Peterson/Puritan, Inc. Superfund Site
Operable Unit 2 Cumberland and Lincoln, RI

U.S. EPA | SUPERFUND CLEANUP PROGRAM AT EPA NEW ENGLAND

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

YOUR OPINION MATTERS: OPPORTUNITIES TO COMMENT ON THE PLAN

EPA will be accepting public comments between Thursday, August 7, 2014 and Monday, September 8, 2014 on this proposal to select its cleanup approach at Operable Unit (OU) 2 of the Peterson/Puritan, Inc. Superfund Site (Site). You don't have to be a technical expert to comment. If you have a concern, suggestion, or preference regarding this Proposed Plan, EPA wants to hear from you before making a final decision on how to protect your community. Comments can be sent by mail, e-mail, or fax. People also can offer oral or written comments at the formal public meeting/hearing. If you have questions about how to comment, or if you have specific needs for the public hearing or questions about the facility and its accessibility, please contact Sarah White, EPA CIC (see below).

PUBLIC INFORMATION MEETING AND HEARING

EPA PUBLIC MEETING
THURS 8/7/14 • 6:30 PM

EPA PUBLIC HEARING
THURS 8/21/14 • 6:30 PM

CUMBERLAND PUBLIC LIBRARY
1464 Diamond Hill Road
Cumberland, RI

The meeting space is fully accessible. If you have any questions, special needs or require translation, please contact:

SARAH WHITE
EPA Community Involvement Coordinator
1 (888) 372-7341, ext. 81026 or
(617) 918-1026, white.sarah@epa.gov

SUMMARY OF THE PROPOSED PLAN

This Proposed Plan presents EPA's plan for addressing contaminated floodplain soils, sediment, and groundwater within OU 2 of the Site and also follows a presumptive containment approach for addressing the large volumes of wastes, including hazardous waste, disposed of in both landfills and associated debris fields within the OU 2 boundary and immediate floodplain of the Blackstone River. This Plan includes the J.M. Mills Landfill, the Nunes Parcel, and an island between the two areas called the "Unnamed Island" (all of which operated for a time as a single landfill and disposal Facility) where contamination from the landfill operations came to be located within the floodplain of the Blackstone River. The Site is also within the Blackstone River Valley National Heritage Corridor **(See Figure 1)**. The plan generally includes the following components:

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KEY CONTACTS:

DAVID J. NEWTON
EPA New England Project Manager
(617) 918-1243
newton.dave@epa.gov

SARAH WHITE
Community Involvement Coordinator
(617) 918-1026
white.sarah@epa.gov

PAUL KULPA
RIDEM State Superfund Project Manager
(401) 222-4700x7111
paul.kulpa@dem.ri.gov

GENERAL INFO:

EPA NEW ENGLAND
5 Post Office Square
Suite 100
Boston, MA 02109-3912
(617) 918-1111
www.epa.gov/region1/

TOLL-FREE CUSTOMER SERVICE
1-888-EPA-7341
www.epa.gov/region1/superfund/sites/peterson

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• Design and construct a Resource Conservation and Recovery Act (RCRA)) Subtitle C (hazardous waste) cap on both the J. M. Mills Landfill and Nunes Parcel;

• Remove buildings/structures located on the Nunes Parcel (to facilitate cap construction);

• Consolidate associated debris fields and contaminated soils under the constructed cap(s);

• Consolidate (under the constructed cap(s)) contaminated soil from riverbank and floodplain and provide appropriate riverbank restoration;

• Excavate and consolidate under the constructed caps on-site waste and soil exceeding cleanup levels from the Unnamed Island;

• Excavate (to a depth of approximately one foot) sediment exceeding cleanup standards (called "Preliminary Remediation Goals" (PRGs)) from site ponds for consolidation on-site (under the constructed cap(s)), and apply a subaqueous cover where PRG exceedances in deeper sediments may remain; and

• Implement long-term monitoring (e.g., groundwater, surface water, sediment, and performance monitoring for cap effectiveness) where contamination will be left on-site, administer land use restrictions (called "institutional controls") to prevent use of groundwater on-site and restrict disturbance of components of the cleanup (landfills, the sediment cover, monitoring wells), and conduct statutorily required five-year reviews.

As part of the RCRA Subtitle C requirements, there will be sufficient groundwater, surface water and sediment monitoring to confirm that contamination from the capped landfills is not exceeding federal and State standards for preventing migration of landfill contaminants beyond an established compliance boundary.

In addition, EPA has determined, in compliance with the federal Clean Water Act, that the selected alternatives for each area of OU 2 are the Least Environmentally Damaging Practicable Alternatives (LEDPAs) for protecting wetland resources, because they provide the best balance of addressing contaminated soil/sediment/debris within and adjacent to wetlands and waterways with minimizing both temporary and permanent alteration of wetlands and aquatic habitats on site. EPA is specifically soliciting public comment concerning this finding through this Proposed Plan. The cleanup plan proposed by EPA also includes activities that result in the occupancy and modification of the floodplain. Federal regulations require EPA to make a determination that there is no practicable alternative to the proposed actions within floodplains and to solicit public comment, which is being done through this Proposed Plan, regarding proposed alterations to floodplain resources. EPA has determined there is no practicable alternative to occupancy and/or modification of portions of the floodplain in the immediate vicinity of the Site, but that EPA will conduct necessary mitigation measures to protect downstream receptors in the floodplain. In addition, EPA has issued a preliminary finding, pending review of public comments solicited through this Proposed Plan, which will address soils contaminated with polychlorinated biphenyls (PCBs) in order to control risk of injury to health or the environment as defined under 40 C.F.R. Section 761, through excavation of soil exceeding 10 part-per-million (ppm) and consolidation under the constructed caps. The final determination will be incorporated into the Record of Decision (ROD) to be issued for OU2. The estimated total present value for this proposed cleanup plan to address OU 2 of the Site is about $40.3 million.

SCOPE AND ROLE OF THIS PROPOSAL

Response activities at the Site are currently divided geographically into two OUs. OU 1 is addressing contamination emanating from the CCL Custom Manufacturing, Inc. (CCL; formerly the location of the Peterson/Puritan, Inc. facility) and Pacific Anchor Chemical Company (PAC) facility north of OU 2. Groundwater response actions at OU 1 remain in progress since the completion of the OU 1 ROD in 1993. OU 2 represents the final response action at the Site with focus on the J. M. Mills Landfill, the Nunes Parcel, and the Unnamed Island. These areas are identified as contributing to groundwater contamination and leading to the continued release and further migration of hazardous substances to the floodplain soils and pond sediments within the OU 2 boundary.

A CLOSER LOOK AT EPA'S PROPOSED CLEANUP APPROACH

The proposed cleanup of OU 2 is primarily focused on the following areas **(Figure 2)**:

J.M. Mills Landfill (Alternative JM-SO-2):

Following a presumptive containment approach, debris fields adjacent to the landfill, excavated floodplain soils, and sediments from Pond N located north of the Landfill would be consolidated under a protective cap constructed on this landfill,

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 OU 2, see the Peterson/Puritan, Inc. Superfund Site Feasibility Study for Operable Unit 2 and other documents contained in the Administrative Record available for review online at www.epa.gov/region1/superfund/sites/peterson or at the Site information repositories at the Cumberland Public Library, 1464 Diamond Hill Rd., Cumberland, RI and the Lincoln Public Library, 145 Old River Rd., Lincoln, RI and at the EPA New England Records Center, 5 Post Office Sq., First Floor, Boston MA.

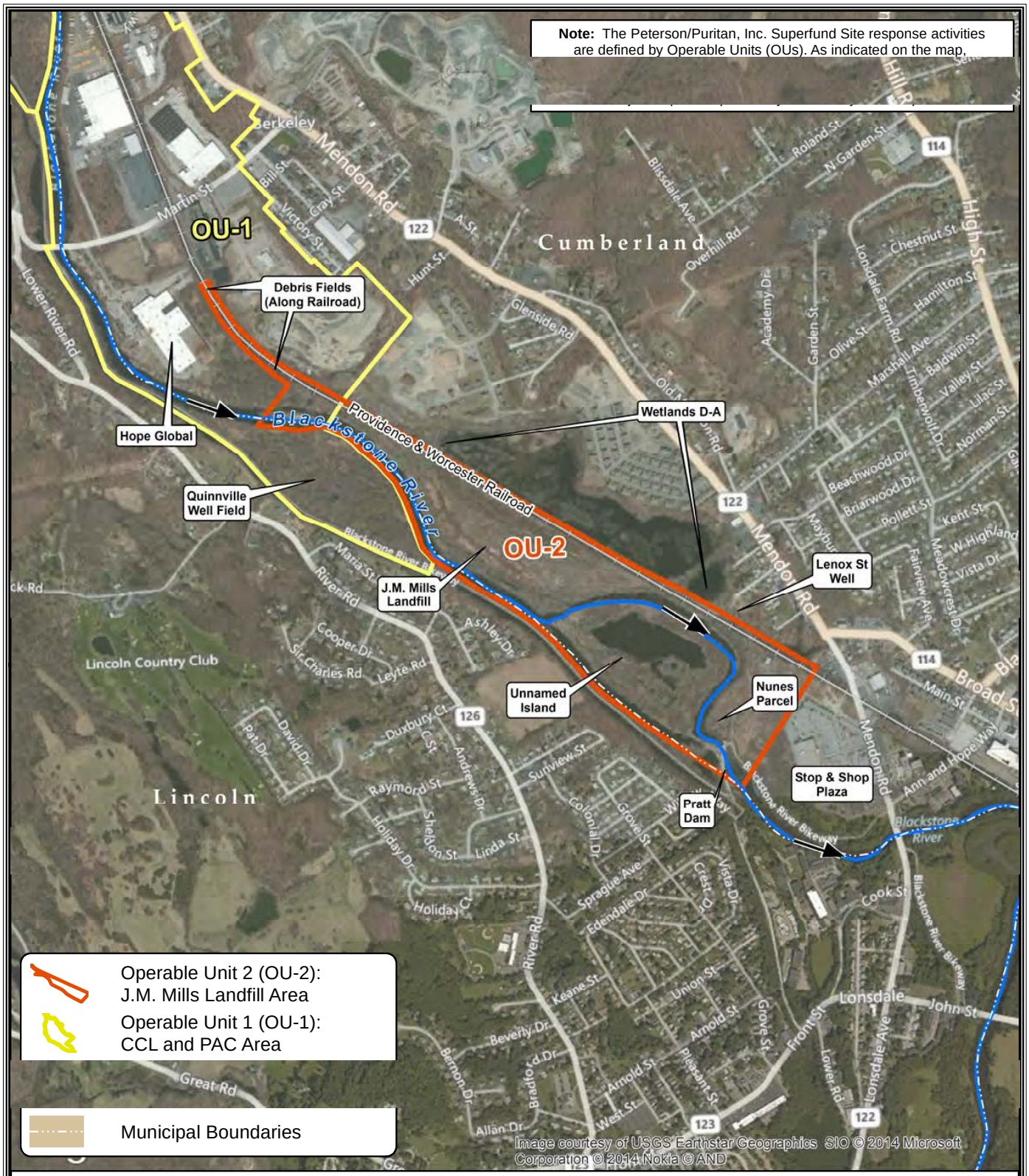

Figure 1

Peterson/Puritan, Inc. Superfund Site
Operable Unit 2 (OU-2)

Cumberland & Lincoln, Rhode Island

N

0 0.25 Miles

EPA

EPA Region 1 GIS Center Map Tracker ID 8590 June 29, 2012 Data Sources: Aerial Photo Base Map - Bing Maps; Municipal Boundary, Railroad - USGS/RIGIS, 1989; River & Flow Direction - National Hydrography Dataset, 2007;

meeting RCRA Subtitle C requirements for preventing the release of hazardous waste and other contaminants **(Figure 4)**. A landfill gas management system will be designed and constructed (passive or active collection/treatment to be determined in design). The cap must be constructed to protect against flooding, up to a 500 year event, and effectively manage stormwater. Riparian habitats will be restored after the contamination is addressed. Long-term monitoring of groundwater, surface water, sediment, landfill gas, and leachate, coupled with operation and maintenance (cap repairs, mowing, etc.) and institutional controls are included to maintain the long-term protectiveness of the remedy for a total estimated cost of $21,559,000.

Nunes Parcel (Alternative NP-SO-3): The proposed cleanup approach includes the demolition of existing buildings, excavation of contaminated perimeter soils and sediments in Pond I located on the north side of the Nunes Parcel exceeding cleanup levels, and consolidating these soils under a protective cap constructed over buried wastes on the Nunes Parcel. Following a presumptive containment approach, the landfill cap would be designed and constructed meeting RCRA Subtitle C requirements **(Figure 5)**. A landfill gas management system will be designed and constructed (passive or active collection/treatment to be determined in design) and the cap will be constructed to protect against flooding, up to a 500 year event, and effectively manage stormwater. Riparian habitats will be restored after the contamination is addressed. To ensure protectiveness, long-term monitoring of groundwater, surface water, sediment, landfill gas and leachate, coupled with operation and maintenance (cap repairs, mowing, etc.), and institutional controls are included for a total estimated cost of $6,080,000.

Unnamed Island Soils and Waste Deposits (Alternative UI-SO-3): The proposed remedy consists of excavating all waste deposits (estimated at 40,000 cubic yards (cy)) and contaminated soils (approximately 62,000 cy) exceeding cleanup levels, which are to be consolidated under the constructed cap (at the Nunes Parcel). Riparian habitats will be restored after the contamination is addressed and after completion of the work there will be no restrictions on recreational use of the area. The total estimated cost of the cleanup is $6,136,000 **(Figure 6)**.

Sediment (Ponds at Unnamed Island; Alternative SE-3): The proposed remedy for managing contaminated sediments would include additional sediment studies to finalize the design depth for the dredging[1] and ascertain stability and practicality of appropriate subaqueous cover designs. Currently one foot of sediment will be removed from each of the Unnamed Island ponds (Ponds A, D, and E; approximately 8,700 cy), with confirmatory sampling. The removed sediments will be dewatered and disposed of under either the J.M. Mills or Nunes landfill caps **(Figure 7)**. Any remaining areas of contaminated sediment will be covered with one foot of sediment/substrate engineered with amendments, as necessary, to limit migration of any remaining contaminants. Institutional controls to protect the subaqueous cover from future disturbance and long-term operations and maintenance (O&M)/monitoring of the subaqueous cover to ensure protectiveness is included for a total estimated cost of $5,804,000.

Groundwater (Alternative GW-2): This portion of the remedy will include the establishment of an OU 2 groundwater compliance boundary **(Figure 8)** around the areas (discussed above), implementation of institutional controls (preventing use and/or alteration of groundwater inside of the compliance boundary), and long-term monitoring to assure there is no migration of contaminated groundwater beyond the compliance boundary. An additional buffer zone around the compliance boundary may be established during the remedial design phase of the cleanup (after the Record of Decision is issued) or, if required, sometime after the remedy is implemented based on future monitoring data and five-year reviews, to prevent wells from being used or installed that have the potential to draw contaminated groundwater away from OU 2. The total estimated cost of for this portion of the remedy is $671,000.

EPA's proposed cleanup plan establishes cleanup levels which are protective of recreational use activities and the environment and the proposed remedy will establish protective caps/covers on the landfills and pond sediments. The plan would also include additional investigations, long-term monitoring, and maintenance of the remedy including conducting five-year reviews. The total cost of Region 1's preferred remedy for OU 2 is estimated at $40.3 million.

POTENTIAL COMMUNITY IMPACTS

Increase in Truck Traffic:
It is anticipated that all construction materials will need to be delivered to OU 2 along Mendon Road and entering from the south of the Site in order to backfill excavated areas, construct the landfill caps and carry out restoration activities. In addition, some demolition materials (from on-site structures) may need to be disposed of, or recycled, off-site. Vehicular noise may also increase during construction. EPA will work with the community on these issues and determine the best routes for minimiz-

[1] If the difference in dredged volume is relatively small, additional dredging would reduce or potentially eliminate the need for a subaqueous cover and future maintenance. Design studies will also include hydrodynamic modeling to ascertain the selection of appropriate cover materials.

ing truck traffic concerns and will notify the community before activities begin. There is also the potential to use the active railroad system which may lessen the disturbance to the community and the environment through reduced traffic and emissions by more efficiently managing the high volume of materials to be handled.

Construction Zones:
Construction areas north of Stop-n-Shop and adjacent to the bikeway would be established, fenced, and the access road to the Site would be controlled to restrict public access. In addition, construction vehicles would be covered and would be washed before leaving the construction zone as necessary to make sure contamination would not spread and to reduce dust.

Air Quality Monitoring:
Excavation of waste, contaminated soils and sediments will be required as part of the proposed remedy. Any option that disturbs the wastes during cleanup has the potential to present short-term airborne risks during excavation, consolidation, capping, or other construction activities. Air monitoring will be performed to protect on-site workers and to ensure that the surrounding neighborhood air quality is not impacted. Dust suppression and odor suppression methods will be employed as necessary.

SITE DESCRIPTION

The Peterson/Puritan, Inc. Superfund Site encompasses about 500 acres (approximately two miles long by 1,500 to 2,000 feet wide), in a mixed industrial/commercial and residential/recreational community, which also includes a portion of the Blackstone River Valley National Heritage Corridor between the Ashton Dam to the north and the Pratt Dam to the south in the towns of Cumberland and Lincoln,

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

Wetland Impacts
The cleanup plan proposed by EPA includes activities that would impact wetlands. Before EPA can select a cleanup plan that would impact wetlands, federal statutes and regulations (found in Appendix I of the Feasibility Study)) require EPA to make a determination that there is no practicable alternative to conducting work that will impact wetlands and that the cleanup activities conducted are the Least Environmentally Damaging Practicable Alternative (LEDPA), as defined by Section 404(b) of the Clean Water Act and regulations promulgated under the Act at 40 C.F.R. Part 230, 231 and 33 C.F.R. Parts 320-323. Protection of Wetlands regulations at 44 C.F.R. Section 9 require EPA to solicit public comment, which is being done through this Proposed Plan, regarding proposed alterations to wetland resources. EPA has determined that because significant levels of contamination exist in wetlands within the cleanup areas, there is no practicable alternative to conducting work in these wetlands. EPA has determined that the proposed cleanup activities that impact wetlands are the LEDPA. EPA is specifically requesting public comment concerning this finding. Wetlands will be restored and/or replicated nearby consistent with the requirements of federal and state wetlands protection standards. Further description of the wetlands within the site is found in Appendix G of the Feasibility Study and a further description of the federal and State statutes and regulations that pertain to the proposed remedy can be found at Appendix I of the Feasibility Study which lists the applicable, or relevant and appropriate requirements (ARAR).

Floodplain Impacts
The cleanup plan proposed by EPA includes activities that result in the occupancy and modification of the floodplain. Before selecting a cleanup alternative, federal Floodplain Management regulations at 44 C.F.R. Section 9 require EPA to make a determination that there is no practicable alternative to the proposed actions within floodplains and to solicit public comment, which is being done through this Proposed Plan, regarding proposed alterations to floodplain resources. EPA has determined there is no practicable alternative to occupancy and/or modification of portions of the floodplain in the immediate vicinity of the J.M. Mills Landfill, the Nunes Parcel, and the Unnamed Island, but that EPA will conduct necessary mitigation measures to protect downstream receptors in the floodplain. EPA is specifically requesting public comment concerning this finding.

Waste deposits are located at the river's edge at some locations requiring excavation of this contaminated material and consolidation under one of the two protective engineered landfill cap(s), either J.M. Mills or Nunes. In addition, some level of floodplain armament at the base and a portion of the side slope of the constructed caps will be necessary to protect these caps from periodic inundation due to flooding as both landfills are situated within the 500 year floodplain of the Blackstone River. Best management practices will be used to minimize adverse impacts on the

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continued from page 5> floodplain resources, including: 1) damage to floodplain areas will be mitigated through erosion control measures and proper re-grading and re-vegetation of the impacted areas with indigenous (native) species and; 2) any lost flood storage capacity from the proposed project will be compensated for so that downstream receptors are protected. The proposed subaqueous sediment cover in the Unnamed Island ponds will be designed to prevent any release of contamination in the event of flooding, up to a 500-year event. Further description of the floodplain within the site is found in Appendix G of the Feasibility Study (FS).

Proposed Finding: PCB Cleanup Level is Protective

Based on historical industrial activity, PCB-contaminated floodplain soils meet the definition of a PCB remediation waste, as defined under 40 C.F.R. Section 761.3 of regulations promulgated under the Toxic Substances Control Act (TSCA), 15 U.S.C. §2601 et seq., and thus are regulated for cleanup and disposal under 40 C.F.R. Part 761. EPA has reviewed the Administrative Record for OU 2 and has proposed the excavation, passive dewatering and on-site disposal of PCB-contaminated floodplain soils exceeding 10 ppm of PCBs from the Unnamed Island, from the riparian buffer of the Blackstone River, and along the perimeter of the J.M. Mills Landfill and Nunes Parcel contained within the boundary of OU 2. The cleanup number is based on an EPA human health risk and ecological risk assessments that have determined that soil PCB levels below 10 ppm will not result in an unreasonable risk of injury to human health or the environment. All soil requiring cleanup will be identified based on in situ (pre-excavation) PCB levels and not subject to dilution.

Consistent with TSCA regulatory requirements at 40 C.F.R. Section 761.61(c), and in view of site-specific land use conditions and human health and ecological exposure assumptions developed for the OU 2 risk assessments, EPA proposes a finding that the on-site disposal of PCB contaminated soil and debris at concentrations up to 25 ppm[2] under either one or both of the landfill caps to be constructed on the Site, as set out in this Proposed Plan, will not result in an unreasonable risk of injury to human health or the environment as long as the following conditions are met:

1. Any PCB-contaminated debris or soil currently existing within the J.M. Mills and Nunes Parcel landfills will be covered with landfill cap(s) that meet the TSCA regulatory requirements of 40 C.F.R. 761.61(a)(7) and RCRA Subtitle C regulations (40 C.F.R. Section 264.310).

2. Any PCB-contaminated debris on the Unnamed Island will be excavated and consolidated under one of the on-site landfill caps that will be constructed to meet requirements under TSCA regulatory requirements at 40 C.F.R. Section 761.61(a)(7), and RCRA Subtitle C regulations (40 C.F.R. Section 264.310).

3. All OU 2 floodplain soil exceeding the proposed cleanup standard of 10 ppm of PCBs shall be excavated from the floodplain and shall be consolidated under one of the on-site landfill caps that will be constructed to meet requirements under TSCA regulatory requirements at 40 C.F.R. Section 761.61(a)(7), and RCRA Subtitle C regulations (40 C.F.R. Section 264.310).

4. Water generated from excavations or dewatering of PCB-contaminated soils/debris will be tested for PCBs and, depending on any PCB contamination identified, managed, treated (if required) and disposed of in compliance with TSCA requirements at 40 C.F.R. Section 761.79(b).

5. Water quality monitoring shall be performed during excavation of adjacent water bodies, passive dewatering and on-site management of excavated soil/debris to ensure that water quality levels comply with the performance criteria specified in the ROD.

6. Air monitoring and appropriate dust suppression measures shall be implemented and maintained to ensure that airborne PCB levels are below levels of concern specified in the ROD during any excavation, passive dewatering, and management of excavated soil/debris conducted prior to completion of cap construction.

7. Land use restrictions (institutional controls) shall be established on the newly capped J.M. Mills and Nunes Parcel landfills to ensure the long-term effectiveness of the caps. These land use restrictions may include, but not be limited to, restricting future excavation into and beneath the caps, restricting access for buried utilities, preventing the construction of buildings with pilings or basements and maintaining the caps.

A final determination will be made after considering all public comments received during the public comment period. To comment, see page 28, "Send us your Comments"

[2] No PCB contamination of soil or sediment above 25 ppm has been identified within the Site, at this time. If higher levels are identified the TSCA finding may be modified. Under TSCA standards, the RCRA Subtitle C landfill covers to be established on Site are protective for the disposal of PCB contamination over 50 ppm.

Rhode Island. The Site also includes the 26-acre Lincoln Quinnville Wellfield and the Cumberland Lenox Street municipal water supply well.

EPA initiated investigations of the Site in 1987. During whole site investigations to address the various environmental issues, the Site was broken into sub-areas in 1990. Currently, the Site is broken into two operable units defined as OU 1 (the Primary Source Area; a ROD addressing groundwater contamination completed in 1993, a Consent Decree signed in 1995, and a treatment remedy installed and operating by 1997), and OU 2 which is located down river from OU 1 on the east side. This proposed cleanup addresses OU 2.

The OU 2 portion of the Site contains many parcels within the immediate floodplain of the Blackstone River stretching over 1-mile in length. It varies in width from approximately 1,200 to 1,900 feet and totals about 200 acres. OU 2 includes, but is not limited to, the J.M. Mills Landfill, the Nunes Parcel, and the Unnamed Island; all of which contain waste deposits and were owned and operated during the time of disposal as a single landfill facility (the Facility) and where contamination from these combined landfill operations came to be located. Bordering OU 2 to the north is the Hope Global Company property and the southern portion of OU 1. To the south of OU 2 is the Stop and Shop Market (and strip mall) on Mendon Road, Cumberland (Route 122) and the Pratt Dam. The eastern boundary of OU 2 includes wetlands formerly known as the New River. The western boundary of OU 2 is the Blackstone River and Canal. The main channel of Blackstone River flows east around the Unnamed Island, and a secondary channel of the river flows west of this island.

OU 2 consists of approximately 74 acres of filled and/or altered floodplain formerly owned and operated as the Facility by Mr. and Mrs. Joseph Marszalkowski and their agent(s)/associates for the purposes of waste transfer and disposal. The Facility included a 35-acre subarea referred to as the J.M. Mills Landfill which reportedly accepted wastes from 1954 through the mid-1980s (likely in 1986). Entry to the Facility occurred from an access road connecting from Mendon Road south of the site and crossing over the Nunes Parcel subarea of the Facility, where at the time of disposal, J. M. Mills, Inc. conducted waste segregation, disposal, business, and accounting operations. A section of the Providence and Worcester Railroad line that runs through OU 2 forms the eastern extent of the J. M. Mills landfill slope, the Nunes Parcel property bounds the area to the southeast. The Blackstone River forms the landfill's western and southwestern boundary, while OU1 borders the landfill to the north.

In 1987, Mrs. Marszalkowski sold an approximate 10 acre portion of the site (now known as the Nunes Parcel) to Michael John Realty, Inc. (Michael and John Nunes) who continued to operate a waste disposal company (Nunes Disposal, Inc.) from these premises until approximately 2003. Prior to 1987, this southern portion of OU 2 maintained the gate where landfill operations were accessed from Mendon Road where mixed industrial, commercial (including some hazardous) wastes, and municipal trash entered the Facility through this Parcel for disposal throughout the Facility. Later investigations identified waste disposal both at the surface and buried within this parcel. This parcel includes an inlet and a buried power canal (partially underlying a transfer station building) perpendicular to, and connecting with, the river's edge. Today, this parcel contains several structures and shacks.

Immediately southwest and across the river channel from the J.M. Mills Landfill is the 28-acre Unnamed Island located in the Blackstone River, that was also used for Facility operations. Wastes were disposed of on the Unnamed Island and the island's soils were quarried from borrow pits, well below the water table in some cases, and used to provide daily cover materials for landfill operations within the Facility. Some of the borrow pits were also used as additional disposal sites during the time in which the Facility was operating. Portions of these pits remain open. The resulting ponds are subject to flooding at times of high flow and are functioning as aquatic habitat. South of the Unnamed Island is the Pratt Dam, which provides an access point to the Unnamed Island. Collectively, the J.M. Mills Landfill, the Nunes Parcel, and portions of the Unnamed Island are identified as principal contaminant sources for OU 2 receptors (including groundwater, floodplain soils, and surface water and sediments in site ponds).

Other specific subareas investigated during the assessment of OU 2 include the following (see Figure 2):

- associated debris fields, staging areas, and suspected disposal trenches along the bank of the Blackstone River;
- gravel/paved access roads in the immediate vicinity of OU 2;
- a series of wetlands to the east of the J.M. Mills Landfill and railroad easement (referred to as Wetlands A through D in the Remedial Investigation (RI) Report);
- Pratt Dam/and Blackstone River Bikeway;
- Providence & Worcester Railroad Company rail line running north to south through the Site which borders the J. M. Mills Landfill and the Nunes Parcel to the east;
- Blackstone River main and back channels flowing north to south and around the Unnamed Island; and

• ponds located on the island, immediately above Pratt Dam, and along the eastern shore and floodplain of the river within OU 2.

LAND USE AND REMEDIATION HISTORY

Historically, the Blackstone River provided both water supply and wastewater drainage for the industries and municipalities along the valley. By the early 17th century, three principal tribes lived here: the Narragansett, the Nipmuc, and the Wampanoag. The Blackstone River Valley was first settled by Europeans in the 17th century, and the area soon became one of the earliest sites for industrial development in North America. In the vicinity of OU 2, the Blackstone Canal was constructed during the 1820's. Historical maps and aerial photographs show that, from at least 1870 to 1951, the Blackstone River Valley area, currently occupied by the J.M. Mills Landfill, as well as the wetlands area northeast of the railroad, was a reservoir referred to as New Pond. By 1956, the area of New Pond appeared drained, although the wetlands retained standing water behind the railroad levee. After the draining of New Pond, the Blackstone River channel flowed almost through the middle of the valley. During this time, filling of the lower floodplain of the river were initiated along the banks of the Blackstone River. By 1970, the Blackstone River channel had been rerouted around the north side of the J.M. Mills Landfill and moved close to the Blackstone River Canal berm to the southwest. Additionally, a new backwater channel was created on the southwest side of the Unnamed Island. This also included the landfill operations within OU 2 until this practice was curtailed in the 1980's.

Based on findings of groundwater contamination, in what would eventually be identified as OU 1, EPA included the Site on the Superfund National Priorities List on September 8, 1983. The area of OU 2 was included to address uncontrolled releases of contamination from the landfills.

In 2001, Peterson/Puritan, Inc. and its former parent company, Bestfoods, now known as Unilever, entered into an amended 1987 Administrative Order on Consent (AOC) to conduct and finance the Remedial Investigation and Feasibility Study (RI/FS) for OU 2. Unilever was later joined by Waste Management, Inc. and together the RI was completed with EPA oversight in 2012, culminating in the development of the FS and this Proposed Plan for OU 2. Currently, approximately 130 Potentially Responsible Parties (PRPs) have been notified of their potential liability.

CURRENT & FUTURE LAND USE

OU2 is located within the John H. Chaffee Blackstone River Valley National Heritage Corridor (Corridor). The Blackstone and Woonasquatucket River systems are also designated as American Heritage Rivers, and as such development of the Corridor prompted EPA, under the Superfund Redevelopment Initiative, to work with Corridor Commission staff, the State, town planners and local stakeholders to draft, and later in 2005, adopt the "Ashton-Pratt Corridor Redevelopment Plan." Among other findings, this plan identified the changing view of the valley and provided future considerations for enhancing recreational uses of the area, maximizing river and canal access, improving transportation facilities and traffic, and overall improvement of aesthetics.

Since 2005, recreational use on, and along, the river has increased significantly. A regional bike path has been completed which follows the Lincoln side of the river and canal before crossing the Pratt Dam onto the Cumberland side (and entering onto the western tip of the Nunes Parcel) on the south end of the Site. The path then follows the eastern side of the river into Lonsdale. With increased recreation in the vicinity of OU 2, reasonably anticipated future land use for the site would largely include recreational and open space considerations. EPA also works with the Valley Falls Fire District and volunteers who continue to maintain access to the Pratt Dam for vehicular access across a portion of OU 2 and over town property leading to the dam. At this location, a staging and portage area just north of the dam (Cumberland side) is used for first responder lifesaving efforts on the river.

Until 2009, it was believed that no public or private groundwater supply wells were operating within or adjacent to OU 2 and that the entire area was served by public water systems. In November 2009, EPA learned of the installation of private wells in bedrock used for drinking water in the immediate vicinity of OU 2. Sampling of the three private use (residential) wells was conducted by EPA. While minimal traces of groundwater contaminants were detected in two of the three wells, concentrations in the potable water from each residential well were found to meet protective groundwater standards at the time. The affected residents were advised to continue to monitor their household water periodically. Aside from these instances, no other groundwater use has been identified on, or in the immediate vicinity of, the Site.

In response to the increase in sport fishing along the river, the Massachusetts Department of Environmental Protection (MassDEP) has issued fish advisories for the Blackstone River from below Worcester, Massachusetts, to the Rhode Island state line (approximately nine river miles upstream of the Site). A resident fish tissue study conducted for OU 2 found that people who catch and eat the fish may be at risk from contaminants found in the fish

TABLE 1: ENVIRONMENTAL INVESTIGATIONS AND CLEANUP ACTIONS TO DATE

1954-1986	Mixed industrial, commercial and solid wastes are accepted for disposal at OU-2 (Nunes Parcel, J.M. Mills Landfill and Unnamed Island).
1979	State-wide sampling by the RI Department of Health (RIDOH) discovers chlorinated volatile organic compounds (CVOCs) exceeding drinking water standards in Quinnville and Lenox St. municipal wells; wells closed.
12/30/1982	Peterson/Puritan, Inc. Site proposed on National Priorities List (NPL).
09/08/1983	Final listing of the Peterson/Puritan, Inc. Site on NPL.
15/16/1986	EPA fundHead Site-wide RI/FS commences along a 2-mile segment of the river between the Ashton and Pratt dams.
05/29/1987	Administrative Order by Consent (AOC) is signed by EPA and Peterson/Puritan, Inc. to perform a Site-wide RI/FS.
1990	Draft "whole site" RI Report is submitted to Agency. Due to the expansive study area and the number of identified areas of concern, EPA administratively divided the Site into Operable Units. Dexter Quarry was removed from the Site's listing description and was delegated to the State for appropriate response actions. Pacific Anchor facility (PAC Remediation Area) is added to the OU 1 investigation. Other portions of the Site, including J. M. Mills Landfill and vicinity to the south, and Mackland Farm (a.k.a. Kelly House property) to the north are identified for potential future response action areas. OU 1 (area encompassed by the industrial park and the Quinnville Wellfield) is earmarked for continued RI/FS, leading to an OU 1 ROD (1993).
1991-1992	EPA conducts a Removal Assessment/Site Investigation for the J.M. Mills Landfill. Removal Action initiated to coordinate the removal of exposed drums, manifested as RCRA hazardous waste, and to secure the landfill with fencing to prevent public access.
1993-1997	ROD for OU 1 signed. Following negotiations with Settling Defendants, a Consent Decree is entered, remediation of OU-1 commences in 1994 and all construction of OU 1 groundwater remedial systems are completed in 1997. The systems remain operating.
1997	EPA conducts second removal action at J.M. Mills Landfill to remove disposed asbestos boiler insulation debris and repair/extend fence.
1998-2001	EPA negotiates with Potentially Responsible Parties (PRPs) to conduct OU 2 RI/FS.
2001	A Site Inspection of OU 2 is conducted for the planning phase of the RI/FS. Observations at the Unnamed Island include additional locations where disposal practices occurred, and a large abandoned excavator is inspected and found to be partially dismantled with its hydraulic lines severed and containing a partially filled fuel tank. The excavator is identified as a potential concern to be further reviewed during the RI. Local citizen action groups initiated communications with EPA for the removal of the excavator from the river way.
07/12/2002	Rhode Island Department of Transportation (RIDOT) conducted a series of test pits in Cumberland (150 ft. northeast of the Pratt Dam) to delineate the lateral extent of suspected landfill operations along the river. This work was conducted as part of the design for Segment 4B of the Blackstone River Bikeway. EPA is consulted regarding a State plan to remove contaminated soils located within the proposed floodplain compensation area for the Bikeway. The State finds that some soils contaminated with lead must be shipped to a hazardous waste landfill. This area encroaches upon the southern boundary of the OU 2 portion of the Site, and is further described in the FS as the RI Department of Environmental Management (RIDEM) Removal Area which is also considered to be an extension of contaminated soils/ buried wastes deposited within the Nunes Parcel.
2003	Field work commences at OU 2. Limited investigations voluntarily conducted by a property owner invested in the River Run and Berkeley Commons development projects evaluated groundwater quality and hydraulic relationship to known groundwater contamination at OU 2. This voluntary effort later leads to a partial delisting (in 2005) of subject properties from the site and allows for residential development east of OU 2.
2003-2004	Owens Corning conducted a limited removal action at the Unnamed Island (OU 2). Work included construction of an access way (bridge improvement) in order to cross equipment and materials over the Pratt Dam and to/from the island and also allowing for parallel OU 2 remedial investigations to take place by other parties. During the removal action, the large excavator abandoned on the Unnamed Island was removed, eliminating the risk of hydrocarbons impacting the river. This was a collaborative effort jointly conducted by RIDOT, RIDEM, US Army Corps of Engineers (USACE), EPA, and local citizen action groups.
07/2004	The removal of approximately 11,600 tons of hazardous waste soil, solid wastes, and other soil from the southern boundary of OU 2 (RIDEM Soil Removal Area) is completed by RIDOT allowing for the construction of Segment 4B of the Blackstone River Bike Path.
08/2004	The Towns of Lincoln and Cumberland complete a Site-specific redevelopment and reuse planning grant and produce the "ASHTON-PRATT CORRIDOR REDEVELOPMENT PLAN".
05/2005	Remedial Investigation Phase 1B (interim deliverable) for OU 2 completed. Soil, groundwater, surface water, and sediment were sampled and analyzed for various contaminants. Sediment probing, benthic community surveys and benthic toxicity tests were conducted in the Blackstone River. Fish community survey conducted with fish samples collected on whole bodies, filets and carcasses. Wildlife and vegetation habitat surveys also conducted along with Rapid Bioassessment Protocol.
2006	Nunes Parcel Investigation commenced to delineate limits of buried waste. Soil sampled and analyzed for various contaminants.
07/2010	EPA revises and finalizes Baseline Human Health Risk Assessment (BHHRA) and Baseline Ecological Risk Assessment (BERA)
08/2012	Final RI Report for OU 2 completed.
12/12/2012	RI Public Information Meeting held in Cumberland. Feasibility Study (FS) underway.
12/17/2013	EPA Region 1 presents cleanup alternatives for OU 2 to the EPA National Remedy Review Board.

tissues of some native, bottom dwelling and predatory species. Similar findings were documented in fish from both within the boundary of OU 2 as well as in the comparative reference areas upstream. This result, among other factors, indicates that the potential cause for the associated risk in eating fish may be due to many sources within the Blackstone River watershed. More detailed information concerning this study is available in an EPA fact sheet called "Community Update: Concerns Identified for Eating Fish from the Blackstone River" which is available as a link at: http://www.epa.gov/region1/superfund/sites/peterson.

In February 2013, RIDEM released its final Total Maximum Daily Load (TMDL) analysis for the Blackstone River Watershed which included, among other findings, trace metals impairments for cadmium and lead along the river segment incorporating OU 2. The Blackstone River is currently classified by the State of Rhode Island as a Class B1 surface-water body designated for secondary contact recreational activities and fish and wildlife habitat.

WHY CLEANUP IS NEEDED:

Past operations at OU 2 resulted in the disposal of wastes (including hazardous wastes, and wastes containing hazardous substances) which contaminated soils, sediments, and groundwater within OU 2. The RI Report was completed in 2012 which summarizes the nature and extent of contamination at OU 2. Investigations have found:

- Evidence of waste and hazardous substances that were disposed at OU 2. Soil contaminants include metals, polycyclic aromatic hydrocarbons (PAHs), pesticides, PCBs, dioxin, semi-volatile organic compounds (SVOCs), and volatile organic compounds (VOCs).

- Estimates of mixed waste volumes within the Facility include:
    - J.M. Mills Landfill – 2.1 million cubic yards (cy);
    - Nunes Parcel – 56,000 cy; and
    - Unnamed Island – 39, 500 to 44,000 cy.

- Sediment and floodplain soil contaminants include metals (cadmium, chromium, copper, lead, and zinc) and PAHs.

- Surface water contaminants originating from contaminated pond sediments and migration from the landfills and waste deposits, include various metals at concentrations which contribute to the impacts on fish and amphibians in site ponds.

- Groundwater contaminants were also detected in monitoring wells within the OU, and include VOCs, SVOCs, PAHs, pesticides, PCBs, and metals; many above heath-based standards.

- Exposed asbestos-containing materials (transite pipe located in associated debris fields).

- Physical hazards, such as metal debris, tires, and broken glass are also observed at the site.

- Surface runoff, erosion, and leaching from the source area deposits are mechanisms by which contaminants mobilize, mix with, and impact site soils and sediments.

- The Blackstone River is an industrialized river that has an extensive history of impacts from urban storm water runoff and industrial discharges which RIDEM considers an impaired waterway. The Blackstone River has the potential to carry elevated levels of contaminants in both surface water and on entrained particulate matter in the water column. These materials can be deposited and redeposited across the Blackstone River channel bottom and (during flooding events) on low-lying floodplain soils and standing water bodies (e.g., ponds and vernal pools located on the floodplain). However, the RI identifies landfilling and waste disposal operations at OU 2 as also having contributed contaminants to the associated floodplain and site ponds within OU 2. Thus, surface runoff, erosion, and leaching from the OU 2 waste deposits are the dominant mechanisms within OU 2 by which contaminants mobilize, mix with, and impact site soils and sediments.

EXPOSURE PATHWAYS & POTENTIAL RISK

Human health and ecological risk assessments were prepared for OU 2 as a part of the RI and were further refined during the FS.

Threats to Human Health:

The risk assessment included evaluation of human exposures to contaminants in soil, sediment, groundwater, surface water, indoor/outdoor air, landfill leachate, and fish tissue. Results of the Human Health Risk Assessment (HHRA) are summarized in this Proposed Plan in **Table 2**, (showing exposures which result in unacceptable risk), and further described in Section 3.1 of the FS. Receptors evaluated in the HHRA included recreational users, trespassers, commercial/site workers, construction workers, and potential future residents, as appropriate to the various areas of the Site. Exposure pathways included inhalation, dermal (skin) contact, and ingestion of contaminants. Calculations were performed to assess the risks/hazards for each receptor appropriate to the various areas/exposure points at the Site. The calculation results were then compared to EPA's risk criteria to determine if the level of risk/hazard warrants cleanup[3].

[3] Note that the HHRA was completed in 2009/2010. In February 2014, EPA finalized a Directive to update standard default exposure factors and frequently asked questions associated with these updates. http://www.epa.gov/oswer/riskassessment/superfund_hh_exposure.htm (items # 22 and #23 of this web link). Applying these updated standard default exposure factors to the risk assessment would possibly result in a slight decrease of the risk estimates; however, it would not change the previous conclusions regarding unacceptable risks at the Site. These revisions would be reviewed further during the ROD development with respect to risk-based performance standards.

HOW IS RISK TO PEOPLE EXPRESSED?

In evaluating risks to humans, estimates for risk from carcinogens (chemicals that may cause cancer) and non-carcinogens (chemicals that may cause adverse effects other than cancer) are expressed differently.

For carcinogens, risk estimates are expressed in terms of probability. For example, exposure to a particular carcinogenic chemical may present a 1 in 10,000 increased chance of causing cancer over an estimated lifetime of 70 years. This can also be expressed as 1x10-4. The EPA acceptable risk range for carcinogens is 1x10-6 (1 in 1,000,000) to 1x10-4 (1 in 10,000). In general, calculated risks higher than this range would require consideration of clean-up alternatives.

For non-carcinogens, exposures are first estimated and then compared to a reference dose (RfD). The RfD is developed by EPA scientists to estimate the amount of a chemical a person (including the most sensitive person) could be exposed to over a lifetime without developing adverse health effects. The exposure dose is divided by the RfD to calculate the measure known as a hazard index (HI) (a ratio). A HI greater than 1 suggests that adverse effects may be possible.

Risk from exposure to lead is evaluated by using the slope-factor approach developed by the EPA. The approach is based on effects to a fetus through exposure to the mother. For fetuses born to mothers exposed to lead, a probability that the fetal blood-lead concentration exceeds 10 micrograms per deciliter (µg/dL) is calculated. If the probability is less than 5 percent, it is accepted that lead does not pose a risk to humans.

Results of this HHRA indicate that risks/hazards for soil, sediment, surface water, leachate, and/or ambient air for trespassers and recreational users, and soil, shallow groundwater, and outdoor (trench) air for construction workers were generally less than or within EPA target levels (i.e., risk range of 10-4 to 10-6; HI of 1).

Non-cancer hazards (expressed as a hazard quotient [HQ]) for ingestion of potable groundwater within the OU by future residents were greater than the EPA target HQ of 1. In addition, risks to hypothetical future residential receptors from ingestion, dermal contact, and inhalation due to potable use of groundwater were greater than 1 x 10-4, even though some COPCs contributing to elevated risks/hazards were generally present at concentrations less than their respective drinking water Maximum Contaminant Levels (MCLs; e.g., benzene). The major contributors to the groundwater risk and hazard are carcinogenic PAHs, 1,4-dioxane, 4-chloroaniline, atrazine, bis(2-ethylhexyl) phthalate (BEHP), naphthalene, 1,4-dichlorobenzene, chloroform, ethylbenzene, methyl tert-butyl ether, tetrachloroethene, trichloroethene, vinyl chloride, aldrin, dieldrin, PCBs, benzene, arsenic, aluminum, cadmium, cobalt, iron, manganese, and thallium.

Risk to a future commercial worker exposed to soil and indoor air at the Nunes Parcel exceeded 1 x 10-4 due primarily to benzene in indoor air. Major contributors to risk are carcinogenic PAHs, bis(2-ethylhexyl)phthalate, dieldrin, dioxins, and/or arsenic in soil and benzene, naphthalene, and/or tetrachloroethene in indoor air. In addition, hazard and risk to a future resident exposed to soil and indoor air at the Nunes Parcel exceeded target organ HIs of 1 and a cancer risk of 1 x 10-4. The exceedances are primarily due to benzene, naphthalene, 1,4-dichlorobenzene, ethylbenzene, tetrachloroethene, and/or vinyl chloride in indoor air and carcinogenic PAHs, PCBs, dieldrin, dioxins, bis(2-ethylhexyl)phthalate, and/or arsenic in soil.

EPA also conducted a lead evaluation which, upon further refinement for the scenarios evaluated, found that the estimated probabilities that modeled blood lead levels (BLLs) would exceed the target BLL were below the EPA threshold probability of 5% for all cases except a construction worker exposed to soil at the Nunes Parcel/RIDEM Soil Removal Area.

Risks and hazards from the fish consumption pathway were evaluated for current/future young child and adult recreational user at four locations: OU 2 (Blackstone River portion adjacent to OU 2, including Site ponds and waters upstream of Pratt Dam), BR-1 (Blackstone River portion upstream of Ashton Dam and upstream of OU 2), BR-2 (Blackstone River portion downstream of Ashton Dam but upstream of OU 2), and P-6 (reference pond approximately 3 miles north and upstream of OU 2) **(Figure 3)**. As indicated in **Table 2**, the results show unacceptable cancer risks and non cancer risks with HQs above 1 at the sampled locations. The cancer risks are due to eating fish with high levels of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, PCBs, aldrin,

dieldrin, and arsenic. However, the background/reference area pond (P-6) also displayed target organ hazards greater than 1 and risks in the range of 10-5, which places site risks into a more regional perspective. Based on the statistical evaluation conducted for fish tissue PCB data, concentrations in fish from upstream portions of the Blackstone River are not significantly different from concentrations found in fish from OU 2. Since the fish study found similar risks in fish from similar contaminants from within the boundary of OU 2 as well as from upstream and reference locations, it indicates that the potential cause for risks associated with eating fish at the Blackstone River may be due to many sources within the Blackstone River watershed, and not limited to just the river portion within the OU boundary. Therefore, no site-specific risk from fish consumption was identified for the OU. Based on the results of this study, EPA finds that eating contaminated fish may pose a risk to public health and therefore recommends against the taking of resident fish for consumption from the water bodies identified in these investigations. It is important to note that since levels of contamination in fish may not to be solely attributable to site-related disposal activities, EPA's plan to address landfill-related contamination with OU 2 is not expected to significantly reduce overall contaminant levels in fish within the river, although there could be some incremental improvements noted over time.

In addition to the quantified risks and hazards mentioned above, physical hazards, such as metal debris, tires, dilapidated buildings, and broken glass at the site may also present some risks. These physical hazards were further considered in the FS. Lastly, asbestos-containing material has been identified which may present significant health risks due to its status as a Class A (known human) carcinogen if fibers are released into the air and inhaled.

Threats to the Environment:
A Baseline Ecological Risk Assessment (BERA) was prepared for OU 2 in phases by EPA and completed in 2009. Investigations in direct support of the BERA included a fish community survey, fish tissue sampling, benthic invertebrate survey, sediment toxicity testing, and habitat assessment studies, that formed the basis of the BERA evaluation for OU 2.

The study area consisted of the Blackstone River and its associated habitats, from approximately 1 mile below the Ashton Dam to the Pratt Dam. Habitats included Aquatic Habitats consisting of the Blackstone River (near site); Wetlands A through D located east of the Blackstone River and the J.M. Mills Landfill; Ponds on the Unnamed Island (Pond A, D, E, P, and Pond F [adjacent to Pratt Dam]); and Ponds located adjacent to the river (Ponds B, C, I, and N). Terrestrial Habitats included the J.M. Mills Landfill; the Nunes Parcel; the Unnamed Island; Quinnville Well Field; Wetlands A through D; and the Pratt Dam **(Figure 2)**. Reference areas were used, when available, to establish a basis for background risk estimates. The reference areas include a section of the Blackstone River upstream of the site and an off-site pond (Pond P-6, located approximately 3 miles north and upstream of OU 2; **Figure 3**). These habitats were divided into specific exposure units defined for each assessment endpoint.

The ecological receptors evaluated in the BERA were selected based on the potential occurrence locally and in the habitats on site, and the potential for exposure to site-related media. Selected feeding guilds and representative species included: benthic macroinvertebrates; amphibians; fish; small and large omnivorous birds; small and large piscivorous birds; small and large omnivorous mammals; and small and large piscivorous mammals.

HOW IS ECOLOGICAL RISK EXPRESSED?

The risk to ecological receptors is frequently expressed as a Hazard Quotient (HQ). A receptor's estimated exposure (e.g., amount of chemical in media or ingested in food) is compared to benchmarks for the chemicals that are considered safe based on toxicity studies. Generally, when the HQ is below 1, toxicological effects are unlikely to occur and no significant risk is present. When the HQ is above 1, there is a potential for significant risk to be present. Toxicity studies and data comparisons to reference (clean) areas are also methods used to assess risk.

More detailed information concerning the BERA is found in Section 3.1 of the FS. The finding of the BERA is that there were:

- Unacceptable ecological risk to small birds from soil at the Unnamed Island (from BEHP and lead);
- Unacceptable ecological risk to small birds from soil at J.M. Mills Landfill (from cadmium); and
- Unacceptable ecological risk to aquatic receptors from sediment in on-site Ponds (from metals and PAHs[4]).

Remedial Action Objectives (RAOs)
After possible exposure pathways and potential risks have been identified at a site, cleanup alternatives are developed in

[4] Note that there were also unacceptable surface water risks determined for receptors in the on-site Ponds due to direct disposal of wastes into the aquatic system contaminating the sediment with metals.

the FS to address the identified risks and to achieve site-specific remedial action objectives. These remedial action objectives are consistent with statutory requirements and preferences established by Congress. A short synopsis of the remedial action objectives and each alternative considered is further outlined below.

J.M. Mills Landfill:

• Prevent direct contact with landfill contents.

• Prevent direct human contact/ingestion/inhalation with contaminated soils that exceed applicable, or relevant and appropriate requirement (ARAR) standards.

• Prevent exposure to ecological receptors from soil contaminants that present an unacceptable ecological risk.

• Prevent soil leaching and landfill cover infiltration and resulting contaminant migration to groundwater.

• Control surface-water runoff and erosion.

• Prevent infiltration and washout during flooding, up to a 500-year flood event.

• If necessary, collect and treat leachate to prevent further contaminant migration to the Blackstone River, based on federal and State water quality standards and RCRA Subtitle C landfill closure standards.

• Control and, if necessary, treat landfill gas, based on federal and state air pollution control standards and RCRA Subtle C landfill closure standards.

• Prevent potential future exposure to contaminated indoor air.

• Prevent migration of contaminated soil/debris to pond sediment.

Nunes Parcel[5]:

• Prevent direct contact with landfill contents.

• Prevent direct human contact/ingestion/inhalation with contaminated soils that exceed ARAR and risk-based standards.

• Prevent exposure to ecological receptors from contaminants in soil that present an unacceptable ecological risk.

• Prevent soil leaching and landfill cover infiltration and resulting contaminant migration to groundwater.

• Control surface-water runoff and erosion.

• Prevent infiltration and washout during flooding, up to a 500-year flood event.

• If necessary, collect and treat leachate to prevent further contaminant migration to the Blackstone River, based on federal and State water quality standards and RCRA Subtitle C landfill closure standards.

• Control and, if necessary, treat landfill gas, based on federal and state air pollution control standards and landfill closure standards.

• Prevent potential future exposure to contaminated indoor air.

• Prevent migration of contaminated soil/debris to pond sediment.

Unnamed Island:

• Prevent direct contact with waste deposits.

• Prevent direct human contact with contaminated soils that exceed ARAR standards.

• Prevent exposure to ecological receptors from contaminants in soil that present an unacceptable ecological risk.

• Prevent soil leaching and resulting contaminant migration to groundwater.

• Prevent washout of waste/contamination during flooding, up to a 500-year flood event.

• Prevent migration of contaminated soil/debris to pond sediment.

Ponds[6]:

• Prevent exposure to ecological receptors from contaminants in sediment that present an unacceptable ecological risk.

• Minimize migration of contaminants from sediment to surface water that present an unacceptable ecological risk.

• Reduce contamination in surface water from CERCLA sources within OU 2 to acceptable ecological risk levels.

• Prevent washout of contaminated sediment during flooding, up to a 500-year flood event.

Groundwater:

• Prevent potential exposure from ingestion/dermal contact/inhalation by a current or future resident to concentrations of contaminants in excess of ARAR and risk-based standards within the compliance boundary for the waste management area.

• Prevent migration of site contaminants in groundwater from beyond the edge of the compliance boundary of the waste management area.

• Prevent contaminant migration from the source areas to the Blackstone River via groundwater.

[5] Includes the RIDEM Soil Removal Area which is considered to be an extension of the wastes disposed of within the Nunes Parcel.

[6] Note that because of the periodic flooding of Ponds A, C, D, E, I, N, and P by the Blackstone River, it was not appropriate to directly remediate surface water in these locations. Instead, surface water exceedances will be addressed by remediating contaminant sources in sediment and from the landfills, with appropriate monitoring of surface water to ensure RAOs are achieved.

Based on the RAO's outlined above, EPA in consultation with the State of Rhode Island, has proposed site-specific cleanup goals called Preliminary Remediation Goals (PRGs) for soil and sediment within OU2. Since all contaminated groundwater in the OU is within the compliance boundary for the OU's waste management area, Performance Standards for monitoring site-wide groundwater within the OU 2 waste management area compliance boundary (Figure 8) were also developed. These PRGs and Performance Standards[7] are protective of human health and the environment based upon the exposure scenarios evaluated in the RI, and through addressing exceedances of risk-based and ARARs standards. The PRGs and Performance Standards are further described in Section 3.5 of the FS.

Human Health risk-based soil PRGs are identified in **Table 3** of this Proposed Plan.

Groundwater Performance Standards were developed for site-wide groundwater based on a future residential scenario (See Table 3-4 of the FS). Many of these Performance Standards represent EPA regulatory drinking water standards, but some are based on a cancer risk level of 1×10^{-6} or an HQ of 1.

Ecological risk-based PRGs were developed and summarized for soil and sediment and incorporated into the FS. For soils, the ecological risk-based PRGs were developed for the J.M. Mills Landfill floodplain (cadmium) and the Unnamed Island (lead and BEHP) **(Table 4)**. The ecological risk-based PRGs for cadmium and BEHP are based on risks to small omnivorous birds. Lastly, ecological risk-based PRGs for sediment in the on-site Ponds were selected by EPA based on the reference sample with the highest/best survival in sediment toxicity tests **(Table 5)**.

CLEANUP ALTERNATIVES BY AREA AND MEDIA

The preferred alternative presented in this Proposed Plan will meet the remedial action objectives described above, and protect public health and the environment. Below is a summary of the alternatives by areas and how they will, or will not, meet the remedial action objectives. For each area, Alternative 1 (No Action) is added, as required under Superfund law for comparison purposes. Under this alternative, no active cleanup activities, periodic monitoring, or environmental deed restriction would be required. It would be unknown if, or when, cleanup objectives would be met under this alternative. The estimated total present value cost of this alternative (for each area) is zero dollars ($0), although there will be some limited costs associated with conducting Site-wide, statutorily required Five-Year Reviews.

In the FS, technologies were screened and Remedial Alternatives were developed to address the exposure and risk determined in the HHRA and BERA at OU 2. The Remedial Alternatives were developed by source area and media. Using a presumptive containment approach for addressing moderate to large landfills in New England, alternatives which include capping the waste in place, were developed for the J.M. Mills Landfill (JM-SO) and Nunes Parcel (NP-SO). Due to the location and other engineering and environmental considerations, the Unnamed Island (UI-SO) was not evaluated presumptively, but rather alternatives were developed addressing this area specifically. Pond sediment (SE) cleanup alternatives were also evaluated in the FS. Since all contaminated groundwater in the OU is within the compliance boundary for the OU's waste management area, Performance Standards were developed for groundwater. As required, a range of alternatives were developed for each area, including a No-Action Alternative. In all cases, RAOs are expected to be achieved upon completion of removal and/or cap and cover construction. For Pond Surface Water, it is expected that RAOs will be met after sources of the surface water contamination from pond sediment and landfill soil/debris migration are addressed and any residuals attenuate.

Alternatives

Brief descriptions of the alternatives are provided below. Further details are presented in the FS. All present worth costs associated with O&M and periodic expenditures are based on a 7% discount rate over 30 years.

J.M. Mills Landfill (JM-SO)

Including the No-Action Alternative, three alternatives were retained for detailed analysis in the FS. A presumptive containment approach (capping) is followed as a part of each of the alternatives (except for No Action) for this landfill. In brief, these alternatives include:

JM-SO-1: No Action

No further action will be taken at the J.M. Mills Landfill portion of the site. Although this alternative does not achieve the RAOs, it is retained as a baseline alternative for comparison in accordance with the National Contingency Plan and EPA's RI/FS Guidance. This alternative requires no further expenditure of costs ($0), but will continue to be evaluated through the Site-wide Five-Year Reviews.

JM-SO-2: RCRA Subtitle C Cap of Whole Landfill, Removal of Soil Exceeding PRGs from Riverbank and Floodplain, Bank Restoration, and Institutional Controls

Using a presumptive containment approach

[7] Performance Standards were developed, rather than PRGs, because no groundwater cleanup is required within the compliance boundary where all of the contaminated groundwater from the OU is located. The Performance standards may be either risk-based or ARARs-based.

for landfill cleanups in New England, wastes would be contained under an engineered RCRA Subtitle C Cap system to meet hazardous waste landfill standards. Floodplain soils and sediments (Pond N) exceeding PRGs would be consolidated under the constructed cap. Outlying waste deposits (including debris fields) from Facility operations that are adjacent to the landfilled waste would be consolidated for placement under the cap to meet landfill closure standards. A landfill gas management system will be designed and constructed (passive or active collection/treatment to be determined in design). The cap must be constructed to protect against flooding, up to a 500 year event, and effectively manage stormwater. Long-term monitoring of groundwater will be performed to ensure that groundwater contamination within the compliance boundary does not migrate beyond the boundary and cause groundwater outside of the compliance boundary to exceed drinking water standards. Long-term monitoring of surface water, landfill gas, and leachate, coupled with operation and maintenance tasks (cap repairs, mowing, etc.) are also included to confirm the continued protectiveness of the remedy. Riparian habitat will be restored, as practicable and a vegetated cover consisting of native grasses and shallow rooted shrubs will be installed to maintain habitat biodiversity. Institutional controls (in the form of deed restrictions) and fencing would be used to control future land use and limit access to the landfill, but there will be no restrictions on access to areas of restored riparian habitat along the river. There will be at least yearly compliance monitoring to ensure restrictions remain in place and are enforced. In addition, there will be periodic reviews no less than every five years as required by statute. Capital Costs are estimated at $21.1 million, with O&M and Periodic Costs estimated at $0.5 million for a total cost for JM-SO-2 at $21.6 million.

JM-SO-3: Combination RCRA Subtitle C Cap (top)/Perimeter Soil Cap (side slopes) of Landfill, Removal of Soil Exceeding PRGs from Riverbank and Floodplain, Bank Restoration, and Institutional Controls

This alternative involves containment of waste via a combination cap consisting of RCRA Subtitle C Cap system over the top 33% and soil only cap over the lower 67% of the landfill slope. As with JM-SO-2, floodplain soils and sediments (Pond N) exceeding PRGs and the debris fields would be consolidated under the cap. A landfill gas management system would be required to be designed and constructed (passive or active collection/treatment to be determined in design). The cap must be constructed to protect against flooding, up to a 500 year event, and effectively manage stormwater. Long-term monitoring of groundwater will be performed to ensure that groundwater contamination within the compliance boundary does not migrate beyond the boundary and cause groundwater outside of the compliance boundary to exceed drinking water standards. Long-term monitoring of surface water, landfill gas, and leachate, coupled with operation and maintenance tasks (cap repairs, mowing, etc.) are also included to confirm the continued protectiveness of the remedy. Riparian habitat will be restored, as practicable and a vegetated cover consisting of native grasses and shallow rooted shrubs will be installed to maintain habitat biodiversity. Institutional controls (in the form of deed restrictions) and fencing would be used to control future land use and limit access to the landfill, but there will be no restrictions on access to areas of restored riparian habitat along the river. There will be at least yearly compliance monitoring to ensure restrictions remain in place and are enforced. In addition, there will be periodic reviews no less than every five years as required by statute. Capital Costs are estimated at $13.2 million, O&M and Periodic Costs at $0.5 million for a total cost for JM-SO-3 at $13.7 million.

Nunes Parcel/RIDEM Soil Removal Area (NP-SO)

Including the No-Action Alternative, three alternatives were retained for detailed analysis in the FS. A presumptive containment approach (capping) is followed as a part of each of the alternatives (except for No Action) for this landfill. In brief, these alternatives include:

NP-SO-1: No Action

No further action would be taken at the Nunes Parcel portion of the site. Although this alternative does not achieve the RAOs, it is retained as a baseline alternative for comparison in accordance with the National Contingency Plan and EPA's RI/FS Guidance. This alternative requires no further expenditure of costs ($0), but will continue to be evaluated through the Site-wide Five-Year Reviews.

NP-SO-2: RCRA Subtitle D Cap (meeting State Solid Waste Regulations) of Landfill, Consolidation, and Institutional Controls

Using a presumptive containment approach for landfill cleanups, wastes would be contained under an engineered Subtitle D Cap system which complies with RI Solid Waste Regulations. Surrounding soils exceeding PRGs (and sediments in Pond I) would be consolidated under the cap. All building structures would be demolished and either consolidated or sent off-site for recycling or disposal. A landfill gas management system will be designed and constructed (passive or active collection/treatment to be determined in design). The cap must be constructed to protect against flooding, up to a 500 year event, and effectively manage stormwater. Long-term monitoring of groundwater will be performed to ensure that groundwater

contamination within the compliance boundary does not migrate beyond the boundary and cause groundwater outside of the compliance boundary to exceed drinking water standards. Long-term monitoring of surface water, landfill gas, and leachate, coupled with operation and maintenance tasks (cap repairs, mowing, etc.) are also included to confirm the continued protectiveness of the remedy. Riparian habitat will be restored, as practicable and a vegetated cover consisting of native grasses and shallow rooted shrubs will be installed to maintain habitat biodiversity. Institutional controls (in the form of deed restrictions) and fencing would be used to control future land use and limit access to the landfill, but there will be no restrictions on access to areas of restored riparian habitat along the river. There will be at least yearly compliance monitoring to ensure restrictions remain in place and are enforced. In addition, there will be periodic reviews no less than every five years as required by statute. Capital Costs for this alternative are estimated at $4.81 million with O&M and Periodic Costs at $0.12 million for a total cost for NP-SO-2 at $4.93 million.

NP-SO-3: RCRA Subtitle C Cap of Landfill, Consolidation, and Institutional Controls

Using a presumptive containment approach for landfill cleanups, wastes would be contained under an engineered RCRA Subtitle C Cap system. Surrounding soils exceeding PRGs (and sediments in Pond I) would be consolidated under the cap. All building structures would be demolished and either consolidated or sent off-site for recycling or disposal. A landfill gas management system will be designed and constructed (passive or active collection/treatment to be determined in design). The cap must be constructed to protect against flooding, up to a 500 year event, and effectively manage stormwater. Long-term monitoring of groundwater will be performed to ensure that groundwater contamination within the compliance boundary does not migrate beyond the boundary and cause groundwater outside of the compliance boundary to exceed drinking water standards. Long-term monitoring of surface water, landfill gas, and leachate, coupled with operation and maintenance tasks (cap repairs, mowing, etc.) are also included to confirm the continued protectiveness of the remedy. Riparian habitat will be restored, as practicable and a vegetated cover consisting of native grasses and shallow rooted shrubs will be installed to maintain habitat biodiversity. Institutional controls (in the form of deed restrictions) and fencing would be used to control future land use and limit access to the landfill, but there will be no restrictions on access to areas of restored riparian habitat along the river. There will be at least yearly compliance monitoring to ensure restrictions remain in place and are enforced. In addition, there will be periodic reviews no less than every five years as required by statute. Capital Costs for this alternative are estimated at $5.96 million with O&M and Periodic Costs at $0.12 million for a total cost for NP-SO-3 at $6.08 million.

Unnamed Island Soil and Waste (UI-SO)

Including the No-Action Alternative, three alternatives were retained for detailed analysis in the FS. One alternative specifically addressed surface soil risks and subsurface waste deposits, while another is a full waste removal (in addition to the soil) option. In brief, these alternatives include:

UI-SO-1: No Action

No further action would be taken at the Unnamed Island portion of the site. Although this alternative does not achieve the RAOs, it is retained as a baseline alternative for comparison in accordance with the National Contingency Plan and EPA's RI/FS Guidance. This alternative requires no further expenditure of costs ($ 0), but will continue to be evaluated through the Site-wide Five-Year Reviews.

UI-SO-2: Remove/Consolidate Surface Waste/Soil (0 to 2 feet) Exceeding PRGs, Geotextile with Riprap where PRG Exceedances Remain, and Institutional Controls

This alternative specifically addresses surface soil risks and subsurface waste deposits through excavation of surface waste/soil exceeding PRGs from the surface to 2 feet and waste down to 2 feet. A cover consisting of geotextile and rip rap would be placed in areas where PRG exceedances and/or waste remain at the bottom of the excavation. The cover must be constructed to protect against flooding, up to a 500 year event, and effectively manage stormwater. Waste and soils would be removed and consolidated under the Nunes Parcel cap. Riparian habitat will be restored, as practicable. Institutional controls (in the form of deed restrictions) would be used to control future land use. There will be at least yearly compliance monitoring to ensure restrictions remain in place and are enforced. In addition, there will be periodic reviews no less than every five years as required by statute. Capital Costs for this alternative are estimated at $4.31 million with O&M and Periodic Costs at $0.06 million for a total cost for UI-SO-2 at $4.37 million.

UI-SO-3: Remove/Consolidate All Waste/Soil Exceeding PRGs

This alternative involves the complete removal of all waste deposits from the former Facility operations along with all contaminated soil that exceeds PRGs and removal of all of the excavated material from the unnamed island for consolidation under the Nunes Parcel cap. Riparian habitat would be restored, as practicable as determined during remedial design. Institu-

tional controls and periodic reviews would not be necessary under this option. Capital Costs for this alternative are estimated at $6.14 million with O&M and Periodic Costs at $0 for a total cost for UI-SO-3 at $6.14 million.

Sediment (in Ponds on the Unnamed Island) (SE)

Including the No-Action Alternative, four alternatives were retained for detailed analysis in the FS. Two alternatives address ecological risks through sediment removal (one full removal and another removing/replacing 0-1 ft of sediment), while another applies a subaqueous cover directly over the contaminated sediment (in place/no sediment removal). It is estimated that the total excavation of sediment results in approximately 5.4 acres of total pond areas disturbed or between 8,700 (for alternative SE-3) to 18,000 cubic yards (considered a maximum volume for costing purposes for alternative SE-2). Excavated sediments will be consolidated, on-site. In brief, these alternatives include:

SE-1: No Action

No further action would be taken for contaminated sediment in site Ponds (including Ponds A, D, and E located on the Unnamed Island). Through no action, impacted sediments would remain and the effects of these impacts on the ecological habitat and pond water quality would be unabated. Although this alternative does not achieve the RAOs, it is retained as a baseline alternative for comparison in accordance with the National Contingency Plan and EPA's RI/FS Guidance. This alternative requires no further expenditure of costs ($0), but will continue to be evaluated through the Site-wide Five-Year Reviews.

SE-2: Remove/Consolidate Sediment Exceeding PRGs

This alternative provides removal of all contaminated sediments, exceeding cleanup standards (estimated at 18,000 cy) for consolidation under the engineered site cap(s) (for the Nunes Parcel and/or J.M. Mills Landfill) and eliminates risks to the pond ecology and the source of contamination impacting pond water quality. At the time of design, additional sediment profiling will be performed to determine more precisely the contamination present and excavation depths needed to ensure attainment of protective cleanup levels in the ponds. No maintenance of the remedy would be required because all sediments which exceed PRGs would be removed. Due to the depth of the sediments in the ponds and their ecological characteristics, no habitat restoration will be required, except for any restoration of shoreline areas altered during the sediment removal process. Capital Costs for this alternative are estimated at $8.12 million with O&M and Periodic Costs at $0 for a total cost for SE-2 at $8.12 million.

SE-3: Remove/Consolidate Sediment (1 foot) with Subaqueous Cover where PRG Exceedances Remain, Institutional Controls

This alternative provides removal of sediment with PRG exceedences to a depth of 1 foot (approx. 8,700 cu.yds.). At the time of design, additional sediment profiling will be performed to determine more precisely the contamination present and excavation depths needed to reach attainment of protective cleanup levels in the ponds. If the difference in dredged volume is relatively small, additional dredging would reduce or potentially eliminate the need for a subaqueous cover and future maintenance. As otherwise required, a subaqueous cover will be utilized in areas where PRG exceedances are not fully removed. An engineered sediment/substrate comprised of geotextile and 1 foot of clean fill would be placed over the remaining sediments not attaining cleanup levels. Design studies will be conducted to ascertain the stability and performance of various cover materials. The cover must be constructed to protect against flooding, up to a 500 year event. Long-term monitoring and maintenance of the engineered cover would be conducted. The use of amendments along with standard cover materials will be evaluated during the remedial design phase to determine if protectiveness (related to future potential erosion) can be improved in a cost-effective manner. In addition, the design will further inform decision makers on the specific type and need for geotextile as part of the cover, as river currents during flooding could potentially disturb the cover more than if it were not in place. Finally, excavated sediments will be consolidated under the Nunes Parcel or J. M. Mills Landfill cap. Riparian and wetland habitat would be restored, as practicable. Long-term monitoring and deed restrictions will be used to prevent disturbance of the remedy. There will be at least yearly compliance monitoring to ensure restrictions remain in place and are enforced. In addition, there will be periodic reviews no less than every five years as required by statute.

Capital Costs for this alternative are estimated at $5.10 million with O&M and Periodic Costs at $0.70 million for a total cost for SE-3 at $5.80 million.

SE-4: Subaqueous Cover (No Sediment Removal) with Institutional Controls

This alternative calls for no excavation but the placement of a subaqueous cover comprised of engineered sediment/substrate as a cover for sediments not meeting cleanup standards. The cover must be constructed to protect against flooding, up to a 500 year event. Long-term monitoring and maintenance of the engineered cover would be conducted. Design studies will be conducted to ascertain the stability and performance of various cover materi-

als. The use of amendments along with standard cover materials will be evaluated during the remedial design phase to determine if protectiveness (related to future potential erosion) can be improved in a cost-effective manner. In addition, the design will further inform decision makers on the specific type and need for geotextile as part of the cover, as river currents during flooding could potentially disturb the cover more than if it were not in place. It may be necessary to compensate elsewhere on site for loss of flood storage capacity due to the cover placement. Riparian and wetland habitat would be restored, as practicable. Long-term monitoring and deed restrictions will be used to prevent disturbance of the remedy. There will be at least yearly compliance monitoring to ensure restrictions remain in place and are enforced. In addition, there will be periodic reviews no less than every five years as required by statute. Capital Costs for this remedy are estimated at $2.88 million with O&M and Periodic Costs at $0.70 million for a total cost for SE-4 at $3.58 million.

Groundwater (GW)

Including the No-Action Alternative, two alternatives were retained for detailed analysis in the FS. Contaminated groundwater within the OU is located completely within the compliance boundary for a waste management area that incorporates the J.M. Mills Landfill, Unnamed Island, and the Nunes Parcel. Therefore, in accordance with the NCP and EPA guidance, groundwater within the compliance boundary does not require treatment, but access to the groundwater be prevented and measures taken to ensure the contaminated groundwater does not migrate beyond the compliance boundary or into the river. Since no groundwater treatment is required, the groundwater alternatives include:

GW-1: No Action

No further action would be taken for groundwater throughout OU 2. Although this alternative does not achieve the RAOs, it is retained as a baseline alternative for comparison in accordance with the National Contingency Plan and EPA's RI/FS Guidance. This alternative requires no further expenditure of costs ($ 0), but will continue to be evaluated through the Site-wide Five-Year Reviews.

GW-2: Limited Action- Institutional Controls and Long-Term Monitoring

Under this alternative, site-wide, institutional controls (in the form of deed restrictions) to prohibit the use and/or alteration of groundwater within the compliance boundary of the waste management area and to prevent disturbance to components of the remedy would be implemented. Additional institutional controls may be placed on a buffer zone outside of the compliance boundary to prevent wells from being installed that would draw contaminated groundwater beyond the compliance boundary. There will be at least yearly compliance monitoring to ensure restrictions remain in place and are enforced. Long-term monitoring will ensure contaminated groundwater is not migrating beyond the compliance boundary or into the river. Monitoring will include the appropriate sampling strategy to evaluate degradation processes that may decrease contaminant concentrations in groundwater (lead, cadmium and organics) and biogeochemical processes that may increase contaminant concentrations in groundwater (arsenic) and be performed on a regular schedule so as to provide trend analyses and tracking of contaminant behavior, especially during times of variable wet/dry seasonal events. In addition, there will be periodic reviews no less than every five years as required by statute. Capital Costs for this alternative are estimated at $166,000 with O&M and Periodic Costs at $505,000 for a total cost for GW-2 at $671,000.

DETAILED COMPARISON OF CLEANUP ALTERNATIVES

In accordance with the National Contingency Plan, the retained remedial alternatives are assessed using EPA's Nine Criteria. The Threshold and Primary Balancing evaluation criteria are addressed in this Plan while the last two Modifying Criteria, State and Community acceptance, will be addressed following the public comment period.

The cleanup alternatives described in this Proposed Plan were compared with each other to identify how well each alternative meets EPA's evaluation criteria. Detailed evaluations and comparisons of alternatives are included in the FS. **Table 6** below summarizes how well each of the cleanup alternatives developed for OU 2 meet the first seven criteria. After comments from the State and community are received and evaluated through this comment period, EPA will select the final cleanup plan. The following discussion and table present a general comparison summary by cleanup areas/media of the alternatives. EPA's Preferred Alternative for each area/media is identified in bold. The areas/media are:

1) J.M. Mills Landfill, 2) Nunes Parcel, 3) Unnamed Island Soils and Waste, 4) Sediment (in the Unnamed Island Ponds), and 5) Groundwater.

1) J.M. Mills Landfill Cleanup Alternatives (JM-SO)

- Alternative JM-SO-1: No Action;
- **Alternative JM-SO-2:** RCRA Subtitle C Cap of Whole Landfill, Removal of Soil Exceeding PRGs from Riverbank and Floodplain, Bank Restoration, and Institutional Controls; and
- Alternative JM-SO-3: Combination RCRA Subtitle C Cap (top)/Perimeter

EPA'S NINE CRITERIA FOR CHOOSING A REMEDIATION PLAN

EPA uses nine criteria to evaluate alternatives and select a final remediation plan. EPA has already evaluated how well each of the remedial alternatives developed for OU 2 meets the first seven criteria (see "Comparative Analysis" below). Once comments from the state and the community are received, EPA will select the remediation plan. The evaluation criteria are as follows:

THRESHOLD CRITERIA

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 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 chosen plan must meet this criterion.

PRIMARY BALANCING CRITERIA

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 (i.e., treatment machinery, space at an approved disposal facility) available for the plan?

7. Cost:
What is the total cost of an alternative over time? EPA must find a plan that gives necessary protection for a reasonable cost.

MODIFYING CRITERIA

8. State acceptance:
Do state environmental agencies agree with EPA's proposal?

9. Community acceptance:
What objections, suggestions or modifications do the public offer during the comment period?

Soil Cap (side slopes) of Landfill, Removal of Soil Exceeding PRGs from Riverbank and Floodplain, Bank Restoration, and Institutional Controls.

Overall Protection of Human Health and the Environment

The HHRA presumed that the J.M. Mills Landfill will be capped to eliminate exposure to the contaminant-impacted waste in these areas. Physical hazards associated with waste deposits were also noted that are required to be addressed under landfill closure standards. In addition, the BERA indicated potential ecological risks to birds exposed to floodplain soils near the J.M. Mills Landfill. Alternative JM-SO-1 is not protective as no action would be taken to control exposure to or reduce concentrations in landfill waste, debris fields, and floodplain soils. JM-SO-2 is protective since it addresses current and potential future exposure risks through restricting exposure to the landfill waste and other contaminated media (through consolidation, containment and institutional controls). Only JM-SO-2, which includes a RCRA Subtitle C cap on the entire J.M. Mills Landfill, will be fully protective of human health and the environment by placing a physical barrier between potential receptors and contaminated materials in soil and waste, reducing the infiltration and the potential for leaching of contaminants in soil to groundwater, fully addressing potential landfill gas releases, and ensuring that contamination is not eroded or washed out of the J.M. Mills Landfill during any flood, up to a 500-year event. JM-SO-3 is not protective because it does not establish a completely protective physical barrier between potential receptors and contaminated materials in soil and waste, does not fully reduce the infiltration and the potential for leaching of contaminants in soil to groundwater, does not fully address potential landfill gas releases, and does not ensure that contamination is not

TABLE 6. Comparison of Cleanup Alternatives

➢ Area/Media:	J.M. Mills Landfill			Nunes Parcel			Unnamed Island			Pond Sediment				Groundwater	
Nine Criteria	JM-SO-1 No Action	*JM-SO-2 RCRA C Cap	JM-SO-3 Hybrid Cap	NP-SO-1 No Action	NP-SO-2 RCRA D Cap	*NP-SO-3 RCRA C Cap	UI-SO-1 No Action	UI-SO-2 Remove 2 ft and Cover	*UI-SO-3 Full Removal	SE-1 No Action	SE-2 Full Removal	*SE-3 Remove 1 ft and Cover	SE-4 Subaqueous Cover	GW-1 No Action	*GW-2 Long-Term Monitoring
Protects human health & environment	✗	✓	✗	✗	✗	✓	✗	✗	✓	✗	✓	✓	✓	✗	✓
Meets federal & state requirements	✗	✓	✗	✗	✗	✓	✗	✗	✓	✗	✓	✓	✓	✗	✓
Provides long term protection	✗	✓	✓̸	✗	✓̸	✓	✗	✓̸	✓	✗	✓	✓	✓	✗	✓
Reduces mobility, toxicity & volume through treatment	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
Provides short-term protection	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Implementable	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cost (millions)	$0.0	$21.6	$13.7	$0.0	$4.9	$6.1	$0.0	$4.4	$6.1	$0.0	$8.1	$5.8	$3.4	$0.0	$0.7
State agency acceptance	To be determined after the public comment period														
Community Acceptance	To be determined after the public comment period														

* **EPA's preferred option**

✓ **Meets or exceeds criterion**

✓̸ **Partially meets criterion**

✗ **Does NOT meet criterion**

eroded or washed out of the J.M. Mills Landfill during any flood, up to a 500-year event.

Compliance with ARARs
Alternative JM-SO-1, No Action, will not meet state or federal ARARs related to addressing site risks or cleanup standards because no action would be taken to control potential exposure pathways or address contaminant concentrations in soil or waste. Alternative JM-SO-2 will fully meet all landfill state and federal closure ARARs, as well as all other chemical, location, and action-specific ARARs standards by capping of the J.M. Mills Landfill (RCRA Subtitle C cap on entire landfill) and by removing or consolidating contaminated material above remedial goals in soil along the riverbank and floodplain. Alternative JM-SO-3 (hybrid cap) does not fully meet chemical-specific, location-specific, or action-specific ARARs, because the soil portion of the cap may not prevent the release of contaminants in the event of a flood, up to a 500-year event. Further, the soil portion of the cap does not meet hazardous waste landfill closure standards throughout the entirety of the cap. The proposed cover also will not allow for landfill gas control standards to be achieved. As a result, Alternative JM-SO-2 is the only alternative that can be designed and implemented to comply with applicable state and federal ARARs. In addition, EPA has determined that Alternative JM-SO-2 is the Least Environmentally Damaging Practicable Alternative (LEDPA) under the federal Clean Water Act, because it provides the best balance of addressing contaminated soil/debris within and adjacent to wetlands and waterways with minimizing both temporary and permanent alteration of wetlands and aquatic habitats on site. EPA has also made a draft finding that Alternative JM-SO-2 will meet risk-based protectiveness requirements for the remediation of PCBs under federal Toxic Substances Control Act regulations. A complete list of state and federal ARARs can be found at Appendix I of the Feasibility Study.

Long-Term Effectiveness and Permanence
Alternative JM-SO-1 would provide the least long-term effectiveness because there would be no controls to limit exposure to contaminants in soil or waste. Alternative JM-SO-2 is the only alternative that will address risks associated with hazardous waste and hazardous substance disposal by installation of the RCRA Subtitle C cap which places a physical barrier between potential receptors and contaminated materials in soil and waste over the entire source area, further reduces the infiltration and the potential for leaching of contaminants in soil to groundwater, addresses landfill gas releases, and ensures that contamination is not eroded or washed out along the side slopes of the J.M. Mills Landfill during a flood, up to a 500-year event. Alternative JM-SO-2 would be protective of the environment by containing the contaminant mass and eliminating potential exposure pathways. While both Alternatives JM-SO-2 and JM-SO-3 implement deed restrictions to control land use to further protect the integrity of the cap, unlike Alternative JM-SO-2, long-term effectiveness and permanence will not be achieved through Alternative JM-SO-3 because the soil portion of the cap does not meet RCRA Subtitle C performance standards, and may not prevent the release of contaminants in the event of a flood, up to a 500-year event, or through continued erosion of the side slopes (if not properly maintained) over the long term.

Reduction of Toxicity, Mobility, or Volume through Treatment
None of the alternatives involve treatment processes.

Short Term Effectiveness
No short-term impacts to the local community, on-site remedial workers or the environment will occur under Alternative JM-SO-1. The soil removal activities in the active remedial alternatives (JM-SO-2 and JM-SO-3) are the same and, therefore, the short-term exposure risks to workers, the community, or the environment from soil removal are equal for these alternatives. The soil removal activities will be managed through engineering controls and worker training.

Both of the remaining presumptive approach alternatives (JM-SO-2 and JM-SO-3) include removal of all trees, clearing and grubbing of the vegetation, and extensive regrading of the J.M. Mills Landfill prior to construction of a cap and the areas of the riverbank and floodplain where soil removal will occur that will create short-term exposure risks to workers, the community, or the environment. During implementation, engineering measures will be used to restrict access, control potential air emissions, fugitive dust, or surface water runoff. Comparatively, Alternative JM-SO-2 will require a higher volume of materials to be brought onsite. While Alternative JM-SO-3 may present a lesser impact to the traffic in the surrounding community through reduced materials handling, use of the active rail system may also reduce overarching traffic impacts for both JM-SO-2 and JM-SO-3.

Implementability
Alternative JM-SO-1 is simple to implement and involves no O&M. For the capping alternatives (JM-SO-2 and JM-SO-3), the location and protection of the caps along the riverbank will present a significant technical challenge. Each alternative requires phased design/construction planning elements, large quantities of material handling, and space and access limitations that may interfere with construction of either cap. Both are equal in that each includes the removal, clearing and grubbing of the vegetation, and regrading of the landfill (prior to

capping) and the areas of the riverbank and floodplain where soil removal will occur. JM-SO-2 may be more difficult to implement than and JM-SO-3 because there is a larger impermeable cap area to construct and larger volumes of material to manage in building a full RCRA Subtitle C cap than is required for a hybrid landfill cap.

Alternative JM-SO-1 is likely to be administratively feasible, but most likely not acceptable because there will be no controls on potential exposure pathways or the potential leaching of contaminants in soil to groundwater. Alternatives JM-SO-2 and JM-SO-3 are both administratively feasible in their requirements to establish and maintain institutional controls.

Alternative JM-SO-3 is easier to implement than Alternative JM-SO-2 given the lower volume of manufactured materials required to construct the cap and the proportionally lower truck traffic through the surrounding community. The smaller footprint of the geosynthetics for Alternative JM-SO-3 reduces the complexity of construction. However, steepness of slope and soil cover stability along the side slopes in the both the short- and long- term is a factor which may further complicate alternative implementability for JM-SO-3; while constructing JM-SO-2 may be more difficult, but may also prove out to be most stable over the long-term because it is designed to withstand a flood, up to a 500-year event.

Costs
The most economical option is Alternative JM-SO-1, at no cost. Alternative JM-SO-2 is the most costly alternative with a present worth cost estimate of $21,559,000. JM-SO-3 presents a lower cost of $13,721,000. The capital costs presented for JM-SO-2 and JM-SO-3 may increase based on design constraints, such as working alongside a new railroad spur and protecting the cover against river flooding, but these additional costs are expected to be within the margin of error expected in the FS stage.

State and Community Acceptance
Each will be evaluated once feedback is received during the public comment period.

2) Nunes Parcel Cleanup Alternatives (NP-SO)

- Alternative NP-SO-1: No Action;
- Alternative NP-SO-2: RCRA Subtitle D Cap (meeting State Solid Waste Regulations) of Landfill, Consolidation, and Institutional Controls; and
- **Alternative NP-SO-3:** RCRA Subtitle C Cap of Landfill (meeting State Hazardous Waste Regulations), Consolidation, and Institutional Controls.

Overall Protection of Human Health and the Environment
Alternative NP-SO-1 (No Action) is not protective because it will not reduce existing contaminant concentrations in soil or provide measures to eliminate or control potential exposure pathways to soil or waste. Alternatives NP-SO-2 is not fully protective because it will not meet protectiveness standards for the landfilling of hazardous waste. NP-SO-3 is protective because it will both achieve the RAOs for soil and waste which provide overall protection of human health and the environment by meeting the protective requirements for the hazardous waste cap.

Compliance with ARARs
Alternative NP-SO-1, No Action, does not meet state or federal ARARs, as impacted soils and waste remain in place, are not capped, and would not address site risks or achieve cleanup standards. Alternative NP-SO-2 does not comply with RCRA Subtitle C closure standards. Alternative NP-SO-3 attains state and federal RCRA Subtitle C landfill closure ARARs, as well as all other identified chemical, location, and action-specific ARARs. In addition, EPA has determined that Alternative NP-SO-3 is the LEDPA, because it provides the best balance of addressing contaminated soil/debris within and adjacent to wetlands and waterways with minimizing both temporary and permanent alteration of wetlands and aquatic habitats on site. A complete list of state and federal ARARs can be found at Appendix I of the Feasibility Study.

Long-Term Effectiveness and Permanence
Alternative NP-SO-1 would provide the least long-term effectiveness because there would be no controls to limit exposure to contaminants in soil or waste, nor would it control the potential for contaminants in soil/waste to leach to groundwater. Alternatives NP-SO-2 and NP-SO-3 are the most effective alternatives in the long-term. These two alternatives would be nearly equally effective and permanent because the landfill caps will equally reduce potential exposure pathways, however, the cap in Alternative NP-SO-2 would allow more infiltration to occur through the cap, thereby allowing for potentially more leachate to be generated via waste contact. Lastly, both caps will be constructed to meet performance standards to prevent the release of contaminants in the event of a flood, up to a 500-year event, or through continued erosion by stormwater over the long term.

Reduction of Toxicity, Mobility, or Volume through Treatment
None of the alternatives involve treatment processes.

Short Term Effectiveness
Alternative NP-SO-1 is the most effective at attaining short-term results with minimal risks because there will be no activities to implement and, therefore, no exposure risks.

Both NP-SO-2 and NP-SO-3 include construction of a landfill cap, which

includes removal of vegetation, grubbing and regrading that will create short-term exposure risks to workers, the community, or the environment. During implementation, engineering measures will be used to control potential air emissions, fugitive dust, or surface water runoff. Comparatively, Alternative NP-SO-3 will create the highest potential risk to the community, workers, or environment due to the greater volume of materials to be brought onsite and increased amount of labor needed to construct the cap. Alternative NP-SO-2 will require a lower volume of materials and less labor to construct and, therefore, create a lower potential risk to the community, workers, or the environment. In either case, if the active rail system is used, risks to the community and the environment due to the high volume of materials to be brought onsite may be lowered through reduced traffic and emissions.

Implementability
Alternative NP-SO-1 involves no implementation and no O&M. Alternative NP-SO-1 is likely to be administratively feasible, but is not acceptable because there will be no controls on potential exposure pathways or the potential leaching of contaminants in waste/soil to groundwater. Alternative NP-SO-2 is a less-complicated remedy to implement than Alternative NP-SO-3 due to smaller volumes of material and a simpler design. Both caps (Alternatives NP-SO-2 and NP-SO-3) will require protection/armoring against flooding of the Blackstone River which will not be simple to design. In addition, inclusion of the soils/sediments around Pond I will increase the difficulty of implementation.

Costs
The most economical option is Alternative NP-SO-1, at no cost. Alternative NP-SO-2 is estimated to cost $4,932,000. Alternative NP-SO-3 is the most costly alternative with a present worth cost estimate of $6,080,000. The capital costs presented for NP-SO-2 and NP-SO-3 may increase based on design constraints, such as protecting the cover against river flooding and inclusion of soils/sediments associated with Pond I, but these additional costs are expected to be within the margin of error expected in the FS stage.

State and Community Acceptance
Each will be evaluated once feedback is received during the public comment period.

3) Unnamed Island Cleanup Alternatives (UI-SO)

- Alternative UI-SO-1: No Action;
- Alternative UI-SO-2: Remove/Consolidate Surface Waste/Soil (0 to 2 feet) Exceeding PRGs, Cover Remaining Contaminated Soil/Waste with Geotextile and Riprap where PRG Exceedances Remain, and Institutional Controls; and
- **Alternative UI-SO-3:** Remove/Consolidate All Waste/Soil Exceeding PRGs.

Overall Protection of Human Health and the Environment
Alternative UI-SO-1 will not reduce existing contaminant concentrations in soil or provide measures to eliminate or control potential exposure pathways to soil or waste.

Alternative UI-SO-2 may achieve the RAOs for soil and waste and provide overall protection of human health and the environment if a protective cover can be designed, constructed and maintained to prevent any release of contaminants in the event of a flood, up to a 500-year event. The protectiveness of the cover is also questionable related to any hazardous materials/wastes which may exist on the island, as the cover is does not meet RCRA Subtitle C protectiveness standards. UI-SO-3 will achieve all RAOs for soil and waste and be protective of human health and the environment because all contaminated soil and waste will be removed from the Unnamed Island. Alternative UI-SO-3 will achieve RAOs in the shortest timeframe by removal of all waste and soil exceeding PRGs thereby eliminating the need to implement institutional controls and to perform O&M on the cover placed over the soil and waste deposits under Alternative UI-SO-2.

Compliance with ARARs
Alternative UI-SO-1, No Action, does not meet ARARs, as impacted soils remain in place and potential exposure pathways are not controlled. Alternative UI-SO-2 will achieve the soil RAOs in soils from 0 to 2 feet below grade, but any remaining contaminants below 2 feet would not meet chemical- and location-specific ARARs, as the cover design does not protect against the release of contaminants through continued leaching or during a flood event because there is no impermeable barrier layer in the cover. Furthermore, Alternative UI-SO-2 would not comply with RCRA Subtitle C closure requirements. Alternative UI-SO-3 would attain all state and federal ARARs by removing all contaminants that exceed risk levels established under state and federal standards and consolidating the material on-site under one of the landfill caps. In addition, EPA has determined that Alternative UI-SO-3 is the LEDPA, because it provides the best balance of addressing contaminated soil/debris within and adjacent to wetlands and waterways with minimizing both temporary and permanent alteration of wetlands and aquatic habitats on site. A complete list of state and federal ARARs can be found at Appendix I of the Feasibility Study.

Long-Term Effectiveness and Permanence
Alternative UI-SO-1 would provide the least long-term effectiveness because there would be no controls to limit exposure to contaminants in soil or waste. Alternative UI-SO-2 may not achieve long-term effectiveness and permanence because there is

no impermeable barrier layer as part of the cover system, making it likely that a release will occur from continued leaching, further erosion over time, and/or during a flood, up to 500-year event. Alternative UI-SO-3 is the most effective alternative in the long-term because all waste and soils exceeding PRGs would be excavated and placed under one of the on-site landfill caps.

Reduction of Toxicity, Mobility, or Volume through Treatment
None of the alternatives involve treatment processes, unless any soil/waste removed under Alternatives UI-SO-2 and UI-SO-3 requires treatment of any water removed from excavations or dewatering of excavated material before it is disposed of under one of the capped landfills.

Short Term Effectiveness
Alternative UI-SO-1 is the most effective at attaining short-term results with minimal risks because there will be no activities to implement and, therefore, no exposure risks to the community, workers, or the environment during implementation of the alternative.

Alternative UI-SO-2 will require limited activities (limited excavation, soil cover installation and maintenance) that will result in short-term exposure risks to workers, the community, or the environment, although these activities will be managed through engineering controls and worker training. Under Alternative UI-SO-3, potential risks to the community, workers, and/or the environment will increase compared to Alternative UI-SO-2 due to the anticipated larger and deeper excavation area. These potential risks will be managed through engineering controls and worker training.

Implementability
Alternative UI-SO-1 involves no implementation and no O&M. Although the implementation of each of the active alternatives (UI-SO-2 and UI-SO-3) is both technically and administratively feasible, the remedial technology is conventional and proven for these contaminants. However, both Alternatives UI-SO-2 and UI-SO-3 will be challenging because the location of the Unnamed Island will require a temporary bridge to move equipment and vehicles, and flooding could disrupt work or damage equipment. Alternative UI-SO-3 will be the most difficult alternative to implement because this alternative requires excavation below the water table. Alternative UI-SO-2 will involve the simplest technical implementation for the active remedy alternatives due to the shallower depth of excavation. In addition, due to the lower amount of material requiring excavation, uncertainty related to the seasonal construction and potential flooding of the Unnamed Island is significantly reduced. However, the reliability of the cover design for Alternative UI-SO-2 is questionable with respect to protectiveness during flood scenarios.

Alternative UI-SO-1 is likely to be administratively feasible, but most likely not accepted because there will be no controls on potential exposure pathways. Alternatives UI-SO-2 and UI-SO-3 are administratively feasible with the level of difficulty increasing respectively.

Costs
The most economical option is Alternative UI-SO-1, at no cost. Alternative UI-SO-2, estimated to cost $4,374,000, is the most economical of the active remedy alternatives; Alternative UI-SO-3 has a present worth cost estimate of $6,136,000. The capital costs presented for UI-SO-3 may increase based on additional information gathered with respect to waste depth, but these additional costs are expected to be within the margin of error expected in the FS stage. Note that there would be O&M and institutional control costs associated with maintenance of the cover in Alternative UI-SO-2, but no O&M and institutional control costs associated with waste and soil deposits remaining on the island in UI-SO-3, as they will have been removed.

State and Community Acceptance
Each will be evaluated once feedback is received during the public comment period.

4) Sediment Cleanup Alternatives (in Site Ponds) (SE)

- Alternative SE-1: No Action;
- Alternative SE-2: Remove/Consolidate Sediment Exceeding PRGs;
- **Alternative SE-3:** Remove/Consolidate Sediment (1 foot) with Subaqueous Cover where PRG Exceedances Remain, Institutional Controls; and
- Alternative SE-4: Subaqueous Cover (No Sediment Removal) with Institutional Controls.

Overall Protection of Human Health and the Environment
Alternative SE-1 will not include monitoring to evaluate changes in risks or determine if RAOs are ever met. Alternative SE-1 does not reduce the potential exposure pathways and is not protective of the environment. Alternatives SE-2, SE-3, and SE-4 achieve the RAOs for sediment and will provide overall protection of the environment. Alternative SE-2 will achieve the RAOs in the shortest period of time through removal of all sediments with contaminants exceeding PRGs, with on-site consolidation in one of the landfills to be capped. In contrast, Alternatives SE-3 and SE-4 will permanently require monitoring and maintenance of the subaqueous covers and institutional controls (necessary to protect the remedy) as long as the underlying sediment still poses a risk. Alternative SE-3 will be more protective of the environment than Alternative SE-4 because

contaminant mass in the top 1 foot of sediment will be removed and consolidated in one of the on-site landfills to be capped, as well as with covering any areas with deeper exceedances. Alternative SE-4 will cover sediments, but not actively reduce contaminant mass or volume.

Compliance with ARARs

Alternative SE-1 would not reduce existing contaminant concentrations below risk-based levels (as developed using To Be Considered guidance documents) in sediments or provide measures to eliminate or control potential exposure pathways associated with possible future use of the site and, therefore, does not meet ARARs. Alternatives SE-2 through SE-4 can all achieve these standards. Alternatives SE-2 through SE-4 would all be designed/implemented to comply with ARARs and TBC standards. Subaqueous covers included in Alternatives SE-3 and SE-4 would be engineered (through use of amendments, if necessary) to remain protective in the event of a flood, up to a 500-year event. In addition, EPA has determined that Alternative SE-3 is the LEDPA, because it provides the best balance of addressing contaminated sediment within and adjacent to wetlands and waterways with protecting wetland/aquatic resources. A complete list of state and federal ARARs and TBCs can be found at Appendix I of the Feasibility Study.

Long-Term Effectiveness and Permanence

Alternative SE-1 would provide the least long-term effectiveness because there would be no controls to limit exposure to contaminants in sediment. Alternative SE-4 would be more effective than Alternative SE-1 because a cover, periodic monitoring, O&M of the cover, institutional controls, and statutory review would be implemented to reduce potential exposure pathways.

Alternatives SE-2 and SE-3 would be more effective than Alternative SE-4 because sediment removal will be implemented to prevent potential exposure to contaminants in sediment. Alternative SE-3 will use a combination of excavation and covering to reduce potential exposure pathways and institutional controls to protect the cover. As part of Alternative SE-3, some impacted sediments will stay in place under the cover and require periodic monitoring and O&M of the cover, maintenance of institutional controls, and statutory review. Alternative SE-2 will excavate all sediments exceeding PRGs and provides the greatest permanence in the shortest timeframe. Alternative SE-2 also eliminates the need for further monitoring, O&M, institutional controls, and statutory review because all contaminated sediments that exceed PRGs will be fully removed. All of the alternatives may be impacted to a limited extent from upriver sources of contaminated sediments discussed in the Blackstone River Watershed TMDL report (February, 2013) for the foreseeable future.

Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative SE-1 will not involve treatment processes. Both Alternatives SE-2 and SE-3 may have limited treatment of water from the sediment dewatering process. In addition, the addition of any supplements to the cover material under Alternatives SE-3 and SE-4 may reduce the mobility of any contaminants that migrate into the cover material.

Short Term Effectiveness

Alternative SE-1 is the most effective at attaining short-term results with minimal risk, because there will be no activities to implement and, therefore, no additional exposure risks. Alternative SE-4 will require less intrusive activities (subaqueous cover periodic monitoring and maintenance) that will result in short-term exposure risks to workers, the community, and/or the environment, although these activities will be managed through engineering controls and worker training. However, there is also the potential for loss of ecological habitat in shallower zones when placing the cover without prior excavation. Under Alternative SE-3, potential risks to the community, workers, or the environment will increase compared to Alternative SE-4 due to the addition of excavation. These potential risks will be managed through engineering controls and worker training. The sediment excavation included as Alternative SE-2 may result in the greatest short-term exposure risks to workers (predominantly due to excavation and consolidation), but these potential risks will be managed through engineering controls and worker training. Alternative SE-2 may also result in the highest short-term exposure risks to the environment and community, because this alternative has the largest volume of sediment to be transported off of the Unnamed Island.

Implementability

Alternative SE-1 involves no implementation and no maintenance. Implementation of Alternatives SE-2, SE-3 and SE-4 are technically and administratively feasible, as the remedial technologies are conventional and proven for the site contaminants. Services and materials necessary for implementing the alternatives are readily available, although design studies will be performed to ascertain the stability and performance of the various cover options and treatability studies may be needed if amendments are to be used as part of any subaqueous cover (Alternatives SE-3 and SE-4). The longer duration required for the excavation under Alternative SE-2 increases risk to equipment and workers due to periodic flooding of the Unnamed Island while installation of subaqueous cover materials also extend the field operations. In addition, dewatering of the excavated sediment will most likely be required prior to consolida-

tion at the Nunes Parcel. Alternative SE-3 also requires excavation, as well as installation of a subaqueous cover, while Alternative SE-4 will include only a subaqueous cover. Alternatives SE-2, SE-3, and SE-4 will use conventional equipment that is readily available, but a temporary bridge will be required to move heavy equipment and trucks across the Blackstone River. Due to the difficulties of moving equipment and materials across a channel of the Blackstone River and the potential for flooding to disrupt work or damage equipment, the implementability of the alternatives is primarily affected by the level of uncertainty in the volume of material requiring transport and the duration of the remedy activities. Thus, Alternative SE-2 is the least implementable and Alternative SE-4 is the most implementable.

Costs
Alternative SE-1, with no cost, is the most economical option. Alternative SE-2 is the most costly alternative, with a present worth cost of $8,120,000 and the highest degree of cost uncertainty due to the potential for excavation beyond currently assumed horizontal and vertical extents. Alternative SE-3 at $5,804,000 has a higher capital cost than SE-4 (at $3,584,000) because of the removal of the uppermost sediment prior to placement of a subaqueous cover.

State and Community Acceptance
Each will be evaluated once feedback is received during the public comment period.

5) Groundwater (Site-wide)(GW)

- Alternative GW-1: No Action; and
- **Alternative GW-2:** Limited Action: Institutional Controls and Long-Term Monitoring.

Overall Protection of Human Health and the Environment
Alternative GW-1 is not protective because it does not address risks posed by contaminated groundwater within the OU. Alternative GW-1 will not provide measures to eliminate or control potential migration of contaminants in groundwater. Alternative GW-2 will achieve the RAOs identified for groundwater once ICs are established and a groundwater monitoring plan is implemented. Alternative GW-2 is protective of human health and the environment by limiting potential exposure pathways through the implementation of institutional controls and by ensuring contaminated groundwater from the Site does not migrate beyond the compliance boundary for the waste management area or into the river at levels which would exceed performance standards identified in the ROD.

Compliance with ARARs
Alternative GW-1 does not meet ARARs or risk-based standards for addressing contaminated groundwater because no action would be taken to control potential exposure pathways or address contaminant concentrations in groundwater consistent with the requirements of the Safe Drinking Water Act Maximum Contaminant Levels and the Rhode Island Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases. Alternative G2-2 meets all ARARs requirements through ICs and long-term monitoring. ARARs and risk-based Performance Standards will be used to ensure that groundwater contamination is not migrating beyond the compliance boundary for the waste management area or into the river at levels which would exceed performance standards to be identified in the ROD. A complete list of state and federal ARARs can be found at Appendix I of the Feasibility Study.

Long-Term Effectiveness and Permanence
Alternative GW-1 would provide the least long-term effectiveness because there would be no controls to limit potential exposure to contaminants in groundwater or monitoring to indicate when PRGs have been reached. Alternative GW-2 will be more effective than Alternative GW-1 because institutional controls will limit potential exposure to contaminants in groundwater and site-wide groundwater monitoring will verify when Performance Standards are being maintained.

Reduction of Toxicity, Mobility, or Volume through Treatment
Neither of the alternatives involves treatment processes.

Short Term Effectiveness
Alternative GW-1 is the most effective at attaining short-term results with minimal risks, as there would not be any activities to implement and, therefore, no potential exposure risks. Alternative GW-2 would permanently require limited activities (long-term monitoring), which would result in minor short-term exposure risks to workers, the community, or the environment. These activities would be managed through engineering controls and worker training.

Implementability
Alternative GW-1 requires no implementation and involves no O&M. Alternative GW-2 is also highly implementable although there may be administrative impediments with establishing ICs on buffer zone properties surrounding the OU, if required.

Alternative GW-1 is unlikely to be administratively feasible because there will be no controls on potential exposure pathways or monitoring of contaminant concentrations in groundwater. Alternative GW-2 is administratively feasible because institutional controls can be

WHY EPA RECOMMENDS THIS CLEANUP PROPOSAL

Based on the results of the RI and human health and ecological risk evaluations, EPA has prepared the FS and Administrative Record and recommends this cleanup plan for Operable Unit 2 of the Peterson/Puritan, Inc. Superfund Site. EPA believes this plan achieves the best balance among EPA's criteria used to evaluate various alternatives. The Proposed Plan also meets the Remedial Action Objectives as outlined herein. In addition, EPA has determined that each alternative (as combined) is the Least Environmentally Damaging Practicable Alternative, because it provides the best balance of addressing contaminated soil/sediment/debris within and adjacent to wetlands and waterways with minimizing both temporary and permanent alteration of wetlands and aquatic habitats on site. EPA has also made a draft finding that the proposed cleanup plan will meet risk-based protectiveness requirements for the remediation of PCBs under federal Toxic Substances Control Act regulations. Further details can be found in FS and the Administrative Record. In summary, the combined alternatives for the five areas of OU 2 are as follows:

• Both the J.M. Mills Landfill and the Nunes Parcel contain waste deposits (including hazardous waste) and were operated for a time as a single landfill Facility where similar contamination from these combined landfill operations came to be located within the immediate floodplain of the river corridor. Therefore, using a presumptive containment approach, EPA is proposing Alternative JM-SO-2 (for the J. M. Mills Landfill) and the Alternative NP-SO-3 (for the Nunes Parcel) to construct protective caps meeting RCRA Subtitle C standards for containment of the buried waste located in both source areas. Moreover, contaminated soils and sediments along the floodplain and debris fields associated with these areas will be consolidated under the protective cap(s). Restoration of the river bank and any wetlands that will be altered will also be accomplished. The caps must be constructed to protect against floods, up to a 500-year event; replace any lost flood storage capacity; and effectively manage stormwater runoff. Landfill gas and leachate controls will be engineered to meet cleanup objectives and long-term monitoring of groundwater, surface water, landfill gas, and leachate, coupled with operation and maintenance tasks (cap repairs, mowing, etc.) will be implemented. Institutional controls will be established and enforce to prevent disturbance of the remedy. Lastly, structures on the Nunes Parcel will be removed to accommodate the cap construction. Taken together, this option meets the threshold criteria (protective of human health and environment over the long term and meets ARARs), and is effective and implementable.

• For the Unnamed Island, Alternative UI-SO-3 is proposed because all waste and contaminated soil will be removed to permanently address the contaminants in the waste/soil deposits posing risk. Restoration of the riparian habitat and any wetlands that will be altered will also be accomplished. The mobility of contaminants in soil and waste will further be reduced over the long term by consolidation under an on-site RCRA C cap(s).

• Alternative SE-3 for Unnamed Island pond sediments requires further sediment profiling during design to ascertain final dredging depths and volume estimates. It is also important to note that if the difference in dredged volume is relatively small, additional dredging may reduce or potentially eliminate the need for a subaqueous cover and future maintenance of this applied cover. Otherwise, by removing a portion of the contaminated sediments and disposing of this material under an on-site RCRA Subtitle C cap(s) and installing a protective cover over the remaining contaminated sediment, the Alternative provides the best balance of addressing contaminated sediment within and adjacent to wetlands and waterways with minimizing both temporary and permanent alteration of wetlands and aquatic habitats on site. By removing and controlling contaminated sediment (and also capping the adjacent landfills), sediment PRGs will be achieved, and water quality designated uses, including aquatic life support for the Unnamed Island Ponds, will be improved.

• In addition, Alternative GW-2 for site-wide groundwater consists of institutional controls to ensure no human exposure to contaminated groundwater occurs. Alternative GW-2 also includes long-term monitoring to ensure there is no migration of contaminated groundwater from the Site, either beyond the compliance boundary for the waste management area or into the river, at levels which would exceed performance standards identified in the ROD occurs.

The Proposed Plan is protective, in the short-term and in the long-term, of human health and the environment while, at the same time, is cost effective. This cleanup attains federal and state applicable or relevant and appropriate requirements; utilizes permanent solutions; and uses institutional controls where practical to prevent unacceptable exposures in the future to all wastes that will be contained on-site. It does not encompass treatment, except to a very limited extent, due to Site limitations and the nature of the contamination being addressed. EPA has consulted with RIDEM regarding this Proposed Plan, and EPA believes that RIDEM will support this proposal.

established and maintainedand groundwater concentrations will be monitored.

Costs
Alternative GW-1, with no cost, is the most economical option. Alternative GW-2, estimated to cost $671,000, is still economical, with monitoring costs spread over 30 years.

State and Community Acceptance
Each will be evaluated once feedback is received during the public comment period.

FOR MORE INFORMATION

The Administrative Record, which includes all documents that EPA has considered or relied upon in proposing this cleanup plan for the 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

Cumberland Public Library
1464 Diamond Hill Road
Cumberland, RI 02864
(401) 333-2552

Lincoln Public Library
145 Old River Road
Lincoln, RI 02865
(401) 333-2422

Information is also available for review online at:
www.epa.gov/region1/superfund/sites/peterson

Additional assistance in review of this Plan may be obtained from the Blackstone River Watershed Council/Friends of the Blackstone River (BRWC/FOB), a Technical Assistance Grant (TAG) recipient. The purpose of the TAG is to help the citizens interpret the technical information regarding the Site cleanup. For further community resource assistance, contact Sarah White, EPA Community Involvement Coordinator, (617) 918-1026 or by email at white.sarah@epa.gov.

WHAT IS A FORMAL COMMENT?

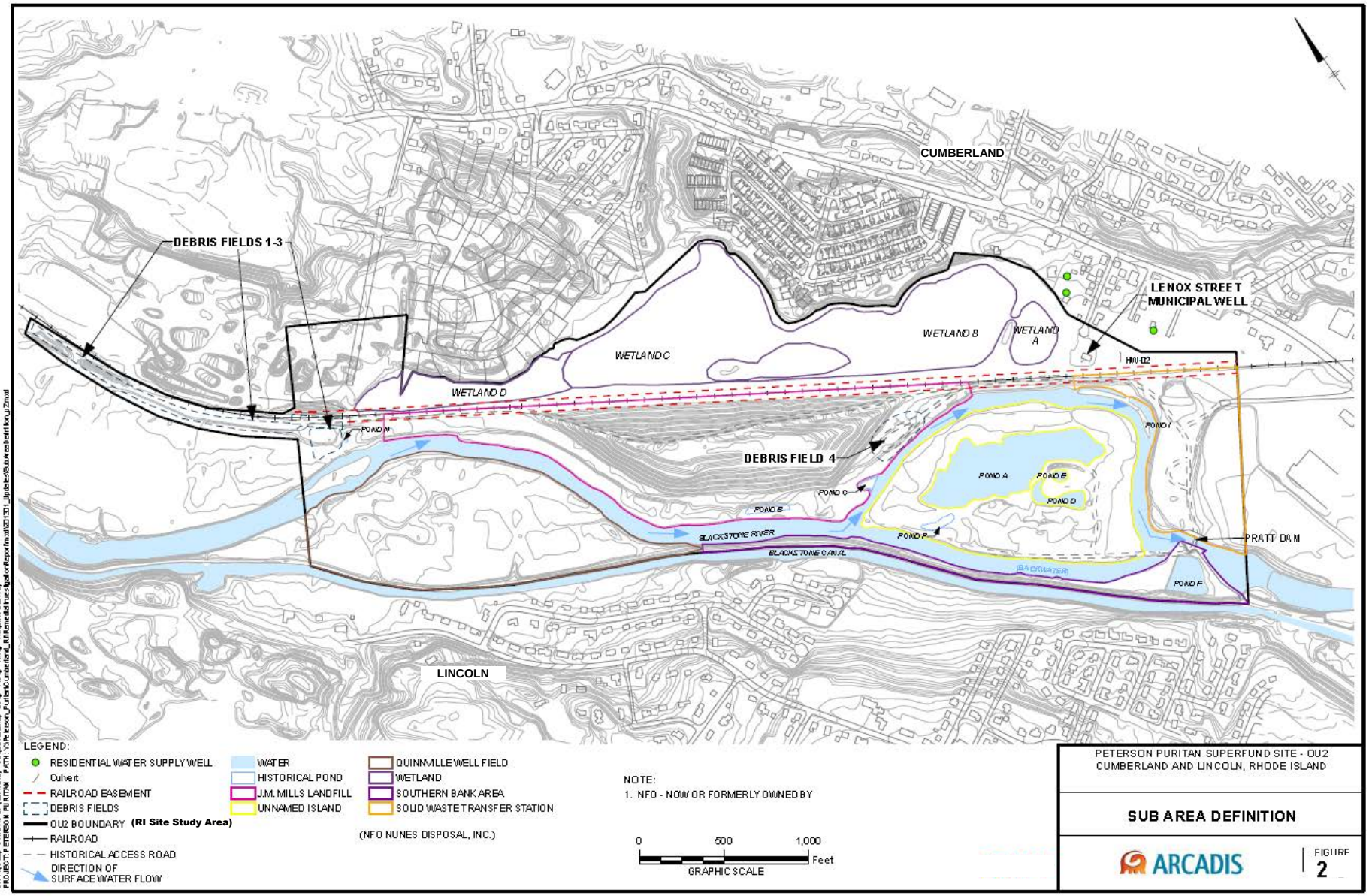
This Proposed Plan has been prepared in accordance with EPA's statutory and regulatory responsibilities. See 40 C.F.R. 300.430(f)(2). This Proposed Plan meets the public participation requirements under CERCLA delineated in the National Contingency Plan. See 40 C.F.R. 300.43S(c)(2)(ii).

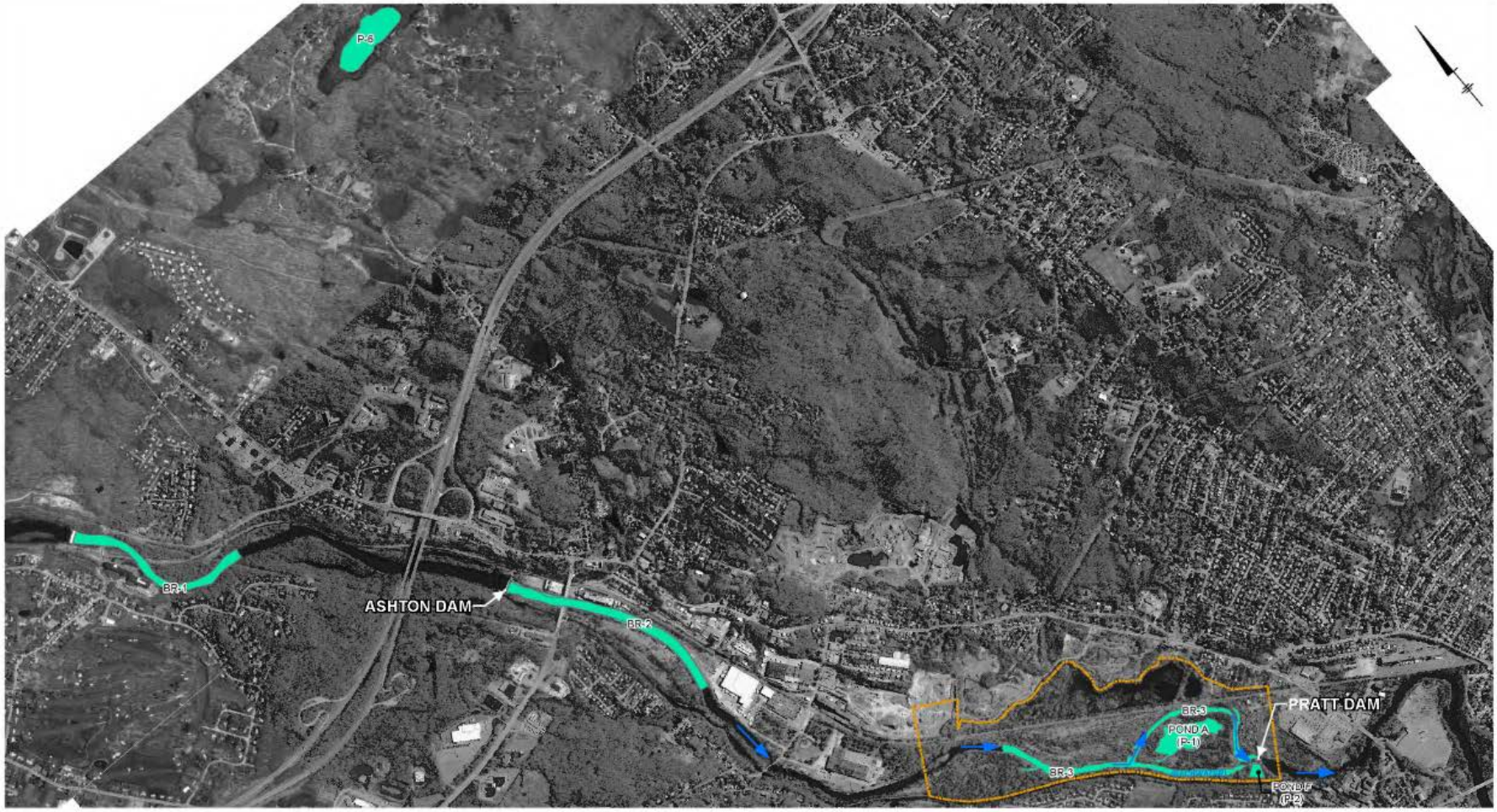
EPA will accept public comments during a 30-day formal comment period. EPA considers and uses the comments received to improve its cleanup approach. During the formal comment period, EPA will accept written comments via mail, email, and fax. EPA will hold an informational meeting around the start of the formal public comment period on insert date. Additionally, verbal comments may be made during the formal Public Hearing on insert date during which a stenographer will record all comments offered during the hearing. EPA will not respond to your comments at the formal Public Hearing.EPA will review the transcript of all formal comments received at the hearing, 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 Cumberland and Lincoln Town Libraries and at the EPA Records Center. EPA will announce the final decision on the cleanup plan through the local media and via EPA's website. To comment, see below, "Send Us Your Comments"

SEND US YOUR COMMENTS

Provide EPA with your written comments about the Proposed Plan for the Peterson/Puritan, Inc. Superfund Site OU 2. Please email (newton.dave@epa.gov), fax (617-918-0243), or mail comments postmarked no later than **Monday, September 8, 2014** to:

David J. Newton, RPM
NH/RI Superfund Section
U.S. EPA Region 1
5 Post Office Square, Suite 100
Mail Code OSRR07-1
Boston, MA 02109-3912
newton.dave@epa.gov


CUMBERLAND
LINCOLN
DEBRIS FIELDS 1-3
DEBRIS FIELD 4
LENOX STREET MUNICIPAL WELL
WETLAND A
WETLAND B
WETLAND C
WETLAND D
HW-02
POND N
POND I
POND A
POND E
POND D
POND C
POND B
POND P
POND F
BLACKSTONE RIVER
BLACKSTONE CANAL
(BA DRAINAGE)
PRATT DAM
LEGEND:
RESIDENTIAL WATER SUPPLY WELL
Culvert
RAILROAD EASEMENT
DEBRIS FIELDS
OU2 BOUNDARY (RI Site Study Area)
RAILROAD
HISTORICAL ACCESS ROAD
DIRECTION OF SURFACE WATER FLOW
WATER
HISTORICAL POND
J.M. MILLS LANDFILL
UNNAMED ISLAND
QUINNVILLE WELL FIELD
WETLAND
SOUTHERN BANK AREA
SOLID WASTE TRANSFER STATION
(NFO NUNES DISPOSAL, INC.)
NOTE:
1. NFO - NOW OR FORMERLY OWNED BY
0
500
1,000
Feet
GRAPHIC SCALE
PETERSON PURITAN SUPERFUND SITE - OU2
CUMBERLAND AND LINCOLN, RHODE ISLAND
SUB AREA DEFINITION
ARCADIS
FIGURE
2



NOTES:

1. 1997 AERIAL PHOTOGRAPH OBTAINED FROM THE UNIVERSITY OF RHODE ISLAND'S DIGITAL IMAGERY SERVER (HTTP://ORTHO.EDC.URI.EDU/). 2002 AERIAL PHOTO OBTAINED FROM RHODE ISLAND GEOGRAPHIC INFORMATION SYSTEM: HTTP://WWW.EDC.URI.EDU/RIGIS/

2. SAMPLE LOCATIONS NAMED USING THE FOLLOWING DESIGNATION:
   <WATER BODY>-<SAMPLE NUMBER>
   EX. BR-1 FISH SAMPLE LOCATION ONE (1) COLLECTION FROM THE BLACKSTONE RIVER (BR)

3. SAMPLE LOCATIONS RECORDED IN THE FIELD USING GPS.

LEGEND:

- FISH COMMUNITY SURVEY AND FISH TISSUE SAMPLE LOCATIONS
- OU2 BOUNDARY (RI Site Study Area)
- DIRECTION OF SURFACE WATER FLOW

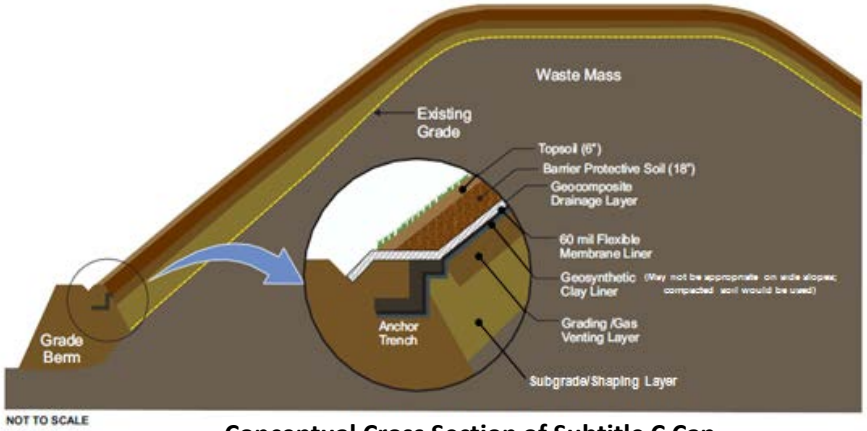
0 1,500 3,000 Feet
GRAPHIC SCALE

PETERSON PURITAN SUPERFUND SITE - OU2
CUMBERLAND AND LINCOLN, RHODE ISLAND
REMEDIAL INVESTIGATION REPORT

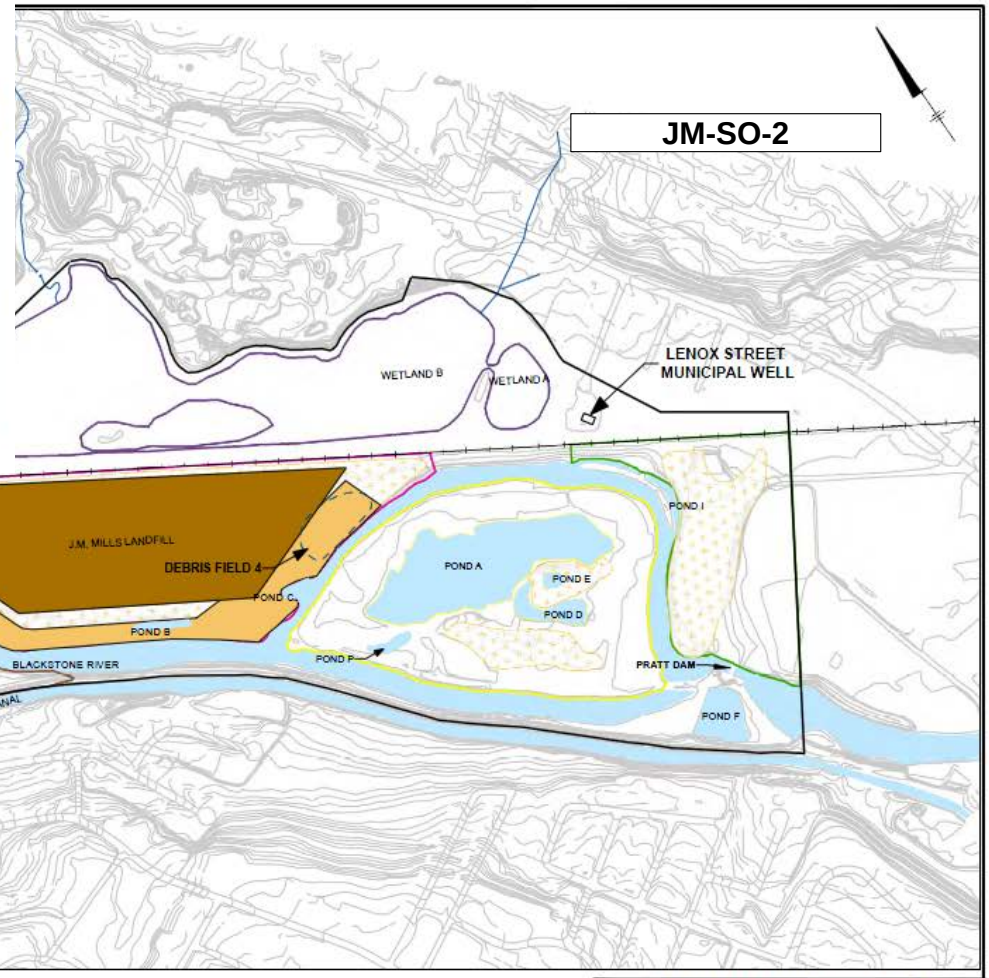
FISH COMMUNITY SURVEY AND FISH TISSUE SAMPLE LOCATIONS

ARCADIS BBL

FIGURE
3



Conceptual Cross Section of Subtitle C Cap



Legend

- OU2 BOUNDARY (RI Site Study Area)
- SURFACE WATER
- APPROXIMATE EXTENT OF SOIL EXCAVATION
- **APPROXIMATE EXTENT OF RCRA SUBTITLE C CAP**
- BURIED WASTE
- RAILROAD
- J.M. MILLS LANDFILL
- UNNAMED ISLAND
- QUINNVILLE WELL FIELD
- WETLAND
- SOLID WASTE TRANSFER STATION (NOW OR FORMERLY OWNED BY NUNES DISPOSAL, INC.)
- SEEP

0 500 1,000
SCALE IN FEET

NOTES:
1) BURIED WASTE AND DEBRIS FIELDS CURRENTLY OUTSIDE THE BOUNDARY OF THE PROPOSED COVER WILL BE CONSOLIDATED UNDER THE PROPOSED COVER.
2) THE APPROXIMATE AREA OF THE LANDFILL COVER IS 21 ACRES.

Soils to be excavated – approximately 10 acres at a depth of 2 ft, resulting in approximately 33,000 cy

PETERSON PURITAN SUPERFUND SITE - OU2
CUMBERLAND AND LINCOLN, RHODE ISLAND

J.M. MILLS LANDFILL SOIL REMOVAL
and Subtitle C Cap

ARCADIS

FIGURE
4

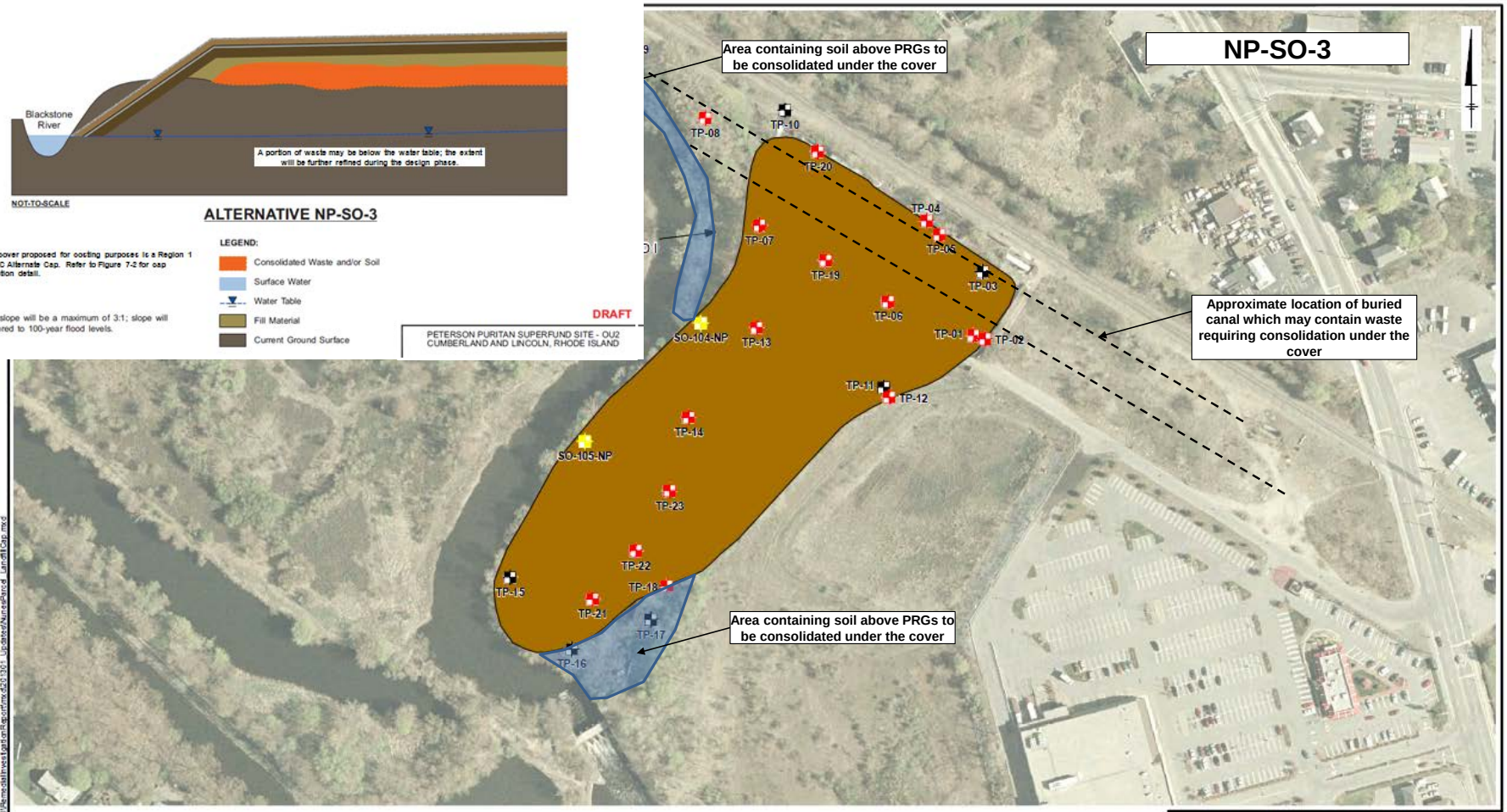
ALTERNATIVE NP-SO-3

NOTES:
1. Landfill cover proposed for costing purposes is a Region 1 Subtitle C Alternate Cap. Refer to Figure 7-2 for cap construction detail.
2. Landfill slope will be a maximum of 3:1; slope will be armored to 100-year flood levels.

LEGEND:
- Consolidated Waste and/or Soil
- Surface Water
- Water Table
- Fill Material
- Current Ground Surface

DRAFT

PETERSON PURITAN SUPERFUND SITE - OU2
CUMBERLAND AND LINCOLN, RHODE ISLAND



LEGEND:
- TEST PIT LOCATION - SAMPLE(S) COLLECTED
- TEST PIT LOCATION - NO SAMPLES COLLECTED
- SOIL BORING LOCATION - HAND AUGERED (UNABLE TO EXCAVATE TEST PIT)
- APPROXIMATE EXTENT OF LANDFILL COVER

Additional soil/sediment to be excavated – approximately 1 acre at a depth of 2 ft, resulting in approximately 3,500 cy

NOTE:
1) 2002 AERIAL PHOTO OBTAINED FROM RHODE ISLAND GEOGRAPHIC INFORMATION SYSTEM: http://www.edc.uri.edu/rigis/
2) THE APPROXIMATE AREA OF THE PROPOSED COVER IS 6.28 ACRES.
3) SEDIMENT FROM POND I MAY BE CONSOLIDATED UNDER THE COVER.

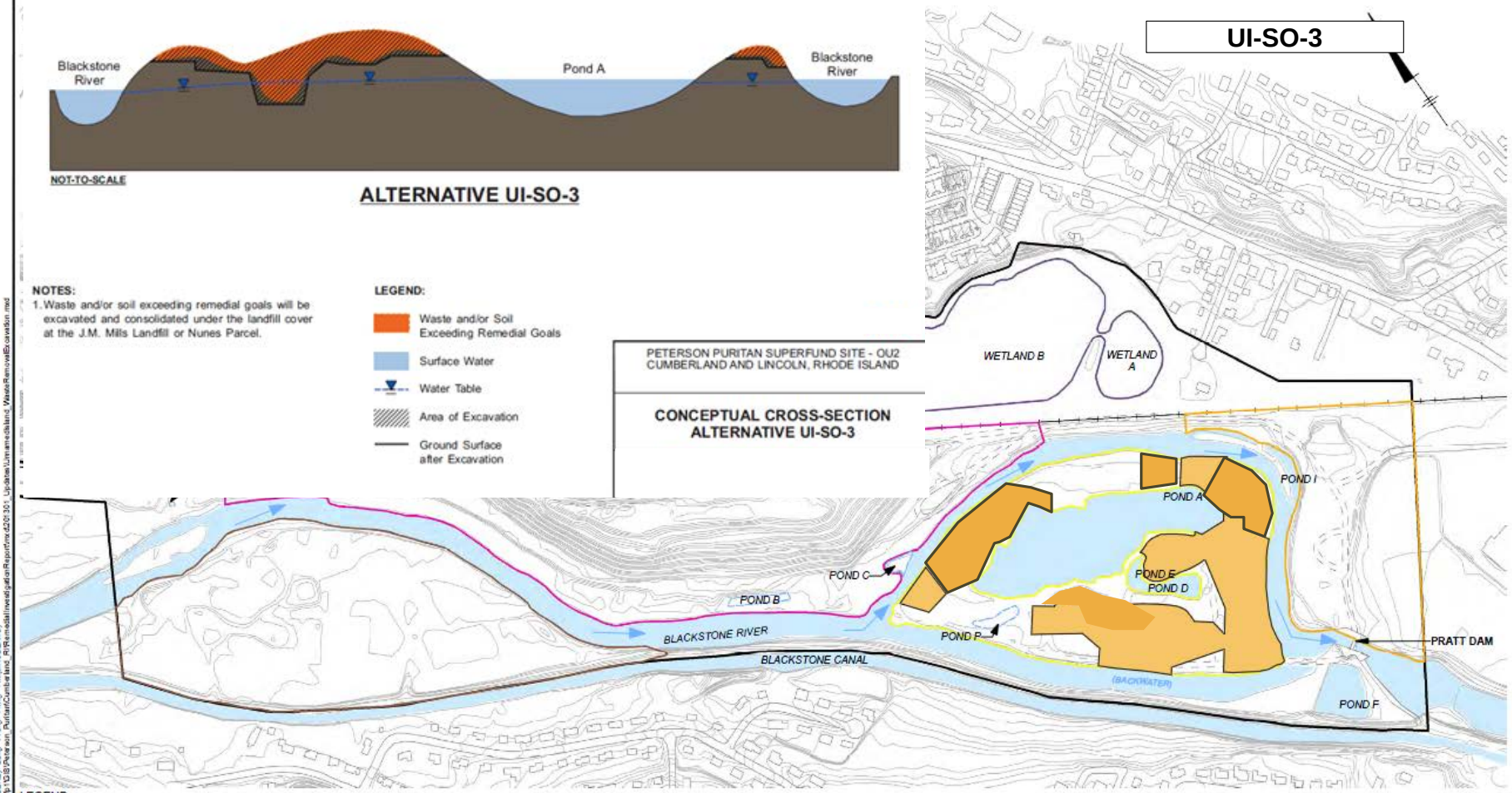
0 150 300 Feet
GRAPHIC SCALE

PETERSON PURITAN SUPERFUND SITE - OU2
CUMBERLAND AND LINCOLN, RHODE ISLAND

NUNES PARCEL LANDFILL CAP LOCATION

ARCADIS

FIGURE 5



LEGEND:

- APPROXIMATE EXTENT OF SOIL EXCAVATION AND WASTE REMOVAL
- HISTORICAL POND
- J.M. MILLS LANDFILL
- UNNAMED ISLAND
- QUINNVILLE WELL FIELD
- WETLAND
- SOLID WASTE TRANSFER STATION (NFO NUNES DISPOSAL, INC.)
- RAILROAD
- OU2 BOUNDARY (RI Site Study Area)
- HISTORICAL ACCESS ROAD
- WATER
- BURIED WASTE

0 400 800 Feet
GRAPHIC SCALE

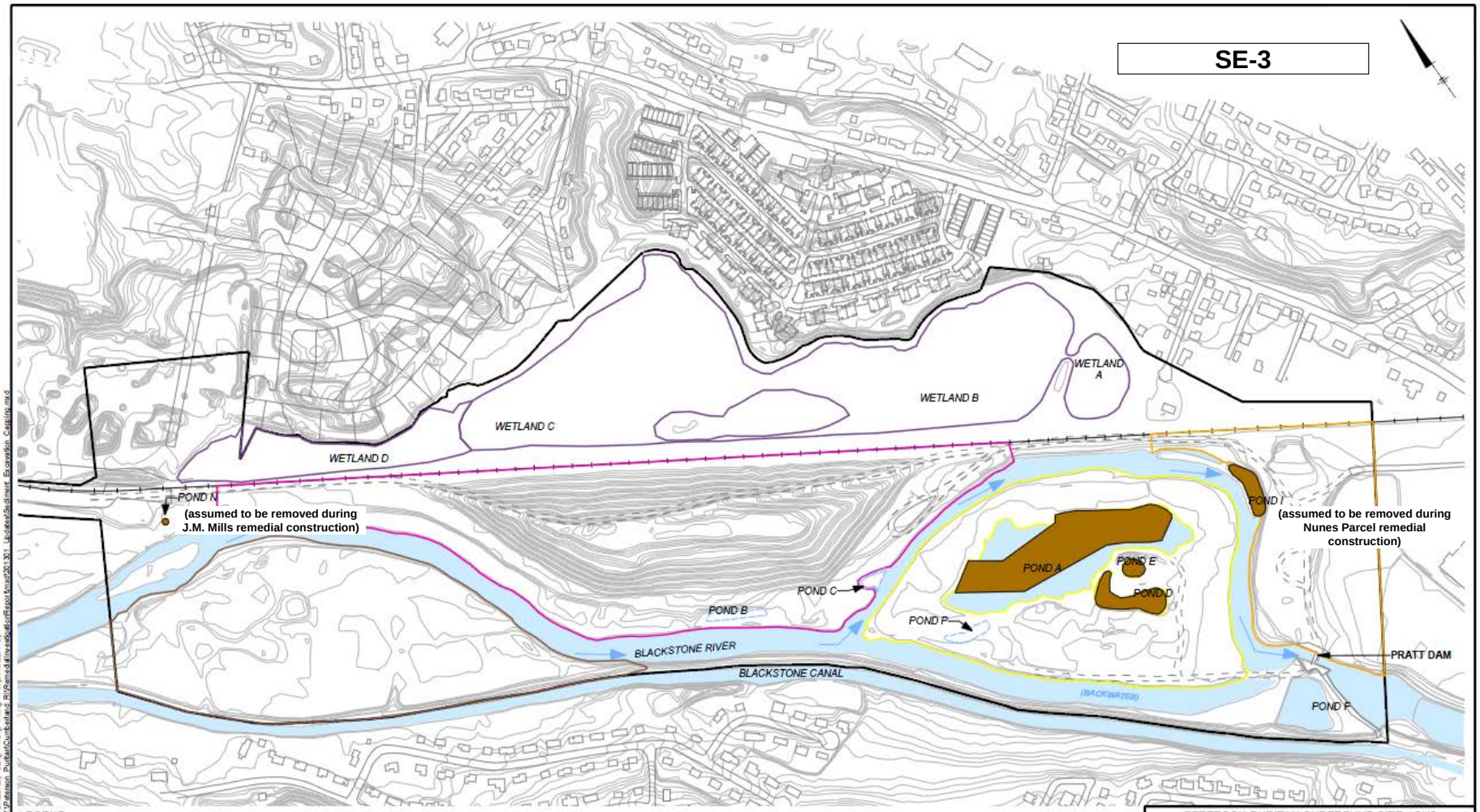
Waste to be excavated – assumed to be approximately 44,000 cy
Soils to be excavated – approximately 13 acres at
an average depth of 3 ft, resulting in approximately 62,000 cy

PETERSON PURITAN SUPERFUND SITE - OU2
CUMBERLAND AND LINCOLN, RHODE ISLAND

UNNAMED ISLAND SOIL EXCAVATION AND WASTE REMOVAL LOCATIONS

ARCADIS

FIGURE 6



LEGEND:

- HISTORICAL POND
- OU2 BOUNDARY (RI Site Study Area)
- RAILROAD
- HISTORICAL ACCESS ROAD
- DIRECTION OF SURFACE WATER FLOW
- WATER
- J.M. MILLS LANDFILL
- UNNAMED ISLAND
- QUINNVILLE WELL FIELD
- WETLAND
- SOLID WASTE TRANSFER STATION (NFO NUNES DISPOSAL, INC.)
- APPROXIMATE EXTENT OF SEDIMENT EXCAVATION (0-1 FT) AND COVERING AS NEEDED

0 400 800 Feet
GRAPHIC SCALE

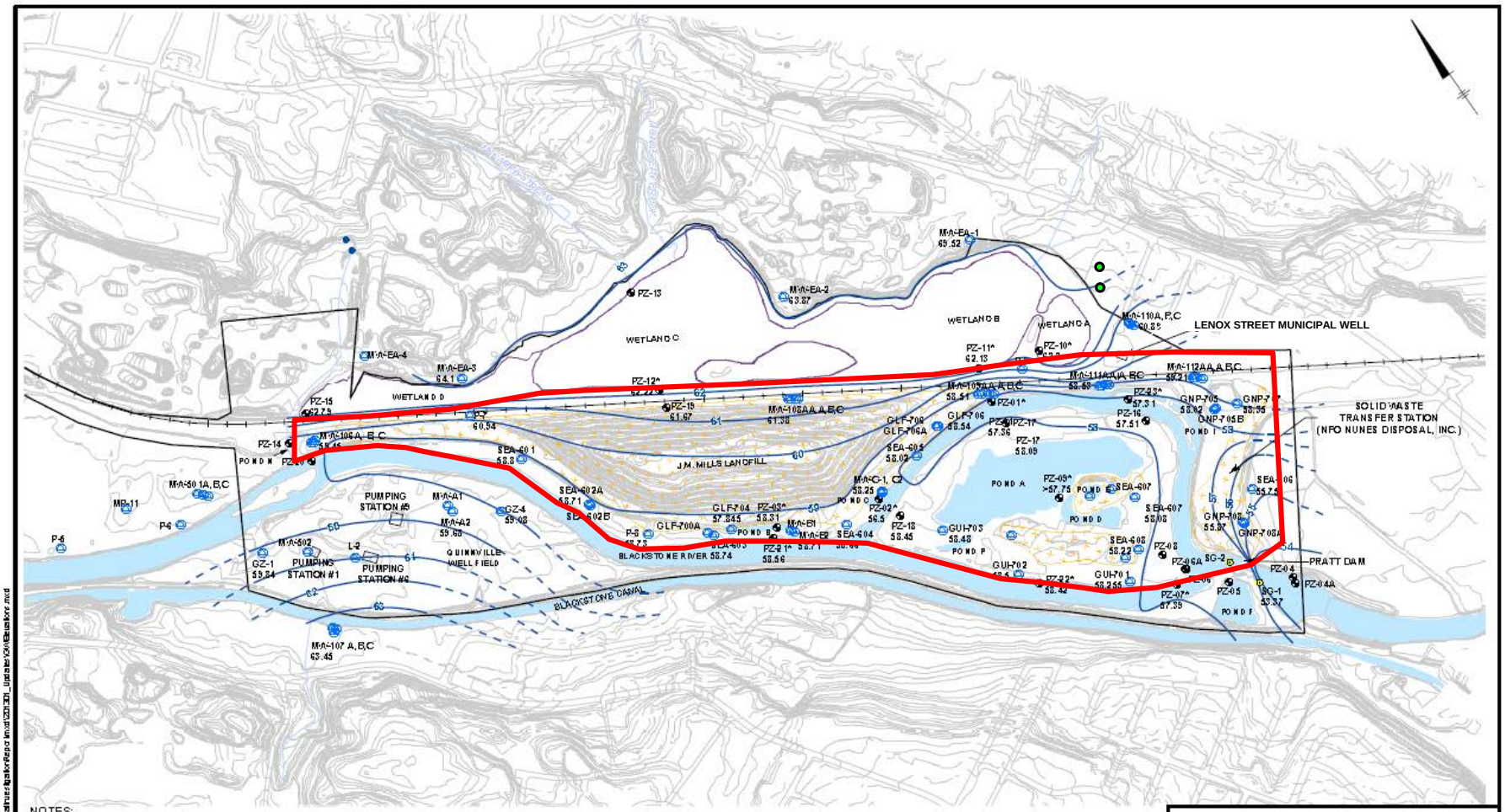
NOTES:
1) THE APPROXIMATE AREA TO BE EXCAVATED AND/OR COVERED IS 5.4 ACRES.
2) EXCAVATED MATERIAL WILL BE CONSOLIDATED UNDER THE J.M. MILLS OR NUNES PARCEL COVER.

PETERSON PURITAN SUPERFUND SITE - OU2
CUMBERLAND AND LINCOLN, RHODE ISLAND

SEDIMENT EXCAVATION AND/OR SUBAQUEOUS COVER LOCATIONS

ARCADIS

FIGURE 7



NOTES:

1) NFO - NOW OR FORMERLY OWNED BY
2) GROUNDWATER ELEVATIONS OBTAINED ON 11/28/05.
3) * WATER ELEVATION REPRESENTS THE SURFACE WATER ELEVATION. THE MEASURMENTS WERE TAKEN FROM OUTSIDE THE PIEZOMETER CASING.
4) PZ-2 WAS NOT USED IN CONTOURING DUE TO AN ANOMALOUS READING.
5) STANDING WATER AT PZ-15 IS INTERPRETED TO BE PERCHED (67.17'). VALUE SHOWN IS LEVEL INSIDE PIEZOMETER.

LEGEND:

- MONITORING WELL
- PIEZOMETER/STAFF GAUGE
- STAFF GAUGE
- SEEPS
- GROUNDWATER CONTOUR
- INFERRED GROUNDWATER CONTOUR
- OU2 BOUNDARY (RI Site Study Area)
- RESIDENTIAL WATER SUPPLY WELLS
- BURIED WASTE
- WETLAND
- SURFACE WATER
- Proposed Groundwater Compliance Boundary

PETERSON PURITAN SUPERFUND SITE - OU2
CUMBERLAND AND LINCOLN, RHODE ISLAND

PROPOSED GROUNDWATER COMPLIANCE BOUNDARY

ARCADIS

FIGURE **8**

TABLE 2: Human Health Risk Summary

Exposure Point	Scenario/ Receptor	Exposure Media	Exposure Pathway(s)	RME or CT	Total Cancer Risks	Total Noncancer Risks	Media > 1E-04 or HI > 1	Major contributors to risk (> 1E-06, HI > 1)
OU2	Current/Future Young Child/Adult Rec. User	Fish Tissue (Fillet)	Ingestion	RME CT	**2E-04** 4E-05	**1E+01** **8E+00**	Fish Tissue	(C) - PAHs, PCBs, pesticides, arsenic (NC) - PCBs
BR-1	Current/Future Young Child/Adult Rec. User	Fish Tissue (Fillet)	Ingestion	RME CT	**2E-04** 3E-05	**1E+01** **6E+00**	Fish Tissue	(C) - PAHs, PCBs, pesticides, arsenic (NC) – PCBs
BR-2	Current/Future Young Child/Adult Rec. User	Fish Tissue (Fillet)	Ingestion	RME CT	**3E-04** 6E-05	**2E+01** **1E+01**	Fish Tissue	(C) - PAHs, PCBs, dieldrin, arsenic (NC) – PCBs
P-6	Current/Future Young Child/Adult Rec. User	Fish Tissue (Fillet)	Ingestion	RME CT	5E-05 1E-05	**4E+00** 2E+00	Fish Tissue	(NC) - PCBs, mercury
On-site Monitoring Wells	Future Young Child/Adult Resident	groundwater	Ingestion, Dermal contact, Inhalation	RME CT	**7E-03** 1E-04	**2E+02** **1E+01**	groundwater	(C) – VOCs, SVOCs (incl. PAHs), PCBs, pesticides, arsenic (NC) - naphthalene, benzene, PCBs, aluminum, arsenic, cadmium, cobalt, iron, manganese, thallium
Nunes Parcel	Future Adult Commercial Worker	surface + subsurface soil, indoor air (vapor intrusion)	Ingestion, Dermal contact, Inhalation	RME CT	**2E-04** 5E-05	2E+00 2E+00	Soil, indoor air	(C) – VOCs, SVOCs (incl. PAHs), dieldrin, dioxin, arsenic
Nunes Parcel	Future Young Child/Adult Resident	surface + subsurface soil, indoor air (vapor intrusion)	Ingestion, Dermal contact, Inhalation	RME CT	**1E-03** **5E-04**	**1E+01** **7E+00**	soil	(C) – VOCs, SVOCs (incl. PAHs), PCBs, dieldrin, dioxin, arsenic (NC) – benzene

Notes
Bolded values exceed a cancer risk of 1E-04 or a target organ HI of 1.

HI - Hazard Index
RME - Reasonable Maximum Exposure
CT - Central Tendency Exposure

(C) - Carcinogenic Risk
(NC) - Noncarcinogenic Risk
NE - Not Evaluated
N/A - Not Applicable

Lead Exposures: For the scenarios evaluated, the estimated probabilities that modeled blood lead levels (BLLs) would exceed the target BLL of 10 ug/dL were below the EPA threshold probability of 5% for all cases except a construction worker exposed to soil at the Nunes Parcel/RIDEM Soil Removal Area.

TABLE 3

HUMAN HEALTH PRELIMINARY REMEDIATION GOALS (PRGs) FOR SOIL[1]

Contaminant	Selected PRG (mg/kg)	Basis[2]
Benzene[3]	0.0012	ILCR = 10^{-6}
Benzo(a)anthracene	0.9	Res. DEC
Benzo(a)pyrene	0.30	Reference
Benzo(b)fluoranthene	0.9	Res. DEC
Benzo(g,h,i)perylene	0.8	Res. DEC
Benzo(k)fluoranthene	0.9	Res. DEC
bis(2-Ethylhexyl)phthalate	46	Res. DEC
Chrysene	0.4	Res. DEC
Dibenz(a,h)anthracene[4]	0.21 / 0.4	ILCR = 10^{-6} / Res. DEC
Fluoranthene	20	Res. DEC
Indeno(1,2,3-cd)pyrene	0.9	Res. DEC
Naphthalene[3]	0.13	ILCR = 10^{-6}
Pyrene	13	Res. DEC
Chlordane	0.5	Res. DEC
Dioxin TEQ[3]	0.000023	Reference
PCBs	10	Res. DEC
Dieldrin	0.04	Res. DEC
Antimony	10	Res. DEC
Arsenic	5.1	Reference
Beryllium	1.5	Res. DEC
Lead	150	Res. DEC
Manganese	390	Res. DEC
Thallium	5.5	Res. DEC

Notes

1. Cleanup goals were not developed for undetected contaminants where the laboratory detection limits were in excess of ARARs. Additional sampling will be performed during the design phase using analytical methods capable of measuring concentrations at levels below the ARARs. These data will be evaluated to assess impacts, if any, to the proposed cleanup goals. In addition, all numeric criteria included in ARARs identified for the site must also be met by the cleanup regardless of whether or not they are identified above except where reference is an issue.

2. See Appendix C.6 of the FS for PRG development and basis:
   Res. DEC - RIDEM Remediation Regulations, DEM-DSR-01-93, February 2004, Table 1 (Residential Direct Exposure Criteria [DEC]); RIDEM utilizes Residential DECs for evaluation of Recreational User exposures
   Reference - If RIDEM criteria or risk-based PRGs were below reference concentrations for the site, the reference concentration was selected.
   ILCR - Incremental Lifetime Cancer Risk

3. PRGs developed for benzene, naphthalene, and dioxin are applicable only at Nunes Parcel based on exceedance of risk criteria for a commercial worker.

4. The risk-based PRG developed for dibenz(a,h)anthracene (0.21 mg/kg) is applicable only at Nunes Parcel based on exceedance of risk criteria for a commercial worker. The Residential DEC (0.4 mg/kg) is applicable to the rest of the site.

ARAR - Applicable or Relevant and Appropriate Requirement

TABLE 4

ECOLOGICAL PRGs FOR SOIL

Area	COC	Recommended PRG (mg/kg)
J.M. Mills Landfill (small omnivorous birds)	Cadmium (Cd)	3.93
Unnamed Island (small omnivorous birds)	Lead (Pb)	161
	BEHP	6.2

Notes
COC - Contaminant of Concern
PRG - Preliminary Remediation Goal
BEHP - bis(2-ethylhexyl)phthalate

TABLE 5

ECOLOGICAL PRGs FOR SEDIMENT

Area	Contaminant	PRG (mg/kg)	PRG Basis
Ponds on the Unnamed Island			
Ponds A, D, and E	Cadmium (Cd)	9.8	Reference - No Effects
	Chromium (Cr)	120	Reference - No Effects
	Copper (Cu)	160	Reference - No Effects
	Lead (Pb)	300	Reference - No Effects
	Zinc (Zn)	490	Reference - No Effects
	Total PAHs	18	Reference - No Effects
Ponds Adjacent to the Blackstone River			
Pond I	Cadmium (Cd)	9.8	Reference - No Effects
	Chromium (Cr)	120	Reference - No Effects
	Copper (Cu)	160	Reference - No Effects
	Total PAHs	18	Reference - No Effects
Pond N	Cadmium (Cd)	9.8	Reference - No Effects

Notes

PRG - Preliminary Remediation Goal
PAHs - Polycyclic aromatic hydrocarbons