Shenorock Park District

Lake Evaluation, Beach Formation, and Remedial Alternatives REPORT

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COMMITMENT & INTEGRITY DRIVE RESULTS

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EXECUTIVE SUMMARY

The Town of Somers retained Woodard & Curran to conduct evaluations and to prepare the necessary documents to facilitate the creation of the Shenorock Park District. The Shenorock Park District will include the transfer of four parcels of land; the 14.82 acre Lake Shenorock property, the nine acre parcel located on Overhill Road (TM 16.06-4-2), the 0.35 acre site that includes the existing clubhouse located on 34 Hillandale Road (TM 19.10-2-5) and the 0.18 acre parcel across from the club house (TM 16.06-2-43) that are owned by the United Owners Association (UOA). Conceptually, the Lake Shenorock parcels and nine-acre parcel would be donated by the UOA of Shenorock, Inc. to the Town of Somers. The Town would develop the Lake into a community beach, restore the nine-acre parcel to beneficial future use, and demolish the former clubhouse.

In 2008, the Town retained Woodard & Curran to complete Phase I and II environmental evaluations for each of these parcels, the results of which are summarized in the Reports entitled: Phase I Environmental Site Assessment (ESA) Shenorock Overhill Road dated April 15, 2008, Phase I Environmental Site Assessment 34 Hillandale Road dated April 18, 2008, Phase I Environmental Assessment 34 Lakeview Drive dated April 21, 2008, and Shenorock Nine Acre Parcel Phase II Environmental Site Assessment.

Based on the results of the environmental review, the Town in coordination with the UOA, decided to pursue the creation of the Park District. This goal will be accomplished in a two phase approach; with the first phase being focused on conducting additional investigations, evaluations, and testing required to better define the costs associated with the Park District development (Data Report), followed by the preparation of a Plan, Map and Report that would serve as the basis for the creation of the Park District.

This Lake Evaluation, Beach Formation, and Remedial Measures Alternative Report (Data Report) is focused on the evaluation phase of this effort and presents the analyses completed, the results of those analyses, and the cost implications associated with the development of the Park District. The components of the Park District include the restoration of Lake Shenorock and developing a beach facility for public use, mitigating the environmental issues identified at the nine-acre parcel and redevelopment for passive recreational use, and demolition of the historical clubhouse and restoration of the site. Each component was evaluated to identify the conceptual process for realizing the formation of the Park District. The evaluation included identifying regulatory and permitting requirements for the development of the proposed beach and Park District, identifying operation and maintenance requirements for the various components of the Park District, and remedial options for the nine-acre parcel. In addition, the report identifies potential Sate and Federal funding opportunities that could defray a portion of the Park District costs to the Town and residents of the proposed Park District.

Following is a summary for each parcel:

Lake Shenorock

Background

- Lake Shenorock is located within the Croton River watershed and is identified by the New York State Department of Environmental Conservation (NYSDEC) as a Class B water body, which is suitable for swimming. Historically, the UOA operated a beach at the lake, which was closed circa 1977.
- The NYSDEC (2008) recognizes that the Lake is impaired by storm water runoff, historical agricultural activities, and excessive nutrient loading, which has contributed to a eutrophic condition. A preliminary investigation of the lake sediment and water quality completed as part of this report indicates the presence of substances indicative of anthropogenic impacts. Although recognized as an impaired water body, the lake is categorized as swimmable by the NYSDEC. In addition, the proposed beach development activities

including dredging, engineered controls for storm water, and aeration system will improve the lake quality for recreational use.

Evaluation Findings

- Water quality was evaluated on three occasions through the summer of 2009, and included measurements of clarity, phosphorous water quality parameters (e.g., pH), and total and fecal coliform bacteria. Based on the limited water quality measurements, the average clarity and bacteriological analysis is consistent with New York State Department of Health (NYSDOH) requirements for a public beach; however, the water contains elevated phosphorous concentrations. The water quality data collected as part of this investigation is consistent with NYSDEC findings (2008 & 2009).
- Sediment was evaluated by collecting five samples from the proposed beach area and behind the dam. The limited sediment data indicates the presence of common constituents from storm water runoff in suburban areas (e.g., pesticides). The sediment data collected as part of this investigation is consistent with NYSDEC findings (2008 & 2009). Further evaluation of the Lake sediment, including additional sampling to fully characterize the lake sediment and an ecological and human health risk analysis, is recommended after creation of the district to demonstrate that current conditions do not pose an inappropriate risk to human health and the environment.

Beach Development

- The construction of the beach would include a dock, parking, modular sanitary facilities or a waterless system, and development of an operation and maintenance plan.
- Based on the beach design which is presented in Section 2, the beach can accommodate 171 bathers.
- Preparatory activities would include permitting, mitigating the algae condition and dredging of the beach area and area behind the existing dam.

Permitting Requirements

- NYSDOH: The NYSDOH requires an extensive study of the lake with seasonal measurements of water quality and quantity to demonstrate that conditions are suitable for swimming.
- ACOE: Permitting would be required for dredging and due to the presence of regulated wetlands near the lake.
- NYSDEC: the Town will likely be required to obtain a Protection of Waters Permit from the NYSDEC for excavation and fill in navigable waters. Due to the presence of National Inventory Wetlands adjacent to the lake, further coordination with the NYSDEC will need to be conducted, including a field verification of jurisdictional wetland requirements by NYSDEC personnel to ascertain whether a NYSDEC Freshwater Wetlands Permit will be required for these activities.
- NYCDEP: As the lake is within a NYCDEP watershed, depending on the final limits of disturbance (greater than 2 acres), a permit from the NYCDEP will also be required.

Cost

- The cost to evaluate the Lake, permit the restoration, and complete the beach development is estimated to be approximately 1.2 million dollars (refer to Appendix B: Cost Analysis for Beach Design, Construction, and Development).

Nine Acre Parcel

Background

- The nine-acre parcel is impaired by historical unauthorized dumping of miscellaneous debris at the parcel, which has caused soil and ground water impacts at the site. Historically, the parcel was utilized as a park and it was closed by the UOA circa 1977.

Remedial Alternatives

- The conceptual remedial options evaluated for the restoration of the nine-acre parcel include capping of the impacted area or removal of waste identified within the impacted area. There are two distinct areas of fill material that were observed during preliminary site investigation activities: an area of relatively clean fill (1.9 acres), and an area of unclassified waste material (0.82 acres).
- Capping of the area would include an initial removal of larger debris, re-grading the area and designing and installing a landfill cap in accordance with New York State solid waste management regulations (Part 360). The capping option would require periodic monitoring and inspection of the cap and ground water monitoring.
- The removal option would include excavation and off-site disposal/recycling of soil and debris and backfilling. The removal option would require periodic ground water monitoring only and assumes that monitored natural attenuation of documented ground water impacts is an acceptable option by the NYSDEC. Based on Woodard & Curran (2009) Phase II report, monitored natural attenuation would be an acceptable alternative given the proposed source mitigation.
- The dredged lake material could be used as backfill in either option, if characterization sampling determines that the material is suitable for reuse.

Regulatory Permitting

- The regulatory framework for facilitating the restoration of the nine-acre parcel includes the New York State Environmental Restoration Program (ERP) within the New York State Brownfield Cleanup Program, or the New York State Spill Program. The ERP was developed for municipalities to mitigate Brownfield sites and has an associated grant program; however, currently New York State has not refunded the program. The evaluated remedial options are contingent on approval by NYSDEC and would likely require further investigation/evaluation of the nine acre parcel in accordance with NYSDEC requirements.

Cost

- The cost for the nine-acre parcel restoration is estimated to be approximately $1.3 to $2.9 million dollars (refer to Appendix B: 9-Acre Parcel – Removal Option and 9-Acre Parcel – Capping Option).

Clubhouse

The cost analysis for the former clubhouse indicated that it would be most cost effective to demolish the existing clubhouse in lieu of upgrading to current building code. The previous cost analysis completed in 2008 was revised to reflect 2009 cost. In addition, as indicated by the UOA, the former clubhouse will likely be donated to Habitat for Humanity and is no longer a consideration for the project.

1. INTRODUCTION

In accordance with Task Order No. 2-3, Woodard & Curran completed an evaluation of several key components to the development of a Lake Shenorock Park District. The evaluation included a screening level investigation of Lake Shenorock, evaluating remedial alternatives for the associated nine-acre parcel, historical Lake Shenorock clubhouse mitigation, grant opportunities, and district formation documents. In addition, as part of this evaluation, the Town of Somers requested a cost analysis to determine the financial implications and feasibility of developing a Shenorock Park District.

1.1 PROJECT BACKGROUND

Historically, the UOA of Shenorock, Inc.; a homeowners' organization, owned and operated two beaches at Lake Shenorock. According to the UOA, Lake Shenorock was closed to public swimming circa 1977 because it was being evaluated for use as a supplemental water supply to the Amawalk/Shenorock Water District. In addition, the Nine-Acre parcel, which was operated by the organization for recreational purposes, was also closed at that time. The UOA is actively seeking to have the Town of Somers create a park district to facilitate the proposed Lake Shenorock development and recreation plan, and the remediation of the Nine Acre parcel.

In 2008, the Town retained Woodard & Curran to complete environmental evaluations for each of four parcels that are owned by the UOA, which would be part of the proposed Shenorock Park District. The evaluations completed and summaries are provided below:

- **Phase I Environmental Assessment 34 Lakeview Drive dated April 21, 2008 -** Overall, this Phase I ESA did not reveal evidence of Recognized Environmental Conditions (RECs) in connection with the Subject Property. However, other potential environmental issues associated with the lake portion of the property likely presence of contaminants in the lake from storm water runoff and failing septic systems. This Site is discussed further in Section 2.0.

- **Phase I Environmental Site Assessment (ESA) Shenorock Overhill Road dated April 15, 2008 and Phase II Environmental Site Assessment for the 9-Acre Parcel dated March 19, 2009** – The Phase I ESA for the 9-acre parcel identify the presence of debris at the Site and nearby conditions, which constituted RECs. A Phase II ESA was completed and identified soil and ground water contamination associated with the illegally placed debris at the Site. This Site is discussed further in Section 3.0.

- **Phase I Environmental Site Assessment 34 Hillandale Road dated April 18, 2008 –** This Site is comprised of two lots one of which contains the former UOA clubhouse. Based on the information reviewed for the Phase I ESA report, no RECs associated with the current or historical uses of the Subject Property were identified. However, Woodard & Curran recommended that the Town consider conducting a Building Materials survey of the Club House to understand potential concerns due to the potential presence of asbestos containing material, lead-based paint, and/or mold. This Site is discussed further in Section 4.0.

1.2 OBJECTIVE

The objective of this evaluation is to conduct further investigations to define the feasibility and costs associates with operating the Shenorock Park District, which would include a public beach at Lake Shenorock and the restoration of the nine-acre parcel to a passive park. The evaluation included an investigation of the existing conditions of Lake Shenorock and a review of the associated federal, state, and local regulations required to create a public beach, and the associated cost analysis; remedial alternative analysis and permitting requirements for the cleanup and redevelopment of the nine acre parcel into a passive recreational area.

1.3 SCOPE

- **Lake Shenorock:** Characterize the sediment in the lake to determine the costs associate with dredging and reuse/disposal of the sediment, assess the water quality for compliance with the New York State Department of Health (NYSDOH) requirements, and determine the capital and operational cost to create and operate a public beach.

- **Nine-Acre Parcel:** Develop a remediation strategy and define the cost that would be associated with the remediation/closure of the identified waste materials, and to create a passive recreational use area.

- **Clubhouse:** Identify the costs associated with the demolition and removal of the existing clubhouse, and the cost associated with the restoration of the site.

- **Grant Research**: Review available State, City, and Federal Funding sources that can be used to offset the proposed project costs.

2. LAKE SHENOROCK

Woodard & Curran completed a preliminary investigation of Lake Shenorock to obtain data for evaluating the feasibility of developing the lake into a public beach and recreational area as part of the Lake Shenorock Park District. The following section includes a discussion of existing lake conditions in Section 2.1, a discussion of the field sampling in Section 2.2, and results of the sampling in Section 2.3. In addition, a discussion of the proposed beach development is provided in Section 2.4

2.1 EXISTING LAKE CONDITIONS

As shown on Figure 1, Lake Shenorock is a 15.2 acre lake located within the Croton River watershed (NYSDEC, 2008). According to NYSDEC (2008), the lake is designated class B, suitable for use as a public bathing beach, for general recreation and aquatic life support, but not as public water supply.

As discussed in NYSDEC (2008), Lake Shenorock has been sampled as part of the NYSDEC Citizen Statewide Lake Assessment Program (CSLAP) beginning in 2004 and continuing through the present. An interpretive summary report of the findings of this sampling was published in September 2009 (NYSDEC, 2009). These data indicate that the lake continues to be best characterized as eutrophic, or highly productive, based on low water transparency, and high nutrient (primarily phosphorus) and algae levels. Phosphorus levels in the lake consistently exceed (and often significantly exceed) the state phosphorus guidance value indicating impacted/stressed recreational uses. Corresponding transparency measurements rarely meet what is recommended for swimming beaches. Measurements of pH typically fall within the state water quality range of 6.5 to 8.5. The lake water is moderately to highly color; however, color only influences transparency when algae levels are low.

In addition NYSDEC (2008) report evaluated and considered public perception of the lake. The most recent assessment (2005) indicates recreational suitability of the lake to be highly unfavorable. The recreational suitability of the lake is described most frequently as "slightly" to "substantially" impacted for most recreational uses. The lake itself is most often described as having "definite algae greenness" to "severe algae levels," an assessment that is consistent with measured water quality characteristics. Assessments have noted that aquatic plants rarely grow to the lake surface.

As reported by the NYSDEC (2008), a Watershed Agreement is in place between the New York City Department of Environmental Protection (NYCDEP) and the Croton Watershed communities, which sets forth programs and funding for watershed protection. In addition, NYCDEP has developed phosphorus Total Maximum Daily Load (TMDL) for the entire Croton System Watershed to aid in the management of nutrients. An Implementation Plan for this TMDL is being developed. (NYSDEC, 2008).

Also, Lake Shenorock is not currently included on the NYS 2008 Section 303(d) List of Impaired Waters. However, NYSDEC suggested that based on the August 2008 report data, it is appropriate to include this water body on the 2010 List. It is recommended that a listing for phosphorus be added to Part 1 of the List, indicating a water body with an impairment requiring TMDL development. This is discussed further in Section 3.2.

2.2 FIELD SAMPLING

The sampling program consisted of sediment and water sampling within the lake at select locations. Specifically, sediment and water samples were collected for laboratory analysis and additional field measurements were collected to characterize sediment and water characteristics within the lake

The following section discusses the field sampling methodology utilized during the investigation.

2.2.1 Water Quality and Sediment Field Measurements

Surface water quality field measurements and sediment thickness measurements were collected across the lake between July 1 and August 12, 2009. Data was collected at 38 locations across the lake from a boat and the locations were sited using a GPS Trimble GEO XH with an accuracy of 1 – 3 feet. The data is summarized in Table 1 and the locations are shown on Figure 2. The data collected included the following:

- Water Quality (July 1, 2009) – Water quality measurements were collected at 14 locations that were selected to provide a range of data across the lake. A YSI 6820 was used to collect temperature, specific conductivity, dissolved oxygen (DO), pH, and oxidation-reduction potential (ORP) readings by lowering the instrument to the middle of the water column at each location measured. Water clarity was measured using a Secchi disk. A Secchi disk is an 8-in plastic disk with alternating black and white colored wedges on the surface. The disk is lowered through the water column and the depth at which the black and white separation is no longer discernable is recorded. An average of three readings was recorded at each location.

- Sediment Thickness (July 1, July 27 & August 12, 2009) - Sediment depths were measured at 29 locations as shown on Figure 2. A Secchi disk and 1-in graduated PVC pipe was used to measure the sediment thickness. The measurement procedure included the following:

  - Lower the Secchi disk through the water column until it settles on the top of the loose sediment layer at the bottom of the lake

  - Insert a graduated 1-in PVC pipe through the loose sediment until refusal was achieved to determine the bottom of the sediment. The difference between the depth to top and sediment bottom was calculated to be the sediment thickness. This method of measurement provides a reasonable thickness estimate to within a few inches.

2.2.2 Sediment Analytical Sampling

Discrete sediment samples were collected for laboratory analysis on July 1, 2009 from five locations shown on Figure 2 (SED-1 through SED-5). The locations were selected based on the current conceptual beach design discussed further in Section 2.4. Specifically, the sediment sampling locations were selected to provide data from the two areas proposed for development within the lake including the proposed swimming area and proposed dock area, which are two potential dredging areas. The sediment samples were selected to provide preliminary data on the sediment quality for potential reuse and/or disposal as part of the beach development process.

A nine square inch Petite Ponar dredge was used to collect the samples and the sediment was dewatered to the extent practicable using cotton filter fabric.

2.2.3 Water Analytical Sampling

Surface water grab samples were collected on July 1, July 27, and August 12, 2009 from five locations shown on Figure 2 (SW-1 through SW-5). Locations were selected to provide information on the two priority areas: the beach and dam areas. Samples were collected by submerging unpreserved laboratory bottle into the lake; however, sample bottles with preservatives were filled with a separate bottle.

2.2.4 Analytical Program

Samples collected were sent to Alpha Analytical, Inc. located in Westborough, MA; a New York State certified laboratory. Laboratory reports are provided in Appendix A. The analytical program included the following:

- Surface Water Samples
  - July 1, July 27, and August 12, 2009 -Total Coliform by Standard Method for the Examination of Water and Wastewater (SM) 18/SM 9222B and fecal Coliform by SM18/SM 9222D.
  - July 1, 2009 - total and soluble phosphorus by SM 4500P-E.
- Sediment Samples (July 1, 2009)
  - Volatile Organic Compounds - Target Compound List – USEPA Method 8260B
  - Semi-Volatile Organic Compounds - Target Compound List – USEPA Method 8270C
  - Metals - Target Analyte List – USEPA Method 6020A and USEPA Method 7474 for mercury
  - Polychlorinated Biphenyls – Target Compound List – USEPA Method 8082
  - Pesticides -Target Compound List – USEPA Method 8081A
  - Herbicides – Target Compound List – USEPA Method 8151A(M)
  - Total and soluble phosphorus – SM 4500P-E

2.3 RESULTS

The following section discusses the results of the lake sampling program including a discussion of the sediment thickness evaluation in Section 2.3.1, a discussion of the sediment analytical results in Section 2.3.2, and a discussion of the lake water sampling results in Section 2.3.3.

2.3.1 Sediment Thickness Results

A sediment isopach map is provided as Figure 2 and the thicknesses are also summarized in Table 1. The average sediment thickness is 15.5 inches and the thickness ranges from seven inches to 40-inches. The isopach map, Figure 2, indicates that there are three areas of thicker sediment deposits within the lake including the northeast (proposed beach area), southwest (tributary inlet) and southeast (upstream of dam) quadrants. As shown on Figure 2, the sediment thickness in the beach area ranges from one foot to 1.92-feet, with an estimated in-situ sediment volume of 30,488 cubic feet (1,129 cubic yards). Sediment thicknesses in the dam area range from 0.67-feet to 1.83-feet with an estimated in-situ sediment volume of 26,623 cubic feet (986 cubic yards). The total sediment volume for Lake Shenorock is estimated at 655,648 cubic feet (25,000 cubic yards).

2.3.2 Sediment Analytical Results

The analytical results from sediment sampling are summarized in Table 2. As shown on Table 2, the following constituents were detected in the sediment samples:

- *Volatile Organic Compounds: Acetone, 2-Butanone.*

- *Semi-volatile Organic Compounds: Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)Pyrene, Phenanthrene, Fluoranthene, Pyrene, Benzo(a) Anthracene, bis(2-ethylhexyl)phthalate, and benzo(ghi) perylene.*

- *Pesticides: 4,4'-DDD, 4,4'-DDE, 4,4-DDT, cis-chlordane, trans-chlordane, and Dieldrin.*

- *Polychorinated Biphenyls: Aroclor 1254.*

- *Metals: All 23 Target Analyte List metals.*

2.3.2.1 Sediment Reuse Evaluation

The analytical results for the sediment was compared to the New York Technical and Administrative Guidance Memorandum (TAGM) 4046, "Determination of Soil Cleanup Objectives and Cleanup Levels" and Brownfield and Superfund Regulation 6 NYCRR Part 375-6, Soil Cleanup Objectives (SCO) to determine the potential for reuse.

TAGM 4046 was designed for the determination of cleanup levels at Inactive Hazardous Waste Sites and was consolidated with other criteria for petroleum and spills sites (NYSDEC, 2000). The SCO criteria were developed for Brownfield and State Superfund Sites and have several components including protection of human health, protection of ground water, and protection of ecological resources. The applicability of the various criteria correlates to the intended future use of the subject site, for which the material is intended to be reused. Therefore, the criteria include Residential, Restricted Residential, Commercial and Industrial uses, which are protective of human health. Unrestricted Use accounts for the protection of ground water and ecological resources where as the Residential, Restricted Residential, Commercial and Industrial criteria are still subject to the protection of ground water and ecological resources criteria. The sediment data was compared to TAGM and SCO criteria for screening purposes to determine potential reuse options upon removal of the sediment from the lake and these criteria are not applicable for evaluating in-situ surface water sediment deposits.

As shown on Table 2, there are several detected constituent concentrations that exceed the TAGM 4046 and/or the SCO criteria. Based on the sediment data collected, the dredged sediment has the appropriate quality to reuse the material for the Nine Acre remediation provided it is placed beneath a cap. The type of cap would be considered in consultation with the NYSDEC. The purpose of the cap is to render the material inaccessible, which will be protective of human health and ecological resource. In addition, the cap would prevent leaching of constituents, which would be protective of ground water. Risk analyses, determination of site-specific criteria, engineered controls, and institutional controls (i.e., deed restrictions) are also viable options to be used in conjunction with the established numeric soil criteria to mitigate impacts to soil and/or ground water.

In a complete removal option at the Nine Acre parcel, the dredged sediment may be reused as backfill; however, further characterization sampling would be required once the final volume of sediment is accumulated to determine suitability as backfill material. Either reuse scenario is subject to approval by the NYSDEC prior to implementation.

2.3.2.2 In-Situ Sediment Quality Evaluation

NYSDEC has available two guidance documents related to the evaluation of sediment chemical concentrations:

- The NYSDEC (1999) Technical Guidance for Screening Contaminated Sediments specifies numeric criteria protective of human health, benthic invertebrates and wildlife for non-polar organic constituents (Table 1 of NYSDEC 1999) and criteria for two levels of risk for metals/metalloids (Table 2 of NYSDEC 1999). This

guidance document serves the purpose of evaluating sediment contamination with respect to waste site assessment and remediation.

- NYSDEC's 2004 Technical and Operational Guidance Series (TOGS) 5.1.9, In-Water and Riparian Management of Sediment and Dredged Material (November 2004) specifies Sediment Quality Threshold Values (SQTVs) for Dredging, Riparian and In-water Placement (Table 2, NYSDEC 2004). This document provides three types of numeric thresholds (Class A, B and C) that determine how sediments will be classified and handled subsequent to dredging/excavation activities. Sediments with chemical concentrations below Class A thresholds are presumed to contain "no appreciable contamination".

As shown on Table 4, the concentrations of constituents detected in sediment samples collected from Lake Shenorock were compared to both Class A SQTVs and the sediment criteria from the NYSDEC 1999 document.

- Concentrations of polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), pesticides (DDD, DDE) and metals (arsenic, cadmium, chromium, copper, lead and zinc) exceeded one or more of these sediment benchmarks, suggesting that there exists some baseline level of sediment contamination in this water body.

- Further assessment of the sediment is warranted to determine the nature and extent of impacts, potential sources of contamination, and potential human health and ecological risks that may result from sediment exposure.

As discussed in NYSDEC (1999), the detection of constituents exceeding the SQTV's does not necessarily require remediation. In addition, as discussed in NYSDEC (2008), Lake Shenorock is documented to be an impaired water body, which has been impacted by urban storm water runoff, and possible agricultural impacts and is consistent with the data presented in Table 2. The detected constituents include PAHs, which are significant constituents of asphalt and petroleum, pesticides from residential and/or historical agricultural applications, and PCBs from transformers releases and other sources.

2.3.2.3 In-Situ Sediment Phosphorous Evaluation

As indicated in NYSDEC (2009), Lake Shenorock is highly eutrophic as a result of phosphorous contribution from various sources including failing septic systems and fertilizer application. Sediment phosphorous concentrations were analyzed to determine concentrations that exist in the sediment content within the lake sediment. An estimate of phosphorous mass within the lake was completed to determine the implications of dredging with respect to the NYCDEP TMDL requirements as part of the Federal Clean Water Act.

As indicated on Table 2, the water content for the sediment samples collected from Lake Shenorock is approximately 70 percent (i.e., 30 percent solids), which results in an average bulk density of 47 pounds per cubic foot. As indicated in Section 2.3.1, the total amount of sediment in the lake is 655,648 cubic feet. Assuming an average phosphorous concentration of 1,500 milligrams per kilogram (mg/kg) from Table 2, the calculated phosphorous mass in the sediment as the bottom of the Lake is approximately 13,800.

2.3.3 Water Analytical Results

The analytical results from water sampling are provided in Table 5 and are summarized as follows:

- Total coliforms results ranged from non-detectable values to 1900 colony forming units per 100 ml (CFU/100mL).

- Fecal coliforms results ranged from non-detectable values to 80 CFU/100 mL. No exceedances were found when comparing the fecal coliform results to the NYSDOH standards for bathing beaches (NYSDOH, 2004).

- Total phosphorus results ranged from 49 ug/l to 113 ug/l. Soluble phosphorus results ranged from 16 to 21 ug/l. The total phosphorous concentrations are consistent with the findings in NYSDEC (2009) and are above the water quality criteria of 20 ug/l.

Field water quality measurements are provided in Table 1. As required by the NYSDOH standards, clarity was achieved to a minimum of four feet, in locations where water height exceeded four feet. Water quality parameters are consistent with NYSDEC (2009) where specific conductance measurements indicate hard water conditions (i.e., > 300 micromohs per centimeter). The pH measurements indicate slightly basic conditions with an average pH measurement of 8.15.

2.4 BEACH DEVELOPMENT

The development of a public beach requires compliance with Chapter I, Subpart 6-1 of the State Sanitary Code for Bathing Beaches and ultimately permitting approval from the Westchester County Department of Health (WCDOH). The application process for obtaining approval of the beach development and the design requirements that will dictate the beach design are summarized below. Furthermore we have outlined the several operation and maintenance requirements to comply with WCDOH regulations.

2.4.1 Design Requirements

The following section discusses the beach design requirements in accordance with NYSDOH regulations.

2.4.1.1 Sanitary Survey

As discussed above in Section 2.3, preliminary water and sediment investigations were completed to assess the current quality of the lake; however, in accordance with the NYSDOH regulations, a comprehensive Sanitary Survey will be required to provide the reviewing agency with an assessment of the physical characteristics, and the biological and chemical quality of the lake. Other components of the Sanitary Survey include, but are not limited to the following:

- Additional water quality, bacteriological testing, and biological evaluation.

- A historic records search to evaluate the weather and topographical influences during bathing seasons and also determine water level variations.

- A map depicting the watershed including existing waste-water discharges, landfills, adjacent land use, major physical contours, highways, etc. All potential sources of pollution and waste-water discharges must be shown.

- A scaled map showing the actual bathing beach location, dimensions, contours, existing land use, wastewater discharges within 10,000 feet of proposed beach.

- Data documenting seasonal or anticipated water level variations.

- A summary listing of type and size of existing and potential sources of contamination. This includes description of volume occurring only with specific weather conditions, and the concentration of the materials

in the effluent that might impact the beach. The potential for contamination during and after storm events must be included.

- A description of prevailing wind direction during bathing season, rainfall, current measurement, topography, or unusual factors.
- A history of bacteriological quality, pH, and turbidity of the body of water from all possible sources. This will be completed by collecting and analyzing data over a one year period. The results of at least one set of representative bacterial samples, pH tests, and turbidity tests each week for a period of eight weeks shall be included. Eight sets of samples shall include at least one set after heavy rains consisting of daily samples for a 5-day period.
- The physical and chemical quality of water, including objectionable color, odor, taste, and other negative substances and any historically related problems.
- The biological quality of bathing area water, including objectionable vegetation, infectious snails, and poisonous or dangerous aquatic organisms.
- Location of boat traffic, marinas, boat dockage area, canoeing, or fishing activity.
- Location, flow rate of auxiliary water source to augment low flow.

The Sanitary Survey will commence once the Park District is created.

2.4.1.2 Beach Layout

The elements that will be included in the proposed public beach are illustrated on the existing concept plan previously prepared by Woodard & Curran in April 2008 (Figure 3). Based on recent discussions with the Town and UOA representatives, this concept plan is the most current representation of the facilities and layout of the proposed public beach. However, based on initial investigations of the Lake and the stipulations set forth in the State Sanitary Code, some minor modifications will be required including:

- Removal of the floating dock/pier - Based on the preliminary investigation of the lake, the water depth is inadequate to safely accommodate a floating dock.
- Extension of the swimming area - After conducting initial sediment thickness and water depth measurements, it will be necessary to extend the swimming area an additional 50 feet from the originally defined roped area, to allow the swim area to reach water depths greater than 2 feet.

2.4.1.3 Beach Facilities

As part of the application process the Town must provide a final approved plan detailing the beach facilities and development activities. This will require coordination with the Town of Somers and Shenorock Park District to refine the location and preferred design features and anticipated usage of the proposed public beach. The plans will be based on the existing concept plan as shown on Figure 3. Some of the specific design elements that will be required include:

- Bather Density - There is a maximum of 1 bather per 25 square feet of water surface in shallow water (<4 ft) and 1 bather per 75 square feet for deep water (>4 ft).
- Beach Area - At least 35 square feet of land area per bather is required.
- Slope - Slope shall be uniform and not exceed 1:10 (for depths <4ft) and 1:3 (for depth >4ft).

- Swimming Area Substrate - The swimming area bottom up to a water depth of 6 ft shall consist of sand, pea gravel, or similar.
- Water Currents - Water currents in bathing area shall not exceed 3 ft/second.
- Water Chemistry Quality - The water shall be free of chemicals capable of toxic reactions and skin or membrane irritations.
- Water Quality – Aeration system or similar system shall be provided to help maintain water quality.
- Clarity - Clarity tests should be performed at a 4 ft depth in the bathing area at a minimum of 3 different locations. A map depicting test locations, dates of sampling, and current conditions should be submitted.
- Wiring - Wiring shall conform to NYS Uniform Fire Prevention and Building Code and a certificate shall be submitted for all new work. No electrical wiring shall pass within 20 ft horizontally of the bathing beach water line.

Based on these design requirements and the available beach and swim areas estimated from the "Conceptual Beach Layout" Plan (Figure 3), the following bather capacity was derived:

Design Capacity per Conceptual Shenorock Beach Layout		Potential Bather Capacity Per Available Land/Swim Area	
Swim Area (Square Feet)	12,500	Maximum Bathers per Swim Area	500
Proposed Land Area (Square Feet)	6,000	Maximum Bathers per Existing Land Area	171

As shown on the table above, the current conceptual beach design will accommodate up to 171 bathers as a function of available beach land area, which is the controlling factor within the current conceptual design.

2.4.1.4 Bathhouse

As part of the creation of a public beach, adequate hand washing and toilet facilities are required in accordance with the State Sanitary Code. As indicated in Section 2.4.1.3, the allowable maximum daily usage of the beach facility is 171 people. To adequately accommodate 171 people, approximately one male and one female lavatory will be required, with two or three toilet stalls in each facility and a hand washing station. This was determined using 2006 New York State Plumbing Code requirements for "arenas, skating rinks, pools and tennis courts", assuming pools have similar restroom facility use as bathing beaches.

Currently, there are no existing municipal sanitary sewer systems within the vicinity of the site and area wastewater is currently managed by septic systems. Based on existing site constraints identified on the proposed beach development, construction of a septic field is not feasible due to limited land area. In accordance with the Code, when municipal sewerage systems are not available, a suitable substitute system will be required and the alternative will require approval by the State Commission of Health or other approving agency.

It is anticipated, that with a 171 people, a maximum daily usage of 1,700 gallons will be required to accommodate all waste-water from the bathhouse. This number is based on a 10-gallon per day, per capita from the 1988 NYSDEC Standards. Possible alternative systems that could be implemented to treat the waste-water include:

- Composting Toilets: Composting toilets utilize an aerobic processing system that treats waste, typically with no water or small volumes of flush water, via composting or managed aerobic decomposition. Composting toilets alleviate the need for water to flush toilets, to avoid discharging nutrients and/or potential pathogens

into environmentally sensitive areas. However, with this option the sink water, or grey water, would have to be treated separeatly through the use of a seepage pit or tank.

- Evapotranspirative Toilets: Evaporator toilet system uses mechanical ventilation to substantially reduce the volume of waste introduced into the system. An electronically powered blower within the vault produces high air movement to evaporate the liquid waste, which exits through a vent pipe that runs from the subsurface vault to the roof. The continuous air movement allows the system to remain aerobic, which greatly reduces odor issues. The evaporator toilet system does not require the water usage of a conventional toilet system. Due to the substantial volume reduction of waste entering the vault system, it requires substantially less maintenance than a traditional compost toilet system.

- Holding Tank: The installation of a holding tank could contain both the sink and toilet waste water. It would need to be of adequate size to hold more than the anticipated daily usage of 1,700 gallons, and would also require that the tank be periodically pumped by a disposal company.

2.4.2 Water Quality

As discussed in Section 2.3.3, the lake water quality is impaired by nutrient loading and associated algal blooms and weed growth. Based on findings from the NYSDEC (2008), Lake Shenorock has been recommended for listing on the New York State Section 303(d) List of Impaired/TMDL Waters in 2010. Woodard & Curran contacted a representative from the NYSDEC Division of Water to determine the implications of a Section 303(d) listing on the proposed beach development. The NYSDEC indicated that the Section 303(d) listing would not affect the classification of the lake; therefore, the listing will not impede the proposed development of a public beach. The listing will require that the lake comply with Section 303(d) of the Federal Clean Water Act and must consider the development of a Total Maximum Daily Load (TMDL) for phosphorous or other strategy to restore and protect the water body.

A TMDL specifies the allowable pollutant loading from all contributing sources (e.g., point sources, non-point sources, and natural background) at a level necessary to attain the applicable water quality standards. The TMDL considers seasonal variations and a margin of safety that takes into account any lack of knowledge concerning the relationship between the sources of the pollutant and water quality. In essence, a TMDL defines the assimilative capacity of the water body to absorb a pollutant and still meet water quality standards (NYSDEC).

In order to improve the lake water quality to meet the NYCDEP TMDL discussed above and NYSDOH in Section 2.4.1.1, engineered controls would be required. Lake management activities to reduce algae or weed growth will need to address watershed inputs of nutrients, specifically phosphorus, and sediment to the lake as they both contribute to algal blooms and excessive weed growth. The conceptual approach would include the following:

- ***Initial Removal*** - Manual removal of the existing algae blooms will be the first step in mitigation. This can be completed during the sediment dredging activities. The same procedures that are used to remove sediment from the bottom of the lake can also be applied to the algae blooms located at the water surface. Dredging activities will provide immediate improvements to the overall quality of the lake.

- ***.Implementation of Best Management Practices (BMPs)***: As indicated in NYSDEC (2008 and 2009) non-point source storm water runoff reaching the lake is one of the major contributors of elevated phosphorous levels. Particulate bound phosphorus enters the lake through sediment contained in the storm water runoff. Based on existing site conditions, it is very difficult to quantify the entry points of overland flow to contain and treat the storm water prior to discharging into the lake. Some preventative measures, which will to the maximum extent practical reduce sediment discharge include:

- Establishing vegetative filters and buffer strips and wetland mitigation plantings to reduce overland flow sediment contributions, promote pollutant uptake, and provide filtration

- Filtration of stream inlet to reduce/control the amount of sediment/nutrient loading to the lake.

- Enhanced inlet BMP's along with an aeration system will continue to maintain the level of nutrients and sediment build up over time.

- ***Lake Aeration System***: A lake aerator is an inversion system that provides the natural control of lake weeds and algae while improving water quality. This is accomplished by aerating, circulating and de-stratifying the water column. Lake aeration provides many benefits when there is an excessive increase in nutrient inflow that disrupts the ecosystem of the lake. The increase in oxygen supplied by the aerator boosts the amount of fish and other aquatic animal habitats. It also controls weeds and algae, thereby improving water quality. The improved water is then suitable for swimming and boating as well. There are several types of technologies that can be utilized to accomplish this aeration including typical pumping of water to create currents and ultrasonic devices, which disperse the algae and resists blooms.

If the lake is added to the 2010 list of impaired water bodies for phosphorus, requiring TMDL development, up stream controls will be a required component as a primary means of reducing runoff volumes and associate pollutant loads. Any new development will be required to include storm water management practices to reduce total loads of phosphorus generated from a particular site. This will ultimately contribute to improved downstream conditions of the lake and increase water quality efficiency.

2.4.3 Dredging

As discussed in Section 2.3.1, approximately 2,000 cubic yards of the 25,000 cubic yards of in-situ sediment that exists within the Lake was identified for removal in the proposed beach and dam areas to facilitate the beach development. In addition, approximately 25,000 cubic yards of sediment was identified within the entire lake. Conceptually, the proposed dredging operation would involve the removal of sediment from the lake and depositing the sediment in a designated staging area where the sediment will be allowed to gravity drain and dry. Dredging options include mechanical processes and vacuuming. The vacuuming option is less disruptive to the ecosystem.

Based on previous experience and the known moisture content (Table 2), upon removal and drying of sediment approximately 25 percent or approximately 450 cubic yards of the original 2,000 cubic yards will remain for disposal and/or reuse. The dredging operation would be completed contemporaneously with the remediation of the nine-acre parcel, which will facilitate the reuse of dredged sediment as an intermediate cover material as part of a capping of impacted soil areas contingent upon the NYSDEC approval. Additional characterization sampling of the dredged sediment will be required to facilitate the reuse and/or off-site disposal of the dredged sediment.

2.4.4 Permitting

The final beach development application submitted to the WCDOH will require approval and permitting to operate a public beach. Concurrently, before dredging activities can begin, the Town will be required to obtain a Protection of Waters Permit from the NYSDEC and the ACOE for excavation and fill in navigable waters. Due to the presence of National Inventory Wetlands adjacent to the lake (Figure 2), further coordination with the NYSDEC will need to be conducted, including a field verification of jurisdictional wetland requirements by NYSDEC personnel to ascertain whether a NYSDEC Freshwater Wetlands Permit will be required for these activities. In addition a jurisdictional request would also be required from the Army Corps of Engineers (USACE) to determine if a wetlands permit would

be required. Because the lake is within a NYCDEP watershed and depending on the final limits of disturbance, a permit from the NYCDEP will also be required.

2.4.5 Operation & Maintenance

There are several provisions associated with the annual operations and long term monitoring of a public beach in accordance with WCDOH requirements. The Town will need to designate an operator responsible for periodic water quality monitoring, completing daily reports on beach operations, supplying supervisory personnel, and maintaining the beach facilities. The beach administrator/operator must also develop, update, and implement a beach safety plan that shall be approved by the permit-issuing official. Supervisory personnel are required for the protection of the beach patrons as well as maintaining lifesaving equipment and safety lines at all times. Additional operation and maintenance tasks would include overall maintenance of the property landscaping and proposed lake aeration system.

3. NINE-ACRE PARCEL

3.1 EXISTING CONDITIONS

The Nine-Acre Parcel is located on Overhill Road in the Town of Somers, Westchester County, New York (Figure 1). The current owner of the Subject Property is listed as the United Owners Association of Shenorock, Inc. The Parcel is approximately nine acres in size. Currently, no structures are present on the parcel. However, solid waste from past unauthorized dumping in the form of cars, construction and demolition debris, washing machines, dryers, and tires exists at the Subject Property. As indicated in Woodard & Curran (2009), there are two distinct areas of fill material that were identified during site investigation including an area of relatively clean fill (1.9 acres), and an area of unclassified waste material (0.82 acres). The total area occupied by the solid waste and fill material is approximately 2.7 acres. The 2.7 acre area is referred to herein as the "Study Area". The remainder of the Subject Property is undisturbed wooded land. Plum Brook, a tributary to the Muscoot Reservoir, runs along the eastern portion of the Subject Property.

The historical uses of the Subject Property were derived from historical Sanborn maps, historical aerial photographs, and an interview with Dennis DiSanto, UOA Board President. Historic use of the property includes a baseball field and park. The current neighboring properties are predominantly residential in nature with areas of wooded open space to the north and east of the study area.

3.2 PROPOSED REMEDIAL OPTIONS

While some ground water and surface water contamination was identified at the Study Area, it does not appear to be an immediate risk to human health or the environment at this time. The majority of the Contaminants of Concerns identified during the Phase II Environmental Site Assessment (Woodard & Curran, 2009), marginally exceed the applicable guidance values or standards and there are no users of ground water or surface water in the immediate area of the Subject Property.

Onsite soils represent a potential exposure pathway to trespassers or other unauthorized users as the Study Area is unsecured. Additionally, the presence of rusted cars and appliances on the surface of the soils represents a physical hazard to trespassers or other unauthorized users.

As part of the overall Shenorock Park District formation plan, the UOA would donate the nine-acre parcel to the Town; however, mitigation of the environmental condition at the property would be required as part of the district formation. Select remedial options were evaluated for the nine-acre parcel to mitigate the environmental conditions; however, the regulatory mechanism for completing the nine-acre parcel remediation requires further evaluation in consultation with the NYSDEC. Possible regulatory programs that the restoration could be completed within include:

- ***The Brownfield Cleanup Program (BCP)*** - Specifically, the Environmental Restoration Program (ERP) component of the BCP program for municipalities; however, the program is currently unfunded by the State. The eligibility requirements include criteria that the applicant can be a municipality acting independently or in conjunction with a community based organization; however, either entity has not caused or contributed to the release or threatened release of hazardous substances at the site. Based on this criteria, the UOA would have to transfer the property to the Town. The Town does not have to own the property before the NYSDEC reviews/approves the application; however, the Town must own the property prior to the approval of the State Financial Assistance Contract.
- ***New York State Spill Response Program*** – This includes petroleum releases covered in Article 12 of NYS Navigation Law and the Petroleum Bulk Storage Regulations (6 NYCRR Part 613.8), Chemical Bulk Storage Regulations (6 NYCRR Part 595, 596, 597), and Article 17 of the Environmental Conservation Law.

- **New York State's Solid Waste Management Regulations (6 NYCRR Part 360)** – Because of the volume of debris, the Solid Waste Management Regulations provides guidelines for managing the waste area as a landfill. Applicability of these regulations to the conditions at the nine-acre parcel requires further evaluation in conjunction with the NYSDEC. Currently, the NYSDEC is amending and revising the regulations, which includes technical amendments and clarifications, as well as updated language due to legal and policy developments.

To prevent exposure and to limit the migration of contaminants, remediation of the nine-acre parcel will be required. The selected remedial options are limited to either capping or removing the extent of waste and associated impacted soil. A discussion of the conceptual remedial options is provided below. For purposes of estimating the remedial cost, the total area requiring capping or removal was estimated as 0.82-acres (i.e., approximately 36,000 square feet), which corresponds to the more impacted area where the debris exists. Also, the removal option is based on an average excavation depth of approximately three feet over the 0.82 acres, which represent an approximate volume of 4,000 cubic yards (i.e., approximately 6,000 tons).

3.2.1 Capping

Capping of the materials would be conducted in accordance with the NYSDEC standards for landfills under subpart 363 for landfills. Construction of a solid waste cap would consist of the following units to achieve at least a two-foot thick cap:

- Vegetative Support Layer -Topsoil
- Vegetative Support Layer – Cover Soil
- Drainage Geocomposite
- Geomembrane Barrier Layer
- Subgrade/Gas Venting Layer

Placement of the soil components of the cap will involve observation, testing, and/or documentation of several parameters such as soil properties and layer thickness. The project also includes gas vents, drainage channels, stormwater management structures, erosion control, and associated earthwork which will be required to meet various performance criteria. As part of the capping process, select materials like the larger metallic objects (e.g., cars) would be removed and recycled/disposed off-site. Also, as discussed previously in Section 2.3.1 and 2.4.3, the dredged materials from Lake Shenorock would be utilized for intermediate grading material under the cap.

Additional components that may be required with the installation of a cap include installing a fence around the capped materials (engineered controls/site security), and instituting land use restrictions (institutional control). Periodic operation and maintenance of the subject property including inspecting and maintaining the cap and fence to ensure that it remains effective, inspecting and monitoring institutional controls, and ground water sampling to assess the effects of the source control action and any ongoing impacts from the capped materials will also be required.

Additional administrative and investigative tasks that would be required include the following:

- The BCP/ERP required pre-application process.
- Completion of additional site investigation in accordance with BCP/ERP requirements.
- Development of a remedial action work plan, quality assurance plan and site specific health and safety plan.
- Cap design including engineering drawings and specifications.
- Execution of a citizen participation plan within the ERP.

3.2.2 Removal

If removal is selected as the remediation approach for the nine-acre parcel, regulations and specific procedures will have to be followed related to the handling, storage and disposing of soil at the site that may contain constituents of concern. At a minimum, the soil removal activities will need to be conducted in accordance with the applicable federal, state and local regulations including:

- The Resource Conservation and Recovery Act (RCRA) of 1980 as amended by the Hazardous and Solid Waste Amendments (HSWA) of 1984;
- The Toxic Substances Control Act (TSCA) 40 CFR 761-763; and
- U.S. Department of Transportation (DOT) Hazardous Materials Regulations (49 CFR 171-180).

Specific procedures that will be required for the removal option include:

- Excavation – The impacted area as discussed in Woodard & Curran (2009) would be excavated and stockpiled. Stockpiles would require management utilizing best management practices to prevent the spread of potentially impacted soil and debris.
- Segregation – To the extent practicable, select debris would be segregated from the soil and stockpiled separately for off-site disposal/recycling.
- Waste Characterization – Prior to removal from the subject property, all waste materials would require proper characterization for off-site disposal/recycling.
- Post-Excavation Sampling – Once the excavation process is completed, post excavation samples would be required to document the soil conditions, which would ensure that impacted soil was effectively removed from the subject property.
- Site Restoration – Re-grading and backfilling of the excavated areas with certified clean fill would be completed once the post-excavation sampling indicates that adequate removal was completed. As discussed previously, if demonstrated through additional characterization sampling that the dredged sediment from Lake Shenorock is acceptable, it can be utilized as part of the backfilling and regarding process.
- Post-Remedial Monitoring – Once the area is remediated, periodic post-remedial ground water monitoring would be required. This option assumes that NYSDEC will accept a natural attenuation option for the remediation of documented ground water impacts.

The additional administrative tasks discussed above in Section 3.2.1 also apply for the removal option.

4. CLUBHOUSE

4.1 EXISTING CONDITIONS

As you are aware, we have previously evaluated the existing conditions of the clubhouse and have prepared conclusions and costs estimates for the Town's use in evaluating the creation of the Shenorock Park District; which includes the transfer of ownership of the Shenorock Clubhouse and parcel to the Town. We have updated these cost estimates to account for construction cost escalation. However, based on recent discussions with the Town, it is our understanding that the UOA is considering other options such as donating the former clubhouse to the Habitat for Humanity program.

4.2 PROPOSED MITIGATION OPTIONS

4.2.1 Continuation of Existing Use

This option is for ongoing use of the clubhouse under UOA ownership. For the structure to be in compliance with current codes, the Town would need to complete modifications to the structure, upgrade systems, as well as complete additional investigation to better define the structural improvements and environmental remedies to the noted conditions. This was outlined in our memorandum to the Town dated July 2008. The building modifications for full compliance are significant and will result in a significant cost. The cost to complete the activities required for continued use and bring the building into compliance are detailed in total $170,000 to $200,000, not including additional costs associated with the structural and environmental issues that require further investigation. It should also be recognized that these estimated costs are subject to increase if further heating and cooling upgrades are desired.

4.2.2 Change in Use

In addition to the activities and upgrades required to support the continuation of the existing use under Town ownership, other activities will be required in the event the use is changed. These include permitting the new use at the Town level (Site Plan) and with the WCDH and the NYCDEP (Septic). We anticipate that expansion of the site use will require a wholesale replacement of the septic system, and the creation of parking in accordance with the use. The additional cost associated with the permitting activities, septic system replacement, and creation of parking is estimated to be $100,000 to $150,000.

4.2.3 Demolition and Removal

Given the amount of renovations, upgrades, and additional investigations required to have a building compliant with current codes the Town should consider demolition and disposal of the building, and if desired, the re-permitting of a new use. Although the building can be brought into compliance with current codes, the Town should understand that the site will be a limiting factor for an expanded Town use and that the building size may be out of balance with the ability of the site to accommodate it (depending upon the use). If the demolition and reconstruction option is chosen by the Town, the site could be planned to include the requisite parking and the building constructed to all codes thus providing a long term solution for the chosen use. Alternatively, the site could be planned to be a park, playground, or other recreational facility to the benefit of the Park District. The estimated cost to demolish and dispose the existing building is approximately $35,000 to $50,000, including the demolition and backfill of building's foundation and disposal of materials. The redevelopment costs would depend upon the alternative chosen by the Town.

5. GRANT AND FUNDING OPPORTUNITIES

Based on the current conceptual site development plan, the nine-acre parcel, and the overall development of a Shenorock Park District, available grants and funding sources that are applicable to the improvements and goals for the District were researched. Each grant has requirements and rating criteria aimed at supporting specific project objectives. In the event that the Town decided to pursue these grants we have illustrated how each aspect of the overall scope of work is compatible with the available funding. A summary table of grants is provided in Table 6 and is discussed further below.

5.1 LAKE SHENOROCK DEVELOPMENT

The following is a discussion of potential grants related to the development of Lake Shenorock.

- **NYC Watershed Protection Program:** The NYSDEC provides funding for water quality improvement projects addressing protection and enhancement of the quality of source waters of the New York City (NYC) water supply system through the NYC Watershed Protection Program. One of the highest priorities of this program is pathogen and phosphorus reduction initiatives. Based on information obtained from our recent water quality sampling activities, and if Lake Shenorock is included on the 2010 NYSDEC list of impaired/priority water bodies with an emphasis on phosphorus reduction, we would be able to promote this project under the NYC Water Quality Improvement Project (WQIP) Programs.

- **The New York State Statewide Grant Program:** provides funding for projects demonstrating direct environmental benefits that will help reduce polluted runoff, improve water quality and restore habitat in New York State waters. Of the three grant applications that fall under this program we would be most applicable to the "Non-point Source Abatement & Control/Aquatic Habitat Restoration" Application. Under this grant, the applicant is required to demonstrate he water quality and/or aquatic habitat problems that the project will address (e.g., the name and value of the affected waterbody (ies); the water quality and/or aquatic habitat problem; the name of the priority pollutant(s) or disturbance(s) causing the impairments; the source(s) of priority pollutants or disturbances causing the impairment; The expected environmental benefit (e.g., the extent to which a water quality and/or aquatic habitat problem will be addressed by the project).

- **New York City Watershed Protection Grant Program**: provides financial assistance for projects that protect and enhance the quality of source waters of the New York City water supply system. Funding is limited to projects within the geographic boundary of the New York City Watershed. Applications are accepted on a continuous basis. Projects eligible under this program must build on watershed protection efforts that help to improve water quality while enhancing and preserving the economy and rural character of local communities. Pathogen and phosphorus reduction will be considered as high priority under this program. Secondary priorities include projects aimed at protect, restore, enhance, or reduce impairments to aquatic habitat (this includes, but is not limited to, non-point source pollution projects providing stream bank erosion control or reduction of nutrients, suspended solids, herbicides, and pesticides, and habitat restoration projects). Eligible types of projects are Non-Point Source Abatement and Control; Assessment, Planning and Research; and Outreach and Education. Projects must build on watershed protection efforts that help to improve water quality while enhancing and preserving the economy and rural character of local communities.

5.2 NINE-ACRE PARCEL

Based on the result of the environmental site assessment of the nine-acre parcel, we have determined that the property may be eligible for the EPA Brownfield Program and/or NYSDEC Brownfield Cleanup Program. These

programs are aimed at providing funds to empower communities to prevent, assess, clean-up, and reuse Brownfield sites. We have determined two grants that meet this project needs:

- **EPA Brownfield Program**: EPA provides Brownfield's funding for three types of grants, one of which applies directly to the Shenorock Site: Brownfield's Cleanup Grants. The Cleanup Grant provides funds to carry out cleanup activities at a specific Brownfield site owned by the applicant. Proposals will be evaluated, among other factors, on the extent to which the applicant demonstrates: economic and environmental needs of the targeted communities; a vision for the reuse and redevelopment of Brownfield sites and the capability to achieve that vision; reasonable and eligible tasks; partnerships and leveraged resources necessary to complete the project; and economic, environmental, health, and social benefits associated with the reuse and redevelopment of Brownfield sites.

  Before Grant applications are even considered for ranking, they are first reviewed for compliant with the applicable threshold criteria which are a pass/fail review. We are confident that the nine-acre Parcel Project proposed site meets the requirements of the threshold criteria. If the threshold criteria is met, the application will be evaluated and scored by specific ranking criteria which includes: Community need, feasibility of success (projects that can demonstrate firm commitments for additional funding for cleanup will be viewed more favorably), project benefits (outcomes that promote general welfare through the improvement of the public), economy, environment.

- **NYSDEC Brownfield Program:** Provides municipalities with financial assistance for site investigation and remediation at eligible Brownfield sites. Projects will be evaluated on environmental and economical benefit, potential for public use and availability of other funds. New York State municipalities are eligible. The municipality must own the property and cannot be responsible for the contamination. The purpose must be to investigate **or** remediate hazardous substances or petroleum on the property. The property cannot be listed as a Class 1 or 2 sites on the New York State Registry of Inactive Hazardous Waste Disposal Sites. Remediation projects are evaluated based upon four criteria: Benefit to the environment; economic benefit to the State; potential for public or recreational use of the cleaned up property; and availability of other funding sources to pay for the project. Projects are prioritized using a priority ranking score based on the four criteria. Remediation applications are reviewed, scored, ranked and approved on a periodic/continuous basis.

- **The Clean Water State Revolving Fund (CWSRF):** The CWSRF finances projects to protect, maintain and improve water quality in accordance with the Clean Water Act. In the case of a modern municipal solid waste landfill that is designed and operated in accordance with state and federal regulations, the facility is intended to provide a waste disposal site while protecting water quality. CWSRF financing for municipally-owned landfill projects is available for project costs that are related to the protection of water quality. The CWSRF may finance the cost of municipal landfill construction, the closure of municipal solid waste and inactive hazardous waste landfills.

6. COST ANALYSIS

A detailed cost analysis was completed for each of the elements of the Lake Shenorock Park District formation and is provided in Appendix B. The cost analysis represents an order-of-magnitude opinion of cost completed utilizing previous experience with similar projects and standardized industry cost analysis tools and resources (e.g., RS Means). Specific scopes of work would require development for bidding purposes to determine actual costs.

Based on the research and work previously completed at the proposed Lake Shenorock Park District, Woodard & Curran believes two packaged options stand out economically and feasibly. Option 1 includes the dredging of the beach area, the design, and development of the beach area, the beach construction, and the capping of the 9-Acre Parcel. Option 2 includes the dredging of the beach area, the design, and development of the beach area, the beach construction, and the removal of the 9-Acre Parcel.

The Option Costs summarized below are detailed in Appendix B. As stated above, these estimates are order-of-magnitude opinions of costs and are not inclusive of operations and maintenance costs or any work to the Clubhouse.

6.1 DREDGE ENTIRE LAKE

The estimated cost associated with the dredging of the entire lake, and all associated professional fees is estimated to be $1.17 million with disposal of dredged material at the 9-Acre Parcel and $2.10 million with off-site disposal of all dredged materials. Refer to Appendix B: Cost Analysis for Lake Dredging for a detailed breakdown of the estimated costs.

6.2 BEACH DESIGN, CONSTRUCTION AND DEVELOPMENT

The estimated cost associated with the beach design, beach development, minimum required dredging of the lake, and all associated professional fees is estimated to be $1.16 million with disposal of dredged material at the 9-Acre Parcel and $1.22 million with off-site disposal of all dredged materials. Refer to Appendix B: Cost Analysis for Beach Design, Construction, and Development for a detailed breakdown of the estimated costs.

6.3 NINE-ACRE PARCEL

6.3.1 Removal

The estimated cost associated with the investigation, removal of contaminated sediment, and all associated professional fees is estimated to be approximately $2.68 million. Refer to Appendix B: Cost Analysis for 9-Acre Parcel – Removal Option for a detailed breakdown of the estimated costs.

6.3.2 Capping

The estimated cost associated with the investigation, capping of contaminated area, and all associated professional fees is estimated to be approximately $1.26 million. Refer to Appendix B: Cost Analysis for 9-Acre Parcel – Capping Option for a detailed breakdown of the estimated costs.

6.4 CLUBHOUSE

The cost to complete the activities required for continued use and bring the building into compliance are detailed in total $170,000 to $200,000, not including additional costs associated with the structural and environmental issues that require further investigation. It should also be recognized that these estimated costs are subject to increase if further heating and cooling upgrades are desired. For a detailed breakdown of costs associated with the Mechanical System upgrade and the Architectural Improvements, refer to Appendix B: Clubhouse.

7. SCHEDULE

A conceptual schedule was developed for the implementation of the proposed elements of the Shenorock Park District formation discussed in this report (Figure 6). Upon development of the park district, the key elements of the process include obtaining approval of the proposed remedial options of the Nine-Acre parcel from the NYSDEC.

Once the approval of the Nine-Acre parcel is obtained by NYSDEC, the necessary further investigation of the Site in accordance with the requirements of the ERP/BCP or other NYSDEC program can be completed contemporaneously with implementing the NYSDOH sanitary study of the lake for the development of the proposed beach.

Once the investigation of the Nine-Acre parcel is completed, approval for either the capping or removal of the impacted area is obtained from NYSDEC, and the NYSDOH approves the formation of the proposed beach, the remaining implementation can be completed.

This would include the necessary permitting and other regulatory approvals, dredging of the lake, moving of the dredged materials to the Nine-acre parcel or off-site disposal, and construction of the beach.

8. REFERENCES

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Table 1
Summary of Field Water Quality Measurements
Lake Shenorock - Somers, NY

Location ID	Avg Clarity (in)	Top of Sed (in)	Bot of Sed (in)	Sed Thickness (in)	Time	Temp °C	SpC mS/cm^3	DO mg/L	pH SU	ORP mV	Reading Depth in below TOS
1	44[a]	44	65	21	1133	23.45	0.569	10.02	8.40	19.2	12
2	76	98	>120	>22	1148	20.68	0.580	7.86	7.77	45.6	48
3	13[a]	13	27	14	1353	23.85	0.576	9.01	8.14	74.7	6
4	16[a]	16	30	14	1323	21.41	0.700	9.5	8.00	60.1	8
5	19	25	44	19	1413	22.99	0.585	9.73	8.11	86.7	12
6	24[a]	24	38	14	1500	25.66	0.568	9.19	8.32	80.4	12
7	36[a]	36	48	12	1455	23.83	0.573	8.82	8.24	81.5	18
8	33[a]	33	56	23	1452	23.57	0.582	11.14	8.38	81.5	12
9	---	132	142	10	---	---	---	---	---	---	---
11	48[a]	48	61.5	13.5	1525	23.31	0.570	9.59	8.30	76.0	24
13	---	72	84	12	---	---	---	---	---	---	---
14	---	93	106	13	---	---	---	---	---	---	---
15	64	90.5	104	13.5	1438	20.42	0.585	6.76	7.80	82.9	48
16	68.5	70	90	20	1532	23.26	0.575	9.51	8.26	83.4	36
17	---	60	65	5	---	---	---	---	---	---	---
18	---	84	96	12	---	---	---	---	---	---	---
20	---	102	112	10	---	---	---	---	---	---	---
22	---	37	53	16	---	---	---	---	---	---	---
23	45[a]	45	63	18	1514	22.55	0.578	8.81	7.98	70.7	24
25	---	101	120	19	---	---	---	---	---	---	---
26	45[a]	45	52	7	1542	24.50	0.570	11.23	8.43	83.3	24
27	---	12	52	40	---	---	---	---	---	---	---
28	---	40	69	29	---	---	---	---	---	---	---
30	---	94	102	8	---	---	---	---	---	---	---
32	---	88	107	19	---	---	---	---	---	---	---
33	---	77	86	7	---	---	---	---	---	---	---
34	81	112	>120	>8	1551	21.95	0.588	9.33	7.98	89.6	36
37	---	102	120	18	---	---	---	---	---	---	---
38	---	36	48	12	---	---	---	---	---	---	---

Notes:
a. Clarity was achieved to top of sediment.

TABLE 2
Summary of Sediment Analytical Data
Lake Shenorock - Somers, NY

LOCATION		SED-1		SED-2		SED-3		SED-4		SED-5	
W&C SAMPLE ID		006		007		009		008		010	
SAMPLING DATE		7/1/2009		7/1/2009		7/1/2009		7/1/2009		7/1/2009	
LAB SAMPLE ID		L0908947-01		L0908947-02		L0908947-03		L0908947-04		L0908947-05	
SAMPLE TYPE		Sediment		Sediment		Sediment		Sediment		Sediment	
	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
VOLATILE ORGANIC COMPOUNDS											
Methylene chloride	mg/kg	0.076	U	0.12	U	0.078	U	0.069	U	0.071	U
1,1-Dichloroethane	mg/kg	0.011	U	0.019	U	0.012	U	0.01	U	0.011	U
Chloroform	mg/kg	0.011	U	0.019	U	0.012	U	0.01	U	0.011	U
Carbon tetrachloride	mg/kg	0.0076	U	0.012	U	0.0078	U	0.0069	U	0.0071	U
1,2-Dichloropropane	mg/kg	0.026	U	0.044	U	0.027	U	0.024	U	0.025	U
Dibromochloromethane	mg/kg	0.0076	U	0.012	U	0.0078	U	0.0069	U	0.0071	U
1,1,2-Trichloroethane	mg/kg	0.011	U	0.019	U	0.012	U	0.01	U	0.011	U
Tetrachloroethene	mg/kg	0.0076	U	0.012	U	0.0078	U	0.0069	U	0.0071	U
Chlorobenzene	mg/kg	0.0076	U	0.012	U	0.0078	U	0.0069	U	0.0071	U
Trichlorofluoromethane	mg/kg	0.038	U	0.062	U	0.039	U	0.035	U	0.036	U
1,2-Dichloroethane	mg/kg	0.0076	U	0.012	U	0.0078	U	0.0069	U	0.0071	U
1,1,1-Trichloroethane	mg/kg	0.0076	U	0.012	U	0.0078	U	0.0069	U	0.0071	U
Bromodichloromethane	mg/kg	0.0076	U	0.012	U	0.0078	U	0.0069	U	0.0071	U
trans-1,3-Dichloropropene	mg/kg	0.0076	U	0.012	U	0.0078	U	0.0069	U	0.0071	U
cis-1,3-Dichloropropene	mg/kg	0.0076	U	0.012	U	0.0078	U	0.0069	U	0.0071	U
1,1-Dichloropropene	mg/kg	0.038	U	0.062	U	0.039	U	0.035	U	0.036	U
Bromoform	mg/kg	0.03	U	0.05	U	0.031	U	0.028	U	0.028	U
1,1,2,2-Tetrachloroethane	mg/kg	0.0076	U	0.012	U	0.0078	U	0.0069	U	0.0071	U
Benzene	mg/kg	0.0076	U	0.012	U	0.0078	U	0.0069	U	0.0071	U

TABLE 2
Summary of Sediment Analytical Data
Lake Shenorock - Somers, NY

LOCATION		SED-1		SED-2		SED-3		SED-4		SED-5	
W&C SAMPLE ID		006		007		009		008		010	
SAMPLING DATE		7/1/2009		7/1/2009		7/1/2009		7/1/2009		7/1/2009	
LAB SAMPLE ID		L0908947-01		L0908947-02		L0908947-03		L0908947-04		L0908947-05	
SAMPLE TYPE		Sediment		Sediment		Sediment		Sediment		Sediment	
	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Toluene	mg/kg	0.011	U	0.019	U	0.012	U	0.01	U	0.011	U
Ethylbenzene	mg/kg	0.0076	U	0.012	U	0.0078	U	0.0069	U	0.0071	U
Chloromethane	mg/kg	0.038	U	0.062	U	0.039	U	0.035	U	0.036	U
Bromomethane	mg/kg	0.015	U	0.025	U	0.016	U	0.014	U	0.014	U
Vinyl chloride	mg/kg	0.015	U	0.025	U	0.016	U	0.014	U	0.014	U
Chloroethane	mg/kg	0.015	U	0.025	U	0.016	U	0.014	U	0.014	U
1,1-Dichloroethene	mg/kg	0.0076	U	0.012	U	0.0078	U	0.0069	U	0.0071	U
trans-1,2-Dichloroethene	mg/kg	0.011	U	0.019	U	0.012	U	0.01	U	0.011	U
Trichloroethene	mg/kg	0.0076	U	0.012	U	0.0078	U	0.0069	U	0.0071	U
1,2-Dichlorobenzene	mg/kg	0.038	U	0.062	U	0.039	U	0.035	U	0.036	U
1,3-Dichlorobenzene	mg/kg	0.038	U	0.062	U	0.039	U	0.035	U	0.036	U
1,4-Dichlorobenzene	mg/kg	0.038	U	0.062	U	0.039	U	0.035	U	0.036	U
Methyl tert butyl ether	mg/kg	0.015	U	0.025	U	0.016	U	0.014	U	0.014	U
p/m-Xylene	mg/kg	0.015	U	0.025	U	0.016	U	0.014	U	0.014	U
o-Xylene	mg/kg	0.015	U	0.025	U	0.016	U	0.014	U	0.014	U
cis-1,2-Dichloroethene	mg/kg	0.0076	U	0.012	U	0.0078	U	0.0069	U	0.0071	U
Dibromomethane	mg/kg	0.076	U	0.12	U	0.078	U	0.069	U	0.071	U
Styrene	mg/kg	0.015	U	0.025	U	0.016	U	0.014	U	0.014	U
Dichlorodifluoromethane	mg/kg	0.076	U	0.12	U	0.078	U	0.069	U	0.071	U
Acetone	mg/kg	**0.26**		**0.43**		0.078	U	**0.23**		**0.082**	

TABLE 2
Summary of Sediment Analytical Data
Lake Shenorock - Somers, NY

LOCATION		SED-1		SED-2		SED-3		SED-4		SED-5	
W&C SAMPLE ID		006		007		009		008		010	
SAMPLING DATE		7/1/2009		7/1/2009		7/1/2009		7/1/2009		7/1/2009	
LAB SAMPLE ID		L0908947-01		L0908947-02		L0908947-03		L0908947-04		L0908947-05	
SAMPLE TYPE		Sediment		Sediment		Sediment		Sediment		Sediment	
	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Carbon disulfide	mg/kg	0.076	U	0.12	U	0.078	U	0.069	U	0.071	U
2-Butanone	mg/kg	**0.094**		**0.17**		0.078	U	**0.072**		0.071	U
Vinyl acetate	mg/kg	0.076	U	0.12	U	0.078	U	0.069	U	0.071	U
4-Methyl-2-pentanone	mg/kg	0.076	U	0.12	U	0.078	U	0.069	U	0.071	U
1,2,3-Trichloropropane	mg/kg	0.076	U	0.12	U	0.078	U	0.069	U	0.071	U
2-Hexanone	mg/kg	0.076	U	0.12	U	0.078	U	0.069	U	0.071	U
Bromochloromethane	mg/kg	0.038	U	0.062	U	0.039	U	0.035	U	0.036	U
2,2-Dichloropropane	mg/kg	0.038	U	0.062	U	0.039	U	0.035	U	0.036	U
1,2-Dibromoethane	mg/kg	0.03	U	0.05	U	0.031	U	0.028	U	0.028	U
1,3-Dichloropropane	mg/kg	0.038	U	0.062	U	0.039	U	0.035	U	0.036	U
1,1,1,2-Tetrachloroethane	mg/kg	0.0076	U	0.012	U	0.0078	U	0.0069	U	0.0071	U
Bromobenzene	mg/kg	0.038	U	0.062	U	0.039	U	0.035	U	0.036	U
n-Butylbenzene	mg/kg	0.0076	U	0.012	U	0.0078	U	0.0069	U	0.0071	U
sec-Butylbenzene	mg/kg	0.0076	U	0.012	U	0.0078	U	0.0069	U	0.0071	U
tert-Butylbenzene	mg/kg	0.038	U	0.062	U	0.039	U	0.035	U	0.036	U
o-Chlorotoluene	mg/kg	0.038	U	0.062	U	0.039	U	0.035	U	0.036	U
p-Chlorotoluene	mg/kg	0.038	U	0.062	U	0.039	U	0.035	U	0.036	U
1,2-Dibromo-3-chloropropane	mg/kg	0.038	U	0.062	U	0.039	U	0.035	U	0.036	U
Hexachlorobutadiene	mg/kg	0.038	U	0.062	U	0.039	U	0.035	U	0.036	U
Isopropylbenzene	mg/kg	0.0076	U	0.012	U	0.0078	U	0.0069	U	0.0071	U

TABLE 2
Summary of Sediment Analytical Data
Lake Shenorock - Somers, NY

LOCATION		SED-1		SED-2		SED-3		SED-4		SED-5	
W&C SAMPLE ID		006		007		009		008		010	
SAMPLING DATE		7/1/2009		7/1/2009		7/1/2009		7/1/2009		7/1/2009	
LAB SAMPLE ID		L0908947-01		L0908947-02		L0908947-03		L0908947-04		L0908947-05	
SAMPLE TYPE		Sediment		Sediment		Sediment		Sediment		Sediment	
	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
p-Isopropyltoluene	mg/kg	0.0076	U	0.012	U	0.0078	U	0.0069	U	0.0071	U
Naphthalene	mg/kg	0.038	U	0.062	U	0.039	U	0.035	U	0.036	U
Acrylonitrile	mg/kg	0.076	U	0.12	U	0.078	U	0.069	U	0.071	U
n-Propylbenzene	mg/kg	0.0076	U	0.012	U	0.0078	U	0.0069	U	0.0071	U
1,2,3-Trichlorobenzene	mg/kg	0.038	U	0.062	U	0.039	U	0.035	U	0.036	U
1,2,4-Trichlorobenzene	mg/kg	0.038	U	0.062	U	0.039	U	0.035	U	0.036	U
1,3,5-Trimethylbenzene	mg/kg	0.038	U	0.062	U	0.039	U	0.035	U	0.036	U
1,2,4-Trimethylbenzene	mg/kg	0.038	U	0.062	U	0.039	U	0.035	U	0.036	U
1,4-Diethylbenzene	mg/kg	0.03	U	0.05	U	0.031	U	0.028	U	0.028	U
4-Ethyltoluene	mg/kg	0.03	U	0.05	U	0.031	U	0.028	U	0.028	U
1,2,4,5-Tetramethylbenzene	mg/kg	0.03	U	0.05	U	0.031	U	0.028	U	0.028	U
Ethyl ether	mg/kg	0.038	U	0.062	U	0.039	U	0.035	U	0.036	U
trans-1,4-Dichloro-2-butene	mg/kg	0.038	U	0.062	U	0.039	U	0.035	U	0.036	U
SEMIVOLATILE ORGANIC COMPOUNDS											
Phenol	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
Bis(2-chloroethyl)ether	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
2-Chlorophenol	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
1,3-Dichlorobenzene	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
1,4-Dichlorobenzene	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
Benzyl Alcohol	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U

TABLE 2
Summary of Sediment Analytical Data
Lake Shenorock - Somers, NY

LOCATION		SED-1		SED-2		SED-3		SED-4		SED-5	
W&C SAMPLE ID		006		007		009		008		010	
SAMPLING DATE		7/1/2009		7/1/2009		7/1/2009		7/1/2009		7/1/2009	
LAB SAMPLE ID		L0908947-01		L0908947-02		L0908947-03		L0908947-04		L0908947-05	
SAMPLE TYPE		Sediment		Sediment		Sediment		Sediment		Sediment	
	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
1,2-Dichlorobenzene	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
2-Methylphenol	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
Bis(2-chloroisopropyl)ether	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
Acetophenone	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
4-Methylphenol	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
N-Nitroso-di-n-propylamine	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
Hexachloroethane	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
Nitrobenzene	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
Isophorone	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
2-Nitrophenol	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
2,4-Dimethylphenol	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
Bis(2-chloroethoxy)methane	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
2,4-Dichlorophenol	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
1,2,4-Trichlorobenzene	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
Naphthalene	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
4-Chloroaniline	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
Hexachlorobutadiene	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
P-Chloro-M-Cresol	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
2-Methylnaphthalene	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
Hexachlorocyclopentadiene	mg/kg	3.8	U	4.66	U	3.91	U	3.48	U	3.59	U

TABLE 2
Summary of Sediment Analytical Data
Lake Shenorock - Somers, NY

LOCATION		SED-1		SED-2		SED-3		SED-4		SED-5	
W&C SAMPLE ID		006		007		009		008		010	
SAMPLING DATE		7/1/2009		7/1/2009		7/1/2009		7/1/2009		7/1/2009	
LAB SAMPLE ID		L0908947-01		L0908947-02		L0908947-03		L0908947-04		L0908947-05	
SAMPLE TYPE		Sediment		Sediment		Sediment		Sediment		Sediment	
	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
2,4,6-Trichlorophenol	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
2,4,5-Trichlorophenol	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
2-Chloronaphthalene	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
2-Nitroaniline	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
Dimethylphthalate	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
Acenaphthylene	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
2,6-Dinitrotoluene	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
3-Nitroaniline	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
Acenaphthene	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
2,4-Dinitrophenol	mg/kg	3.8	U	4.66	U	3.91	U	3.48	U	3.59	U
4-Nitrophenol	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
Dibenzofuran	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
2,4-Dinitrotoluene	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
Diethylphthalate	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
4-Chlorophenyl-phenylether	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
Fluorene	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
4-Nitroaniline	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
4,6-Dinitro-2-Methylphenol	mg/kg	1.9	U	2.33	U	1.95	U	1.74	U	1.8	U
NitrosoDiPhenylAmine(NDPA)/DPA	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
4-Bromophenyl-phenylether	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U

TABLE 2
Summary of Sediment Analytical Data
Lake Shenorock - Somers, NY

LOCATION		SED-1		SED-2		SED-3		SED-4		SED-5	
W&C SAMPLE ID		006		007		009		008		010	
SAMPLING DATE		7/1/2009		7/1/2009		7/1/2009		7/1/2009		7/1/2009	
LAB SAMPLE ID		L0908947-01		L0908947-02		L0908947-03		L0908947-04		L0908947-05	
SAMPLE TYPE		Sediment		Sediment		Sediment		Sediment		Sediment	
	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Hexachlorobenzene	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
Pentachlorophenol	mg/kg	3.8	U	4.66	U	3.91	U	3.48	U	3.59	U
Phenanthrene	mg/kg	0.951	U	1.16	U	0.976	U	**2.66**		**1.02**	
Anthracene	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
Di-n-butylphthalate	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
Fluoranthene	mg/kg	**2.7**		**1.42**		**1.19**		**7.38**		**3.68**	
Pyrene	mg/kg	**2.32**		**1.21**		**1.02**		**6.13**		**3.07**	
Butylbenzylphthalate	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
3,3'-Dichlorobenzidine	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
Benz(a)anthracene	mg/kg	**1.14**		1.16	U	0.976	U	**3.17**		**1.58**	
Chrysene	mg/kg	**1.48**		1.16	U	0.976	U	**3.85**		**2.05**	
Bis(2-Ethylhexyl)phthalate	mg/kg	0.951	U	1.16	U	0.976	U	**0.94**		0.898	U
Di-n-octylphthalate	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
Benzo(b)fluoranthene	mg/kg	**1.2**		1.16	U	0.976	U	**4.16**		**1.81**	
Benzo(k)fluoranthene	mg/kg	**1.2**		1.16	U	0.976	U	**2.09**		**1.69**	
Benzo(a)pyrene	mg/kg	**1.12**		1.16	U	0.976	U	**2.87**		**1.64**	
Indeno(1,2,3-cd)Pyrene	mg/kg	0.951	U	1.16	U	0.976	U	**1.79**		**1.08**	
Dibenz(a,h)anthracene	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
Benzo(ghi)perylene	mg/kg	0.951	U	1.16	U	0.976	U	**2.04**		**1.22**	
Aniline	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U

TABLE 2
Summary of Sediment Analytical Data
Lake Shenorock - Somers, NY

LOCATION		SED-1		SED-2		SED-3		SED-4		SED-5	
W&C SAMPLE ID		006		007		009		008		010	
SAMPLING DATE		7/1/2009		7/1/2009		7/1/2009		7/1/2009		7/1/2009	
LAB SAMPLE ID		L0908947-01		L0908947-02		L0908947-03		L0908947-04		L0908947-05	
SAMPLE TYPE		Sediment		Sediment		Sediment		Sediment		Sediment	
	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Carbazole	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
Benzidine	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
n-Nitrosodimethylamine	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
Biphenyl	mg/kg	0.951	U	1.16	U	0.976	U	0.871	U	0.898	U
Benzoic Acid	mg/kg	3.8	U	4.66	U	3.91	U	3.48	U	3.59	U
PESTICIDES											
4,4'-DDD	mg/kg	**0.00834**		**0.017**		**0.0024**		**0.00397**		**0.00359**	
4,4'-DDE	mg/kg	**0.00721**		**0.0131**		**0.00756**		**0.00817**		**0.00772**	
4,4'-DDT	mg/kg	**0.00157**		**0.00275**		0.000492	U	0.000422	U	0.000501	U
Aldrin	mg/kg	0.000449	U	0.000606	U	0.000492	U	0.000422	U	0.000501	U
Alpha-BHC	mg/kg	0.000449	U	0.000606	U	0.000492	U	0.000422	U	0.000501	U
cis-Chlordane	mg/kg	**0.00678**		**0.00483**		**0.0173**		**0.039**		**0.0224**	
Beta-BHC	mg/kg	0.000449	U	0.000606	U	0.000492	U	0.000422	U	0.000501	U
Delta-BHC	mg/kg	0.000449	U	0.000606	U	0.000492	U	0.000422	U	0.000501	U
Dieldrin	mg/kg	**0.00179**		0.000606	U	**0.00928**		0.000422	U	0.000501	U
Endosulfan I	mg/kg	0.000449	U	0.000606	U	0.000492	U	0.000422	U	0.000501	U
Endosulfan II	mg/kg	0.000449	U	0.000606	U	0.000492	U	0.000422	U	0.000501	U
Endosulfan sulfate	mg/kg	0.000449	U	0.000606	U	0.000492	U	0.000422	U	0.000501	U
Endrin	mg/kg	0.000449	U	0.000606	U	0.000492	U	0.000422	U	0.000501	U
Endrin aldehyde	mg/kg	0.000449	U	0.000606	U	0.000492	U	0.000422	U	0.000501	U

TABLE 2
Summary of Sediment Analytical Data
Lake Shenorock - Somers, NY

LOCATION		SED-1		SED-2		SED-3		SED-4		SED-5	
W&C SAMPLE ID		006		007		009		008		010	
SAMPLING DATE		7/1/2009		7/1/2009		7/1/2009		7/1/2009		7/1/2009	
LAB SAMPLE ID		L0908947-01		L0908947-02		L0908947-03		L0908947-04		L0908947-05	
SAMPLE TYPE		Sediment		Sediment		Sediment		Sediment		Sediment	
	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Endrin ketone	mg/kg	0.000449	U	0.000606	U	0.000492	U	0.000422	U	0.000501	U
gamma-BHC	mg/kg	0.000449	U	0.000606	U	0.000492	U	0.000422	U	0.000501	U
trans-Chlordane	mg/kg	**0.00614**		**0.00475**		**0.0137**		**0.0345**		**0.0205**	
Heptachlor	mg/kg	0.000449	U	0.000606	U	0.000492	U	0.000422	U	0.000501	U
Heptachlor epoxide	mg/kg	0.000449	U	0.000606	U	0.000492	U	0.000422	U	0.000501	U
Methoxychlor	mg/kg	0.000449	U	0.000606	U	0.000492	U	0.000422	U	0.000501	U
Toxaphene	mg/kg	0.0224	U	0.0303	U	0.0246	U	0.0211	U	0.0251	U
Chlordane	mg/kg	0.0224	U	0.0303	U	0.0246	U	0.0211	U	0.0251	U
HERBICIDES											
MCPP	mg/kg	10.1	U	16.7	U	10.4	U	9.26	U	9.52	U
MCPA	mg/kg	10.1	U	16.7	U	10.4	U	9.26	U	9.52	U
Dalapon	mg/kg	0.101	U	0.167	U	0.104	U	0.093	U	0.095	U
Dicamba	mg/kg	0.101	U	0.167	U	0.104	U	0.093	U	0.095	U
Dichloroprop	mg/kg	0.101	U	0.167	U	0.104	U	0.093	U	0.095	U
2,4-D	mg/kg	0.101	U	0.167	U	0.104	U	0.093	U	0.095	U
2,4-DB	mg/kg	0.101	U	0.167	U	0.104	U	0.093	U	0.095	U
2,4,5-T	mg/kg	0.101	U	0.167	U	0.104	U	0.093	U	0.095	U
2,4,5-TP (Silvex)	mg/kg	0.101	U	0.167	U	0.104	U	0.093	U	0.095	U
Dinoseb	mg/kg	0.101	U	0.167	U	0.104	U	0.093	U	0.095	U
PCBs											

TABLE 2
Summary of Sediment Analytical Data
Lake Shenorock - Somers, NY

LOCATION		SED-1		SED-2		SED-3		SED-4		SED-5	
W&C SAMPLE ID		006		007		009		008		010	
SAMPLING DATE		7/1/2009		7/1/2009		7/1/2009		7/1/2009		7/1/2009	
LAB SAMPLE ID		L0908947-01		L0908947-02		L0908947-03		L0908947-04		L0908947-05	
SAMPLE TYPE		Sediment		Sediment		Sediment		Sediment		Sediment	
	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Aroclor 1016	mg/kg	0.018	U	0.0242	U	0.0197	U	0.0169	U	0.017	U
Aroclor 1221	mg/kg	0.018	U	0.0242	U	0.0197	U	0.0169	U	0.017	U
Aroclor 1232	mg/kg	0.018	U	0.0242	U	0.0197	U	0.0169	U	0.017	U
Aroclor 1242	mg/kg	0.018	U	0.0242	U	0.0197	U	0.0169	U	0.017	U
Aroclor 1248	mg/kg	0.018	U	0.0242	U	0.0197	U	0.0169	U	0.017	U
Aroclor 1254	mg/kg	**0.0489**		**0.0699**		**0.217**		**0.074**		**0.192**	
Aroclor 1260	mg/kg	0.018	U	0.0242	U	0.0197	U	0.0169	U	0.017	U
METALS											
Aluminum, Total	mg/kg	**12700**		**26200**		**12600**		**11400**		**13200**	
Antimony, Total	mg/kg	**0.52**		**0.863**		**0.406**		**0.448**		**0.383**	
Arsenic, Total	mg/kg	**8.74**		**24**		**19.9**		**4.34**		**7.6**	
Barium, Total	mg/kg	**128**		**281**		**272**		**121**		**160**	
Beryllium, Total	mg/kg	**0.792**		**1.58**		**0.47**		**0.424**		**0.459**	
Cadmium, Total	mg/kg	**0.599**		**1.04**		**1.1**		**0.804**		**0.901**	
Calcium, Total	mg/kg	**23600**		**21400**		**8640**		**11000**		**11100**	
Chromium, Total	mg/kg	**24.3**		**43.1**		**26.1**		**30.6**		**27.2**	
Cobalt, Total	mg/kg	**9.96**		**16.9**		**9.72**		**8.65**		**9.44**	
Copper, Total	mg/kg	**127**		**388**		**416**		**73.3**		**258**	
Iron, Total	mg/kg	**27100**		**54400**		**27600**		**25300**		**29900**	
Lead, Total	mg/kg	**55.5**		**87.9**		**53.5**		**71.8**		**63.8**	

TABLE 2
Summary of Sediment Analytical Data
Lake Shenorock - Somers, NY

LOCATION		SED-1		SED-2		SED-3		SED-4		SED-5	
W&C SAMPLE ID		006		007		009		008		010	
SAMPLING DATE		7/1/2009		7/1/2009		7/1/2009		7/1/2009		7/1/2009	
LAB SAMPLE ID		L0908947-01		L0908947-02		L0908947-03		L0908947-04		L0908947-05	
SAMPLE TYPE		Sediment		Sediment		Sediment		Sediment		Sediment	
	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Magnesium, Total	mg/kg	**6300**		**9180**		**4680**		**6340**		**5710**	
Manganese, Total	mg/kg	**776**		**1800**		**772**		**539**		**2080**	
Mercury, Total	mg/kg	**0.105**		**0.185**		**0.206**		**0.124**		**0.114**	
Nickel, Total	mg/kg	**21.2**		**36.6**		**19.7**		**19.8**		**19.4**	
Potassium, Total	mg/kg	**1800**		**2980**		**1420**		**1540**		**1500**	
Selenium, Total	mg/kg	**5.05**		**4.09**		**1.87**		**1.04**		**0.932**	
Silver, Total	mg/kg	**0.207**		**0.554**		**0.3**		**0.209**		**0.226**	
Sodium, Total	mg/kg	**369**		**1300**		**384**		**451**		**346**	
Thallium, Total	mg/kg	**0.246**		**0.428**		**0.184**		**0.186**		**0.189**	
Vanadium, Total	mg/kg	**32.1**		**65.6**		**31.4**		**29**		**27.6**	
Zinc, Total	mg/kg	**166**		**296**		**269**		**271**		**266**	
GENERAL CHEMISTRY											
Solids, Total	%	**33**		**20**		**32**		**36**		**35**	
Phosphorus, Soluble	mg/L	**0.019**		**0.117**		**0.067**		**0.015**		**0.035**	
Phosphorus, Total	mg/kg	**760**		**1800**		**1800**		**1700**		**1300**	

Bold value is detected concentration.
U indicates that the analyte was not detected at the detection limit shown
mg/kg= milligrams per kilograms
mg/l = milligram per liter

TABLE 3
Summary of Sediment Analytical Data
Lake Shenorock - Somers, NY

LOCATION										SED-1		SED-2		SED-3		SED-4		SED-5	
W&C SAMPLE ID										006		007		009		008		010	
SAMPLING DATE										7/1/2009		7/1/2009		7/1/2009		7/1/2009		7/1/2009	
LAB SAMPLE ID										L0908947-01		L0908947-02		L0908947-03		L0908947-04		L0908947-05	
SAMPLE TYPE										Sediment		Sediment		Sediment		Sediment		Sediment	
	TAGM[1]	UNRES[2]	RES[3]	RESTR-RES[4]	COM[5]	INDUS[6]	ECO[7]	GW[8]	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
VOLATILE ORGANIC COMPOUNDS																			
Acetone	0.2	0.05	100	100	500	1,000	2.2	0.05	mg/kg	0.26		0.43		0.078	U	0.23		0.082	
2-Butanone	0.3	0.12	100	100	500	1,000	100	0.12	mg/kg	0.094		0.17		0.078	U	0.072		0.071	U
SEMIVOLATILE ORGANIC COMPOUNDS																			
Chrysene	0.4	1	3.9	3.9	56	110	---	1	mg/kg	1.48		1.16	U	0.976	U	3.85		2.05	
Benzo(b)fluoranthene	1.1	1	1	1	5.6	11	---	1.7	mg/kg	1.2		1.16	U	0.976	U	4.16		1.81	
Benzo(k)fluoranthene	1.1	0.8	1	3.9	56	110	---	1.7	mg/kg	1.2		1.16	U	0.976	U	2.09		1.69	
Benzo(a)pyrene	0.061	1	1	1	1	1.1	2.6	22	mg/kg	1.12		1.16	U	0.976	U	2.87		1.64	
Indeno(1,2,3-cd)Pyrene	3.2	0.5	0.5	0.5	5.6	11	---	8.2	mg/kg	0.951	U	1.16	U	0.976	U	1.79		1.08	
Phenanthrene	50	100	100	100	500	1,000	---	1,000	mg/kg	0.951	U	1.16	U	0.976	U	2.66		1.02	
Fluoranthene	50	100	100	100	500	1,000	---	1,000	mg/kg	2.7		1.42		1.19		7.38		3.68	
Pyrene	50	100	100	100	500	1,000	---	1,000	mg/kg	2.32		1.21		1.02		6.13		3.07	
Benz(a)anthracene	---	---	1	1	5.6	11	---	1	mg/kg	1.14		1.16	U	0.976	U	3.17		1.58	
Bis(2-Ethylhexyl)phthalate	50	---	---	---	---	---	---	---	mg/kg	0.951	U	1.16	U	0.976	U	0.94		0.898	U
Benzo(ghi)perylene	50	100	100	100	500	1,000	---	1,000	mg/kg	0.951	U	1.16	U	0.976	U	2.04		1.22	
PESTICIDES																			
4,4'-DDD	2.9	0.0033	2.6	13	92	180	0.0033	14	mg/kg	0.00834		0.017		0.0024		0.00397		0.00359	
4,4'-DDE	2.1	0.0033	1.8	8.9	62	120	0.0033	17	mg/kg	0.00721		0.0131		0.00756		0.00817		0.00772	
4,4'-DDT	2.1	0.0033	1.7	7.9	47	94	0.0033	136	mg/kg	0.00157		0.00275		0.000492	U	0.000422	U	0.000501	U
Dieldrin	0.044	0.005	0.039	0.2	1.4	2.8	0.006	0.1	mg/kg	0.00179		0.000606	U	0.00928		0.000422	U	0.000501	U
cis-Chlordane	---	0.094	0.097	0.48	3.4	6.8	0.04	0.02	mg/kg	0.00678		0.00483		0.0173		0.039		0.0224	
trans-Chlordane	---	---	---	---	---	---	---	---	mg/kg	0.00614		0.00475		0.0137		0.0345		0.0205	
HERBICIDES	NA	NA	NA	NA	NA	NA	NA	NA	mg/kg	ND		ND		ND		ND		ND	

TABLE 3
Summary of Sediment Analytical Data
Lake Shenorock - Somers, NY

LOCATION										SED-1		SED-2		SED-3		SED-4		SED-5	
W&C SAMPLE ID										006		007		009		008		010	
SAMPLING DATE										7/1/2009		7/1/2009		7/1/2009		7/1/2009		7/1/2009	
LAB SAMPLE ID										L0908947-01		L0908947-02		L0908947-03		L0908947-04		L0908947-05	
SAMPLE TYPE										Sediment		Sediment		Sediment		Sediment		Sediment	
	TAGM[1]	UNRES[2]	RES[3]	RESTR-RES[4]	COM[5]	INDUS[6]	ECO[7]	GW[8]	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
PCBs																			
Aroclor 1254	1	1	1	1	1	25	1	3.2	mg/kg	0.0489		0.0699		0.217		0.074		0.192	
METALS																			
Aluminum, Total	---	---	---	---	---	---	---	---	mg/kg	12700		26200		12600		11400		13200	
Antimony, Total	---	---	---	---	---	---	---	---	mg/kg	0.52		0.863		0.406		0.448		0.383	
Arsenic, Total	7.5	13	16	16	16	16	13	16	mg/kg	8.74		24		19.9		4.34		7.6	
Barium, Total	300	350	350	400	400	10,000	433	820	mg/kg	128		281		272		121		160	
Beryllium, Total	0.16	7.2	14	72	590	2,700	10	47	mg/kg	0.792		1.58		0.47		0.424		0.459	
Cadmium, Total	1	2.5	2.5	4.3	9.3	60	4	7.5	mg/kg	0.599		1.04		1.1		0.804		0.901	
Calcium, Total	---	---	---	---	---	---	---	---	mg/kg	23600		21400		8640		11000		11100	
Chromium, Total	10	---	---	---	---	---	---	---	mg/kg	24.3		43.1		26.1		30.6		27.2	
Cobalt, Total	30	---	---	---	---	---	---	---	mg/kg	9.96		16.9		9.72		8.65		9.44	
Copper, Total	25	50	270	270	270	10,000	50	1,720	mg/kg	127		388		416		73.3		258	
Iron, Total	2000	---	---	---	---	---	---	---	mg/kg	27100		54400		27600		25300		29900	
Lead, Total	---	63	400	400	1,000	3,900	63	450	mg/kg	55.5		87.9		53.5		71.8		63.8	
Magnesium, Total	---	---	---	---	---	---	---	---	mg/kg	6300		9180		4680		6340		5710	
Manganese, Total	---	1,600	2,000	2,000	10,000	10,000	1,600	2,000	mg/kg	776		1800		772		539		2080	
Mercury, Total	0.1	0.18	0.81	0.81	2.8	5.7	0.18	0.73	mg/kg	0.105		0.185		0.206		0.124		0.114	
Nickel, Total	13	30	140	310	310	10,000	30	130	mg/kg	21.2		36.6		19.7		19.8		19.4	
Potassium, Total	---	---	---	---	---	---	---	---	mg/kg	1800		2980		1420		1540		1500	
Selenium, Total	2	3.9	36	180	1,500	6,800	3.9	4	mg/kg	5.05		4.09		1.87		1.04		0.932	
Silver, Total	---	2	36	180	1,500	6,800	2	8.3	mg/kg	0.207		0.554		0.3		0.209		0.226	
Sodium, Total	---	---	---	---	---	---	---	---	mg/kg	369		1300		384		451		346	
Thallium, Total	---	---	---	---	---	---	---	---	mg/kg	0.246		0.428		0.184		0.186		0.189	
Vanadium, Total	150	---	---	---	---	---	---	---	mg/kg	32.1		65.6		31.4		29		27.6	
Zinc, Total	20	109	2,200	10,000	10,000	10,000	109	2,480	mg/kg	166		296		269		271		266	

TABLE 3
Summary of Sediment Analytical Data
Lake Shenorock - Somers, NY

LOCATION										SED-1		SED-2		SED-3		SED-4		SED-5	
W&C SAMPLE ID										006		007		009		008		010	
SAMPLING DATE										7/1/2009		7/1/2009		7/1/2009		7/1/2009		7/1/2009	
LAB SAMPLE ID										L0908947-01		L0908947-02		L0908947-03		L0908947-04		L0908947-05	
SAMPLE TYPE										Sediment		Sediment		Sediment		Sediment		Sediment	
	TAGM[1]	UNRES[2]	RES[3]	RESTR-RES[4]	COM[5]	INDUS[6]	ECO[7]	GW[8]	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
GENERAL CHEMISTRY																			
Solids, Total	---	---	---	---	---	---	---	---	%	33		20		32		36		35	
Phosphorus, Soluble	---	---	---	---	---	---	---	---	mg/L	0.019		0.117		0.067		0.015		0.035	
Phosphorus, Total	---	---	---	---	---	---	---	---	mg/kg	760		1800		1800		1700		1300	

ND = Not detected
U indicates that the analyte was not detected at the detection limit shown
mg/kg= milligrams per kilograms
mg/l = milligram per liter
NA= Not applicable
--- = criteria not established
1. TAGM 4046 Reccommended Soil Cleanup Objectives
2. Part 375-6 Unrestricted Use Criteria
3. Part 375-6 Protection of Public Health - Residential
4. Part 375-6 Protection of Public Health - Restricted Residential
5. Part 375-6 Protection of Public Health - Commercial
6. Part 375-6 Protection of Public Health - Industrial
7. Part 375-6 Protection of Ecological Resources
8. Part 375-6 Protection of Ground Water

Exceeds TAGM, unres
Exceeds unres, GW
Exceeds TAGM, unres, res, restr-res
Exceeds TAGM, unres, res, restr-res, GW
Exceeds TAGM, unres, res
Exceeds TAGM, unres, res, GW
Exceeds TAGM, unres, res, restr-res, com, indust
Exceeds TAGM, unres, res, restr-res, com, indust, eco
Exceeds unres, res, restr-res
Exceeds unres, eco
Exceeds unres
Exceeds TAGM
Exceeds TAGM, unres, res, restr-res, com, indust, eco, GW
Exceeds TAGM, unres, eco
Exceeds TAGM, unres, res, rest-res, com, eco
Exceeds unres, res, restr-res, eco, GW
Exceeds TAGM, unres, eco, GW
Exceeds res, rest-res, GW
Exceeds GW

TABLE 4
Summary of Sediment Analytical Data
Lake Shenorock - Somers, NY

LOCATION				SED-1		SED-2		SED-3		SED-4		SED-5	
W&C SAMPLE ID				006		007		009		008		010	
SAMPLING DATE	Class A	*Sed Screening*		7/1/2009		7/1/2009		7/1/2009		7/1/2009		7/1/2009	
LAB SAMPLE ID	SQTV	*Guidance*		L0908947-01		L0908947-02		L0908947-03		L0908947-04		L0908947-05	
SAMPLE TYPE	Dredging	*Criteria*		Sediment		Sediment		Sediment		Sediment		Sediment	
	2004	1999	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
VOLATILE ORGANIC COMPOUNDS													
SEMIVOLATILE ORGANIC COMPOUNDS													
Chrysene	---	1.3	mg/kg	1.48		1.16	U	0.976	U	3.85		2.05	
Benzo(b)fluoranthene	---	1.3	mg/kg	1.2		1.16	U	0.976	U	4.16		1.81	
Benzo(k)fluoranthene	---	1.3	mg/kg	1.2		1.16	U	0.976	U	2.09		1.69	
Benzo(a)pyrene	---	1.3	mg/kg	1.12		1.16	U	0.976	U	2.87		1.64	
Indeno(1,2,3-cd)Pyrene	---	1.3	mg/kg	0.951	U	1.16	U	0.976	U	1.79		1.08	
Phenanthrene	---	120	mg/kg	0.951	U	1.16	U	0.976	U	2.66		1.02	
Fluoranthene	---	1020	mg/kg	2.7		1.42		1.19		7.38		3.68	
Pyrene	---	961	mg/kg	2.32		1.21		1.02		6.13		3.07	
Benz(a)anthracene	---	12	mg/kg	1.14		1.16	U	0.976	U	3.17		1.58	
Bis(2-Ethylhexyl)phthalate	---	199.5	mg/kg	0.951	U	1.16	U	0.976	U	0.94		0.898	U
Benzo(ghi)perylene	---	---	mg/kg	0.951	U	1.16	U	0.976	U	2.04		1.22	
Total PAH	<4	---	mg/kg	11.2		2.6		2.2		36.1		18.8	
PESTICIDES													
4,4'-DDD	---	0.01	mg/kg	0.00834		0.017		0.0024		0.00397		0.00359	
4,4'-DDE	---	0.01	mg/kg	0.00721		0.0131		0.00756		0.00817		0.00772	
4,4'-DDT	---	0.01	mg/kg	0.00157		0.00275		0.000492	U	0.000422	U	0.000501	U
Sum DDT+DDD+DDE	<0.003	---	mg/kg	0.01712		0.03285		0.00996		0.01214		0.01131	
Dieldrin	<0.11	0.1	mg/kg	0.00179		0.000606	U	0.00928		0.000422	U	0.000501	U
HERBICIDES	NA	NA		ND		ND		ND		ND		ND	
PCB													
Aroclor 1254	<0.1	0.0008	mg/kg	0.0489		0.0699		0.217		0.074		0.192	

TABLE 4
Summary of Sediment Analytical Data
Lake Shenorock - Somers, NY

LOCATION				SED-1		SED-2		SED-3		SED-4		SED-5	
W&C SAMPLE ID				006		007		009		008		010	
SAMPLING DATE	Class A	*Sed Screening*		7/1/2009		7/1/2009		7/1/2009		7/1/2009		7/1/2009	
LAB SAMPLE ID	SQTV	*Guidance*		L0908947-01		L0908947-02		L0908947-03		L0908947-04		L0908947-05	
SAMPLE TYPE	Dredging	*Criteria*		Sediment		Sediment		Sediment		Sediment		Sediment	
	2004	1999	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
METALS													
Antimony, Total	---	2	mg/kg	0.52		0.863		0.406		0.448		0.383	
Arsenic, Total	<14	6	mg/kg	8.74		24		19.9		4.34		7.6	
Cadmium, Total	<1.2	0.6	mg/kg	0.599		1.04		1.1		0.804		0.901	
Chromium, Total	---	26	mg/kg	24.3		43.1		26.1		30.6		27.2	
Copper, Total	<33	16	mg/kg	127		388		416		73.3		258	
Iron, Total	---	20000	mg/kg	27100		54400		27600		25300		29900	
Lead, Total	<33	31	mg/kg	55.5		87.9		53.5		71.8		63.8	
Manganese, Total	---	460	mg/kg	776		1800		772		539		2080	
Mercury, Total	<0.17	0.15	mg/kg	0.105		0.185		0.206		0.124		0.114	
Nickel, Total	---	16	mg/kg	21.2		36.6		19.7		19.8		19.4	
Silver, Total	---	1	mg/kg	0.207		0.554		0.3		0.209		0.226	
Zinc, Total	---	120	mg/kg	166		296		269		271		266	
GENERAL CHEMISTRY													

U indicates that the analyte was not detected at the detection limit shown
mg/kg= milligrams per kilograms
mg/l = milligram per liter
ND= Not detected
--- = criteria not established

Concentration exceeds Class A SQTV
Concentration exceeds 1999 Sediment Criteria
Concentration exceeds Class A SQTV and 1999 Sediment Criteria

TABLE 5
Summary of Water Analytical Data
Lake Shenorock - Somers, NY

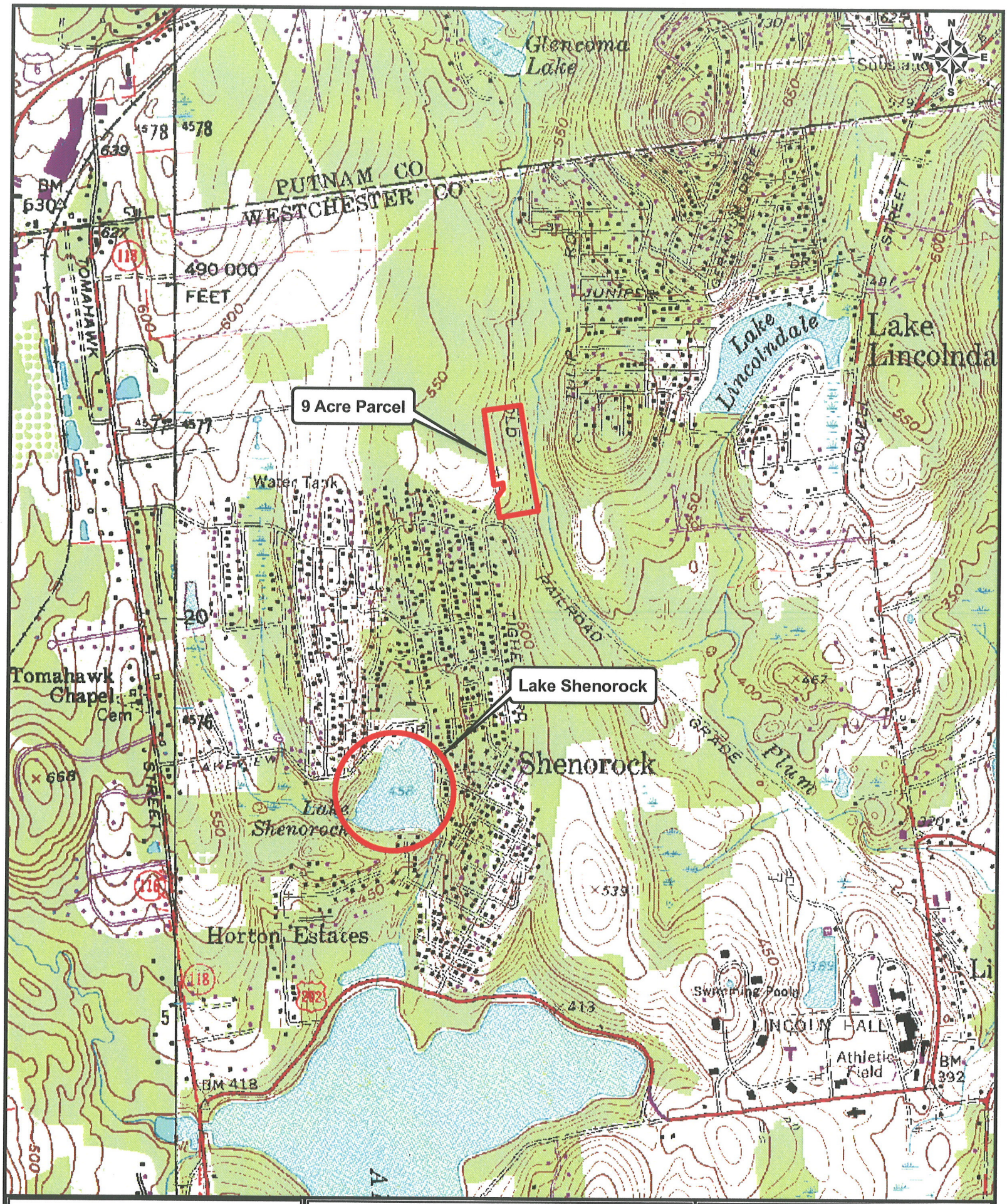
LOCATION			SW-1		SW-1		SW-1		SW-1		SW-2		SW-2		SW-2		SW-2	
W&C SAMPLE ID			001		011		017		022		002		012		016		021	
SAMPLING DATE			7/1/2009		7/1/2009		7/29/2009		8/12/2009		7/1/2009		7/1/2009		7/29/2009		8/12/2009	
LAB SAMPLE ID			420-27994-1		420-27994-1		420-28692-2		420-29075-2		420-27994-2		420-27994-2		420-28692-1		420-29075-1	
	NYS Sanitary Code	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
BACTERIA																		
Total Coliform Count	---	CFU/100mL	1900		---		40		40		120		---		10	U	10	
Fecal Coliform	1000	CFU/100mL	50		---		10	U	10	U	80		---		10	U	50	
Phosphorus, Total	---	ug/l	---		113		---		---		---		54		---		---	
Phosphorus, Soluble	---	ug/l	---		17		---		---		---		16		---		---	

LOCATION			SW-3		SW-3		SW-3		SW-3		SW-4		SW-4		SW-4		SW-4	
W&C SAMPLE ID			004		014		018		023		003		013		019		024	
SAMPLING DATE			7/1/2009		7/1/2009		7/29/2009		8/12/2009		7/1/2009		7/1/2009		7/29/2009		8/12/2009	
LAB SAMPLE ID			420-27994-3		420-27994-3		420-28692-3		420-29075-3		420-27794-4		420-27794-4		420-28692-4		420-29075-4	
	NYS Sanitary Code	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
BACTERIA																		
Total Coliform Count	---	CFU/100mL	80		---		10	U	120		250		---		640		220	
Fecal Coliform	1000	CFU/100mL	60		---		10	U	60		20		---		30		60	
Phosphorus, Total	---	ug/l	---		49		---		---		---		93		---		---	
Phosphorus, Soluble	---	ug/l	---		18		---		---		---		17		---		---	

LOCATION			SW-5		SW-5		SW-5		SW-5	
W&C SAMPLE ID			005		015		020		025	
SAMPLING DATE			7/1/2009		7/1/2009		7/29/2009		8/12/2009	
LAB SAMPLE ID			420-27994-5		420-27994-5		420-28692-5		420-29075-5	
	NYS Sanitary Code	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual
BACTERIA										
Total Coliform Count	---	CFU/100mL	90		---		60		200	
Fecal Coliform	1000	CFU/100mL	50		---		10	U	10	
Phosphorus, Total	---	ug/l	---		66		---		---	
Phosphorus, Soluble	---	ug/l	---		21		---		---	

Table 6
Summary of Grants
Lake Shenorock Park District – Somers, NY

Program	Grant Type	Qualifications	Amount	Deadline	Agency
Brownfield Cleanup Program	Cleanup Grant for cleanup activities at a specific Brownfield site owned by the applicant.	Enter into a Brownfield Cleanup Agreement with NYS Department of Environmental Conservation.	Up to $200,000 per site. Require a 20% cost share, which may be in the form of contribution of money, labor, material, or services, and must be for eligible and allowable costs.	November 2009	U.S. Environmental Protection Agency (EPA)
Environmental Facilities Corporation State Revolving Fund	Clean Water State Revolving Fund (CWSRF)	The CWSRF provides low interest rate financings to municipalities to construct water quality protection projects. A variety of publicly-owned water quality improvement projects are eligible for financing. Eligible projects nonpoint source projects such as landfill closures and stormwater management projects.	Revolving Fund	----	Environmental Facilities Corporation and the NYS Department of Environmental Conservation
Water Quality Improvement Project (WQIP) Programs	Watershed Protection Grant Program: Non-point Source Abatement & Control/Aquatic Habitat Restoration	Projects aimed to protect and enhance the quality or quantity of the NYC water supply, while preserving and enhancing the economic and social character of the communities in the NYC Watershed	Up to 50% of approved and eligible project costs. Required matching share is 50% of the approved project cost (up to $250,000)	Continuously	NYS Department of Environmental Conservation Division of Water New York City Watershed
Water Quality Improvement Project (WQIP) Programs	Statewide Grant Program: Water Quality Management	Provides funding for projects demonstrating direct environmental benefits that will help reduce polluted runoff, improve water quality and restore habitat in New York State waters.	Reimbursed for up to 75% or 85% of the total cost of the project.	October 16, 2009.	NYS Department of Environmental Conservation
Environmental Protection Fund	Parks Development and Planning Grant Program	Funds must be used to preserve, rehabilitate, or restore lands, waters, or structures for use by all segments of the population for park, recreation or conservation purposes.	Matching grant up to 50%, grant limit of $350,000	September 14, 2009	NYS Office of Parks, Recreation and Historic Preservation



WOODARD & CURRAN
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Site Location Map

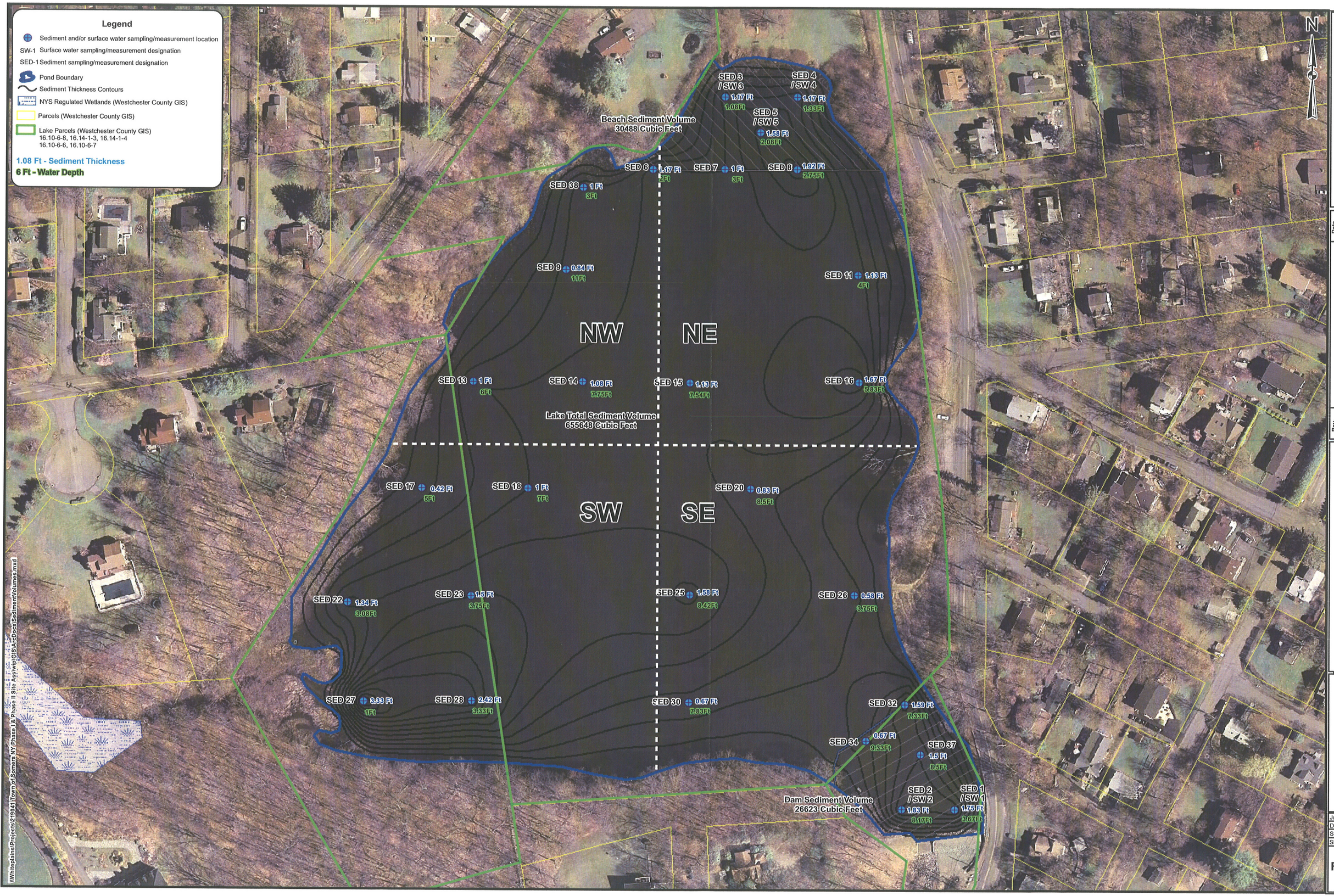
9 Acre Parcel & Lake Shenorock

Source: USGS Seamless Server

1 Inch equals 1500 Feet

0 750 1,500 3,000 Feet

Figure: 1	Drawn By: ADF
Date: September 14, 2009	Project #: 209041.01



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WOODARD & CURRAN

Commitment and Integrity Drive Results

Rev.	Date

Drawn By: ADF
Checked By:
File: SedimentVolumes.MXD
Path:

Lake Shenorock Site Plan

Somers, NY

Feet 0 30 60 120

Job No: 219041
Date: November 19, 2009
Scale: 1 Inch = 60 Feet
Sheet: 1/1

Figure: 2

SCHEMATIC SITE PLAN FOR SHENOROCK BEACH CLUB ASSOCIATION
SOMERS, NEW YORK

1. PROVIDE NEW CLUBHOUSE BUILDING FOR COMMUNITY ACTIVITIES INCLUDING RESTROOMS, CONCESSION STAND, KITCHEN, GATHERING SPACE, AND OUTDOOR SHOWER
2. PROVIDE LIMITED PARKING AND DROP OFF AREA ASSOCIATED WITH NEW CLUBHOUSE
3. CREATE NEW SAND BEACH AT OPEN LAWN AREA THAT EXTENDS INTO LAKE TO ALLOW FOR SWIMMING
4. PROVIDE FLOATING DOCK IN DEEP AREA OF LAKE SWIMMERS
5. DEFINE LAKE SWIMMING AREA WITH FLOATING ROPES TO SEPARATE RECREATIONAL BOATING AND FISHING FROM SWIMMERS
6. MAINTAIN OPEN LAWN AREAS NEAR CLUBHOUSE AND BEACH TO ALLOW FOR PASSIVE RECREATION
7. PROVIDE RECREATIONAL VOLLEYBALL COURT
8. PROVIDE NEW PLAY AREA FOR AGES 5-12
9. PROVIDE NEW PICNIC AREAS WITH BARBEQUES
10. PROVIDE 5' WIDE TRAIL SYSTEM THAT RUNS ALONG EDGE OF LAKE ALONG LAKEVIEW AVENUE FOR PEDESTRIAN ACCESS TO LAKE AREA
11. INSTALL THREE (3) NEW WOOD BRIDGES AT EXISTING STREAM CORRIDORS TO PROVIDE A CONTINUOUS TRAIL SYSTEM
12. ENHANCE LAKE ENTRANCE THROUGH THE ADDITION OF NEW SIGNAGE AND PLANTINGS
13. MAINTAIN LARGE ROCKS AT EDGE OF OPEN AREA TO CONTROL VEHICULAR ACCESS
14. PLANT COMBINATION OF DECIDUOUS SHADE AND FLOWERING TREES AND SHRUBS THROUGHOUT THE PARK TO PROVIDE ADDITIONAL SEASONAL INTEREST, TO DEFINE AND HIGHLIGHT SPECIFIC AREAS OF THE PARK, AND TO INTRODUCE NATIVE PLANT MATERIALS TO THE AREA
15. PROVIDE NEW PARKING ALONG LAKEVIEW AVENUE TO ALLOW FOR EASIER USER ACCESS TO THE PARK
16. IMPROVE EXISTING BOAT LAUNCH BY STABILIZING VEHICULAR ACCESS AND PROVIDING ASSOCIATED PARKING
17. PROVIDE NEW FISHING PIER AT DISCHARGE LOCATION OF EXISTING STREAM CORRIDOR
18. CREATE NODES TO PROVIDE PEDESTRIAN ACCESS ALONG EXISTING STREAMS AND LAKE EDGE
19. PLACE LARGE BOULDERS AND PLANT NATIVE SHRUBS AND GRASSES ALONG LAKE EDGE TO STABILIZE AND NATURALIZE SLOPE

NOTE:
1. BEACH LAYOUT HAS BEEN TAKEN FROM A DRAWING PREPARED BY EBERLIN AND EBERLIN DATED APRIL 2008.

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COMMITMENT & INTEGRITY DRIVE RESULTS

WOODARD & CURRAN

REV	DESCRIPTION	DATE
1.	REVISIONS MADE FOR SEPTEMBER 2009 REPORT	9/04/09

DESIGNED BY:
DRAWN BY:
CHECKED BY:
Beach.dwg

CONCEPTUAL BEACH DESIGN

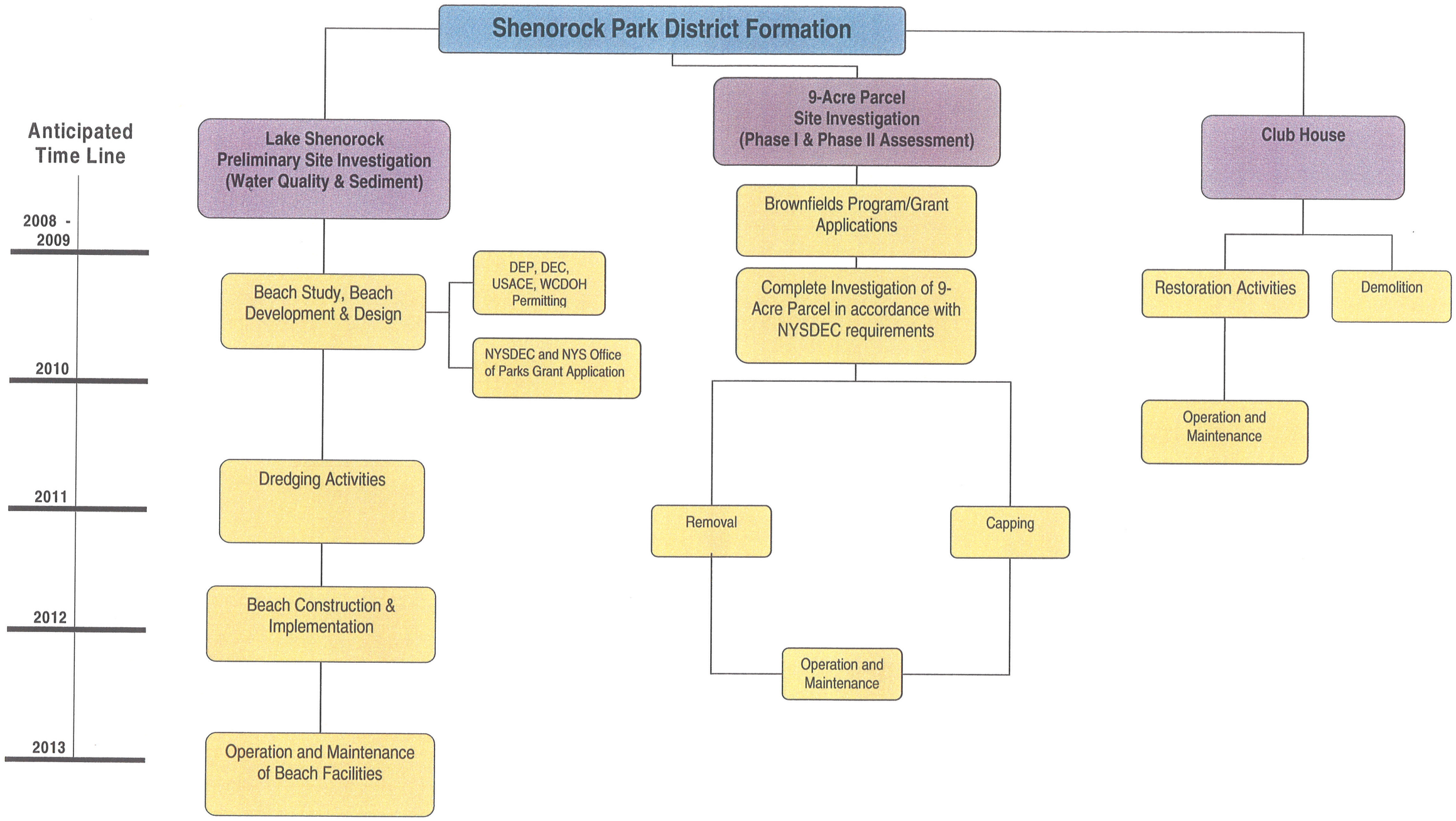
LAKE SHENOROCK
TOWN OF SOMERS
WESTCHESTER COUNTY, NEW YORK

JOB NO.: 219041.01
DATE: November 19, 2009
SCALE: ±1"=30'
SHEET: 1 OF 1

FIGURE 3

W:\219041.01 Somers NY Town of - Shenorock Park District\wip\01 Lake Shenorock\Drawings\Beach Plans\dwg\Beach.dwg, Nov 19, 2009 - 2:08pm

FIGURE 4
Conceptual Time-Line for the Shenorock Park District



APPENDIX B: COST ANALYSIS

6.1 Cost Analysis for Entire Lake Dredging
Lake Shenorock Park District - Somers, NY

Construction Activities

		QTY	UNIT	UNIT COST	TOTAL
Dredging of Entire Lake					
1.0	**Administrative**				
	Admin/Submittals/Implementation Plans	1	LS	$ 10,000	$ 10,000
	Temporary Facilities/Utilities	1	LS	$ 5,000	$ 5,000
	Equipment Mobilization/Demobilization	1	LS	$ 5,000	$ 5,000
	Site Survey (Record Drawings)	1	LS	$ 25,000	$ 25,000
	Subtotal				**$ 45,000**
2.0	**Earthwork/Dredging Activities**				
	Dredging of Lake Beach/Dam Areas	25,000	CY	$ 18	$ 450,000
	Sediment Bags to Store Material	20	EA	$ 2,500	$ 50,000
	Characterization Sampling (Lab & Labor)	1	LS	$ 30,000	$ 30,000
	Erosion & Sedimentation Controls (Silt Fence/Haybales)	500	LF	$ 12	$ 6,000
	Subtotal				**$ 536,000**
3.1	**Transportation and Disposal (9-Acre Parcel)**				
	Haul and Load to 9-Acre Parcel (1.5 Miles Round Trip)	7,500	CY	$ 15	$ 112,500
	Erosion & Sedimentation Controls (Silt Fence/Haybales)	500	LF	$ 12	$ 6,000
	Subtotal				**$ 118,500**
3.2	**Transportation and Disposal (Off-Site)**				
	Haul and Load Offsite (Trucking and Tipping Fee)	7,500	CY	$ 100	$ 750,000
	Erosion & Sedimentation Controls (Silt Fence/Haybales)	500	LF	$ 12	$ 6,000
	Subtotal				**$756,000**

Subtotal Construction (with Disposal at 9-Acre Parcel)	$ 699,500
Contractor Overhead & Profit (15%)	$ 104,925
Estimated Construction Cost	$ 804,425
Contingency (25%)	$ 174,900
Total Estimated Construction Cost (with Disposal at 9-Acre Parcel)	**$ 979,325**
Subtotal Construction (with Off-Site Disposal)	$ 1,337,000
Contractor Overhead & Profit (15%)	$ 200,550
Estimated Construction Cost	$ 1,537,550
Contingency (25%)	$ 334,300
Total Estimated Construction Cost (with Off-Site Disposal)	**$ 1,871,850**

6.1 Cost Analysis for Entire Lake Dredging
Lake Shenorock Park District - Somers, NY

Professional Fees

	QTY	UNIT	UNIT COST	TOTAL
Dredging of Entire Lake				
1.0 Permitting				
NYSDEC Permit Coordination (Excavation & Fill)	1	LS	$ 10,000	$ 10,000
Subtotal				**$ 10,000**
2.1 Design (Disposal at 9-Acre Parcel)				
Approximated to be 5% of Total Construction Costs	1	LS	$ 48,966	$ 48,966
Subtotal				**$ 48,966**
2.2 Design (Disposal Off-Site)				
Approximated to be 5% of Total Construction Costs	1	LS	$ 93,593	$ 93,593
Subtotal				**$ 93,593**
3.0 Construction Administration				
Procurement Documents	1	LS	$ 8,000	$ 8,000
Construction Oversight	1	LS	$ 120,000	$ 120,000
Subtotal				**$ 128,000**

Subtotal Professional Fees (with Disposal at 9-Acre Parcel)	$	186,966
Total Estimated Professional Fees (with Disposal at 9-Acre Parcel)	**$**	**186,966**
Subtotal Professional Fees (with off-site Disposal)	$	231,593
Total Estimated Professional Fees (with Off-Site Disposal)	**$**	**231,593**

Total Construction Costs and Professional Fees

For the Dredging of the Entire Lake (with Disposal at the 9-Acre Parcel), and Associated Professional Fees

Total Estimated Construction Cost (with Disposal at 9-Acre Parcel)	$	979,325
Total Professional Fees	$	186,966
TOTAL CONSTRUCTION COSTS AND PROFESSIONAL FEES	**$**	**1,166,291**

Total Construction Costs and Professional Fees

For the Dredging of the Entire Lake (with Off-Site Disposal), and Associated Professional Fees

Total Estimated Construction Cost (with Off-Site Disposal)	$	1,871,850
Total Professional Fees	$	231,593
TOTAL CONSTRUCTION COSTS AND PROFESSIONAL FEES	**$**	**2,103,443**

6.2 Cost Analysis for Beach Design, Construction and Development
Lake Shenorock Park District - Somers, NY

Construction Activities

		QTY	UNIT	UNIT COST	TOTAL
Dredging of Beach Area					
1.0	**Administrative**				
	Admin/Submittals/Implementation Plans	1	LS	$ 10,000	$ 10,000
	Temporary Facilities/Utilities	1	LS	$ 5,000	$ 5,000
	Equipment Mobilization/Demobilization	1	LS	$ 5,000	$ 5,000
	Subtotal				**$ 20,000**
2.0	**Earthwork/Dredging Activities**				
	Dredging of Lake Beach/Dam Areas	2,000	CY	$ 18	$ 36,000
	Sediment Bags to Store Material	2	EA	$ 2,500	$ 5,000
	Characterization Sampling (Lab & Labor)	1	LS	$ 10,000	$ 10,000
	Erosion & Sedimentation Controls (Silt Fence/Haybales)	500	LF	$ 12	$ 6,000
	Subtotal				**$ 57,000**
3.0	**Transportation and Disposal**				
3.1	Haul and Load to 9-Acre Parcel (1.5 Miles Round Trip)	450	CY	$ 15	$ 6,750
	Subtotal				**$ 6,750**
3.2	Haul and Load Offsite (Trucking and Tipping Fee)	450	CY	$ 100	$ 45,000
	Subtotal				**$ 45,000**

Construction Activities

		QTY	UNIT	UNIT COST	TOTAL
Beach Construction/Development					
4.0	**Admin/Submittals/Implementation Plans**				
	Admin/Submittals/Implementation Plans	1	LS	$ 10,000	$ 10,000
	Submittals/Implementation Plans (HASP, Air Monitoring Plan, etc	1	LS	$ 25,000	$ 25,000
	Temporary Facilities and Utilities (Fencing, Signage, Restrooms,	1	LS	$ 15,000	$ 15,000
	Subtotal				**$ 50,000**
5.0	**Site Preparation**				
	Mobilization/Demobilization	1	LS	$ 15,000	$ 15,000
	Erosion & Sedimentation Controls (Silt Fence/Haybales)	2,000	LF	$ 15	$ 30,000
	Subtotal				**$ 45,000**
6.0	**Earthwork**				
	Landgrading	4,000	SY	$ 5	$ 20,000
	Import Sand	6,000	CF	$ 4.00	$ 24,000
	Subtotal				**$ 44,000**
7.0	**Landscaping**				
	Trees, Shrubs,	1	LS	$ 20,000	$ 20,000
	Topsoil (6-inch Layer) and Seeding	2,500	SY	$ 5	$ 12,500
	Aeration System	1,200	Ac.	$ 20	$ 24,000
	Subtotal				**$ 56,500**

6.2 Cost Analysis for Beach Design, Construction and Development
Lake Shenorock Park District - Somers, NY

Construction Activities

		QTY	UNIT	UNIT COST	TOTAL
Beach Construction/Development					
8.0	**Site Furnishings, Structures, Amenities**				
	Clubhouse (Bathrooms, Locker Rooms, Kitchen, Concession Stand)	1	LS	$ 200,000	$ 200,000
	Fishing Pier	1	EA	$ 40,000	$ 40,000
	Wooden Bridge	3	EA	$ 1,667	$ 5,000
	Minor Beach Components (Playground Area, Volleyball, Signage, Picnic)	1	LS	$ 25,000	$ 25,000
	Subtotal				**$ 270,000**
9.0	**Concrete and Asphalt Paving**				
	Parking/Drop Off Areas	4,500	SF	$ 5	$ 22,500
	Trail System (5' Wide Walking Paths)	700	LF	$ 8	$ 5,600
	Subtotal				**$ 28,100**

tal Construction (with Disposal at 9-Acre Parcel)	$ 577,350
Contractor Overhead & Profit (15%)	$ 86,603
Estimated Construction Cost	$ 663,953
Contingency (25%)	$ 165,988
Total Estimated Construction Cost (with Disposal at 9-Acre Parcel)	**$ 829,941**
Subtotal Construction (with off-site Disposal)	$ 615,600
Contractor Overhead & Profit (15%)	$ 92,340
Estimated Construction Cost	$ 707,940
Contingency (25%)	$ 176,985
Total Estimated Construction Cost (with Off-Site Disposal)	**$ 884,925**

6.2 Cost Analysis for Beach Design, Construction and Development
Lake Shenorock Park District - Somers, NY

Professional Fees

		QTY	UNIT	UNIT COST	TOTAL
Beach Construction/Development					
10.0	**Permitting**				
	NYSDEC, NYCDEP, & ACOE Permitting	1	LS	$ 25,000	$ 25,000
	NYSDEC SEQR Review	1	LS	$ 10,000	$ 10,000
	Local Site Plan Approvals	1	LS	$20,000	$20,000
	Westchester County DOH Approval	1	LS	$ 35,000	$ 35,000
	Subtotal				**$ 90,000**
11.0	**Design**				
	Preparation of Preliminary Plans	1	LS	$ 10,000	$ 10,000
	Engineer's Report (Form/Narrative)	1	LS	$ 10,000	$ 10,000
	Site Drawings & Report	1	LS	$ 10,000	$ 10,000
	Historic Records/Data Search (Weather/Rainfall/Unusual/Quality Problems)	1	LS	$ 10,000	$ 10,000
	8-Week Sampling Effort (Bacteriological, pH, Turbidity)	1	LS	$ 35,000	$ 35,000
	Biological analysis of water quality (Sub-consultant)	1	LS	$ 15,000	$ 15,000
	Review of Auxiliary Water Source	1	LS	$ 5,000	$ 5,000
	Lab Analysis	1	LS	$ 15,000	$ 15,000
	Subtotal				**$ 110,000**
12.0	**Construction Administration**				
	Construction Oversight	1	LS	$ 60,000	$ 60,000
	Prepare Contract Drawings for Beach Design (Architectural & En	1	LS	$ 50,000	$ 50,000
	Prepare Beach Operation & Maintenance Plan	1	LS	$ 25,000	$ 25,000
	Subtotal				**$ 135,000**
				Total Professional Fees	**$ 335,000**

Total Construction Costs and Professional Fees

For the Dredging of the Beach Area (with Disposal at the 9-Acre Parcel), Beach Construction and Development, and Associated Professional Fees		
Total Estimated Construction Cost (with Disposal at 9-Acre Parcel)	$	829,941
Total Professional Fees	$	335,000
TOTAL CONSTRUCTION COSTS AND PROFESSIONAL FEES	**$**	**1,164,941**

Total Construction Costs and Professional Fees

For the Dredging of the Beach Area (with Off-Site Disposal), Beach Construction and Development, and Associated Professional Fees		
Total Estimated Construction Cost (with Off-Site Disposal)	$	884,925
Total Professional Fees	$	335,000
TOTAL CONSTRUCTION COSTS AND PROFESSIONAL FEES	**$**	**1,219,925**

6.3.1 Cost Analysis for Remediation of 9-Acre Parcel - Removal Option
Lake Shenorock Park District - Somers, NY

Construction Costs

		QTY	UNIT	UNIT COST	TOTAL
Construction Activities					
1.0	**Administrative**				
	Temporary Facilities/Utilities	1	LS	$ 5,000	$ 5,000
	Equipment Mobilization/Demobilization	1	LS	$ 10,000	$ 10,000
	Site Survey (Record Drawings)	1	LS	$ 10,000	$ 10,000
	Subtotal				**$ 25,000**
2.0	**Earthwork**				
	Clearing and Grubbing	1	Acre	$ 15,000	$ 15,000
	Excavate and Consolidate Waste for T&D	13,500	CY	$ 4	$ 54,000
	Grading Soils	5,000	SY	$ 2.50	$ 12,500
	Backfill material 12" Compaction Layers	13,500	CY	$ 37	$ 499,500
	Subtotal				**$ 581,000**
3.0	**Transportation and Disposal**				
	Haul and Load Off-Site	6,000	TON	$ 140	$ 840,000
	Subtotal				**$ 840,000**
4.0	**Site Restoration**				
	Topsoil (6-inch Layer) and Seeding	4,500	SY	$ 5	$ 22,500
	Erosion & Sedimentation Controls (Silt Fence/Haybales)	1,500	LF	$ 12	$ 18,000
	Subtotal				**$ 40,500**

Subtotal Construction	$ 1,486,500
Contractor Overhead & Profit (15%)	$ 222,975
Estimated Construction Cost	$ 1,709,475
Contingency (25%)	$ 371,700
Total Estimated Construction Cost	**$ 2,081,175**

6.3.1 Cost Analysis for Remediation of 9-Acre Parcel - Removal Option
Lake Shenorock Park District - Somers, NY

Professional Fees

		QTY	UNIT	UNIT COST	TOTAL
Professional Fees					
1.0	**Design**				
	Complete Investigation of Site & Post Remedial Sampling	1	LS	$ 200,000	$ 200,000
	Work Plans & Reports	1	LS	$ 100,000	$ 100,000
	Design Drawings & Specifications	1	LS	$ 25,000	$ 25,000
	Procurement Documents	1	LS	$ 15,000	$ 15,000
	Admin/Submittals/Implementation Plans/Monitoring Plans	1	LS	$ 20,000	$ 20,000
	Subtotal				$ 360,000
2.0	**Permitting**				
	BCP Application/Regulatory Interface	1	LS	$ 45,000	$ 45,000
	BCP Work Plans, Reports, & Admin	1	LS	$ 150,000	$ 150,000
	Subtotal				$ 195,000
3.0	**Construction Administration**				
	Construction Oversight	1	LS	$ 50,000	$ 50,000
	Subtotal				$ 50,000
			TOTAL Professional Fees		**$ 605,000**

Total Construction Costs and Professional Fees

Remediation of 9-Acre Parcel - Removal Option	
Total Estimated Construction Cost	$ 2,081,175
Total Professional Fees	$ 605,000
TOTAL CONSTRUCTION COSTS AND PROFESSIONAL FEES	**$ 2,686,175**

6.3.2 Cost Analysis for 9-Acre Parcel Remediation - Capping Option
Lake Shenorock Park District - Somers, NY

Construction Costs

		QTY	UNIT	UNIT COST	TOTAL
Construction Activities					
1.0	**Administrative**				
	Temporary Facilities/Utilities	1	LS	$ 5,000	$ 5,000
	Equipment Mobilization/Demobilization	1	LS	$ 10,000	$ 10,000
	Site Survey (Record Drawings)	1	LS	$ 10,000	$ 10,000
	Subtotal				**$ 25,000**
2.0	**Earthwork**				
	Clearing and Grubbing	1	Acre	$ 7,000	$ 7,000
	Grading/Compacting Subgrade	4,500	SY	$ 7.00	$ 31,500
	Placement and Grading of 6" Subgrade (Gas Venting Layer)	4,500	SY	$ 15	$ 67,500
	Subtotal				**$ 106,000**
3.0	**Cap Construction**				
	60-mil LLDPE Geomembrane Barrier	43,560	SF	$ 1.00	$ 43,560
	Drainage Geocomposite Installation	46,530	SF	$ 0.50	$ 23,265
	Cover Soil (24-inch Layer)	3,500	CY	$ 15	$ 52,500
	Topsoil (6-inch Layer) and Seeding	4,840	SY	$ 5	$ 24,200
	Gas Venting System (Trenches, Piping, Stone Geotextile)	1	LS	$ 15,000	$ 15,000
	Subtotal				**$ 158,525**
4.0	**Ground Water Monitoring**				
	Installation of Additional Monitoring Wells	1	LS	$ 50,000	$ 50,000
	Subtotal				**$ 50,000**
5.0	**Site Security and Site Stabilization**	5,000	SF	$ 2	$ 10,000
	6' Chain Link Fence, Gates	1	LS	$ 40,000	$ 40,000
	Erosion & Sedimentation Controls (Silt Fence/ Haybales/ Stabilization)	1,500	LF	$ 12	$ 18,000
	Subtotal				**$68,000**

Subtotal Construction	$ 407,525
Contractor Overhead & Profit (15%)	$ 61,129
Estimated Construction Cost	$ 468,654
Contingency (25%)	$ 117,163
Total Estimated Construction Cost	**$ 585,817**

6.3.2 Cost Analysis for 9-Acre Parcel Remediation - Capping Option
Lake Shenorock Park District - Somers, NY

Professional Fees

		QTY	UNIT	UNIT COST	TOTAL
Professional Fees					
1.o	**Permitting**				
	BCP Application/Regulatory Interface	1	LS	$ 45,000	$ 45,000
	BCP Work Plans, Reports, & Admin	1	LS	$ 150,000	$ 150,000
	Subtotal				**$ 195,000**
2.o	**Design**				
	Complete Investigation of Site	1	LS	$ 200,000	$ 250,000
	Work Plans & Reports	1	LS	$ 100,000	$ 100,000
	Cap Design Drawings & Specifications	1	LS	$ 25,000	$ 25,000
	Procurement Documents	1	LS	$ 15,000	$ 15,000
	Admin/Submittals/Implementation Plans/Monitoring Plans	1	LS	$ 20,000	$ 20,000
	Subtotal				**$ 410,000**
3.0	**Construction Administration**				
	Construction Oversight	1	LS	$ 50,000	$ 50,000
	Procurement Documents	1	LS	$ 15,000	$ 15,000
	Subtotal				**$ 65,000**
			Total Professional Fees		**$ 670,000**

Total Construction Costs and Professional Fees

Remediation of 9-Acre Parcel - Capping Option	
Total Estimated Construction Cost	$ 585,817
Total Professional Fees	$ 670,000
TOTAL CONSTRUCTION COSTS AND PROFESSIONAL FEES	**$ 1,255,817**

6.4 Cost Analysis for Clubhouse
Lake Shenorock Park District - Somers, NY

Construction Costs

		QTY	UNIT	UNIT COST	TOTAL
Mechanical Systems					
1.0	**Heating System**				
	New boiler with hot water loop, circulators, hot water	1	LS	$ 20,700	$ 20,700
	Subtotal				**$ 20,700**
2.1	**Ventilation & Air Conditioning System**				
	New air handler with 5 ton condensing unit and ductwork	1	LS	$ 15,500	$ 15,500
	Subtotal				**$ 15,500**
2.2	**Ventilation & Air Conditioning System**				
	New air handler with 10 ton condensing unit and ductwork	1	LS	$ 31,000	$ 31,000
	Subtotal				**$ 31,000**
3.0	**Plumbing System**				
	Upgrade of Fixtures and Cleaning of Piping	1	LS	$ 3,600	$ 3,600
	New Ejector Pumps	2	EA	$ 1,550	$ 3,100
	Subtotal				**$ 6,700**
4.0	**Electrical System**				
	Increased Lighting and Distribution	1	LS	$ 3,600	$ 3,600
4.1	Service Upgrade (If Required)	1	LS	$ 5,200	$ 5,200
	Subtotal				**$ 8,800**

Minimum Subtotal Construction	$	46,500
Contractor Overhead & Profit (15%)	$	6,975
Estimated Construction Cost	$	53,475
Contingency (25%)	$	13,369
Minimum Total Estimated Construction Cost	**$**	**66,844**
Maximum Subtotal Construction	$	67,200
Contractor Overhead & Profit (15%)	$	10,080
Estimated Construction Cost	$	77,280
Contingency (25%)	$	19,320
Maximum Total Estimated Construction Cost	**$**	**96,600**

6.4 Cost Analysis for Clubhouse
Lake Shenorock Park District - Somers, NY

Professional Fees

		QTY	UNIT	UNIT COST	TOTAL
Architectural Improvements					
1.0	**Roof Structure**				
	Repair broken/missing members in roof support system,	1	LS	$ 28,000	$ 28,000
	Subtotal				**$ 28,000**
2.0	**Building Exterior**				
	Repair/Replace exposed sections of siding	1	LS	$ 7,600	$ 7,600
	Reconstruct building entrances to current standards	1	LS	$ 7,800	$ 7,800
	Replace existing doors to current standards	1	LS	$ 2,800	$ 2,800
	Subtotal				**$ 18,200**
3.0	**Building Interior**				
	Replace damaged areas of flooring	1	LS	$ 4,700	$ 4,700
	Renovations to Kitchen	1	LS	$ 21,000	$ 21,000
	Reconstruct bathroom to current standards	1	EA	$ 21,000	$ 21,000
	Subtotal				**$ 46,700**
4.0	**Materials Disposal**				
	Materials Disposal	1	LS	$ 10,000	$ 10,000
	Subtotal				**$ 10,000**
			Total Professional Fees		**$ 102,900**