2018 ANNUAL POST-CONSTRUCTION WETLAND MITIGATION REPORT for the BROOKFIELD AVENUE LANDFILL Operable Unit 1

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Staten Island, NY 10308

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1.0 INTRODUCTION

On behalf of the New York City Department of Parks and Recreation (NYCDPR), Amy S. Greene Environmental Consultants Inc. (ASGECI) has prepared this Post-Construction Wetland Mitigation Monitoring Report for submittal to New York State Department of Environmental Conservation (NYSDEC) as part of the requirements set forth by the Tidal Wetland regulations (6NYCRR Part 661) and Freshwater Wetland regulations (6NYCRR Part 663) and Wetlands Permit Equivalency (Site No. 2-43-006, dated December 11, 2009; see Appendix A). The contents of this report will present the wetland data collected during the 2018 growing season for the 11 wetlands associated with the compensatory mitigation for the Brookfield Avenue Landfill closure.

Brookfield Avenue Landfill is currently a Class 4 inactive hazardous waste disposal site. The New York City Department of Environmental Protection (NYCDEP) implemented the remediation and closure of the landfill which was approved by the NYSDEC on April 6, 2015, marking the official start of the post-closure period. The remedial action of the landfill enabled its reuse as a public park and the NYCDPR officially opened the site to the public as Brookfield Park on December 12, 2017. The landfill is located to the north of Arthur Kill Road and to the east of Richmond Avenue in Richmond County, Staten Island, New York City. Approximately 132 acres of this 272-acre site were used for the disposal of municipal solid waste. The site is adjacent to a primarily suburban residential area and is adjoined immediately to the north by Richmond Creek (See Project Location Map, Figure 1). This site is adjacent to the Northwest Staten Island Harbor Herons Special Natural Waterfront Area along Richmond Creek, and adjacent to a Significant Coastal Fish and Wildlife Area.

This document is the fourth of five planned annual Wetland Mitigation Monitoring Reports for the project. Wetland Mitigation Monitoring Reports summarizing the findings related to vegetation establishment and associated habitat development will be presented annually to NYSDEC at the end of each growing season. If the percent coverage and percent survival requirements are not met, recommendations for additional plantings or other adaptive management measures will be provided in the annual report.

1.1 Project Description

Disturbance to tidal and freshwater wetlands and adjacent areas required permit authorization from the NYSDEC. As part of the compensatory mitigation for the project, NYCDEP has developed mitigation plans and 11 wetlands have been constructed or restored at the Brookfield Avenue Landfill. One salt marsh and two brackish wetlands make up 7.33 acres of tidal wetlands, and eight freshwater wetlands consist of 9.28 acres. The total wetland mitigation acreage is 16.61 acres (Appendix B). According to the regulatory permit equivalency issued by NYSDEC in 2009, monitoring of the Brookfield Avenue Landfill wetland mitigation areas is required for a minimum of five years following their construction in accordance with the permit conditions.

This document is the fourth of five annual monitoring reports. The objectives of this report are to:

- Quantify and document woody and herbaceous plant species within the wetland creation areas.
- Quantify and describe the hydrology within the wetland creation areas.
- Provide descriptions of soil morphology from the monitoring plots.
- Discuss 2018 maintenance and monitoring activities.
- Discuss routine maintenance & monitoring activities recommended for 2019.

The Brookfield Avenue Landfill wetland mitigation will be deemed "successful" if after a minimum monitoring period of five growing seasons following completion of construction for freshwater and intertidal wetland mitigation areas the following criteria are achieved:

- The specified minimum wetland creation, wetland enhancement and intertidal wetland compensation areas have been created or enhanced to the greatest extent possible.
- Native tree species are an average of at least five feet in height, and are growing and thriving.
- There is at least 85% survival (i.e., average density of native trees and shrubs $\geq$ 340 trees/shrubs per acre) of mitigation plantings including natural regeneration of native species throughout the forested wetland creation, forested wetland enhancement and riparian compensation areas.
- There is at least 85% coverage of desirable (i.e., native non-invasive) plant species throughout the wetland creation, wetland enhancement and riparian compensation areas.
- There is less than 10% coverage by invasive, non-native species.
- Saturation and/or inundation within the surface (i.e., within 18" of the surface) is present at a minimum of 5% of the growing season within the wetland creation areas.
- Monitoring data indicates that the plant species composition and density of the forested wetland creation and enhancement areas exhibit an ecological trajectory indicative of reference forest ecosystems.

1.2 Project History

Disturbance to tidal and freshwater wetlands and adjacent areas required permit authorization from the NYSDEC. A Wetland Mitigation Plan for 11 wetlands was originally created by CDM Smith, and later edited by ASGECI to accommodate variations in subgrade, salt tolerance, level of inundation, and site-specific plantings. All adaptations were developed in August 2012, in conjunction with NYCDEP and approved by NYSDEC.

Pre-construction tidal wetlands bordering Richmond Creek were composed mostly of high marsh common reed (*Phragmites australis*) and intertidal marsh zones of smooth cordgrass (*Spartina alterniflora*) and salt meadow cordgrass (*Spartina patens*). Pre-construction freshwater wetlands on site existed along the southwest portion of the site. These wetlands were also dominated by common reed. Common reed grew in both wetland and upland areas. The existing salt marsh to the north of the site is dominated by common reed. The goals of the mitigation plan were to enhance onsite wetlands and create wetlands to provide stormwater storage and wildlife habitat within this site.

As part of the Wetland Mitigation Plan, elevation-based planting zones were developed throughout the wetlands in 6-inch intervals. Within the freshwater wetland design, each zone corresponds to potential standing water depths ranging from 0 to 2 feet. Higher elevation planting areas, "Planting Islands", were developed to incorporate wetland trees and shrubs into certain wetland areas. Trees and shrubs were designed to be planted 10-foot on center and 5-foot on center, respectively. Within the tidal wetland design, each zone corresponds to differing levels of salinity and frequency of tidal flushing (or lack thereof) due to elevations of the wetland areas. The planting zones contain appropriate flood-tolerant or salt-tolerant plant species.

Restored or enhanced wetlands have had at least one foot of material (i.e. vegetation and soil) excavated from the existing grade, and at least one foot of clean topsoil replaced. Restored freshwater wetlands received at least one foot clean freshwater sand/topsoil placed above the existing clay soil. Created freshwater wetlands have up to five feet of clean sand/topsoil to achieve final grade. All freshwater wetlands were seeded and planted with herbaceous plugs; five wetland areas were planted with a scrub-shrub fringe. The salt marsh and brackish wetlands were planted with herbaceous plugs. Three freshwater wetlands are forested wetlands.

The design and implementation of the 11 Brookfield Avenue Landfill wetlands required observations of hydrology, tidal fluctuations and the extent of salinity, and adaptation of the original planting list due to the result of those observations. In accordance with best restoration practices, some wetlands were expanded to remove additional invasive species, or reduced to preserve pre-existing native wetland species. As a result, the onsite wetland mitigation activities have either met or exceeded the anticipated mitigation acreage requirement.

The 11 wetlands differ from each other due to the fact that they have varying levels of salinity, differing hydrology, and underlayment. Because of the complex diversity of the 11 wetlands, several factors were considered and incorporated in the design process including water saturation depth, level of salinity, infiltration, tidal fluctuation, and potential depth of standing water.

All freshwater wetlands were seeded and later planted with herbaceous plugs to supplement wetland seed. Salt marsh and brackish wetlands were not seeded; however, these areas were planted with smooth cordgrass (*Spartina alterniflora*) or similar plugs in accordance with the approved mitigation plans.

Trees and shrubs were planted in eight of the 11 wetlands. In three freshwater wetlands on the landfill cap, higher elevation planting areas, "Planting Islands", were developed to incorporate wetland trees and shrubs into certain wetland areas. Trees and shrubs have been planted approximately 10-foot on center and 5-foot on center, respectively.

All wetland areas were built and landscaped in accordance with the approved Wetland Mitigation Plan (3/01/2013). Construction of the Final Wetland Mitigation Plan commenced in September 2012. The sequence of construction followed the approved Construction Plans. Earthwork, seeding (when applicable), herbaceous and woody plant material installation was completed by September 2013. Additional replacement plantings were completed in 2014 (Appendix B). A total of 1,871 trees and shrubs and 111,380 herbaceous plugs were planted throughout the 11 wetlands.

Routine maintenance inspections were conducted during the 2015-2017 growing seasons and have continued during the 2018 growing season. Activities performed during the routine maintenance inspection included invasive species assessment and observations regarding hydrologic characteristics and wildlife usage within the site. In 2015, replacement plantings for dead material were installed as needed in accordance to the landscape guarantee following the performance of a tree mortality survey.

Figure 1


Fresh Kills Park
Latourette Park
Great Kills Park
Arthur Kill Rd
Richmond Ave
Richmond Hill Rd
Gifffords Ln
Hylan Blvd
Legend
Project Location
Project Location Map
Brookfield Avenue Landfill
Borough of Staten Island
Richmond County, New York
ASGECI Project # 3242
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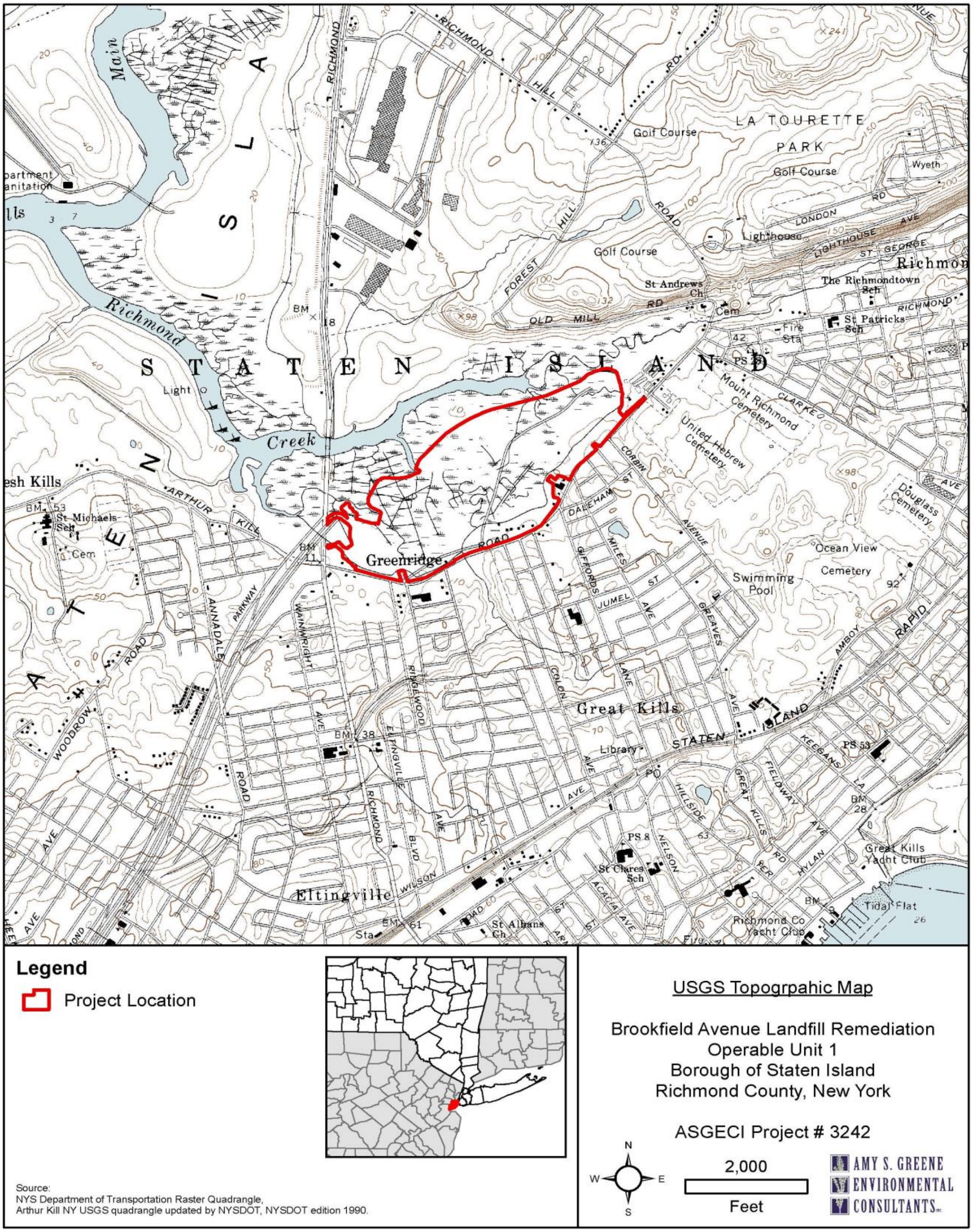
AMY S. GREENE
ENVIRONMENTAL
CONSULTANTS
Source:
ESRI Street Map North America, Tele Atlas North America, Inc.,
published by ESRI® Data & Maps, Redlands, California, 2010.

Figure 2



STATEN ISLAND
Richmond Creek
Main Creek
Fresh Kills
LA TOURETTE PARK
Golf Course
Greenridge
Great Kills
Eltingville
Richmondtown
Mount Richmond Cemetery
United Hebrew Cemetery
Ocean View Cemetery
Douglass Cemetery
Great Kills Yacht Club
Richmond Co Yacht Club
Tidal Flat
Legend
Project Location
USGS Topogrpahic Map
Brookfield Avenue Landfill Remediation
Operable Unit 1
Borough of Staten Island
Richmond County, New York
ASGECI Project # 3242
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AMY S. GREENE
ENVIRONMENTAL
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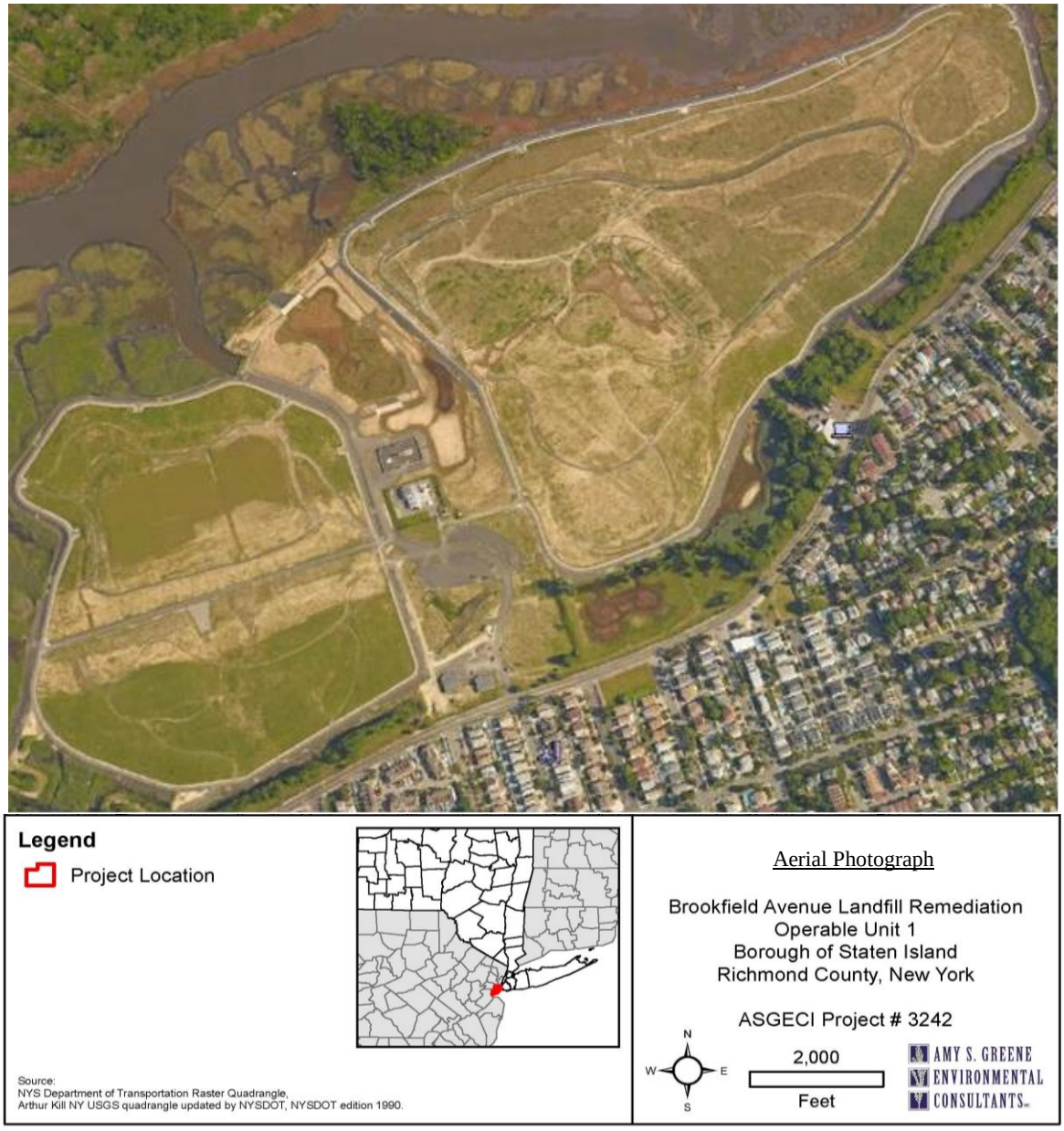
Source:
NYS Department of Transportation Raster Quadrangle,
Arthur Kill NY USGS quadrangle updated by NYSDOT, NYSDOT edition 1990.

Figure 3.


Legend
Project Location
Source:
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Aerial Photograph
Brookfield Avenue Landfill Remediation
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CONSULTANTS

2.0 MONITORING PROGRAM

A Post-Construction Wetland Mitigation Monitoring Plan (Monitoring Plan) was submitted to NYCDEP and NYSDEC in December 2013. The Post-Construction Wetland Mitigation Monitoring Program was developed based on the approval of the Monitoring Plan.

2.1 Monitoring Summary

The Brookfield Avenue Landfill construction was documented by a post-construction, as-built survey (Appendix B). The as-built survey depicts the post-construction elevations within the wetland mitigation project including adjacent transition areas at no less than 1 foot contour intervals, locations of monitoring devices, location of deer exclusion fencing, and other pertinent information required to assess construction and success of the project. An as-built plant list highlighting the species planted within the project area is included in Appendix B.

Monitoring will determine if the requirements of the approved mitigation plan have been met, including vegetation development, soil properties, colonization by benthic invertebrates, and habitat usage by wildlife.

Annual monitoring will be conducted at the mitigation site and a suitable reference site (see Section 2.2 below) for five years following the completion of the mitigation planting operation. Monitoring includes photo documentation and vegetation community mapping, including analysis of wetland vegetation, soil properties, and wildlife. The protocols followed for each parameter are described in the following sections.

Annual monitoring reports are submitted to the NYSDEC following each growing season during the monitoring period. Annual monitoring reports contain summaries of the monitoring data including woody plant species, height and densities; herbaceous cover estimates and species; representative descriptions of soil morphology; site photographs; hydrologic data and description of management issues. Monitoring memos have been submitted to the NYCDEP each year in May and are now submitted to NYCDPR. Monitoring memos addressed whether adequate hydrology has been established, plant survival and growth, herbivory, invasive species and other maintenance issues that may affect the long-term development of the wetland mitigation project. Monitoring the freshwater and intertidal wetland mitigation areas has commenced and will continue for a period of at least five years. The NYSDEC may require monitoring beyond the initial five year period if monitoring data do not indicate that the species composition and density of the wetland creation and enhancement areas do not yet meet the target success criteria previously stated.

2.2 Selection of Reference Marsh

The selected tidal reference marsh is an existing salt marsh located immediately to the north of the mitigation site. The reference marsh has intertidal communities of smooth cordgrass, and high marsh communities of salt meadow cordgrass (*Spartina patens*), but portions of it are dominated by common reed (*Phragmites australis*). An area of the reference marsh that does not contain invasive species was chosen as a reference location in order to provide an actual onsite comparison of the mitigation areas to a stabile tidal marsh area. The reference data was collected in 2017 and will be used to compare the tidal mitigation areas to the reference areas each year.

The following is a synopsis of the herbaceous cover found within the reference marsh sample location:

Table 1. Average Vegetative Coverage Within Reference Tidal Wetland	
Vegetation Description	**Average**
Spartina patens (Pct. Coverage)	**6.27**
Spartina alterniflora (Pct. Coverage)	**67.08**
Avg. Height (cm):	**49.26**
Avg. Density (¼ m^2):	**5.95**

All freshwater wetlands onsite have been created atop the landfill cap and are hydrologically driven by precipitation and stormwater runoff. Additionally, soils contain very low nutrients and are sandy in nature. Furthermore, many of the wetlands have been designed as forested wetlands. For these reasons, an on-site or nearby reference wetland could not be established for these wetlands. Nonetheless, these wetlands have been built and maintained with the original goals and performance standards in mind, as presented in the approved wetland mitigation plan.

2.3 Mitigation Success Criteria

Standard success criteria have been identified for the wetland mitigation project. At the end of the five-year review period, the mitigation project will be deemed successful if the following criteria are met:

- Achieve functional ecosystems to the greatest extent possible.
- At least 85% survival of mitigation plantings.
- At least 85% coverage of desirable plant species.
- Less than 10% coverage by invasive, non-native plant species.
- Mitigation areas contain hydric soils.
- Wetland hydrology has been documented within wetland areas.

2.4 Vegetation

Each spring, a qualitative assessment of the mitigation areas is conducted using data sheets and photos, making note of items that call for immediate attention, such as mass mortality, aggressive invasive species, lack of hydrology, or erosion hazards.

Each fall, a quantitative assessment of each wetland is conducted. Vegetative success criteria will be evaluated by systematic sampling within the constructed and restored wetlands and adjacent areas.

2.4.1 Forested Wetlands

The growth and coverage of all woody vegetation, and scrub-shrub communities, and areas within the project area is monitored. Information recorded consists of the following:

- All planted trees and shrubs surveyed for species, health, height and caliper.
- All planted trees and shrubs counted, and their condition (healthy, stressed, or dead) noted.
- The number of healthy live trees and shrubs compared to the plant schedule in order to determine the percent survival.

- Any signs of disease, predation, or other disturbance monitored and recorded; recommendations provided to address problem situations

For the three forested wetlands (Wetlands #3, #4, and #5), permanent vegetation plots were established within the wetlands and adjacent areas. Plot locations are indicated on the As-built Plan in Appendix B.

The corners of the vegetation sampling plots are staked in the field. The proposed sampling methodology for inventory plots is discussed in detail by Peet, et. al. (1998); an abbreviated discussion of the procedure follows. The standard observation unit to be used is a 10 x 10 meter module (0.01 ha/0.02 ac). Generally, each plot consists of a 2 x 3 array of modules (0.04 ha/0.10 ac). A 2 x 5 meter array is the recommended size for description of forest communities. However, smaller arrays may be used in areas with homogeneous overstory vegetation or dense understory.

Within each array, woody stem presence, cover, diameter, and height is recorded within each module. Depending on coverage of herbs and bryophytes (i.e. mosses), these strata are sampled using a subset of modules or nested quadrats within modules. Plot and site data is recorded for each array including soil morphology, aspect, slope, elevation, topographic position, and total estimated cover of the vegetative strata (trees, saplings, shrubs, herbs, vines, and bryophytes).

Estimates of woody stem density, woody stem height, and herbaceous cover are obtained for each planted and naturally regenerating species. In addition, a complete count of all planted trees is performed to determine tree planting success.

2.4.2 Emergent Wetlands

For the eight emergent wetlands (see map for Wetlands #1, #2, #6, #7, #8, #9, #10 and #11), each wetland contains transects, spaced evenly, running the length of the wetland. Transect endpoints are permanently marked with PVC piping. Quadrats (1.0 m^2) are placed along the transects at a minimum of ten locations per transect. Information recorded in each quadrat consists of the following:

- All plant species occurring in each quadrat along the transect.
- All live stems of any plant species within a 0.25 m^2 section of the quadrat are counted.
- All live stems of any plant species within a 0.25 m^2 section of the quadrat are measured from the base of the plant to the top of the stem in meters.

A Trimble GPS is used to show the approximate locations of pertinent features and vegetation zones. A base map is provided with the annual monitoring report. All transects and sampling plots are shown on plans and submitted with each monitoring report.

Color photographs of the restoration site are taken during each monitoring visit. Transect marker stakes are utilized as permanent photo stations for photographic monitoring.

2.5 Soil Sampling

A complete soil profile, including hydric soil characteristics, is recorded along each transect and presented in each of the monitoring reports. In year five, a total of five soil samples will be collected in order to determine the total organic carbon content, hydrologic features, and the soil salinity (where applicable). Samples will be collected along wetland transects. Topsoil will be sampled within the top 6 inches.

2.6 Hydrology

The presence/absence of wetland hydrology within the wetland enhancement areas is verified by review of field indicators during wetland delineation and data obtained from onsite monitoring devices. A total of eight automatic recording wells (i.e., RDS WM-40 model or equivalent) were installed within the wetland areas at representative locations, ranging from the lowest elevation to the upper limit of the onsite created or enhanced wetlands. Automatic monitoring wells will be maintained throughout the monitoring period.

2.7 Wetland Delineation

A comprehensive, final report that summarizes the results and success of the mitigation project, including a delineation of the extent of wetlands, will be submitted after the final visit in the fall of the fifth year of monitoring. The fifth year wetland delineation will be performed utilizing methodology outlined in the *US Army Corps of Engineers Wetland Delineation Manual (1987)* and corresponding supplements.

The five-year report will compare the delineated wetland boundary and the design plans. Differences between the two will be analyzed and discussed based on findings documented in monitoring efforts.

2.8 Fish and Wildlife

During site visits, evidence or sighting of amphibian, reptile, mammal, fish, or bird activity within the site was documented. State-listed species utilizing the site were also documented. Benthic invertebrates utilizing the wetland area were noted along each transect. Targeted species surveys were not conducted as part of the mitigation monitoring.

During site visits, all sightings of fish-feeding birds; benthic-invertebrate-feeding birds; wading birds, waterfowl, and other freshwater or brackish wetland associated bird species were recorded. Any other wildlife observed at the site during any site visit were recorded as well.

2.9 Recommendations and Corrective Actions

Wetland parameters (hydric soils, hydric vegetation, and hydrology) were compared to success criteria for each wetland area. The overall function of the wetlands was assessed based on the purpose and goals of the project.

During site visits, items that may require changes to the site, corrective actions, and/or further monitoring were documented. If necessary, NYSDEC would be notified of any problems identified onsite. Invasive species were evaluated to determine if they meet the permit equivalency requirements (<10% coverage). Maintenance activities (such as hand weeding, application of pesticide or other NYCDEP/NYCDPR-approved method for the removal of invasive/noxious species in the site) were identified.

The number of healthy live trees and shrubs were compared to the planting schedule in order to calculate the percent survival. Herbivory from rodent girdling or deer browse is evaluated to determine if it is resulting in excessive plant mortality or lack of coverage.

In the event of winter storms or other destructive events, the mitigation site will be inspected for damage. At a minimum, this will include one visit annually following any noteworthy storm event. Photographs will be taken to document any damage.

ASGECI recommends changes, maintenance, or corrective actions that will better the results and outcome of the project. These measures may include replanting, herbicide treatment, weeding, installation of erosion control measures, etc. All findings from annual site visits are presented in the annual monitoring reports. Per the project

specifications, the final monitoring report will also include a long-term (30-year) maintenance plan, as well as the required short-term maintenance plan.

3.0 HYDROLOGY

The primary sources of hydrology for freshwater wetland creation areas within the Brookfield Avenue Landfill, includes precipitation, shallow seasonal groundwater and overland flow (i.e., surface runoff). Four of the 11 wetlands (Wetlands #2, #3, #4, #5) are located on the capped landfill, where the cap geomembrane is considered the wetland liner. The as-built drawings indicate that approximately two to six feet of soil is present between the bottoms of these four wetlands and the landfill cap geomembrane. Hydrology within the intertidal wetland mitigation areas is derived primarily from diurnal tidal flow.

A total of eight automatic monitoring wells (RDS WM-40 and WM-80) were installed within the mitigation wetlands in 2015 at representative locations throughout the freshwater wetland creation areas and intertidal wetland areas (Appendix B). Monthly precipitation data for 2018 were obtained from Rutgers University for three stations in New Brunswick, New Jersey which is the closest climate monitoring data location.

Table 2. Summary of Precipitation Recorded at New Brunswick 3 SE, NJ Climatological Station for 2018

Month	2018 Actual Precipitation (in)	Average Precipitation (in)	Deviation From Normal Monthly	Cumulative Deviation
January	2.16	3.44	-1.28	-1.28
February	6.67	3.01	3.66	2.38
March	5.53	3.80	1.73	4.11
April	5.03	3.75	1.28	5.39
May	5.85	4.00	1.85	7.24
June	4.96	3.89	1.07	8.31
July	4.30	4.84	-0.54	7.77
August	4.18	4.68	-0.50	7.27
September	8.82	4.07	4.75	12.02
October	3.20	3.51	-0.31	11.71
November	8.72	3.48	5.24	16.95
December	5.81	3.73	2.08	19.03
TOTALS:	65.23	46.20	19.03	----

*Date Source: Rutgers University, Merged Data from Stations 286055, 286062 and 286053

Annual growing season precipitation for 2018 (May-September) was 28.11 inches, approximately 6.63 inches above average (Table 2). Precipitation was slightly below average in July and August 2018, but well above average during the other growing-season months.

3.1 Hydrologic Description

The primary hydrologic source for the tidal wetlands is diurnal tidal flow. The primary hydrologic sources for the non-tidal wetlands are precipitation, shallow groundwater and surface water runoff. Sources of hydrology for the four wetlands located atop the landfill are precipitation and surface water runoff.

3.2 Results of Hydrologic Monitoring

Monitoring wells were installed in October 2015. A total of eight monitoring devices were maintained during 2018. Monitoring data was downloaded and formulated into hydrographs, specific to the wetland(s) at which it is installed. However, during the download process, it was found that one of the monitoring devices (MW-8) was in disrepair and data could not be salvaged from it. This well will be repaired or replaced and function during the next growing season. Concurrently, MW-3 also was malfunctioned during a portion of the season and only downloaded data through May 2018. As such, the MW-3 hydrograph reflects only the obtainable data. Locations of each monitoring device can be viewed on the Monitoring Plan (Appendix B). The wetland hydrographs can be viewed in Appendix C.

With total rainfall being well above normal during the 2018 growing season, the data collected from the monitoring devices, as presented in Appendix C, indicate wetland hydrology in most of the 11 eleven wetlands. Wetland hydrology was identified in all three tidal gauges (TG-1, TG-6 & TG-11) through daily tidal ebb and flow. Wetland hydrology was also identified at MW-2 and MW-9, where standing water and saturation was observed throughout a majority of the planting area. At locations MW-3 and MW-5, water levels were again documented to be typically more than 18 inches below the average land surface elevation. Therefore, it can be inferred that wetland hydrology was not present in the higher elevation planting islands in Wetlands #3, #4 and #5 during the 2018 growing season.

3.3 Conclusions

Average growing season precipitation (May-September) is 21.48 inches. Actual growing season precipitation for 2018 was 28.11 inches. Hydrologic data collected onsite is representative of the annual precipitation data and onsite conditions. Diurnal tidal flow continued to be documented within all tidal wetlands.

Qualitative assessments conducted during monitoring are consistent with the hydrograph data. All Tidal Wetlands showed evidence of regular tidal flushing, as drift lines and saturated soils were regularly documented. Wetlands #2, #7, #8, #9, and #10 also were documented to contain wetland indicators during monitoring, which is consistent with data collected from the correlating monitoring devices. Forested areas of Wetlands #3, #4 and #5 were again documented to have little to no wetland hydrology, however, ponded areas and ditch areas surrounding the perimeter contained standing water and wetland hydrology during visits.

4.0 VEGETATION

Vegetation monitoring was completed in late October 2018. The methodology generally followed procedures described in Peet, et. al. (1998). Photos of the monitoring plots and transects are contained in Appendix D. Field data sheets were completed for each monitoring plot to document woody stem density, woody stem height, and herbaceous cover for each planted and naturally regenerating plant species (Appendix E).

4.1 Success Criteria

The following vegetative performance criteria are the long-term goals for the Brookfield Avenue Landfill mitigation project. The mitigation project will be deemed "successful" if after a minimum monitoring period of five growing seasons, the freshwater and intertidal wetland mitigation areas:

- Achieve functional ecosystems to the greatest extent possible.
- At least 85% survival of mitigation plantings.
- At least 85% coverage of desirable plant species.

- Less than 10% coverage by invasive, non-native plant species.

Six permanent vegetation plots were established within the forested freshwater wetland areas using a stratified-random approach (1 plot per 5 acres +/-). The proposed sampling methodology for inventory plots is discussed in detail by Peet, et. al. (1998). An abbreviated discussion of the procedure follows. The standard observation unit is a 10 x 10 meter module (0.01 ha/0.02 ac). Generally, each plot consists of a 2 x 3 array of modules (0.04 ha/0.10 ac). A 2 x 5 array is the recommended size for description of forest communities (Peet, et. al., 1998) However, smaller arrays may be used in areas with homogeneous overstory vegetation or dense understory. Within each array, woody stem presence, cover, and height is recorded within each module. Depending on coverage of herbs and bryophytes, these strata are sampled using a subset of modules or nested quadrats within modules. Plot and site data is recorded for each array including: soil morphology, aspect, slope, elevation, topographic position, and total estimated cover of the vegetative strata (trees, saplings, shrubs, herbs, vines and bryophytes). Monitoring plots were permanently located in the wetland mitigation area using PVC pipe and mapped using global positioning system (GPS) technology (Appendix B.).

Vegetation monitoring in the intertidal wetland areas generally follows the protocol outlined in the NYSDEC's *New York State Salt Marsh Restoration and Monitoring Guidelines* (2000). Site inspections are performed twice annually; one inspection is performed in the spring and a second inspection is performed during the fall. ASGECI performed the annual qualitative assessment in May 2018. Due to the unanticipated brush fire in April 2018, ASGECI was also onsite to map the extent of the damage done during this event. The fall visit includes the annual quantitative site monitoring and was conducted in October 2018. The quantitative monitoring consists of the following:

1. Fifteen permanent sampling transects placed evenly across the tidal, intertidal, and freshwater herbaceous wetland areas of the site (Appendix B). These transects were positioned to include the channels, mudflats, and newly planted areas. Transect locations were permanently marked at each end with PVC piping. During the 2016 site monitoring, "Transect A" in Wetland #1 was relocated due to loss of the PVC marker. "Transect A" was moved from the northern most portion of Wetland #1 to the southernmost portion of the tidal wetland, while the remaining transects remained in place. The remaining transects were renamed to coincide with the 2015 transect names. During each monitoring visit, noteworthy features occurring along each transect are recorded.

2. Randomly spaced quadrats (4.0 m^2) were placed along transects. A minimum of seven quadrats were established per transect.

    2.1 All plant species occurring in each quadrat along transects were recorded.

    2.2 All live stems of any plant species found within a 0.25 m^2 section of the quadrat were counted.

    2.3 All live stems of any plant species within a 0.25 m^2 section of the quadrat were measured from the base of the plant to the top of the stem in meters.

3. Signs of disease, predation, or other disturbance were monitored and recorded in each quadrat and along the length of transects.

4. Transects are depicted on the Monitoring Plot Plan which is provided in Appendix B (As-built Map).

5. Color photographs of the site were obtained during each monitoring visit (Appendix D). Transect marker stakes were utilized as permanent photo stations for photographic monitoring. Photographs of the tidal wetlands were taken at both low and high tide to depict variations in hydrology.

6. Qualitative benthic invertebrate monitoring was performed within the monitoring transects. This included qualitative observations on the presence of ribbed mussels, fiddler crab burrows and additional species observed.

7. Sightings of saltwater-fish-feeding birds; benthic-invertebrate-feeding birds; and other salt marsh associated bird species were recorded. Other macrofauna observed at the site during any site visit were recorded.

4.2 Description of Species

A total of 1,871 trees and shrubs and 111,380 herbaceous plugs were planted throughout the 11 wetlands in 2013. Most (1,581) of the trees and shrubs were planted in the forested wetlands (Wetlands #3, #4 and #5). In accordance with best restoration practices, some wetlands were expanded to remove additional invasive species, or reduced to preserve pre-existing native wetland species. As a result, the onsite wetland mitigation activities have either met or exceeded the anticipated mitigation acreage requirement.

Wetland #1: Salt Marsh / Low Marsh Community

Wetland #1 is located at the far western side of the site and is directly connected to a tidal salt marsh to the north by way of the daily tidal flush. This wetland has been designed to receive tidal flushing on a daily basis.

The original northern limit of excavation for this site was altered in order to preserve areas of existing high marsh containing desirable native species such as salt meadow cordgrass (*Spartina patens*) and groundsel tree (*Baccharis halimifolia*).

Wetland #1 has been revegetated with smooth cordgrass (*Spartina alterniflora*) plugs planted 2-foot on center. Completion of plug installation occurred Spring 2013.

Wetland #2: Lined Emergent Freshwater Wetland

Wetland #2 is designed as a lined freshwater wetland located between the East and West Cells, downstream of Wetland #3, and thus receives significant amounts of stormwater runoff from the capped former landfill, including the overflow from the three upstream freshwater wetlands.

The installed freshwater wetland seed mix contained species such as blue joint grass (*Calamagroistris Canadensis*), broom sedge (*Andropogon virginicus*), fringed sedge (*Carex crinita*), soft rush (*Juncus effuses*), switchgrass (*Panicum virgatum*), woolgrass (*Scirpus cyperinus),* fox sedge *(Carex vulpenoidea*), common threesquare (*Scirpus pungens* now *Schoenoplectus pungens*), and soft stem bulrush (*Scirpus tabernaemontani* now *Schoenoplectus tabernaemontani)*). This wetland was planted in Fall 2013 with 2-inch herbaceous plugs including species such as arrow arum (*Peltandra virginica*), arrowhead (*Sagittaria spp*.), pickerelweed (*Pontederia cordata*), Cardinal flower (*Lobelia cardinalis),* marsh marigold (*Caltha palustris*), blue flag (*Iris virginica*), bur-reed (*Sparganium spp.*), common three-square (*Scirpus pungens*), hardstem bulrush (*Scirpus acutus*), lizard's tail (*Saururus cernuus*), soft stem bulrush (*Scirpus tabernaemontani*), soft rush (*Juncus effusus*), water plantain (*Alisma spp*.), blue vervain (*Verbena hastate*), boneset (*Eupatorium perfoliatum),* joe-pye weed (*Eupatorium maculatum*), swamp milkweed (*Asclepias incarnata*), swamp rosemallow (*Hibiscus moscheutos*), switchgrass (*Panicum virgatum*), and fox sedge (*Carex vulpenoidea*).

Wetland #3: Lined Freshwater Red Maple-Sweet Gum Forested Wetland

Wetland #3 is designed as a lined freshwater wetland located between the East and West Cells, downstream of Wetland #4 and upstream of Wetland #2. Hydrology of this wetland is derived from precipitation, stormwater runoff from the adjacent portions of the capped landfill, and overflow from Wetlands #4 and #5.

Upon completion of construction, this wetland was seeded with the freshwater wetland seed mix as mentioned in Wetland #2. Plug, tree, and shrub installation occurred later, in Fall 2013 according to the NYCDEP approved planting plan. Planting zones below the spillway elevation are designed to contain mostly herbaceous plants such as arrow arum (*Peltandra virginica*), arrowhead (*Sagittaria spp*.), pickerelweed (*Pontederia cordata*), Cardinal flower (*Lobelia cardinalis)*, marsh marigold (*Caltha palustris*), blue flag (*Iris virginica*), bur-reed (*Sparganium spp*.), common three-square (*Scirpus pungens*), hardstem bulrush (*Scirpus acutus*), lizards's tail (*Saururus cernuus*), soft stem bulrush (*Scirpus tabernaemontani*), soft rush (*Juncus effusus*). The planting zone above the spillway is designed to contain mostly trees and shrubs such as red maple (*Acer rubrum*), sweet gum (*Liquidambar styraciflua*), black gum (*Nyssa sylvatica*), pin oak (*Quercus palustris*), swamp white oak (*Quercus bicolor*), willow oak (*Quercus phellos*), arrowwood (*Viburnum dentatum*), black chokeberry (*Aronia Melanocarpa*), highbush blueberry (*Vaccinium corymbosum),* inkberry (*Ilex glabra),* northern arrowwood (*Viburnum recognitum*), spicebush (*Lindera benzoin*), swamp azalea (*Rhododendron viscosum*), sweet bay magnolia (*Magnolia virginiana*), sweet pepperbush (*Clethra alnifolia*), and Virginia creeper (*Parthenocissus quinquefolia*).

Wetland #4: Lined Freshwater Atlantic White Cedar Forested Wetland

Wetland #4 is designed as a lined freshwater wetland located on the East Cell, downstream of Wetland #5 and upstream of Wetland #3. Its hydrology is provided by direct precipitation, storm water run-off from the adjacent portions of the capped landfill and overflow from Wetland #5.

Upon completion of construction, this wetland was seeded with the freshwater wetland seed mix as specified. Plug, tree, and shrub installation occurred in Fall 2013. Planting zones below the spillway elevation are designed to contain mostly herbaceous plants such as arrow arum (*Peltandra virginica*), arrowhead (*Sagittaria spp*.), pickerelweed (*Pontederia cordata*), Cardinal flower (*Lobelia cardinalis),* marsh marigold (*Caltha palustris*), blue flag (*Iris virginica*), bur-reed (*Sparganium spp.*), common threes-quare (*Scirpus pungens*), hardstem bulrush (*Scirpus acutus*), lizards's tail (*Saururus cernuus*), soft stem bulrush (*Scirpus tabernaemontani*), soft rush (*Juncus effusus*).The planting zone above the spillway contains mostly trees and shrubs such as Atlantic white cedar (*Chamaecyparis thyoides*), red maple (*Acer rubrum*), sweet gum (*Liquidambar styraciflua*), black gum (*Nyssa sylvatica*), arrowwood (*Viburnum dentatum*), black chokeberry (*Aronia Melanocarpa*), highbush blueberry (*Vaccinium corymbosum,* inkberry (*Ilex glabra),* northern arrowwood (*Viburnum recognitum*), swamp azalea (*Rhododendron viscosum*), and sweet pepperbush (*Clethra alnifolia*).

Wetland #5: Lined Freshwater Atlantic White Cedar Forested Wetland

Wetland #5 is designed as a lined freshwater wetland located on the East Cell, upstream of Wetland #4. Its hydrology is derived from precipitation and storm water runoff from the adjacent portions of the capped landfill.

Upon completion of construction, this wetland was seeded with the freshwater wetland seed mix as mentioned. Plug, tree, and shrub installation occurred in Fall 2013. Planting zones below the spillway elevation contain mostly herbaceous vegetation such as arrow arum (*Peltandra virginica*), arrowhead (*Sagittaria spp*.), pickerelweed (*Pontederia cordata*), Cardinal flower (*Lobelia cardinalis),* marsh marigold (*Caltha palustris*), blue flag (*Iris virginica*), bur-reed (*Sparganium spp.*), common three-square (*Scirpus pungens*), hardstem bulrush (*Scirpus acutus*), lizards's tail (*Saururus cernuus*), soft stem bulrush (*Scirpus tabernaemontani*), soft rush (*Juncus effusus*). The planting zone above the spillway contains mostly trees and shrubs such as Atlantic white cedar (*Chamaecyparis thyoides*), red maple (*Acer rubrum*), sweet gum (*Liquidambar styraciflua*), black gum (*Nyssa sylvatica*), arrowwood (*Viburnum dentatum*), black chokeberry (*Aronia melanocarpa*), highbush

blueberry (*Vaccinium corymbosum),* inkberry (*Ilex glabra),* swamp azalea (*Rhododendron viscosum*), and sweet pepperbush (*Clethra alnifolia*).

Wetland #6: Unlined Brackish Emergent Wetland

Wetland #6 is designed as a unlined brackish wetland with areas suitable for varying levels of salt tolerance. It receives occasional tidal flushing from an adjacent channel located directly to the south. However, based on the 2018 hydrograph for location TG-6, the degree of tidal flushing is minimal and the water level was typically around two feet below the average land surface elevation. As a result, salinity levels can fluctuate from 3 ppt to 16 ppt. Planting zone elevations in this wetland are based off of National Oceanic and Atmospheric Administration's salt water tide data. Lower elevations in Wetland #6 contain species with higher salt tolerance such as spikegrass (*Distichlis spicata*), saltmarsh rush (*Scirpus robustus*), and smooth cordgrass (*Spartina alternifolia*), common three-square (*Scirpus pungens*), swamp rosemallow (*Hibiscus moscheutos*), switchgrass (*Panicum virgatum*), salt reedgrass (*Spartina cynosuroides*), saltmarsh rush (*Scirpus robustus*), saltmeadow grass (*Spartina patens*) and soft stem bulrush (*Scirpus tabernaemontani*). Species planted in elevations above the average high tide level have a lower salt tolerance: seaside goldenrod (*Solidago sempervirens*), boneset (*Eupatorium perfoliatum*), New England aster (*Aster novae-angliae),* and groundsel tree (*Baccharis halimifolia*). Wetland #6 was vegetated with planted 2-foot on-center. Completion of plug installation occurred Spring 2013.

Wetland #7: Unlined Freshwater Emergent Wetland with Scrub-Shrub Fringe

Wetland #7 is designed as a unlined freshwater wetland. Hydrology for this wetland comes mainly from groundwater, but is augmented by precipitation and localized storm water run-off. This wetland was seeded with the same freshwater wetland seed mix. Plug and shrub installation occurred in late summer 2013. The planting zone in the lower elevations contains mostly herbaceous vegetation such as common three-square (*Scirpus pungens*), pickerelweed (*Pontederia cordata*), Cardinal flower (*Lobelia cardinalis),* marsh marigold (*Caltha palustris*), bur-reed (*Sparganium spp.*), hardstem bulrush (*Scirpus acutus*), soft stem bulrush (*Scirpus tabernaemontani*), soft rush (*Juncus effusus*), common spikerush (Eleocharis palustris), swamp rosemallow (*Hibiscus moscheutos*), swamp milkweed (*Asclepias incarnata*), and fox sedge (*Carex vulpenoidea*). The planting zone in the higher elevations contains shrubs and herbaceous material such as black-eyed Susan (*Rudbeckia hirta*), New England aster (*Aster novae-angliae*), joe-pye weed (*Eupatorium maculatum*), Ohio goldenrod, (*Solidago ohioensis*), ox-eye sunflower (*Heliopsis helianthoides*), stiff goldenrod *(Solidago rigida),* switchgrass *(Panicum virgatum),* arrowwood (*Viburnum dentatum*), black chokeberry (*Aronia Melanocarpa*), inkberry (*Ilex glabra),* swamp azalea (*Rhododendron viscosum*), and sweet pepperbush (*Clethra alnifolia*).

Wetland #8: Unlined Freshwater Emergent Wetland with Scrub-Shrub Patchwork

Wetland #8 is designed as an unlined freshwater wetland. Sources of hydrology for this wetland are from groundwater, precipitation and storm water runoff from the East Cell. This wetland was also seeded with the freshwater wetland seed mix. Plug and shrub installation occurred in late summer 2013. The planting zone in the lower elevations contains herbaceous vegetation such as common three-square (*Scirpus pungens*), pickerelweed (*Pontederia cordata*), Cardinal flower (*Lobelia cardinalis),* bur-reed (*Sparganium spp.*), hardstem bulrush (*Scirpus acutus*), soft stem bulrush (*Scirpus tabernaemontani*), soft rush (*Juncus effusus*), salt reedgrass (*Spartina cynosuroides*), swamp rosemallow (*Hibiscus moscheutos*), swamp milkweed (*Asclepias incarnata*), fox sedge (*Carex vulpenoidea*) and common buttonbush (*Cephalanthus occidentalis*).The planting zone in the higher elevations contains shrubs and herbaceous material such as black-eyed Susan (*Rudbeckia hirta*), New England aster (*Aster novae-angliae*), black chokeberry (*Aronia melanocarpa*), inkberry (*Ilex glabra),* swamp azalea (*Rhododendron viscosum*), highbush blueberry (*Vaccinium corymbosum*), and sweet pepperbush (*Clethra alnifolia*).

Wetland #9: Unlined Freshwater Emergent Wetland

This small wetland located south of the East Cell and east of Wetland #8, runs into a channel that connects it to Wetland #10. Hydrology is supplied by groundwater, precipitation, and runoff from the East Cell and adjacent woodland located to the south. This wetland was seeded with the freshwater wetland seed mix. Plug and shrub installation occurred in 2013. Plug and shrub species included are blue flag (*Iris virginica*), bur-reed (*Sparganium spp.*), hardstem bulrush (*Scirpus acutus*), Cardinal flower (*Lobelia cardinalis),* New England aster (*Aster novae-angliae*), soft rush (*Juncus effusus*), common three-square (*Scirpus pungens*), and arrowwood (*Viburnum dentatum).*

Wetland #10: Unlined Freshwater Emergent Wetland

This wetland, connected to Wetland #9, is hydrologically supplied by groundwater, precipitation, and runoff from the East Cell and adjacent woodland located to the south and east. This wetland was seeded with the freshwater wetland seed mix. Plug and tubeling installation occur in fall 2013. Plug species included are blue flag (*Iris virginica*), bur-reed (*Sparganium spp.*), hardstem bulrush (*Scirpus acutus*), Cardinal flower (*Lobelia cardinalis*, soft rush (*Juncus effusus*), pickerelweed (*Pontederia cordata)*, common three-square (*Scirpus pungens)* and swamp rosemallow (*Hibiscus moscheutos*).

Wetland #11: Unlined Tidal Wetland

This wetland is located at the northeast corner of the site, between a tidal channel and a tidal pond. This wetland includes an existing tidal mudflat where the channel and pond meet. Salinity in this wetland fluctuates. High salt tolerant plants were selected accordingly. Planting occurred in fall 2013, with little success and again in spring 2014, with better results. The low marsh was planted with 2-inch smooth cordgrass (*Spartina alternifolia*) plugs, spaced 2-foot on center. Species selected for high marsh include common three-square *(Scirpus pungens*), saltgrass (*Distichlis spicata*) and groundsel tree (*Baccharis halimifolia).*

4.3 Results of Vegetation Monitoring

Forested Freshwater Wetlands (Wetlands #3, #4 and #5)

Forested freshwater wetland monitoring plots were set up according to methodology outlined in Peet, et. al. (1998). Data for woody stems and herbaceous species coverage were obtained at six permanent monitoring plots. Rectangular, 66 ft x 99 ft (20 m x 30 m), monitoring plots were established in September 2015. Data collected within each individual forested wetland area was combined to formulate overall results for onsite forested wetlands.

Following the 2018 growing season, the average estimated density of planted woody plant species was 279 stems/acre within the site (Table 3). The 2018 growing season revealed that planted tree and shrub density for all planted species recording in the monitoring plots ranged from 1 to 77 trees and shrubs per acre (Figure 4). For the average density of planted trees and shrubs to achieve the 85% survival rate criterion, the density of woody species must be greater than 340 stems/acre. It was determined that the forested wetlands currently do not meet this criterion as the average stem density of planted species was estimated at 279 stems per acre. The dominant planted species in the 2018 data collection was sweetgum (*Liquidambar styriciflua*) which was estimated at an average density of 77.55 stems per acre. Other planted species that had an average density of over 25 stems per acre included: Atlantic white cedar (*Chamaecyparis thyoides*) (35 stems/acre), buttonbush (*Cephalanthus occidentalis*) (27 stems/acre), and black chokeberry (*Aronia melanocarpa*) (48 stems/acre). Following the 2018 growing season, the average estimated density of all species (i.e., planted and naturally regenerating) was 927 stems/acre (Table 3). The combination of planted and naturally regenerating (native volunteer) species is well above the 340 stems/acre target and has increased from the previous year. A slight decrease in the dominant species eastern cottonwood (*Populus deltoides)* was noted, from 331 down to 292 stems/acre. This species was

targeted by mechanical removal and herbicide application in 2016. Following the 2018 growing season, average tree and shrub density for naturally regenerating species ranged from 1 to 292 trees and shrubs per acre (Figure 4). Co-dominant species included bayberry (*Morella pensylvanica)* (149 stems/acre), pussy willow (*Salix discolor*) (86 stems/acre), black willow (*Salix nigra*) (58 stems/acre), black chokecherry *(Aronia melanocarpa)* (48 stems/acre), and high-tide bush (*Baccharis halimifolia*) (47 stems/acre). This represents a significant increase in density of bayberry *(Morella pensylvanica)* from 15 stems/acre in 2017 to 149 stems/acre in 2018 though the average height dropped substantially to below 1ft height.

The average height class of planted species sampled within the monitoring plots in 2018 was 1.98 feet. The average height class of naturally regenerating species, was 2.29 feet. A combined average height of approximately 2.12 feet was estimated throughout the project area. In 2018, approximately 5.02% of all woody species in the monitoring plots were greater than 4 feet in height (Figure 5).

Table 3. Average Density, Average Height and Importance Value for Planted and Naturally Regenerating Woody Plants Within the Brookfield Site Following the 2018 Growing Season[1]

Species	Common Name	Average Density (stems/acre)	Average Height (feet)	Importance Value
Populus deltoides	cottonwood	292.13	2.05	17.78
Morella pensylvanica	bayberry	148.96	0.96	8.98
Salix discolor	pussy willow	86.24	2.30	6.92
Liquidambar styriciflua	sweetgum	77.55	2.01	6.16
Salix nigra	black willow	58.21	2.82	5.92
Aronia melanocarpa	black chokecherry	48.04	1.94	4.50
Baccharis halmifolia	eastern baccharis	47.18	1.60	4.12
Chamaecyparis thyoides	atlantic white cedar	35.19	3.34	5.18
Cephalanthus occidentalis	buttonbush	27.85	2.96	4.41
Vaccinium corymbosum	highbush blueberry	23.05	1.90	3.11
Clethra alnifolia	sweet pepperbush	14.80	2.34	3.10
Viburnum dentatum	arrowwood	14.25	1.58	2.32
Acer rubrum	red maple	13.06	1.41	2.10
Ilex glabra	inkberry	9.43	0.63	1.12
Magnolia virginiana	sweet bay magnolia	6.72	2.00	2.33
Rhododendron viscosum	swamp azalea	5.70	1.57	1.86
Juniperus virginiana	eastern redcedar	4.65	1.50	1.73
Rhus sp.	sumac	3.56	1.50	1.67
Prunus serotina	black cherry	2.43	0.50	0.62
Robinia pseudoacacia	black locust	2.33	3.90	3.96

Table 3. (Cont.) Average Density, Average Height and Importance Value for Planted and Naturally Regenerating Woody Plants Within the Brookfield Site Following the 2018 Growing Season[1]

Species	Common Name	Average Density (stems/acre)	Average Height (feet)	Importance Value
Quercus phellos	willow oak	2.24	2.50	2.58
Elaeagnus umbellata	autumn olive	1.21	5.50	5.48
Quercus palustris	pin oak	1.12	1.50	1.54
Rubus occidentalis	black raspberry	1.12	2.50	2.52
Planted Species 2018 Totals:		**279.02**	**1.98**	**40.31**
Naturally Regenerating Species 2018 Totals:		**648.03**	**2.29**	**59.69**
Compiled 2018 Data:		**927.04**	**2.12**	**100.00**

[1] calculated as the ((relative density + relative height) / 2) for all planted and naturally regenerating species
***red text = naturally regenerating or volunteer species**

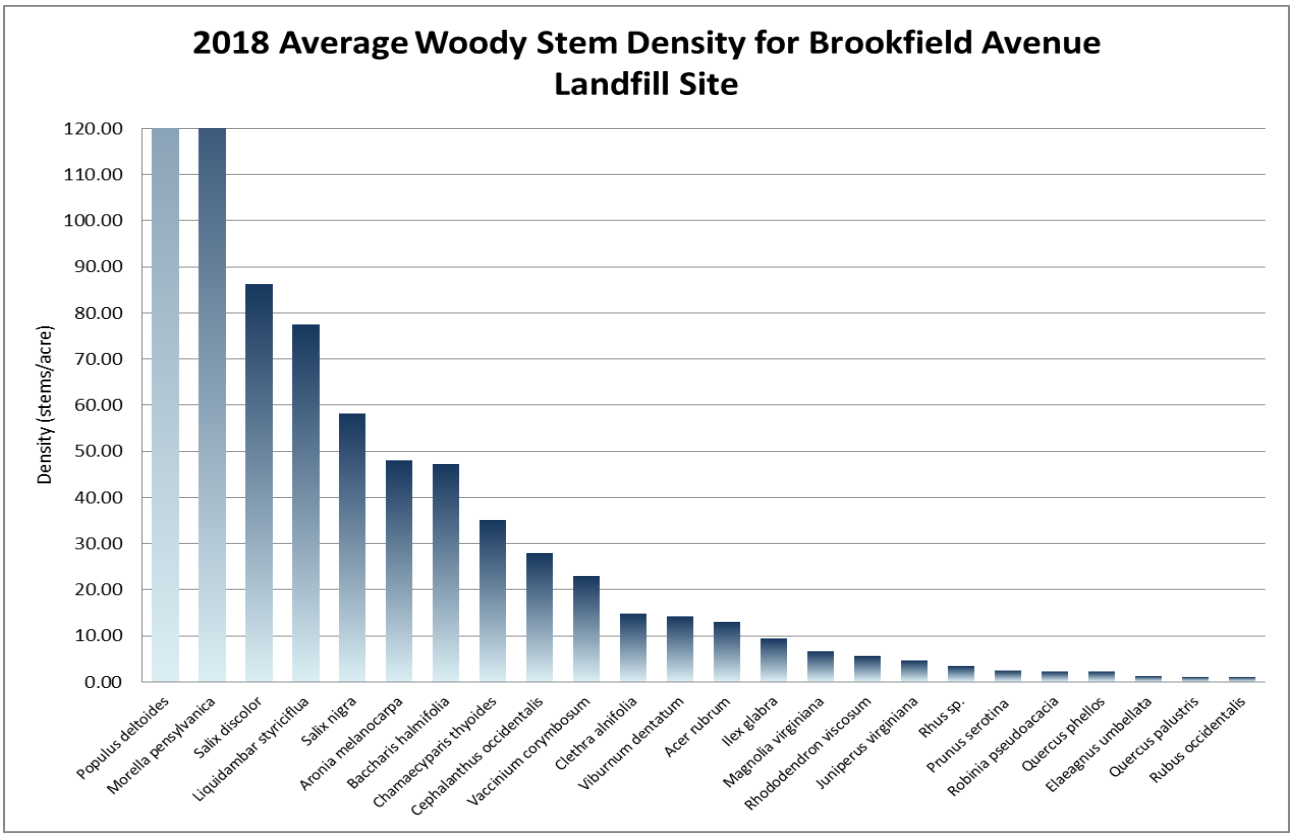

Figure 4. Average woody stem density for all species recorded within forested wetland monitoring plots at the Brookfield Avenue Landfill Site following the 2018 growing season.

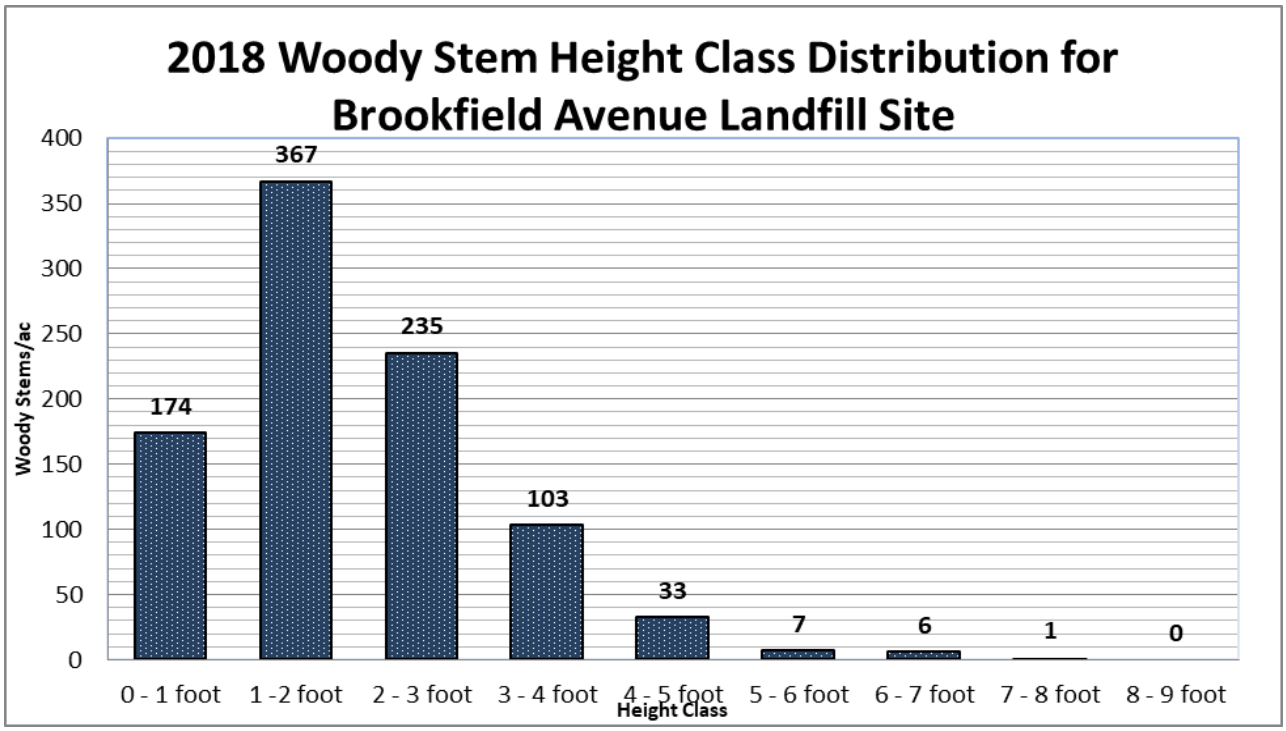

Figure 5. Woody stem height class distribution for all species within forested wetlands at the Brookfield Avenue Landfill Site following the 2018 growing season.

Average herbaceous cover in the forested freshwater wetland area following the 2018 growing season was 75.65%. Little blue stem (*Schizachyrium scoparium*) was identified as the dominant herbaceous species within the monitoring plots followed by buttonweed (*Diodia teres*), rosette grass (*Dicanthemium sp.)*, and soft rush (*Juncus effusus).* (Table 4). The presence of these two FACU species is consistent with the hydgrograph results.

Table 4. Average Estimated Herbaceous Species Cover for the 2018 Growing Season Within the Forested Freshwater Wetland Area

Plant Species	Common Name	Indicator Status	Average Percent Cover
Schizachyrium scoparium	little bluestem	FACU	13.42
Diodia teres	buttonweed	FACU	9.42
Panicum virgatum	switchgrass	FAC	6.25
Dicanthelium sp.	rosette grass	NL	3.43
Juncus effusus	softrush	OBL	3.43
Solidago rugosa	wrinkle-leaf goldenrod	FAC	3.35
Solidago sempivirens	seaside goldenrod	FACW	2.68
Euthamia graminifolia	flat-top goldentop	FAC	2.67
Aster pilosus	white oldfield american-aster	FACW	2.43
Persicaria hydropiper	waterpepper	OBL	1.93
Lotus sp.	trefoil	NL	1.69
Cyperus filicinus	fern flat sedge	OBL	1.59
Eupatorium serotinum	late-flowering thoroughwort	FAC	1.53

Table 4. (Cont.) Average Estimated Herbaceous Species Cover for the 2018 Growing Season Within the Forested Freshwater Wetland Area			
Plant Species	**Common Name**	**Indicator Status[2]**	**Average Percent Cover[1]**
Symphyotrichum lateriflorum	calico aster	FAC	1.52
Luwigia palustris	water purslane	OBL	1.43
Cyperus difformis	variable flat sedge	OBL	1.34
Schoenoplectus pungens	common threesquare	OBL	1.33
Cyperus odoratus	rusty flat sedge	FACW	1.25
Poa sp.	grass	NL	1.18
Polygonum articulatum	sand jointweed	NL	1.17
Rudbeckia hirta	black-eyed susan	FACU	1.04
Cyperus sp.	flat sedge	NL	1.02
Juncus diffussisimus	slip-pod rush	FACW	1.01
Scirpus cyperinus	woolgrass	OBL	0.93
Panicum dichotomiflorum	fall panic grass	FACW	0.92
Lespedeza cuneata	Chinese bush-clover	UPL	0.79
Juncus acuminatus	knotty-leaf rush	OBL	0.76
Plantago lanceolata	English plantain	FACU	0.76
Pluchea odorata	saltmarsh fleabane	OBL	0.76
Typha latifolia	broadleaf cattail	OBL	0.75
Bidens sp.	beggartick	NL	0.52
Eleocharis obtusa	spikerush	OBL	0.51
Lythrum salicaria	purple loosestrife	OBL	0.50
Oenothera biennis	evening primrose	FACU	0.50
Verbascum thapsus	common mullein	UPL	0.50
Cyperus esculentus	nutsedge	FAC	0.28
Gnaphalium sp.	cudweed	NL	0.27
Phragmites australis	common reed	FACW	0.26
Iris versicolor	blue-flag iris	OBL	0.25
Verbena hastata	blue vervain	FAC	0.25
Asclepias tuberosa	butterfly milkweed	UPL	0.03
Baccharis halimifolia	groundseltree	FACW	0.02
Solidago sp.	goldenrod	NL	0.02
Artemesia vulgaris	mugwort	UPL	0.01
Symphyotrichum subulatum	eastern annual saltmarsh aster	OBL	0.01
Lespedeza capitata	bush clover	FACU	0.01
2018 Total Herbaceous Cover for all Freshwater Wetlands:			**75.65**

[1] Average estimated cover based on 10 nested 10m x 10m quadrats within monitoring plots
[2] Based on USACE National Wetland Plants List (Lichvar, 2014) Northcentral and Northeast region.

Tidal and Brackish Emergent Wetlands

Data for herbaceous and woody plant species coverage within the herbaceous tidal, brackish, and emergent freshwater wetlands area were obtained at seven permanent monitoring transects with a total of 190 (4.0 m^2) quadrats (Appendix B.). For representative data purposes, certain quadrats in Wetland #1 were neglected due to their position in mudflat areas. Monitoring transects were established in September 2015 and adjusted in November 2016 due to missing PVC flagging locations which were likely dislodged by tidal flow. To summarize changes, 'Transect B' became the new 'Transect A' and the others were adjusted accordingly. A new 'Transect E' was added to the southern edge of the plot.

Wetland #1

Wetland #1 is a tidal salt marsh that receives tidal flush on a daily basis. This area is completed dominated by smooth cordgrass (*Spartina alterniflora*) which was the desired species when the site was planted in 2013 via plugs. Data collection revealed significant areas of the wetland as "mudflat" areas. Mudflats are natural, important features of salt marsh habitats, however they do not correspond well with the target goals of the mitigation project. While compiling this data, ASGECI analyzed the wetland with these mudflats and without. Overall, the average percent vegetative cover of this wetland is 23.82% (down from 35.6% in 2017). However, omitting the mudflats, the vegetative coverage is approximately 62% (Table 5). This is also down from 68.4% in 2017 and approximately 5% below the reference marsh (Table 1). It is unclear if this pattern of increasing mudflat/open water areas within this wetland will eventually lead to loss of substantial *Spartina alterniflora* coverage in Wetland #1. Entire clumps of *Spartina alterniflora* were noted heaved from their established locations (photos). Herbivory by Canada geese is likely an ongoing problem preventing new plant establishment, but it is unclear at this point what may be causing the loss of mature plants.

Table 5. Average Estimated Plant Species Cover[1] for 2018 Growing Season Within the Intertidal Wetland Area (Wetland #1)

Plant Species	Common Name	Avg. Cover (%)	Avg. Height (cm)
Iva frutescens	high tide bush	0.14	27.5
Spartina alterniflora	smooth cordgrass	61.79	154.79
Total for All Species:		**61.93**	**91.15**
(Total including mud flat area):		**23.82**	

Wetland #6

In this brackish emergent wetland, there was a significant natural regeneration of the invasive species common reed (*Phragmites australis*) from 3% in 2017 to 16% in 2018. This highlights the need for additional herbicide management of common reed throughout the site. The dominant species is sturdy bulrush (*Schoenoplectus robustus)* and co-dominant species common three-square (*Schoenoplectus pungens*) and common reed (*Phragmites australis)*. Additionally, other *Spartina* and goldenrod species were well-represented. Overall, the percent coverage of this area met the criteria for density, but the percent cover of invasive species has increased above the allowable 10% threshold (Table 6).

Table 6. Average Estimated Plant Species Cover[1] for 2018 Growing Season Within the Intertidal Wetland Area (Wetland #6)		
Plant Species	**Common Name**	**Avg. Cover (%)**
Schoenoplectus robustus	sturdy bulrush	31.67
Schoenoplectus pungens	common threesquare	17.25
Phragmites australis	common reed	16.00
Spartina patens	salt-meadow cordgrass	7.08
Solidago sempivirens	seaside goldenrod	6.67
Spartina cynosuroides	big cordgrass	3.92
Spartina alterniflora	smooth cordgrass	2.08
Pluchea odorata	saltmarsh fleabane	1.25
Atriplex sp.	Saltbush	1.17
Persicaria hydropiper	water-pepper	0.42
Baccharis halimifolia	eastern baccharis	0.29
Lythrum salicaria	purple loosestrife	0.20
Hibiscus moscheutos	swamp rose mallow	0.08
Bidens sp.	beggartick	0.04
	Total All Species:	**88.12**

Wetland #11

Smooth cordgrass (*Spartina alterniflora)* was found to have the highest percent cover at 52% in Wetland #11. This island of smooth cordgrass has heavy tidal influence and exhibited a good diversity of well-established vegetation and wildlife. Common reed was noted to be controlled in this area, although present in small amounts (Table 7).

Table 7. Average Estimated Plant Species Cover[1] for 2018 Growing Season Within the Intertidal Wetland Area (Wetland #11)		
Plant Species	**Common Name**	**Avg. Cover (%)**
Spartina alterniflora	smooth cordgrass	51.92
Symphyotrichum subulatum	eastern annual saltmarsh aster	12.31
Spartina patens	saltmeadow cordgrass	11.54
Atriplex sp.	saltbush	4.62
Iva frutescens	high-tide bush	3.46
Phragmites australis	common reed	2.31
	Total All Species:	**86.16**

Combined Tidal and Brackish Wetlands

A combined interpretation of the data from these three wetlands shows an overall cover of 68.6%, which is lower than the 85% target goal. (When lower percent cover for Wetland #1 is used by including all mudflats, combined tidal and brackish percent cover is closer to 32%). However, this result is comparable to the reference wetland. Smooth cordgrass (*Spartina alterniflora)* was the dominant species. Sturdy bulrush (*Schoenoplectus robustus),* saltmarsh cordgrass *(Spartina patens),* common reed *(Phragmites australis),* and common three-square (*Schoenoplectus pungens)* were present in the tidal and brackish wetland areas. The invasive species populations of common reed (*Phragmites australis*) had increased notably since last year (Table 8). Efforts to scout for and maintain control over the populations of common reed *(Phragmites australis)* should continue.

Table 8. Average Estimated Plant Species Cover[1] for 2018 Growing Season Within Brackish/Tidal Wetland Areas (Wetland #1, #6, and #11)

Plant Species	Common Name	Avg. Cover (%)
Spartina alterniflora	smooth cordgrass	52.89
Schoenoplectus robustus	sturdy bulrush	4.00
Spartina patens	saltmarsh cordgrass	2.47
Phragmites australis	common reed	2.34
Schoenoplectus pungens	common three-square	2.18
Symphyotrichum subulatum	eastern annual saltmarsh aster	1.68
Solidago sempivirens	seaside goldenrod	0.84
Atriplex sp.	saltbush	0.78
Iva frutescens	high-tide bush	0.58
Spartina cynosuroides	big cordgrass	0.49
Pluchea odorata	saltmarsh fleabane	0.16
Persicaria hydropiper	water pepper	0.05
Baccharis halimifolia	eastern baccharis	0.04
Lythrum salicaria	purple loosestrife	0.03
Hibiscus moscheutos	swamp rose mallow	0.01
Bidens sp.	beggar stick	0.01
	Total All Species:	**68.55**

Emergent Freshwater Wetlands (Wetlands #2, #7, #8, #9 & #10)

Wetland #2

This freshwater emergent wetland contained a large species diversity totaling 36 different plant species. The dominant species continues to be slim-pod rush (*Juncus diffusissimus)* followed by common three-square *(Schoenoplectus pungens),* soft rush (*Juncus effusus),* broadleaf cattail, (*Typha latifolia),* and purslane *(Ludwigia palustris).* The invasive species of common reed (*Phragmites australis*) is present at a slightly higher percentage than last year (Table 9). Efforts to scout for and maintain control over the populations of common reed *(Phragmites australis)* should continue.

Table 9. Average Estimated Plant Species Cover[1] for 2018 Growing Season Within Wetland #2		
Plant Species	**Common Name**	**Avg. Cover (%)**
Juncus diffusissimus	slim-pod rush	9.88
Schoenoplectus pungens	common threesquare	9.63
Juncus effusus	soft rush	8.28
Typha latifolia	broadleaf cattail	8.25
Ludwigia palustris	purslane	5.66
Schoenoplectus tabernaemontani	soft-stem bulrush	4.92
Cyperus difformis	variable flat sedge	4.86
Lythrum salicaria	purple loosestrife	3.71
Solidago sempivirens	seaside goldenrod	3.65
Phragmites australis	common reed	3.55
Pluchea odorata	saltmarsh fleabane	3.52
Hibiscus moscheutos	swamp rosemallow	3.05
Pontederia cordata	pickerelweed	2.20
Eleocharis obtusa	spikerush	2.08
Juncus sp.	rush	1.77
Morella pensylvanica	bayberry	1.72
Salix discolor	pussy willow	1.65
Symphyotrichum subulatum	eastern annual saltmarsh aster	1.49
Salix nigra	black willow	1.20
Cyperus odoratus	rusty flat sedge	1.17
Panicum dichotomiflorum	fall panicgrass	0.78
Panicum virgatum	switchgrass	0.77
Baccharis halimifolia	eastern baccharis	0.74
Eupatorium serotinum	late-flowering boneset	0.69
Cyperus esculentus	yellow nutsedge	0.68
Symphyotrichum lateriflorum	calico aster	0.63
Iris versicolor	blue flag iris	0.49
Scirpus cyperinus	woolgrass	0.45
Apocynum cannabinum	dogbane	0.38
Verbena hastata	blue vervain	0.37
Carex vulpinoidea	fox sedge	0.31
Alisma subcordatum	water plantain	0.23
Saururus cernuus	lizard's tail	0.12
Sagittaria latifolia	broadleaf arrowhead	0.08
Solidago sp.	goldenrod	0.08
Polygonum sp.	smartweed	0.05
	Total All Species:	**89.09**

Wetland #7

Common threesquare (*Schoenoplectus pungens)* was the dominant species in this wetland with significant populations of soft-stem bulrush (*Schoenoplectus tabernaemontani),* broadleaf cattail (*Typha latifolia),* and pickeralweed (*Pontederia cordata)* as well (Table 10). The overall percent cover decreased slightly since the 2017 growing season. Areas throughout this wetland were noted with surface water in excess of what had been visible in 2017. Signs of herbivory by the Canada geese present in the wetland during monitoring were also noted in the open water areas.

Table 10. Average Estimated Plant Species Cover[1] for 2018 Growing Season Within the Intertidal Wetland Area (Wetland #7)

Plant Species	Common Name	Avg. Cover (%)
Schoenoplectus pungens	common threesquare	14.76
Schoenoplectus tabernaemontani	soft-stem bulrush	13.54
Typha latifolia	broadleaf cattail	6.93
Pontederia cordata	Pickerelweed	5.29
Cyperus difformis	variable flat sedge	4.32
Phragmites australis	common reed	3.71
Ludwigia palustris	water purslane	3.05
Pluchea odorata	saltmarsh fleabane	3.02
Schizachyrium scoparium	little bluestem	2.88
Juncus effusus	soft rush	2.68
Eleocharis obtusa	spikerush	2.37
Solidago sp.	goldenrod	1.39
Baccharis halmifolia	eastern baccharis	1.34
Juncus diffusissimus	slim-pod rush	1.22
Poa sp.	grass	1.15
Eragrostis capillaris	lace lovegrass	1.10
Lespedeza capitata	bush clover	0.98
Panicum virgatum	switchgrass	0.98
Populus deltoides	cottonwood	0.98
Salix nigra	black willow	0.73
Rudbeckia hirta	black-eyed susan	0.61
Hibiscus moscheutos	swamp rosemallow	0.54
Solidago gigantea	late goldenrod	0.54
Eupatorium serotinum	late-flowering boneset	0.41
Aster pilosus	frost aster	0.37
Cyperus odoratus	rusty flat sedge	0.37
Solidago sempervirens	seaside goldenrod	0.37
Cyperus esculentus	yellow nutsedge	0.24
Lotus sp.	trefoil	0.12
	Total All Species:	**75.99**

Wetland #8

Common reed (*Phragmites australis*), common threesquare *(Schoenoplectus pungens),* and salt-marsh fleabane *(Pluchea odorata)* were the species with the highest percent cover (Table 11). Due to high common reed percent cover, herbicide application and ongoing monitoring should continue to control and monitor the population which persists in dense stands directly adjacent to the monitored wetland. Overall, the percent cover in this wetland remains low and has decreased approximately 10% since the previous year data and much of the vegetation did not appear to be thriving or well-established. A significant portion of transect B is open water.

Table 11. Average Estimated Plant Species Cover[1] for 2018 Growing Season Within the Intertidal Wetland Area (Wetland #8)

Plant Species	Common Name	Avg. Cover (%)
Phragmites australis	common reed	7.00
Schoenoplectus pungens	common threesquare	5.51
Pluchea odorata	saltmarsh fleabane	4.64
Typha latifolia	broadleaf cattail	3.21
Schoenoplectus tabernaemontani	soft-stem bulrush	2.95
Sphagnum sp.	moss	2.95
Juncus diffusissimus	slim-pod rush	2.86
Cyperus odoratus	rusty flat sedge	2.56
Ludwigia palustris	water purslane	2.14
Panicum virgatum	switchgrass	1.88
Baccharis halimifolia	eastern baccharis	1.07
Iris versicolor	blue flag iris	0.91
Symphyotrichum subulatum	eastern annual saltmarsh aster	0.81
Eleocharis obtusa	spikerush	0.71
Eupatorium serotinum	late-flowering boneset	0.50
Polygonum sp.	smartweed	0.36
	Total All Species:	**40.06**

Wetlands #9 & 10

Wetlands 9 and 10 were combined due to their similarities. A single transect was run though each of these wetlands. The dominant species were pickerelweed (*Pontederia cordata),* American bur-reed *(Sparganium americanum),* blueflag iris (*Iris versicolor),* and broadleaf cattail (*Typha latifolia).* The percentage of common reed (*Phragmites australis*) has remained below 1% through 2017 and 2018 growing seasons. The loss in percent cover noted in 2017 was regained in 2018 with the overall percent cover of the wetlands increasing again to near 70%. Common three-square (*Schoenoplectus pungens*), water purslane (*Ludwigia palustris),* and softrush (*Juncus effusus)* were also present (Table 12). Efforts to scout for and maintain control over the populations of common reed *(Phragmites australis)* should continue as dense stands exist nearby.

Table 12. Average Estimated Plant Species Cover[1] for 2018 Growing Season Within the Unlined Freshwater Emergent Wetlands #9 and #10		
Plant Species	**Common Name**	**Avg. Cover (%)**
Pontederia cordata	pickerelweed	19.92
Sparganium americanum	bur-reed	10.41
Iris versicolor	blueflag iris	8.02
Typha latifolia	broadleaf cattail	5.99
Schoenoplectus pungens	common threesquare	4.43
Ludwigia palustris	water purslane	4.31
Juncus effusus	softrush	4.26
Poa sp.	grass	2.83
Saururus cernuus	lizard's tail	2.36
Cephalanthus occidentalis	buttonbush	2.17
Hibiscus moscheutos	swamp rosemallow	1.81
Schoenoplectus tabernaemontani	soft-stem bulrush	0.98
Phragmites australis	common reed	0.92
Peltandra virginica	green arrow-arum	0.56
Sphagnum sp.	moss	0.56
Symphyotrichum subulatum	eastern annual saltmarsh aster	0.44
Persicaria hydropiper	smartweed	0.29
	Total All Species:	**70.26**

Compiled Freshwater Wetland Data for 2018

Overall, herbaceous cover in 2018 for the freshwater wetlands resulted in slightly increased coverage relative to 2017. The combined plant species estimated average groundcover was 75.68%, which is lower than the 85% coverage goal. The dominant species - common threesquare (*Schoenoplectus pungens),* broadleaf cattail (*Typha latifolia),* pickerelweed (*Pontederia cordata),* soft-stem bulrush (*Schoenoplectus tabernaemontani),* and softrush (*Juncus effusus*) - each had approximately 5% average cover or greater throughout these wetlands. Average cover of common reed (*Phragmites australis*) was 3.4%, a slight increase from 2017 (Table 13). Due to the persistence and close proximity of dense stands of common reed, it is necessary to continue efforts to monitor and address invasive species. Overall, the freshwater wetlands displayed well-established vegetation and species diversity.

Table 13. Combined Estimated Plant Species Cover[1] for 2018 Growing Season Within Freshwater Wetlands (#2, #7, #8, #9 and #10)		
Plant Species	**Common Name**	**Avg. Cover (%)**
Schoenoplectus pungens	common threesquare	9.32
Typha latifolia	broadleaf cattail	6.84
Pontederia cordata	pickerelweed	6.71
Schoenoplectus tabernaemontani	soft-stem bulrush	6.06
Juncus effusus	soft rush	4.99

Table 13. (Cont.) Combined Estimated Plant Species Cover[1] for 2018 Growing Season Within Freshwater Wetlands (#2, #7, #8, #9 and #10)		
Plant Species	**Common Name**	**Avg. Cover (%)**
Juncus diffusissimus	slim-pod rush	4.68
Ludwigia palustris	purslane	4.32
Phragmites australis	common reed	3.40
Cyperus difformis	variable flat sedge	3.10
Pluchea odorata	saltmarsh fleabane	2.74
Sparganium americanum	bur-reed	2.23
Iris versicolor	blue flag iris	2.07
Hibiscus moscheutos	swamp rosemallow	1.79
Solidago sempervirens	seaside goldenrod	1.59
Eleocharis obtusa	spikerush	1.54
Lythrum salicaria	purple loosestrife	1.52
Poa sp.	grass	0.93
Cyperus odoratus	rusty flat sedge	0.86
Symphyotrichum subulatum	eastern annual saltmarsh aster	0.80
Panicum virgatum	switchgrass	0.78
Schizachyrium scoparium	little bluestem	0.74
Juncus sp.	rush	0.72
Morella pensylvanica	bayberry	0.70
Salix nigra	black willow	0.68
Salix discolor	pussy willow	0.67
Saururus cernuus	lizard's tail	0.58
Cephalanthus occidentalis	buttonbush	0.47
Sphagnum sp.	moss	0.46
Eupatorium serotinum	late-flowering boneset	0.45
Baccharis halimifolia	eastern baccharis	0.42
Solidago sp.	goldenrod	0.39
Cyperus esculentus	yellow nutsedge	0.34
Panicum dichotomiflorum	fall panicgrass	0.32
Eragrostis capillaris	lace lovegrass	0.28
Symphyotrichum lateriflorum	calico aster	0.26
Lespedeza capitata	bush clover	0.25
Populus deltoides	cottonwood	0.25
Scirpus cyperinus	woolgrass	0.18
Rudbeckia hirta	black-eyed susan	0.16

Table 13. (Cont.) Combined Estimated Plant Species Cover[1] for 2018 Growing Season Within Freshwater Wetlands (#2, #7, #8, #9 and #10)		
Plant Species	**Common Name**	**Avg. Cover (%)**
Apocynum cannabinum	dogbane	0.16
Verbena hastata	blue vervain	0.15
Solidago gigantea	late goldenrod	0.14
Carex vulpinoidea	fox sedge	0.13
Peltandra virginica	green arrow-arum	0.13
Aster pilosus	frost aster	0.10
Alisma subcordatum	water plantain	0.09
Persicaria hydropiper	water pepper	0.06
Polygonum sp.	smartweed	0.06
Sagittaria latifolia	broadleaf arrowhead	0.03
Lotus sp.	trefoil	0.03
	Total All Species:	**75.68**

4.4 CONCLUSIONS

The average estimated density of planted species was 279 stems/acre for the forested freshwater wetlands, and the average height for planted species in the forested wetlands was 1.98 feet. Average herbaceous cover in the forested freshwater wetland area following the 2018 growing season was 75.72%. Little bluestem (*Schizachyrium scoparium*) was identified as the dominant herbaceous species within the forested wetland monitoring plots followed by buttonweed (*Diodia teres*), switchgrass (*Panicum virgatum),* rosette grass (*Dicanthemium sp.),* soft rush (*Juncus effusus),* goldenrod *(Solidago rugosa* and *S. sempervirens),* and flat-top goldentop *(Euthamia graminifolia).* The dominance of non-hydrophytic vegetation is a definitive sign that wetland hydrology is lacking within much of the forested wetland areas, which is consistent with the hydrograph results.

The average percent cover for planted and naturally regenerating native plant species combined was 68.55% in the tidal/brackish wetland areas following the 2018 growing season. Smooth cordgrass (*Spartina alterniflora)* was the dominant species with sturdy bulrush (*Schoenoplectus robustus)* and saltmarsh cordgrass (*Spartina patens)* made up the other species with the highest overall percent cover in the tidal and brackish wetland areas. Percentages of the invasive species common reed (*Phragmites australis*) increased slightly to 2.3% overall and is particularly elevated in Wetland #6, to over the target 10% threshold.

Within the emergent freshwater wetlands, the average percent cover for planted and naturally regenerating species was 75.72%. Prospering species within these wetland areas include common threesquare (*Schoenoplectus pungens),* broadleaf cattail (*Typha latifolia),* pickerelweed (*Pontederia cordata),* soft-stem bulrush (*Schoenoplectus tabernaemontani),* softrush (*Juncus effusus*), and slim-pod rush (*Juncus diffusissimus).* Percentages of common reed (*Phragmites australis*) were higher in 2018, so continued efforts to monitor and address invasive species are recommended.

5.0 SOILS

Qualitative observations of soils throughout the site indicate a layer of suitable topsoil throughout the site. In wetland areas existing topsoil, debris, and vegetation were removed and disposed to a minimum of 12", and a new 12" loam soil was installed. Physical examination of the topsoil indicates that there is at least 6 inches of suitable topsoil (i.e. A horizon) present throughout the site. As routine soil sampling has been documented and a complete wetland delineation is anticipated in 2019, a selection of the 2018 soil profiles are provided in Appendix F. Based on these soil profiles, specifically comparison of the value/chroma data and the presence/absence of mottles to standard hydric soil identification criteria, hydric soils or the formation of wetland indicators indicative of wetland hydrology are indicated for Wetlands #1, #2, #4, #6, #7, #8, #9, #10 and #11; but not for Wetlands #3, and #5. These findings are consistent with the hydrograph results for 2018.

6.0 WILDLIFE UTILIZATION

Qualitative observations of wildlife species utilization of the Brookfield Avenue Landfill site were recorded during routine site inspections throughout the 2018 growing season. Overall, a diverse assemblage of amphibians, birds, and crustaceans were observed within the site. Numerous bird species such as great egret (*Ardea alba),* snowy egret (*Egretta thula),* mallard duck (*Anas platyrhynchos*), green-backed heron (*Butorides virescens*), glossy ibis (*Plegadis falcinellis*), and killdeer (*Charadrius vociferus*) were observed utilizing the wetland areas throughout the summer months.

White-tailed deer have been noted within the project area on several occasions. A deer exclusion fence was installed that connects to the site's property line fence. Although these fences are regularly inspected, deer still appear to access the site. Damage to trees and shrubs due to herbivory, rubbing, and scraping was noted throughout, specifically regarding the Atlantic white cedar *(Chamaecyparis thyoides)* in Wetlands #4 and #5. Additionally, Canada goose (*Branta canadensis*) was noted in within open water areas and emergent wetlands. Damage to emergent vegetation was noted from goose grazing. Several large (carapace estimated to be 8-10 inches in length) common snapping turtles (*Chelydra serpentina*) were noted in Wetland #11 during May 2018. Although not visually identified, it is assumed that muskrat (*Ondatra zibethicus*) are also present.

7.0 MAINTENANCE AND MONITORING SUMMARY

Routine maintenance inspections were conducted throughout the 2018 season as part of annual monitoring activities. ASGECI will continue to monitor the mitigation site and will identify problems, concerns, or hazards observed, plant die-off, establishment of invasive species, and damage (if any) caused by deer and rodents. ASGECI will provide recommendations to control or mitigate issues that have been identified.

8.0 OVERALL CONCLUSIONS & RECOMMENDATIONS

Overall growth, survival and density of woody and herbaceous plant species in 2018 were still below the 85% coverage goal for herbaceous species and average woody density within the forested and emergent freshwater wetlands. Tidal wetland coverage was found to be 69%, which is also below the target goal. Also, naturally-occurring mudflats have established within Wetland #1, which decrease the overall coverage to (23% Wetland #1 only, OR 34% when mudflats factored into compiled tidal/brackish wetlands) if included in the data analysis. However, overall, the percent coverage for Wetland #1 is similar to the reference marsh.

The forested freshwater wetland areas exhibited an average planted species density of 279 stems/acre, which is below the minimum target goal of 340 stems/acre, and an average planted species height of 1.98 feet. The lower stems per acre in 2018 could reflect in part loss of trees to deer browse and damage. Average herbaceous cover in the forested freshwater wetland area following the 2018 growing season was 75.72%. Little bluestem (*Schizachyrium scoparium*) was identified as the dominant herbaceous species within the monitoring plots

followed by buttonweed (*Diodia teres*), switchgrass *(Panicum virgatum),* rosette grass (*Dicanthemium sp.),* soft rush (*Juncus effusus),* and goldenrod *(Solidago rugosa* and *S. sempervirens).*

Within the emergent wetland areas an average percent cover for planted and naturally regenerating species resulted in 75.68% cover. Prospering species within these wetland areas include common threesquare (*Schoenoplectus pungens),* broadleaf cattail (*Typha latifolia*), pickerelweed (*Pontederia cordata),* soft-stem bulrush (*Schoenoplectus tabernaemontani),* and softrush (*Juncus effusus*). Populations of common reed (*Phragmites australis*) were generally slightly higher than 2017, though not substantially in most cases. Continued efforts to monitor and address invasive species are crucial, especially in the vicinity of Wetland #6 which had the highest percentage of common reed in 2018.

The average percent cover for planted and naturally-regenerating native plant species combined was 68.6% in the tidal/brackish wetland areas following the 2018 growing season. Smooth cordgrass (*Spartina alterniflora)* was the dominant species followed by sturdy bulrush (*Schoenoplectus robustus)* and saltmarsh cordgrass (*Spartina patens).*

Good hydrologic indicators were observed throughout most of the site, consistent with the significantly above-average precipitation during the 2018 growing season. Wetland hydroldogy and hydric soils are documented within all wetlands with the exception of Wetlands #3 and #5, which are freshwater wetlands on top of the capped landfill, did not exhibit wetland hydrology in 2018. This could be attributed to the fact that the as-built drawings indicate that approximately two to six feet of soil is present between the bottoms of these three wetlands and the sloped cap geomembrane that acts as their liner.

Based on field observations, the created wetlands provide beneficial wildlife habitat values and perform important water quality and surface water storage functions.

In addition to the spring qualitative monitoring and fall quantitative monitoring, which will include a final wetland delineation, recommendations for 2019 include:

- Continue the identification and targeted spraying of common reed and other invasive plant species.
- Monitor any damage to trees.
- Conduct quarterly routine site inspections and monitoring well maintenance, including repair of the dataloggers for MW-3 and/or MW-8.
- Conduct informal wildlife surveys to assess amphibian, reptile, bird and invertebrate use.
- Efforts to control herbivory damage by Canadian geese, white-tailed deer and muskrat.
- Conduct the additional fifth-year work items required by the monitoring plan, specifically delineating the boundaries of the 11 plan wetlands, and developing a long-term monitoring plan.

9.0 LITERATURE CITED

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APPENDIX A
Coordination and Correspondence

New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau E, 12th Floor
625 Broadway, Albany, New York 12233-7017
Phone: (518) 402-9814 • **Fax:** (518) 402-9819
Website: www.dec.ny.gov

DEC 11 2009

Alexander B. Grannis
Commissioner

Kevin Clarke, P.E.
Chief, Wastewater and Water Infrastructure and Support
New York City Department of Environmental Protection
Bureau of Engineering Design and Construction
96-05 Horace Harding Expressway
Corona, New York 11368

RE: Brookfield Avenue Landfill Operable Unit No. 1
Site No. 2-43-006
Wetland Permit Equivalency

Dear Mr. Clarke:

The New York State Department of Environmental Conservation has determined that the proposed activities at the referenced site meet the requirements for permit issuance under the Tidal Wetland regulations (6NYCRR Part 661) and Freshwater Wetland regulations (6NYCRR Part 663). These determinations are conditional pending the satisfactory submittal of additional wetland mitigation documentation required by Region 2, Office of Natural Resources.

John McLaughlin of your office has been involved in discussions with Steve Zahn of Region 2 concerning the level of detail required for final acceptance of the wetland mitigation proposal. Issues involving appropriate wetland elevations, planting specifications, hydrology, monitoring and mitigation acreage need agreement prior to final acceptance of the wetlands mitigation proposal.

As we move forward with construction, I will monitor the progress in addressing the outstanding issues so final unconditional approval can be given.

If you have any questions, please call me at (518) 402-9814.

Sincerely,

Michael A. Mason

Michael A. Mason, P.E.
Project Manager
Remedial Section A, Remedial Bureau E
Division of Environmental Remediation

ec: R. Betemit, NYCDEP

APPENDIX B
As-Built Map
Plant Schedule

Planting Data- Herbaceous

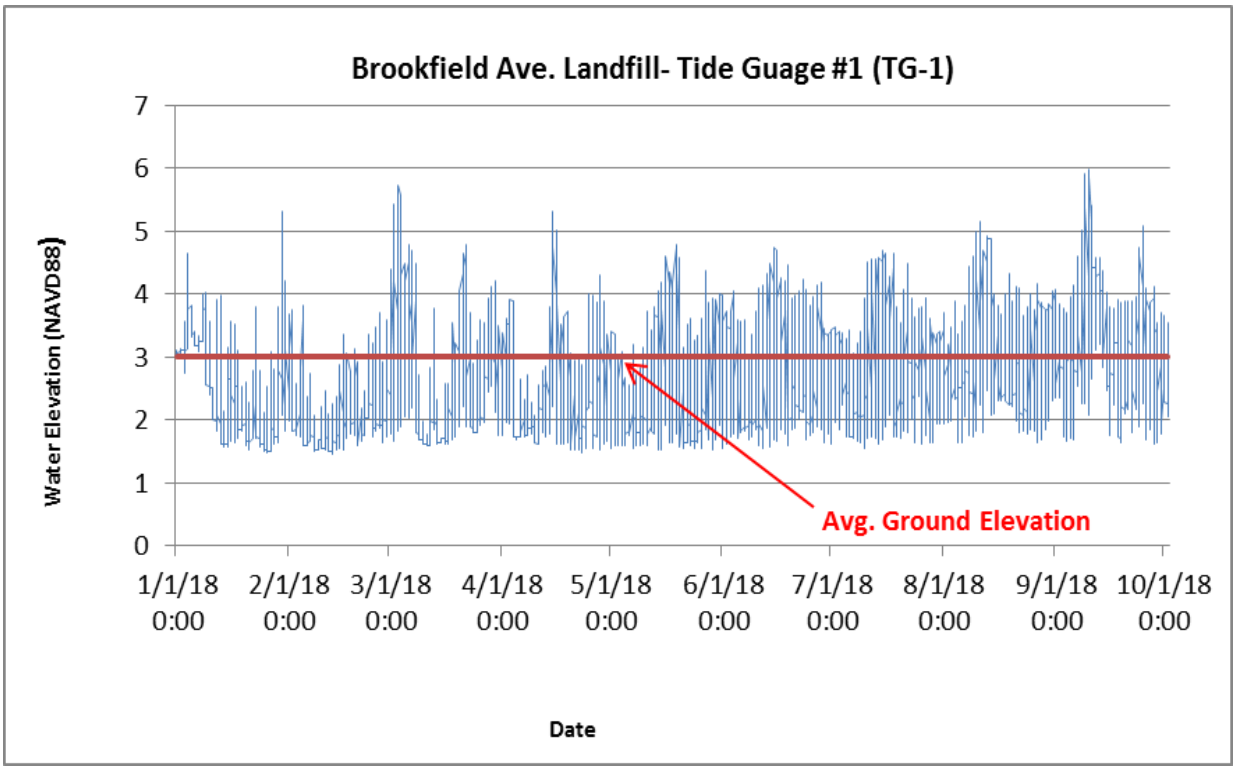
Scientific name	**Common Name**	**Salt tolerance**	**Water Depth**
Rudbeckia hirta	black-eyed Susan	None	None
Verbena hastata	blue vervain	Unknown	None
Eupatorium perfoliatum	boneset	Unknown	None
Lobelia cardinalis	Cardinal flower	None	permanent saturation
Eupatorium maculatum	joe-pye weed	None	None
Caltha palustris	marsh marigold	None	inundation up to 6"
Aster novae-angliae	New England aster	Unknown	irregular saturation
Solidago ohioensis	Ohio goldenrod	Unknown	None
Heliopsis helianthoides	ox-eye sunflower	None	None
Solidago rigida	stiff goldenrod	None	None
Asclepias incarnata	swamp milkweed	None	permanent saturation
Peltandra virginica	arrow arum	*.2ppt-2ppt*	inundation up to 1'
sagittaria spp.	arrowhead	No data	inundation 1' to 3'
Iris virginica	blue flag	None	inundation up to 6"
Sparganium spp.	bur-reed	less than .5ppt	inundation up to 6”
Cephalanthus occidentalis	common buttonbush	some	inundation up to 3'
Eleocharis palustris	common spikerush	some	permanent saturation
Scirpus pungens	common threesquare	*15ppt*	inundation up to 6"
Nymphaea odorata	fragrant waterlily	No data	Permanent inundation
Scirpus acutus	hardstem bulrush	*some*	inundation up to 3'

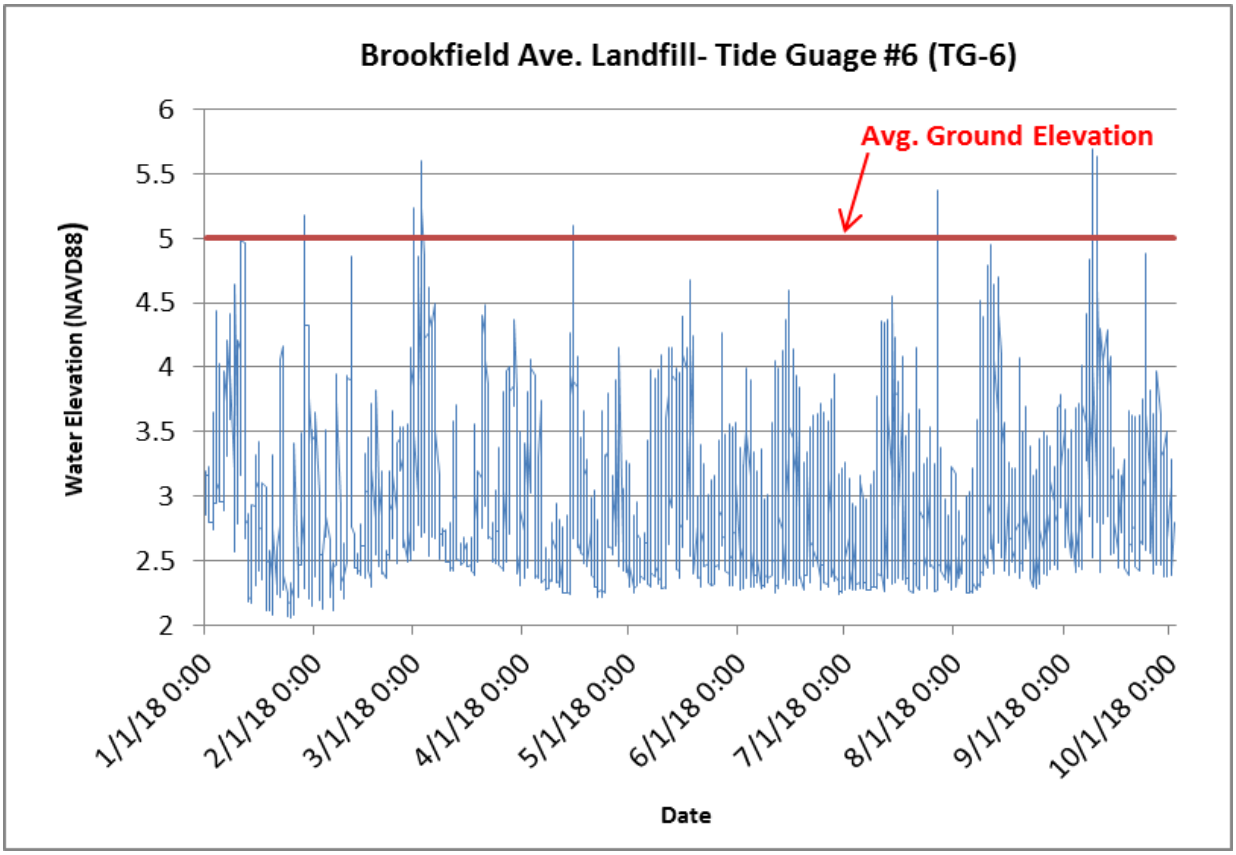
Saururus cernuus	lizards's tail	less than .5ppt	inundation up to 1'
Hibiscus moscheutos	swamp rosemallow	*.2ppt-15ppt*	inundation up to 3"
Juncus roemerianus	needlegrass rush	*25ppt*	up to spring tide
Panicum virgatum	switchgrass	*10ppt*	Some saturation
Pontederia cordata	pickerelweed	3ppt	inundation up to 1'
Spartina pectinata	prairie cordgrass	*3ppt*	spring tide elevation
Spartina cynosuroides	salt reedgrass	*3ppt-10ppt*	above spring tide
Distichlis spicata	saltgrass	*50ppt*	above spring tide
Scirpus robustus	saltmarsh rush	*6ppt-25ppt*	fluctuating salinity, up to spring tide
Spartina patens	saltmeadow grass	*6ppt-35ppt*	above to upland
Solidago sempervirens	seaside goldenrod	*Not quantified*	None
Spartina alternifolia	smooth cordgrass	*3ppt-35ppt*	up to spring tide
Scirpus tabernaemontani	soft stem bulrush	*.5ppt-15ppt*	inundation up to 6"
Juncus effusus	soft rush	*low*	inundation up to 6"
Alisma spp.	water plantain	No data	inundation up to 6"
Carex vulpenoidea	fox sedge	less than .5ppt	prefers fluctuating levels- up to 6"
Carex hystericenia	porcupine sedge	less than .5ppt	prefers fluctuating levels- up to 6"
Leersia oryzoides	rice cutgrass	less than .5ppt	inundation up to 6"

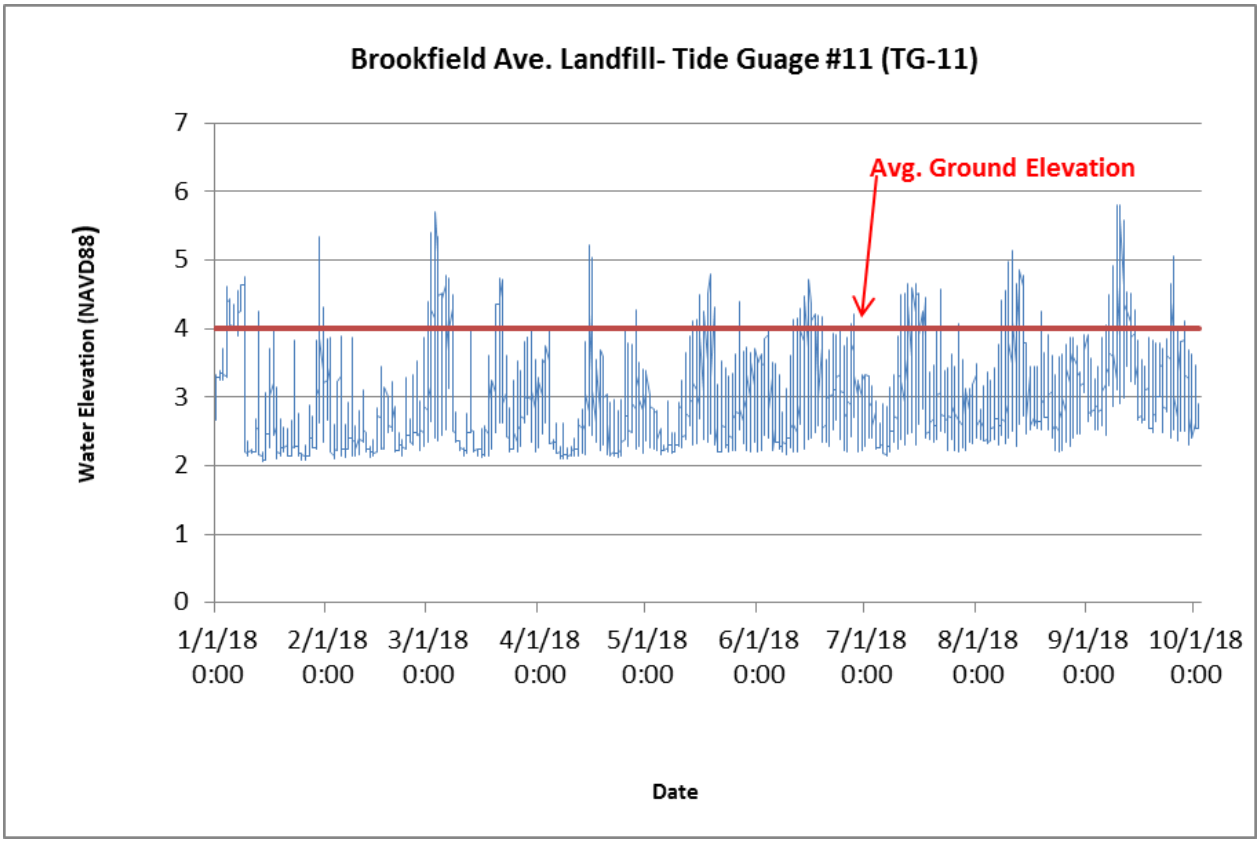
Scientific name	**Salt tolerance**	**Water Depth**
Viburnum dentatum	some	seasonal inundation
Chamaecyparis thyoides	less than .5ppt	semi-permanent inundation
Aronia Melanocarpa	some	seasonal inundation
Vaccinium corymbosum	some	seasonal inundation
Ilex glabra	some	seasonal inundation
Quercus palustris	some	seasonal inundation
Acer rubrum	less than .5ppt	seasonal inundation
Quercus rubra	No data	None
Viburnum recognitum	No data	No data
Lindera benzoin	some	seasonal inundation
Rhododendron viscosum	less than .5ppt	seasonal inundation
Quercus bicolor	some	seasonal inundation
Magnolia virginiana	some	seasonal inundation
Liquidambar styraciflua	some	seasonal inundation
Clethra alnifolia	some	seasonal inundation
Nyssa sylvatica	some	seasonal inundation
Parthenocissus quinquefolia	No data	No data
Quercus phellos	No data	seasonal inundation
Baccharis hamifolia	High	regular inundation

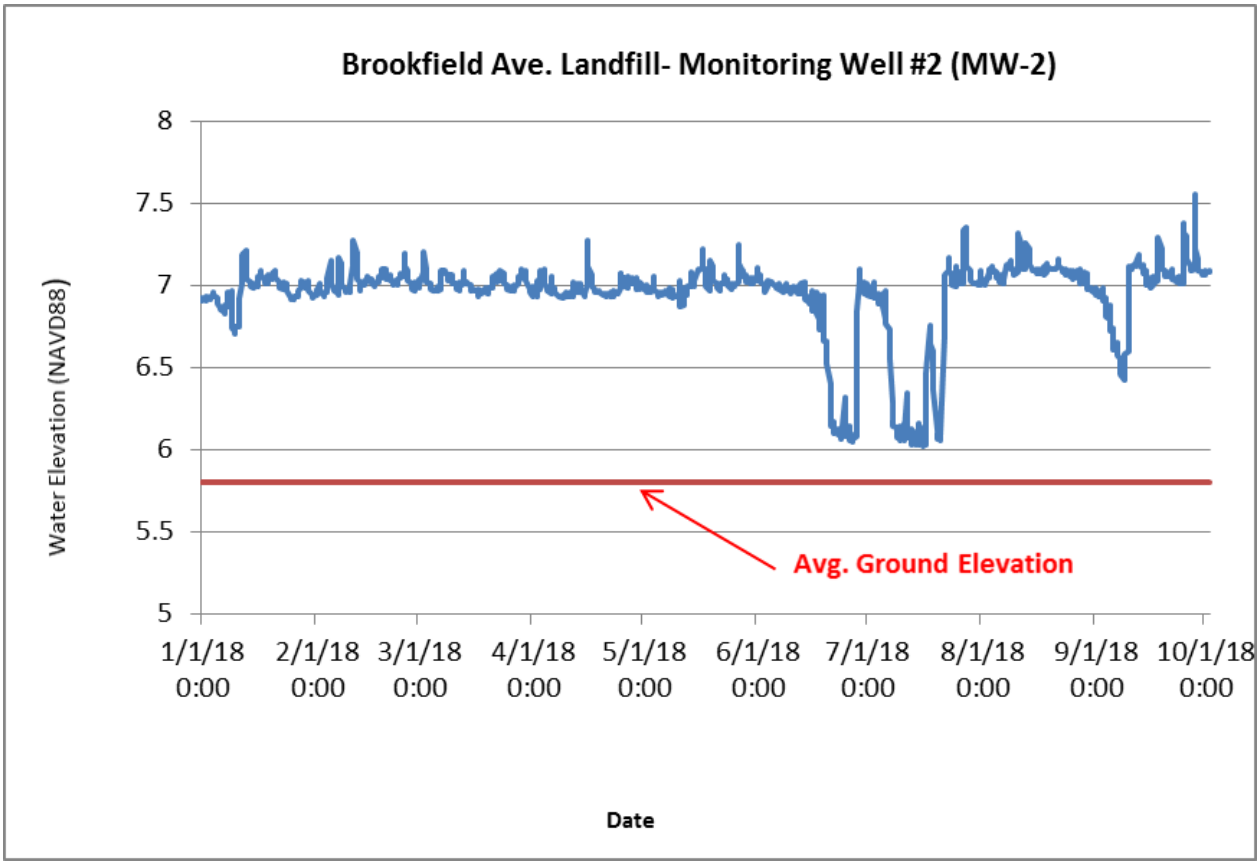
APPENDIX C

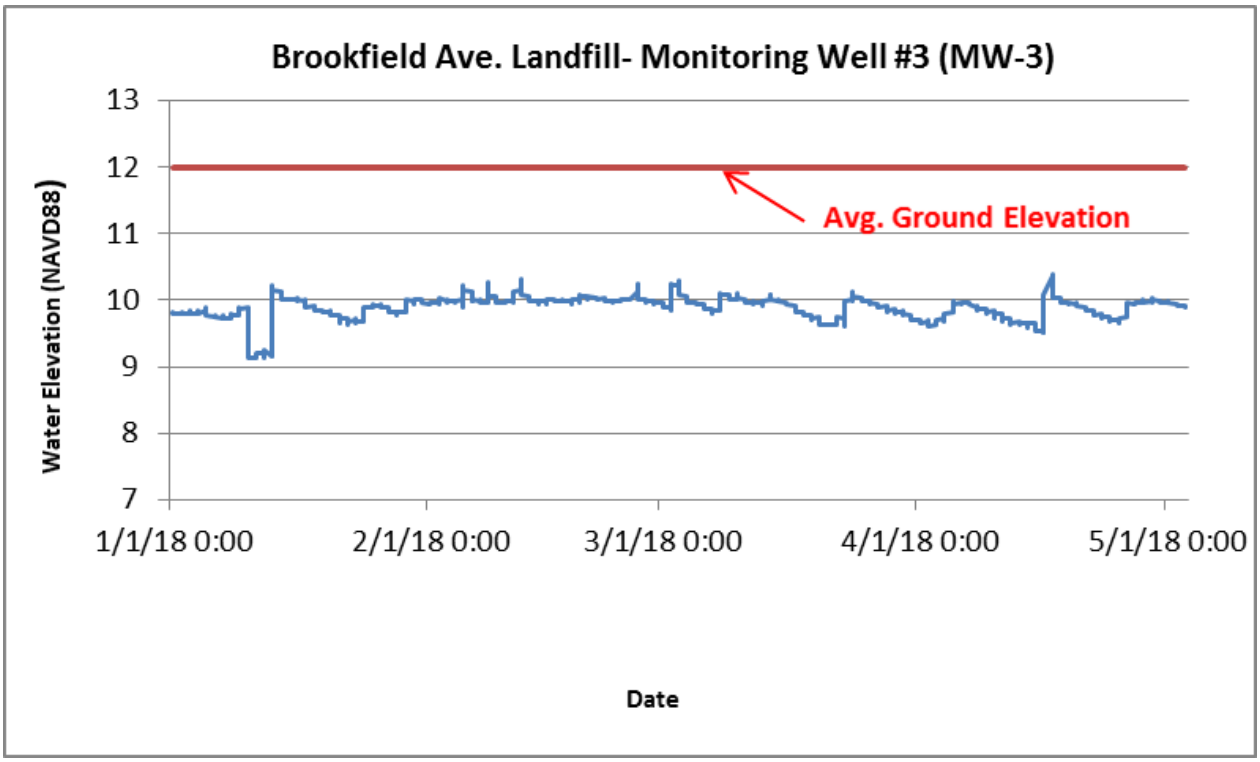
Wetland Hydrographs

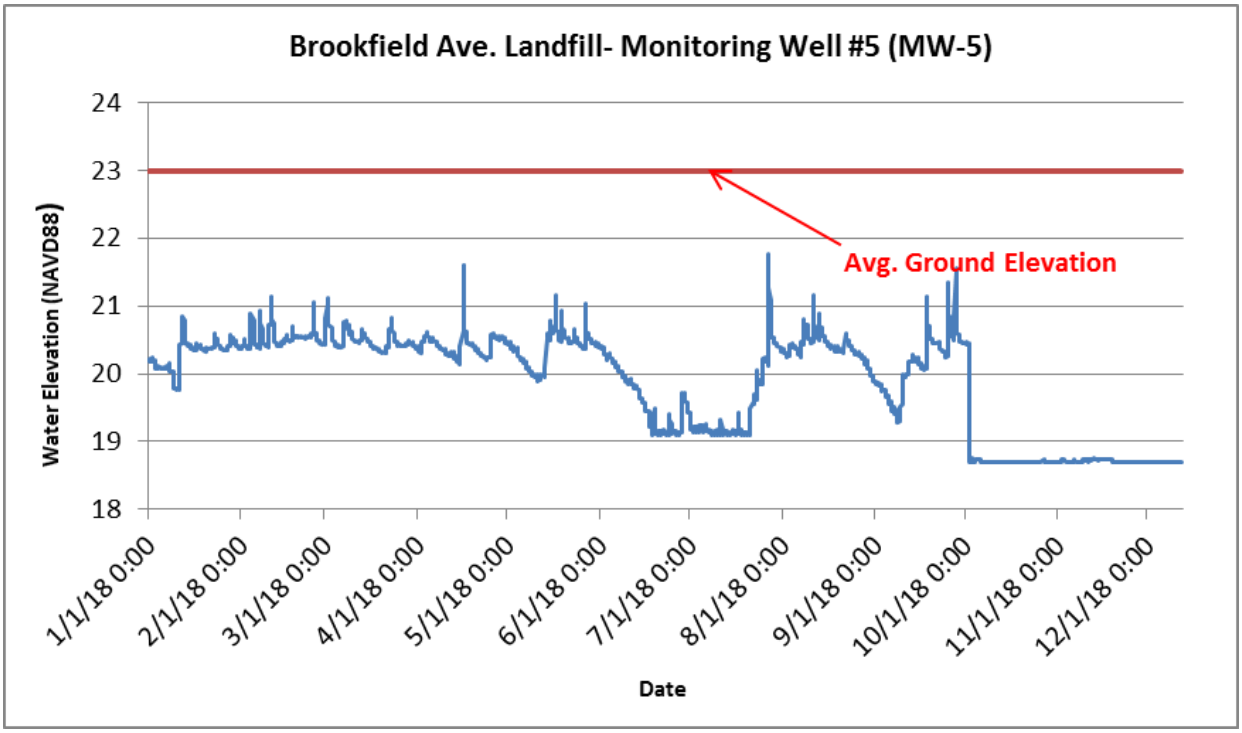

Brookfield Ave. Landfill- Tide Guage #1 (TG-1)
Water Elevation (NAVD88)
7
6
5
4
3
2
1
0
Avg. Ground Elevation
1/1/18 0:00
2/1/18 0:00
3/1/18 0:00
4/1/18 0:00
5/1/18 0:00
6/1/18 0:00
7/1/18 0:00
8/1/18 0:00
9/1/18 0:00
10/1/18 0:00
Date

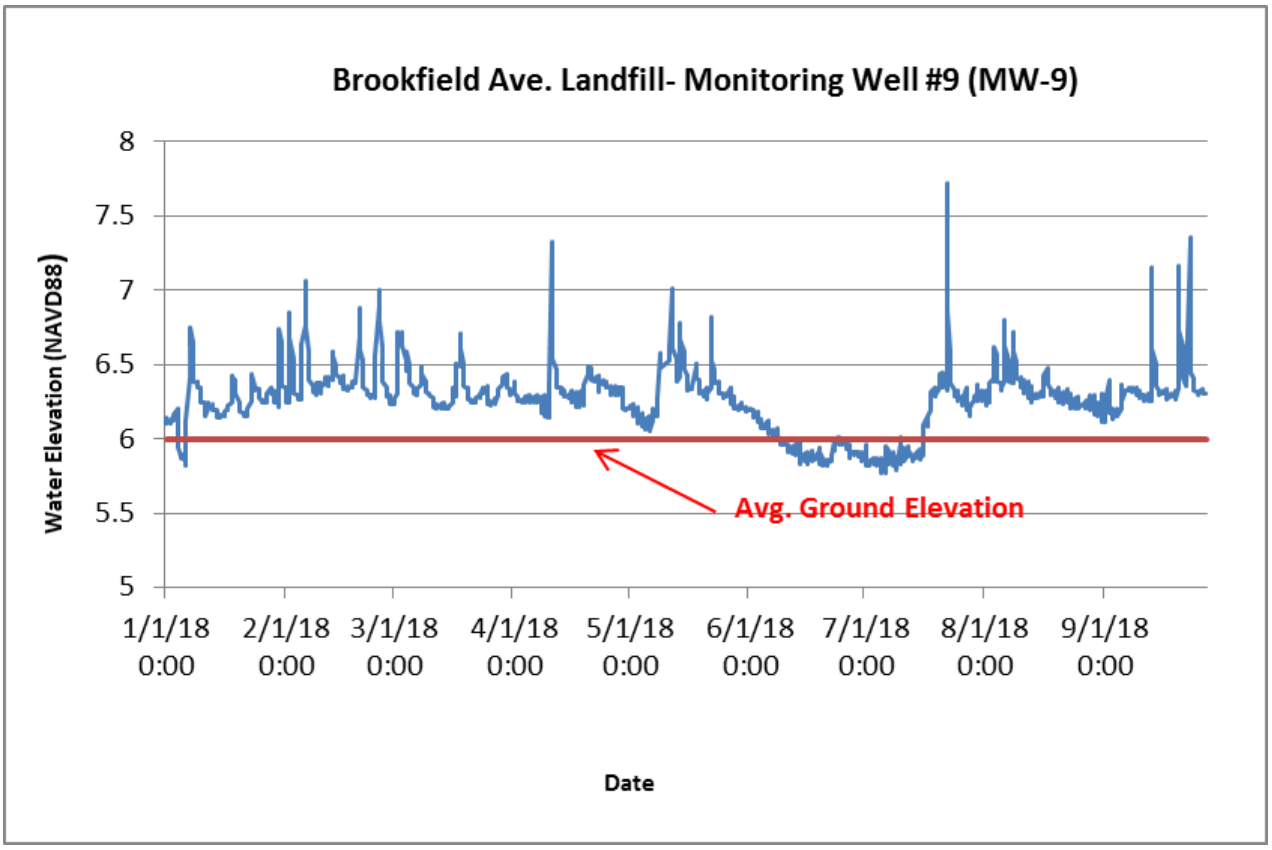

Brookfield Ave. Landfill- Tide Guage #6 (TG-6)
Water Elevation (NAVD88)
6
5.5
5
4.5
4
3.5
3
2.5
2
Avg. Ground Elevation
1/1/18 0:00
2/1/18 0:00
3/1/18 0:00
4/1/18 0:00
5/1/18 0:00
6/1/18 0:00
7/1/18 0:00
8/1/18 0:00
9/1/18 0:00
10/1/18 0:00
Date


Brookfield Ave. Landfill- Tide Guage #11 (TG-11)
Water Elevation (NAVD88)
Avg. Ground Elevation
7
6
5
4
3
2
1
0
1/1/18 0:00
2/1/18 0:00
3/1/18 0:00
4/1/18 0:00
5/1/18 0:00
6/1/18 0:00
7/1/18 0:00
8/1/18 0:00
9/1/18 0:00
10/1/18 0:00
Date


Brookfield Ave. Landfill- Monitoring Well #2 (MW-2)
Water Elevation (NAVD88)
Avg. Ground Elevation
8
7.5
7
6.5
6
5.5
5
1/1/18 0:00
2/1/18 0:00
3/1/18 0:00
4/1/18 0:00
5/1/18 0:00
6/1/18 0:00
7/1/18 0:00
8/1/18 0:00
9/1/18 0:00
10/1/18 0:00
Date


Brookfield Ave. Landfill- Monitoring Well #3 (MW-3)
Water Elevation (NAVD88)
13
12
11
10
9
8
7
Avg. Ground Elevation
1/1/18 0:00
2/1/18 0:00
3/1/18 0:00
4/1/18 0:00
5/1/18 0:00
Date


Brookfield Ave. Landfill- Monitoring Well #5 (MW-5)
Water Elevation (NAVD88)
24
23
22
21
20
19
18
Avg. Ground Elevation
1/1/18 0:00
2/1/18 0:00
3/1/18 0:00
4/1/18 0:00
5/1/18 0:00
6/1/18 0:00
7/1/18 0:00
8/1/18 0:00
9/1/18 0:00
10/1/18 0:00
11/1/18 0:00
12/1/18 0:00
Date


Brookfield Ave. Landfill- Monitoring Well #9 (MW-9)
Water Elevation (NAVD88)
8
7.5
7
6.5
6
5.5
5
Avg. Ground Elevation
1/1/18 0:00
2/1/18 0:00
3/1/18 0:00
4/1/18 0:00
5/1/18 0:00
6/1/18 0:00
7/1/18 0:00
8/1/18 0:00
9/1/18 0:00
Date

APPENDIX D
Color Photographs

Photo A: Wetland#1 Transect 1A View: Southeast (12/20/18)

Photo B: Wetland #1 Low tide View: West (10/09/18).

Photo C: Wetland #2 Transect 2C View: Southeast (10/08/18).

Photo D: Wetland #3 Plot 3C View: Southwest (10/09/18).

Photo E: Wetland #4 Plot 4A
View: South (10/10/18).

Photo F: Wetland #5 Plot 5A
View: Northwest (10/10/18).

Photo G: Wetland #6 Transect 6A View Southeast (10/16/18).

Photo H: Wetland #7 Transect 7B View: Southwest (10/16/18).

Photo I: Wetland#8 View: Northeast (5/16/18).

Photo J: Wetland #9 Transect 9A View Southwest (5/16/18).

Photo K: Wetland#10 Transect 10A View: Southwest (5/16/18).

Photo L: Wetland #11 Transect 11A View Northeast (12/20/18).

	**Photo M: Wetland#11 Transect 11A** View: Northeast (5/16/18).

APPENDIX E
Field Data Sheets

VEGETATION MONITORING DATA SHEET

GENERAL INFORMATION

Team: WE/JB
Date: 10/9/18
Transect ID: W1

LOCATION

State: NY
Township: Staten Island
County: Richmond
USGS Quad:

SOIL DESCRIPTION

Depth	Matrix	Mottle	Texture
0-24	10 YR 2/1		sandy clay

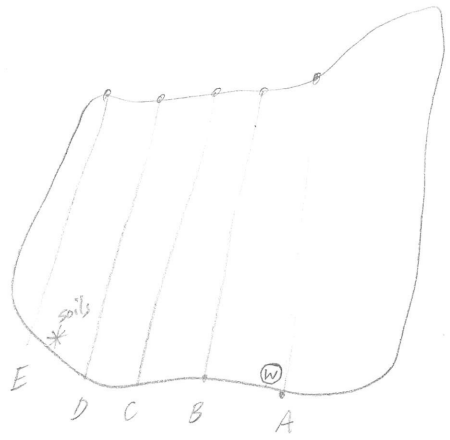
distinct hydrogen sulfide aroma

water at surface

WILDLIFE OBSERVATIONS

(benthic invertebrates, mussels, crabs, mammals, birds, fish)

TRANSECT & QUADRANT PLOT MAP



VEGETATION MONITORING DATA SHEET- Herbaceous Data Sheet

Page 1 of 2 Transect W1A Team WE/JB Date 10/9/18

*height measured in feet

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
spartina alterniflora	0		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
Sp. alt	50	6'	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	30	6'	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	100	6'	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	75	6'	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	100	5'	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
~~SD~~	50	6'	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	100	6'	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	50	5'	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	100	6'	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	80	6'	

VEGETATION MONITORING DATA SHEET- Herbaceous Data Sheet

Page 2 of 2 Transect W1A Team WE/JB Date 10/9/18

Quadrant	M			Quadrant	M			Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	100	6'			100	6'			~~100~~ 25	6'	
Quadrant	M			Quadrant	M			Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	25	6'			100%	6'		S. alt	0	0'	
								x17			
Quadrant	M			Quadrant	M			Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2
Quadrant	M			Quadrant	M			Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2

VEGETATION MONITORING DATA SHEET

GENERAL INFORMATION

Team: WE / JB
Date: 10/9/18
Transect ID: W1 B

LOCATION

State: NY
Township: Staten Island
County: Richmond
USGS Quad:

SOIL DESCRIPTION

Depth	Matrix	Mottle	Texture

WILDLIFE OBSERVATIONS

(benthic invertebrates, mussels, crabs, mammals, birds, fish)

TRANSECT & QUADRANT PLOT MAP

See W1A

VEGETATION MONITORING DATA SHEET- Herbaceous Data Sheet

Page 1 of 1 Transect W1B Team WE/DB Date 10/9/18

*height measured in feet

Quadrant	M		
Species	% cover	Avg. Height* (cm)	Density stems/0.25m2
spartina alterniflora	50	5'	
iva frutescens	10	2'	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
s. alt	100	6'	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
s. alt	25	5	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	0	0	
x32			

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
s. alt	25	3'	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
s. alt	50	5'	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
spartina alterniflora	100	5'	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

VEGETATION MONITORING DATA SHEET

GENERAL INFORMATION

Team: WE/JB
Date: 10/9/18
Transect ID: W1C

LOCATION

State: NY
Township: Staten Island
County: Richmond
USGS Quad:

SOIL DESCRIPTION

Depth	Matrix	Mottle	Texture

WILDLIFE OBSERVATIONS

(benthic invertebrates, mussels, crabs, mammals, birds, fish)

TRANSECT & QUADRANT PLOT MAP

see W1A

VEGETATION MONITORING DATA SHEET- Herbaceous Data Sheet

Page 1 of 1 Transect WIC Team WE/JB Date 10/9/18

*height in feet

Quadrant	M			Quadrant	M			Quadrant	M		
Species	% cover	Avg. Height* (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	0			spartina alterniflora	40	4'			45	5'	
x30											
Quadrant	M			Quadrant	M			Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2
s. alt	50	5'			100	5'			75	6'	
Quadrant	M			Quadrant	M			Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2
s. alt	80	6'			25	4'			25	4'	
Quadrant	M			Quadrant	M			Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2

VEGETATION MONITORING DATA SHEET

GENERAL INFORMATION

Team: WE/JB
Date: 10/10/18
Transect ID: W1D

LOCATION

State: NY
Township: Staten Island
County: Richmond
USGS Quad:

SOIL DESCRIPTION

Depth	Matrix	Mottle	Texture

WILDLIFE OBSERVATIONS

(benthic invertebrates, mussels, crabs, mammals, birds, fish)

TRANSECT & QUADRANT PLOT MAP

see W1A

VEGETATION MONITORING DATA SHEET- Herbaceous Data Sheet

Page 1 of 2 Transect WID-[illegible] Team WE/JB Date 10/10/18

*Height in feet

Quadrant	M		
Species	% cover	Avg. Height* (cm)	Density stems/0.25m2
	100	6'	20

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	30	5'	20

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	40	5'	10

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	80	6'	25

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	30	5'	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	70	5'	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	30	5'	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	100	6'	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	40	4'	20

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	60	5	15
x3			

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	20	2'	5
x2			

VEGETATION MONITORING DATA SHEET- Herbaceous Data Sheet

 Transect W1D Team WE/JB Date 10/10/18

Quadrant	M			Quadrant	M			Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	0	0									
x22											

Quadrant	M			Quadrant	M			Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M			Quadrant	M			Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M			Quadrant	M			Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2

VEGETATION MONITORING DATA SHEET

GENERAL INFORMATION

Team: WE/JB
Date: 10/10/18
Transect ID: W1E

LOCATION

State: NY
Township: Staten Island
County: Richmond
USGS Quad:

SOIL DESCRIPTION

Depth	Matrix	Mottle	Texture

WILDLIFE OBSERVATIONS

(benthic invertebrates, mussels, crabs, mammals, birds, fish)

TRANSECT & QUADRANT PLOT MAP

see W1A cover sheet

VEGETATION MONITORING DATA SHEET- Herbaceous Data Sheet

Page 1 of 2 Transect W1E Team WE/JB Date 10/10/18

*Height in feet

Quadrant	M		
Species	% cover	Avg. Height* (cm)	Density stems/0.25m2
	20	4	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	0	0	
x9			

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	40	3'	10

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	60	5'	25

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	40	6	10

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	50	5	15

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	40	5'	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	30	4'	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	40	5'	

Quadrant	M		
Species	% cover	Avg. Height* (cm)	Density stems/0.25m2
	30	3'	10

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	60	6'	25

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	100	7'	
x3			

VEGETATION MONITORING DATA SHEET- Herbaceous Data Sheet

Page 2 of 2 Transect W1E Team WE/DB Date 10/10/18

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	100	6'	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	100	5	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	30	3'	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	30	3'	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	10	3'	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	40	4'	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	100	5'	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	100	6'	
x2			

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	80	6'	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	100		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	90	6'	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	0		

VEGETATION MONITORING DATA SHEET

GENERAL INFORMATION

Team: JB + WE
Date: 10/8/18
Transect ID: W2A

LOCATION

State: NY
Township: Staten Island
County: Richmond
USGS Quad:

SOIL DESCRIPTION

Depth	Matrix	Mottle	Texture
0-6"	2.5 Y 4/2	2.5 Y 5/3 (10%)	sand
6-12"	10 YR 5/1	10 YR 6/4 (10%)	sand
12-~~18~~ 24	10 YR 4/1	10 YR 5/4 (20%)	sand
~~18-24~~	~~N/A not solid enough to remove from boring~~		

saturated at ground level

WILDLIFE OBSERVATIONS

(benthic invertebrates, mussels, crabs, mammals, birds, fish)

TRANSECT & QUADRANT PLOT MAP

VEGETATION MONITORING DATA SHEET- Herbaceous Data Sheet

Page 1 of 2 Transect W2 A Team JB + WE Date 10/8/18

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
NL cattail	10	75	
Black willow	10	75	
phrag	10	100	
calico aster	5	25	
verbena hastata	20	50	
rose mallow	5	25	
J. diff	40	25	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
cattail	20		
pickeral	10		
phrag	10		
J. diff	20		
soft rush	5		
purslane	30		
cyperus diformis	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
softrush	40	50	
~~[illegible]~~ purslane	30		
phrag	5		
cattail	10		
ss bulrush	5	40	
pluchea	5		
J. diff	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
cattail	40		
pickeralweed	20		
arrow arum	5		
3 square	15		
cyp. dif.	20		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
pickeral	10		
3 square	15		
purslane	20		
~~J. diff~~ Pic #1	5		
cattail	15		
eleocharis	5		
cyperus dif.	15		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
black willow	40	120	
pickeralweed	15		
3 square	15		
rose mallow	10	60	
pic #1	5		
J. diff.	10		
eleocharis	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
J. diff	30		
phrag	10		
purple loostrife	20		
purslane	10		
blue flag iris	5		
softrush	10		
cattail	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
NL golden rod	25		
purple loostrife	25		
phrag	10		
sm aster	10		
3 square	5		
softrush	5		
rose mallow	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
purple loos	15		
phrag	10		
NL goldenrod	5		
J. diff.	25		
purslane	10		
eleocharis	5		
calico aster	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
switchgrass	10	80	
wool grass	10	75	
pussy willow	15	60	
J. diff.	25		
spike grass Pic #2	15		
soft rush	10		
cyperus odoratus	5	20	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
NL golden rod	10		
phrag	5		
pussy willow	10		
softrush	5		
boneset	10		
dogbane	10		
J. diff	20		
grass pic #2	10		
cyperus odoratus	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
NL goldenrod	20		
bay berry	10		
~~iva frutescens~~ barchanis	5		
calico aster	5		
phrag	10		
softrush	5		
fox sedge	20		
cyperus odoratus	5		

VEGETATION MONITORING DATA SHEET- Herbaceous Data Sheet

Page 2 of 2 Transect W2A Team JB + WE Date 10/8/18

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
NL goldenrod	10		
softrush	15		
bayberry	7		
beggarticks	15		
purple loosestrife	15		
cyperus odoratus	10		
path rush	15		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
softrush	15		
phrag	3		
goldenrod	10		
purple loos	15		
j. diff	30		
spike rush	10		
pluchea	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
goldenrod	10		
purple loos	5		
J. diff.	15		
cyperus odoratus	3		
y. nutsedge	5		
spike rush	7		
pussy willo	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
Pluchea	50		
golden rod	5		
J. dif	15		
sm aster	10		
fall panicgrass pic #3	10		
switchgrass pic #4	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
bl. willow	10		
purple loos	10		
phrag	5		
softrush	25		
~~iva frut~~ beggarticks	8		
J. diff.	15		
spike rush	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
blue flag iris	12		
golden rod	7		
soft rush	18		
ss bulrush	30		
pussy willow	10		
J. diff	15		
cattail	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
golden rod	10		
pussy willow	10		
grass pic #2	30		
purple loos	15		
cyperus odoratus	5		
J. diff	7		
spike rush	8		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
rose mallow	20		
3 square	20		
phrag	5		
J. diff	25		
pluchea	15		
spike rush	10		
pic #3	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
ss. bulrush	30		
cattail	25		
blue flag iris	5		
cyperus odor	3		
J. diff	12		
y. nutsedge	7		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
goldenrod	20		
bl willow	10		
softrush	25		
J. diff	20		
grass pic #2	10		
purple loos	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
bayberry	40		
blue vervain	4		
J. diff	30		
golden rod	10		
phrag	3		
purple loos	10		
path rush	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
phrag	35		
pluchea	20		
J. diff	20		
msemallow	10		
sm aster	5		
golden rod	5		

VEGETATION MONITORING DATA SHEET

GENERAL INFORMATION

Team: SB + WE

Date: 10/8/18

Transect ID: W2B

LOCATION

State: NY

Township: Staten Island

County: Richmond

USGS Quad:

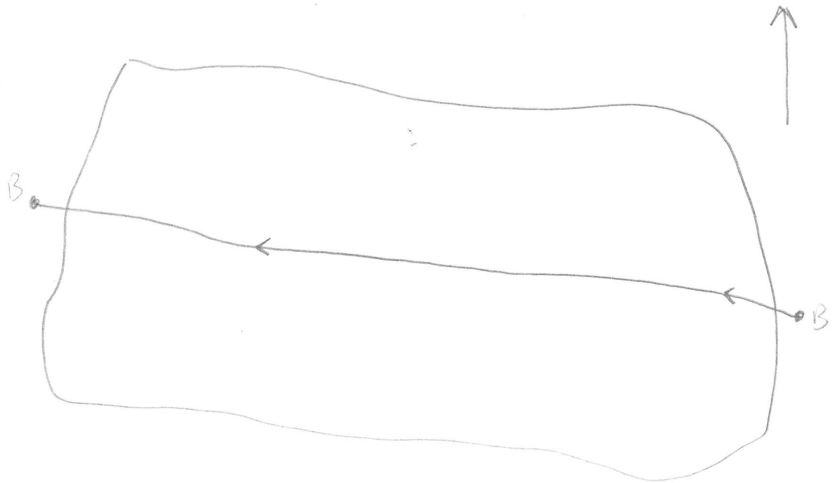
SOIL DESCRIPTION

Depth	Matrix	Mottle	Texture

WILDLIFE OBSERVATIONS *

(benthic invertebrates, mussels, crabs, mammals, birds, fish)

TRANSECT & QUADRANT PLOT MAP



VEGETATION MONITORING DATA SHEET- Herbaceous Data Sheet

Page 1 of 2 Transect W2B Team JB + WE Date 10/8/18

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
purple loos	20		
phrag	5		
NE cattail	10		
J. diff.	25		
pluchea	22		
ss. bulrush	5		
spike rush	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
cattail	60		
3 square	20		
pickeralweed	5		
spike rush	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
cattail	20		
ss bulrush	20		
3 square	60		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
cattail	30		
pickeralweed	20		
ss bulrush	30		
3 square	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
soft rush	10		
cattail	30		
ss bulrush	40		
rose mallow	5		
spike rush	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
J diff	20		
pluchea	20		
golden rod	5		
rose mallow	20		
cattail	10		
phrag	4		
ss. bulrush	15		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
bayberry	40		
fall panicgrass	15		
ss goldenrod	10		
grass leaf goldenrod	5		
calico aster	3		
Y. nutsedge	10		
J. dif	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
soft rush	20		
rose mallow	15		
phrag	5		
cattail	10		
3 square	5		
wool grass	4		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
Softrush	40		
phrag	10		
3-square	30		
J diff	5		
SM aster	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
softrush	30		
cattail	5		
phrag	4		
purslane	18		
pluchea	6		
3 square	20		
cyper odoratus	5		
ss. bulrush	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
Softrush	50		
switch grass	10		
3 square	20		
cattail	4		
pluchea	3		
purslane	5		
J. diff.	8		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
ss. bulrush	40		
cattail	10		
purslane	10		
pluchea	5		
~~wool grass~~			
3-square	30		
spike rush	5		

VEGETATION MONITORING DATA SHEET- Herbaceous Data Sheet

Page 2 of 2 Transect W2B Team JB + WE Date 10/8/19

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
cyperus dif	50		
ss. bulrush	20		
3-square	10		
purslane	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
cattail	10		
cyperus dif	60		
3-square	10		
pickeral weed	4		
lizards tail	4		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
cyperus dif.	50		
pickeral weed	5		
softrush	10		
ss. bulrush	12		
3-square	4		
purslane	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
ss. bulrush	8		
3 square	22		
purslane	25		
cyperus odo	5		
cyp dif.	20		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
rosemallow	10		
cyperus dif.	20		
pickeral weed	10		
3-square	40		
purslane	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
pickeral weed	20		
3 square	30		
cyp dif.	15		
smart weed	3		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
cattail	10		
ss. bulrush	10		
3 square	15		
~~Spartanium~~ scirpus sp	5		
cyp. diformis	15		
purslane	20		
pickeral weed	4		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
rosemallow	10		
spike rush	10		
cattail	20		
pluchea	4		
purslane	20		
J. diff.	5		
scirpus sp	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
ss. golden rod	15		
purple loos	8		
softrush	10		
J. diff.	15		cyperus odo 10%
pussy willow	10		
SM aster	4		
y. nutsedge	9		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
3-square	40		
purple loos	20		
calico aster	15		
SM aster	5		
pluvea	2		
cyperus odo	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

VEGETATION MONITORING DATA SHEET

GENERAL INFORMATION

Team: JB + WE

Date: 10/8/18

Transect ID: W2 C

LOCATION

State: New York

Township: Staten Island

County: Richmond

USGS Quad:

SOIL DESCRIPTION

Depth	Matrix	Mottle	Texture
0-6"	10 YR 5/2	10 YR 5/4 (20%)	sand
6-10"	2.5 Y 5/1	2.5 Y 5/4 (20%)	sand
10-18"	2.5 Y 4/1	2.5 Y 5/6 (10%)	sand
18-24	saturated soil not removable		

standing water at 3" depth

WILDLIFE OBSERVATIONS

(benthic invertebrates, mussels, crabs, mammals, birds, fish)

monarch butterflies and unopened chrysalis

blue heron

great egret

TRANSECT & QUADRANT PLOT MAP

VEGETATION MONITORING DATA SHEET- Herbaceous Data Sheet

Page 1 of 2 Transect W2C Team JB + WE Date 10/8/18

Quadrant	M			Quadrant	M			Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2
softrush	10			rose mallow	20			3-square	20		
ss goldenrod	15			softrush	15			cattail	20		
spike grass	10			phrag	5			pickerel weed	5		
3M aster	8			purple loos	8			cyperus odo	5		
purslane	20			pluchea	10			cyperus dif	25		
blue flag iris	10			purslane	20			spike rush	10		
bacchanis	5%			cattail	15			purslane	15		
Quadrant	M			Quadrant	M			Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2
3 square	20			cattail	20			SM aster	30		
pickeral weed	10			lizards tail	4			phrag	5		
cattail	12			purslane	20			rosemallow	10		
rosemallow	10			ss bulrush	10			late flower thorow	2		
cyperus odo	5			pickerelweed	5			purslane	15		
" dif.	15			cyperus dif	6			pussy willow	10		
purslane	10							J. dif.	20		
Quadrant	M			Quadrant	M			Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2
late flowering thoroughwort	20			cattail	15			cattail	25		
phrag	20			rosemallow	10			J. dif	15		
rose mallow	8			phrag	5			bl willow	8		
SM aster	20			boneset	10			rosemallow	5		purslane 10%
J. dif.	15			pic #3 grass	8			ss. bulrush	10		
calico aster	3			purple loos	5			plantain	5		
				pussy willow	10			pluchea	15		
Quadrant	M			Quadrant	M			Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2	Species	% cover	Avg. Height (cm)	Density stems/0.25m2
softrush	20			3 square	35			cattail	35		
ss goldenrod	15			softrush	20			3 square	10		
phrag	5			rosemallow	10			softrush	20		
purple loos	30			purslane	20			phrag	5		
panicum dichotomiflorum	8			phrag	5			J. dif	10	10	
J. dif.	15			J. dif	15			purslane	10	10	
y. nutsedge	10										

VEGETATION MONITORING DATA SHEET- Herbaceous Data Sheet

Page 2 of 2 Transect W2C Team JB+WE Date 10/8/18

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
3 square	10		
soft rush	30		
ss goldenrod	15		
J. diff.	15		
pluchea	20		
phrag	10		
spike rush	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
marsh mallow	15		
cattail	10		
soft rush	20		
3 square	25		
J. dif	10		
pluchea	12		
purslane	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
cattail	5		
3 square	25		
soft rush	10		
J. diff	25		
ss bulrush	5		
pluchea	2		
phrag	2		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
soft rush	5		
3 square	25		
ss bulrush	20		
dog bane	5		
J. dif.	20		
spike rush	10		
phrag	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
cattail	15		
phrag	5		
baccharis	15		
purple loos	10		
woolgrass	35		
soft rush	15		
3 square	20		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
J. dif	15		
spike rush	5		
pluchea	15		
ss goldenrod	5		
soft rush	15		5
bur sedge	3		
y nutsedge	3		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
pussy willow	10		
Rose	8		
dogbane	10	vegetation pic #4) 20%	
bayberry	15		
soft rush	10		
Spike grass	20		
SS goldenrod	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

VEGETATION MONITORING DATA SHEET – PLOT COVER SHEET

GENERAL INFORMATION

Team: WE/JB

Plot ID: W3A

Date: 10/9/18

LOCATION

State: NY County: Richmond

Township: Staten Island

USGS quad: _____

Latitude: _____ Longitude: _____

PLOT DOCUMENTATION

Vegetation: _____

Canopy ht: _____

Plot Types: ___ relv. ___ ints.

Plot size: _____

Herb modules: _____

Depth: _____

Soil series: _____

Soil classification: _____

Modules sampled: _____

Film roll / frames: _____

Photopoint frame(s): _____

Bearing: _____

SITE CHARACTERISTICS

Elevation: _____

Aspect: _____ Slope: _____

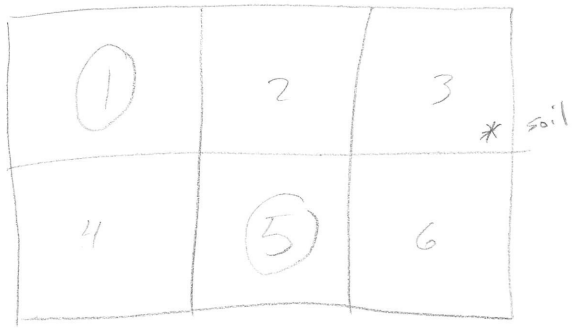
Topography:

_____ valley/ravine
_____ alluvial flat
_____ upland flat
_____ toe slope
_____ lower slope
_____ mid slope
_____ upper slope
_____ ridgetop
_____ ledge/escarpment
_____ other

Hydrology:

_____ terrestrial
_____ palustrine
_____ estuarine
_____ riverine
_____ lacustrine

PLOT MAP: fill in template below, showing arrangement of module(s) actually used, corners of modules sampled, locations of permanent stakes, directions and distances to witness trees, location and bearing of photopoints, etc.



NOTES: consider type(s) and frequency/severity of disturbance(s), community structure (stratification, etc.), and any other special features of the site or vegetation

Depth	Matrix	Mottle	Texture
0-10"	10YR 5/4		sand
10-24"	10 YR 5/3		sand

VEGETATION MONITORING DATA SHEET - Herbaceous Module Data Sheet

Team: WE/JB Plot: W3-A Date: 10/9/2018 Page: 1 of 3

Species	Cover Classes: Module 1										Cover Classes: Module 5									
	+	1-5	6-10	11-15	16-20	21-25	26-50	51-75	76-90	91-100	+	1-5	6-10	11-15	16-20	21-25	26-50	51-75	76-90	91-100
SS goldenrod		✓									✓									
Dioica							✓										✓			
Bl eye Susan		✓									✓									
Little Bluestem				✓								✓	✓							
Pearly everlasting		✓																		
Fall panic grass			✓									✓								
Lespidisa		✓																		
Phrag	✓																			
Cyperus ~~sp~~ filicens			✓										✓							
Callico aster	✓											✓								
RL Goldenrod		✓										✓								
blue vernin												✓								
Photo #2 verbascum		✓										✓								
Sand jointweed												✓								
Boneset												✓								
b. milkweed	✓										✓									

VEGETATION MONITORING DATA SHEET – Seedling/Sapling Data Sheet

Team: WE/JB Plot: W3-A Date: 10/9/2018 Page 3 of 3

Species	Code	Seedling / Sapling Height						
		0 – 1 ft	1 – 2 ft	2 – 3 ft	3 – 4 ft	4 – 5 ft	5 – 6 ft	6 – 7 ft
Cottonwood	POPE	II	𝍸 𝍸 𝍸 𝍸	𝍸 I	IIII			
Red Maple	ACRU	III	II		I			
Sweetgum	NYSY	𝍸	𝍸 IIII	𝍸 𝍸	IIII			
Winged Sumac	RH		I					
Black Locust	ROPS		I					I
Bl Cherry	PRSE	II						
Buckhorn Ivy fruticescens	~~IVFR~~		II					
Viburnum dentatum	VIDE	I	I	I				
Bayberry		III		I				

Species	Code	Seedling / Sapling Height						
		7 – 8 ft	8 – 9 ft	9 – 10 ft	10 – 11 ft	11 – 12 ft	12-13 ft	13 – 14 ft

VEGETATION MONITORING DATA SHEET – PLOT COVER SHEET

GENERAL INFORMATION

Team: WE/JB

Plot ID: W3B

Date: 10/9/18

LOCATION

State: NY County: Richmond

Township: Staten Island

USGS quad: _____

Latitude: _____ Longitude: _____

PLOT DOCUMENTATION

Vegetation: _____

Canopy ht: _____

Plot Types: ___ relv. ___ ints.

Plot size: _____

Herb modules: _____

Depth: _____

Soil series: _____

Soil classification: _____

Modules sampled: _____

Film roll / frames: _____

Photopoint frame(s): _____

Bearing: _____

SITE CHARACTERISTICS

Elevation: _____

Aspect: _____ Slope: _____

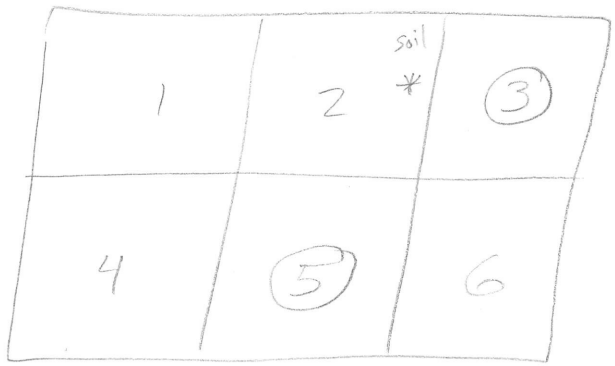
Topography:

_____ valley/ravine
_____ alluvial flat
_____ upland flat
_____ toe slope
_____ lower slope
_____ mid slope
_____ upper slope
_____ ridgetop
_____ ledge/escarpment
_____ other

Hydrology:

_____ terrestrial
_____ palustrine
_____ estuarine
_____ riverine
_____ lacustrine

PLOT MAP: fill in template below, showing arrangement of module(s) actually used, corners of modules sampled, locations of permanent stakes, directions and distances to witness trees, location and bearing of photopoints, etc.



NOTES: consider type(s) and frequency/severity of disturbance(s), community structure (stratification, etc.), and any other special features of the site or vegetation

Depth	Matrix	Mottle	Texture
0-1"	roots/organic matter		
1-12"	2.5Y 4/3 (90%)	7.5YR 5/8 (10%)	sand
12-24"	10YR 5/4		sand

standing water at 12"

VEGETATION MONITORING DATA SHEET - Herbaceous Module Data Sheet

Team: WE/JB Plot: W3-B Date: 10/9/2018 Page: 2 of 3

Species	Cover Classes: Module 3										Cover Classes: Module 5									
	+	1-5	6-10	11-15	16-20	21-25	26-50	51-75	76-90	91-100	+	1-5	6-10	11-15	16-20	21-25	26-50	51-75	76-90	91-100
Distia			✓												✓					
RL goldenrod		✓												✓						
Little bluestem					✓								✓							
Soft rush			✓									✓								
Purpl. loosestrife		✓																		
Yellow nutsedge		✓									✓									
SS goldenrod		✓										✓								
Cyperus sp. filicinus		✓									✓									
GL goldenrod	✓											✓								
Calico aster		✓									✓									
Panic grass		✓											✓							
Lespidisa		✓																		
~~Poa sp.~~																				
Juncus df		✓										✓								
Plantain		✓									✓									
Poa sp.		✓																		
Birds-foot trefoil		✓											✓							
Aster pilosis												✓								
BL eyed Susan											✓									
Primrose												✓								
Cyperus strigosus												✓								
Eupatorium serotinum											✓									
Gnaphalium											✓									

VEGETATION MONITORING DATA SHEET – Seedling/Sapling Data Sheet

Team: WE / JB Plot: W3-B Date: 10/9/2018 Page 3 of 3

Species	Code	Seedling / Sapling Height						
		0 – 1 ft	1 – 2 ft	2 – 3 ft	3 – 4 ft	4 – 5 ft	5 – 6 ft	6 – 7 ft
Sweetgum	~~NYSY~~ LIST		卌 卌	卌 I 卌	I	I		
R Maple	ACRU		I	I				
Cottonwood	PODE	卌	卌 卌 卌 II 卌 卌 卌	卌 卌 卌 III IIII	卌 IIII	卌		
Baccharis ~~Iva frutescens~~	~~IVFR~~	I	卌 IIII					
Aronia	ARME		卌	卌 卌				
Bayberry	MOPE	卌 卌 卌 卌 I 卌 卌 卌	卌 II 卌					
Eleagnus	EL						I	
Pussys willow	SADI		卌 II	卌 III 卌	I	II		
Bl willow	SANI		卌 IIII	卌 II		I		
Viburnum	VIDE		卌 I					
Clethra	CLAL		I					

Species	Code	Seedling / Sapling Height						
		7 – 8 ft	8 – 9 ft	9 – 10 ft	10 – 11 ft	11 – 12 ft	12-13 ft	13 – 14 ft

VEGETATION MONITORING DATA SHEET – PLOT COVER SHEET

GENERAL INFORMATION

Team: WE/JB

Plot ID: W3C

Date: 10/9/18

LOCATION

State: NY County: Richmond

Township: Staten Island

USGS quad: _____

Latitude: _____ Longitude: _____

PLOT DOCUMENTATION

Vegetation: _____

Canopy ht: _____

Plot Types: ___ relv. ___ ints.

Plot size: _____

Herb modules: _____

Depth: _____

Soil series: _____

Soil classification: _____

Modules sampled: _____

Film roll / frames: _____

Photopoint frame(s): _____

Bearing: _____

SITE CHARACTERISTICS

Elevation: _____

Aspect: _____ Slope: _____

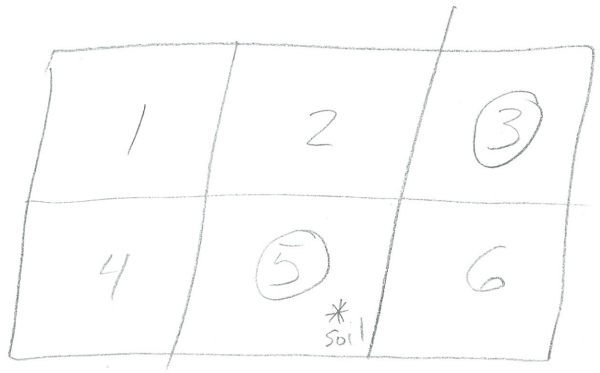
Topography:

_____ valley/ravine
_____ alluvial flat
_____ upland flat
_____ toe slope
_____ lower slope
_____ mid slope
_____ upper slope
_____ ridgetop
_____ ledge/escarpment
_____ other

Hydrology:

_____ terrestrial
_____ palustrine
_____ estuarine
_____ riverine
_____ lacustrine

PLOT MAP: fill in template below, showing arrangement of module(s) actually used, corners of modules sampled, locations of permanent stakes, directions and distances to witness trees, location and bearing of photopoints, etc.



NOTES: consider type(s) and frequency/severity of disturbance(s), community structure (stratification, etc.), and any other special features of the site or vegetation

Depth	Matrix	Mottle	Texture
0-2"	organic matter		
2-10"	10YR 4/3 (90%)	10YR 4/6 (10%)	sand
10-24"	10YR 4/3		sand

water at 6"

VEGETATION MONITORING DATA SHEET - Herbaceous Module Data Sheet

Team: WE/JB   Plot: W3-C   Date: 10/9/2018   Page: 2 of 3

Module 3 (Cover Classes):

Species	+	1-5	6-10	11-15	16-20	21-25	26-50	51-75	76-90	91-100
Panic grass				✓						
GL goldenrod	✓									
SS goldenrod		✓								
RL goldenrod		✓								
Birdsfoot trefoil		✓								
Baccharis halim.	✓									
Boneset	✓									
sand jointweed ~~Wild sena~~			✓							
b. milkweed	✓									
Lespidisa		✓								
Diotia			✓							
Dichanthelium ~~Arogrostis~~	✓									
Aster pilosis		✓								
Little bluestem			✓							
Plantain		✓								
Three square		✓								
Soft rush	✓									
Blue flag iris										
Cattail										
Purple loosestrife										
Pluchea										
Cyperus dif										
Juncus dif										
Poa sp.										
Switchgrass										
Cyperus odoratus										
phrag										
Woolgrass										

Module 5 (Cover Classes):

Species	+	1-5	6-10	11-15	16-20	21-25	26-50	51-75	76-90	91-100
Panic grass		✓								
GL goldenrod										
SS goldenrod		✓								
RL goldenrod		✓								
Birdsfoot trefoil	✓									
Baccharis halim.	✓									
Boneset										
sand jointweed ~~Wild sena~~		✓								
b. milkweed										
Lespidisa	✓									
Diotia		✓								
Dichanthelium ~~Arogrostis~~		✓								
Aster pilosis	✓									
Little bluestem			✓							
Plantain										
Three square				✓						
Soft rush		✓								
Blue flag iris		✓								
Cattail		✓								
Purple loosestrife		✓								
Pluchea		✓								
Cyperus dif		✓								
Juncus dif		✓								
Poa sp.			✓							
Switchgrass		✓								
Cyperus odoratus		✓								
phrag		✓								
Woolgrass	✓									

VEGETATION MONITORING DATA SHEET – Seedling/Sapling Data Sheet

Team: WE / JB Plot: W3-C Date: 10/9/2018 Page 3 of 3

Species	Code	Seedling / Sapling Height						
		0 – 1 ft	1 – 2 ft	2 – 3 ft	3 – 4 ft	4 – 5 ft	5 – 6 ft	6 – 7 ft
Bayberry	MOPE	6	7	1	4	3		
Arrowwood	ARME	5	1	4		1	1	
Clethra	CLAL		2	5	1			
Cottonwood	PODE	5	11	10	8	4		
Pussy Willow	SADI	2	9	8	5	2	2	1
Bl Willow	SANI		2	1	1	1		
Sweetgum	~~ANSY~~ LIST	3	4	3	1			
Viburnum dentatum	VIDE		2	1				
Vaccinium corymbosum	VACO		3		2			
Buckthorn ~~Ilex~~ frutescens	~~ILFR~~	1	3					
Sweet Bay Magnolia		1	3		1			
Rhododendron			4					

Species	Code	Seedling / Sapling Height						
		~~7 – 8 ft~~	~~8 – 9 ft~~	~~9 – 10 ft~~	10 – 11 ft	~~11 – 12 ft~~	12-13 ft	~~13 – 14 ft~~
Winged Sumac	RH	1						1
Black Locust	ROPS			1				
Raspberry								
Pin Oak	QUPA	1						
Red Maple	ACRU	1	11					
Willow Oak				11				

VEGETATION MONITORING DATA SHEET – PLOT COVER SHEET

GENERAL INFORMATION

Team: JB + WE

Plot ID: W4A

Date: 10/10/18

LOCATION

State: NY County: Richmond

Township: Staten Island

USGS quad: _____

Latitude: _____ Longitude: _____

PLOT DOCUMENTATION

Vegetation: _____

Canopy ht: _____

Plot Types: ___ relv. ___ ints.

Plot size: _____

Herb modules: _____

Depth: _____

Soil series: _____

Soil classification: _____

Modules sampled: _____

Film roll / frames: _____

Photopoint frame(s): _____

Bearing: _____

SITE CHARACTERISTICS

Elevation: _____

Aspect: _____ Slope: _____

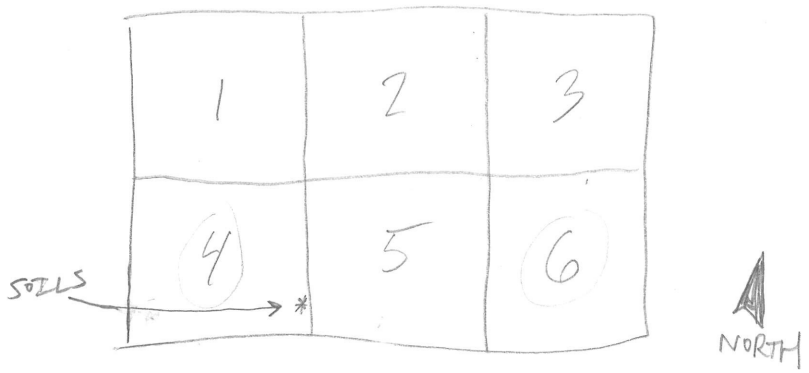
Topography:

_____ valley/ravine
_____ alluvial flat
_____ upland flat
_____ toe slope
_____ lower slope
_____ mid slope
_____ upper slope
_____ ridgetop
_____ ledge/escarpment
_____ other

Hydrology:

_____ terrestrial
_____ palustrine
_____ estuarine
_____ riverine
_____ lacustrine

PLOT MAP: fill in template below, showing arrangement of module(s) actually used, corners of modules sampled, locations of permanent stakes, directions and distances to witness trees, location and bearing of photopoints, etc.



NOTES: consider type(s) and frequency/severity of disturbance(s), community structure (stratification, etc.), and any other special features of the site or vegetation

Depth	Matrix	Mottles	Texture
0-12"	2.5Y 5/2	10YR 5/6 (25%)	sand
12-24"	10YR 5/2	10YR 5/6 (25%)	sand

standing water at 6"

VEGETATION MONITORING DATA SHEET - Herbaceous Module Data Sheet

Team: JBeWE Plot: W4A Date: 10/10/18 Page: 2 of 3

Species	Cover Classes: Module 4										Cover Classes: Module 6									
	+	1-5	6-10	11-15	16-20	21-25	26-50	51-75	76-90	91-100	+	1-5	6-10	11-15	16-20	21-25	26-50	51-75	76-90	91-100
Photo #2																				
Panicum virgatum		✓													✓					
Aster pilosis		✓											✓							
SS goldenrod		✓										✓								
Salt marsh aster	✓																			
PA smartweed						✓					✓									
Cyperus dif				✓							✓									
Cyperus sp.	✓										✓									
Water purslane			✓									✓								
Path rush (Juncus)		✓									✓									
BE eyed S-san		✓									✓									
Pluchea	✓											✓								
Birdsfoot trefoil		✓										✓								
Little bluestem		✓										✓								
Bidens	✓											✓								
Dichanthelium sp			✓										✓							
Lespidisa	✓										✓									
milkweed	✓																			
Plantain		✓																		
Eupatorium		✓									✓									
RL goldenrod	✓											✓								
Mugwort	✓																			
~~Panicum (photo #5) switchgrass~~																				
Evening primrose												✓								
Bush clover											✓									
Soft rush												✓								
Poa sp (Photo #4)												✓								

VEGETATION MONITORING DATA SHEET – Seedling/Sapling Data Sheet

Team: JB+WE Plot: W4A Date: 10/10/18 Page 3 of 3

Species	Code	Seedling / Sapling Height						
		0 – 1 ft	1 – 2 ft	2 –3 ft	3 – 4 ft	4 – 5 ft	5 – 6 ft	6 – 7 ft
Atl White Cedar	CHTH		III	III	IIII			II
Blueberry	VACO		IIII I ..		II			
Baccharis	BAHA		IIII			I		
Cottonwood	PODE	II	IIII IIII	IIII	II	II		
Ilex glabra	ILGL	IIII	IIII I					
Clethra	CLAL			I				
Aronia	ARME	II	II	III	II			
Rhododendron	RH		I	IIII				
Bayberry	MOPE		I					

Species	Code	Seedling / Sapling Height						
		7 – 8 ft	8 – 9 ft	9 – 10 ft	10 – 11 ft	11 –12 ft	12-13 ft	13 – 14 ft
Atl Wh Cedar	CHTH	I						

VEGETATION MONITORING DATA SHEET – PLOT COVER SHEET

GENERAL INFORMATION

Team: WE / JB

Plot ID: 5A

Date: 10/10/2018

LOCATION

State: NY County: Richmond

Township: Staten Island

USGS quad: _____

Latitude: _____ Longitude: _____

PLOT DOCUMENTATION

Vegetation: _____

Canopy ht: _____

Plot Types: ___ relv. ___ ints.

Plot size: _____

Herb modules: _____

Depth: _____

Soil series: _____

Soil classification: _____

Modules sampled: _____

Film roll / frames: _____

Photopoint frame(s): _____

Bearing: _____

SITE CHARACTERISTICS

Elevation: _____

Aspect: _____ Slope: _____

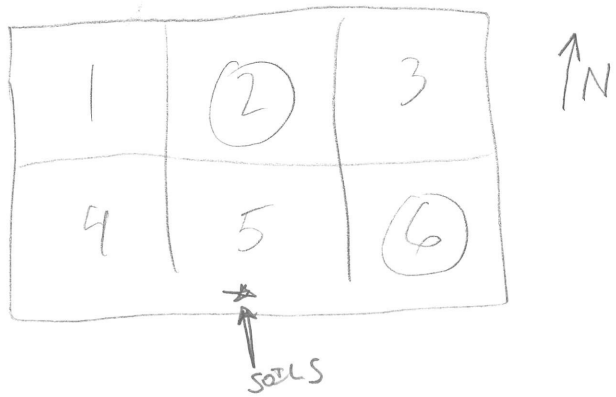
Topography:

_____ valley/ravine
_____ alluvial flat
_____ upland flat
_____ toe slope
_____ lower slope
_____ mid slope
_____ upper slope
_____ ridgetop
_____ ledge/escarpment
_____ other

Hydrology:

_____ terrestrial
_____ palustrine
_____ estuarine
_____ riverine
_____ lacustrine

PLOT MAP: fill in template below, showing arrangement of module(s) actually used, corners of modules sampled, locations of permanent stakes, directions and distances to witness trees, location and bearing of photopoints, etc.



NOTES: consider type(s) and frequency/severity of disturbance(s), community structure (stratification, etc.), and any other special features of the site or vegetation

Depth	Matrix	Mottles	Texture
0-24"	10YR 4/3	None	sand

water standing at 10" depth

VEGETATION MONITORING DATA SHEET - Herbaceous Module Data Sheet

Team: JB + WE Plot: 5A Date: 10/10/2018 Page: 2 of 3

Species	Cover Classes: Module 2										Cover Classes: Module _____									
	+	1-5	6-10	11-15	16-20	21-25	26-50	51-75	76-90	91-100	+	1-5	6-10	11-15	16-20	21-25	26-50	51-75	76-90	91-100
Little bluestem						✓											✓			
Aster pilosus		✓										✓								
Switchgrass ~~Tall prairie grass~~ photo #3				✓									✓							
Euthamia gymnospermoides NL goldenrod			✓									✓								
SS Goldenrod													✓							
LF Thoroughwort		✓										✓								
Dichanthelium		✓										✓								
Birdsfoot trefoil	✓										✓									
Cyperus sp.		✓										✓								
Soft rush			✓																	
Carex sp.		✓																		
~~Photo #2~~																				
Calico aster		✓										✓								
Juncus acuminatus		✓										✓								
Lespidisa	✓										✓									
Bl eyed Susan	✓										✓									
Rabbit (Gnaphalium obtusifolium)	✓												✓							
RL goldenrod		✓	✓									✓								
Water purslane		✓																		
Spike rush	✓																			
Yellow nutsedge	✓										✓									
Bidens sp.	✓											✓								
Cyperus odoratus												✓								

VEGETATION MONITORING DATA SHEET – Seedling/Sapling Data Sheet

Team: JB + WE Plot: 5A Date: 10/10/2018 Page 3 of 3

Species	Code	Seedling / Sapling Height						
		0 – 1 ft	1 – 2 ft	2 – 3 ft	3 – 4 ft	4 – 5 ft	5 – 6 ft	6 – 7 ft
Atl White Cedar			4	2	3	3	1	1
Cottonwood	PODE	7	8	5			1	
BL Willow	SANI			2				
Bayberry	MYPE	13	6					
Winged Sumac	RH		1					
Aronia	AR	1						
Baccharis	BA	2	5	1	1			
Pussy Willow			1					
Red Cedar			2					
Blueberry	VACO		1					

Species	Code	Seedling / Sapling Height						
		7 – 8 ft	8 – 9 ft	9 – 10 ft	10 – 11 ft	11 – 12 ft	12-13 ft	13 – 14 ft

VEGETATION MONITORING DATA SHEET – PLOT COVER SHEET

GENERAL INFORMATION

Team: JB + WE

Plot ID: 5B

Date: 10/10/18

LOCATION

State: NY County: Richmond

Township: Staten Island

USGS quad: _____

Latitude: Longitude:

PLOT DOCUMENTATION

Vegetation: _____

Canopy ht: _____

Plot Types: ___ relv. ___ ints.

Plot size: _____

Herb modules: _____

Depth: _____

Soil series: _____

Soil classification: _____

Modules sampled: _____

Film roll / frames: _____

Photopoint frame(s): _____

Bearing: _____

SITE CHARACTERISTICS

Elevation: _____

Aspect: _____ Slope: _____

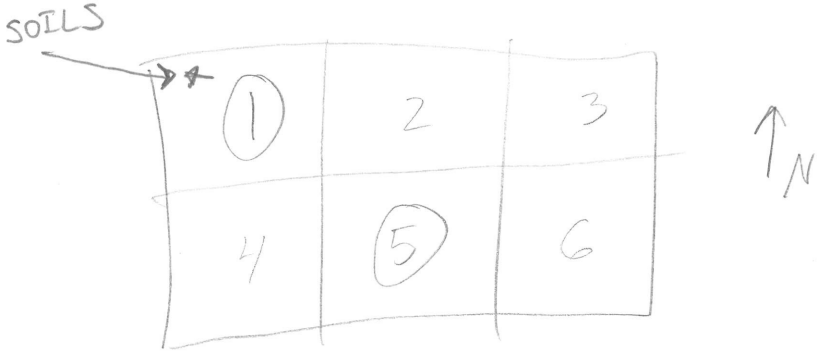
Topography:

_____ valley/ravine
_____ alluvial flat
_____ upland flat
_____ toe slope
_____ lower slope
_____ mid slope
_____ upper slope
_____ ridgetop
_____ ledge/escarpment
_____ other

Hydrology:

_____ terrestrial
_____ palustrine
_____ estuarine
_____ riverine
_____ lacustrine

PLOT MAP: fill in template below, showing arrangement of module(s) actually used, corners of modules sampled, locations of permanent stakes, directions and distances to witness trees, location and bearing of photopoints, etc.



NOTES: consider type(s) and frequency/severity of disturbance(s), community structure (stratification, etc.), and any other special features of the site or vegetation

Water @ 12"

Depth	Matrix	Mottles	Texture
0-8"	10YR 4/3 (90%)	7.5YR 5/8 (10%)	Sand
8-24"	10YR 4/3		

VEGETATION MONITORING DATA SHEET - Herbaceous Module Data Sheet

Team: JB + WE Plot: 5B Date: 10/10/2018 Page: 2 of 3

Species	Cover Classes: Module ____										Cover Classes: Module ____									
	+	1-5	6-10	11-15	16-20	21-25	26-50	51-75	76-90	91-100	+	1-5	6-10	11-15	16-20	21-25	26-50	51-75	76-90	91-100
Little Bluestem					✓										✓					
Eutham. graminifolium NL goldenrod				✓									✓							
Aster pilosis		✓										✓								
Cattail		✓																		
soft rush			✓										✓							
wool grass			✓									✓								
spiked rush		✓										✓								
juncus acuminatus		✓									✓									
Cyperus sp		✓										✓								
SS goldenrod	✓											✓								
LF thoroughwort		✓										✓								
water purslane	✓											✓								
Dichanthelium			✓										✓							
BE eyed Susan		✓										✓								
Panicum virgatum		✓										✓								
Calico aster		✓										✓								
RL goldenrod	✓											✓								
Cyperus odoratus		✓										✓								
Pluchea												✓								
10/9/18 Photo #4											✓									

VEGETATION MONITORING DATA SHEET – Seedling/Sapling Data Sheet

Team: JB+WE Plot: 5B Date: 10/10/2018 Page 3 of 3

Species	Code	Seedling / Sapling Height						
		0 – 1 ft	1 – 2 ft	2 – 3 ft	3 – 4 ft	4 – 5 ft	5 – 6 ft	6 – 7 ft
Buttonbush	CEOC							
Cottonwood	PODE							
Pussy Willow	SADI							
Raspberry	MOPE							
Sweetgum	~~MYSY~~ LIST							
Arrowwood	~~AR~~ ME							
Red Cedar	JUVI							
Blueberry	VACO							
Ath. W. Cedar	CHTH							
Black Willow	SANI							
Clethra	CLAL							
Ilex glabra	ILGL							

Species	Code	Seedling / Sapling Height						
		7 – 8 ft	8 – 9 ft	9 – 10 ft	10 – 11 ft	11 – 12 ft	12-13 ft	13 – 14 ft

VEGETATION MONITORING DATA SHEET

GENERAL INFORMATION

Team: JB/ME
Date: 10/16/18
Transect ID: W 6 A

LOCATION

State: NY
Township: Staten Island
County: Richmond
USGS Quad:

SOIL DESCRIPTION

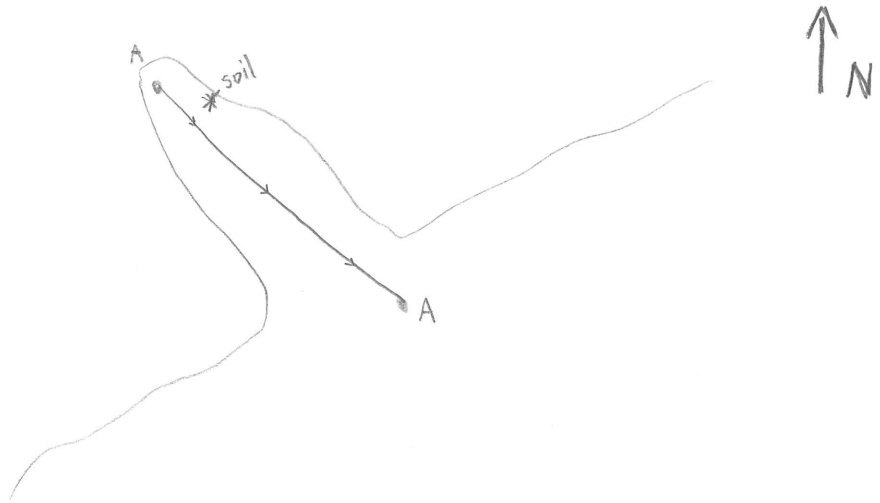
Depth	Matrix	Mottle	Texture
0-2"	organic material		
2"-24"	2.5Y 4/1	2.5Y 2.5/1 (25%)	sand

water standing at 1" depth

WILDLIFE OBSERVATIONS

(benthic invertebrates, mussels, crabs, mammals, birds, fish)

TRANSECT & QUADRANT PLOT MAP



VEGETATION MONITORING DATA SHEET- Herbaceous Data Sheet

Page 1 of 1 Transect W6-A Team WE / JB Date 10/16/2018

Quadrant	M		
Species	% cover	Avg. Height ~~(cm)~~ ft	Density stems/0.25m2
phrag	30	6	
3 square	50		
water pepper	5		
pluchea	5		
bidens	2		
purple loosestrife	5		

Quadrant	M		
Species	% cover	Avg. Height ~~(cm)~~ ft	Density stems/0.25m2
phrag	40	7	
3 square	40		
spartina c	15	8	

Quadrant	M		
Species	% cover	Avg. Height ~~(cm)~~ ft	Density stems/0.25m2
3 phrag	20	6	
3 square	60		
spartina c	10	8	
Scirpus robustus	10		

Quadrant	M		
Species	% cover	Avg. Height ~~(cm)~~ ft	Density stems/0.25m2
phrag	20	7	
spartina c	5		
3 square	10		
scirpus robustus	40		

Quadrant	M		
Species	% cover	Avg. Height ~~(cm)~~ ft	Density stems/0.25m2
phrag	60	7	
spartina c	5		
3 sq	10		
scirpus r	20	3	
pluchea	5		

Quadrant	M		
Species	% cover	Avg. Height ~~(cm)~~ ft	Density stems/0.25m2
phrag	20	7	
sw rose mallow	2		
scirpus robustus	60		
3 sq	10		

Quadrant	M		
Species	% cover	Avg. Height ~~(cm)~~ ft	Density stems/0.25m2
Scirpus rob-stus	70		
3 sq	10		

Quadrant	M		
Species	% cover	Avg. Height ~~(cm)~~ ft	Density stems/0.25m2
Scirpus robustus	60	3	
3 sq.	15		
spartina alt.	15	3	
pluchea	5		

Quadrant	M		
Species	% cover	Avg. Height ~~(cm)~~ ft	Density stems/0.25m2
Scirpus robustus	80	3	
3 sq	2		
phrag	2	5	
salt marsh aster	5		
spartina alt	5	1	

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
Sp. patens	50		
ss goldenrod	10		
spartina c	2		
baccharis	5		
scirpus robustus	15		
salt marsh aster	1		
atriplex	2		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
ss goldenrod	20		
sp. patens	25		
scirpus robustus	15		
spartina c.	10		
baccharis	10		
atriplex	2		
salt marsh aster	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
ss goldenrod	50		
baccharis	10		
sp. alt	5		
sp. patens	10		
scirpus robustus	10		
atriplex	10		

VEGETATION MONITORING DATA SHEET

GENERAL INFORMATION

Team: JB + WE
Date: 10/16/18
Transect ID: W 7 A

LOCATION

State: NY
Township: Staten Island
County: Richmond
USGS Quad:

SOIL DESCRIPTION

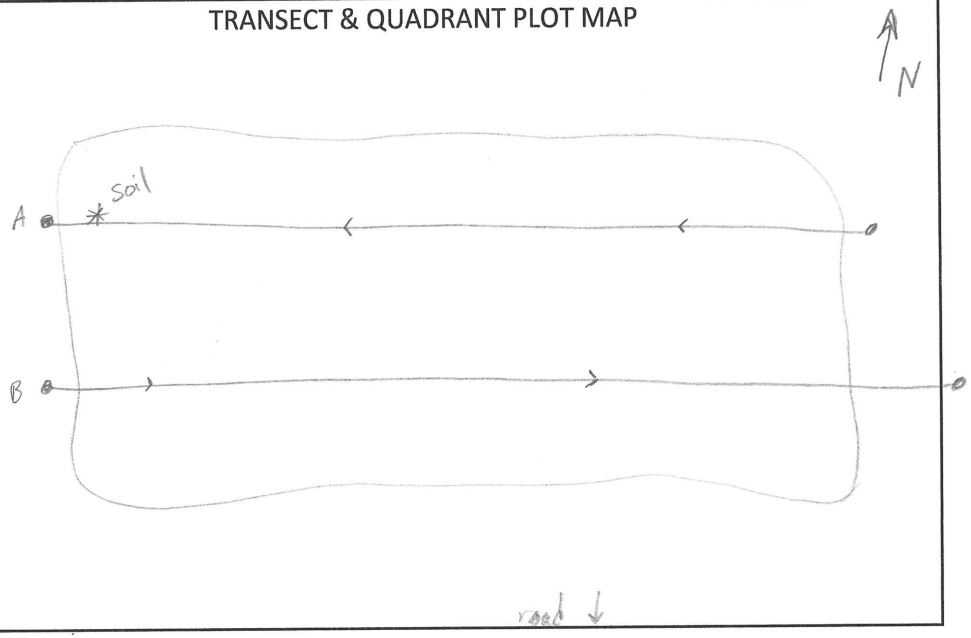
Depth	Matrix	Mottle	Texture
0-1"	organic matter		
1-8"	10YR 5/4 (60%)	10YR 5/8 (40%)	sand
8-24"	10YR 4/4 (80%)	5YR 4/6 (10%)	sand
		10YR 5/6 (10%)	sand

standing water at 7" depth

WILDLIFE OBSERVATIONS

(benthic invertebrates, mussels, crabs, mammals, birds, fish)

TRANSECT & QUADRANT PLOT MAP



VEGETATION MONITORING DATA SHEET- Herbaceous Data Sheet

Page 1 of 2 Transect W7A Team WE / SB Date 10/16/2018

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
soft rush	40		
phrag	15		
baccharis	10		
giant goldenrod	2		
bl willow	1.5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
SS bulrush	10		
phrag	5		
cattail	12		
cyp dif	2		
WL#2 plant	2		
3 sq.	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
3 sq.	25		
pickerel weed	10		
cyperus dif	1.5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
cattail	15		
3 sq.	15		
cyperus dif	5		
ludwigia	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
3 sq	15		
pickerel weed	15		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
SS bulrush	20		
3 sq	20		
cyperus dif	5		
rose mallow	15		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	0		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
3 sq.	40		
SS bulrush	50		
phrag	2		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
SS bulrush	50		
pickerel weed	15		
3 sq.	10		
cattail	20		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
cattail	8		
SS bulrush	60		
ludwigia	10		
cyperus dif	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
pickerel weed	20		
SS bulrush	20		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
pickerel weed	10		
3 sq	50		
cattail	20		

VEGETATION MONITORING DATA SHEET- Herbaceous Data Sheet

Page 2 of 2 Transect W 7A Team WE/JB Date 10/16/2018

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
3 sq	40		
cattail	20		
ludwigia	10		
pluchea	20		
phrag	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
3 sq.	15		
cyperus dff	15		
pluchea	15		
phrag	5		
SS bulrush	25		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
3 sq	25		
cyperus dif	15		
pluchea	15		
phrag	10		
SS bulrush	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
ludwigia	30		
cyperus dif	25		
SS bulrush	10		
phrag	5		
cattail	15		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
cattail	20		
cyperus dif	10		
spike rush	20		
WL #2 plant	5		
pickerel weed	15		
3 sq.	25		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
3 sq.	25		
pickerel weed	30		
ludwigia	25		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
cyperus odoratus	10		
juncus diff	15		
SS bulrush	10		
pluchea	15		
phrag	15		
switch grass	5		
cattail	15		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

VEGETATION MONITORING DATA SHEET

GENERAL INFORMATION

Team: WE/JB
Date: 10/16/18
Transect ID: W7B

LOCATION

State: New York
Township: Staten Island
County: Richmond
USGS Quad:

SOIL DESCRIPTION

Depth	Matrix	Mottle	Texture

WILDLIFE OBSERVATIONS

(benthic invertebrates, mussels, crabs, mammals, birds, fish)

TRANSECT & QUADRANT PLOT MAP

see W7A cover sheet

VEGETATION MONITORING DATA SHEET- Herbaceous Data Sheet

Page 1 of 2 Transect W7B Team WE / SB Date 10/16/2018

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
phrag	10		
j. dif	10		
~~[illegible]~~ spike rush	20		
3 sq	10		
LF thoroughwort	15		
Cyperus odoratus	5		
soft rush	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
3 sq	50		
SS bulrush	30		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
3 sq	50		
SS bulrush	10		
pluchea	12		
cyperus dif	10		
[illegible]	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
3 sq.	25		
SS bulrush	20		
spike rush	10		
pluchea	12		
cy dif	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
3 sq	20		
cattail	12		
cyperus dif	5		
pluchea	15		
ludwigia	20		
spike rush	10		
pickerel weed	12		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
cattail	15		
spike rush	10		
cyperus dif	10		
WL=2 plant	5		
3 sq.	20		
SS bulrush	15		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
pick	15		
3 sq	20		
SS bulrush	10		
cyperus dif	15		
spike rush	12		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
cattail	15		
cyperus dif	10		
pickerel weed	15		
SS bulrush	10		
spike rush	5		
pluchea	15		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
SS bulrush	60		
cattail	2		
Spike rush	10		
cyperus dif	5		
3 sq.	10		
pluchea	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
juncus dif	20		
phrag	10		
LF thoroughwort	2		
bl eye susan	15		
3 sq	15		
calico aster	5		
RL goldenrod	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
RL goldenrod	10		
little bluestem	25		
calico aster	5		
bl eyed susan	5		
yellow nutsedge	10		
lt. willow	15		
~~[illegible]~~	~~2~~		
phrag	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
RL goldenrod	2		
phrag	20		
soft rush	30		
lone grass	10		
baccharis	10		
little bluestem	15		
bl eyed susan	5		

VEGETATION MONITORING DATA SHEET- Herbaceous Data Sheet

Page 2 of 2 Transect W 7 B Team WE / JB Date 10/16/2018

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
switchgrass	15		
little bluestem	8		
soft rush	30		
love grass	5		
phrag	15		
juncus dif	5		
baccharis	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
pickerel weed	15		
3 sq	25		
cyperus dif	5		
SS bulrush	10		
ludwigia	15		
cattail	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
SS bulrush	90		
cattail	10		
3 sq.	15		
WL #2 plant	5		
pickerelweed	10		
cyperus dif	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
SS bulrush	25		
pickerel weed	20		
cyperus dif	10		
ludwigia	10		
3 sq.	20		
sw rose mallow	2		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
pickerel weed	15		
SS bulrush	60		
3 sq.	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
cattail	70		
phrag	10		
3 sq	5		
sw rose mallow	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
phrag	15		
giant goldenrod	20		
cottonwood	10		
RL goldenrod	10		
calico aster	5		
unknown grass	15		
bl eyed susan	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
switch grass	20		
RL goldenrod	10		
cottonwood	5		
Lespidisa	10		
~~horseweed~~ unk. grass	15		
little bl stem	25		
birdsfoot trefoil	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
love grass	15		
Lespedisa	25		
little bl. stem	15		
baccharis	10		
cottonwood	10		
SS goldenrod	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
little bl stem	30		
RL goldenrod	15		
lespidisa	5		
love grass	15		
SS goldenrod	5		
cottonwood	15		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

VEGETATION MONITORING DATA SHEET

GENERAL INFORMATION

Team: JB + WE

Date: 10/16/18

Transect ID: W8 A

LOCATION

State: New York

Township: Staten Island

County: Richmond

USGS Quad:

SOIL DESCRIPTION

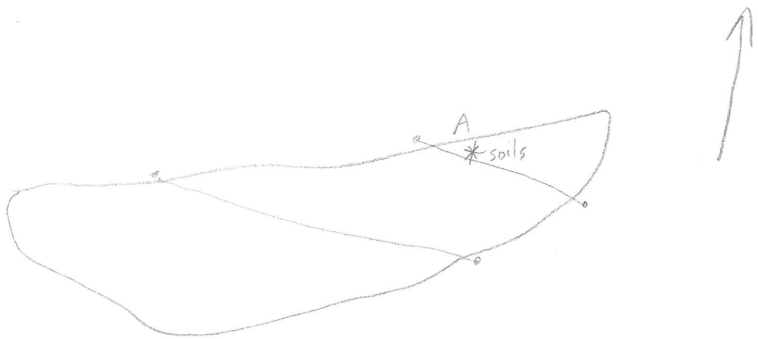
Depth	Matrix	Mottle	Texture
0-12	2.5 Y 4/2		sand
12-24	2.5 Y 3/2		sand

water at surface

WILDLIFE OBSERVATIONS

(benthic invertebrates, mussels, crabs, mammals, birds, fish)

TRANSECT & QUADRANT PLOT MAP



VEGETATION MONITORING DATA SHEET- Herbaceous Data Sheet

Page 1 of 1 Transect WL 8 A Team WE + JB Date 10/16/2018

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
phrag	30		
SS bulrush	15		
cattail	5		
3 sq.	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
phrag	30		
SS bulrush	10		
cattail	10		
3 sq.	5		
pluchea	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
phrag	10		
pluchea	5		
juncus dif	20		
eupatorium	5		
ludwigia	10		
water pepper	5		
SS bulrush	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
phrag	10		
juncus dif	20		
cyperus odor	10		
baccharis	15		
eupatorium	2		
salt marsh aster	5		
pluchea	15		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
switchgrass	20		
phrag	8		
3 sq.	10		
pluchea	10		
cyperus odoratus	5		
ludwigia	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
cattail	10		
pluchea	25		
spike rush	10		
cyperus odoratus	5		
ludwigia	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
cattail	20		
phrag	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

VEGETATION MONITORING DATA SHEET

GENERAL INFORMATION

Team: JB + WE

Date: 10/16/18

Transect ID: W8 B

LOCATION

State: New York

Township: Staten Island

County: Richmond

USGS Quad:

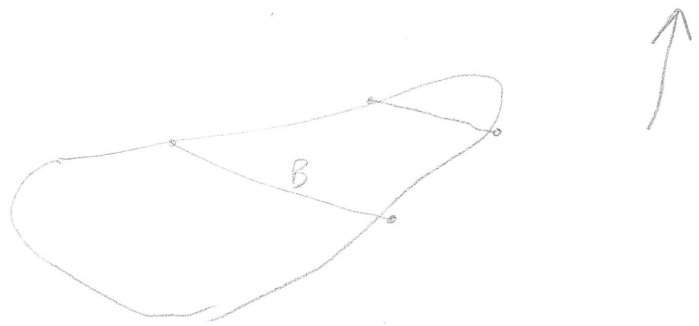
SOIL DESCRIPTION

Depth	Matrix	Mottle	Texture

WILDLIFE OBSERVATIONS

(benthic invertebrates, mussels, crabs, mammals, birds, fish)

TRANSECT & QUADRANT PLOT MAP



VEGETATION MONITORING DATA SHEET- Herbaceous Data Sheet

Page 1 of 1 Transect WL 8 B Team WE x JB Date 10/16/2018

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
sp moss	15		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
sp. moss	50		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
iris	20		
cyp sp.	10		
switchgrass	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	0		
x3			

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
cyp odor	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
3 sp	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
3 sp.	2		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
3 sp.	20		
sm aster	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
3 sp.	50		
sm aster	5		
cyperus odo	5		
ss. bulrush	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

VEGETATION MONITORING DATA SHEET

GENERAL INFORMATION

Team: JB + WE

Date: 10/16/18

Transect ID: W9

LOCATION

State: NY

Township: Staten Island

County: Richmond

USGS Quad:

SOIL DESCRIPTION

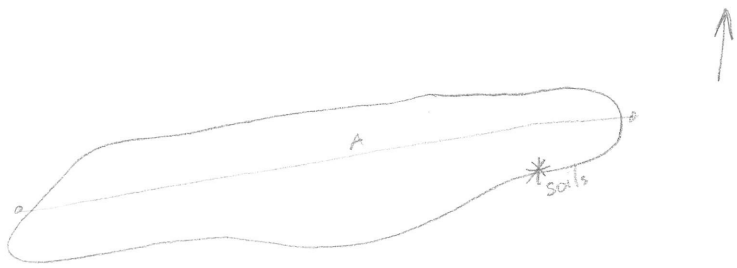
Depth	Matrix	Mottle	Texture
0 - 6"	7.5 Y 3/3	5 YR 3/1 (10%)	sandy clay
6 - 18"+	7.5 YR 3/2	2.5 YR 4/6 (20%)	sandy loam

water at 4" depth

WILDLIFE OBSERVATIONS

(benthic invertebrates, mussels, crabs, mammals, birds, fish)

TRANSECT & QUADRANT PLOT MAP



VEGETATION MONITORING DATA SHEET- Herbaceous Data Sheet

Page 1 of 2 Transect WL 9 Team JB + NE Date 10/16/2018

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
bl flag iris	15		
3 sq.	30		
cattail	10		
WL #2 plant	5		
sparganium	20		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
Sparganium	50		
cattail	15		
pickerel weed	25		
phrag	2		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
Sparganium	70		
phrag	5		
3 sq.	15		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
Sparganium	40		
cattail	10		
buttonbush	10		
3 sq.	5		
bl flag iris	5		
pickerel weed	2		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
pickerel weed	10		
3 sq	45		
soft rush	25		
sparganium	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
soft rush	15		
3 sq.	10		
buttonbush	15		
sparganium	20		
pickerel weed	20		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
bl. fl. iris	40		
pickerel weed	30		
3 sq	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
cattail	30		
bl. fl. iris	30		
WL #2 plant	15		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
WL #2 plant	10		
pickerel weed	30		
sparganium	40		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
sparganium	20		
soft rush	40		
pickerel weed	15		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
s rush	25		
3 sq.	10		
SS bulrush	5		
bl. fl. iris	30		
sparganium	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
cattail	20		
bl. fl. iris	30		
sparganium	20		

VEGETATION MONITORING DATA SHEET- Herbaceous Data Sheet

Page 2 of 2 Transect WL - 9 Team JB + WE Date 10/16/2018

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	0		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	0		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
	0		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
S rush	40		
WL #2	5		
Water pepper	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
sparganium	15		
Salt marsh aster	15		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
sparganium	15		
buttonbush	10		
phrag	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
phrag	10		
pickerel weed	40		
buttonbush	15		
sparganium	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

VEGETATION MONITORING DATA SHEET

GENERAL INFORMATION

Team: JB + WE
Date: 10/16/18
Transect ID: W10

LOCATION

State: NY
Township: Staten Island
County: Richmond
USGS Quad:

SOIL DESCRIPTION

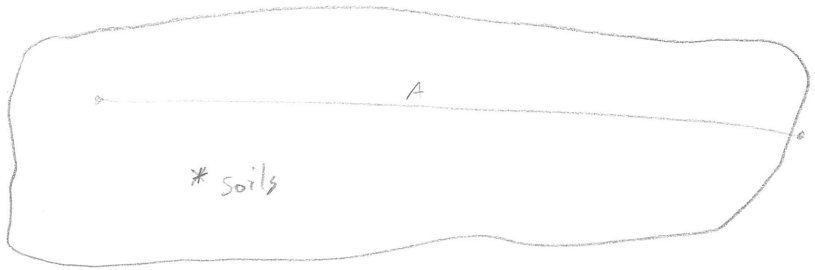
Depth	Matrix	Mottle	Texture
0-4	10 YR 3/2		loam
4-16	10YR 3/2	5YR 4/3 (30%)	sand/clay
16-24	5 YR 4/4		sand/clay

water at surface

WILDLIFE OBSERVATIONS *

(benthic invertebrates, mussels, crabs, mammals, birds, fish)

TRANSECT & QUADRANT PLOT MAP



VEGETATION MONITORING DATA SHEET- Herbaceous Data Sheet

Page 1 of 2 Transect WL-10 Team JB + WE Date 10/16/2018

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
bl fl iris	60		
phrag	10		
ludwigia	10		
sparganium	20		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
unknown grass	10		
ludwigia	30		
arrow arum	5		
pickerelweed	5		
sw rose mallow	20		
cattail	20		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
pickerel	50		
ludwigia	30		
s rose mallow	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
pickerelweed	85		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
cattail	50		
Pickerelweed	30		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
cat	15		
pick	60		
unknown gr.	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
pick	80		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
SS bulrush	30		
cattail	30		
ludwig	15		
arrow arum	15		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
~~bulr~~ pickerel	40		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
pick	50		
un gr	5		
s r mallow	15		
3 sq.	12		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
WL#2	10		
s r mallow	20		
pick	20		
3 sq.	15		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
pickerelweed	90		

VEGETATION MONITORING DATA SHEET- Herbaceous Data Sheet

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Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
pick	10		
ludwig	25		
sphag. moss	20		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
lizard's tail	15		
pick	20		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
buttonbush	25		
lizard's tail	20		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
pick	15		
unk gr.	5		
lizard's tail	20		
ludwigia	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
lizard tail	30		
unkn gr	10		
bl fl. iris	30		
ludwigia	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
unkn. gr.	20		
ludwigia	25		
bl fl iris	40		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

VEGETATION MONITORING DATA SHEET

GENERAL INFORMATION

Team: JB + WE
Date: 10/16/18
Transect ID: W // A

LOCATION

State: NY
Township: Staten Island
County: Richmond
USGS Quad:

SOIL DESCRIPTION

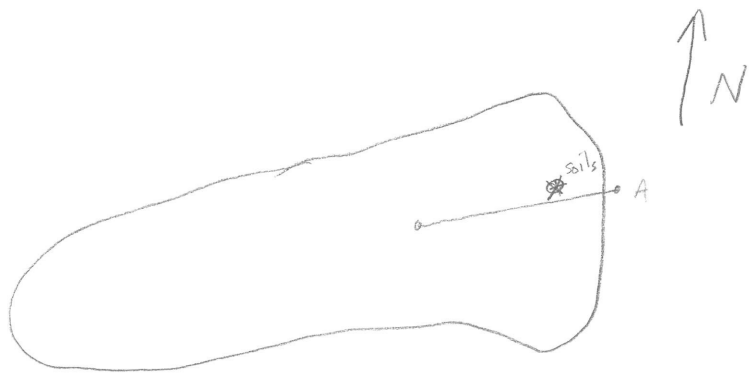
Depth	Matrix	Mottle	Texture
0-12	7.5 YR 3/2	5Y 3/2 (10%) 7.5 YR 4/6 (20%)	sandy loam
12-24	7.5 YR 3/2		sandy loam

standing water at 6"

WILDLIFE OBSERVATIONS

(benthic invertebrates, mussels, crabs, mammals, birds, fish)

TRANSECT & QUADRANT PLOT MAP



VEGETATION MONITORING DATA SHEET- Herbaceous Data Sheet

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Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
iva	25		
s. alt.	50		
SM aster	15		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
atriplex	5		
SM aster	20		
s. alt.	40		
iva	20		
sp. patens	15		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
s. alt.	40		
sp. patens	20		
SM aster	20		
atriplex	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
SM aster	15		
sp. alt.	20		
sp. patens	50		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
sp. alt.	35		
SM aster	15		
sp. patens	30		
~~distichlis~~			

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
sp. alt.	60		
SM aster	10		
atriplex	10		
sp. patens	15		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
sp. alt.	60		
SM aster	10		
atriplex	5		
sp. patens	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
sp. alt.	75		
sp. patens	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
sp. alt.	50		
SM aster	20		
atriplex	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
sp. alt.	60		
SM aster	10		
atriplex	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
sp. alt.	85		
atriplex	5		
SM aster	5		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
sp. alt.	40		
sphrag	20		
SM aster	20		
atriplex	15		

VEGETATION MONITORING DATA SHEET- Herbaceous Data Sheet

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Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2
Sp. alt	60		
Sm aster	10		
phrag	10		

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

Quadrant	M		
Species	% cover	Avg. Height (cm)	Density stems/0.25m2

APPENDIX F
Soil Profiles

Wetland #1 (Transect A)

Depth (in.)	Matrix	Mottles	Texture
0-24	10 YR 2/1		Sandy clay

Wetland #2 (Transect 2A)

Depth (in.)	Matrix	Mottles	Texture
0-6	2.5 Y 4/2	2.5 Y 5/3 (10%)	Sand
6-12	10 YR 5/1	10 YR 6/4 (10%)	Sand
12-24	10 YR 4/1	10 YR 5/4 (20%)	Sand

Wetland #3 (Plot A)

Depth (in.)	Matrix	Mottles	Texture
0-10	10 YR 5/4		Sand
10-24	10 YR 5/3		Sand

Wetland #4

Depth (in.)	Matrix	Mottles	Texture
0-12	2.5 Y 5/2	10 YR 5/6 (25%)	Sand
12-24	10 YR 5/2	10 YR 5/6 (25%)	Sand

Wetland #5 (Plot A)

Depth (in.)	Matrix	Mottles	Texture
0-24	10 YR 4/3		Sand

Wetland #6

Depth (in.)	Matrix	Mottles	Texture
0-2	Organic matter		
2-24	2.5 Y 4/1	2.5 Y 2.5/1 (25%)	Sand

Wetland #7 (Transect 7A)

Depth (in.)	Matrix	Mottles	Texture
0-1	Organic matter		
1-8	10 YR 5/4	10YR 5/8 (40%)	Sand
8-24	10 YR 4/4	5YR 4/6 (10%) 10YR 5/6 (10%)	Sand

Wetland #8 (Transect 8A)

Depth (in.)	Matrix	Mottles	Texture
0-12	2.5 Y 4/2		Sand
12-24	2.5 Y 3/2		Sand

Wetland #9

Depth (in.)	Matrix	Mottles	Texture
0-6	7.5 Y 3/3	5 YR 3/1 (10%)	Sandy clay
6-24	7.5 YR 3/2	2.5 YR 4/6 (20%)	Sandy loam

Wetland #10

Depth (in.)	Matrix	Mottles	Texture
0-4	10 YR 3/2		loam
4-16	10 YR 3/2	5 YR 4/3 (30%)	Sandy clay
16-24	5 YR 4/4		Sandy clay

Wetland #11

Depth (in.)	Matrix	Mottles	Texture
0-12	7.5 YR 3/2	7.5 YR 4/6 (20%) 5 Y 3/2 (10%)	Sandy loam
12-24	7.5 YR 3/2		Sandy loam