PLANNING ASSISTANCE TO STATES PROGRAM

Rhode Island Coastal Wetlands Inventory Report

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14. ABSTRACT

The State of Rhode Island, Coastal Resources Management Council (CRMC) requested that the Army Corps of Engineers (Corps) conduct an inventory of degraded or filled coastal wetlands to identify opportunities for future wetlands restoration projects. The purpose of this project is to develop an accurate wetland map for coastal Rhode Island, inventory those coastal wetlands and identify potential restoration sites based on aerial photographs and ground truthing of vegetative cover types.

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Rhode Island Coastal Wetlands Inventory Report

Department of the Army
New England District
U.S. Army Corps of Engineers
Concord, MA

April 2008

Rhode Island Coastal Wetlands Inventory Report

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RI Coastal Wetlands Inventory Project

Purpose of the Study

The State of Rhode Island, Coastal Resources Management Council (CRMC) requested that the Army Corps of Engineers (Corps) conduct an inventory of degraded or filled coastal wetlands to identify opportunities for future wetlands restoration projects.

Authority

Congress provided funding for the Corps to undertake this task under the Planning Assistance to States (PAS) program. The PAS program is authorized under Section 22, WRDA 1974 (P.L. 93251), as amended. This program provides technical assistance to support state preparation of comprehensive water and related land resources development plans, including watershed and ecosystem planning.

Description of the Study Area

This project was confined to coastal Rhode Island from the most western end of Westerly near the mouth of the Pawcatuck River, easterly to Point Judith, the coastal zone from Sakonnet Point easterly to the state line of Massachusetts, and Block Island as shown in Figure 1. This study did not focus on any sections of Stonington, Connecticut that were included as part of the Rhode Island Department of Environmental Management (RIDEM) Narragansett Bay Estuary Program (NBEP) study. However, data pertaining to Connecticut was documented in the final updated data matrix. The coastal habitats for this study included the following municipalities: Westerly, Charleston, South Kingstown, Narragansett (partial coverage), Little Compton, and New Shoreham (Block Island). The coastal wetlands for these towns can be found on the following United States Geological Survey (U.S.G.S.) topographic quadrangle maps: Mystic (Connecticut), Watch Hill, Quonochontaug, Carolina, Kingston, Narragansett Pier, Sakonnet Point, Tiverton, Westport (Massachusetts), and Block Island.

Problem Identification

Rhode Island has about 384 miles of shoreline (http://www.worldatlas.com/webimage/countrys/namerica/usstates/ri.htm). Approximately 256 miles of this shoreline are associated with Narragansett Bay and Block Island has 17 miles of shoreline. This study included approximately 111 miles of shoreline. The coastline of Rhode Island has a series of coastal lagoons called salt ponds lying behind narrow barrier beaches. The salt ponds provide habitat for various commercial and recreational fish and shellfish, a resting and feeding stop for migrating waterfowl, and other recreational activities. Historically, temporary breach-ways used to be dredged from the ocean into the larger ponds to accommodate large boats used to bring both agricultural and fishing products to market, but in the 1950s permanent breach-ways were constructed in some of the ponds (Ely, 1990). The increase in salinity caused by uninterrupted flow of seawater changed the habitat of the ponds and the surrounding wetlands. Since the mid-1980's, increases in

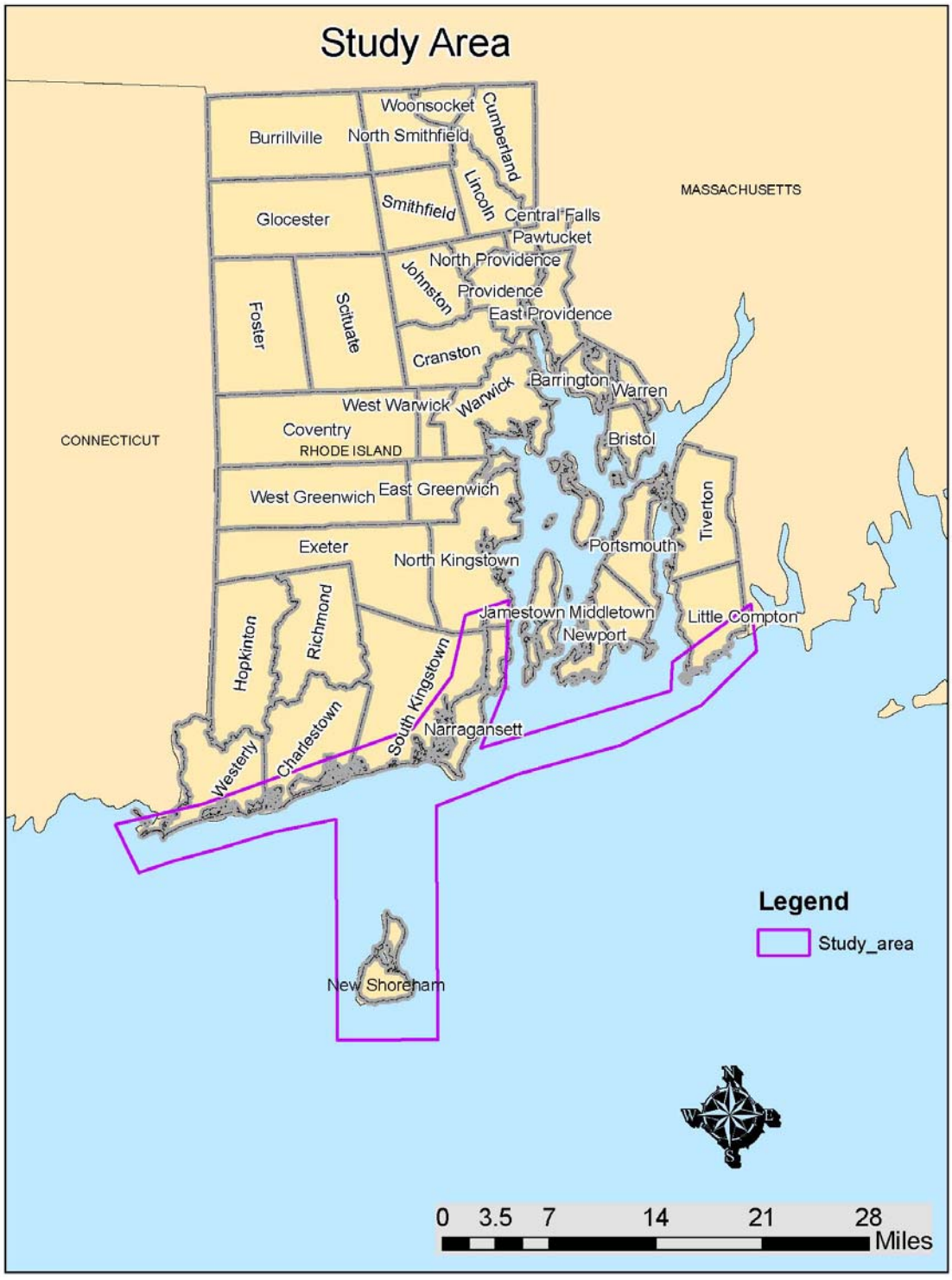

Figure 1: Site map

population, commercial development, and tourist related activities have also impacted the ponds and the surrounding wetlands.

The purpose of this project is to develop an accurate wetland map for coastal Rhode Island, inventory those coastal wetlands and identify potential restoration sites based on aerial photographs and ground truthing of vegetative cover types.

During the preliminarily stages of the project (scoping), the Corps identified approximately 50 degraded coastal wetland sites for further evaluation for restoration along the coast from Rhode Island's western boarder to Narragansett Bay. In addition, there were approximately 75 sites (299 acres) that are dominated by *Phragmites* in the Narragansett Bay Area. These sites were identified in the Narragansett Bay Estuary Program Report (Huber, 2000 and Tiner e*t al*., 2003).

Methodology

Aerial photos of coastal Rhode Island taken from over-flights on June 5, 1999 by the James W. Sewell Company, Old Town, Maine, were used for wetlands identification. This coastal wetlands study used the previous inventory of coastal wetlands and potential restoration sites for the Narragansett Bay Estuary by Tiner *et al*. (2003) as a guideline. The data was compared and reviewed based upon the 1:12,000 scale (1:12K) aerial photos for photo interpreting the estuarine and marine habitats but did not focus on the sub-aqueous vegetation (SAV) as in Tiner *et al.* (2003).

Geographic Information Systems (GIS) and conventional photo-interpretation techniques were used to identify and map the potential estuarine wetland restoration sites and external sites of degradation within a 500-foot buffer around all estuarine wetlands. Photo-interpretation was performed using mirror stereoscopes and compared against mapped data generated by Huber (2003) for submerged aquatic vegetation and coastal wetlands. GIS shapefiles and databases were developed for the wetlands inventory.

Wetlands and deepwater habitats were classified according to Cowardin *et al*. (1979), the national digital data standard for wetlands. Procedures for this study are based on those used for the inventory of coastal wetlands, and potential restoration sites for the Narragansett Bay Estuary (Tiner *et al*., 2003). Coastal wetlands include Cowardin's marine and estuarine intertidal wetlands i.e. tidal wetlands with measurable traces of ocean-derived salts (see Tables 1 and 2 for classifications and modifiers (also see Appendix A)).

Table 1: Classification, Tidal regimes and Special Modifiers used for Habitat Types (from Huber, 2003).

Habitat Classification

Subtidal – The substrate is continuously submerged.

Intertidal – The substrate is exposed and flooded by tides; includes associated splash zone.

Tidal Regimes

Subtidal (L) –The substrate is permanently flooded with tidal water.
Irregularly exposed (M) -The land surface is exposed by tides less often than daily.
Regularly Flooded (N) - Tidal water alternately floods and exposes the land surface at least once daily.
Irregularly Flooded (P) - Tidal water floods the land surface less often than daily.

Special Modifiers

Excavated (x) – Lies within a basin or channel excavated by man.
Impounded (h) – Created or modified by a barrier or dam which purposely or unintentionally obstructs the outflow of water; includes man-made dams and beaver dams.
Diked (h) – Created or modified by a man-made barrier or dike designed to obstruct the inflow of water.
Ditched/Partly Drained (d) – The water level has been artificially lowered, but the area is still classified as wetland because soil moisture is sufficient to support hydrophytes.
Artificial (r) – Refers to substrates classified as Rock Bottom, Unconsolidated Bottom Rocky Shore and Unconsolidated Shore that were emplaced by man, using either natural material such as dredge spoil or synthetic material such as concrete. Jetties and breakwaters are examples of Artificial Rocky Shores.
Oligohaline (6) – Term to characterize water with salinity of 0.5 to 5.0 parts per thousand due to ocean-derived salts.

Table 2: NWI Classification Codes and Descriptions (Taken from Huber 2003).

NWI Code and Modifier	Cowardin et al. (1979) Description	Common description	Examples of Vegetation or Cover
E1UB, M1UB (L, Lh, Lx)	Estuarine, Marine Subtidal, Unconsolidated Bottom	Estuarine, or Marine Open Water	Open Water (includes open ocean, lagoons & tidal creeks)
E1AB3L; M1AB3L	Estuarine or Marine, Subtidal, Rooted Vascular Aquatic Bed	Eelgrass Beds	*Zostera marina*
E1AB1L	Estuarine, Subtidal Algal, Aquatic Bed	Algal Beds	*Ulva lactuca*, *Fucus* spp. *Chondrus crispus*, *Enteromorpha* sp.
E1UB4L	Estuarine, Subtidal, Unconsolidated Bottom Organic	Pools	*Ruppia* sp. Or other algae
E2US4 (N, M)	Estuarine, Intertidal Unconsolidated Bottom Organic	Pannes	*Salicornia* sp.
E2US (1,2,3) (M,N)	Estuarine, Intertidal Unconsolidated Shores	Tidal Flats	Cobble, gravel, sand or mud; patches or algae
E2RS (1,2) (N,P); M2RS (1,2) (N,P)	Estuarine or Marine, Intertidal Rocky Shores	Rocky Shores	Bedrock or rubble; patches of *Fucus* sp.
E2RFN	Estuarine, Intertidal, Mollusc Reef	Oyster Bed	*Crassostrea virginica*
E2SB (2,3)(N)	Estuarine, Intertidal Streambed	Tidal Creek	Sand or Mud
E2EM(1,5*) P	Estuarine, Intertidal Persistent Emergents, Irregularly Flooded	High Marsh	*Spartina patens*, *Juncus gerdii*, *Distchlis spicata* (*note: 5= *Phragmites australis*)
E2SS1P	Estuarine, Intertidal Scrub-Shrub, Broad-Leaved Deciduous, Irregularly Flooded	High Marsh	*Iva frutescens*, *Baccharis halmifolia*
E2EMIN	Estuarine, Intertidal Persistent Emergents Regularly Flooded	Low marsh	*Spartina alterniflora*
E2EM(1,5*)P6	Estuarine, intertidal Persistent Emergents Irregularly Flooded, Oligohaline	Brackish Marsh	*Typha angustifolia*, *Sartina pectinata* (note:5 = *Phragmites australis*)

Potential estuarine wetland restoration sites were assigned to specific categories within two broad types used by Tiner *et al*. (2003):

Type 1 - former estuarine wetlands (sites for increasing estuarine wetland acreage) and Type 2 - degraded estuarine wetlands (existing coastal wetlands whose functions may be improved through restoration).

Type 1 sites were separated into two major categories: (Type 1A) filled and effectively drained sites and (Type 1B) submerged sites or palustrine wetlands that were formerly estuarine sites. Potential external impacts to Type 1B sites were also identified.

Type 2 sites were subdivided into two broad categories: (1) sites with internal alterations (e.g., tidal restrictions, ditches, dikes, excavation, vegetation changes, and minor filling) and (2) estuarine wetland that may be threatened by off-site activities. Table 3 lists specific categories of potential restoration sites.

Table 3: Potential estuarine wetland restoration site types and coding used for the Coastal Rhode Island wetlands (taken from Tiner *et al*. (2003)).

Restoration Site Type	**Code**	**Impact Type**
1 (former estuarine wetland)	1f	Fill
	1fph	Fill/Phragmites-dominated
	1fsp	Fill/Dredged Spoil
	1d	Effectively Drained
	1su	Submerged
	1w	Palustrine Wetland (former estuarine wetland)
	1x	Excavated or Impounded Fresh Waterbody (former estuarine wetland)
2 (exiting estuarine wetlands	2r	Tidally Restricted
That have been or may be degraded	2rs	Severely Tidally Restricted
	2d	Significantly Ditched
	2h	Diked/Impounded
	2f	Minor Filling
	2fs	Minor Filling/Dredge Spoil
	2v	Vegetation Change (also includes Phragmites-dominated estuarine wetlands)
	2vi	Vegetation Change/Iva
	2x	Excavated

Potential restoration sites were identified by creating wetland complexes. The complexes were generated by selecting all potential restoration polygons with an internal

degradation code as well as all wetlands bordered by an external impact. A list of external impact codes used in this project can be found in Table 4. The individual wetland polygons were then grouped into potential restoration project areas or complexes based on their location, type of impairment, ecology, field conditions, and other variables as described in Tiner *et al*. (2003). All potential restoration sites within one complex have the same complex code. Polygons with internal impacts of *Phragmites* in areas with no access were not given a restoration complex code since there was no way to verify the impact or to restore the area. Each large coastal pond and nearby wetlands were provided one complex code with individual numbers for each complex in that area. A list of restoration complexes per town is shown in Table 5.

Table 4: Potential External Impact Codes

Code	Description
Ecr	Cropland
Egc	Golf course
Eis	Impervious surfaces
Ela	Lawns
v	Phragmites

Table 5: Restoration Complexes per Town

Town	Code and number of complexes	Total number of Complexes
Block Island	bls (14)	14
Charlestown	chl (21) quo (8)	29
Little Compton	lcm (8) nsk (1)	9
Narragansett	gal(1) - previously restored Galilee area skg (34)	35
South Kingstown	car (4) chl (10) skg (21 tru (1)	36
Westerly	ln (10) quo (3) wes (3) win (13)	29
Total		**152**

CRMC conducted field verification studies for areas within a restoration complex and determined if the site was coded correctly from the aerial photo interpretation, and noted

any changes that may have occurred since these photos were taken (aerial photos from 1999). They also made notes of vegetation, restrictions, and potential for restoration. Once the data was rectified, then the wetlands with potential for restoration were identified. Corps personnel then completed ground truthing of potential restoration sites and collected real estate information for each of the identified wetlands.

Results

Wetlands Data

Approximately 13,052 acres of marine and estuarine wetland and habitats were mapped for coastal Rhode Island (excluding Narragansett Bay Estuary) as part of this project. Estuarine environments account for about 85 % (11,045 acres) of the total acreage. The ocean habitat was not included except for near shore areas with aquatic beds. Irregularly flooded emergent wetlands dominate the tidal marshes, representing approximately 99% (1,325 acres) of these vegetated wetlands. *Phragmites australis* (common reed) occurs in 555 acres and is the dominant species in at least 289 acres. Scrub shrub wetlands only account for approximately 12 % of the vegetated wetlands (159.3 acres).

The acreage amounts and types of coastal wetlands for each town as well as the total acreage amounts for coastal Rhode Island can be found in Table 6. The total acreage of estuarine water (unconsolidated bottom) is a rough estimate because Little Narragansett Bay and Pawcatuck River were not divided into separate areas and are within Connecticut boundaries.

Restoration Complexes

This project identified 152 restoration complexes for coastal Rhode Island including Block Island, but not Narragansett Bay. Many of the coastal ponds are crossed by town lines, but Tables A1 – A6, Appendix A provides an estimate of acreages for complexes in each town. A complete list of all complexes and associated impacts (internal and/or external) can be found in Appendix B.

Nine complexes were identified for Little Compton, eight of which relate to coastal ponds along the southern edge of the coastline. Each pond has its own complex number. There are 39 complexes within Point Judith Pond and Potters Pond, all coded under the same general complex. Within Narragansett and South Kingston there are 71 complexes. The recently restored region in Galilee was all coded as one complex. Cards Pond has four complexes while Trustom Pond has one. Ninigret Pond has 28 complexes of which ten are located in South Kingstown and 18 in Charlestown. Quonochontaug Pond has 11 complexes, of which 7 are located in Charlestown and four in Westerly. Winnapaug Pond has 13 restoration complexes. Little Narragansett Bay has five restoration complexes with an additional five complexes along the Pawcatuck River.

Potential Restoration Sites

The field verifications done by CRMC, revealed additional information on most wetland complex sites and several areas were identified as high potential restoration sites. Field

sheets for all field verifications are included in Appendix E. A total of nine restoration sites were identified after site visits by CRMC. One site in Little Compton and three sites in New Shoreham (Block Island) were identified and later discussed during a meeting with CRMC (Megan Higgins and Janet Freedman). Additionally, two sites in South Kingstown, one in Charlestown, and two in Westerly were identified on the field data sheets which the Corps personnel re-visited to verify and obtain additional information. Descriptions of these nine potential restoration sites are provided below.

One of the potential restoration sites is located in Little Compton; a small coastal pond between Sakonnet Point and Sakonnet Harbor, in the Haffenreffer Refuge. This site was also included in the Narragansett Bay Study. This site consists of one restoration complex with 27 polygons included. The pond and its surrounding wetlands are impounded and ditched with *Phragmites* on the northern side. Of the 27 polygons, 5 were flagged by the Corps for potential restoration (**ID's 8001, 8003, 8004, 8007, 8012 or ID's 4897, 4091, 4902, 4908, 4923** from Narragansett Bay data). Together these five sites cover 5.14 acres. Site 8001 is the largest covering 3.49 acres, next is site 8012 at 0.57 acres, and the other three sites are between 0.31 and 0.40 acres each (see Figures 2 and 3). Restoration activities would include increased flushing of salt water to the area from Sakonnet Harbor (using the existing pipe outlet). Also, *Phragmites* needs to be removed from approximately 1.27 acres in polygons 8003, 8004, and 8012. The southern section of the 27 polygons is currently a freshwater wetland. This area was previously estuarine so restoration would involve flushing an additional 6 acres of land with salt water without flooding the nearby residences. Overall it would be a much larger project to revert the current freshwater wetland back to an estuarine wetland area.

Table 6. Extent of Wetlands in Coastal Rhode Island.

		Town													
Wetland or Waterbody	**Type**	**Block Island**		**Little Compton**		**Narragansett**		**South Kingstown**		**Charlestown**		**Westerly**		**Total Coastal RI**	
		Acres	Polygons	Acres	Polygons	Acres	Polygons	Acres	Polygons	Acres	Polygons	Acres	Polygons	Acres	Polygons
Estuarine Water	Eelgrass Bed	10.48	4	0.00	0	0.09	2	194.86	11	161.33	9	126.08	8	492.84	34
	Algal Bed	15.21	2	0.00	0	3.08	5	1.46	10	36.33	22	43.91	25	99.99	64
	Floating Aquatic Bed	0.00	0	0.00	0	0.78	1	0.00	0	0.00	0	0.00	0	0.78	1
	Saline/Brackish	525.68	1	0.96	2	1231.84	5	440.04	10	1459.18	11	2787.83	8	6445.53	37
	Pools	0.00	0	0.00	0	0.00	0	10.18	6	2.12	5	0.13	1	12.43	12
	Oligohaline	31.51	5	693.05	10	5.68	3	180.57	9	7.72	3	58.32	12	976.85	42
	Oligohaline Aquatic Beds	55.83	4	1.85	1	0.00	0	2.82	1	11.41	2	1.59	1	73.50	9
	Subtotal	**638.71**	**16**	**695.86**	**13**	**1241.47**	**16**	**829.93**	**47**	**1678.09**	**52**	**3017.86**	**55**	**8101.92**	**199**
Estuarine Marsh	Emergent Regularly Flooded	3.73	8	0.00	0	7.79	5	0.73	2	1.09	2	3.37	7	16.71	24
(Salt/Brackish Marsh)	Phragmites Irregularly Flooded	0.00	0	0.00	0	58.86	19	16.91	22	27.10	16	10.13	10	113.00	67
	Em/Phrag Irregularly Flooded	4.93	3	0.00	0	0.00	0	102.10	28	112.05	15	31.62	16	250.70	62
	Other Emergent Irregularly Flooded	40.61	21	4.60	4	134.96	61	79.33	37	140.33	59	190.42	36	590.25	218
	Phrag/Shrub Irregularly Flooded	0.00	0	0.00	0	0.00	0	8.25	1	8.51	2	0.00	0	16.76	3
	Other Em/Shrub Irregularly Flooded	0.18	1	0.98	1	0.00	0	0.00	0	12.47	5	12.21	2	25.84	9
	Subtotal	**49.45**	**33**	**5.58**	**5**	**201.61**	**85**	**207.32**	**90**	**301.55**	**99**	**247.75**	**71**	**1013.26**	**383**
Estuarine Oligohaline Marsh	Emergent Regularly Flooded	0.00	0	1.48	1	0.00	0	0.00	0	0.00	0	0.00	0	1.48	1
	Phragmites Irregularly Flooded	13.53	5	68.28	18	0.00	0	19.40	16	7.15	4	14.66	11	123.02	54
	Em/Phrag Irregularly Flooded	7.56	1	4.05	6	10.16	3	6.16	6	12.30	2	10.44	8	50.67	26
	Other Emergent Irregularly Flooded	8.15	5	15.14	5	0.61	1	10.07	10	1.90	2	2.54	5	38.41	28
	Phrag/Shrub Irregularly Flooded	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.89	1	0.89	1
	Em/Shrub Irregularly Flooded	1.33	2	21.12	3	0.00	0	0.00	0	0.00	0	0.00	0	22.45	5
	Subtotal	**30.57**	**13**	**110.07**	**33**	**10.77**	**4**	**35.63**	**32**	**21.35**	**8**	**28.53**	**25**	**236.92**	**115**
Estuarine Rocky Shore	Bedrock Regularly Flooded	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.06	1	0.06	1
	Bedrock Irregularly Flooded	0.00	0	0.00	0	0.00	0	0.00	0	0.40	3	0.00	0	0.40	3
	Rubble Regularly Flooded	0.00	0	0.00	0	0.00	0	0.00	0	5.54	5	0.00	0	5.54	5
	Rubble Irregularly Flooded	0.00	0	0.00	0	2.58	2	0.00	0	0.00	0	0.00	0	2.58	2
	Reef					0.02	1	0.00	0	0.00	0	0.01	1	0.03	2
	Subtotal	**0.00**	**0**	**0.00**	**0**	**2.60**	**3**	**0.00**	**0**	**5.94**	**8**	**0.07**	**2**	**8.61**	**13**
Estuarine Scrub-Shrub Wetland	Deciduous Irregularly Flooded	2.45	3	0.80	3	4.19	2	6.20	3	24.38	13	12.01	6	50.03	30
	Shrub/Emergent Irregularly Flooded	0.00	0	0.00	0	0.00	0	0.00	0	20.26	3	0.00	0	20.26	3
	Shrub/Phrag Irregularly Flooded	0.00	0	0.00	0	0.00	0	0.00	0	4.15	3	0.00	0	4.15	3
	Olighaline Shrub Irregularly Flooded	0.94	2	17.97	4	0.00	0	0.00	0	0.00	0	0.00	0	18.91	6
	Subtotal	**3.39**	**5**	**18.77**	**7**	**4.19**	**2**	**6.20**	**3**	**48.79**	**19**	**12.01**	**6**	**93.35**	**42**
Estuarine Unconsolidated Shore	Cobble-Gravel Regularly Flooded	1.23	2	0.00	0	0.00	0	2.76	4	1.62	2	2.39	3	8.00	11
	Cobble-Gravel Irregularly Exposed	0.00	0	0.00	0	0.00	0	0.00	0	0.46	1	0.00	0	0.46	1
	Cobble-Gravel Irregularly Flooded									0.23	1	0.51	1	0.74	2
	Sand Irregularly Exposed	73.94	9	14.01	4	93.84	2	112.66	14	455.59	13	168.21	10	918.25	52
	Sand Regularly Flooded	16.49	9	0.00	0	57.54	18	64.70	8	51.48	9	284.42	19	474.63	63
	Sand Irregularly Flooded	20.85	15	7.69	1	0.75	2	5.73	5	4.40	8	35.59	8	75.01	39

Table 6. Extent of Wetlands in Coastal Rhode Island.

Wetland or Waterbody	Type	Block Island		Little Compton		Narragansett		South Kingstown		Charlestown		Westerly		Total Coastal RI	
	Cobble-Gravel Reg Flooded Oligo	0.00	0	0.00	0	0.00	0	3.98	3	0.00	0	0.00	0	3.98	3
	Sand Regularly Flooded Oligohaline	0.00	0	0.00	0	0.00	0	4.07	3	0.00	0	0.00	0	4.07	3
	Sand Irregularly Flooded Oligohaline	0.00	0	0.00	0	0.00	0	2.47	4	0.00	0	0.00	0	2.47	4
	Stream Bed	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	4.95	2	4.95	2
	Subtotal	**112.51**	**35**	**21.70**	**5**	**152.13**	**22**	**196.37**	**41**	**513.78**	**34**	**491.12**	**41**	**1487.61**	**178**
Estuarine Salt Panne	Irregularly Exposed	0.16	1	0.00	0	3.87	2	72.22	3	7.73	15	12.26	1	96.24	22
	Regularly Flooded	0.00	0	0.00	0	7.06	2	0.00	0	0.00	0	0.00	0	7.06	2
	Subtotal	**0.16**	**1**	**0.00**	**0**	**10.93**	**4**	**72.22**	**3**	**7.73**	**15**	**12.26**	**1**	**103.30**	**24**
Total Estuarine Habitats		**834.79**	**103**	**851.98**	**63**	**1623.70**	**136**	**1347.67**	**216**	**2577.23**	**235**	**3809.60**	**201**	**11044.97**	**954**
Marine Water	Algal Beds	1037.07	11	46.66	7	40.53	2	46.99	5	23.03	8	35.51	5	1229.79	38
	Unconsolidated Bottom	16.06	1	0.00	0	0.00	0	0.00	0	0.00	0	1.81	1	17.87	2
	Subtotal	**1053.13**	**12**	**46.66**	**7**	**40.53**	**2**	**46.99**	**5**	**23.03**	**8**	**37.32**	**6**	**1247.66**	**40**
Marine Rocky Shore	Bedrock Regularly Flooded	0.00	0	15.69	32	0.00	0	0.00	0	0.00	0	6.48	2	22.17	34
	Bedrock Irregularly Flooded	0.00	0	16.25	17	0.00	0	0.00	0	0.00	0	0.00	0	16.25	17
	Rubble Regularly Flooded	33.47	16	24.17	6	0.03	1	0.00	0	6.15	4	0.00	0	63.82	27
	Rubble Irregularly Flooded	22.29	4	0.75	3	7.12	1	0.00	0	0.00	0	0.00	0	30.16	8
	Subtotal	**55.76**	**20**	**56.86**	**58**	**7.15**	**2**	**0.00**	**0**	**6.15**	**4**	**6.48**	**2**	**132.40**	**86**
Marine Unconsolidated Shore	Cobble-Gravel Regularly Flooded	2.33	1	10.44	2	6.96	2	0.00	0	0.00	0	0.00	0	19.73	5
	Cobble-Gravel Irregularly Exposed	9.20	1	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	9.20	1
	Cobble-Gravel Irregularly Flooded	2.97	2	11.41	3	0.00	0	0.00	0	0.00	0	4.42	3	18.80	8
	Sand Irregularly Exposed	21.13	4	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	21.13	4
	Sand Regularly Flooded	8.58	3	17.83	5	17.62	3	11.75	3	4.81	4	3.90	2	64.49	20
	Sand Irregularly Flooded	80.31	5	31.70	6	9.40	1	77.56	4	79.67	2	150.78	5	429.42	23
	Sand/Cobble Regularly Flooded	4.62	1	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	4.62	1
	Sand/Cobble Irregularly Flooded	59.48	4	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	59.48	4
	Subtotal	**188.62**	**21**	**71.38**	**16**	**33.98**	**6**	**89.31**	**7**	**84.48**	**6**	**159.10**	**10**	**626.87**	**66**
Total Marine Habitats		**1297.51**	**53**	**174.90**	**81**	**81.66**	**10**	**136.30**	**12**	**113.66**	**18**	**202.90**	**18**	**2006.93**	**192**
Grand Total		**2132.30**	**156**	**1026.88**	**144**	**1705.36**	**146**	**1483.97**	**228**	**2690.89**	**253**	**4012.50**	**219**	**13051.90**	**1146**

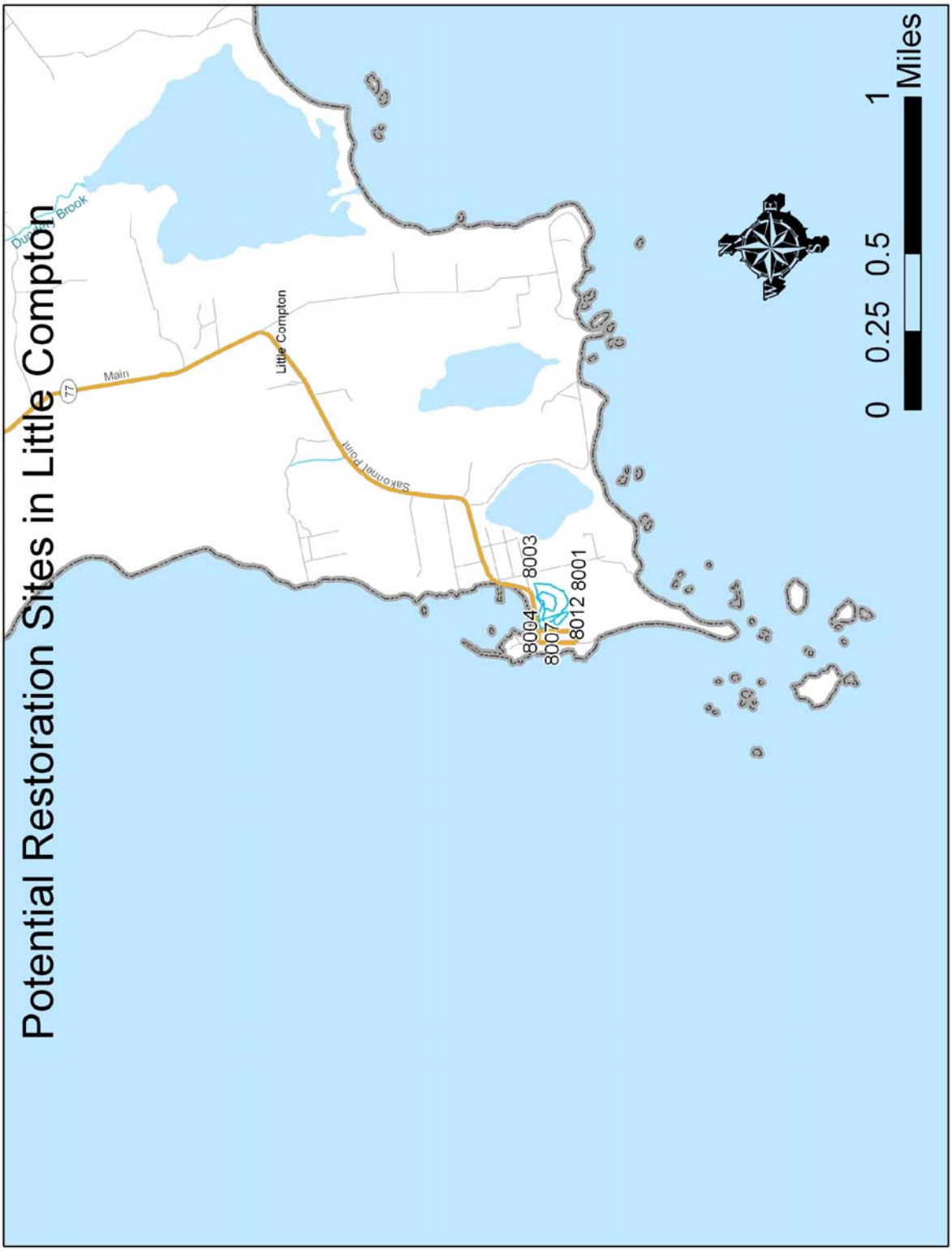

Figure 2: Potential restoration sites in Little Compton, RI

Figure 3: Sites 8001, 8003, 8004, 8007 and 8012 in Little Compton

In New Shoreham, the three sites (**1316, 1341, and 1368**) that contain *Phragmites* abutting nearby local roads were identified as potential restoration sites. Site 1316 is 1.35 in acres and lies south east of Cormorant Cove between two small un-named roads. Site 1341 is approximately 0.43 acres and lies in Veterans Park. Site 1368, the largest site with 4.15 acres, is found between Harbor Pond and Ocean Ave. These sites are shown in Figures 4 and 5. Restoration activities would include *Phragmites* removal and increased flushing of salt water to all three sites.

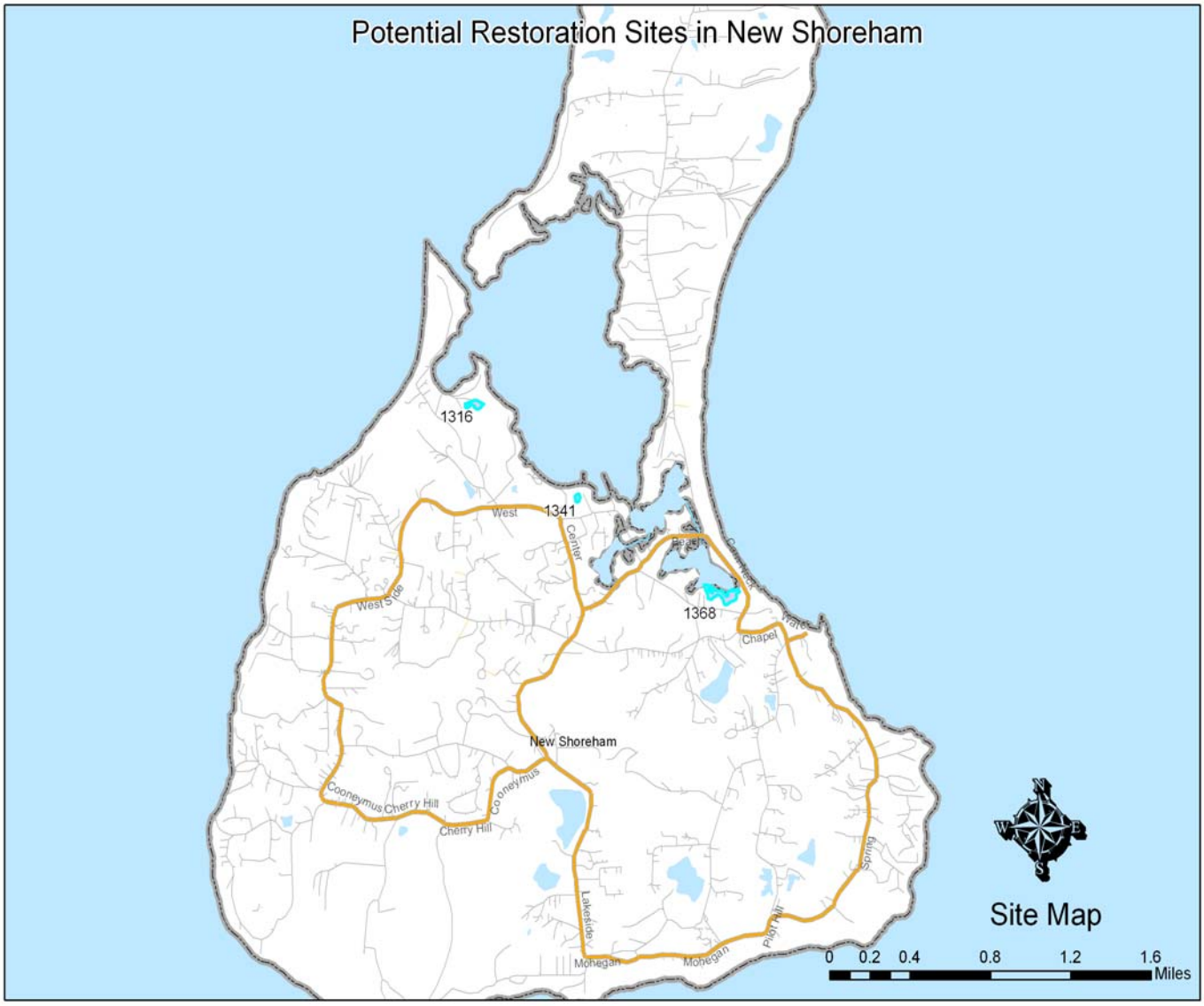

Figure 4: Potential restoration sites in New Shoreham, RI

Figure 5: Sites 1316, 1341 and 1368 in New Shoreham.

There are two potential restoration sites in South Kingstown, site 158 by Congdon Cove and sites 391/400/409 in Matunuck, as shown in Figures 6, 7 and 8.

Site 158 – This site is located off of Point Judith Pond between Pond St and Billington Ave. It consists of a small area of open water (salinity ~16 ppt) with *Spartina patens* along water edges and *Phragmites* (see Figures C1 and C2 in Appendix C). Along the road side there was *Toxicodendron radicans, Solidago sempervirens* and some *Rosa multifora, Celastrus scandens* (Bittersweet) and *Myrica* sp. The entire site is approximately 2.26 acres in size. There was no visible culverst connecting this area to the Point Judith Pond across the street (see Figure C2 in Appendix C), however, it was noticed that some water seemed to be seeping through to the area. Sites 160 (0.95 acres) and 163 (5.83 acres) have direct input from the Point Judith pond by a creek but there is probably little to no flow into site 158. Site 160 (the site closest to 158) was wet, but there was no standing water present about 2 hours into the outgoing tide. Site 160 had *Spartina alterniflora* and *S. patens* in the center of the site surrounded by *Phragmites* along the perimeter areas. *Solidago sempervirens* and *Juncus* were observed along the roadside (Figure 7).

Restoration of site 158 would involve building a culvert under Pond Street from Point Judith Pond to the site. If a culvert already exists, it needs to be repaired/enlarged to allow for increased flow. Also due to the large amount of *Phragmites* in the area, a *Phragmites* eradication program might be necessary.

Sites 391/400/409 – These sites are part of an un-named coastal pond connected to Potter's Pond in Matunuck as shown in Figure 8. The sites are surrounded by residential homes and a trailer park (summer homes) (see Figure C3, Appendix C for view of these sites from the trailer park). The area is dominated by *Phragmites* with some *Spartina* surrounding an open water area (a creek/ditch). At the entrance to the site (391) from Potter's Pond the open water is surrounded by *S. alterniflora, S. patens and Solidago sempervirens* along the edges with *Phragmites* which dominates the site. The entire site is 11.53 acres (Figure C4, Appendix C). Approximately 200 feet from the entrance to the site there appears to be a restriction of flow caused by upland vegetation encroaching toward both sides of the creek (see Figures C5, C6, and C7 in Appendix C). Within sites 391 and 400 (1.96 acres), the area appeared to have been ditched at one time with *Spartina* growing along the water edges and then transitions to *Phragmites*. Site 409 is 1.10 acres and totally inundated with *Phragmites*. In October of 2006, CRMC had identified a small pocket of cattail in site 409 but none was found by Corps personnel during a site visit at the end of October 2007. Opening the entrance to these sites would allow for better water flow into the area and improve the habitat conditions. Also, due to the large amount of *Phragmites* present, it would probably be necessary to start a *Phragmites* eradication project as well along the outer edges of the sites.

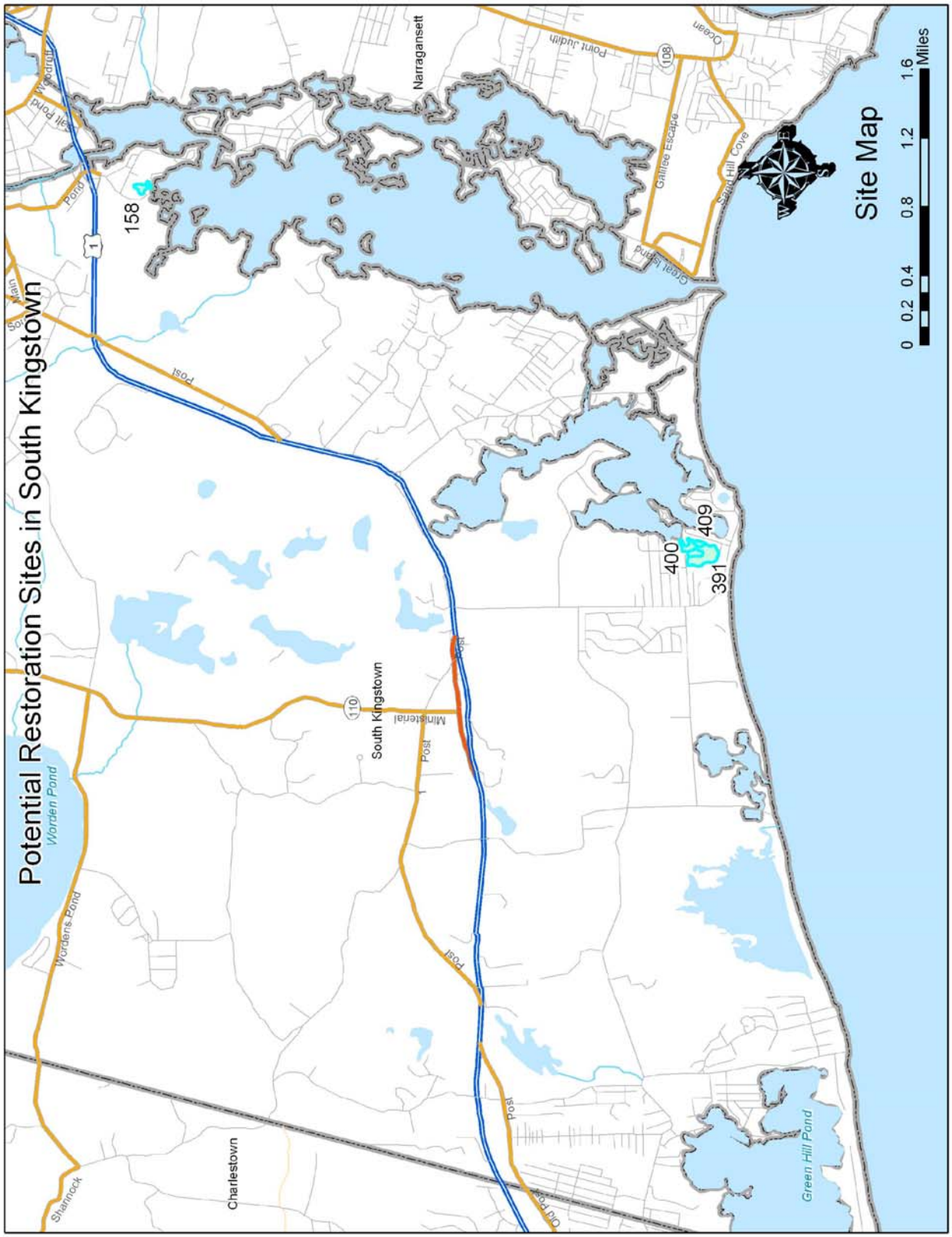

Figure 6: Potential restoration sites in South Kingstown, RI

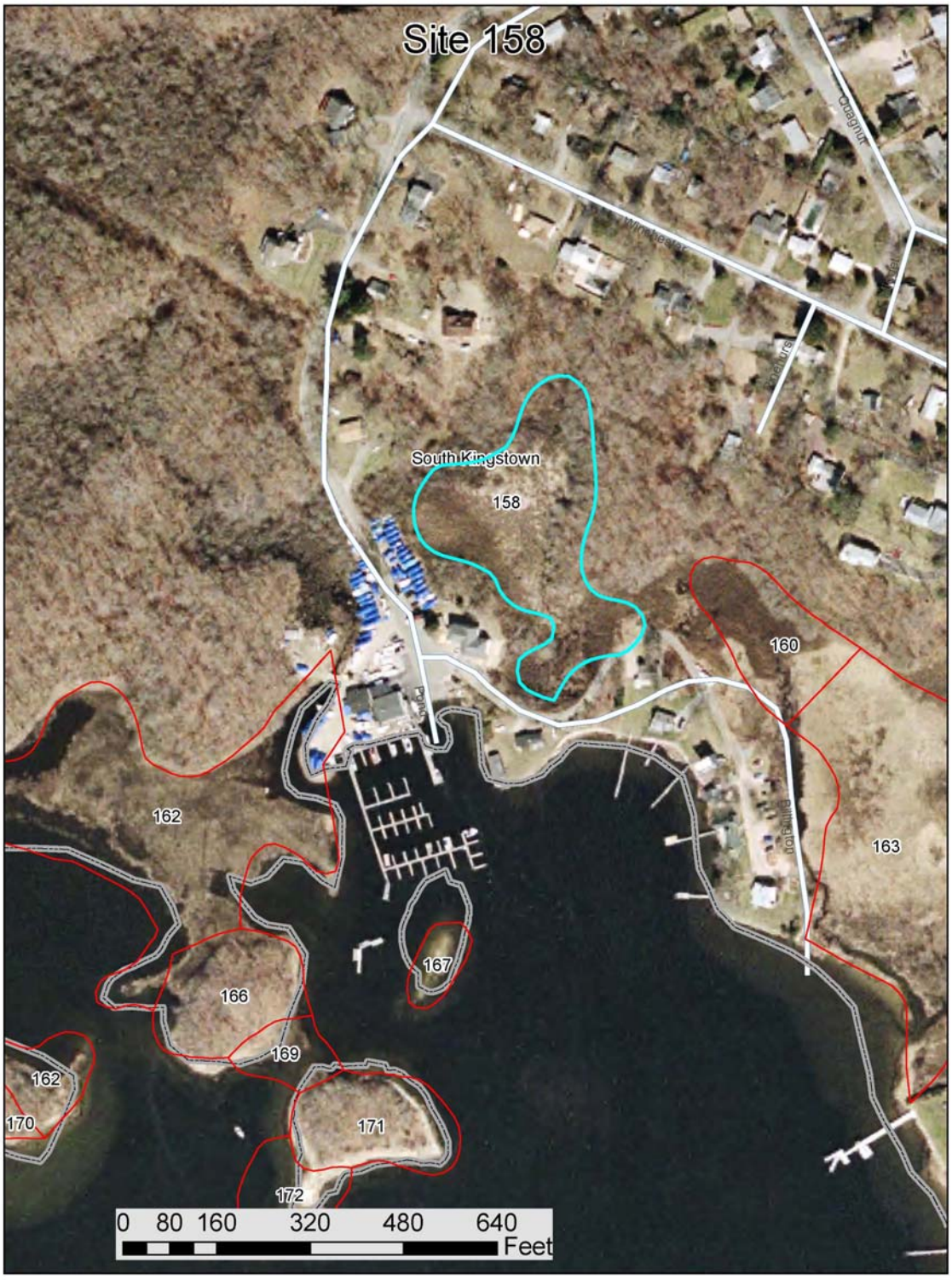

Figure 7: Site 158 in South Kingstown

Figure 8: Sites 391, 400 and 409 in South Kingstown.

In Charlestown there is a potential restoration area (site 682) between Mud and Foster Coves near Wildflower and Cove Roads (See Figures 9 and 10).

Site 682 – This site is a wetland area surrounded by residences of a private community between Mud and Foster Coves off of Ninigret Pond. The 1.9 acre area is dominated by *Phragmites*. There is also some open water in the site that is surrounded by *Spartina* (Figure C8, Appendix C). There is some *Lythrum salicaria* (purple loosestrife) along the edges of the site by the road. This area is hydraulically connected to site 696 by a culvert under the road (Wildflower Road). The culvert consists of a concrete pipe approximately 3 feet in diameter. At the time of the site visit (10/31/2007, 12:30 pm) the water level within the pipe was about half filled. However, about one-fourth of the pipe was filled with sediment. Also the invert of the pipe seems to be lower on Site 682 side of the road as compared to the opening at site 696 (Figure C9, Appendix C shows a view of the culvert from site 696).

Site 696 has a creek that connects to Ninigret Pond (Figure C10, Appendix C). The salinity at the creek entrance was 25 ppt at about high tide and the salinity at the entrance at both ends of the culvert was 22 ppt. There was no evidence of marine life at the far side of the creek. In this site, *Spartina patens* is found along the edges of the open water and then transitions to *Phragmites*. Adjacent to the roads one can find *Solidago sempervirens* (golden rod), *Baccharis halimolia* (sea myrtle), *Rhamnus* sp (buckthorn), *Cornus amonum* (silky dogwood), *Salix* sp. (willow), *Rosa multiflora* (rose), *Lonicera japonica* (Japanese honeysuckle), *Toxicodendron radicans* (poison ivy), and *Toxicodendron vernix* (poison sumac).

Restoration of site 682 would involve removal of invasive species of *Phragmites* and purple loosestrife and cleaning out the culvert to allow for better flow between the two sites. Repositioning of the culvert may also be necessary.

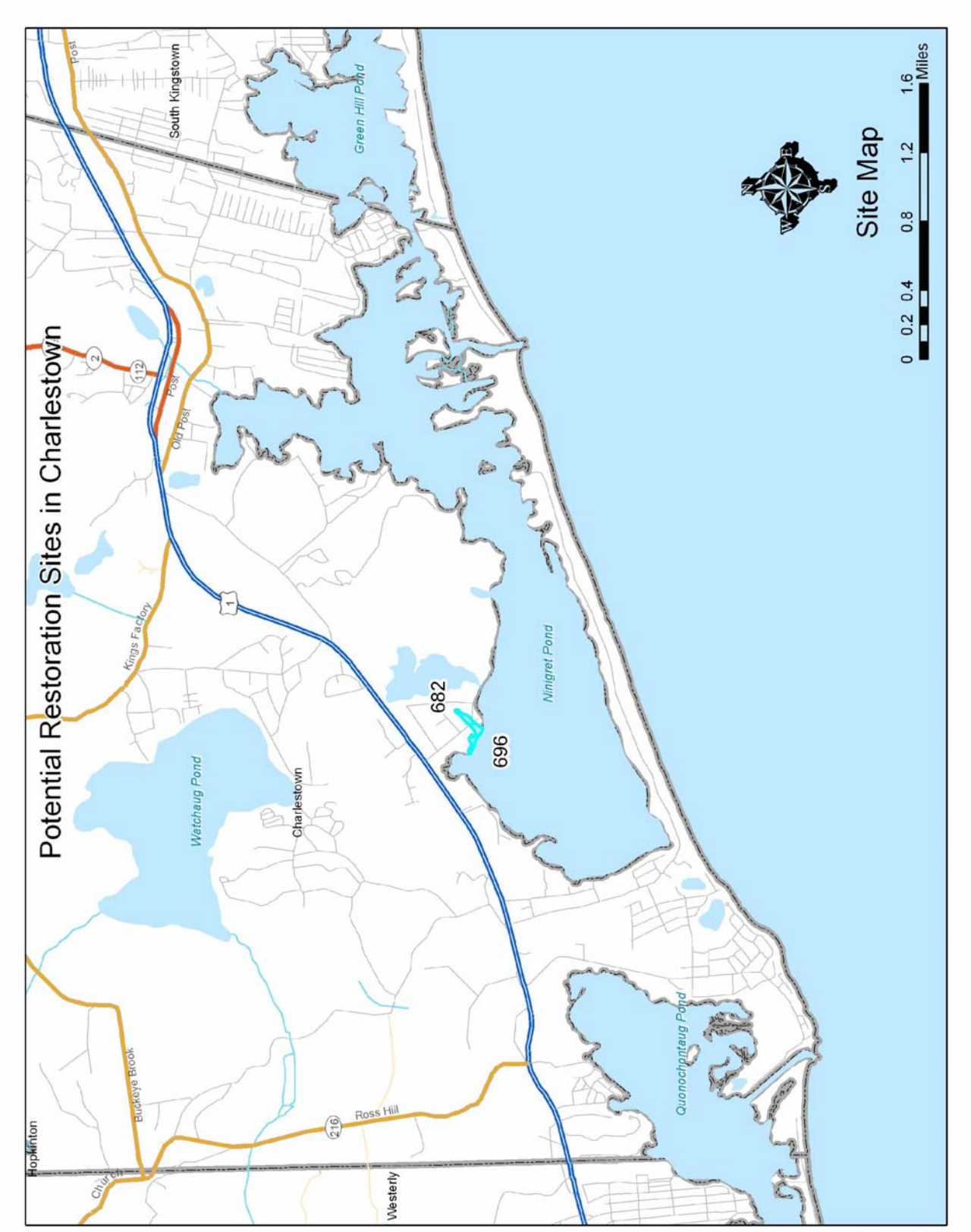

Figure 9: Potential restoration sites in Charlestown, RI

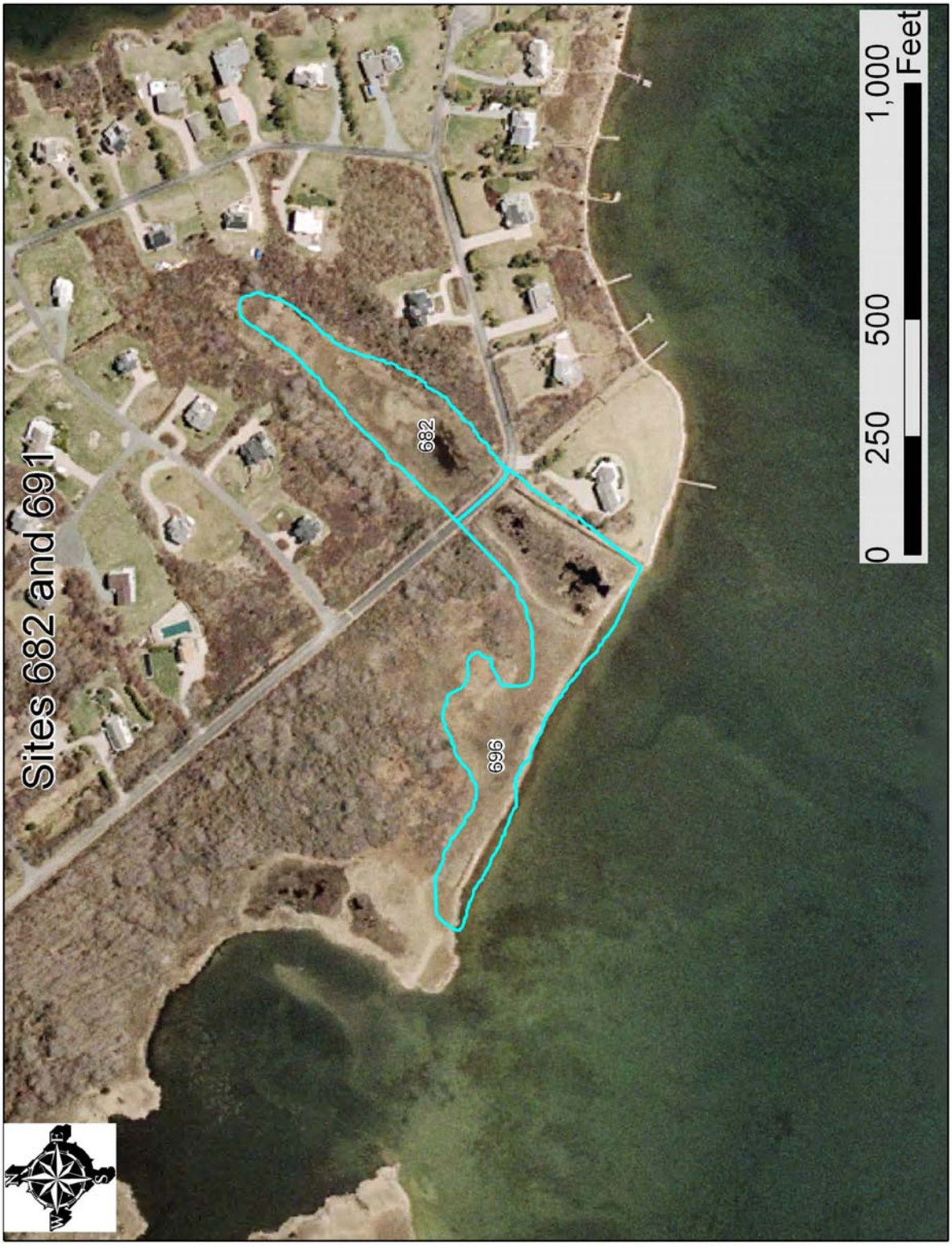

Figure 10: Sites 682 and 696 in Charlestown.

There are two potential restoration sites in Westerly, one in the Weekapaug Breachway of Winnapaug Pond (1076/1432) and the other (Site 1161) near Potter Cove in Little Narragansett Bay/Pawcatuck River (See Figures 11, 12 and 13).

Sites (1076/1432) –Polygon 1076 was split into two sites - 1076 for the open water (0.53 acres) and 1432 for the filled area (0.45 acres). This site is the entrance of the former inlet into Winnapaug Pond that has filled (silted) in over time. The channel has filled with sediment and *Phragmites* is now dominating the area. *Spartina patens* was also present at the site (see Figure C11, Appendix C). The open water sections appear to have high quality habitat with fishes observed in all areas. The salinity in the breach way and at both ends of the filled area was 33 ppt at the time of the site visit (10/31/2007, 11:40 AM) (Figure C12, Appendix C, shows the entrance into the former channel looking at filled area and Figure C13, Appendix C shows a view of the far end of filled area). The triangle of land between the filled area and the current breach-way is an upland environment consisting of *Juniperus* sp. (Juniper), *Juniperus virginiana* (red cedar), *Salix* sp. (willow), *Andropogon glomeratus* (broom grass) *Toxicodendron radicans* (poison ivy), *Solidago sempervirens* (goldenrod), *Myrica cerifera* (wax myrtle), *Comptonia peregrine* (sweet fern), *Limonium nashii* (sea lavender), *Lonicera japonica* (Japanese honeysuckle), *Baccharis halimolia* (sea myrtle), and lichens (encrusting and folious) (see Figure C14, Appendix C).

Dredging the area will restore flows to the old inlet, but it will not increase the amount of wetland in the area since by dredging an area of fill, a new area of open water is created. Sites 1076 and 1432 are shown in Figures 11 and 12.

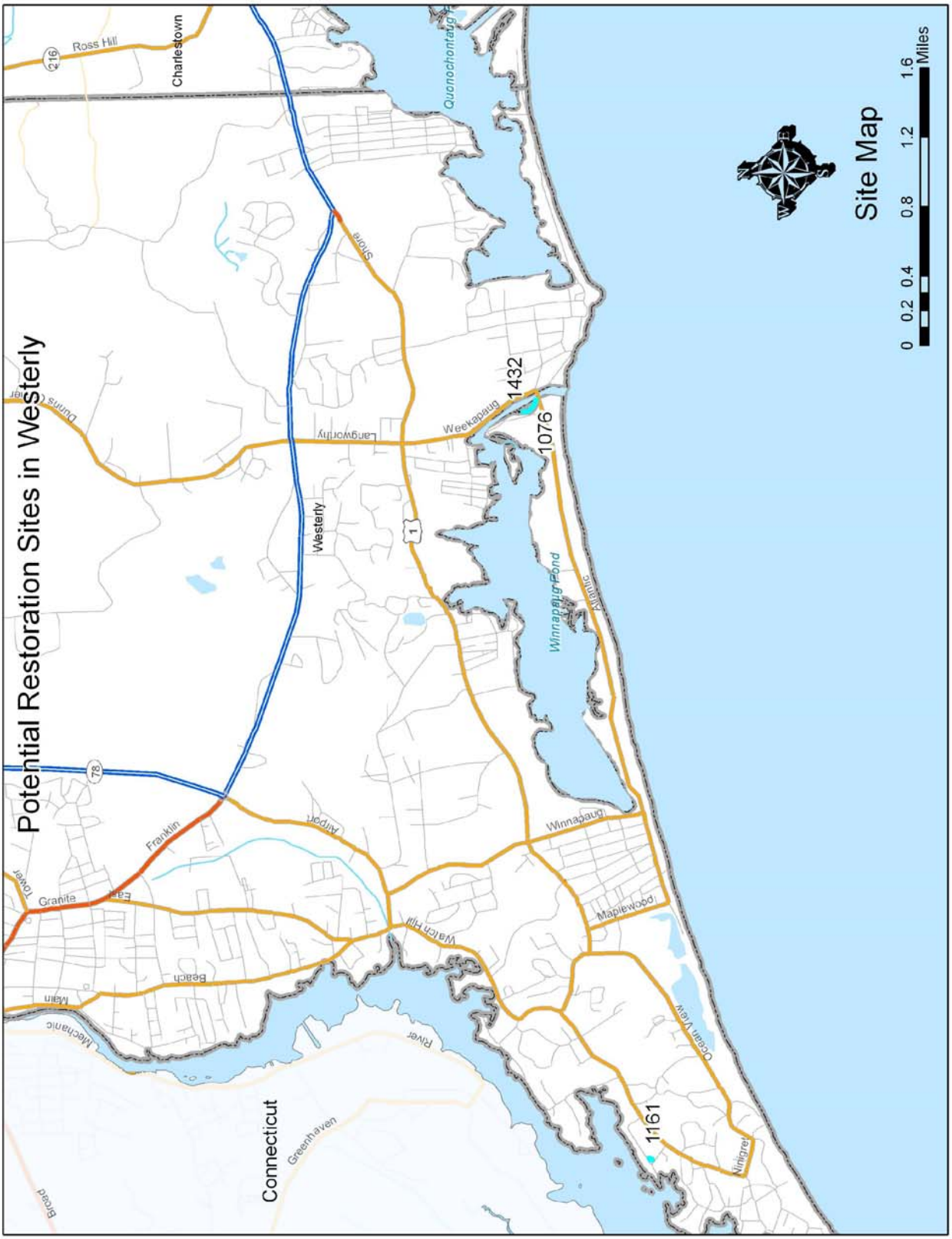

Figure 11: Potential restoration sites in Westerly

Figure 12: Sites 1076 and 1432 in Westerly.

Figure 13: Site 1161 in Westerly.

Site 1161- Site 1161 is about one quarter of an acre in size and is located in western Westerly, north of Potter Cove, between Breen Road and Pasadena Avenue off of the Pawcatuck River as shown in Figure 13. The site is connected to sites 1165 (5.13 acres) and 1167 (1.54 acres) located on the other side of Breen Road. Adjacent to site 1161 is site 1160 (2.52 acres). The land between sites 1160 and 1161 appears to be of higher elevation. An existing culvert under Watch Hill Road (Route 1A) diverts water from the roadway into site 1160 likely contributing to the growth of *Phragmites australis* that dominates most of the site (CRMC field notes record culvert as not functioning properly). Site 1161 is also predominantly *Phragmites* (Figure C15, Appendix C). There is some *Toxicodendron radicans*, *Salix* and *Erigeron strigosus* along the edges of site. There is a box culvert with a pipe about 12 inches in diameter (see Figure C16, Appendix C) that runs under Breen Road that connects this site to site 1165. There is ponded water by the culvert with a salinity of about 22 ppt at the time of sampling (10/31/2007, 10:15 AM) during an incoming tide (closer to low tide) (Figure C17, Appendix C).

Sites 1165 and 1167 are across Breen Rd from site 1161. The end of the culvert in 1165 that connects to site 1161 is a box culvert with an iron pipe that has partially collapsed (see Figure C18, Appendix C). Site 1165 is dominated by *Phragmites* with some *Solidago sempervirens* along the outer edges with *Myrica cerifera*, *Rosa palustris*, *Vitis* sp. and *Eunymous* (planted) along roadside areas that parallel site 1165. At the entrance to the creeks leading from Potter Cove there is *Spartina alterniflora* with *S. patens* behind it with *Phragmites* up at the road (Breen Rd) (see Figures C19 and C20, Appendix C). The salinity at the entrance of the creek from Potter Cove was about 28 ppt at the time of sampling (it was early in the incoming tide on 10/31/2007 at 10:15 AM) with evidence of a healthy marine environment (limpets, mussel shells, blue crab, and brown algae on the rocks) in the area. Site 1167 also has *S. alterniflora* along with *S. patens* in the higher marsh areas gradually giving way to grass then more *S. patens* and then a small upland area closer to the road (Breen Rd.). The upland area had thick growth of pines and red cedar present, making it difficult to access the area to get more details. The upland area west of site 1165 also had *Rhamnus* sp. (buckthorn) and *Cornus amomum* (silky dogwood) so it is probable that these species were also within the upland area of site 1167 (Figure C21, Appendix C).

Restoration of site 1161 would require *Phragmites* removal from this site and increased flushing of the area with salt water so the water does not just pond by the culvert.

Conclusions and Recommendations

This Study inventoried approximately 1475 coastal wetland sites along the coast of Rhode Island including New Shoreham but excluding the wetlands in the Narragansett Bay region. Nine sites with high potential restoration values were identified. Real estate information for these sites can be found in Appendix D. It is recommended that detailed best management practices be developed to maximize habitat function and value for each of these wetland sites. To further the process of initiating restoration activity it may

prove beneficial and ultimately necessary for CRMC to apprise the current land owners of the potential restoration opportunities at the areas identified in this report and to collaborate on their implementation or determine their interest in selling those lands or obtaining a conservation easement.

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APPENDIX A

TYPES OF POTENTIAL RESTORATION SITES

Codes for Symbology used in Wetland Mapping (taken from Tiner et al 2003 based on Cowardin et al 1979).

For each town a table is presented with an account of type and acreage of potential restoration sites. Within a restoration complex multiple sites with the same code are considered part of one site regardless of the number of polygons.

A code is represented by system, subsystem, class, subclass, water regime and special modifiers as in the following examples:

1) E2EM2N –System E (Estuarine), Subsystem 2 (Intertidal), Class EM (Emergent), Subclass 1 (Persistent), Water Regime N (Regularly flooded),

2) E2EM1/5P6- System E (Estuarine), Subclass 2 (intertidal), Class EM (Emergent), Subclass 1/5 (Persistent/Phragmites), Water Regime P (Irregularly flooded), Special Modifier 6 (Oligohaline), and

3) E2SS1Pd - System E (Estuarine), Subclass 2 (intertidal), Class SS 9Scrub-Shrub), Subclass 1 (Broad-leaved Deciduous), Water Regime P (Irregularly flooded), Special Modifier d (Partly drained).

Table of parameters used in creating a code

System/Subsystem	Class/Subclass	Water Regime	Special Modifier
E1 = Estuarine Subtidal	AB1= Algal Bed	L = Subtidal	d = partly drained
E2 = Estuarine Intertidal	AB3= Aquatic Bed Vascular	M = Irregularly Exposed	h = impounded
M1 = Marine Subtidal	AB4 = Aquatic Bed Floating	N= Regularly Flooded	r = artificial
M2 = Marine Intertidal	EM1= Emergent Persistent	P = Irregularly Flooded	x = excavated
	EM5 = Emergent Phragmites		6 = oligohaline
	RF2 = Reef Mollusc		
	RS1 = Rocky Shore Bedrock		
	RS2 = Rocky Shore Rubble		
	SS1 = Scrub-Shrub Broad-leaved Deciduous		
	US1 = Unconsolidated Shore Cobble-Gravel		
	US2 = Unconsolidated Shore		

Sand

US4 = Unconsolidated Shore
Organic

UB = Unconsolidated Bottom

Table A-1. Potential wetland restoration sites in Charlestown, RI.

Wetland RestorationType		Current Classification	# of Sites	Acreage
1	palustrine wetland (former estuarine) (1w)	PEM	1	0.59
	Subtotal		**1**	**0.59**
	Total Type 1 Sites		**1**	**0.59**
2	ditched (2d)	E2ESS1Pd	1	6.21
	Subtotal		**1**	**6.21**
	ditched/veg change-Phragmites (2d-2v)	E2EM1/5Pd	1	8.25
	Subtotal		**1**	**8.25**
	impounded (2h)	E2EM1Ph	1	0.71
		E1UBLh	1	0.28
	Subtotal		**2**	**0.99**
	impounded/veg change-Phragmites (2h-2v)	E2EM1/5Ph	1	0.91
	Subtotal		**1**	**0.91**
	tidally restricted/veg change-Phragmites (2r-2v)	E2EM5/1P6	1	1.90
	Subtotal		**1**	**1.90**
	vegetation change - Phragmites (2v)	E2EM1/5P	9	101.81
		E2EM5P	11	27.04
		E2EM5P6	3	7.15
		E2EM5/1P	2	11.49
		E2EM5/SS1P	2	11.65
	Subtotal		**27**	**1110.14**
	Total Type 2 Sites		**33**	**1128.40**
	Total All Types		**34**	**1128.99**

Coastal Wetlands in Charlestown

Church
Buckeye Brook
Watchaug Pond
Charlestown
216
Ross Hill
Westerly
Shore
112
Post
Old Post
South Kingstown
Green Hill Pond
Ninigret Pond
Quonochontaug Pond

E2US1M
E2EM1N
E1UBL6h
E1UBLh
E1AB4L6
E1AB3L
E2AB1N
E2US/AB1N
E2US4M
E2AB3L
E2US1N
E2EM5P
E1AB1M
E2EM5/1P
E2EM5/SS1P
UPLAND
E2AB1M
E2SS1/EM5P
E2SS1P
E1AB1L
E2SS1/EM1P
M2AB1N
E2EM1P6
E1AB1/UBL
E2SS1Pd
E2EM1/5P
E2RS2/AB1N
E1UBL
E2US2ME2EM1/SS1P
DUNE
M2US2P
E2EM1Ph
E2RS1P
E2EM1Pd
E2RS2N
E2AB1/US2M
E2US1P
E2EM5P6E1UBL6
E2EM1/5P6
E1AB1/UBL6
M2US2N
E2EM1P
M2RS2N
M1AB1L
E1UBLx
E1UB4L
E2US2N
E2US2P

Wetland codes are shown as labels

0 0.35 0.7 1.4
Miles

Table A-2. Potential wetland restoration sites in Little Compton, RI.

Wetland RestorationType		Current Classification	# of Sites	Acreage
1	filled (1f)	UPLAND	2	0.73
	Subtotal		**2**	**0.73**
	change in vegetation wetland type (1w)	PEM1RH	3	4.27
		PSS1Rh	3	1.06
	Subtotal		**6**	**5.33**
	change to nonvegetated wetland (1x)	PUB/AB4Hx	2	0.63
	Subtotal		**2**	**0.63**
	Total Type 1 Sites		**12**	**7.42**
2	ditched/tidally restricted (2d-2r)	E2EM1Pdh	1	4.60
	Subtotal		**1**	**4.60**
	ditched/severely tidally restricted/veg change Phragmites (2d-2rs-2v)	E2EM5P6d	1	2.41
	Subtotal		**1**	**2.41**
	tidally restricted /veg change- Iva (2d-2vi)	E2SS1Ph	1	0.80
	Subtotal		**1**	**0.80**
	tidally restrcted (2r)	E1UBL	1	0.96
	Subtotal		**1**	**0.96**
	vegetation change - Phragmites (2v)	E1UBL/E2EMP6	1	2.80
		E2EM1/5P	3	4.05
		E2EM5P6	3	63.36
	Subtotal		**7**	**70.21**
	excavated/veg change-Phragmites (2x- 2v)	E1UBL6x/EM5P6	1	1.18
	Subtotal		**1**	**1.18**
	Total Type 2 Sites		**12**	**80.16**
	Total All Sites		**24**	**87.58**

Coastal Wetlands in Little Compton

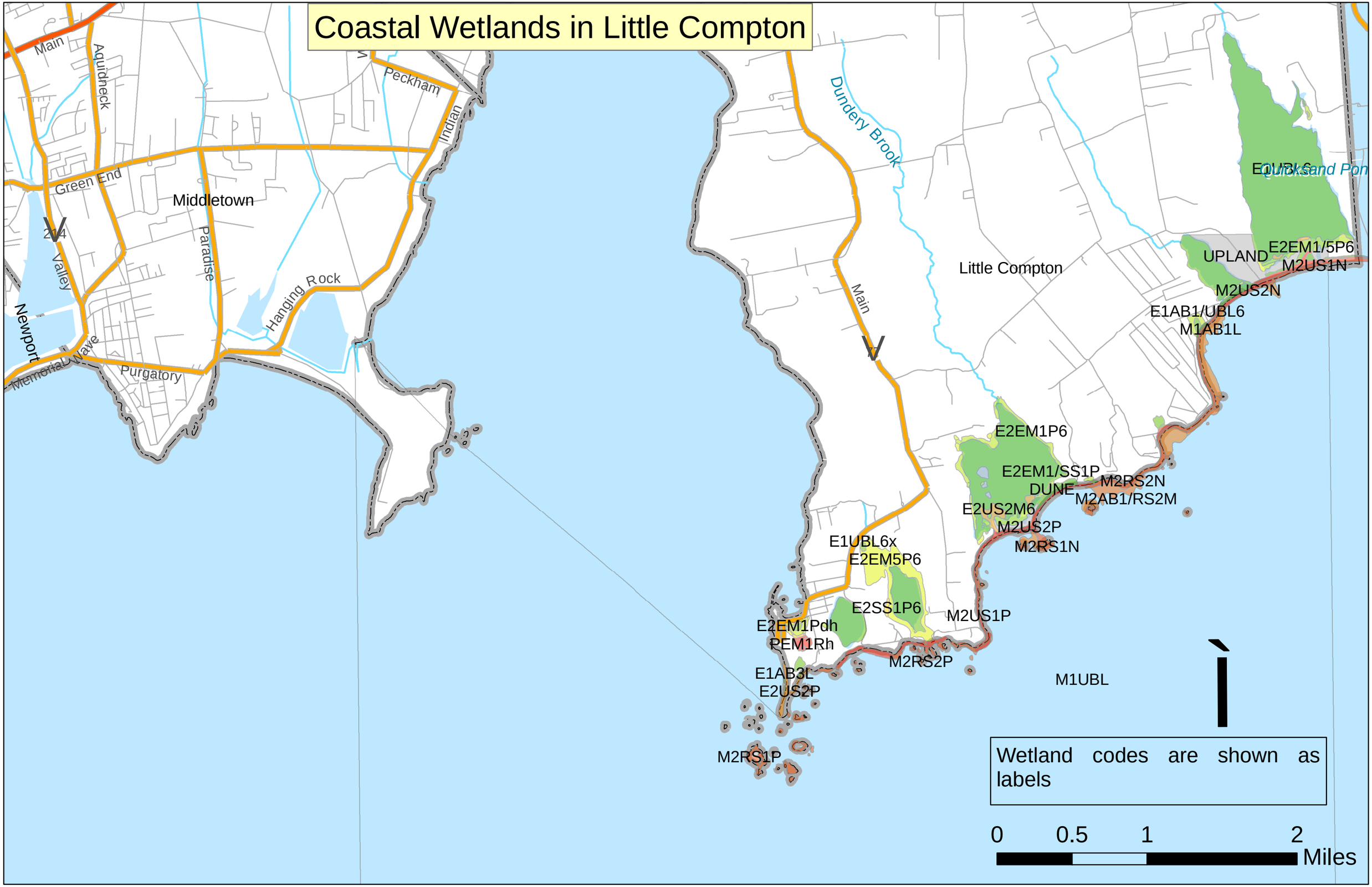


Table A-3. Potential wetland restoration sites in Naragansett, RI.

Wetland RestorationType		Current Classification	# of Sites	Acreage
1	None			
	Total Type 1 Sites		**0**	**0**
2	vegetation change- Phragmites (2v)	E2EM5P	8	2.67
	Subtotal		**8**	**2.67**
	Total Type 2 Sites		**8**	**2.67**
	Total All Sites		**8**	**2.67**

*Galilee Restoration Site is not inclued

Coastal Wetlands in South Kingstown and Narragansett

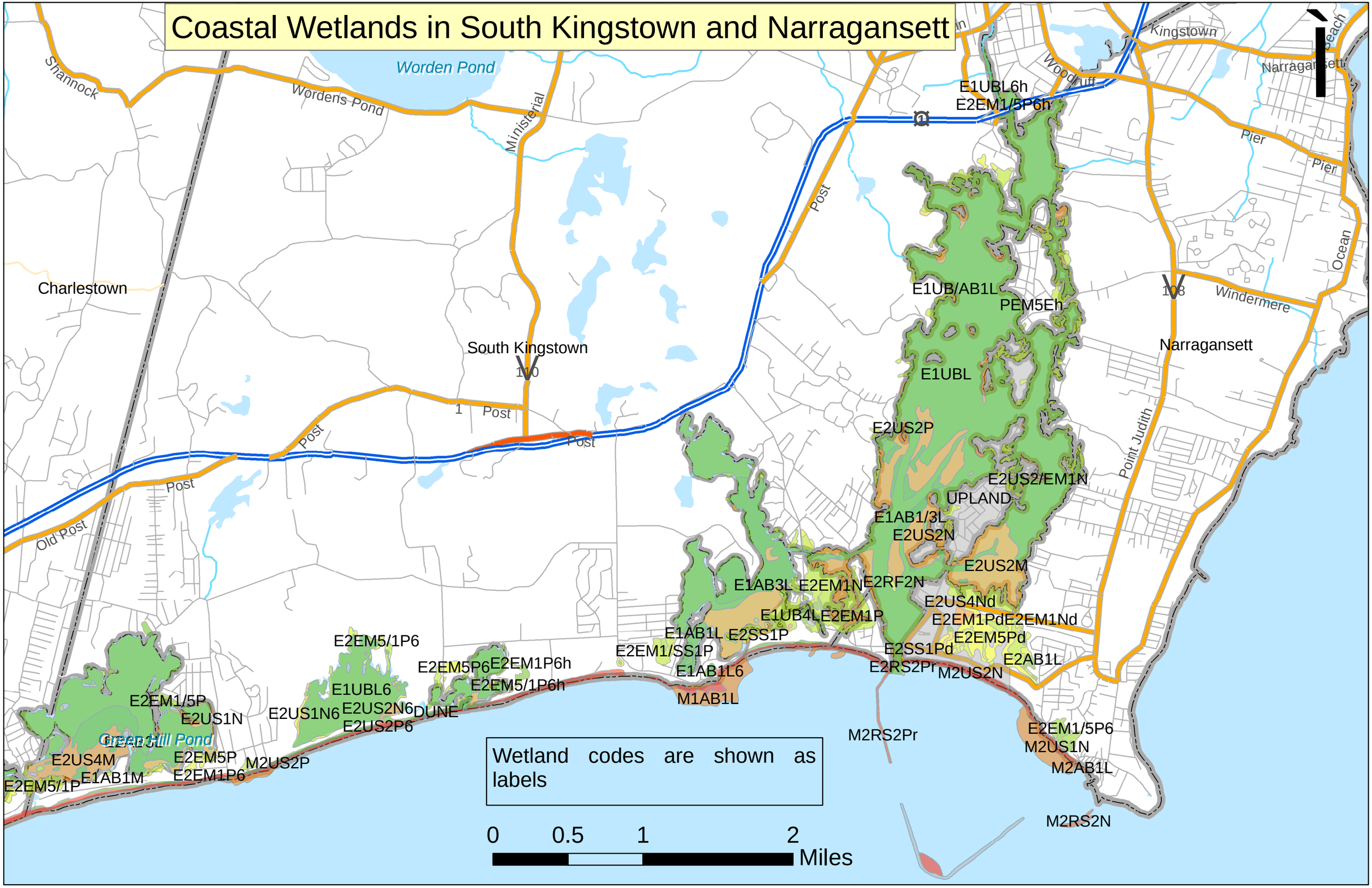


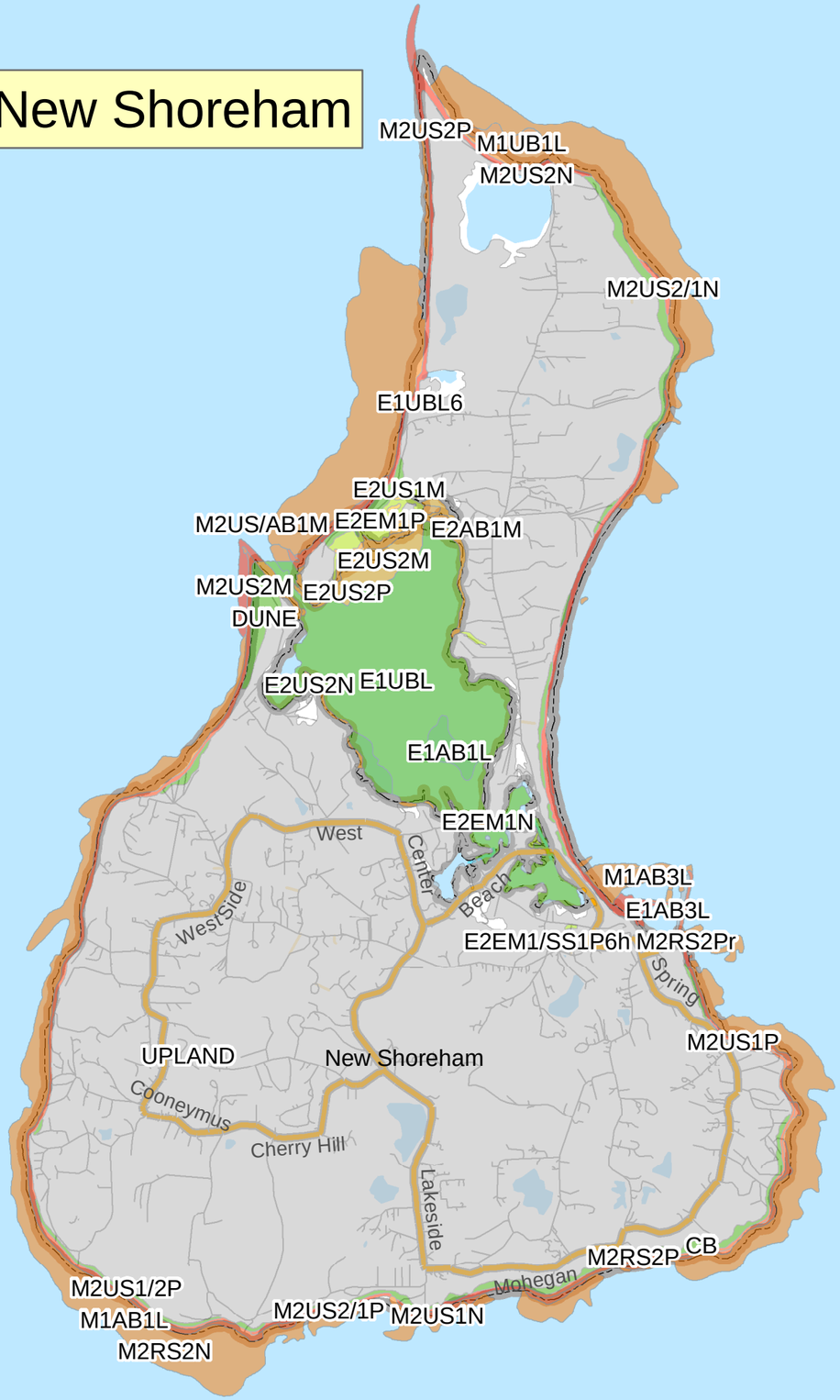
Table A-4. Potential wetland restoration sites in South Kingstown, RI.

Wetland RestorationType		Current Classification	# of Sites	Acreage
1	None		0	0.00
	Total Type 1 Sites		**0**	**0**
2	impounded	E1UBL6h	1	3.92
	Subtotal		**1**	**3.92**
	impounded/veg change-Phragmites	E2EM5P6h	1	0.72
		E2EM1/5P6h	1	0.63
	Subtotal		**2**	**1.35**
	tidally restricted (2r)	E1UBL6h	1	10.66
	Subtotal		**1**	**10.66**
	tidally restricted/veg change-Phragmtes (2r-2v)	E2EM1/5P6h	1	1.69
	Subtotal		**1**	**1.69**
	vegetation change- Phragmites (2v)	E2EM1/5P	16	89.98
		E2EM1/5P6	2	1.31
		E2EM5/1P	2	13.85
		E2EM5/SS1P	1	8.25
		E2EM5P	13	15.57
		E2EM5P6	4	9.24
	Subtotal		**38**	**138.20**
	Total Type 2 Sites		**43**	**155.82**
	Total All types		**43**	**155.82**

Table A-5. Potential wetland restoration sites in Block Island (New Shoreham), RI.

Wetland RestorationType		Current Classification	# of Sites	Acreage
1	None		0	0.00
	Total Type 1 Sites		**0**	**0**
2	ditched (d)	E2EM1Pd	1	2.33
	Subtotal		**1**	**2.33**
	ditched/tidally restricted (2d-2r)	E2EM1P6dh	1	0.61
	Subtotal		**1**	**0.61**
	tidally restricted (2r)	E1AB3Lh	2	0.92
		E2AB3Lh	1	0.29
		E2AB1M6h	1	1.25
		E1UBL6h	1	1.77
		E2EM1Nh	1	0.18
		E2EM1Ph	1	1.57
		E2EM1P6h	1	0.38
		E2EM1/SS1P6h	1	0.21
		E2EM1/SS1Ph	1	0.45
		E2SS1Ph	1	0.38
		E2SS1P6h	1	0.52
	Subtotal		**12**	**7.92**
	tidally restricted/veg change-Phragmites	E2EM1/5P6h	1	0.39
		E2EM5P6h	1	1.35
	Subtotal		**2**	**1.74**
	vegetation change-Phragmites	E2EM5P6	3	12.01
		E2EM1/5P	2	28.00
	Subtotal		**5**	**40.01**
	Total Type 2 Sites		**21**	**52.61**
	Total All Sites		**21**	**52.61**

Coastal Wetlands in New Shoreham



Wetland codes are shown as labels

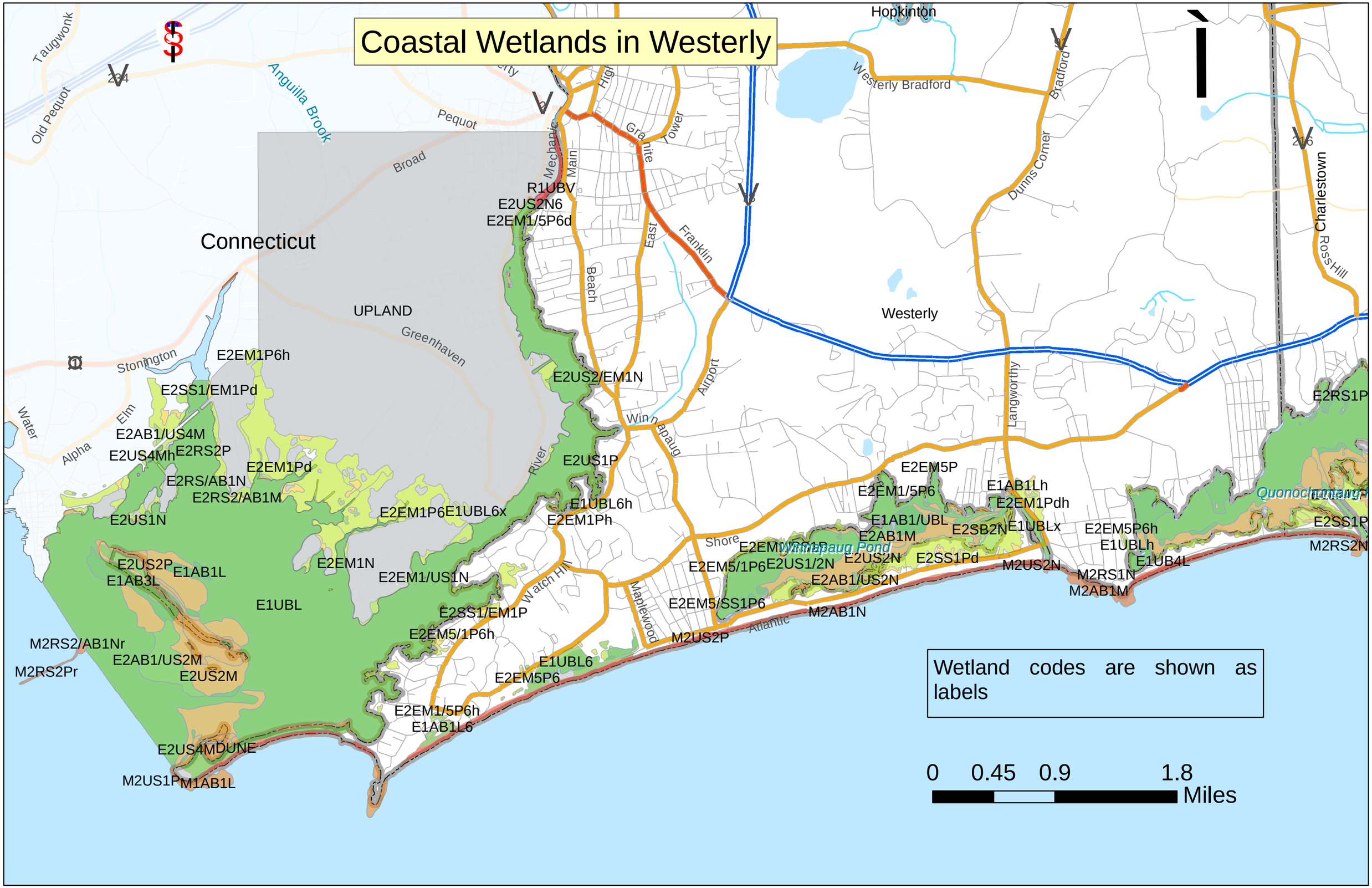
0 0.4 0.8 1.6
Miles

Table A-6. Potential wetland restoration sites in Westerly, RI.

Wetland RestorationType		Current Classification	# of Sites	Acreage
1	Fill/Phragmites-dominated (1fph)	E2EM5P	1	0.45
	Subtotal		**1**	**0.45**
	change in vegetation wetland type (1w)	PEM	1	2.12
	Subtotal		**1**	**2.12**
	impounded freshwater (former estuarine 1x)	PUB	3	6.15
	Subtotal		**3**	**6.15**
	Total Type 1 Sites		**5**	**8.72**
2	ditched (2d)	E2EM1Pd	4	120.94
		E2SS1Pd	1	10.31
	Subtotal		**5**	**131.25**
	ditched/tidally restricted (2d-2r)	E2EM1Pdh	1	11.13
		E2EM5Pdh	1	3.02
	Subtotal		**2**	**14.15**
	ditched/veg change -Phragmites (2d-2v)	E2EM1/5Pd	1	7.94
		E2EM5/1Pd	2	5.05
	Subtotal		**3**	**12.99**
	ditched/tidally restricted/veg change (2d-2r-2v)	E2EM1/5Pdh	1	9.60
	Subtotal		**1**	**9.60**
	impounded (2h)	E2EM1Pdh	1	0.13
	Subtotal		**1**	**0.13**
	impounded/veg change- Phragmites (2h- 2v)	E2EM5Ph	1	0.26
		E2EM5P6h	1	2.96
	Subtoal		**2**	**3.22**
	tidally restricted	E1AB1Lh	1	1.82
		E2AB1Nh	1	3.28
		E1UBLh	1	2.39
		E1UBL6h	1	0.33
		E2EM1Nh	1	0.33
		E2EM1Ph	1	0.81
		E2SS1Ph	1	0.69
	Subtotal		**7**	**9.65**
	Tidally restricted/veg. change - Phragmites (2r-2v)	E2EM1/5Ph	2	0.19
		E2EM5/1P6h	1	3.95
		E2EM5P6h	1	1.90
	Subtotal		**4**	**6.04**

veg change - Phragmites (2v)	Dune/PEM5	1	7.22
	E2EM1/5P	3	6.47
	E2EM1/5P6	1	0.87
	E2EM5/1P	3	4.90
	E2EM5/1P6	1	1.40
	E2EM5/SS1P6	1	0.89
	E2EM5P	4	8.14
	E2EM5P6	4	7.12
Subtotal		**18**	**37.01**
Total Type 2 Sites		**43**	**224.04**
Total All Sites		**48**	**232.76**

Coastal Wetlands in Westerly



APPENDIX B

RESTORATION COMPLEXES

Restoration Complexes – coded from aerial photo interpretations prior to QA from field visits.

Each restoration complex was given a code, listed below, and a number.

Town/Pond Codes

bls – Block Island, New Shoreham
chl – Charlestown, includes Ninigret Pond
car – Cards Ponds
gal – Galilee area that has been restored
lcm – Little Compton
ln – Little Narragansett Bay into Pawcatuck River
quo – Quonochontaug Pond
skg – South Kingston
tru – Trustom Pond
wes- Westerly (Mickill Pond, Maschaug Pond and Little Maschaug Pond)
win – Winnapaug Pond

Impacts for Little Narragansett Bay

ln1 – external impacts 2Eis
ln2 – external impacts 2Eis
ln3 – internal impacts 2d, 2r, external 2Eis
ln4 – internal impacts 2h, 2v, and external 2v, 2Eis
ln5 – internal impacts 2r, external 2Eis, 2Egc, 2Ela
ln6 – external impacts 2Ela
ln7 – internal impacts 2r, 2v, external impacts 2Ela, 2Ecr, 2Eis
ln8 – external impacts 2Eis, internal impacts 2r, 1x
ln9 – external impacts 2Eis, internal 2v, 2h
ln10 –internal impacts 2v, 2d external impacts 2Eis.

Impacts for Westerly

wes1 – internal impacts 1x, 1w, 2r, 2v and external impacts 2v, 2Eis, 2Ela.
wes2 – external impacts 2Ela.
wes3 – internal impacts, 2h, 2r, 2v and external impacts are 2Egc, 2Eis, 2Ela

Impacts for Winnapaug Pond

win1 – external impacts, 2Ecr, internal impacts 2v, 2d.
win2 - internal impacts 2v, external impacts 2Eis, 2Ela
win3 – internal impacts 2v, external impacts 2Egc.
win4 – external impacts 2Eis and 2 Egc.
win5 – external impacts 2Eis
win6 – internal impacts 2d, 2r, external impacts 2Eis.

win7 – external impacts 2Eis, 2Ela, internal impacts 2v
win8 – external impacts 2Ecr and 2Eis, internal impacts 2r, 2v, and 2d
win9 – internal impacts 2v
win10 – external impacts 2Eis, internal 2v
win11 – internal impacts 2v
win12 – internal impacts 2v, external impacts 2Eis
win13 – internal impacts 2h, external impacts 2Eis
There is also a golf course on the coast of northern part of the pond.

Impacts for Quonochontaug Pond

quo1 – internal impacts 2v, external impacts 2Eis
quo2 – internal impacts 2v, external impacts 2Eis, many of the polygons coded as quo2 are water areas surrounded by polygons with impacts, but have no direct impacts listed.
quo3 – Internal impacts 2d, external impacts 2Eis
quo4 – Internal impacts 2d, 2h, external impacts 2Eis and 2Ela.
quo5 – external impacts 2Eis
quo6 – external impacts 2Eis
quo7 – external impacts 2Eis
quo8 – internal impacts 1w, external impacts 2Eis, 2Ela
quo9 – internal impacts 2d
quo10 –internal impacts 2v and 2r, external impacts 2Eis
quo11 – external impacts 2Eis, there may be some phrag present.

Impacts for Charlestown and Ninigret Pond

chl1 – external impacts 2Eis and 2Ela, internal impacts 2v
chl2 – external impacts 2Eis, internal impacts 2v
chl3 – internal and external impacts 2v
chl4 – internal impacts 2v
chl5 – internal impacts 2v
chl6 - internal impacts 2v
chl7 – internal and external impacts 2v
chl8 - external impacts 2Eis, internal impacts 2v
chl9 – external impacts 2Eis, internal impacts 2v
chl10 – external impacts 2Eis and 2v, internal impacts 2v
chl11 – external impacts 2Eis, internal impacts 2v
chl12 - external impacts 2Eis
chl13 – external impacts 2Eis, internal impacts 2v
chl14 - external impacts 2Eis, internal impacts 2v
chl15 – external impacts 2Eis and 2Ela
chl16 – external impacts 2Eis
chl17 – external impacts 2Ecr
chl18 – external impacts 2Ecr
chl19 – internal impacts 2v and external impacts 2Ela
chl20 – internal impacts 2h and external impacts 2Eis, possibly phrag in the area

chl21 – internal and external impacts are 2v
chl22- internal impacts 2v, external 2v and 2Eis
chl23 – internal impacts 2v, 2d, external impacts 2Eis and 2v.
chl24 – internal impact 2v
chl25 – external impacts 2Eis and 2Ela, internal impacts 2v and 2r
chl26 – external impacts 2Eis, internal impacts 2v
chl27 – external impacts 2Eis
chl28 – external impacts 2Eis and 2v, internal impacts 2v
chl29 - external impacts 2Eis and 2Ela, internal impacts 2v
chl30 – external impacts 2Eis
chl31 – external impacts 2Eis

Impacts for Trutom Pond

tru1 - Trustom Pond, entire pond is coded as one complex due to cropland on the eastern side. Internal impacts 2v, external 2Ecr and 2v.

Impacts for Cards Pond

car1 – external impacts 2Ecr and 2Eis
car2 – internal impacts 2v, external impacts 2Ecr and 2Eis
car3 – external impacts 2Eis
car4- internal impacts 2v and 2h, external impacts 2Eis and 2v

Impacts for South Kingstown

skg1 – internal impacts 2v, external impacts 2Eis
skg2 – internal impact 2v (only one spot), external impacts 2Eis, 2Ela, 2Ecr (only 2 areas)
skg3 – external impacts 2Eis and 2Ela
skg4 – internal impacts 2v, external impacts 2Eis and 2Ela
skg5 – internal impacts 2v, external impacts 2Eis and 2Ela, also 2v
skg6 – external impacts 2Eis
skg7 – external impacts 2Eis
skg8 – external impacts 2Eis, internal impacts 2v
skg9 – external impacts 2Eis and 2Ela, internal impacts 2v
skg10 – external impacts 2Eis and 2Ela, internal impacts 2v
skg11 – external impacts 2Ela
skg12 - external impacts 2Eis and 2Ela
skg13 - external impacts 2Eis
skg14 - external impacts 2Eis and 2Ela
skg15 - external impacts 2Eis
skg16 - external impacts 2Eis
skg17 - external impacts 2Eis and 2Ela
skg18 - external impacts 2Eis and 2Ela
skg19 - external impacts 2Eis and 2Ela
skg20 - external impacts 2Eis

skg21 - external impacts 2Eis
skg22 - external impacts 2Ela
skg23 - external impacts 2Eis
skg24 - external impacts 2Ela
skg25 - external impacts 2Eis
skg26 - external impacts 2Eis and 2Ela, internal impacts 2v
skg27 - external impacts 2Eis, internal impacts 2r and 2v
skg28 - external impacts 2Eis
skg29 - external impacts 2Eis
skg30 - external impacts 2Ela
skg31 - external impacts 2Eis and 2Ela
skg32 - external impacts 2Eis and 2Ela
skg33 - external impacts 2Eis and 2Ela, internal impacts 2v
skg34 – external impacts 2Eis, internal impacts 2v
skg35 – external impacts 2Eis, internal impact 2v
skg36 – external impacts 2Eis, internal impacts ID 196, phrag present?
skg37 – external impacts 2Ela, internal impacts ID 201, phrag present?
skg38 – external impacts 2Ela
skg39 – external impacts 2Eis
skg40 – external impacts 2Ecr and 2Ela
skg41 – external impacts 2Eis and 2Ela
skg42 – external impacts 2Eis
skg43 – external impacts 2Eis
skg44 – external impacts 2Eis
skg45 – external impacts 2Eis
skg46 – external impacts 2Eis
skg47 – external impacts 2Eis and 2Ela
skg48 – external impacts 2Eis
skg49 – external impacts 2Eis and 2Ela
skg50 – external impacts 2Eis
skg51 - external impacts 2Eis
skg52 - external impacts 2Ela and 2Eis
skg53 - external impacts 2Ela and 2Eis, internal 2v
skg54 - external impacts 2Eis, internal impacts 2h and 2v

Impacts for Little Compton

lcm1 – second pond, external impacts 2 Eis, 2Ecr, and 2Ela
lcm2 – third pond, external impacts 2Eis, 2Ecr, 2Ela and 2Egc, internal impacts 2v and 2x
lcm3 – fourth pond, external impacts 2Eis, 2Ecr, and 2Ela, internal impacts 2v
lcm4 – 5th pond, external impacts 2Ecr
lcm5 – 6th pond, external impacts 2Eis
lcm6 – 7th pond, external impacts 2Ecr, internal impacts 2v
lcm7 – first pond, external impacts 2Ecr
lcm8 – internal impacts 2v, external impacts 2Ecr and 2Ela.

Impacts for New Shoreham (Block Island)
bls1 – external impacts 2Eis, internal impacts 2r and 2v.
bls2 – external impacts 2Eis and 2Ecr, internal impacts 2r.
bls3 – external impacts 2Ela
bls4 – external impacts 2Eis and 2Ela, internal impacts 2r.
bls5 – external impacts 2Eis and 2Ela
bls6 – external impacts 2Ela and 2Eis
bls7 – external impacts 2Eis and 2Ela, internal impacts 2v and 2d
bls8 – external impacts 2Ela and 2Eis
bls9 – external impacts 2Eis
bls10 – external impacts 2Ela and 2Eis
bls11 – external impacts 2Eis and 2Ela, internal impacts 2r, 2v, and 2d
bls12 – external impacts 2Eis and 2Ela
bls13 – internal impacts 2v, external impacts 2Ecr and 2v
bls14 – internal impacts 2v, external impacts 2Eis and 2Ecr (probably pasture land)

APPENDIX C

CORPS SITE VISIT PICTURES

Following are the pictures taken from the Corps site visits to verify and collect additional information for wetlands with potential for restoration. These pictures were taken on 10/31/2007.

Figure C1: Site 158- area off of Point Judith Pond by Pond St. and Billington Ave. showing open water surrounded by with *Spartina* and *Phragmites*.

Figure C2: Across the street from Site 158, there is no obvious culvert but water is seeping under the road.

Figure C3: Site 391/400/409, view of site from trailer park.

Figure C4: Site 391/400/409, view of the site from entrance off of Potter's Pond.

Following figures C5, C6 and C7 shows sites 391/400/409 with views of constriction within entrance channel with upland vegetation.

Figure C5: Sites 391/400/409

Figure C6: Sites 391/400/409

Figure C7: Sites 391/400/409

Figure C8: Site 682- wetland area between mud and Foster Coves off of Ninigret Pond.

Figure C9: View of Site 696 across the street from Site 682, showing a culvert that leads into the wetland area.

Figure C10: View of Site 696 with Ninigret Pond in the background. In foreground is the creek and open water in site 696 that provides water for wetland 682.

Figure C11: Site 1432- showing filled area of former inlet into Winnapaug Pond with *Phragmites*.

Figure C12: Sites 1076 and 1432, looking down the old breach way to the filled area.

Figure C13: Site 1432- looking from far end of filled area into former inlet to Winnapaug Pond.

Figure C14: Upland area connected to site 1432.

Figure C15: Edge of Site 1161, showing area covered by *Phragmites*.

Figure C16: Site 1161- view of the culvert allowing flow into and out of the site.

Figure C17: Site 1161- edge of culvert box with ponded water and most of the site being covered by *Phragmites*.

Figure C18: Site 1165- culvert leading into Site 1161across the road.

Figure C19: Entrance to creeks from Potter Cove leading into sites 1165 and 1167, showing healthy marsh with some upland and *Phragmites* in the background.

Figure C20: Close-up view of sites 1165 and 1167 (the background view of Figure C19).

Figure C21: Upland area west of Site1165.

APPENDIX D

REAL ESTATE INFORMATION

South Kingstown:

Site 400

Location: (Map 92-2/56)
Owner: Eileen R Biancuzzo, 12 Lister Dr, RI 02806
Use: Vacant residential land
Land Area: 4.9 acres
Land Value: $370,400

Location: (Map: 92-2-70)
Owner: Vincent T Izzo Sr.
Use: 43,560 sq.ft residential land and marsh
Land Area: 1.98 acres
Land Value: residential land - $317,600 and marsh land - $900.

Site 409:

Location: (Map: 93-1/1)
Owner: Mary et al Desista Carpenter, Richard J CPA, Trustees, 133 Silver Lake Ave, Wakefield, RI 02879
Use: 43,560 sq.ft residential land and marsh
Land Area: 5.76 acres marsh
Land Value: residential land - $441,300 and marsh land - $2,600

Site 391:

Location: (Map: 92-2-72)
Owner: Vespia, Judith Ann and Vincent Jr., 106 Sycamore Lane, Wakefield, RI 02879
Use: 43,560 sq.ft residential land and marsh
Land Area: 0.66 acres marsh
Land Value: residential land - $317,600 and marsh land - $300

Site: 158
Location: (Map: 69-2/19)
Owner: Phillips, David M and Cindy, 556 Pond St, Wakefield, RI 02879
Use: 43,560 sq.ft residential land and marsh
Land Area: 0.62 acres marsh
Land Value: residential land - $377,200 and marsh land - $900
Location: (Map: 69-2/11)
Owner: Everett L Tefft, c/o Elsie Harvey, 350 Winchester Dr, Wakefield, RI 02879
Use: marsh
Land Area: 11.21 acres marsh
Land Value: residential land - $5,500

CHARLESTOWN

Site: 696
Location: (Map: 5//24)
Owner: State of RI, DEM, 235 Promenade St, Providence, RI 02908
Use: Vacant land
Land Area: 20 acres marsh
Land Value: residential land - $3,712,500

Site: 682
Location: (Map: 5//33)
Owner: Foster Cove Imp Assn, c/o Harold Denfield, 112 West Willow Lane, Charelestown, RI 02813
Use: Vacant land
Land Area: 2.07 acres marsh
Land Value: residential land - $55,100

Site: 682
Location: (Map: 5//35)
Owner: Grosser, Frank and Blanche, 819 Old Litchfield Turnpike, Bethany, CT 06525
Use: Vacant land
Land Area: 1.13 acres marsh
Land Value: residential land - $475,200

WESTERLY

Site: 1161
Location: (Map: 173/7/A)
Owner: Breen Road Properties LLC, c/o Roy Howard, 82 East Ave, Westerly, RI 02891
Use: Marsh
Land Area: 1 acres
Land Value: $288,400

Site: 1076
Location: (Map: 156/51)
Owner: State of RI and Providence Plantations, 1 Capitol Hill, Providence, RI 02908
Use: Marsh
Land Area: 2.7 acres
Land Value: $37,300

LITTLE COMPTON

Site: 8007
Location: (Map: 9//397) 184 Sakonnet Point Rd
Owner: State of RI
Use: marsh
Land Area: 0.05 acres

Land Value: $61,100

Site: 8001 and 8003
Location: (Map: 9//398) 180 Sakonnet Point Rd
Owner: State of RI
Use: marsh
Land Area: 8.9 acres
Land Value: $106,000

NEW SHOREHAM

No real estate information was collected for New Shoreham.

APPENDIX E

SITE VISIT FIELD SHEETS