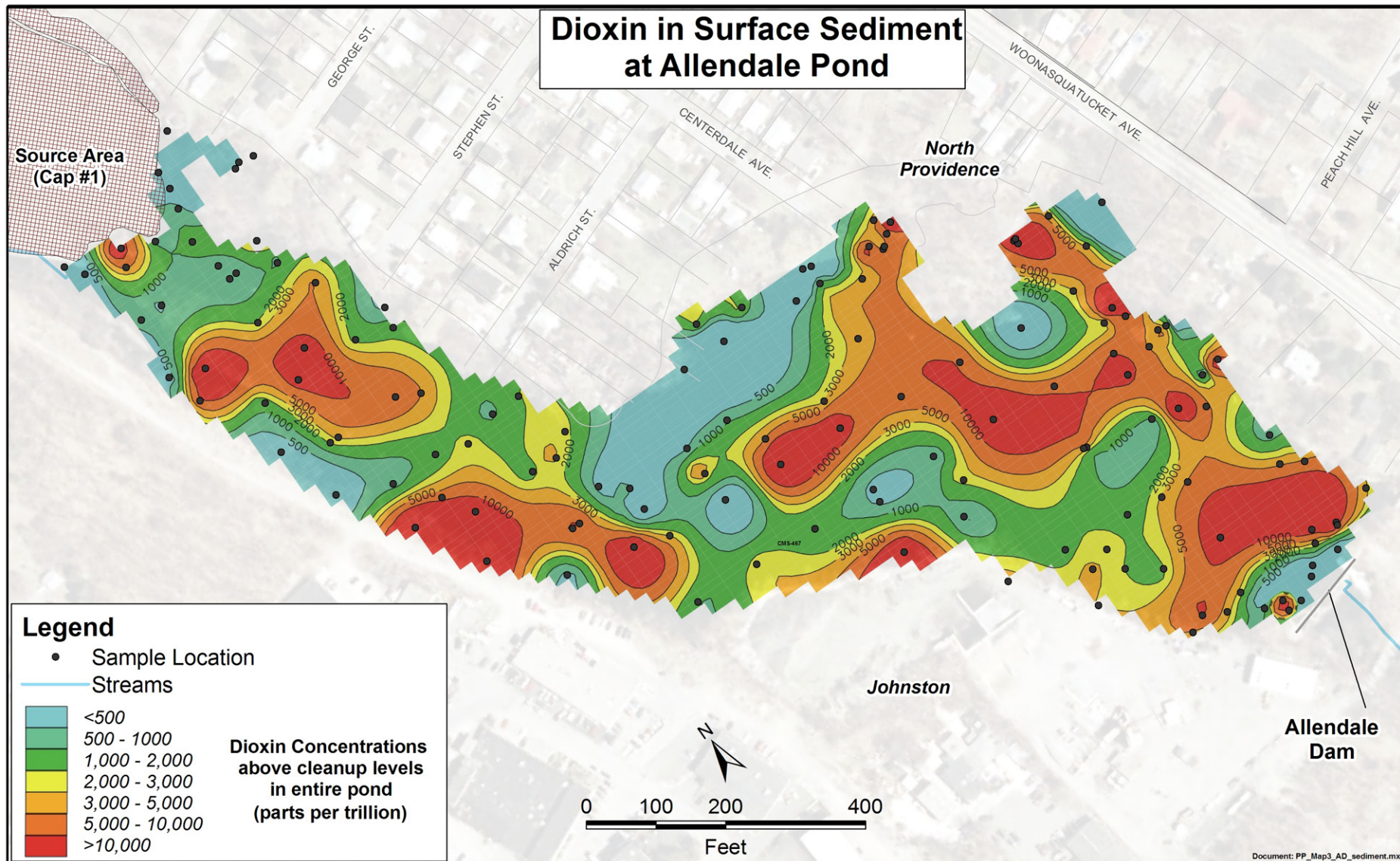
Oxbow Area:

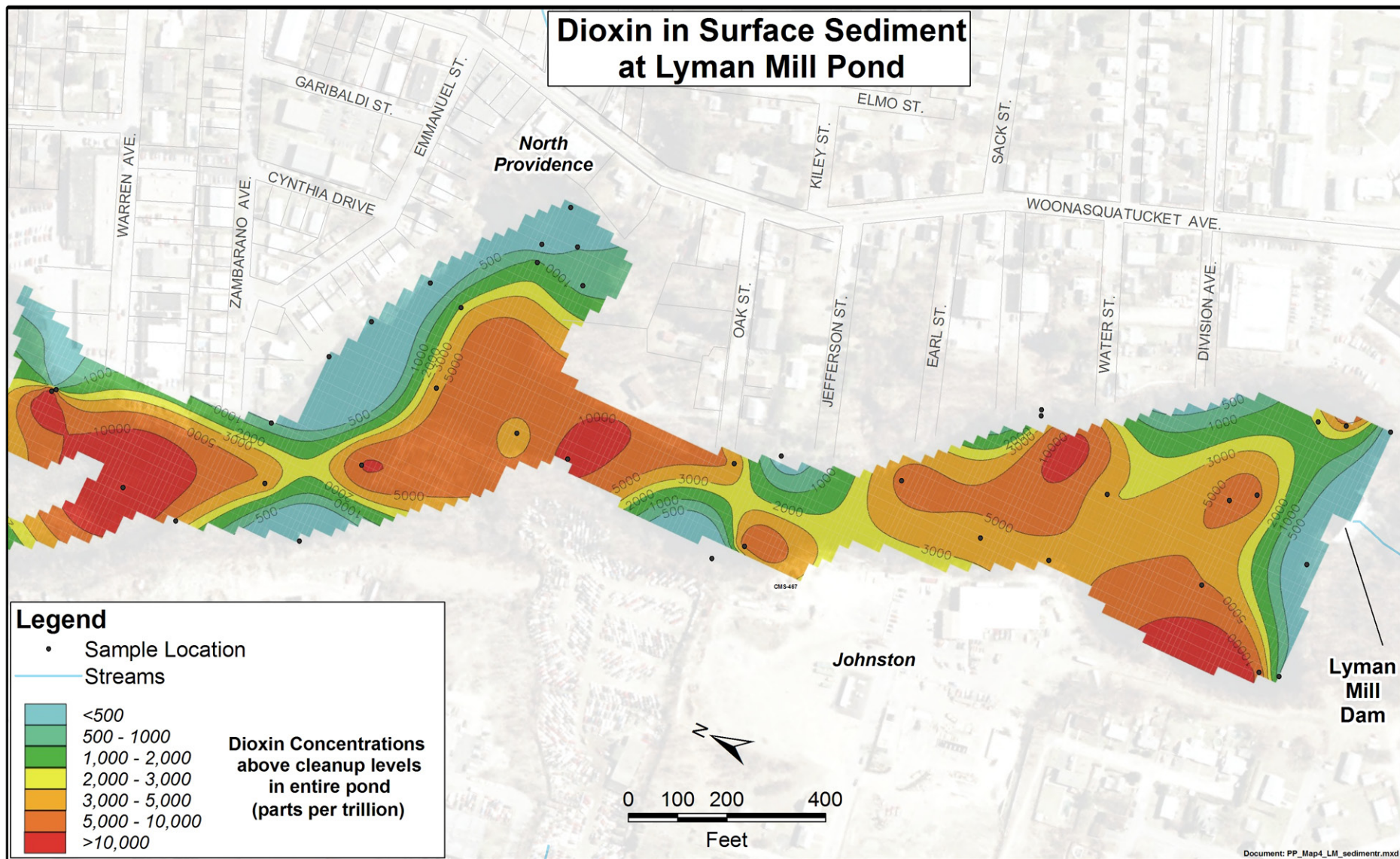
- Having direct skin contact with or accidentally ingesting contaminated floodplain soil may pose a 6 in 100,000 chance of causing cancer for recreational visitors in a portion of the Oxbow Area.

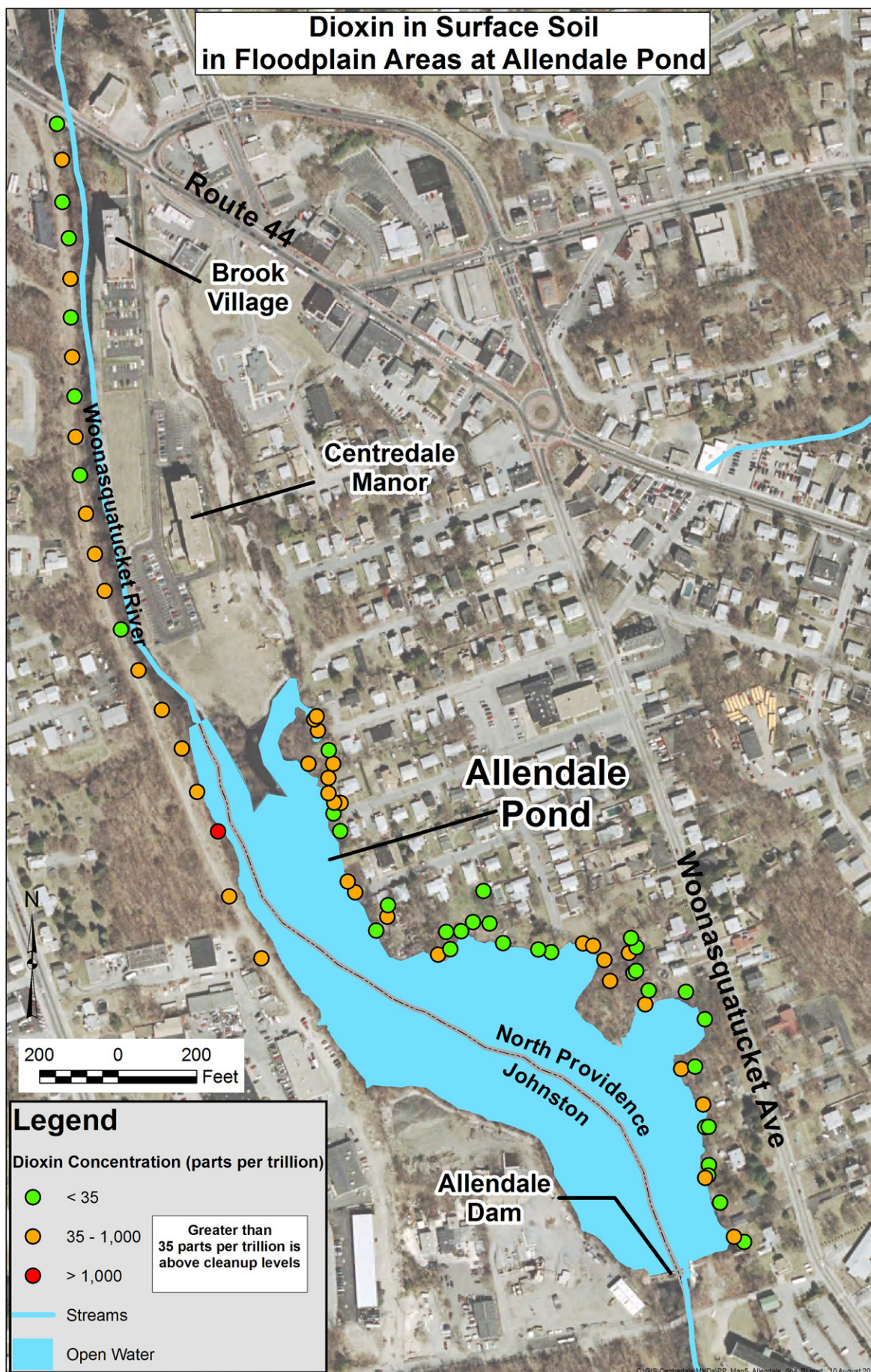
Site Exposure Assumptions:

EPA used the following exposure assumptions to estimate the potential human health risks posed by the site:

continued on pg. 15







Map 5

ENVIRONMENTAL INVESTIGATIONS AND CLEANUP ACTIONS

- 1943 to 1970s:..... Source Area used for chemical manufacturing activities. Metro-Atlantic, Inc. manufactured hexachlorophene around 1965 in a building on the eastern bank of the river (currently Brook Village parking lot). Dioxin is associated with this process. Other manufacturing activities resulted in additional contamination.
- 1952 to 1970s: New England Container Company operated incinerator-based drum reconditioning facility at Source Area. Chemical residues were dumped or burned prior to and during drum reconditioning and are a source of site dioxins, furans and other chemicals.
- 1972: Fire destroyed most structures.
- 1977:..... Brook Village apartment complex constructed.
- 1982: Centredale Manor apartment complex constructed and approximately 400 drums and 6,000 cubic yards of contaminated soil were removed and disposed of off-site under RIDEM supervision.
- 1991:..... Floodwaters breached Allendale Dam reducing pond surface water level and exposing bottom sediment. The Dam was breached again in 2001.
- 1996: EPA identified dioxin and other contaminants in fish.
- 1998: RIDOH issued fish advisories for dioxin, mercury and PCBs in Woonasquatucket River.
- 1996 to 2004: EPA conducted numerous investigations to characterize nature and extent of site contamination.
- 1999 to 2000: 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 the Source Area and Allendale Pond. Repairs to the fence were performed in 2005.
- 2000 to 2003: 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.
- 2000:..... Added to Superfund Program's National Priorities List.
- 2003 to 2004: Third short-term cleanup covered contaminated soil and sediment in Source Area's former tailrace (a narrow channel that moved away industrially used water).
- 2005:..... Remedial Investigation identifies extensive contamination in site soil, sediment, surface water, and animals and localized groundwater contamination at Source Area.
- 2004 to 2005: Baseline Human Health and Ecological Risk Assessments conclude current and future exposures to site contaminants pose elevated risks.
- 2009 to 2010:..... Fourth short-term cleanup focused on 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.
- 2010:..... Feasibility Study identifies long-term cleanup options for contaminated soil, groundwater, surface water and sediment.
- 2010:..... Additional investigations conducted in the Oxbow Area.
- 2011: Addendum to the Feasibility Study issued.

DISPOSAL OPTIONS

Because of limited available space for contaminated sediment and soil disposal, and the high cost of treatment or off-site disposal, particularly for dioxin-contaminated material, several disposal options were evaluated in detail.³ All of the cleanup alternatives for sediment and soil (cleanup areas #3-5) include the following disposal options:

- Option A: on-site containment in an Upland Confined Disposal Facility (an area located on higher land designed to permanently and securely contain excavated contaminated sediment/soil). Any excavated soil and dewatered sediment that exceeds specific soil treatment standards (e.g., dioxin above 10 parts per billion) would instead be shipped off-site for treatment and disposal;
- Option B: on-site containment in a Near Shore Confined Disposal Facility (an area located within the ponds along the riverbank designed to permanently and securely contain excavated contaminated sediment/soil);
- Option D: on-site incineration of contaminated soil and sediment; and
- Option E: off-site disposal and/or treatment of contaminated soil, sediment, and/or buried waste. Contamination in soil, sediment and buried waste that exceeds specific levels (estimated to be 10 percent) would require treatment prior to disposal.

Option C, on-site containment in an Island Confined Disposal Facility (an area located in a pond), was eliminated from consideration because it did not provide enough disposal space. Disposal Option F (on-site consolidation within new floodplain areas and capping in place) is included only in Alternative 11 for the Allendale Pond and Lyman Mill Pond Sediment area. All of the cleanup alternatives for Source Area Soil and Groundwater evaluated only off-site disposal and/or treatment (Option E).

³The cleanup alternatives evaluated by EPA include treatment of some, most, or all of the site's contaminated soil and sediment. This contaminated material must meet Land Disposal Restrictions which have specific treatment standards that waste must meet before it can be land disposed.

- 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.
- For the Oxbow Area, having direct skin contact with or accidentally ingesting contaminated floodplain soil, it is assumed a recreational visitor would visit 26 days a year 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 river and its ponds, or floodplain soil in wetlands. 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 on 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 Source Area as this bird species preys upon emergent, flying aquatic insects that develop from benthic macroinvertebrates.

Threats to the environment exist for wildlife that uses the following areas to forage for food: Allendale Pond aquatic and wetland habitats; Oxbow Area aquatic habitat in between Allendale Pond and Lyman Mill Pond; and Lyman Mill Pond (including Oxbow) wetland habitats.

CLEANUP ALTERNATIVES

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 Remedial

Action Objectives, also known as cleanup objectives.⁴ A detailed description and analysis of each alternative developed to reduce risks from exposure to contaminated soil, sediment, and groundwater is presented in the Feasibility Study, which is also available for public review and comment (see page 34). To protect public health and the environment from actual or threatened releases of hazardous substances into the environment, EPA believes that its preferred alternatives presented in this Proposed Plan are necessary. Below is a summary of the multiple cleanup objectives and alternatives, some with several disposal options, considered for each of the site's five cleanup areas: 1. Source Area Soil; 2. Groundwater; 3. Allendale Pond and Lyman Mill Pond Sediment; 4. Allendale Floodplain Soil; and 5. Lyman Mill Stream Sediment and Floodplain Soil (including the Oxbow Area).

(1) Source Area Soil Cleanup Area

Cleanup alternatives for this area were developed to fulfill the following cleanup objectives:

- Prevent direct human exposure by incidental (accidental) ingestion of and dermal (skin) contact with Source Area soil that contain contamination in excess of state and federal environmental laws and regulations⁵ and EPA's recommended residential level of 1 part per billion for dioxin and 1 part per million for PCBs.⁶
- Prevent leaching (contaminants moving from soil into water) or migration (movement) of contaminants from vadose zone (unsaturated) soil that would result in groundwater contamination in excess of state and federal environmental laws and regulations.⁷

1-No Action is required by the Superfund law to be evaluated and is used as a baseline for comparison to other cleanup alternatives. This alternative would not require any further cleanup action, but would include limited periodic monitoring, triggered by severe weather events, and Five-Year Reviews. Cleanup objectives would not be met for the foreseeable future. The estimated total present value of this alternative is \$170,000.

3E-Targeted Excavation, Upgrade and Maintain Existing Surfaces, and Off-Site Disposal and/or Treatment includes targeted excavation to remove potential buried waste materials and contaminated soil, as well as upgrading and maintaining the existing surfaces. Alternative 3E would include excavation of approximately 14,300 cubic yards of potential highly toxic or mobile buried waste material and soil with contaminant concentrations above the Toxic Substances and Control Act criteria for PCBs and the state's leachability (ability of toxic materials to move from soil to groundwater) criteria for PCBs, pesticides, VOCs and/or SVOCs. The existing caps would be inspected and repaired to meet the requirements of the original designs and would be extended to cover additional areas. The post-cap surface elevation would increase by approximately 0.5 feet. Upgrades to the parking lots and paved surfaces would include placement of asphalt sealant over all paved surfaces. The excavated material would be shipped off-site to a permitted facility for disposal and/or treatment. This alternative assumes that all of the excavated waste material and approximately 10 percent of the excavated soil would require treatment. This alternative also includes Land Use Controls (including prohibition on future excavation), long-term operation and maintenance, long-term monitoring, and Five-Year Reviews. The estimated timeframe

to prevent direct contact with contaminated soil is 5 months and significantly longer to prevent movement of contaminants from soil into water. The estimated total present value of this alternative is \$24.4 million.

4E – Targeted Excavation, Convert to Caps Designed to Cover Hazardous Waste, and Off-Site Disposal and/or Treatment is EPA's preferred alternative and includes targeted excavation to remove potential highly toxic or mobile buried waste materials and then covering the existing surfaces to meet the requirements for caps designed to cover hazardous waste (see page 18 for the approximate locations). Alternative 4E would consist of the excavation of an estimated 5,500 cubic yards of potential buried waste material and converting all existing caps, landscape areas, and paved surfaces to caps designed to cover hazardous waste. Caps would include geomembranes and would be layered 2.5 to 3.5 feet, resulting in the ground surface elevation increasing an average of 2.5 feet. The underground utilities serving existing buildings would be relocated into trenches with only clean soil. The excavated material would be shipped off-site to a permitted facility for treatment. This alternative also includes Land Use Controls, long-term operation and maintenance, long-term monitoring, and Five-Year Reviews. Direct contact cleanup objectives are expected to be met in about 8 months. The estimated total present value of this alternative is \$21.3 million.

(2) Groundwater Cleanup Area

Cleanup alternatives were developed to address groundwater contamination and to fulfill the following cleanup objectives:

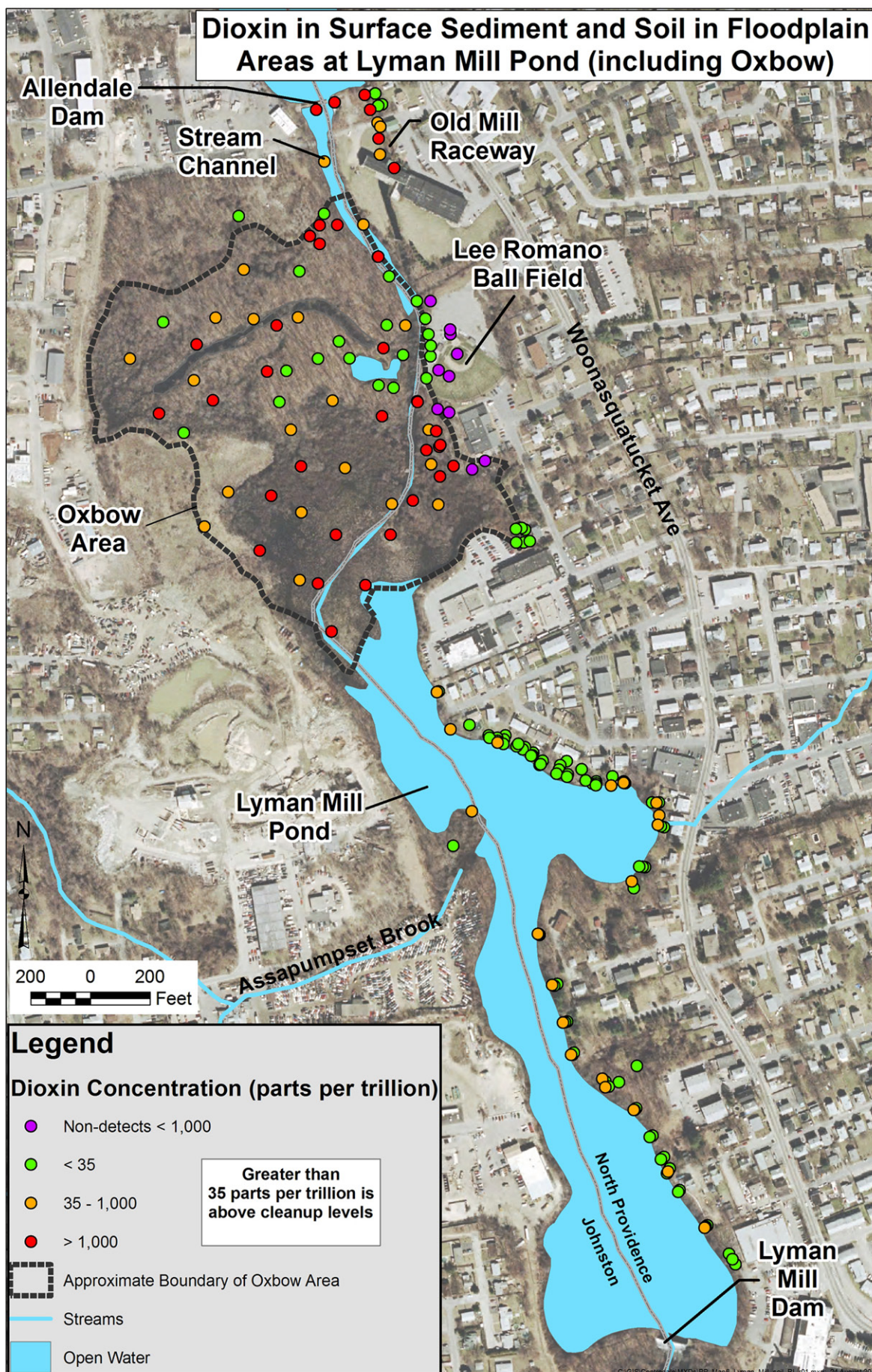
- Prevent migration (movement) of contaminants from groundwater within the Source Area that would result in surface water

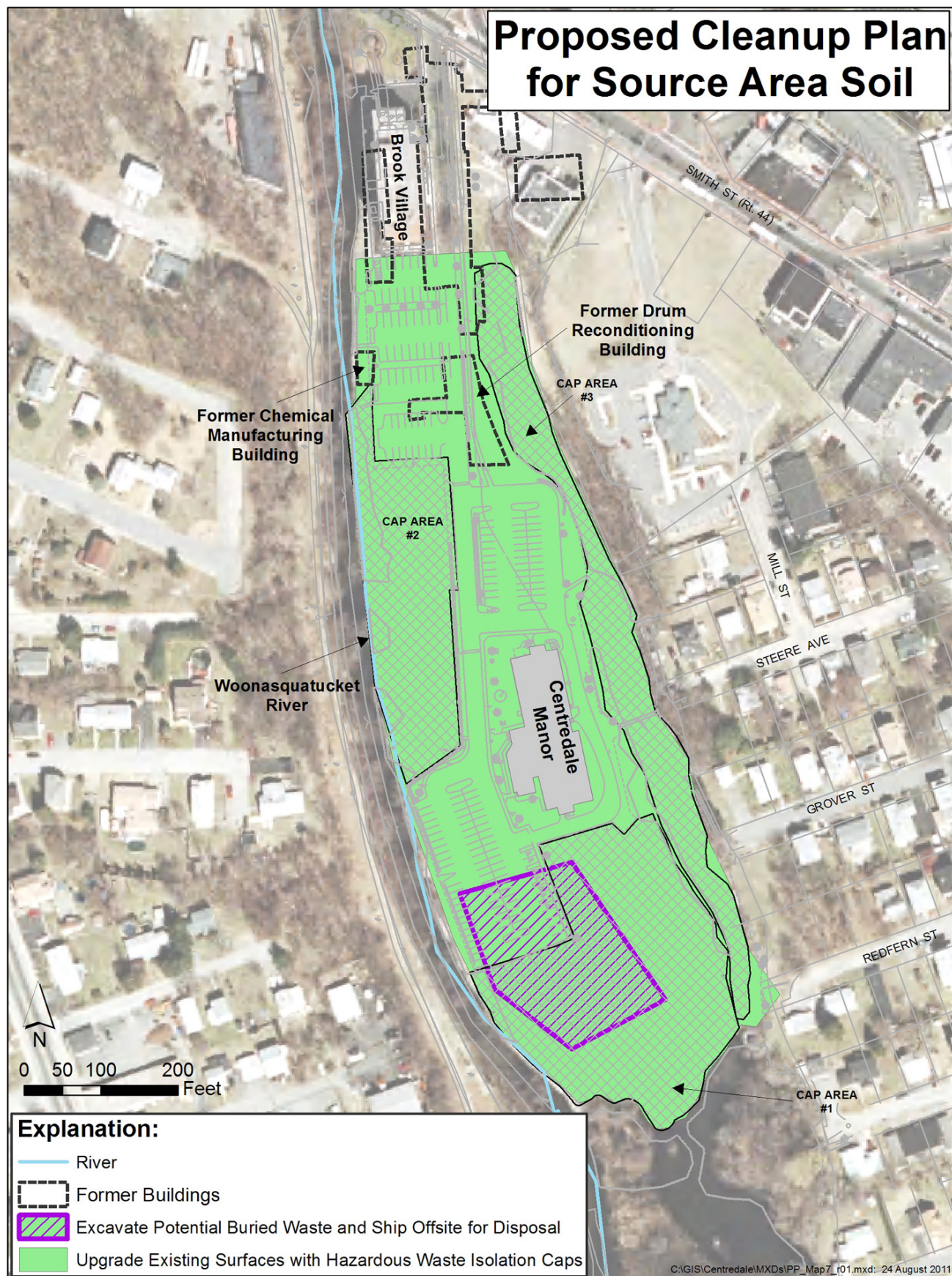
⁴The Remedial Action Objectives in this Proposed Plan include language in parentheses (). The language in parentheses is included solely to facilitate understanding by the reader. The actual text of these objectives is included in the Feasibility Study.

⁵ARARs (Applicable or Relevant and Appropriate Requirements) are state and federal environmental laws and regulations that address a hazardous substance, pollutant, contaminant, and type of action, location or other circumstance at a CERCLA site. These ARARs include, for example, RIDEM residential direct exposure criteria and TSCA requirements for PCBs.

⁶EPA's recommended residential level of 1 part per billion for dioxin and 1 part per million for PCBs are based upon EPA guidances issued in 1998 and 1990, respectively.

⁷These ARARs include, for example, federal Maximum Contaminant Levels (MCLs)/non-zero Maximum Contaminant Level Goals (MCLGs). Groundwater within the Source Area is federally classified as Class IIB (Potential Source of Drinking Water). As a result, RIDEM's GA leachability criteria and federal MCLs and non-zero MCLGs are potential ARARs for soil and groundwater within the Source Area.





Map 7

contamination in excess of state and federal environmental laws and regulations⁸ and/or that could indirectly lead to unacceptable human health risks and/or that could result in concentrations in the river above sediment cleanup goals.

- Prevent direct human exposure by dermal (skin) contact with or ingestion of groundwater by occupants and/or workers within the Source Area that contain contamination in excess of state and federal environmental laws and regulations.
- Comply with the federal drinking water standards (for example 0.03 parts per trillion for dioxin and 5 parts per billion for PCE and TCE).

Although construction of the groundwater portion of the cleanup has been conducted, see pages 4&5 (with the exception of additional groundwater monitoring wells), the long-term parts of Alternative 2E, including monitoring, Land Use Controls and Five-Year Reviews, have not been put into place. These cleanup components are part of the preferred alternative in this Proposed Plan. The estimated total present value of this portion of the cleanup plan is \$900,000.

(3) Allendale Pond and Lyman Mill Pond Sediment Cleanup Area

Cleanup alternatives were developed to fulfill the following cleanup objectives for this area:

- Prevent direct human exposure by incidental (accidental) ingestion of and dermal (skin) contact with sediment containing contaminants at concentrations that would result in a total excess lifetime cancer risk greater than the target risk range⁹ of 10^{-6} to 10^{-4} or a hazard index (for non-cancer health effects) greater than

1. [The sediment cleanup levels include 14.7 parts per trillion for dioxin and 0.21 parts per million for PCBs (based on background concentrations)].

- Prevent human ingestion of fish and other aquatic organisms containing contaminants at concentrations that would result in a total excess lifetime cancer risk greater than the target risk range of 10^{-6} to 10^{-4} , or a hazard index (for non-cancer health effects) greater than 1.
- Prevent dermal (skin) contact and ingestion by ecological receptors (wildlife) to sediment containing contaminants at levels that would result in unacceptable impacts.
- Prevent migration (movement) of contaminants from sediment that would result in surface water concentrations in the river in excess of state and federal environmental laws and regulations or migration (movement) of contaminants downstream.

1-No Action is required by the Superfund law to be evaluated and is used as a baseline for comparison to other cleanup alternatives. This alternative would not require any further cleanup action, but would include limited periodic monitoring, triggered by severe weather events and Five-Year Reviews. Cleanup objectives would not be met for the foreseeable future. The estimated total present value of this alternative is \$450,000.

7-Excavation and Disposal and/or Treatment (this is EPA's preferred alternative) would remove all sediment with contaminant concentrations above the cleanup levels, and the contaminated material would be contained on-site, treated, or shipped off-site for disposal and/or treatment. Both ponds would be drained and

BACKGROUND LEVELS OF CONTAMINATION

It is not surprising in urban areas to find a range of chemicals in the air, water, sediment or soil. Contaminants are present simply because of the urban nature of the area or happen to occur naturally. Because of the mixed use of land in developed areas, chemicals either historically or currently get released into the environment. This contamination becomes part of the "background levels" that are detected nearby and upstream of the Centredale Manor site which did not come from site operations. EPA cannot clean hazardous waste sites to below background levels.

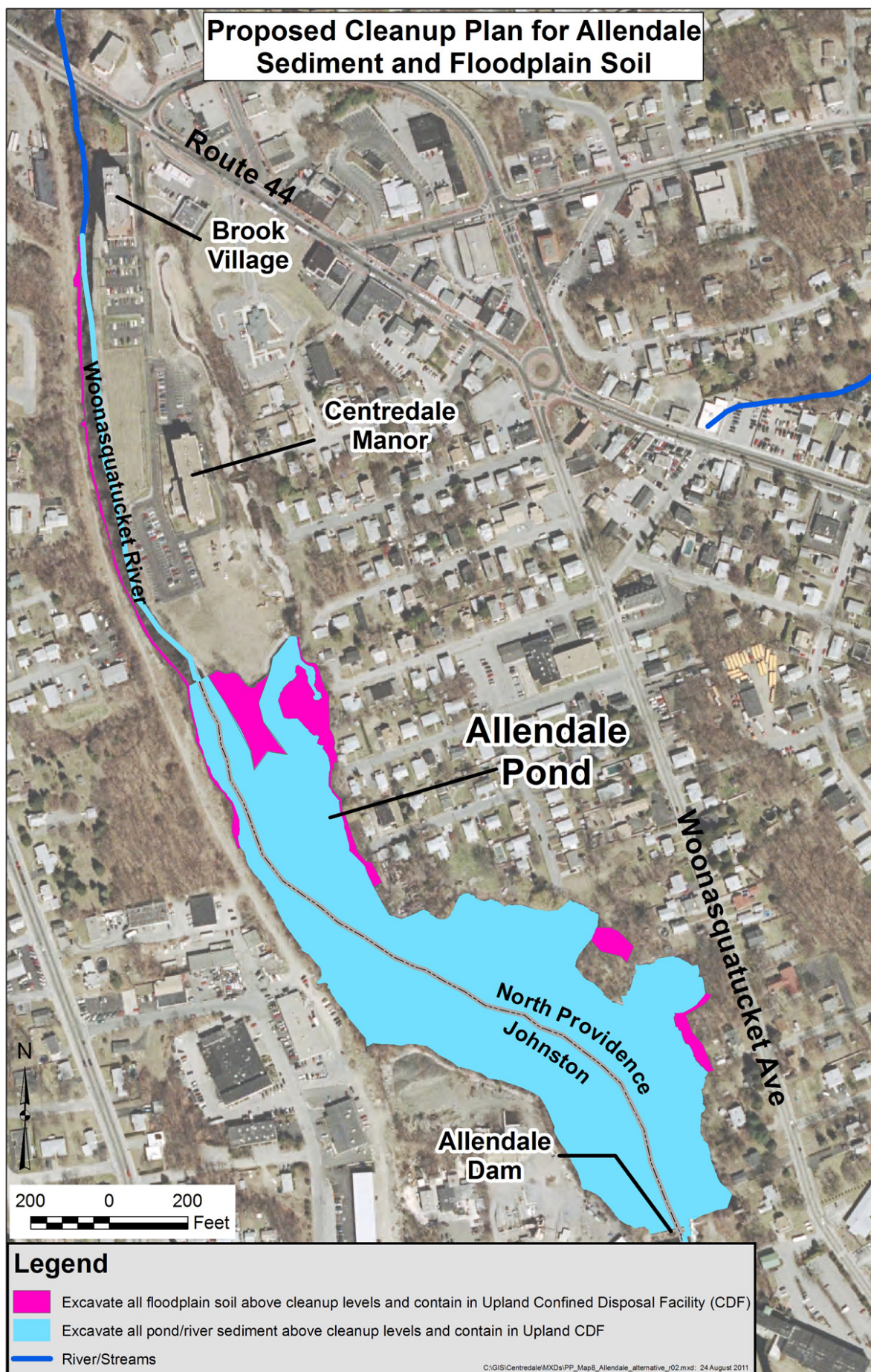
sediment excavation would be performed in the dry, to an average depth of 2.2 feet at Allendale Pond and 2.7 feet at Lyman Mill Pond, resulting in removal of upwards of 155,800 cubic yards (see pages 20 & 21 for approximate locations). Post-excavation sampling would be performed to confirm that the cleanup levels were met, and a thin 6-inch sand cover would be placed (if required) over the sediment bottom in areas where left over contamination was found above the cleanup levels. Excess water drained out of the excavated sediment would be treated.

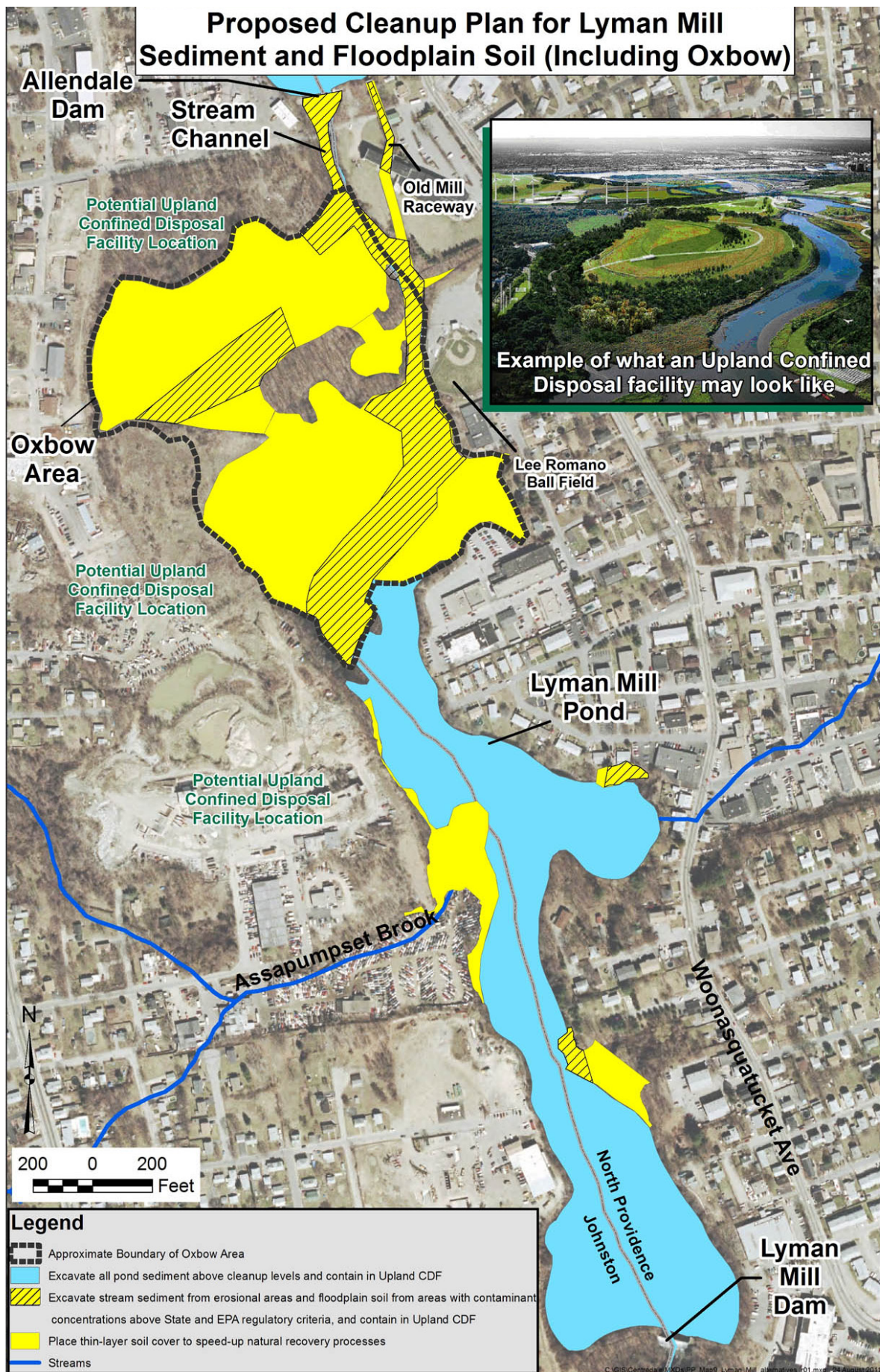
Alternative 7 Disposal Options

Option A (this is EPA's preferred disposal option): Upland Confined Disposal Facility: the excavated, dewatered sediment would be contained in a 6-8 acre Confined Disposal Facility constructed above the 100-yr flood elevation, most likely on the western shore of Lyman Mill Pond (see page 21 for approximate potential location). This option assumes that approximately 10 percent of the excavated material would be shipped off site to a permitted facility for treatment to meet Land Disposal Restriction requirements.

⁸ These ARARs include, for example, State of Rhode Island standards and federal Water Quality Criteria (WQC) and chronic ambient freshwater and human health criteria for consumption of water and aquatic organisms.

⁹ The term " 10^{-4} to 10^{-6} " is referred to as scientific notation which is used to express risk. A risk value of 2×10^{-4} would mean a 2 in 10,000 chance of causing cancer. A risk value of 7×10^{-5} would mean a 7 in 100,000 chance of causing cancer.





Option B: Near Shore Confined Disposal Facility: the excavated sediment would be contained within the Allendale Pond and Lyman Mill Pond, resulting in a 25 to 30 percent loss of the water surface areas in these ponds. The contaminated sediment below the footprint of the Near Shore Confined Disposal Facility would not be excavated nor would sediment be dewatered.

Option D: On-site Incineration: all of the excavated sediment would be treated on site using a mobile incineration unit.

Option E: Off-site Disposal and/or Treatment: the excavated sediment would be shipped off-site to a permitted facility for disposal and/or treatment. This option assumes that some of the excavated material (potentially 10 percent) could require treatment.

Alternative 7 includes restoration and mitigation for the temporary elimination of fish populations and to help with habitat recovery, as well as for lost aquatic habitat (Alternative 7B) and for other wetlands impacts. This alternative would require long-term monitoring to assess river recovery, maintenance of the Confined Disposal Facilities, Five-Year Reviews, and for Alternatives 7A and 7B, would also require Land Use Controls and long-term maintenance.

The estimated timeframe to achieve cleanup objectives is about 2 years. The estimated total present value for:

Alternative 7A

(on-site containment in an Upland Confined Disposal Facility) is \$61 million;

Alternative 7B

(on-site containment in a Near Shore Confined Disposal Facility) is \$47 million;

Alternative 7D

(on-site incineration) is \$118 million; and

Alternative 7E

(off-site disposal and/or treatment) is \$93 million.

8 – Partial Excavation, Isolation Capping, and Disposal and/or Treatment would rely on a combination of partial excavation and a 2-foot isolation cap over the entire bottom of both ponds. The ponds would be drained and

excavation and cap placement would be conducted in the dry. This alternative includes two excavation options: removal of the top 2 feet of sediment from areas of shallow water and areas of high erosion potential, with an excavation volume of 64,400 cubic yards, or removal of sediment from the river channel and areas of the highest contaminant concentrations, resulting in a total excavation volume of 56,500 cubic yards. Excess water from excavated sediment would be drained and treated, see page 15 for disposal and/or treatment options. Restoration/mitigation, Land Use Controls, long-term monitoring, maintenance and Five-Year Reviews are similar to Alternative 7, except that additional Land Use Controls and monitoring would be required for the isolation cap.

The estimated timeframe to achieve cleanup objectives is about 2 years. The estimated total present value for:

Alternative 8A

(on-site containment in an Upland Confined Disposal Facility) is \$45 million;

Alternative 8B

(on-site containment in a Near Shore Confined Disposal Facility) is \$36 million;

Alternative 8D

(on-site incineration) is \$67 million; and

Alternative 8E

(off-site disposal and/or treatment) is \$57 million.

10–Dam Replacement, Excavation and Disposal and/or Treatment

is similar to Alternative 7, except that the Allendale and Lyman Mill Dams would be replaced with smaller weir structures designed to allow fish to swim upriver and water to flow freely between the ponds. Under this alternative, some open water area would be lost and converted to floodplains and wetlands. The ponds would be drained and excavation would be conducted in the dry. Under Alternatives 10A, 10D, and 10E, approximately 5 acres (10 to 15 percent) of open water would be lost and converted to floodplains and wetlands. Under Alternative 10B, an additional 13 acres of open water would be lost and converted to uplands for the Near Shore Confined Disposal Facility, resulting in about a 50 percent reduction in the overall size of the ponds.

Sediment processing and dewatering are similar to Alternative 7 (see page 15 for disposal and treatment options). Restoration/mitigation, Land Use Controls, long-term monitoring, maintenance and Five-Year Reviews are similar to Alternative 7. Land Use Controls for the new weir structures also would be required.

The estimated timeframe to achieve the cleanup objectives is about 2 years. The estimated total present value for:

Alternative 10A

(on-site containment in an Upland Confined Disposal Facility) is \$62 million;

Alternative 10B

(on-site containment in a Near Shore Confined Disposal Facility) is \$50 million;

Alternative 10D

(on-site incineration) is \$119 million; and

Alternative 10E

(off-site disposal and/or treatment) is \$94 million.

11–Dam Replacement, Partial Excavation, Isolation Capping, and Disposal and/or Treatment

is similar to Alternative 8 and includes replacing the Allendale and Lyman Mill Dams with smaller weir structures designed to allow fish to swim upriver and water to flow freely between the ponds and removing all contaminated sediment within the extent of the new water bodies. About 23 acres of open water would be changed to floodplains, wetlands, or uplands, resulting in approximately 60 percent reduction in the ponds' size. Under Alternative 11, the ponds would be drained and sediment would be excavated in the dry within the footprint of the smaller future ponds, resulting in removal of approximately 59,800 cubic yards. An isolation cap would be placed over contaminated sediment left in place in the newly created floodplain and wetland areas. The new stream channel in both ponds would consist of engineered structures along the entire length of the channel. In addition to the other four disposal options (see page 15), this alternative also includes an option for on-site consolidation (Option F). Under Option F, the excavated sediment would be consolidated within the new

floodplain areas and capped in place. Restoration/mitigation, Land Use Controls, long-term monitoring, maintenance and Five-Year Reviews are similar to Alternative 8. Land Use Controls for the new weir structures also would be required.

The estimated timeframe to achieve the cleanup objectives is about 1 year for Option F and about 2 years for all other options. The estimated total present value for:

Alternative 11A

(on-site containment in an Upland Confined Disposal Facility) is \$42 million;

Alternative 11B

(on-site containment in a Near Shore Confined Disposal Facility) is \$37 million;

Alternative 11D

(on-site incineration) is \$64 million;

Alternative 11E

(off-site disposal and/or treatment) is \$54 million; and

Alternative 11F

(on-site consolidation) is \$35 million.

(4) Allendale Floodplain Soil Cleanup Area

Cleanup alternatives were developed to fulfill the following cleanup objectives for this area:

- Prevent direct human exposure by incidental (accidental) ingestion of and dermal (skin) contact with floodplain soil that contain contaminants at concentrations in excess of state and federal environmental laws and regulations¹⁰ or EPA's recommended residential level for dioxin (toxic equivalency of 1,000 parts per trillion) and/or that would result in a total excess lifetime cancer risk¹¹ greater than the target risk range of 10^{-6} to 10^{-5} and/or a hazard index (for non-cancer health effects) greater than 1.
- Prevent dermal (skin) contact and ingestion by ecological receptors (wildlife) to floodplain soil containing contaminants at levels that would result in unacceptable impacts (including exposure to dioxin above the cleanup level of 35 parts per trillion).

tion by ecological receptors (wildlife) to floodplain soil containing contaminants at levels that would result in unacceptable impacts (including exposure to dioxin above the cleanup level of 35 parts per trillion).

- Prevent migration (movement) of contaminants from floodplain soil that would result in river surface water concentrations in excess of state and federal environmental laws and regulations or migration (movement) of contaminants downstream that could result in concentrations in the river above sediment cleanup goals.

1-No Action is required by the Superfund law to be evaluated and is used as a baseline for comparison to other cleanup alternatives. This alternative would not require any further cleanup action, but would include limited periodic monitoring, triggered by severe weather events, and Five-Year Reviews. Cleanup objectives would not be met for the foreseeable future. The estimated total present value of this alternative is covered under the No Action alternative for sediment (cleanup area #3).

5-Excavation and Disposal and/or Treatment

EPA's preferred alternative, would be implemented along with the sediment cleanup action at Allendale Pond, once the pond has been drained, and would use the same work areas and disposal options. All soil within the 1.5 acre cleanup area would be excavated to a depth of 1 foot or deeper if required, resulting in an excavation volume of approximately 2,400 cubic yards (page 20 shows approximate locations). Post-excavation sampling would be performed to confirm that the cleanup levels were met. Disposal options include Alternative 5A (EPA's preferred disposal option which is on-site containment in an Upland Confined Disposal Facility); Alternative 5B (on-site containment in a Near Shore Confined Disposal Facility); Alternative 5D (on-site incineration); and Alternative 5E (off-site disposal and/or treatment). Restoration would be performed to help with habitat recovery within the cleaned up area. Land Use Controls would be required to prevent excavation or other activities that could harm any on-site disposal facility (Alternatives 5A and 5B). This alternative includes long-term monitoring and Five-Year Reviews. The on-site containment options (Alternatives 5A and 5B) would also require long-term maintenance.

Cleanup objectives are expected to be achieved in about 1 month. The estimated total present value for:

Alternative 5A

(on-site containment in an Upland Confined Disposal Facility) is \$1.4 million;

Alternative 5B

(on-site containment in a Near Shore Confined Disposal Facility) is \$1.4 million;

Alternative 5D

(on-site incineration) is \$4.3 million; and

Alternative 5E

(off-site disposal and/or treatment) is \$3.2 million.

(5) Lyman Mill Stream Sediment and Floodplain Soil (including Oxbow) Cleanup Area

Cleanup alternatives for this area were developed to fulfill the following cleanup objectives:

- Prevent direct human exposure by incidental (accidental) ingestion of and dermal (skin) contact with floodplain soil and/or sediment or human ingestion of fish and other aquatic organisms that contain contaminants at concentrations in excess of state and federal environmental laws or regulations¹² or EPA's recommended residential level for dioxin (as toxic equivalency of

¹⁰These ARARs include, for example, RIDEM residential direct exposure criteria.

¹¹The Rhode Island Site Remediation Regulations define acceptable carcinogenic risk as within the range of 10^{-6} to 10^{-5} .

¹²These ARARs include, for example, RIDEM residential direct exposure criteria.

1,000 parts per trillion) and/or that would result in a total excess lifetime cancer risk¹³ greater than the target risk range of 10^{-6} to 10^{-5} (soil) or 10^{-6} to 10^{-4} (sediment) and/or a hazard index (for non-cancer health effects) greater than 1.

- Prevent dermal (skin) contact and ingestion by ecological receptors (wildlife) to floodplain soil/sediment containing contaminants at levels that would result in unacceptable impacts (including exposure to dioxin above the cleanup level of 35 parts per trillion for soil).
- For ecological receptors (wildlife), the cleanup objective is to maximize hazard (contamination) reduction and minimize remediation (cleanup) related habitat loss.
- Prevent migration (movement) of con-

taminants from floodplain soil and sediment that would result in river surface water concentrations in excess of state and federal environmental laws and regulations or migration (movement) of contaminants downstream that could result in concentrations in the river above sediment cleanup goals.

1-No Action is required by the Superfund law to be evaluated and is used as a baseline for comparison to other cleanup alternatives. This alternative would not require any further cleanup action, but would include limited periodic monitoring, triggered by severe weather events and Five-Year Reviews. The estimate to achieve the ecological and human health cleanup objectives is more than 200 years. The estimated total present value of this alternative is \$250,000.

3-Targeted Excavation, Enhanced Natural Recovery, and Disposal and/or Treatment

is EPA's preferred alternative and would be implemented along with the sediment cleanup action at Lyman Mill Pond, once the pond has been drained, and would use the same work areas and disposal options. This alternative relies on a combination of targeted excavation and enhanced natural recovery to address sediment and floodplain soil contamination. This alternative would excavate the top 1 foot of soil, or deeper if required, from areas exceeding state residential direct exposure criteria or EPA's recommended residential level for dioxin in soil and the top 1 to 3 feet of sediment from erosional areas such as the stream channel with contamination above the site's cleanup levels. The approximate total excavation area is 6.5 acres, resulting in an excavation volume of 20,500 cubic yards (page 21 shows approximate locations). Post-excavation sampling would be performed to confirm that the cleanup levels were met, and the excavation area would be backfilled with clean material with a goal of no net loss of flood storage capacity. For enhanced natural

THE NINE CRITERIA FOR CHOOSING A CLEANUP PLAN

EPA uses nine criteria to evaluate cleanup alternatives and select a cleanup plan. EPA has already evaluated how well each of the cleanup alternatives developed for the Centredale Manor site meets the first seven criteria in the Feasibility Study. Once comments from the state and the community are received and considered, EPA will select the final cleanup plan.

1. **Overall protection of human health and the environment:** Will it protect you and the plant and animal life on and near the site? *EPA will not choose a cleanup plan that does not meet this basic criterion.*
2. **Compliance with Applicable or Relevant and Appropriate Requirements (ARARs):** Does the alternative meet all federal and state environmental statutes, regulations and requirements? *The cleanup plan must meet this criterion.*
3. **Long-term effectiveness and permanence:** Will the effects of the cleanup plan last or could contamination cause future risk?
4. **Reduction of toxicity, mobility or volume through treatment:** Using treatment, does the alternative reduce the harmful effects of the contaminants, the spread of contaminants, and the amount of contaminated material?
5. **Short-term effectiveness:** How soon will site risks be adequately reduced? Could the cleanup cause short-term hazards to workers, residents or the environment?
6. **Implementability:** Is the alternative technically feasible? Are the right goods and services (e.g., treatment equipment, space at an approved disposal facility) available?
7. **Cost:** What is the total cost of an alternative over time? EPA must select a cleanup plan that provides necessary protection for a reasonable cost.
8. **State acceptance:** Do state environmental agencies agree with EPA's proposal?
9. **Community acceptance:** What support, objections, suggestions or modifications did the public offer during the comment period?

¹³The Rhode Island Site Remediation Regulations define acceptable carcinogenic risk as within the range of 10^{-6} to 10^{-5} .

recovery, a 3-inch thin-layer cover would be placed over the remaining 22.2 acres of contaminated floodplain soil and sediment not excavated, and flow control structures would be installed to divert water flow into the Oxbow to help the natural build-up of clean soil and sediment. Disposal and/or treatment options would be similar to Allendale Pond and Lyman Mill Pond Sediment Alternative 7. Impacted wetlands and floodplains would be restored to help with habitat recovery. Land Use Controls would be required to prevent excavation or other activities that could harm any on-site disposal facility (Alternatives 3A and 3B) or expose contamination beneath the thin-layer cover. This alternative includes restoration/mitigation, long-term monitoring, maintenance of the Allendale Dam, and Five-Year Reviews. The on-site containment options (Alternatives 3A and 3B) would also require long-term maintenance.

The best estimate to achieve the ecological cleanup objectives is about 30 years. Human health cleanup objectives would be achieved in about 4 years. The estimated total present value for:

Alternative 3A

(on-site containment in an Upland Confined Disposal Facility) is \$16.4 million;

Alternative 3B

(on-site containment in a Near Shore Confined Disposal Facility) is \$13.7 million;

Alternative 3D

(on-site incineration) is \$33.3 million; and

Alternative 3E

(off-site disposal and/or treatment) is \$26 million.

5-Partial Excavation, Enhanced Natural Recovery, and Disposal and/or Treatment

is the same as Alternative 3, except that a larger area of 19.5 acres would be excavated to a depth of 1 foot or deeper if required for soil, and to a depth 1 to 3 foot for sediment. This alternative targets excavation areas to maximize mass removal, areas of highest potential human exposure, and areas with higher

potential for downstream transport of contamination. The approximate total excavation volume is 50,900 cubic yards. Alternative 5 also includes post-excavation sampling and restoration of excavated areas with a goal of no net loss of flood storage capacity. A 3-inch thin-layer cover would be placed over the remaining 9.2 acre area of floodplain soil and sediment, and flow control structures would be installed to divert water flow into the Oxbow Area.

Wetland and floodplain restoration, mitigation, Land Use Controls, long-term monitoring and maintenance and Five-Year Reviews would be required.

The best estimate to achieve the ecological cleanup objectives is about 25 years. Human health cleanup objectives would be achieved in about 6 months. The estimated total present value for:

Alternative 5A

(on-site containment in an Upland Confined Disposal Facility) is \$31.5 million;

Alternative 5B

(on-site containment in a Near Shore Confined Disposal Facility) is \$24.1 million;

Alternative 5D

(on-site incineration) is \$73.3 million; and

Alternative 5E

(off-site disposal and/or treatment) is \$55.3 million.

CLEANUP ALTERNATIVES COMPARISON

The alternatives for each cleanup area were compared with each other to identify how well each alternative meets EPA's evaluation criteria. The following discussion and tables present a general comparison summary by cleanup area of the alternatives. Detailed evaluations and comparisons of alternatives are included in the Feasibility Study.

(1) Source Area Soil Cleanup Area

Cleanup Alternatives:

- 1 - No Action

3E-Targeted Excavation, Upgrade and Maintain Existing Surfaces, and Off-Site Disposal and/or treatment

4E-Targeted Excavation, Convert to Caps Designed to Cover Hazardous Waste and Off-Site Disposal and/or Treatment

Overall Protection of Human Health & the Environment

Alternative 1 provides no additional protection of human health and the environment than what currently exists within the Source Area. Alternatives 3E and 4E are protective of human health and the environment by removing potential buried waste material that could be highly toxic or highly mobile and upgrading the existing surfaces and interim caps. Alternative 4E provides greater overall protection by relying on a cap designed for hazardous waste to prevent contaminants from impacting groundwater or surface water beyond the cap. The cap will prevent floodwaters and precipitation from flowing downward through the soil, thereby eliminating the pathway of contaminants moving from soil into groundwater. Shoreline erosion protection installed during past short-term cleanups will help to prevent additional movement of soil and direct contact of floodwaters with contaminated soil.

Compliance with Applicable or Relevant and Appropriate Requirements

Alternative 1 would not meet state residential direct exposure or leachability (ability of toxic materials to move from soil to groundwater) criteria, Toxic Substances Control Act criteria for PCBs, or EPA's recommended residential levels for dioxin and PCBs. Alternative 3E would meet all state and federal environmental laws and regulations except requirements for Resource Conservation and Recovery Act Subtitle C requirements. Alternative 4E would meet all state and federal environmental laws and regulations, including requirements for hazardous waste and PCB closure. Both Alternatives 3E and 4E would result in unavoidable impacts to the floodplain and wetlands, with Alterna-

tive 4E resulting in a greater occupancy of the floodplain. Mitigation for any floodplain loss would be performed and replacement flood storage capacity may be required.

Long-Term Effectiveness and Permanence

Alternative 1 does not provide long-term effectiveness or permanence. Of the two active alternatives, Alternative 4E would provide the greatest long-term effectiveness because caps designed to cover hazardous waste would provide more reliable chemical isolation in the Source Area (which is prone to flooding) when compared to the soil cover in Alternative 3E.

Reduction of Toxicity, Mobility or Volume through Treatment

Alternative 1 does not contain any measures to reduce the toxicity, mobility, or volume of contaminants through treatment. Alternatives 3E and 4E would reduce contaminant toxicity, mobility, and volume through treatment since these

alternatives include excavation of potential buried waste materials which would be shipped off site for treatment. Alternative 3E requires a greater volume of material to be excavated to meet regulatory requirements.

Short-Term Effectiveness

For Alternative 1, there would be no short-term impacts because no action would be taken. Alternatives 3E and 4E could have potential impacts to residents from dust and/or VOCs generated during excavation activities and installation of asphalt sealants. Alternative 4E would have a greater impact due to a slightly longer implementation timeframe (8 months versus 5 months). Phased construction, engineering controls, dust suppression techniques, and perimeter air monitoring would be undertaken to address potential risks from construction to the community. Standard safety measures would be taken to protect workers under Alternatives 3E and 4E. Alternatives 3E and 4E would have

similar short term impacts to the environment.

Implementability

Alternative 1 does not present any implementability issues since no action is being taken. Alternatives 3E and 4E would involve routine construction work that would be technically easy to implement because the technology, equipment, and materials required for excavation and capping are expected to be readily available. Both Alternatives 3E and 4E would have to address the fact that the apartment buildings are close to the work area, that sensitive populations are near the work zones, and that limited construction space is available. Alternative 4E would be slightly more difficult to implement compared to Alternative 3E because construction activities would be more extensive, especially in the parking areas, with respect to placing a cap designed to cover hazardous waste and installing a clean utility corridor.

Table 1 Comparison of Source Area Soil Cleanup Area Alternatives

Alternative	Evaluation Criteria									Time to Achieve Cleanup Objectives
	Protects Human Health & Environment	Meets Federal & State Requirements	Long-term Effectiveness and Permanence	Reduces Toxicity, Mobility & Volume Through Treatment	Short-Term Effectiveness	Implementability	Cost ¹	State Agency Acceptance	Community Acceptance	
1 – No Action	☐	☐	☐	☐	■	■	\$170 thousand	TBD	TBD	Not for the foreseeable future
3E – Targeted Excavation, Upgrade and Maintain Existing Surfaces, and Off-Site Disposal and/or Treatment	■	☐	■	■	☐	☐	\$24.4 million	TBD	TBD	• 5 months to prevent direct contact • Significantly longer to prevent movement and leaching of contaminants
4E – Targeted Excavation, Convert to Caps Designed to Cover Hazardous Waste and Maintain and Off-site Disposal and/or Treatment	■	■	■	■	☐	☐	\$21.3 million	TBD	TBD	• 8 months to prevent direct contact, migration and leaching

Notes:

¹ Estimated Total Present Value

Key: □ EPA's preferred cleanup alternative

□ Does not meet criterion; ■ Partially meets criterion; ■ Meets criterion; TBD – to be determined following public comment period.

This table is not a substitute for the detailed alternatives analysis in the Feasibility Study; it is an evaluation summary intended to be helpful for the public. The reader is directed to the Feasibility Study for further understanding of important legal and technical differences between the alternatives.

Cost

Total estimated present values for all of the Source Area Soil alternatives are presented in Table 1 on page 26.

(2) Groundwater Cleanup Area

Construction of this part of the cleanup plan (with the exception of additional monitoring wells) was performed by a Potentially Responsible Party in 2009/2010 as a short-term cleanup.

(3) Allendale Pond and Lyman Mill Pond Sediment Cleanup Area

Cleanup Alternatives:

- 1 – No Action
- 7 – Excavation and Disposal and/or Treatment
 - 7A: on-site containment in an Upland Confined Disposal Facility (an area located on higher land designed to permanently contain excavated contaminated sediment/soil);
 - 7B: on-site containment in a Near Shore Confined Disposal Facility (an area located along the riverbank designed to permanently contain excavated contaminated sediment/soil);
 - 7D: on-site incineration; and
 - 7E: off-site disposal and/or treatment.
- 8 – Partial Excavation, Isolation Capping, and Disposal and/or Treatment
 - 8A: on-site containment in an Upland Confined Disposal Facility;
 - 8B: on-site containment in a Near Shore Confined Disposal Facility;
 - 8D: on-site incineration; and
 - 8E: off-site disposal and/or treatment.
- 10 – Dam Replacement, Excavation and Disposal and/or Treatment
 - 10A: on-site containment in an Upland Confined Disposal Facility;
 - 10B: on-site containment in a Near Shore Confined Disposal Facility;
 - 10D: on-site incineration; and
 - 10E: off-site disposal and/or treatment.
- 11 – Dam Replacement, Partial Excavation, Isolation Capping, and Disposal and/or Treatment
 - 11A: on-site containment in an Upland Confined Disposal Facility;

11B: on-site containment in a Near Shore Confined Disposal Facility;

11D: on-site incineration;

11E: off-site disposal and/or treatment; and

11F: on-site consolidation.

Overall Protection of Human Health and the Environment

Alternative 1 provides no protection of human health and the environment. Alternatives 7A, B, D, and E and 10A, B, D, and E would provide the highest level of protection to human health and the environment because all sediment above the site-specific cleanup levels would be removed from the river bottom. Alternatives 8A, B, D, and E and 11A, B, D, E, and F would also provide effective protection. However, some contaminated sediment would remain in place in the river or in newly created floodplain under an isolation cap which could be breached in the future should catastrophic events occur, or if monitoring, maintenance and/or Land Use Controls are not effective in the long term.

Compliance with Applicable or Relevant and Appropriate Requirements

Alternative 1 would not meet state and federal water quality standards because continued contribution of contaminants from sediment would harm the river's surface water quality. Alternatives 7, 8, 10, and 11 would be implemented to comply with most or all state and federal environmental laws and regulations. However, all of these alternatives would involve destruction of wetlands and a discharge of dredged or fill material into waters of the state and/or U.S. Alternative 7 (except for Option B) would be the least damaging practicable alternative under the Clean Water Act and wetlands requirements. Those cleanup alternatives that would use Near Shore Confined Disposal Facilities (Alternatives 7B, 8B, 10B, and 11B) or would require an isolation cap (Alternatives 8 and 11) would result in permanent occupancy/modification to floodplain areas within the river and may not meet floodplain requirements.

Long-Term Effectiveness and Permanence

Alternative 1 would not provide long-term effectiveness and permanence. All of the variations of Alternatives 7, 8, 10, and 11 would provide varying degrees of long-term effectiveness and permanence through active cleanup and restrictions on land use. Of all these cleanup alternatives, those variations of Alternatives 7 and 10 that combine excavation with on-site incineration (Alternatives 7D and 10D) or off-site disposal and/or treatment (Alternatives 7E and 10E) would provide the highest level of long-term effectiveness and permanence because the contaminated sediment would be removed from the river, ponds and site. The remaining excavation alternatives (Alternatives 7A, 7B, 10A or 10B) use on-site containment in either Upland or Near Shore Confined Disposal Facilities to provide effective long-term protection at costs that are substantially lower than the on-site incineration or off-site disposal and/or treatment options. Alternatives 7A and 10A would provide a higher degree of long term protection and permanence by permanently removing contamination from the river and placing it into an Upland Confined Disposal Facility. Where a considerable amount of sediment is capped in place (Alternatives 8 and 11), there would still be the potential for contaminated sediment to move downstream, and the long-term effectiveness of these alternatives would rely significantly on long-term maintenance, monitoring and permanent Land Use Restrictions to prevent disturbance of the cap.

Reduction of Toxicity, Mobility or Volume through Treatment

Alternatives 1, 7B, 8B, 10B, 11B, and 11F do not contain any measures to reduce the toxicity, mobility, or volume of contaminants through treatment. Alternatives 7A, 7D, 7E, 8A, 8D, 8E, 10A, 10D, 10E, 11A, 11D, and 11E would reduce contaminant toxicity, mobility, and volume through some amount of treatment (either on-site or off-site) to meet Land Disposal requirements. Among these alternatives, Alternatives 7D and 10D would result in the greatest reduction, followed by Alternatives 7A, 7E, 10A and 10E.

Table 2 Comparison of Allendale Pond and Lyman Mill Pond Sediment Cleanup Area Alternatives

Alternative	Disposal Option	Evaluation Criteria									Time to Achieve Cleanup Objectives
		Protects Human Health & Environment	Meets Federal & State Requirements	Long-term Effectiveness & Permanence	Reduces Toxicity, Mobility & Volume Through Treatment	Short-Term Effectiveness	Implementability	Cost ¹	State Agency Acceptance	Community Acceptance	
1 – No Action	—	□	□	□	□	■	■	\$450 thousand	TBD	TBD	Not for the foreseeable future
7- Excavation	7A: On-site Containment in Upland Confined Disposal Facility	■	■	■	■	■	■	\$61 million	TBD	TBD	2 years
	7B: On-site Containment in Near Shore Confined Disposal Facility	▣	□	▣	□			\$47 million			
	7D: On-site Incineration	■	■	■	■			\$118 million			
	7E: Off-site Disposal and/or Treatment	■	■	■	■			\$93 million			
8– Partial Excavation and Isolation Capping	8A: On-site Containment in Upland Confined Disposal Facility	▣	□	▣	■	▣	▣	\$45 million	TBD	TBD	2 years
	8B: On-site Containment in Near Shore Confined Disposal Facility	▣	□		□			\$36 million			
	8D: On-site Incineration	▣	□		■			\$67 million			
	8E: Off-site Disposal and/or Treatment	▣	□		■			\$57 million			
10 – Dam Replacement and Excavation	10A: On-site Containment in Upland Confined Disposal Facility	■	□	■	■	▣	▣	\$62 million	TBD	TBD	2 years
	10B: On-site Containment in Near Shore Confined Disposal Facility	▣	□	▣	□			\$50 million			
	10D: On-site Incineration	■	□	■	■			\$119 million			
	10E: Off-site Disposal and/or Treatment	■	□	■	■			\$94 million			
11 – Dam Replacement, Partial Excavation, and Isolation Capping	11A: On-site Containment in Upland Confined Disposal Facility	▣	□	▣	■	▣	▣	\$42 million	TBD	TBD	2 years
	11B: On-site Containment in Near Shore Confined Disposal Facility	▣	□		□			\$37 million			
	11D: On-site Incineration	▣	□		■			\$64 million			
	11E: Off-site Disposal and/or Treatment	▣	□		■			\$54 million			
	11F: On-site Consolidation	▣	□		□			\$35 million			1 year

Notes:¹ Estimated Total Present Value.**Key:** ☐ EPA's preferred cleanup alternative☐ Does not meet criterion; ☐ Partially meets criterion; ☒ Meets criterion; TBD – to be determined following public comment period.

This table is not a substitute for the detailed alternatives analysis in the Feasibility Study; it is an evaluation summary intended to be helpful for the public. The reader is directed to the Feasibility Study for further understanding of important legal and technical differences between the alternatives.

Short-Term Effectiveness

For Alternative 1, there would be no short-term risks to the community, site workers, or the environment because no active cleanup action would be taken. All of the variations of Alternatives 7, 8, 10, and 11 would pose limited risks to the community and site workers during excavation and capping activities. These possible risks would be addressed as described on page 6. In addition, all of the variations of Alternatives 7, 8, 10, and 11 would result in the complete loss of the existing ecological habitat in both ponds and the temporary elimination of fish populations. This loss would have a significant short-term impact on the overall ecological health of the ponds, and full recovery would likely take years (possibly up to five) to complete. Restoring wetlands would be performed to make up for this damage and help with habitat recovery.

Implementability

Alternative 1 would be the easiest to implement because no active cleanup actions are required. All of the variations of Alternatives 7, 8, 10, and 11 would be technically easy to implement because the required technology, equipment, and materials are readily available. The biggest implementation difficulties would arise as a result of the close proximity of residential neighborhoods to the ponds and the limited construction space to work. Variations of Alternatives 10 and 11 would also present additional uncertainties about potential effects on the river after the dams are replaced with smaller weir structures. A large land area would be required for the Upland Confined Disposal Facility (Alternatives 7A, 8A, 10A, and 11A). The advantage of constructing the Confined Disposal Facility within the pond footprints (i.e., Near Shore Confined Disposal Facility, Alternatives 7B, 8B, 10B, and 11B) or on-site consolidation (Alternative 11F) is that there is enough space within the ponds for these disposal facilities to be constructed. However, these alternatives would reduce the size of the ponds and result in the loss of waterfront property. Those cleanup alternatives that utilize a Near Shore Confined Disposal Facility (Alternatives 7B, 8B, 10B and 11B) or on-site

consolidation (Alternative 11F) would also result in the permanent occupancy and modification of the floodplain. Concerns regarding air quality may make it difficult to implement the on-site incineration options (Alternatives 7D, 8D, 10D, and 11D).

Cost

Total estimated present value for all of the Allendale Pond and Lyman Mill Pond Sediment alternatives are presented in Table 2 on page 28.

4) Allendale Floodplain Soil Cleanup Area

Cleanup Alternatives:

1 – No Action

5 – Excavation and Disposal and/or Treatment

5A: on-site containment in an Upland Confined Disposal Facility (an area located on higher land designed to permanently contain excavated contaminated sediment/soil);

5B: on-site containment in a Near Shore Confined Disposal Facility (an area located along the riverbank designed to permanently contain excavated contaminated sediment/soil);

5D: on-site incineration;

5E: off-site disposal and/or treatment.

Overall Protection of Human Health and the Environment

Alternative 1 provides no protection of human health and the environment. All variations of Alternative 5 would provide a high level of protection to human health and the environment because all floodplain soil above the site-specific cleanup objectives would be excavated.

Compliance with Applicable or Relevant and Appropriate Requirements

Alternative 1 would not meet state residential direct exposure criteria or EPA's recommended residential level for dioxin. All variations of Alternative 5 would meet all state and federal environmental laws and regulations, including requirements for hazardous waste with the exception that Alternative 5B may not meet wet-

lands and floodplain requirements because of impacts from the Near Shore Confined Disposal component of this alternative. Each of these variations of Alternative 5, however, would result in unavoidable destruction of some wetlands; therefore, mitigation/restoration for this damage would need to be performed to meet state and federal environmental laws and regulations.

Long-Term Effectiveness and Permanence

Alternative 1 would not provide long-term effectiveness or permanence. All variations of Alternative 5 would be highly effective in the long-term because contaminated soil would be excavated. Of all the disposal options considered for the contaminated floodplain soil, on-site incineration (Alternative 5D) or off-site disposal and/or treatment (Alternative 5E) would provide the highest level of long-term effectiveness and permanence. Disposal options that use on-site containment in a Confined Disposal Facility (Alternatives 5A and 5B) would also provide effective long-term protection, although under Alternative 5B, contaminants would remain in the floodplain in a Near-Shore Confined Disposal Facility and therefore could be less reliable and/or effective in the long term.

Reduction of Toxicity, Mobility or Volume through Treatment

Alternatives 1 and 5B do not include any measures to reduce the toxicity, mobility, or volume of contaminants through treatment. Alternative 5D would reduce contaminant toxicity, mobility, and volume through on-site incineration, and Alternatives 5A and 5E may require some level of treatment if necessary to meet land disposal restrictions.

Short-Term Effectiveness

For Alternative 1, there would be no short-term impacts. All variations of Alternative 5 would pose potential limited short-term impacts to the community and site workers during excavation activities; however, these possible risks would be addressed as described on page 6.

All variations of Alternative 5 would result in

Table 3 Comparison of Allendale Floodplain Soil Cleanup Area Alternatives

Alternative	Disposal Option	Evaluation Criteria									Time to Achieve Cleanup Objectives
		Protects Human Health & Environment	Meets Federal & State Requirements	Long-term Effectiveness & Permanence	Reduces Toxicity, Mobility & Volume Through Treatment	Short-Term Effectiveness	Implementability	Cost ¹	State Agency Acceptance	Community Acceptance	
1 – No Action	—	☐	☐	☐	☐	■	■	\$0	TBD	TBD	Not for the foreseeable future
5- Excavation	5A: On-site Containment in Upland Confined Disposal Facility	■	■	■	☐	■	■	\$1.4 million	TBD	TBD	1 month
	5B: On-site Containment in Near shore Confined Disposal Facility	■	☐	■	☐			\$1.4 million			
	5D: On-site Incineration	■	■	■	■			\$4.3 million			
	5E: Off-site Disposal and/or Treatment	■	■	■	☐			\$3.2 million			

Notes:

¹ Estimated Total Present Value

Key: □ EPA's preferred cleanup alternative

□ Does not meet criterion; □ Partially meets criterion; ■ Meets criterion; TBD – to be determined following public comment period.

This table is not a substitute for the detailed alternatives analysis in the Feasibility Study; it is an evaluation summary intended to be helpful for the public. The reader is directed to the Feasibility Study for further understanding of important legal and technical differences between the alternatives.

the temporary elimination of existing floodplain habitat which may have impacts to wildlife as well as destruction of wetlands. Several years would be required before the excavated areas within the Allendale floodplain/wetlands would be sufficiently recovered.

Implementability

Alternative 1 would be the easiest to implement because no active cleanup actions are required. All variations of Alternative 5 would be easy to implement technically. However, administrative issues regarding each disposal option would have to be addressed.

Cost

Total estimated present value for all of the Allendale Floodplain Soil alternatives are presented above in Table 3.

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

Cleanup Alternatives:

1-No Action

3-Targeted Excavation, Enhanced Natural Recovery and Disposal and/or Treatment:

3A: on-site containment in an Upland Confined Disposal Facility (an area located on higher land designed to permanently contain excavated contaminated sediment/soil);

3B: on-site containment in a Near Shore Confined Disposal Facility (an area located along the riverbank designed to permanently contain excavated contaminated sediment/soil);

3D: on-site incineration; and

3E: off-site disposal and/or treatment.

5 - Partial Excavation, Enhanced Natural Recovery and Disposal and/or Treatment:

5A: on-site containment in an Upland Confined Disposal Facility (an area located on higher land designed to permanently contain excavated contaminated sediment/soil);

5B: on-site containment in a Near Shore Confined Disposal Facility (an area located along the riverbank designed to permanently contain excavated contaminated sediment/soil);

5D: on-site incineration; and

5E: off-site disposal and/or treatment.

Overall Protection of Human Health and the Environment

Alternative 1 provides no protection of human health and the environment. All variations of

Table 4 Comparison of Lyman Mill Stream Sediment and Floodplain Soil (including Oxbow) Cleanup Area Alternatives

Alternative	Disposal Option	Evaluation Criteria									Time to Achieve Cleanup Objectives
		Protects Human Health & Environment	Meets Federal & State Requirements	Long-term Effectiveness & Permanence	Reduces Toxicity, Mobility & Volume Through Treatment	Short-Term Effectiveness	Implementability	Cost ¹	State Agency Acceptance	Community Acceptance	
1 – No Action	—	□	□	□	□	■	■	\$250 thousand	TBD	TBD	Ecological & Human Health estimated over 200 years
3– Targeted Excavation and Enhanced Natural Recovery	3A: On-site Containment in Upland Confined Disposal Facility	■	■ ²	□	■	□	□	\$16.4 million	TBD	TBD	- Ecological: best estimate 30 years - Human Health: about 4 years
	3B: On-site Containment in Near Shore Confined Disposal Facility	□	□		□			\$13.7 million			
	3D: On-site Incineration	■	■ ²		■			\$33.3 million			
	3E: Off-site Disposal and/or Treatment	■	■ ²		■			\$26 million			
5– Partial Excavation and Enhanced Natural Recovery	5A: On-site Containment in Upland Confined Disposal Facility	■	□	□	■	□	□	\$31.5 million	TBD	TBD	- Ecological: best estimate 25 years - Human Health: about 6 months
	5B: On-site Containment in Near Shore Confined Disposal Facility	□	□		□			\$24.1 million			
	5D: On-site Incineration	■	□		■			\$73.3 million			
	5E: Off-site Disposal and/or Treatment	■	□		■			\$55.3 million			

Notes:¹ Estimated Total Present Value.² Assumes conditions exist (preserve unique and valuable habitat) for a waiver of the Resource Conservation and Recovery Act, Subtitle C capping requirements.**Key:**

□ EPA's preferred cleanup alternative □ Does not meet criterion; □ Partially meets criterion; ■ Meets criterion; TBD – to be determined following public comment period.

This table is not a substitute for the detailed alternatives analysis in the Feasibility Study; it is an evaluation summary intended to be helpful for the public. The reader is directed to the Feasibility Study for further understanding of important legal and technical differences between the alternatives.

Alternatives 3 and 5 would provide effective protection of human health because floodplain soil with contaminant concentrations in excess of state residential direct exposure criteria or EPA's recommended residential level for dioxin would be excavated. Because more contaminated material would remain all variations of Alternative 3 would provide a somewhat lower level of ecological protection (in the shorter term) than the variations of Alternative 5. However, it would preserve more of the Oxbow, the largest area of forested wetland habitat remaining along the lower portion of the river. The long-term wildlife impacts from eliminating this valuable hardwood forest habitat are greater than the potential benefits of reducing ecological risk in a slightly shorter period of time.

Compliance with Applicable or Relevant and Appropriate Requirements

Alternative 1 would not meet state and federal environmental laws and regulations or guid-

ance such as the state's residential direct exposure criteria or EPA's recommended residential level for dioxin. The variations of Alternatives 3 and 5 would meet most or all state and federal environmental laws and regulations. Neither alternative will meet Resource Conservation and Recovery Act Subtitle C requirements for which a waiver would be required. A waiver would be made on the basis that installing a cap designed to cover hazardous waste and minimize washout of hazardous substances would be more harmful to the environment because it would permanently eliminate one of the largest areas of remaining forested riparian habitat along the river in this part of Rhode Island. All variations of Alternatives 3 and 5 would result in an unavoidable destruction of wetlands and the permanent occupancy and modification of the floodplain. Alternative 5 may not be the least damaging practicable alternative. Finally, Alternatives 3B and 5B may not meet wetlands and floodplain requirements because of im-

pacts from the Near Shore Confined Disposal component of these alternatives. Restoring wetlands would meet the state and federal environmental laws and regulations and speed up habitat recovery.

Long-Term Effectiveness and Permanence

Alternative 1 would not provide long-term effectiveness or permanence. All variations of Alternatives 3 and 5 would provide effective protection in the long term by excavating higher levels of contamination and enhancing natural recovery in the remainder of the cleanup area. While it would take 6 months (Alternative 5) to 4 years (Alternative 3) to achieve human health cleanup objectives, a minimum of decades may be required to meet the ecological cleanup objectives.

Reduction of Toxicity, Mobility or Volume through Treatment

Alternatives 1, 3B and 5B do not include any

WHY EPA RECOMMENDS THIS CLEANUP PROPOSAL

EPA's proposed comprehensive cleanup plan includes a combination of approaches to address Source Area Soil (Alternative 4E), Groundwater (Alternative 2E), Allendale Pond and Lyman Mill Pond Sediment (Alternative 7A), Allendale Floodplain Soil (Alternative 5A), and Lyman Mill Stream Sediment and Floodplain Soil [including the Oxbow Area] (Alternative 3A).

The proposed cleanup approach was selected over other alternatives because it uses proven cleanup technologies such as excavation, treatment and disposal to achieve substantial long-term risk reduction by aggressively addressing the identified sources of contamination and minimizing downstream movement of remaining contaminants. Use of an Upland Confined Disposal Facility allows removal of contamination from the river and floodplain within a reasonable timeframe and provides secure disposal at a lower cost than the on-site incineration and off-site disposal options. To ensure the cleanup is fully protective, maintenance, monitoring and land use restrictions would need to be implemented to prevent unacceptable exposures in the future to the remaining wastes that would be contained on-site. These activities are believed to be more reliable over the long-term if waste does not remain in floodplain areas or the river.

Based on information available at this time, EPA believes its proposed cleanup alternatives provide the best balance of tradeoffs among the other alternatives. The proposed cleanup alternatives would be protective of human health and the environment; would comply with state and federal environmental laws and regulations (or justify a waiver); would be cost-effective; and would utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. The proposed cleanup alternatives would also satisfy the preference for treatment as a principal element because they would treat source material that is the most mobile or toxic, and soil and sediment that is the most highly contaminated at the site.

The preferred cleanup alternative would also avoid significant impacts to floodplain and wetland areas to the extent possible, and provide restoration for unavoidable damage to speed up habitat recovery.

measures to reduce the toxicity, mobility, or volume of contaminants through treatment. Alternatives 3A, 3D, 3E, 5A, 5D and 5E would reduce contaminant toxicity, mobility, and volume through some amount of treatment (either on-site or off-site) to meet Land Disposal requirements.

Short-Term Effectiveness

For Alternative 1, there would be no short-term risks. The variations of Alternatives 3 and 5 would pose limited risks to the community and site workers during construction activities; however, these potential risks would be addressed as described on page 6. Alternative 5 would have the most short-term impacts to the environment. Alternative 3 would have somewhat fewer short-term impacts to the environment due to the reduced excavation footprint, where destruction of the habitat would occur.

Implementability

Alternative 1 would have no implementation issues. The variations of Alternatives 3 and 5 would be moderately easy to implement from a technical perspective, although the application method for placement of a wetland cover has not been widely used and has a risk of damaging habitat.

Cost

Total estimated present value for all of the Lyman Mill Stream Sediment and Floodplain Soil alternatives are presented in Table 4 on page 31.

For all cleanup alternatives in each of the cleanup areas evaluated in the Feasibility Study, two additional criteria will be addressed at the conclusion of the public comment period. These two additional criteria are:

State Acceptance

RIDEM, the support agency for site activities, has been actively involved in the many substantive discussions regarding the site and the cleanup alternatives evaluated in the Feasibility Study. RIDEM has indicated its support of the comprehensive cleanup approach identified in this Proposed Plan.

Community Acceptance

Throughout the site's history, community interest has been high. To help impacted communities better understand technical data and site hazards, EPA has provided a Superfund Technical Assistance Grant since 2005 to the Woonasquatucket River Watershed Council. In addition to a series of public meetings, in 1999 a Management Action Committee was formed and met regularly through the mid-2000s. Through this committee, EPA provided information to the affected communities regarding the on-going field activities and planned future actions. The committee evolved into the Dialogue Group comprised of representatives from the impacted towns, potentially responsible parties, elected officials, environmental groups, state and federal environmental and natural resource agencies, and academia. The Dialogue Group convened for a series of meetings that provided a forum to exchange ideas and gave stakeholders input into EPA's investigation and cleanup selection process. Additionally, EPA sought and received input from the Dialogue Group and other stakeholders as part of an internal EPA national peer review process prior to the preparation of EPA's proposed cleanup plan. Broader community acceptance of EPA's preferred alternatives will be further evaluated based on the feedback received during the public comment period.

(continued)

WHAT IS A FORMAL COMMENT?

EPA will accept public comments during a 60-day formal comment period. EPA considers and uses these comments to improve its cleanup approach. During the formal comment period, EPA will accept written comments via mail, email, and fax (see page 34 for details). Additionally, verbal comments may be made during the formal Public Hearings on December 7, 2011 during which a stenographer will record all offered comments during the hearings. EPA will not respond to your comments at the formal Public Hearings but will hold informational meetings prior to the start of the formal Public Hearings (see page 1 for details).

EPA will review the transcript of all formal comments received at the hearings, and all written comments received during the formal comment period, before making a final cleanup decision. EPA will then prepare a written response to all the formal written and oral comments received. Your formal comment will become part of the official public record. The transcript of comments and EPA's written responses will be issued in a document called a Responsiveness Summary when EPA releases the final cleanup decision, in a document referred to as the Record of Decision. The Responsiveness Summary and Record of Decision will be made available to the public on-line, at the North Providence Union Free Library, Mohr Memorial Library, and at the EPA Records Center. EPA will announce the final decision on the cleanup plan through the local media and via EPA's Web site.

For More Detailed Information:

The Administrative Record, which includes all documents that EPA has considered or relied upon in proposing this cleanup plan for the Centredale Manor Site, is available for public review and comment at the following locations:

EPA Records and Information Center
5 Post Office Square, First Floor
Boston, MA 02109-3912
617-918-1440

North Providence Union Free Library
1810 Mineral Springs Ave.
North Providence, RI 02904
401-353-5600

Marian J. Mohr Memorial Library
1 Memorial Ave.
Johnston, RI 02919
401-231-4980

www.epa.gov/region1/superfund/sites/centredale

SEND US YOUR COMMENTS

Provide EPA with your written comments about the Proposed Plan for the Centredale Manor Restoration Project Superfund Site.

Please email (krasko.anna@epa.gov), fax (617-918-0232), or mail comments, postmarked no later than Thursday - January 12, 2012:

Anna Krasko
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Boston, MA 02109-3912