Pompton Lake Study Area
Corrective Measures Implementation
Work Plan

Pompton Lakes Works Site
Pompton Lakes, New Jersey

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Table of Contents

Tables

Figures

Appendices

Table of Contents

Acronyms and Abbreviations

ABD	Acid Brook Delta
ACO	Administrative Consent Order
ADJ	water column monitoring station adjacent to the active remediation area
AHA	Activity Hazard Assessment
bgs	below ground surface
BMP	Best Management Practice
BGR	Discharge to Surface Water Permit
Chemours	The Chemours Company FC, LLC
CMI WP	Corrective Measures Implementation Work Plan
CQAP	Construction Quality Assurance Plan
CRG	Corporate Remediation Group
Cu	copper
cy	cubic yard(s)
dBA	decibels
DERS	DuPont Environmental Remediation Services, Inc.
DRET	Dredge Elutriate Tests
DuPont	E.I. du Pont de Nemours and Company
EET	Effluent Elutriate Tests
EPA	United States Environmental Protection Agency
$FeCl_2$	iron (II) chloride
GDT	Geotube Dewatering Tests
HASP	Health and Safety Plan
HEP	Hudson-Essex-Passaic
Hg	mercury
HSWA	Hazardous and Solid Waste Amendments of 1984

LTM	long-term monitoring
mg/kg	milligram(s) per kilogram
mg/L	milligram(s) per liter
Na_2S	sodium sulfide
N.J.A.C.	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
NJPDES	New Jersey Pollutant Discharge Elimination System
NJRDCSRS	New Jersey Residential Direct Contact Soil Remediation Standards
NTU	Nephelometric Turbidity Unit
Pb	lead
PCB	polychlorinated biphenyl
PCI	Type I Portland Cement
Permit Modification I	RCRA Permit Modification I to the HSWA Permit
PEM	palustrine emergent
PFO	palustrine forested
PFT	paint filter test
PLSA	Pompton Lake Study Area
PLW	Pompton Lakes Works
PM_{10}	particulate matter less than 10 microns in diameter
PPE	personal protective equipment
PPV	peak particle velocity
psi	pounds per square inch
PSS	palustrine scrub/shrub
PTI	PTI Environmental Science
QA	quality assurance
QC	quality control
QEA	Quantitative Environmental Analysis, LLC

RAOs	Remedial Action Objectives
RASR/CMS	Remedial Action Selection Report/Corrective Measures Study
RCRA	Resource Conservation and Recovery Act
RDT	Rapid Dewatering Tests
RMS	root mean square
RTK DGPS	real-time kinematic differential global positioning system
RSL	EPA Regional Screening Level
SAV	submerged aquatic vegetation
SCD	Soil Conservation District
SESCP	Soil Erosion and Sediment Control Plan
Sevenson	Sevenson Environmental Services, Inc.
SESTL	Sevenson Environmental Services Treatability Laboratory
SPLP	Synthetic Precipitation Leaching Procedure
SVOC	semivolatile organic compound
TCLP	Toxicity Characteristic Leaching Procedure
TMDL	Total Maximum Daily Load
TSS	total suspended solids
TWA	Treatment Works Approval
µg/L	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter
USFWS	United States Fish and Wildlife Service
VOC	volatile organic compound
WST	Waste Stream Technologies, Inc.
Zn	zinc

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- ARCADIS, Syracuse, New York was the lead in developing the document, focusing on the sediment/soil remediation efforts.

- Parsons, Gold Creek, Montana and Syracuse, New York developed the soil/sediment processing, transport, and disposal processes.

- Sevenson Environmental Services, Inc. (Sevenson), Niagara Falls, New York developed the Operations Plan, Contingency Plan, and provided input related to the equipment, processes, and methods to be used as part of remediation.

- AECOM (formerly URS), Conshohocken, Pennsylvania provided the restoration approach and permit discussion.

1. Introduction

This Corrective Measures Implementation Work Plan (CMI WP) presents the remedial approach and corrective measures to be implemented within portions of the Pompton Lake Study Area (PLSA, Figure 1-1) to implement the remedy contained in the Permit Modification I to the Hazardous and Solid Waste Amendments of 1984 (HSWA) Permit (Permit Modification I) for the Pompton Lakes Works (PLW) Site under the Resource Conservation and Recovery Act (RCRA) made effective by the United States Environmental Protection Agency (EPA) on June 22, 2015.

The remedial approach was determined based on the evaluations contained in the Acid Brook Delta Area Remedial Action Selection Report/Corrective Measures Study (RASR/CMS; DuPont Corporate Remediation Group [CRG], September 2009) which was subsequently approved by New Jersey Department of Environmental Protection (NJDEP) and EPA on October 22, 2009. Per the approved RASR/CMS, the selected remedial approach is removal (Alternative 4). An additional investigation was conducted at the request of EPA in 2013 to evaluate areas identified by EPA. The results and data from the investigation were provided in a report submitted to EPA in March 2014. Two technical memoranda were also submitted to EPA in October 2014 to support identification of the remedial areas (URS, October 2014a and 2014b). This information was included in the evaluation of additional areas to be considered for inclusion in the overall remedy presented in Permit Modification I.

Permit Modification I established the areas to be remediated in the PLSA and includes three general areas – the portion in Pompton Lake (i.e., lake sediments) termed the Delta or Acid Brook Delta (ABD); the portion of Pompton Lake (i.e., lake sediments) outside of the Delta between Lakeside Avenue Bridge and the Pompton Lake Dam; and the uplands portion (Uplands) defined as the soils between Lakeside Avenue and the water's edge (i.e., full pool lake elevation) along the lake (including wetland areas) (see Figures 1-1, 1-2, and 1-3). The Delta sediments include the portion of Pompton Lake south of the Lakeside Avenue Bridge, east of the discharge point of Acid Brook into Pompton Lake, and generally west of the centerline of the former Ramapo River channel as defined by the 2007 bathymetric survey of Pompton Lake (Delta Area). The lake sediment areas outside of the Delta identified for remediation include an area approximately 0.5 acres in size just

south of the Delta Area (Lake Area A as shown on Figure 1-1) and an approximate 2.8-acre area around the island located in the lower Ramapo River channel north of the Pompton Dam (Island Area as shown on Figure 1-1).

1.1 Purpose

The purpose of this document is to present the means and methods to implement the remedial approach and corrective measures for the PLSA. Remediation will be performed to meet the Remedial Action Objectives (RAOs) established in Permit Modification I.

The medium of concern and constituent driving remediation is mercury-containing sediment in the Delta Area, Lake Area A, and the Island Area. For the Uplands, soil is the medium of concern and the constituents driving remediation are copper, lead, mercury, and zinc.

1.2 Background Information

The former PLW facility started operations in the early 1900s. Manufacturing operations ceased in 1994 and the facility was dismantled over a several year period following closure. E.I. du Pont de Nemours and Company (DuPont) entered into an Administrative Consent Order (ACO) with NJDEP in September 1988. In June 1992, EPA issued DuPont a Hazardous Waste Management Facility Permit under Section 9003 of HSWA. The ACO and HSWA permit, which were revised in 1996, required DuPont to conduct a remedial investigation addressing impacts at, or emanating from, the Site. Effective June 22, 2015, the HSWA permit was modified to incorporate the elected corrective action measures for the PLSA (Permit Modification I). The ACO was amended on February 1, 2015 to incorporate The Chemours Company FC, LLC (Chemours) as the primary responsible party. The HSWA permit is currently awaiting modification by EPA to identify Chemours as the operating entity for the Site.

Numerous investigations have been conducted within the PLSA resulting in the collection of over 2,000 sediment and soil samples. A summary of documents resulting from these investigations are listed below:

- Delta Sampling Report (DuPont Environmental Remediation Services, Inc. [DERS], June 1994)
- Evaluation of Pompton Lake Hydrodynamics and Transport Processes (Quantitative Environmental Analysis, LLC [QEA], June 1994)
- Acid Brook Delta Ecological Investigation Reference Area Evaluation and Phase 1 Data Report (PTI Environmental Science [PTI], January 1997)
- Acid Brook Delta Ecological Investigation – Phase 2 Report (Exponent, August 1999)
- Acid Brook Delta Ecological Investigation Phase 2 Report (Exponent and Academy of Natural Sciences, January 2003)
- Acid Brook Delta Sediment Reuse Plan (DuPont CRG, November 2005)
- Draft Remedial Action Proposal for Acid Brook Delta Sediments (DuPont CRG, November 2006)
- Evaluation of Pompton Lake Hydrodynamics and Transport Processes (QEA, November 2007)
- Revised Acid Brook Delta Remedial Investigation Report (DuPont CRG, January 2008)
- Acid Brook Delta Uplands Remedial Investigation Work Plan (DuPont CRG, January 2009)
- RASR/CMS (DuPont CRG, September 2009)
- Remedial Investigation Report, Pompton Lake Uplands (Parsons, June 2010)
- Supplemental Technical Information Report (DuPont CRG, October 2010)
- Evaluation of the Acid Brook Delta Ecological Investigation and the Onondaga Lake Baseline Risk Assessment (URS, May 2010, revised December 2010)

- Revised CMI WP (ARCADIS et al., September 2011)
- Draft Technical Memorandum: Updated Conceptual Site Model (ARCADIS et al., June 2013)
- Pompton Lake Ecological Investigations: Framework Document (URS, June 2013)
- 2013 Sediment Sampling Plan (ARCADIS, July 2013)
- 2013 Pompton Lake Ecological Investigation Report (URS, March 2014)
- Technical Memorandum: Updated Conceptual Site Model (ARCADIS et al., March 2014)
- Technical Support for Additional Sediment Removal Areas, Pompton Lake Corrective Action Implementation, Pompton Lakes, New Jersey Technical Memorandum (URS, October 2014a)
- Technical Support for Acid Brook Delta Upland Soil Areas Corrective Action Implementation, Pompton Lakes, New Jersey Technical Memorandum (URS, October 2014b)

Remedial measures were conducted in a portion of the Upland soils and Acid Brook. An interim remedial measure was conducted in the Upland area from July to August 1996 that included soil excavation, post-excavation sampling, backfilling with clean soil, and re-establishing vegetation. Acid Brook (upstream of Lakeside Avenue bridge) was remediated between 1991 and 1997 through stream-bed cleaning and excavation of adjacent floodplain soils.

1.3 Overview of Corrective Measures

Based on the approved RASR/CMS (DuPont CRG, September 2009), the selected remedial approach for the PLSA, as presented in Permit Modification I, is to remove sediment/soil to achieve the RAOs. This section briefly outlines the components of the remedial approach and corrective measures to be implemented; additional details are provided in Section 2.

Soil from the Uplands and sediment from the Delta Area, Lake Area A, and Island Area have been identified for removal through excavation and/or dredging (Figures 1-2 and 1-3). Six main steps are required for the remediation of soil and sediment, including:

- Installation of a containment system
- Dredging and/or excavation
- Transport and re-handling
- Processing and treatment
- Material disposal
- Restoration

Installation of a Containment System: A series of geotechnical investigations were completed to design a containment system for the Delta Area removal work. A summary of the investigation efforts and results are provided in Section 2.5.1. The proposed systems consist of turbidity curtains which will be installed around the Delta Area to provide an engineering control to protect the surrounding water from resuspended sediment that may be generated during dredging activities. As further described in Section 2.5.1, a three-tiered approach will be used in this area to provide additional measures of protection since the Delta Area is the area of largest disturbance. Containment systems consisting of single turbidity curtains will also be installed around Lake Area A and the Island Area to provide an engineering control to protect the surrounding water from resuspended sediment that may be generated during dredging activities. The systems will enclose each of the removal areas, and will be put in place prior to the removal activities. The Uplands and shallow water Delta Area removal areas will be isolated with sheetpile and erosion (e.g., silt fencing) control measures to reduce the potential for erosion or washout from disturbed areas to uncontained areas of Pompton Lake or other areas within the Uplands.

Dredging and/or Excavation: Removal activities within the Delta Area will be performed using a combination of hydraulic and mechanical dredging equipment. Removal activities within Lake Area A/Island Area and Uplands

will be performed using mechanical dredging and excavation equipment, respectively.

Transport and Re-handling: The hydraulically dredged sediment will be slurried and pumped to the shoreline and mechanically dredged sediment will be transported to the shoreline via barge, where the sediment and water will be processed. Uplands soils will be trucked to the processing area.

Processing and Treatment: Excavated materials will be transported and solidified, as needed, to meet disposal requirements as described in Section 2.6.2. Sediment in the Delta Area, Lake Area A, and Island Area is a very soft, fine-grained material with very low strength, and may require solidification prior to transport and disposal. Solidification will be performed through a mechanical solidification and processing operation. The soils in the Uplands are typical of conventional earthwork projects and may not require solidification – this is also potentially the same for the sediments within certain portions of the shallow water Delta Area. As necessary, soils and shallow water sediments will be processed or solidified in water-tight containment boxes. Decontamination water, stormwater in contact with soil or sediment to be dredged and/or excavated, and water generated during material handling will be processed in accordance with the requirements of the regulatory permits obtained for the project.

Material Disposal: Sediment and soils removed during the project will be transported to an off-site permitted facility licensed to receive this type of material for final disposition.

Restoration: Following removal, the Uplands will be restored in accordance with the requirements contained in the regulatory permits obtained for this project. For the Delta Area, Lake Area A, and Island Area, the dredged area will be restored by placing a granular layer of sand (ecological-layer) over the dredged area to establish a zone for benthic community recolonization over time. Also, planting of desirable native vegetation along the margins of the temporarily disturbed wetlands and lake margins will be completed. In combination, the plantings and sand layer will advance restoration and increase the ecological services provided by both aquatic and benthic habitats (i.e., create potential conditions that could increase the functions and associated benefits provided by the natural systems). When excavation in the

Uplands is complete, the area will be restored in-kind and in accordance with the required regulatory permit(s).

Additional details regarding the tasks to be completed, equipment to be utilized and actual operations and procedures to be implemented by the Remedial Action Contractor to perform each of these main components are provided in the Operations Plan (Appendix A).

Water, air, odor, noise, and vibration monitoring will be performed during excavation, dredging, material handling and processing, and ecological-layer placement to assess potential impacts from implementation of the corrective measures on the surrounding environment and community as described in Section 2.7 and Appendix A.

As required by Permit Modification I, a post-remediation Long-Term Monitoring (LTM) Program Work Plan will be developed and submitted to EPA. The LTM Program Work Plan will outline a monitoring program that will establish baseline conditions and be used to conduct monitoring after completion of construction to measure key indicators of the overall condition of the PLSA. The results of the monitoring will be utilized to determine the scope of any needed future activities.

1.4 Public Involvement Plan

While EPA will take the lead on public participation and communications based on Permit Modification I, a public involvement approach has also been developed to maintain open, transparent, timely, and consistent communications with residents of the Pompton Lakes, New Jersey community, and other internal and external stakeholders during implementation of this CMI WP and related activities.

The primary methods of communication with the community are summarized below. Additional activities/measures may be implemented to support specific project goals.

Information Outreach Office: The PLW Remediation Project Office is located in Pompton Lakes, and details on the location are provided on the project website (www.pomptonlakesworks.com). The office supports continuing outreach activities concerning environmental remediation work related to

former manufacturing operations at the PLW Site. The center houses information materials and documents relevant to the project.

Website: PLW will continue to maintain and update the project's public web site (www.pomptonlakesworks.com).

1.5 Document Organization

The remainder of this document is organized into five sections. Section 2 presents the remedial approach and corrective measures to be implemented. Specifically, Section 2 describes RAOs, pre-construction activities, preparation and access, soil and sediment removal activities, processing and disposal operations, monitoring program, restoration, contingency measures, demobilization, green remediation practices, and the forthcoming completion report. A listing of permits and other necessary approvals to implement the corrective measures is provided in Section 3. Sections 4 and 5 outline the health and safety measures and the quality assurance (QA) and quality control (QC) procedures to be executed during implementation of this CMI WP, respectively. Section 6 provides the general project schedule and anticipated project management structure. Section 7 lists references cited as sources for this document. Tables, figures, and appendices are also included in this CMI WP to support the overall document.

2. Corrective Measures for the PLSA

This section describes the approach for the activities to be conducted for the remediation of targeted soils and sediment in the PLSA. As indicated in Section 1 and discussed further below, the methods used to implement the work (e.g., work area isolation methods, specific soil and sediment removal methods, sediment/soil processing, etc.) have been determined in consultation with the Remedial Action Contractor [Sevenson Environmental Services, Inc. (Sevenson)]. Additional details regarding the remediation methods including tasks to be completed, equipment to be utilized and actual operations and procedures to be implemented by the Remedial Action Contractor are provided in the Operations Plan (Appendix A).

The RAOs are presented in Section 2.1 and descriptions of the corrective measures to be implemented are provided in Sections 2.2 through 2.10. Section 2.11 summarizes the green remediation practices, and Section 2.12 summarizes the completion report components.

2.1 Remedial Action Objectives

The RAOs defined in Permit Modification I are listed below (EPA, June 2015).

Qualitative Sediment RAOs (Delta Area, Lake Area A, and Island Area)

- Remove sediments with the potential to methylate mercury and reduce the potential for further mercury methylation in the near-shore sediments in the Delta Area.

- Reduce the area of exposure of ecological receptors to elevated mercury concentrations in sediments.

- Reduce the potential for ecological receptor exposure by removing sediment which has the potential to methylate mercury which reduces the mass of mercury in the surficial sediment (i.e., the sediment found at 0 to 0.5 feet) in the Delta Area, Lake Area A, and Island Area.

- Reduce the potential for ecological receptor exposure by removing sediments which have the highest potential to methylate mercury which reduces the mercury mass in the deep sediment (i.e., the sediment found at >0.5 feet) in the Delta Area, Lake Area A, and Island Area.

Quantitative Upland Soil RAOs

- Soils outside of the wetland and wetland transition zone: In surface soils (0 to 0.5 feet), RAOs are based on the lower value of the New Jersey Residential Direct Contact Soil Remediation Standards (NJRDCSRS) or ecological soil delineation criteria. In subsurface soils (deeper than 0.5 feet), the RAO is the NJRDCSRS. The criteria considered in establishing the RAOs for the Uplands are provided in Table 2-1.

Table 2-1: Uplands RAOs and Removal Criteria

Analyte	Surface Soil Criteria (mg/kg)	Subsurface Soil Criteria (mg/kg)
Copper (Cu)	1,100*	3,100**
Mercury (Hg)	20.5*	23**
Lead (Pb)	400**	400**
Zinc (Zn)	1,507*	23,000**

Note: * represents ecological soil delineation criteria, while ** represents the NJRDCSRS; mg/kg = milligrams per kilogram

- Within the wetland and wetland transition zone (Removal Areas A, B, B1, C, D1, D2, lower portions of E4, E5, E6, and F, as shown on Figure 2-1): Eliminate or minimize the potential exposure to ecological receptors within the wetland and wetland transition zone to surface and subsurface soils in these areas by limiting the potential for mercury methylation, bioaccumulation, and translocation. To achieve the RAO, areas within the wetland and wetland transition zone will be excavated to a depth of three feet below the final restoration elevation or one foot below the assumed water table elevation of 200.4 feet (i.e., one foot below full pool lake level), whichever is encountered first.

2.2 Pre-Construction Activities

The Remedial Action Contractor has developed an Operations Plan (Appendix A) that outlines further details on the construction activities to be implemented. The Remedial Action Contractor has also prepared a Contingency Plan (see Section 2.9 and Appendix B) that provides the procedures for responding to emergency conditions or events that may occur during implementation of the corrective measures. Additionally, the Remedial Action Contractor will provide and/or support other pre-mobilization submittals such as permitting (see Section 3 for additional details). The Remedial Action Contractor has also

prepared a Health and Safety Plan (HASP) that identifies the project-specific health and safety procedures and presents information such as training certification, environmental and personnel monitoring, hazards and associated controls, work zones, identification of key personnel, standard operating procedures, and safety programs (see Section 4 and Appendix C).

Pre-construction activities will also include establishment of survey control and an inventory to document pre-construction conditions, as necessary (see Section 6.1 for the anticipated pre-construction activities to be completed and associated schedule). Survey control points and benchmarks will be established at the start of the work (including field verification of the existing ground surface elevation and sediment bed elevation) and maintained throughout the construction activities. The Remedial Action Contractor will use such benchmarks to verify that the horizontal and vertical limits of removal have been obtained and that final surface grades have been achieved.

Prior to initiation of construction, an inventory will be performed to document the numbers, types, and locations of facilities (e.g., structures, pavement, benches) and other physical features (e.g., trees, fences) within Rotary Park, Lakeside Park, and other needed areas that may be affected by or interfere with implementation of the corrective measures (see Section 6.1 for the anticipated pre-construction activities to be completed and associated schedule). As necessary, these features may be protected or removed for the duration of remedial activities.

2.3 Preparation and Access

Various preparation activities and control measures will be implemented prior to and/or during remedial construction to limit potential construction impacts on the surrounding areas. These include establishing security and traffic control; implementing noise controls (as appropriate); identifying and/or relocating (as necessary) aboveground and underground utilities; installing erosion and stormwater control measures; accessing and establishing appropriate material and equipment staging areas; and clearing activities. These items are discussed in further detail below.

Security and Traffic Control

Security will be established during initial mobilization to the project/work area, and will be maintained until demobilization activities are complete. Fencing will

be installed to restrict access to work areas and protect monitoring and construction equipment (see Appendix A, Drawing 1 for location of fencing). During working hours, an on-site resource will inspect the fence integrity and observe the work area for the presence of non-approved individuals. School personnel will monitor student activities during the day to keep students away from the work area/fence. A visual screen will be installed on the fence separating the Lakeside Middle School from the work area as well as near Lakeside Avenue Park from the water's edge to Lakeside Avenue. There will also be no walking access on the side of the road where the gate is located, and the Remedial Action Contractor will establish new crossing areas and maintain safe walking space along Lakeside Avenue.

Additional security measures will consist of the following: signage posted indicating that site access is restricted; contractor resources positioned at the gate, thereby eliminating the opportunity for non-work personnel to enter through the gate; photographic surveillance; perimeter inspections during non-working hours at nights and on the weekends by a contracted security firm; and periodic patrols of the area at night and on the weekends by the Pompton Lakes Police Department as part of their routine activities.

Traffic control (e.g., signage, flag person) will be provided, as necessary, where construction activities may interfere with normal vehicle or pedestrian traffic in the vicinity of the work area. It is also important to note that when school is opening and closing, transport of materials and other construction-related traffic during certain morning and afternoon hours will be voluntarily suspended to minimize interference with school-related traffic. Further details on overall traffic control measures for this project are presented in the Traffic Control Plan (Appendix D).

Noise Controls

The Remedial Action Contractor will take adequate measures to keep noise at safe and tolerant levels as described in the Operations Plan (Appendix A). Noise controls will be implemented as necessary to mitigate the potential impact on the community due to construction activities, and noise monitoring will be performed to assess levels as described in Section 2.7.

Management of Existing Utilities

Aboveground (e.g., overhead power lines) and underground utilities (e.g., gas, storm sewer lines, water, electric lines) that could potentially be affected by the construction activities will be identified prior to and during mobilization. The Remedial Action Contractor will coordinate with New Jersey One Call (800-272-1000 or 811) to determine the locations of utilities at the start of work and coordinate with the owners of the utilities regarding the relocation/termination of utilities, as required (see Section 6.1 for the anticipated pre-construction activities to be completed and associated schedule).

Erosion and Stormwater Control Measures

Prior to the initiation of removal activities, stormwater controls, erosion prevention measures, and sediment control measures will be implemented (see Section 6.1 for the anticipated pre-construction activities to be completed and associated schedule). The design will establish the erosion and sediment control measures in accordance with applicable local and state regulations, permits, and the Soil Erosion and Sediment Control Plan (SESCP).

Erosion control measures (e.g., silt fencing, hay bales, diversion berms) will be implemented in association with the active construction areas. Erosion controls will be installed as needed to mitigate the potential for erosion or washout from disturbed areas, as well as to divert rainfall or surface water runoff from work areas and open excavations. Storm sewer outfalls that may be present in the work areas will be located and managed, as needed, through consultation with the Pompton Lakes Municipal Utilities Authority.

Access for Mobilization of Equipment

Access for equipment mobilization will be secured as part of the pre-construction activities (see Section 6.1 for the anticipated pre-construction activities to be completed and associated schedule). The Uplands and Rotary Park will be used as an access point for the equipment and materials associated with the Uplands construction activities. This area will also be used for staging of equipment and materials during remediation.

Two locations have been identified as access points for mobilization and/or demobilization of water-based equipment and materials to Pompton Lake. The public boat launch at Lakeside Park (located east of Rotary Park and owned by

the Borough of Pompton Lakes) will be used for marine equipment and materials associated with the in-water containment system and mechanical dredging equipment (Figure 1-3). A temporary water access point will be established by the Remedial Action Contractor adjacent to the Uplands access/staging area once the Delta Area containment system is in place. This access point (area owned by the Pompton Lakes Board of Education) will be used for the hydraulic dredge and associated equipment.

Establishing Appropriate Material and Equipment Staging Areas

The Uplands and Rotary Park will be used for material and equipment staging once the shallow water Delta Area has been isolated behind the sheetpile. Generally, Rotary Park will be used for equipment staging during mobilization and load out of stabilized soil materials. The non-maintained park area will be used for staging the mechanical solidification equipment to support dredging operations following removal of the targeted soils. The planned configuration for the Uplands material and equipment staging area will include fencing, access gates and roads, asphalt material pads and associated equipment, and access ramps. Details on this configuration are provided in the Operations Plan (Appendix A, see specifically Drawings 2, 3, and 8).

Clearing

To facilitate access to Pompton Lake and the Uplands for implementation of remedial activities, land and shoreline areas will require clearing and grubbing (e.g., trimming and/or removal) of the heavy underbrush and trees. The clearing activities will also assist in reducing potential safety hazards during operations. Where practicable, areas that are not targeted for removal or needed for general operations activities will be left undisturbed. In keeping with restoration efforts, invasive tree species in areas targeted for removal or general operations will be removed as part of the clearing and grubbing efforts. The major areas to be cleared include heavy shrub and trees from the area surrounding Acid Brook, Rotary Park, along the shoreline located adjacent to Lakeside Avenue, and in the backwater area (i.e., western channel) within the Island Area. Some limited clearing activities may also be required within the existing boat launch area at Lakeside Park. Tree removal will be performed in accordance with required regulatory permits.

2.4 Uplands Soil Remediation

This section presents an overview of the approach to be used for the remediation of the soils in the Uplands. Soil will be removed in the Uplands to achieve the soil RAOs (i.e., criteria listed in Table 2-1) followed by restoration activities. Additional details regarding tasks to be performed, equipment and procedures to be utilized, and a discussion of the actual operations necessary to complete the Uplands remediation are provided in the Operations Plan (Appendix A) prepared by the Remedial Action Contractor.

2.4.1 Acid Brook Flow, Sewers, Outfalls, and Groundwater Management

Acid Brook flows approximately north to south and enters through the Uplands under the Lakeside Avenue culvert and takes a slight northeastern jog before entering Acid Brook Delta, as shown on Figure 2-1. Acid Brook has an average base flow of approximately 0.71 cubic feet per second. During remedial activities in the Uplands and Delta Area, Acid Brook flow will be managed through development of a collection sump at the upstream end of the soil removal area in the Uplands and installing a sand bag/stone dam across the face of the brook to intercept flow. Ponded water will then be pumped through pipes that will discharge into the lake. Once the area within Acid Brook has been remediated, active pumping will be discontinued and instead gravity flow through pipes will be used to transport the water to the lake.

Two sanitary sewers cross under the bed of Acid Brook in the vicinity of Lakeside Avenue. As discussed in Section 2.4.4, limited remedial excavation is targeted for the area near where these sewer lines are located (Area A1). As such, the Remedial Action Contractor will work closely with the Pompton Lakes Municipal Utilities Authority during the pre-construction activities (see Section 6.1 for the anticipated pre-construction activities to be completed and associated schedule) to locate and protect these lines, as necessary, during the removal action. These coordination efforts have been initiated and will continue as needed. Additional sampling was performed in September 2015 to further refine the extent of removal required in this area. The results of this additional sampling are provided in Appendix F, and the limits of remediation for Area A1 are shown on Figure 1-2.

Certain soils may be excavated to depths below the typical groundwater elevation and/or are in close proximity to the shoreline of Pompton Lake (e.g.,

Areas B, B1, C, D1 and D2, E1, E4 through E6, and Area F as shown on Figure 2-1). Management of groundwater during these activities is described in the Operations Plan (Appendix A).

2.4.2 Uplands Work Area Isolation and Erosion Control Measures

During removal activities in the Uplands, erosion control measures will be implemented in the active construction areas in accordance with the approved SESCP. The erosion controls will be installed as needed to mitigate the potential for erosion or washout from disturbed areas. Similar measures will be used as needed to divert rainfall or surface water runoff from entering work areas and open excavations.

In addition, sheetpile will be installed between the Uplands and the in-water Delta Area to mitigate infiltration of surface water from Pompton Lake into the active removal areas in the Uplands, as shown on Figure 2-1. The sheetpile will be placed using a vibratory hammer attached to a backhoe. This barrier will also provide stability for the work and processing area to be established. An access road will be constructed along the perimeter of this sheetpile. Three-sided sheetpile will be used to isolate certain remote removal areas (i.e., Areas E-5, E-6, and F) and mitigate the flow of surface water from the lake into the soils designated for removal from these areas. Sheeting will be installed from land in a "U" shape around these areas.

Erosion and sediment control practices will remain in place throughout construction activities until the disturbed areas are stabilized in accordance with the approved SESCP. During construction, erosion and sediment control devices will be routinely inspected and maintained and/or adjusted as necessary based on changes in conditions and/or activities in accordance with the approved SESCP.

2.4.3 Limit and Depth of Uplands Soil Removal

As indicated in Permit Modification I, 16 areas have been defined for removal in the Uplands (Figure 2-1). Removal depths generally range from 0.5 to 9 feet below ground surface (bgs). The current total in-situ estimated removal volume is 3,160 in-situ cubic yards (cy).

As indicated in Section 2.2, control points have been established to define the target removal extent within each area. Control points have been developed at

the corners, vertices, and over an approximate 25-feet (or less) grid within the removal areas (Figure 2-1A). The corresponding depth of excavation will be subtracted from the existing ground surface elevation consistently at control points to determine the removal elevation. Field verification of the existing ground surface elevation will be performed by the Remedial Action Contractor during pre-construction activities.

The approximate removal area, depth, and in-situ volume for each of the areas are listed below in Table 2-2.

Table 2-2: Approximate Removal Area, Depth, and Volume for the Uplands

Area	Approximate Removal Area (square feet)	Removal Depth (feet)	Approximate Removal Volume (in-situ cy)
A	2,750	3.5	360
A1	190	2.5	25
B	3,670	5	680
B1	760	4	115
C	860	5	160
D1	190	8.5	60
D2	1,380	7	360
E1A	310	1	10
E1B	310	4	45
E2	190	2	15
E3	195	1	10
E4	150	8	45
E5	50	6	10
E6	55	3.5	10
E7	200	0.5	5
F	8,290	3 and 9	1,250
Total:	19,550	---	3,160

Notes:
1. All areas, depths, and volume are approximate. The locations of the removal areas are presented on Figure 2-1.
2. The removal depth for Area F has been primarily estimated at 3 feet per the Permit Modification I requirement, but this depth may be less based on conditions encountered in the field (specifically groundwater elevation as stated in Permit Modification I). A small portion of Area F (immediately east of Area A) was estimated for removal to a depth of 9 feet based on the restoration plan topography.

2.4.4 Uplands Soil Removal Process

Prior to initiating activities for the areas subject to soil removal, the horizontal limits of removal will be surveyed and staked in the field, and the removal areas stripped of vegetation and/or cleared of debris as necessary. Vegetation cleared above grade (e.g., trees, bushes, and branches) or below grade (e.g., tree stumps, roots) will be broken into smaller pieces for disposal. Soils will then be removed to the specific elevations defined in Section 2.4.3 using conventional construction equipment (i.e., backhoe with a long-stick) operating from land within the Uplands; some removal in Area A1 will be performed by hand digging near the sewer lines. For deeper excavation areas (e.g., Areas D1, D2, E4, and a portion of F), the Remedial Action Contractor will establish safe slope or work areas to allow access to the area as outlined in the Operations Plan (Appendix A). The excavated soils will be stockpiled within the footprint of the Uplands excavation areas and processed/transported as described in Section 2.6.

Monitoring will be performed during soil excavation activities to assess the impact of construction on the surrounding environment and community (e.g., air monitoring). Corrective action levels have been established and these levels will be achieved during soil excavation activities (see Section 2.7 for additional details on monitoring activities, levels, and corrective actions).

During removal activities, the Remedial Action Contractor will record surveyed field measurements, coincident with the survey control points (Figures 2-1 and 2-1A), to verify that the target removal extent and elevations have been achieved for each excavation area as described in the Operations Plan (Appendix A). Removed soil materials will be transported for processing and management, characterized for purposes of acceptance at the disposal facility in accordance with the landfill's requirements, and then transported for disposal.

Toxicity Characteristic Leaching Procedure (TCLP)/Synthetic Precipitation Leaching Procedure (SPLP) testing was performed to determine the leaching characteristics of the soil. Results indicated that one area exceeded TCLP lead levels in Area B (see Figure 2-1). This area was delineated during the spring 2010 investigations. TCLP results are provided in Appendix G. Soils in these areas will be treated in-situ to meet the TCLP standard through an amendment injection system prior to being excavated, as discussed in the Operations Plan (Appendix A). The area will be sampled post treatment/pre-

excavation to confirm the appropriate parameters and standards have been achieved prior to removal in accordance with the Construction Quality Assurance Plan (CQAP; Appendix E, Table 3-1).

Backfilling will be initiated as soon as practicable after completion and proper documentation of excavation activities. Excavations will be backfilled with common backfill (i.e., soil fill) obtained from an off-site permitted source. Backfill material will meet the NJDEP requirements for backfill material, no greater than gravel in size to promote proper settlement, permeability, and compaction, and will meet the gradation provided below (see also requirements outlined in the CQAP in Appendix E).

Sieve	Percent Passing
3 inch	100
No. 200	10-30

Backfill materials will be trucked to the work area and spread/compacted in controlled, uniform lifts with several passes of a bulldozer.

Note that following backfilling activities, the Uplands will be used as a staging area during sediment removal from the Delta Area. As such, once backfilling activities are complete, a geotextile liner will be laid down (lower liner) and ecological-layer fill material will be added to create a temporary working surface for equipment required for sediment removal activities. An impermeable liner (upper liner) will also be installed over the ecological-layer to separate equipment from the working surface. Typical cut sheets are provided in the Operations Plan (Appendix A) for the geotextile and impermeable liners. These liners will isolate the materials from operations and delineate between the two zones of backfill material. Following dredging and demobilization of the solidification equipment, the additional fill material under the upper liner will then be removed and reused for the ecological-layer to be placed in the Delta Area. Finally, the Uplands will be restored using the backfill material under the lower liner to establish design elevations and install the final surface layer or restoration features as discussed in Section 2.8.

2.4.5 Uplands Soil Removal Completion Confirmation

As discussed in Section 2.2, the Remedial Action Contractor will establish horizontal and vertical survey control points for each soil removal area. Each

targeted removal area will then be excavated to the specified elevation, with points verified through surveying following removal (Figures 2-1 and 2-1A). Removal completion confirmation surveying will be elevation-based, and the surveyed control points will be used to verify that the horizontal and vertical limits of removal have been achieved.

2.5 ABD and Pompton Lake Sediments Remediation

This section outlines the approach for the remediation of sediments in the Delta Area, Lake Area A, and Island Area (Figures 2-1 and 2-2) to achieve the sediment RAOs. Additional details regarding tasks to be performed, equipment and procedures to be utilized, and a discussion of the actual operations necessary to complete sediment remediation are provided in the Operations Plan (Appendix A).

2.5.1 In-water Work Area Isolation

Geotechnical borings were advanced in spring 2010 and summer 2015 to obtain additional data regarding sub-surface material characteristics in the Delta (boring logs provided in Appendix H). Results of these efforts generally show that dense to very dense materials are found throughout the area, with refusal encountered along much of the eastern boundary of the removal area indicating installation of a sheetpile wall would not be feasible. As such, the Delta Area work area will be isolated using a turbidity containment system. The approximate location of the turbidity control system is shown along the approximate boundary of the Delta Area removal area on Figure 2-2.

It is currently anticipated that a three-tiered approach will be utilized for the Delta Area turbidity containment system. An approximate distance of 3 feet will be established between the three tiers so that the curtains do not get entangled. The three-tiered containment system will include the following:

- The first tier (i.e., closest to the dredge area) will be offset from the dredge area and installed over non-targeted sediment, and will consist of an oil/debris boom. This oil/debris boom will be installed “top-down” (i.e., the top edge of the curtain will be above the water surface) with the oil boom attached on the inside edge (i.e., closest to the dredge area), and will extend approximately 1.5 feet below the water surface.

- The second tier will consist of a bedload baffle, and will be installed "bottom-up" such that the top of the bedload baffle is approximately two feet above the sediment surface.

- The third tier will consist of a traditional permeable turbidity curtain, installed such that the fabric extends to within one foot above the sediment surface.

This three-tiered approach has proven successful during use at similar sites, including the NW Natural Gas Site on Willamette River in Portland, Oregon and the Roebling Steel Superfund Site in Roebling, New Jersey. Additional information and details on the turbidity containment system are provided in the Operations Plan (Appendix A).

The Lake Area A and Island Area work areas will be individually isolated using a single turbidity curtain installed down to the sediment surface and positioned around the exterior of removal areas, as indicated in the Operations Plan (Appendix A). The approximate location of the turbidity curtains are shown along the boundary of the Lake Area A and Island Area removal areas on Figure 2-2.

The turbidity containment systems will be installed prior to removal activities in each area, and will be maintained for the duration of the dredging and ecological-layer placement activities. In the event of heavy rains or potential flooding scenarios, work will be halted and equipment will be secured within the isolated areas as necessary. Additional details regarding contingency measures associated with severe weather/flooding are included in the Contingency Plan (Appendix B).

To mitigate the potential effects of prop-wash (i.e., propeller wash or current of water created on the sediment bed by the action of the boat propeller) on the impacted sediments, to the extent practicable, the equipment used to install the turbidity containment systems will operate from the outside of the respective removal area. Once the turbidity containment systems are installed, and prior to the initiation of sediment removal-related activities in each area, an attempt will be made to capture and relocate fish and other large aquatic species from the containment area in accordance with the approved Scientific Collector's Permit and Fish Stocking Permit (see also Section 3). This will primarily be performed using electrofishing equipment and supplemented using seine nets, trap nets, etc.

Access to the lake by residents in the areas where the turbidity containment systems must be installed will be limited and boundaries will be clearly marked with lights and high visibility buoys.

A shallow water portion of the Delta Area adjacent to Rotary Park will be isolated from the Delta Area by the sheetpile barrier described in Section 2.4.2. In addition, erosion control measures will be implemented between the Uplands and the shallow water portion of the Delta Area within the sheetpile barrier, as necessary. Erosion and sediment control practices will remain in place throughout construction activities until the disturbed areas are stabilized in accordance with the approved SESCP. During construction, erosion and sediment control devices will be routinely inspected and maintained and/or adjusted as necessary based on changes in conditions and/or activities in accordance with the approved SESCP.

2.5.2 Debris Removal

Debris is likely to be encountered during dredging operations; however, based on previous sampling and field reconnaissance efforts, it is not anticipated that a separate step will be required for debris removal. Debris may be natural material or man-made items. Large debris includes items such as logs or stumps greater than 6 inches in diameter, boat anchors, car or truck tires, steel cables or chains, broken concrete, etc. If encountered, debris removal activities will be performed using an excavator equipped with a perforated bucket located on a flexi-float barge. The Remedial Action Contractor may also use a specialized rake and grapple depending on the nature of the debris encountered. Debris will be placed in a shallow-draft material scow for transport to the processing area using a work boat. Debris will be removed from the scow using a backhoe or crane and then handled as described under Section 2.6.1.

Dense submerged aquatic vegetation (SAV) has historically been observed in Pompton Lake during the summer growing season. This vegetation is currently managed by the Borough of Pompton Lakes by chemically treating it on an annual basis. It is anticipated that any SAV encountered will be removed using the dredging equipment and processed similar to other debris and material and loaded into trucks for off-site disposal per the Operations Plan (Appendix A). In the event that the vegetation is too thick for the dredge and processing equipment, a weed harvester (or equivalent) may be used to remove vegetation in advance of dredging.

2.5.3 Limit and Depth of Sediment Removal

As indicated in Permit Modification I, sediment removal will occur in the Delta Area, Lake Area A, and Island Area. The overall horizontal extent of the sediment removal areas are provided on Figures 2-1 and 2-2. The vertical extent of removal varies throughout each area, with removal in the Delta Area targeting mercury-impacted sediments down to the peat layer and removal in Lake Area A and the Island Area targeting mercury-impacted sediments down to the native cobble or gravel layer. Isolated locations in the Delta Area will require peat removal based on historical data as identified on Figure 2-3.

The volume to be removed will need to account for operational considerations such as allowances for sloping that may be necessary to enable the selected method of dredge operation (Palermo et al., 2008). To account for sloping and actual dredging operations, a dredge prism has been developed for each removal area (Figures 2-3 and 2-4). The dredge prism includes, at a minimum, the removal elevation defined by sampling and core log material type observations. In addition, the dredge prism accounts for the general assumptions/boundary conditions listed below.

- A 1-foot vertical cut will be removed along the boundary of the sediment removal limit at the shoreline, at which point the removal depth will be tapered at a 3H:1V slope (i.e., 3 horizontal:1 vertical), as necessary, to the required removal depth.

- Along the sheetpile adjacent to Rotary Park, a vertical cut will be removed at the sheetpile to the required removal depth.

- Along the water side of the Delta Area, Lake Area A, and the Island Area (i.e., where the turbidity containment systems will be installed), a vertical cut will be removed at the sediment removal limit boundary to the dredge surface removal elevation, at which point the removal depth will be tapered at a 3H:1V slope towards the turbidity containment system outside of the sediment removal area limit to transition to the existing grade.

- The dredge prism has been designed with consideration for constructability (i.e., range of accuracy of dredging equipment, reasonable tolerances, etc.). As such, the dredge prism surface has been smoothed to allow for more gradual transitions between adjacent removal areas.

Overall, the resulting dredge prism provides the approximate areal extent and elevations that would need to be achieved during dredging activities and is used to determine the resulting removal volumes provided in Table 2-3 below. A series of cross-sections within the dredge prism are also presented on Figures 2-1B, 2-3A, 2-3B, 2-3C, and 2-4A.

Table 2-3: Approximate Removal Area and Volume for the Delta Area, Lake Area A, and Island Area

Location	Approximate Removal Area (acres)	Dredge Prism Volume (in-situ cy)
Delta Area	35.9	114,400
Lake Area A	0.5	4,100
Island Area	2.8	15,200
Total	39.2	133,700

Notes:
1. All volumes are approximate. The location of the removal areas and dredge prisms are presented on Figures 2-3 and 2-4.

A shoreline reconnaissance effort was performed in fall 2010 to locate and identify structures along the shoreline that may influence the removal extent/boundaries. These structures include docks, retaining walls, etc. It is anticipated that removal adjacent to these structures will be handled consistent with the shoreline (i.e., 1-foot vertical cut tapered at a 3H:1V slope). A more thorough evaluation of these structures and removal activities will be performed and discussed with the property owner as part of the pre-construction activities (see Section 6.1).

2.5.4 Sediment Removal Process and Sequencing

Prior to initiating dredging, the horizontal limits of removal will be surveyed and defined in the field using buoys or other acceptable markers. The removal approach for the areas differs based on site conditions – each of these areas are described below.

Delta Area

The majority of sediments will be removed from the Delta Area “in the wet” utilizing a hydraulic dredge capable of removing 50 to 120 cy per hour on average that can be operated in relatively shallow water depths, as outlined in the Operations Plan (Appendix A). Positioning of the hydraulic dredge will be

performed using a real-time kinematic differential global positioning system (RTK DGPS) and Dredgepack system designed specifically for the hydraulic dredge. The proposed contour surface illustrated on Figure 2-3 will be programmed into the Dredgepack system to provide the operator with a real-time display of removal depths/elevations. The output from the RTK DGPS and Dredgepack system will be used to verify that the target removal depths/elevations have been achieved. Sediment removed during the dredging process will be directly transported in a slurry via pipeline to the shore for processing.

As discussed above, the portion of the Delta Area immediately adjacent to the Uplands with very shallow water depths will be isolated from the rest of the Delta Area by a sheetpile barrier. Sediments from this area will be removed similar to the removal process outlined for the soils in the Uplands as summarized in Section 2.4.4, including removal using conventional construction equipment (e.g., backhoe with a long-stick excavator). The excavated sediments will be stockpiled within the footprint of the Uplands excavation areas and processed/transported as described in Section 2.6.

During removal activities, the Remedial Action Contractor will record surveyed field measurements using RTK DGPS and/or traditional survey techniques to verify that the target removal extent and elevations have been achieved, as described in the Operations Plan (Appendix A).

In 2003, TCLP/SPLP testing was performed to determine the leaching characteristics of the sediment in a portion of the Delta Area, and the results were summarized in the ABD Sediment Reuse Plan (DuPont CRG, November 2005). Results indicated four areas with exceeded TCLP levels for lead (see Figure 2-3). These areas were further delineated during the spring 2010 and summer 2015 investigations. The 2010 TCLP results are provided in Appendix G, and the 2015 results are provided in Appendix I. Sediments in these areas will be treated to meet TCLP standards through an amendment injection system and specialized mixing head attached to a hydraulic excavator on a flexi-float barge prior to being dredged. MAECTITE® will be the additive used to stabilize the sediment. MAECTITE® is a process patented by the Remedial Action Contractor to treat RCRA metal-contaminated waste and render it non-hazardous by RCRA definition. The MAECTITE® process was accepted into the EPA Superfund Innovative Technology Evaluation program in 1992. The principle behind the MAECTITE® process is chemical bonding, which creates substituted mixed mineral forms, stable and resistant to leaching. Additional

details on MAECTITE® are provided in the Operations Plan (Appendix A). Those areas requiring pre-treatment prior to removal to meet TCLP standards will be sampled post treatment to confirm the appropriate standards have been achieved prior to removal.

Lake Area A and the Island Area

Sediments will be removed from the Lake Area A and Island Area "in the wet" utilizing standard mechanical dredging equipment (e.g., barge-mounted excavator), as outlined in the Operations Plan (Appendix A). Similar to positioning for the hydraulic dredge, lateral and vertical control during mechanical excavation will be performed using a RTK DGPS mounted on the excavator, combined with Dredgepack software, inclinometers, and use of level-cut clamshell buckets. Similar to the techniques discussed above for hydraulic dredging, the proposed contour surface illustrated on Figures 2-3 and 2-4 will be programmed into the Dredgepack system, and the output will be used to verify that the target removal depths/elevations have been achieved. The excavator will remove sediments from the dredge areas and place them into material scows for transport to the Uplands shore area for unloading and processing as described in Section 2.6.

Sediment Removal Sequencing

Based on an anticipated June 2016 construction start date, removal activities in the shallow water Delta Area will be completed in combination with the soil removal activities in the Uplands. Once backfill activities are complete, a working surface for equipment will be established to support sediment dredging activities. Removal in Lake Area A and the Island Area will then be performed, followed by placement of the ecological-layer. Ecological-layer placement will be not be initiated until excavation has been completed in each area. After completion of removal in the other areas, removal activities in the Delta Area will be performed. To mitigate the potential effect of prop-wash on the impacted sediments, to the extent practicable, the hydraulic dredge will operate from within areas already remediated. The Operations Plan (Appendix A) provides additional details on the overall schedule, dredge sequencing, material handling, etc.

Monitoring will be performed during dredging activities to assess the impact of construction on the surrounding environment and community. Corrective action levels have been established and these levels will be achieved during

sediment excavation activities (see Section 2.7 for additional details on monitoring activities, levels, and corrective actions).

2.5.5 Sediment Removal Completion Confirmation

Sediment removal completion confirmation will be elevation-based as defined by the dredge prisms (Figures 2-1, 2-3, and 2-4). Both traditional survey techniques (e.g., pole shots) and the dredge- or excavator-mounted RTK DGPS will be used by the Remedial Action Contractor to verify that the horizontal and vertical limits of removal have been achieved. It is anticipated that an approximate 50-feet by 50-feet grid will be used for survey confirmation efforts.

2.5.6 In-situ Post-Dredging Management

The dredged areas will be covered with a layer of granular material that will be placed after dredging operations have been completed. This granular material will cover the dredge areas and will also serve to establish a zone or "ecological-layer" within which the benthic community can re-establish over time. Details on the ecological-layer and restoration are provided in Section 2.8.

2.6 Sediment/Soil Processing and Disposal

Once the soils are excavated as described in Section 2.4 or sediments are dredged as described in Section 2.5, the materials will require further processing (e.g., transportation within the work area, particle separation and compression or solidification, conveyance for off-site disposal, etc.). A description of these processes is provided in the following sections.

2.6.1 Material Transport and Re-handling

Sediment dredged from the Delta Area, Lake Area A, and the Island Area will be transported from the lake to land for treatment and disposal. Therefore, it will be necessary to establish a staging area to re-handle dredge materials prior to transport.

Staging Area

The staging area will be established on the soil removal area in the Uplands and adjacent lands following soil remediation and backfill. The staging area will use available land space in Rotary Park and the lower lands adjacent to Acid Brook, as shown in Figure 2-2, to accommodate the equipment and other supporting materials and facilities associated with sediment solidification and remedial activities. Soil/sediment solidification or sediment particle separation and compression will be done on the lower backfilled portions of the area, which provides the maximum distance between residential areas and the equipment. Remedial activities will be confined to the fenced area shown in the Operations Plan (Appendix A, Drawing 1). The actively used grounds of the Lakeside Middle School (e.g., athletic fields) will not be utilized for remedial activities. Details on the staging area layout are provided in the Operations Plan (Appendix A, see specifically Drawings 2 and 8).

The design of the staging area takes into account the difference in elevation between the elevation of Lakeside Avenue and the lake. The ground surface in the park and on Lakeside Avenue is fairly level with existing elevations from 206 to 208 feet. The lower staging area will be established at elevations 203 to 205 feet.

Transport and Re-handling

Hydraulically dredged sediment from the Delta Area will be processed via sequential solidification and compression to prepare the material for transport from the lakeshore staging area. This process will reduce the number of vehicles needed to transport sediment for off-site disposal. Excavated soil and mechanically dredged sediment will be processed and solidified, if necessary, following gravity drainage.

Large, non-porous debris materials may be cleaned and taken to an appropriate recycling facility. It is not practical to decontaminate porous debris (e.g., logs, stumps, broken concrete, etc. or something that may be difficult to decontaminate), so it will be managed by creating smaller pieces as necessary with transport to the same off-site permitted and licensed disposal facility as the impacted sediment and soil. The specific methods of handling debris will be further refined during construction in consideration of the nature and characteristics of the debris materials and the overall sequence and schedule of the removal actions.

2.6.2 Soil and Sediment Bench-Scale Testing

Bench-scale treatability study testing was performed on soil and sediment samples obtained from the Delta Area, Lake Area A, Island Area, and Uplands area. These studies were performed to evaluate methods to dewater or solidify soil and sediment, to evaluate impacts to surface water quality during dredging, and to evaluate treatment of water that is separated from contaminated soil or sediment. In general, processing to reduce the moisture content of excavated Uplands soil or mechanically dredged sediment may include passive gravity drainage or addition of solidification agents. It is expected that these methods will be used during construction. This will allow flexibility to perform the work in a cost-effective manner and still meet disposal requirements for moisture. Processing to reduce the moisture content of hydraulically dredged sediment will include screening to separate sand and gravel-sized particles followed by compression using filter presses to reduce the weight required for disposal.

Sediment samples from the Delta Area, Area A, Island Area, and soil samples from the Uplands were used in bench-scale solidification testing. The purpose of the testing was to assess the effectiveness of various solidification agents. Testing was conducted on samples collected in November 2008, spring of 2010 and summer of 2015. A summary of the testing and results follows.

<u>2008 to 2009 Testing</u>

Waste Stream Technologies, Inc. (WST) performed bench-scale treatability tests to assess water quality impact during dredging, to assess methods for dewatering sediment slurries and to provide information for preliminary design of water treatment. WST performed Dredge Elutriate Tests (DRET), Effluent Elutriate Tests (EET), Rapid Dewatering Tests (RDT), Geotube Dewatering Tests (GDT), and polymer screening tests. The results are reported in the Treatability Report, Acid Brook Delta Geotextile Evaluation and Bench Scale Study, January 2009, which is presented in Appendix I.

In addition, WST performed supplemental testing on filtered samples from the GDT and performed Extended DRET and EET tests. The results from this testing are attached to the January 2009 report and also presented in Appendix I.

In November 2008, bulk sediment, peat and water samples were collected from the Delta Area and a total of 30 five-gallon buckets of sediment, and 10 five-

gallon buckets of peat were sent to WST for testing. Two composite samples were made from bulk materials; sediment which was 80% sediment and 20% peat; and peat which was 50% sediment and 50% peat.

The data from the standard and extended DRET and EET were used to assess the water quality impacts from dredging and the reduction in suspended sediment and metals concentrations with time.

Samples were treated with a cationic, anionic or a combination of a solution polymer and an anionic polymer.

- In general, a cationic or a combination of a solution polymer and an anionic polymer produced a good floc that settled well, could withstand RDT testing and generated clear filtrate.

- Anionic polymers alone produced a good floc that settled well with a lot of filtrate. However, the filtrate was cloudy and high in solids.

- Solution polymers produced a floc that settled well, leaving clear filtrate. However, the floc was very fine and did not withstand RDT testing.

- Lower charged cationic polymers, also produced desirable floc and filtrate on its own.

- Higher charged cationic polymers may have been too strong for the test material as it was easy to over-treat the samples with a high charged polymer.

- The high solids sediment samples did not readily release water, even with the addition of polymer.

After sediment and peat material was dewatered in the GDT, samples were obtained and analyzed for percent solids and moisture content. The results are shown below:

- Sediment composite sample – 24.3 to 36.4 percent solids (315 to 174 percent moisture content).

- Peat composite sample – 26.9 to 31.6 percent solids (218 to 273 percent moisture content).

2010 Testing

In May and early June 2010, bulk sediment was collected from three areas (twelve sub-areas) in the Delta Area, Lake Area A, and Island Area to get representative sediment in these areas, with peat also included as an area. The collected sediment and peat were placed in two 3-gallon containers per sub-area or area and delivered to Parsons' laboratory for testing. The primary objective of testing was to identify an optimum solidification process that passes acceptance criteria for acceptance at an approved landfill while allowing for safe and environmentally sound treatment, transport, and disposal. Testing results are presented in Appendix I (Parsons, 2010) and summarized below.

Composite samples were made from bulk materials including three of the soft sediment and one from peat. Each composite was tested with cement, ground corn cobs, polymers from two suppliers, cement with iron (II) chloride ($FeCl_2$) and sodium sulfide (Na_2S), cement with alum, and cement with polymer. Results indicated the following:

- Samples treated with cement produced the highest strength index and lowest TCLP mercury and lead concentrations; but exhibited pH approaching 11 and the paint filter test (PFT) did not pass at the time of application.
    - Adding alum resulted in immediate passage of PFT and provided some attenuation of pH.
    - Adding $FeCl_2$ and Na_2S did not confer significant advantage over cement alone.
- Samples treated with ground corn cobs passed PFT at the time of mixing, and had low TCLP mercury and lead concentrations, but resulted in low strength index and low unit weight. They were plagued by sediment expansion accompanied by a putrid odor possibly due to an adverse biochemical reaction.
- Samples treated with polymer passed PFT at the time of mixing and had neutral pH, but had low strength index, and the highest TCLP mercury and lead concentrations, which were below characteristic hazardous waste criteria.

- Samples treated with cement combined with polymer had low TCLP mercury and lead concentrations, but retained several disadvantages that characterized each agent separately.

After the results from testing on the composite samples were available, sediment from the sub-areas with the highest mercury and lead concentrations were tested with cement and one polymer.

- The three samples of soft sediment treated with 10 percent cement and 20 percent cement by wet weight failed PFT at the time of mixing and passed after one day of cure time. Samples treated with 20 percent cement had strength index values an order of magnitude higher than the 10 percent samples.

- Samples treated with 20 percent cement had low TCLP mercury and lead.

- The peat sample treated with 5 and 10 percent cement by weight passed PFT at the time of mixing.

- The peat sample with 10 percent cement had low TCLP mercury and lead.

- The four samples treated with polymer passed PFT at the time of mixing. TCLP mercury and lead were below regulatory criteria, but were higher than cement.

Based on the three rounds of testing plus the cement set-up test, the most favorable solidification results for the Delta Area, Lake Area A and Island Area sediments were obtained using cement combined with alum. The most favorable solidification results for the peat were obtained using cement combined with ZappaTec Low End polymer.

2015 Testing

In July 2015, bulk sediment was collected from five areas; the Uplands, Delta Area, Lake Area A, Island Area, and 3 areas that failed lead for TCLP to obtain representative soil and sediment in these areas, with peat also included. The collected soil, sediment and peat were placed in 5-gallon buckets and delivered to Sevenson Environmental Services Treatability Laboratory (SESTL) for testing. Buckets were segregated according to sample location and matrix, than each was homogenized. The 2015 treatability study is presented in

Appendix I (SESTL, 2015). Initial analyses for each area included solids, density, pH, PFT, TCLP metals and particle size less than 75 microns. Based on initial results, additional treatability studies were conducted such as the evaluation of pre-treatment with commercially available polymers to enhance dewatering. The treatability studies conducted are described below by area.

- Uplands soil passed PFT and TCLP; no further testing was completed.

- The Delta Area sediment passed TCLP but failed the PFT, so mechanical dewatering with recessed chamber filter press was conducted and polymer screening performed. Testing determined a polymer that yielded a filter cake with excellent handling properties and good filtrate. The filter press results are discussed in Section 2.6.3 below.

- Mechanical dredge areas, Island Area and Lake Area A samples passed TCLP but failed the PFT. Sediments from these areas were decanted for free liquid and treated with varying percents of commercially available Type I Portland Cement (PCI). Testing indicated that sediments from Area A pass the PFT with the addition of 2 percent PCI and a 24-hour cure time. Island Area sediments passed with 5 percent PCI and a 48-hour cure time.

- Samples from the lead areas 1, 2 and 3 failed TCLP, as expected, and failed the PFT. Sediment from lead area 2 was comparable in solids and appearance to lead area 3 and was not tested further. Sediment from lead areas 1 and 3 was decanted for free liquid and treated with varying percents of commercially available PCI. Testing results indicated that sediment from lead area 1 passed the PFT with the addition of 5 percent PCI and a 48-hour cure time. Lead area 3 passed with 5 percent PCI and a 24-hour cure time.

The 2015 study results show that commercially available PCI readily stabilizes dredged sediment. These results agree with the 2010 solidification study results.

Mechanically excavated soils or sediments that do not dry sufficiently by passive drainage will be further treated by the addition of solidification agents within water-tight containment boxes to render the material acceptable to a permitted off-site licensed facility.

Additional details related to material handling and processing for transport for off-site disposal are outlined in the Operations Plan (Appendix A).

2.6.3 Hydraulically Dredged Sediment Particle Separation and Compression

2008 to 2010 Testing

During November 2008 to October 2010, WST performed treatability studies to assess particle separation and compression technologies for sediment obtained from the Delta Area (Appendix I). Mechanical compression testing was done using a filter press, belt press and centrifuge.

- The average percent solids of the sediment samples were 30.3 percent.
- The percent solids after compression at 150 pounds per square inch (psi) in the filter press tests were 55.7 to 56.5 percent.
- The percent solids after compression at 225 psi in the filter press tests were 58.1 to 59.1 percent.

WST tested for mercury in unfiltered and filtered water samples of the filtrate from the filter press test.

- In the unfiltered water, mercury concentrations were 0.5 and less than 0.2 micrograms per liter (µg/L).
- In the filtered water (using a 0.5-micron filter), the mercury concentrations were all less than 0.2 µg/L.

After dewatering in the belt press, the percent solids were 31.9 to 37.9 percent. After dewatering in the centrifuge, the percent solids were 29.3 percent. These tests show that a belt press and centrifuge are less effective than a recessed chamber filter press for dewatering sediment from the PLSA.

In conclusion, WST reported that the treatability study indicated that pretreatment with polymer and compression by recessed chamber filter press technology would be an appropriate, effective, and cost efficient regimen for compression of sediments hydraulically dredged from the Delta Area.

2015 Testing

In August 2015, SESTL performed additional treatability studies to assess the filter press technology (see Appendix I). Testing was performed on sediments collected in July 2015 from the Delta Area.

- The Delta Area sediment passed TCLP but failed the PFT, so mechanical dewatering with recessed chamber filter press was conducted and polymer screening performed. Filter press tests determined percent solids for the feed, pressure, and cycle time that yielded a filter cake with excellent handling properties and good filtrate.

- Filter press cake passed TCLP, had no detectable concentrations of polychlorinated biphenyls (PCBs), and no detectable concentrations of volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) except common laboratory contaminants as very low levels. Some total metals were detected above criteria.

- Filter press filtrate had a pH of 6.73, low total suspended solids, and no detectable concentrations of PCBs, VOCs or SVOCs. Lead was not detected and mercury was 0.6 µg/L in the filtrate.

The 2015 study results show that Delta sediment is readily dewatered using a filter press and dewatering produces a good cake with good handling properties that does not exceed TCLP metals. Filter press filtrate was clear, and analytical results indicate minimal secondary water treatment would be needed. This data show that the work can be done as planned and were used by the Remedial Action Contractor in developing the Operations Plan (Appendix A).

Temporary particle separation and compression equipment will be set up within the staging area to compress the sediment slurry, as outlined in the Operations Plan (Appendix A). For projects of this size, trailer-mounted equipment is available that can be set up in a relatively small area. The process consists of screening to separate gravel and sand size particles, followed by polymer addition and mixing and then pumping the slurry into filter presses to compress the fine-grained sediment into a filter cake.

One advantage of hydraulic dredging with filter press compression is that the compressed sediment will be denser than in-situ, which will result in a significant reduction in the weight of sediment for transport and a reduction in

the number of trucks required. Another advantage is that hydraulic dredging and mechanical compression will have a higher production rate than mechanical dredging and solidification, which may result in a reduction of the duration of dredge work.

2.6.4 Water Treatment

Water that comes in contact with the soil or sediment to be dredged and/or excavated will be classified as "contact water". Water that does not contact contaminated soils or sediments will be classified as "non-contact water". Non-contact water will be managed as stormwater from the general construction site and will be diverted to Acid Brook or the ABD. Contact water will be managed in accordance with the approved New Jersey Pollutant Discharge Elimination System (NJPDES) Discharge to Surface Water Permit (BGR) and Treatment Works Approval (TWA) permits issued by NJDEP.

Non-contact and contact water will be diverted or discharged into the ABD. A turbidity containment system will be in place when discharge of non-contact or contact water is occurring. Additional details are outlined in the Operations Plan (Appendix A).

The processed contact water discharge will flow through a flowmeter that will continuously measure the flow rate and totalize the volume of discharge water to the ABD. Since the constituents of concern do not include organics, treatment by gravity settling and filtration of suspended particles is expected to be sufficient to meet the permit requirements. No treatment for organic constituents is anticipated for this project. Additional information on the anticipated water treatment process is provided in the Operations Plan (Appendix A); this process may be modified or adjusted following receipt of the NJDEP permit.

2.6.5 Material Disposal

Impacted material (e.g., soil and sediment) will be processed and shipped to an off-site permitted facility licensed to receive the material for final disposition as described in the Operations Plan (Appendix A), even though the sediment from the Delta Area could be reused on the PLW property according to the NJDEP-approved Sediment Reuse Plan (DuPont CRG, November, 2005). The main criterion for off-site disposal is to pass the PFT for transport in standard trucks and placement in the licensed facility.

The Remedial Action Contractor will contract with licensed haulers to transport the sediment, soil, water, and other materials (e.g., debris, vegetation) in accordance with appropriate local, state, and federal regulations. Construction-derived debris, such as used liners, personal protective equipment (PPE), and decontamination water, will also be transported to an off-site permitted and licensed facility. Additional details on material handling, procedures for transport for off-site disposal, and the disposal facility are provided in the Operations Plan (Appendix A).

Trucks that leave the work area will be covered and cleaned via dry methods whenever possible. Wheels and vehicle sides will be broom cleaned. Excavation equipment that enters the lake is not expected to leave the lake frequently. However, when equipment does leave, cleaning will be accomplished by appropriate methods as described in the Operations Plan (Appendix A).

2.7 Monitoring Program

Monitoring will be performed during excavation, dredging, material handling and processing, and ecological-layer placement to assess potential impacts on the surrounding environment and community due to implementation of the corrective measures. Monitoring will be conducted to obtain timely information in order to determine if additional monitoring or corrective actions are necessary. The following types of monitoring are planned:

- Water
- Air
- Odor
- Noise
- Vibration

Table 2-4 summarizes the types, locations, and parameters for monitoring to be conducted in conjunction with each remedial activity. The CQAP (Appendix E, Table 3-1) also provides the QA/QC elements and measurement approach for monitoring. The types of monitoring and how monitoring results will be

reported are discussed in the following sections. Monitoring data will be included in the Construction Completion Report (see Section 2.12).

Water Monitoring

Water monitoring will include measurements of water within the lake (referred to as water column), as well as water being discharged from the uplands excavation area and from the staging area into the lake.

Water Column Monitoring

Water column monitoring will be performed during excavation in the Uplands, mechanical and hydraulic dredging, and ecological-layer placement during construction work hours at fixed stations located upstream and downstream of the dredging areas (Delta Area, Lake Area A, and Island Area). These stations will be established outside of the active work areas (i.e., areas enclosed by turbidity containment systems) to monitor for releases from the work areas during excavation, dredging, and/or ecological-layer placement operations. The approximate locations of these stations are illustrated on Figure 2-2, and as appropriate have been selected to be consistent with locations sampled during prior sampling events. Table 2-4 identifies which turbidity fixed stations will be monitored during the different remedial activities. The locations of the fixed stations are as follows:

- A station will be placed on the north side of the Lakeside Avenue Bridge (LAB) to assess upstream turbidity levels entering Pompton Lake.

- A station will be placed near surface water sampling location 9 (SW9) to monitor levels downstream of the Delta Area and Lake Area A.

- A station will be placed just south of surface water sampling location 10 (SW10) to monitor downstream levels of the Island Area.

- Stations will also be established adjacent to and outside each turbidity containment system that bounds the three active sediment remediation areas (ADJ-ABD, ADJ-AA, and ADJ-IA), to serve as an early warning mechanism for potential concerns that may be observed at the downstream monitoring locations (SW9 and SW10).

Water column monitoring will include the collection of continuous real-time turbidity readings. Readings will be obtained at near mid-water column depth at the upstream, adjacent, and downstream stations. Real-time turbidity readings will be collected in the field to provide immediate data on the solids within the water column. Readings will be recorded in 15-minute intervals (with each reading consisting of an average of 15, one-minute readings). Turbidity data will only be recorded during working hours.

The real-time turbidity data will be sent to a computer with network access so that the data can be viewed by project personnel. Additionally, the data will be transmitted once per day to an off-site database specifically dedicated for this project for archival purposes.

The turbidity monitoring system will be configured to transmit alert notifications (e.g., email and/or SMS messages) to designated personnel based on the levels discussed below. The corresponding turbidity levels for the downstream stations (SW9 and SW10) are as follows:

- Early Warning Level: >25 and <50 Nephelometric Turbidity Units (NTUs) over upstream levels (LAB station). Two consecutive turbidity measurements (i.e., two consecutive 15-minute time intervals) at this level will prompt visual inspection of current work areas.

- Action Level: >50 NTUs over upstream levels (LAB station). Two consecutive turbidity measurements (i.e., two consecutive15-minute time intervals) at this level will result in a prompt evaluation of the probable cause and the collection of water column samples from the upstream, adjacent (if applicable), and downstream stations with submittal of the samples for analysis of total suspended solids (TSS) and dissolved mercury. Samples will be submitted to the laboratory on a quick turnaround-time schedule for analysis (e.g., 24 to 48 hours).

Action levels for dissolved mercury and TSS are as follows:

- Detection of mercury at the downstream station at or above 1.4 µg/L (dissolved phase) over upstream station concentration. This level is the NJDEP aquatic-acute surface water quality standard for fresh water (http://www.state.nj.us/dep/wms/bwqsa/swqs.htm).

- Detection of TSS levels at the downstream water column station greater than 25 milligrams per liter (mg/L) over the level measured at the upstream station.

If results exceed either the TSS or dissolved mercury action level, a number of assessment activities may be initiated, potentially including the following:

- Review the ongoing dredging activities and modify the condition or performance of the existing erosion and sediment control measures and the turbidity barriers.

- Continue turbidity monitoring to determine if the elevated reading was possibly a short-duration event.

- Collect additional samples from various locations within or adjacent to the dredge area to possibly identify the potential source(s) of the elevated reading.

If these assessment activities indicate that the elevated monitoring results reflect a water quality impact that could persist or recur and that it is related to specific dredging activities or controls, the pertinent activities will be modified to the extent feasible or additional controls may be implemented.

At the conclusion of work in each area (Delta Area, Island Area, and Area A), one mid-depth water column sample within the respective turbidity containment system will be collected and analyzed for dissolved mercury and TSS. If the results are below the limits described above, then the turbidity containment systems can be removed. If they are not below the limits, additional samples will be collected after allowing additional time for the suspended sediment to settle further and until sample results are below corrective action triggers.

Water Discharge Monitoring

Water that comes in contact with the excavated soils or dredged sediment staged for processing or disposal will be monitored to ensure that the concentrations of constituents do not exceed limits established in the approved NJPDES permit prior to discharging such water into the lake. Water discharge points will be monitored in accordance with this approved permit.

Air Monitoring

Air monitoring will be performed during soil excavation and sediment handling and processing onshore at locations around the material handling/processing areas.

Air monitoring will consist of continuous real-time monitoring for particulate (dust) and mercury vapor, verification sampling for particulate-containing mercury, and continuous meteorological monitoring. The air monitoring activities outlined herein are not intended for use in establishing actions levels for workers, as this will be accomplished in accordance with the Remedial Action Contractor's HASP (Appendix C).

Particulate (Dust) Monitoring/Verification

Air monitoring activities will include continuous real-time monitoring for particulate matter less than 10 microns in diameter (PM_{10}), herein referred to as dust, during soil excavation and sediment handling and processing. It is anticipated that the dust monitor (used to measure PM_{10}) will be a Thermo Scientific Inc. ADR1500, TSI DustTrak II, or equivalent with a measurement range consistent with the requirements in the CQAP (Appendix E).

Dust monitoring will be conducted at four fixed locations shown on Figure 2-2. The dust monitoring system will be configured to transmit alert notifications (e.g., email and/or SMS messages) to designated personnel based on the action levels discussed below. The monitoring team will alert the Remedial Action Contractor to implement dust controls (described below) when dust concentrations reach the following levels:

- Early Warning: Greater than 100 micrograms per cubic meter ($\mu g/m^3$) and less than 150 $\mu g/m^3$ (based on 15-minute averages) above the upwind concentration. One measurement (15-minute average) at this level will prompt implementation of dust control measures. Observations will be conducted by the on-site monitoring team to evaluate the cause of the elevated PM_{10} concentration at the monitoring station(s). If it is attributable to the work activities, then dust control measures may be implemented.

- Action Level: Greater than 150 µg/m^3 (based on 15-minute averages)[1] above the upwind concentration. One measurement (15-minute average) at or above this level will prompt action to the operations found to be attributable to the source of dust, to be curtailed or modified until dust levels decrease below the corrective action level. Observations will be conducted by the on-site monitoring team to evaluate the cause of the elevated PM_{10} concentration at the monitoring station(s). If it is attributable to the work activities, then dust control measures may be implemented.

If four consecutive readings at a specific location are above the action level and the source of the dust is attributable to remediation processes, then a sample for particulate mercury will be collected at the location where the exceedance occurred to determine if mercury is present and additional control measures are necessary.

Appropriate dust control measures may include the following:

- Spraying water on identified sources
- Restricting vehicle speeds
- Covering excavation faces after excavation activities cease for the day, if applicable

In all instances, environmental conditions at the time of the exceedance will be investigated. It is possible that certain conditions (e.g., fog, high humidity, heavy precipitation, pollen, diesel exhausts, etc.) may influence the values recorded by the dust monitors. If environmental rather than operational conditions are determined to be the cause of the exceedance, the on-site monitoring team will identify and record the cause of the exceedances and monitoring will continue.

[1] The dust limit is equivalent to the national ambient air quality standard for PM_{10} established by the EPA for one-hour averages.

Mercury Vapor Monitoring/Verification

A pre-design investigation was conducted to measure mercury emissions from ABD sediment samples. The investigation involved sampling of vaporous mercury from sediment placed in a flux chamber. Mercury vapor was not detected in the headspace above any of the six samples at levels above 0.1 µg/m^3. The investigation also used the sampling results and the highest (99^{th} percentile) mercury concentration in sediment to estimate the mercury concentration in ambient air at the monitoring perimeter. The maximum concentration of vaporous mercury at the work perimeter, using atmospheric dispersion modeling, was estimated to be <0.001 µg/m^3, which is well below the EPA Regional Screening Level (RSL) for inhalation of mercury for residential settings of 0.31 µg/m^3. Results from the pre-design investigation are provided in Appendix J.

Based on the results of the investigation, mercury in its vapor phase is not expected to be released during sediment processing and handling as mercury in the sediment is bound to the sediment and is not present in its volatile forms (such as elemental mercury). However, real-time monitoring for mercury vapor will be conducted using a portable mercury vapor detector with a resolution and accuracy to monitor concentrations of mercury vapor to 0.1 µg/m^3 (along with the capability to store test results). Mercury monitoring will be performed only when active remediation (e.g., excavation, dredging, material processing) is being conducted as follows:

- The detector will be placed at an observed upwind location from the work area perimeter 30 minutes prior to remedial activity commencing for the day to establish background mercury vapor concentrations.

- The detector will be placed at the dust monitoring station which is in the observed downwind position (determined 2 times per day) along the work area perimeter. Readings will be collected at 15-minute intervals and stored within the internal equipment data bank.

- The detector will also be used during the Uplands excavation activity only in a real-time mode to collect data in the area of the Lakeside Middle School athletic field and parking area. A maximum of 4 measurements per day will be collected during this time frame.

If four consecutive readings above the background reading plus the RSL are observed on the mercury vapor detector at a location, then an air sample for gaseous elemental mercury will be collected for laboratory analysis. Samples will be collected at the predominant downwind location and upwind location with regards to where the readings were observed. Analysis of the samples will be completed at a certified laboratory using a methodology which has analytical reporting limits below the RSL.

If laboratory results indicate concentrations above the RSL, then further evaluation will be completed to identify where the potential source for the mercury vapor is located (e.g., using the vapor detector). Potential mitigation techniques for mercury vapor related to the remediation process may include, but are not limited to, vapor suppressing foaming agents similar to those proposed for odor control or modifying the sediment processing equipment (e.g., cover openings to prevent emissions).

Meteorological Monitoring

Concurrent with the air monitoring, continuous meteorological monitoring of wind direction and wind speed will be performed. Meteorological monitoring will use the nearby weather station – Caldwell Essex County Airport, which is approximately 10 miles from the site.

Odor Monitoring

Nuisance odors associated with natural material and decay processes can be expected. Constituents of concern within project area soils and sediment are not expected to cause odors. If odors occur, they are expected to be attributable to typical lake bottom odors from naturally-occurring organic decay processes. Algal blooms can sometimes cause odors as well.

The on-site monitoring team will be continually inspecting the air and water column monitoring stations during active work periods and will identify odors as they occur. If nuisance odors are noticed, the Remedial Action Contractor will be instructed to apply mitigation strategies such as:

- Minimizing the extent/duration of open excavations
- Installation of backfill as soon as soil excavations are complete

- Implementing dust control measures (e.g., water mist/spray)
- Keeping stockpiles to a minimum
- Covering stockpiles
- Maintaining enclosures over individual pieces of equipment

If needed, additional engineering and operational controls, such as a foaming agent, will be applied on an open material surface to provide a barrier to contain the odor. An example of a type of foaming agent that could be applied during stabilization and stockpiling activities includes Rusmar Foam Technology (product sheet provided in the Operations Plan [Appendix A]). Other technologies, such as odor neutralizers (which are not "deodorizers"), may be used if foaming agents are not effective. An example of this type of technology is the Piian Flexi~Fog System (product sheet provided in the Operations Plan [Appendix A]). If a foaming agent or technology other than those listed above is utilized, product information will be provided to EPA.

Noise Monitoring

The Borough of Pompton Lakes' noise ordinance protects the "peace and good order" of its residents. It does not have a quantitative sound level limit. However, sound level (5-minute A-weighted averages) will be measured a minimum of two times per day during air monitoring periods at locations along the work perimeter nearest to the noise source(s). Additional sound level measurements will be made when new noise sources begin, when noise sources create higher than normal noise, or when concerns are identified from the community. The on-site monitoring team conducting the monitoring will notify the Remedial Contractor when sound levels are consistently elevated [typically above 65 decibels (dBA)] to institute noise controls or modify its operation to reduce noise levels (e.g., install mufflers on diesel or gasoline engines and turn off equipment when not in use).

Vibration Monitoring

Before any construction activity that could cause vibration (i.e., sheetpile installation), a pre-construction structural inspection will be performed by a professional structural engineer at vibration-sensitive structures such as residential structures, garages, retaining walls, and pools within 100 feet of

sheetpile work activities (see Section 6.1 for the anticipated pre-construction activities to be completed and associated schedule). Pre-construction surveys will require property access including entry to portions of the interior and exterior of structures of interest. Access to properties and photographic documentation are subject to land owner's approval. The pre-construction structural inspection and vibration survey will:

- Document existing ambient vibration levels at each of the proposed monitoring locations prior to the start of construction.

- Document the structural condition of structures including the location and size of cracks, foundation settling, and other features.

Pre-construction structural inspections will occur at locations which are representative of the nearest vibration-sensitive structures such as residential structures, garages, retaining walls, and pools. On-site observations regarding the aesthetic and structural condition of the residences will be made. Documentation of the existing structural condition will include photographic and video documentation of cracks, active leaks, foundation, joints, and other features. Additionally, non-destructive measurements and observations may be made on areas of concern, if identified. Non-destructive measurements may include crack monitoring or crack gauges.

Continuous vibration monitoring will be performed during sheetpile installation and removal activities when vibration producing activities occur within 100 feet of a vibration-sensitive structure. Vibration monitoring systems will be unattended and downloaded periodically. Monitoring data collected will include peak particle velocity (PPV) and root mean square (RMS) velocity where applicable. The meter will record and store data at 10-minute intervals or less. Each vibration monitoring location will utilize equipment capable of triaxial measurement.

Post-construction surveys structural surveys will be performed by a professional structural engineer at the completion of vibration producing activities. Surveys will be performed at residences within 100 feet of sheetpile installation, coinciding with vibration monitoring locations. The post-construction surveys will document the structural condition of vibration-sensitive structures following the removal of barriers.

Monitoring Reporting

Dust/mercury vapor measurements and mercury verification sample results will be presented graphically on a website for public access within 24 hours after each monitoring day or within 24 hours after receipt of laboratory data. Water quality sampling results will be posted on the website within 24 hours after receipt of laboratory data. Noise and odor monitoring results will also be posted to the website. Vibration inspection reports and vibration monitoring results will be provided to the individual property owner in which the monitoring was conducted.

2.8 Restoration

Implementation of the corrective measures will result in the temporary disturbance to regulated natural resources including state open waters (i.e., portions of Pompton Lake and Acid Brook), freshwater wetlands and associated transition areas, and riparian zones. Implementation of the corrective measures will also result in temporary disturbance to additional unregulated upland areas required for staging and access, including public open space and parkland. These regulated and unregulated resources will be restored as necessary to satisfy permit/regulatory requirements and meet restoration objectives. Section 3 provides a summary of the required permits, including those that specifically address restoration of regulated natural resources (i.e., Freshwater Wetlands General Permit 4 and Flood Hazard Area Individual Permit Modification). The restoration objectives are to integrate restoration to re-establish ecological functions and societal benefits that are generally equivalent to, or exceed those presently provided, as practicable. In overview, restoration will be conducted as a combination of in-kind rehabilitation of temporarily disturbed habitats and enhancement of adjacent transition/buffer areas, as possible.

To integrate restoration with the corrective measures, the restoration designs consider impacts and constraints due to implementation of the corrective measures, restoration opportunities, and associated limitations afforded by the landscape setting of the project. A summary of restoration details are provided in this section, and additional restoration design elements are included in drawings prepared for NJDEP permit applications for the Freshwater Wetland General Permit No. 4 Modification and Flood Hazard Area Individual Permit Modification. Information is also provided within the Operations Plan (Appendix A). Permit level design details will be supplemented with

implementation specifications to be provided to the Remedial Action Contractor in advance of restoration activities.

The following sections describe additional concepts regarding restoration of each resource. For baseline purposes, general descriptions of the existing conditions of each area are also provided. The existing conditions and restoration elements are supported by Figures 2-5 to 2-14.

2.8.1 Uplands

The term "uplands" as discussed within this restoration section refers to restoration activities that will be conducted on lands disturbed by implementation of the corrective measures or staging and access that occur at higher elevations (above 201.4, full pool elevation) that do not support open water (Pompton Lake), stream (Acid Brook), or wetland resources. As used within this section, uplands includes areas that may be disturbed as part of remediation within public parkland, the potential use of this land (Rotary Park and Lakeside Park) for temporary staging, processing, and for access to Pompton Lake or the ABD. Uplands also occur as part of wetland transition areas; the restoration of which is described under Section 2.8.3. No privately held uplands are anticipated to be disturbed, but restoration of such property is discussed herein for clarity in the event that such disturbances do occur.

2.8.1.1 Public

Existing Conditions – Implementation of the corrective measures will require excavation of soils within public areas (Figure 2-1). The majority of these areas are along the southern edge of Rotary Park; however, additional isolated Uplands remedial areas are located east of the park on the slope adjacent to the lake, a single location west of Acid Brook, upland areas on the banks of Acid Brook, and the slope south of Rotary Park. In addition to these remedial areas, the use of Rotary Park, and portions of Lakeside Park and connecting uplands for temporary staging may disturb uplands that are not within resource areas otherwise described (i.e., wetland transition areas or riparian zones). With the exception of Rotary and Lakeside Park, the above remedial/disturbance areas are described in the following subsections.

Rotary Park is located on Lakeside Avenue to the east-northeast of Acid Brook. The main portion of this 'pocket park' is maintained as lawn with decorative plantings, benches, and tables. A macadam walkway connects to

areas east and west of the park including Lakeside Park, which is located at the northeastern extent of the project (Figure 2-5).

To the east, Lakeside Park includes a macadam public boat ramp that will be used during the project for access to the lake, seasonally deployed floating dock, small playground area, support building and gazebo, public utility structure, lawn/tree covered open space, and several decorative planting beds (Figure 2-5).

Preliminary Restoration – Implementation of the corrective measures in the Uplands and staging/processing activities will require temporary disturbance of Rotary Park, portions of Lakeside Park, connecting upland areas along Lakeside Avenue, and the clearing of lawn, ornamental, and woodland vegetation. Areas are maintained as public open space with the exception of the woodland area south and west of Rotary Park. The Lakeside Park building, playground, and public utility structures are not anticipated to be disturbed. NJDEP regulated wetland transition areas and/or riparian zones extend into the maintained areas and across portions of these temporary upland disturbance areas. These areas will be restored in-kind, which will include the following:

- Re-establishment of uplands vegetation including lawn, ornamental plantings, and native plantings within the footprint of existing park and woodland areas.

- Replacement of park amenities and pathways and enhancement of public space and access by establishment of a new pedestrian crossing on Lakeside Avenue; upgrade sidewalk/path along Lakeside Avenue; and establishment of greater access along Pompton Lake by reconfiguring a portion of the walking path and public space.

Preliminary plans that present these elements are included as Figures 2-9 and 2-10, with additional details on the restoration elements provided in the Operations Plan (Appendix A); note that adjustments may be needed based on the final permits issued. Of note, additional excavation in public areas will be necessary to establish stable restoration features and to promote positive drainage which will minimize soil erosion effects. Trees, shrubs, park lawn, and ornamental plantings will be re-established in keeping with the existing conditions. Insight from discussions with community leaders, public surveys, and input from the community during an open information session, along with

input from NJDEP has been used to develop the preliminary restoration plans and is being used to help finalize restoration designs. Final uplands restoration designs will also take into account wetland transition area and riparian zone requirements.

2.8.1.2 Private

Existing Conditions – Privately held uplands proximate to the remedial activities are single-family residential properties. As previously noted, no privately held uplands areas are expected to be disturbed as a result of implementation of the corrective measures.

Preliminary Restoration – Since implementation of the corrective measures is not anticipated to disturb privately held uplands, restoration is not likely to be required. However, in the event of temporary disturbances associated with implementation of the corrective measures, restoration is anticipated to include:

- Replacement of uplands vegetation.
- Replacement and/or repair of disturbed property amenities.

Of note, the replacement or repair approach described above would also apply to project related disturbances, if any, which may impact amenities extending beyond private uplands areas and into Pompton Lake (e.g., private docks).

2.8.2 Pompton Lake – Delta Area, Lake Area A, and Island Area

Existing Conditions – The approach to remediation of sediments from Pompton Lake is presented in Section 2.5. Restoration of Pompton Lake, including the Delta Area, Lake Area A, and Island Area will include the entire open water remedial area (approximately 39 acres; Figure 2-2). Existing conditions within the project currently can be described as shallow open water (littoral, <6.6 feet deep) (majority of Delta Area and Island Area) with confined areas of deeper habitat (i.e., limnetic, >6.6 feet deep) (southwest portions of Delta Area, Lake Area A, and far eastern portion of Island Area). Based on the Cowardin system (i.e., classification system for wetlands and deep water habitats), the area is broadly classified as lacustrine littoral open water and aquatic bed habitats (i.e., SAV areas) with unconsolidated bottom material (Cowardin et al., 1979). However, National Wetland Inventory mapping identifies the area as

deeper water habitat (limnetic, >6.6 feet deep), which would only apply to those areas noted above. The majority of the areas include water depths of approximately 3 to 5 feet, with shallower depth approaching the shoreline and throughout much of the Island Area.

The existing substrate is predominantly fine-grained; silt and clay fractions account for 50 to 95 percent of the substrate. A layer of peat occurs below this substrate in portions of the project. The fine-grained substrate supports a benthic macroinvertebrate community that is characteristic of temperate lentic systems (harpacticoid copepods, oligochaete worms [*Oligochaeta*], and midge larvae [*Chironomidae*]). In addition to the benthic community, the aquatic resources are used by game and non-game fish species including bluegill (*Lepomis macrochirus*), yellow perch (*Perca flavescens*), and largemouth bass (*Micropterus salmoides*), among others. Recreational fishing is common throughout the lake. The portion of the lake closest to Acid Brook is also used seasonally by geese, swans and other waterfowl.

Based on SAV mapping conducted in 2007 (Ocean Surveys, Inc., July 2007), a subsequent survey in early fall 2010, and field observations in 2013 and 2014, the littoral portion of the project is extensively vegetated with aquatic macrophytes during the growing season with a mixture of submergent and emergent non-native invasive and native species. The abundance of SAV (particularly submerged invasive species) is considered a nuisance by lakefront property owners, recreational users of the lake, and borough officials. In previous years, this vegetation has impeded recreational use of the lake. Within recent years, nuisance vegetation has been chemically treated annually by specialty subcontractors contracted with the borough who are permitted by the State. Particular focus areas of such treatment have been the near-shore and public boat ramp areas in proximity to Lakeside Avenue at Acid Brook and Lakeside Park, respectively, and western portions of the Island Area; much of which overlaps the project sediment removal area.

Finally, existing conditions include lake water quality that is degraded by nutrient loading. A Total Maximum Daily Load (TMDL) has been adopted to address phosphorus impairments within the Pompton Lake drainage area, which includes the area of the project (NJDEP, 2008). According to a TMDL support study, much of the total phosphorous loading to the Ramapo River and Pompton Lake originates from the upper watershed (QEA, July 2005).

Preliminary Restoration – In general, the above aquatic resources will be restored through a combination of efforts that include:

- Re-establishing a beneficial substrate habitat for aquatic organisms.
- Enhancing desirable vegetation establishment through plantings.

As described in Section 2.5.6, remedial dredging will be followed by placement of a layer of sand across the footprint of the remedial areas. This ecological habitat layer (i.e., ecological-layer) will provide a desirable substrate habitat for aquatic benthic organisms. It is anticipated that the ecological-layer will include approximately 6 inches of material (i.e., sand; natural unwashed) that will be placed through the water column in two distinct lifts (i.e., base layer and final layer). The base layer will be approximately 2 inches and the final layer will be approximately 4 inches, for a combined total of approximately 6 inches of material. The material will be placed using mechanical or hydraulic systems in accordance with the Operations Plan (Appendix A). No areas will be filled to an elevation greater than the existing sediment bed elevation.

Placement of both the base and final ecological-layers will be achieved using methods (e.g., spreader system) that will minimize re-suspension of residual bottom sediments to prevent mixing with the ecological-layer materials. Further, the base layer will not be placed until suspended sediments in the water column associated with dredging have declined to acceptable levels. This will be achieved either by allowing sufficient time for settling, or by isolating active areas of dredging from ecological-layer placement via a turbidity curtain as described in the Operations Plan (Appendix A). Of note, the final ecological-layer will not be placed until dredging activities have been completed and the initial ecological-layer has been placed.

Assuming 6 inches of material for the ecological-layer, the estimated volume of granular material required is approximately 47,300 cy. A sufficient supply of material will be delivered from the selected borrow source such that continuous placement of materials can be achieved. Additional material would be used to re-establish wetland elevations as needed. The material will be obtained from a permitted/licensed facility, and testing will be performed to confirm that the materials meets the requirements outlined in the CQAP (Appendix E) with results provided to EPA.

A sand substrate will optimize ecological restoration objectives and will facilitate a rapid recovery of benthic macroinvertebrate over time. Fringe portions of this ecological-layer along sections of the northern shoreline of the Delta Area and Island Area will be planted to further enhance aquatic wildlife habitat.

2.8.3 Delta Area Wetlands and Wetland Transition Areas

Existing Conditions – Based on the findings of the wetlands delineation conducted in 2009 for investigation permitting (URS, September 2009), approximately 1.02 acres of vegetated freshwater wetlands occur within the Delta Area including portions of the area situated between the full pool lake elevation (201.4 NAVD 88) and the open water portion of the Delta Area. These wetland areas are expected to be disturbed by the project activities. These resources are clustered in the northern portion of the Delta Area (Figures 2-5). The wetlands extend along the lower elevations of the confined Acid Brook floodplain, are bisected by Acid Brook, and also occur as a fringe along the toe of slope by Lakeside Avenue at Acid Brook. Based on the Cowardin system, the areas are classified as a complex system of lacustrine littoral emergent non-persistent/palustrine forested broad-leaved deciduous/scrub-shrub wetlands (Cowardin et al., 1979). These resources include approximately 0.66 acres of palustrine emergent (PEM), 0.31 acres of palustrine forested (PFO), and 0.05 acres of palustrine scrub/shrub (PSS) wetlands. In accordance with New Jersey Administrative Code (N.J.A.C.) 7:7A (NJDEP, February 2015) these areas are considered to have intermediate resource value and, as such, have a designated 50-foot regulated wetland transition area that extends through much of the Uplands remediation areas and associated temporary work areas (Figure 2-5).

Existing wetlands are dominated by native vegetation but also include non-native invasive species (e.g., Norway maple [*Acer platanoides*], purple loosestrife [*Lythrum salicaria*] and Japanese knotweed [*Polygonum cuspidatum*]). Norway maple is generally dispersed throughout the Acid Brook floodplain. Purple loosestrife and Japanese knotweed (in addition to other invasive plants) primarily occur on the lake and stream edge of the Acid Brook floodplain and throughout the narrow fringe wetland that extends along Lakeside Avenue.

Wetland transition areas include uplands portions of the Acid Brook floodplain and other adjacent upland areas. Cover/land use within the wetland transition

area consists of forested floodplain, public open space or parkland (lawn), school athletic fields/maintained turf, and existing roadways.

Wetland resources provide limited wildlife habitat and minimal flood desynchronization benefits. Wetland resources are degraded and/or have reduced functional capacity due to the landscape setting within a highly developed environment, invasive species, impacts from high-intensity stormwater flow from Acid Brook, previous and current land management practices, and recreational use of the area.

Preliminary Restoration – Implementation of the corrective measures, including access and staging, will require temporary disturbance to nearly all delineated wetlands within the Acid Brook floodplain. Avoidance and minimization practices will be applied to the extent practicable. For resources within the wetland and transition areas that cannot be avoided, restoration will be conducted as replacement in-kind and will include the following elements:

- Re-establishment of wetlands in areas of temporary disturbance.
- Enhancement of wetland resources adjacent to temporary disturbances.
- Re-establishment and enhancement of existing transition area habitats.

Disturbed emergent, scrub/shrub, and forested wetland resources will be re-established within the Acid Brook floodplain and along the Lakeshore Avenue shoreline. Preliminary plans that present these elements are included as Figures 2-9 and 2-10, with additional details on the restoration elements provided in the Operations Plan (Appendix A); note that adjustments may be needed based on the final permits issued by NJDEP. Wetland restoration designs have taken into account existing soil characteristics, hydrology, surface elevations, micro-topography, and plant community composition/distribution/structure, among other conditions or factors that may influence restoration success. The re-established resources will be designed to provide wetland ecological functional capacity equal to or greater than those that are anticipated to be disturbed. To that extent, implementation of the corrective measures adjacent to Acid Brook may provide the opportunity to establish additional wetland resources as part of the remedial footprint restoration. Preliminarily, restoration of the Acid Brook area will include the additional excavation of approximately 225 cy of material, primarily along

hillsides/embankment to re-establish a more gradual slope thereby promoting public access and supporting positive drainage.

As part of restoration efforts, remaining fringe wetlands that occur in immediate proximity to disturbance/restoration areas will be enhanced with supplemental native plantings.

Wetland transition areas will also be restored to existing conditions following remedial activities. As noted previously, transition areas are primarily forested uplands, maintained turf/lawn grass, and vegetated slopes. Forested uplands adjacent to Acid Brook will be replanted with native species from multiple stratum (e.g., herbaceous, shrub, understory trees, canopy trees) to re-establish a diverse structural habitat and vegetative community. Maintained turf/lawn grass areas will be restored in keeping with standard seed mixes and/or sod application practices that may currently be employed by the Board of Education (school adjacent to project area) and Borough of Pompton Lakes maintenance departments. Vegetated slopes along Lakeside Avenue at Acid Brook that are temporarily disturbed during operations will be stabilized with jute erosion control matting, as necessary, and seeded to re-establish native herbaceous cover.

2.8.4 Acid Brook Stream and Delta Area Riparian Zones

Existing Conditions – Within the project, Acid Brook extends approximately 310 feet from Lakeside Avenue to the confluence with Pompton Lake (Figures 2-5). The upstream portion of this reach (approximately 170 feet) extends through the higher elevation/uplands sections of the forested floodplain. The lower reach meanders through the wetlands described in Section 2.8.3.

Based on the National Wetland Inventory mapping and the Cowardin system, Acid Brook is classified as riverine, lower perennial habitat with unconsolidated bottom that has previously been excavated (Cowardin et al., 1979). More specifically, the upper reach can be described as a single-thread entrenched and over-widened channel with highly eroded banks, extensive in-channel bar deposits, and negligible aquatic habitat. In the upper reach, bank vegetation, that may act to stabilize bank soils, is largely limited to scattered trees. Urban debris (e.g., tires, trash) is common within the channel and along the banks. The channel bed is a mixed substrate of cobble, gravel, coarse woody material, and urban debris material. As previously noted, this reach has a modest base flow of approximately 0.7 cubic feet per second on average but

receives storm and overland flows from upstream reaches and a watershed of predominately residential and developed areas. Based on the Rosgen classification system for stream channel types, this reach includes both F and G channels (Rosgen, 1996), which are considered unstable. Of note, two 8-inch diameter sanitary sewer lines cross under and perpendicular to Acid Brook approximately 20 feet downstream of Lakeside Avenue (Figure 2-9). These lines include a gravity feed and a force main line. Appurtenant manholes are located to the east in Rotary Park.

The downstream reach of Acid Brook (approximately 140 feet) is a lower-gradient, wide channel that is generally actively meandering through the Delta/floodplain wetlands. Several abandoned channels provide evidence of historic channel migrations. Stream banks are low, somewhat eroded, but primarily vegetated with shrub/scrub and herbaceous wetland species. Debris is present, and aquatic habitat is negligible. Based on the Rosgen classification system, the lower reach is a single-thread D channel (Rosgen, 1996).

Of note, based on historical aerial photography, the Acid Brook channel downstream of Lakeside Avenue was previously aligned such that flow was primarily routed along the western edge of the lower floodplain terrace (Figure 2-14). This is consistent with statements provided by long-time residents who have indicated the channel was relocated to the east about the time the aerial photograph was taken (1940) and would be in keeping with the structural alignment of the culvert under Lakeside Avenue. Given development practices of the time, the 1940 alignment likely also represents a channelized or excavated pathway.

As regulated waters, both Acid Brook and Pompton Lake have riparian zones, which provide a regulated 'buffer' similar to wetland transition areas. Within the project area, riparian zones often overlap wetland transition areas; however, each carries different regulatory requirements. As per NJDEP Flood Hazard Area Control Act Rules (N.J.A.C. 7:13) (NJDEP, February 2015), a 50-foot riparian zone extends landward from either bank of Acid Brook and from the Pompton Lake normal water surface limit (Figures 2-5).

Preliminary Restoration – Implementation of the corrective measures and associated access/staging will require the temporary disturbance of the Acid Brook stream bed and banks downstream of Lakeside Avenue and the noted sanitary sewer lines. Additionally, vegetation within portions of the associated riparian zone of both Acid Brook and Pompton Lake will need to be cleared to

facilitate remediation. For impacts to Acid Brook and riparian zone resources that cannot be avoided, restoration will be conducted as replacement in-kind to include the following:

- Re-establishment of Acid Brook as a lower perennial stream channel.
- Enhancement of aquatic habitats.
- Re-establishment and enhancement of riparian zone vegetation.

Acid Brook will be re-established and designed using criteria from applicable regulations (N.J.A.C. 7:13), principles of natural stream channel design adapted for an urban setting, and supported with site-specific engineering review. Additional restoration design elements are included in drawings prepared for NJDEP permit applications for Freshwater Wetland General Permit No. 4 Modification and Flood Hazard Area Individual Permit Modification as well as discussed within the Operations Plan (Appendix A). Permit level design details will be supplemented with implementation specifications to be provided to the Remedial Action Contractor in advance of restoration activities. Channel reconstruction is anticipated to start downstream of the noted sanitary sewer lines. As previously described, the upper reach of Acid Brook south of Lakeside Avenue is considered degraded, eroded, and with sections of channel that are overly wide and unstable. These present conditions may be associated with previously noted historical actions unrelated to the current project that resulted in the realignment of Acid Brook from the western portion of the Acid Brook floodplain area to the eastern portion. Given these conditions that are representative of 'flashy' stormwater-driven systems, re-alignment of the channel and use of grade control structures will be considered to provide stability for the re-established stream bed and banks. Preliminary plans that present these elements are included as Figure 2-9, with additional details on the restoration elements provided in the Operations Plan (Appendix A); note that adjustments may be needed based on the final permits issued. Such actions and structures may also serve to enhance aquatic habitat for fish and other organisms. As with all project restoration designs, the re-establishment of Acid Brook will be integrated with adjacent wetland, transition area, riparian zone, and Pompton Lake restoration.

The riparian zone vegetation will be re-established in-kind. As feasible, supplementary woody vegetation plantings will be included in portions of the riparian zone that currently lack these species (e.g., on portions of vegetated

slope along Lakeside Avenue at Acid Brook). Such supplemental planting may provide additional wildlife habitat, erosion control, and aesthetic benefits.

2.8.5 Island Area Wetlands, Shallow Water Delta Area, and Riparian Zone

Existing Conditions – On November 19, 2014, AECOM conducted a wetland delineation of the Island Area of Pompton Lake. This effort was supplemented with topographic and vegetation boundary survey conducted by Vargo Associates on June 1, 2015. The purpose of the delineation was to provide clarification on regulated resources that may occur within this additional area. In total, the Island Area is approximately 2.5 acres. This area includes an approximate 0.75-acre island feature with upland forest (~0.33 acres) within a riparian zone, and forested wetlands (PFO)(0.40 acres), scrub/shrub wetlands (PSS)(0.08 acres), and fringe emergent wetlands (PEM) that extend primarily to the west of the island feature into a backwater area that separates the feature from the mainland. The emergent wetland resources also occur as patches along the western shoreline. Approximately 0.91 acres of wetland resources are within the proposed extent of the corrective measures (i.e., below the full pool elevation of 201.4 feet) and could be impacted. These resources consisted of PEM (~0.62 acres), PSS (0.08 acres), and PFO (0.22 acres) wetlands. Note, Island Area wetland impacts may be reduced during remedial construction activities based on observed indicators of pool elevations to minimize disturbance to wetland resources. In accordance with N.J.A.C. 7:7A (NJDEP, February 2015), these areas are considered to have intermediate resource value and, as such, have a designated 50-foot regulated wetland transition area. No wetland transition areas are anticipated to be impacted during project implementation.

The backwater between the island feature and the mainland is choked with SAV. As with the aforementioned Delta Area, this area has also been chemically treated to control invasive SAV. As per NJDEP Flood Hazard Area Control Act Rules (N.J.A.C. 7:13) (NJDEP, February 2015), a 50-foot riparian zone extends landward from either bank of the island feature and from the backwater channel portion of Pompton Lake from the normal water surface limit. As with the wetland transition area, neither the riparian zone of the island or the mainland in the Island Area is expected to be impacted during project implementation.

Preliminary Restoration – Implementation of the corrective measures will result in disturbance to wetlands within the Island Area; avoidance and minimization practices will be applied to the extent practicable. For resources within the wetlands that cannot be avoided, and if there are unanticipated transition area/riparian zone impacts, restoration will be conducted as replacement in-kind and will include the following elements:

- Re-establishment of wetlands in areas of disturbance due to implementation of the corrective measures.

- Re-establishment and enhancement of existing transition area and riparian zone habitats that may be disturbed.

Disturbed PEM, PSS, and PFO wetland resources will be re-established within the Island Area (Figures 2-8 and 2-11). Final wetland restoration designs have taken into account existing soil characteristics, hydrology, surface elevations, micro-topography, and plant community composition/distribution/structure, among other conditions or factors that may influence restoration success. As noted previously, re-established resources will be designed to provide wetland ecological functional capacity equal to or greater than those that are anticipated to be disturbed. Wetland transition areas will also be restored to existing conditions following remedial activities.

2.9 Contingency Measures

Contingency measures will be established to promote rapid and effective responses to accidental releases within and outside of the enclosed area. Efforts will be made during the remediation activities to avoid potential releases; as a precaution, the active work area will be enclosed by the isolation and containment systems discussed in Sections 2.4 and 2.5.

The Remedial Action Contractor has prepared a Contingency Plan (Appendix B) to set forth procedures for responding to emergency conditions or events that may occur during implementation of the corrective measures. The plan includes spill prevention, odor control methods, adverse weather contingencies, prevention of injury or damage by inclement weather and flood control contingencies, marine contingency measures, sediment processing/water treatment spill responses, damage to overhead and underground utilities, emergency vehicle access and egress routes, off-site

truck material spills, evacuation procedures, emergency numbers and route to the hospital, and a listing of responsible persons.

Communication with the affected community and involved agencies will be completed throughout the duration of remedial activities. Project information will be shared via web updates and the PLW Information Center is available for the community to visit to find updated information about the project.

2.10 Demobilization

Following completion of the work described in this document, including restoration activities described in Section 2.8, demobilization activities including the following will be performed:

- Dismantle the work area(s) and staging area(s).
- Clean/decontaminate equipment, if necessary, and construction-related materials prior to removal.
- Remove material, equipment, and support structures, and restore the impacted areas as appropriate.

The same access points described in Section 2.3 will potentially also be used for demobilization activities.

2.11 Summary of Green Remediation Practices

Green Remediation practices and principles outlined in EPA Region 2's "Clean and Green" Policy (EPA, March 2012) have been considered in the development of the corrective measures to be implemented. Specifically, the corrective measures meets the objectives of green remediation, as outlined in the "Clean and Green" Policy, by:

- Protecting human health and the environment by achieving the RAOs.
- Supporting human and ecological use and reuse of remediated land.
- Implementing appropriate containment to create work area isolation to minimize impacts to water quality and water resources.

- Utilizing technologies and practices that are sustainable, to the extent practicable, to reduce air emissions and greenhouse gas production.

- Utilizing technologies and practices to adhere to the tolerances specified in this CMI WP such that material use and waste production are minimized to the extent practicable.

- Utilizing technologies and practices, to the extent practicable, to conserve natural resources and energy.

The Remedial Action Contractor is committed to being a green and environmentally sustainable company. In addition to following Leadership in Energy and Environmental Design principles promulgated by the United States Green Building Council and SPiRiT criteria publicized by the United States Army Corps of Engineers, the Remedial Action Contractor supports and actively cooperates with EPA Region 2 to fulfill the requirements of its "Clean and Green" policy. The Remedial Action Contractor continues to invest in new construction equipment that meets the highest energy savings and low carbon standards for the construction industry to upgrade the fleet of heavy equipment. The bulk of the Remedial Action Contractor's fleet is comprised of machines that meet Tier 3 standards, more recently Tier 4 interim, and moving forward Tier 4 final. The tier level governs the required emissions reductions for non-road diesel engines with the focus on carbon monoxide, hydrocarbons, nitrogen oxides, and particulate matter (http://www3.epa.gov/otaq/ nonroad-diesel.htm).

The Remedial Action Contractor's equipment managers and mechanics have attended workshops sponsored by manufacturers to become familiar with the various nuances of Tier 4 interim. Each manufacturer has its own proprietary system in place and the daily, weekly and monthly maintenance along with machine allowable idling times can vary. Mechanics and the equipment operators have been trained to understand how these state of the art machines work to avoid downtime and to maximize the benefits of the technology.

The following specific procedures will also be implemented during construction activities:

- Equipment operated by the Remedial Action Contractor burns ultra-low sulfur diesel fuel.

- On projects where the equipment is used on waterways, biodegradable oil is used in the hydraulic system of the machine.

- Solar-powered Met-One Air Monitors are used to eliminate the need for electrical power.

- Purchase recycled copy paper.

- Recycle non-contaminated debris and construction waste at a site (asphalt, metals, etc.).

The Remedial Action Contractor will execute remediation activities to minimize the potential for negative impacts on the environment through implementation of best management practices (BMPs). Examples of such BMPs include:

- Minimizing access routes into the work areas and maintaining designated vehicular traffic routes on-site to protect fragile ecosystems.

- Limiting, where practical, the "footprint" of equipment staging material processing areas, soil areas, and field offices. The footprint will be restored to original condition upon completion of the project.

- Utilizing technologies and practices to adhere to the tolerances specified in this CMI WP such that material use and waste production are minimized to the extent practicable.

- Utilizing technologies and practices to adhere to the tolerances specified in this CMI WP such that material use and waste production are minimized to the extent practicable.

- Collection and on-site treatment of wastewaters encountered during operations.

- Maintaining pollution prevention and waste minimization programs from initiation of mobilization activities to project close out.

- Inspecting on-site equipment on a daily basis for clean operation.

- Maintaining good site housekeeping practices.

- Utilization of low emission diesel equipment and fuel.

2.12 Construction Completion Report

Following completion of the work, a Construction Completion Report will be prepared in general accordance with the current RCRA Corrective Action Plan guidance (EPA, May 1994). The report will describe the following: purpose of the corrective measures; summary of soil/sediment remediated; detailed descriptions of the source and quantity of fill used; deviations from the Operations Plan (Appendix A) and/or modifications necessitated by field conditions; documentation regarding achievement of RAOs and all as-built drawings; summary of significant actions; summary of environmental monitoring data; and summary of inspection findings. A detailed description of restoration activities will also be included.

3. Permitting and Other Approvals

The proposed corrective measures and restoration activities will require authorizations and approvals from state and local authorities. The summary list provided below reflects existing project related approvals, outcome of NJDEP and local meetings, and other known or anticipated authorization requirements.

- NJDEP Wetlands Protection Act (N.J.A.C. 7:7A) – Freshwater Wetlands General Permit 4: Hazardous Site Investigation and Clean-up. Issued by NJDEP, Division of Land Use Regulation is required for remediation and dredging activities in and adjacent to freshwater wetlands, freshwater wetlands transition areas, and State open waters. This authorization meets the requirements of the Section 404 Federal Clean Water Act through federal delegation of authority to NJDEP. Authorization includes Section 401 and NJDEP Water Quality Certification. The project previously obtained approval for activities regulated under N.J.A.C. 7:7A via Permit No. 1609-09-0006.1 FWW110001 issued April 3, 2012. Since the project has been revised following the issuance of this permit, a modification is required.

- NJDEP Flood Hazard Area Control Act (N.J.A.C. 7:13). Requires an individual Flood Hazard Area Permit with Hardship Waiver for remediation and dredging activities within the flood hazard area, which includes the floodway, flood fringe, and/or riparian zone of Pompton Lake and Acid Brook. For activities resulting in greater than 1,000 square feet of riparian zone disturbance, a hardship waiver for riparian zone disturbance is required. The project previously obtained approval for activities regulated under N.J.A.C 7:13 via Permit No. 1609-09-0006.1 FHA110001 issued February 3, 2012. Since the project has been revised following the issuance of this permit, a revision is required.

- NJDEP Division of Air Quality requires authorization for a Preconstruction Permit and operating certificate (N.J.A.C. 7:27-8) to cover potential emissions from equipment and processes during project implementation.

- NJDEP Division of Water Quality, Bureau of Surface Water Permitting requires General Permit Authorization under Category BGR – General Remediation Clean-up Permit (NJ0155438). Such authorization is issued

in accordance with NJPDES regulations (N.J.A.C. 7:14A). The authorization is required for surface water discharge associated with the recycling of dredge return water, groundwater, incidental stormwater, and miscellaneous waters during project activities.

- NJDEP Division of Water Quality, General Industrial Treatment Works Approval (N.J.A.C. 7:14A-23) will be required for the design, construction, and operation of the proposed treatment works. The water treatment will be used to treat surface water discharges.

- SESCP prepared in accordance with the New Jersey Department of Agriculture Soil Erosion and Sediment Control Act (Chapter 251, P.L. 1975). For earth disturbance projects exceeding 5,000 square feet, the Hudson-Essex-Passaic Soil Conservation District (HEP SCD) requires that a SESCP be prepared, certified, and implemented in accordance with these regulations. The project previously obtained approval for activities regulated under Chapter 251 via Soil Erosion Sediment Control Certification No. HEPSCD#211-P-3641 obtained January 13, 2012. Since the project has been revised following the issuance of this certification, a modification is required.

- Request for Authorization under NJPDES General Permit No. NJG0201332 (Stormwater General Construction Permit-5G3) for stormwater discharge during construction activities is issued by NJDEP, Bureau of Non-Point Pollution Control upon certification of a SESCP by HEP SCD. The project previously obtained authorization for construction stormwater discharges on February 3, 2012. Since the project has been revised following this authorization, a modification is required.

- NJDEP Division of Fish and Wildlife Scientific Collection Permit. Required for the collection, transport, handling and release of aquatic species within the proposed removal areas.

- Agreement with the Borough of Pompton Lakes to implement dredging, soil removal, and restoration activities in accordance with applicable provisions of Chapter 159 (Soil Removal Ordinance) of the Borough Administrative Code, this CMI WP, and NJDEP-issued permits.

- Local construction permits for activities such as installation of contractor trailer or electric work, if any, will be obtained by the Remedial Action Contractor.

4. Health and Safety Measures

The HASP that was developed to support this CMI WP is contained in Appendix C. The HASP provides the policies, controls, and work practices to be implemented during remedial activities to minimize hazards associated with the work.

As listed in Section 1.3, the main steps required for sediment and soil remediation include: 1) installation of a containment system; 2) dredging and/or excavation; 3) transport and re-handling; 4) processing and treatment; 5) material disposal; and 6) restoration. Mobilization and demobilization activities will also be performed at the beginning and end of the project and construction seasons. These activities will be performed in close proximity to the community and in cases such as truck transport, will be coordinated with the community to minimize impact. The HASP addresses worker safety as well as public safety. To that end, an Activity Hazard Assessment (AHA) was performed for each task which identifies the potential hazards associated with each operation along with the control measures used to mitigate the hazards. These AHAs are included in Attachment 1 of the HASP.

In addition, a series of occupational and environmental monitoring activities will be conducted before work begins to establish baseline conditions. The occupational and environmental monitoring will also be performed during excavation, dredging, material handling and processing, and ecological-layer placement activities to assess potential exposure to the community and workers.

The HASP anticipates the implementation of control measures, but it is not all-inclusive and should be considered a “living document”; modifications to the document may be necessary during the execution of the remediation. Other controls, such as daily toolbox safety meetings, Job Safety Analysis, and Project Safety Analysis will refine the safety control measures specified in the HASP and are intended to protect the workers and community from the safety hazards of this remediation.

5. Quality Assurance / Quality Control Procedures

A CQAP has been developed to describe the QA and QC systems that will be established and followed to verify compliance with the technical approach included in Permit Modification I and this CMI WP. This document is provided in Appendix E.

The plan will establish the overall requirements and management of the quality approach to be followed by the Remedial Action Contractor and PLW Site representatives. The CQAP specifically provides information on the following components of the quality program:

1. Purpose and objectives of the QA/QC program.

2. Project and personnel responsibilities including the organizations and key personnel involved in the implementation of the corrective measures, their responsibilities, and the expected reporting structure and communication.

3. QA/QC inspections to be conducted to monitor the performance of the corrective measures to be implemented, as well as the overall QA/QC elements, measurement approach, pass/fail criteria and corrective actions for construction processes.

4. Procedures for processing pre-, during, and post-construction submittals and documentation, identifying construction deficiencies and acceptable corrective actions, identifying and approving field changes, as well as the requirements for documentation storage.

6. Project Schedule and Management

The estimated project schedule and anticipated management structure are presented below. The construction schedule is provided in the Operations Plan (Appendix A).

6.1 Schedule

The overall schedule for implementation of the corrective measures is presented below, and includes approximate timing for significant steps in the process and submittal dates for key deliverables to EPA.

- EPA Permit Modification I effective date: June 22, 2015
- Submittal of Draft CMI WP: September 2015
- Submittal of Revised CMI WP: April 2016
- Submittal of LTM Program Work Plan: 45 days from approval of CMI WP
- Permit approvals from NJDEP: Needed by spring 2016 in order to begin field work in June 2016
- Anticipated pre-construction activities to be completed:
    - Complete United States Fish and Wildlife Service (USFWS)-required activities to address restrictions of tree clearing – work will be initiated upon scope of work approval by USFWS; anticipated to be completed in early May
    - Obtain permits (see Section 3 for listing of applicable permits for project) – work initiated/in progress and will continue through mobilization
    - Establish points of contact with applicable entities (i.e., Pompton Lakes police and fire departments, school, etc.) to discuss project specifics – work initiated/in progress and will continue through mobilization

- Establish survey control (survey control points and benchmarks including field verification of existing ground surface elevation and sediment bed elevation) – to be initiated after CMI WP approval and continue through mobilization

- Inventory numbers, types, and locations of facilities and other physical features within Rotary Park, Lakeside Park, and other needed areas – work initiated/in progress and will continue through mobilization

- Establish security/traffic control measures (such as installing temporary fencing and coordinating with the Passaic County Engineer's office regarding signage and clearing of vegetation) – to be initiated after CMI WP approval and continue through mobilization

- Identify aboveground and underground utilities and coordinate with New Jersey One Call and owners of utilities regarding the relocation/termination, as required – work with utility owners initiated/in progress and will continue through mobilization

- Implementation of stormwater controls, erosion prevention measures, and sediment control measures (in accordance with applicable local and state regulations, permits, and SESCP) – to be initiated after CMI WP approval and continue through mobilization

- Identify storm sewer outfalls and coordinate with Municipal Utilities Authority regarding relocation, as required – work with owner initiated/in progress and will continue through mobilization

- Locate sanitary sewer lines in Uplands removal area and coordinate with Municipal Utilities Authority on protection of those lines during remedial activities – work initiated/in progress and will continue through mobilization and removal in the area of the sewer lines

- Secure access for equipment mobilization and material/equipment staging areas – access has been obtained

- Establish horizontal limits of removal (to be surveyed and staked in field) – to be initiated after CMI WP approval and continue through mobilization

  - Perform clearing and grubbing of heavy underbrush and trees, as necessary, on land and along shoreline areas – to be initiated after CMI WP/USFWS approval and continue through mobilization

  - Perform shoreline reconnaissance to locate and identify structures along the shoreline that may influence removal extent/boundaries – to be initiated within a few weeks of starting remediation activities adjacent to each specific property

  - Perform pre-construction structural inspection at vibration-sensitive structures within 100 feet of sheetpile work activities – to be initiated after CMI WP approval and continue through mobilization

- Implementation of corrective measures, restoration, and submittal of Construction Completion Report: Anticipated 3 years of in-field work

- Evaluation of the LTM Program results: 5 years after completion of implementation of the corrective measures and associated restoration

The schedule for implementation of the remedial activities will take into account work hour restrictions due to proximity of the Uplands and Delta Area to the Lakeside Middle School, the Pompton Lake fish window and stocking program, and local and/or state laws. It is anticipated that the typical work hours for active removal/processing activities will be from 8:00 am to 6:00 pm, Monday through Friday. Saturday will be used for equipment maintenance. It is expected that an additional hour will be required at the start and end of each work day for preparation/set-up and general shut-down activities. As such, it is anticipated that typical work hours during which personnel will be on-site will be from 7:00 am to 7:00 pm, Monday through Friday. If delays in the work schedule are encountered due to poor weather or other reasons, make up work days may be considered for Saturday. To the extent practicable, EPA will be given prior notice of the Remedial Action Contractor's intent to perform make-up work on a Saturday.

Adjustments in work activities and timing will be required when school is in session (as discussed in Section 2.3) to minimize interference with school-related traffic. The general game fishery timing restriction is May 1 to June 30

as identified in Freshwater Wetlands and Flood Hazard Area rules[2]. Fish are to be relocated outside of the containment system by the beginning of that period and no work that may introduce sediment into the waterbody or cause turbid conditions can occur outside of the containment system during this period of time. Additional coordination may be required if fish stocking were to occur in the vicinity of Pompton Lake. Moreover, due to sensitivity regarding potential impacts to migratory birds and bats, State Fish & Wildlife representatives have identified a timing restriction on tree clearing from April 1 to August 31 and requested that trees be cleared, if necessary, during the winter. Species presence/absence surveys would be required if clearing is necessary outside of that period for tree removal. The Remedial Action Contractor will also adhere to local and state laws or ordinances that may govern or restrict the performance of the work during regular or extra work hours.

6.2 Project Management

Multiple organizations will be involved in implementation of the remedial activities outlined within this document. The anticipated project team and responsibilities are:

- Agencies: EPA (lead) and NJDEP
- Implementing Organization/Responsible Party: Chemours and their designated consultants providing on-site resources
- Engineering Design/Support and Monitoring Efforts: ARCADIS, HDR Engineering, Inc. and Parsons
- Restoration and Permitting Support: AECOM
- Implementation of the Corrective Measures: Sevenson, as the Remedial Action Contractor

[2] Special Condition 21 of the approved FHA permit imposes a general fishery timing restriction for Pompton Lake from May 1 to July 31.

Organizations involved with the engineering design/support, monitoring, restoration and permitting support, and construction will report directly to Chemours. Chemours and their designated PLW Site resources will be the primary point of contact for EPA and NJDEP interactions. Figure 6-1 presents a organization chart showing information known at this this time; this chart should be considered preliminary only and is subject to change as the project progresses to construction.

7. References

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Tables

Table 2-4: Monitoring Summary
Pompton Lake Study Area - Correction Measures Implementation Work Plan

	Monitoring		
Remedial Activity	**Parameter(s)**	**Location(s)**	**Frequency[a]**
Sheetpile Installation and Removal	Structure Inspections	Structures within 100 feet of sheetpile activities	Inspections before installation & after removal
	Vibration Monitoring	Structures within 100 feet of sheetpile activities	Continuous monitoring during installation and removal activities
Upland Excavation	Turbidity (water)	LAB, SW-9	Real-time continuous monitoring during removal activities
	TSS and Mercury (water)	LAB, SW-9	One sample per location if turbidity exceeds action level[b]
	Particulates (PM_{10}- air)	AM-1, AM-2, AM-3, and AM-4	Real-time continuous monitoring during removal activities
	Particulate Mercury Verification (air)	Downwind perimeter (nearest particulate station)	During removal activities, one sample at location when four consecutive readings exceed action level for particulates
	Mercury Vapor	Downwind perimeter (nearest particulate station); on activity field within school property	Real-time continuous monitoring during removal activities; four times per day on activity field
	Mercury Verification (air)	Downwind perimeter (nearest particulate station)	During removal activities, one sample when four consecutive mercury vapor meter readings exceed action level
	Noise	Nearest onshore position to sound source	Twice daily concurrent with air monitoring and at beginning of new noise sources
	Odor	Nearest onshore position to odor source	Continual observations
Sediment Handling and Processing	Particulates (PM_{10}- air)	AM-1, AM-2, AM-3, and AM-4	Real-time continuous monitoring during material handling activities
	Particulate Mercury Verification (air)	Downwind perimeter (nearest particulate station)	During material handling activities, one sample at location when four consecutive readings exceed action level for particulates
	Mercury Vapor	Downwind perimeter (nearest particulate station); on activity field within school property	Real-time continuous monitoring during material handling activities; four times per day on activity field
	Mercury Verification (air)	Downwind perimeter (nearest particulate station)	During material handling activities, one sample when four consecutive mercury vapor meter readings exceed action level
	Noise	Nearest onshore position to sound source	Twice daily concurrent with air monitoring and at beginning of new noise sources
	Odor	Nearest onshore position to odor source	Continual observations

Table 2-4: Monitoring Summary
Pompton Lake Study Area - Correction Measures Implementation Work Plan

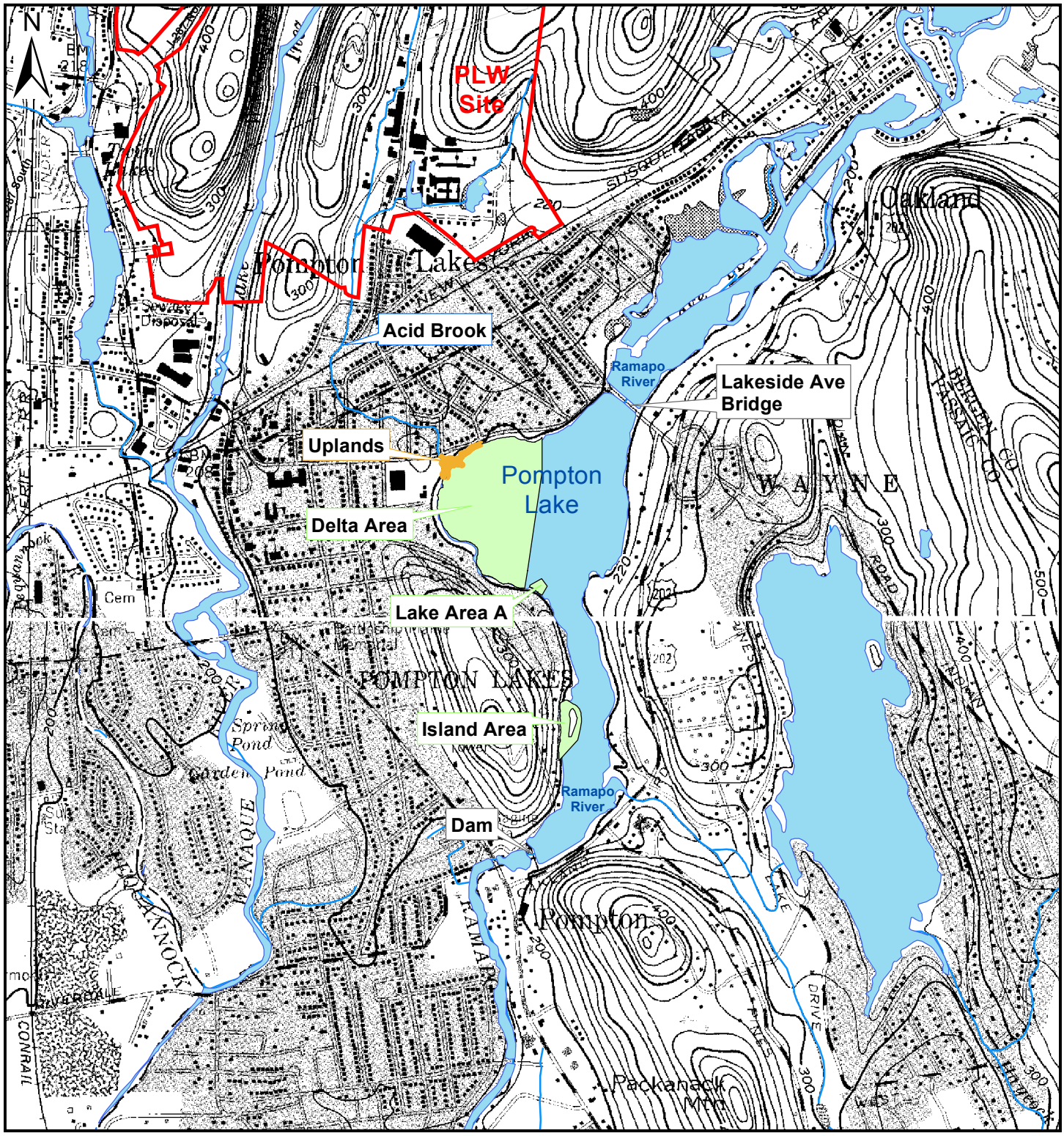
Remedial Activity	Monitoring		
	Parameter(s)	Location(s)	Frequency[a]
Delta Area Dredging & Ecological-layer Placement	Turbidity (water)	LAB, ADJ-ABD, SW-9	Real-time continuous monitoring during dredging and placement activity hours.
	TSS and Mercury (water)	LAB, ADJ-ABD, SW-9	One sample per location if turbidity exceeds action level[b]
	Noise	Nearest onshore position to sound source	Twice daily concurrent with air monitoring and at beginning of new noise sources
	Odor	Nearest onshore position to odor source	Continual observations
Lake Area A Dredging & Ecological-layer Placement	Turbidity (water)	LAB, ADJ-AA, SW-9	Real-time continuous monitoring during dredging and placement activity hours.
	TSS and Mercury (water)	LAB, ADJ-AA, SW-9	One sample per location if turbidity exceeds action level[b]
	Noise	Nearest onshore position to sound source	Twice daily concurrent with air monitoring and at beginning of new noise sources
	Odor	Nearest onshore position to odor source	Continual observations
Island Area Dredging & Ecological-layer Placement	Turbidity (water)	LAB, ADJ-IA, SW-10	Real-time continuous monitoring during dredging and placement activity hours
	TSS and Mercury (water)	LAB, ADJ-IA, SW-10	One sample per location if turbidity exceeds action level[b]
	Noise	Nearest onshore position to sound source	Twice daily concurrent with air monitoring and at beginning of new noise sources
	Odor	Nearest onshore position to odor source	Continual observations

[a] During project activity.

[b] Additionally, sample to be collected at the conclusion of work in each area (Delta Area, Island Area, and Area A) to confirm containment can be removed.

AA = Lake Area A; ABD = Acid Brook Delta; ADJ = Adjacent; IA = Island Area; LAB = Lakeside Avenue Bridge; SW = Surface Water

Figures



Legend:

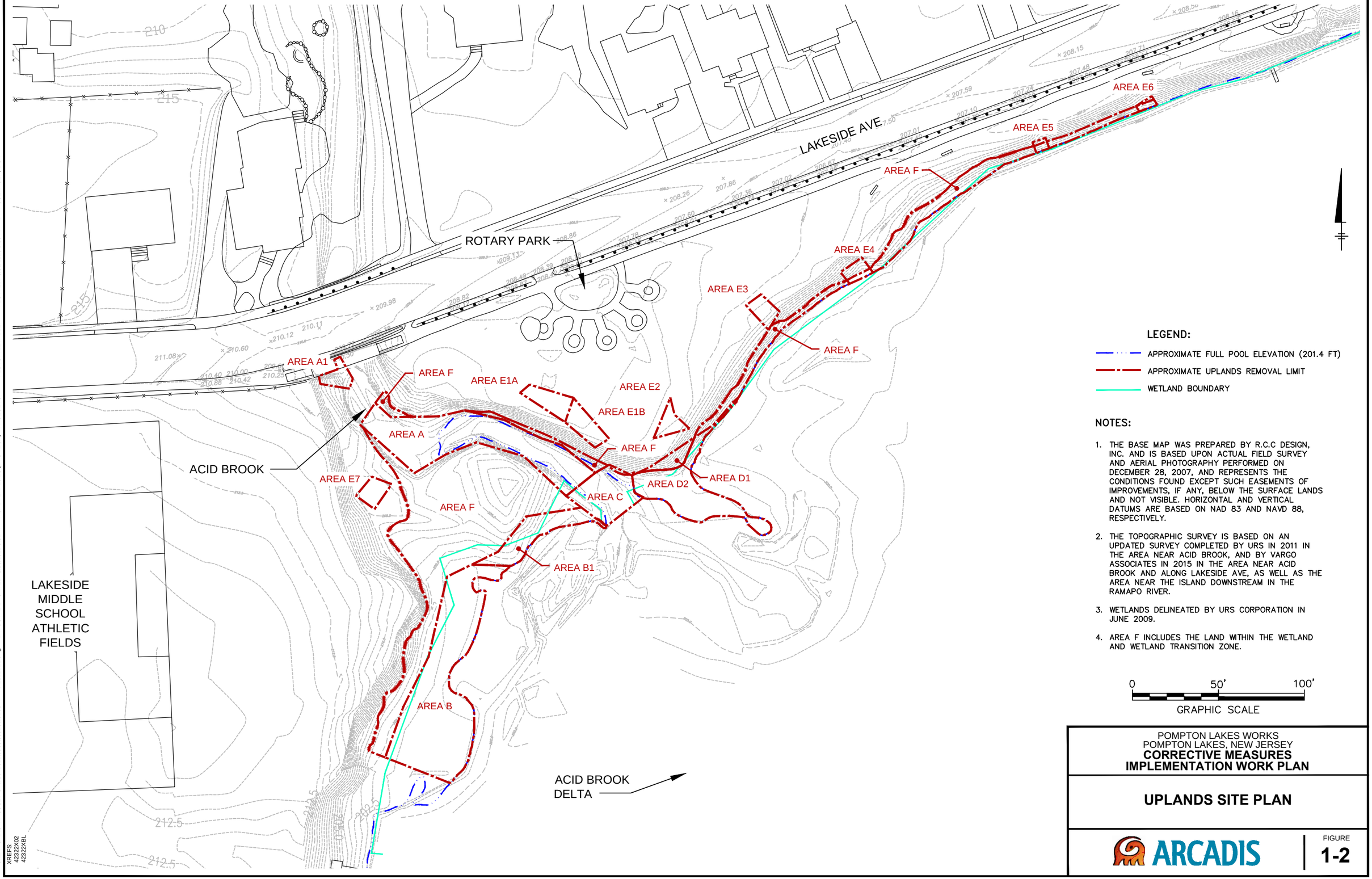
Base is portions of the USGS Wanaque and Pompton Plains QUAD.

PARSONS
200 Cottontail Lane South
Somerset, New Jersey 08873

POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN

SITE LOCATION MAP

FIGURE **1-1**



LEGEND:

- APPROXIMATE FULL POOL ELEVATION (201.4 FT)
- APPROXIMATE UPLANDS REMOVAL LIMIT
- WETLAND BOUNDARY

NOTES:

1. THE BASE MAP WAS PREPARED BY R.C.C DESIGN, INC. AND IS BASED UPON ACTUAL FIELD SURVEY AND AERIAL PHOTOGRAPHY PERFORMED ON DECEMBER 28, 2007, AND REPRESENTS THE CONDITIONS FOUND EXCEPT SUCH EASEMENTS OF IMPROVEMENTS, IF ANY, BELOW THE SURFACE LANDS AND NOT VISIBLE. HORIZONTAL AND VERTICAL DATUMS ARE BASED ON NAD 83 AND NAVD 88, RESPECTIVELY.
2. THE TOPOGRAPHIC SURVEY IS BASED ON AN UPDATED SURVEY COMPLETED BY URS IN 2011 IN THE AREA NEAR ACID BROOK, AND BY VARGO ASSOCIATES IN 2015 IN THE AREA NEAR ACID BROOK AND ALONG LAKESIDE AVE, AS WELL AS THE AREA NEAR THE ISLAND DOWNSTREAM IN THE RAMAPO RIVER.
3. WETLANDS DELINEATED BY URS CORPORATION IN JUNE 2009.
4. AREA F INCLUDES THE LAND WITHIN THE WETLAND AND WETLAND TRANSITION ZONE.

0 50' 100'

GRAPHIC SCALE

POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN

UPLANDS SITE PLAN

ARCADIS

FIGURE
1-2

CITY: SYRACUSE, NY DIV/GROUP: EBC-IM/DV DB/LD: L.POSENAUER PM: H.VANDEWALKER TM: L.PUTNAM LYR:(Opt)ON=*;OFF=*REF*
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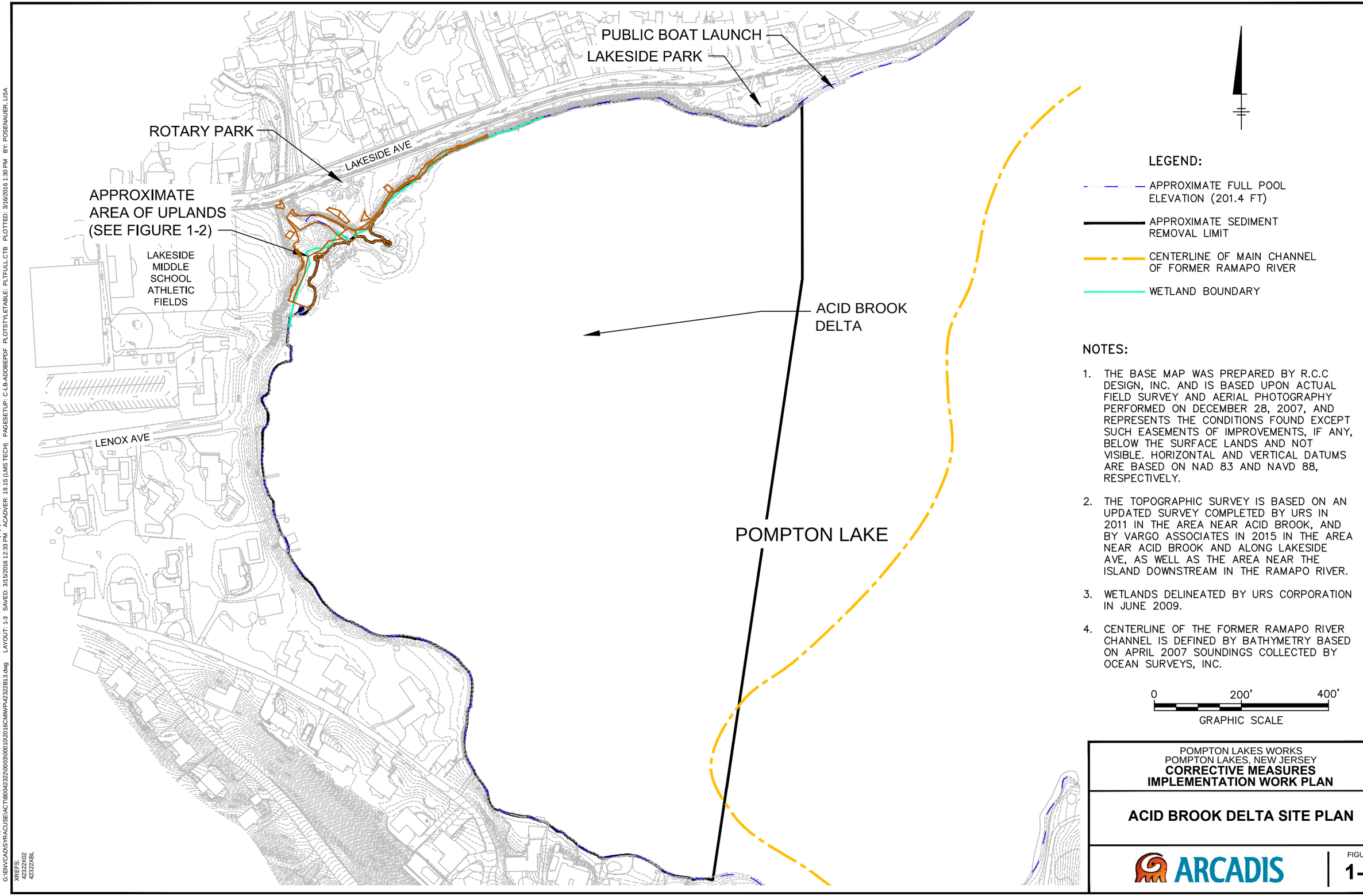
42322XBL



LEGEND:

- APPROXIMATE FULL POOL ELEVATION (201.4 FT)
- APPROXIMATE SEDIMENT REMOVAL LIMIT
- CENTERLINE OF MAIN CHANNEL OF FORMER RAMAPO RIVER
- WETLAND BOUNDARY

NOTES:

1. THE BASE MAP WAS PREPARED BY R.C.C DESIGN, INC. AND IS BASED UPON ACTUAL FIELD SURVEY AND AERIAL PHOTOGRAPHY PERFORMED ON DECEMBER 28, 2007, AND REPRESENTS THE CONDITIONS FOUND EXCEPT SUCH EASEMENTS OF IMPROVEMENTS, IF ANY, BELOW THE SURFACE LANDS AND NOT VISIBLE. HORIZONTAL AND VERTICAL DATUMS ARE BASED ON NAD 83 AND NAVD 88, RESPECTIVELY.
2. THE TOPOGRAPHIC SURVEY IS BASED ON AN UPDATED SURVEY COMPLETED BY URS IN 2011 IN THE AREA NEAR ACID BROOK, AND BY VARGO ASSOCIATES IN 2015 IN THE AREA NEAR ACID BROOK AND ALONG LAKESIDE AVE, AS WELL AS THE AREA NEAR THE ISLAND DOWNSTREAM IN THE RAMAPO RIVER.
3. WETLANDS DELINEATED BY URS CORPORATION IN JUNE 2009.
4. CENTERLINE OF THE FORMER RAMAPO RIVER CHANNEL IS DEFINED BY BATHYMETRY BASED ON APRIL 2007 SOUNDINGS COLLECTED BY OCEAN SURVEYS, INC.

0 200' 400'

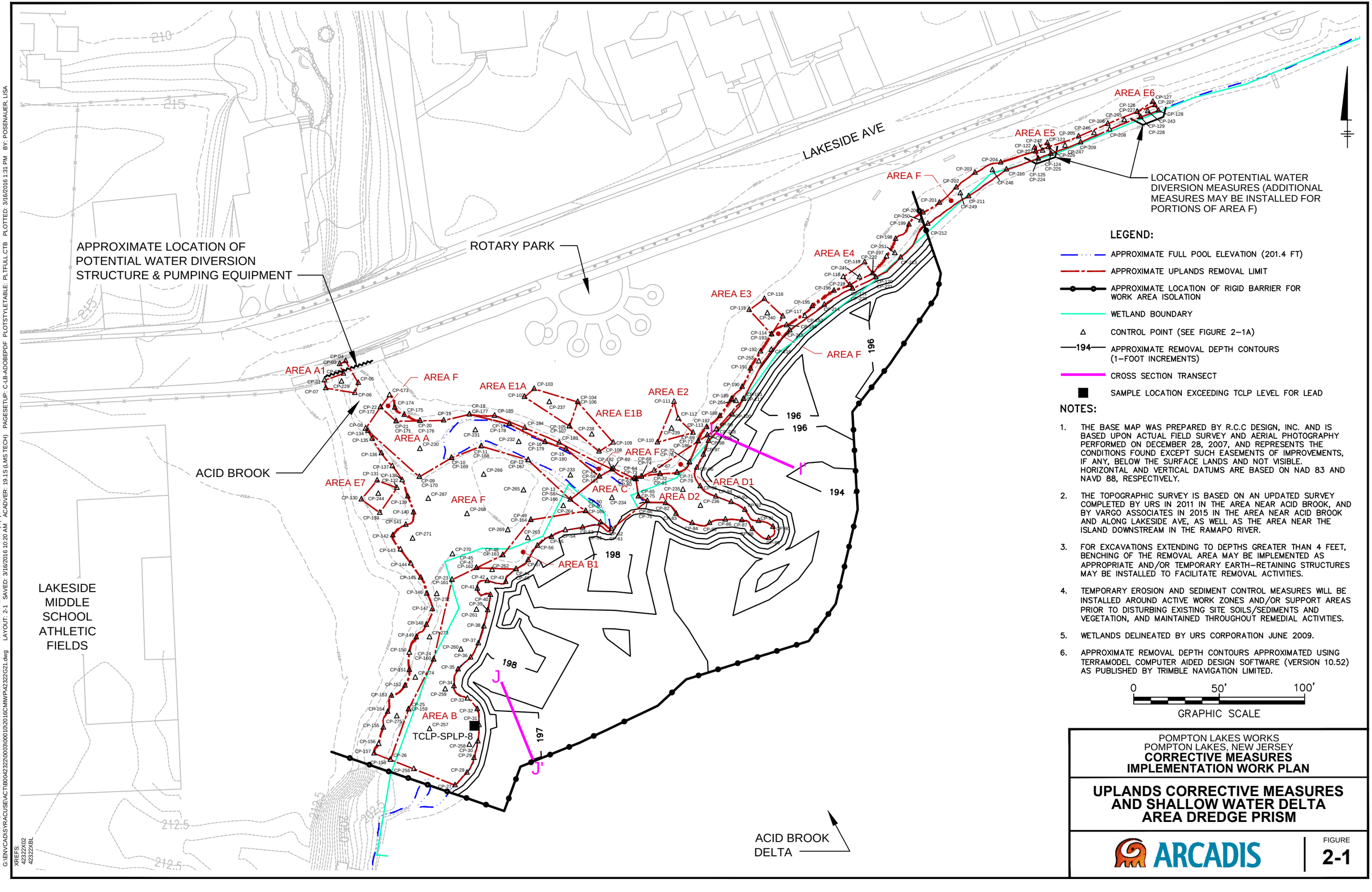
GRAPHIC SCALE

POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN

ACID BROOK DELTA SITE PLAN

ARCADIS

FIGURE
1-3



LEGEND:

- APPROXIMATE FULL POOL ELEVATION (201.4 FT)
- APPROXIMATE UPLANDS REMOVAL LIMIT
- APPROXIMATE LOCATION OF RIGID BARRIER FOR WORK AREA ISOLATION
- WETLAND BOUNDARY
- △ CONTROL POINT (SEE FIGURE 2–1A)
- —194— APPROXIMATE REMOVAL DEPTH CONTOURS (1–FOOT INCREMENTS)
- CROSS SECTION TRANSECT
- ■ SAMPLE LOCATION EXCEEDING TCLP LEVEL FOR LEAD

NOTES:

1. THE BASE MAP WAS PREPARED BY R.C.C DESIGN, INC. AND IS BASED UPON ACTUAL FIELD SURVEY AND AERIAL PHOTOGRAPHY PERFORMED ON DECEMBER 28, 2007, AND REPRESENTS THE CONDITIONS FOUND EXCEPT SUCH EASEMENTS OF IMPROVEMENTS, IF ANY, BELOW THE SURFACE LANDS AND NOT VISIBLE. HORIZONTAL AND VERTICAL DATUMS ARE BASED ON NAD 83 AND NAVD 88, RESPECTIVELY.
2. THE TOPOGRAPHIC SURVEY IS BASED ON AN UPDATED SURVEY COMPLETED BY URS IN 2011 IN THE AREA NEAR ACID BROOK, AND BY VARGO ASSOCIATES IN 2015 IN THE AREA NEAR ACID BROOK AND ALONG LAKESIDE AVE, AS WELL AS THE AREA NEAR THE ISLAND DOWNSTREAM IN THE RAMAPO RIVER.
3. FOR EXCAVATIONS EXTENDING TO DEPTHS GREATER THAN 4 FEET, BENCHING OF THE REMOVAL AREA MAY BE IMPLEMENTED AS APPROPRIATE AND/OR TEMPORARY EARTH–RETAINING STRUCTURES MAY BE INSTALLED TO FACILITATE REMOVAL ACTIVITIES.
4. TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES WILL BE INSTALLED AROUND ACTIVE WORK ZONES AND/OR SUPPORT AREAS PRIOR TO DISTURBING EXISTING SITE SOILS/SEDIMENTS AND VEGETATION, AND MAINTAINED THROUGHOUT REMEDIAL ACTIVITIES.
5. WETLANDS DELINEATED BY URS CORPORATION JUNE 2009.
6. APPROXIMATE REMOVAL DEPTH CONTOURS APPROXIMATED USING TERRAMODEL COMPUTER AIDED DESIGN SOFTWARE (VERSION 10.52) AS PUBLISHED BY TRIMBLE NAVIGATION LIMITED.

0 50' 100'

GRAPHIC SCALE

POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN

UPLANDS CORRECTIVE MEASURES AND SHALLOW WATER DELTA AREA DREDGE PRISM

ARCADIS

FIGURE **2-1**

CITY: SYRACUSE, NY DIV/GROUP: EBC-IM/DV DB/LD: L.ROSENAUER PM: H.VANDEWALKER TM: L.PUTNAM LYR:(On)ON=*OFF=*REF*
G:\ENVCAD\SYRACUSE\ACT\B0042322\0003\0001\0\2016CMWP42322G21.dwg LAYOUT: 2-1 SAVED: 3/16/2016 10:20 AM ACADVER: 19.1S (LMS TECH) PAGESETUP: C:\LB-ADOBEPDF PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 3/16/2016 1:31 PM BY: POSENAUER, USA
XREFS:
42322X02
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TABLE1

Soil Removal Area	Control Point	Easting	Northing	Removal Depth (ft)
A	CP-08	552172.5	791161.1	3.5
A	CP-09	552203.9	791133.0	3.5
A	CP-10	552222.7	791144.0	3.5
A	CP-11	552240.1	791150.9	3.5
A	CP-12	552267.5	791142.8	3.5
A	CP-13	552292.2	791119.7	3.5
A	CP-14	552309.2	791133.2	3.5
A	CP-15	552289.6	791149.2	3.5
A	CP-16	552277.4	791153.4	3.5
A	CP-17	552256.6	791163.8	3.5
A	CP-18	552233.2	791169.4	3.5
A	CP-19	552218.2	791165.9	3.5
A	CP-20	552204.3	791165.7	3.5
A	CP-21	552190.4	791165.4	3.5
A	CP-22	552181.2	791173.7	3.5
A	CP-230	552204.2	791149.3	3.5
A	CP-231	552236.6	791160.2	3.5
A	CP-232	552262.1	791153.3	3.5
A	CP-233	552292.2	791133.8	3.5
A1	CP-01	552148.5	791189.4	2.5
A1	CP-02	552159.5	791193.3	2.5
A1	CP-03	552157.3	791198.9	2.5
A1	CP-04	552160.8	791200.6	2.5
A1	CP-05	552168.2	791187.8	2.5
A1	CP-06	552166.2	791182.0	2.5
A1	CP-07	552149.3	791184.8	2.5
A1	CP-229	552158.4	791188.6	2.5
B	CP-23	552223.0	791072.8	5
B	CP-24	552212.3	791026.2	5
B	CP-25	552197.6	790997.1	5
B	CP-26	552187.0	790967.6	5
B	CP-27	552224.8	790952.7	5
B	CP-28	552231.8	790960.1	5
B	CP-29	552235.9	790968.7	5
B	CP-30	552238.2	790978.3	5
B	CP-31	552238.8	790987.9	5
B	CP-32	552237.8	790997.2	5
B	CP-33	552232.0	791003.4	5
B	CP-34	552224.2	791010.6	5
B	CP-35	552226.5	791020.4	5
B	CP-36	552233.9	791027.3	5
B	CP-37	552238.4	791035.7	5
B	CP-38	552241.6	791045.5	5
B	CP-39	552243.9	791055.0	5
B	CP-40	552245.5	791063.9	5
B	CP-41	552237.8	791067.6	5
B	CP-42	552243.6	791072.1	5
B	CP-43	552254.4	791071.6	5
B	CP-44	552260.5	791079.0	5
B	CP-45	552237.3	791079.7	5
B	CP-256	552200.7	790962.2	5
B	CP-257	552209.9	790985.5	5
B	CP-258	552233.1	790976.3	5
B	CP-259	552219.0	791008.7	5
B	CP-260	552228.2	791032.0	5
B	CP-261	552237.4	791055.3	5
B	CP-262	552246.5	791078.5	5
B1	CP-46	552260.5	791079.0	4
B1	CP-47	552237.3	791079.7	4
B1	CP-48	552252.7	791087.2	4
B1	CP-49	552269.1	791107.8	4
B1	CP-50	552301.2	791112.9	4
B1	CP-51	552309.8	791106.4	4
B1	CP-52	552316.2	791102.5	4
B1	CP-53	552299.3	791103.4	4
B1	CP-54	552289.3	791101.7	4
B1	CP-55	552281.2	791097.9	4
B1	CP-56	552273.0	791092.7	4
B1	CP-57	552267.5	791084.3	4
B1	CP-263	552267.4	791097.2	4
C	CP-58	552292.2	791119.7	5
C	CP-59	552309.2	791133.2	5
C	CP-60	552301.2	791112.9	5
C	CP-61	552316.2	791102.5	5
C	CP-62	552317.4	791137.8	5
C	CP-63	552329.6	791132.1	5
C	CP-64	552330.6	791131.6	5
C	CP-65	552332.0	791121.6	5
C	CP-66	552337.2	791118.8	5
C	CP-234	552316.5	791120.6	5

TABLE2

Soil Removal Area	Control Point	Easting	Northing	Removal Depth (ft)
D1	CP-67	552341.2	791136.6	8.5
D1	CP-68	552333.7	791133.1	8.5
D1	CP-69	552366.9	791153.8	8.5
D1	CP-70	552361.9	791141.5	8.5
D1	CP-71	552354.6	791135.4	8.5
D1	CP-72	552344.6	791134.6	8.5
D2	CP-73	552330.6	791131.6	7
D2	CP-75	552332.0	791121.6	7
D2	CP-74	552333.7	791133.1	7
D2	CP-76	552337.2	791118.8	7
D2	CP-77	552366.9	791153.8	7
D2	CP-78	552361.9	791141.5	7
D2	CP-79	552354.6	791135.4	7
D2	CP-80	552329.6	791132.1	7
D2	CP-81	552344.6	791134.6	7
D2	CP-82	552347.9	791117.6	7
D2	CP-83	552354.0	791111.5	7
D2	CP-84	552363.4	791105.9	7
D2	CP-85	552373.6	791106.0	7
D2	CP-86	552382.8	791108.0	7
D2	CP-87	552392.5	791107.6	7
D2	CP-88	552398.7	791102.5	7
D2	CP-89	552408.1	791097.2	7
D2	CP-90	552410.7	791103.8	7
D2	CP-91	552402.4	791107.2	7
D2	CP-92	552394.2	791113.7	7
D2	CP-93	552386.2	791118.2	7
D2	CP-94	552377.3	791121.5	7
D2	CP-95	552368.1	791127.5	7
D2	CP-96	552366.2	791138.4	7
D2	CP-97	552370.0	791146.0	7
D2	CP-98	552372.9	791154.0	7
D2	CP-99	552377.7	791160.7	7
D2	CP-100	552386.8	791169.4	7
D2	CP-101	552393.4	791178.5	7
D2	CP-235	552358.0	791125.4	7
D2	CP-236	552368.3	791116.0	7
E1A	CP-102	552265.4	791179.7	1
E1A	CP-103	552271.0	791184.4	1
E1A	CP-104	552296.5	791176.7	1
E1A	CP-105	552291.7	791162.5	1
E1A	CP-237	552279.9	791176.6	1
E1A	CP-238	552304.7	791157.7	1
E1B	CP-106	552296.5	791176.7	4
E1B	CP-107	552291.7	791162.5	4
E1B	CP-108	552309.0	791147.8	4
E1B	CP-109	552317.2	791153.0	4
E2	CP-110	552343.1	791153.1	2
E2	CP-111	552352.8	791176.8	2
E2	CP-112	552355.3	791167.0	2
E2	CP-113	552363.9	791158.8	2
E2	CP-239	552351.4	791161.2	2
E3	CP-114	552409.9	791216.3	1
E3	CP-115	552396.8	791230.5	1
E3	CP-116	552405.7	791236.9	1
E3	CP-117	552416.4	791226.8	1
E3	CP-240	552407.4	791228.5	1
E4	CP-118	552451.8	791249.8	8
E4	CP-119	552464.3	791258.3	8
E4	CP-120	552470.7	791249.6	8
E4	CP-121	552457.1	791243.1	8
E4	CP-241	552461.2	791249.7	8
E5	CP-122	552563.5	791325.3	6
E5	CP-123	552571.1	791327.9	6
E5	CP-124	552573.2	791321.8	6
E5	CP-125	552565.7	791319.0	6
E5	CP-242	552568.4	791323.6	6
E6	CP-126	552623.6	791346.3	3.5
E6	CP-127	552632.7	791352.1	3.5
E6	CP-128	552636.0	791347.1	3.5
E6	CP-129	552625.6	791343.2	3.5
E6	CP-243	552629.8	791346.7	3.5
E7	CP-130	552170.0	791119.8	0.5
E7	CP-131	552179.3	791130.9	0.5
E7	CP-132	552190.8	791126.5	0.5
E7	CP-133	552180.8	791111.9	0.5
E7	CP-244	552179.9	791123.0	0.5

TABLE3

Soil Removal Area	Control Point	Easting	Northing	Removal Depth (ft)
F	CP-134	552173.9	791159.8	3
F	CP-135	552176.4	791155.3	3
F	CP-136	552181.7	791146.8	3
F	CP-137	552188.1	791139.2	3
F	CP-138	552193.9	791131.0	3
F	CP-139	552197.1	791121.5	3
F	CP-140	552200.6	791112.2	3
F	CP-141	552196.0	791104.9	3
F	CP-142	552188.4	791098.8	3
F	CP-143	552192.9	791090.5	3
F	CP-144	552198.9	791082.4	3
F	CP-145	552204.7	791074.1	3
F	CP-146	552208.3	791064.8	3
F	CP-147	552211.6	791055.6	3
F	CP-148	552208.1	791046.4	3
F	CP-149	552202.2	791039.2	3
F	CP-150	552198.0	791030.2	3
F	CP-151	552198.1	791020.1	3
F	CP-152	552195.5	791011.0	3
F	CP-153	552187.6	791005.0	3
F	CP-154	552185.4	790995.6	3
F	CP-155	552182.9	790986.4	3
F	CP-156	552180.1	790976.9	3
F	CP-157	552177.5	790971.4	3
F	CP-158	552187.0	790967.6	3
F	CP-159	552197.6	790997.1	3
F	CP-160	552212.3	791026.2	3
F	CP-161	552223.0	791072.8	3
F	CP-162	552237.3	791079.7	3
F	CP-163	552252.7	791087.2	3
F	CP-164	552269.1	791107.8	3
F	CP-165	552301.2	791112.9	3
F	CP-166	552292.2	791119.7	3
F	CP-167	552267.5	791142.8	3
F	CP-168	552240.1	791150.9	3
F	CP-169	552222.7	791144.0	3
F	CP-170	552203.9	791133.0	3
F	CP-171	552190.4	791165.4	3
F	CP-172	552181.2	791173.7	3
F	CP-173	552186.5	791180.7	3
F	CP-174	552189.6	791173.5	3
F	CP-175	552195.1	791169.2	3
F	CP-176	552204.3	791165.7	3
F	CP-177	552233.2	791169.4	3
F	CP-178	552256.6	791163.8	3
F	CP-179	552277.4	791153.4	3
F	CP-180	552289.6	791149.2	3
F	CP-181	552309.2	791133.2	3
F	CP-182	552316.5	791137.3	3
F	CP-183	552285.7	791152.9	3
F	CP-184	552265.5	791161.5	3
F	CP-185	552247.9	791168.7	3
F	CP-186	552366.9	791153.8	3
F	CP-187	552371.9	791162.0	3
F	CP-188	552379.6	791168.6	3
F	CP-189	552386.5	791178.5	3
F	CP-190	552392.7	791185.6	3
F	CP-191	552397.5	791196.3	3
F	CP-192	552403.4	791206.2	3
F	CP-193	552409.9	791216.3	3
F	CP-194	552418.6	791221.6	3
F	CP-195	552433.7	791232.7	3
F	CP-196	552446.3	791241.8	3
F	CP-197	552477.1	791261.7	3
F	CP-198	552482.4	791272.0	3
F	CP-199	552490.2	791280.5	3
F	CP-200	552498.4	791287.4	3

TABLE4

Soil Removal Area	Control Point	Easting	Northing	Removal Depth (ft)
F	CP-201	552508.0	791293.2	3
F	CP-202	552517.8	791302.1	3
F	CP-203	552528.8	791310.6	3
F	CP-204	552543.9	791316.7	3
F	CP-205	552589.3	791331.9	3
F	CP-206	552606.4	791339.3	3
F	CP-207	552634.0	791350.2	3
F	CP-208	552607.5	791335.9	3
F	CP-209	552590.5	791328.4	3
F	CP-210	552547.2	791312.6	3
F	CP-211	552525.0	791296.9	3
F	CP-212	552501.2	791280.8	3
F	CP-213	552485.3	791261.2	3
F	CP-214	552440.7	791233.5	3
F	CP-215	552420.5	791218.6	3
F	CP-216	552409.7	791207.1	3
F	CP-217	552393.4	791178.5	3
F	CP-218	552377.7	791160.7	3
F	CP-219	552455.5	791245.1	3
F	CP-220	552457.1	791243.1	3
F	CP-221	552470.7	791249.6	3
F	CP-222	552468.9	791252.0	3
F	CP-223	552564.3	791323.1	3
F	CP-224	552565.7	791319.0	3
F	CP-225	552573.2	791321.8	3
F	CP-226	552571.8	791325.8	3
F	CP-227	552623.6	791346.3	3
F	CP-228	552625.6	791343.2	3
F	CP-245	552616.1	791341.5	3
F	CP-246	552598.4	791333.8	3
F	CP-247	552581.4	791326.4	3
F	CP-248	552538.9	791312.2	3
F	CP-249	552520.2	791298.7	3
F	CP-250	552497.2	791282.9	3
F	CP-251	552481.9	791263.7	3
F	CP-252	552429.3	791226.9	3
F	CP-253	552402.4	791200.4	3
F	CP-254	552389.0	791177.3	3
F	CP-255	552372.3	791157.3	3
F	CP-264	552288.1	791115.9	3
F	CP-265	552264.8	791125.1	3
F	CP-266	552241.6	791134.2	3
F	CP-267	552209.1	791120.1	3
F	CP-268	552231.8	791111.2	3
F	CP-269	552255.7	791101.8	3
F	CP-270	552223.2	791087.7	3
F	CP-271	552200.0	791096.8	3
F	CP-272	552214.1	791064.4	3
F	CP-273	552209.9	791039.2	3
F	CP-274	552201.6	791015.6	3
F	CP-275	552190.7	790993.0	3

NOTE:

1. EXISTING ELEVATIONS ARE APPROXIMATE, AND WILL NEED TO BE VERIFIED IN THE FIELD DURING THE PRE-CONSTRUCTION SURVEY. THE EXCAVATION ELEVATION WILL BE ADJUSTED AS NECESSARY BASED ON THE RESULTS OF THE PRE-CONSTRUCTION SURVEY. HORIZONTAL AND VERTICAL DATUMS ARE BASED ON NAD 83 AND NAVD 88, RESPECTIVELY.

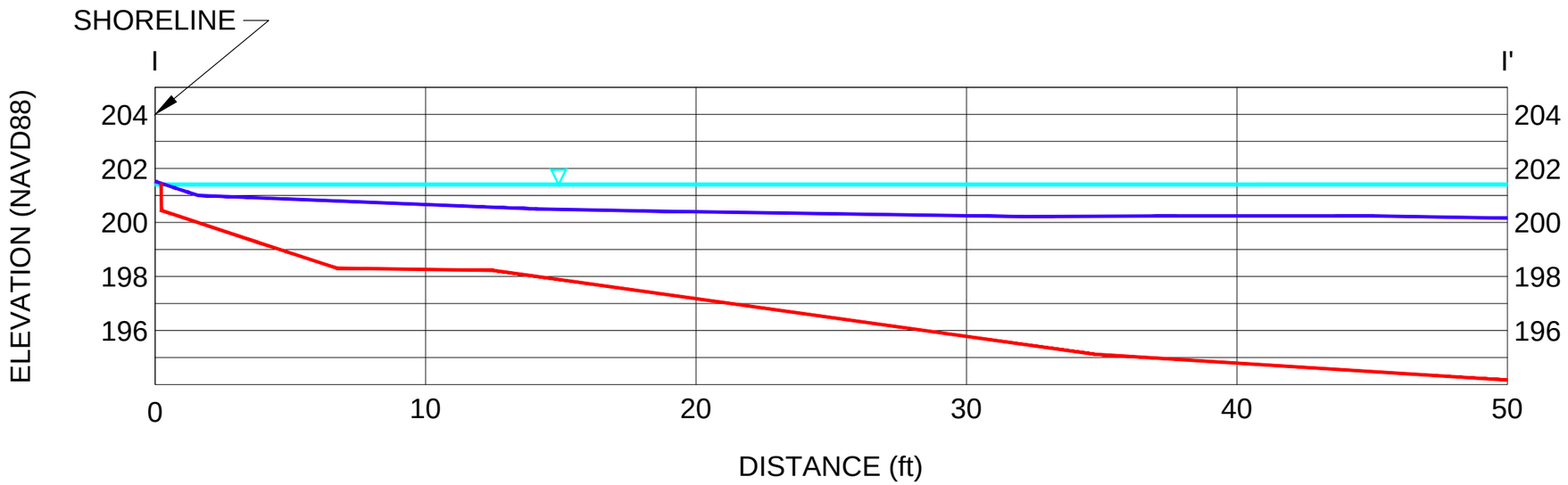
POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN

UPLANDS CORRECTIVE MEASURES CONTROL POINTS

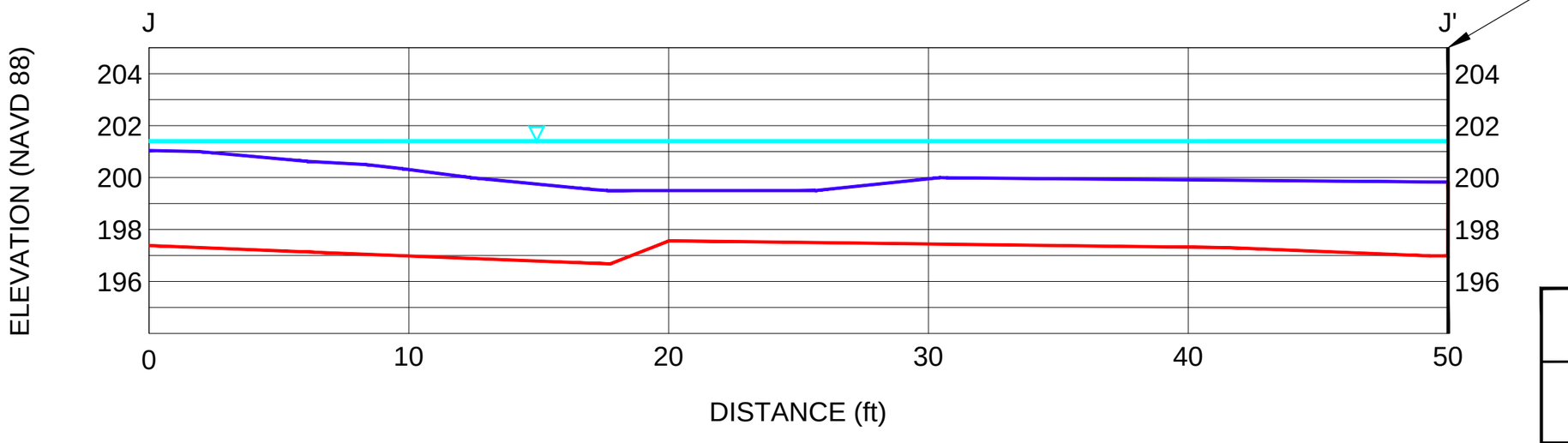
ARCADIS

FIGURE
2-1A

CROSS-SECTION I-I'
SHORELINE ADJACENT TO UPLANDS



CROSS-SECTION J-J'
SOUTHERN SHALLOW WATER DELTA AREA NEAR SHEETING



LEGEND:

- EXISTING SEDIMENT SURFACE
- POST–DREDGE SURFACE
- APPROXIMATE WATER LINE

0 5' 10'
HORIZONTAL GRAPHIC SCALE

0 5' 10'
VERTICAL GRAPHIC SCALE

POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN

SHALLOW WATER DELTA AREA CROSS SECTIONS

ARCADIS

FIGURE
2-1B

CITY: SYRACUSE, NY DIV/GROUP: EBC-IM/DV DB/LD: L.POSENAUER PM: H.VANDEWALKER TM: L.PUTNAM LYR:(Opt)ON=*;OFF=*REF*
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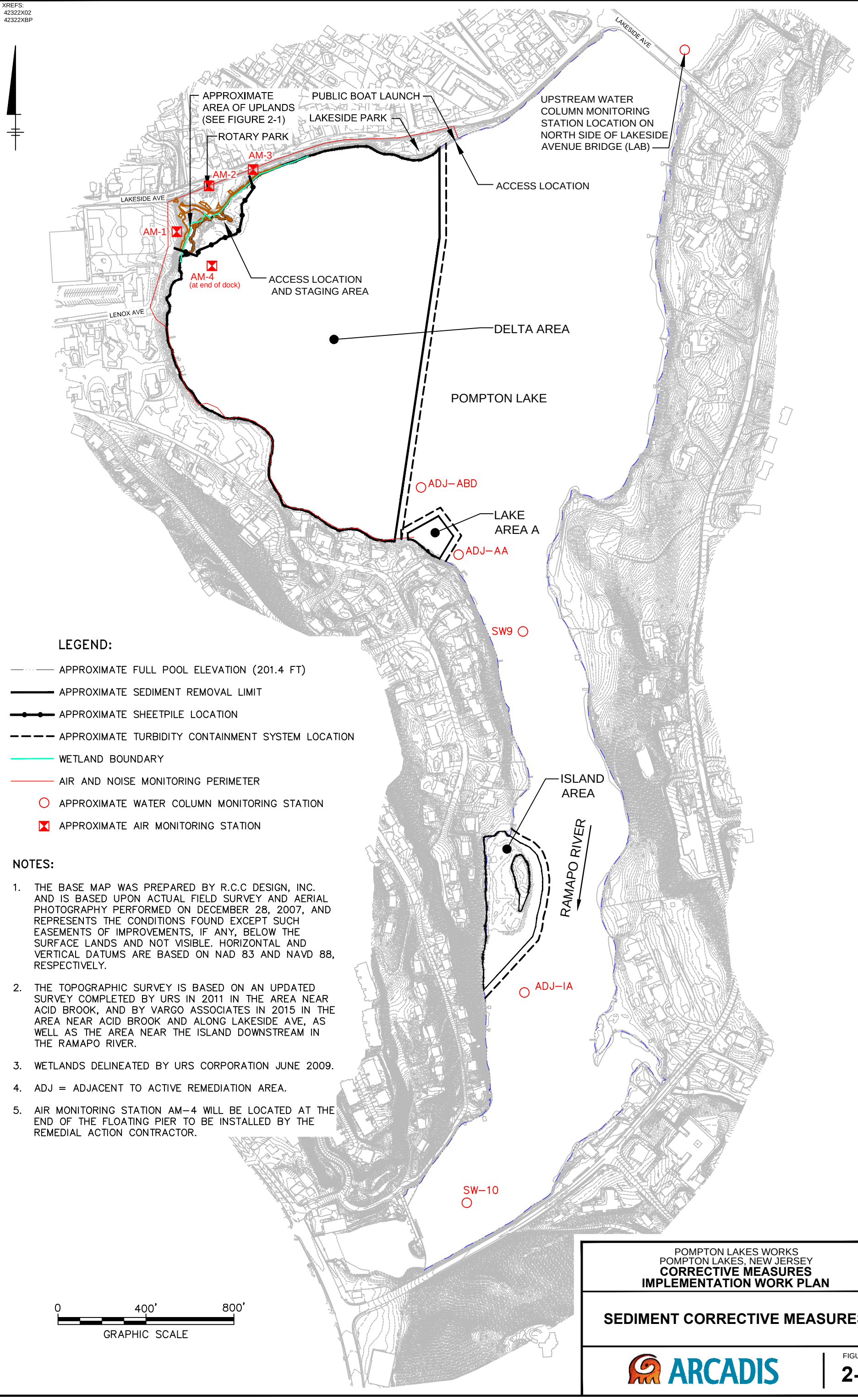


LEGEND:

- APPROXIMATE FULL POOL ELEVATION (201.4 FT)
- APPROXIMATE SEDIMENT REMOVAL LIMIT
- APPROXIMATE SHEETPILE LOCATION
- APPROXIMATE TURBIDITY CONTAINMENT SYSTEM LOCATION
- WETLAND BOUNDARY
- AIR AND NOISE MONITORING PERIMETER
- APPROXIMATE WATER COLUMN MONITORING STATION
- APPROXIMATE AIR MONITORING STATION

NOTES:

1. THE BASE MAP WAS PREPARED BY R.C.C DESIGN, INC. AND IS BASED UPON ACTUAL FIELD SURVEY AND AERIAL PHOTOGRAPHY PERFORMED ON DECEMBER 28, 2007, AND REPRESENTS THE CONDITIONS FOUND EXCEPT SUCH EASEMENTS OF IMPROVEMENTS, IF ANY, BELOW THE SURFACE LANDS AND NOT VISIBLE. HORIZONTAL AND VERTICAL DATUMS ARE BASED ON NAD 83 AND NAVD 88, RESPECTIVELY.
2. THE TOPOGRAPHIC SURVEY IS BASED ON AN UPDATED SURVEY COMPLETED BY URS IN 2011 IN THE AREA NEAR ACID BROOK, AND BY VARGO ASSOCIATES IN 2015 IN THE AREA NEAR ACID BROOK AND ALONG LAKESIDE AVE, AS WELL AS THE AREA NEAR THE ISLAND DOWNSTREAM IN THE RAMAPO RIVER.
3. WETLANDS DELINEATED BY URS CORPORATION JUNE 2009.
4. ADJ = ADJACENT TO ACTIVE REMEDIATION AREA.
5. AIR MONITORING STATION AM–4 WILL BE LOCATED AT THE END OF THE FLOATING PIER TO BE INSTALLED BY THE REMEDIAL ACTION CONTRACTOR.

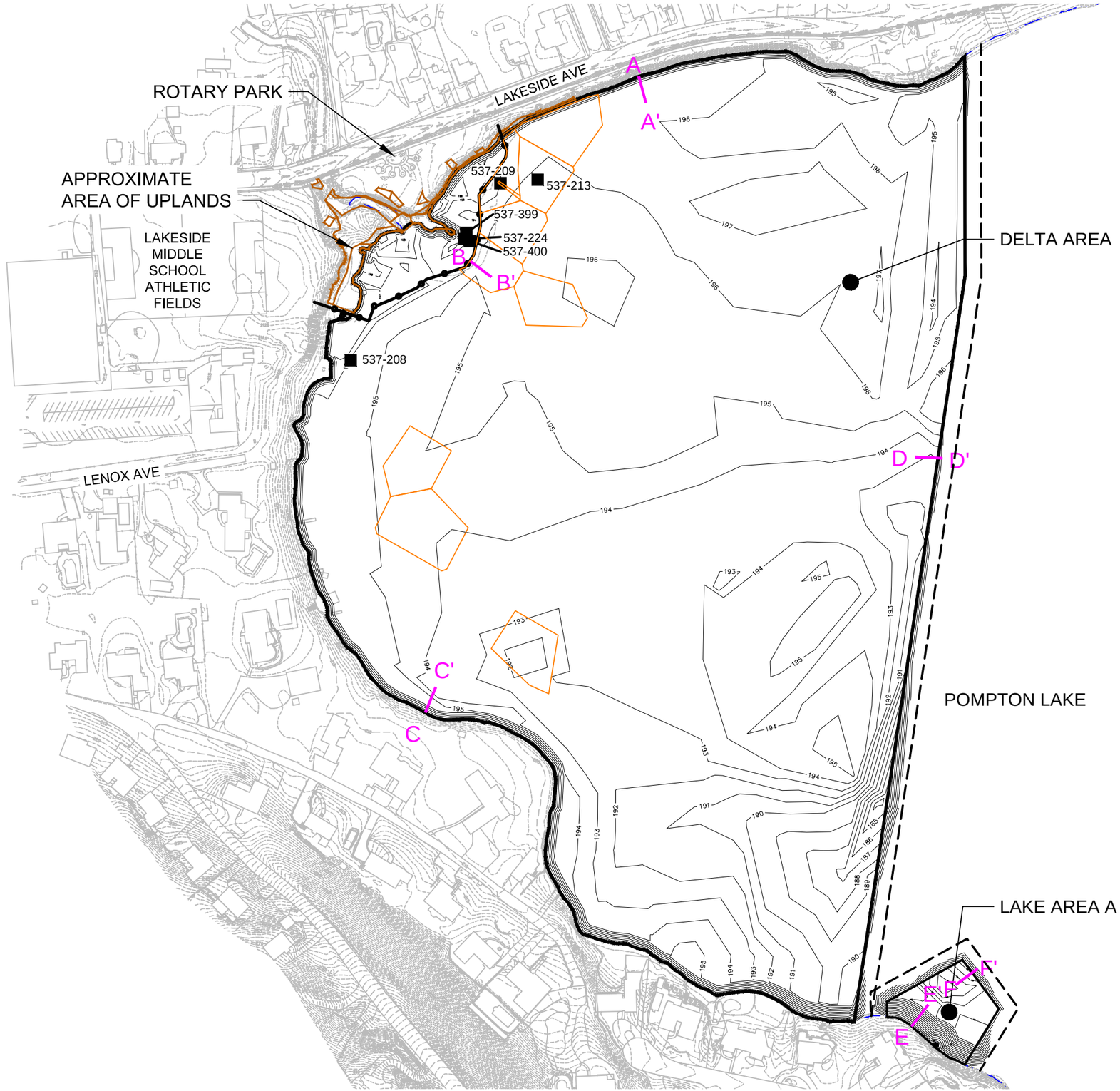
0 400' 800'
GRAPHIC SCALE

POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN

SEDIMENT CORRECTIVE MEASURES

ARCADIS

FIGURE
2-2



LEGEND:

- APPROXIMATE SHEETPILE LOCATION
- APPROXIMATE TURBIDITY CONTAINMENT SYSTEM LOCATION
- APPROXIMATE SEDIMENT REMOVAL LIMIT
- APPROXIMATE FULL POOL ELEVATION (201.4 FT)
- POST–DREDGE SURFACE CONTOURS (1–FOOT INCREMENTS)
- CROSS SECTION TRANSECT
- SAMPLE LOCATIONS EXCEEDING TCLP LEVELS FOR LEAD
- APPROXIMATE AREA OF TARGETED PEAT REMOVAL

NOTES:

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3. POST–DREDGE SURFACE CONTOURS APPROXIMATED USING TERRAMODEL COMPUTER AIDED DESIGN SOFTWARE (VERSION 10.52) AS PUBLISHED BY TRIMBLE NAVIGATION LIMITED.

0 200’ 400’

GRAPHIC SCALE

POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN

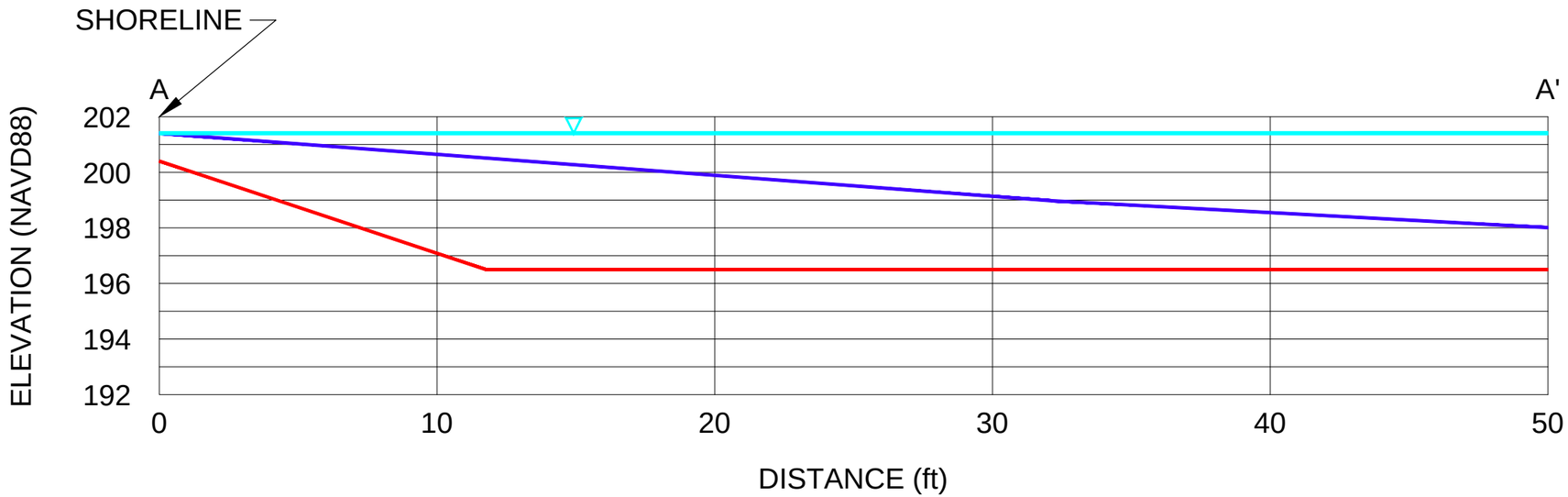
DELTA AREA AND LAKE AREA A DREDGE PRISMS

ARCADIS

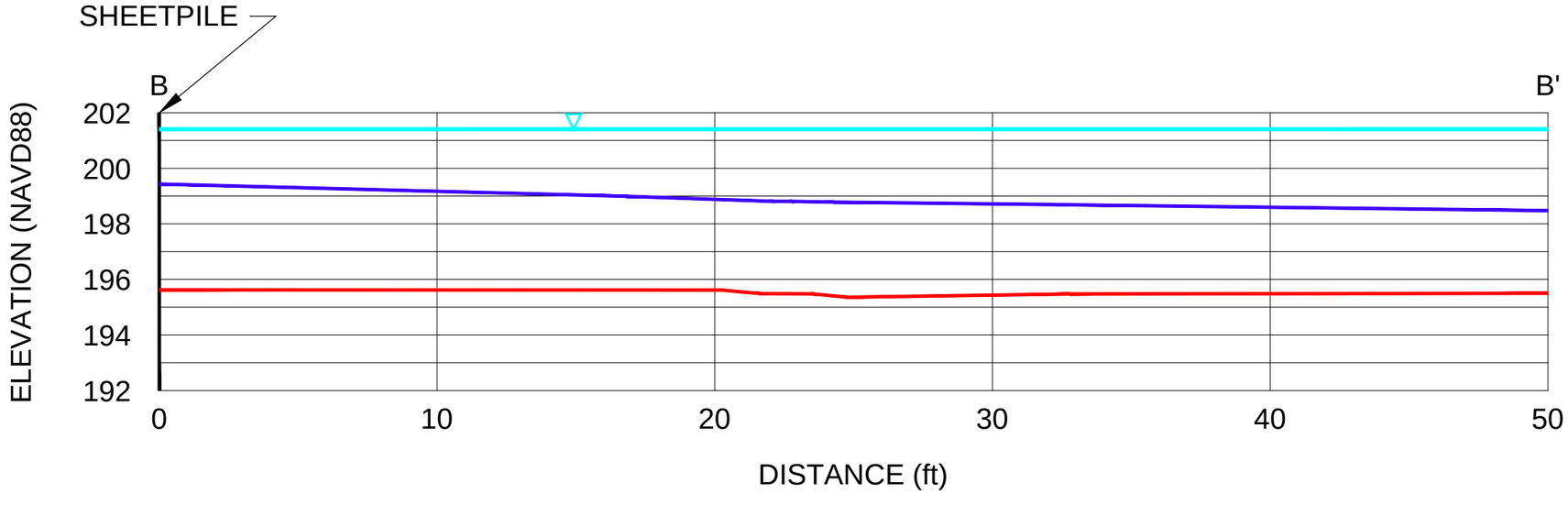
FIGURE
2-3

CITY: SYRACUSE, NY DIV/GROUP: EBC-IM/DV DB/LD: L.POSENAUER PM: H.VANDEWALKER TM: L.PUTNAM LYR:(Obj)ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACTIB\042322\0003\000\10\2016CMWP\42322V23-V24.dwg LAYOUT: 2-3 SAVED: 3/16/2016 1:27 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: C:\LB-ADOBEPDF PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 3/16/2016 1:32 PM BY: POSENAUER, LISA
XREFS:
42322X02
42322XBL

CROSS-SECTION A-A'
NORTHERN SHORELINE ADJACENT TO LAKE SIDE AVENUE



CROSS-SECTION B-B'
WESTERN DELTA AREA NEAR SHEETPILING



LEGEND:

- EXISTING SEDIMENT SURFACE
- POST–DREDGE SURFACE
- APPROXIMATE WATER LINE

0 5' 10'
HORIZONTAL GRAPHIC SCALE

0 5' 10'
VERTICAL GRAPHIC SCALE

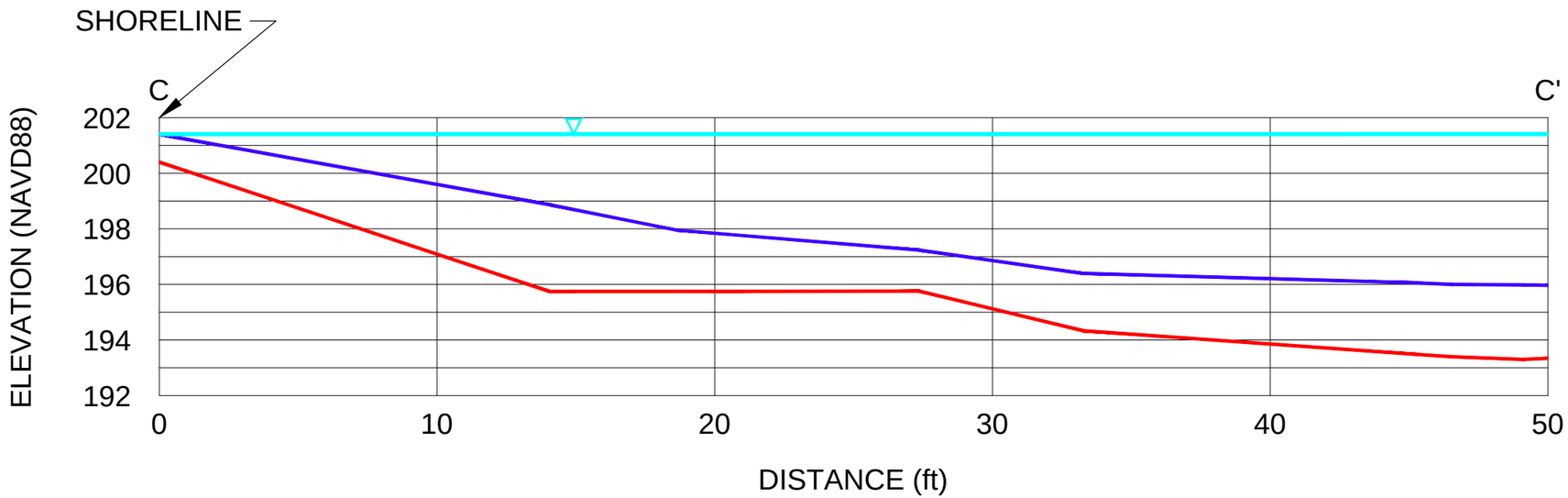
POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN

DELTA AREA DREDGE PRISM CROSS SECTIONS

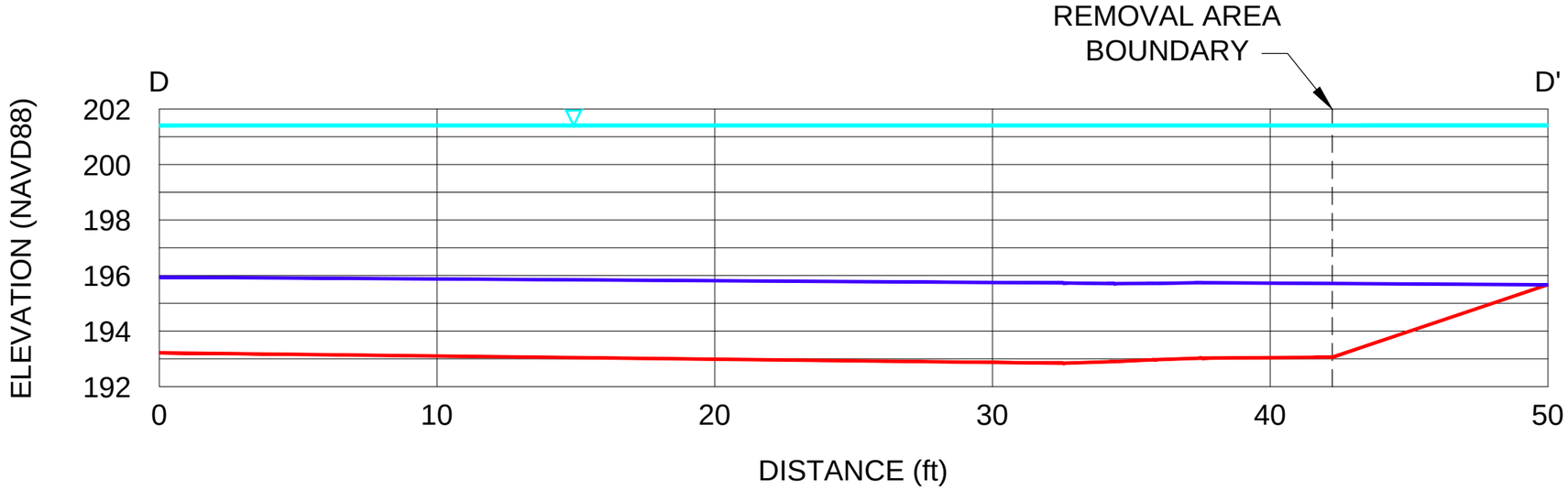
ARCADIS

FIGURE
2-3A

CROSS-SECTION C-C'
SOUTHWESTERN SHORELINE



CROSS-SECTION D-D'
EASTERN DELTA AREA NEAR TURBIDITY CONTAINMENT SYSTEM



LEGEND:

- EXISTING SEDIMENT SURFACE
- POST–DREDGE SURFACE
- APPROXIMATE WATER LINE

0 5' 10'
HORIZONTAL GRAPHIC SCALE

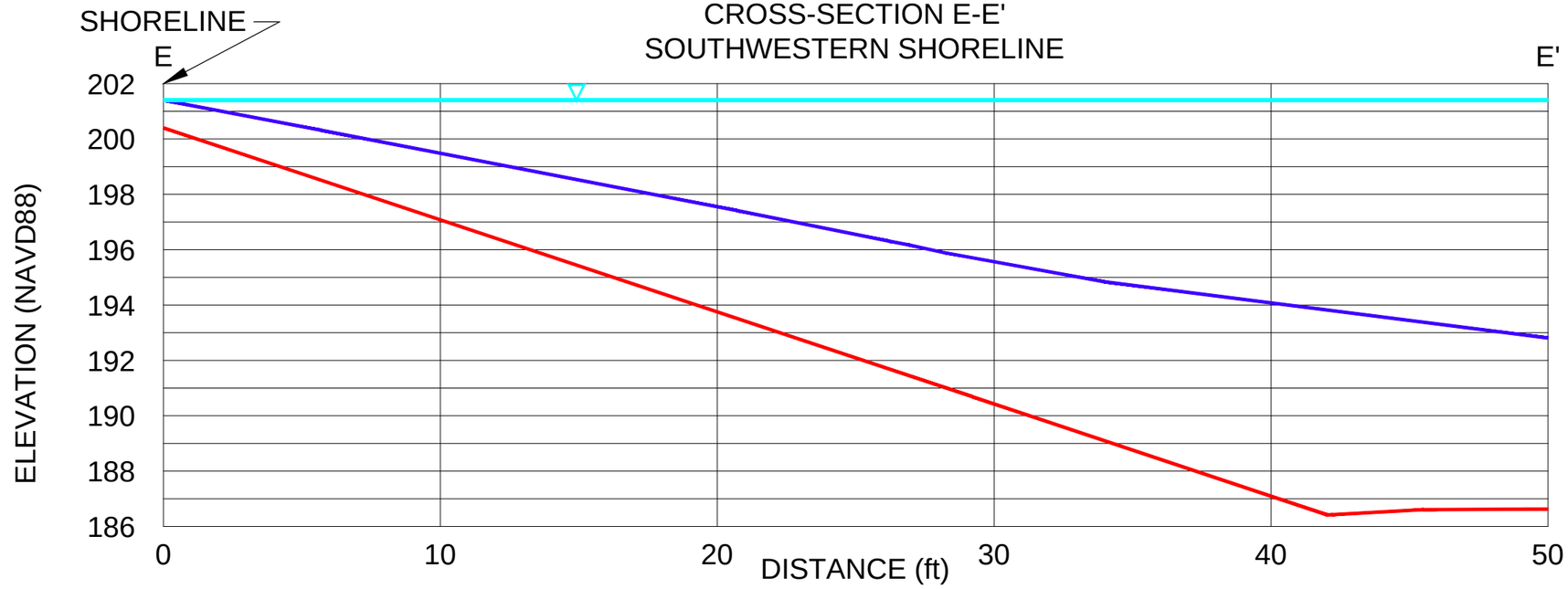
0 5' 10'
VERTICAL GRAPHIC SCALE

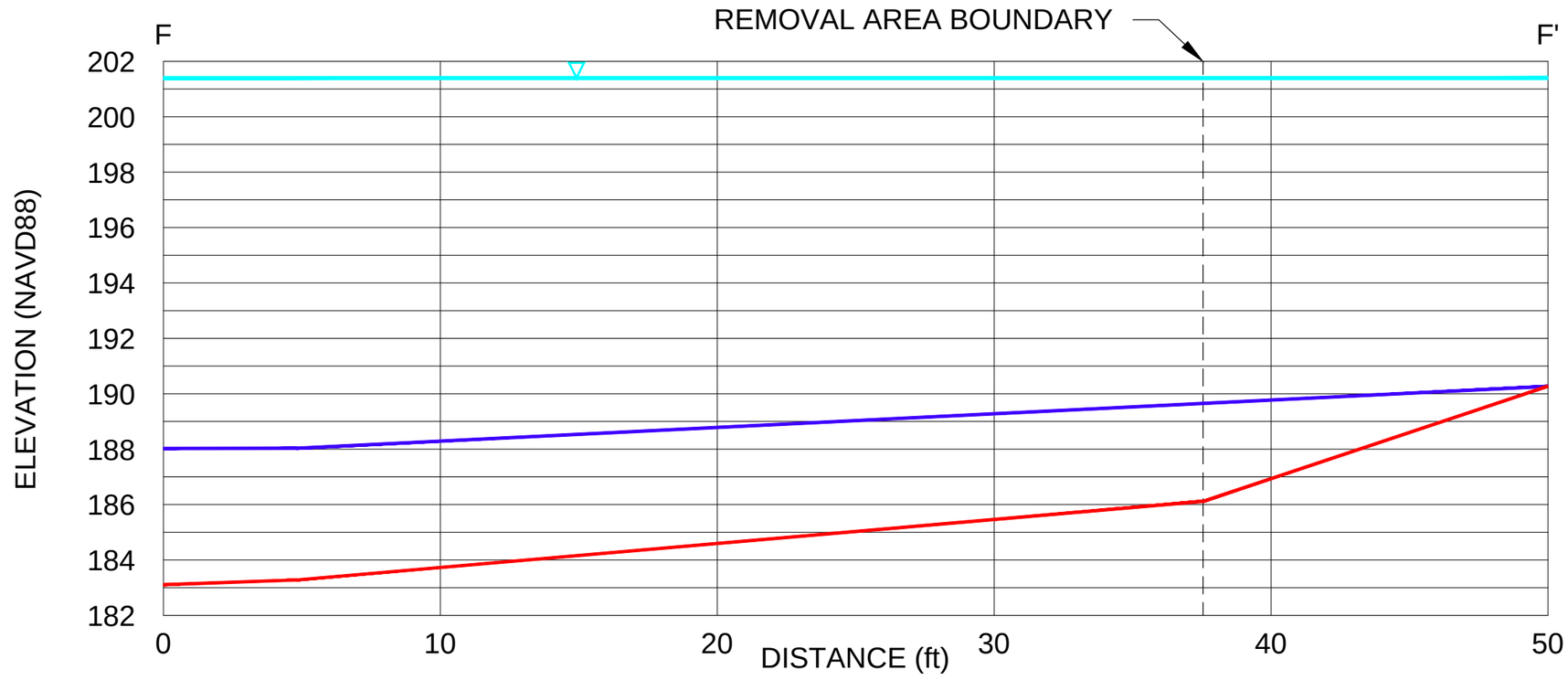
POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN

DELTA AREA DREDGE PRISM CROSS SECTIONS

ARCADIS

FIGURE
2-3B





LEGEND:

- EXISTING SEDIMENT SURFACE
- POST–DREDGE SURFACE
- APPROXIMATE WATER LINE

0 5' 10'
HORIZONTAL GRAPHIC SCALE

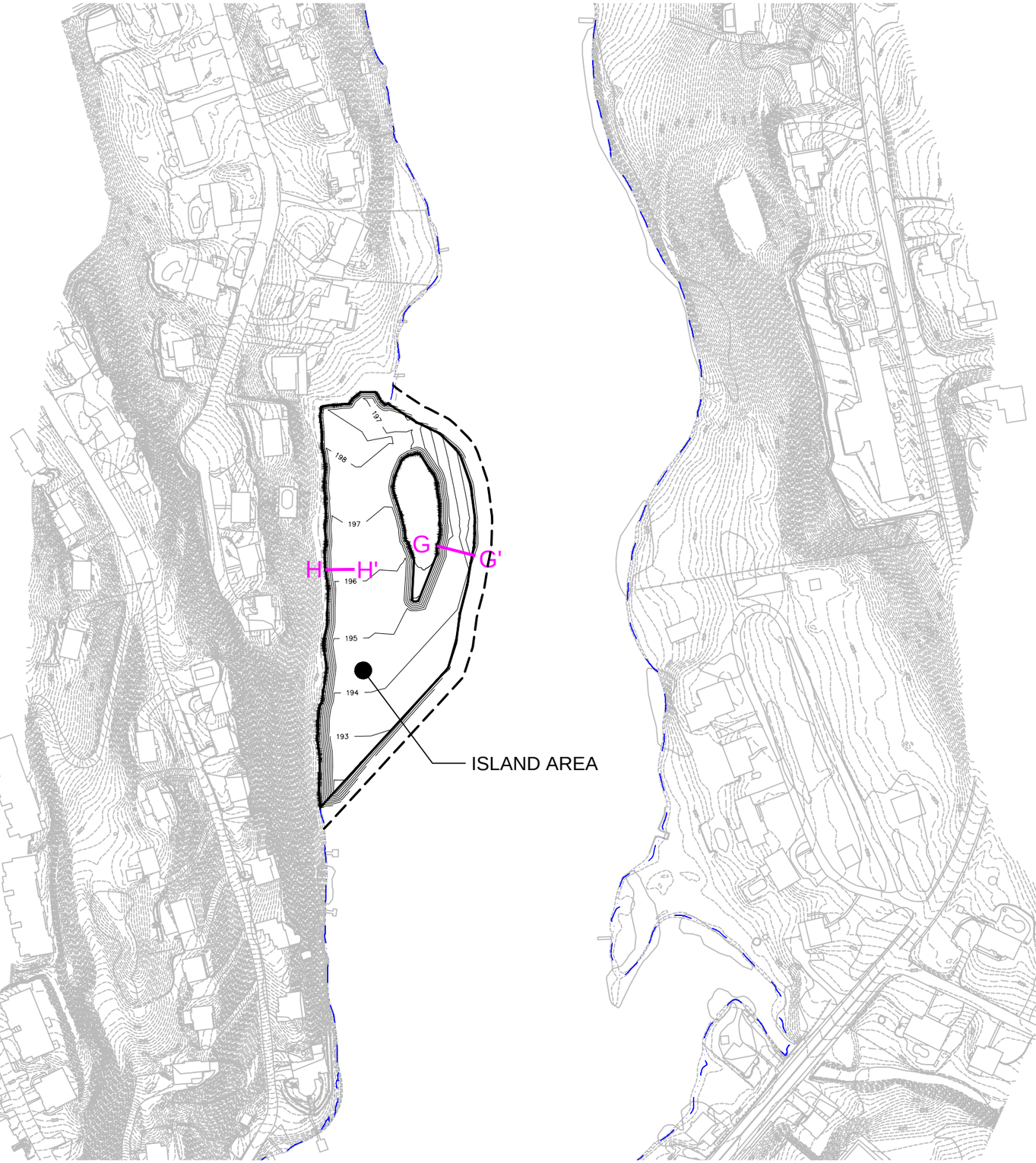
0 5' 10'
VERTICAL GRAPHIC SCALE

POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN

LAKE AREA A DREDGE PRISM CROSS SECTIONS

ARCADIS

FIGURE
2-3C



LEGEND:

- APPROXIMATE TURBIDITY CONTAINMENT SYSTEM LOCATION
- APPROXIMATE SEDIMENT REMOVAL LIMIT
- APPROXIMATE FULL POOL ELEVATION (201.4 FT)
- POST–DREDGE SURFACE CONTOURS (1–FOOT INCREMENTS)
- CROSS SECTION TRANSECT

NOTES:

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0 200' 400'

GRAPHIC SCALE

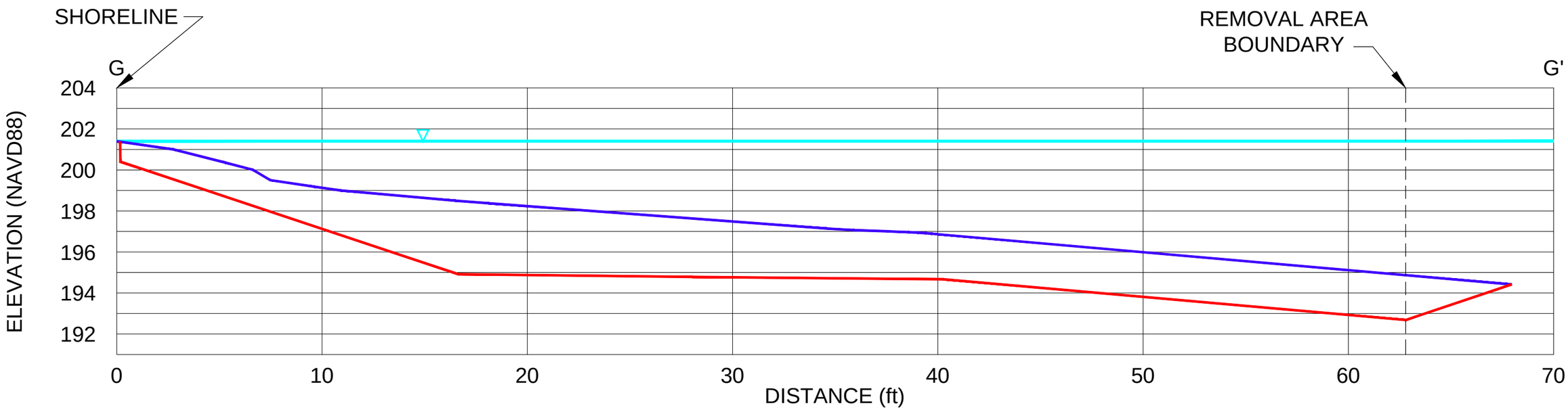
POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN

ISLAND AREA DREDGE PRISM

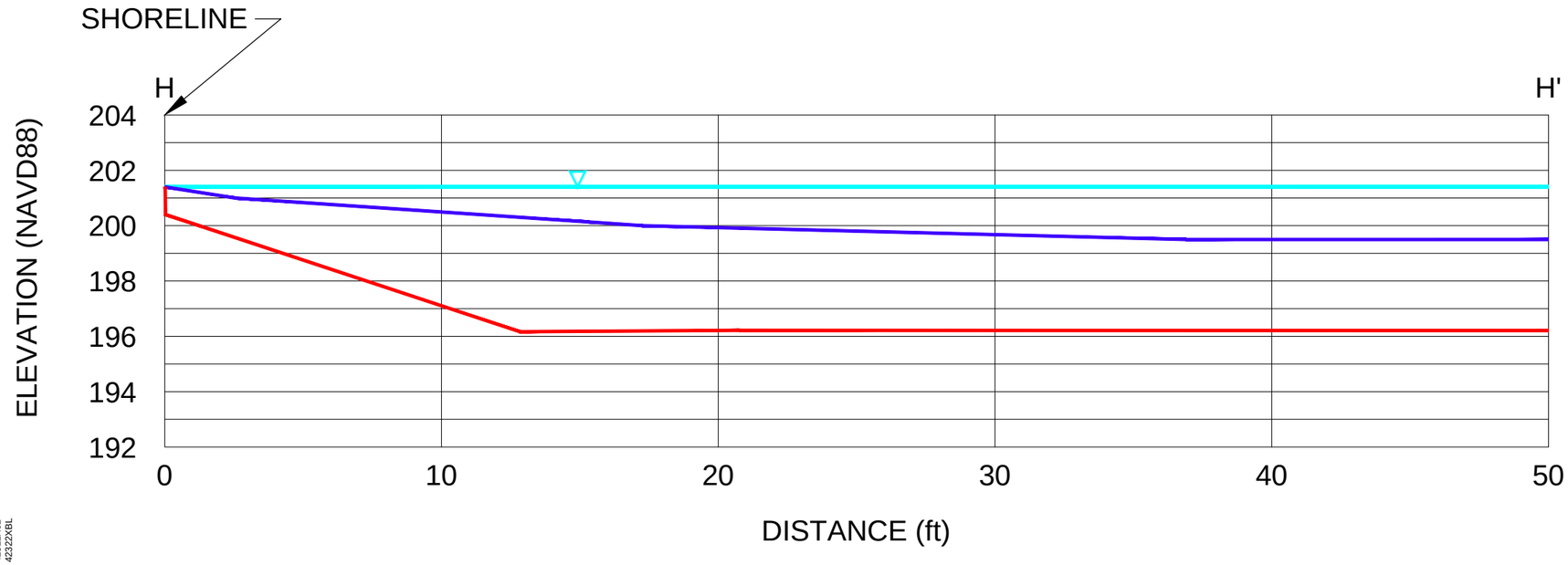
ARCADIS

FIGURE
2-4

CROSS-SECTION G-G'
ISLAND SHORELINE AND EASTERN ISLAND AREA NEAR TURBIDITY CONTAINMENT SYSTEM



CROSS-SECTION H-H'
WESTERN SHORELINE



LEGEND:

- EXISTING SEDIMENT SURFACE
- POST–DREDGE SURFACE
- APPROXIMATE WATER LINE

0 5' 10'
HORIZONTAL GRAPHIC SCALE

0 5' 10'
VERTICAL GRAPHIC SCALE

POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN

ISLAND AREA DREDGE PRISM CROSS SECTIONS

ARCADIS

FIGURE
2-4A

Last saved by: JASON_JERRYTONE(2016-03-17) Last Plotted: 2016-03-17
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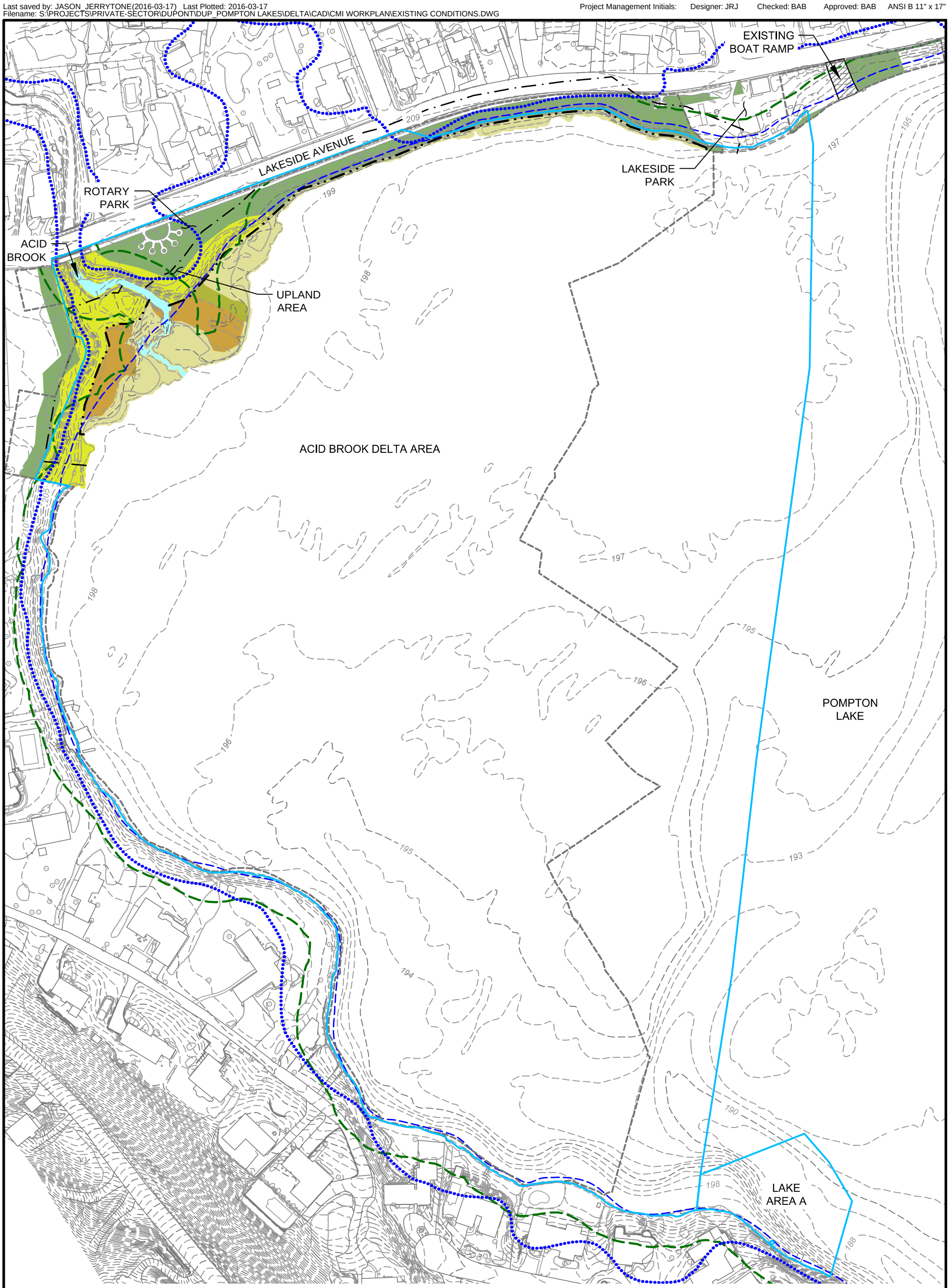
Project Management Initials: Designer: JRJ Checked: BAB Approved: BAB ANSI B 11" x 17"



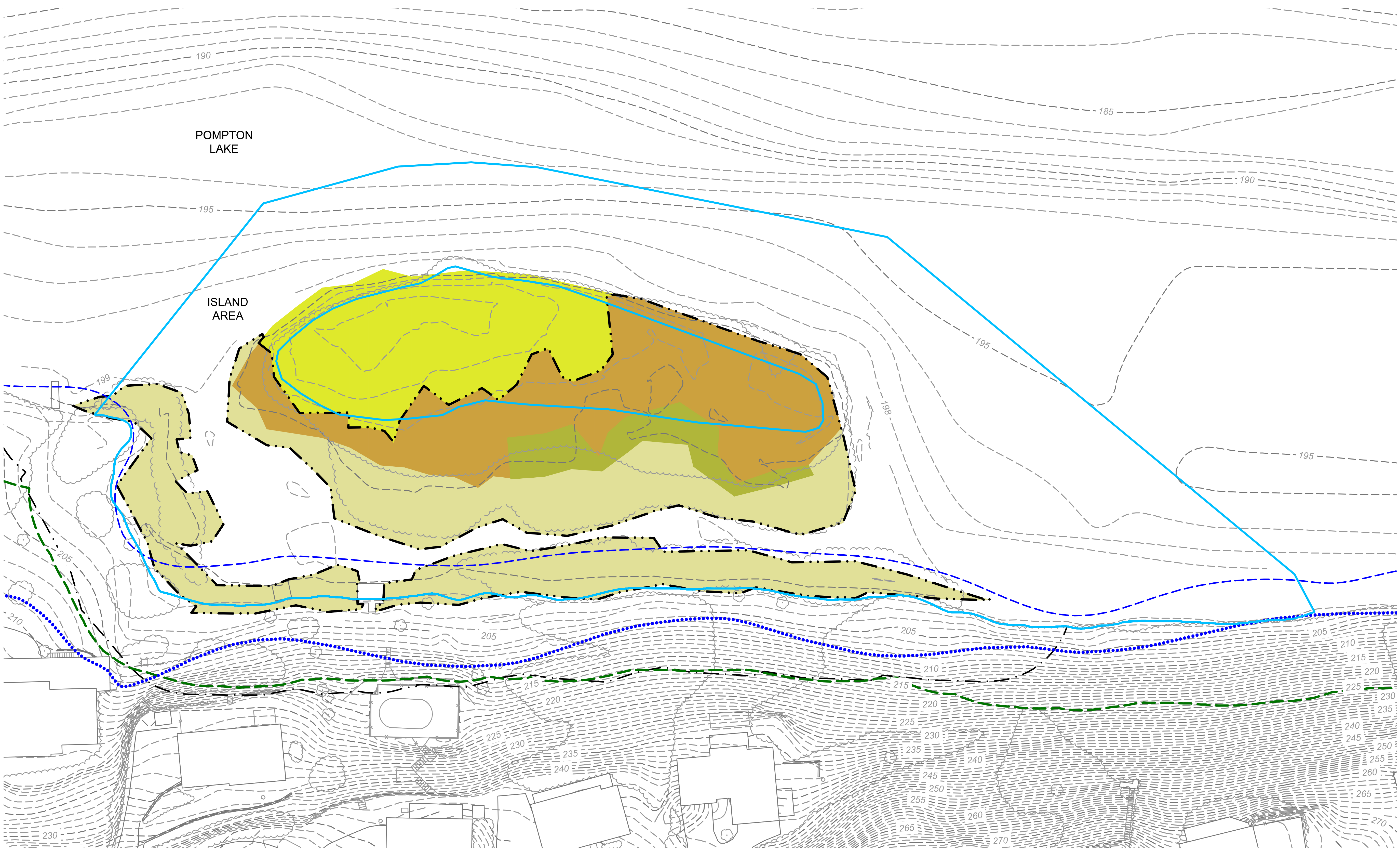
POMPTON LAKE STUDY AREA
POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
Project No.: 60391550 Date: 2016-03-17

CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN
UPLAND AREA, ACID BROOK DELTA AREA, AND LAKE AREA A
EXISTING CONDITIONS

AECOM

Figure: 2-5

CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN
ISLAND AREA
EXISTING CONDITIONS



LEGEND:

- EX. MINOR CONTOUR (1-FOOT INTERVAL)
- EX. MAJOR CONTOUR (5-FOOT INTERVAL)
- WETLAND BOUNDARY
- WETLAND TRANSITION AREA
- RIPARIAN ZONE
- NJ DELINEATED FLOODWAY
- NJ DELINEATED 100-YEAR LIMIT
- REVISED PROJECT AREA
- PALUSTRINE EMERGENT WETLAND (PEM)
- PALUSTRINE SCRUB-SHRUB WETLAND (PSS)
- PALUSTRINE FORESTED WETLAND (PFO)
- FORESTED UPLANDS

NOTES:

1. THE FORESTED UPLANDS SHOWN ON THE ISLAND AREA ARE WITHIN THE WETLAND TRANSITION AREA AND RIPARIAN ZONE.

30 0 30 60
SCALE IN FEET

AECOM

POMPTON LAKE STUDY AREA
POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
Project No.: 60391550 Date: 2016-03-17

Project Management Initials: Designer: JRJ Checked:BAB Approved: BAB ANSI B 11" x 17"

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Project Management Initials: Designer: JRJ Checked: BAB Approved: BAB ANSI B 11" x 17"

LAKESIDE PARK
LAKESIDE AVENUE
ROTARY PARK
ACID BROOK
ACID BROOK DELTA AREA
APPROXIMATE LOCATION OF TURBIDITY CURTAIN CONTAINMENT SYSTEM
POMPTON LAKE
APPROXIMATE LOCATION OF TURBIDITY CURTAIN
LAKE AREA A

LEGEND:

- EX. MINOR CONTOUR (1-FOOT INTERVAL)
- EX. MAJOR CONTOUR (5-FOOT INTERVAL)
- WETLAND BOUNDARY
- WETLAND TRANSITION AREA
- RIPARIAN ZONE
- NJ DELINEATED FLOODWAY
- NJ DELINEATED 100-YEAR LIMIT
- PREVIOUSLY AUTHORIZED PROJECT AREA
- REVISED PROJECT AREA
- ESTIMATED ECOLOGICAL-LAYER GRADE (0.5-FOOT INTERVAL)
- ESTIMATED ECOLOGICAL-LAYER GRADE (1-FOOT INTERVAL)

NOTES:
1. GRADING SHOWN IS BASED ON THE PROPOSED DREDGE PRISM LIMITS AND ELEVATIONS.

N

75 0 75 150
SCALE IN FEET

POMPTON LAKE STUDY AREA
POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
Project No.: 60391550 Date: 2016-03-17

CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN
ACID BROOK DELTA AREA AND LAKE AREA A
ESTIMATED FINISHED ECOLOGICAL-LAYER GRADING

AECOM

Figure: 2-7

POMPTON LAKE

ISLAND AREA

APPROXIMATE LOCATION OF TURBIDITY CURTAIN

LEGEND:

- EX. MINOR CONTOUR (1-FOOT INTERVAL)
- EX. MAJOR CONTOUR (5-FOOT INTERVAL)
- WETLAND BOUNDARY
- WETLAND TRANSITION AREA
- RIPARIAN ZONE
- NJ DELINEATED FLOODWAY
- NJ DELINEATED 100-YEAR LIMIT
- REVISED PROJECT AREA
- ESTIMATED ECOLOGICAL-LAYER GRADE (0.5-FOOT INTERVAL)
- ESTIMATED ECOLOGICAL-LAYER GRADE (1-FOOT INTERVAL)

NOTES:
1. GRADING SHOWN IS BASED ON THE PROPOSED DREDGE PRISM LIMITS AND ELEVATIONS.

N

30 0 30 60

SCALE IN FEET

AECOM

Figure: 2-8

CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN
ISLAND AREA
ESTIMATED FINISHED ECOLOGICAL-LAYER GRADING

POMPTON LAKE STUDY AREA
POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
Project No.: 60391550 Date: 2016-03-17

Project Management Initials: Designer: JRJ Checked:BAB Approved: BAB ANSI B 11" x 17"

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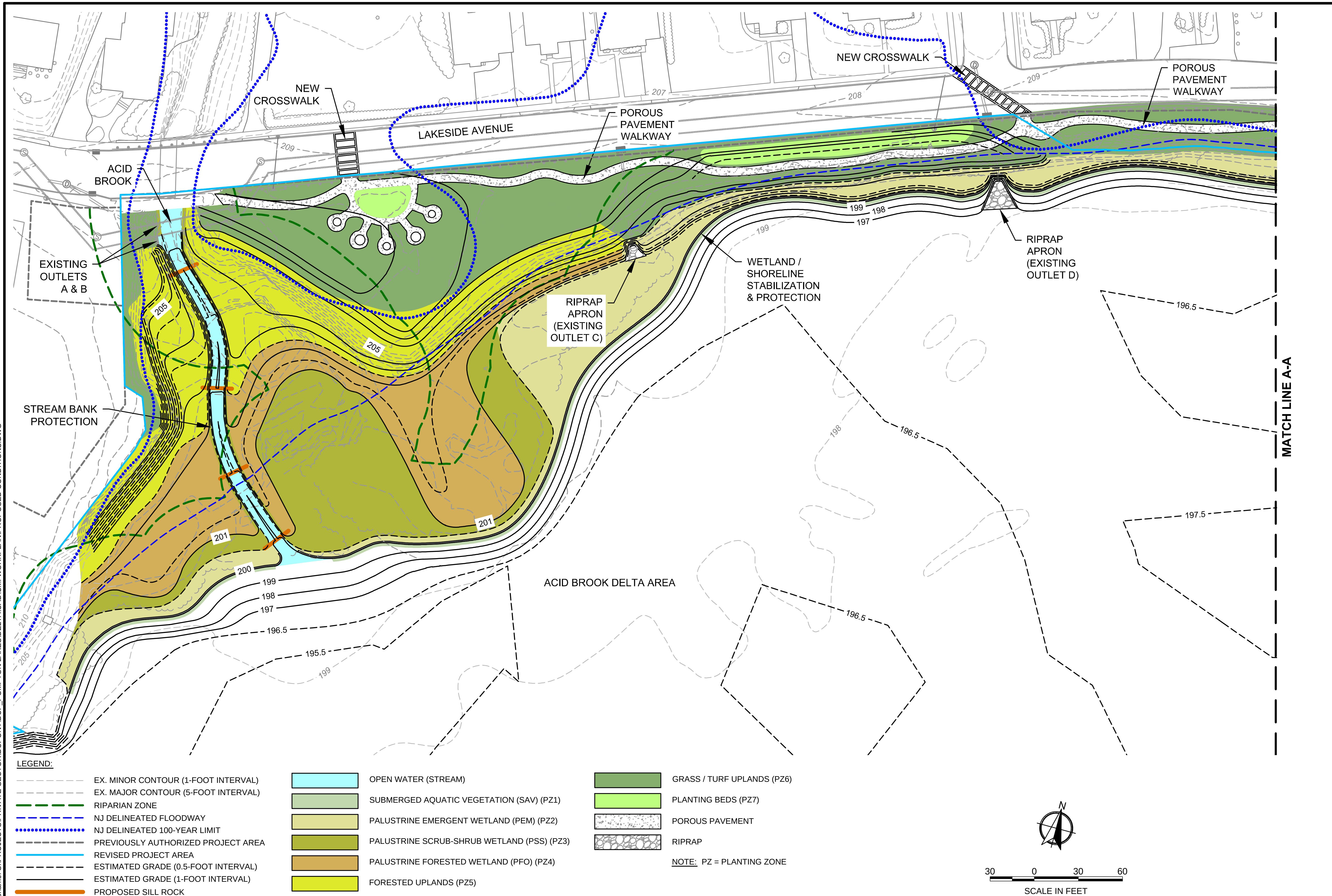

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AECOM

Figure: 2-9

CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN
ACID BROOK DELTA AREA AND LAKESIDE AVENUE
PROPOSED CONDITIONS

POMPTON LAKE STUDY AREA
POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
Project No.: 60391550 Date: 2016-03-17

POROUS PAVEMENT WALKWAY

LAKESIDE AVENUE

RIPRAP APRON (EXISTING OUTLET E)

WETLAND / SHORELINE STABILIZATION & PROTECTION

BOAT RAMP

RIPRAP APRON (EXISTING OUTLET F)

POMPTON LAKE

MATCH LINE A-A

ACID BROOK DELTA AREA

LEGEND:

- EX. MINOR CONTOUR (1-FOOT INTERVAL)
- EX. MAJOR CONTOUR (5-FOOT INTERVAL)
- RIPARIAN ZONE
- NJ DELINEATED FLOODWAY
- NJ DELINEATED 100-YEAR LIMIT
- PREVIOUSLY AUTHORIZED PROJECT AREA
- REVISED PROJECT AREA
- ESTIMATED GRADE (0.5-FOOT INTERVAL)
- ESTIMATED GRADE (1-FOOT INTERVAL)
- PROPOSED SILL ROCK
- OPEN WATER (STREAM)
- SUBMERGED AQUATIC VEGETATION (SAV) (PZ1)
- PALUSTRINE EMERGENT WETLAND (PEM) (PZ2)
- PALUSTRINE SCRUB-SHRUB WETLAND (PSS) (PZ3)
- PALUSTRINE FORESTED WETLAND (PFO) (PZ4)
- FORESTED UPLANDS (PZ5)
- GRASS / TURF UPLANDS (PZ6)
- PLANTING BEDS (PZ7)
- POROUS PAVEMENT
- RIPRAP

NOTE: PZ = PLANTING ZONE

N

30 0 30 60

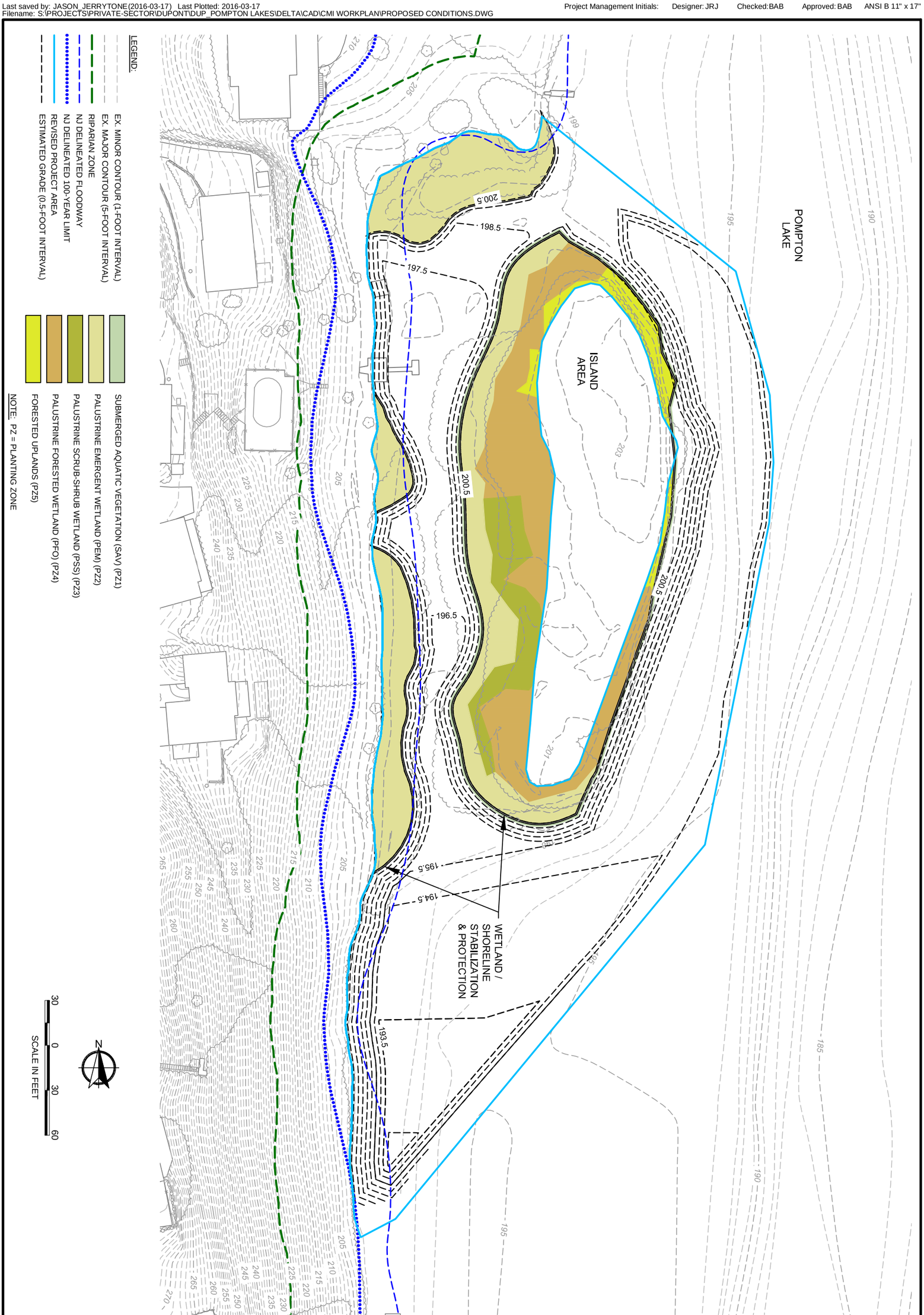
SCALE IN FEET

AECOM

Figure: 2-10

CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN
ACID BROOK DELTA AREA AND LAKESIDE AVENUE
PROPOSED CONDITIONS

POMPTON LAKE STUDY AREA
POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
Project No.: 60391550 Date: 2016-03-17



POMPTON LAKE STUDY AREA
POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
Project No.: 60391550 Date: 2016-03-17

CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN
ISLAND AREA
PROPOSED CONDITIONS

AECOM

Figure: 2-11

PLANTING ZONE 1 (Submerged Aquatic Vegetation)				Area (sq. feet)	2,570
Scientific Name	**Common Name**	**Form**	**Size**	**Spacing (feet)**	**Quantity**
Nuphar lutea	spatterdock	Aquatic Herbaceous	1 quart	3	71
Nymphea odorata	white water lily	Aquatic Herbaceous	1 quart	3	71

PLANTING ZONE 2 (Palustrine Emergent Wetlands)				Area (sq. feet)	20,780
Scientific Name	**Common Name**	**Form**	**Size**	**Spacing (feet)**	**Quantity**
Carex stricta	tussock sedge	Emergent	2 inch plug	1.5	400
		Herbaceous	1 quart	1.5	200
Iris versicolor	blue flag iris	Emergent	2 inch plug	1.5	1,154
		Herbaceous	1 quart	1.5	1,154
Juncus effusus	soft rush	Emergent	2 inch plug	1.5	400
		Herbaceous	1 quart	1.5	200
Peltandra virginica	arrow arum	Emergent	2 inch plug	1.5	1,154
		Herbaceous	1 quart	1.5	1,154
Pontedaria cordata	pickerelweed	Emergent	2 inch plug	1.5	1,154
		Herbaceous	1 quart	1.5	1,154
Scirpus tabermontanii	soft stemmed bulrush	Emergent	2 inch plug	1.5	1,154
		Herbaceous	1 quart	1.5	1,154

PLANTING ZONE 2 (Wetland / Shoreline Live Stake Stabilization)				Area (sq. feet)	6,620
Scientific Name	**Common Name**	**Form**	**Size**	**Spacing (feet)**	**Quantity**
Salix discolor	pussy willow	Shrub	LS (3 ft)	2	828
Salix exigua ssp interior	sandbar willow	Shrub	LS (3 ft)	2	828
Salix purpurea	streamco willow	Shrub	LS (3 ft)	2	828
Salix nigra	black willow	Shrub	LS (3 ft)	2	828

	PLANTING ZONE 3 (Palustrine Scrub / Shrub Wetlands)				Area (sq. feet)	15,480
	Scientific Name	**Common Name**	**Form**	**Size**	**Spacing (feet)**	**Quantity**
	Clethra alnifolia	sweet pepperbush	Shrub	#3	6	45
				#7	6	30
	Cornus amomum	silky dogwood	Shrub	#3	6	45
				#7	6	30
	Cornus sericea	red-osier dogwood	Shrub	#3	6	45
				#7	6	30
	Ilex verticillata	winterberry	Shrub	#3	6	44
				#7	6	30
	Sambucus canadensis	elderberry	Shrub	#3	6	44
				#7	6	30
	Viburnium dentatum	arrowwood	Shrub	#3	6	44
SYM				#7	6	30
BNN	*Betula nigra Heritage*	river birch	Tree	#7	8	10

PLANTING ZONE 4 (Palustrine Forested Wetlands)					Area (sq. feet)	18,070
SYM	**Scientific Name**	**Common Name**	**Form**	**Size**	**Spacing (feet)**	**Quantity**
CO	*Cornus amomum*	silky dogwood	Shrub	#3	8	35
COO				#7	8	28
IE	*Ilex verticillata*	winterberry	Shrub	#3	8	35
IEE				#7	8	28
AA	*Acer saccharinum*	silver maple	Tree	#7	15	16
BN	*Betula nigra Heritage*	river birch	Tree	#7	15	16
FA	*Fraxinus americana*	green ash	Tree	#7	15	16
PO	*Platanus occidentalis*	American sycamore	Tree	#7	15	16
QP	*Quercus palustris*	pin oak	Tree	#7	15	16

PLANTING ZONE 5 (Forested Upland)					Area (sq. feet)	19,610
SYM	**Scientific Name**	**Common Name**	**Form**	**Size**	**Spacing (feet)**	**Quantity**
AM	*Aronia melanocarpa*	black chokeberry	Shrub	#3	6	20
AMM				#7	6	30
CR	*Cornus racemosa*	gray dogwood	Shrub	#3	6	30
CRRR				#7	6	22
HV	*Hamamelis virginiana*	witch hazel	Shrub	#3	6	30
HVV				#7	6	22
SL	*Spiraea latifolia*	meadowsweet	Shrub	#3	6	30
SLL				#7	6	30
MV	*Magnolia virginiana*	sweetbay	Tree	#7	15	18
AH	*Acer saccharum*	sugar maple	Tree	#7	15	18
JN	*Juglans nigra*	black walnut	Tree	#7	15	18
QR	*Quercus rubra*	red oak	Tree	#7	15	18
LT	*Liriodendron tulipifera*	tulip poplar	Tree	#7	15	18

ACID BROOK - Shoreline Live Stakes				Area (sq. feet)	3,040
Scientific Name	**Common Name**	**Form**	**Size**	**Spacing (feet)**	**Quantity**
Salix discolor	pussy willow	Shrub	LS (3 ft)	2	380
Salix exigua ssp interior	sandbar willow	Shrub	LS (3 ft)	2	380
Salix purpurea	streamco willow	Shrub	LS (3 ft)	2	380
Salix nigra	black willow	Shrub	LS (3 ft)	2	380

ROTARY PARK / STREET TREE PLANTING ALONG LAKESIDE AVENUE						
SYM	**Scientific Name**	**Common Name**	**Form**	**Size**	**Spacing (feet)**	**Quantity**
GT	Gleditsia triacanthos inermis 'Skyline'	skyline honeylocust	Tree	3 inch caliper	--	4
GB	Ginkgo biloba 'Fairmount'	farimount ginkgo	Tree	3 inch caliper	--	4
BNNN	Betula nigra 'Heritage'	heritage river birch	Multi-stem	3.5 inch caliper	20	10

PLANTING ZONE 7 (Planting Bed)					Area (sq. feet)	2,660
SYM	**Scientific Name**	**Common Name**	**Form**	**Size**	**Spacing (feet)**	**Quantity**
VT	Viburnum trilobum 'Wentworth'	American cranberrybush	Shrub	#3	10	9
IG	Ilex glabra 'Densa'	densa compact inkberry	Shrub	#3	5	20
RK	Rosa 'Knock Out'	knockout rose	Shrub	#3	4	45
JS	Juniperus squamata 'Blue Star'	blue star juniper	Shrub	#5	5	30
LSS	Liatris spicata	gayfeather	Perennial	#1	1.5	60
MC	Monarda 'Cambridge Scarlet'	Cambridge scarlet beebalm	Perennial	#1	1.5	70
HR	Hosta 'Royal Standard'	royal standard hosta	Perennial	#1	1.5	30
HI	Hosta Ice Follies	ice follies hosta	Perennial	#1	1.5	50
PAA	Panicum virgatum 'Northwind'	northwind' switch grass	Grass	#3	1.5	20
PV	Panicum virgatum 'Heavy Metal'	heavy metal switchgrass	Grass	#3	1.5	40
SN	Sorghastrum nutans	Indian grass	Grass	#3	1.5	20
CX	Carex radiata	eastern star wood sedge	Grass	#1	1.5	60
SS	Schizachyrium scoparium	little blue stem	Grass	#2	1.5	18
PH	Pennisetum alopecuroides 'Hameln'	hameln dwarf fountain grass	Grass	#2	1.5	18
AG	Acer saccharum 'Green Mountain'	green mountain sugar maple	Tree	2.5 inch caliper	--	6

PLANTING ZONE 6 (Lawn / Turf)			Area (sq. feet)	43,330
Mix Name	**Seed Mix No.**	**Form**	**Size**	**Quantity**
Athletic Mix	ERNMX-106	Seed Mix	NA	Total Coverage

SEEDING SCHEDULE	
PLANTING ZONE 3 (Palustrine Scrub/Shrub Wetlands)	
Seed Mix	**Application Rate**
Riparian Buffer Mix (ERNMX-178)	30 lb/acre
PLANTING ZONE 4 (Palustrine Forested Wetlands)	
Seed Mix	**Application Rate**
Riparian Buffer Mix (ERNMX-178)	30 lb/acre
PLANTING ZONE 5 (Forested Uplands)	
Seed Mix	**Application Rate**
Partial Shaded Roadside Mix (ERNMX - 140)	20 lb/acre

AECOM

Figure: 2-12

CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN
UPLAND AND ACID BROOK DELTA AREA
PLANTING SCHEDULES

POMPTON LAKE STUDY AREA
POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
Project No.: 60391550 Date: 2016-03-17

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PLANTING ZONE 1 (Submerged Aquatic Vegetation)				Area (sq. feet)	920
Scientific Name	**Common Name**	**Form**	**Size**	**Spacing (feet)**	**Quantity**
Nuphar lutea	spatterdock	Aquatic Herbaceous	1 quart	3	51
Nymphea odorata	white water lily	Aquatic Herbaceous	1 quart	3	51

PLANTING ZONE 2 (Palustrine Emergent Wetlands)				Area (sq. feet)	17,210
Scientific Name	**Common Name**	**Form**	**Size**	**Spacing (feet)**	**Quantity**
Carex stricta	tussock sedge	Emergent Herbaceous	2 inch plug	1.5	255
			1 quart	1.5	130
Iris versicolor	blue flag iris	Emergent Herbaceous	2 inch plug	1.5	956
			1 quart	1.5	956
Juncus effusus	soft rush	Emergent Herbaceous	2 inch plug	1.5	255
			1 quart	1.5	130
Decodon verticillatus	hairy swamp loosestrife	Emergent Herbaceous	2 inch plug	1.5	1,780
Pontedaria cordata	pickerelweed	Emergent Herbaceous	2 inch plug	1.5	956
			1 quart	1.5	956
Scirpus tabermontanii	soft stemmed bulrush	Emergent Herbaceous	2 inch plug	1.5	956
			1 quart	1.5	956

PLANTING ZONE 2 (Wetland / Shoreline Live Stake Stabilization)				Area (sq. feet)	4,000
Scientific Name	**Common Name**	**Form**	**Size**	**Spacing (feet)**	**Quantity**
Salix discolor	pussy willow	Shrub	LS (3 ft)	2	500
Salix exigua ssp interior	sandbar willow	Shrub	LS (3 ft)	2	500
Salix purpurea	streamco willow	Shrub	LS (3 ft)	2	500
Salix nigra	black willow	Shrub	LS (3 ft)	2	500

	PLANTING ZONE 3 (Palustrine Scrub / Shrub Wetlands)				Area (sq. feet)	3,280
	Scientific Name	**Common Name**	**Form**	**Size**	**Spacing (feet)**	**Quantity**
SYM	*Clethra alnifolia*	sweet pepperbush	Shrub	#3	6	10
				#7	6	6
	Cornus amomum	silky dogwood	Shrub	#3	6	10
				#7	6	6
	Cornus sericea	red-osier dogwood	Shrub	#3	6	10
				#7	6	6
	Ilex verticillata	winterberry	Shrub	#3	6	10
				#7	6	6
	Sambucus canadensis	elderberry	Shrub	#3	6	10
				#7	6	6
	Viburnium dentatum	arrowwood	Shrub	#3	6	10
				#7	6	6
BNN	*Betula nigra Heritage*	river birch	Tree	#7	15	2

PLANTING ZONE 4 (Palustrine Forested Wetlands)					Area (sq. feet)	9,620
SYM	**Scientific Name**	**Common Name**	**Form**	**Size**	**Spacing (feet)**	**Quantity**
CO	*Cornus amomum*	silky dogwood	Shrub	#3	8	19
COO				#7	8	15
IE	*Ilex verticillata*	winterberry	Shrub	#3	8	19
IEE				#7	8	15
AA	*Acer saccharinum*	silver maple	Tree	#7	15	12
BN	*Betula nigra Heritage*	river birch	Tree	#7	15	12
PO	*Platanus occidentalis*	American sycamore	Tree	#7	15	12
QP	*Quercus palustris*	pin oak	Tree	#7	15	12

SEEDING SCHEDULE	
PLANTING ZONE 3 (Palustrine Scrub/Shrub Wetlands)	
Seed Mix	**Application Rate**
Riparian Buffer Mix (ERNMX-178)	30 lb/acre
PLANTING ZONE 4 (Palustrine Forested Wetlands)	
Seed Mix	**Application Rate**
Riparian Buffer Mix (ERNMX-178)	30 lb/acre
PLANTING ZONE 5 (Forested Uplands)	
Seed Mix	**Application Rate**
Partial Shaded Roadside Mix (ERNMX - 140)	20 lb/acre

AECOM

Figure: 2-13

CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN
ISLAND AREA
PLANTING SCHEDULES

POMPTON LAKE STUDY AREA
POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
Project No.: 60391550 Date: 2016-03-17

Project Management Initials: Designer: JRJ Checked:BAB Approved: BAB ANSI B 11" x 17"

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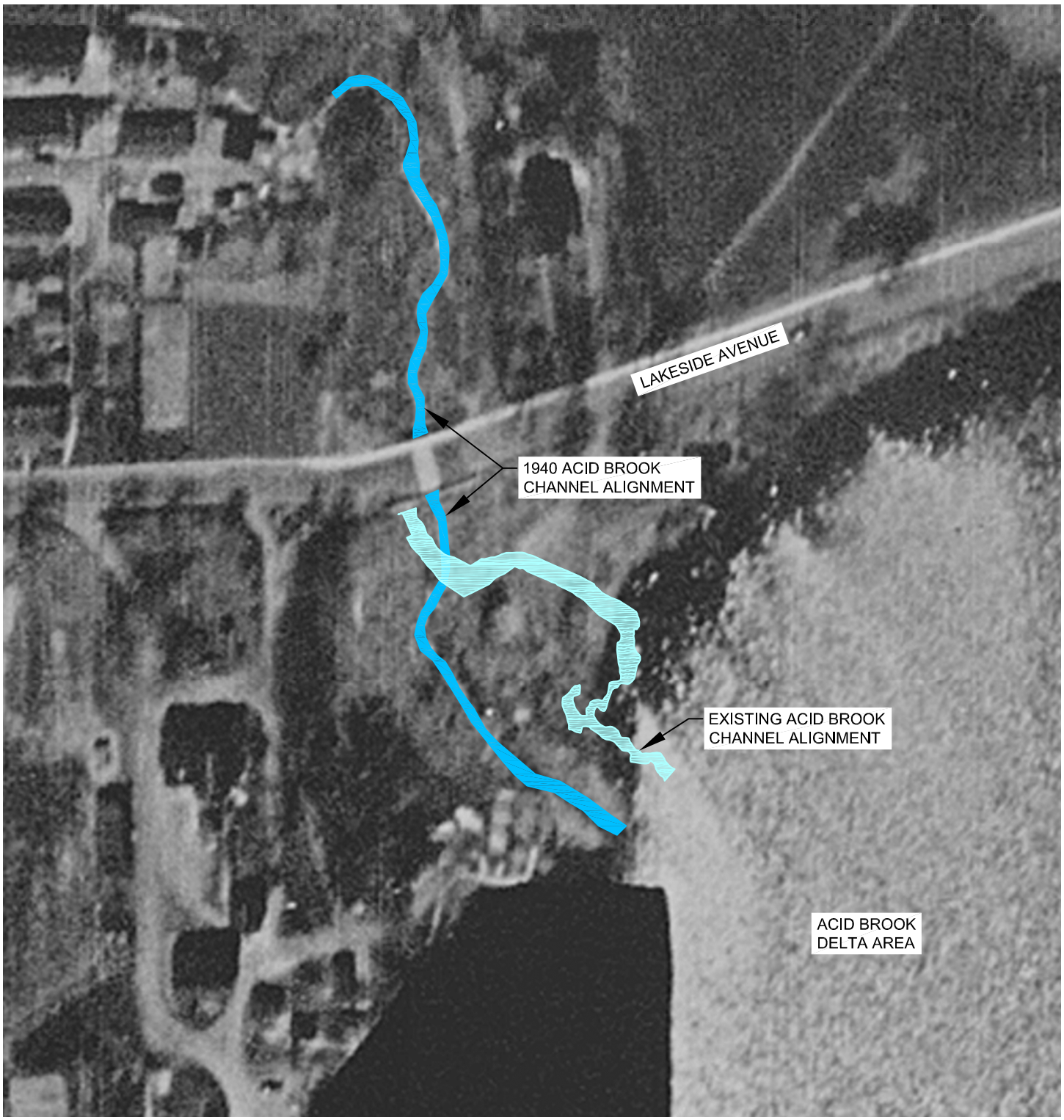

LEGEND:

1940 ACID BROOK CHANNEL ALIGNMENT

EXISTING ACID BROOK CHANNEL ALIGNMENT

N

50 0 50 100

SCALE IN FEET

SOURCE: 1940 AERIAL PHOTOGRAPH - URS CORPORATION CUSTOM DATA

POMPTON LAKE STUDY AREA
POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
Project No.: 60391550 Date: 2016-03-17

CORRECTIVE MEASURES
IMPLEMENTATION WORK PLAN
1940 ACID BROOK CHANNEL ALIGNMENT

AECOM

Figure: 2-14

Figure 6-1 – Preliminary Project Organization Chart