

DRAFT
REMEDIAL ACTION WORK PLAN

PHASE I SOIL CAPPING: PARCEL D
FORMER GORHAM MANUFACTURING FACILITY
333 ADELAIDE AVENUE
PROVIDENCE, RHODE ISLAND

FEBRUARY 2012



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ACRONYMS

ABB-ES	ABB Environmental Services
AMEC	AMEC Environment & Infrastructure, Inc.
COPC	Constituents of Potential Concern
1,2-DCE	1,2-dichloroethene
ELUR	Environmental Land Usage Restriction
HLA	Harding Lawson Associates
LOW	Limit of Work
MACTEC	MACTEC Engineering and Consulting, Inc.
µg/kg	Micrograms per Kilogram
mg/m ³	Milligrams per Cubic Meter
OSHA	Occupational Safety and Health Administration
PA	Preliminary Assessment
PAH	Polynuclear Aromatic Hydrocarbons
PCE	Tetrachloroethene
PEL	Permissible Exposure Limit
PNOC	Particulates Not Otherwise Characterized
PRA	Providence Redevelopment Agency
RAWP	Remedial Action Work Plan
RDEC	Residential Direct Exposure Criteria
RIDEM	Rhode Island Department of Environmental Management
SI	Site Inspection
SMP	Soil Management Plan
SPLP	Synthetic Precipitation Leaching Procedure
SSIR	Supplemental Site Investigation Report
SVOCs	Semi-volatile Organic Compounds
1,1,1-TCA	1,1,1-trichloroethane
TCE	Trichloroethene
TEQ	Toxic Equivalence
TEXTRON	Textron, Inc.
TPH	Total Petroleum Hydrocarbons
TSDF	Treatment Storage and/or Disposal Facility

TEXTRON, INC.
FORMER GORHAM MANUFACTURING FACILITY, PROVIDENCE, RI
DRAFT REMEDIAL ACTION WORK PLAN – PHASE I SOIL CAPPING: PARCEL D

USEPA United States Environmental Protection Agency

VOCs Volatile Organic Compounds

1.0 INTRODUCTION

The Former Gorham Manufacturing Facility is located at 333 Adelaide Avenue, Providence, Rhode Island (Figures 1 and 2). The focus of this Remedial Action Work Plan (RAWP) is Phase I of Parcel D (the Site) (Figure 3). This RAWP provides details for the preferred remedial alternative as specified in the Program Letter issued May 18, 2011 (RIDEM, 2011a), and Remedial Decision letter dated December 12, 2011 (RIDEM, 2011b) for Case No. 2005-059 by the State of Rhode Island Department of Environmental Management (RIDEM) for Phase I of Parcel D. This RAWP incorporates the approved response to comments generated from the public meeting held on July 12, 2011.

Supplemental site investigation activities were conducted between December 2005 and February 2007 to support completion of a human health and ecological risk assessment for Parcel D, including Mashapaug Cove (MACTEC Engineering and Consulting, Inc. (MACTEC), 2006 and 2007). Based on the results of these sampling events, soils exhibiting contaminant concentrations exceeding RIDEM Residential Direct Exposure Criteria (RDEC) for metals, polynuclear aromatic hydrocarbons (PAHs), and dioxin require capping as detailed in this RAWP. This RAWP has been prepared pursuant to Section 9.0 (Remedial Action Work Plans) of the RIDEM *Rules and Regulations for the Investigation and Remediation of Hazardous Materials Releases* (hereafter referred to as the Remediation Regulations) on behalf of Textron, Inc. (Textron) by AMEC Environment & Infrastructure, Inc. (AMEC) (formerly known as MACTEC).

A phased approach to capping Parcel D was developed such that the area along Mashapaug Pond and Cove west and north of the Alvarez High School (Figure 2) would be addressed first, followed by remaining areas of Parcel D, including Mashapaug Cove (Phase II) and the northern portion of Parcel D (Phase III). This RAWP details the work to be performed for the Phase I Cap Construction. Phase II Mashapaug Cove sediment remediation and Phase III Soil Capping will be detailed under separate RAWPs.

1.1 Property and Site History

The Former Gorham Manufacturing Facility is a 37-acre parcel of land where Gorham Silver engaged in the manufacture of silverware, both sterling and plated, and bronze castings from approximately 1890 to 1985 (Figure 1). Operations included casting, rolling, polishing, lacquering, forging, plating, annealing, soldering, degreasing, machining, and melting. Vapor degreasers reportedly used trichloroethene (TCE), tetrachloroethene (PCE), and 1,1,1-trichloroethane (1,1,1-TCA). More recent Site conditions are shown in the aerial photograph in Figure 2. In this figure, the Site is located immediately north of Adelaide Avenue and west of the railroad tracks. The former manufacturing facility has been razed. A retail development has been completed on the southeastern portion (Parcel A). A public high school (Alvarez High

School) has been constructed on a second parcel (Parcel B). A grassed lawn area/open space and parking lot is proposed for Parcel C by the City of Providence.

1.2 Physical Setting

The 333 Adelaide Avenue property is bordered to the east by railroad tracks (Figure 2). Adelaide Avenue and a residential neighborhood bound the 333 Adelaide Avenue property to the south. To the north and west, the Site is bounded by Mashapaug Pond. Parcel D constitutes the northern portions of the 333 Adelaide Avenue property. On the opposite (northern) shore of Mashapaug Pond is an industrially-zoned area.

Parcel D has been divided into three areas moving from west to east for the purposes of physical description. Phase I capping will be conducted within the western and central areas. Phase III capping will address contamination in the third (eastern) area of Parcel D. Phase II remediation of Parcel D will address Mashapaug Cove.

The first of these areas is the portion of the parcel extending from the southwestern property boundary (Adelaide Avenue/Crescent Street) to the tip of the western peninsula that bends into Mashapaug Pond. This area is heavily wooded with moderate to steep slopes that descend to the Pond. Limited areas along the western shoreline contain industrial fill material (Figure 3). There is no historic information or current visual evidence that would suggest that the remaining portion of the parcel was subject to other industrial uses. There are structures present which based on historic maps, were used for water extraction purposes associated with the former facility's fire suppression system and/or process water.

The second (central) area is the portion that borders the southern shore of Mashapaug Cove. This area includes a steep wooded embankment that leads down to wooded lowland that is adjacent to the cove. A slag pile previously located in the central portion of this area was removed from the property by Textron in July 2006 (Figure 3). Post-excavation confirmatory soil sampling was conducted, indicating isolated exceedances of Remediation Regulation Direct Exposure Criteria. AMEC (formerly MACTEC) submitted a September 2006 *Slag Removal Action Summary Report* to the Consent Order parties summarizing analytical results and the excavation activities completed to date (MACTEC, 2006).

The embankments along the southern end of Mashapaug Cove are underlain by heterogeneous fill, consisting of granular reworked soils with varying amounts of casting sands and construction, demolition, and miscellaneous debris such as fire brick, old wood beams, and metal debris. The fill varies in thickness from one-foot at the northern edge of the former West Parking area (former facility area) to approximately 20-feet along the embankment north of the high school parking lot (Figures 3 and 4). Several historic groundwater well structures that were formerly used for industrial and/or fire suppression purposes are present near the southwestern shore of the cove.

The third portion of the parcel lies to the northeast. It borders the cove and pond and includes the eastern shore of Mashapaug Cove, a steep hill to the east, and a flat upland area that formerly housed an employee recreational building (known as the ‘Casino’) and associated parking lots. In addition, in the northeast corner of the Site is a plot of land that is in active use by the Amtrak High Speed railroad. Also a garage or carriage house was formerly located in the upland area in the northeast corner of the parcel. This structure burned down approximately two years ago. . There is an approximately 30-foot difference in elevation between the former manufacturing facility upland parcel and the shoreline of Mashapaug Cove.

A large portion of Parcel D is currently wooded and heavily vegetated. The Western Peninsula has variable elevation and is a wooded environment. The peninsula is accessible via one or more paths. The tip of the peninsula is relatively open compared to the wooded areas adjacent to it. The Cove shore area is a small, relatively flat area at the bottom of the embankment and is vegetated with brush and saplings. There is a very steep embankment between the developed portion of the property to the south of the Parcel D and the shore of Mashapaug Cove. The Eastern Peninsula has trees and vegetation, but is generally more open and accessible than the areas immediately to the south of Mashapaug Cove. The uplands portion of the Site is currently enclosed by a chain-link fence.

1.3 Regulatory Background and Previous Investigations

Environmental investigations have been carried out at the 333 Adelaide Avenue property beginning in 1985. RIDEM completed a United States Environmental Protection Agency (USEPA) Potential Hazardous Waste Site Identification Form in 1987 in response to a complaint by the Providence Police Department. This occurred after the facility ceased operations in 1986. RIDEM completed a Preliminary Assessment (PA) of the 333 Adelaide Avenue property in 1989 which designated the property as a Medium Priority for a Site Inspection (SI). A SI Report was prepared by Camp Dresser & McKee in 1993 under contract to RIDEM. The SI recommended further investigation of the property. ABB Environmental Services (ABB-ES), subsequently, Harding Lawson Associates (HLA and Harding ESE), MACTEC (now AMEC) completed several environmental investigations on behalf of Textron since 1993.

In 1995, a Remedial Investigation Report (ABB-ES, 1995a) and a Supplemental Remedial Investigation Report (ABB-ES, 1995b) were prepared to assess site conditions, including portions of Parcel D. The results of the earlier investigations (circa 1986 to 1995) were summarized in the Remedial Investigation Report.

A Supplemental Investigation Report (HLA, 1998) was prepared in 1998 for the Site. In 1999 a Site Investigation Summary Report and Risk Assessment (HLA, 1999) was prepared and submitted to RIDEM that addressed the entire 333 Adelaide Avenue property. This report was formally approved by RIDEM in a June 15, 2001 RIDEM Remedial Decision Letter. In April

2001, Harding ESE (now AMEC), prepared and submitted to RIDEM on Textron's behalf the *Remedial Action Work Plan, Former Gorham Manufacturing Facility, Providence, Rhode Island*.

In November 2002, MACTEC (now AMEC) submitted a Method 3 Risk Assessment Work Plan (MACTEC, 2002) to RIDEM to assess the proposed redevelopment of the undeveloped portion of the 333 Adelaide Avenue property (Parcel D) as a park with walking trails. Following review comments from RIDEM in September 2003, MACTEC submitted the *Method 3 Human Health Risk Assessment – Park Parcel* (MACTEC, 2004) to RIDEM in August 2004. No comments were received on this submittal.

Soil conditions at selected locations within the Site, material from the slag pile, and sediment conditions at selected locations in Mashapaug Cove were investigated in December 2005 on RIDEM's behalf and are documented in a Site Investigation Report submitted by Fuss & O'Neill, Inc. to RIDEM in April 2006. Surface soil sampling was also conducted by MACTEC in 1994, 1998, 2001, 2002, 2006 and 2007, including both surface soils and surface sediment found in erosion channels along the bank that leads into the Cove. The 1998 surface soil analytical results for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH), and metals are presented in the *Supplemental Site Investigation Report, Proposed Park Subdivision, Former Gorham Manufacturing Facility, 333 Adelaide Avenue, Providence, Rhode Island* (HLA, 1998). Additional surface soil sampling was conducted along the bank of the Cove in 2001 and 2002 by MACTEC. This soil sampling program is summarized and results are presented in the *Method 3 Human Health Risk Assessment – Park Parcel* (MACTEC, 2004). Soil sampling for metals and dioxin along the western side of Parcel D is summarized and results are presented in the Supplemental SIR Addendum (MACTEC, 2006 and 2007).

The previous environmental investigations have demonstrated that soil at the 333 Adelaide Avenue Property, particularly the former manufacturing facility parcel, has been impacted by historical industrial operations. Constituents of potential concern (COPC) in soils at the Site include VOCs (principally the chlorinated hydrocarbons TCE, PCE, and 1,1,1-TCA and their degradation products 1,2-dichloroethene (1,2-DCE) and vinyl chloride), SVOCs (principally PAHs), metals (primarily arsenic, copper, and lead), dioxin, and TPH. The south bank of the Cove is an area of exposed fill material. Variable concentrations of VOCs, PAHs, metals and TPH were reported to be associated with these fill materials.

The available information indicates that limited manufacturing activities (other than withdrawal of groundwater for use in manufacturing operations and the operation of Building V) were conducted within the Phase I Parcel D area. A portion of Building V, the former smelting building, was within Parcel D and the former slag pile was associated with that building. The data suggest that impacted fill from the former manufacturing facility parcel impinges upon the westerly and southerly portions of Parcel D. That fill material generally contains metals and PAHs.

Constituents detected in sediments and surface soils adjacent to the Cove include TPH, SVOCs, VOCs, metals, and dioxins. Sediment samples from drainage swales and erosion channels that serve as a pathway for the discharge into Mashapaug Cove showed sporadic detections of SVOCs, TPH, and some metals. Surface soil samples from low lying areas adjacent to the Cove also showed some detections of metals.

Based on discussions with RIDEM and comments received on earlier reports and Work Plans, MACTEC prepared a Supplemental SI Work Plan in June 2006. On July 31, 2006 MACTEC submitted a *Supplemental Site Investigation Report* (SSIR) to RIDEM. Section 6.0 of the 2006 SSIR proposed three remedial alternatives to address soil contamination. On June 28, 2007 MACTEC submitted an addendum to the SSIR to RIDEM (MACTEC, 2007). The SSIR Addendum detailed compliance sampling performed in February 2007 and the analytical results. These results, together with a site walk of RIDEM and MACTEC in August 2010, and other soil sampling outside the proposed Phase I cap supported the regulatory compliance of the preferred remedial alternative (see Section 4.0). This RAWP details the approach for Phase I soil capping following applicable RIDEM regulations as specified in the Program Letter issued May 18, 2011 (RIDEM, 2011a), and Remedial Decision letter dated December 12, 2011 (RIDEM, 2011b).

1.4 Phased Approach

A phased remediation approach has been developed for the Parcel D (Figure 3). Phase I will occur first and is scheduled to begin in the spring of 2012. It includes the portion of Parcel D along Mashapaug Pond and Cove west and north of the Alvarez High School (Parcel B) and the proposed open space/fields (Parcel C). Work on the Phase I soil cap will proceed from west to east going away from the school. Phase II consists of Mashapaug Cove, and Phase III consists of the open area north of the stormwater detention basin. This Phase III area will be used for the staging of materials and equipment necessary to complete Phase I and Phase II activities. This area will be referred to as the “lay down” area for the remainder of this document. Groundwater remediation is also being planned for the former Gorham Site concurrently with the Phase I construction.

Completion of the Phase II cove sediment and wetland remediation work is planned for 2013. The Phase III soil cap will be performed following Phase II. As part of the Phase I remedial activities the existing chain-link fence will be relocated or replaced to run along the Parcel D boundary extending from the southwest corner near Adelaide Avenue along Parcel C and connect to the existing fence at the top of slope behind the high school. The chain-link fence following the upland (southern) portion of Parcel D will be maintained through the completion of Phase III when all soils exceeding RIDEM RDEC have been addressed. Both Phase II and Phase III will be described in detail to RIDEM under separate RAWPs. The purpose of this RAWP is to address the Phase I area only.

2.0 LIMITED DESIGN INVESTIGATION

Additional soil test pits and analytical testing is proposed for the former slag pile (Figure 4). This will be used to determine if the proposed geotextile liner and soil cover needs to be extended to address the lead contamination. These activities are described in detail under section 3.1.2. This RAWP also includes Engineered Controls and Institutional Controls.

3.0 REMEDIAL OBJECTIVE AND REMEDY

3.1 Supplemental Soil Excavation

3.1.1 Western Shoreline Soil Excavation

Concentrations of PAHs, lead and dioxin exceeding RIDEM's applicable cleanup standards were detected in surface soils along the western shoreline of Parcel D. These isolated locations will be excavated and the soil moved to a nearby area of proposed for soil cover as part of Phase I. These soil removal areas include the southwestern corner of Parcel D at SS-210/SS-SI210 (PAHs and lead) within a stormwater drainage ditch (Appendix A, Drawing C-106) and two locations on the western peninsula near SS-206 (lead and dioxin), as shown on Appendix A, Drawing C-101. Soil will be removed from these areas, approximately 10 feet x 10 feet to a depth of one foot below ground surface. Confirmatory soil samples will be collected from the bottom and each sidewall of the excavation areas for comparison to Rhode Island RDEC (Appendix C) for PAHs, metals and risk-based derived dioxin concentration of 0.0043 micrograms per kilogram ($\mu\text{g}/\text{kg}$) (July 2006 SIR and June 2007 SIR Addendum). Method detection limits (Appendix D) for the confirmation soil samples will be equal to or below the Rhode Island RDEC.

If necessary, based on initial exceedances at confirmatory sample locations, additional material will be removed and the areas in question and subsequently re-sampled to confirm compliance with the applicable standards. This process will be repeated until compliant sample results are identified. Once these cleanup criteria are met, the three areas will be backfilled with clean material.

The excavated area at SS-210/SS-SI210 will be covered with geotextile fabric and backfilled with stone from the Former Slag Pile stockpile in order to secure this area within the stormwater drainage ditch. The two western peninsula locations will be backfilled with clean soil meeting Rhode Island RDEC criteria. Limited tree clearing will be conducted to access these locations and support the removal of soil and backfill with clean material.

3.1.2 Former Slag Area Removal and Testing

In response to prior RIDEM comments soil will be excavated at two locations in the former slag pile area (Figure 4) and transported offsite for disposal. Following removal of soil from the two locations, ten test pits will be conducted along the perimeter of the former slag pile removal area and at locations within the former slag pile to determine if additional slag material is present. The proposed test pit locations are shown on Figure 4 and will be coordinated in the field with RIDEM. Confirmatory soil sampling will be conducted at the excavations and test pits for total lead and Synthetic Precipitation Leaching Procedure (SPLP) for metals. This data will be used

to define the full extent of the liner and cap and to determine future soil management requirements, as necessary.

A geomembrane liner is proposed for the cap of this former slag pile area to be protective for the proposed future passive recreational use of Parcel D. The cap in this former slag area is described below in Section 3.3.

3.2 Remedial Objective for Soil

The July 31, 2006, SSIR presented contaminant concentrations in surface soils, sediment, and surface water. As part of the phased-approach, this remedial action will focus solely on surface soil in the Phase I area of Parcel D (Figure 3).

The remedial objectives for the Phase I area work consists of the following:

- contain/consolidate identified areas of solid waste
- prevent direct-contact human exposure to contaminated soil and waste exceeding RIDEM RDEC
- minimize leaching of metals from vadose zone soil to groundwater at the location of the former slag pile.

3.3 Preferred Remedial Alternative

The Phase I remedial action will consist of installation of a soil cap(s) at the approximate locations shown on Figure 3. Cap construction will be modified to result in a low-permeability cap at the former location of the slag pile (Appendix A, Drawing C-105). The soil cap will prevent direct contact exposure, and restrict the potential migration of contaminants through the action of wind erosion and surface run-off into Mashapaug Pond. The low-permeability section of the cap above the former slag area will restrict water infiltration and reduce potential leaching of metals from vadose zone soil to groundwater.

The Phase I soil cap contains three distinct components. These components are color-coded on Figure 3 and include an upland fill area cap, a wetland buffer cap, and a former slag area cap. All components of these caps (imported soil) will be tested to meet RIDEM RDEC. Refer to Figure 5 and Drawing C-503 for cross sections of the cap across Phase I, including grading of slopes that exceed a one-to-three slope. Figure 5 depicts the approximate location of the cross sections and Drawing C-503 depicts typical cross sections of the Phase I cap.

During the construction of the Phase I soil cap, soil thickness will be measured following final grading as a quality control (contractor) and quality assurance (Textron/RIDEM) measure to ensure the proper soil cap has been constructed. Stormwater management will be included

with the construction of the cap to maintain its integrity and recharge stormwater runoff into the buffer zone, wetlands, and Cove.

Fill Area Cap

The fill area extends along the top of the western slope and extends along the shoreline of the Mashapaug Inner Cove (Appendix A, Drawings C-104, C-105 and C-106). This fill material was historically characterized through soil borings and test pits and found to contain casting sands, concrete, rubble, and other debris. Soil excavated from SS-210/SS-SI210 will be spread within the southwestern most fill area (Appendix A, Drawing C-106) and capped. Soil removed from the western peninsula will be spread under the fill area cap south of Mashapaug Inner Cove. The fill areas (blue) will be covered with a marker fabric and capped with two feet of clean soil (18" cover soil and 6" topsoil). The finished surface will be seeded or stabilized with erosion control matting. The fill area cap located along Parcels B and C will match the existing grade at the high school and proposed grade at the Parcel C boundaries. Note that the soil cap in the northwest corner of Parcel C has been extended to follow the grade and fill material further down slope to address elevated PAHs, lead and dioxin concentrations within the drainage swale (SS-SI-001) (Appendix A, Drawing C-106). The soil cap along the western shoreline has been extended south to the base of the 24-inch tree (co-located with SS-106) to encompass the historical lead exceedance found in this area (Appendix A, Drawing C-106).

Wetland Buffer Cap

As the Parcel D cap abuts the shore of Mashapaug Cove, special considerations for wetlands have been included as part of Phase I. The wetland buffer area consists of the area within 50' of the Inner Cove shoreline. The wetland delineation was completed in May 2007 and reviewed in the field with RIDEM in August 2011.

The wetland boundary is shown on Drawings C-104 and C-105 in Appendix A. The "delineated" wetlands are typically located 5' to 10' upland from the shoreline. Thus, the limit of work (LOW) for Phase I will be along a 10' setback from the shoreline of Mashapaug Cove such that all of the remediation work within the freshwater wetlands will be conducted in the future as part of the Mashapaug Cove sediment remediation (Phase II Parcel D remediation). This will allow for improved access to the wetland area for the capping and construction of a natural transition zone from the wetlands into the Cove. The wetland buffer cap will include a geotextile fabric as a marker for the fill material surface and 12-inches of soil over the marker fabric (Appendix A, Drawing C-503). The wetland cap has been extended to include SD-002 (lead contaminated soil), as shown in Appendix A, Drawing C-104. In accordance with state regulations, some remediation activities in the wetland buffer may be exempt from the State wetland permitting requirements as this work is part of a remedial action under the RIDEM Remediation Regulations. These activities will be coordinated with RIDEM to assure compliance with all applicable regulations. However, future construction work within Parcel D not conducted under

the Remediation Regulations will need to comply with all state wetland permitting requirements and regulations.

Clearing and grubbing of the wetland buffer zone scrub material will be conducted, as necessary, to support the installation of the soil cap. One foot of soil at the toe of the LOW will be removed to allow the soil cap to key into the existing grade above the wetland boundary. The soil removed from the toe will be placed under the cap during the grading of the existing site soil.

The finished surface for the wetland buffer cap will be stabilized with erosion control matting, and wetland vegetation will be planted. This cap will restrict the contact with the subsurface soils. Please refer to Appendix B for specifications detailing the existing wetland condition and the planned restoration strategy.

Former Slag Area Cap

In response to RIDEM questions regarding the potential leaching from the soil in contact with the former slag pile, the cap design for the former slag area contains a drainage geocomposite layer over the membrane to limit infiltration and restrict contact with the underlying soils. Following the grading of the existing soil, the former slag area will be capped with 6" sand, 40-mil geomembrane, drainage composite layer, 12" clean cover soil, and 6" clean fill topsoil (Appendix A, Drawing C-503). The finished surface for the slag area will be seeded or stabilized with erosion control matting. The haul road access to the former slag area will be improved during construction and removed after construction is complete.

Wetland Restoration within the Phase I Cap

Parcel D is located along the shoreline of Mashapaug Cove within Mashapaug Pond within the Pawtuxet River watershed. Existing vegetative communities include forested and scrub-shrub wetlands, mixed oak woodland and mid-successional woodland cover types.

Wetlands at Parcel D occur as fringe features forming a narrow band along the cove shore. Tree species within the wetland areas include, red maple (*Acer rubrum*), silver maple (*A. saccharinum*), and black willow (*Salix nigra*). The shrub layer consists of sweet pepperbush (*Clethra alnifolia*), red osier dogwood (*Cornus stolonifera*), and buttonbush (*Cephalanthus occidentalis*). Sensitive fern (*Onoclea sensibilis*), blue flag iris (*Iris versicolor*), and poison ivy (*Toxicodendron radicans*) occur in the herbaceous understory.

The mixed oak woodland community occurs in the upland areas on the western shore of the cove (west of the slag removal area). Tree species within this area include red oak (*Quercus rubra*), black oak (*Q. velutina*), and to a lesser extent white oak (*Q. alba*). Sweet birch (*Betula lenta*) and black cherry (*Prunus serotina*) are also present within this cover type. The understory includes a mix of low growing shrubs such as low bush blueberry (*Vaccinium*

angustifolium), mountain laurel (*Kalmia latifolia*), and huckleberry (*Gaylussacia baccata*). There are few non native invasive species present within this habitat type. In addition, several signs of wildlife usage were observed including a fox den and a painted turtle shell.

The mid-successional community occurs in the perimeter wetland and upland areas along the eastern shore of the cove (east of the slag removal area). Tree species within this area include red maple, red oak, black oak, tree-of-heaven (*Ailanthus altissima*), and gray birch (*Betula populifolia*). The understory within this area is dominated by non native invasive plant species including, Asiatic bittersweet (*Celastrus orbiculatus*), Morrow's honeysuckle (*Lonicera morrowii*), Japanese honeysuckle (*L. japonica*), and Japanese knotweed (*Fallopia japonica*). The dominance of invasive species in this habitat is likely a result of previous disturbances which allowed these opportunistic species to colonize.

Invasive Species Management

As noted earlier, portions of Parcel D are typical of disturbed sites in that they harbor numerous invasive plant species. Invasive plants of note at this site include; Japanese knotweed, Morrow's and Japanese honeysuckle, and Asiatic bittersweet. If these populations are not addressed they will undoubtedly compromise the integrity of the restoration project. The aggressive nature and superior competitive ability of these plants in disturbed habitats (i.e., newly planted areas), will negatively affect botanical diversity and survivorship of restorative plantings.

Therefore, potential treatment options include chemical and mechanical approaches. Mechanical removal (i.e., cutting) of above ground plant parts can aid in the management of certain invasive species. Mechanical treatment alone will not control the revegetation of the invasive species. Foliar or cut stem, application of herbicidal chemicals (i.e., glyphosate (Rodeo)) will transport the herbicide to belowground parts detrimentally affecting the vigor of the belowground root/rhizome system and effect plant death or vigor. These options will be coordinated with the construction schedule as part of the site clearing and restoration activities.

Revegetation

Following Phase I remedial construction, the wetland buffer cap surface will be revegetated to stabilize soils and enhance species diversity and structural complexity. These activities will be conducted using best management practices and every effort to minimize impacts to the surrounding landscape will be taken.

The restoration planting plan consists of two distinct vegetation zones. The species composition of each zone reflects morphological and physiological adaptations of the species occupying them to their specific habitats. Since remediation activities will strive to preserve mature trees and other desirable native vegetation when possible, an enhancement planting

approach has been developed. This approach stresses under-story, and shade tolerant plantings as the primary components of the revegetation activities. Species composition within the mixed oak woodland are proposed to be used as a reference condition to guide restoration and revegetation of upland portions of the Phase I of Parcel D. In addition, only woody species have been selected for these plantings in order to enable the anticipated installation between 1 September and 15 November.

The diversity of species outlined in the following zone descriptions is reflective of the inherent uncertainties of restorative planting success. For this reason many of the species are redundant throughout the various zones, these redundancies are also found in nature as certain plant species are tolerant of a wide range of hydrologic and soil saturation scenarios. Due to the uncertainty of post-remediation site hydrology in the restoration area specific elevation boundaries for these zones are not described.

Forested Wetland

This zone will occur in areas along the Cove shoreline that will be subject to wetland hydrology after remediation activities. Revegetation will focus on recreation of extant on-site habitats of good quality (i.e., few invasive). Revegetation for these areas will include species selected from Table A. Selections will be based largely on availability and will only use plant species native to Rhode Island.

TABLE A – FORESTED WETLAND SPECIES

Common Name	Botanical Name	Wetland Indicator Status
Red Maple	<i>Acer rubrum</i>	FAC
Silver Maple	<i>Acer saccharinum</i>	FACW
Black Willow	<i>Salix nigra</i>	FACW+
Red-osier Dogwood	<i>Cornus sericea</i>	FACW+
Northern Arrowwood	<i>Viburnum dentatum</i>	FACW-
Sweet Pepper Bush	<i>Clethra alnifolia</i>	FAC+
Highbush Blueberry	<i>Vaccinium corymbosum</i>	FACW
Buttonbush	<i>Cephalanthus occidentalis</i>	OBL
Sensitive Fern	<i>Onoclea sensibilis</i>	FACW
Blue Flag Iris	<i>Iris versicolor</i>	OBL

Mixed Oak Woodland

This zone will occur in areas upland of the Cove shoreline that will not be subject to wetland hydrology after remediation activities. Revegetation will focus on recreation of extant on-site

habitats of good quality (i.e., few invasive). Revegetation for these areas will include species selected from Table B. Selections will be based largely on availability and will only use plant species native to Rhode Island.

TABLE B – MIXED OAK WOODLAND SPECIES

Common Name	Botanical Name	Wetland Indicator Status
Red Maple	<i>Acer Rubrum</i>	FAC
Sweet Birch	<i>Betula Lenta</i>	FACU
White Pine	<i>Pinus Strobus</i>	FACU
White Oak	<i>Quercus Alba</i>	FACU
Northern Red Oak	<i>Quercus Rubra</i>	FACU-
Black Oak	<i>Quercus Velutina</i>	UPL
Black Cherry	<i>Prunus Serotina</i>	FACU
Gray Birch	<i>Betula Populifolia</i>	FAC
Mountain Laurel	<i>Kalmia Latifolia</i>	FACU
Lowbush Blueberry	<i>Vaccinum Angustifolium</i>	FACU-
Black Huckleberry	<i>Gaylussacia Baccata</i>	FACU

3.4 Installation of Monitoring Wells

As groundwater infiltration and flow from Parcel D to Mashapaug Pond play a critical role in the Site conceptual model, AMEC will restore monitoring well GZA-5 and maintain existing monitoring wells within the Phase I Cap. These monitoring wells will provide information about groundwater flow and aid in developing and monitoring groundwater remedial actions. Monitoring well GZA-5 was removed during the slag excavation activities in the summer of 2006 and will be re-installed through the Phase I Cap as a shallow well to straddle the groundwater table (Appendix A, Drawing C-105).

The number of existing monitoring wells maintained during the soil cap construction may be modified pending the design of the groundwater treatment system and monitoring network.

Existing monitoring wells within the cap (e.g., GZA-3) will be secured and maintained during the construction of the soil cap. Also, a new shallow monitoring well will be installed on the east side of the former slag area cap, outside the impermeable cap over the former slag pile and close to the edge of the cove. This new well, together with the reinstalled GZA-5 and MW-237S (located on the west side of the former slag area cap), will be included in a targeted monitoring program for potential leaching of metals from the former slag pile area. The future groundwater monitoring program for the Gorham Site will be developed in coordination with RIDEM as part of the groundwater RAWP.

3.5 Fencing

The existing chain link fence will be relocated along the boundary between Parcels C and D, extending from Adelaide Avenue to the existing chain link fence in the northwest corner of the high school parking lot (Drawings C-104 and C-106, Appendix A). The chain link fence and access gate in the northwest corner of the retail property (intersection of Parcels A and B) will be replaced or reset and will extend east to the stormwater detention basin fencing.

This fence will remain in place until all three phases of remediation on Parcel D have been completed or when the City of Providence has completed the installation of the planned walking path and fence/plantings along the water side of the path to restrict access to the steep slope down to the shoreline.

4.0 POINTS OF COMPLIANCE & COMPLIANCE DETERMINATION

4.1 Points of Compliance

In accordance with Section 9.06 and 9.18 of the Remediation Regulations, MACTEC has performed confirmatory sampling outside of the cap to determine that remedial objectives have been met. The points of compliance are sample locations outside of the Phase I cap that are detailed in Section 4.2 below.

4.2 Compliance Determination

Textron has proposed a “Recreational Use” Cap that will bring Parcel D into compliance, per the Remediation Regulations, with soil RDEC. The compliance demonstration is accomplished by using Method 1 and Method 2 (dioxin toxic equivalence (TEQ) and several other analytes) soil objectives approach. In the absence of any recreational land use criteria, the RDEC are health protective criteria for recreational land use. The exposure assumptions used to calculate the RDEC clearly overestimate likely recreational exposures and compliance with these criteria will create a health protective environment for use of Parcel D for passive recreational purposes.

The soil cap has been designed to extend over those areas where surface soil exceeds the RDEC. There are three distinct areas outside of the cap (Appendix B drawings C-104 and C-106) that currently exceed the RDEC, but will be excavated and confirmatory soil sampling conducted to determine that the remaining soil is in compliance with the RDEC. These excavation areas will be backfilled with soil meeting the RDEC (Appendix C).

In addition, the cap will be constructed with material that also meets RDECs, so overall, the soils both inside and outside the footprint of the “Recreational Use” Cap will be in compliance with the health protective RDECs. Therefore, upon construction of the “Recreational Use” Cap, Parcel D soils will represent a health protective condition for recreational use by the community.

Procedures for determining compliance with cap construction requirements and specification (e.g., materials, thicknesses, and construction methods) will be detailed in the construction drawings and specifications.

5.0 PROPOSED SCHEDULE FOR REMEDIATION

The following schedule is proposed to minimize conflicts with the proposed redevelopment plans. This schedule is contingent upon the timing of approvals and subcontractor availability.

<u>Description</u>	<u>Completion Date</u>
Draft Work Plan to RIDEM	February 2012
Issue Final RAWP	Within two weeks upon receipt of comments
Distribute Public Notice Materials or RIDEM comment	Within four weeks of Final RAWP
Mobilization	May 2012
Complete Construction	October 30, 2012

Schedules will be provided to the RIDEM as bids are accepted for the Phase I Parcel D preparation and construction. Follow-up verification and monitoring will also be conducted in a phased approach. Schedules will be provided for the installation of monitoring wells.

6.0 CONTRACTORS AND/OR CONSULTANTS

As part of this RAWP, Textron will subcontract the construction and laboratory services. All other services including environmental, wetland replication oversight, construction management and survey services, can be provided by AMEC.

The construction and earthworks contractor and laboratory has yet to be determined. Potential bidders will be provided with the construction documents and scope of work of the project. Once the work has been awarded by Textron to the contractors, AMEC will notify RIDEM.

7.0 DESIGN STANDARDS AND TECHNICAL SPECIFICATIONS

Technical specifications (Division 1) are included as Appendix B to this RAWP. The specifications outline the required standards, products, and execution to implement the remedial action. The drawings presented in Appendix A provide supplemental design information including quantities of materials, limits of work, and construction components and dimensions. A more detailed set of construction drawings and specifications will be prepared to support the procurement of a construction contractor and the construction activities. These will be provided to RIDEM for their review and comment in draft form.

In some cases, the construction is defined by performance based requirements as noted in the specifications and drawings. In other cases, products are specified by fabricator/vendor/manufacturer and model.

Actual material and products to be incorporated into the work will be based on the proposal of the remediation subcontractor. The subcontractor will propose a material/product for the project and submit requisite product information and literature to AMEC for review and approval. If the submittal satisfactorily meets the requirements of the construction documents (specification and drawings), AMEC will approve the product/material.

8.0 SET UP PLANS

Set-up Plans as defined by the Rhode Island Remedial Regulations describe pre-operational staging or construction requirements that must be in place prior to implementation of the remedial action. A Subcontractor Work Plan is required by the subcontractor selected to implement the remedial action. This Plan will include descriptions and information as outlined in Specification Section 01110 “Summary of Work” (Appendix B). The measures and controls required are shown on the Construction Drawings and are described in Specification Section 01500 “Temporary Facilities and Controls. The purpose of these measures and controls include the following:

1. To maintain a healthy and safe work environment for remediation construction and oversight personnel;
2. To minimize erosion of soil and downgradient migration of sediment;
3. To minimize waste generation and migration outside of the Exclusion Zone; and
4. To provide proper collection and storage of generated wastes until characterization and off-site disposal can occur.

9.0 EFFLUENT DISPOSAL

Effluents as defined by the Rhode Island Remedial Regulations are any products or by-products from the proposed remedial action. Waste or waste by-products that will be produced as a result of the remedial action include the following:

1. Clearing and miscellaneous debris;
2. Grubbings and tree stumps;
3. Liquid waste (decontamination water, stormwater management water, etc.);
4. Site trash; and
5. Remediation waste (PPE, plastic sheeting, sampling equipment, etc.).

Waste handling and disposal will be in accordance with the requirements of Specification Sections 02110 "Waste Excavation, Removal, and Handling" and 02120 "Off-Site Transportation and Disposal". The remediation subcontractor is required to submit a Work Plan to Textron and AMEC for review and approval prior to commencing construction. The plan will contain project specific proposals for waste handling, transportation, and disposal. Characterization of the waste will occur in accordance with the requirements of the Treatment Storage and/or Disposal Facility (TSDF). Disposal will occur at licensed facilities approved by Textron and AMEC.

10.0 CONTINGENCY PLAN/ HEALTH AND SAFETY PLAN

AMEC's Contingency Plans are documented within the AMEC Health and Safety Plan for Phase I Parcel D Soil Capping. This document contains the names and phone numbers of emergency coordinators and the emergency response procedures and arrangements for the Site. The Health and Safety Plan with contingency procedures will be available on site at all times during the implementation and operations of the Phase I remedial action.

Specification Section 01350 Safety, Health, and Emergency Response requires the selected remediation subcontractor to prepare and follow a site-specific health and safety plan for the work described and referred to in this RAWP.

As part of the site health and safety, dust monitoring will be performed in the work zone and at the work area perimeter during activities that have the potential to disturb soil using hand held real-time continuous air monitoring instruments. Work area perimeter dust monitoring will also be performed using monitors placed in cases designed to protect the logging unit from precipitation. These instruments measure aerosol dust and will be set to automatically store data for subsequent retrieval. One perimeter dust monitor will be placed on each of the four points outside and within 30 feet of the soil capping activities (North, South, East, and West) to confirm that nearby residential populations and retail operations are not impacted by the capping activities. Real-time dust monitoring will continue throughout the capping activities, unless a significant precipitation event occurs, at which time dust monitoring may be suspended per manufacturer specifications and standard industrial hygiene practices.

Continuous visual monitoring of dust (particulate) levels will also be conducted and recorded. If visible dust conditions are sustained for more than one minute within the work zone, dust suppression methods (i.e., water spray) will be implemented to reduce airborne dust levels. Dust suppression will be performed throughout the capping activities as needed and will include spraying of fine mist of water over exposed soils to suppress dust as needed. A portable water tank containing municipal water or a nearby fire hydrant if approved by the city of Providence will be used as the water supply for dust suppression activities. If heavy precipitation (rain or snow) is adequate to suppress dust, additional water spray will not be applied.

11.0 OPERATING LOG

All on-site activities will be recorded in an operating logbook to document progress associated with remedial activities at the Phase I Parcel D area. The logbook will include, at a minimum, detailed information on the following:

1. Personnel on-site and their time of arrival and departure.
2. Time of system (if applicable) operation, including startup time, time of shutdown due to equipment malfunction or failure, and time of completion for the remedial activity.
3. Records of materials transported off-site, and materials brought on-site.
4. Instances during remedial activities where a Contingency Plan may be implemented.
5. Records of any accidents or injuries incurred on the site.
6. Documentation of inspections and any instances where remedial activity procedures must be changed and/or equipment must be repaired or replaced. An inspection plan will be designed for all remedial activities to ensure that all equipment or activities are operating properly.
7. Details of the work stages and activities, as will records of sampling and any field screening (e.g., dust monitoring) that is performed.
8. Perimeter air monitoring dust readings will be logged in the Site field logbook, making note of the time the readings were obtained, the concentrations observed, the weather conditions, the prevailing wind direction, and the general site conditions and activities. Time weighted averages of total dust concentrations from perimeter monitoring stations will be compared the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) of particulates not otherwise regulated including aerosol dust (referred to as particulates not otherwise characterized or (PNOC)), which is 15 milligrams per cubic meter (mg/m^3).

In addition to documentation of field activities, quality assurance procedures for cap construction as described in Specifications Sections 02072, 02073, and 02300 will be recorded in the operating log.

The operating log will be readily available at the site during all activities outlined in this RAWP.

12.0 SECURITY PROCEDURES

Access to the Phase I work area will be at three locations. One access point is the existing gate on Adelaide Avenue, in the southwestern corner of Parcel C. The gate at this access point will be repaired or replaced, and it will be used after Phase I Construction. In addition, an access road will be constructed in the northwestern corner of the Parcel C down to the western end of the Phase I cap (near Mashapaug Cove). The other two access points will be the existing gate at the slag area and at the laydown area in the northeast of the site (behind the detention basin on Parcel A).

An 8' high security fence and gate will be installed along the LOW at the north end of the Parcel C and it will tie into the existing fence at the school property for vehicular access to the western end of the cap near Mashapaug Cove. It is assumed that plantings along the new fence will not be required with the installation of the fence around Alvarez High School restricting access to the Parcel D and planned remedial activities in support of a recreational use. This fence will be maintained through the completion of the Phase III remediation.

Only authorized personnel (e.g., engineer, construction personnel, and approved visitors) will be permitted to access the work zone. All visitors required to check in with the Site Superintendent upon entering.

Fencing and gates will be secured at the close of each working day. Areas where fencing is removed will be gated and/or properly secured with temporary fencing and signage. Signage will be in English and Spanish and will include a site contact phone number and other pertinent information.

13.0 SHUT-DOWN, CLOSURE AND POST-CLOSURE REQUIREMENTS

Shutdown will consist of final cleanup, removal of temporary facilities and controls, and equipment demobilization from the site. Points of compliance and compliance determination for capping activities are discussed in Section 4.0. Security and siltation fencing will not be removed before construction is complete, specified erosion control measures (e.g., rock dams, erosion control mats, etc.) have been installed, and specified erosion control vegetation is established.

14.0 INSTITUTIONAL CONTROLS AND NOTICES

An Environmental Land Usage Restriction (ELUR), in accordance with Rule 8.09 of the Remediation Regulations, will be developed with the City of Providence or Providence Redevelopment Agency (PRA) as property owner and RIDEM and formerly recorded with the property deed at the conclusion of Parcel D remediation activities. A Soil Management Plan (SMP) which will outline the procedures for managing the soils on site should disturbances below the cap be required, will be recorded with the ELUR. This ELUR will address all three phases of Parcel D (upland and Mashapaug Cove). A draft ELUR and SMP has been included in Appendix E for review. Textron will maintain and monitor the completed engineered soil cap in the Phase I area until the responsibility is taken over by the City of Providence or PRA at the time the ELUR is recorded.

15.0 CERTIFICATION REQUIREMENTS

The following certifications are provided pursuant to Rule 9.19 of the Remediation Regulations.

The undersigned hereby certifies that to the best of their knowledge the information contained in this report is complete and accurate based on the information available at the time of its preparation. Furthermore, the undersigned certifies that to the best of their knowledge the report is as complete and accurate of a representation of the Site and the release based on the available information, and contains the known facts surrounding the release.

AMEC Environment & Infrastructure, Inc.

David E. Heislein
Senior Principal

Date

Textron, Inc.

Gregory Simpson
Senior Project Manager, Site Remediation

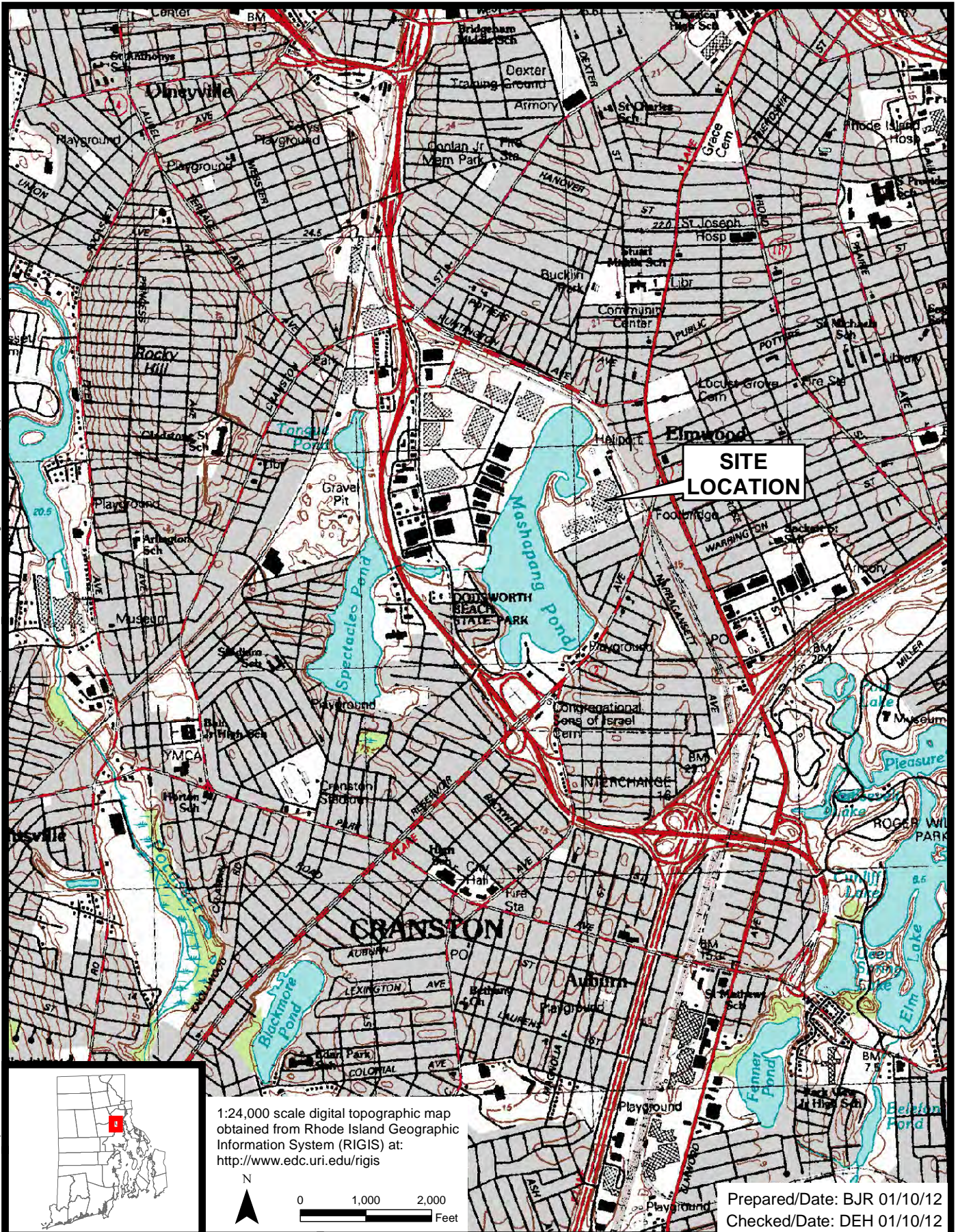
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16.0 REFERENCES

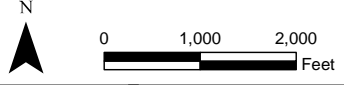
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TEXTRON, INC.
FORMER GORHAM MANUFACTURING FACILITY, PROVIDENCE, RI
DRAFT REMEDIAL ACTION WORK PLAN – PHASE I SOIL CAPPING: PARCEL D

FIGURES



1:24,000 scale digital topographic map obtained from Rhode Island Geographic Information System (RIGIS) at: <http://www.edc.uri.edu/rigis>



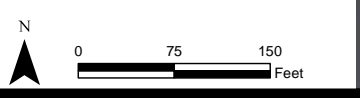
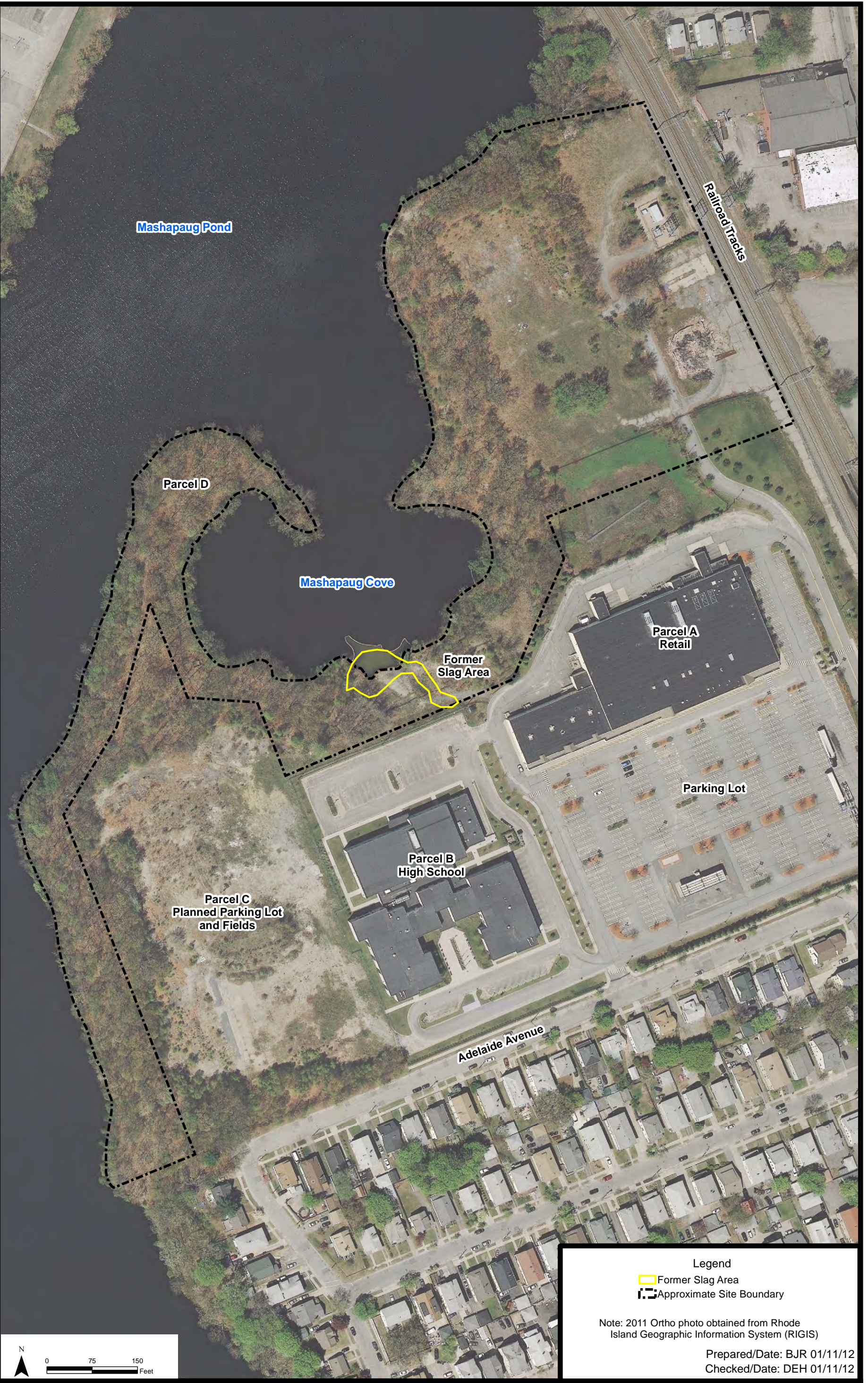
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Remedial Action Work Plan
Phase I Parcel D
333 Adelaide Avenue
Providence, RI





Site Location Map
Former Gorham Manufacturing Site
Project 3650-11-0213 Figure 1

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Legend

-  Former Slag Area
-  Approximate Site Boundary

Note: 2011 Ortho photo obtained from Rhode Island Geographic Information System (RIGIS)

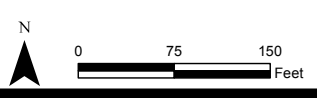
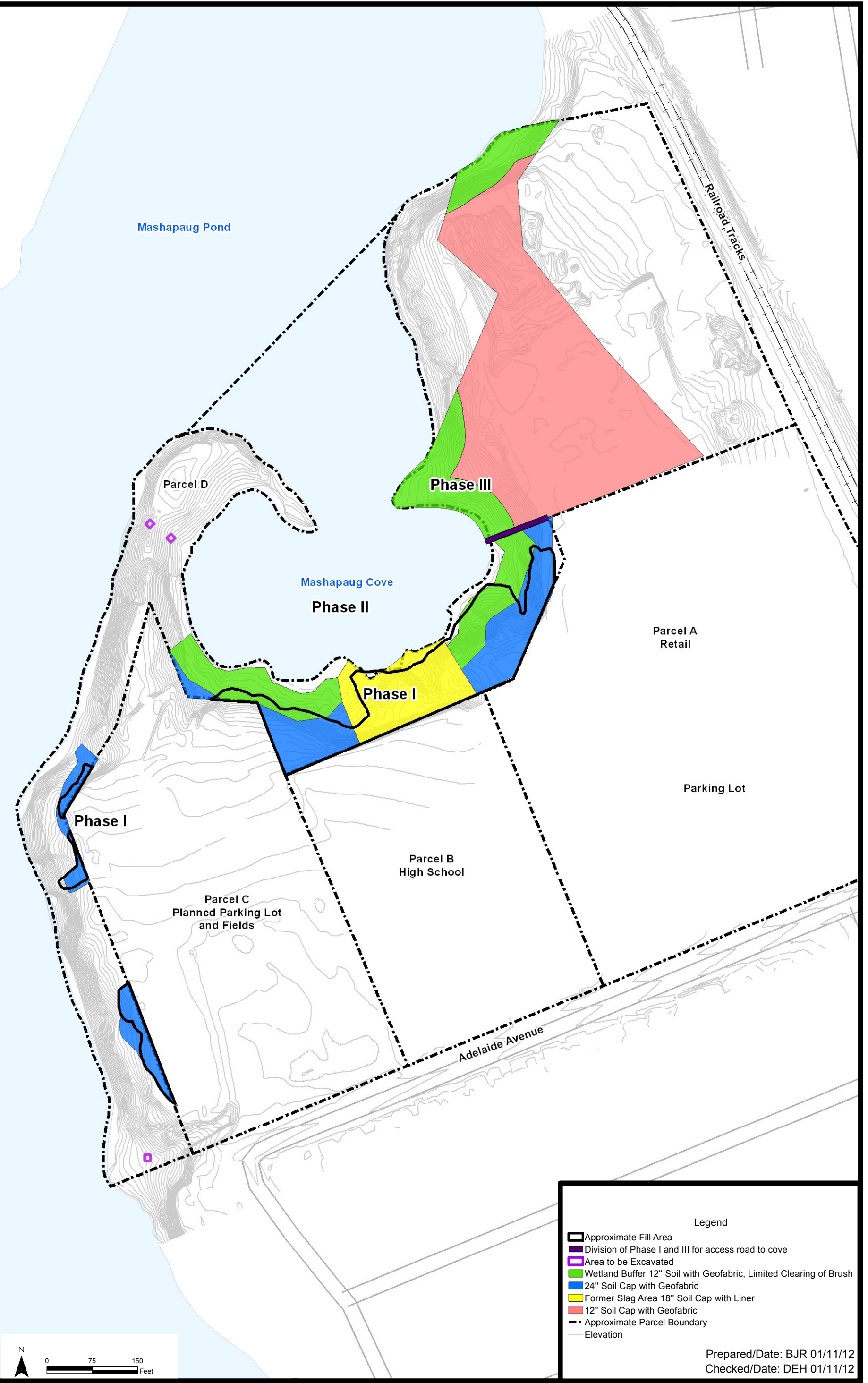
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Remedial Action Work Plan
Phase I Parcel D
333 Adelaide Avenue
Providence, RI



Site Plan
Former Gorham Manufacturing Site
Project 3650-11-0213
Figure 2

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Legend

- Approximate Fill Area
- Division of Phase I and III for access road to cove
- Area to be Excavated
- Wetland Buffer 12" Soil with Geofabric, Limited Clearing of Brush
- 24" Soil Cap with Geofabric
- Former Slag Area 18" Soil Cap with Liner
- 12" Soil Cap with Geofabric
- Approximate Parcel Boundary
- Elevation

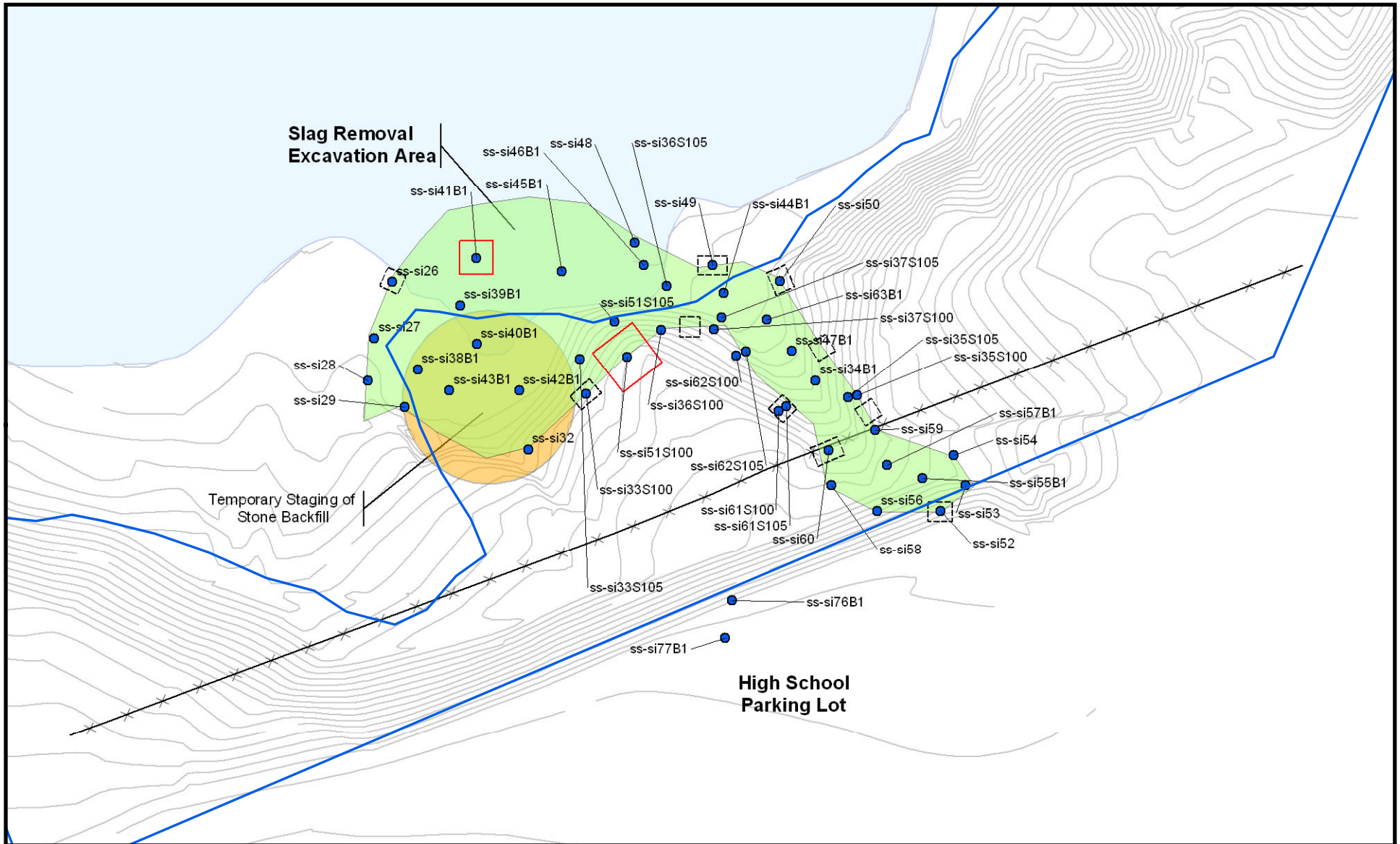
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Remedial Action Work Plan
Phase I Parcel D
333 Adelaide Avenue
Providence, RI



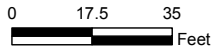
Parcel D Three Phased Remediation
Former Gorham Manufacturing Site

Project 3650-11-0213 Figure 3



Legend

- Approximate Fill Area
- Additional Removal Areas
- Test Pit (Final Locations To Be Determined In Field)
- Previous Sample Locations
- Initially Excavated Area
- Fence
- Mashapaug Cove
- Elevation

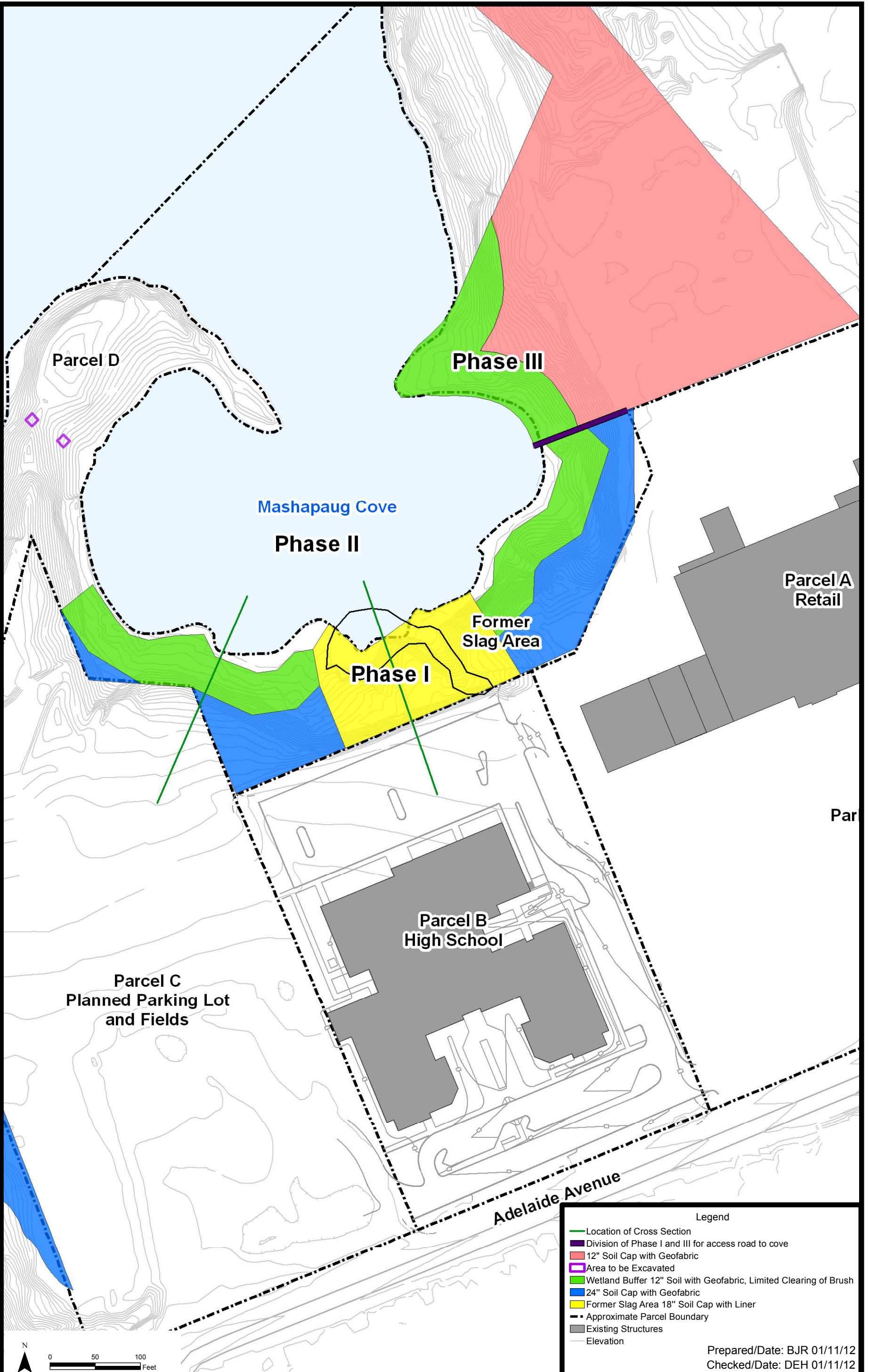


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Figure 4
 Former Slag Pile Area
 Former Gorham Manufacturing Site
 Remedial Action Work Plan
 Phase I Parcel D
 333 Adelaide Avenue
 Providence, RI

Document: P:\TEXT\GORHAM\GIS\MapDocuments\RAWP - Phase I\RAWP_11x17_P.mxd PDF: P:\36501\02\13 - Textron - Draft & Final\RAWP\4.0 Project Deliverables\4.2 Work Plans\Figure 5 - Approximate Location of Cap Cross Section Details.pdf 1/11/2012 10:30 AM jbroden



Legend

- Location of Cross Section
- Division of Phase I and III for access road to cove
- 12" Soil Cap with Geofabric
- Area to be Excavated
- Wetland Buffer 12" Soil with Geofabric, Limited Clearing of Brush
- 24" Soil Cap with Geofabric
- Former Slag Area 18" Soil Cap with Liner
- Approximate Parcel Boundary
- Existing Structures
- Elevation

Prepared/Date: BJR 01/11/12
Checked/Date: DEH 01/11/12

Remedial Action Work Plan
Phase I Parcel D
333 Adelaide Avenue
Providence, RI



Approximate Location of Cap Cross Section Details
Former Gorham Manufacturing Site
Project 3650-11-0213
Figure 5

TEXTRON, INC.
FORMER GORHAM MANUFACTURING FACILITY, PROVIDENCE, RI
DRAFT REMEDIAL ACTION WORK PLAN – PHASE I SOIL CAPPING: PARCEL D

APPENDIX A DRAWINGS

TEXTRON, INC.
FORMER GORHAM MANUFACTURING FACILITY, PROVIDENCE, RI
DRAFT REMEDIAL ACTION WORK PLAN – PHASE I SOIL CAPPING: PARCEL D

APPENDIX B

SPECIFICATIONS

TEXTRON, INC.
FORMER GORHAM MANUFACTURING FACILITY, PROVIDENCE, RI
DRAFT REMEDIAL ACTION WORK PLAN – PHASE I SOIL CAPPING: PARCEL D

APPENDIX B
SPECIFICATIONS
(Division 0)

TEXTRON, INC.
FORMER GORHAM MANUFACTURING FACILITY, PROVIDENCE, RI
DRAFT REMEDIAL ACTION WORK PLAN – PHASE I SOIL CAPPING: PARCEL D

APPENDIX B
SPECIFICATIONS
(Division 1)

TEXTRON, INC.
FORMER GORHAM MANUFACTURING FACILITY, PROVIDENCE, RI
DRAFT REMEDIAL ACTION WORK PLAN – PHASE I SOIL CAPPING: PARCEL D

APPENDIX B
SPECIFICATIONS
(Division 2)

TEXTRON, INC.
FORMER GORHAM MANUFACTURING FACILITY, PROVIDENCE, RI
DRAFT REMEDIAL ACTION WORK PLAN – PHASE I SOIL CAPPING: PARCEL D

APPENDIX C
RHODE ISLAND RESIDENTIAL DIRECT EXPOSURE CRITERIA

TEXTRON, INC.
FORMER GORHAM MANUFACTURING FACILITY, PROVIDENCE, RI
DRAFT REMEDIAL ACTION WORK PLAN – PHASE I SOIL CAPPING: PARCEL D

APPENDIX D
LABORATORY METHOD DETECTION LIMITS

TEXTRON, INC.
FORMER GORHAM MANUFACTURING FACILITY, PROVIDENCE, RI
DRAFT REMEDIAL ACTION WORK PLAN – PHASE I SOIL CAPPING: PARCEL D

APPENDIX E

ENVIRONMENTAL LAND USE RESTRICTION AND SOIL MANAGEMENT PLAN

(Being completed with the City of Providence and Textron)