

1.0 Project Management

1.1 Title and Approval Page

**Project Title: Quality Assurance Project Plan for the Peconic Land Trust
Widow's Hole Preserve Shoreline Restoration Project (Southold, NY)**

Effective date July 1, 2019-September 30, 2024

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Prepared by:

Stephen Schott

Marine Botany/Habitat Restoration Specialist

Cornell University Cooperative Extension of Suffolk County

3690 Cedar Beach Road

Southold, NY 11971

Under Contract Agreement to:

Suffolk County Department of Health Services

On behalf of the Peconic Estuary Program

300 Center Drive, Room 204N

Riverhead, NY 11901

Project Conducted by:

Peconic Land Trust

PO Box 1776

Southampton, NY 11969

Prepared for:

USEPA Region 2

290 Broadway

New York, NY 10007

Approved By:

Matthew Swain



7/12/2019

Director of Stewardship & Geographic Information Systems

Peconic Land Trust

Stephen Schott



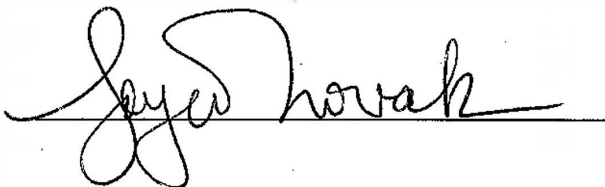
7/12/2019

Marine Botany/Habitat Restoration Specialist

Cornell University Cooperative Extension of Suffolk County

Project QA/QC Manager

Joyce Novak, PhD



7/12/19

Director

Peconic Estuary Program

Aisha Sexton-Sims

Project Manager/Officer

USEPA

Donna Ringel

EPA QA Manager/ Representative, USEPA

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1.3 Distribution List

Stephen Schott

Project QA/QC Manager

Marine Botany/Habitat Restoration Specialist

Cornell University Cooperative Extension of Suffolk County

3690 Cedar Beach Road

Southold, NY 11971

ss337@cornell.edu

(631) 852-8660 x26

Matthew Swain

Director of Stewardship & Geographic Information Systems

Peconic Land Trust

PO Box 1776

Southampton, NY 11969

mswain@peconiclandtrust.org

631-283-3195 x36

Elizabeth Hornstein

Peconic Estuary Program State Coordinator

NYSDEC, Division of Marine Resources

205 North Belle Meade Road, Suite 1

East Setauket, NY 11733

elizabeth.hornstein@dec.ny.gov

(631) 444-0871

Sarah Schaefer

Program Coordinator, Peconic Estuary Program

Suffolk County Department of Health Services

300 Center Drive, Room 204N

Riverhead, NY 11901

Sarah.Schaefer@suffolkcountyny.gov

(631) 852-5806

Joyce Novak, PhD

Director, Peconic Estuary Program

Suffolk County Department of Health Services

300 Center Drive, Room 204N

Riverhead, NY 11901

Joyce.Novak@suffolkcountyny.gov

(631) 852-2961

Aisha Sexton-Sims, Project Officer

USEPA

290 Broadway

NY, NY 10007

Sexton-Sims.Aisha@epa.gov

(212) 637-3608

Donna Ringel

EPA QA Manager

Monitoring and Assessment Branch

US EPA Region 2

2890 Woodbridge Ave., MS-220

Edison, NJ 08837

Ringel.Donna@epa.gov

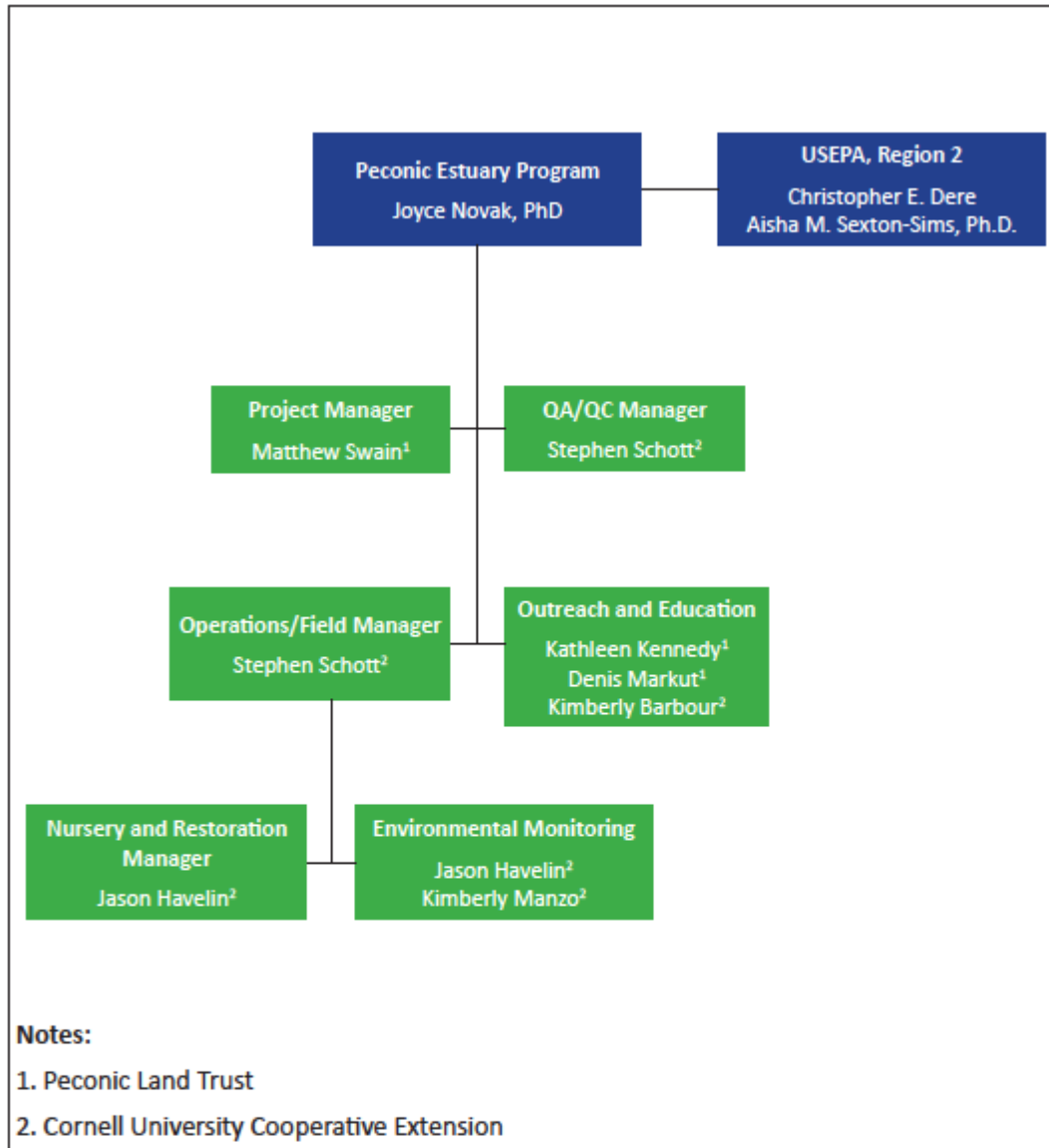
(732) 321-4383

1.4 Project Organization

The following table outlines the organization of responsibilities for personnel associated with this project.

Table 1. Project organization identifying all participants and their roles/responsibilities for the Widows Hole Preserve Shoreline Restoration Project.		
Title	Name and Organization	Role/Responsibility
Project Manager	Matthew Swain, Peconic Land Trust (PLT)	General management and overall coordination of project
Operations/Field Manager	Stephen Schott, Cornell University Cooperative Extension (CCE)	Development of restoration plan, permitting and completion of project, including coordination of contractors and project staff. Generation of final report.
Outreach and Education	Kathy Kennedy, Peconic Land Trust (PLT) Denise Markut, Peconic Land Trust Kimberly Barbour, Cornell University Cooperative Extension (CCE)	Organization and management of volunteers assisting with field work. Dissemination of information to the public and development of informational materials detailing the project.
Peconic Estuary Program (PEP)	Joyce Novak, Peconic Estuary Program Director Sarah Schaefer, Peconic Estuary Program, Program Coordinator Elizabeth Hornstein, Peconic Estuary Program, New York State Coordinator	Oversight of project
Nursery and Restoration Manager	Jason Havelin, Cornell University Cooperative Extension (CCE)	Overseeing propagation and installation of plants used in project.
Primary Field Samplers	Jason Havelin and Kimberly Manzo, Cornell University Cooperative Extension (CCE)	Completion of all monitoring and data collection conducted for project, including baseline, “as-built”, and long-term monitoring.
Quality Assurance/Quality Control (QA/QC) Manager	Stephen Schott, Cornell University Cooperative Extension (CCE)	Prepare QAPP and ensure data collection follows accepted QAPP standards.

Project Organization Chart



1.5 Problem Definition/Background

The former Greenport Terminal is 2.31 acres, an estimated 1.67 acres of which comprised the former terminal area with the remaining 0.64 acres consisting of undeveloped beachfront along Greenport Harbor. The facility became operational in the 1920s and was taken out of service in the early 1980s. The former site included six above ground storage tanks (ASTs) that varied in capacity from an estimated 46,000 gallons to 329,000 gallons and an approximate 900 S.F. warehouse was situated at the northwest corner of the subject site. In addition, ancillary terminal equipment such as above ground piping, a distribution rack, and fuel pumps were also present on Site. Historical releases have occurred at the subject site that resulted in several NYSDEC spill numbers to be opened, including the most recent NYSDEC spill No, 92-00081. All spill numbers associated with the site have since been closed with approval from the NYSDEC. The most recent remediation project and final spill closure was completed in December 2003 upon completion of hot spot excavation which removed 194.5 tons of impacted soil. There are no environmental easements, engineering controls, or site management plans associated with past cleanup activities at the site.

On December 7, 2012 ExxonMobil Oil Corporation (“ExxonMobil”), donated the approximately 2.3-acre property, situated in the Village of Greenport, Town of Southold, New York, to the Peconic Land Trust subject to a conservation easement granted to the Town of Southold.

The historic use of the Widow's Hole Preserve has led to a degradation of the shoreline. Bulkheads, pilings for supporting piers, and other structures installed, and eventually removed, over the years have left this section of the shoreline disturbed and virtually unvegetated. To add resiliency to the shoreline, a restoration plan was developed that would rebuild the shore with clean sand fill, restoring a more natural grade, to allow for the planting of intertidal marsh, beachgrass, and coastal grasses and shrubs. The proposed focus of the shoreline restoration activities at the Widow's Hole Preserve, Greenport, NY, includes approximately 0.4 acres of environmentally degraded shoreline and adjacent upland identified in Figure 1. As detailed below, the shoreline restoration will include two components that are intended to significantly increase the resiliency of the shoreline to erosion, while also increasing the overall habitat value and aesthetics of the property. As this is the first living shoreline project conducted in the Peconic Estuary, the completed shoreline restoration project will serve as an example for future projects in the estuary that hope to employ this methodology over conventional hardened shoreline structures (e.g. bulkheads, revetments, etc.).

1.6 Project/Task Description and Schedule

Due to recurrent storm damage, beginning with Superstorm Sandy, there continues to be erosion along the upland edge of the beach. Figure 2 identifies the overall project area proposed for restoration activities and the project components. The area indicated as the “Beachgrass/Coastal Plant Restoration Area”, would require clean sand fill to provide a 50% grade on the beach face and a sand dune area that would transition into the upland section of the property. This area of the restoration would require approximately 900 cubic yards of clean sand to create, 430 cubic yards for the upland restoration area and 470 cubic yards for the beach face (indicated in Figure 2). The filled area would be planted by Cornell University Cooperative Extensions (CCE), the Peconic Land Trust (PLT) and volunteers recruited from the community with American beachgrass (*Ammophila breviligulata*) to stabilize the beach face and crest of the dune and a mix of little bluestem (*Schizachyrium scoparium*), switchgrass (*Panicum virgatum*) and possibly other coastal grasses and salt-tolerant shrubs (e.g. eastern baccharis (*Baccharis halimifolia*) and northern bayberry (*Morella pensylvanica*)).

The plants to be used for this restoration will be locally sourced when possible. Beachgrass was collected from the northern shoreline of Widows Hole Preserve on May 6th, 2016 and transplanted into sand-filled planting frames located at Peconic Land Trust's (PLT) Agricultural (Ag) Center in Southold on May 7th by PLT volunteers. An additional beachgrass nursery was also established at CCE's Habitat Restoration Greenhouse in Southold. The plants will be propagated until they are harvested for restoration after the second hard frost in the Winter-Spring 2019. Approximately 250 beachgrass culms were initially planted into five of the eight frames at the Ag Center, with a like number of culms planted at CCE's facility. The remaining three frames were filled in January 2017 with beachgrass culms split from plants that had been planted in 2016. It is estimated that there will be between 4,000-6,000 beachgrass culms available for transplanting by Winter 2019, which should exceed the needs of the upland edge restoration.

Volunteer assistance will be used to sort beachgrass into individual culms from the nursery plantings, as well as for the installation of the plants into the restoration area. The other plants listed above for the upland restoration would be sourced from Widow's Hole Preserve and transplanted into the restoration area. Once the restoration planting is finished, the perimeter of the restoration area should be fenced to prevent foot traffic through the plantings that could trample and kill the plants. Snow fencing attached to wooden or metal stakes would be adequate and would also serve to reduce the loss of sand to winter winds at the site while the plants are dormant.

The *Spartina* restoration area is presented in Figure 2. The area covers approximately 8,000 square feet and would connect to, and extend, the *Spartina* stand (encircled area) that currently inhabits the site and will be used as a biological benchmark for the restoration. *Spartina* is an intertidal plant that spends approximately half of each day immersed in saltwater and ranges from mean sea level (MSL) to mean high water (MHW). To restore a 5% grade to the shoreline, an estimated 1,100 cubic yards of sand would be needed to fill the shore, providing an elevation near, or above MSL, at which *Spartina* could survive in the area indicated.

Prior to the addition of fill and grading of the shoreline, a small patch of smooth cordgrass that currently exists in the proposed restoration area (indicated in Figure 3) would need to be removed, transplanted into one gallon pots, and held at CCE's Habitat Restoration Greenhouse until the planting phase of the project would begin. The smooth cordgrass plants would be removed by hand, wrapped in wet burlap, then transported to CCE's facility in Southold where they would be planted into pots using a potting medium of 3:1 peat moss to sand. The smooth cordgrass would be planted back into the upper intertidal zone of the project area, with the plants that CCE grew from local seeds to complete the shoreline restoration.

Using the adjacent stand of *Spartina* and a marsh in Orient Harbor as references, an "armoring" band of cobble will be installed along the seaward edge of the proposed *Spartina* restoration area (Figure 2). The band would include 4-8-inch cobble placed in a 6-foot-wide band starting 2-3 feet upshore of MSL (within the *Spartina* restoration area), and extending seaward. Approximately 20 cubic yards of cobble will be spread approximately 6 inches deep over the proposed buffer area. The cobble band will assist in holding the new sand fill from washing offshore, add resiliency to waves, and protect the *Spartina* transplants from grazing by resident swans.

Once the shoreline has been properly graded, *Spartina* would be planted into the project area. *Spartina* transplants will be propagated from seed collected from a local salt marshes (Cedar Beach Creek, Southold and Pipes Cove, Greenport) by CCE and PLT in October 2016. *Spartina* seeds will be sown into plug trays starting in April 2017 and held in CCE's restoration nursery until planting. Additionally, the *Spartina* that was removed from the project site prior to fill and grading would be replanted back into the shoreline. *Spartina* are planted at 1 foot spacing, requiring approximately 8,000 planting units (e.g. plugs or bare root) to cover the proposed project area. Planting is conducted by hand and can utilize volunteer labor to complete. The planting window for *Spartina* extends from June through the end of September, providing enough time to propagate the material needed for the restoration. Throughout the planting process, the restoration area will need to be fenced off to prevent herbivory from waterfowl, specifically mute swans and Canada geese. There is evidence in the existing *Spartina* stands that these birds visit this shoreline and graze on the rhizomes and young shoots. Simple string

fences typically prove sufficient in discouraging geese and swans. Until the transplants become established, or go dormant for the winter, the fencing will have to be maintained, including regular removal of macroalgae and other materials that might get caught in the fencing during the tidal cycle and storm events.

This living shoreline project will be the first conducted in the Peconic Estuary and one of the few undertaken on Long Island. Given the limited local experience with living shoreline construction, this project includes an adaptive management plan to address concerns with a specific of the project., specifically the cobble band. The six-foot wide cobble (2-4-inch stone) was proposed to offer protection from wave action and to prevent/reduce erosion within the lower areas of the *Spartina* plantings. A concern was offered that the small diameter cobble would not provide adequate protection from waves along this shoreline. The cobble band was designed based on the shoreline composition of the adjacent *Spartina* stand, as presented in Figure 3. However, if the cobble band does not prove to be adequate for wave protection, based on the amount of erosion after the first winter, it is proposed that large rock be installed along the MSL edge of the project area to provide increase protection the following spring. Based on recommendations published for several other states (e.g. Virginia, Maryland, Delaware, and New Jersey), rocks ranging from 1.5-3 feet in diameter (approximately 300-600 pounds) would be appropriate for the level of wave exposure of the project site. The larger rock could be placed with a skidsteer accessing the beach through the Preserve or from the end of 4th Street. Any *Spartina* lost due to wave erosion and/or the placement of the larger rock would be replanted.

1.7 Quality Objectives and Criteria for Measurement Data

The overall goal of our project is to restore a natural resilience and ecologically diversity to an approximately 160 ft of shoreline at the Widow's Hole Preserve, Greenport, New York. This shoreline had been impacted by its historic use as a commercial fuel depot and also heavily damaged by super storm Sandy, which led to significant erosional loss of beach sediment and existing shoreline vegetation, as well as encroachment into the upland areas of the preserve. In its current state the shoreline is highly degraded and especially susceptible to sea level rise and the impacts of future storms, which will likely become more frequent in the coming years. By completing this work, we will greatly increase the carrying capacity of the local waters for important species of fish and wildlife and protect the preserve through wave attenuation/damping and sediment trapping.

The installation of vegetation to the project site will provide the primary resilience and habitat value for this project. As such, monitoring the health and population dynamics of the two, main targeted species for this project, American beachgrass (*Ammophila breviligulata*) and smooth

cordgrass (*Spartina alterniflora*), will be vitally important in gauging the success of this restoration. The success of the project will be determined by the survival of each of the two plant populations 5-years, post-construction. Monitoring of the restoration planting will be conducted at the end of the growing season (September-October) annually for the five years. Quadrat counts of shoot density, taken randomly throughout each of the planted areas, will be used to assess overall survival (compared to post-construction plant densities determined 2-3 weeks after the last planting event to allow identification of any transplant mortality) and spread of plants. An average shoot density across the planting areas will need to meet a threshold of 85% of the original, post-construction shoot density. Densities below 85% will be assessed for causation of loss and maintenance plantings will be conducted, as needed to mitigate the damage to the planting area.

The expected precision for shoot density counts or percent cover is estimated at less than 5% error between successive counts of the same quadrat by one technician and between technicians counting the same quadrat. The use of cover classes for the percent cover increases precision. The use of controls and replicate samples for the analytical procedures provide a means to calculate precision and identify errors. For GPS data collection, a Trimble Yuma 2 unit with DGPS antenna will be used for locating and marking sampling points for the monitoring program within the project area. A horizontal dilution of precision (HDOP) of two-feet or less will be required before navigating to or taking new points. Field team members using the Trimble Yuma 2 will all follow this protocol. CCE has only one staff member that is trained in using the transit to shoot elevations, ensuring that the elevations will be read the same way every time.

There are few areas within the monitoring protocol that allow for investigator bias. The counting of shoots within the quadrats is an objective activity and does not provide opportunity for researcher bias in itself. However, placement of quadrats does provide the possibility of researcher bias as quadrats are more likely to be placed in areas that contain plants over areas that do not, thus resulting in a higher mean shoot density and lower variance that may be truly representative of the plant population being sampled. Using predetermined GPS locations randomly generated by GIS alleviates the possibility of quadrat placement bias. Additionally, it is protocol that those quadrats containing no plants (i.e., bare patches within a population) are significant in elucidating the overall patchiness, based on the statistical variance, of the population. GPS data will not be collected as part of the monitoring program for this project. GPS data, generated from ESRI ArcGIS will be loaded into the Trimble Yuma 2 and used to locate sample locations within the project area during monitoring. This use of GPS data does not generate bias between different GPS users. CCE has only one staff member that is trained in using the transit to shoot elevation data. As this single staff member will be consistently reading elevations on the staff, there will be no inter-personal bias in reading the elevations.

Collection of statistically relevant and ecologically representative data is one of the objectives of this project's monitoring program. After review of the initial data collected for this project, adjustments will be made in sample size, sample number, or other methodology that will ensure that the data collected accurately reflects the conditions within the project area.

To ensure comparability, monitoring protocol will be strictly followed to maintain consistency in data collection for all parameters throughout the duration of the project. Maintaining this consistency will be a top priority for all field data collection.

While the monitoring protocol is considered to provide a thorough coverage of all the monitoring parameters of this project, there remains the ability to add or modify the protocol to increase the vigor of the data collected for the project. Any changes in the monitoring protocol will be vetted by CCE and the Peconic Land Trust prior to its implementation.

The collecting of the field data for the Widow's Hole Preserve Shoreline Restoration Project is basic counting of individuals (e.g. shoots, mussels, snails, etc.). As a result, the sensitivities are relatively coarse when compared to water quality data that are generated from laboratory testing. The sensitivity of the shoot density data is one shoot, which corresponds to the basic unit of plant growth. Elevation data collected during surveying will be taken to 1/100th of a foot and is based on the standard scale of the survey staff and the detection limit for this model optical transit.

1.8 Special Training Requirements/Certifications

Quadrat Sampling

CCE utilizes in-situ quadrat sampling to monitor plant populations over the course of restoration activities. Individuals conducting the field data collection for this program must demonstrate proficiency in collecting quadrat sample data (e.g. shoot density and/or percent cover, species identification, etc.) under any possible field conditions. Individuals are required to practice quadrat sampling in controlled environments, such as static seawater tanks (for eelgrass monitoring) or in a reference stand (beachgrass and smooth cordgrass), under the supervision of an experienced program member. Individuals are then taken into the field and required to count several different quadrats that have been counted by the supervising program member. Trainee results will be compared to those of the training supervisor and any

deviations in quadrat counts greater than the accepted 5% will be evaluated for the source of error and the trainee corrected on their methods. Trainees will continue these practice quadrat counts until they can consistently return density counts within the 5% variability of the accepted practice quadrat densities.

Plant and Animal Identification

Plants and animals observed within a quadrat being sampled over the course of the project will be recorded. Individuals conducting the field sampling will be trained by a senior team member in the use of taxonomic keys and field identification of common species encountered in the field. Species observed during monitoring will also be photographically recorded for verification and use as voucher specimen for the project.

Transit Survey, GPS and GIS Mapping

All transit survey and GIS work for this project will be supervised by CCE's GIS and Remote Sensing Program. Field technicians from CCE will be trained by a GIS specialist in the use of the survey transit, Trimble Yuma 2 GPS unit and collection of GPS data for mapping and GIS processing.

1.9 Documents and Records

All records generated by this project will be stored at the Peconic Land Trust's main office, with copies also stored at Cornell University Cooperative Extensions facility. Records stored for this project will include all laboratory records and field records pertinent to this project. Copies of records held by the laboratory will be provided to project manager and maintained in the project file.

Copies of this QAPP will be distributed to all parties involved with the project, including signatories and field sampling and laboratory personnel. Any future changes or amendments to the QAPP will be held and distributed in the same fashion. Copies of previous versions of the QAPP will be clearly marked as "superseded by Revision #" so as not to create confusion.

The records of all project information and data used to complete the activities of the project will be retained for at least seven years from the date of sampling, measurement, report, or application.

2.0 DATA GENERATION

Collection of data for the Peconic Land Trust's Widow's Hole Preserve Shoreline Restoration Project requires several field data collection techniques and skills to accomplish the goals of the program.

2.1 Sampling Design (Experimental Design)

Monitoring is an important component of any habitat restoration project. The monitoring plan for this project will be carried out annually for five years following the completion of the construction phase of the project. The goals of the monitoring program will be to evaluate changes in the elevation of the shoreline in the project area over time to identify loss/gain of sand and to monitor the growth of the *Spartina* plants. Elevational changes will be monitored at several points throughout the restoration area. Stakes will be driven into the shoreline at points within the project area, randomly chosen by ArcMap GIS software, and located using a Trimble Yuma 2 DGPS unit. A survey transit level will be used to determine the elevations at each of the monitoring stations starting with elevations taken immediately after the completion of construction, followed by annual measurements for the 5-year period.

Monitoring within the *Spartina* restoration area will be conducted at least ten (10) stations, randomly assigned by the GIS software. Three 0.25 meter² PVC quadrats will be randomly placed within a two-meter radius of the center point of the station (marked by a short PVC stake) and *Spartina* shoot densities recorded. A baseline count will be completed following the completion of the project to establish the "as-built" shoot density for the *Spartina* area. Additional counts will be conducted in August-September, annually, starting the year after initial installation of the plants to monitor change in density/cover over time and to identify and mitigate damage to the restoration plantings for 5-years after completion of the planting.

Beachgrass (*Ammophila*) will be monitored in a manner similar to *Spartina*, as stated above. At least ten, randomly selected monitoring stations will be selected using GIS. Labeled stakes will be driven in at each monitoring station. A one-meter² PVC quadrat will be placed with the stake at its center, and all beachgrass culms within the quadrat will be recorded. A baseline "as-built" quadrat sampling will be conducted following completion of the beachgrass plantings, with subsequent monitoring beginning one year after the initial installation of the plants and continuing for five-years, post-construction.

2.2 Sampling Methods

Shoreline Elevation Change

A survey transit will be used to determine any changes in sediment elevation (erosion or accretion) over several, randomly determined points generated by the ESRI ArcMap software to provide

coverage for the shoreline area of the project site. A monument has already been established during pre-construction as the center for setting the transit for each survey. Additionally, two control sites were marked with pipe driven into the ground to the soil surface in the upland adjacent to the shoreline. These control site will allow for the height calibration of the transit during each visit. For the elevation points within the project area, the location of the points will be randomly determined by GIS software within an area extending from MSL to the base of the dune. PVC stakes will be driven into the sediment (at least 3ft) until the top of the stake is level with the sediment surface at each of the locations. At least 10 stakes will be deployed throughout this area. The latitude/longitude and initial elevation of the top of the stake will be recorded in the project field notebook.

Surveying of the elevation points will be conducted annually, prior to the quadrat sampling of the vegetation. GPS will be used to locate the stake locations and a level staff will be placed on the undisturbed sediment surface next to the stake and the elevation will be read, to 1/100th of a foot, using the transit set on the monument site. At least two measurements will be taken at different locations next to the stake at each site and recorded in the field notebook. Changes in elevation will be noted and reported in the annual monitoring report to the Peconic Land Trust.

Vegetation Quadrat Monitoring

Quadrat sampling will be conducted around at least 10 randomly determined, permanent sampling stations within both the beachgrass and *Spartina* planting areas, annually. PVC stakes, with identification codes engraved in them will be driven into the sediment until no more than 4-inches of the pipe remains above the sediment surface. A 0.25m², PVC quadrat will be randomly dropped three times, within a 2-meter radius of the stake, at each location. There should be no overlap of sample quadrats at each location. Within each quadrat, the total number of shoots will be enumerated, with the results from the three quadrats at each site being averaged. Additionally, notes will be taken on any noteworthy observations including animals observed (species and number), damage severity/type, new plant species, etc, within quadrats sampled.

2.3 Sample Handling and Custody

The Widow's Hole Preserve Shoreline Restoration Project includes non-destructive field monitoring to evaluate the progress and success of the project. As such, no samples are collected and removed from the site. Data collected from the quadrat sampling and elevation surveys will be recorded in field notebooks and stored, as detailed in section 1.9 Documents and Records.

2.4 Analytical Methods

Survey Transit

The survey transit will be deployed during each monitoring visit at the same location and at the same height, to insure the accuracy of sediment elevation. With the installation of a monument at the site, the location of the transit will be the same for each deployment. A plumb bob extending from the center of the transit tripod will be used to position the transit in the center of the monument each time. The height from the top of the monument to the base plate (on which the transit sits) will be set at a standard height. The initial survey readings will be of the two control sites located along the upland. The elevations of the control points should be within 1/100th of a foot of the elevations recorded when they were first installed. A greater difference than this will require that the transit be reset, and the control elevation taken again. Deviations greater than 1/100th of a foot may indicate that the control points or monument had been tampered with. If, after resetting the transit, the control point elevation still deviates from its original elevation by more than 1/100th of a foot, the survey team will note the deviation and rely on the other, non-deviating control point, until the incorrect control point can be reset to its original control elevation. If both control points' elevations are found to be outside this tolerance, but are within tolerance relative to one another, this could indicate that the transit monument has moved and the monument would have to be reset. Once the transit is set to specifications, sediment elevations can be collected throughout the project area.

2.5 Quality Control Requirements

For the surveying, the use of two control points located outside of, but adjacent to, the project site will provide confirmation that the transit is in the same position each deployment. The use of control points could also identify if there has been tampering with the monument by indicating disparities between the initial control point elevations and subsequent measurements, allowing the surveyor to fix the changes or determine a method to standardize the measurements across visits.

All individuals that conduct field quadrat counts will have undergone the training discussed in section 1.8. Only individuals found to be proficient in the sampling methodologies will be permitted to conduct the field quadrat sampling. For beachgrass and smooth cordgrass quadrat sampling, one out of every 10 quadrats sampled will be counted by at least two samplers as a means of "spot-checking" accuracy and precision. All field counts will hold a 5% error in shoot density between samplers as acceptable. If percent error exceeds this threshold, the quadrats will be resampled until the 5% error threshold is met.

2.6 Instrument/Equipment Testing, Inspection, and Maintenance

The survey transit will be inspected prior to each use to make sure everything is in working order. The tripod will have all moving parts including sliding legs, leg locks, etc. move freely and lock in place. The transit will have all optics checked for damage and all leveling devices (e.g.

bubble level) check for proper function. The level staff will be cleaned and inspected to make sure that the graduations are clearly visible.

2.7 Instrument/Equipment Calibration and Frequency

The survey transit used for the project is not in constant use, so it should be calibrated prior to use for the sediment elevations. The calibration of the transit uses the Two-Peg Test to determine the level of the transit and allow for adjustment of the level using two rods placed approximately 100 feet apart. The completion date of each calibration will be recorded in the field notebook for the project.

2.8 Inspection/Acceptance Requirements of Supplies and Consumables

The nature of this project does not require any critical or consumable supplies.

2.9 Data Acquisition Requirements (Non-Direct Measurements)

The only outside data that will be used for this project will be historical aerial imagery obtained through the New York State GIS Clearinghouse. Other materials used for this project included surveys, photographs and site remediation plans/reports provided to PLT from the previous property owner ExxonMobil. Old photographs of the site from the 1930s were acquired by CCE.

2.10 Data Management

Copies of field logs and electronic media reports will be kept for review by the Peconic Land Trust and CCE. The Operations/Field Manager will retain original field logs and GPS data. Field data sheets will be checked and signed in the field by the project primary field sampler or operations manager. They will identify any results where recorded data or calibration information is missing or incorrect, or inadequate. Such data will be marked as unacceptable and will not be entered into the electronic data base and/or otherwise used for project analysis, reporting or other purpose.

GPS and survey elevation data will be incorporated into ArcGIS software and saved in the project file for the Widow's Hole Preserve Shoreline Restoration Project. The GIS data in this file will be stored at both PLT and CCE and will be available upon request by outside parties, with the approval of PLT and Suffolk County.

3.0 ASSESSMENT AND OVERSIGHT

3.1 Assessments/Oversight and Response Actions

The Operations/Field Manager will meet with the primary field samplers prior to each year's monitoring visit and review procedures for the data collection. Additionally, the Operations/Field Manager is required to review and sign off on all data collected during the monitoring of the project site and, if issues with the collected data are found, a resampling can be scheduled immediately.

3.2 Reports to Management

Included in the annual monitoring of the Widow's Hole Preserve Shoreline Restoration Project, a monitoring report summarizing the results of the monitoring and detailing any management actions (e.g. maintenance planting, addition of fencing) will be submitted to the PLT and the Peconic Estuary Program (PEP). The monitoring reports will be provided to others at the discretion of PLT and PEP.

4.0 DATA REVIEW AND USABILITY

4.1 Data Review, Verification, and Validation Requirements

All data sets are checked several times from collection through report submission. The Project Director will give the final verification of all data and reports prior to release. Careful inspection of statistical analysis results is the primary means of identifying data errors, though all field notes and data sheets will also be checked and compared to correct any transcription errors that may have occurred.

4.2 Verification and Validation Methods

Field monitoring data must be verified and accepted by the Operations/Field Manager prior to being accepted as complete. Only after the manager has signed off on the data collected, can it be included in the project database for analysis. Final verification of all project data is proved by the Project Manager, who will review and sign off on the data and accompanying reports, annually.

Data validation will be the responsibility of the Operations/Field Manager. The manager will review all raw data and look for anomalies/outliers that may suggest erroneous data. For monitoring data collected after construction, the baseline "as-built" shoot densities will be used to compare annual shoot density data and identify any data significantly different. Data flagged by this process will be investigated for cause of error (e.g. transcription error, natural variation,

etc.). This review process should occur within two-days of the data being submitted for review so that field sampling can be reconducted, if necessary.

4.3 Reconciliation with User Requirements

The annual reports generated by the monitoring program for the Widow's Hole Preserve Shoreline Restoration Project will supply data to PLT (the property owner and manager) that will allow them to evaluate the progress of the restoration project and determine what management actions may be needed to maintain the project area. The annual reports will also provide a baseline for future projects in the region, particularly as the living shoreline technique will likely become a more acceptable option for restoration in New York.

5.0 References

Niedowski, N.L. 2000. New York State Salt Marsh Restoration and Monitoring Guidelines. New York State Department of State, and New York State Department of Environmental Conservation. http://www.dec.ny.gov/docs/wildlife_pdf/saltmarsh.pdf

Figures

Figure 1. The proposed project area (indicated by the hashed area) within the Widow's Hole Preserve property, the Village of Greenport, New York. The proposed project area encompasses approximately 0.4 acres of shoreline and adjacent upland.



Figure 2. A map of the proposed project area (indicated by the thick, black line) including the different component areas of the shoreline restoration project: the Beachgrass/Coastal Plant Restoration, Open Beach, *Spartina* Restoration, and the Cobble Band



Figure 3. Photographs of two reference salt marshes, one (a) adjacent to the proposed project area and (b) a second in Orient Harbor, East Marion with naturally-occurring “armoring” bands of gravel and cobble extending seaward from the base of the smooth cordgrass. It is proposed for this project to include a 4-6 foot band of 2-4 inch cobble, seaward, from the base of the smooth cordgrass plantings at the Widow's Hole Preserve.

