ONONDAGA LAKE
SEDIMENT MANAGEMENT
FINAL DESIGN

Prepared For:

Honeywell

301 Plainfield Road, Suite 330
Syracuse, New York 13212

Prepared By:

PARSONS

301 Plainfield Road Suite 350
Syracuse, New York 13212
Phone: (315) 451-9560
Fax: (315) 451-9570

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CERTIFICATION

Pursuant to item 28 of the Consent Decree, the following certification is provided, signed by a licensed professional engineer in New York:

> I, David Steele, am currently a registered professional engineer licensed by the State of New York, and I certify that this Sediment Management Final Design was in my professional opinion, prepared insubstantial conformance with the Consent Decree between the State of New York and Honeywell International, Inc. dated January 4, 2007.

STATE OF NEW YORK
DAVID D. STEELE
No. 082293
LICENSED PROFESSIONAL ENGINEER

By: David Steele

NYS PE # 082293

9/20/11

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LIST OF ACRONYMS

AOS	apparent opening size
cm/sec	centimeters per second
CPP	Citizens Participation Plan
CQAPP	Construction Quality Assurance Procedures Plan
CSX	CSX Corporation
CY	cubic yard(s)
FHWA	Federal Highway Administration
fps	feet per second
GCL	geosynthetic clay liner
gpm	gallons per minute
HDPE	high-density polyethylene
Honeywell	Honeywell International Inc.
IDS	initial design submittal
ILWD	in-lake waste deposit
Metro	Metropolitan Wastewater Treatment Plant
MGD	million gallons per day
mg/L	milligrams per liter
NPL	National Priorities List
NYSDAM	New York State Department of Agriculture and Markets
NYSDEC	New York State Department of Environmental Conservation
NYSDOT	New York State Department of Transportation
OBG	O'Brien & Gere
OSHA	Occupational Safety and Health Administration
PDI	Pre-design Investigation
P-GDT	pressure-gravity dewatering test
QA	Quality Assurance
RDT	rapid dewatering test
ROD	Record of Decision
ROW	right-of-way
SCA	sediment consolidation area
SOW	scope of work
SMU	sediment management unit
SVOC	semi-volatile organic compound

LIST OF ACRONYMS (CONT.)

TDH	total dynamic head
TSS	total suspended solids
USEPA	U.S. Environmental Protection Agency
VGAC	vapor granular activated carbon
VOC	volatile organic compound
WTP	water treatment plant

EXECUTIVE SUMMARY

The development of this Draft Sediment Management Final Design is Honeywell's next step towards achieving the goals of the Record of Decision (ROD) and the community's vision for a restored Onondaga Lake. The lake remediation plan, which was selected by the New York State Department of Environmental Conservation (NYSDEC) and the U.S. Environmental Protection Agency (USEPA), calls for a combination of dredging and capping. These processes are standard environmental cleanup methods that address the contamination in lake sediment and water. This Draft Final Design presents the details associated with the conveyance and dewatering of the dredged sediments, and the infrastructure and processes that will support those operations.

Honeywell's remedial design effectively restores Onondaga Lake while ensuring long lasting protection of health and the environment by meeting the design and performance criteria consistent with the requirements set forth in the ROD and associated Consent Decree Statement of Work (SOW).

Community input remains a vital component of Honeywell's design for the restoration of Onondaga Lake. Honeywell is committed to working with community leaders, interested stakeholders, and citizens to include input, recommendations, comments, and perspectives. Community members have the opportunity to participate in the design, construction, and post-construction periods as detailed in the NYSDEC's Citizen Participation Plan (CPP) (NYSDEC, 2009). Feedback received through the community participation process has already had a considerable influence on the design components discussed in this Final Design, including:

- Geotextile tubes for sediment dewatering (i.e., control of potential odors)
- Hydraulic dredging and transportation
- Secondary containment of the slurry pipeline

This report describes how the sediments dredged from the lake bottom will be conveyed to the sediment consolidation area (SCA), and dewatered.

Slurry Conveyance

The slurry conveyance system will incorporate several components that ensure the integrity of the pipe and conveyance operation, while protecting human health and the environment. Sediment will be hydraulically dredged from the lake remediation areas and pumped through a double-walled pipeline to the SCA located on Wastebed 13. The dredged material is never exposed to the air during conveyance. A leak detection system in the pipeline has been incorporated into the design.

Sediment Dewatering

Sediment dewatering is a necessary step in the sediment management. The dredged slurry is first passed through a screen to remove oversized material and debris, and then is injected into geotextile tubes for dewatering and management.

Geotextile tubes were selected for dewatering based on an enhanced ability, to achieve the various project objectives:

- Offers additional health and safety protection for site workers and local community
- Provides for greater setbacks from site boundaries
- Effective odor control by reducing exposure of sediments to air
- Allows for quicker closure of SCA following completion of dredging
- Reduces the quantity of imported materials needed for construction
- Provides flexibility on the placement of tubes
- Reinforces containment system


Typical geotextile tube dewatering operation

Water that drains from the geotextile tubes and precipitation that falls into the SCA will be collected in a controlled system and sent to the water treatment plant located on-site.

The design team will continue to work with the community to develop various performance criteria and work plans specifically designed to ensure that the health and safety of the surrounding community and environment are maintained throughout the execution of the remedy. An Onondaga Lake Remedial Activity Community Health and Safety Plan will be developed prior to the start of dredging, and will include:

- Site Security
- Air Quality Monitoring
- Spill Contingency
- Traffic Management
- Noise Abatement
- Navigational Protection
- Risk Identification and Contingency Plans

Sustainable Practices

Honeywell is committed to minimizing the carbon footprint of remedial construction activities. Evaluations are being conducted to identify opportunities to incorporate sustainability concepts, including those presented in the Clean and Green Policy (USEPA, 2009) into all aspects of the remediation. To the extent practicable, use of renewable energy sources, utilization of locally produced/sourced materials and supplies, reduction/elimination of waste, efficient use of resources and energy, and other practices will be specified in the remedial design, and implemented during remedial construction.

SECTION 1

INTRODUCTION AND DESIGN PROCESS OVERVIEW

This Onondaga Lake Sediment Management Final Design has been prepared on behalf of Honeywell International Inc. (Honeywell). The lake bottom is on the New York State Registry of Inactive Hazardous Waste Sites and is part of the Onondaga Lake National Priorities List (NPL) Site. Honeywell entered into a Consent Decree (United States District Court, Northern District of New York, 2007) (89-CV-815) with the NYSDEC to implement the selected remedy for Onondaga Lake as outlined in the ROD issued on July 1, 2005. The following documents are appended to the Consent Decree: ROD, Explanation of Significant Differences, SOW, and Environmental Easement.

This Design Report provides the final design evaluation of components of the Onondaga Lake Remediation pertaining to the land-based components of the sediment conveyance and management of dredged sediments from the lake. This report has been prepared to document advancement of several of the components of the conceptual level design previously submitted in the Onondaga Lake Sediment Management Intermediate Design Submittal (Parsons, 2010).

1.1 DESIGN PROCESS OVERVIEW

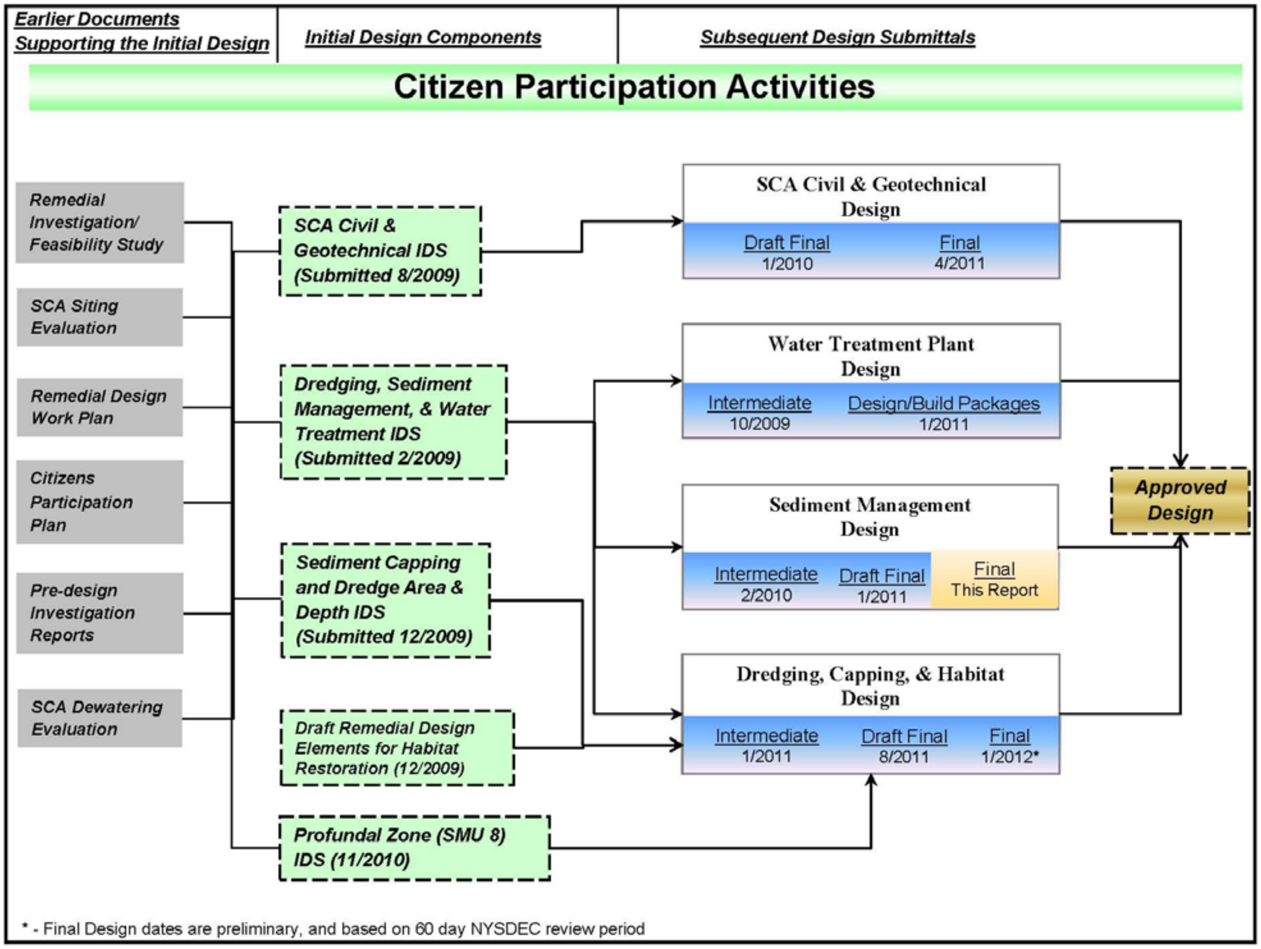
As described in the Sediment Management Intermediate Design (Parsons, 2010), the conceptual design of the Onondaga Lake Remediation was split into four Initial Design Submittals (IDS). These IDS reports included:

- The *Dredging, Sediment Management, and Water Treatment IDS* (referred to as the Operations IDS) provided initial design-level information pertaining to operational components of the remedy including the dredging, conveyance, and dewatering of impacted lake sediments, and treatment of construction water generated during the process. This IDS was submitted in February 2009.
- *The SCA Civil & Geotechnical IDS* (referred to as the SCA IDS) included the civil and geotechnical design elements (such as the liner system) required for construction of the SCA. This IDS was submitted in August 2009.
- *The Sediment Cap and Dredge Area Depth and Volume IDS* (referred to as the Dredging & Capping IDS) included the proposed, conceptual level, design detail for the sediment cap component of the remedy, as well as the design details pertaining to habitat restoration, and dredging volumes and removal areas/depths. This IDS was submitted in December 2009.
- *Draft IDS for the Onondaga Lake Profundal Zone (Sediment Management Unit [SMU] 8)* focuses on the deep water areas of the lake, and will provide initial design-level details pertaining to thin-layer capping (including locations, extent, materials, and sequencing), nitrate addition and/or oxygenation for the purposes of inhibiting the formation of methylmercury within the lake, and the approach to monitoring natural recovery in specific areas of the lake. This IDS was be submitted in November 2010.

Following the initial phase of the design, separate design tracks were established, with each track ultimately constituting a portion of the overall Onondaga Lake Design. These design tracks include:

- SCA Civil & Geotechnical Design
- Water Treatment Plant (WTP)
- Sediment Management
- Dredging, Capping, & Habitat (including SMU 8)

The graphic below depicts the overall Onondaga Lake Design process and how project documents submitted to date serve as the basis for the various design tracks. It also presents the schedule for the submittal of the remaining design components.



1.2 FINAL DESIGN SUBMITTAL ORGANIZATION

This Draft Final Design is organized into four sections and nine appendices.

- Section 1: Introduction and Design Process Overview – Presents a summary of the overall Onondaga Lake Remedial Design process and the contents of this Draft Final Design.
- Section 2: Engineering Analysis and Design – Provides final design details and technical evaluation for specific aspects of the remedy included in the sediment management aspects of the project.
- Section 3: Construction Implementation– Summarizes design plans that have been prepared to facilitate construction and operation of the sediment management system and project schedule.
- Section 4: References – Lists the references used to prepare this Draft Final Design Report.

SECTION 2

ENGINEERING ANALYSIS AND DESIGN

This Final Design focuses on the conveyance and dewatering of dredged sediment at the SCA and supporting operations. It summarizes the advancement of details for several remedial components, initially provided in the Sediment Management Intermediate Design (Parsons, 2010).

2.1 SEDIMENT CONVEYANCE AND DEWATERING SCOPE OVERVIEW

Sediments from Onondaga Lake will be dredged hydraulically from the remediation areas within the lake. Details pertaining to the definition of material that will be dredged (areas, depths, etc.) and operational details associated with dredging are addressed as part of the Draft Capping, Dredging, and Habitat Intermediate Design (Parsons, 2011). The dredged sediment will be conveyed hydraulically through a pipeline, as slurry, from the lake to the SCA (located on Wastebed 13) using a series of booster pumps.

Once at the SCA, the dredge slurry will be passed through a screening process, which is designed to remove coarse materials prior to geotextile tube dewatering. After screening, the slurry will undergo polymer injection, which will precondition the slurry for dewatering within the tubes.

Next, the dredged sediment will be discharged into geotextile tubes for dewatering. The geotextile tubes will be managed within the lined SCA, which will collect and manage the filtrate (water discharged from the geotextile tubes).

The geotextile tube filtrate and water coming into contact with filling tubes or dredged sediment (referred to as contact water) will be collected and routed to the water treatment plant (WTP) for treatment (metals, volatile organic compound [VOC]/semi-volatile organic compound [SVOC]/total suspended solids [TSS] removal) prior to discharge to Onondaga County Metropolitan Wastewater Treatment Plant (Metro), for ammonia removal.

There are several areas associated with design and construction of the slurry conveyance and sediment dewatering operations where adaptive management concepts may be appropriate. Adaptive management refers to enhancements to project implementation based on lessons learned and from actual experience gained during the course of the project. These lessons learned can lead to revisions to the assumptions that were made during the design and optimization of the project construction schedule and final remedy effectiveness. Specific areas of the sediment management design and construction where adaptive management may be appropriate include the material (oversized, gravel, sand) screening steps, polymer injection operations, and geotextile tube operations. Each of these areas of the sediment management design is discussed in detail below.

2.1.1 Design Flowrate and Dredge Productivity

Dredging productivity estimates have been prepared by the contractor selected for sediment dredging (Sevenson Environmental Services). These estimates are presented in the Draft

Capping, Dredging, and Habitat Intermediate Design (Parsons, 2011). For these productivity estimates, a design dredge flowrate of 5,500 gallons per minute of slurry (mix of sediment and water) has been retained as the basis of design for the slurry transportation and sediment management systems. This flow rate will allow the dredging operation to be completed within the four-year window outlined in the ROD, as presented in the Draft Capping, Dredging, and Habitat Intermediate Design (Parsons, 2011), and will also maintain the water volume to be treated and discharged to Metro within the anticipated permit limit of 6.5 million gallons per day (MGD). See Section 2.3.7 for more details on the process water and mass balance, which demonstrate compliance with the discharge limitation.

The dredging operation is being designed as a 24 hour/day, 6 days/week activity (with the option to dredge on the 7th date as needed). As such, the slurry transportation and sediment management systems have been designed accordingly.

2.2 SLURRY CONVEYANCE

Sediments dredged from the remediation areas will be pumped hydraulically from the dredge head through an in-water (floating or submerged) pipeline to the lakeshore. When necessary, the dredging contractor may use in-water booster stations to convey the slurry to shore over distances greater than the capacity of the dredge pump. Upon reaching shore, the pipeline will be routed on land, and use a series of booster pumps to convey the slurry to the sediment processing area located adjacent to the SCA. A general layout drawing of the slurry pipeline is presented in Drawing 200-C-004.

2.2.1 Design and Performance Criteria

The slurry conveyance system has a design flowrate of 5,500 gpm, operating 24 hours per day, and will operate as a continuous system with the dredging equipment selected for the project. As such, the operational capacity of the system, including booster pump size and pipeline diameter, has been coordinated with the capabilities and requirements of the specific dredging equipment selected by the dredging contractor.

To ensure the protection of human health and the environment, the design of the slurry conveyance system incorporates several measures and procedures to ensure the integrity of the pipe and conveyance operation. Secondary containment will be provided for the entire length of the pipe, and means for leak detection in the pipeline are incorporated into the design. Leak detection measures and procedures are discussed in Section 2.2.5.

The slurry transport system is designed such that pumping can continue in the event that the dredge or one of the boosters fails. Several design and operational procedures have been included to minimize the potential for slurry back flow if a booster pump or dredge pump fails, including automated valves at each booster pump suction and discharge. In addition, prior to regularly planned shutdown periods of the slurry conveyance system, the pipe will be flushed with lake water to remove solids contained within the pipe. Furthermore, a supply of key replacement parts will be kept on-site, to allow for quick repair/replacement and to minimize system downtime.

The slurry pipeline alignment and design of associated supporting utilities require coordination and approval by other third parties, property owners, and entities. Several of these groups have specific requirements (such as occupancy permits, operational limitations, etc.) for the design and operation of the slurry pipeline. Section 2.2.2 provides a description of the required permits and operations limitations.

2.2.2 Slurry Pipeline Alignment

The slurry pipeline alignment was selected based on several factors, including minimizing both visibility and accessibility of the pipeline to the public.

When dredging in Remediation Areas D or E, the pipeline will transition from water to land near Wastebed B, which is close to the dredging operations in the southern end of the lake. From Wastebed B, the pipeline will run along the western shore of the lake, along the western side of the Wastebeds 1-8 site adjacent to the I-690 corridor, to an intersection point with Ninemile Creek. From the creek intersection point, the pipeline will then follow the Ninemile Creek corridor to Wastebed 13. The total length of the pipeline from Wastebed B to the SCA is approximately 20,600 ft. (3.9 miles).

Drawings 200-C-101 through 200-C-118 present the pipeline route, the final booster pump locations, necessary utility connections, infrastructure requirements, and other design features. In some areas, the land will need to be graded in order to locate a booster pump. Grading plans for those areas area also included on those drawings in Appendix A.

During dredging in Remediation Area A, the pipeline will transition from water to land near the outlet of Ninemile Creek and will be located adjacent to the creek. Drawings 200-C-119 through 200-C-121 present the pipeline route for this portion of dredging. It is anticipated that no additional on-land booster stations will be required, and the slurry pipeline will tie into booster station #3. Installation of this portion of the pipeline will be coordinated with the installation of the Onondaga County Bike Trail, which may be constructed prior to or during remedial construction in this area. Burial of a portion of the pipeline may be required within the area of the trail.

During dredging in Remediation Areas B and C, the pipeline will transition from water to land near the southern portion of Wastebeds 1-8. Drawing 200-C-105 presents the pipeline route for this portion of dredging. No additional on-land booster stations will be required, and the slurry pipeline will tie into booster station #2.

2.2.2.1 New York State Department of Transportation (NYSDOT) Requirements

As depicted in Drawings 200-C-105 through 200-C-110, a portion of the slurry pipeline will be located next to the I-690 west-bound lane, and will cross beneath the I-690 westbound Exit 6 ramp connecting to NY-695S at approximately STA 56+50 (Drawing C-107) and beneath I-690 at approximately STA 97+50 (Drawing 200-C-110). In these locations, the pipeline will be installed within the NYSDOT right of way (ROW). A Use and Occupancy Agreement has been granted from NYSDOT, pending Federal Highway Administration (FHWA) approval of the occupancy, which will allow the pipeline to be installed in these locations. An application to the FHWA was submitted during the preparation of this Final Design, and approval is anticipated in early 2011. In addition to this permit, a highway work permit will be required from NYSDOT for the installation of the pipeline. This permit will be obtained following FHWA approval of the occupancy in early 2011.

2.2.2.2 New York State Department of Agriculture and Markets (NYSDAM) Requirements

As shown on Drawings 200-C-105 through 200-C-109, and on Drawings 200-C-112 through 200-C-114, a portion of the slurry pipeline will be located on property owned by the New York State Department of Agriculture and Markets (NYSDAM). This property is used for the New York State Fairgrounds as parking lots and staging areas during events. To ensure all NYSDAM requirements are met, discussions with NYSDAM have been initiated during the preparation of the Final Design. Based on initial discussions, a portion of the pipeline on NYSDAM property will be buried (see Drawing 200-C-114), to minimize the impacts to access and use of the property. Pipeline alignment and construction details may be modified based on continuing discussions.

2.2.2.3 Ninemile Creek / Wetland Considerations

In support of the design of the slurry pipeline, wetland delineation was performed along the pipeline route, along Route 695 on the NYSDAM property, upstream of the confluence of Geddes Brook, and on the Wastebed 12-15 site. This work was completed by O’Brien & Gere (OBG), under two separate NYSDEC-approved work plans (OBG, 2009; OBG, 2010). Summary reports for this delineation effort are included as Appendix B. Four individual wetland areas and five resource areas are located in close proximity to the final slurry pipeline alignment. Areas of temporary wetland disturbance are shown on Drawings 200-C-112 and 200-C-113. The pipeline routing shown in these drawings falls within NYSDAM property. The specific alignment of the pipeline was directed by NYSDAM, to minimize the impact of the pipeline on various activities for which NYSDAM uses this property. The total area of wetland disturbance will be approximately 30,000 ft^2. Areas of temporary resource area disturbance are shown on Drawing 200-C-116. The total area of resource area disturbance will be approximately 3,650 ft^2. Following completion of the dredging operation and deconstruction of the slurry pipeline, any impacted wetlands and resource areas will be restored. Details pertaining to the restoration of these areas are presented on Drawing 200-C-101. The pipeline alignment has been selected so as to minimize the impact of the slurry pipeline and any supporting infrastructure (such as the service road) on these identified wetland areas and Ninemile Creek.

2.2.2.4 Ninemile Creek Remediation

The slurry pipeline will be located outside areas where construction activities associated with the remediation of the creek and floodplains will take place.

2.2.2.5 CSX Corporation (CSX) Requirements

The slurry pipeline will cross through CSX’s ROW in two locations. The first crossing, shown on Drawing 200-C-110, is under the former Erie Lackawanna line adjacent to State Fair Blvd and the 690-695 interchange. The second CSX crossing is under three adjacent tracks north of the SCA area shown in Drawing 200-C-114. The pipeline will cross under the tracks to the west of the Route 695 crossing of the rail lines.

An access agreement has been reached with CSX for the first crossing and an application has been made for the second crossing. Agreement on this second crossing is anticipated for early 2011. The pipeline will be installed using trenchless technology (jack and bore) at both locations. The slurry pipeline high-density polyethylene (HDPE) “carrier” pipe is required to be encased in steel within the CSX ROW.

2.2.3 Pipeline and Booster Pump Hydraulic Design

This section discusses the hydraulic design of the slurry conveyance pipeline and associated booster pump stations. A calculation that demonstrates the hydraulic modeling of the pipeline is included in Appendix C. The design approach includes definition of the following items:

1. Critical (minimum) flow velocity
2. System total dynamic head (TDH)
3. System horsepower requirements
4. Booster pump size (Hp), number, and location

A critical (minimum) flow velocity must be maintained in the pipe to prevent settling of particles in the pipe. As flow velocities increase within the pipeline, the system TDH also increases, which increases the pump energy input to convey the material at that velocity. The focus of the slurry conveyance hydraulic design was to weigh these two factors and select the optimum pipe size that met the critical velocity criteria but also minimized TDH and pumps energy requirements.

Based on the geotechnical properties of the dredge material and a review of standard HDPE pipeline sizes, the critical velocity is estimated to be approximately 12.3 ft. per second (fps) for pipeline sections with an 8 percent incline. A calculation is included in Appendix C for demonstrating the approach to critical velocity calculation.

Based on the above critical velocity estimates and the corresponding requirement to limit system TDH and pump energy requirements, 16 inch SDR11 HDPE pipe (average inner diameter 12.3 inches) will be used for the conveyance line. TDH calculations have been completed using this pipe size to determine the size, number, horsepower, and location of the booster pumps that will be employed in the conveyance system. Pipeline TDH and corresponding horsepower requirements were estimated using the Hazen-Williams model.

2.2.4 Booster Pump Stations

The locations for the four booster stations are as follows:

- Booster pump station #1 – This station will be located on a barge, just off-shore from the shoreline support area located on the northwest corner of the Wastebed B site, and is depicted on Drawing 200-C-102. This pump station will draw lake water into the conveyance system when necessary to maintain operability of the system. The booster will be situated on a barge to limit the amount of head that the pump must overcome when drawing water from the lake.
- Booster pump station #2 – This station will be located on the south east corner of the Wastebeds 1-8 site, adjacent to the entrance ramp to the fairgrounds parking area. This station will be located on property owned by NYSDOT, adjacent to the NYSDOT turnaround area and the Onondaga County West Side Pump Station. This station is depicted on Drawing 200-C-105.

- Booster pump station #3 – This station will be located adjacent to I-690W and the exit from the fairgrounds parking area, near an existing I-690 billboard. This station will be located on land owned by Onondaga County Parks Department and is depicted on Drawing 200-C-121.
- Booster pump station #4 – This station will be located on the Wastebeds 12-15 site, to the east of the Camillus Pump Station. This station will be located on Honeywell property and is depicted on Drawing 200-C-114.

Additional engineering details pertaining to the design of these booster pump stations (including foundation requirements, utility connections, etc.) are provided in the drawings.

The booster pumps will be electric powered. The design of the electrical connections to the booster pumps has been approved by the two utility companies located in the project area (Solvay Electric and National Grid).

2.2.5 Secondary Containment

Secondary containment of the slurry pipeline and booster stations has been incorporated into the design for enhanced protection of the environment and the public. The slurry pipeline, from the outlet downstream of booster station #1, will be double-walled HDPE pipe. Leak detection in the annular space between the inner and outer pipes will be incorporated at low points in the pipeline. Details pertaining to the leak detection system are provided on Drawing 200-C-124. The annular space between the two pipes will be open to the booster pump secondary containment areas to ensure containment of any leaking slurry. At the transition between the on-water and on-land portions of the pipeline immediately downstream of booster #1, the secondary pipe will be sealed since there is no secondary containment area at booster #1.

Booster stations 2, 3, and 4 will be situated within a secondary containment area, which will consist of a geomembrane lined area surrounded by 3-ft. tall walls. The slurry pipeline will transition from double-walled to single-walled at the perimeter of this containment area. Piping within this containment area will be single-walled. The capacity of the containment area will be equal to the volume of slurry contained within the pipeline between the booster station and the next “high” point in the pipeline in both upstream and downstream directions. The capacity of these containment areas, and the upstream/downstream capacity of the pipeline to the next “high” point are provided in the table below. Details pertaining to these containment areas are provided in Drawings 200-C-402 through 200-C-405.

	Booster Station No.2:		**Booster Station No.3:**		**Booster Station No.4:**	
	Length: (ft)		Length: (ft)		Length: (ft)	
Total Area	3162	ft^2	3484	ft^2	3,199	ft^2
Available Containment Volume: (Wall Height = 4ft)	59,137	gal.	65,144	gal.	59,821	gal.
Upstream/Downstream Pipe Distance to next 'high point"	2759	ft.	3763	ft.	2,847	ft.
Required Containment Volume	17728	gal.	24180	gal.	18,294	gal.

2.3 SLURRY PROCESSING

The dredge slurry will undergo a screening step designed to optimize the geotextile tube dewatering process. The process flow diagram for the slurry processing operations is presented on Drawings 200-D-001.

2.3.1 Design and Performance Criteria

The overall design objective of the processing system is to optimize geotextile tube dewatering by removing material that can be more efficiently dewatered by other means. This is achieved by enhancing the polymer addition step by removing a portion of the material which does not require polymer for dewatering and by conditioning the dredge slurry to provide optimum dewatering. The level of processing will not impact the volume of material placed in the SCA, nor the dredge rate. The slurry processing system has been designed to handle a range of operational conditions that would normally be expected from a project of this nature, which may alter the flow of water/slurry to the geotextile tube dewatering operation. As such, the system does not include provisions for flow equalization or water storage to offset such conditions.

The slurry processing system is designed to operate 24 hours a day and have the capacity to process the maximum flow produced by the dredging and slurry conveyance operations. To account for the various sinks and sources of sediment/water/slurry throughout the process, the mass balance presented in Section 2.3.7 provides a maximum flow for each of the processing components.

2.3.2 Screening

The dredging contractor will take measures to limit the size and quantity of large debris entering the slurry pipeline. Details pertaining to these measures are being advanced as part of the dredging design, under a separate design package.

During the dredging and conveyance processes, much of the larger sized particles taken in by the dredge will be reduced in size by the action of the dredge cutter head and booster pump impellers. This will decrease the quantity of material that will be screened out and will serve to reduce the potential for clogging and other issues related to the screening process.

Based on testing conducted during the pre-design investigation, the material to be dredged from the lake bottom may have the potential to create foam during slurry processing. Anti-foaming agents were found to be effective in dispersing foams during pre-design testing. If foaming is experienced during remedial operations, the contractor will coordinate with the polymer manufacturers, and the WTP operators to implement foam reduction measures which will not adversely affect the geotextile tube operations, or the water treatment plant.

2.3.2.1 Volatile & Odor Emissions Control

The screening equipment has been designed with an enclosure, which will eliminate the exposure of the screening process and holding tank to the open atmosphere. Air will be drawn from the enclosure and treated with vapor phase granular activated carbon to remove any volatile organic chemicals that may be generated from the screening operation. Details pertaining to the vapor granular activated carbon (VGAC) system design are provided on Drawing 200-D-108.

2.3.2.2 Screening Process

Following conveyance of the dredge slurry to the SCA, screening will be conducted to enhance the geotextile tube dewatering process. The screen apparatus will be able to accommodate a variety of screen sizes. Screen size will be determined in the field based on operational considerations and is expected to range between ¼ and 2 inches.

Material screened out during screening will be conveyed to a temporary staging area, before being transferred to the SCA for final management. If the screened material has a gradation consistent with the material specified for the SCA gravel drainage layer, the material will be placed within the SCA. If the material does not meet the gradation requirements for the gravel drainage layer, the material will be encased within geotextile material when placed in the SCA. The underflow of the screen will be routed into a holding tank. Slurry in this tank will then be routed to the SCA for dewatering in geotextile tubes.

Water is required to rinse the screens to maintain their operability. Rinsing frequency and duration will vary based on the nature of the material being dredged at a given time. Rinse water will be collected in the holding tanks along with the underflow of the screen. Based on an assessment of commercially-available equipment capable of meeting the design requirements for the screening operation, the required rinse flow is assumed to be approximately 300 gallons per minute (gpm). This water will be drawn from the SCA basin sumps (described in Section 2.5.4).

2.3.2.3 Screened Material Management

Material produced from the screening operation will be periodically transported from the screened material management area to the SCA. Details pertaining to the design of this management area are provided in Drawings 200-C-301 and 200-C-303. This material is expected to consist primarily of coarse gravel, cobbles, gravel or cobble-sized particles of in-lake waste deposit (ILWD) material, and debris with very few fine particles. All material generated by the screening will be incorporated into the SCA prior to closure for final containment. For non-ILWD material, beneficial reuse of this material within the SCA (e.g., access roads and ramps) will be evaluated during the course of the remediation. Over-sized material generated through this screening step is not anticipated to be a significant source of volatile or odor emissions. Contingency measures for covering the separated material (e.g., with tarps) will be planned should the separated material become a significant source of volatile or odor emissions.

2.3.3 Chemical Conditioning

Chemical conditioning is a critical element of the operation of the geotextile tube dewatering system. Chemical conditioning impacts the performance and capacity realized within each tube, as well as the quality of filtrate produced by the tubes. Minimization of filtrate TSS is important for maintaining the functionality of the gravel collection system and the downstream WTP.

Bench-scale testing was conducted, using lake sediment and water, as part of the Phase IV PDI to identify the most effective polymers for enhancing the geotextile tube dewatering process. This investigation included rapid dewatering tests (RDT) of more than 160 unique polymers from several of the major manufacturers with experience in similar sediment dewatering applications using four geotextile fabric types. The three polymers identified as the best performers during the RDTs were carried to the next phase of the testing, the pressure-gravity dewatering test (P-GDT). Three of the four fabrics tested performed sufficiently during the RDT to warrant further evaluation in the P-GDT. The summary report describing the results of this testing is included in Appendix D.

The P-GDT is designed to assess the performance of the chemical conditioning step in a bench-scale pressurized geotextile tube by monitoring the dewatering rate of the sediments within the tube, and the quality of filtrate (the TSS) passing through the tube fabric. The test is designed to expose the treated slurry to representative conditions of a full-scale operation to ensure the polymer selected is capable of producing a sufficient dewatering performance to meet the project requirements.

The three RDT best performing polymers were tested in the P-GDT. Based on this testing, best performing polymers were identified as providing the best dewatering performance for the sediments tested (Remediation Areas D and E). During P-GDT testing, dry polymers were found to result in a better dewatering performance than emulsions. As such, the design of the polymer addition process includes infrastructure and equipment to process the dry polymer. The best performing polymers identified in this testing, or an approved equivalent, will be used for this project. Based on P-GDT testing, 1.59 pounds of dry polymer per dry ton of sediment was used as the base design dosage rate.

Based on P-GDT testing results, the addition of a coagulant may be necessary to effectively dewater Remediation Area E sediments. As such, the design of the polymer addition process includes infrastructure and equipment to process the emulsion coagulant. The coagulant used during P-GDT testing, or an approved equivalent, will be used for this project. Based on P-GDT testing, 5.71 pounds of emulsion coagulant per dry ton of sediment was used as the base design dosage rate.

Based on experience at other projects, it may be necessary to modify the polymer/coagulant dosage rate on a regular basis to maintain optimum dewatering, as the characteristics of the sediment processed by the dredging operation change from area to area. The dewatering operation will have the flexibility to modify the dosage as necessary. Additionally, should the polymers and coagulant selected based on the P-GDT testing not perform adequately during remedial operations, the contractor will have the flexibility to test and use an alternate polymer/coagulant.

2.3.3.1 Polymer Storage and Mixing

Dry polymer is typically delivered in 2,000 pound “supersacks,” which must be stored in a dry area prior to use. Polymer will be delivered weekly and a sufficient storage area will be provided to ensure adequate polymer is on hand to continue polymer addition. The polymer will be stored in containers that will provide an adequately dry environment and will be located close to the mixing and addition operations. The polymer mixing system will be equipped to accommodate the supersacks.

Prior to injection into the slurry line, dry polymer will be mixed with “make-down” water and allowed to age. Based on the design dosing rate obtained from the bench-scale testing, up to 300 gpm of polymer make-down water will be required. The bench-scale testing also evaluated SCA WTP effluent as make-down water and results indicate that the quality of the WTP effluent was sufficient. WTP effluent will serve as the primary source of make-down water during remedial construction. In the event that WTP effluent is not available or water quality is not conducive to creating an effective polymer, accommodations for an alternative water source (such as a potable water line) have been incorporated into the design. See Section 2.7.3.2 for details pertaining to this water line.

Based on the bench testing described above, a minimum aging period of 30 minutes is required. Mixed polymer is typically considered usable for up to 72 hours after initial mixing. To ensure that all the polymer solution has achieved the minimum aging time, several polymer mixing/aging tanks will be provided.

The coagulant recommended during the P-GDT testing was an emulsion coagulant and will be injected directly into the slurry line after it outlets from the geotextile tube feed pump. Based on previous project experience, it may be necessary to supplement this injection with a small flow of flush water (5-10 gpm) when the solids content of the dredge slurry exceeds certain percent solids. The solids content requiring flush water will be determined in the field. To accommodate this potential demand, the return line from the WTP effluent, which will provide the polymer make-down water, will be sized with sufficient capacity to provide this flow.

2.3.3.2 Polymer/Coagulant Injection

Following the mixing and aging steps, the polymer will be injected in-line into the slurry. The number and location of the injection points will be based upon several factors including pipeline mixing, contact time, and floc stability/shear. The mixture will then be pumped to the geotextile tube dewatering system for final dewatering.

Operational factors, such as a change of physical properties of the sediments being dredged or the implementation/suspension of sand removal, will lead to variation in the properties and corresponding polymer/coagulant demand of the slurry entering the polymer injection system. The density and flow rate of the dredge slurry will be continually monitored by in-line flow and density meters that control the dose applied to the dredge slurry.

The flocculation of the dredge slurry will be observed in the field frequently to ensure proper conditioning of the dredge slurry is occurring prior to entry into the geotextile tubes. This will be accomplished by manually drawing grab samples from the header system via sample ports located downstream for the polymer injection spool pieces. The samples will be observed for proper floc formation and water clarity. Additionally, when necessary, the dewatering contractor will perform “jar tests” in the field to assess the need for changes in the required polymer dose.

2.3.4 Dredging / Conveyance / Process System Mass Balance

To provide a basis for the sizing and design of the slurry processing equipment, ancillary pipes, and pumps, the geotextile tube header and distribution system, and the SCA WTP, a system mass balance was developed which identified the various flows (solids and liquid) associated with the dredging, dewatering, and water treatment systems. This mass balance was developed in conjunction with the WTP Design Package #3, which contains the mass balance for the water treatment plant under maximum flow conditions. This mass balance is presented in Appendix E. These calculations are based on geotechnical characteristics of the sediment that will be dredged as part of the remediation. These characteristics are based on analysis of samples collected during the pre-design investigation and are summarized in Appendix F.

2.3.5 Equipment List

Table 2.2 provides a list and brief description of the equipment that will be required for the processes described in this section. Equipment noted on this table is also presented in the process and instrument diagrams (P&IDs), Drawings 200-D-101 through 200-D-114.

2.4 GEOTEXTILE TUBE DEWATERING

Following applicable processing and polymer addition steps, the remaining sediments contained within the dredge slurry will be dewatered for final management using geotextile tubes. As described in SCA Dewatering Evaluation (Parsons, 2009), geotextile tubes were selected based on an enhanced ability to achieve the various project objectives, including:

- Offers additional health and safety protection for site workers and local community
- Provides for greater setbacks from site boundaries
- Effective odor control by reducing exposure of sediments to air
- Allows for quicker closure of SCA following completion of dredging
- Reduces the quantity of imported materials needed for construction
- Provides flexibility on the placement of tubes
- Reinforces containment system

Geotextile tubes will be placed in the SCA and receive pre-conditioned slurry from the slurry processing area. The geotextile tubes will retain the solids and allow filtered water (filtrate) to drain to the SCA liquids management system. The basic steps in geotextile tube dewatering are:

- Slurry is routed through a header system into the tubes via fill ports located on the top of each tube.
- Slurry will be pumped into the tubes over several filling cycles until the tube capacity is reached. Maximum fill height is the primary method of process control for each individual tube.
- The filtrate seeps out of the tubes while the solids remain in the tube and consolidate.
- Filtrate flows to SCA liquids management system and is pumped to the water treatment system.

This section describes these process steps that will comprise the geotextile tube dewatering operation, outline supporting infrastructure, present design constraints associated with geotechnical and operational limitations of the geotextile tube dewatering operation.

2.4.1 Geotextile Tube Header System

Pumps located upstream to the polymer addition equipment in the slurry processing area will be used to transfer the pre-conditioned slurry to the geotextile tube header system located in the SCA. The pumps will have a capacity to handle the maximum flow produced by the dredging operation, as calculated in the mass balance presented in Appendix E.

An area of the SCA will be designated for active tube dewatering. The active area may consist of an entire phase of SCA construction, or combinations of several phases, and will be adjusted throughout the operation.

The geotextile tube header will consist of a piping network routed around the active area of the SCA with several branch manifolds deployed in a configuration that facilitates distribution of the slurry into geotextile tubes within the active dewatering area. Based on the maximum flows estimated for the project, five to ten geotextile tubes will be on-line at any given time. The header system will have a capacity to handle the maximum flow, as calculated in the mass balance presented in Appendix E.

The header piping will transition from solid pipe to flexible pipe near the geotextile tubes to allow for manual reconfiguration of the filling network as full tubes are taken off-line and new tubes are being prepared for filling. Valves will be installed in selected areas of the header piping to allow for control of slurry flow to the desired tube. Tube operation, including piping reconfiguration and flow control, will primarily be manual. Tube operators will constantly monitor filling tubes and perform necessary adjustments to maintain the performance of the tubes and line velocities in the header system to minimize plugging and excessive pressure buildups. The number of tubes being filled at any time will depend on the flow rate at that time, the characteristics of the slurry, and the rate of drainage through the tubes.

2.4.2 Geotextile Tube Design

Geotextile tubes are fabricated in a variety of circumferences and lengths using high strength, permeable geotextile. For dewatering the Onondaga Lake sediments, geotextile tubes 80 to 90 ft. in circumference and up to 300 ft. in length, will be used in the dewatering operation.

Based on the results of the P-GDT testing conducted in the Phase IV PDI, TenCate Geotube Fabric GT500 was found to provide the best dewatering performance as compared to other TenCate fabrics tested. The fabric used for geotextile tubes for this project will be GT500, which has an apparent opening size (AOS) of 0.425 mm, or an approved equivalent from another manufacturer.

The geotextile tube fabric material was tested for compatibility with the Solvay waste material to be dredged from Remediation Area D (the ILWD). As part of this testing, high-strength geotextile tubes and the thread for the geotextile tubes were evaluated. Both performed well and are considered suitable for the project.

2.4.3 Geotextile Tube Dewatering Operations

The operational objectives for the geotextile tube dewatering are to:

- Achieve a dewatered condition in a reasonable time frame to allow for efficient tube stacking
- Achieve a filtrate quality that allows for effective operation of the water treatment system
- Operate in accordance with the SCA design constraints
- Minimize the impact on dredge production rates and project schedule

The geotextile tubes will undergo several fill cycles until their capacity is reached. The capacity of each geotextile tube is a function of the tube's material properties and size. The primary control parameter is the maximum fill height of each tube, determined by the tube's circumference and seam loading. The height of actively-filling tubes will be continuously monitored by the geotextile tube operators. Once a geotextile tube has been filled to capacity, sediments within the tube will need to sufficiently consolidate before another tube can be safely stacked on top of it. The required level of sediment consolidation and the methods for verification will be developed by the contractor as a construction submittal, and may be subject to modification during remedial activities, as part of adaptive management of the dewatering activities.

The primary measure of the quality of the filtrate passing through the tubes is the TSS. Low TSS levels in the filtrate will help maintain the gravel collection layer beneath the tubes, control deposition in the sump areas, and minimize impacts to the performance of the WTP. Based on the Phase IV bench-scale testing, it is estimated that the geotextile tube filtrate will contain TSS less than 200 milligrams per liter (mg/L). This 200 mg/L has been utilized as a conservative maximum TSS value for the design of the WTP.

Similar to the need for flexibility in the polymer addition process, as discussed in Section 2.3.6, it may be necessary to adjust geotextile tube operational parameters, such as number of fill cycles for each tube and dewatering periods, to maintain optimal tube performance, and filtrate quality. As such, the contractor will have the flexibility to modify the tube dewatering operations to optimize tube performance. In addition, the contractor will have responsibility of preparing draft tube arrangement plans and filling/tube management procedures.

The SCA design is based on stacking the geotextile tubes to a height of approximately 30 ft. (approximately five tubes stacked) over the SCA footprint. The sequence of tube placement (location, alignment, rate of stacking, etc.) up to this final configuration will be guided by the geotechnical behavior of the SCA as the project progresses. To monitor this behavior, extensive instrumentation, including piezometers, settlement cells, settlement profilers, and inclinometers, will be installed during the construction of the SCA. These instruments will be monitored during the dewatering operation to ensure the SCA continues to operate within its design parameters. This monitoring will be conducted in accordance with an approved Geotechnical Instrumentation and Monitoring Plan. Contingencies are outlined in the Geotechnical Instrumentation and Monitoring Plan that should be followed when an unexpected condition occurs that will affect the stability or performance of the SCA.

2.4.4 Supporting Infrastructure

A road is incorporated in the design of the top of the SCA perimeter berm to allow access to the SCA for installing the header piping system, deploying the geotextile tubes, and tube filling operations. Small, low-ground-pressure vehicles will be operated within the SCA to aid in tube deployment and other tasks. Some gravel may be placed at strategic locations in the SCA for this small vehicle access. Ladders, steps, and platforms will also be installed in the SCA for worker access. As layers of tubes are added, the gravel ramps/roads and ladders/steps/platforms will be extended to allow access to the active working areas. Infrastructure (such as lighting) will be installed to ensure the health and safety of workers during night time operating hours, in accordance with applicable requirements (Occupational Safety and Health Administration

[OSHA]). Details pertaining to this infrastructure will be the contractor's responsibility to establish, based on operational needs.

2.5 WATER MANAGEMENT

As the dredge slurry is pumped into the geotextile tubes, filtrate water will weep out, while the sediment will remain in the tubes. The filtrate water will flow into the SCA liquids management system, where it will be collected in the temporary (during operations only) and permanent sump areas and transferred to the WTP.

As discussed in the Sediment Management Intermediate Design (Parsons, 2010), the WTP will be subject to periods of shutdown, as dictated by the permit terms for the discharge of the water to the Metro plant. These shutdown events are typically tied to periods of high precipitation. To manage precipitation and filtrate generated during shutdown events, provisions for water storage have been included in the design.

2.5.1 Design and Performance Criteria

The design of water management strategies and infrastructure will account for filtrate, process water, and precipitation/contact water falling within the SCA, slurry processing area, and WTP area.

The management strategies and associated conveyance infrastructure are designed to handle the maximum flow from the dredge, in addition to the daily average precipitation and recirculation flows identified in the mass balance. Based on the mass balance presented in Appendix E, and based on the dredge flowrate of 5,500 gpm, the SCA operational liquids management system will be sized to handle approximately 6,500 gpm.

In addition to the operational capacity of the filtrate collection and management system, the SCA will also be designed with contingency water storage capacity within the two SCA basins adjacent to the SCA to the east and west. This capacity will provide storage for high precipitation events. Total water storage capacity upstream of the WTP has been sized to contain the volume of water generated by a 25-year, 24-hour storm falling within the SCA and basins, with all three stages open; a volume of approximately 8.4 million gallons.

2.5.2 Non-SCA-Area Water Management Systems

Water requiring treatment will be collected from the slurry processing area and the WTP area. Surface water control features will be incorporated into the grading of these areas to direct surface water and water from decontamination facilities to collection points. Pumps in these collection points will convey the collected water to a dedicated geotextile tube, the debris screen holding tank, or directly into the SCA. Ultimately, the collected water will be routed to the WTP. The destination of the water will be a field decision and may vary under different conditions. Engineering controls (e.g., grading and covers) will minimize the amount of water requiring management. The surface water control system and collection points are shown on Drawing 200-C-302, and details are provided on Drawing 200-C-304.

2.5.3 Water Management Within the SCA

Water contained by the SCA composite liner system will be managed by a liquids management system that will collect and remove water, as described below.

2.5.3.1 SCA Operation Liquids Management System Design

Details pertaining to the SCA composite liner and liquids management system design are described in Onondaga Lake SCA Civil and Geotechnical Final Design (Parsons, 2010). The SCA composite liner system consists of the following components from top to bottom:

- 24-inch (average) drainage layer (24-inch minimum in truck traffic areas)
- Geotextile cushion
- 60-mil linear HDPE geomembrane liner
- Geosynthetic clay liner (GCL) in sump areas
- 12-inch minimum (18-inch minimum at the sumps) low-permeability soil component with top 6 inches compacted to achieve a permeability less than or equal to $1x10^{-6}$ centimeters per second (cm/sec)

The liquids management system includes the drainage layer (which is also part of the base composite liner system), pumps, sumps, and risers, which are designed to handle the appropriate design flows. The liquids management system will have operational and post-closure phases because the volume of liquids will change significantly as the SCA transitions from operation to closure. During operation, the liquids management system will collect filtrate from the geotextile tubes and precipitation that comes into contact with the tubes. An evaluation was completed to assess the potential for biological growth in the gravel collection layer. Based on the evaluation conducted, potential for growth is limited, primarily based on the high anticipated pH of the filtrate that will pass through the tubes.

After SCA closure, the liquids management system will handle remaining water that is generated by the continuing dewatering of the dredge material within the tubes and precipitation that infiltrates through the SCA cover. The details associated with the liquids management strategy under post-closure conditions are included in the Final Onondaga Lake SCA Civil and Geotechnical Final Design (Parsons, 2010). The details associated with the liquids management strategy during operational conditions are discussed in the subsections below.

2.5.3.2 SCA Operational Liquids Management System Operation

The location and intensity of flow within the SCA are expected to vary depending on precipitation events, dredge rate, dredge work schedule, and operation of the geotextile tubes. The operational liquids management system is designed to handle this variability by having mobile components and the ability to use temporary storage for precipitation events

Part of the potential spatial variability in SCA flows is due to variability in liquid flow routes. As filtrate flows out of the geotextile tubes, it will follow one or a combination of the following flow paths:

- Directly into the gravel drainage layer beneath the tubes
- Across the top of adjacent tubes and into the gravel drainage layer
- Across the top of adjacent tubes and to the SCA perimeter channel

Filtrate that enters the gravel drainage layer will follow the SCA liner slope towards two permanent internal collection sumps from which it will be removed via submersible pumps in the risers. Filtrate that flows to the perimeter channel will follow the slope of this channel towards low points on the east and west sides of the SCA. From the low points on the east and west sides of the SCA, filtrate will flow through culverts into sumps located in the SCA basins. Pumps will remove the filtrate from these sumps and transfer it to the WTP. The amount of flow that enters the gravel drainage layer and the amount that flows down the channel will depend on the head and resistance to flow at any given time. Water may also flow out of the gravel drainage layer and into the perimeter channel, also depending on head differentials and flow resistance. This potential redirection of flow contributes to the potential spatial variability of flow, but does not affect the total flow volume in the SCA.

It is possible that, due to variations in geotextile tube configurations, filtrate may locally pond before it follows the identified flow paths. Additional mobile pumps and aboveground piping will be deployed if necessary around the SCA to move ponded water to the perimeter channel for collection in the SCA basins and conveyance to the WTP to ensure the maximum allowable head is not exceeded.

Design details associated with the permanent collection sumps are presented in the Onondaga Lake SCA Civil and Geotechnical Final Design (Parsons, 2010). Water collected in these sumps will be pumped to the sumps in the SCA basins through temporary, above-ground piping that will be repositioned as geotextile tubes are deployed in the area. Also as described in the Onondaga Lake SCA Civil and Geotechnical Final Design (Parsons, 2010), the SCA perimeter berms and channels have been designed with adequate dimensions to convey the design flow to the SCA basins, through culverts in the SCA berms. In order to account for the potential spatial variability of flow, each side of the SCA channel has sufficient capacity to carry the full design flow. Likewise, the pump capacity at each permanent, internal sump and each SCA basin sump will have sufficient capacity for the full design flow. As part of SCA operations, a probe will be lowered into one of the permanent risers in each of the SCA sumps to monitor for the presence / accumulation of NAPL. This will initially be done on a weekly basis. If detected, the NAPL will be pumped out of the sump for proper disposal offsite.

As described in Section 2.6.4, a separate debris management area will be constructed in the Phase 2 footprint for management of debris removed from the lake. This debris management area will be constructed in 2011, to be ready for the start of 2012 dredging. The rest of Phase 2 of the SCA will be constructed in 2012. Prior to this, water collecting in the debris management area will be routed to either the east basin sump or directly to the WTP via temporary pumping. Ultimately, the debris management area will be hydraulically connected to the rest of the SCA, at which point any precipitation falling in this area will flow to the SCA sumps and SCA basin sumps. Piping outside the footprint of the SCA or SPA will be double-walled.

2.5.4 SCA Basins

The discharge of water from the WTP to Metro will be subject to shutdown periods, based on total flow to the Metro facility during precipitation events. To manage precipitation and residual filtrate during these shutdown events, provisions for water storage upstream of the WTP has been incorporated into the design.

2.5.4.1 Basin Design

Two basins have been designed on the eastern and western berms of the SCA. As presented in the Onondaga Lake SCA Civil and Geotechnical Final Design (Parsons, 2010), the SCA perimeter berm height and the stormwater basin volume were optimized so that a 25-year, 24-hour storm could be contained within the SCA and stormwater basins without discharging to the WTP. These basins are sized for the condition where all three phases of the SCA (i.e., 65 acres) have been constructed and covered with at least one layer of geotextile tubes, which is expected to be the case that requires the most storage because precipitation will be directed to the basins by the geotextile tubes, rather than directly infiltrating into the gravel drainage layer. Based on this design storm event, each of these basins will provide approximately 4.2 million gallons of storage, or 8.4 million gallons total.

The basins will have a double-liner system with leak detection incorporated between the two layers. The basins have been designed with sump systems, which will include a system of perforated lateral collection pipe distributed in the gravel-filled sump, designed to ensure adequate flow to the pump transfer points. Drawings 201-C-001 through 201-C-009 present detailed plans and design details associated with the civil and mechanical engineering design for these basins. Calculations pertaining to the design of these basins are included in Appendix G.

2.5.4.2 Basin Operations

During normal operations, the sumps located within each of the SCA basins will be used as water collection and transfer points for filtrate to be treated at the WTP. Water pumped from the two internal collection sumps will be routed to their respective SCA basin sumps, and the culverts from the eastern and western channels will direct surface flow directly to the basin sumps. Flow accumulating in the western basin sump will be pumped to the eastern basin sump. Water drawn from the eastern basin sump will be pumped by the SCA transfer pumps to the WTP for treatment. SCA transfer pumps will be sized to match the flow produced by the dredging operation and average precipitation, which will control liquid levels within the SCA during normal operations.

During Metro shutdown periods, treatment at the WTP will be stopped and dredging operations will be stopped. However, the geotextile tubes will continue to dewater. The internal sumps within the SCA will stop pumping and filtrate and precipitation flowing into the gravel will accumulate within the SCA. Surface water in the perimeter channels will continue to flow into the SCA basin sumps and pumping from the western SCA basin sump to the eastern will be stopped. When the WTP can begin discharging again, normal pumping will resume. Once sufficient water has been removed from the SCA and the SCA basins, dredging operations will resume.

2.6 DEBRIS MANAGEMENT

In-lake debris management is detailed in the Draft Capping, Dredging, and Habitat Intermediate Design (Parsons, 2011). In general, debris will be removed from the lake only to the extent necessary to avoid significant interference with dredging or capping operations. In many cases, larger debris targets will be moved aside to accommodate the cutter head rather than being removed. The dredges used for this project will be cutter head dredges, and may be equipped with additional features that will either prevent the debris from being taken in by the dredge pump, or will grind up the debris that does enter the cutter head allowing it to be transferred to the SCA through the pipeline.

Information on the debris present in the lake is based on geophysical survey work that was completed as part of the Phase I Pre-Design Investigation, as well as aerial photographs that have been collected by Honeywell during the various phases of the PDI. In preparation for remedial activities, additional surveys may be completed by the dredging contractor. Any additional information gained from future surveys will be evaluated, and debris management strategies may be modified to accommodate major changes to the quantity or type of debris that may require removal.

Based on initial evaluations, it is anticipated that management of aquatic macrophytes will be necessary. The management strategy for these macrophytes is being evaluated as part of the dredging design and the management of organic materials is not included in this design document. Some macrophyte management approaches (such as aquatic herbicide) would eliminate the need for mechanical removal and management.

2.6.1 Emissions and Odors

Neither the debris removed from the lake, nor the debris management process, is anticipated to be a significant source of volatile emissions or odors. As such, several emission mitigation steps have been identified, and will be used as-needed to minimize the generation potential when necessary. These mitigation strategies include:

- Minimizing debris storage/stockpiling at shoreline support area
- Covering of debris trucks/containers during transport from the barge off-loading area to the SCA
- Application of odor suppressants/foaming agents
- Covering of debris stockpiles

2.6.2 Lakeshore Operation & Transport

The debris will be segregated into three categories: general debris, tires, and large scrap metal. The remedial contractor will use one or a combination of the following methodologies for material segregation:

- Segregate debris using separate containers staged on a barge, or
- Place removed debris into a barge and segregate the debris during the mechanical transfer from the barge to separate containers located on the shore.

The containers will be covered (to minimize emissions), sealed (to prevent leaks), and transferred to the SCA by trucks. Free liquids from the barge will be decanted back to the lake. Any water removed from containers prior to transport will be put into the slurry pipeline for treatment at the SCA WTP. Containers will be transferred to the SCA to a designated management area. No long-term storage or processing at the shoreline support area, aside from the general segregation noted above, is anticipated.

Management strategies for each of the three debris categories are described below.

2.6.3 Debris Management Strategies

2.6.3.1 Debris

Debris pulled from the lake bottom is anticipated to consist of both porous (e.g., concrete, timbers, rubber) and non-porous (e.g., large rocks, metal, plastics) material. Debris will be transported to a designated management area within the SCA as described in Section 2.6.4. Final management of the debris may consist of burial within the debris management area, or potential transfer to another section of the SCA if it better facilitates overall SCA closure.

2.6.3.2 Tires

There is a large tire field in the southwest corner of the lake in Remediation Area E, north of where Harbor Brook discharges into the lake. The field is estimated to contain up to 1,500 tires, which will be removed as required to facilitate dredging and capping. As most tires are located in this one area, tire removal should take less than one dredge season.

An on-site tire cleaning and processing operation will be set up near the debris screening operation located within the Sediment Processing Area to prepare the tires for offsite disposal. The tire cleaning and processing approach will be approved by NYSDEC prior to construction and implementation. After cleaning and processing, tires will be temporarily stored on site and then transported off site for disposal. Less than 1,000 tires will be temporarily stored on site and tires will be stored on site less than 18 months.

2.6.3.3 Large Scrap Metal Debris

Large scrap metal debris (such as automobiles, abandoned pipelines, and metal barges or other vessels) that requires removal will be segregated during the debris removal. Large metal debris will be recycled offsite through the use of a metal recycling facility. Depending on the requirements of the facility, large scrap metal debris would either be taken directly to the recycling facility, or to the SCA for cleaning, prior to transfer to the recycling facility. The cleaning operation would be conducted within the debris management cell described below, and contact water generated during the cleaning would be captured and sent to the water treatment plant. Debris cleaning operations will incorporate appropriate measures to prevent detrimental impact to the gravel drainage layer, such as the placement of a geotextile fabric to capture solids and fines.

2.6.4 Debris Management at SCA

Debris trucked to Wastebed 13 will be managed within a designated area within the SCA. The approximately 2 acre area represents a portion of SCA Phase 2. SCA Phase 2 is scheduled for construction in 2012 prior to debris removal during 2012 dredging operations. Design details pertaining to this area are presented in the Final SCA Design (Parsons, 2011).

The location depicted was selected for debris management for several reasons, including:

- Settlement beneath the debris is anticipated to be less than beneath the geotextile tubes. This n of this area represents one of the farthest spots away from Wastebed 13 borders, providing a maximum buffer from sensitive receptors.

This debris management area will be constructed as part of the Phase I SCA, but is a part of the Phase II area. This area will be incorporated into the rest of the Phase II construction. The size of the area was based on current understanding of the quantity of debris that is likely to be removed from the lake bottom. Observations during the first year of dredging (debris quantity and settlement) will be used to determine whether the area needs to be expanded to contain additional debris or to maintain the appropriate drainage. The design and construction of the liner system in this area will be the same as the SCA, however, as necessary, additional gravel (providing a minimum 24 inches over the geomembrane) will be placed to protect the liner from debris transportation truck traffic.

The southern and western berms of this area will be the permanent SCA berms. The northern and eastern berms of this area will be temporary. These berms may be removed once Phase II construction is complete. Contact water accumulating in this area will be conveyed, using temporary pumping, to the SCA sumps for treatment at the SCA.

2.7 UTILITIES

Various utilities will be needed to support dredging, slurry conveyance, sediment dewatering, and water treatment. This section includes a summary of the utility needs, where they will be needed, and plans for installing the necessary utilities in time to allow for equipment testing prior to the start of dredging in 2012.

2.7.1 Lakeshore Support Area and Booster Stations #1 & #2

Several operations and activities will be based at the Lakeshore Support Area that will be located on or near the Wastebed B site, including:

- Office facilities
- Operational support facilities for work crews (break trailers, decontamination trailers, etc.)
- Equipment storage
- Heavy craft (dredge, debris barge, etc.) service dock
- Small craft (oversight boats, tender boats, etc.) dock
- General debris segregation / transfer
- Booster pump station(s)

Utility requirements for these activities are described below.

2.7.1.1 Electrical Service

Based on the activities and operations that will be staged in the lakeshore area, two types of electrical service will be required. Office facilities, operational support facilities, equipment storage, docking facilities, and debris decontamination/staging areas will require 480 volt three phase power service. Existing service lines owned by Solvay Electric in the vicinity of the Wastebed B site will be sufficient for this demand.

Three phase electrical service will be installed at each booster pump station. To supply power to booster pump station #1, located near Wastebed B, three phase infrastructure is currently in place, which supplies the Semet/Willis Groundwater Pump Station with three phase power. This service line, owned by Solvay Electric, will require line upgrades to ensure the supply is sufficient for the demands from the booster pump. Furthermore, additional infrastructure will be necessary to bring the power to the actual booster pump location. To supply power to booster pump station #2, preliminarily located at the southeast corner of the Wastebeds 1-8 site, existing infrastructure which supplies power to the Onondaga County West Side pump station may be used. However additional infrastructure will be necessary to extend the service a short distance, to the actual booster pump location.

The Lakeshore Support Area is located within the jurisdiction of Solvay Electric. To ensure necessary connections are installed prior to beginning dredging, Honeywell has begun coordinating with Solvay Electric to extend the necessary electrical service to the lakeshore site.

2.7.1.2 Water

Potable water will be needed for the office and support facilities. Potable water service is available near the Westside Pump Station. A buried tap from this source to the office and support trailer area will be installed during the construction of this support area.

Other activities and processes in the shoreline support area will require a source of non-potable water. Activities such as fire protection, equipment and debris decontamination, truck wash stations, and booster pumps will have a considerable demand for non-potable water. To provide water for these activities, surface water will be drawn from Onondaga Lake. The intake for the lake water will be designed with a screening system to prevent the intake of objects which may damage conveyance pipes and pumps (aquatic vegetation, debris, etc.). If necessary, lake surface water will be passed through a simple filtration system to remove suspended solids. Any surface water used on-site and considered construction/contact water will be collected and routed into the slurry pipeline for treatment at the WTP.

2.7.2 Slurry Pipeline Alignment (Booster Stations #3 & #4)

Utility requirements along the slurry pipeline will be limited to booster pump locations. Electrical power and water services will not be required along the length of the pipeline in between these locations.

2.7.2.1 Electrical Service

Three phase electrical service will be required to power the booster stations.

Booster pump station #3 and any associated appurtenances will be served by a new three phase drop from Solvay Electric. The wooden pole infrastructure is located within the New York State Fairgrounds parking lot located on the Wastebeds 1-8 site. Honeywell will work with NYSDAM to coordinate construction of the infrastructure needed to support the Solvay Electric service drop.

Booster pump station #4, and any associated appurtenances, will be served by a new three phase drop from National Grid. New infrastructure will need to be installed, as there are no current poles which extend to this vicinity to support a new three phase National Grid service drop.

The locations of the booster pump stations lie within the jurisdiction of both Solvay Electric and National Grid. To ensure necessary connections are installed before dredging begins, Honeywell has coordinated with Solvay Electric and National Grid to extend the necessary electrical service to these locations.

2.7.2.2 Water

Water services are not needed along the slurry pipeline alignment. Water for the booster pump seals will be obtained by a closed system that draws slurry from the pipeline, filters the slurry, uses the filtered slurry as seal water, and re-injects the larger particles and the filtered seal water back into the slurry pipeline. Details of this system are provided on Drawings 200-D-102 through 200-D-105.

2.7.3 SCA

Several operations and activities will be based at the SCA, including:

- Office facilities
- Operational support facilities for work crews (break trailers, decontamination trailers, etc.)
- Equipment storage
- Screening
- Polymer addition
- Geotextile tube dewatering
- Water treatment

Utility requirements for these activities are described below.

2.7.3.1 Electrical Service

The SCA and supporting areas will be served by a new 13,200 volt primary metered service distributed to the site by the installation of a new National Grid service drop. After the 13,200 volt has been distributed to the site, transformation to a reduced voltage will be required. A new 3-switch compartment (line, load-1, load-2) pad mounted 13.2 KV switch at the SCA/WTP area will be used to distribute an individual 13,200 volt service to both the SCA and WTP. At the SCA and WTP, new pad mounted transformers will transform the power to 480 volt 3-phase. The SCA is estimated to require a service of 2,500 amps at 480 volt three phase, and the WTP is estimated to require a service of 4,000 amps at 480 volt 3-phase. After transformation to 480 volt 3-phase, a new service-entrance-rated switchboard will be used to either distribute power to single pieces of equipment or motor control centers capable of providing the required starting characteristics of the equipment. SCA area equipment lighting will be 480 volt single phase. Convenience outlets and administrative support offices will be from the SCA service at 120 volt single phase.

Electrical service lines currently extend to the perimeter of the Wastebeds 12-15 site near the Gere Lock Road entrance, but do not extend to Wastebed 13. New poles and service lines are required to extend services to the Wastebed 13 area. The location of the SCA lies within the jurisdiction of National Grid. To ensure necessary connections are installed before dredging begins, Honeywell has coordinated with National Grid to extend the necessary electrical service up to the SCA site.

2.7.3.2 Water Demands

Potable water will be provided for the office and support Facilities. In addition, a potable water supply will be required for potential use as polymer “make-down” water (up to 260 gpm for Remediation Area D), should the treated effluent water from the WTP not be available, or suitable for that purpose. Potable water will also be needed at the WTP for eye wash stations, emergency showers, and sanitary purposes. The total estimated potable water demand at Wastebed 13 is estimated at 70 gpm.

Potable water will also be needed for fire protection at an emergency flowrate of 500 gpm.

As potable water is not currently available on the Wastebeds 12-15 site, Honeywell has coordinated with the local water supplier to extend water service. To provide the necessary supply, a buried service line will be installed to bring the water supply to the SCA area.

SECTION 3

CONSTRUCTION IMPLEMENTATION

3.1 CONSTRUCTION & REMEDIAL IMPLEMENTATION PLANS

Several plans have been prepared to ensure proper construction of the sediment management system, and to provide operational guidelines for how the sediment transport and dewatering systems have been designed to function.

3.1.1 Construction Quality Assurance Protection Procedures Plan

A Construction Quality Assurance Plan (CQAP) summarizes the quality assurance (QA) requirements and procedures for the project, including:

- Identifying the roles and responsibilities of the project team members
- Outlining the chain of command and communication procedures for QA related issues
- Summarizing requirements for project meetings including schedule/frequency, purpose, required attendees
- Outlining QA oversight tasks, including routine inspections, QA testing/protocols, review of technical submittals, and documentation

This CQAP is included in this design as Appendix H.

3.1.2 Sediment Management System Operational Guidelines

A set of operational guidelines for the sediment management system has been developed with contractor input, and outlines (1) procedures associated with the normal operations of the integrated dredging, conveyance, (2) procedures for management of the remedial activities, and (3) implementation of contingency measures under specific scenarios. Procedures will be developed for a variety of scenarios, including:

1. Mechanical problems
    a. Plan for dredge shutdown
    b. Plan for booster pump shutdown
    c. Plan for sediment processing shutdown
    d. Plan for geotextile tube dewatering operation shutdown
    e. Plan for WTP shutdown
2. Wet weather / Metro shutdown protocols
3. Seasonal Startups/Shutdowns
    a. Plan for winter shutdown
    b. Plan for spring startup

These Operational Guidelines are included in this design as Appendix I.

3.2 PROJECT SCHEDULE

Critical to the success of the lake remedial action is the sequencing of design and construction activities to assure the process is efficient and completed within the appropriate timeframe. A logical progression of the decisions, analysis, and planning needed to execute the work was established during the initial design phase and is updated throughout the project.

Construction of infrastructure included in this design report has begun, and will be completed to support the start of dredging, in 2012.

SECTION 4

REFERENCES

Honeywell. 2009. Letter Work Plan from John McAuliffe to Tim Larson. Dated September 24, 2009.

OBG. 2009. *Onondaga Lake Remedial Design SCA Water Treatment Plant Intermediate Design Submittal*. October 2009.

NYSDEC. 2009. *Citizens Participation Plan, Onondaga Lake Bottom Subsite of the Onondaga Lake Superfund Site*. March 2009.

Parsons. 2004. *Onondaga Lake Feasibility Study Report*. Onondaga County, NY. Three volumes. Prepared for Honeywell. Draft Final (final version). November 2004.

Parsons. 2006. *Onondaga Lake Sediment Consolidation Area (SCA): Siting Evaluation*. Prepared for Honeywell, Syracuse, New York. September 2006.

Parsons. 2009. *Remedial Design Work Plan for the Onondaga Lake Bottom Subsite*. Prepared for Honeywell, Morristown, NJ. Draft March 2009.

Parsons. 2008. *Onondaga Lake Pre-Design Investigation Phase IV Work Plan, Phase IV Work Plan, Addendum 6.* Prepared for Honeywell, Morristown, NJ. December, 2008.

Parsons. 2009. *Onondaga Lake Sediment Consolidation Area (SCA) Dewatering Evaluation Report*. Prepared for Honeywell, Morristown, NJ. Draft January 2009.

Parsons. 2009 *Remedial Design Work Plan for the Onondaga Lake Bottom Subsite*. Prepared for Honeywell, Morristown, NJ. March 2009.

Parsons. 2009. *Draft Onondaga Lake Dredging, Sediment Management & Water Treatment Design Submittal*. Prepared for Honeywell, Morristown, New Jersey and Syracuse, New York in association with O'Brien & Gere and Anchor. February, 2009.

Parsons. 2010 *Draft Onondaga Lake Sediment Consolidation Area Civil and Geotechnical Final Design*. Prepared for Honeywell, Morristown, NJ. January 2010.

TAMS Consultants, Inc. 2002. *Onondaga Lake Remedial Investigation Report*. Prepared with YEC, Inc. for NYSDEC, Division of Environmental Remediation, Albany, New York. December 2002.

United States District Court, Northern District of New York. 2007. State of New York and Denise M. Sheehan against Honeywell International, Inc. Consent Decree Between the State of New York and Honeywell International, Inc. Senior Judge Scullin. Dated October 11, 2006. File January 4, 2007.

USEPA. 2009. *Clean and Green Policy. U*.S. Environmental Protection Agency, Region 2. http://epa.gov/region2/superfund/green_remediation/policy.html

TABLES

TABLE 2.1
ONONDAGA LAKE SEDIMENT PHYSICAL CHARACTERISTICS & GEOTECHNICAL PROPERTIES

Remediation Area	Parameter	Water Content %	Percent Gravel %	Percent Coarse Gravel %	Percent Fine Gravel %	Percent Sand %	Percent Coarse Sand %	Percent Medium Sand %	Percent Fine Sand %	Particles < 0.150 mm (Sieve #100) %	Particles < 0.040 mm %	Percent Fines (<0.075 mm) %	Percent Silt %	Percent Clay %	D85 mm	D50 mm	D15 mm	Liquid Limit %	Plastic Limit %	Plasticity Index %	Specific Gravity	Bulk Density pcf	Dry Density pcf
A Dredge Prism	Volume-DD-Weighted Average (1) (2)	77.2	0.3	0.0	0.3	23.0	0.9	4.0	18.1	86.0	66.3	76.7	58.7	18.0	0.163	0.020	0.005	48	34	14	2.68	96.6	54.5
C Dredge Prism	Volume-DD-Weighted Average (1)	76.0	15.6	0.0	15.3	30.2	4.9	6.9	18.5	62.7	51.0	54.2	32.6	21.7	5.338	0.052	0.003	43	32	10	2.74	97.4	55.3
D Dredge Prism - SMU 2	Volume-DD-Weighted Average (1)	132.9	0.1	0.0	0.1	5.9	0.3	0.7	5.0	96.0	88.8	94.0	73.0	21.0	0.035	0.014	0.007	88	48	40	2.47	84.1	36.3
D Dredge Prism - West	Volume-DD-Weighted Average (1)	127.9	0.6	0.0	0.6	9.2	1.4	3.2	4.5	91.5	87.4	90.3	56.8	33.5	0.163	0.009	0.002	82	52	29	2.52	85.0	37.3
D Dredge Prism - Center	Volume-DD-Weighted Average (1)	115.7	0.5	0.0	0.5	16.3	3.2	4.3	8.8	86.1	78.9	83.2	53.1	30.0	0.224	0.014	0.003	82	52	29	2.55	86.8	40.2
D Dredge Prism - East	Volume-DD-Weighted Average (1)	128.7	0.6	0.0	0.5	6.6	0.9	1.7	4.2	94.7	89.6	92.8	66.9	25.7	0.281	0.014	0.004	72	45	27	2.54	85.1	37.5
D Dredge Prism	Average (3)	126.3	0.4	0.0	0.4	9.5	1.5	2.5	5.6	92.1	86.2	90.1	62.5	27.5	0.176	0.013	0.004	81	49	31	2.52	85.2	37.8
E Dredge Prism	Volume-DD-Weighted Average (1)	61.9	0.4	0.0	0.3	56.3	1.3	7.3	47.7	62.9	33.0	43.3	31.8	11.5	0.340	0.107	0.024	46	32	14	2.58	100.6	62.1

Notes:

1. Calculations are based on available PDI geotechnical data within the dredge prism. DD indicates dry density. Bulk density and dry density values are based on volume-weighted average calculations.
2. Since only one sample location is available for volume-DD-weighted average for the specific gravity of Remediation Area A, volume-weighted average specific gravity from seven sample locations is presented in this summary.
3. Average values shown are the arithmetic means of the volume-DD-weighted averages of the four sub-areas in Remediation Area D (i.e., D-SMU2, D-West, D-Center, D-East).
4. Remediation Area B only has two available sample locations within the dredge prism for calculations; therefore, Remediation Area B is not included in this summary. Design parameters can be assumed to be the same as Remediation Area A.

Table 2.2
Equipment List

Drawing #	Tag #	Description	Comment
D-102	DCH-1	Dredge Cutter Head	150 hp
D-102	DP-1	Dredge Pump	1000 hp
D-102	SP-17	Sump Pump	10 hp
D-102	C-1	Air Compressor	10 hp
D-102	T-1	Air Compressor Tank	TBD
D-102	P-1	Booster Pump	600hp
D-102	E-1	Gear Oil Cooler	10 hp
D-102	P-1A	Gland Water Pump	10 hp
D-102	N-1	Centrifuge	TBD
D-103	SP-19	Sump Pump	10 hp
D-103	C-2	Air Compressor	10 hp
D-103	T-2	Air Compressor Tank	TBD
D-103	P-2	Booster Pump	600hp
D-103	E-2	Gear Oil Cooler	10 hp
D-103	P-2A	Gland Water Pump	10 hp
D-103	N-2	Centrifuge	TBD
D-104	SP-23	Sump Pump	10 hp
D-104	C-3	Air Compressor	10 hp
D-104	T-3	Air Compressor Tank	TBD
D-104	P-3	Booster Pump	600hp
D-104	E-3	Gear Oil Cooler	10 hp
D-104	P-3A	Gland Water Pump	10 hp
D-104	N-3	Centrifuge	TBD
D-105	SP-25	Sump Pump	10 hp
D-105	C-4	Air Compressor	10 hp
D-105	T-4	Air Compressor Tank	TBD
D-105	P-4	Booster Pump	600hp
D-105	E-4	Gear Oil Cooler	10 hp
D-105	P-4A	Gland Water Pump	10 hp
D-105	N-4	Centrifuge	TBD
D-106	SC-1	Primary Screen Shaker Bed	6,000 gpm capacity
D-106	SC-2	Primary Screen Shaker Bed	6,000 gpm capacity
D-106	SCT-1	Screen Tank w/ Auger	11,700 gal capacity
D-106	SCT-2	Screen Tank w/ Auger	11,700 gal capacity
D-106	CV-1A	Solids Conveyor	~30 ft x 40 ft
D-106	CV-2A	Solids Conveyor	~30 ft x 40 ft
D-106	CV-1B	Solids Conveyor (radial stacking)	~30 ft x 50 ft
D-106	CV-2B	Solids Conveyor (radial stacking)	~30 ft x 50 ft
D-107	T-12	Seal Water Storage Tank	8000 gal
D-107	P-39	Seal Water Booster Pump	TBD
D-107	P-40	Seal Water Booster Pump	TBD
D-107	P-7 to P-9	Geotextile Tube Feed Pump	3000 gpm
D-107	P-8	Geotextile Tube Feed Pump (Spare)	3000 gpm
D-107	P-9	Geotextile Tube Feed Pump	3000 gpm

Table 2.2
Equipment List

Drawing #	Tag #	Description	Comment
D-108		GAC Blower Motor	TBD
D-108		GAC Blower Motor	TBD
D-108		GAC Vessel	TBD
D-109	P-28	Overflow Solids Stockpile Sump Pump	5 hp
D-109	P-38	Stormwater Pump Station	15 hp
D-110	P-29	Polymer Pump	15 hp
D-110	P-30	Polymer Pump	15 hp
D-110	SP001	Injection Ring	TBD
D-110	SP002	Injection Ring	TBD
D-110	POL-3	Polymer Make-up Unit	TBD
D-110	T-6	Neat Coagulant Polymer Storage Tank	TBD
D-111	P-11	SCA/Basin Transfer Pumps	100 hp
D-111	P-12	SCA/Basin Transfer Pumps	100 hp
D-111	P31-A	SCA Sump Pump	75 hp
D-111	P-31B	SCA Sump Pump	75 hp
D-111	P-31C	SCA Sump Pump	75 hp
D-111	P-31D	SCA Sump Pump	75 hp
D-112	P-32A	SCA Sump Pump	75 hp
D-112	P-32B	SCA Sump Pump	75 hp
D-112	P-32C	SCA Sump Pump	75 hp
D-112	P-32D	SCA Sump Pump	75 hp
D-112	P-13	SCA/Basin Transfer Pumps	100 hp
D-112	P-14	SCA/Basin Transfer Pumps	100 hp
D-112	P-(TBD)	Screen Wash Water Pump	TBD
D-113	P-36	Polymer Make-up Water Pump	15 hp
D-113	P-37	Polymer Make-up Water Pump	15 hp
D-113	P-35	Make-up Water Booster Pump	15 hp
D-113	POL-1	Dry Polymer Make-up Unit	TBD
D-113	POL-2	Dry Polymer Make-up Unit	TBD
D-113	T-6	Make-up Water Storage Tank	TBD
D-113	T-7	Polymer Aging/Mix Tank	TBD
D-113	T-8	Polymer Aging/Mix Tank	TBD
D-113	T-9	Polymer Aging/Mix Tank	TBD
D-113	T-10	Polymer Aging/Mix Tank	TBD
D-113	MX-1A	Polymer Mixer	10 hp
D-113	MX-1B	Polymer Mixer	10 hp
D-113	MX-1C	Polymer Mixer	10 hp
D-113	MX-2A	Polymer Mixer	10 hp
D-113	MX-2B	Polymer Mixer	10 hp
D-113	MX-2C	Polymer Mixer	10 hp
D-113	MX-3A	Polymer Mixer	10 hp
D-113	MX-3B	Polymer Mixer	10 hp
D-113	MX-3C	Polymer Mixer	10 hp
D-113	MX-4A	Polymer Mixer	10 hp
D-113	MX-4B	Polymer Mixer	10 hp
D-113	MX-4C	Polymer Mixer	10 hp

FIGURES

NOTES:

1. TRUCK ROUTE SHOWN IS FOR GENERAL ACCESS TO THE SCA PROCESS AREA.

LEGEND:

TRUCK ROUTE

2000 1000 0 2000 4000

SCALE: 1"=2000'

FIGURE 2.1

Honeywell SYRACUSE, NEW YORK

DRAFT SEDIMENT MANAGEMENT
FINAL DESIGN
SITE TRAFFIC ROUTES PLAN

PARSONS
301 PLAINFIELD ROAD, SUITE 350, SYRACUSE, NY 13212 PHONE: 315-451-9560

NOT FOR CONSTRUCTION

FILE NAME: P:\HONEYWELL -SYR\444853 - LAKE DETAIL DESIGN\10 TECHNICAL CATEGORIES\10.1 CAD\REPORTS\REPORT_1 SED MGMT INTERMEDIATE DESIGN\444853-FIG 2.1.DWG
PLOT DATE: 1/20/2011 1:45 PM PLOTTED BY: DORN, ADAM

APPENDIX A

FINAL DESIGN DRAWINGS AND SPECIFICATIONS

PARSONS DRAWINGS

THE STATE EDUCATION DEPARTMENT / THE UNIVERSITY OF THE STATE OF NEW YORK / ALBANY, NY 12234

State Board for Engineering and Land Surveying, Education Building, 89 Washington Avenue, 2nd Floor Mezzanine-East Wing
Tel. (518) 474-3817, Ext. 140
Fax (518) 473-6282
E-mail: enginbd@mail.nysed.gov
E-mail: lsurvbd@mail.nysed.gov

December 4, 2009

Richard F. Otoski
10 Greenmeadow Lane
Bedford, NH 03110

Dear Mr. Otoski:

The enclosed Limited Permit authorizes you to practice professional engineering in New York State for the single engineering project identified on the permit.

If you have questions regarding this permit, please contact the Board Office. The contact information is provided above.

Sincerely,

Jane W. Blair, P. E.
Executive Secretary

Enclosure

THE STATE EDUCATION DEPARTMENT / THE UNIVERSITY OF THE STATE OF NEW YORK / ALBANY, NY 12234

State Board for Engineering and Land Surveying, Education Building, 89 Washington Avenue, 2nd Floor Mezzanine-East Wing
Tel. (518) 474-3817, Ext. 140
Fax (518) 473-6282
E-mail: enginbd@mail.nysed.gov
E-mail: lsurvbd@mail.nysed.gov

LIMITED PERMIT TO PRACTICE PROFESSIONAL ENGINEERING

This permit shall entitle the holder to practice Professional Engineering in New York
but only in connection with the specific project listed below:

Permit Number: 000374 **Permit Issue Date: December 4, 2009** **Registration Expiration Date: December 3, 2012**	**Issued To:** **Richard F. Otoski** **10 Greenmeadow Lane** **Bedford, NH 03110**

This is to certify that

Richard F. Otoski

having applied for a limited permit to practice professional engineering in the State of New York and having submitted satisfactory evidence of established and recognized professional standing in the **State of New Hampshire and holds license number 10974,** and the State Board for Professional Engineering having recommended the issuance of such limited permit; therefore, in accordance with the provisions of Section 7207, subdivision 1, of the Education Law, the said **Richard F. Otoski** is hereby granted this limited permit to practice professional engineering in this state but only in connection with a specific project, viz., **Onondaga Lake Superfund Site (NYSDEC #734030) Onondaga County, New York** and is authorized to file plans, specifications, and reports using his **State of New Hampshire seal**, as provided in Section 7207 of the Education Law. A copy of this permit shall accompany all documents filed with building officials or others in conjunction with this project.

Jane W. Blair

Jane W. Blair, PE
Executive Secretary

Non-transferable
Valid only for project listed above

Professional Engineers must register triennially with the department to practice the profession in New York State. Limited permit holders whose projects may take longer to complete than the three-year registration period must renew their NYS registration to practice the profession in New York State.

GEOSYNTEC DRAWINGS

APPENDIX B

SLURRY PIPELINE WETLAND DELINEATION MEMO

APPENDIX C

CONVEYANCE SYSTEM HEADLOSS CALCULATIONS

APPENDIX D

MINERAL PROCESSING SERVICES PHASE IV ADDENDUM 6 SUMMARY REPORT

APPENDIX E

MASS BALANCE CALCULATIONS

E.1 MASS BALANCE CALCULATIONS
E.2 MATHCAD CALCULATIONS
E.3 EXCEL CALCULATIONS

APPENDIX E

MASS BALANCE CALCULATIONS

E.1 CALCULATION ASSUMPTIONS

The mass balance presented in this Appendix has been prepared to provide a basis for the sizing and design of the equipment, pumps, and pipelines that will be utilized in the various sediment management activities that are described in this Draft Final Design Report. Since the submission of the Intermediate Design Report, the mass balance process flow diagrams (PFD) have been revised as part of the Final Design. The mass balance calculations have been revised accordingly.

The selected dredge contractor has proposed three dredges for the project. The production rates and slurry flow rates of each dredge have been calculated by the contractor based on the dredge characteristics, sediment geotechnical properties, booster pump locations, and pipeline size. These production rates and slurry flow rates are the basis for the mass balance calculations. As presented in this Appendix, two scenarios have been evaluated for each of Remediation Areas A, C, D, and E with the average precipitation, namely, the maximum flow produced by the dredge, and the average flow. The maximum flow scenario represents the mass balance of flows while dredging operations are ongoing using the largest dredge planned for each area. The average flow scenario incorporates the dredging "up-time" (assumed to be 70%) and estimated usage percentage of each dredge to produce combined average flows over the course of dredging in each area.

Due to the nature of dredging operations, the achieved percent solids produced will vary significantly over short periods of time, which will result in significant short-term variation in the proportion of water versus solids entering the system at a given time. The impact of these changes on processing equipment is expected to be minimal. Due to the time required for geotextile tube filtrate to flow through the gravel and/or drainage channels, water within the SCA will effectively have some residence time before reaching the basin sumps. This residence time will attenuate fluctuating solids content, limiting any potential impacts to the SCA WTP.

E.1 MASS BALANCE CALCULATIONS

E.2 MATHCAD CALCULATIONS

E.3 EXCEL CALCULATIONS

APPENDIX F

LAKE SEDIMENT PHYSICAL CHARACTERISTICS & GEOTECHNICAL PROPERTIES

APPENDIX G

SCA BASIN CALCULATIONS

APPENDIX H

CQAP

APPENDIX I

OPERATIONS GUIDELINES