# **BAR BEACH SALT MARSH RESTORATION** HEMPSTEAD HARBOR, NEW YORK

# **THIRD YEAR MONITORING REPORT**

Submitted to: National Oceanic and Atmospheric Administration New York, New York



*Prepared by:* **The Louis Berger Group, Inc.** Florham Park, New Jersey



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### **TABLE OF CONTENTS**

#### Page

EXECU	JTIVE SUMMARYi	
1.0	INTRODUCTION 1	
2.0	VEGETATION MONITORING	
3.0	NEKTON MONITORING	
4.0	BENTHIC MACROINVERTEBRATE MONITORING11	
5.0	AVIAN MONITORING	
6.0	SUMMARY	
7.0	REFERENCES	

### LIST OF TABLES

Table 1	Monitoring Schedule
Table 2	Plant Species Observed in Sampled Quadrats
Table 3	Summary of Vegetative Ground Cover7
Table 4	Summary of Nekton Sampling Results
Table 5	Summary of Benthic Macroinvertebrate Sampling Results
Table 6	Summary of Avian Sampling Results14
Table 7	Summary of Monitoring Results
Table 8	Restoration Site Comparisons, 2004-200616

### LIST OF FIGURES

Figure 1	Site Location Map	3
Figure 2	Vegetation Transect Map	5
Figure 3	Overview of the Restoration Site	6
Figure 4	Throw Trap Sampling for Nekton	8
Figure 5	Fish Length Frequency Distributions1	0
Figure 6	Benthic Macroinvertebrate Quadrat Sampling 1	1

### **APPENDICES**

Appendix A	Vegetation	Quadrat	Locations	and	Elevations
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- Appendix B Vegetation Field Data
- Appendix C Site Photographs
- Appendix D Nekton Field Data
- Appendix E Benthic Macroinvertebrate Field Data
- Appendix F Avian Field Data
- Appendix G NOAA 2002 Pre-Restoration Monitoring Data

# **EXECUTIVE SUMMARY**

In 2003, The National Oceanic and Atmospheric Administration (NOAA), New York Department of Environmental Conservation, U.S. Fish and Wildlife Service restored the salt marsh in Bar Beach Lagoon, North Hempstead, New York, as part of a Superfund settlement (AES Shoreline Realty) addressing natural resource damages that had occurred as a result of the release of contaminants into Hempstead Harbor. Restoration activities included the removal of substantial volumes of fill consisting of sand, gravel, concrete, and solid waste debris from the site, as well as the physical removal of approximately 0.2 acres of common reed (*Phragmites australis*). Each of the fill removal areas was excavated to sub-grade, backfilled with clean soils, and planted with native wetland and coastal upland plant species. The Town of North Hempstead participated in the restoration through a NOAA Community-based Restoration Program grant award and provided access to the site and removal of the site fill debris.

The Louis Berger Group, Inc. conducted the third year monitoring of the five year monitoring program in May and September of 2006. This monitoring consisted of biological sampling of vegetation, nekton, and benthic macroinvertebrates at the restoration site and at a nearby reference site. Avian monitoring was conducted by an experienced birder (volunteer) affiliated with the North Shore Audubon society and arranged by NOAA staff. The monitoring program was developed in collaboration with NOAA staff, and in accordance with the Final Restoration Plan (NOAA *et al.* 2002).

After the third year of monitoring, the restoration site has met the 85 percent native species vegetative cover requirement. *Phragmites* and other undesirable invasive species have been limited to 10 percent or less of the total vegetative cover of the restored area, as set forth in the restoration plan. Quadrat sampling revealed that an average of 87.8 percent of the restoration site was covered with native vegetation, compared to 22.5 percent recorded during baseline pre-construction monitoring. The average height of *Spartina alterniflora* at the restoration site increased from 93 cm in 2004 to 114 cm in 2006. The percent of *Spartina* which were flowering was higher at the restoration site than at the reference site. Ground cover by *Phragmites* was limited to 0.3 percent of the restoration site.

Monitoring results indicate that nekton density and abundance at the restoration site are greater than that of the reference site. The nektonic community of the restoration site is as diverse as that of the reference site, and species richness of both sites is the same. Monitoring results also suggest that the restoration site supports a more diverse benthic macroinvertebrate community than the reference site. Benthic macroinvertebrate species richness was the same for the two sites, but abundance at the restoration site was considerably lower than that of the reference site due to the presence of well-established beds of the ribbed mussel. The restoration site had lower avian abundance than the reference site, but higher diversity, probably due to differences in the surrounding habitats of each site, as well as the presence of flocking species at the reference site.

The third year monitoring results indicate that restoration efforts to date have been successful in establishing a diverse population of salt marsh plant and animal species. The planted salt marsh grasses are well established and flowering. The coastal shoreline zone in particular, has greater cover than in previous years. Bare patches observed on the marsh at the restoration site in May had filled in by September. Recommendations include removal of mugwort and Japanese knotweed by the gazebo and a stand of *Phragmites* by the boat ramp.

# 1.0 INTRODUCTION

In 2003, The National Oceanic and Atmospheric Administration (NOAA), New York Department of Environmental Conservation, U.S. Fish and Wildlife Service, and the Town of North Hempstead restored the salt marsh in Bar Beach Lagoon (also known as Hempstead Harbor Cove, see Figure 1), North Hempstead, New York, as part of a Superfund settlement addressing natural resource damages that had occurred as a result of the release of contaminants into Hempstead Harbor. Prior to restoration activities, Bar Beach Lagoon consisted of mudflats and sparsely vegetated hummocks, and dense stands of common reed (*Phragmites australis*) covered the high marsh and coastal uplands. Concrete debris and other fill had been dumped along much of the shoreline, possibly for erosion control. Restoration activities included the removal of substantial volumes of fill consisting of sand, gravel, concrete, and solid waste debris from the site. Removal of *Phragmites* was also a component of the project, and involved physical removal of approximately 0.2 acres. Each of the fill removal areas was excavated to sub-grade, backfilled with clean soils, and planted with native wetland and coastal upland plant species.

Smooth cordgrass (*Spartina alterniflora*) was planted in the intertidal zone at elevations from 2.5 to 4 feet National Geodetic Vertical Datum (NGVD). Salt marsh cordgrass (*Spartina patens*) and spikegrass (*Distichlis spicata*) were planted in the high marsh at elevations from 4 to 5 feet NGVD. Between the high marsh and the upland, a coastal shoreline zone consisting of marsh elder (*Iva frutescens*), groundsel-bush (*Baccharis halimifolia*), perennial ryegrass (*Panicum amarum*), and seaside goldenrod (*Solidago sempervirens*) was planted. Upland areas adjacent to the restoration site were seeded with a native warm season grass mixture and various native shrubs were planted in the upland periphery. Additional plantings in 2004 augmented the 2003 plantings where mortality, erosion, and fill compaction occurred. In 2004, switch grass (*Panicum virgatum*) plugs were planted in the upland to address areas that did not respond well to seeding. Virginia creeper (*Parthenocissus virginiana*) was initially planted in the upland area, but because its survival was poor and the primary purpose for the plantings was stabilization of soils, it was not replanted. In the spring of 2005, the Performing Parties Group replanted the center portion of the peninsula area of the restoration site with *Spartina alterniflora* and also erected herbivore-exclusion fence and overhead string. Dead shrubs in the coastal shoreline zone were also replaced and *Spartina patens* was replanted at the eastern end of the site where ice damage had occurred.

As part of the Superfund settlement, a monitoring program was implemented to assess the extent of success of the restoration project. The performance criteria for the restoration project requires 85 percent vegetative cover of the restoration area (marsh and stabilized coastal shoreline) within 5 years of initial planting and minimal re-establishment of *Phragmites* and other undesirable invasive vegetation to 10 percent or less of the total restored area. Performance criteria also included 90 percent survival of *Spartina alterniflora* and shoreline vegetation after two full growing seasons, which was independently evaluated by NOAA and not discussed in this report. In addition, fish, benthic macroinvertebrate, and avian species abundance, richness, and composition must demonstrate a strong positive trend toward and not significantly differ from that of a reference marsh. The reference marsh, located 600 feet to the northeast of the restoration site, is also a fringing marsh and was selected to serve as the reference site for this monitoring program. The baseline reference marsh used by NOAA during pre-restoration monitoring, located approximately half a mile south of Bar Beach Lagoon, was not selected as the reference site for post-construction monitoring because it is larger and similarly exposed as the newly selected reference site. The restoration and reference sites are similar in size, each consisting of approximately 0.75 acres.

On behalf of NOAA, The Louis Berger Group, Inc. conducted the spring component of the third year of monitoring on May 24<sup>th</sup> and 25<sup>th</sup>, of 2006, and the fall monitoring on September 28<sup>th</sup> and 29<sup>th</sup>, of 2006. Nekton and benthic macroinvertebrates were monitored during the spring and fall, while vegetation was only monitored during the fall, in accordance with the schedule presented in Table 1 and agreed upon by Berger and NOAA. Vegetation monitoring occurs annually in the fall, while nekton and benthic monitoring is conducted during the spring and fall, but only every other year. Avian monitoring was conducted by an

experienced birder (volunteer) arranged by NOAA staff. The monitoring program was developed in collaboration with NOAA staff, and in accordance with the Final Restoration Plan (NOAA *et al.* 2002).

	Monitoring Parame			eter
Year	Season	Vegetation	Nekton and Benthos	Avian
2004	Spring			
2004	Fall	~	~	$\checkmark$
2005	Spring			$\checkmark$
	Fall	~		~
2006	Spring		$\checkmark$	$\checkmark$
2000	Fall	$\checkmark$	$\checkmark$	$\checkmark$
2007	Spring			?
2007	Fall	~		?
2000	Spring		$\checkmark$	?
2008	Fall	~	~	?

Table 1.	Monitoring	Schedule.
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# **2.0 VEGETATION MONITORING**

#### 2.1 Methodology

Plant cover at the restoration site and reference site was measured within one-meter square quadrats placed along permanently established transects. The restoration site was sampled along seven transects composed of forty quadrats. Six of these transects were oriented from the upland to the lower edge of the marsh, while the seventh transected the peninsula area from southwest to northeast. The reference site was sampled along three transects composed of ten quadrats, also oriented from upland to the lower edge of the marsh. At NOAA's request, quadrats were arranged so that the first quadrat was positioned in the coastal shoreline zone (above 5 feet NGVD), the second quadrat was placed in the high marsh (4 to 5 feet NGVD), and subsequent quadrats were placed in the low marsh (2.5 to 4 feet NGVD).

The ends of each transect were marked in the field with PVC pipes driven into the substrate and were surveyed with a Trimble Pro XRS Global Positioning System (GPS) with Asset Surveyor. The distance of each quadrat along the transect was measured and recorded to ensure that the same quadrats will be sampled each year. The locations of the vegetation transects appear in Figure 2, and the positions of the transect ends and quadrats are presented in Appendix A. The elevations of each quadrat were measured in 2004 and 2005, to determine if any fill compaction was occurring, but results indicated that there were no discernable elevation changes during this period.

#### 2.2 Results

A summary of vegetation observed within sampled quadrats at the restoration and reference sites is presented in Table 2. A total of 11 species were present within the sampled quadrats at the restoration site, seven of which were planted and four which volunteered, including *Phragmites*. The coastal shoreline zone at the restoration site was primarily vegetated with the planted species *Iva frutescens*, *Panicum amarum*, *Solidago sempervirens*, and *Spartina patens*, while the marsh vegetation consisted almost entirely of *Spartina alterniflora*, *Spartina patens*, and *Distichlis spicata*. Sea blite (*Sueda linearis*) and switchgrass (*Panicum virgatum*) are also present at the restoration site, but were not present within sampled quadrats. Only four species were present within the sampled quadrats at the reference site. Vegetation in the coastal shoreline zone of the reference site was dominated by *Phragmites*, *Spartina alterniflora*, *Parthenocissus cinquefolia*, and *Iva frutescens*, while marsh vegetation consisted exclusively of *Spartina alterniflora* and *Phragmites*.

Common Name	Scientific Name	Restoration Site	Reference Site
marsh orach	Atriplex patula	$\checkmark$	
groundsel tree*	Baccharis halimifolia	$\checkmark$	
spike grass*	Distichlis spicata	$\checkmark$	
high tide bush*	Iva frutescens	$\checkmark$	$\checkmark$
perennial ryegrass*	Panicum amarum	$\checkmark$	
Virginia creeper*	Parthenocissus cinquefolia		1
common reed	Phragmites australis	$\checkmark$	$\checkmark$
pearlwort	Sagina procumbens	$\checkmark$	
glasswort	Salicornia europa	$\checkmark$	
seaside goldenrod*	Solidago sempervirens	$\checkmark$	
smooth cordgrass*	Spartina alterniflora	$\checkmark$	1
salt meadow grass*	Spartina patens	$\checkmark$	

Table 2. Plant Species Observed in Sam	pled Quadrats.	
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\*Species planted or seeded at the restoration site





#### Figure 3. Overview of the Restoration Site.

Table 3 presents a summary of vegetative ground cover, including cover by *Phragmites*, for each transect in the restoration and reference sites, as well as the mean value for these parameters across all transects at each site. Quadrat sampling indicates that native vegetative cover of the restoration site was 87.8 percent, representing a slight increase over the 2005 observation of 84 percent native cover. *Phragmites* accounted for 0.3 percent of cover, representing a very slight decrease from the 2005 observation of 0.4 percent *Phragmites* cover. Total native vegetative cover of quadrats at the reference site was 66 percent, with *Phragmites* covering 14 percent of ground.

Prior to restoration activities, the upper elevations of the restoration site were dominated by *Phragmites*, while lower elevations were either unvegetated, or contained some *Spartina alterniflora*. Sampling conducted by NOAA in 2002 before the restoration indicated that total plant cover of the restoration site was approximately 47 percent, with *Spartina alterniflora* covering 22.5 percent of sampled quadrats and *Phragmites* covering 14.5 percent of quadrats sampled. High tide bush, spikegrass, poison ivy (*Toxicodendron radicans*), mugwort (*Artemisia vulgaris*) sea lavender (*Limonium* sp.), and glasswort were also present, but accounted for relatively little cover.

Mean *Spartina alterniflora* height within quadrats at the restoration site was 114 cm, an increase over the 103 cm average height in 2005, which was also an increase over the 93 cm observed in 2004. In 2002, prior to the restoration, NOAA staff measured *Spartina alterniflora* height at the restoration site, finding the mean height of the remnant plants in the lower tidal elevations to be 116 cm. The mean height of plants in quadrats at the reference site was 108 cm, similar to the 110 cm average height in 2005. After four growing seasons, plants at the restoration site have reached the average height of plants there prior to the restoration and plants at the reference site. At the restoration site, 66.1 percent of *Spartina alterniflora* measured were

flowering, while at the reference site, 51.9 percent of plants sampled were flowering. Flowering data were not collected in 2004 or 2005, so no comparisons are possible.

Transect	Number of Quadrats	Mean Percent Vegetative Ground Cover for All Species Excluding <i>Phragmites</i>	Mean Percent Vegetative Ground Cover of <i>Phragmites</i>	Mean Total Percent Cover
		Restoration Si	te	
1	5	86	0	86
2	5	91	0	91
3	5	95	0	95
4	5	66	0	66
5	5	92	2	94
6	10	90	0	90
7	5	93	0	93
Mean (all	quadrats)	87.8	0.3	88
		Reference Sit	e	
8	3	82	3	85
9	4	46	33	79
10	3	77	0	77
Mean (all	quadrats)	66	14	80

Table 3. S	Summary	of V	egetative	Ground	Cover
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Plant field data documenting the ground cover estimates for the restoration and reference sites, as well as *Spartina alterniflora* height measurements and flowering status, are presented in Appendix B. Photographs taken along each transect at the restoration site appear in Appendix C. Appendix G contains NOAA pre-restoration monitoring of percent plant cover by species at the restoration site.

# **3.0 NEKTON MONITORING**

#### 3.1 Methodology

Nekton use of the restoration and reference sites was investigated by means of throw trap sampling conducted around the time of high tide. Nekton sampling was conducted in May and September of 2006. Fifteen stations were sampled, following the protocol established in conjunction with NOAA in 2004. Ten stations were sampled at the restoration site, and five were sampled at the reference site. The throw locations ranged from high marsh to low marsh. The throw trap consisted of an open-ended one-meter square polycarbonate box measuring 75 cm in height. Sampling was conducted by throwing the trap onto the flooded marsh surface so that the open end fully contacted the substrate, preventing any escape. Sampling locations were limited to areas of relatively flat substrate where *Spartina alterniflora* growth was not so dense as to prohibit the trap from fully contacting the substrate. Fish and invertebrates were removed from the trap by passing a meter-wide net of 0.25-inch mesh through the trap. Repeated passes of the net through the trap were made until three successive passes failed to produce any fish or shrimp. All fish were identified to species and measured before being released. Invertebrates were identified to genus and counted.



Figure 4. Throw Trap Sampling for Nekton.

#### 3.2 Results

Table 4 presents the pooled spring and fall nekton sampling results, including species richness, abundance, diversity, and density for nekton collected in the throw traps at the restoration and reference sites. Nekton field data for the spring and fall sampling events are provided in Appendix D. A total of four fish species were caught at the reference and restoration sites: mummichog (*Fundulus heteroclitus*), striped killifish (*Fundulus majalis*), Atlantic silverside (*Menidia menidia*), and sheepshead minnow (*Cyprinodon variegatus*). Grass shrimp (*Palaeomonetes* sp.) were also included in the analysis, as they were caught in significant numbers. All of these species were caught by NOAA during pre-restoration monitoring. With the exception of the one sheepshead minnow caught, all of these species had previously been caught during post-construction monitoring.

Overall fish abundance, as measured by the mean number of fish per trap throw, was 4 fish at the restoration site, which was higher than the abundance of 1.6 fish at the reference site. Very few fish were caught during the spring sampling event, possibly because the *Spartina alterniflora* height was only 30 to 40 cm at this time of year. Fish density for the restoration site, with a mean of 7.9 fish per cubic meter of water, was markedly higher than the density of 4.2 fish at the reference site. Fish diversity, as measured by the Shannon-Weaver Diversity Index, was 0.367 at the restoration site, which was very similar to the reference site diversity index of 0.360. Grass shrimp abundance and density were higher at the restoration site than at the reference site. At the restoration site, grass shrimp mean abundance was 13.8 shrimp per throw, and the density was 27.6 shrimp per cubic meter of water. At the reference site, mean shrimp abundance was 8.2 shrimp per throw, and the density was 21.6 shrimp per cubic meter of water.

Species		Restoration Site (10 throws)		Reference Site (5 throws)	
Common Name	Scientific Name	Number Caught	Mean Abundance	Number Caught	Mean Abundance
Mummichog	Fundulus heteroclitus	44	2.2	10	1
Striped killifish	Fundulus majalis	31	1.6	5	0.5
Atlantic silversides	Menidia menidia	4	0.2	0	
Sheepshead minnow	Cyprinodon variegatus	0		1	0.1
Grass shrimp	Palaemonetes sp.	275	13.8	82	8.2
All Fish Species Fish Species Richness Fish Diversity Index		79	4.0	16	1.6
			3		3
		0.367		0.360	
Fish Density (fish per m <sup>3</sup> )		7.9		4.2	
Grass Shrin	np Density (shrimp per m <sup>3</sup> )	27.6 21.6		21.6	

Table 4.	Summary	of Nekton	Sampling	<b>Results.</b>
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The length frequency distributions of *Fundulus heteroclitus* and *Fundulus majalis* from the fall sampling event appear in Figure 5. Lengths from all trap throws within the restoration sites were pooled, as were all throws within the reference site. Very few *Menidia menidia* or *Cyprinodon variegatus* were caught during the fall, and so these species were not plotted. Also, few fish were caught during the spring sampling event (n=6), and so these fish were not plotted. Members of the 2005 and 2006 year classes of both *Fundulus* species were found at the restoration site and reference site during the fall, with these classes consisting of length categories of approximately 30-55 mm and 70-100 mm, respectively.







# 4.0 BENTHIC MACROINVERTEBRATE MONITORING

#### 4.1 Methodology

Benthic macroinvertebrate monitoring was conducted in May and September of 2006 using 0.25-meter square quadrats randomly laid on the marsh surface. All macroinvertebrates observed within the quadrats were identified and recorded. In the case of fiddler crabs, burrows were counted. Quadrat sampling was stratified in order to sample both high marsh and low marsh habitats, with the majority of quadrats located in the low marsh, which accounts for most of the area of both sites. Twenty-five quadrats were sampled at the restoration site (five in the high marsh and twenty in the low marsh), and fifteen quadrats were sampled at the reference site (three in the high marsh and twelve in the low marsh), except in September, when only twelve quadrats were sampled (three in the high marsh and nine in the low marsh) due to the onset of heavy rains on the final sampling day.

#### Figure 6. Benthic Macroinvertebrate Quadrat Sampling.

#### 4.2 Results

Table 5 presents macroinvertebrate species composition, abundance, richness, and diversity for the restoration and reference sites, pooled from spring and fall quadrat sampling. Macroinvertebrate field data for each sampling event are provided in Appendix E. A total of seven macroinvertebrate species were found in quadrats at the restoration site and the reference site. Ribbed mussels (*Geukensia demissa*) and mud snails (*Nassarius obsoletus*, also known as *Ilyanassa obsoleta*) dominated the macroinvertebrate communities at both sites. Burrows of the mud fiddler crab (*Uca pugnax*) were present at both sites, but were much more abundant at the restoration site. Individuals of several other crab and snail species were also observed.

Macroinvertebrate abundance in the high marsh was low, relative to the low marsh. At both the restoration site and reference site, just a few fiddler crab burrows and marsh snails were present in the high marsh.

Overall, mean macroinvertebrate abundance at the restoration site was 63.3 individuals per quadrat, which is substantially lower than the mean of 189.6 individuals per quadrat at the reference site. This difference, also observed in 2004, is due to the high abundances of ribbed mussels and mud snails at the reference site, as most other macroinvertebrates occurred at both sites in relatively similar abundances. Ribbed mussels were more than three times as abundant at the reference site than at the restoration site. The distribution of ribbed mussels at the restoration site was generally limited to the lower edge of the low marsh, where *Spartina alterniflora* existed prior to the restoration, whereas high densities of this species are present nearly thoughout the *Spartina alterniflora* at the reference site. Ribbed mussels will continue to colonize the restoration site, but it is unknown if they will ever approach the high densities observed at the reference site. Species richness at both sites was six, though each site had one species not found at the other. Macroinvertebrate diversity, as measured by the Shannon-Weaver Diversity Index, was 0.35 at the restoration site, which was higher than the reference site diversity index of 0.305, both of which were very close to the diversities observed in 2004 (restoration=0.349; reference =0.285).

	Species	Restoration Site	Reference Site
Common Name	Scientific Name	Mean Abundance (per ¼ m <sup>2</sup> )	Mean Abundance (per ¼ m <sup>2</sup> )
Mud fiddler crab	Uca pugnax	2.4	0.6
Asian shore crab	Hemigrapsus sanguineus		0.1
Green crab	Carcinus maenas	0.02	0.04
Ribbed mussel	Geukensia demissa	20.6	75.6
Salt marsh snail	Melampus bidentatus	0.04	0.1
Mud snail	Nassarius obsoletus	40	113.1
Rough periwinkle	Littorina saxatilis	0.2	
	All Species	63.3	189.6
	Species Richness	6	6
	Diversity Index	0.35	0.305

#### Table 5. Summary of Benthic Macroinvertebrate Sampling Results.

Differences between the physical conditions at the restoration and reference sites may also be responsible for some macroinvertebrate species distributions. For example, the greatest density of fiddler crab burrows was in the peninsula area of the restoration site, where the substrate is nearly level, whereas the reference site has a relatively uniform slope. Differences in sediment grain size between the sites are also probably responsible for the observed differences in benthic communities. The reference site is also more exposed to wave energy than the restoration site and its high marsh zone is characterized by sparse vegetation and heavy cover of wrack and debris.

Horseshoe crabs (*Limulus polyphemus*) were observed paired up for mating on the peninsula during the May sampling event and numerous nest pits were present near the tip of the peninsula and near transect 4. Careful excavation of several pits revealed that they contained eggs. Numerous paired crabs and nest pits were also present across the lagoon along the sandy shoreline.

# 5.0 AVIAN MONITORING

#### 5.1 Methodology

Avian monitoring was conducted by an ornithologist from the North Shore Audubon Society arranged by NOAA. During 2006, monitoring was conducted each month and typically at least twice a month, for a total of 39 sampling events. The ornithologist spent 20 minutes at the restoration site and 20 minutes at the reference site, and noted the bird species present within each site, their numbers and activity, as well as the weather and tide conditions. Birds within 100 yards of the restoration and reference sites were also noted, but not included in the analysis, as they were generally flying through the area, or were between the sites in the parking lot or on the power lines or towers.

#### 5.2 Results

Table 6 presents avian species abundance, richness, composition, and diversity for the restoration and reference sites. Avian monitoring data are provided in Appendix F. Twenty avian species were observed at the restoration site, while twelve were observed at the reference site. Mean avian abundance per observation at the restoration site was 3.7, which was considerably lower than the mean of 8.5 birds per observation at the reference site. Avian diversity, as measured by the Shannon-Weaver Diversity Index, was 0.992 at the restoration site, which was considerably higher than the reference site diversity index of 0.672. Both songbirds and waterbirds were well represented at the restoration site, while the bird community at the reference site was consisted almost entirely of the flocking species Canada goose, Ring-billed gull, and the non-native European starling. The greater avian species richness and diversity of the restoration site as compared to the reference site and the difference in species composition are likely due to bordering habitat differences. The waters adjacent to the restoration site are less exposed to wind and waves than the reference site and the restoration site is nearly surrounded by densely forested habitat providing a close source of food and shelter for songbirds. The observed differences in species composition and abundance between the restoration site and reference site were very similar to observations presented in the Year 2 monitoring report.

Spec	ies	Restora	tion Site	Refere	nce Site		
Common Name	Scientific Name	Number of Individuals	Mean Abundance	Number of Individuals	Mean Abundance		
Canada Goose	Branta canadensis	50	1.3	132	3.4		
Mute Swan	Cygnus olor	12	0.3	12	0.3		
Mallard	Anas platyrhynchos	4	0.1	17	0.4		
Great Blue Heron	Ardea herodias	1	0.03	0			
Little Blue Heron	Egretta caerulea	1	0.03	0			
Great Egret	Ardea alba	3	0.1	5	0.1		
Snowy Egret	Egretta thula	2	0.1	2	0.1		
Black-crowned Night Heron	Nycticorax nycticorax	4	0.1	0			
Belted Kingfisher	Ceryle alcyon	2	0.1	0			
Double-crested Cormorant	Phalacrocorax auritus	1	0.0	0			
Herring Gull	Larus argentatus	0		3	0.1		
Great Black-backed Gull	Larus marinus	0		1	0.03		
Laughing Gull	Larus atricilla	0		2	0.1		
Ring-billed gull	Larus delawarensis	0		68	1.7		
Robin	Turdus migratorius	1	0.03	0			
Mourning Dove	Zenaida macroura	8	0.2	0			
Red-winged Blackbird	Agelaius phoeniceus	19	0.5	0	1449		
Savannah Sparrow	Passerculus sandwichensis	2	0.1	0			
Song Sparrow	Melospiza melodia	10	0.3	2	0.1		
Goldfinch	Carduelis tristis	2	0.1	0			
Northern Mockingbird	Mimus polyglottos	3	0.1	0			
Willow Flycatcher	Empidonax trailli	1	0.03	0			
Grackle	Quiscalus quiscula	0		1	0.03		
House Sparrow	Passer domesticus	15	0.4	0			
House Finch	Carpodacus mexicanus	4	0.1	0			
Starling	Sturnus vulgaris	0		86	2.2		
	All species	145	3.7	331	8.5		
	Species Richness	2	20	1	2		
	Diversity Index	0.9	992	0.672			

### Table 6. Summary of Avian Monitoring Results.

# 6.0 SUMMARY

After the third year of monitoring, the restoration site has met the 85 percent native species vegetative cover requirement and re-establishment of *Phragmites* and other undesirable invasive species has been limited to 10 percent or less of the total restored area, as set forth in the restoration plan. Quadrat sampling revealed that an average of 87.8 percent of the restoration site was covered with native vegetation. Ground cover by *Phragmites* was limited to 0.3 percent of the restoration site. Comparisons with NOAA pre-restoration monitoring indicate substantially greater coverage of the restoration site with native wetland vegetation, and the near-total eradication of *Phragmites*. In 2002, prior to the restoration, only 47 percent of the site had vegetative cover, nearly a third of which consisted of *Phragmites*. Table 7 summarizes the monitoring results for all parameters investigated at the restoration and reference sites in 2006.

Resource	Monitoring Result	Restoration Site	Reference Site	Restoration Site compared to Reference site
	Percent Ground Cover (excluding Phragmites)	87.8	66	+
Vegetation	Percent Cover by Phragmites	0.3	14	+
	Species Richness	11	4	+
	Mean Abundance	11.6	1.6	+
	Species Richness	3	3	<u> </u>
Nekton	Diversity Index	0.367	0.36	=
	Mean Fish Density (fish per m <sup>3</sup> )	7.9	4.2	+
	Mean Shrimp Density (grass shrimp per m <sup>3</sup> )	27.6	21.6	+
Denthia	Mean Abundance	63.3	189.6	-
Macroinvertebrates	Species Richness	6	6	=
Madronivortobratob	Diversity Index	0.35	0.305	+
	Mean Abundance	3.7	8.5	-
Avian	Species Richness	20	12	+
	Diversity Index	0.992	0.672	+

#### Table 7. Summary of 2006 Monitoring Results

Monitoring results indicate that the nekton community of the restoration site is as diverse as that of the reference site. Monitoring results also suggest that the restoration site supports more diverse benthic macroinvertebrate and avian communities than the reference site. Species richness of nekton and benthic invertebrates at the restoration site were equal to that of the reference site. Fish and grass shrimp density and abundance at the restoration site were greater than that of the reference site. Benthic macroinvertebrate abundance at the restoration site was considerably lower than that of the reference site, but this is due to high densities of ribbed mussels at the reference site. The expansion of the existing mussel beds at the restoration site is expected to take years, as the dense mussel beds observed at the reference site (extrapolated at over 1,000 mussels per m<sup>2</sup> in some areas) are relatively undisturbed and have certainly been present for decades. Avian diversity and species richness at the restoration site are greater than that of the reference site, due to the presence of three flocking species, including a non-native species, at the reference site. Differences in the composition of the avian communities at the restoration and reference site are probably due to differences in the surrounding habitats of each site.

Table 8 summarizes the parameters monitored at the restoration site in 2004, 2005, and 2006. The vegetative monitoring data are directly comparable across years. The nekton, benthic, and avian data are not directly comparable across years, as these parameters were monitored according to different schedules. The 2004

avian data only included the period from October to December of 2004, as opposed to the year-round data collected in 2005 and 2006. Additionally, the nekton data for 2004 were only collected in the fall, when the marsh vegetation is at its tallest, resulting in a greater amount of sheltered habitat and high catches of fish and shrimp during sampling. The 2006 nekton data includes sampling in May, when the marsh grass was still short, and few fish or shrimp were caught. Likewise, the benthic data for 2006 included spring and fall sampling, while the 2004 data only consisted of fall sampling. It should also be noted that the data include only species which were found within sampled quadrats. Other species, such as horseshoe crabs and amphipods, were observed at the restoration site during sampling.

The percent cover of native vegetation at the restoration site has increased every year since 2004. The average height of *Spartina alterniflora* has also increased every year since 2004. The presence of *Phragmites* at the site is low, and has remained essentially unchanged since 2004. The nekton and benthic macroinvertebrate monitoring data indicate that restoration site supports diverse nektonic and benthic communities. Several species of snails and crabs not encountered by NOAA prior to restoration in 2002 are now common inhabitants (marsh snail, rough periwinkle, green crab, and Asian shore crab). Avian monitoring data also indicate that the restoration site supports a diverse avian community, with songbirds and waterbirds being well represented.

Resource	Monitoring Result	2004	2005	2006
	Percent Ground Cover (excluding Phragmites)	83	84	87.8
Vocatation	Percent Cover by Phragmites	0.5	0.4	0.3
vegetation	Species Richness	12	11	11
	Mean Spartina alterniflora height	93	103	114
	Mean Abundance	21.6	NS	11.6*
Nekton	Species Richness	3	NS	3*
	Diversity Index	0.337	NS	0.367*
Deathia	Mean Abundance	76.8	NS	63.3*
Bentnic	Species Richness	6	NS	6*
Macionivertebrates	Diversity Index	0.349	NS	0.35*
	Mean Abundance	4.9	3	3.7
Avian	Species Richness	8	23	20
	Diversity Index	0.771	1.137	0.992

#### Table 8. Restoration Site Comparisons, 2004-2006

NS=not sampled

Values followed by an asterisk (\*) are results of pooled spring and fall data

#### Management Recommendations

The third year monitoring results indicate that restoration efforts to date have been successful in establishing a diverse population of salt marsh plant and animal species. The planted salt marsh grasses and coastal shoreline zone vegetation have become well established. Based upon monitoring results, Berger does not recommend any planting at this time. *Phragmites* presence is minimal at the restoration site, however, there is a small stand of *Phragmites* along the shoreline near the boat ramp, as well as some mugwort and Japanese knotweed near the gazebo. It is recommended that the Town of North Hempstead, as owner of the property, remove these invasive plants under the supervision of a qualified botanist.

# 6.0 REFERENCES

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## APPENDICES

APPENDIX A VEGETATION QUADRAT LOCATIONS AND ELEVATIONS

				Referen	nce Site				
	(transe	ect lengths and qua	adrat location	Transect and C	Quadrat positio	n easure laid betwee	n the PVC end pip	es)	
End	northing	easting	Quadrat	Distance from lower pipe (m)	End	northing	easting	Quadrat	Distance from lower pipe (m)
T1up	240496.692	1079543.771	1	21.0	T8up	240917.997	1080339.707	1	14
T1low	240443.858	1079592.021	2	18.3	T8low	240865.224	1080350.428	2	6.1
			3	13.8		T8 total length 16	.0 m	3	0.7
	11 total length 22.	07 m	4	7.7	T9up	240863.950	1080015.822	1	18.5
			5	0.9	T9low	240794.065	1080028.913	2	14.8
T2up	240473.546	1079513.559	1	21.0		T9 total length 21	6 m	3	6.7
T2low	240411.422	1079547.602	2	18.4		ro total longar er	.0111	4	0.5
	To total least of	05	3	15.8	T10up	240851.720	1079907.820	1	12.3
	12 total length 21.	95 M	4	7.7	T10low	240792.253	1079905.867	2	5.6
			5	0.5		T10 total length 19	9.0 m	3	0.6
T3up	240471.818	1079476.992	1	17.6					
T3low	240413.046	1079475.841	2	15.2					
	T0 10101 100 010 17	05	3	9.8					
	13 total length 17.	95 M	4	4.9					
			5	0.6					
T4up	240481.267	1079420.387	1	15.1					
T4low	240425.061	1079411.027	2	12.6					
	T4 total length 17	50 m	3	7.8					
	14 total length 17.	30 11	4	5.4					
			5	0.5					
T5up	240482.271	1079329.557	1	9.9					
T5low	240444.181	1079324.130	2	7.7					
	T5 total length 12	.1 m	3	5.3					
	i o to la longar re		4	2.9					
			5	0.7					
T6up	240451.950	1079149.276	1	47.4					
T6low	240317.391	1079242.701	2	46.8					
			3	42.4					
			4	37.8					
	T6 total length 50	1 m	5	30.8					
	To total length 50	.1.111	6	23.4					
			7	17.4					
			8	11.5					
			9	5.8					
			10	0.7					
17west	240359.023	1079164.397	1	26.7					
17east	240397.675	1079243.907	2	21.9					
	T7 total length 27	.3 m	3	11.8					
	4		4	0.7					
			5	0.7					

### Bar Beach Vegetation Monitoring Quadrat Locations

### APPENDIX B VEGETATION FIELD DATA

2006 Bar Beach Vegetative Cover Data																																								
Restoration Site		Tra	anse	ct 1			Tr	anse	ct 2			Tr	anse	ct 3			Tra	anse	ct 4			T	anse	ct 5						Tran	sect 6	5				1	Tr	ranse	ct 7	
Quadrat	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5
Spartina alterniflora	10	10	95	100	55	0	5	100	100	90	0	45	100	95	80	0	0	60	80	10	0	45	95	90	90	0	5	85	100	100	90	70	60	95	95	100	75	95	100	95
Spartina patens	5	0	0	0	0	20	0	0	0	0	30	10	0	0	0	0	70	0	0	0	20	0	0	0	0	10	35	0	0	0	0	0	0	0	0	0	0	0	0	0
Distichlis spicata	55	90	0	0	0	45	90	0	0	0	20	45	0	0	0	75	30	0	0	0	40	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salicornia europa	0	0	0	0	0	0	5	+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atriplex patula	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0	0	0	0	+	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sueda linearis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Baccharis halimifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iva frutescens	10	0	0	0	0	0	0	0	0	0	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	85	60	0	0	0	0	0	0	0	0	0	0	0	0	0
Phragmites australis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Panicum amarum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solidago semipervirens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagina procumbens	+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parthenocissus cinquefolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% dead vegetation	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% open/mud/water	20	0	5	0	45	20	0	0	0	10	0	0	0	5	20	10	0	40	20	90	0	5	5	10	10	0	0	15	0	0	10	30	40	5	5	0	25	5	0	5
% vegetative ground cover	80	100	95	100	55	65	100	100	100	90	100	100	100	95	80	80	100	60	80	10	100	95	95	90	90	100	100	85	100	100	90	70	60	95	95	100	75	95	100	95

Reference Site	Tra	ansed	t 8		Trans	sect 9		Tra	nsec	10
Quadrat	1	2	3	1	2	3	4	1	2	3
Spartina alterniflora	0	85	90	0	30	100	50	95	80	55
Spartina patens	0	0	0	0	0	0	0	0	0	0
Distichlis spicata	0	0	0	0	0	0	0	0	0	0
Salicornia europa	0	0	0	0	0	0	0	0	0	0
Atriplex patula	0	0	0	0	0	0	0	0	0	0
Sueda linearis	0	0	0	0	0	0	0	0	0	0
Baccharis halimifolia	0	0	0	0	0	0	0	0	0	0
Iva frutescens	70	0	0	0	0	0	0	0	0	0
Phragmites australis	10	0	0	80	50	0	0	0	0	0
Panicum amarum	0	0	0	0	0	0	0	0	0	0
Solidago semipervirens	0	0	0	0	0	0	0	0	0	0
Sagina procumbens	0	0	0	0	0	0	0	0	0	0
Parthenocissus cinquefolia	0	0	0	5	0	0	0	0	0	0
% dead vegetation	0	0	0	0	0	0	0	0	0	0
% open/mud/water	20	15	10	15	20	0	50	5	20	45
% vegetative ground cover	80	85	90	85	80	100	50	95	80	55

+ = present, but covers less than 1 percent of quadrat

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																			Re	stora	atio	n Sit	e																	
		T	anse	ct 1			Tr	anse	ct 2			T	ranse	ct 3			Т	ranse	ect 4			T	ranse	ect 5						Trans	sect (	6					Tr	ansec	ct 7	
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	56	76	130	128	111		61	116	142	113		94	148	118	74		31	91	139	145		83	151	140	159		178	101	144	124	67	16	43	154	51	187	135	122	105	123
	32	158	94	140	80		56	140	121	129		81	154	97	137			24	136	34		121	114	139	151		113	74	131	103	92	32	96	121	100	160	149	113	120	142
	29	166	76	137	149		28	130	135	27		76	158	149	33			21	183	15		147	121	150	183		98	71	147	106	80	14	11	178	104	193	181	112	121	142
	37	120	91	164	107		65	132	148	109		82	126	139	114			29	121	37		113	86	157	186		77	31	150	114	18	33	85	187	79	167	134	95	116	189
	36	60	79	159	87		56	125	174	131		103	150	159	67			42	125	20		87	106	128	191		100	84	182	123	73	81	9	126	129	192	152	75	115	132
	57		101	141	143		60	121	167	150		104	163	123	137			32	118	72		123	115	139	179			99	161	149	69	36	52	44	158	203	112	79	96	55
	34		80	149	114			139	173	138		93	169	146	121			43	163	99		99	103	191	159			111	162	127	47	88	102	31	161	206	187	115	121	118
0	36		102	139	40			65	104	119		87	152	124	147			76	164	82		123	83	135	123			95	109	142	144	60	16	188	160	94	92	75	144	133
	46		81	163	77			79	106	145		83	170	128	144			68	152	46		82	113	164	114			113	155	83	81	79	13	103	142	179	190	62	101	188
			93	160	98			104	119	75		87	132	133	115			68	166	185		70	119	130	110			75	188	87	82	56	13	175	146	199	137	110	135	145
			100	146	94			113	126	128		97	140	160	157			105	143	13		140	98	131	24			122	117	90	103	59	10	114	173	181	163	111	138	149
		_	130	140	102			120	137	137		82	158	178	152			82	153	16		102	95	127	17			128	152	90	72	66	62	160	181	152	220	147	137	194
			113	136	116			143	133	106		123	172	183	147			126	49	12		156	107	156	126			183	111	95	76	45	18	110	144	181	37	97	114	155
			86	148	103			133	139	83		111	206	154	143			96	70	70		136	117	129	167			97	164	81	79	19	117	144	202	192	34	96	119	150
			104	150	131			91	157	61		109	139	184	86			91	25	148		161	127	141	151			104	130	134	119	28	42	134	183	190	16	118	93	86
			172	154	102			101	157	82		113	144	177	64			65	55	173		104	101	106	206			113	141	134	122	33	43	175	128	65	153	107	102	95
			112	169	60			89	162	144		115	118	170	145			98	161	86		126	112	116	187			105	159	116	106	45	52	164	129	54	175	113	112	156
			82	171	63			122	169	119		138	138	169	142			78	175			99	85	135	42			90	53	132	103	26	40	124	62	134	199	114	116	107
			103	178	132			118	137	144		120	162	168	139			74	179			85	68	97	183			104	35	77	112	55	61	126	133	192	120	145	123	184
			100	161	127			66	134	137		128	156	208	142			75	142			122	93	100	196			114	7	48	130	57	31	159	126	131	164	111	25	152

### 2006 Bar Beach Sparting alterniflora height (in centimeters)

1		1	-	Re	fere	nce	Site			d'an
	Tr	ansed	ct 8		Trans	sect 9		Tra	nsect	t 10
Quadrat	1	2	3	1	2	3	4	1	2	3
		203	126		57	123	23	85	128	161
		145	105		56	146	16	117	116	143
		147	42		41	149	48	94	131	26
		136	14		42	129	132	78	188	95
		123	19		37	123	49	80	106	155
		120	68		43	172	34	71	119	136
		109	71		44	116	35	87	112	120
		106	119		61	155	84	147	152	128
		139	168		94	157	81	95	188	169
		128	146		81	178	104	104	196	158
		145	148	_	61	163	66	149	160	160
		124	153		64	176	110	106	170	143
		128	157		27	164	106	122	135	104
		142	139		75	161	22	87	149	85
		151	117		64	163	21	88	103	32
		46	116		36	124	29	83	84	126
		63	132		58	150	128	112	82	128
		138	152		54	105	135	107	131	106
		102	139		63	139	68	150	121	80
		201	145		45	131	13	154	142	68

Measurements in bold font represent flowering plants

### APPENDIX C SITE PHOTOGRAPHS



Restoration site-view of transect 1 from upland end.



Restoration site-view of transect 2 from upland end.



Restoration site-view of transect 3 from upland end.



Restoration site-view of transect 4 from upland end.



Restoration site-view of transect 5 from upland end.



Restoration site-view of transect 6 from upland end.



Restoration site-view of transect 7 from west end.



Restoration site-view from boat ramp.



Reference site, view from boat ramp.



Reference site-view of transect 10.



Reference site-view of transect 9.



Reference site-view of transect 8.



Horseshoe crab excavations on peninsula at restoration site, May 2006.



### APPENDIX D NEKTON FIELD DATA

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Soring 2005 Fish	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
Data	, Restoration, near T4, high marsh	5/24/06	40	9:35 AM	10:49 AM
Species	Fundulus heterociitus	Fundulus majalis	Menidia menidia	Paeleomonetes sp.	
Total Caught	0	Q	0	9	
Length (mm) 21					
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Spring 2006 Fich	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
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Data	Restoration, on T5, high marsh	5/24/06	25	9:35 AM	10:41 AM
Species	Fundulus heteroclitus	Fundulus majalis	Menidia menidia	Paeleomonetes sp.	
Total Caught	3	0	0	5	
Length (mm) 21 22	······	· · · · · · · ·	<del>.</del> .	· · ·	<u> </u>
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Spring 2006 Fish	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
Data	Restoration, between T6 and T5 high marsh	5/24/06	40	9:35 AM	10:32 AM
Species	Fundulus heteroclitus	Fundulus maialis	Menidia menidia	Paeleomonetes	
Total Caught	0	0	D	зр. 9	
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Spring 2006 Field	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
Data	Restoration, between T4 and T5, low marsh	5/24/06	65	9:35 AM	11:19 AM
Species	Fundulus			Paeleomonetes	
Opecies .	heteroclitus	Fundulus majalis	Menidia menidia	sp.	
Total Caught		<u>P</u>	0	35	
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Spring 2006 Fich	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
Data	Restoration, near T5, low marsh edge	5/24/06	75	9:35 AM	11:26 AM
Species	Fundulus			Paeleomonetes	
Total Caucht	heteroclitus	Fundulus majalis	Menidia menidia	<u>sp.</u>	
Length (mm) 21	0	~ <u>- </u>	0		
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Spring 2005 Eich	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
Data	Restoration, near T3, low marsh	5/24/06	50	9:35 AM	11:09 AM
Species	Fundulus heteroclitus	Fundulus meialis	Menidia menidia	Paeleomonetes sp.	
Total Caught	0	0	_ 0	32	
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Sadas 2006 Eich	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
Data	Restoration, between 11 and T2, low marsh erice	5/24/06	45	9:35 AM	10:55 AM
Species	Fundulus	<b>F</b>		Paeleomonetes	
Total Caught	neterociitus 0	Fundulus majalis 0	Menidia menidia D	sp. 7	
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Spring 2006 Fish	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
Data	Restoration, peninsula T6, outer	5/24/05	27	9:35 AM	10:13 AM
Species	Fundulus		1	Paeleomonetes	
Species	hererociitus	Fundulus majalis	Menidia menidia	sp.	
Total Caught	0	0	0	3	
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Spring 2006 Fish	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
Data	Restoration, peninsula on T6 inner end	5/24/06	25	9:35 AM	9:50 AM
Species	Fundulus			Paeleomonetes	
Trailor unb	heteroclitus	Fundulus mejalis	Menidia menidia	sp.	
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Spring 2006 Fish	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
Data	Restoration, peninsula 17	5/24/06	33	9:35 AM	9:58 AM
Species	Fundulus heterociitus	Fundulus majalis	Menidia menidia	Paeleomonetes sp.	
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	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
Spring 2006 Fish Data	Reference, near T8, low marsh	5/24/08	32	9:35 AM	12:06 PM
Species	Fundulus heteroclitus	Fundulus majalis	Menidia menidia	Paeleomonetes sp.	Carcinus maenas
Total Caught	0	0	0	3	1
Length (mm) 21					
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	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
opring 2006 Fish Data	Reference, between T8 and T9 low marsh	5/24/06	50	9:35 AM	12:19 PM
Species	Fundulus heterociitus	Fundulus majalis	Menidia menidia	Paeleomonetes	Carci <u>nus maenas</u>
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	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
Spring 2006 Fish Data	Reference between T8 and	5/24/06	39	9:35 AM	11:54 AM
	T9 mid marsh			9.99 AM	11.041 (100
Species	Fundulus			Paeleomonetes	
	heteroclitus	Fundulus majalis	Menidia menidia	sp.	
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	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
Spring 2006 Fish Data	Reference	Entre	45	0:25 414	*****
	Tt0 mid marsh	5/24/06	40	9;35 AM	0 1(44 AM
Species					
	Fundulus heteroclitus	Fundulus majalis	Menidia menidia	Paeleomonetes sp.	
Total Caught	0	0	0	5	
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Spring 2006 Fish	Reference				
Date	between T9 and T10 low march	5/24/06	30	9:35 AM	12:28 PM
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Species	Fundulus		1	Paeleomonetes	1
	heteroclitus	Fundulus majalis	Menidia menidia	sp.	
Total Caught	0	0	0	2	
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	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
Fail 2006 Fish Data	Restoration site, near T5	9/28/06	70	2:57 PM	2:40 PM
Species	Fundulus			Cyprinedon	Paeleomonetes
Total Caught	heteroclitus 6	Fundulus majalis1	Menidia menidia	variegatus D	sp 12
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	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
Fall 2006 Fish Data	Restoration site, peninsula	9/28/06	60	2:57 PM	2:50 PM
Species	Fundulus heteroclitus	Fundulus majalis	Menidia menidie	Cyprinodon variegatus	Paeleomonetes sp.
Total Caught	1	0	1	0	10
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	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
Fall 2006 Fish Data	Restoration site, on peninsula	9/28/06	60	2:57 PM	3:00 PM
Species	Fundulus	Fundutus maialis	Menidia menidia	Cyprinodon	Paeleomonetes
Total Caught	3	3	0	0	3p. 9
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	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
Fall 2006 Fish Dat	Restoration site, on peninsula	9/28/06	58	2:57 PM	3:10 PM
Species	Fundulus			Cyptinodon	Paeleomonete
Total Caush	heteroclitus	Fundulus majalis	Menidia menidia	variegatus	<u>sp.</u>
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	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
Fall 2006 Fish Data	Restoration site, between T4 and T5	9/28/06	70	2:57 PM	3:20 PM
Species	Fundulus heterociitus	Fundulus maialis	Menidia menidia	Cyprinodon varienatus	Paeleomonetes sn
Total Caught	2	0	Ō	Ö	0
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	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
Fall 2006 Fish Data	Restoration site, near T4	9/28/06	70	2:57 PM	3:30 PM
Species	Fundulus heterociltus	Fundulus mejalis	Menidia menidia	Cyprinodon variegatus	Paeleomoneles sp
Total Caught	2	1	0	0	21
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	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
Fall 2006 Fish Data	Restoration site, between T3 and T4	9/28/06	45	2:57 PM	3:40 PM
Species	Fundulus	Euclus maialia	Monidia monutia	Cyprinodan	Paeleomonetes
Total Caught	12	8		variegatus	9p. 0
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	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
Fail 2006 Fish Data	Restoration site, near T3	9/28/06	60	2:57 PM	4:00 PM
Species	Fundulus heterociltus	Fundulus majalis	Menidia menidia	Cyprinodon variegatus	Paeloomoneles sp.
Total Caught	5		0	Ö – – –	20
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	Location	Date	Water Depth (cm)	Time of High	Sample Time
Fall 2009 Fish Date					
	Restoration site, between T3 and T2	9/28/06	40	2:57 PM	4:10 PM
Species	Fundulus heterociitus	Fundulus maialis	Menidia menidia	Cyprinodon variegatus	Paeleomonetes so.
Total Caught	3	12	3	0	28
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	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
Fall 2006 Fish Data	Restoration site on T2	9/28/06	40	2:57 PM	4:30 PM
Species	Fundulus			Cyprinodon	Paeleomonetes
Total Caught	heferoclitus	Fundulus majelis	Menidia menidia	variegatus	5 <u>p.</u>
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	near T10	9/28/06	40	2.37 PM	4:40 PM
Species	Frendster			0	
	Fundulus heterociitus	Fundulus majalis	Menidia menidia	Cypnnodon vanegatus	Paeleomonetes sp.
Tetal Caught Length (mm) 21	4	2	D	0	2
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	Location	Date	Water Depth (cm)	Time of High	Sample Time
Fall 2006 Fish Data	Reference site.			Tide	
	near T10	9/28/06	30	2:57 PM	4:55 PM
Species					
Species	Fundulus heteroclitus	Fundulus majalis	Menidia menidia	Cyprinodon variegatus	Paeleomonetes sp.
Total Caught	1	1	0	1	0
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	Location	Date	Water Depth (cm)	Time of High	Sample Time
Fall 2006 Fish Data	Reference site			Tide	
	between T10 and T9	9/28/05	25	2:57 PM	5:00 PM
Species	Fundulus			Cyprinodon	Paeleomonetes
Total Caught	heteroclitus 2	Fundulus majalis 0	Menidia menidia 0	variegatus Q	sp.
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	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
Fall 2006 fish Data	Reference site. near T9	9/28/06	30	2:57 PM	5:05 PM
Species	Fundulus heterociitus	Fundulus majalis	Menidia menidia	Cyprinodon variegalus	Paeleomonetes sp.
Total Caught	2	2	0	-6	4
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	Location	Date	Water Depth (cm)	Time of High Tide	Sample Time
Fail 2006 Fish Data	Reference site,	9/28/06	60	2:57 PM	5;12 PM
Species	Fundulus			Cyprinodon	Paeleomonetes
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# APPENDIX E BENTHIC MACROINVERTEBRATE FIELD DATA

### Bar Beach benthic monitoring data

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Fall 2006 Ribbed mussel Fiddler crab burrow	Citackat Stratum Gaskanska degrupsa Lida stronax humpera	nid . Nich	2 Nigh 3	3 high 2	4 7000 6 14	6 1000 2	6 11 6	20	<b>8</b> 10w 39 7	9 haw 21	93 19	10 16 13	Ri Ju Ju Ju Ju Ju Ju Ju Ju Ju Ju Ju Ju Ju	estorat 10 3	ion s	ite 14 - 1 24 - 2 25	15 04 3	18 90 3	317 IOW 10 14	18 109	19. tow 4	20 10w 1	21 1049 8	22 1044	23 100 2	24 Iow 68	25 109 95		lasia Lasia	niaceto 3	214	· ę low 4	<b>10</b> 00	Ref Iow 89	erenc 1.8 10w 223	e Site Iow 113	10 Юж 66	1 10 5	1 1 1	12 CM	13   Init	14 600	15 15
Fall 2006 Ribbed mussel Fiddler crab burrow Asian shore crab	Cuarket Stratum Gaptensus deraitese Lice program terminen entigrapsyn Sampelfiers	. d N (4)	2 Nigh 3	3 high 2	4 high 6 14	k bgr 2	8 10 11 6	20	<b>8</b> 10w 39 7	9 Iaw 21	93 93 19	16 16	Ro Ju Ju Ju Ju Ju Ju Ju Ju Ju Ju Ju Ju Ju	astorat a to 3	ion s	ite 4 5	15. Gw 3	3	12 10 10 14	18	49. Iow 4	20 Iuw 1	21 504 8	22	23) Jow 2	24 10m 68	225 1090 95			3	214	4	90 1	Ref Iow 89	erenc 1.8 1cw 223	e Site Iow 113	66	10 5	1 1 1 1	12 04	13. Iow	54. 64	15 109
Fall 2006 Ribbed mussel Fiddler crab burrow Asian shore crab Green crab	Ozaster Statum Gelikanser deruitse Eksi signet, turnes Higressig: Seneriraus Cercinis menes		2 Nigh 3	2 2	4 110 14	2	6 11 6	20	8 104 39 7	9 Kow 21	93 93 19	16 16 13	Ro Bo 3 3	estorat	tion s	ite 4 : 26 :	15. 294 3	3	12 10 14	18 (04)	49. Iow 4	20 1	21 049 8	22	28) Iom 2	68	95		bigh	3	214	4 	90 1000 90	Ref 29 89	erenc 8 10w 223	e Site	66	5	1 ji	12 04 06	not sa	mpled	due
Fall 2006 Ribbed mussel Fiddler crab burrow Asian shore crab Green crab Marsh snail	Oracter Stration Gapikbraia contras Cos proprio: burrows Materials contrains Concing meanes Melangues trionspipe		2 Nigh 3	3 Non 2	4 114	2 	11 6	20	5 104 39 7	9 109 21	93 19	19 16 13	Re Boot 3 3	astorat	tion s	ite 4 1 5	15 cw 3	3	12 10 14		49. iow 4	1	21. 504 8	22 10W	23 Jow 2	68	95			3	214	4	90 90	Re1	erenci 8 Iow 223	e Site	66 66	10 10 5			13 Iowr Iowr not sa to he	ing iong mpled avy ra	15 109 due ins
Fali 2006 Ribbed mussel Fiddler crab burrow Asian shore crab Green crab Marsh snail Mud snail	Curacter Stratum Gautomia conten Una propras burrowa Manager Samurinans Carcinia memas Melamana montatus Melamana montatus Melamana montatus		2 Ngh 3	2 2	4 114	2	11 6	20 20 233	8 104 39 7 7 14	9 huw 21	93 93 19	16 16 13	R( 10 3 3	e to 3 3	tion s	ite	15 cow 3	3 3 34	10 10 14		19. 10w 4	20 1 1 	21 500 8 3	22 1049 1	28	24 104 68	95 95 36			3	214 214 15	4	90 1 1	Ref 9 89 	erenc 39 223 223 35	e Site 104 113 40	66 66 50	5	1 1 1 1 9 6	12 06 7	13 low not sa to he	mpled avy ra	15 Low due ins
Fali 2005 Ribbed mussel Fiddler crab burrow Asian shore crab Green crab Marsh snail Mud snail Rough periwinkle	Cranstee Stratum Gapitemin corrupas Lice arconex berrown enterness Sementinus Corcinia meenes Meterness Archardin Merezetes adoptee Merezetes adoptee Licentus anteres		2 Ngt 3	2	4 http:///	2	11 6	20 233	<b>5</b> 10% 39 7 7 14 14	9 how 21	93 93 19 24 6	16 16 13	Re Bo	astorat 3 3	ion s	ite 14 25 95 83	15 3 18	3 3 34 1	10 10 14		19 iow 4 21	20 1 1 47 1	21 1040 8 3	22 1044 1	2	68 14	95 95 36			3	214 15	4	90 1 1	Ref 39 31	erenci 223 223 35	e Site 10% 1113 40	66 50	1 10 5	1 1 1 1 9 6	12 06 106	ia low not sa to he	mpled avy ra	due ins

## APPENDIX F AVIAN FIELD DATA

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M	ONITORING INFORMATION
Date of Monitoring / 2/3	3/05
Time of Monitoring	Began: <u>9:30 Am</u> Concluded: <u>10 Am</u>
Tide (please circle one)	High Tide / Ebbing / Low Tide / Flooding
	Predicted low and high tides:
	Time of tidal measurements:
	Nearest tidal station:
Weather 27° NW (temperature, wind, precipitation	1@5-10 clear )
Monitor(s) (name, affiliation) M.NO	RMANDIA, NSAS
Type of Monitoring	Pre-Construction
(prease encie one)	As-built (4-5 weeks)
	Annual Post-Construction: Year 1 (2) 3 / 4 / 5
Parameters Measured	Vegetation
(prease encie an that apply)	Sediment
	Benthic Invertebrates
	Birds
	Other (please describe):
Photo Monitoring Conducted? (please indicate station codes)	Yes No
Video Monitoring Conducted? (please provide brief description)	Yes No

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# MONITORING PARAMETERS: BIRD OBSERVATION

12/8/05 Species Abundance Location Activity **Duration of Stav** Site: Great Egret 15 minutes mud hunting 6 5 25 <u>Canada Gæse</u> Mallard Reg: mud sitting sleeping 15minsta 15 minutes mud feeding Eu. Starling 15mmuts Flying about 5 Minute Song Sparrin 15 MINACS feeding mid Ringbilled GU Ia 3 Killdeer ? Partelot 6 Gold Finch ? Flying Othen bird Noves: 40 Ringbilled Gull Parking lot 65 Canada Geese Parking lot 30 ROCK Pigeon 70 Starling 1 100n/sp.) 95 Canada S Harbor 6 Mallard 2 Miste Swan

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Date of Monitoring	12/12/05
Time of Monitoring	Began: $9.30 \text{ M}$ Concluded: $10.4 \text{ M}$
Tide (please circle one)	High Tide / Ebbing / Low Tide / Flooding Predicted low and high tides:
	Time of tidal measurements:
	Nearest tidal station:
Weather (temperature, wind, precipitation)	34° WNW@10 cloudy
Monitor(s) (name, affiliation) M.NO	FMANDIA, NSAS
Type of Monitoring (please circle one)	Pre-Construction
	As-built (4-5 weeks)
	Annual Post-Construction: Year 1 $(2)/3/4/5$
<b>Parameters Measured</b> (please circle all that apply)	Vegetation
	Sediment
	Benthic Invertebrates
(	Birds
	Other (please describe):
Photo Monitoring Conducted? (please indicate station codes)	Yes No
Video Monitoring Conducted? (please provide brief description)	Yes No

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# MONITORING PARAMETERS: BIRD OBSERVATION 12/12/05

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	Species	Abundance	Location	Activity	Duration of Stay
Site	Song Sparrow	6	grasses	Feeding	10 minutes
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Lil	Votes: 1 Core + Blue H	eron )		3 Killdee	Trail & Packi
har Jum	Pied billed G	rebe S.S.	wth Cove	49 Ringbilly	ed GULI ( Varier
	1 Belted Kinc	fisher (	-	28 ROULT	ading
	Red tailed hi	auk /			re ling
	•	J	IP	perarine-	Flying
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MO	NITORING INFORMATION				
Date of Monitoring 12	21/05				
Time of Monitoring	Began: <u>9:45</u> An Concluded: <u>10:15</u> An				
Tide (please circle one)	High Tide / Ebbing Low Tide / Flooding				
	Predicted low and high tides:				
	Time of tidal measurements:				
	Nearest tidal station:				
Weather 35° NW (temperature, wind, precipitation)	@ 5-10 (lean)				
Monitor(s) (name, affiliation) M. NOR	MANDIA, NSAS				
Type of Monitoring (please circle one)	Pre-Construction				
	As-built (4-5 weeks)				
	Annual Post-Construction: Year 1 2 / 3 / 4 / 5				
Parameters Measured	Vegetation				
(please circle all that apply)	Sediment				
	Benthic Invertebrates				
	Birds				
	Other (please describe):				
Photo Monitoring Conducted? (please indicate station codes)	Yes No				
Video Monitoring Conducted? please provide brief description)	Yes No				
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### MONITORING PARAMETERS: BIRD OBSERVATION

	Species	Abundance	Location	Activity	Duration of Stay
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has brid No	tes: 2 Muter	kans-Harbor	>		
A C NOCO	35 Ringbo	led Gull		A &	
	35 Henrin	haded Gull	Starking	lot	
	60 Rir P	Piceon			
	39 Starle	NR /			
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МО	NITORING INFORMATION
Date of Monitoring 12/30	65
Time of Monitoring	Began: 10 AM Concluded: 10:30
Tide (please circle one)	High Tide / Ebbing / Low Tide / Flooding
•	Predicted low and high tides:
	Time of tidal measurements:
	Nearest tidal station:
Weather $40^{\circ}$ Å(temperature, wind, precipitation)	JW@18-25 SUNNY
Monitor(s) (name, affiliation) M.N	ORMANDIA, NSAS
Type of Monitoring (please circle one)	Pre-Construction
	As-built (4-5 weeks)
	Annual Post-Construction: Year 1 2/3/4/5
Parameters Measured	Vegetation
(prease encie an mar appry)	Sediment
	Benthic Invertebrates
	Birds
	Other (please describe):
Photo Monitoring Conducted? (please indicate station codes)	Yes No
Video Monitoring Conducted? (please provide brief description)	Yes No

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### MONITORING PARAMETERS: BIRD OBSERVATION

12/30/05

	Species	Abundance	Location	Activity	Duration of Stay
Site:	Ø			 	
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ther fid,	votes: 40 Hearin 78 Ring-bi	realls Zr	Parking Lot	26	200grine Talcon
	47 Rock	Pisern (	J		
	6 Canad	alpena			
		- use j			

Date of Monitoring	1-7-06
Time of Monitoring	Began: 2pm
	Concluded: <u>230 pm</u>
Tide	High Tide / Ebbing Low Tide / Flooding
(prease encie one)	Predicted low and high tides:
	Time of tidal measurements:
	Nearest tidal station:
Weather 39° (temperature, wind, precipitation)	15-7mph/sunny
Monitor(s) (name, affiliation) M. NC	RMANDIA, NSAS
Type of Monitoring	Pre-Construction
(prease circle one)	As-built (4-5 weeks)
	Annual Post-Construction: Year 1 (2) 3 / 4 / 5
Parameters Measured	Vegetation
(please circle an that apply)	Sediment
	Benthic Invertebrates
(	Birds
	Other (please describe):
Photo Monitoring Conducted? (please indicate station codes)	Yes No
Video Monitoring Conducted? (please provide brief description)	Yes / No

## MONITORING PARAMETERS: BIRD OBSERVATION

1/8/06

i	•	Species	Abundance	Location	Activity	Duration of Stay
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0	rentral	60 Ringbil	led 5 JIL	Protonolat		
		15 Herring	GJII S'	w Ango		
		45 Nock		1		
「大学		2 Mite Sh	)an>Hav	bor		

	00
Time of Monitoring	Began: 9:30 AM
	Concluded: 10:00 AM
Tide (please circle one)	High Tide / Ebbing / Low Tide / Flooding
	Predicted low and high tides:
	Time of tidal measurements:
	Nearest tidal station:
Weather (temperature, wind, precipitation)	42°/5-10mph WNW Sunny
Monitor(s) (name, affiliation)	JORMANDIA, NSAS
Type of Monitoring (please circle one)	Pre-Construction
	As-built (4-5 weeks)
	Annual Post-Construction: Year $1(2)/3/4/5$
<b>Parameters Measured</b> (please circle all that apply)	Vegetation
	Sediment
	Benthic Invertebrates
	Birds
	Other (please describe):
Photo Monitoring Conducted? (please indicate station codes)	Yes/No
Video Monitoring Conducted?	Yes No

1/10/06 MONITORING PARAMETERS: BIRD OBSERVATION

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1.140 Sulan				
1.140 Swan			· · · · · · · · · · · · · · · · · · ·	
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25:   D.C. Co.	rmorant.	>Harbor	45 Punk	ng Gull
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-	es:   D.C. Co	es: I D.C. Cormorant:	es: I D.C. Cormorant: Harbor	es: I D.C. Cormorant: Harbor 16 Herri 45 Ringt

1 Peregrine > L.I.P.A

40 Kock Pigeon I Fish Crow

MONITORING	<b>INFORMATION</b>
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MIG	
Date of Monitoring 1/19/0	76
Time of Monitoring	Began: <u>//30</u> Concluded: <u>2 pm</u>
Tide (please circle one)	High Tide / Ebbing Low Tide / Flooding
	Predicted low and high tides:
	Time of tidal measurements:
	Nearest tidal station:
Weather $48^{\circ}/4$ dire (temperature, wind, precipitation)	ection/60% cloud coverage
Monitor(s) (name, affiliation) M. NO	RMANDIA, NSAS
Type of Monitoring (please circle one)	Pre-Construction
	As-built (4-5 weeks)
	Annual Post-Construction: Year 1 $(2)/3/4/5$
Parameters Measured	Vegetation
(prouse en ere	Sediment
	Benthic Invertebrates
(	Birds
	Other (please describe):
Photo Monitoring Conducted? (please indicate station codes)	Yes No
Video Monitoring Conducted? (please provide brief description)	Yes No

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MONITORING PARAMETERS: BIRD OBSERVATION 1/19/06

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	Species	Abundance	Location	Activity	Duration of Stay
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Then Buch	37 Pin Blb	d Gull		6100	tEast South
	37 Ride Pi	upn	Particia	-	
	3 Conada	Georo	Surremy	Per	Legrine-LIPA
	2 Fish (		( 201		0
	I SMO S	(ALALA)	)		
	1 - 01.8 -	previer .	/.		

Date of Monitoring 1/20	2/06
Time of Monitoring	Began: <u>8:45 AM</u> Concluded: <u>9:30 AM</u>
Tide ( (please circle one)	High Tide / Ebbing / Low Tide / Flooding Predicted low and high tides:
	Time of tidal measurements:
	Nearest tidal station:
Weather (temperature, wind, precipitation	35° N@5-10, Clear )
Monitor(s) (name, affiliation)	NORMANDIA, NSAS
Type of Monitoring (please circle one)	Pre-Construction
	As-built (4-5 weeks)
	Annual Post-Construction: Year 1 (12) / 3 / 4 / 5
Parameters Measured (please circle all that apply)	Vegetation
	Sediment
	Benthic Invertebrates
	Birds
	Other (please describe):
Photo Monitoring Conducted? (please indicate station codes)	Yes No
Video Monitoring Conducted? (please provide brief description)	Yes No

## MONITORING PARAMETERS: BIRD OBSERVATION 1/2 z/06

	Species	Abundance	Location	Activity	Duration of Stay
Ste:	Belted Kingfisher		demarkationBle	hunting	15 minutes
		<u> </u>			
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Reg:	Ring billed Gulls	40	tideline	resting	15 minutes
	Herring Guil		11 11		
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Rid 1	Votes: 10 Red Br. N	tergansers		1 (	Peregnine tala
	30 Ring till	Gulla (	- Harbou	<1 Dear	d Red th Loon
	2 Canada Good	007-	)		-
3	S Rock Piseon	C C Pa	levislat		
5	>> > Chilling		many mark		

MONITORING	INFORMATION
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Date of Monitoring $\frac{2}{3}$	106
Time of Monitoring	Began: <u>4 pm</u> Concluded: <u>4 30 pm</u>
Tide (please circle one)	High Tide Ebbing / Low Tide / Flooding Predicted low and high tides:
	Time of tidal measurements:
	Nearest tidal station:
Weather (temperature, wind, precipitation)	52° SSW CLEAN
Monitor(s) (name, affiliation) M. N	IORMANDIA, NSAS
Type of Monitoring	Pre-Construction
(please circle one)	As-built (4-5 weeks)
	Annual Post-Construction: Year $1(2)/3/4/5$
Parameters Measured (please circle all that apply)	Vegetation
	Sediment
	Benthic Invertebrates
(	Birds
	Other (please describe):
Photo Monitoring Conducted? (please indicate station codes)	Yes No
Video Monitoring Conducted? (please provide brief description)	Yes No

MONITORING PARAMETERS: BIRD OBSERVATION 2/3/06

Species Abundance Location Activity **Duration of Stay** 0 Site: Ø Refo: .

Other bird Notes: 8 Red Breated Mergansers 3 Mute Swans 16 Ringbilled gulls

Date of Monitoring 2	17/06
Time of Monitoring	Began: 9:30 AM Concluded: 10: AM
Tide (please circle one)	High Tide / Ebbing / Low Tide Flooding
	Time of tidal measurements:
	Nearest tidal station:
Weather (temperature, wind, precipitation)	37° WNNOIO/Clean
Monitor(s) (name, affiliation) M.N	IORMANDIA, NSAS
Type of Monitoring (please circle one)	Pre-Construction
(p	As-built (4-5 weeks)
	Annual Post-Construction: Year 1 (2)/3/4/5
Parameters Measured	Vegetation
(please chele an mai appry)	Sediment
	Benthic Invertebrates
(	Birds
	Other (please describe):
Photo Monitoring Conducted? (please indicate station codes)	Yes No
Video Monitoring Conducted? (please provide brief description)	Yes No

## MONITORING PARAMETERS: BIRD OBSERVATION 2/7/06

Species Abundance Location Activity **Duration of Stay** site: Other bird Notes: 9 Canada Geese South Cone 1 Belfed Kingfisher South Cone 1 Ringbilled bull 6 Canada Geese Harbor 2 Unite Swan 2 Red Dr. Mergansers 130 Ring Bulled Gull Bar 1 Herring bull Bar 40 Rock Pigeon 2 Parking 2 Canada Geese Lot

Date of Monitoring 2/16	106
Time of Monitoring	Began: <u>11:30 AM</u> Concluded: 12 pM
Tide (please circle one)	High Tide Ebbing / Low Tide / Flooding Predicted low and high tides:
	Time of tidal measurements:
	Nearest tidal station:
Weather (temperature, wind, precipitation)	52° 5010 Clear
Monitor(s) (name, affiliation) M. N	IORMANDIA, NSAS
Type of Monitoring (please circle one)	Pre-Construction
•	As-built (4-5 weeks)
	Annual Post-Construction: Year 1 (2)/ 3 / 4/ 5
<b>Parameters Measured</b> (please circle all that apply)	Vegetation
	Sediment
	Benthic Invertebrates
(	Birds
	Other (please describe):
Photo Monitoring Conducted? (please indicate station codes)	Yes No
Video Monitoring Conducted? (please provide brief description)	Yes No

# MONITORING PARAMETERS: BIRD OBSERVATION 2/16/06

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	Species	Abundance	Location	Activity	Duration of Stay
Site:	Canadabeese	35	tidal grasse	SWIMMIN	15 minutes
	Muteswan	よ	Water	1(	1 5
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o ∧					
Refo:	Canada Geese	28	tida/grasses	Swimming	15 minutes
V					
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al 1.1				1	
Other and	Notes: 45 King 23 Sta	Dilled Gull	& Parting L	ot	
	19 Rac	K P. apa			
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1. Red	tail Hawk	A I			
Pono	ATUNO.	pling			
1 1200		<i>v</i> () <i>v</i>			

Date of Monitoring $3/7$	66
Time of Monitoring	Began: $9:30 \text{ AM}$ Concluded: $10^{\circ} \text{ AM}$
Tide (please circle one)	High Tide / Ebbing / Low Tide ) Flooding Predicted low and high tides:
	Time of tidal measurements:
	Nearest tidal station:
Weather (temperature, wind, precipitation)	40° NW@5 Clear
Monitor(s) (name, affiliation) M. N	IORMANDIA, NSAS
Type of Monitoring	Pre-Construction
(please chere one)	As-built (4-5 weeks)
	Annual Post-Construction: Year 1 (2)/ 3 / 4 / 5
Parameters Measured	Vegetation
(please chere an mat apply)	Sediment
	Benthic Invertebrates
(	Birds
	Other (please describe):
Photo Monitoring Conducted? (please indicate station codes)	Yes No
Video Monitoring Conducted? (please provide brief description)	Yes No

				NO COVE	2/25 and 3/4	t -
	MONITORING PA	RAMETER	S: BIRD OBSEI	RVATION	3/7/06	
Site:	Species	Abundance	Location	Activity	Duration of Stay	
	· · · · · · · · · · · · · · · · · · ·					
			· · · · · · · · · · · · · · · · · · ·			
Refo:	Canada beese Ringbilled bull	40 8	mid mid	sitting Standing	15 minutes 15 minutes	
Other brid	29 Starl Notes: 30 Ringb 18 Herring 95 Canad 1 Redta	ing alled Gul Gul la Geese led Hauk	S Parking Lot	35 Ca 49 Ru 2 MJ 6 Rei	inada Geese ngbilizad Guil te Swan LBr. Wergan	ZHarba
130	(anada beese)	End of Vative tro	id 2	2 Peregrin	e Falcons>	L·I.P.A

Date of Monitoring 3/16/06	0		
Time of Monitoring	Began: Q:30 A.M. Concluded: 10: AM		
Tide (please circle one)	High Tide / Ebbing / Low Tide / Flooding		
	Time of tidal measurements:		
	Nearest tidal station:		
Weather 2 (temperature, wind, precipitation)	40° NWO20, clear		
Monitor(s) (name, affiliation) M.N	IORMANDIA, NSAS		
Type of Monitoring	Pre-Construction		
(please circle one)	As-built (4-5 weeks)		
	Annual Post-Construction: Year $1(2)/3/4/5$		
Parameters Measured (please circle all that apply)	Vegetation		
	Sediment		
	Benthic Invertebrates		
(	Birds		
	Other (please describe):		
Photo Monitoring Conducted? (please indicate station codes)	Yes No		
Video Monitoring Conducted? (please provide brief description)	Yes No		

MONITORING PARAMETERS: BIRD OBSERVATION 3/16/06

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	Species	Abundance	Location	Activity	Duration of Stay
Cita.	Ø	,			
Jue.					
•					
			·····	·····	
OA		20	Acces A		15.44
Refo:	( Unada Geere.	20	mud	peeding	Smin.
V	EU. Starling	43	mude	pedding	15 MIM
		· ·····			
	•	L			
Athen hind	Notes: 2 Mute	Swan	211	40	Ringbilled GU
Oner ona	G Red Br	, Merganser	stharbor	40	Herring Gull
~	be (anad	ia brese	J	-	· · ·
_ <u>8</u> 1	ish Gow	)	-	2 P.	in Falcon 24
30 1	eingbilled Gull (	Partinol	ot	& l'éregr	ine inconst br
40 8	U. Starling	- Im Nig-	-	·	- na
$\Delta$	UDINS ,	)			.,.

MON	ITORING INFORMATION
Date of Monitoring $3/22$	106
Time of Monitoring	Began: 12 pm Concluded: 1230 pm
Tide (please circle one)	High Tide / Ebbing / Low Tide / Flooding Predicted low and high tides: Time of tidal measurements: Nearest tidal station:
Weather (temperature, wind, precipitation)	15°@15-20mph/NW clear
Monitor(s) (name, affiliation) M.N.	IORMANDIA, NSAS
Type of Monitoring	Pre-Construction
(please circle one)	As-built (4-5 weeks)
	Annual Post-Construction: Year $1(2)/3/4/5$
Parameters Measured	Vegetation
(please circle all that apply)	Sediment
	Benthic Invertebrates
(	Birds
	Other (please describe):
Photo Monitoring Conducted? (please indicate station codes)	Yes No
Video Monitoring Conducted? (please provide brief description)	Yes No
	······································

3/22/06

### MONITORING PARAMETERS: BIRD OBSERVATION

Activity Species Abundance Location **Duration of Stay** Site: 15 minutes water/mud feeding Mute Subin 2 2 15 ministes 11 Mallard SPECPING h 15 minutes Ce н anada beese •{ Wading RingbilledGuil " L E 1. .

Other bird Notes: 205 Canada Geese South Harbor

30 Starling 40 Ring billed Gull & Around 32 Rock Pigeon & parking 45 Robin Lot.

MON	ITORING INFORMATION
Date of Monitoring	3/29/06
Time of Monitoring	Began: 12 pm Concluded: 12:30 pm
Tide (please circle one)	High Tide / Ebbing / Low Tide / Flooding
	Predicted low and high tides:
	Time of tidal measurements:
	Nearest tidal station:
Weather (temperature, wind, precipitation)	51 NW@ Smph
Monitor(s) (name, affiliation) M. N	ORMANDIA, NSAS
<b>Type of Monitoring</b> (please circle one)	Pre-Construction
	As-built (4-5 weeks)
	Annual Post-Construction: Year 1 (12) 3 1 4 1 5
Parameters Measured (please circle all that apply)	Vegetation
	Sediment
	Benthic Invertebrates
(	Birds
	Other (please describe):
Photo Monitoring Conducted? (please indicate station codes)	Yes No
Video Monitoring Conducted? (please provide brief description)	Yes No

MONITORING PARAMETERS: BIRD OBSERVATION 3/29/06

	Species	Abundance	Location	Activity	Duration of Stay
Sita:	Ø				
July;			· · · · · · · · · · · · · · · · · · ·		
					-
P.D.	Ø.				
Nepo'					· · · · · · · · · · · · · · · · · · ·
			· · · · · · · · · · · · · · · · · · ·		
					_
			·····		
				[	
Other bird	Notes: 12 Car 30 St 10 Ro. 1 Run	ada beese arling K Pigeon gb. Ileol G.	. ( Parking	Lot	
10	Herring Gulls on	Harbor-Pilin	195		-

MUN	IT OKING INFORMATION
Date of Monitoring 4/2/	06
Time of Monitoring	Began: <u>3 pm</u> Concluded: <u>3 3Upm</u>
Tide (please circle one)	High Tide D Ebbing / Low Tide / Flooding
	Predicted low and high tides:
	Time of tidal measurements:
	Nearest tidal station:
Weather (temperature, wind, precipitation)	60 WNW@ 5-10mph
Monitor(s) (name, affiliation) M.N	ORMANDIA, NSAS
Type of Monitoring (please circle one)	Pre-Construction
	As-built (4-5 weeks)
	Annual Post-Construction: Year 1 (2)/ 3 / 4/ 5
Parameters Measured	Vegetation
(prease circle an mar apply)	Sediment
	Benthic Invertebrates
(	Birds
	Other (please describe):
Photo Monitoring Conducted? (please indicate station codes)	Yes No
Video Monitoring Conducted? (please provide brief description)	Yes No

4/2/06

Duration of Stay

Activity

### MONITORING PARAMETERS: BIRD OBSERVATION

Abundance

Site

Species

		$r_1$ $\overline{\Lambda}$		. مهر ر
Lanada beese	.d	+lagged Mud	sleeping	15 Min
Mite Swan	ス	marsh	SWIMMINIA	(Smin
Malland	2	inauch	Swimming	10 minu
	L			
	·			· · ·
· •				
· _ · · · · · · · · · · · · · · ·				
<u> </u>		·		
				<u> </u>
		· - ·		L,
		<u>                                      </u>	· · · · · · · · · · · · · · · · · · ·	
	l			
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Location

Other bud Lesson fillowlegs (South Cove) Starling Fish Crowfall Parkinghot Ringbulled Gull Parkinghot Herring Gull Mute Swanz Harbor 30873 2 Mu

2 Peregrines - LIPA

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Date of Monitoring 4/11/00	0
Time of Monitoring	Began: <u>9:30</u> Concluded: <u>10:00</u>
Tide (please circle one)	High Tide / Ebbing / Low Tide / Flooding
	Predicted low and high tides:
	Time of tidal measurements:
	Nearest tidal station:
Weather (temperature, wind, precipitation)	50 WSN05, clear
Monitor(s) (name, affiliation) M. N	ORMANDIA, NSAS
<b>Type of Monitoring</b> (please circle one)	Pre-Construction
	As-built (4-5 weeks)
	Annual Post-Construction: Year 1 (2)/ 3 / 4/ 5
Parameters Measured	Vegetation
(please circle all that apply)	Sediment
	Benthic Invertebrates
(	Birds
	Other (please describe):
Photo Monitoring Conducted? (please indicate station codes)	Yes No
Video Monitoring Conducted? (please provide brief description)	Yes No

## MONITORING PARAMETERS: BIRD OBSERVATION 4/1/06

Abundance Location Species Activity **Duration of Stay** 1 grass island Great Blue Heron 15 minutes Site: roosting Canada Geese Ю 15 minutes Water Swimming Mockingbird 2 15 minutes nesting SCrubern Hying over site. ted Kingfisher 10 Minutes -7 Canadabeese 15minutes 12 Grasses feeding 10 Minutes Qrasses 2 feeding Mallard Other bird Notes: Harbor > 2 mallard 2 D.C. Cormorant Parking Lot: 30 Canada Gerse 32 Rock Pipeon 40 Stading 1 Savanneh Sparrow 48 Ring billed 5011 Caroline Wren Peregnine-hunting

Date of Monitoring $4/19$	106
Time of Monitoring	Began: <u>11AM</u> Concluded: <u>12AM</u>
Tide (please circle one)	High Tide / Ebbing Low Tide / Flooding Predicted low and high tides:
	Time of tidal measurements:
	Nearest tidal station:
Weather (temperature, wind, precipitation)	60° NO 15 clean
Monitor(s) (name, affiliation) M. N	IORMANDIA, NSAS
Type of Monitoring	Pre-Construction
(please circle one)	As-built (4-5 weeks)
	Annual Post-Construction: Year 1 (2)/ 3 / 4/ 5
Parameters Measured	Vegetation
(prease circle art mar appry)	Sediment
	Benthic Invertebrates
(	Birds
	Other (please describe):
Photo Monitoring Conducted? (please indicate station codes)	Yes No
Video Monitoring Conducted? (please provide brief description)	Yes No

### MONITORING PARAMETERS: BIRD OBSERVATION $\frac{4}{20}06$

Abundance Location Species Activity **Duration** of Stay Robin perched 10 minutes Site: perchanflagging Ð . Other bid Notes: 2 D.C. Cormorants FLY BY 10 Herring Gulls 10 Ring billed Gulls 22 Rock Pigeons Parking Lot 33 Starling S 4 Song Sparrow 20 Canada Gerse 10 Great Egret 2 Snowy Egret 8 Osprey 2 Turkey Vulture 1 Peregrine - L.I.P.A

Time of MonitoringBegan: 12:00 Concluded: 13:30Tide (please circle one)High Tide / Ebbing / Low Tide / Flooding Predicted low and high tides: Time of tidal measurements: Nearest tidal station:Weather (temperature, wind, precipitation)56 N@ 5-10 CleanMonitor(s) (name, affiliation)M. NORMANDIA, NSA S	Date of Monitoring 4/26/	06
Tide (please circle one)High Tide / Ebbing / Low Tide / Flooding Predicted low and high tides: Time of tidal measurements: Nearest tidal station:Weather (temperature, wind, precipitation)56 NO 5-10 CleanMonitor(s) (name, affiliation)M. NORMANDIA, NSA S	Time of Monitoring	Began: $12:00$ Concluded: $13:30$
Predicted low and high tides: Time of tidal measurements: Nearest tidal station: Weather (temperature, wind, precipitation) Monitor(s) (name, affiliation) M.NORMANDIA, NSAS	Tide (please circle one)	High Tide / Ebbing / Low Tide / Flooding
Time of tidal measurements:Nearest tidal station:Weather (temperature, wind, precipitation) $56 N @ 5 - 10 Clear$ Monitor(s) (name, affiliation)M.NORMANDIA, NSA S		Predicted low and high tides:
Nearest tidal station:   Weather (temperature, wind, precipitation) 56 N @ 5-10 Clean   Monitor(s) (name, affiliation) M. NORMANDIA, NSA S		Time of tidal measurements:
Weather (temperature, wind, precipitation) 56 N@ 5-10 Clean Monitor(s) (name, affiliation) M.NORMANDIA, NSAS		Nearest tidal station:
Monitor(s) (name, affiliation) M. NORMANDIA, NSAS	Weather (temperature, wind, precipitation)	56 N@ 5-10 Clean
	Monitor(s) (name, affiliation) M.N	ORMANDIA, NSAS
Type of MonitoringPre-Construction(please circle one)	Type of Monitoring (please circle one)	Pre-Construction
As-built (4-5 weeks)		As-built (4-5 weeks)
Annual Post-Construction: Year 1 (1 2)/ 3 / 4 / 5		Annual Post-Construction: Year 1 (2)/3/4/5
Parameters MeasuredVegetation(please circle all that apply)	<b>Parameters Measured</b> (please circle all that apply)	Vegetation
Sediment		Sediment
Benthic Invertebrates		Benthic Invertebrates
Birds	(	Birds
Other (please describe):		Other (please describe):
Photo Monitoring Conducted? Yes No (please indicate station codes)	<b>Photo Monitoring Conducted?</b> (please indicate station codes)	Yes No
Video Monitoring Conducted? Yes No (please provide brief description)	Video Monitoring Conducted? (please provide brief description)	Yes No

monitoring parameters: Bird observation  $4\beta606$ 

	Species	Abundance	Location	Activity	Duration of Stay
Site:	Canada Goose	.1	Water	mone	15 min
<i>JU2</i> .					
	· · · · · · · · · · · · · · · · · · ·				
		· · ·			
•					
Reb:	Canada Gorse	1	reeds	Mone	15 min
V	Mallard	3	relds	Sanaking	15 minutes
	Great Eget	2	reeds	Walking	10 minutes
		 	. <u> </u>		
		· .	 		
	· · · · · · · · · · · · · · · · · · ·				
1	· · · · · · · · · · · · · · · · · · ·	<u>ر</u> ،	L		

Other bird Notes: 5 D.C. Cormorants Harbor 50 specy J Harbor 2 HouceSpanon 15 Rock Piseon 2 Red Wins Blk. Brids 7 P. Lot 35 Starture Startine Fish Cron

06   Began: 9.4M   Concluded: 9.30AM   High Tide / Ebbing / Low Tide Flooding   Predicted low and high tides:   Time of tidal measurements:   Nearest tidal station:   62° NOIOmph   ORMANDIA, NSAS   Pre-Construction
Began: <u>9AM</u> Concluded: <u>9:30AM</u> High Tide / Ebbing / Low Tide Flooding Predicted low and high tides: Time of tidal measurements: Nearest tidal station: 62° NOIOmph cloudy ORMANDIA, NSAS Pre-Construction
High Tide / Ebbing / Low Tide ) Flooding Predicted low and high tides: Time of tidal measurements: Nearest tidal station: 62° NOIOmph Cloudy ORMANDIA, NSAS Pre-Construction
Predicted low and high tides: Time of tidal measurements: Nearest tidal station: 62° NOIOmph cloudy ORMANDIA, NSAS Pre-Construction
Time of tidal measurements: Nearest tidal station: 62° NOIOmph cloudy ORMANDIA, NSAS Pre-Construction
Nearest tidal station: 62° NOIOmph cloudy ORMANDIA, NSAS Pre-Construction
62° NOIOmph cloudy ORMANDIA, NSAS
Pre-Construction
Pre-Construction
The constituent on
As-built (4-5 weeks)
Annual Post-Construction: Year $1(2)/3/4/5$
Vegetation
Sediment
Benthic Invertebrates
Birds
Other (please describe):
Yes No
Yes No

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# MONITORING PARAMETERS: BIRD OBSERVATION 5/3/06

Abundance Location Activity **Duration of Stay** Species Savannah Sparron 15 minutes Site: 2 grasses teeding 2 mud Saministes teeding tidal island Mourning Dove 2 i( mud 15 minutes Rinabilled /311 standing (o 9 EU. Starling bank Flocking 10 minutes 5 minutes 4 Mallard SWIMMING provater 5 Ion water 11 anada Geese tı 8 D.C. (ormorant) 34 (anada Geese > Harb. 8 Osprey Other bird Notes: 2 Plover (Sp.?) Other bird Notes: 1 Sandpiper (Sp? South Cove 1 Snowy Egret 1 Gr. Egret 16 Ringsillyd 6,11 1 Yellow Warthler 4 RWBlackbird 40 Starling 4 Robin r Parking Lot. 6 Canada Grese ( 20 Rry Billed Guil 12 Herring Gul 2 Fish Crow 1 Perearine, - 1.1.P.A.
### MONITORING INFORMATION

Date of Monitoring $5/8/c$	06
Time of Monitoring	Began: <u>9</u> : AM Concluded: <u>9:30</u>
Tide (please circle one)	High Tide D Ebbing / Low Tide / Flooding
	Predicted low and high tides:
	Time of tidal measurements:
	Nearest tidal station:
Weather (temperature, wind, precipitation)	59 EOIS Cloudy
Monitor(s) (name, affiliation) M.N	ORMANDIA, NSAS
Type of Monitoring	Pre-Construction
	As-built (4-5 weeks)
	Annual Post-Construction: Year 1 (12)/ 3 / 4 / 5
Parameters Measured	Vegetation
(prease entrie an that appry)	Sediment
	Benthic Invertebrates
(	Birds
	Other (please describe):
Photo Monitoring Conducted? (please indicate station codes)	Yes No
Video Monitoring Conducted? (please provide brief description)	Yes No

## MONITORING PARAMETERS: BIRD OBSERVATION 5/8/06

	Species	Abundance	Location	Activity	Duration of Stay	
Sito:	Great Egret	. 1	flagged Island	Feeding	10 minutes	
	Mourning Dore	d	Walking ont	flagged island	10 minutes	
	Double Gr. Cormorant	1	water	Swimming	5 minutes	
			· · · · · · · · · · · · · · · · · · ·			
Rob:	Com. Grackle	1	tide line	feeding	15 minuts	
	Song Sparrow	1	at fr	ie .	u të	
	Canada beese	5	Water	SWIMMIS	10 MINUTES	
		•				
						-
		·				
	•	( )		10 0110	La Lassa WIG	
Other bird	3 P.C. LON Notes: & Octown	moran († )		30 Rivala	ued 6011	Symil
	17 Canada	Geest	larbor	14 Herrin	q $Gull$	Parkin
	i Mallard	)		30 E. Sto	white	Lot
	1 Swan	~~~		і цечош	Win all	
	2 Laughing 60	1/2 Bar			<u>ر</u>	
	G Mallard	$\langle \langle \cdot \rangle$		Ø Peregr	me	
	34 Fish Crow	)				

## FIELD NOTES

5/13/06

Town to North Hempstal workers cut through large cable in Parking lot causing oil spill. (The oil encased the cable For heating/cooling) Various devises were placed around harbor to contain spill Parking lot was dug up and many trucks and environmental orgs. constantly in area (still-to 5/22). May have effect on breeding birds, turtles, inverts, fishes

No work on restoration of south cove noted to date.

#### MONITORING INFORMATION

Date of Monitoring $5/21$	106
/ Time of Monitoring	Began: 12 pm Concluded: 12:30 pm
Tide (please circle one)	High Tide / Ebbing / Low Tide / Flooding
	Predicted low and high tides:
	Time of tidal measurements:
	Nearest tidal station:
Weather (temperature, wind, precipitation)	60° NO10-20 cloudy
Monitor(s) (name, affiliation) M.N	ORMANDIA, NSAS
Type of Monitoring (please circle one)	Pre-Construction
· · ·	As-built (4-5 weeks)
	Annual Post-Construction: Year 1 (2)/ 3 / 4 / 5
Parameters Measured (please circle all that apply)	Vegetation
	Sediment
	Benthic Invertebrates
(	Birds
· · · · · · · · · · · · · · · · · · ·	Other (please describe):
Photo Monitoring Conducted? (please indicate station codes)	Yes No
Video Monitoring Conducted? (please provide brief description)	Yes No

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MONITORING PARAMETERS: BIRD OBSERVATION 5/21/06

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	Species	Abundance	Location	Activity	Duration of Stay	
Site:	Red Wing BK Bird	2	grasses	Flying	10 minutes	
2000	Canadabase	2	mud	Walking	10 minity	
Reb:	ð.					
					ļ	
					<u></u>	
	·····					
					-	
	· ·					
	2 Snowin P	Forets )	1			
Other bud	Notes: 2 Great E	grets { P.	ci-	1 Song-	parrow 2 F	arkingi
	2 Gr. BK Bieck	kGulls)		2 Hous	e Spann/	1
6 adult/1	5 young Canada G	erse >	IL Cur	6 Star	ling.	• _
BK.G	owned Night Her	on ZSOI	othewe			
1 Yellow	J Warbler			2 Ospre	y E Harbor	
1 Pere	gnie Falcon öft	L'I'P.A				

**FIELD NOTES** 

6/27/06

Other than the emergency cable repair in parking lat, I have not seen anything resembling further restoration of this coverat Bar Beach I was signed on to monitor birds for another year (through Sept 06) with the understanding that more we tlands would be restored. Would like update please. Mary 516 671 4359

MON	NITORING INFORMATION
Date of Monitoring $5/2^{4}$	2/06
Time of Monitoring	Began: <u>3pm</u> Concluded: <u>3:30</u>
Tide (please circle one)	High Tide / Ebbing / Low Tide / Flooding Predicted low and high tides:
	Time of tidal measurements:
	Nearest tidal station:
Weather (temperature, wind, precipitation)	80° 5E @ 0-5, hazy
Monitor(s) (name, affiliation) M. N	IORMANDIA, NSAS
<b>Type of Monitoring</b> (please circle one)	Pre-Construction
	As-built (4-5 weeks)
	Annual Post-Construction: Year $1(2)/3/4/5$
<b>Parameters Measured</b> (please circle all that apply)	Vegetation
	Sediment
	Benthic Invertebrates
(	Birds
	Other (please describe):
<b>Photo Monitoring Conducted?</b> (please indicate station codes)	Yes No
Video Monitoring Conducted? (please provide brief description)	Yes No

5/30/06

## MONITORING PARAMETERS: BIRD OBSERVATION

Abundance Location Activity **Duration of Stay** Species Song Sparrow SCrub Site: hoping 10 minutes 8 Canada Geese South 2 Mute Swam W/3 young Cove ParkingLot Harbol & Ospery (unknown amount Harbol & Ospery (unknown amount of young in 5 nests) (4 Canada beese (17 young) 2 Peregrine Falcon (lof which presumed youn: Other bird Notes: 1 Meckingbird 2 Barn Swallow ( 2 Mourning Dove 16 Starling 2 Mallard 1 Fish Crow 1 Great Bluetteron

#### MONITORING INFORMATION

Date of Monitoring 6/5	106
Time of Monitoring	Began: 9:30 AM Concluded: 10 pm
Tide (please circle one)	High Tide / Ebbing / Low Tide / Flooding Predicted low and high tides:
	Time of tidal measurements:
	Nearest tidal station:
Weather (temperature, wind, precipitation)	70 NOS-10
Monitor(s) (name, affiliation) M.N	ORMANDIA, NSAS
Type of Monitoring	Pre-Construction
(please circle one)	As-built (4-5 weeks)
	Annual Post-Construction: Year 1 (2)/ 3 / 4 / 5
Parameters Measured (please circle all that apply)	Vegetation
	Sediment
	Benthic Invertebrates
(	Birds
	Other (please describe):
Photo Monitoring Conducted? (please indicate station codes)	Yes No
Video Monitoring Conducted? (please provide brief description)	Yes No

6/5/06

## MONITORING PARAMETERS: BIRD OBSERVATION

Abundance Species Location Activity **Duration of Stay** Site: Ø Other bird Notes: 2 D.C. Cormorant G Osprey 60 Canada beese G Laughing Gull 2 Mallard 35 Starling 9 Pigeon 9 & Parking 2 House Sparrow 2 Red Wing Black Bird Lot 2 Fish Crow >Harbor 1 BK: Crowned Night Heroin 1 Mallard 1 Yellow Wartsler South Cove 1 Kobin 2 Peregrine Falion

MON	FTORING INFORMATION
Date of Monitoring 6/8/0	6
Time of Monitoring	Began: 5'30pm Concluded: 6:15pm
Tide (please circle one)	High Tide / Ebbing / Low Tide / Flooding Predicted low and high tides:
	Time of tidal measurements:
	Nearest tidal station:
Weather (temperature, wind, precipitation)	66°, UA, cloudy
Monitor(s) (name, affiliation) M.N	ORMANDIA, NSAS
Type of Monitoring	Pre-Construction
(please circle one)	As-built (4-5 weeks)
	Annual Post-Construction: Year 1 (/ 2)/ 3 / 4 / 5
Parameters Measured	Vegetation
(please circle all that apply)	Sediment
	Benthic Invertebrates
(	Birds
	Other (please describe):
Photo Monitoring Conducted? (please indicate station codes)	Yes No
Video Monitoring Conducted? (please provide brief description)	Yes No
	· · · · · · · · · · · · · · · · · · ·

MONITORING PARAMETERS: BIRD OBSERVATION G/8/06

Species Abundance Location Activity **Duration of Stay** Little Bluetteron 1 BK Lround Night Heron 2 grass/mud feeding 8 minites Site: 15 minutes ed Wins BlackBird Post Sitting Snintes mud/water feeding 15 minutes Great Egret Parkinglot Havbul 3 D.C. Cormorant Zarkinglot Havbul 3 D.C. Cormorant Zaushing 6011 7 Herring 6011 40 Canada Grese Other bid Notes: 4 Mainingdare 4 House Sparrow 1 Mockingbard 12 Starling 2 Cedar Waxwing 1 B. Oricle 2 Peregrine ( Lofwhi Yellow Warbler 6 Ban Swallow

in of	
Date of Monitoring	106
Time of Monitoring	Began: 9: AM Concluded: 945 AM
Tide (please sincle one)	High Tide / Ebbing / Low Tide / Flooding
(prease entre one)	Predicted low and high tides:
	Time of tidal measurements:
	Nearest tidal station:
Weather (temperature, wind, precipitation)	75 NWOS clear
Monitor(s) (name, affiliation) M. N	ORMANDIA, NSAS
Type of Monitoring (please circle one)	Pre-Construction
	As-built (4-5 weeks)
	Annual Post-Construction: Year 1 (2)/ 3 / 4/ 5
Parameters Measured	Vegetation
(Free correction of the state o	Sediment
	Benthic Invertebrates
(	Birds
	Other (please describe):
Photo Monitoring Conducted? (please indicate station codes)	Yes No
Video Monitoring Conducted? (please provide brief description)	Yes No
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Noth's ferraline (alive) No howeshe (alive) M<sup>D</sup> MONITORING PARAMETERS: BIRD OBSERVATION 6/16/06

Parki Lot

					<u> </u>
	Species	Abundance	Location	Activity	Duration of Stay
Sita.	am. Goldfinch	2	scrub	Feeding	10 minutes
Jue.	BK. Crownfight Havo	(4000)	mud	Freding	1. Sminutes
	Collins Black Bird	2	perchangings	Sitting	5 minutes
		<u>↓                                     </u>			
				<u></u>	
				<u> </u>	
٥	Cause de hasce	2 nd Comment	Muld	Sitteria	15 miles
)'	Carent Enert	Child la good	mild	lating	15 unades
	Mile Sulan	2.13	mild	hunsurg	10 minutes
	Herrina (11	June Jupons	maila	Wantence	15 min tes
	TIGTIN GJI		mun	Carns and ISh	120000
1	7 Mallar	dw/1 your	19	۰ <u>ــــــــــــــــــــــــــــــــــــ</u>	1 FISH CROW
n bud	Notes: j Mute Swi	an w/3 yos.	าช )	16	Starling
	4 P.C. Lo.	rmovant		() ()	Rock Ase
	9 Osprey	(unknownyou	ung Haichay	- <sup>11</sup>	in the second se
	1 MUdate	abiron.	2 I MA DUA	4	A . 1 A
•	1_Balt- Di	riole		la	dult 1 young
	25 Great C	ale Hero	5)	Per	egrine tall
	6 Great	Sulallow			

ini O i					
Date of Monitoring 6/10/0	6				
Time of Monitoring	Began: <u>4pm</u> Concluded: <u>5pm</u>				
Tide (please circle one)	High Tide Ebbing / Low Tide / Flooding Predicted low and high tides:				
	Time of tidal measurements:				
	Nearest tidal station:				
Weather (temperature, wind, precipitation)	89° WSW@10-15 Cloudy				
Monitor(s) (name, affiliation) M. N	JORMANDIA, NSAS				
Type of Monitoring	Pre-Construction				
(please circle one)	As-built (4-5 weeks)				
	Annual Post-Construction: Year 1 (2)/ 3 / 4/ 5				
Parameters Measured	Vegetation				
(please chele an mat appry)	Sediment				
	Benthic Invertebrates				
(	Birds				
	Other (please describe):				
Photo Monitoring Conducted? (please indicate station codes)	Yes No				
Video Monitoring Conducted? (please provide brief description)	Yes No				

## MONITORING PARAMETERS: BIRD OBSERVATION 6/19/06

Abundance Location Activity **Duration of Stay** Species Great Egret Island grass 15 martes Site: Keeding Ø Other bird Notes: & Grackle 4 Fish Grow PartingLot 29 Starling 16 RockPigeon Harlow & Osphery - Unknown young 4 Great Egret I Great Blue Herm 35 Canada Geese 1 Laushing Guil 2 Gr. Bk Buck Guil 4 P.C. Cormonaut 1 HouseFinic 20001+ 3 young Peregrine Falcon-

MON	ITORING INFORMATION
Date of Monitoring 6/2	7 106
Time of Monitoring	Began: 9:15AM Concluded: 9:45AM
Tide	High Tide / Ebbing / Low Tide / Flooding
(prease entre one)	Predicted low and high tides:
	Time of tidal measurements:
	Nearest tidal station:
Weather (temperature, wind, precipitation)	75°5E@15 Cloudy
Monitor(s) (name, affiliation) M. N	ORMANDIA, NSAS
Type of Monitoring	Pre-Construction
(prease entre oney	As-built (4-5 weeks)
	Annual Post-Construction: Year 1 (/ 2)/ 3 / 4/ 5
Parameters Measured	Vegetation
	Sediment
	Benthic Invertebrates
(	Birds
	Other (please describe):
Photo Monitoring Conducted? (please indicate station codes)	Yes No
Video Monitoring Conducted? (please provide brief description)	Yes No

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6/27/06 75° SE@15 LOW cloudy

#### MONITORING PARAMETERS: BIRD OBSERVATION

Location Marsh Grasses **Duration** of Stay Species Abundance Activity Site: RedWing BK. Binds Mute Swan 4400 15 minutes feeding 44000 msd. Feeding 15 minutes 15mintes Marning Pose sitting grass tide Snowy Egret Mallard Eeding 10 minutes mud. 15 minutes mud BK Bek CJI SMINUter mud foeding Other bird Notes: 8 Gr. BK. Buck Guil () Other bird Notes: 8 Gr. BK. Buck Guil () Osprey (? young) Harbor 9 Starling 4 D. C Cormorat C Mallard Black hound Night Heron in South Cove Black hound Night Heron in South Cove () Outher Buck Cove () Stack repair 6/23/06 <u>female very upset</u> () Outher bird () () Other bird () () Outher bird () () Other bir 2 Peregrine Falcon - L.IPA. (Stack repair 6/23/06 female very upset) No young se

Date of Monitoring 7/7/0	16				
Time of Monitoring	Began: <u>9:30AM</u> Concluded: <u>10 - AM</u>				
Tide (please circle one)	High Tide / Ebbing / Low Tide / Flooding Predicted low and high tides:				
	Time of tidal measurements:				
	Nearest tidal station:				
Weather (temperature, wind, precipitation)	75° NEOS-10 SUNNY				
Monitor(s) (name, affiliation) M.N	ORMANDIA, NSAS				
Type of Monitoring (please circle one)	Pre-Construction				
	As-built (4-5 weeks)				
	Annual Post-Construction: Year 1 (12)1 3 / 4/ 5				
Parameters Measured (please circle all that apply)	Vegetation				
	Sediment				
	Benthic Invertebrates				
(	Birds				
	Other (please describe):				
Photo Monitoring Conducted? (please indicate station codes)	Yes No				
Video Monitoring Conducted? (please provide brief description)	Yes No				

7/7/06

## MONITORING PARAMETERS: BIRD OBSERVATION

Location Abundance Activity **Duration of Stay** Species Willow Flycatcher W.BK.G. Nicht Heron scub perch feeding Site: 10 minutes 1 minute 1 Flying fly by Ø. Other bid Notes: 3 Barn Swellow 1 Mackengbud Starking Lot 3 Reducing Bk Brid 1 Fish Crow 4 O sprey (undeterminal young in 6 mests) 10 Mite Swan (wy young) (2 sets) 30 Canada Geese Peregnine Falcon I (stack repair contin

	TI ORING INFORMATION
Date of Monitoring 7	112/06
Time of Monitoring	Began: 2:15 pm Concluded: 2:45 pm
Tide	High Tide Ebbing / Low Tide / Flooding
	Predicted low and high tides:
	Time of tidal measurements:
	Nearest tidal station:
Weather (temperature, wind, precipitation)	85° 505 Hazy
Monitor(s) (name, affiliation) M. N	JORMANDIA, NSAS
Type of Monitoring	Pre-Construction
please circle one)	As-built (4-5 weeks)
	Annual Post-Construction: Year 1 (12)1 3 / 4/ 5
Parameters Measured	Vegetation
(preuse en ele an mar appr))	Sediment
	Benthic Invertebrates
(	Birds
	Other (please describe):
Photo Monitoring Conducted? (please indicate station codes)	Yes No
Video Monitoring Conducted?	Yes No

## MONITORING PARAMETERS: BIRD OBSERVATION 7/12/06

Species Abundance Location Activity Duration of Stay Site: RudWangBlackBu site Marker sitten 10 Minutes 1\_ Â Other bird Notes: 5 Mute Swan (406 whick young) - South Cone 1 D.C. Cormorant 15 Barn Swallow 5 Osprey (still unteleven of young) 16 Howesponon 26 E. Stailing Parkers Lot 3 RWOO 1 Peregrine

## MONITORING PARAMETERS: BIRD OBSERVATION 7/18/06

	Species	Abundance	Location	Activity	Duration of Stay	
Site:	Song Sparrow	ふ	grasses	eating	15 min.	
<i>JUC</i> .	Mounting Pove	2	tideline	walking	Sminutes	
	Red Wine BK Bird	ム	orangenetting	singing	15 minutés	
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		······				
$D_{0}/2^{\circ}$	Starling	7/all	Shoreline	eating	15 minutes	
40.						
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					<u> </u>	]
The hid	Novas: 17 Aspen	Jan / Sotw	hich young)	26 Huse	Sparrow )	ы <b>О</b> і ,
ther ong	day 2 D.C. (a	1/ SKHWA	young)	27 Sta	Hing Gura	Tarking
Ho	2 Laushing	2 GUL		9 Ring	billed bill "	Lot .
11	14 Greats	Inck BIC-C		30 (nn	ada beese	· .
	Lanad	aux				

2 Peregrine (1 of which young)

No terrapins seen all season

MONITORING PARAMETERS: BIRD OBSERVATION 7/25/06

	Species	Abundance	Location	Activity	Duration of Stay
Site:	SongSpane	N I	grass	Fording	5 minutes
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Refo:	D.				· · · · · · · · · · · · · · · · · · ·
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				<u> </u>	<u> </u>
			<u> </u>		
	· · · · · · · · · · · · · · · · · · ·				
Other brid	Notes: 2 Great Eq	reteron (So	Hilare	4 Rock ligeo	and farking Lot
8 From S	and and		3	7 Starling	
6 Osprey	(still no young seen			Parmana	(a lift) enting Pigeon
30 tens 4 Gr. Bla	(species!)	< Harbo	r	on highter	sion pollon Bar
3 Ringb.	lled Guil	)		(	Noyoung)
6 D.C.	CON MONTON (			<u> </u>	

8/9/06

## MONITORING PARAMETERS: BIRD OBSERVATION

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	Species	Abundance	Location	Activity	Duration of Stay	
Site:	Mockingbird	. /	91a55	Standing	10 minutes	
200.						
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Reh:	Ø.					
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		· · · · · · · · · · · · · · · · · · ·				
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			<u> </u>			
	2 Baca	Swallan)	)	2 lases	+ Farr + - South	Cose
Other bid	Notes: 2 Fish (		Parking Lot	a orna		
	24 HUSE SP	parow )	/	1 Van	Peregrine - Knoc	kedsma
	a chance for	1 million	()	bird int	o havbor andr	etrived
	2 (or Ble Back	· GJ11		if		- • <b>·</b> • <b>*</b> • •
	6 Mute Sulan		>Harbor			
	1 Ring Billed 6	ulc.	)			

8/16/06

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## MONITORING PARAMETERS: BIRD OBSERVATION

	Species	Abundance	Location	Activity	Duration of Stay	
Site;	Snowy Egret	·a	mud flats	hunting	15 min	
<i></i>	SongSparrow		grasses	flying	5minites	
	Red Wing BK Bird	1	grasses	Flying	15mmiles	
•						
			· · · · · · · · · · · · · · · · · · ·			
		· · · ·				
$\gamma \Lambda $	CartEast		mita	Chanding	10 minuto	
eb:	Sumin Faires		unid	standing	5 minutes	
	Taushinabills	2	min	u	5 minutes	
	10W Jungeo 115		1,000		0,11,0,0	
	·					
	16 Houses	sparrow )		2 DC	Comprant	$\searrow$
Other bud	Notes: 4 Fish	now (	Tarking	505p	rey (young?)	)
	16 Canada	v Geese	Lot	2 Barn	Swallow	
t.		J		1 leas	t tern (banded)	'C Harb
1 Nor	15+1 adult	Peregrin	e flying	20 Great 20Gr. Bl	ue Heron	
$U^{-}$	L	0	VOV	15 Shou	y Egret	
				P.M.E	r Swan	,

## MONITORING PARAMETERS: BIRD OBSERVATION 8/25/06

5ite

r					Duration of Stay
Site:	Miteswan	.2	streamin mud	feeding	15 minutes
					<u> </u>
$\sim \Lambda$					
Ref:					
$\checkmark$		+			
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				<u>.</u>	
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al 1.1	4 Rungbille	d Guils ? Par	king Lot		
Other bud	Ivoles: 2 Herring		١		
	2 Laurhing (	Sull)		<u> </u>	(1 al 1 w
	4 Mute Sw	an (H	admit	d M	erequire ( Lack, 174
	G Gr. Alve	iteron	(1) 40 T		LILA
.**	2 Snowy 4 Ospra	1			

# 70 EQ 10 donzie MONITORING PARAMETERS: BIRD OBSERVATION 8/29/06

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	Species	Abundance	Location	Activity	Duration of Stay	
Site:		 		ļ		
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		· · · · · · · · · · · · · · · · · · ·			+	
		<u> </u>		+		
				<u> </u>		
Pole:	Ø					
Nep?						
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	<b></b>	<u> </u>	 			
			<u></u>			
						4
			·			4
				10.0 (.th		
Other bid	Notes: 12 Rmg bd	abcese (	arking Lot	G Herring 4 Gr. Blad	Back Gul	
	3 Mouring 35 House 5	paro (	·	4 Ospra	8 (H	arbov
	30 Starlin	m ).		2 Gr. Eq	eron et en t	
		-		6 D.C. C	ormorant)	
1 aduit	Peregrine - Tension E	bleon Bar		4 Mite Su	jan /	

# MONITORING PARAMETERS: BIRD OBSERVATION 9/6/06

	Species	Abundance	Location	Activity	Duration of Stay	
Site:	Red Wms Black bid	4 young	grasses	Feeding	10 minutes	
	House Sparrow	15	grasses	feeding	10 minutes	
	HouseFinch	4	srub	Flying	5 minutes	
	Song Sparrow	3	grasses	feeding	15 minutes	
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Ref:	0	 				
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	ļ	ļ		<del>_</del>		
			<u> </u>	 ۱۱۰	1 Rule Parts	
Ther bid	Notes: 2 Snow	Egrets	) cont	1	9 Ring bured 6	J
	2 Great B	lue theron	Source	1	15 Starling	
	1 Bic. (now	in Night lite	eron conc		-	/
	S Mitas	moran !	punys		1.1+ Personino	(
					w	-

1 adult Perequise on pole on Bar

MONITORING PARAMETERS: BIRD OBSERVATION 9/16/06

Species Abundance Activity Location Duration of Stay Site: . Other bid Notes: South Cove - Imm. BK. Crownol Nightheron Black+White Waterthirsh Northeun Waterthirsh Coopers Hawk 1 Stealth Fighter plone

Harbor 2 Great Elve Herous G Great Equet 3 D.C. Cormorant 4 Herring Syll 2 River billrel Gull

No Peregrines

MONITORING PARAMETERS: BIRD OBSERVATION 9/25/06

	Species	Abundance	Location	Activity	Duration of Stay
$\subset t_{a}$	8				
Sve.					
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Other bird Notes:

10 HerringGel in P.L. 12 Pigeon in P.Lot

No peregnines

## APPENDIX G NOAA 2002 PRE-RESTORATION MONITORING DATA

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#### NOAA 2002 Pre-Restoration Monitoring Data

																					1	Restr	ratio	n Site																						
	Vegetative Cover (percent)																																													
Species	Transect 1 Transect 2								Transect 3					Transect 4						Transect 5				Transect 6						Transect 7					Average											
Piants	Q1	Q2	Q3	Q4	Q5	Q6	Q1	Q2	Q3	Q4	QS	Q8	Q7	Q1	Q2	Q3	Q5	Q6	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q1	Q2	Q3	Q4	Q5	Q6	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q1	Q2	Q3	Q4	Q5	Q6	(square meter)
Spartine alternitiona	0	0	1	90	90	40	0	0	0	35	18	0	0.5	0	85	20	0	0	0	0	0	0	0	Ö	0	60	0	0	65	45	55	40	0	0	0	85	80	3.5	25	0	0	80	60	35	0.5	22.5%
Phragmitas austrais	37	7	0	0	0	0	45	0	1	0	0	0	0	7	0	0	0	0	15	20	30	20	25	5	37	0	5	100	0	0	0	0	100	100	70	0	0	0	0	15	15	0	0	0	0	14.5%
iva frutescens	0	65	0	0	0	Û	0	60	50	0	0	0	0	0	0	0	0	0	40	10	5	0	0	Û	0	0	Û	0	0	0	0	0	0	0	0	0	0	Ö	0	0	0	0	0	0	0	5.1%
Distichiis spicata	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	Q	0	0	0	0	0	60	0.5	0	0	Û	0	0	0	0	0	0	0	0	0	Q	0	0	0	0	0	0	0	0	14.1%
Artemesia vuigaris	0	0	0	0	0	0	0	0	0	0	0	0	0	$\overline{1}$	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
Limonium ap.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45	0	47	6	0	0	0	0	0	0	0	0	0	0	Ō	C	0	C		0	0	0	0	0	2.2%
Toxicodendron redicens	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	Ð	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7.7%
Salicomia auropa	0	0	1	0	0	0	0	Û	0	Û	0	0	0	0	0	0	0	0	0	0	0	0	0	Q	0	0	0	Ũ	0	0	0	0	0	0	0	0	Û	C	0	0	0	0	0	0	0	0.0%
																															•												Total F	Plant (	Cover	46.6%
Invertebrates						-												N	iacroin	verte	brate (	densit	y (Indiv	/iduals	s per s	square	e mete	ir)		_																(1/4 square meter)
Geukensia demissa	0	0	0	200	600	1500	0	0	0	0	180	140	10	0	0	120	15	69	0	0	0	0	0	0	1	150	0	0	54	67	40	78	0	0	0	5	67	42	92	0	0	0	39	105		19.9
Uca pugnax (burrows)	0	0	Û	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Ō	0	0	0	0	10	0	0	Û	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Nassarius obsolatus	0	0	Ô	Û	0	0	0	0	0	0	90	240	410	0	0	240	130	312	0	0	0	0	O T	Q	0	0	0	0	87	400	100	420	Q	0	0	15	120	31	60	0	0	0	218	352	128	18.6

NOTE: These transects are not the same as those used in the 5 year post-construction monitoring program.

							Re	eferer	nce S	ite				· · · ·						
	Vegetative Cover (percent)																			
Species	Refe		Average																	
Plants	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	(square meter)						
Spartina alterniflora	88	25	95	32	55	85	100	100	90	100	50	45	12	67.5%						
Invertebrates	Macr	oinver	tebrate	e dens	sity (in	dividu	ials pe	r squa	are me	eter)				(1/4 square meter)						
Geukensia demissa	320	19	600	38	0	0	1400	1180	1310	1620	177	0	5	128.3						
Nassarius obsoletus	0	30	0	0	1300	0	0	1000	1860	0	172	0	0	83.9						

The reference site is not the same as the reference site used in the 5 year post-construction monitoring program.

						S,	partina	a alteri	niflora	heigt	n <b>t</b> (first	numbe	er is fe	et, sec	ond nu	imber i	s inche	s)									
							R	estora	tion S	ite									Reference Site								
T1	T1	T2	T2	T3	T3	T4	T5	T5	T5	T5	T6	T6	T6	17	T7	T7	17		R1	R1	R1	R1	R1	R1			
Q4	Q5	Q4	Q5	Q2	Q3	Q8	_Q3	Q4	Q5	Q6	Q4	Q5	Q7	Q3	Q4	Q5	Q6		Q1	Q3	Q5	Q7	Q9	Q11			
4.5	4	4.8	5.10	6	2.5	3	2.1	5	4.5	2	4	4	3.3	5.4	6	5.3	2.3		4.3	4	4.4	4.1	6	4.6			
4	3	3.11	5.9	4.5	3.25	3.5	2.5	5	2.5	1.5	3.1	2.65	2	4.9	5	4.3	4.4		6.8	4	3.10	5	6.7	4			
4	2.5	6.4	4.11	2	1,5	6	2.2	4.5	2	3	4.2	6	3	5.3	5.3	5			4	4.2	4.3	5.7	5.6	5.5			
2	3	5	6.4	4.25	2.5	4	4	3	2.1	2.2	4.6	2.6	3.1	4.6	6.10	4.5			3.5	4.7	3	5.1	5.3	5			
3	3	5.1	6.5	<b>\$</b> .5	3	6	3	2	3	2	4.5	6	2.5	4.7	5.5	4.11			4.11	4	4.1	5.3	5	4.4			
4.5	4	4.6	4.4	5	3	4.5	2.5	2.2	4.5	3	5	3	3	4.10	5.9	5.6			3	3.11	4.4	5.6	6.5	<b>6.</b> 6			
5	4.5	3.10	3.8	5.5	3.25	5.75	2.3	2.4	3.1	3.1	6	1.5	3.5	4.7	5.10	5.6			2.5	3,6	4.6	6.3	4.1	4			
4	3.5	4.6	2.10	2.5	2.5	4	4.6	2.5	3	3.5	3.2	4.5	1	5.2	6.3	4.8			5	4.5	4	6	5.4	4.7			
5.5	3.5	3.9	5.4	6.1	2.25	6.25	5	3	3	4	4.3	4	3.2	4.5	5.3	5.4			3,7	3.10	3.10	8	6.1	4.9			
3	5	4.5	6.1	5	1.75	3.5	3.2	1.6	2.1	3.7	5	4.2	1.5	4.2	5.5	5.3			4.6	4.5	6.1	6.10	3.7	4.2			
4.5	5	4.5	1.8	6.25	2.75	5.5	6	3	3.5	3.8	3.1	4	1.8	4.8	5.7	5.4			4.5	4.5	3	5.4	6	4.10			
4	4.5	4.6	1.5	5.2	2	5	5.2	5.5	3.8	3.6	4.5	3.5	1.6	4.5	4.10	4.10			3.4	4.2	4.1	5	5,3	4.10			
4	3	3.11	1.6	5.75	2.5	5	5	3	3.2	4	6	4.5	1.8	5.5	5.2	4.9			3.4	4.4	4.6	4.8	4.7	3.5			
4	4	3.7	3.7	6.5	2	3.25	5.5	3	2.2	4.1	5.8	4.2	1.9	5.4	4.8	4.9			4.7	3.10	3.4	6.3	5.11	6			
3	4	3.3	2.2	5.5	1.5	6.75	6.1	6	3	4.2	4.2	4.1	2	5.10	6.3	5			3.6	3.2	4.8	4.5	<b>5.1</b>	4.11			
4.6	4	3.2	0.83	4.5	2.5	5.5							2.8	5.15	6,4	4.9			3.10	3,5	3.7	3.6	4.7	<b>5.1</b>			
4.5	6	3.2	1.4	6.5	1.75	3.5							3	5.1	5	4.10			4.10	4.11	3	5.2	6.2	4.4			
4	3.5	2.4	0.91	6.25	2.25	3.75							1.7	5.15	5	4.7			4.6	3.7	4.6	6.3	5	5.5			
5	3	3.2	0.83	6	3	4							6	5.15	5	4.7			4.3	4.4	4.3	4.2	6.4	4.11			
4.5	3	4	4.9	5.25	2.5	5.5							1.7	5.1	4.10	4.9				4.10	4.1	5.5	5.9	5.5			

The reference site is not the same as the reference site used in the 5 year post-construction monitoring program.

Heights in bold font are flowering plants.