Atlantic Coast of Long Island,
Fire Island Inlet to Montauk Point (FIMP), New York,
Storm Damage Reduction Project, Reformulation Study

EVALUATION OF RESTORATION OPPORTUNITIES USING THE HABITAT EVALUATION PROCEDURES (HEP) METHOD

FINAL PHASE II REPORT

Volume 2 – Appendices

JULY 2009

Prepared by: **U.S. Army Corps of Engineers**
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New York, New York 10278-0090

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FOR THE

ATLANTIC COAST OF LONG ISLAND,

FIRE ISLAND INLET TO MONTAUK POINT (FIMP), NEW YORK,

STORM DAMAGE REDUCTION PROJECT, REFORMULATION STUDY

JULY 2009

Prepared by:

U.S. Army Corps of Engineers
New York District, Planning Division (CENAN-PL-E)
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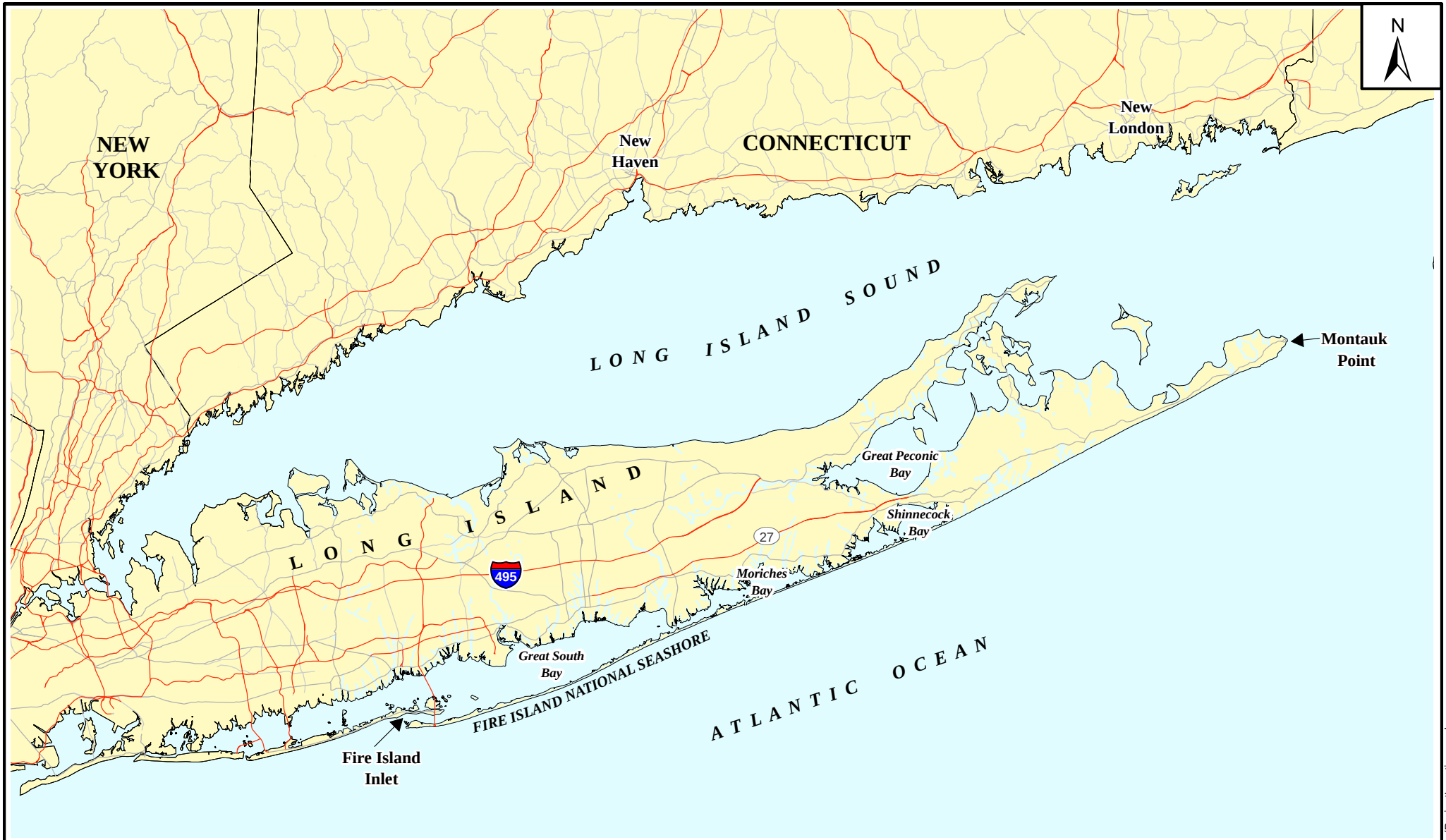

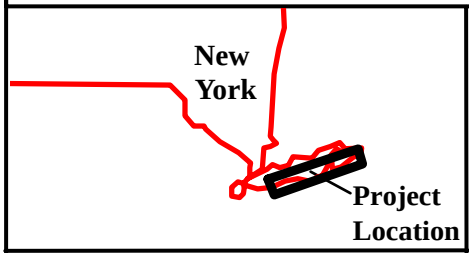

Source: ESRI Data and Maps, 2005.

LEGEND

Major Highway

Major Road

10 5 0 10 20 30

Miles

Figure 1. Site Location for Fire Island to Montauk Point, NY Habitat Evaluation Procedures Study.

Prepared By: Department of the Army New York District Corps of Engineers

Date: 08/06

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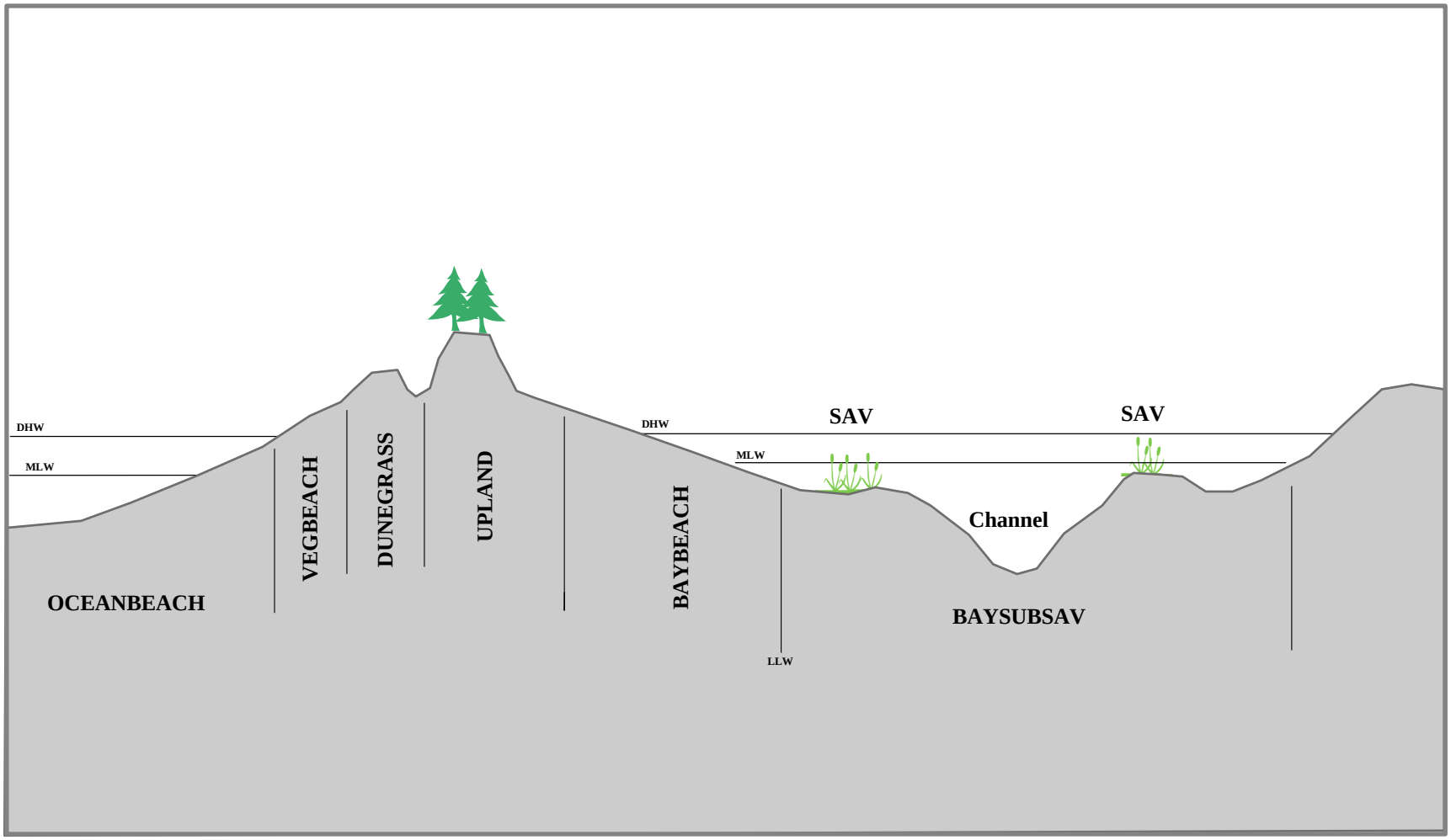


Drawing Not to Scale

LEGEND

OCEANBEACH - 10m to Daily High Water (Wrack Line)

VEGBEACH - MHW to Toe of Dune

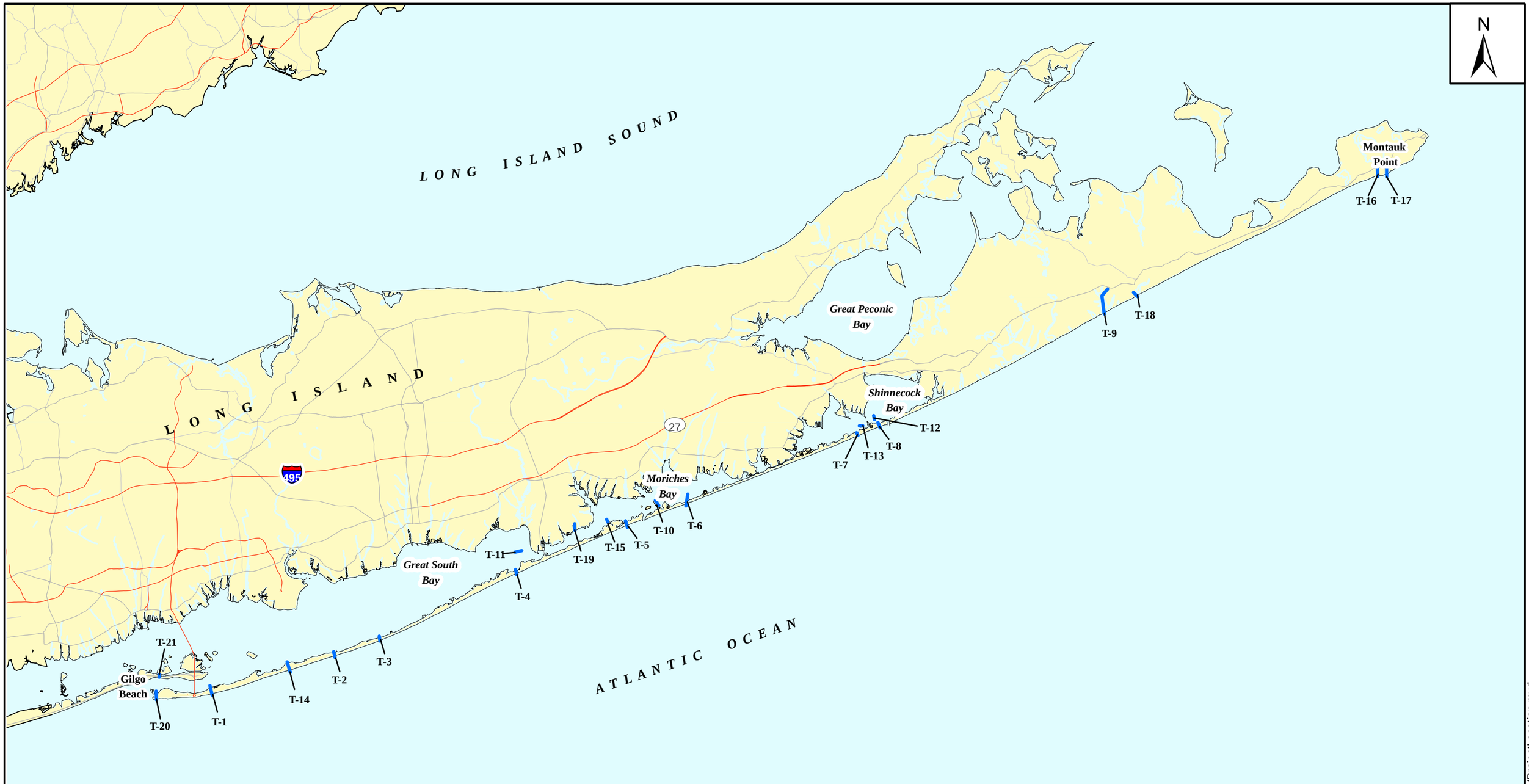
DUNEGRASS - Toe of Dune to Upland

UPLAND - Dominated by >20% Shrub/Tree

BAYBEACH - Upalnd Edge to Low-Low Water

BAYSUBSAV - Permanantly Inundated

Figure 2. Idealized Transect of Ecosystems for Fire Island to Montauk Point, NY Habitat Evaluation Procedures Study.



Source: ESRI Data and Maps, 2003; USACE, 2004?

LEGEND

- HEP Survey Location
- Major Highway
- Major Road

HEP Survey Location Names

T-1 - Robert Moses	T-8 - WOSI	T-15 - New Made Island
T-2 - Sunken Forest	T-9 - Georgica Pond	T-16 - Ditch Plains Road
T-3 - Reagan Property	T-10 - East Inlet Island	T-17 - Ranch Road (Bluffs)
T-4 - Old Inlet	T-11 - John Boyle Island	T-18 - Hook Pond
T-5 - Great Gun	T-12 - Warner Island	T-19 - Mastic Community
T-6 - Pikes Breach	T-13 - Ponquogue Spoil Island	T-20 - Democrat Point
T-7 - Tiana	T-14 - Ocean Beach	T-21 - Oak Beach

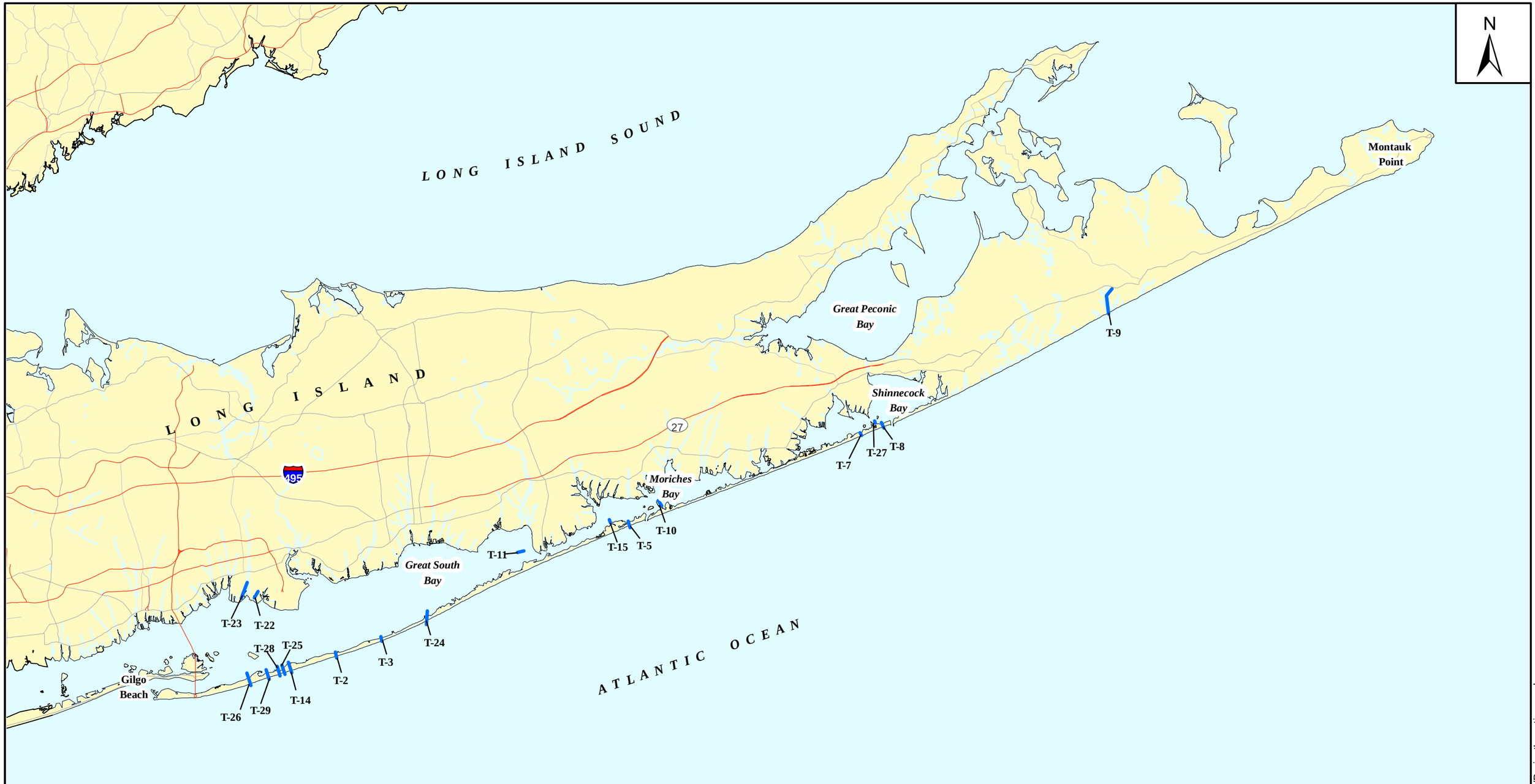
10 5 0 10 20
Miles

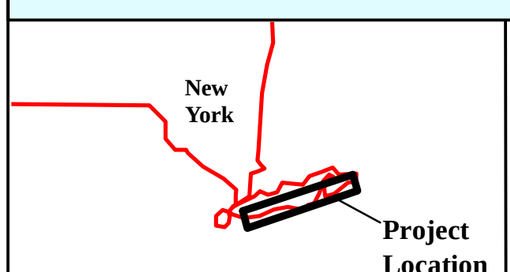
Figure 3. HEP Data Collection Locations for Fire Island to Montauk Point, NY Habitat Evaluation Procedures Study.

Prepared By: Department of the Army, New York District, Corps of Engineers

Date: 08/06

z:/projects/fimp-hep-rest/maps2005/figures/ProjectLocation.mxd





Source: ESRI Data and Maps, 2003; USACE, 2004

LEGEND

- Restoration Location
- Major Highway
- Major Road

Restoration Location Names

T-2 - Sunken Forest	T-10 - East Inlet Island	T-24 - Davis Park
T-3 - Reagan Property	T-11 - John Boyle Island	T-25 - Atlantique to Corneille
T-5 - Great Gun	T-14 - Ocean Beach	T-26 - Kismet
T-7 - Tiana	T-15 - New Made Island	T-27 - Warner Island East
T-8 - WOSI	T-22 - Islip Meadows	T-28 - Atlantique
T-9 - Georgica Pond	T-23 - Seatuck Refuge	T-29 - Fair Harbor

10 5 0 10 20
Miles

Figure 4. Restoration Site Location for Fire Island to Montauk Point, NY Habitat Evaluation Procedures Study.

Prepared By: Department of the Army, New York District, Corps of Engineers

Date: 07/09

z:/projects/limp-hep-rest/maps2005/figures/ProjectLocation.mxd

APPENDIX B

ADDITIONAL SUPPORTING TABLES

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Table 1. Interagency Team Members for FIMP Habitat Evaluation.

Team Member	Affiliation	Responsibility
Pamela Lynch	USACE	Advisory Team, USACE Biologist
Robert Smith	USACE	Advisory Team, USACE Biologist
Karen Graulich	NYSDEC	Advisory Team/Phase I Member Only
Jean O'Neil	USACE/ERDC	Advisory Team (non-voting member)
Kelly Burks-Copes	USACE/ERDC	Advisory Team (non-voting member)/Phase I Member Only
Patricia Rafferty	USNPS	Advisory Team
Steve Sinkevich	USFWS	Advisory Team
Norb Psuty	Rutgers University	Advisory Team
Stacie Grove	USACE Consultant	Advisory Team, NEA Project Manager (non-voting member)

Table 2. List of HSI Variables Sampled for HEP Community Models (see HEP Report, Section 3.4 for additional information on variables).

HSI Variables	ACRONYM	TOPIC	OCEANBEACH	VEGBEACH	DUNEGRASS	UPLANDS	BAYBEACH	BAYSUBSAV
Percent Cover of Submergent Aquatic Vegetation (%)	CANSAVCOV	Biota						x
Percent Cover of Vegetation (%)	CANVEGCOV	Biota		x	x			
Percent Cover of Shrubs and Trees (%)	CANTRSHRB	Biota				x		
Presence of Non-desirable, Invasive, and/or Exotic Species	INVASIVES	Biota			x	x	x	x
Species Richness of Desirable Plant and Animal Species	RICHSPP	Biota					x	x
Presence of Erosion	EROSION	Geomorph					x	
Presence of Modified Shoreline	SHOREMOD	Geomorph	x	x			x	
Average Slope of Dune and Shoreline	SLOPE	Geomorph		x	x			
Width of Cover Type (ft)	WIDTH	Geomorph	x	x	x			
Suitability of Substrate for Given Area	SUBSTRATE	Geomorph	x	x	x	x	x	x
Impact of Barriers to Wildlife Passage	BARWILDLF	Human	x	x	x	x	x	
Presence of Human Disturbance Factors	HUMFACTORS	Human	x	x	x	x	x	x
Magnitude of Impact From Human Disturbance (%)	HUMMAGNIT	Human	x	x	x	x	x	x

x indicates that the variable is applicable to this community.

Table 3. Final Mathematical Functions and Equations Used in the FIMP Study

HEP Community Model	Equation Used in Model
OCEANBEACH	HSI = minimum of SUBSTRATE or (WIDTH*((SHOREMOD+(((HUMFACTORS*HUMMAGNIT)+BARWILDLF)/2))/2))
VEGBEACH	HSI - minimum of SUBSTRATE or (((((WIDTH*SLOPE)^(1/2))*CANVEGCOV)+SHOREMOD+(((HUMFACTORS*HUMMAGNIT)+BARWILDLF)/2))/3)
DUNEGRASS	(((((WIDTH*SLOPE)^(1/2))*CANVEGCOV)+INVASIVES+(((HUMFACTORS*HUMMAGNIT)+BARWILDLF)/2))/3)
UPLAND	(INVASIVES+CANTRSHRUB+(((HUMFACTORS*HUMMAGNIT)+BARWILDLF)/2))/3
BAYBEACH	Minimum of SUBSTRATE or ((((RICHSPP*INVASIVES)^(1/2))+SHOREMOD+EROSION+(((HUMFACTORS*HUMMAGNIT)+BARWILDLF)/2))/4)
BAYSUBSAV	Minimum of SUBSTRATE or ((((RICHSPP*INVASIVES)^(1/2))+CANSAVCOV+(HUMFACTORS*HUMMAGNIT))/3)

Table 4. Future Conditions - Assumptions Without Restoration or Shoreline Stabilization Actions Incorporated into HSI models.

TRANSECT	OCEANBEACH	VEGBEACH	DUNEGRASS	UPLAND	BAYBEACH	BAYSUBSAV
Applied to ALL Sites (Restoration, Shoreline Protection, and Breach Response)						
Transect 1 (R. Moses)	loss of width 10%	loss of width 20%	loss of width 20%	loss of SI	no change	no change
	2000 ft to 1800, SI = .8	width to 52', SI = .3	SI = .1	dec by .1		
Transect 2 (Sunken)	loss of width 10%	none	none	loss of SI		gain in acres
	1500 ft to 1350, SI = .6			dec by .1		
Transect 3 (Reagan)	loss of width 10%	loss of width 20%	loss of width 20%	loss of SI		gain in acres
	1600 ft to 1440, SI = .6	width to 132', SI =1.0	SI = .1	dec by .1		
Transect 4 (Old Inlet)	loss of width 10%	none	none	loss of SI	gain in acres	loss in acres
	1600 ft to 1440, SI = .6			dec by .1	10% change in acres	10% change in acres
Transect 5 (Great Gun)	loss of width 10%	none	none	loss of SI	loss in acres	
	1800 ft to 1620, SI = .6			dec by .1	10% change in acres	inc by .1
Transect 6 (Pikes Breach)	loss of 20% width	loss of width 20%	loss of width 20%	loss of SI	loss in acres	gain in acres
	2600 ft to 2080, SI = 1.0	width to 165', SI =1.0	width to 17.5', SI = .3	dec by .1	10% change in acres	inc by .1
Transect 7 (Tiana)	loss of 20% width	none	none	loss of SI	loss in acres	gain in acres
	1900 ft to 1520, SI = .7			dec by .1	.05% change in acres	inc by .1
Transect 8 (WOSI)	loss of 20% width	none	none	loss of SI		no change
	2100 ft to 1680, SI = .8			dec by .1		
T-10 East Inlet Island	na	na	loss of width 30%	loss of SI	no change	no change
			SI = .1	dec by .1		

Table 4. Future Conditions - Assumptions Without Restoration or Shoreline Stabilization Actions (continued)

TRANSECT	OCEANBEACH	VEGBEACH	DUNEGRASS	UPLAND	BAYBEACH	BAYSUBSAV
T-11 John Boyle Island	na	na	loss of width 30%	loss of SI	no change	no change
			SI = .1	dec by .1		
T-12 Warner Island	na	na	loss of width 30%	loss of SI	no change	no change
			SI = .1	dec by .1		
T-13 Ponqougue Spoil Island	na	na	loss of width 30%	loss of SI	no change	no change
			SI = .1	dec by .1		
T-14 (Ocean Beach)	loss of 20% width	loss of width 40%	loss of width 40%	loss of SI		no change
	2300 ft to 1840, SI = .9	width to 36, SI =.1	width to 28', SI to .7	dec by .1		
T-15 New Made Island	na	na	loss of width 30%	loss of SI	no change	no change
			SI = .1	dec by .1		
Breach Response Sites Only (to account for full breach of area)						
All Breach Response Sites	no change	Complete overwash	Complete overwash	Complete overwash	Complete overwash	Complete overwash
		some SI gains, some losses	some SI gains, some losses	some SI gains, some losses	some SI gains, some losses	some SI gains, some losses

Table 4. Future Conditions - Assumptions Without Restoration or Shoreline Stabilization Actions (continued).

Assumptions Made When Calculating Future Conditions

Baysubsav - gain throughout area due to sea level rise and erosion of BAYBEACH

Baybeach - loss throughout area due to erosion

Upland - loss throughout area due to increased development pressures, erosion, and shifting of DUNEGRASS community

Dunegrass - loss in developed areas where dune evolution is restricted, communities will shift in location (loss in some areas/gain in others) with no net loss project wide

Vegbeach - loss in developed areas where dune evolution is restricted, communities will shift in location (loss in some areas/gain in others) with no net loss project wide

Oceanbeach -loss throughout area; eastern 1/2 of area (except rocky area near Montauk) will lose sand 2-3x's faster than the west

Oceanbeach width decrease will be 10% west and 20% east

Vegbeach and Dunegrass width decrease will be 20% sites 1, 3, 6, and 40% site 14 (sites where dune evolution is restricted)

Dunegrass width decrease will drop sites 10 and 11 which were at 10' and SI of .2. Sites 12, 13, 15 were already at the lowest SI

Upland showed an overall decrease in SI of .1; plus loss of 10% acres on islands plus 35% loss of upland areas

All types - Invasives will all decrease in SI by two classes, i.e., .8 to .4 and then to .2

All types - the three Human variables will all decrease in SI by one class

No change in Canvegcov, Cantreeshrb, Richspp, Slope, Shoremod

Baybeach - assume no change in Richspp without change in community

Baybeach on islands increased by 5% acres

AREA - in the first four, decreased acres by 10% from baseline to reflect loss of material to the west and away from these transects

Exception - in the islands, decreased area by 25% in the DUNEGRASS

Trasnsect 4 BAYBEACH acres increased by 10%

Transects 5, 6, 7 BAYBEACH decreased acres 10%

BAYSUBSAV transects 2 and 3 increased acres 1%

BAYBEACH 5, 6, 7 stopped reduction of HSIs by .1

BAYSUBSAV 4,5,6,7 stopped increased in HSIs.

Under Breach Response scenario breach results in complete overwash of dune and deposition of sand across all habitats, acreage changes NOT addressed

Breach will result in some SI improvements while others will be negatively impacted

Table 5. HEP Transects Used to Generate HSI Scores for Restoration Areas

RESTORATION LOCATION	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	COMMENTS
Sunken Forest	T-2	T-2	T-2	T-2	T-2	T-2	HEP T-2
Reagan Property	T-3	T-3	T-3	T-3	T-3	T-3	HEP T-3
Great Gunn	T-5	T-5	T-5	T-5	T-5	T-5	HEP T-5
Tiana	T-7	T-7	T-7	T-7	T-7	T-7	HEP T-7
WOSI	T-8	T-8	T-8	T-8	T-8	T-8	HEP T-8
East Inlet Island	T-10	T-10	T-10	T-10	T-10	T-10	HEP T-10, transcomm HSI = 1.0 when 4 communities are present
John Boyle Island	T-11	T-11	T-11	T-11	T-11	T-11	HEP T-11, transcomm HSI = 1.0 when 4 communities are present
Ocean Beach	T-14	T-14	T-14	T-14	T-14	T-14	HEP T-14
New Made Island	T-15	T-15	T-15	T-15	T-15	T-15	HEP T-15, transcomm HSI = 1.0 when 4 communities are present
Georgica Pond	T-9	T-9	T-9	T-9	T-9	T-9	HEP T-9
Islip Meadows	na	na	na	avg T-2, 3, 5	T-19	T-2	Setting of T-19, T-2, or average of T-2, 3, 5, except that hummfact, hummdist, barriers = average T-10, T-11, erosion = T-5, and shoremod is assigned a .8 (has minor modifications but minimal impact overall and less impact than found at other example areas). Transcomm HSI on mainland = 1.0 when 4 communities are present.

Table 5. HEP Transects Used to Generate HSI Scores for Restoration Sites (continued)

RESTORATION LOCATION	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	COMMENTS
Seatuck Refuge	na	na	na	avg T-2, 3, 5	T-19	T-2	Setting of T-19, T-2, or average of T-2, 3, 5, except that hummfact, hummdist, barriers = avg T-10, T-11, erosion = T-5, and shore-mod is assigned a .8 (minor modifications, minimal impact overall and less impact than at other example areas). Transcomm HSI on mainland = 1.0 when 4 communities are present.
Davis Park	T-3	T-14	T-14	T-14	T-14	T-14	T-14, also account for lack of groins in OB by using T-3
Atlantique to Corneille	T-3	T-14	T-14	T-14	T-14	T-14	T-14, also account for lack of groins in OB by using T-3
Kismet, Atlantique, Fair Harbor	T-3	T-14	T-14	T-14	T-14	T-14	T-14, also account for lack of groins in OB by using T-3
Warner Island East	na	na	na	T-6	avg T-10, T-11, T-15	na	Only 2 communities present, BAYSUB = average of T-10, 11, and 15, BAYBEACH = T-6 except for hummfact and humdist which = average of T-10, 11, and 15

Notes:

T-1 Robert Moses
T-2 Sunken Forest
T-3 Reagan Property
T-4 Old Inlet
T-5 Great Gun
T-6 Pikes Breach
T-7 Tiana
T-8 WOSI
T-9 Georgica Pond
T-10 East Inlet Island
T-11 John Boyle Island
T-12 Warner Island
T-13 Ponquogue Island
T-14 Ocean Beach
T-15 New Made Island
T-16 Ditch Plains Road
T-17 Ranch Road (Bluffs)
T-18 Hook Pond
T-19 Mastic Community
T-20 Democrat Point
T- 21 Oak Beach
* - Breach Response Site

At modeled sites that did not include site transects, assumptions from "parent" sites were assigned to the modeled sites.

Table 6. Effect of Alternative 1 on Coastal Processes at Restoration Sites as Per HEP Team.

Restoration Site	Longshore Sediment Transport	Cross-island Sediment Transport	Dune Development and Evolution	Bayside Shoreline	Estuarine	Benefit T & E Species	Total +	Total -
T-2 Sunken Forest	0	0	0	++	+	0	2	0
T-3 Reagan Property	0	0	0	++	+	0	2	0
T-5 Great Gun	0	0	0	0	++	0	1	0
T-7 Tiana	0	-	+	+	+	0	3	1
T-8 WOSI	0	0	0	0	++	0	1	0
T-10 East Inlet Island	0	0	0	+	+	y	1	0
T-11 John Boyle Island	0	0	0	0	0	y	0	0
T-14 Ocean Beach	++	0	0	0	0	0	1	0
T-15 New Made Island	0	0	0	0	0	y	0	0
T-9 Georgica Pond	0	0	0	0	++	0	1	0
T-22 Islip Meadows	0	0	0	0	++	0	1	0
T-23 Seatuck Refuge	0	0	0	0	++	0	1	0
T-24 Davis Park	0	-	+	0	0	0	1	1
T-25 Atlantique to Corneille	0	+	0	++	0	0	2	0
T-26 Kismet	++	0	0	0	0	0	0	0
T-27 Warner Island East	0	0	0	++	0	y	1	0
T-28 Atlantique	++	0	0	0	0	0	0	0
T-29 Fair Harbor	++	0	0	0	0	0	0	0

Key:
+ = net positive effect (small effect, plus high or low likelihood of occurring)
++ = significant net positive effect (large effect, plus high likelihood of occurring)
- = net negative effect (small effect, plus high or low likelihood of occurring)
- - = significant net negative effect (large effect, plus high likelihood of occurring)
0 = no/minimal net effect

Table 7. Effect of Alternative 2 on Coastal Processes at Restoration Sites as Per HEP Team.

Restoration Site	Target Coastal Processes					Benefit T & E Species	Total +	Total -
	Longshore Sediment Transport	Cross-island Sediment Transport	Dune Development and Evolution	Bayside Shoreline	Estuarine			
T-2 Sunken Forest	+	-	+	0	0	0	2	1
T-3 Reagan Property	+	0	+	0	0	0	2	0
T-5 Great Gun	0	- -	++	0	0	0	1	1
T-7 Tiana	0	-	+	+	+	0	3	1
T-8 WOSI	0	-	+	++	0	0	2	1
T-10 East Inlet Island	0	0	0	++	+	y	2	0
T-11 John Boyle Island	0	0	0	++	+	0	2	0
T-14 Ocean Beach	++	0	+	0	0	0	2	0
T-15 New Made Island	0	0	0	+	+	y	2	0
T-9 Georgica Pond	0	0	0	0	++	0	1	0
T-22 Islip Meadows	0	0	0	0	+	0	1	0
T-23 Seatuck Refuge	0	0	0	0	++	0	1	0
T-24 Davis Park	0	-	++	0	0	0	1	1
T-25 Atlantique to Corneille	0	++	0	++	0	0	2	0
T-26 Kismet	++	0	0	0	0	0	1	0
T-27 Warner Island East	0	0	0	++	0	y	1	0
T-28 Atlantique	++	0	0	0	0	0	1	0
T-29 Fair Harbor	++	0	0	0	0	0	1	0

Key:
+ = net positive effect (small effect, plus high or low likelihood of occurring)
++ = significant net positive effect (large effect, plus high likelihood of occurring)
- = net negative effect (small effect, plus high or low likelihood of occurring)
- - = significant net negative effect (large effect, plus high likelihood of occurring)
0 = no/minimal net effect

Table 8. Effect of Alternative 3 on Coastal Processes at Restoration Sites as Per HEP Team

Restoration Site	Target Coastal Processes					Benefit T & E Species	Total +	Total -
	Longshore Sediment Transport	Cross-island Sediment Transport	Dune Development and Evolution	Bayside Shoreline	Estuarine			
T-2 Sunken Forest	++	++	++	++	++	0	5	0
T-3 Reagan Property	0	0	0	++	++	0	2	0
T-5 Great Gun	++	++	++	++	++	0	5	0
T-7 Tiana	0	0	0	0	++	0	1	0
T-8 WOSI	0	-	+	++	0	0	2	1
T-10 East Inlet Island	0	0	0	++	+	y	2	0
T-11 John Boyle Island	0	0	0	++	+	0	2	0
T-14 Ocean Beach	++	0	+	0	0	0	2	0
T-15 New Made Island	0	0	0	++	+	y	2	0
T-9 Georgica Pond	++	0	+	0	++	0	3	0
T-22 Islip Meadows	0	0	0	0	++	0	1	0
T-23 Seatuck Refuge	0	0	0	+	++	0	2	0
T-24 Davis Park	0	- -	++	0	0	0	1	1
T-25 Atlantique to Corneille	0	-	++	0	0	0	1	1
T-26 Kismet	++	0	0	0	0	0	1	0
T-27 Warner Island East	0	0	0	++	0	y	1	0
T-28 Atlantique	++	0	0	0	0	0	1	0
T-29 Fair Harbor	++	0	0	0	0	0	1	0

Key:
+ = net positive effect (small effect, plus high or low likelihood of occurring)
++ = significant net positive effect (large effect, plus high likelihood of occurring)
- = net negative effect (small effect, plus high or low likelihood of occurring)
- - = significant net negative effect (large effect, plus high likelihood of occurring)
0 = no/minimal net effect

Table 9. Effect of Alternative 4 on Coastal Processes at Restoration Sites as Per HEP Team

Restoration Site	Target Coastal Processes					Benefit T & E Species	Total +	Total -
	Longshore Sediment Transport	Cross-island Sediment Transport	Dune Development and Evolution	Bayside Shoreline	Estuarine			
T-2 Sunken Forest	0	0	0	++	++	0	2	0
T-5 Great Gun	0	0	0	++	++	0	2	0
T-8 WOSI	0	0	0	+	++	0	2	0

Key:
+ = net positive effect (small effect, plus high or low likelihood of occurring)
++ = significant net positive effect (large effect, plus high likelihood of occurring)
- = net negative effect (small effect, plus high or low likelihood of occurring)
- - = significant net negative effect (large effect, plus high likelihood of occurring)
0 = no/minimal net effect

Table 10. Conceptual Ranking Matrix for Evaluating Restoration Alternatives and the No-Action Plan.

			Restoration Alternative & Description																			
			No-Action					Restoration Alternative 1					Restoration Alternative 2					Restoration Alternative 3				
		Acres Oceanbeach																				
INDICATES CATEGORY IDENTIFIED BY HEP TEAM		Acres Vegbeach																				
		Acres Dunegrass																				
		Acres Upland																				
		Acres Bayintertidal																				
		Acres Baysubsav																				
		Total Acres Restored																				
		Cost (Million $)																				
		Benefits (AAHUs)																				
		Cost per Acre (Thousand $)																				
		Cost per HU (Thousand $)																				
		RANKING	**1**	**2**	**3**	**4**	**Avg**	**1**	**2**	**3**	**4**	**Avg**	**1**	**2**	**3**	**4**	**Avg**	**1**	**2**	**3**	**4**	**Avg**
THREATENED AND ENDANGERED SPECIES	Likelihood that the proposed activity would benefit Federal or state-listed species or species of special concern	low = 1 high = 5																				
LAND OWNERSHIP	Likelihood that the landowner will support the proposed activity	low = 1 high = 5																				

Table 10. Conceptual Ranking Matrix for Evaluating Restoration Alternatives and the No-Action Plan.

Restoration Alternative & Description

			No-Action					Restoration Alternative 1					Restoration Alternative 2					Restoration Alternative 3				
NATURAL SUSTAINABILITY	Likelihood that the habitats created from the proposed activity are sustainable (at least 50 years)	low = 1 high = 5																				
NATURALNESS	Degree that proposed activity supports naturally occurring conditions in the general project area	low = 1 high = 5																				
MAINTENANCE and MANAGEMENT	Likelihood that a project sponsor would assume responsibility for long-term maintenance/ management	low = 1 high = 5																				
ANTHROPOGENIC EFFECTS	Likelihood that activity would help to reduce the overall affects of human activities on the environment/nature	low = 1 high = 5																				
COMBINED APPROACH	Likelihood that proposed activity would support a combined project + restoration effort	low = 1 high = 5																				
LONGSHORE SEDIMENT TRANSPORT PROCESSES	Likelihood that the proposed activity would support natural movement of sediment along the ocean side shoreline	low = 1 high = 5																				

Table 10. Conceptual Ranking Matrix for Evaluating Restoration Alternatives and the No-Action Plan.

Restoration Alternative & Description

			No-Action					Restoration Alternative 1					Restoration Alternative 2					Restoration Alternative 3				
CROSS-ISLAND SEDIMENT TRANSPORT PROCESSES	Likelihood that activity would support the natural movement of sand back and forth across the barrier island, between the offshore bar, beach face, berm, dune, island core, bayshore, and bay	low = 1 high = 5																				
DUNE DEVELOPMENT and EVOLUTION PROCESSES	Likelihood that activity would support the natural process of sand transport and recovery associated with natural dune growth and formation	low = 1 high = 5																				
BAYSIDE SHORELINE PROCESSES	Likelihood that activity will support the natural process of longshore currents along the bay shorelines and the natural creation of narrow sandy beaches, tidal creeks, mud and sand tidal flats, salt marshes, and eelgrass beds	low = 1 high = 5																				
ESTUARINE PROCESSES	Likelihood that activity would support the circulation of water and the movement of sediments, in support of natural ecological functioning of the habitats and species within the estuary	low = 1 high = 5																				

Table 10. Conceptual Ranking Matrix for Evaluating Restoration Alternatives and the No-Action Plan.

Restoration Alternative & Description

			No-Action					Restoration Alternative 1					Restoration Alternative 2					Restoration Alternative 3				
INSTITUTIONAL RECOGNITION	The importance of the environmental resource as evidenced by existing laws, plans, and policy statements from international, national, regional, state, local and tribal entities.	low = 1 high = 5																				
PUBLIC RECOGNITION	The importance of the environmental resource as evidenced by the general public's interest, participation and funding of resource related groups and activities.	low = 1 high = 5																				
TECHNICAL RECOGNITION	The importance of the environmental resource as evidenced by the scientific knowledge and understanding of critical characteristics of the resource, such as its scarcity, representativeness, status of disturbance, level of biodiversity, use for RTE animals and plants, etc. (current vs. future conditions).	low = 1 high = 5																				

Table 10. Conceptual Ranking Matrix for Evaluating Restoration Alternatives and the No-Action Plan.

Restoration Alternative & Description

			No-Action					Restoration Alternative 1					Restoration Alternative 2					Restoration Alternative 3				
ACCEPTABILITY	Is the plan acceptable to Federal and state resource agencies, and local government?	low = 1 high = 5																				
EFFECTIVENESS	Does the plan make a significant contribution to addressing the specified restoration problems or opportunities?	low = 1 high = 5																				
RELATIVE UNCERTAINTY	What level of uncertainty is associated with the estimation of ecological outputs (FCUs)?	high = 1 low = 5																				
		TOTAL:																				

Ranking Completed by: 1 = USACE, 2 = NPS, 3 = USFWS, 4 = NYSDEC

APPENDIX C

VISION STATEMENT, RESTORATION FRAMEWORK AND COASTAL PROCESSES FACT SHEETS

CONTENTS:

Section 1. FIMP Vision Statement ..... 2 Pages
Section 2. Restoration Framework..... 2 Pages
Section 3. Coastal Process Fact Sheets..... 9 Pages

FIRE ISLAND INLET to MONTAUK POINT
Reformulation Study

Fire Island to Montauk Point (FIMP)
Reformulation Study

Preface: The purpose of the FIMP Vision Statement is to articulate the goals and strategies of the Reformulation Study so that all decision-makers, stakeholders, and study team members may share a common understanding in this multi-faceted study. It is hoped that the FIMP Reformulation Study will serve as a model for addressing similar coastal issues elsewhere on Long Island, the Northeast, and the United States as a whole.

Vision Statement

The vision for the Fire Island to Montauk Point Reformulation Study is to prepare an implementable, comprehensive, and long-term regional strategy for the 83 mile portion of the south shore of Suffolk County, Long Island, New York that will reduce risks to human life and property while maintaining, enhancing, and restoring ecosystem integrity and coastal biodiversity. This will require an assessment of at-risk properties within the 71 square mile floodplain, present and future sea level rise, restoration and protection of important coastal landforms and processes, and important public uses of the area. The Reformulation Study will lead to a project that provides New York State and its residents with lower storm damage risks and a full range of future options for coastal zone management.

The Reformulation Study is taking an innovative approach using the best available analyses tools for addressing coastal storm risk reduction and pre- and post-storm shoreline management along both barrier and mainland shorelines. The U.S. Army Corps of Engineers and the State of New York, in their lead project planning and cost sharing roles, are developing innovative management and restoration measures working with a wide range of stakeholders to establish comprehensive, consensus-based solutions. The final plan will recommend measures for implementation by federal agencies, New York State, Suffolk County, and local governments through the exercise of all applicable governmental authorities to the maximum extent practical to achieve national, state, and local objectives.

- No plan can reduce all risks. On-going monitoring will evaluate the effectiveness and impacts of implemented policies. The monitoring results will serve as the basis for adaptations and adjustments to improve the project's effectiveness and respond to the dynamic nature of the FIMP study area.

- Collection, analysis, and independent technical review of scientific data will be conducted to improve understandings of complex and dynamic, regional hydrologic, geomorphic, and ecological factors and interrelationships while simultaneously facilitating the building and sharing of an integrated scientific, economic, and social knowledge base.

- Efforts will be undertaken to reduce mainland and barrier island flooding through site specific measures that address the variety of causes of flooding throughout the study area consistent with applicable agency laws and missions.

- Priority will be given to measures that reduce risks and provide protection to human life and property, restore and enhance coastal processes and ecosystem integrity, and are environmentally sustainable.

- Preference will be given to measures that protect and restore coastal landforms and natural habitats, aid in recovery of threatened and endangered species, enhance public recreation and use, and ensure perpetuation of essential physical and biological processes.

- Measures that avoid or minimize adverse environmental impacts, and adequately address long-term demands for public resources, will be used wherever and whenever appropriate and required while continuing to accept and embrace governmental responsibility and accountability under the law.

- Dune and beach replenishment will be optimized to balance storm damage reduction and environmental considerations. Sand nourishment will be considered where it will create conditions suitable for restoration of natural processes and where appropriate to protect important uses. Active intervention will be considered where it is possible to achieve balance and synergy between human development, economic activities, and natural systems.

- Existing shore stabilization structures, inlet stabilization measures, dredging practices, and other coastal area modifications past and present, including bay and estuarine shorelines, will be assessed to examine their impacts and, as appropriate, recommended to be altered, mitigated or removed to help restore important physical and biological processes.

The FIMP Web Page:
http://www.nan.usace.army.mil/fimp/index.htm

FIRE ISLAND INLET to MONTAUK POINT

Reformulation Study

Fire Island to Montauk Point (FIMP)
Reformulation Project

Restoration Framework

Restoring important coastal physical processes and natural protective features which include barrier islands and spits, shallow nearshore areas, beaches, dunes, and wetlands will strengthen the protective capabilities of Long Island's south shore barrier islands, estuaries/bays, and mainland shoreline which will reduce risks to human life and property from coastal flood, wave attack, and erosion hazards. Key ecosystem processes are littoral transport, overwash, breaching and inlet formation, natural dune building, intertidal and subtidal flats, and wetland establishment and growth.

The Vision for Fire Island to Montauk Point (FIMP) project is to use the Army Corps' authority for Storm Damage Reduction to reduce risks to human life and property by restoring the important structural, functional, and dynamic integrity of Long Island's south shore barrier islands, other natural protective features, and coastal ecosystem. Actions undertaken through implementation of the FIMP project will advance necessary measures that allow conditions for natural processes to become restorative forces. Re-establishing the natural functioning and self-regulating attributes of the system will maximize the high protective qualities and values of natural protective features and processes, their self-sustainability and ability to protect more landward areas from flooding and erosion hazards, minimize need for costly future intervention, and enhance ecosystem integrity and coastal biodiversity.

The entire study area, which includes the mainland, estuaries/bays, inlets, barrier islands, and offshore areas operates as an integrated system subject to the influence of global scale processes. It is a dynamic sandy coastal system that must be able to move and respond to winds and waves plus major storms and long-term sea level rise. On a large-scale, these processes drive the net transport of sand along the shore, while hurricanes and nor'easters, through the processes of breaching and overwash, influence the gradual south-to-north movement of the barrier islands and the exchange of ocean water with the bays. These processes maintain a shifting mosaic of inter-related ecosystems such as Atlantic Ocean nearshore areas, barrier islands, bluffs, beaches and dunes, salt marshes, sand and mud flats, and eelgrass beds. The ecosystem(s) contained within the study area are therefore adapted to frequent change. The resilience and sustainability of the essential ecosystem depends upon the perpetuation of important coastal processes. Therefore, the FIMP study will take an ecosystem approach to maintain and restore essential physical coastal processes, particularly the hydrological and geomorphological regimes.

Development and shoreline alterations of the last 75 years have affected the south shore's coastal system. It is now recognized that the ability of the system to sustain itself and its important natural protective capabilities over time has been compromised. Jetties, groins, seawalls, bayside bulkheads, barrier island infrastructure, and shoreline and other human activities associated with development have directly and indirectly resulted in adverse effects on coastal processes, water quality, natural habitats, and fish and wildlife abundance and diversity. Creating the conditions for landscape-scale restoration and self-sustainability entails correcting these causes of degradation.

The five key physical processes that need to be sustained, restored, or enhanced to re-establish protective features are:

1. Longshore sediment transport
2. Cross-shore sediment transport
3. Dune growth and evolution
4. Bayside shoreline processes
5. Circulation and water quality

The FIMP Web Page:
http://www.nan.usace.army.mil/fimp/index.htm

Longshore Sediment Transport Fact Sheet

Sediment is moved along the coast by the daily conditions of waves and currents interacting with tides. Storm events, such as hurricanes and nor'easters, move greater quantities of sediment in short periods and cause pulses within the pattern of longshore transfers. In the study area, longshore sediment transport is primarily from east to west, with local as well as temporary reversals in direction. Sediment is eroded from the cliffs and bluffs of Montauk to create the sandy barriers and islands to the west. Sediment is also contributed to the longshore conveyor from onshore and offshore sources and from human actions such as beach nourishment. The relative amount of sediment coming in from the east, onshore and offshore, compared to the amount exiting to the west is the sediment budget. The sediment budget helps to identify if the area is expected to be erosional, stable, or accretional over the long-term. Longshore transport provides material that contributes to a natural development of the barrier island profile, including the formation of offshore bars, beach slopes, beach berm, foredunes, dunes, and backdune areas.

Inlets serve as sediment sinks, where sediment may be sequestered in broad shoals to form flood-tide and ebb-tide deltas, or sediment may move through the inlet into the bay. While inlets are naturally occurring interruptions in the longshore conveyor system, the inlets have been dredged and stabilized for navigation, thus further interrupting the magnitude of sediment transported. Groin fields and jetties are interruptions that block and redirect longshore flows, resulting in the accumulation of material on the updrift side of these structures. The long-term impact of these structures varies based upon localized sediment transport regimes and the size, effectiveness, and integrity of the structure. Whereas the structures that influence longshore transport are localized, their impacts can be both localized and regional in effect.

Longshore sediment transport contributes to creating and maintaining protective features on the oceanfront. Balanced longshore sediment transport allows for natural evolution of the beach and dune features, which serve as natural protective features. Restoring a more natural magnitude of the longshore sediment transport will also benefit key habitats and species (both directly and indirectly) linked to this process:

1. Coastal Marine Habitat, Sandy Nearshore and Sandy Intertidal: Longshore transport is necessary for larval transport. In addition, coastal marine and nearshore habitats provide feeding areas for finfish (bluefish), baitfish (silversides), and piscivorous birds (osprey, least tern, common tern, roseate tern, mergansers, sea ducks, loons, gannets, pelicans). Sandy intertidal habitat is important for benthic and bottom dwelling invertebrates.

2. Barrier Island Habitat, Sandy Beach: The lower beach is habitat for a variety of burrowing worms, crustaceans (sand crabs), and migratory shorebirds (sanderlings, piping plovers). Higher beach areas provide nesting habitat for birds, including piping plovers, oystercatchers, and black skimmers. Plant species adapted to high salinity and shifting sands, such as seabeach amaranth, as well as numerous beetle and insect species are also dependant upon this habitat.

Restoration of longshore transport will provide sediment for the more natural development of the shoreline as well as the cross-island response of the project area. Restoration of longshore sediment transport will also reduce long-term erosion rates caused by artificial disruptions in the system (sediment transport deficits). In addition, longshore transport of sediment allows for the development of habitats that are important for wildlife, commercial and recreational fishing, recreation, and aesthetic values.

Cross-Island Sediment Transport Fact Sheet

Cross-island sediment transport is the natural movement of sand back and forth across the barrier island, between the offshore bar, beach face, berm, dune, island core, bayshore, and bay. The movement of sand through the inlets also significantly contributes to this process. Cross-island transport is influenced by daily and seasonal conditions that govern exchange of material between the beach face and nearshore area; episodic storm events can remove sand from the beach, as well as push large amounts of sand from the beach, over the dunes, and sometimes into the bays; as well, sea level rise results in long-term evolution of the barrier island system. Cross-island processes also include the aeolian (wind blown) transport of fine sand. Cross-island sediment transport is observable in:

- Beach erosion/scarping and beach recovery.
- Dune erosion/scarping and dune rebuilding (through littoral and aeolian transport).
- Dune / island overwash (movement of sand and water across dunes and islands).
- Barrier island breaching (cutting of a new channel across spit or island), inlet formation, and shoal evolution at inlets.

Along the south shore of Long Island the amount of net cross-island transport (1000's of CY/yr of sand) is overshadowed by the amount of longshore sediment transport (100,000's CY/yr), but cross-island sediment transport or lack thereof, however, has a dramatic effect on the barrier island habitats and the long-term geomorphic response of the islands.

Cross-island sediment transport is complex and varies in amount and location year to year, and is strongly influenced by the longshore transport processes occurring in an area. Cross-island processes can appear destructive in the short run, such as when a dune is knocked down by waves or a salt marsh is buried under overwash sediments. Over time, this process can help the beaches and barrier islands build height, volume, and width.

Cross-shore processes function's vary in winter and summer, changing the profile of beaches. In the winter, the beach typically becomes narrow and steep as the sand moves into offshore bars. In the summer, the beach tends to widen with the onshore movement of material. The sand that is carried by winds and waves across the barrier island can, over time, build the island's volume, dune height and width. Breaching and inlet dynamics create flood tidal deltas or sand flats that, over time, can also widen the bayside of barrier islands making them less susceptible to future breaching. This process, in conjunction with longshore transport, can, over the long-term, build and maintain critical protective features that help the coastal system adjust to rising sea levels.

Inlets exchange flows and sediments between the ocean and the bays, and also serve as important corridors for finfish, including adults, juveniles, and larvae. Sand builds up at each end of the inlets creating tidal deltas (flood tidal on the bayside and ebb tidal deltas on the oceanside). These tidal deltas control the volume of water that enters the bays. In a naturally evolving inlet, undisturbed flood tidal deltas tend to close the inlet and create sand flats and platforms for new salt marsh growth, which, over time, helps widen these areas of the barrier islands, making these areas less susceptible to breaching.

Cross-island sediment processes are tightly linked to natural communities and coastal biodiversity. The shallows and sand flats associated with the tidal deltas and bayside overwash fans support a host of worms, crustacea, and other invertebrates which attract finfish, such as silverside, kingfish, and bluefish, during high tide and many species of shorebirds during low tide. A federally protected shorebird species—piping plover—appears to benefit from bayside flats for nesting and feeding. From year to year they tend to congregate in overwash areas for nesting and feeding, but leave once vegetation becomes too dense.

The intertidal flats and low wet areas behind the dunes can support *Spartina* growth and salt marsh development, so long as the wave environment is suitable. These areas attract a great variety of wading birds, shorebirds, waterfowl, finfish, and crustacea. Horseshoe crabs and diamond-backed terrapins rely on sandy portions of marsh habitats for nesting and feeding.

The subtidal portions of overwash fans may serve as platforms for eelgrass meadows if the surrounding conditions are suitable for eelgrass growth, including currents, wave climate, depth, turbidity, and water quality. The underground stems (rhizomes) of eelgrass may also help to stabilize shoreline sediments. In addition, the grasses (leaves) serve to slow water flow and promote the deposition of suspended particles and larvae. Scallop larvae are dependent upon eelgrass, as are many fish and crustacea, for refuge.

Human activities can directly and indirectly affect the scale and location of cross-island transport. In general, groin construction, breach closures, inlet stabilization, and beach and dune nourishment change the amount of cross-island sediment transport. Other human activities that affect cross-island sediment transport include dune enhancement and construction—trucking of sand, beach scraping, and sand fencing, dune removal to enhance water views, structures, and cuts in dunes for vehicles and access paths. Disruptions to cross-island sediment processes have local and immediate impacts as well as regional and long-term impacts. In most instances these measures reduce the amount of transport, but in some instances measures such as groin construction and inlet stabilization can result in areas of increased cross-shore transport outside the immediate footprint of the project. This affects the on-going creation of barrier island and bayshore habitats and changes habitat succession patterns throughout the area.

Restoration of the cross-island processes will allow for a more natural mosaic of habits consistent with the variability of responses across the project area.

Dune Development and Evolution Fact Sheet

Coastal dunes are part of the Dune-Beach sand-sharing system. These dunes (referred to as the foredune or primary dune) are an accumulation of sand at the upper margin of the beach. Their growth is largely a product of wind transport, although water may also contribute to the accumulation during storms. Dune development occurs when sand is transported inland across the bare sand beach to gather in areas of vegetation uniquely adapted to surviving in this harsh habitat (salt, heat, drought, abrasion, nutrient deficiency). This pioneer vegetation is the elemental component in trapping sediment and stabilizing the dune form. Dune development and evolution is largely related to the conditions of the shoreline. If the beach is stable, sand continues to accumulate in the foredune and it increases in width and height. Along the south shore, foredunes generally achieve heights in the range of 15-30 ft above mean water level. If the shoreline is eroding, the foredune is intermittently scarped and lowered, sand is transported offshore, or inland, over the crest, and the dune ridge shifts inland. If the shore is accreting, the foredune may widen or, more likely, a new foredune area will develop and strand the older foredune in the landscape (old foredune lines).

Foredunes are dynamic features in the sand-sharing system. They are often scarped during storm events and lose some of their sand to wave erosion. In association with the storm, or afterwards, sand may be transported to the dune crest as well as inland of the dune crest. In the post-storm period, the dune face will receive new sand and will revegetate over time. Together, these transport and recovery processes allow the foredune to re-develop from storm events and to maintain its morphology even while being displaced.

Dunes serve an important ecological function. They provide a unique habitat at the transition (ecotone) between the exposed beach and the sheltered landward portion of the barrier island. The foredune toe habitat with sparse vegetation density is the site of runners and rhizomes of the pioneer vegetation, clumps of seabeach amaranth and seabeach knotweed, and nesting sites for a variety of shorebirds. The dune face and crest is more thoroughly colonized by dune grass, seaside goldenrod, and dusty miller, providing cover and feeding for birds and insects. The leesides of dunes offer protection and are occupied by shrubs and bushes and salt-pruned trees which support insects, birds, and small mammals. Often, low areas to the lee of the foredunes are poorly drained and these dune slacks are home to freshwater pond/marsh habitats.

Dunes also have a topographical function. They constitute a storage bank of sand and they diminish the effects of erosion during extreme events by contributing sand to the total transport. They also serve as a barrier against storm surge, and wave penetration. In providing these several functions, dunes are an important buffer between the very active beach and the more stable interior areas.

In the past, human activities have been undertaken which affect the dune development. Some foster sand accumulation and dune growth, such as erection of sand fencing and planting of beach grass. These programs usually focus on trapping of sand on and/or in front of the foredune. On the other hand, the presence of houses within the foredune, or primary dune, interferes with vegetation cover, the opportunity for sand accumulation, and the creation of habitat. Access paths and dune cuts also result in breaches of the natural dune system, and buildings and other structures alter wind flow and the pattern of wind transport.

On a larger scale, the aeolian transport of sand is also affected by disruptions in the longshore transport of sand, because disruptions to the beach reduce the amount of material that is available within the system to allow for natural dune growth and recovery. Severe interruptions in sediment availability will lead to breaks in the foredune ridge—blowouts—and will compromise the continuity of the foredune ridge form and function.

Maintaining the natural dune process(es) supports the presence of a unique landform at the transition between the very dynamic beach and the more stable interior landscape. The foredune is part of the buffer that absorbs and diminishes the effects of storms. It provides a myriad of habitats because of its windward and leeward exposure and protection.

BAYSIDE SHORELINE PROCESSES

The natural shore of the bays is characterized by narrow sandy beaches, tidal creeks, mud and sand tidal flats, salt marshes, and eelgrass beds. These beaches, tidal wetlands, and shallows are natural features that contribute to barrier island integrity, buffer the upland from bay wave action, and are integral to maintenance of the diversity of the natural system in the face of rising sea level.

Waves, winds, and wave- and tidally-generated longshore currents are responsible for the characteristics of the bay shorelines. Areas of higher energy tend to establish beaches, while more sheltered areas tend to establish salt marshes and eelgrass beds. The beaches tend to be erosive, and migrate up with rising sea level. The process that creates and sustains marshes and tidal flats is primarily slow currents which allow for deposition of fine-grained sediment. Organic detritus trapped in the saltmarsh contributes to its upward growth and maintenance to maintain the marsh elevation relative to rising sea levels. Eelgrass establishes itself in clear waters, primarily in the shallows adjacent to the barrier islands. On the bayshores of the barrier islands this gradual sedimentation process is punctuated by cross-island processes of breaching and overwash (as described in the cross-island transport), which deposit significant amounts of sediment on the bayside, and provide essential sources of sediment that allow for the creation of tidal flats, marshes, and eelgrass beds.

Because of the infinite volume of seawater during storm events, tidal marshes can do little to reduce coastal flooding during storms unlike their riverine counterparts. However, they can provide an important buffer against erosion of the shore from storm waves on the bay. On the barrier islands, tidal wetlands also form a bayside “platform” which effectively widens the barrier island, making it less susceptible to breaching. Breaches are less likely to occur, and the flooding impact may be less severe where the bayside of the barrier island has a wide salt marsh, tidal flats, and very shallow waters. In addition, these broad tidal flats and wetlands help the barrier island maintain its integrity by serving as the platform on which washover deposits delivered by ocean waves build up the barriers, helping them migrate up and landward during rising sea levels.

These bay shoreline processes establish habitats which are essential to the overall system functioning. Bayside beaches, tidal flats, salt marshes, and SAV beds provide fish and wildlife nursery spawning and feeding habitats. These habitats support diverse populations of fish and wildlife, and support most life stages of fish, crabs, and other invertebrates which are essential components of the food web. These habitats also support migratory and resident shorebirds and wading birds, diamond-backed terrapins, horseshoe crabs, hard and soft shell clams, prey fish such as mummichugs and other killifish, shrimp, northern puffers, and recreationally and commercially important finfish species. Marshes also contribute to water quality, by providing filtration services, absorbing nutrients and capturing pollutants from the uplands.

Human activities have directly and indirectly impacted the bay shoreline processes and habitats, and have impaired the ability of beaches, marshes, tidal flats, and eelgrass to function as natural and protective features. These changes are primarily a result of dredging and placement of material, and through stabilization of the bay shorelines.

Navigational dredging can result in direct degradation, removal, or burial of tidal wetlands. In addition, dredging can alter bay circulation patterns and influence the natural processes of sediment deposition and scour. In many instances, in the dredging of the bayside channels, the dredged sediment is placed either in the ocean or in an upland location, which further impacts the bay processes by removing this material from the system. Channels in proximity to the bayside of the barrier island can also increase both the likelihood of breaching and the flooding impacts into the bay as a result of a breach. As well, channels through the barrier islands can increase tidal range in the bays adversely affecting flooding and tidal wetlands. The presence of channels can also further alter the natural processes by allowing for greater wave energy in proximity to the shoreline, due to both deeper water and the waves from vessels which utilize the channels.

Bulkheads and other hard structures associated with marina facilities can increase the amount of scour near them and result in the re-distribution of material into the bay. Shoreline hardening also can trap material and alter the alongshore distribution of material. Finally, shoreline hardening prevents sediment landward of the structures from entering the bayside littoral system, resulting in the direct loss or alteration of bayside beaches, tidal flats, and salt marshes. As sea level increases within the bays, these shore stabilization structures prevent the landward and upward migration of these natural features, thus resulting in their long term loss or impairment.

In general, the cumulative impact of the above threats has gradually led to the degradation of bayside beaches, tidal flats and salt marshes and their function. Restoration of the bay shoreline processes will serve to restore these habitats both as natural protective features and as critical bayside habitat.

Estuarine Processes Fact Sheet

Estuaries are places of transition from land to sea and from fresh to salt water. Estuarine processes can be characterized by the circulation of water and the movement of sediments as it relates to the ecological functioning of the habitats within the estuary.

The movement of water within estuaries is influenced by the magnitude of freshwater input, the bathymetry (topography of the bottom) of the bays, exchange of water through the inlets, and wind. Wind-driven currents are dependent on the direction and strength of the wind and on fetch. The movement of water from the mainland, into the bay, and through the inlets serves to flush the system and helps to maintain water quality. Salinity and temperature are characteristics of estuarine water quality that are affected by circulation. Water quality is also influenced by surface and ground water, point and non-point sources, variability in precipitation events, and regional changes in ocean circulation patterns. Storms can alter estuarine circulation through surges into the bay and by breaching of the barrier islands. Breaches of the barrier islands alter circulation patterns and salinity distribution by changing the location and amount of ocean water entering the bay.

The movement of sediment in the bay is also connected with the day-to-day movement of water, punctuated by storm events that can result in large infusions and redistribution of sediment.

The circulation and sediment movement are (both directly and indirectly) linked to key habitats and species, as follow:

1. Open Bay: Estuarine circulation, in the form of currents and mixing, affect the distribution patterns of plankton species including the larvae of benthic species. Phytoplankton, tiny single-celled algae, are the foundation of the estuarine food web.

2. Bay Bottom: The bay bottom provides habitat for shellfish and finfish.

3. Shoals: Many commercially valuable marine organisms depend upon estuaries during some point of their development. Shoals provide spawning and feeding habitat for clams and other shellfish, finfish, and horseshoe crabs. These shallow areas are also important feeding habitat for wading birds.

4. Eelgrass beds: Eelgrass habitats provide forage, breeding, and nursery areas for shellfish, crustaceans, and fish. The main function of eelgrass beds is to produce detritus (decaying plant matter). Bacteria, worms, and crabs feed on detritus and are then eaten by other animals in the food web.

The estuary also serves as an important area for recreation, including fishing, boating, swimming, and bird watching. As the demands imposed on the estuary have increased, so has the importance of restoring and protecting this resource for its ecological and aesthetic values. Restoring estuarine processes and improving water quality will enhance commercial, recreational, and ecological functions within the estuary.

As human population density has increased, land clearing, application of fertilizers, discharge of sewage and cesspool systems, and other activities have increased the delivery of nutrients such as nitrogen and phosphorus to the estuary. The introduction of these materials

has altered the composition of the sediment on the surface of the bay bottom. Another effect of excessive nutrient loading into the bays can be observed as brown tides.

Simultaneously, the inlets have been modified and stabilized to provide reliable navigation and to increase the exchange of water between the ocean and bays. Dredging for the creation of navigable channels has altered the bottom composition, the bottom topography (through both dredging and placement) and salinity distribution in the bays by increasing the amount of ocean water entering the bay. The dredging of inlets has also moderated the amount and distribution of flow that comes through the inlets. This increase in salinity has shifted the historically dominant shellfish species from oysters to clams.

The magnitudes of human changes within the estuary, and the complexity of the interaction between the physical processes and the environment, make it difficult to identify a clear objective for the restoration of estuarine circulation processes. Alternately, the topographic and bathymetric changes within the estuaries can provide clear opportunities for habitat restoration.

APPENDIX D

MEETING MINUTES

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FIRE ISLAND TO MONTAUK POINT (FIMP) REFORMULATION STUDY
RESTORATION AND HABITAT EVALUATION MEETING SUMMARY
MAY 12 THROUGH 14, 2004
USFWS LONG ISLAND FIELD OFFICE, ISLIP, NY

TO: Pamela Lynch, USACE

FROM: Stacie Grove, NEA

SUBJECT: Summary of FIMPS Team Meeting

DATE: June 21, 2004

CC: Karen Graulich (NYSDEC), Jean O'Neil (WES), John Pavacic (NYSDEC), Patricia Rafferty (NPS), Steve Sinkevich (USFWS), Robert Smith (USACE), Norb Psuty (Rutgers), David Santillo (NEA)

In attendance:

Michael Bilecki (NPS) [3]	John Pavacic (NYSDEC) [2]
Lynn Bocamazo (USACE) [3]	Patricia Rafferty (NPS) [1]
Steve Couch (USACE) [3]	Dan Rosenblatt (NYSDEC) [3]
Mary Foley (NPS Boston) [3]	Jeff Zapperi (DES Coastal Program) [3]
Karen Graulich (NYSDEC) [1]	Steve Sinkevich (USFWS) [1]
Stacie Grove (NEA) [2]	Robert Smith (USACE) [2]
Pamela Lynch (USACE) [1]	Norb Psuty (Rutgers) [1]
Jean O'Neil (WES) [2]	Theresa Rotunno (EEA Consulting) [3]

[1] voting member of the FIMP advisory Team
[2] assisting advisory Team, but not a voting member
[3] non team attendee/interested party

All meeting attendees listed above participated in a ½-day meeting on May 12, 2004, which included an overview of Habitat Evaluation Procedures (HEP) and potential application of HEP to evaluate the restoration component of the Fire Island to Montauk Point (FIMP) shore protection and storm damage reduction project (Project) as described below.

I. INTRODUCTION TO HABITAT EVALUATION PROCEDURES (HEP)

Jean O'Neil provided an introduction to HEP. HEP is a method developed by the United States Fish and Wildlife Service (USFWS) for documenting the quality and quantity of available habitat. HEP provides information for two general types of habitat comparisons: 1) the relative score of different areas at the same point in time; and 2) the relative score of the same area at different points in time. This information is useful in baseline and impact assessments to evaluate proposed actions (such as restoration alternatives) that potentially result in a change in either habitat quantity or quality. Through the use of HEP, the relative score of habitats can be quantitatively assessed through a final numerical output that is technically defensible, replicable, and can be applied consistently in a variety of different habitat types. HEP is based on combining a measure of habitat quantity with an index of habitat quality to determine habitat scores.

Habitat Suitability Models (HSI's) are used to determine the suitability (i.e., quality) of a given habitat or community type for a species or group of species. Models include quantifiable environmental variables that are deemed to affect the species' presence, distribution, and/or abundance to determine suitability.

The USACE is proposing that HEP will be used to evaluate the restoration components of the FIMP Project. HEP could also be applied to evaluate impacts, costs, and benefits of flood protection/storm damage reduction components, but at this time the USACE is not planning to use HEP to evaluate Project impacts or alternatives. In some cases, restoration components and Project components may occur in the same area. In this case, HEP data could be used to evaluate the Project.

II. HEP ADVISORY TEAM WORK SESSION

Meeting attendees identified with a superscript of 1 or 2 are members of the FIMP restoration and habitat evaluation advisory Team (Team). The Team was created to assist the USACE in developing an approach to evaluate restoration opportunities for the FIMP study area. Team members participated in a 2 ½ day work session from May 12, 2004 through May 14, 2004, in which Team members determined the appropriate habitat evaluation method approach to use for FIMP restoration analysis and began developing appropriate habitat suitability index models for use in the evaluation of restoration alternatives. Specific Team tasks included the following:

- Identify Goal Statements.
- Identify Example Restoration Measures.
- Identify Best Approach to Evaluate Restoration Measures.
- Identify Evaluation Communities or Species.
- Develop Models to Evaluate Communities or Species.

HEP GOALS

Each member of the Team identified his or her restoration goals for FIMP (i.e., the results they are hoping to see from USACE and partners' restoration efforts). Fourteen (14) goals were identified. After Team discussion, 13 of the original 14 goals were consolidated into the following five (5) goals:

1. Maximize the benefits, functions, and biodiversity of natural and native habitats on FIMP

2. Advance the status of populations of rare, threatened, and endangered biota on FIMP.

3. Re-establish natural rates of longshore sediment transport along the ocean and the bay.

4. Improve circulation into and within the back bay.

5. Re-establish natural rates of cross-island sediment transport.

It is assumed that objectives 3-5 are necessary to accomplish objectives 1 and 2. Further, the community types selected for evaluation model development will reflect changes in the system related to the physical processes including implementation of restoration actions.

The non-incorporated objective, *compliment natural processes with active management to support natural processes*, was discussed at length. Some members of the Team expressed concern about including active management as a restoration objective, assuming that whatever restoration was done, would be self-sustaining and would not require long-term active management strategies to ensure success. Others expressed concern about excluding it as an option, indicating that active management may be one

of the best options for restoring the area to natural conditions. Although issues may still not be resolved on this, current FIMP ETMG and IRG members, as well as the stakeholders involved, are continuing to address the issue.

RESTORATION MEASURES

Each member of the Team identified some examples of restoration measures that he or she felt might be appropriate for the FIMP study area. This list was created as an exercise to gain consensus within the group regarding the types of restoration that may be considered. Measures identified in the list may or may not be pursued as restoration options for FIMP, and the Team may add additional options if appropriate.

Sixteen (16) measures were identified as follows:

1) Remove dredge spoil to re-establish pre-existing habitats.
2) Increase tidal flow (i.e., wetland extent).
3) Create overwash fans.
4) Bypass dredge channels and/or inlets.
5) Notching groins.
6) Remove hard structures such as groins, bulkheads, jetties.
7) Create open space through land protection, property buy-outs, removal of structures and impervious surfaces.
8) Replant submergent aquatic vegetation (SAV).
9) Reduce direct impacts by restricting access, off-road vehicle use, etc.
10) Restore dunes in order to limit breaks in dunes.
11) Eliminate impediments to natural migration of dunes.
12) Monitor shorebirds and other "target" species.
13) Remove undesirable species (i.e., *Phragmites*) from salt marshes.
14) Erect dune fences.
15) Build embryonic dunes.
16) Create ephemeral pools.

Several of these restoration measures (restrictions to access, long-term monitoring of specific species) may not be appropriate restoration options for the USACE to pursue. However, should the results of the HEP study show that these are viable restoration options, the USACE will identify these as such and would encourage the appropriate local entities (such as local, county) to address them.

EVALUATION APPROACH

The Team discussed the pros and cons of species models, community models, and the combined use of both. The Team agreed that a community-based approach was most appropriate for the FIMP area. Individual species, such as piping plover, may be added at a later date if needed.

EVALUATION COMMUNITIES

The Team reviewed the idealized transects of a barrier island ecosystem identified from the FIMP conceptual model, and evaluated the cover type information available for FIMPS. The Team identified 6 community complexes to be addressed in the FIMPS HEP as follows:

1) Nearshore/sandy intertidal/sandy beach – area from 30 ft (10 m) depth in ocean landward to the seaward toe of the primary dune.

2) Primary dunes and swales – area from seaward toe of primary dune landward to the seaward toe of the secondary dune or upland.
3) Terrestrial uplands – area from the crest of dune bayside to the landward limit of swale.
4) Bay intertidal/bay beach – area from Low-Low Water (LLW) to Storm High Water (i.e., High-High Water) and beach landward to the crest of the bayside dune or upland (includes mainland).
5) Bay islands – all area on islands from LLW landward to include upland.
6) Bay subtidal/submergent aquatic vegetation – area from LLW and below (i.e., areas constantly covered by water).

MODEL DEVELOPMENT

The Team used Community Model Builder software (provided by WES) to assist in model development. During the work session, the Team provided input into model development and information was entered directly into the Community Model Builder database. A printout of each community model including detail regarding assumptions, evaluation variables, weighting factors, mathematical equations, suitability index curves, and general description of model application, will be provided to the Team for review once models are refined by WES.

The models developed for FIMPS could be applied to other similar systems and processes. However, the assumption made by the Team is that these models would only apply and be used for the FIMP project. Note: Although the issue was not fully addressed, it is the hope of USACE staff that further discussion and correspondence could be possible for use of these models in any other system(s) and/or for any other project. The appropriate methodology etc. would need to be employed, for each new project area and HEP model creation, however if similar conditions and systems exist the USACE would like the opportunity to keep this option available. The following is an overview of the community models developed by the Team. WES and NEA are working to further develop the Community Model database based on input from Team. Therefore, the variables listed for each model below are not all accurate (and are thus highlighted in yellow). Once the database is completed, these will be amended, as needed.

For all models the Project life is assumed to be 50 years, however, target years may be identified for additional analysis throughout the 50-year life of the project. In addition, based on the 2006 WRDA, restoration authorization for the Project, the start of construction is assumed to be 2011.

BAYSUBSAV – Bay Subtidal/Submergent Aquatic Vegetation

Problems: poor water quality, direct disturbance, reduction in availability of suitable substrate for SAV communities.
Indicators: loss of, and/or negative impacts to, SAV and associated species.
Endpoints (how Team will know that conditions have improved): improvements in the health and extent of SAV and associated species.
Evaluation variables: V1 – Species richness, V2 – Abundance of desirable species, V3 – Abundance of undesirable species, V4 – Percent cover of SAV.
Assumptions: date of first known occurrence of SAV (TO BE DETERMINED) will serve as the reference, existing data will be used to develop species lists, no major changes will occur in the FIMP area between baseline and construction date.
Weighting factors: V3 was weighted at half the value of other variables, and may not remain in the model.
Potential outstanding issues: none identified.

NEARBEACH – Nearshore/Sandy Intertidal/Sandy Beach

Problems: hard structures have interfered with normal coastal sediment transport processes.

Indicators: narrower beaches and steeper slopes occurring at faster rates and/or in areas of special concern.

Endpoints: over a landscape scale, the characteristics of the beach and dune system of the FIMP area will more closely resemble that of the Fire Island Wilderness Area where the effects of man-made structures are believed to have not significantly altered the coastal processes.

Evaluation variables: V1 – Distribution of successional stages (i.e., early, transitional, and mature), V2 – Human disturbance (i.e., hard structures, inlets, residential development, and vehicle access), V3 – Average width of beach.

Assumptions: Wilderness area conditions will serve as the reference, proportion variable V1 will be applied to the area of "expected" impacts from restoration (i.e., hard structure removal or modification), no major changes will occur in the FIMP area between baseline and construction date.

Weighting factors: none identified.

Potential outstanding issues: how to address the dynamic nature of this system (baseline conditions will change considerably 50 years from now); USACE Project activities may further restrict the natural processes that we are trying to restore; part of the "natural" process is for sand to be displaced in one area and re-deposited in another, restoration that includes beach re-nourishment would be intervening in this "natural" process; bypass restoration measures could accomplish both restoration and Project goals, there is concern about using a component of restoration to accomplish Project goals. Also, variable 2 seems to skew the model in favor of unnatural, stabilized, wide beaches, which may limit the likelihood of cross island transport. As a result, the model will show significant benefit from beach renourishment.

PRIMDUNES – Dunes and Swales

Problems: hard structures (including houses and infrastructure) have interfered with cross-island transport and dune growth and evolution.

Indicators: loss of dunes or dunes in some unnatural state.

Endpoints: dune growth, evolution and characteristics will more closely follow natural dune systems.

Evaluation variables: V1 – Ratio of "natural" dune crest conditions to "altered dune crest conditions, V2 – Coefficient of variation in dune height and width, V3 – Amount of human disturbance, V4 – Proportions of early, transitional, and mature dune (same variable as Model 2 V1).

Assumptions: 1930's conditions will serve as the reference for V1 through V4, Fire Island wilderness area data will serve as the reference for V4, existing data will be used to develop species lists, no major changes will occur in the FIMP area between baseline and construction date.

Weighting factors: Human impacts to dunes are the most significant factor in negative impacts to dunes and swales and V3 was therefore weighted 2x's higher than all other variables.

Potential outstanding issues: V1 may be a quantity variable rather than quality. The USFWS has proposed to add a variable "cross island access for shorebird broods" to this model.

BAYBEACH – Bay Intertidal/Bay Beach (to include Mainland)

Problems: invasive species, hard structures, and human disturbance have reduced diversity of these areas and altered cross-island and littoral processes.

Indicators: alteration of topography, decreased productivity of commercially valuable species (i.e., clams), loss and/or degradation of natural communities

Endpoints: improvements in the productivity and number of clams, increase in extent of natural communities such as salt marsh, improved conditions/health of desirable communities.

Evaluation variables: V1 – Species richness, V2 – Abundance of desirable species, V3 – Abundance of undesirable species, V5 – ratio of natural conditions of bay beach versus modified condition, V6 – Connectivity across island for terrapin, V7 – human disturbance.

Assumptions: 1930's conditions will serve as the reference, existing data will be used to develop species lists, no major changes will occur in the FIMP area between baseline and construction date.

Weighting factors: Weight non-desirable species less than desirable species, weight V5 higher than other variables.
Potential outstanding issues: none identified.

ISLANDS – Bayside Islands

Islands have similar community composition as bay intertidal/bay beach. But, the Team determined that these communities were unique enough to be evaluated as a unique community type. Restoration potential for these areas is very high.
Problems: invasive species, hard structures, predators (i.e., gulls), human disturbance have reduced diversity of these areas and have disrupted normal processes for several bird species of concern that are closely linked to protected island habitats.
Indicators: decreased productivity of target bird species (i.e., heron, tern), loss and/or degradation of natural communities.
Endpoints (how will we know conditions have improved): improvements in the productivity and/or number of target bird species, increase in extent of natural communities such as salt marsh, improved conditions/health of desirable communities.
Evaluation variables: V1 – Species richness, V2 – Abundance of desirable species, V3 – Abundance of undesirable species, V4 – connectivity of habitats across island, V5 – human disturbance, V6 – ratio of natural versus modified shoreline conditions.
Assumptions: 1930's conditions will serve as the reference, existing data will be used to develop species lists, no major changes will occur in the FIMP area between baseline and construction date.
Weighting factors: weight V6 higher and V5 lower than other variables.
Potential outstanding issues: none identified.

UPLANDS – Terrestrial Upland

Problems: invasive species, hard structures, human disturbance have reduced diversity of these areas and have disrupted normal cross-shore and cross-island processes.
Indicators: evidence of severe erosion bayside, decreased productivity of target bird species (i.e., plover), loss and/or degradation of natural communities.
Endpoints: improvements in the productivity and/or number of target bird species, increase in extent and/or improvements to the condition/health of natural communities.
Evaluation variables: V1 – Evidence of severe erosion, V2 – connectivity across community for target species such as plover, V3 – evidence of human disturbance.
Assumptions: 1930's conditions will serve as the reference, existing data will be used to develop species lists, no major changes will occur in the FIMP area between baseline and construction date.
Weighting factors: none identified.
Potential outstanding issues: none identified.

The Team identified several indicators of disturbance that may be used in the models as follows:

- Evidence of vehicle/pedestrian use (tracks, ruts, boat access areas, picnic grounds, campsites, picnic tables)
- Hard structures (i.e. groins, jetties, walls, docks, marinas)
- Developed (permanent buildings, fences, bulkheads, paved or unimproved roads and access points)
- Evidence of periodic maintenance such as mowing and cutting
- Trash, debris
- Noise (esp. boat traffic, jet skis)
- Presence of outfall pipes or other potential sources of pollution
- Human activities in close proximity to nest sites or islands (boat traffic, jet skis, vehicles, various beach activities, residential areas)

- Area tilled, filled, logged, cleared, or excavated

III. GENERAL COMMENTS/QUESTIONS REGARDING APPLICATION OF HEP

- Can predictions of "future" conditions account for the periodic catastrophic events that occur on FIMP (i.e., show results of these events with and without the Project)
- Can uncertainty be incorporated into the models? Some options may include Crystal Ball software, sensitivity analysis of data, identifying the most sensitive variables, and weighting variables during model development.
- Can HEP adequately address the dynamic nature of a coastal system? Can the daily and periodic cyclic events that change the system be incorporated into evaluation of habitat characteristics over time? Can predictions of future change be built into the models?
- Can habitat fragmentation, barriers to animal movement, possibly other landscape variables be incorporated into community models?
- The processes of beach overwash, sediment transport from one area to another, widening and narrowing of dunes and beaches, etc., are continuous processes that occur throughout the FIMP study area. The Team is assuming that the locations of these may change, but the rates and average conditions should not change significantly over time across the FIMP landscape. The overall perception is that man-made structures and human activities have negatively affected the rates and occurrences of these processes.
- Concern that storm protection measures may be proposed for areas where we want to allow the natural sediment transport processes that are currently occurring to continue.
- Team questions why HEP was not being used to evaluate impacts from the actual Project.
- Some members of the Team are uncomfortable with the assumption that the Team's efforts will be directed at restoration and not mitigation because the Project will not have impacts and therefore mitigation will not be required. It is likely that Project activities and even enhancement activities will require negative tradeoffs for other species. All potential impacts must be evaluated and addressed in the EIS for the Project. HEP provides an important framework for evaluating tradeoffs.
- Some members of the Team are uncomfortable with the assumption that restoration efforts can be accomplished by restoring natural processes, and that active management and/or physical alteration of habitats are not desired or necessary.
- Restoration components may or may/not also provide storm protection benefits for the Project.
- The Team does not support using HEP as a way to avoid mitigation responsibilities.
- The USFWS is concerned about long-term future for listed species and would like the USACE to develop a long-term regional comprehensive management plan for listed species.
- Restoration of natural processes is the USFWS's preferred approach to restoration. However, the USFWS is unclear how natural processes can be restored in developed areas in light of the Project that will presumably be designed to protect these same areas. Natural processes will likely only be restored in segmented parcels.
- Should USACE be responsible for ensuring success for the 50-year life of the Project?

IV. SCHEDULING

Meeting 2 (tentatively to be held on Fire Island, from August 25-27, 2004)

- NEA to present baseline conditions.

Meeting 3 (late summer 2004)

- NEA to present future conditions (without project).
- NEA to present conditions based on each restoration alternative.

Meeting 4 (late fall 2004)

- NEA to present results of restoration cost/benefit analysis and future conditions with restoration.

Meeting 5 (March 2005)

- NEA to present final HEP results.

V. ACTION ITEMS

NEA/WES

- Determine if the ratio variable used in Models 3, 4, and 5 are quality or quantity variables.
- Identify ways to measure connectivity and evaluate how best to apply this variable (i.e., within each model or as a landscape model).
- Determine if a diversity matrix can be used in the models.
- Refine models and prepare model summaries for Team.
- Develop field-sampling methods.

USACE

- Provide NEA/WES with species list from USACE clam, intertidal benthic, and SAV studies for use in developing species lists for Models.
- Identify the time period necessary to determine "high quality" SAV for use in BAYSUBSAV Model.
- Address mainland in cover type mapping and as component in restoration.
- Map/identify islands as separate communities.
- Identify which cover types are considered passable and impassable for the terrapin.
- Define cover types and provide citation for descriptions.

USFWS

- Identify the characteristics of the key successional stages of a beach/dune community (i.e., early, transitional, and mature) for use in NEARBEACH and PRIMDUNES Models.
- Identify any additional target species associated with islands for use in UPLAND Model.

RUTGERS

- Identify the characteristics of natural conditions of ocean side dunes versus displaced dunes for use in PRIMDUNES Model.
- Identify the characteristics of natural conditions of bay side dunes versus displaced dunes for use in BAYBEACH Model.

ALL

- Assist in developing a description of 1930's conditions for use as reference in Models
- Assist in identifying the extent of study areas.

Summary of HEP Onsite Team Meeting June 28 through July 2, 2004

We have split the nearbeach community into nearbeach and vegetated beach, do we also need to split baysubtidal into salt marsh, wetland shrub, or split uplands into shrub, forest, herb? At what point do we lump/split cover types for HEP.

Islands and SAV are own units and will be treated separately from all transects. Does a bias result? Similarly, does the fact that transects may or may not have all community types bias transects?

Issues of reference conditions for what appear to be 3 to 4 unique areas on the island. Are 3 separate references needed? Team agreed that there is a place for all dune types on a dynamic barrier island. However, because we are dealing with very small focused areas, the Team agreed to use 1 standard as the reference condition for all areas. This standard would be determined by Team consensus and would be a condition that is supportive of a diversity of plant and animal species.

4 unique dune types include:

- Robert Moses @ monument
- WOSI
- Wilderness area
- Gunn

Reference – should it be the best currently available or the best based on 1930's (per-development) conditions?

SAV references might include Gunn or Pomquog East. Worst SAV bed is west of Old Inlet.

Budget stuff, Pam needs an update to plan for benthic analysis.

Barriers listed are not extensive. Can't critters just go around most obstacles. How does HEP deal with this? Perhaps tally # of "barriers" (obstacles that a chick or terrapin could not go through) along the centerline of the transect. Don't worry about whether it could go around. Just tally hits that a "golf ball" couldn't pass through or over.

Survey area – transect only. 100 feet wide for all variables except disturbance factors.

NPS not in favor of habitat manipulation, but does support manipulation as a tool to promote processes.

USFWS dredge island info:
Breezy Point – best example of shorebird nest island
Would like list of areas evaluated by NEA.
East Inlet – USFWS planted A*mmophola* and *Solidago* in May 2004.

Sunken Forest/Reagan area – USACE and USFWS recommended bio-engineering but NYDEC overrode this indicating forces were too extreme and that bulkheading was the only option. NPS totally opposed to bulkheading area. Original forest was 100 feet further into the bay 30 years ago.

NPS and USFWS has plover data. NPS can provide nesting data for past 3 years. Will help in determining the characteristics of the areas most productive for plover.

Disagreement between NPS and USFWS regarding overwash area. NPS wants to let natural processes proceed, even if it means wash will revegetate. USFWS would like to see overwash maintained as an overwash due to its uniqueness and value to wildlife. Especially since landscape wide Projects are preventing overwash, breaching and promoting stability. May be good to maintain these few areas while we have them.

1960's data from Roselle and Joe Vitri's work on Fire Island.

Team wants to see an overall landscape evaluation of the island, but realize that restoration will be very site specific. So, in specific sites, the Team agrees that the approach should be taken to improve the communities in the area to benefit a large suite of species or species that are Rare.

Consider restoration opportunities that may leak into the Wertheim project (USFWS refuge). Is a collaborative approach by Suffolk County, Ducks Unlimited, USFWS, NYDEC, etc. for marsh restoration, ditch plugging, mosquito control, *Phragmites* removal, etc. Considerable $$$ and research ongoing. DEC highly supportive of the work. Sue Adamovich (USFWS – Wells, ME) has been assisting on marsh restoration work.

FIRE ISLAND TO MONTAUK POINT (FIMP) REFORMULATION STUDY
RESTORATION AND HABITAT EVALUATION MEETING SUMMARY
AUGUST 25 THROUGH 27, 2004
WATCH HILL NATIONAL SEASHORE, FIRE ISLAND, NY AND
THE USFWS LONG ISLAND FIELD OFFICE, ISLIP, NY

TO: HEP Team

FROM: **USACE, Pamela Lynch**

SUBJECT: Summary of FIMP (HEP) Team Meeting

DATE: September 23, 2004

To: Karen Graulich (NYSDEC), Jean O'Neil (WES), Patricia Rafferty (NPS), Steve Sinkevich (USFWS), Robert Smith (USACE), Norb Psuty (Rutgers), David Santillo (NEA), Steve Couch (USACE)

ATTACHMENT: Table 1 – HSI variables and communities
"Initial" restoration site selection study sites (map)

In attendance:

Jean O'Neil (WES)
Karen Graulich (NYSDEC)
Norb Psuty (Rutgers)
Pamela Lynch (USACE)
Patricia Rafferty (NPS)
Robert Smith (USACE)
Stacie Grove (NEA)
Steve Sinkevich (USFWS)

All Habitat Evaluation Procedures (HEP) meeting attendees listed above (Team) participated in a 1-day meeting/field site visit on Fire Island on August 25, 2004, which included an overview of HEP sampling activities, sampling methodology, Habitat Suitability Index (HSI) model development, and selection of potential restoration sites. The meeting/site visit was followed by a 2-day meeting in Islip on August 26-27, 2004, which included a thorough evaluation of the HSI models, HSI variables, preliminary HSI output data, and applicability of models/variables to the Fire Island to Montauk Point (FIMP) Project area.

I. INTRODUCTION

The USACE provided a summary of restoration site selection and HEP evaluation activities to date as follows:

The USACE has evaluated over 60 potential restoration sites within the FIMP project area, including 24 sites on the barrier island, 36 dredge disposal islands and disposal sites on the mainland, and areas within Wertheim and Seatuck wildlife refuges. Sites were initially identified by the USACE and outside sources such as the USFWS and various other stakeholders and interested parties

Under the current scope of work for USACE restoration activities, 13 sites were selected for further evaluation in the HEP process based on their restoration need, likelihood of restoration success, potential link to future shoreline protection actions, contribution toward restoration of key coastal processes identified by the HEP Team, and based on how well sites represented the types of restoration and community types in need of restoration in the FIMP project area.

The selected sites include Robert Moses Lot 4, Sunken Forest, Reagan Property, Old Inlet, Great Gunn, Pikes Breach, Tiana, WOOSI, Georgica Pond and four dredge islands: Great Gull, Warner's, John Boyle and East Inlet. In addition, the USACE is continuing to evaluate the following additional sites for possible late inclusion in the HEP analysis: Wertheim Refuge, Seatuck Refuge and Orchard Beach. These sites were recommended following HEP data collection activities and will be included in HEP if time and funding permit and if within the scope of USACE restoration activities.

In addition, the USFWS currently is preparing a list of recommended potential restoration sites as part of the Fish and Wildlife Coordination Act requirements for the FIMP flood control Project. This list will include sites identified by numerous Federal, state and local agencies, and interested parties. The USACE will not proceed with the evaluation of these sites at this time, but sites may be included in future evaluation if time and funding become available.

The USACE has documented all sites evaluated as possible restoration sites as well as the rationale for inclusion/exclusion in the current HEP analysis process. Many sites that have been excluded from current HEP evaluation, although in need of restoration, are at a scale that exceeds the scope of current USACE restoration authorization. The USACE objective for the current restoration component is to develop HSI community models and to use those models to address restoration needs at sites at a manageable scale. The HSI models currently being developed by the Team may be applied at larger-scale restoration sites in the future as part of the flood protection project.

The Team discussed the current site conditions and restoration need for each of the 13 sites selected for HEP evaluation.

II. SITE VISIT

HEP field sampling activities were completed by the USACE for the 13 restoration sites on August 13, 2004. The Team visited two of the restoration sites (i.e., Sunken Forest and Old Inlet) to discuss the definition of each of the five HSI model community types

and to evaluate the HEP field sampling methodology. Recommended modifications to sampling methodology were minor and are discussed in Section IV.

Modifications made to the community type definitions include the following: 1) the addition of the vegbeach community in order to address the unique upper beach habitat found within the FIMP project area; 2) renaming the dune/swale community as dune/grassland to better reflect the vegetated condition of this community, and revising the community definition to include areas from the crest of the dune to shrub and/or tree-dominated areas; and 3) the elimination of islands as a unique community type because islands contain representative examples of each of the six HSI model communities identified below.

1 NEARBEACH (ocean nearshore and intertidal zone) – unvegetated area dominated by sand and extending from 30 ft (10 m) depth in ocean landward to the average daily high tide line (i.e., wrack line).
2 VEGBEACH (ocean upper beach zone) – bare or sparsely vegetated area dominated by sand from the average daily high tide line (i.e., wrack line) landward to the crest of the primary (i.e., fore) dune.
3 DUNEGRASS (dunes, interdunes and swales dominated by sand or herbs) - area from the crest of the primary dune extending landward to the crest of the bayside dune or bayside storm high water mark. Community is dominated by maritime herb species and often includes a significant component of vine species. Shrubs, when present, are typically stunted and cover less than 20% of this community. This community is well interspersed throughout the island from ocean to bay. Beach grass is the dominant species in this community type.
4 UPLANDS (dunes, interdunes and swales dominated by shrub, forest or development) – area from the crest of the primary dune extending landward to the average daily high tide line (i.e., wrack line) of the bayside dune or upland (includes mainland). Maritime shrubs and/or trees dominate this community type. Herbs and/or vines also are common components of this community, but do not dominate (< 20% cover).
5 BAYBEACH (bay intertidal and bay upper shore zone) – area from the average daily high tide line (i.e., wrack line) of the bayside dune or upland (includes mainland) extending bayward to the LLW (low-low water mark). Includes unvegetated areas dominated by sand or mud and areas vegetated with wetland herb and/or wetland shrub communities (i.e., salt marsh, *Phragmites*, *Baccharis*, *Vaccinium*).
6 BAYSUBSAV (bay subtidal and submergent aquatic vegetation) – area from LLW bayward (i.e., areas constantly covered by water). This community is typically dominated by bare sand substrate or submergent aquatic vegetation.

III. EVALUATION OF MODELS AND VARIABLES

Much, not all, of the HEP data has been entered into the HEP database (i.e., FieldKit.xls developed by WES) and preliminary HEP analysis has been conducted for all transects. WES provided some preliminary results to assist with the Team's evaluation of the

models. The Team discussed each HSI community model, the sampling methods for each variable in the model, the contribution of each variable to each HSI model, and defined the reference conditions for each variable. A description of proposed changes to the models or variables is provided below. Unless otherwise noted, the Team agreed to keep the variable in the model and did not alter the definition of the variable or the method of data collection or evaluation. See Table 1 for a list of HSI variables and communities.

NEARBEACH

1 Presence of a modified shoreline – during data collection this variable was originally evaluated only within the limits of the 240-foot wide (80 m) transect. This variable will be re-evaluated within a 1,000-foot wide transect to capture the effect of any modifications (i.e. jetties, groins).

2 Barriers to shorebirds and terrapin – change variable name to "barriers to wildlife" and change database x-axis to read "magnitude of impact to species".

3 The Team considered whether to add the variable species richness to this model. However, based on a partial evaluation of data collected as part of HEP and from previous USACE studies, species richness in the NEARBEACH community does not appear to differ significantly within the FIMP project area and therefore species richness may not contribute to the HSI model. Data from prior studies will be further evaluated to determine if species richness will remain as a variable in the model. If excluded, the USACE will provide a statement (with references to prior studies) indicating the rationale for exclusion. Three items are of relevance to the decision: differences in data among transects, to show if data will distinguish among sites; quality or reliability of the data; and, adequacy of the data.

4 The NEARBEACH community does not apply to islands and will be excluded from HEP analysis for islands.

VEGBEACH

1 Two new variables will be added to this model to address the following: 1) the slope and percent of vegetative cover from the high wrack line (high tide line) to the toe of dune; and, 2) the slope, percent of vegetative cover and height from toe of dune to crest of dune.

2 The Team thoroughly discussed how to handle scores for wildlife habitat and for maintenance of other functions, specifically stabilization, in the VEGMEACH community. A chart of potential scores for slope, width, and percent vegetation cover was prepared for consideration in the model as follows:

	Slope	**% cover**	**Width**
Wildlife habitat reference condition = 1	**< 10 %**	**5 – 40 %**	**>100 ft**
Wildlife habitat reference condition = 0.1	**> 10%**	**> 90 %**	**< 10 ft**
Shoreline reference condition = 1	**< 5%**	**> 40%**	**>150 ft**
Shoreline reference condition = 0.1	**> 10%**	**0**	**< 30 ft**

3 Erosion – quantitative information from the linear characterization of the shoreline will be used to evaluate erosion.
4 Presence of modified shoreline – extend evaluation area to 1,000 feet.
5 Barriers to shorebirds and terrapin – change variable name to “barriers to wildlife” and change database x-axis to read “magnitude of impact to species”.

DUNEGRASS

1 Erosion – remove variable from model. Erosion is covered within the VEGBEACH model.
2 Presence of modified shoreline – remove variable from model. Modified shoreline is covered within the VEGBEACH model.
3 Dune morphology – remove variable from model. Dune slope and height will address morphology.
4 Barriers to shorebirds and terrapin – change variable name to “barriers to wildlife” and change database x-axis to read “magnitude of impact to species”.

UPLANDS

1 Presence of invasive species – based on field observations, most of the potential invasive/undesirable species identified by the Team for this community (i.e., fox, gulls, crows) were present throughout the entire study area. Phragmites was the only species found in some upland areas and not others. Leave variable in to identify areas of Phragmites growth in uplands.
2 An additional variable may need to be added to this model to make results more meaningful. WES will evaluate the feasibility of including a diversity index in the upland model for a mosaic of cover types.
3 Presence of modified shoreline – extend evaluation area to 1,000 feet.
4 Erosion – quantitative information from the linear characterization of the shoreline will be used to evaluate erosion of upland shoreline.
5 Barriers to shorebirds and terrapin – change variable name to “barriers to wildlife” and change database x-axis to read “magnitude of impact to species”.

BAYBEACH

1 Species richness – based on a partial evaluation of data collected as part of HEP and from previous USACE studies, species richness in the BAYBEACH community does not appear to differ significantly within the FIMP project area and therefore species richness may not contribute to the HSI model. The variable will remain in the model and the Team will evaluate the results to determine if species richness will remain as a variable in the model. The Team will consider robustness of data, significance of differences, and will determine if species richness results are indicative of high or low quality community conditions.
2 Grain size – possibly use as a surrogate for benthic community.
3 Barriers to shorebirds and terrapin – change variable name to “barriers to wildlife” and change database x-axis to read “magnitude of impact to species”.

BAYSUBSAV

1 Barriers to shorebirds and terrapin – remove variable; not applicable to this community type.

IV. EVALUATION OF MATHEMATICAL EQUATIONS

WES provided a summary of the mathematical functions used to define the relationships between variables in the models. The equations were modified as needed based on Team input. Some models will be run using two or more equations so that the Team can evaluate which equation is preferred. In addition, equations will be set up so that scores can be calculated both within communities and across each entire transect.

The Team calibrated the curves for variables in each model to identify HSI scores for optimal (HSI = 1.0) and low quality conditions. Limiting variables were given a low quality HSI score of 0.0 and non-limiting variables were given a low quality HSI score of 0.1.

The Team will revisit the species richness and abundance variables pending the results of the HEP evaluation to determine if the variables will remain in the models, and if so, what the reference conditions will be.

V. MISCELLANEOUS

To help place the restoration in context of the larger Corps picture and to begin model documentation, the following text was prepared:

The Corps mission in ecosystem restoration is stated in regulations as: "The purpose of ecosystem restoration is to restore degraded ecosystem structure, function, and dynamic processes to a less degraded, more natural condition." Restoration for species of special interest, scarcity of ecological resources, and connectivity of systems are important considerations.

The dynamic environment of FIMP is defined by large-scale physical processes, the presence of many significant ecological resources, and high human pressures, which make it difficult to set and attain restoration objectives. It is well recognized that ecosystem restoration is needed. However, the dynamics of the system make it difficult to determine what restoration measures might be appropriate and at what locations. Conflicts in land use priorities further complicate planning for restoration.

Several ecological communities have been defined and serve to organize thinking and planning for ecosystem restoration in this system. These communities can be described from data on geomorphology and biotic resources. They are each significant because of the functions they perform including their provision of fish and wildlife habitat. Six communities have been defined for FIMP. A community-based HSI model has been

constructed to (1) guide restoration planning and (2) provide a metric for decision-makers.

The next meeting is scheduled for November 17th through the 19th, 2004. The agenda will include an evaluation of results and selection of sites for further development of conceptual restoration designs, followed by without-project and with-project trends based on model results for the communities.

VI. ACTION ITEMS

NEA

1. Provide Team with a .pdf of HEP restoration site locations.
2. Continue with HEP data input and evaluation.
3. Provide Team with a summary of HEP sampling methodology.
4. Prompt DEC for additional information regarding NEARBEACH and VEGBEACH species if needed.

NEA/WES

1. Continue with HSI model building and analysis.
2. Provide HSI models and HEP analysis results to Team.

NEA/USACE

1. Evaluate data from existing reports to determine if differences occur in species richness in NEARBEACH and VEGBEACH communities.
2. Evaluate whether to include grain size as a variable in models.

FIRE ISLAND TO MONTAUK POINT (FIMP) REFORMULATION STUDY
RESTORATION AND HABITAT EVALUATION MEETING SUMMARY
NOVEMBER 17 THROUGH 19, 2004
THE USFWS LONG ISLAND FIELD OFFICE, ISLIP, NY

TO: Karen Graulich (NYSDEC), Jean O'Neil (WES), Patricia Rafferty (NPS), Steve Sinkevich (USFWS), Robert Smith (USACE), Norb Psuty (Rutgers), David Santillo (NEA), Steve Couch (USACE)

FROM: USACE, Pamela Lynch

SUBJECT: Summary of FIMP (HEP) Team Meeting

DATE: December 20, 2004

ATTACHMENTS: Attachment 1. USFWS Comments Regarding FIMP HEP
Attachment 2. Potential Restoration Options for Each Transect (not for public release)

In attendance:

Michael Bilecki (NPS) [3]	John Pavacic (NYSDEC) [2]
Steve Couch (USACE) [3]	Patricia Rafferty (NPS) [1]
Mary Foley (NPS Boston) [3]	Dan Rosenblatt (NYSDEC) [3]
Karen Graulich (NYSDEC)[1]	Steve Sinkevich (USFWS) [1]
Stacie Grove (NEA) [2]	Robert Smith (USACE) [2]
Pamela Lynch (USACE) [1]	Norb Psuty (Rutgers) [1]
Jean O'Neil (WES) [2]	

[1] voting member of the FIMP advisory Team
[2] assisting advisory Team, but not a voting member
[3] non-team attendee/interested party

All meeting attendees listed above participated in a half-day meeting on November 16, 2004, which included an update and overview of engineering and environmental components of the Fire Island to Montauk Point (FIMP) shore protection and storm damage reduction project (Project) as described below. The group also was provided with an overview of HEP, a brief introduction to the HSI models, variables, data, equations, and an overview of proposed restoration sites and restoration options.

I. FIMP UPDATE

Steve Couch provided a status update on the coastal, geological, economic, cultural, and design/planning components of the Project. Pamela Lynch provided a status update for the environmental components including cover type mapping, conceptual model development, restoration, impact assessment, Habitat Evaluation Procedures (HEP), restoration site selection, borrow area surveys, and historical vegetation analysis.

Discussion specifically relating to the use of HEP to evaluate the restoration component of FIMP follows:

HEP is being used to justify restoration and storm damage reduction projects by providing a way to marry National Economic Development (NED) and National Ecosystem Restoration (NER) goals and objectives, and is used as a tool to assist in the evaluation of costs, benefits, and/or impacts, from proposed activities.

NED is a planning document that refers to developing or maintaining economic opportunities through Corps actions, and includes items such as navigation and flood damage reduction. Benefits are economic in nature (e.g., xx dollars saved from protecting residential, commercial properties, and infrastructure from future damage) and are portrayed in dollars in terms of a benefit/cost ratio.

NER is a relatively new planning document that refers to restoring structure and function of degraded ecosystems. Benefits are environmental in nature (e.g., improved wetland habitat) and are portrayed in non-monetary forms such as habitat units—they are not shown in dollars and no benefit/cost ratio is developed. Impacts to the environment are assumed not to occur (i.e., restoration design should be done to restore, not require mitigation for impacts).

In cases where Project activities and restoration activities occur in the same location, NED and NER accounts can be combined in project planning by conducting an incremental cost analysis for the proposed Project activities under NED. This analysis helps to identify the most cost-effective plan (based on economic benefit versus cost). Then, an incremental cost analysis can be conducted for those Project locations identified as cost-effective. In this analysis, the cost of each proposed activity is compared with environmental benefit (e.g., habitat units from HEP). In this way both NED and NER objectives are considered by a) identifying those sites that are most cost-effective and b) selecting from those sites the site that provides the most environmental benefit for the project cost.

Alternatively, site selection for the Project (based on economic factors) can be conducted separately from site selection for restoration (based on environmental factors). In this case, the environmental impacts from the selected Project and proposed restoration are both are identified in terms of habitat units through HEP. NED and NER goals can be met through the selection of the best Project (in terms of cost-benefit ratio), and offsetting any habitat impacts from the Project, through the selection of restoration sites that provide habitat benefits greater than Project impacts.

Fourteen (14) potential restoration sites are currently being evaluated for FIMP using HEP. Sites were selected for, or eliminated from, consideration as a restoration area based on overall feasibility, restoration need, likelihood of restoration success, potential link to future shoreline protection actions, contribution toward restoration of key coastal processes identified by the HEP Team, and based on how well sites represented the types of restoration and community types in need of restoration in the FIMP project area. Since the last Team meeting (August 25–27, 2004), New Made Island and Ocean Beach were added to the list of potential restoration sites and Georgica Pond was removed from further consideration. Data collection has been completed, preliminary HSI results have been produced, and potential restoration options have been identified for the 14 locations.

The USFWS is preparing a list of recommended potential restoration sites as part of Fish and Wildlife Coordination Act requirements for the FIMP flood control Project, which will include sites identified by numerous Federal, state and local agencies, and interested parties. The list includes several sites that are currently being evaluated with HEP. The USACE will not proceed with the evaluation of additional sites at this time, but sites may be included in future evaluation if time and funding become available.

HEP models were originally designed to evaluate restoration options, not shoreline protection Project activities. However, the models provide information on existing conditions, future analysis options, and the opportunity for impact analysis and can likely be used to evaluate both restoration and Project activities. However, under this scope of work, the Team will focus on evaluating the models for restoration activities only. Models may be evaluated for use in Project analysis and modified (if necessary) if funding becomes available.

To clarify the Team's decision to create community models: species-specific approaches to HEP are traditional. However, the Team decided to use a more holistic community-based approach rather than species-driven models with the understanding that many wildlife species and ecosystem processes would likely benefit by establishing "optimal" conditions for communities found on the barrier island. When developing model variables, groups of species, such as those with very specific habitat requirements, low mobility, and documented sensitivity to habitat changes were considered, as were overall ecosystem processes and the stability of natural features.
The Team requested clarification/answers from the USACE on the following items:

1) Are restoration efforts likely to proceed in areas that are not proposed for shoreline protection activities?
2) Can restoration activities be used to mitigate for Project impacts?
3) Will the USACE support restoration activities that do not clearly improve one or more of the five processes (i.e., habitat improvements/enhancements)?
4) Might the USACE build dunes as part of flood protection Project then count the activity as restoration based on the fact that the site was identified as a possible location to restore/enhance the dune processes?
5) Elaborate on how the Project and restoration activities, HEP results, and the costs associated with each will be presented to justify the Project.
6) Provide a definition of how the USACE interprets the word "restoration". True restoration implies restoring to an unaltered condition. In addition, restoration efforts should target areas that have been altered unnaturally. Some Team members expressed concern about restoring a natural area such as old inlet and calling it restoration.
7) How does restoration link to the processes and does restoration need to benefit a process in order to be considered? Might restoration include actions that are strictly enhancement, habitat improvement?
8) Will restoration be used as mitigation for Project impacts?

II. HEP ADVISORY TEAM WORK SESSION

Meeting attendees identified with a superscript of 1 or 2 are members of the FIMP, restoration and habitat evaluation advisory Team (Team). Team members participated in a 3-day work session from November 16, 2004 through November 19, 2004, in which Team members evaluated and discussed baseline HEP results, HEP models, without project trends, and conceptual restoration options for each site. Specifically the Team addressed the following:

- Baseline results
- Specific model questions
- Relationships among models for communities
- Suggested changes to models
- Verification of target years
- Project trends in communities, variables, and area/extent

- Proposed ecosystem restoration options and activities
- Candidate restoration objectives
- Expected effects to biota, geomorphology, and human influences from restoration
- Rules for area/extent of effects from restoration
- Project trends in communities, variables, and area/extent in time and space

A. GENERAL HEP COMMENTS

Please refer to Attachment 1 of meeting minutes for a disclaimer regarding unresolved issues raised by the USFWS and associated USACE responses. Although the USFWS is a voting member of the HEP team, the USFWS wishes to state that they do not necessarily agree with all decisions the team has made.

Additionally, since the USACE personnel were not able to answer all questions raised (specifically regarding NED/NER benefits, restoration vs. storm damage reduction project inclusions, etc.) some of the following discussions are incomplete (as noted in text). However, internal USACE meetings are being held to gather the required information and the team will be provided responses shortly.

General Meeting Minutes

The Team considered whether to remove biological indicators (i.e., *spprich, sppabund)* from models. The extreme variability in the data and 1-time sampling effort has yielded data that are of relatively limited value in drawing conclusions regarding the quality of the habitat. However, the Team decided to leave biotic variables in the models (for most communities) at this time. The Team will revisit the issues following edits to the database and release of revised HSI results.

The island formerly referred to as "Great Gull Island" will heretofore be referred to as "Ponquogue Spoil Island."

The Team discussed whether to treat islands as a separate entity due to the unique habitat conditions/features and restoration potential of islands. However, the Team determined that the processes and characteristics from the exposed side (i.e., dune) to the protected side (i.e., bay) of islands are similar to the exposed and protected areas of the barrier island. Therefore, all transects (dredge islands and barrier island) will be evaluated similarly. However, NEARBEACH is not applicable to bay environments and will therefore not be evaluated for dredge islands.

The Team determined that the weighted HSI, as currently calculated in the models [i.e., (width of community/total length of transect)*HSI score of community], is not an appropriate way to account for the contribution of a community within a given transect. The Team also decided that it was not appropriate to combine all communities within a given transect when evaluating final HSI scores. Therefore, HSI values will be evaluated by community type on a transect-to-transect basis. Weighting of communities and transects will be addressed once the size of the effect of the activity is determined.

In the original HSI equations, the Team elected to weight human factors twice as much as other variables and to weight presence of invasives half as much. However, after an evaluation of the resulting scores, the Team made the decision to weight all variables equally because the weights work against the intended effect. When conditions are good (e.g., little human disturbance) the resulting HSI score is high. But when conditions are not good (e.g., considerable human disturbance) the score is higher than intended

because the low score is doubled. The clearest way to approach the weights is with the choice of mathematic function. Team members will re-evaluate the mathematical functions to determine if any revisions are needed.

The Team recognized that a diversity of community types and conditions (i.e., mosaic) are desirable across the 82 mile project area and would like to promote this diversity within HEP. Currently, HEP establishes an "optimal" condition for each community type and in order to reach the highest HSI value (1.0) through restoration efforts, communities are pushed toward that "optimal" condition. For example, based on the Team's definition for optimal conditions for dunegrass, any dune area currently without a high dune would be targeted for dune enhancement. However, overwash areas (such as the natural former breach area at Old Inlet) are a desirable feature on the landscape. The Team does not want HEP to be perceived as a blanket approach to push toward the reference (i.e., optimal) conditions identified in HEP. Features, conditions, and areas, may be excluded from restoration simply because the feature or condition adds to the diversity of the island. Further, the Team would like restoration efforts to target those areas/processes that have been modified unnaturally.

Closely related to this is the evaluation of the trade-off of processes. For example, dune restoration improves the dune enhancement process but lowers the cross-island transport process. The Team will revisit this topic on a site-by-site basis and will take into consideration the broader mosaic of communities and conditions, specific site conditions, and whether a process was impacted as a result of unnatural modifications.

The Team will consider whether to add a variable to the models, or use a ranking matrix, to assist in evaluating restoration priorities depending on whether a community is on a natural trajectory.

The Team expressed concern that the USACE may attempt to claim that they have provided a benefit to a given process by NOT working in a particular area (e.g., benefit to the cross-island transport process by not building a dune at old inlet). In addition, the Team is concerned that the USACE will perform an activity for shoreline protection (such as increasing the height/width of a dune) and will call it restoration (by claiming it has restored the dune enhancement processes). DEC noted that as the non-Federal sponsor on FIMP, they would not support Project activities that are presented to the public as restoration.

Despite the uncertainty of how HEP may be applied/presented for the Project and restoration, the Team agreed that it would be useful to continue with the HEP process. The sites identified and being evaluated by HEP, are no less important whether the work proposed at each site is for restoration, a Project benefit, or mitigation. HEP is a useful tool to document the current site conditions and to assist in the evaluation of future impacts and/or benefits. The decision whether to allow an action to move forward as restoration, a Project activity, or mitigation, will be made by reviewing agencies and is irrelevant to HEP.

B. EVALUATION OF MODELS AND VARIABLES

HEP data has been entered into the HEP database (i.e., FieldKit.xls developed by WES) and preliminary results were provided to the Team for evaluation of the models, variables and results. The Team discussed the HEP process to date and conducted a review of the preliminary HSI results for each community type and transect. Unless otherwise noted, the Team agreed to keep the variable in the model and did not alter the definition of the variable or the method of data collection or evaluation.

NEARBEACH

- Team determined that MHW to 10 m depth offshore is appropriate for this community because it captures the key coastal processes and would pick up changes to the community from natural processes and any proposed Project and/or restoration activities.

- Rename the community "OCEANBEACH."
- Readjust width variable curve to better represent the current width conditions (i.e., range from 2,000 to 2,800 ft). New curve HSI values 1.0 = 2,100 ft and a value of 0.1 = < 500 ft.
- Remove this community type from HEP evaluation on islands. The BAYBEACH and BAYSUBSAV community types will be used to evaluate all intertidal and subtidal areas around islands.
- Remove species richness variable from the NEARBEACH community. Based on an evaluation of existing USACE data, this variable does not show major differences across the 82-mile project area and species in this community are expected to quickly recover from any impacts from restoration or Project activities.

VEGBEACH

- Redefine the community as the area from MHW (i.e., high wrack line) to toe of dune.
- Re-examine wildlife barriers for VEGBEACH and DUNEGRASS separately.
- When determining the reference conditions for this community, the Team considered the conditions they felt best provided for dune stability, natural processes, RTE species, and a host of wildlife species.
- Remove *erosion* variable from the model. Erosion is addressed through slope and width.
- Scarping at the MHW line is a natural ephemeral process and should not be treated as evidence of erosion. Field data will be reevaluated and HSI values will be adjusted accordingly.
- Re-do the curve for the width variable so that 1.0 = $\geq$ 125 ft and 0.1 = $\leq$ 30 ft.

DUNEGRASS

- Redefine the community to include the area from toe of dune to crest of dune (i.e., dune face). Dunegrass includes the dunes, interdunes and swales that are dominated by sand or herbs and extends from the toe of dune landward to the upland or bayside community.
- When determining the reference conditions for this community the Team considered the conditions they felt best provided for dune stability, natural processes, RTE species, and a host of wildlife species.
- Adjust *slope* curve as follows: 0 – 5% = 0.1, 5 – 10% = 0.2, 10 – 15% = 0.4, 15 – 20% = 0.6, 20 – 25% = 1.0, > 80% = 0.6.
- Adjust *width* curve so that > 45' = 1.0 and divide lower distances into three HSI values.
- Adjust the *vegcover* curve so that the curve is asymmetric with the value on the right side of the curve (i.e., higher % cover) dropping less than the left side (i.e., low % cover). 40-50% cover = 1.0.
- Add the variable *invasives* to this model to account for *Phragmites*.
- Following release of the revised HSI results, the Team will reconsider the need to add the variable *canvegshrub* to this community to capture modifications to vegetation that may occur as part of restoration (i.e., reducing the % cover of vegetation to improve wildlife habitat).

UPLANDS

- Redefine the community to exclude the upper beach zone from this type. BAYBEACH will now include the upper beach zone.
- Remove fox, mud crabs and gulls from consideration as invasive/un-desirable species. Sai mud crabs and *Phragmites* will remain.
- Include the percent cover of *Phragmites* in the evaluation and determination of the HSI score.
- Modify the curve for *canvegcov* % cover so that the minimum value is < 20%. If less than 20%, the community is considered to be dunegrass, not upland. Description should indicate the value is to include both shrubs and trees.
- Remove the variables *erosion* and *shoremod* form the model. These are addressed in the BAYBEACH community type.

- The team considered removing the cantreeshrub variable from non-islands. No decision was made. Team should revisit this subject.

- The Team expressed concern that uplands that are in relatively good condition were receiving a very low HSI score due to the erosion factor. The Team will reevaluate these HSI values following edits to the database and release of the HSI results.

BAYBEACH

- Redefine the community to include the area from LLW landward to 20% cover of upland or dunegrass is encountered.
- Remove the variable *slope* from the list of variables assessed for this community. This was a typo.
- The BAYBEACH variables should be evaluated for both ends of transects on islands.
- Check the mathematical equation and curve for *spprich* and *sppabund*. The HSI values may be skewed.

BAYSUBSAV

- Revise the equations/curves for this community to ensure that the HSI result does not = 0 when SAV is not present.
- Most SAV beds are located beyond the 250 ft survey transect and beds with consecutive years of intensive data collection are often > 1 mile from most transects. The Team determined that models would only include data from SAV beds located within 500 ft of transects.
- The Team would like to re-evaluate whether to remove biotic factors from this model following edits to the database and release of revised HSI results.

C. WITHOUT PROJECT TRENDS

HEP communities were evaluated to determine how the quality of each might be expected to change over a 50-year period without restoration (i.e., without restoration activities and without the proposed USACE shoreline protection Project or other major restoration and/or manmade shoreline modifications). Assumptions regarding trends will be re-evaluated and revised as appropriate pending receipt of supporting information from USACE/Moffet-Nichols engineering models.

In many cases, communities are expected to shift, with decreases in size and/or habitat quality (i.e., downward trend) in some locations, and increases in size and/or habitat quality (i.e., upward trend) in others. Typically, however, no net change in the community is expected (i.e., flat) Project area wide. The Team may evaluate data from Moffet-Nichols modeling, and other sources, to try to identify site-specific trends at each transect (which may differ from Project area-wide trends and may be indicative of an un-natural/problem area). In addition, the Team will evaluate sea level rise, population growth, and invasive species information to determine how these may affect trends. For example, the bayside sites may be more sensitive to sea level rise and show more flooding.

NEARBEACH

Flat trend in habitat quality/size in the NEARBEACH community in the Project area over a 50-year cycle. However, it was noted that the Eastern ½ of the island (east of Watch Hill) is expected to erode 2 to 3 times faster than the western half and accretion is expected near inlets in the western section.

VEGBEACH

Downward trend in habitat quality/size of the VEGBEACH community over time, but only in developed areas where beach/dune evolution is restricted. Otherwise, a flat trend in habitat quality/size of the VEGBEACH community is anticipated in undeveloped areas. The community will shift, but there will be

no overall net loss of the community throughout the Project area over a 50-year cycle.

DUNEGRASS
Downward trend in habitat quality/size over time in developed areas where beach/dune evolution is restricted and the community will be compressed on both sides by shifts in adjacent communities.

Flat trend in habitat quality/size of DUNEGRASS. The community will shift, but there will be no overall net loss of the community throughout the Project area over a 50-year cycle.

UPLAND
Downward trend in habitat quality/size of the UPLAND community. Uplands will continue to be lost/impacted on the bayside. Increased development pressures may significantly affect the community. However, it is uncertain whether these changes will result in additive impacts.

BAYBEACH
Flat trend in habitat quality/size of the BAYBEACH community. Additional hard structures are expected and water quality may be slightly reduced.

BAYSUBSAV
Flat trend in habitat quality/size of the BAYSUBSAV community. More pressures are expected, but better laws, enforcement, and improvements will offset these. Changes in water quality are uncertain.

D. EVALUATION OF PROPOSED RESTORATION OPTIONS

The Team evaluated various restoration options proposed for each transect. See the attached handout for a summary of the proposed activities. Proposed restoration activities are a one-time event. The USACE will make recommendations regarding the need for long-term maintenance, but the USACE will not revisit restoration areas unless a problem is identified at the site within a 5-year window post-restoration.

Some general concerns/topics discussed by the Team included:

- The NPS cannot support work in NPS wilderness area due to Wilderness Act regulations; actions would take Congressional legislation.
- Agencies in general will not support the use of hard structures in the bay. If used, the structures will not improve bayside processes and in general are not supported by the Team.
- Dune enhancement is supported in areas where the threat of cross-island breaching is due to man-made/artificial dune modifications.
- Uplands are not included in the five key processes that the USACE hopes to target for restoration. Therefore, the USACE will not get credit for improving a process when improving upland conditions. Improvement would be considered strictly a habitat enhancement. USACE/Team to consider adding a process to address uplands.
- The Team supports projects that may improve wildlife habitat even though they may not be directly linked to a process, particularly on islands where the objectives are clearly habitat improvements for particular groups of species.
- To assist in restoration evaluation, the USACE will identify which actions are related to processes, habitat management, or both and will identify those areas that will require periodic maintenance.
- Good opportunities exist for co-operative approaches to restoration with the NPS. Joint projects are more likely to be supported.

The following section presents a summary of discussions relating to each of the proposed restoration sites, including identification of the processes that will likely benefit from the proposed restoration activity. Unless otherwise noted below, the Team agreed to the general restoration options presented in Attachment 2.

Transect 1 – Robert Moses Lot 4

Process – dune development and evolution.
Extent of Effect – unknown. Area for HU calculation would be the footprint.
Other – the Team concluded that the beach widening proposed for restoration in this location (as well as others) would not benefit the long-shore processes over time because restoration is a one-time event that would not include re-nourishment. Long-shore processes will likely not be improved over time unless the proposed activity adds a substantial amount of new sand into the system. Dune development and evolution processes would, however, be improved with restoration proposed for this location.

Transect 2 – Sunken Forest

Process – bayside and upland. Upland improvements are not accounted for under any of the five processes. In addition, restoration may negatively affect bayside processes if hard structures are used.
Extent of Effect – unknown. However, if the marina is removed or redesigned, the effect would be seen for 800-1000 ft of shoreline.
Other – soft structures are proposed for bayside restoration, but only if the marina is addressed. The marina in this location (as well as others) must be removed or redesigned in order to improve bayside processes. In this, and similar areas, the USACE would not remove hard structures such as bulkheads or marinas. However, the USACE will support and recommend removal or redesign and would perform shoreline restoration using soft structures following marina removal. The Team will not accept hard structures as an improvement to bayside processes.

Transect 3 – Reagan Property

Process – dune development and evolution, bayside, and upland. Upland improvements are not accounted for under any of the 5 processes. Would also negatively affect the cross-island transport process and may negatively affect bayside processes if hard structures area used. The Team will evaluate the trade-offs pending receipt of revised HSI results.
Extent of Effect – unknown.
Other – similar to Transect 2, soft structures are proposed for bay side restoration, but only if the cause of the erosion is addressed (bulkheads are believed to be an issue). Otherwise soft-structures are very likely to fail. The Team will not accept hard structures as an improvement to bayside processes.

Replacing/enhancing the dune in this area would reduce the potential for cross-shore transport in this naturally-occurring low-lying area. Team to evaluate the benefit of not enhancing dunes in naturally-occurring potential breach areas.

The NPS will not allow for road closures at this location.

Transect 4 – Old Inlet

The NPS will not approve of any proposed restoration or Project activity in this area due to restrictions

defined under the National Wilderness Act.

In addition, the Team expressed concerns about "restoration" of naturally occurring potential breach areas that are also ecologically desirable features in the landscape.

Therefore, despite the restoration opportunity in this location, the USACE will remove this site from future consideration for restoration because of (1) ownership and (2) the option of allowing natural cross-island transport to occur at this site (as one of only a few natural places that it does occur on the island).

Transect 5 – Great Gun

Process – dune development and evolution, Bayside, estuarine, and upland. But, similar to other transects, no process has been identified for the restoration of uplands; restoration would also negatively affect the cross-island transport process and restoration may negatively affect bayside processes if hard structures area used. The Team will evaluate the trade-offs pending receipt of revised HSI results. Draft objective is to restore hydrologic process, improve herbaceous estuarine wetland, and restore dune processes
Extent of Effect – 1000 feet to either side of restored area.
Other – modifications to the shoreline are not proposed for this area. However, the USACE will recommend that the causes of erosion are addressed (bulkheads and dock are believed to be an issue). Otherwise soft-structures are very likely to fail. Team will not accept hard structures as an improvement to bayside processes.
Replacing/enhancing the dune in this area would reduce the potential for cross-shore transport in this naturally-occurring low-lying area. However, in this particular case the reason the potential for cross-island transport exists is due to an artificial, man-made cut in the dune. Therefore, dune restoration is warranted.

May need to keep roads open for access to the heli-pad. Roads could be narrowed and re-angled to reduce overflow threat. No restoration of SAV bed needed.

Transect 6 - Pikes Breach

Process – proposed activities do not support any of the processes; they are considered habitat management/enhancement and would require periodic maintenance for long-term success. However, the Team supports projects that may improve wildlife habitat even though they may not be directly linked to a process. Draft Objective – devegetate to early-succession habitat, reduce human access
Extent of Effect – 1000 feet to either side of restored area.
Other – USFWS would prefer not to lower the elevation of the spit and would prefer to see the area devegetated to create potential nesting area for terns and other shorebirds.

Transect 7 - Tiana

Process – estuarine, dune development and evolution.
Extent of Effect – 1000 feet to either side of restored area.
Other – Team concerned about where to re-direct water flow.

Transect 8 - WOSI

Process – estuarine, dune development and evolution. Objective – improve estuarine process (with marsh restoration).

Extent of Effect – 1000 feet to either side of restored area.
Other – the WOSI project currently is proposing dune modifications in proximity to the proposed restoration activities for FIMP. Modifications include lowering of dune to encourage breaching. Check to ensure proposed restoration work does not duplicate and/or conflict with WOSI efforts

USFWS recommended a review the Biological Opinion (BO) for the WOSI project in this area before developing restoration designs to ensure that proposed activities are in line with recommendations made in the BO.

Transect 9 – Georgica Pond

Has been eliminated from further consideration. The area is currently a highly functioning intertidal system, which provides significant breeding and foraging habitat for wildlife. Additional constraints include land ownership, limited restoration opportunities, and low potential for restoration success.

Transects 10, 11, 12, 13 and 15 (Islands)

Process – proposed activities do not support any of the processes. Is considered habitat management.
Extent of Effect – entire island area.
Other – must consider that restoration will eliminate the island from future use as dredge deposition site. Re-grading of scarped areas is temporary fix. Erosive forces will quickly re-scarp these areas.

Transect 10 (East Inlet) – historically this island was a tern nesting area, is currently part of a NYDEC restoration project and is currently an active dredge deposition site.
Transect 11 (John Boyle) – a significant gull colony on island must be addressed, USFWS to determine if early or late-successional habitat is preferred for restoration.
Transect 12 (Warner) – is currently an active heron and tern colony. The Team does not support restoration of this site.
Transect 13 (Ponquogue Spoil) – a significant gull colony on island must be addressed, historically this island was a heron/egret colony.
Transect 15 (New Made) – historically a tern, black skimmer colony, terrapins are known to nest on this site.

Transect 14 – Ocean Beach

Process – longshore transport, dune development and evolution.
Extent of Effect – 2,000 feet to the east and 3,000 feet to the west of the restoration area.
Other – consider a joint effort with the NPS (Robin Laporte) to buy-out houses to the SEA-HA line
USACE will recommend bulkhead and marina removal to improve bayside processes, but the option would not be supported by the local community.

We are presently looking at engineering models to address this area and are attempting to determine what groin removal would mean to the nearby homes.

E. RESTORATION PHILOSOPHY

In closing, the Team prepared a statement regarding their philosophy towards restoration efforts under FIMP HEP project as follows:

"We are developing restoration projects with the understanding that no one project or site will completely restore one or more processes. However, development of projects was directed towards those that would

contribute to incremental improvement of one or more selected processes. At times, selected projects may improve one process over another. Selections have been directed toward reversing anthropogenic interruption of processes. Additional projects have been identified that do not contribute to selected processes but may provide important habitat restoration or management options and can be recommended for other funding avenues. Other opportunities to restore processes may exist in other locations than our current transects."

F. SCHEDULE.

January – submit revised documentation for variables, variable codes, variable list, a description of sampling methods, a description of the HSI evaluation, and a list of any supporting references/data sources to Team.

February – submit revised database, equations, HSI results for existing baseline conditions, and preliminary results for the conceptual restoration plans to the Team for review/comment. Solicit names from Team for potential reviewers of the models.

March – conference call to discuss results.

April – send models out for review.

May – 3-day HEP meeting. The agenda will include final presentation of results for existing conditions, draft results for project conceptual designs, and a discussion of comments received from model review by other professionals.

III. ACTION ITEMS

NEA

- Send definitions of variables, variable codes, a description of sampling methods, a description of the HSI evaluation, and a list of any supporting references/data sources to Team.
- Send field data forms to USFWS (task completed at time of release of minutes to Team).
- Modify database and re-enter data as appropriate.
- Re-run HSI models for existing conditions.
- Develop conceptual restoration designs in GIS.
- Re-enter data for future conditions and re-run HSI models.

NEA/WES

- Data variability – conduct sensitivity analysis.
- Modify database, revise equations, curves, etc.
- Revisit the suggestion to remove the *cantreeshrub* variable from non-islands.

USACE

- Check into availability of population growth models for use in predicting future trends.
- Request 50-year without project trend data for oceanbeach width, vegbeach width and dune slope, width and height from Moffet/Nichol (work ongoing).
- Coordinate with Moffet/Nichol to identify current and future (50-year) potential breach areas (work ongoing).
- USACE/Team to consider adding a process to address uplands.
- Identify which actions are related to processes, habitat management or both and will identify those areas that will require periodic maintenance.

- Follow up on questions posed by the Team in Section I.

NPS/Rutgers

- Identify trends for the impacts that may affect the HEP community types from sea level rise.
- Provide NEA with invasive species report.

ALL

- Locate any documents, data, etc to support the assumptions and decisions made by the Team.
- Evaluate mathematical equations by substituting the name of the variable into the definition for each equation. Provide recommendations regarding changes (if/then statements are not recommended). Evaluate curves, HSI outputs and provide recommendations.
- Identify potential reviewers of the HEP models.

Attachment 1 to HEP mtg. minutes (Nov. 17-19th): An e-mail discussion between FWS personnel (Steve Sinkevich) and USACE personnel (Pamela Lynch) regarding unresolved issues raised at the HEP team meeting.

Pam: I've listed below my interpretation of the HEP team's collective determinations/direction regarding some of the issues that the Service has concerns with, which were discussed during the HEP meetings that occurred on November 17-19. I wanted to be sure that I understood what the team (or a majority of the team) had agreed upon and for you to be clear on what our agency's concerns are.

General Note: The Service has statutory responsibilities under the Endangered Species Act (ESA) and Fish and Wildlife Coordination Act (FWCA) requiring that we assess the affects of federal actions on federally listed species/fish and wildlife resources. Our participation as a member of the HEP team does not preclude/supercede these responsibilities. As such, determinations made in our ESA and FWCA assessments will be independent of, and may not be consistent with, the HEP team determinations, especially in light of our concerns stated below.

ANSWER: Yes, I agree. Please read question above and let me know if you want this cut-n-paste right into the meeting minutes or if a disclaimer (stating the above) is enough.

· The majority of the team wants to remove bay island restoration and early successional habitat restoration projects from consideration because they are considered by the majority of the team to be restoration of habitat and not of processes and that active management would be required to maintain early successional habitat;

ANSWER: Yes, the majority of the team has voted for removal but we are still KEEPING THEM ALL IN to run the HEP models on them to determine what values we would get from restoration. I think the real decisions would be made after the results are in. Also, while they are not linked directly to a process, I am not sure that means we absolutely cannot include it as an option. This is a question I'm actually trying to get answered myself. Regardless, if they are removed from inclusion as restoration locations under the FIMP storm damage reduction project, we still have other authorities (CAP etc.) that we could pursue in the future.

· HEP modeling of restoration activities will proceed prior to landowner consent of proposed projects (As I stated during the meetings, there are several projects proposed that I do not believe the landowner will agree to, especially the closing of dunes @ Robert Moses Field No.4);

ANSWER: Yes, HEP will be run regardless of ownership.

· There are no projects proposed to restore cross island transport

(each of the 7 viable projects propose the stabilization of bay shorelines or the closing of dune cuts- actions that may actually reduce the likelihood of cross island transport and have implications during ESA consultation). I believe that several team members stated that allowing for natural processes at Old Inlet should count as restoration. However, nothing is being restored-existing conditions are simply being allowed to remain;

ANSWER: Yes, none of the HEP options include a restoration of cross-island transport. Some of the dune projects, according to Norb, may have slight benefits in that manner but nothing significant enough to claim. Additionally, it was mentioned that leaving areas alone (such as Old Inlet and/or Reagan) would allow for NATURAL cross-island transport to occur. This is NOT restoration but simply allowing a natural process (that is already occurring) to occur. This would not be part of the (restoration) project.

· Projects that may require active management or projects that do not restore one of the five processes will not be considered for restoration under the FIMP (regardless of their potential to improve the ecological value of habitats);

ANSWER: See previous answers above - I'm not sure yet if they MUST involve 1 of the 5 processes to move forward and, regardless, we still have other options to explore under future project authorities. Additionally, we will recommend active management under the HEP/restoration options (in sites where it is relevant) but we (the COE) cannot actually do it (but maybe the non-fed. sponsor and/or land owner and/or stakeholder can?).

· There are no restoration projects proposed for early-successional and/or bay island communities which are essential for federally and state-listed species (resources that arguably need restoration the most).

ANSWER: I thought some of the dredge islands had the opportunity for early successional habitat? Yes, the islands might be removed all together but NOT yet - I say we still run the HEP and see where that gets us. I think this is one of the larger questions I still need answered from my HQ and FIMP team.

· One of the proposed restoration projects involves restoration (involving the filling-in of man-made breaks in dunes) within the Shinnecock Inlet Interim Project area (another project that the land-owner may not want to agree to). A Biological Opinion was prepared by the Service for this project, which stated that one of the primary concerns was the limiting/prevention of cross island transport. Re-initiation of ESA consultation may be required if this project is selected for construction since it may affect listed species in a manner not previously considered. (This re-initiation of consultation may be in addition to, or part of, the ESA consultation that will be required for any restoration activities

proposed as part of the FIMP.)

ANSWER: This is noted in the HEP meeting minutes and, if it does turn out that our restoration is a BAD thing, we simply won't do it. However, the other "restoration opportunity" at that site of wetland creation is still out there as an option - and a good one I think we should seriously consider. That isn't on the beach, doesn't involve manipulation of the dunes and won't interfere w/ the cross-island transport the BO mentions.

· At this time, pending future funding, all restoration efforts and HEP modeling will be limited to the sites located along one of the 15 Corps-identified transects. With the apparent removal of bay islands, Pikes Beach and Old Inlet from consideration, there are therefore a total of seven viable projects. None of the projects/opportunities identified in our Planning Aide Letter are included in these seven projects.

ANSWER: Yes...and no...we are hoping to get additional funding this FY to select a few more sites for the HEP model runs. Nothing is definitive and no sites are determined. We are currently writing a response to your PAL and, in it, it outlines exactly which sites are in and out and which are still "open" to be studied this FY (pending funding). However, from a first thought, SAV is still included (something you mention of value in the PAL), the islands are not completely out, and the rest were removed (for now) because we couldn't link them to a process...

FIRE ISLAND TO MONTAUK POINT (FIMP) REFORMULATION STUDY
RESTORATION AND HABITAT EVALUATION MEETING SUMMARY
APRIL 21 THROUGH 22, 2005
THE USFWS LONG ISLAND FIELD OFFICE, ISLIP, NY

TO: Karen Graulich (NYSDEC), Jean O'Neil (WES), Patricia Rafferty (NPS), Steve Sinkevich (USFWS), Robert Smith (USACE), Norb Psuty (Rutgers), David Santillo (NEA), Steve Couch (USACE)

FROM: USACE, Pamela Lynch

SUBJECT: Summary of FIMP (HEP) Team Meeting

DATE: August 17, 2005

ATTACHMENTS:
Attachment 1. Baseline HSI Values
Attachment 2. Restoration HSI Values for Great Gun and New Made Island
Attachment 3. Assumptions and Trends for Future Conditions

In attendance:

Stacie Grove (NEA) [2]	Steve Sinkevich (USFWS) [1]
Pamela Lynch (USACE) [1]	Robert Smith (USACE) [2]
Jean O'Neil (WES) [2] via phone	Norb Psuty (Rutgers) [1]
Patricia Rafferty (NPS) [1]	

[1] voting member of the FIMP advisory Team
[2] assisting advisory Team, but not a voting member

I. FIMP UPDATE

Pamela Lynch provided a status update on the Fire Island Inlet to Montauk Point (FIMP) Reformulation Project, which included an overview of progress to date on Phase I and Phase II efforts. Phase I HEP efforts included HEP meetings, field work, and HEP analysis conducted in 2004 to address potential impacts (both positive and negative) associated with proposed restoration efforts in the FIMP study area. Phase II includes additional HEP fieldwork and analysis at 5 to 8 sites to address potential impacts (both positive and negative) in proposed project areas. The existing HEP models will be used to evaluate both Project and restoration components and only minor revisions to the existing models will be needed.

Restoration activities will be used to offset any impacts caused by the Project. The USACE objective is no net loss of habitat units as a result of Project activities. At this time, no hard structures are proposed as part of the Project.

In addition, the "Process Fact Sheets" have been revised by the USACE. Copies will be sent to the Team for review and comment. Additionally, the project area for FIMP has been extended an additional 3 miles to the west and now includes areas such as Cedar Beach, Gilgo Beach and Captree Island.

II. GENERAL HEP COMMENTS

The Team noted that the HEP models do not adequately reflect impacts to the "Processes" and recommend adding a component to the HEP process to evaluate these impacts. In addition, there is no "Process Fact Sheet" that addresses uplands.

Models currently favor beach-widening activities. The Team is concerned that the models do not adequately address "big-picture" issues, such as the need to maintain certain processes or characteristics that may not be optimal, but are part of the natural processes in the FIMP study area. For example, wide beaches are not desirable in all areas. Also, severely eroding bluffs located on the eastern end of the island are necessary for the cross-shore transport process. We would not want to propose restoring these areas to the "ideal" condition as "ideal" is currently defined in the HEP models.

Baseline HSI values will be calculated for all 14 potential restoration areas. This information will assist the Team in selecting the "preferred" restoration option and area. The Team will also use the USFWS planning aid letter to assist in selecting the restoration site and will not base selection exclusively on the HSI numbers. In addition, consideration should be given to sites identified for RTE species restoration at meeting between Bob Kurtz, USFWS, M. Belecki (NPS), and town representatives. The USACE will coordinate with Bob Kurtz regarding the meeting.

III. EVALUATION OF FUTURE PREDICTIONS AND ASSUMPTIONS

The general assumptions regarding trends will be edited to state the following:

- BAYSUBSAV – gain throughout area due to sea level rise and erosion of bay beach. However, some areas likely to experience no change or losses as detailed in the futures table or as indicated below.
- BAYBEACH – loss throughout area due to erosion. However, some areas likely to experience no change or gains as detailed in the futures table or as indicated below.
- UPLAND – loss throughout area due to increased development pressures, erosion, and shifting of DUNEGRASS community.
- DUNEGRASS – loss in developed areas where dune evolution is restricted. In other areas, the ecological communities are expected to shift in location (loss in some areas/gain in others); but, no net loss Project area-wide.
- VEGBEACH – loss in developed areas where dune evolution is restricted. In other areas, the ecological communities are expected to shift in location (loss in some areas/gain in others); no net loss Project area-wide.
- OCEANBEACH – loss throughout area. The eastern ½ of the Project area (with the exception of the rocky shoreline near Montauk) will lose sand 2 to 3x's faster than in areas located to the west.

Future calculation assumptions (over 50 year life of project) will change as follows:

- OCEANBEACH width variable will decrease 10% in the west and 20% in the east.
- VEGBEACH and DUNEGRASS width will decrease by 20% at Transects 1, 3, and 6, and decrease by 40% at Transect 14 (i.e., sites where dune evolution is restricted.).
- Invasive species will decrease the HSI score at all transects by two classes.
- Abundspp variable will be removed from all models, thus the statements regarding species abundance will be deleted.
- An internal diversity variable may be added to the models. The Team will need to determine how this variable may change over time.
- Eelgrowth variable will be removed from all models, thus the statement regarding eelgrass will be deleted.

- The Table will be modified so that OCEANBEACH shows a loss at Transect 1: BAYBEACH shows no change at Transects 1, 10, 11, 12, 13 and 15, gain at Transect 4, and loss at Transects 5, 6, and 7; BAYSUBSAV shows no change at Transects 1, 8, and 10 through 15, gain at Transects 2, 3, 5, 6, and 7, and loss at Transect 4.

IV. MODELS AND BASELINE CONDITIONS

Species included in the BAYBEACH and BAYSUBSAV communities were redefined. BAYBEACH will no longer include the data from the seine surveys that were collected in the intertidal zone. BAYSUBSAV will include seine data collected from within the SAV bed **or** from the seine surveys conducted in the intertidal zone of each transect (whichever is appropriate). For example, the intertidal seine data will be used for islands and other areas where no SAV beds were identified.

The Team discussed the difficulty in using biotic variables such as species richness and abundance due to the extreme variability in community data and low number of sampling event to base the results on. However, the Team agreed that there is value in keeping at least one variable to evaluate species data in the models. Species richness will be kept.

The Team discussed adding a variable called "substrate" to the OCEANBEACH, VEGBEACH and BAYBEACH communities as a way to evaluate conditions. The logic is that diverse substrates (i.e., mix of cobble, sand, gravel, etc.) will result in more desirable species and higher species diversity. However, this approach may be flawed in that a model for this variable would result in a higher HSI score for sand than mudflat, yet each are of high value to certain desirable organisms. One approach may be to add the variable, but call it "availability of appropriate substrate" for each given area. That way, if a town dumped rubble on sand or if sediment covered cobble, a change in the HSI score would result. For baseline conditions though, the rocky shoreline near Montauk, beach areas, and the intertidal mudflat at Democrat Point, would have the same HSI score. The Team will revisit this discussion.

The Team discussed adding limiting factors to models for OCEANBEACH, VEGBEACH, BAYBEACH and BAYSUBSAV. Limiting factors are assumptions or conditions that should never be violated. A violation would automatically drop the HSI value to zero. For example, the team discussed adding a limiting factor that would prohibit a change in substrate in any area. However, while this would ensure that mudflat could not be replaced with sand it would also mean that sand could not be replaced by mudflat to create intertidal marsh. This limiting factor might make work on the islands impossible. The Team will revisit this discussion.

The Team discussed adding an Internal Diversity Index that gives a score to each transect based on the number of desirable habitat features encountered. However, this approach might unfairly assign a higher value to one transect because it has more communities even though those communities may be sub-optimal. Consider how an area with only unvegetated mudflat might compare to an area with salt marsh, upland, or shrub. Each is of high value to wildlife. One approach may be to evaluate transects within the broader context. That is, transects would be assigned a score relative to the quality of area surrounding a transect. Highly developed areas would score low, areas in the wilderness would score high. The Team will revisit this discussion.

In addition:

- EELGROWTH was removed as a variable from the BAYSUBSAV model.
- Change the invasive variable to record percent cover rather than high, moderate, low, very low categories.
- Remove the ABUNDSPP variable from all models.

- Remove vegetation species from RICHSPP variable, but keep the variable in the models. Species included as "target species" will be redefined for the BAYBEACH community based on information from Gary Ray at WES. Species will remain the same for the BAYSUBSAV community.
- Change the text describing the ideal conditions for BAYBEACH to indicate that some erosion is acceptable and is part of the natural system.

V. FUTURE WITH RESTORATION HSI/HU CALCULATIONS

The team reviewed baseline and future (with project) tables for Transects 5 and 14. The team discussed the assumptions that were made by NEA regarding changes in HSI values following restoration activities. Where appropriate, table values were modified based on Team input.

VI. SCHEDULE

The next meeting will be a conference call. Agenda items will likely include a discussion of the revised community and variable definitions, species curves, future assumptions, baseline HSI values, and restoration plans for Great Gun and New Made Island. The team will also evaluate the benthic species list to be provided by WES, discuss the results of the sensitivity equations and discuss the HEP model philosophy as it relates to restoration and project components.

A final meeting will be held to present the HEP process and findings and will be open to a larger audience.

VII. ACTION ITEMS

NEA

- Provide Team with a figure that includes the 8 additional sites that have been added for 2005 HEP sampling.
- Revise baseline and future with restoration HSI/HU tables as needed.
- Modify community descriptions, tables, etc. as necessary to address team comments.
- Extend oceanbeach community out to 30 ft depth when calculating baseline HSI/HU's.

NEA/WES

- Evaluate if a component can be added to the models to address impacts to "Processes".
- Provide Team with summary tables that provide 1) community type definitions, 2) variable definitions, 3) definitions of HSI 1 = good, 0 = bad.
- Identify which species or features to include in the internal diversity index. Determine how this variable may change over time.
- Identify how "management" of restoration sites can be included in models. Particularly in the future projections calculations.
- Conduct sensitivity analysis.
- Revisit the issues/concerns identified in Section IV and present options to the Team.

USACE

- Send revised "Process Fact Sheets" to the Team.
- Investigate whether it is feasible to prepare a Fact Sheet to address uplands.
- Coordinate with Bob Kurtz regarding the RTE species restoration sites identified during Aril 2005 meeting with town representatives, NPA, USFWS, etc. Send minutes from the April 2005 meeting to HEP Team.
- Get a list of target species for the BAYBEACH community from Gary Ray.

FIRE ISLAND TO MONTAUK POINT (FIMP) REFORMULATION STUDY
RESTORATION AND HABITAT EVALUATION MEETING SUMMARY
SEPTEMBER 23, 2005
USFWS LONG ISLAND FIELD OFFICE, ISLIP, NY

TO: Karen Graulich (NYSDEC), Jean O'Neil (ERDC), Patricia Rafferty (NPS), Steve Sinkevich (USFWS), Robert Smith (USACE), Norb Psuty (Rutgers), David Santillo (NEA), Steve Couch (USACE)

FROM: USACE, Pamela Lynch

SUBJECT: Summary of FIMP (HEP) Team Meeting

DATE: December 19, 2005

HANDOUTS (provided prior to or during meeting):

Figure – HEP Transect Locations
Variables Evaluated with HEP Models
HEP Sampling Methodology
Description of Potential Restoration Options
FIMP HEP Curves Database
Future Conditions and Assumptions Table
Baseline, Future No-Action, and Future HSI and HU Scores for 14 Restoration Sites
Baseline and Future No-Action HSI and HU Scores for 7 Additional Sites

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In attendance:

Kelly Burks-Copes (ERDC-EL)[2]	Jean O'Neil (ERDC-EL)[2]
Stacie Grove (NEA)[2]	Patricia Rafferty (NPS)[1]
Roselle Henn (USACE)[3]	Steve Sinkevich (USFWS)[1]
Robin Laporte (NPS)[3]	Robert Smith (USACE)[2]
Pamela Lynch (USACE)[1]	Norb Psuty (Rutgers)[1]

[1] voting member of the FIMP advisory Team
[2] assisting advisory Team, but not a voting member
[3] non-team attendee/interested party (participated in morning session)

I. FIMP UPDATE

Pamela Lynch provided an overview of the Fire Island Inlet to Montauk Point (FIMP) Reformulation Project. To date, there have been two phases of the Habitat Evaluation Procedures (HEP) process that have been designed/used to address two phases of the FIMP project. Phase I HEP included 14 transects established to address potential impacts (both positive and negative) associated with proposed restoration efforts in the 82-mile FIMP study area. Phase II HEP included the evaluation of seven additional transects established to address community types and conditions not previously included in the Phase I effort.

In accordance with National Economic Development Plan (NED) and National Ecosystem Restoration Plan (NER) objectives, the next phase of HEP will use data and results from Phase I and Phase II efforts to evaluate baseline, future no-action, and future with action conditions at the actual proposed shoreline protection and restoration site locations across the 82-mile Project area. In addition, (if necessary) HEP

may be used in mitigation analysis and design to offset any potential impacts through restoration/mitigation. However, the USACE is proceeding on the assumption that activities related to the beach renourishment and dune restoration component of the storm damage reduction project will not have adverse negative impacts that would require mitigation.

The current USACE authorization for the FIMP project covers the studies needed to evaluate the proposed project option and does not authorize activities directly associated with storm damage reduction and restoration. The USACE is currently pursuing new authorizations that will likely include the restoration component. Other options for restoration authorization and funding may be pursued under the CAP program or under authorization for projects that support threatened or endangered species.

Non-Federal sponsors cannot pay for a restoration project unless components of the project also provide storm damage reduction. Therefore, the Project will proceed, and will include BOTH shoreline protection and restoration/mitigation components. In some cases, proposed Project alternatives may also serve as restoration.

II. GENERAL DISCUSSION OF MODELS

Model certification and peer review – Kelly will follow up with Roselle to provide recommendations regarding the process as it applies to FIMP HEP. Jean will provide Kelly with additional information after she attends the upcoming meeting on certification. Peer review may be significantly limited due to the project schedule and funding limitations.

ERDC/NEA to determine if it is appropriate to use the average or weighted average when presenting HSI scores.

Project activities may occur anywhere across the 82-mile Project area and until recently the proposed locations were unknown. Therefore, the location of existing HEP transects were selected in order to provide data from representative examples of the types and quality of communities likely to be impacted by restoration or project activities. This baseline HEP data may be extrapolated to evaluate potential impacts to restoration or project locations within the broader study area. Team input will be needed to identify which of the communities already evaluated with HEP would apply to selected project or restoration areas not already surveyed using HEP. Due to limited time and funding, the USACE will not be conducting additional HEP field sampling activities in additional areas.

The team worked on a ranking matrix for use in evaluating and documenting impacts on the ecological processes, and on rare/threatened/endangered species, from proposed activities. This ranking matrix would be used after calculating HSI and HU scores to assist in justifying why activities should or should not be undertaken in a given area. The Team worked through the decision matrix process for several sites and determined it would likely be a useful tool. Decision Matrix symbols: + = supports process; - = negative affect on process; and, 0 = no obvious affect on process. The symbols ++ or - - were used to indicate that the effect on a process would be very high. The effect on RTE species was also included as a decision category in the matrix. However, this category would only be used to move an activity forward when the activity did not strongly support any other processes. This may be a way to elevate the status or importance of island restoration, given that there has not been a process identified to address the upland community.

The TRANSCOMM variable was added to the HEP models to help ensure continuity of communities across the island. However, the team was unable to fully evaluate the usefulness of the TRANSCOMM variable at this meeting.

The Team discussed developing decision rules that would be used to help to determine and document why some sites would be removed from further consideration. The decision rules could be used in a matrix (or combined with the process matrix described above) to assist in selecting or eliminating sites. Categories (or rules) might include raw feasibility, representation of key processes, and National Performance Measures (e.g., connectivity, species of concern, invasive species, partner support). ERDC will suggest how best to incorporate these categories and the process matrix into HEP and the site selection process. ERDC will provide a copy of the performance measures to the Team. (i.e., agency opposed, landowner issue, cost, likelihood of success, etc.).

III. HEP Results

NEA and ERDC presented baseline, future no-action, and future with restoration, HSI and HU values for the 14 Phase I restoration sites to the Team. In addition, baseline and future no-action conditions were presented for the seven, Phase II transects. Copies of all results and HEP databases will be sent to the Team for further evaluation.

The team reviewed the handout of future conditions and assumptions. The Team evaluated each assumption and adjusted them as needed to best represent overall trends expected for acreages or HSI scores in each community over time. ERDC incorporated changes in tables and database as they were being discussed during the meeting.

Future conditions calculations will be revised and resubmitted to the Team. ERDC and NEA will coordinate regarding AAHU calculations over 50 year project life. The team will need to establish target years for AAHU calculations.

IV. RESTORATION LOCATIONS AND ALTERNATIVES

NPS restated the fact that in accordance with Federal regulations, no activities could be undertaken at Old Inlet (or any other site within the Wilderness Area).

The Team reviewed the handout that described potential restoration options for each of the original 14 transect locations. The options were revised based on comments received from the Team at the previous meeting. On this handout, additional management options that would not to be undertaken by the USACE as part of restoration are presented. Changes in acreages or HSI scores that may result from these non-USACE activities were not included in HSI calculations. However, HSI scores could be adjusted accordingly, if other organizations were to agree to complete the management recommendation.

The USACE will not manage restored areas beyond 5 years. The assumption is that the non-Federal sponsor would take over the management of an area beyond the 5-year period.

Agencies requested the opportunity to propose additional restoration areas and designs to be evaluated with HEP as part of this project. Therefore, by October 24th, each voting agency on the Team will provide the USACE with up to nine restoration site locations and one alternative per each site (potentially 36 different sites) that are supported by their agency. The Team was strongly encouraged to use sites and designs already identified and evaluated using HEP if possible. Designs should be conceptual and should include location, acreages of each community (based on the identified HEP community types), target species, a description of how the HSI scores and processes would be affected, a brief description of the proposed restoration, and text describing the rationale used to prioritize the nine sites.

A conference call will be held the week following submittal of restoration locations and alternatives (week of October 24th, 2005) for the Team to discuss which sites and alternatives the USACE would likely move forward to the next phase of HEP analysis. Time and funding limitations may significantly

limit the number of options that the USACE may select. The goal will be to select several options that the Team collectively identifies as priorities. Once the "final" sites are identified, at least three alternatives will be developed per site and would include designs that show the minimum acceptable restoration, best case scenario for restoration, and a scenario that falls somewhere in between. Three design alternatives are needed for each site in order to run the Institute for Water Resources (IWR)-Plan which is used in incremental cost analysis.

V. PROJECT LOCATIONS AND ALTERNATIVES

Based on current estimates of alternatives from enginners at Moffett-Nichol, approximately 24 potential locations and up to three alternatives per site will be evaluated (72 scenarios) with HEP. The assumption is being made for these sites that the proposed project alternatives (i.e., beach renourishment and dune stabilization) will only affect the VEGBEACH and the foredune portion of the DUNEGRASS HEP communities. Therefore, only slope, width, vegetation, and total acreages will be modified for each scenario to produce HSI and HU scores for baseline, future no-action, and future with action conditions in these communities. No other HEP communities will be affected, thus no changes will be realized in the HSI or HU scores for these communities as a result of the project.

Other components of the storm damage reduction project may include modifications to inlets, revetements, and groins. HEP will also be used to evaluate impacts that may result from these activities. Impacts may affect communities other than VEGBEACH and DEUNEGRASS.

Engineer models for various reaches have generated data on average beach and foredune widths and slope across the 82-mile project area. These data will be used instead of field data in the HEP models to ensure consistency across the 82-mile project area. NEA will coordinate with Moffett-Nichol to ensure data are compatible and suitable for use in the HEP models. HEP curves may need to be reevaluated and adjusted for engineer data.

VI. MITIGATION

Standard benefit-cost analysis analysis will be used to determine the NED plan. HEP will be used to generate ecological impacts. Any impacts generated by the proposed design must be offset with mitigation. Mitigation designs must be analyzed using HEP (to generate outputs), and Cost Effectiveness/Incremental Cost Analysis (CE/ICA) to determine the cost-effective, biologically productive solution for full mitigation. For the ecosystem restoration portion of the study, HEP and CE/ICA will be used to determine the NER plan. A combination of both NED and NER components will then be generated to develop a multi-purpose project. These components will then be re-evaluated using both benefit-cost analysis, CE/ICA and HEP in an iterative fashion.

The USACE is proceeding with a new SOW to fund the next phase of work. This phase will include HEP analysis to produce baseline, future no-action, and future with action scenarios for the new restoration sites (to be identified by the Team the week of October 24th) and for many of the potential project sites. NEA will prepare conceptual costs and designs needed for the evaluation of restoration sites and costs will be prepared by the USACE for the evaluation of project sites. The USACE will run the IWR-Plan on project and restoration alternatives and will develop a strategy that provides separable elements and dictates rules for the CE/ICA (i.e., combinabilities, cumulative effects, thresholds, etc.).

It is assumed that for future use of HEP, the USACE will apply the HSI score of the HEP community or communities that have characteristics most similar to the areas that have not actually been evaluated with HEP. For example, Water Island was not surveyed during HEP field data collection. However, the Reagan property was surveyed and the characteristics of the communities in Reagan are similar enough to Water Island to justify using Reagan HSI data in HEP analysis for Water Park

If mitigation for project impacts is needed, future discussions would need to be held to determine if mitigation would be in-kind, out-of-kind, both, etc.

VII. SCHEDULE

- October 24, 2005 – HEP Team to submit lists of priority restoration sites and descriptions to the USACE
- October 26, 2005 – HEP Team conference call to discuss the list of restoration sites
- December 2005 – all engineering data for the project is due to the USACE
- January 2006 – all HEP data for restoration sites and project alternatives due to the USACE
- March 2006 HEP report due to the USACE
- November 2006 – USACE to submit draft EIS to agencies
- November 2006 – Independent Technical Review

VIII. ACTION ITEMS

NEA

- Provide HEP databases and associated tables to the Team
- Prepare cover type maps and conceptual designs for selected additional restoration locations and alternatives provided by the Team (NPS to assist as needed)
- Calculate baseline, future no-action and future with restoration HSI and HU's scores for selected additional restoration locations and alternatives provided by the Team
- Calculate baseline, future no-action and future with project HSI and HU's scores for selected shoreline protection project locations and alternatives provided by Moffett-Nichol

NEA/ERDC

- Continue to assist with any necessary adjustments to models/equations as needed in the next phase of HEP
- Continue advisory role in HEP process
- Provide Team with list of National Performance Measures
- Evaluate how best to incorporate site selection criteria and the process evaluation matrix into HEP and the site selection process

USACE

- Send templates for Team's use in identifying restoration sites (task completed)
- Send revised "Process Fact Sheets" to the Team.
- Prompt the NYSDEC for input of HEP and restoration site selection
- Investigate whether it is feasible to prepare a Fact Sheet to address uplands.
- Provide the Team with a copy of the USACE flowchart that shows the NED/NER process.
- Coordinate with NEA/ERDC for next phase of work
- Roselle to coordinate with ERDC regarding certification on models

USFWS/NPS/NYDEC

- Provide USACE (by October 24, 2005) a list of up to nine restoration locations (1 alternative per location) with descriptions of the proposed restoration, anticipated impacts to communities in terms of HSI values and acreage changes, and provide description of how sites were prioritized. Use template from USACE to facilitate this.

FIRE ISLAND TO MONTAUK POINT (FIMP) REFORMULATION STUDY
MEETING SUMMARY - DRAFT HEP RESULTS AND EVALUATION ASSUMPTIONS
APRIL 18, 2006, 9:00 AM THROUGH 4:00 PM
FIIS RIVER ROOM, 166 WEST AVE, PATCHOGUE, NY

TO: Karen Graulich (NYSDEC), Patricia Rafferty (NPS), Steve Sinkevich (USFWS), Robert Smith (USACE), Norb Psuty (Rutgers), David Santillo (NEA), Steve Couch (USACE)

FROM: USACE, Pamela Lynch

SUBJECT: Summary of April 18, 2006 FIMP (HEP) Team Meeting

DATE: April 25, 2006

HANDOUTS (provided prior to meeting):

Draft HEP Report and Appendices, version dated March 31, 2006

In attendance:

Patricia Rafferty (NPS) [1]	Robert Smith (USACE) [2]
Steve Sinkevich (USFWS) [1]	Stacie Grove (NEA) [2]
Norb Psuty (Rutgers) [1]	Steve Couch (USACE) [3]
Pamela Lynch (USACE) [1]	

[1] voting member of the FIMP advisory Team
[2] assisting advisory Team, but not a voting member
[3] non-Team attendee/interested party

I. MEETING SUMMARY

1) Patty (NPS) requested that "Appendix D" be removed from the document (it contained what she felt to be classified and confidential information). Material will be excluded in future releases/versions of the report.

2) The next version of the report will include an Executive Summary.

3) The Team made note of several other editorial comments on the HEP report, but were asked to provide comments specific to the report to NEA in written format within two weeks.

4) Norb (NPS/Rutgers) requested that a "flow chart" be generated for inclusion in the report's introduction. He felt this was necessary to help the common "reader" to understand the process of HEP better. NEA will attempt this "flow chart" in a latter version of the report (if possible).

5) Steve S. (FWS) did not agree w/ the assessment of the FWS's "selected" restoration designs. Steve felt that all of his alternatives were not represented and the alternatives weren't, in some cases, shown correctly. He will address each of these individually, in an e-mail, following the meeting. Patty will do the same (if necessary).

6) Norb requested that a "disclaimer" be added to the beginning section(s) of the report to state that the model is community based (as designed) and thus has significant limitations in geomorphology. Therefore, as assumptions are stated, all limitations should equally be disclosed. The HEP Team will identify any additional limitations or assumptions that need to be added. NEA will add these to future versions of the report.

7) The application of the HEP "Transcomm" variable needs to be re-evaluated. Patty (NPS) illustrated its intended use (as was created in prior meetings), but admits it might not have been used/created properly. She will revisit this variable (as will NEA) and a decision will be reached on how to handle it in future HEP analyses (and, if necessary, to re-compute those from the past).

8) Regardless of what happens w/ the variable, it must be more clearly stated in the report the purpose and application of the variable, any should elaborate on any modifications made to the variable and why.

9) The misinterpretation of an EIS was clarified. It was incorrectly stated that a "programmatic" EIS would be prepared for FIMP when that is, in fact, not the case.

10) Target Years (0, 1, 50), set as they are now, are OK w/ Team for all calculations. But, it should be clearly stated in report WHY these years were selected and why the Team felt that no other years were needed. This was also highlighted w/ a discussion on the future (HEP) scope of services; it will cover future without project storm events (future change conditions). Accordingly, as the team agreed, because maintenance (management) is required and assumed under the future with project conditions years between 1 and 50 were not needed because they'll be assessed on a trajectory (weighted over time) to show ecological change rather than set with years that "events" are to occur. Similarly, under future change conditions the same types of assumptions will be applied. Rather than placing a storm (or other) event at a set (unknown) year the data will be applied to a trajectory (curve) and weighted over time.

11) The Team requested that text be added to the report to note that the target years and assumptions were selected/identified not because the Team did not feel changes would occur, but because the variables, modeling, and the Teams ability to predict habitat conditions, could not accurately capture the changes at discrete time periods.

12) The Team approved the assumptions for baseline conditions as presented in the HEP report, and agreed that the HEP data from the original 24 transect locations was suitable for extrapolation to other potential project and restoration areas on the barrier island as documented in the report.

13) The Team approved the assumptions for future no-action conditions as presented in the HEP report and in Appendix B, Table 4. No new assumptions or future conditions were added. However, future conditions calculations will be re-calculated such that the end condition at TY50 occurs gradually over the life of the project. Currently, future conditions are incorporated into the mode at TY1 and these same conditions are carried through the 50-year project life.

    In addition, the assumptions regarding the future conditions at the BCP locations will need to be reevaluated. The future conditions as currently calculated and presented in the HEP report reflect conditions expected following an overwash event rather than a complete breach (as they were intended). Thus the Team has been instructed to temporarily disregard this section (until

edited). The USACE will provide a more thorough description of the BCP component of the project and will work with NEA to document the assumptions and habitat conditions used in BCP analysis. Edited BCP sections and results will be included in the final version of the report.

14) The Team approved the assumptions for future with-action conditions (i.e., with restoration or project activities) as presented in the HEP report. The Team discussed whether conditions following restoration activities would in fact be carried through the entire 50-year life of the project and decided that it was reasonable to assume that the management and maintenance required for entire 50 year life of the project would be a component of the restoration/project otherwise the activity would likely not move forward. The USACE may not actually perform the management/maintenance activity, but it would support the agency or organization that would.

15) Inlet section will not be in next version of this report (but it will be in future versions and completed immediately following the 30 May deadline of this report). Work is ongoing between engineers, USACE and NEA, to develop the assumptions and anticipated future with project and future without project habitat conditions at inlet locations.

16) A matrix was created to further "assess" the 16 restoration options currently "on the table." The following will be included in the matrix: Land ownership, anthropogenic effects, threatened and endangered species, natural sustainability, maintenance/sponsor availability, suitability of storm damage reduction + restoration combination, and each of the 5 processes (separately). These matrix variables will be weighted as "na" (not applicable) or w/ a numerical rating of 0-5 w/ 0 being lowest and 5 being highest. NEA will further develop the matrix and will submit to the HEP Team within 2 weeks for their input.

17) The Team reviewed the 5 coastal processes to determine which processes would not be applicable (i.e., na) in the 16 restoration sites. The following was determined: on islands the "longshore transport" process is not applicable; on the Seatuck refuge and Islip Meadow sites only the "estuarine" and "bayside shoreline" processes apply. All processes are applicable to the Georgica Pond site.

    The matrix can be used to screen potential sites for further evaluation. The matrix is not needed in order to complete the project incremental cost analysis (to be conducted by the USACE).

18) Another disclaimer is needed in the text to explain our "trade-offs" section. In other words, we had said it was of more value (at a given site, under certain conditions, at a certain time) to have 1 habitat in existence vs. another. That doesn't mean that the habitat is "more important" or "better" than the other, but that it is more relevant/needed at the site at that time. In all decisions regarding this issue, the report should clearly illustrate and highlight the Teams' thought process and response for each.

19) NEA will be editing portions of the text and the "future no action" #'s are expected to change.

20) Steve S. (FWS) stated that he still has reservations about the outcome of the models. Steve is concerned that the models show that overwash areas score relatively low and that building a beach and dune increases habitat value. He is concerned that the USACE might use these results to justify beach renourishment projects throughout the area and to support the claim that such activities would result in no adverse impacts. Steve also expressed concern that because HEP models are driven primarily by size (i.e., acres), the results will tend to favor large dune

rebuilding efforts island-wide. These concerns will be articulated in FWS's formal response to the document.

21) Patty (NPS) seemed to exhibit similar concerns (as above, #18). Patty pointed out that "any model, which says that the habitat value for Old Inlet increases dramatically with the construction of a dune is fundamentally flawed." Shoreline stabilization activities alone generally do not show a dramatic increase in HSI scores. However, we were unable to pull this data up to show Patty this result because the "Old Inlet" site has since been removed from further model development. This issue clearly highlighted that NPS is uncomfortable w/ the results. NEA will provide a summary of the HSI results for the original HEP transects to the Team for evaluation.

22) Regarding points #19-20 above: both Steve (USFWS) and Patty (NPS) do recognize that the Team worked hard to identify appropriate variables and "optimal" habitat conditions within communities, that their input into the model was captured, and that the models were functioning as designed. The models do in fact have limitations in their application (as most models do) and the important point is to identify the assumptions, limitations, and ensure appropriate application of the models. At this point it is not possible, or feasible, to go back and change models to capture all possible scenarios.

VII. SCHEDULE

- May 3, 2006 – HEP Team to submit comments on draft HEP report (minus the BCP section) to NEA
- May 12, 2006 – NEA will forward the matrix, once completed, from input from the Team. Two weeks will be given as a response time for matrix input from the HEP Team. However, this matrix is needed in FUTURE section of the report/HEP analyses therefore it will not be rushed for inclusion in existing document.
- Mid-May – Steve Couch/Pamela Lynch/Stacie Grove will have a conference call to discuss BCP alternatives and assumptions.
- May 30, 2006 – final report will be released to FWS, NPS and COE.

Patty will receive 1 hard copy and the total # of CD's needed for distribution to NPS members (only) she is asking to review. Steve S. will receive 1 hard copy and the total # of CD's needed for distribution to FWS members (only) he is asking to review. Norb will receive 1 CD. Pam and Steve C. (COE) will each receive 1 hard copy and 1 CD (to make the necessary copies). WES will receive 1 copy of this document, at that time, for their official review and input as well (1 hard, 1 CD).

Habitat Evaluation Procedures (HEP)Analysis and Ecosystem Restoration Plan Selection Meeting Minutes
***August 16, 2007,* 9:00 am through 4:30 pm**
USFWS Long Island Field Office, #3 Old Barto Road, Long Island, New York

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In Attendance:

Pamela Lynch, Roselle Henn, and Steve Couch; US Army Corps of Engineers (USACE), NY District

Norb Psuty; Rutgers University

Patty Rafferty; National Park Service (NPS), Fire Island National Seashore

Steve Sinkevich; US Fish and Wildlife Service (USFWS), Long Island Field Office

Stacie Grove; Northern Ecological Associates (NEA)

I. Overview of Meeting Objectives and HEP/Project Schedule (Lynch, Henn)

The USACE provided an overview of activities since the last HEP meeting, presented a tentative schedule for next steps in the process, and discussed meeting goals and objectives which include evaluating and identifying the HEP team members (Team) preferred restoration alternatives and the preferred combinations of alternatives and sites (i.e., restoration plan).

The Team expressed concern that the New York Department of Environmental Conservation (NYDEC) has not been involved in the HEP process, particularly since they have been identified as the non-Federal sponsor for the project. The Team questioned whether NYDEC would agree to fund the restoration component of the project. Based on comments made by USACE staff at previous planning meetings, the Team developed concerns that none of the restoration alternatives evaluated would move forward unless they clearly provided a storm damage reduction (SDR) benefit (as well as restoration). The Team feels this is not consistent with the intent of the HEP process as originally presented to the Team and want to ensure that suitable alternatives that do not provide SDR are not eliminated from consideration.

Roselle Henn stated that, through future meetings (including the upcoming Interagency Reformulation Group (IRG) meeting), these restoration plans would be presented as part of the USACE plan. However, the USACE may recommend/present more than one plan and these may be termed either “Locally Preferred” and/or “Environmentally Preferred” depending on the outcome of agency coordination and impact analysis.

Finally, the Team questioned whether the USACE plans to use National Ecosystem Restoration (NER) benefits to offset project impacts. If so, Team members express opposition.

II. Summary of HEP Process and Results (Grove)

NEA provided an overview of the HEP process to date including site identification and evaluation, HEP model development, HEP data collection, Habitat Suitability Index (HSI)/Habitat Unit (HU)/Average Annualized Habitat Unit (AAHU) calculations. Numerous handouts were provided (attached).

The Team discussed how target years (0, 1, 5 and 50) were structured in the HEP analysis and whether site conditions would be maintained over the life of a project. NEA provided an overview of the application of target years (as detailed in the Final HEP Phase I Report). Target year 5 was added to the HEP analysis to introduce changes in the habitat over the life of the project. For example, full habitat value for replanting a shrub community is only realized after the community has had several years to year 5, and is not realized immediately after planting in year 1. Additional target years could be included in the model. However, the Team would need to quantify what those changes would be and when they would occur. It was determined at a previous HEP meeting that the addition of target year 5 would suffice and that not enough information was available for the Team to (with any confidence) add additional target years to the models. In addition, as previously agreed upon by the Team, it was assumed that once an area was restored that it would maintain the same HSI score over time because the sites would be managed appropriately. The Team now questioned whether this is appropriate for all sites and alternatives but agreed to move forward (and note it in text for the final HEP report).

The Team requested that all sites with T & E species be maintained to provide the optimal habitat value for those species for the life of the project, but other sites would be managed only as needed. The Team does not support human manipulation of an area in order to maintain it in a static state over time unless in the best interest of T & E species or supporting a desirable coastal process. More specifically, the Team does not support dune rebuilding to maintain SDR values at a site as a restoration measure.

The Team questioned whether HEP models were applied in the same manner when evaluating SDR and restoration? Grove noted that the models were applied similarly, as fully described in the Final Phase I HEP report.

The Team suggested that a ranking matrix (same matrix as used for restoration) should be completed to evaluate SDR, and recommended that the HEP Team conduct the SDR ranking matrix evaluation to ensure consistency in evaluation of restoration and project activities. The USACE responded that an evaluation similar to the NER Matrix will be conducted. It is anticipated that the Cooperating Agencies will participate in the same manner for SDR + Breach Control Procedures (BCP) alternatives as was conducted for the restoration alternatives. At this time the USACE does not know who will be tasked with doing the evaluation (i.e. may not be HEP Team), but the USACE will be coordinating with the Cooperating Agencies in the process.

The Team discussed general formatting and editorial changes for consistency between tables and several edits were noted.

In discussing the matrix results, it was determined that when completing the matrix some agencies did not use “na” and “u” correctly. That is, in some cases an “na” was used, when the “u” should have been. However, the Team determined that either response would be okay; particularly since neither answer was included in the evaluation the results will remain the same. NEA will edit matrix to correctly insert “na” and “u” appropriately and to edit footnote accordingly. This change will not affect matrix results as ”na’s” and “u’s” were not included in the calculations of the average rank for each variable (see updated Matrix in upcoming e-mail).

It was also determined that the USACE was the only agency to provide ranking scores for the “Ecological Gain per Cost” variable in the matrix. The Team did not respond to the variable because they did not feel they had adequate information to adequately assess and answer the question. Since only the USACE responded, the Team requested that this variable be removed from the evaluation and the results recalculated. NEA will remove the variable, recalculate the matrix scores, and provide results to the Team (see new Matrix in upcoming e-mail). The ranking scores will decrease slightly for all alternatives as a result of removing this variable, but the rank of each alternative will not be affected, thus the conclusions from the ranking matrix (i.e., which sites rank high, moderate, or low) will not change.

In general, the Team indicated that they would have preferred to have an opportunity to meet as a group to discuss ranking matrix results prior to the National Economic Development (NED)/NER analysis and incorporation of ranking results into the analysis. However, the Team agreed that the matrix results are one of many tools being used in the evaluation and that they collectively, or individually, can recommend that an alternative receive higher or lower consideration regardless of the matrix ranking it received. Therefore, the Team agreed to move forward in the evaluation and selection process using the existing matrix results (knowing edits would occur as discussed and provided herein).

III. Results of the Cost Effective (CE)/Incremental Cost Analysis (ICA) for Restoration Alternatives, and Integration of Matrix (Couch)

In summary, the USACE provided an overview of the NED/NER cost analysis conducted on the restoration sites (see handouts for specifics). Originally, sites were evaluated to identify the best-buy combinations of alternatives at a given site (best combinations within a given site). The analysis was later modified to evaluate all possible combinations of alternative at all sites to identify best-buy plans (i.e., best combinations of alternatives and sites across entire project area).

The Team discussed the method/rationale that was used to eliminate nine sites from the NED/NER analysis process. The USACE noted that sites were removed based on consensus that the lack of landowner support for a given restoration alternative would significantly hinder the possibility of moving forward with a proposed alternative. This was necessary to focus on alternatives most likely to be supported and to reduce the number of alternatives being evaluated to a more manageable number. The decision to remove a site was based on several considerations: indications in the USFWS Planning Aid Letter that restoration at a site was generally not well-supported; low scores for the landowner support variable in the ranking matrix; general input from the Team during previous HEP Team meetings. The USACE sent

several emails to the Team to confirm that removal of the nine sites was supported and Team members responded with approval to remove sites. However, having had more opportunity to assess the matrix, the Team now questions the rationale for removal of sites and believes some sites should be added back into the NED/NER evaluation process. To do so will require re-analysis of NED/NER. Accordingly, those specific sites are now listed on the "orange" restoration list (see attachment and associated explanation).

The Team expressed concern regarding the prioritization of sites based on ICA results and feel that some desirable sites may not have made it to the list of highest priority sites. The USACE/NEA noted that the point of this meeting is to collectively evaluate the results to identify any sites that should be made higher or lower priority. No sites will be removed or made lower priority unless the Team agrees. Team members can, and should, at any time offer rationale to move a site higher or lower in the list of priority sites.

IV. Discussion of Results and Identification of Preferred Plan(s) (Team)

The Team assessed all alternatives identified as best-buys by ICA, the matrix scores were used to assist the Team in evaluating if a best-buy alternative generally ranked high, moderate, or low in the matrix (regardless of ICA score). Through this process the Team discussed each alternative individually and made the decision whether to keep the same priority (i.e., high, moderate, low) or to reassign it. It was noted that for some sites that the alternative was supported only when combined with other alternatives at the same site. For example, at Kismet, alternative 2 would only be undertaken if alternative 1 were also completed at the site. The team developed a new "Prioritization List" that re-categorized the restoration alternatives as follows:

Green – High Priority
Yellow – Moderate Priority
Red – Low Priority (may not move forward)
Orange – alternative could move forward with some modifications to the design, or additional information is needed to determine status (see landowner issue as addressed in previous text herein).

Special Notes:

Use of hard structures is not supported by the NPS, but were somewhat supported by other Team members. Thus, alternatives using hard structures (e.g., shoreline stabilization of islands) were made less of a priority (i.e., yellow)

V. Summary and Conclusions (Lynch)

Pamela Lynch stated that, upon completion of this meeting (and associated tasks herein), the HEP Team has completed its original 5 Tasks (see Grove summary for review). Thus, the remaining (and terminal) tasks for the HEP process will be the production of a final HEP Report (to replace the existing, Phase 1, Report). This report will include all Phase 1 components + add SDR HEP assessments and final "Restoration" list (in order of recommendation) and all associated decision-making process(es).

This report will be included in the future planning and management documents (including the Fire Island to Montauk Point (FIMP) Reformulation Environmental Impact Statement (EIS).
Prior to completion of the report, the current decisions and assessment measures (i.e. matrix, "Prioritization List," etc.) will be presented @ an upcoming IRG meeting. The intent of this meeting will be to provide an overview of our process and to explain/highlight our decision-making process for full Agency (and Stakeholder, etc.) support. It will also be used to help solve/discuss sections/decisions that we (as a HEP Team) could not reach consensus on.

IRG meeting date: October 10th and 11th, 2007.

VI. Action Items

NPS – Description of how alternatives for Reagan and Sunken Forest might be modified to make them more acceptable to the HEP and thus, moved from orange status to green or yellow. Otherwise the alternative would be moved to red and not moved forward for consideration as an alternative.

USACE – Gather additional information to determine if remaining alternatives in orange status can be moved to green, yellow, or red (completed – Planning Aid Letter requested for Team through Steve Sinkevich; all "landowner" issue sites to remain on "orange" list until advised otherwise).

ALL – Review new matrix (under separate e-mail) and "Prioritization List" (attached) within 2 weeks of receipt of these minutes; provide comments and/or "acceptance" of minutes.

APPENDIX E

HABITAT EVALUATION PROCEDURES MODEL DOCUMENTATION AND HABITAT SUITABILITY INDEX CURVES/HISTOGRAMS

CONTENTS:

Section 1 Mathematical Explanations of HSI Model Equations..11 Pages
Section 2 Suitability Index Curves.....16 Pages

Habitat-based index models address the qualitative element of an assessment as outlined in the HEP procedures (USFWS 1980). Models are associated with specific areas that they are to be applied. The numbers of acres of the habitat areas provide the quantitative aspects of the assessment and ultimately, lead to area-based outputs displayed in terms of Habitat Units (HU).

A HEP workshop was convened by the FIMP HEP Team in October of 2004 to generate a list of key components or ecosystem characteristics of the unique FIMP setting. The initial product of the workshop was a series of community models, a list of "suggested" ecosystem components, and a list of variables (with suggested sampling protocols). When these components were combined in mathematical fashion, they could be used to capture the magnitude to which the community performed functions – community suitability was dictated by attributes of the ecosystems and the surrounding landscape and interaction between the two components. Six community models were developed and applied in the FIMP storm damage reduction and ecosystem restoration study as listed below.

MODEL CODE	MODEL NAME
OCEANBEACH	Ocean Nearshore and Intertidal Zone
VEGBEACH	Ocean Upper Vegetated Beach Zone
DUNEGRASS	Dunes, Interdunes and Swales Dominated by Sand or Herbs
UPLANDS	Dunes, Interdunes and Swales Dominated by Shrub, Forest or Development
BAYBEACH	Bay Intertidal and Bay Upper Shore Zone
BAYSUBSAV	Bay Subtidal and Submergent Aquatic Vegetation

The accuracy and utility of the proposed models were "tested" (e.g., validated and verified) with specific field and planning exercises on the District's ongoing FIMP storm damage reduction and ecosystem restoration feasibility study. The application led ERDC to modify the models to accommodate broader planning specifications.

Ocean Near-shore and Inter-tidal Community Model

This section defines the habitats associated with the ocean near-shore and inter-tidal community and the variables necessary to populate model formulations. This community includes the near-shore of the ocean and the beach inter-tidal zone extending from 30 ft (10 m) depth in the ocean landward to the average daily high tide line (i.e., wrack line). The community is characterized by un-vegetated areas that are dominated by sand.

Applicable Cover Type Habitats

To fully quantify the habitat conditions, the HEP process requires the study area be divided into manageable sections and quantified in terms of acres. This process, referred to as "cover typing," allows the user to define the differences between vegetative covers (e.g., prairie, northern flatwood forest, shrublands), hydrology and soils characteristics, and clearly delineate these distinctions on a map. The final classification system, based primarily upon dominant vegetation cover, captures "natural" settings and common land-use practices in a specific and orderly fashion that accommodates the USACE Plan Formulation Process.

In the Fire Island to Montauk Point (FIMP) study, an Ocean near-shore and inter-tidal cover type (CT) was identified and mapped across the study area and referred to as: OCEANBEACH. Cover types identified as "NEW" refer to newly developed areas proposed with project designs. These cover types are assessed with this model.

Model Components and Relationships

The model components are detailed below, namely: Components, Model Formulas and Associated Variables, and Reference Standards. The final version of the HSI models contains two discrete functional components (referred to in HEP terms as Life Requisite Suitability Index (LRSI)): geomorphology and human influence. It is important to note that the components described here were selected on the basis of their representation of ongoing critical ecosystem processes within the FIMP systems.

General form of the model component. Six measured variables comprise the Geomorphology component to qualify the geomorphic processes of the ocean beach.

(1) BARWILDLF – Impact of barriers to wildlife passage

(2) SHOREMOD – Presence of modified shoreline

(3) SUBSTRATE – Suitability of substrate for a given area

(4) WIDTH – Width of cover type

(5) HUMFACTORS – Presence of human disturbance factors

(6) HUMMAGNIT – Magnitude of impact from human disturbance

The mathematical relationship is interpreted as the minimum of the SUBSTRATE or the average of the Geomorphic process (WIDTH and SHOREMOD) and Human Influence factors (HUMFACTORS, HUMMAGNIT, BARWILDLF). Both the Geomorphic and the Human factors are required and optimal to achieve a 1.0 score. If SUBSTRATE is not the limiting factor, shortcomings of one variable can be offset (compensated for) by any other. One variable may be entirely absent, but some suitability will still be achieved with regards to the remaining variables. An arithmetic

mean is taken for the components to determine the Suitability Index (SI) for the OCEANBEACH community.

HSI = minimum of SUBSTRATE or (WIDTH * ((SHOREMOD + (((HUMFACTORS * HUMMAGNIT) + BARWILDLF)/2))/2))

Ocean Upper Vegetated Beach Community Model

This section defines the habitats associated with the ocean upper vegetated beach community and the variables necessary to populate model formulations. This community includes the upper beach zone extending from the average daily high tide line (i.e., wrack line) landward to the toe of the primary (i.e., fore) dune. The community comprises bare or sparsely vegetated areas dominated by sand. Vegetation when present, is dominated by beachgrass (*Ammophila breviguluta*), but also includes beach pea (*Lathyrus maritimus*), seaside goldenrod (*Solidago sempervirens*), beach heather (*Hudsonia tomentosa*), running dune grass (*Panicum amarum*), and dune bean (*Strophyostyles helvola*). Scattered species from the open sandy dune areas can also be found on the primary dunes, but only in low densities.

Applicable Cover Type Habitats

In the Fire Island to Montauk Point (FIMP) study, an ocean upper vegetated beach cover type (CT) was identified and mapped across the study area and referred to as: VEGBEACH. Cover types identified as "NEW" refer to newly developed areas proposed with project designs. These cover types are assessed with this model.

Model Components and Relationships

The model components are detailed below, namely: Components, Model Formulas and Associated Variables, and Reference Standards. The final version of the HSI models contains three functional components (referred to in HEP terms as Life Requisite Suitability Index (LRSI)): biota, geomorphology and human influence. It is important to note that the components described here were selected on the basis of their representation of ongoing critical ecosystem processes within the FIMP systems.

General form of the model component. Six measured variables comprise the Geomorphology component to qualify the geomorphic processes of the ocean beach.

(1) BARWILDLF – Impact of barriers to wildlife passage

(2) CANVEGCOV – Percent cover of vegetation

(3) SHOREMOD – Presence of modified shoreline

(4) SLOPE – Average slope of dune and shoreline

(5) SUBSTRATE – Suitability of substrate for a given area

(6) WIDTH – Width of cover type

(7) HUMFACTORS – Presence of human disturbance factors

(8) HUMMAGNIT – Magnitude of impact from human disturbance

The mathematical relationship is interpreted as the minimum of the SUBSTRATE or the average of the three components: Biota (CANVEGCOV), Geomorphic process (WIDTH, SLOPE and SHOREMOD) and Human Influence factors (HUMFACTORS, HUMMAGNIT, BARWILDLF). All three components are required and optimal to achieve a 1.0 score. If SUBSTRATE is not the limiting factor, shortcomings of one variable can be offset (compensated for) by any other. One variable may be entirely absent, but some suitability will still be achieved with regards to the remaining variables. An arithmetic mean is taken for the components to determine the Suitability Index (SI) for the VEGBEACH community.

HSI = Minimum of SUBSTRATE or (((((WIDTH * SLOPE)^(1/2)) * CANVEGCOV) + SHOREMOD + (((HUMFACTORS * HUMMAGNIT) + BARWILDLF)/2))/3)

Dunes, Inter-dunes and Swales Dominated by Sand or Herbaceous Vegetation Community Model

This section defines the habitats associated with the sand/herbaceous dunes, inter-dunes and swales community and the variables necessary to populate model formulations. This community includes the face of the primary dune (i.e., foredune), dunes, inter-dunes, and swales that are dominated by sand or herbaceous cover. In general, this community is found in areas extending from the toe of the primary dune landward to the bayside storm high water mark. Beach grass is typically the dominant species, but the community often includes a significant component of vine species. Shrubs, when present, are typically stunted and cover less than 20% of the community. The area is well interspersed throughout the island from ocean to bay.

Applicable Cover Type Habitats

In the Fire Island to Montauk Point (FIMP) study, a sand/herbaceous dune, inter-dune and swales cover type (CT) was identified and mapped across the study area and referred to as: DUNEGRASS. These dunes are dominated by sand and/or herbaceous vegetation. Cover types identified as "NEW" refer to newly developed areas proposed with project designs. These cover types are assessed with this model.

Model Components and Relationships

The model components are detailed below, namely Components, Model Formulas and Associated Variables, and Reference Standards. The final version of the HSI models contains three functional components (referred to in HEP terms as Life Requisite Suitability Index (LRSI)): biota, geomorphology and human influence. It is important to note that the components described here were selected on the basis of their representation of ongoing critical ecosystem processes within the FIMP systems.

General form of the model component. Six measured variables comprise the Geomorphology component to qualify the geomorphic processes of the ocean beach.

(1) BARWILDLF – Impact of barriers to wildlife passage

(2) CANVEGCOV – Percent cover of vegetation

(3) INVASIVES – Presence of non-desirable, invasive, and/or exotic species

(4) SLOPE – Average slope of dune and shoreline

(5) WIDTH – Width of cover type

(6) HUMFACTORS – Presence of human disturbance factors

(7) HUMMAGNIT – Magnitude of impact from human disturbance

The mathematical relationship is interpreted as the average of the three components: Biota (CANVEGCOV and INVASIVES), Geomorphic process (WIDTH and SLOPE) and Human Influence factors (HUMFACTORS, HUMMAGNIT, BARWILDLF). All three components are required and optimal to achieve a 1.0 score. Shortcomings of one variable can be offset (compensated for) by any other. One variable may be entirely absent, but some suitability will still be achieved with regards to the remaining variables. An arithmetic mean is taken for the components to determine the Suitability Index (SI) for the DUNEGRASS community.

HSI = (((((WIDTH * SLOPE)^(1/2)) * CANVEGCOV) + INVASIVES + (((HUMFACTORS * HUMMAGNIT) + BARWILDLF)/2))/3)

Dunes, Inter-dunes, and Swales Dominated by Shrub, Forest, or Development Community Model

This section defines the habitats associated with the woody/developed dunes, inter-dunes and swales community and the variables necessary to populate model formulations. This community occurs behind the primary dunes and includes shrub-dominated areas of the secondary dunes and stunted maritime forest that occur behind secondary dunes. Generally, this community is found in areas extending from the crest of the primary dune landward to the bayside storm high water mark. Vegetation is characterized by >20% cover of non-wetland shrubs or trees. Herbaceous vegetation and vines are also common, but do not dominate.

Applicable Cover Type Habitats

In the Fire Island to Montauk Point (FIMP) study, a woody/developed dune, inter-dune and swales cover type (CT) was identified and mapped across the study area and referred to as: UPLAND. These dunes are dominated by shrubs, forest and/or developed areas. Cover types identified as “NEW” refer to newly developed areas proposed with project designs. These cover types are assessed with this model.

Model Components and Relationships

The model components are detailed below, namely Components, Model Formulas and Associated Variables, and Reference Standards. The final version of the HSI models contains three functional components (referred to in HEP terms as Life Requisite Suitability Index (LRSI)): biota, geomorphology and human influence. It is important to note that the components described here were selected on the basis of their representation of ongoing critical ecosystem processes within the FIMP systems.

General form of the model component. Six measured variables comprise the Geomorphology component to qualify the geomorphic processes of the ocean beach.

(1) BARWILDLF – Impact of barriers to wildlife passage

(2) CANTRSHRUB – Percent cover of trees and shrubs

(3) INVASIVES – Presence of non-desirable, invasive, and/or exotic species

(4) HUMFACTORS – Presence of human disturbance factors

(5) HUMMAGNIT – Magnitude of impact from human disturbance

The mathematical relationship is interpreted as the average of the two components: Biota (CANTRSHRUB and INVASIVES), and Human Influence factors (HUMFACTORS, HUMMAGNIT, BARWILDLF). Both components are required and optimal to achieve a 1.0 score. Shortcomings of one variable can be offset (compensated for) by any other. One variable may be entirely absent, but some suitability will still be achieved with regards to the remaining variables. An arithmetic mean is taken to determine the Suitability Index (SI) for the UPLAND community.

HSI = (INVASIVES + CANTRSHRUB + (((HUMFACTORS * HUMMAGNIT) + BARWILDLF)/2))/3

Bay Inter-tidal and Bay Upper Shore Community Model

This section defines the habitats associated with the bay inter-tidal and bay upper shore community and the variables necessary to populate model formulations. This community includes bay inter-tidal areas and the bay upper shore zone and extends from the bay lower-low water (LLW) line landward to the point where the upland or dunegrass (i.e., non-wetland) community is encountered. This community may be dominated by sand, mud, or vegetated with wetland herbaceous and/or wetland shrub communities (i.e., salt marsh, *Phragmites, Baccharis, Vaccinium*) and includes wetland and beach areas that are hydrologically connected to the bay and are not permanently inundated. These wetlands can be very divers in terms of species composition and dependent on hydrologic regime.

Applicable Cover Type Habitats

In the Fire Island to Montauk Point (FIMP) study, a bay inter-tidal and bay upper shore cover type (CT) was identified and mapped across the study area and referred to as: BAYBEACH. These dunes are dominated by sand and/or herbaceous vegetation. Cover types identified as "NEW" refer to newly developed areas proposed with project designs. These cover types are assessed with this model.

Model Components and Relationships

The model components are detailed below, namely Components, Model Formulas and Associated Variables, and Reference Standards. The final version of the HSI models contains three functional components (referred to in HEP terms as Life Requisite Suitability Index (LRSI)): biota, geomorphology and human influence. It is important to note that the components described here were selected on the basis of their representation of ongoing critical ecosystem processes within the FIMP systems.

General form of the model component. Six measured variables comprise the Geomorphology component to qualify the geomorphic processes of the ocean beach.

(1) BARWILDLF – Impact of barriers to wildlife passage

(2) EROSION – Presence of erosion

(3) INVASIVES – Presence of non-desirable, invasive, and/or exotic species

(4) RICHSPP – Species richness of desirable plant and animal species

(5) SHOREMOD – Presence of modified shoreline

(6) SUBSTRATE – Availability of appropriate substrate

(7) HUMFACTORS – Presence of human disturbance factors

(8) HUMMAGNIT – Magnitude of impact from human disturbance

Mathematical explanations of NY-FIMP model formulas

The mathematical relationship is interpreted as the minimum of the SUBSTRATE or the average of the three components: Biota (RICHSPP and INVASIVES), Geomorphic process (SHOREMOD and EROSION) and Human Influence factors (HUMFACTORS, HUMMAGNIT, BARWILDLF). All three components are required and optimal to achieve a 1.0 score. If SUBSTRATE is not the limiting factor, shortcomings of one variable can be offset (compensated for) by any other. One variable may be entirely absent, but some suitability will still be achieved with regards to the remaining variables. An arithmetic mean is taken for the components to determine the Suitability Index (SI) for the BAYBEACH community.

HSI = Minimum of SUBSTRATE or ((((RICHSPP * INVASIVES)^(1/2)) + SHOREMOD + EROSION + (((HUMFACTORS * HUMMAGNIT) + BARWILDLF)/2))/4)

Bay Sub-tidal and Submergent Aquatic Vegetation Community Model

This section defines the habitats associated with the bay sub-tidal and submergent Aquatic vegetation community and the variables necessary to populate model formulations. This community includes permanently inundated areas from the bay LLW line bayward to 500 ft from the shoreline and includes permanently inundated impounded areas (i.e., ponds). The 500 ft distance is arbitrary and was selected to facilitate HEP analysis of the community, which, could extend for several thousand feet in some areas of the study area. This community is typically not vegetated and is dominated by bare sand substrate. However, submergent aquatic vegetation (SAV) beds are found in some areas.

Applicable Cover Type Habitats

In the Fire Island to Montauk Point (FIMP) study, a bay sub-tidal and submergent aquatic vegetation cover type (CT) was identified and mapped across the study area and referred to as: BAYSUBSAV. These dunes are dominated by sand and/or herbaceous vegetation. Cover types identified as "NEW" refer to newly developed areas proposed with project designs. These cover types are assessed with this model.

Model Components and Relationships

The model components are detailed below, namely Components, Model Formulas and Associated Variables, and Reference Standards. The final version of the HSI models contains three functional components (referred to in HEP terms as Life Requisite Suitability Index (LRSI)): biota, geomorphology and human influence. It is important to note that the components described here were selected on the basis of their representation of ongoing critical ecosystem processes within the FIMP systems.

General form of the model component. Six measured variables comprise the Geomorphology component to qualify the geomorphic processes of the ocean beach.

(1) BARWILDLF – Impact of barriers to wildlife passage

(2) CANSAVCOV – Percent cover of submergent aquatic vegetation

(3) INVASIVES – Presence of non-desirable, invasive, and/or exotic species

(4) RICHSPP – Species richness of desirable plant and animal species

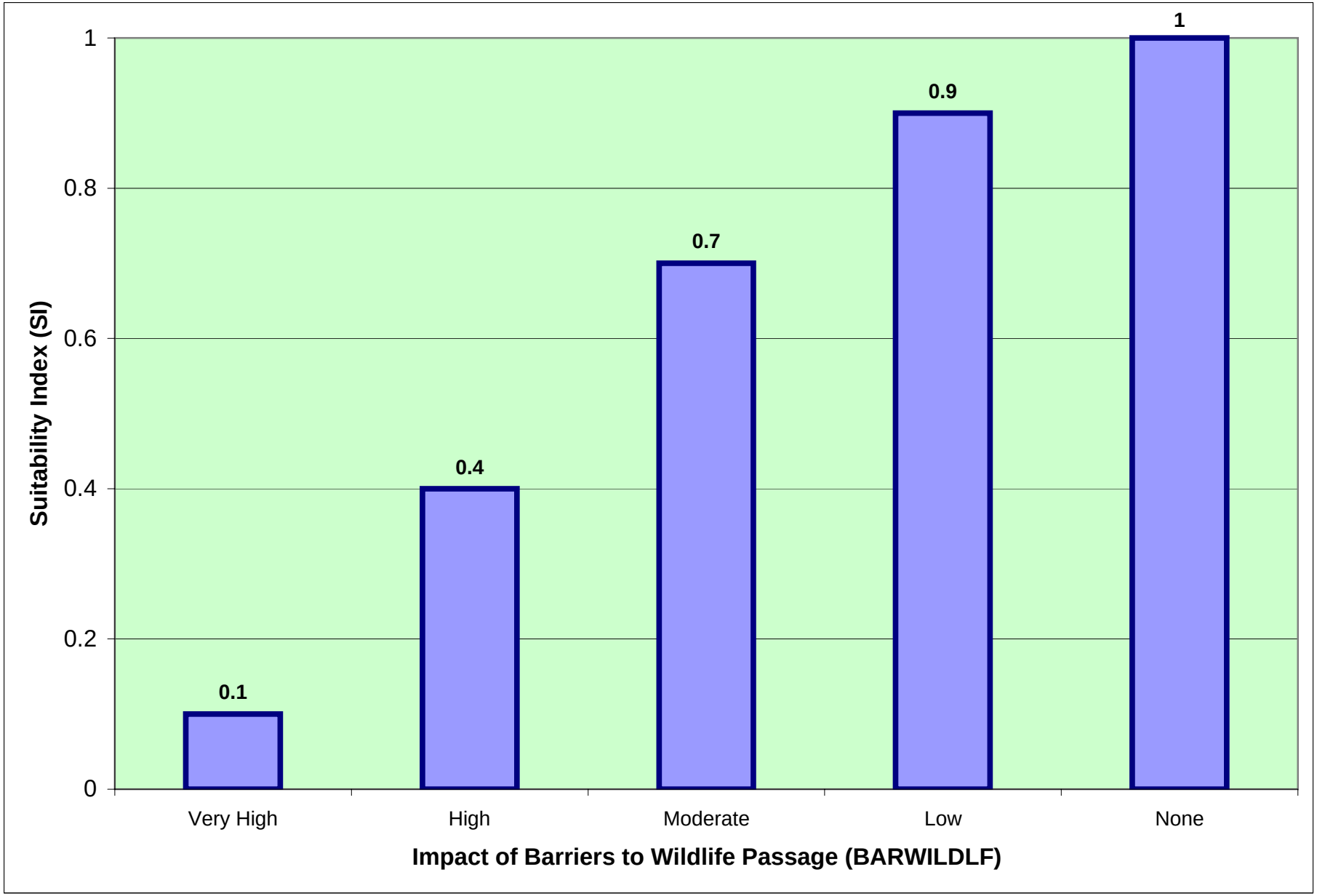
(5) SUBSTRATE – Availability of appropriate substrate

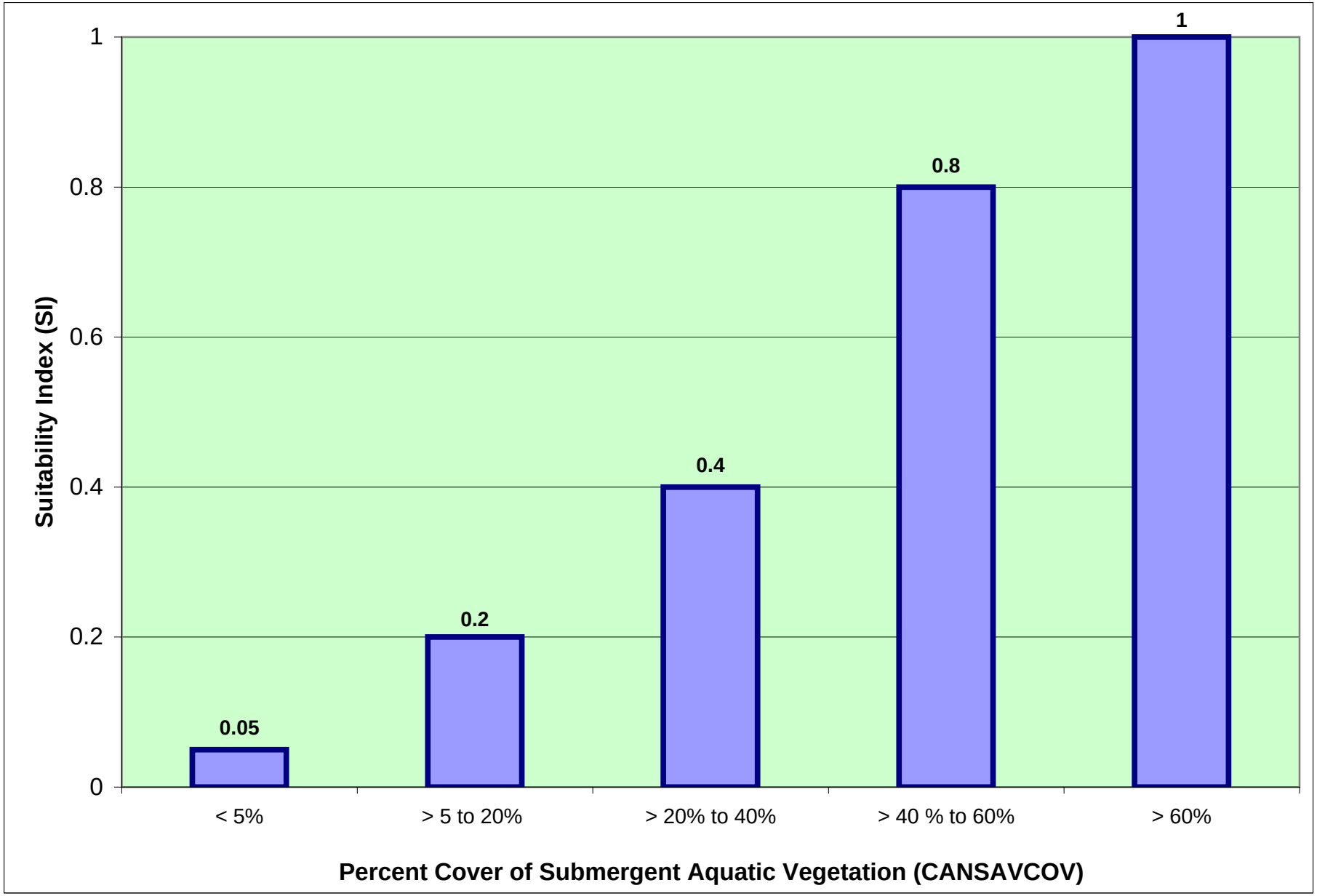
(6) HUMFACTORS – Presence of human disturbance factors

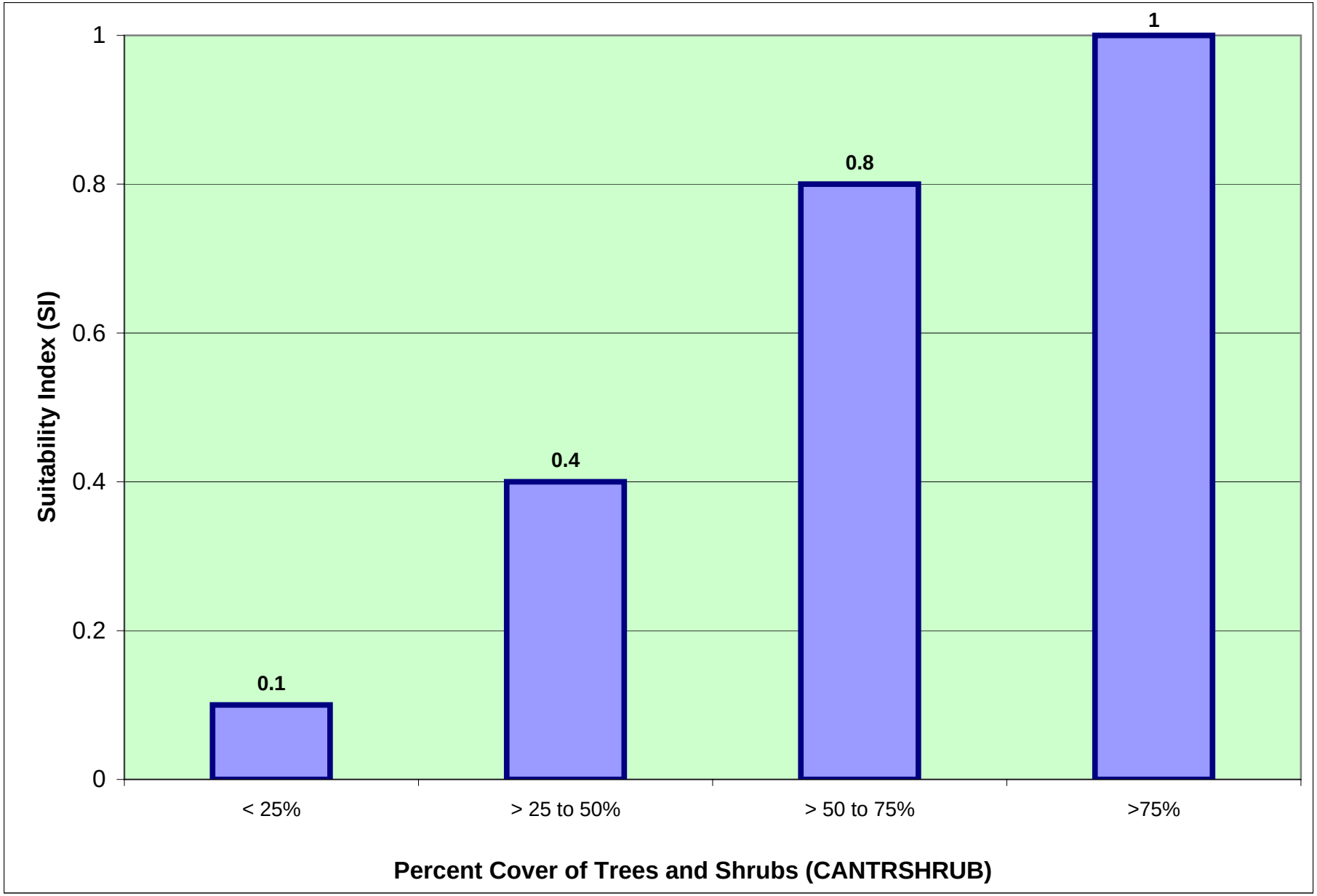
(7) HUMMAGNIT – Magnitude of impact from human disturbance

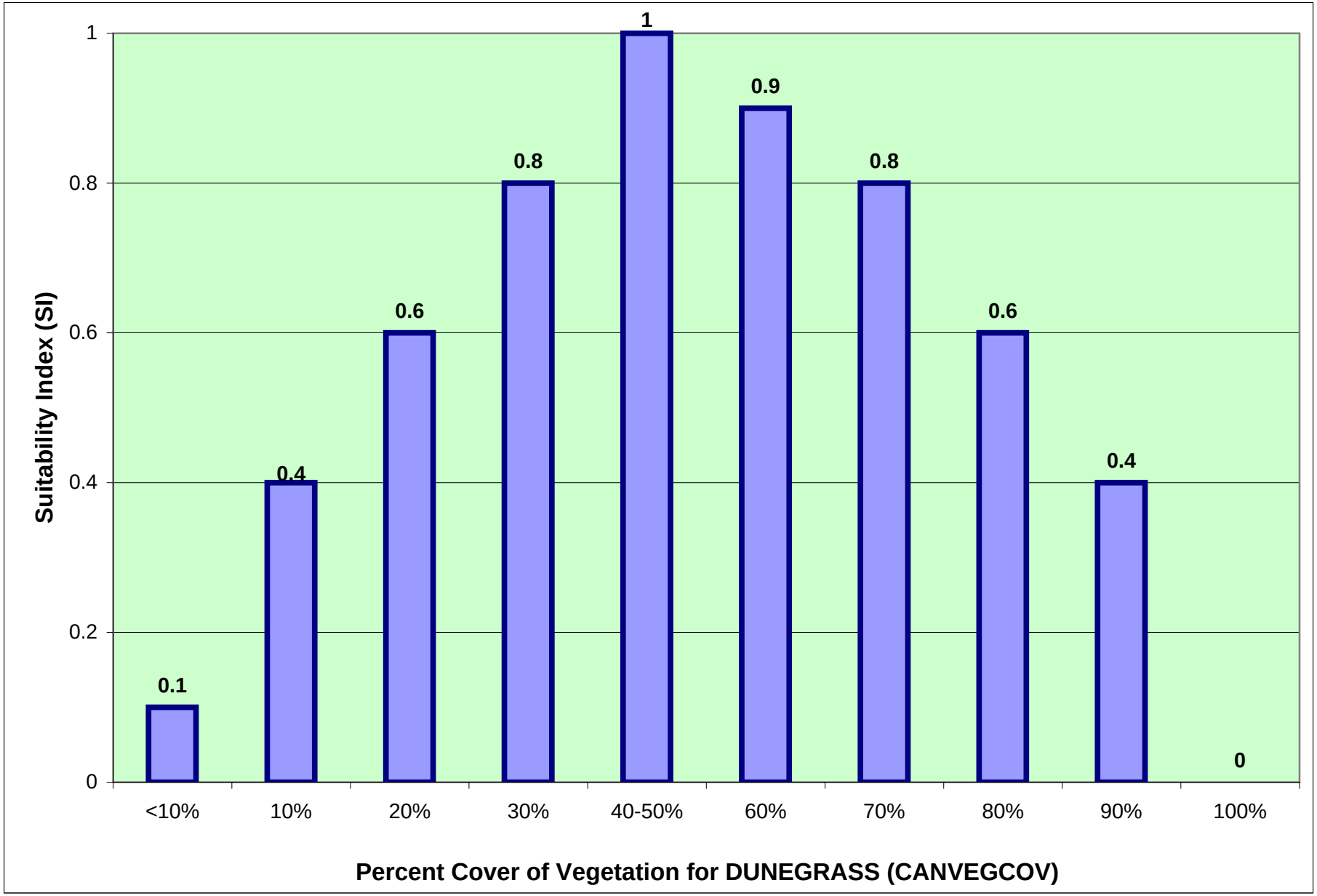
The mathematical relationship is interpreted as the minimum of the SUBSTRATE or the average of the two components: Biota (RICHSPP, INVASIVES, and CANSVACOV) and Human Influence factors (HUMFACTORS, HUMMAGNIT, BARWILDLF). Both components are required and optimal to achieve a 1.0 score. If SUBSTRATE is not the limiting factor, shortcomings of one variable can be offset (compensated for) by any other. One variable may be entirely absent, but some suitability will still be achieved with regards to the remaining variables. An arithmetic mean is taken for the components to determine the Suitability Index (SI) for the BAYSUBSAV community.

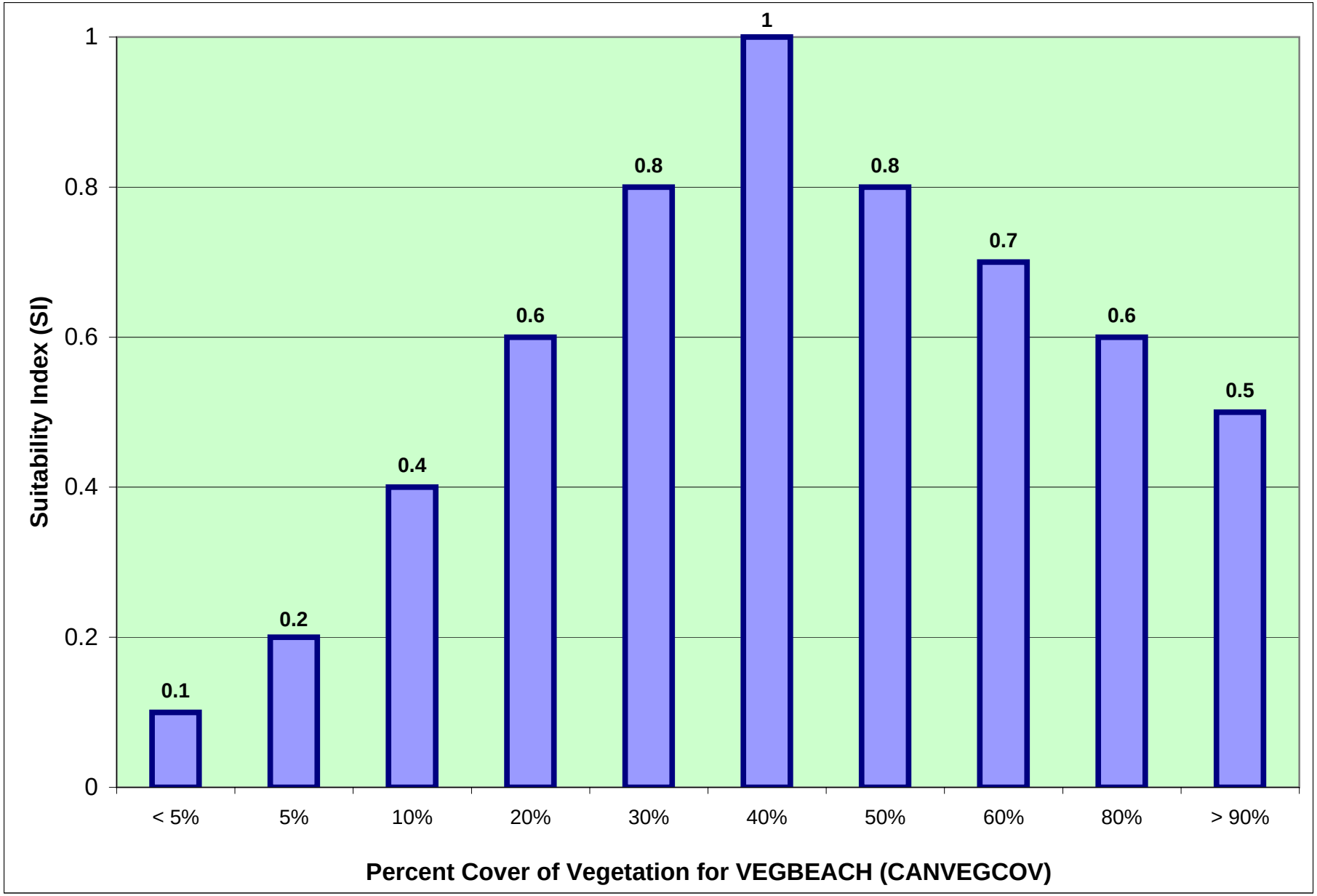
HSI = Minimum of SUBSTRATE or ((((RICHSPP * INVASIVES)^(1/2)) + CANSAVCOV + (HUMFACTORS*HUMMAGNIT))/3)

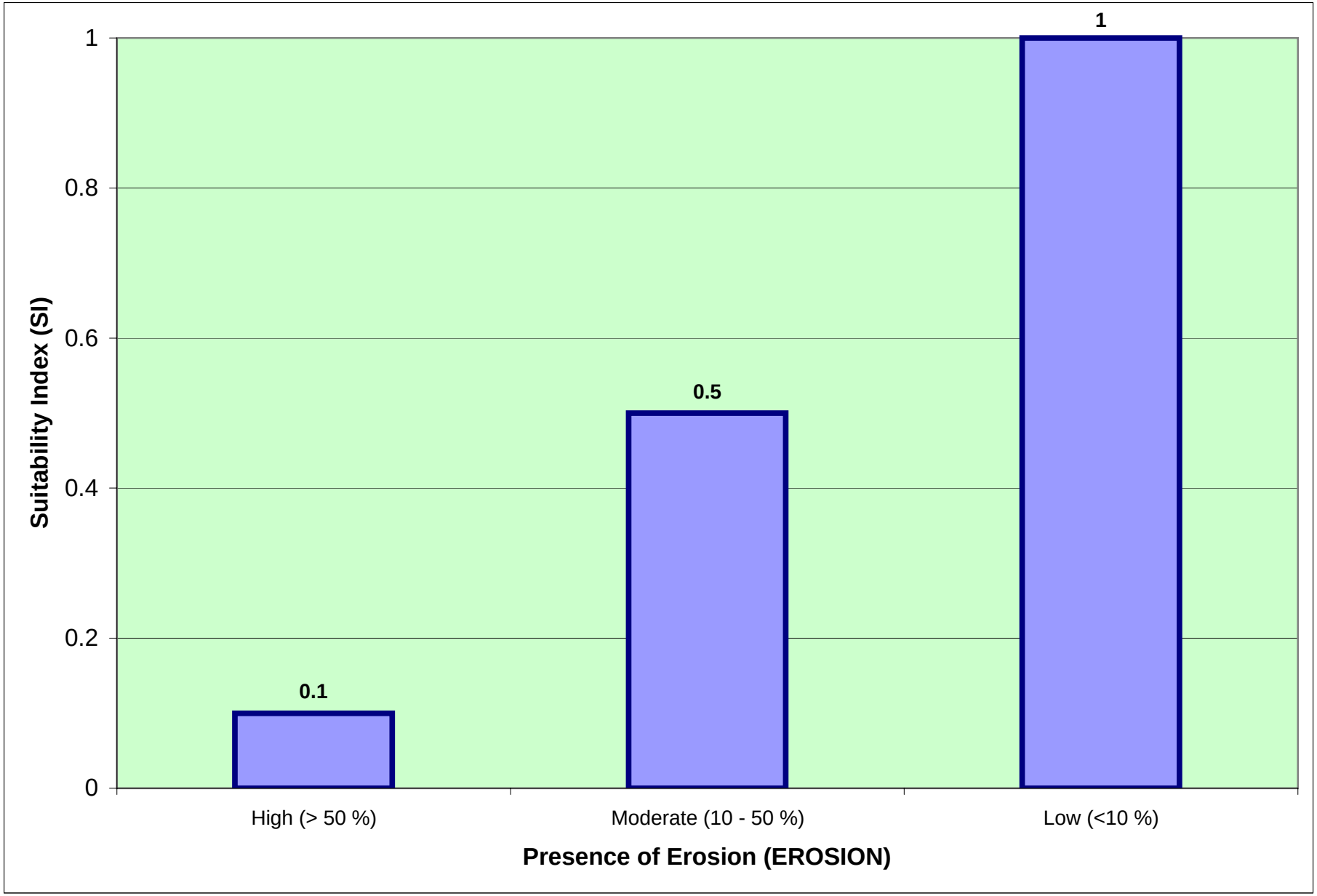

Suitability Index (SI)
1
0.8
0.6
0.4
0.2
0
0.1
0.4
0.7
0.9
1
Very High
High
Moderate
Low
None
Impact of Barriers to Wildlife Passage (BARWILDLF)

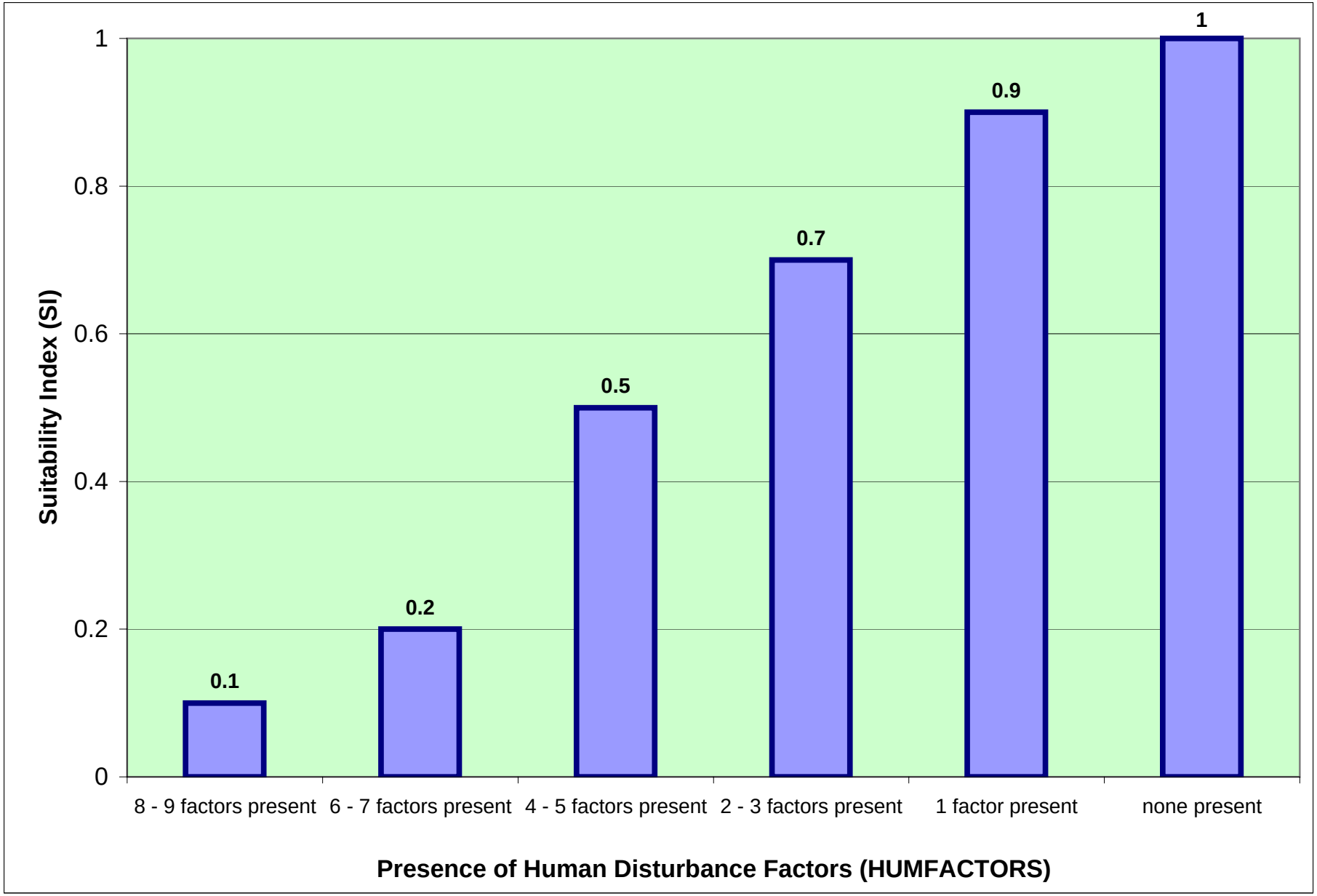

1
0.8
0.6
0.4
0.2
0
Suitability Index (SI)
0.05
0.2
0.4
0.8
1
< 5%
> 5 to 20%
> 20% to 40%
> 40 % to 60%
> 60%
Percent Cover of Submergent Aquatic Vegetation (CANSAVCOV)

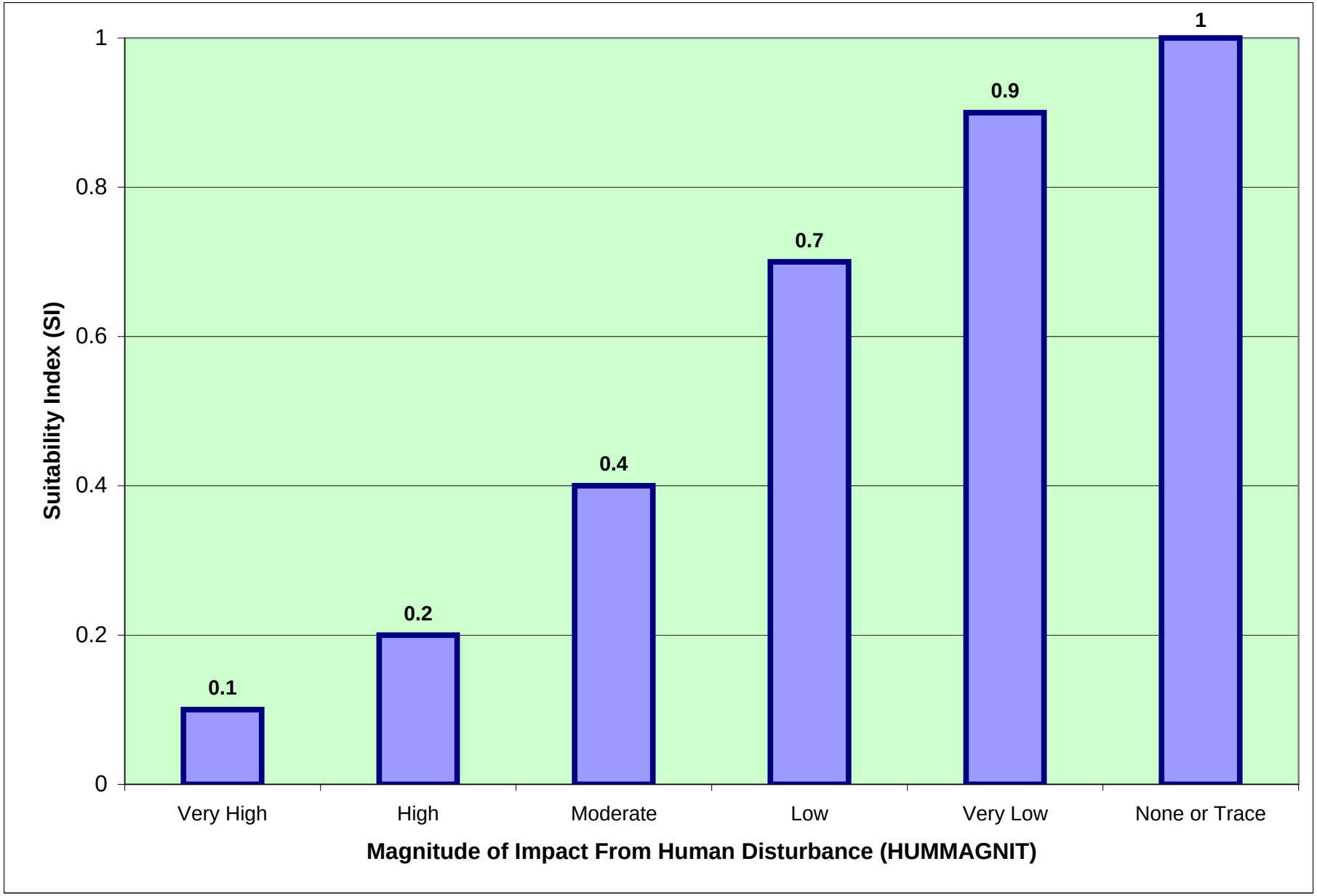

1
0.8
0.6
0.4
0.2
0
Suitability Index (SI)
0.1
0.4
0.8
1
< 25%
> 25 to 50%
> 50 to 75%
>75%
Percent Cover of Trees and Shrubs (CANTRSHRUB)

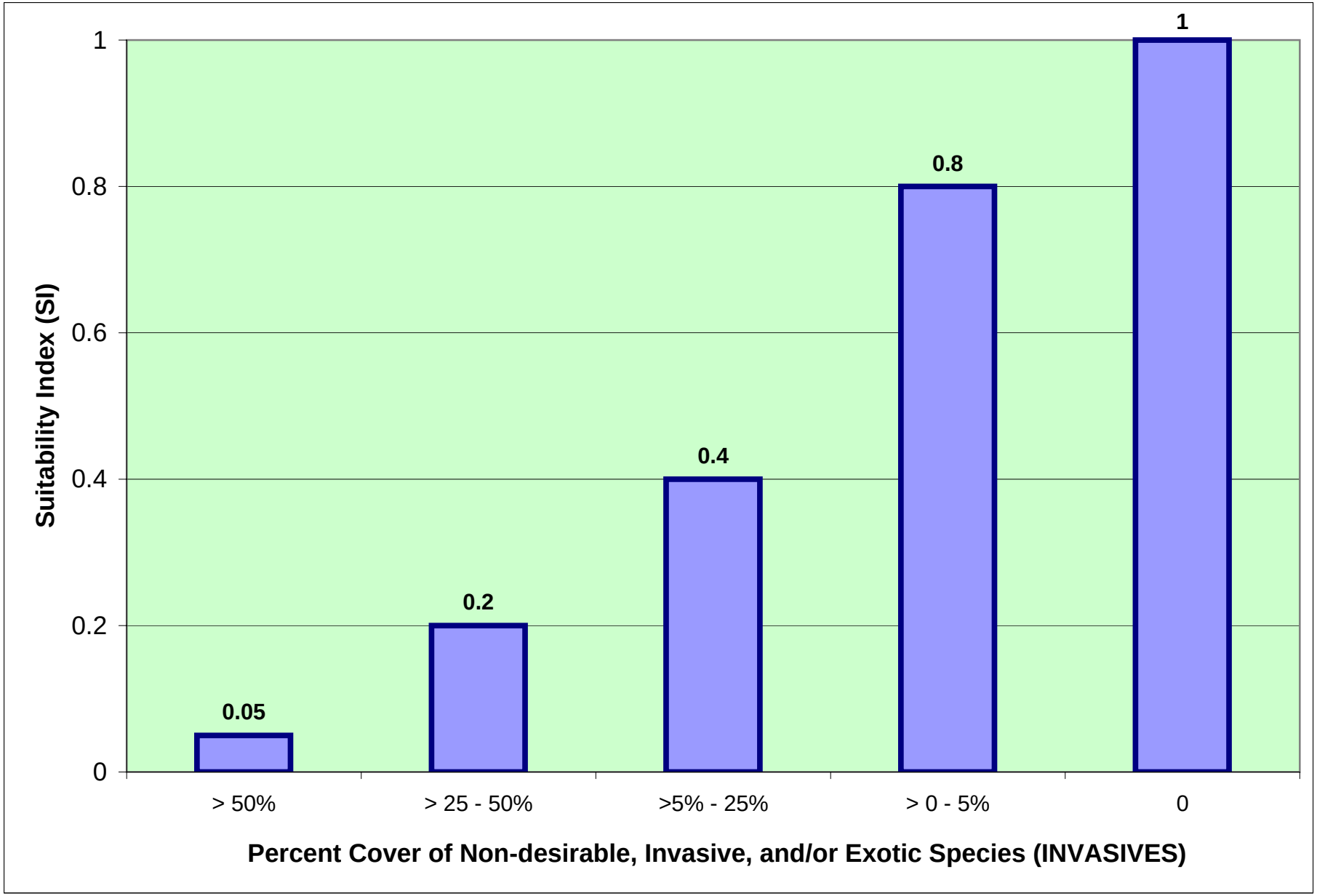

Suitability Index (SI)
1
0.8
0.6
0.4
0.2
0
0.1
0.4
0.6
0.8
1
0.9
0.8
0.6
0.4
0
<10%
10%
20%
30%
40-50%
60%
70%
80%
90%
100%
Percent Cover of Vegetation for DUNEGRASS (CANVEGCOV)

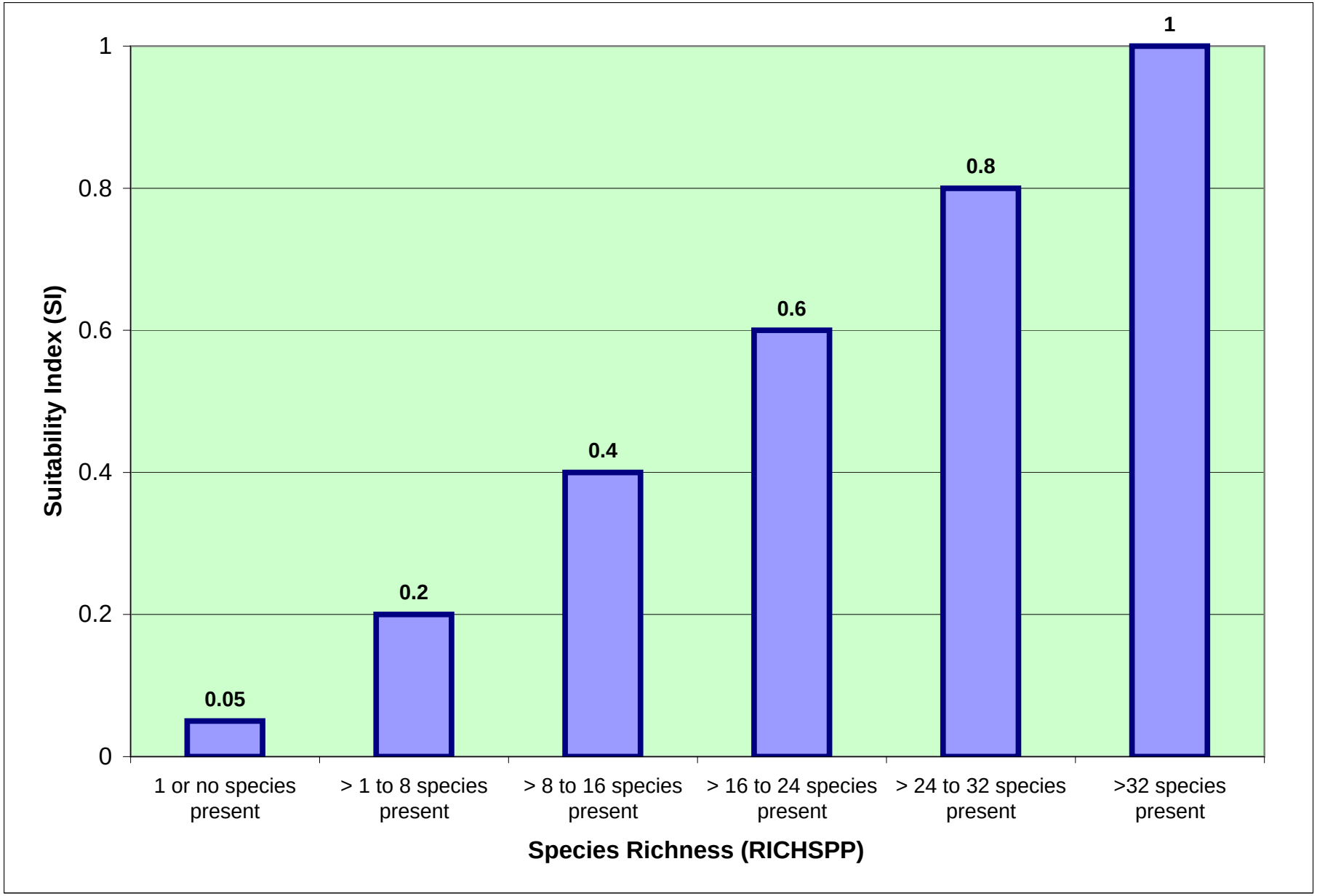

Suitability Index (SI)
1
0.8
0.6
0.4
0.2
0
0.1
0.2
0.4
0.6
0.8
1
0.8
0.7
0.6
0.5
< 5%
5%
10%
20%
30%
40%
50%
60%
80%
> 90%
Percent Cover of Vegetation for VEGBEACH (CANVEGCOV)

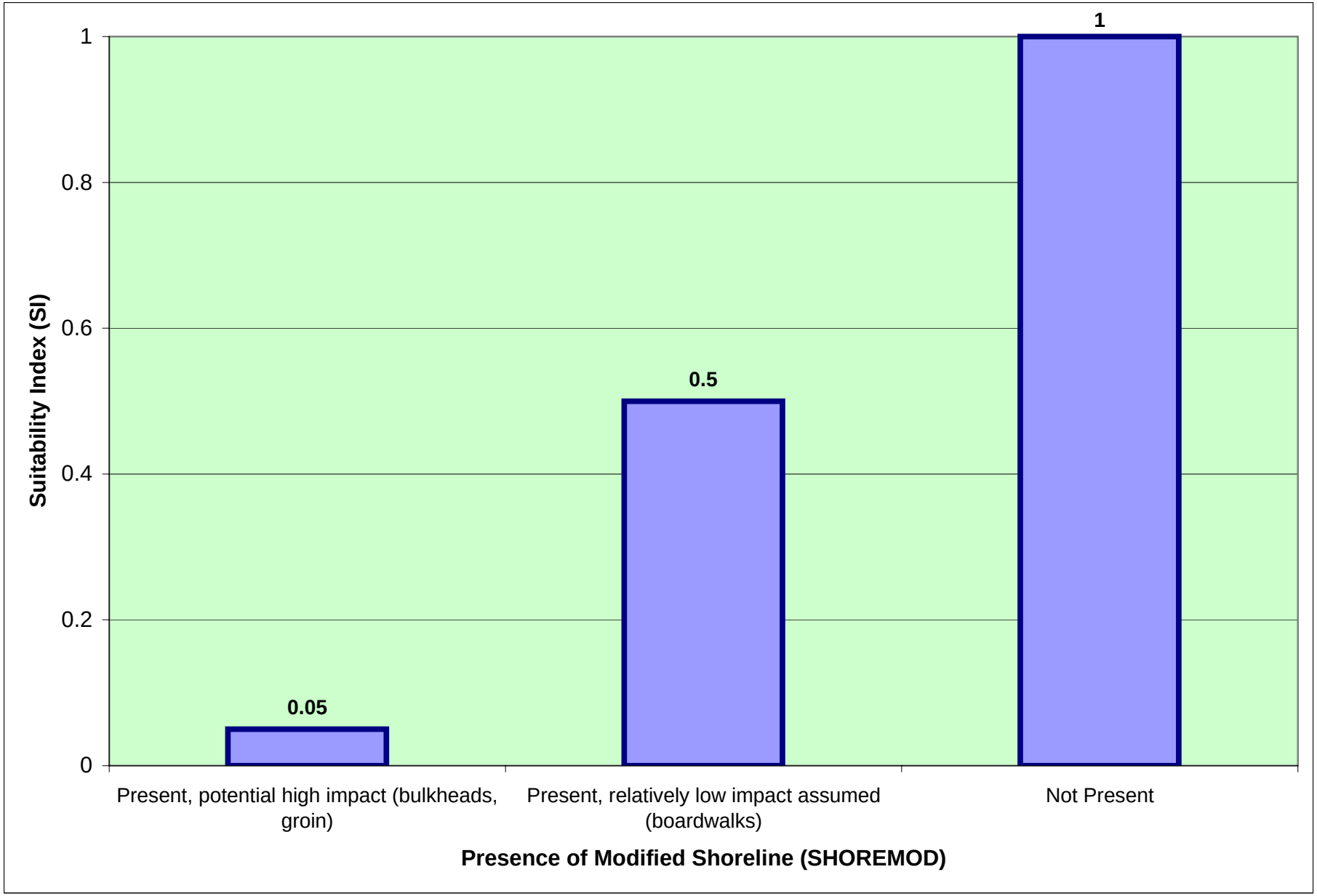

1
0.8
0.6
0.4
0.2
0
Suitability Index (SI)
0.1
0.5
1
High (> 50 %)
Moderate (10 - 50 %)
Low (<10 %)
Presence of Erosion (EROSION)

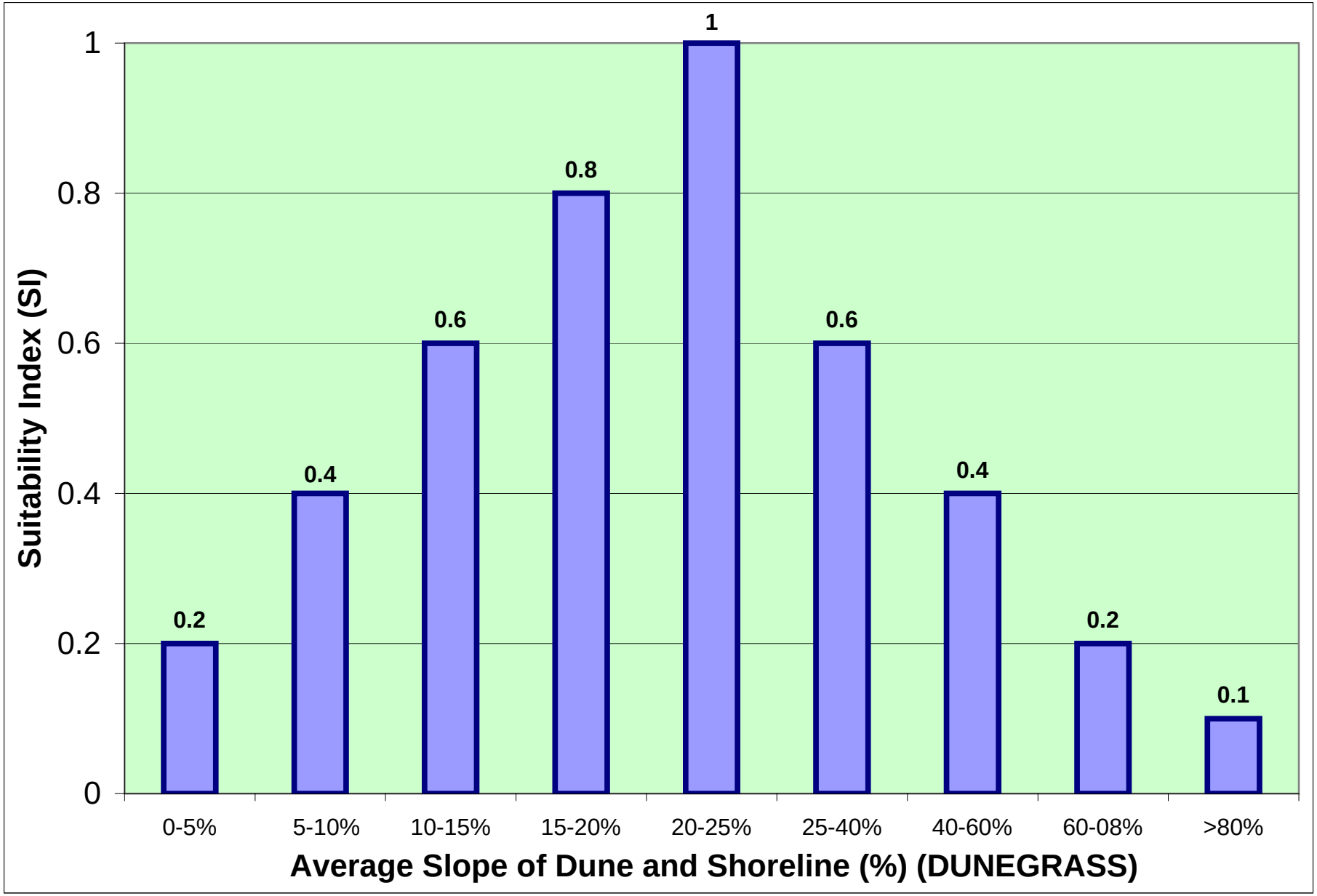

Suitability Index (SI)
1
0.8
0.6
0.4
0.2
0
0.1
0.2
0.5
0.7
0.9
1
8 - 9 factors present
6 - 7 factors present
4 - 5 factors present
2 - 3 factors present
1 factor present
none present
Presence of Human Disturbance Factors (HUMFACTORS)

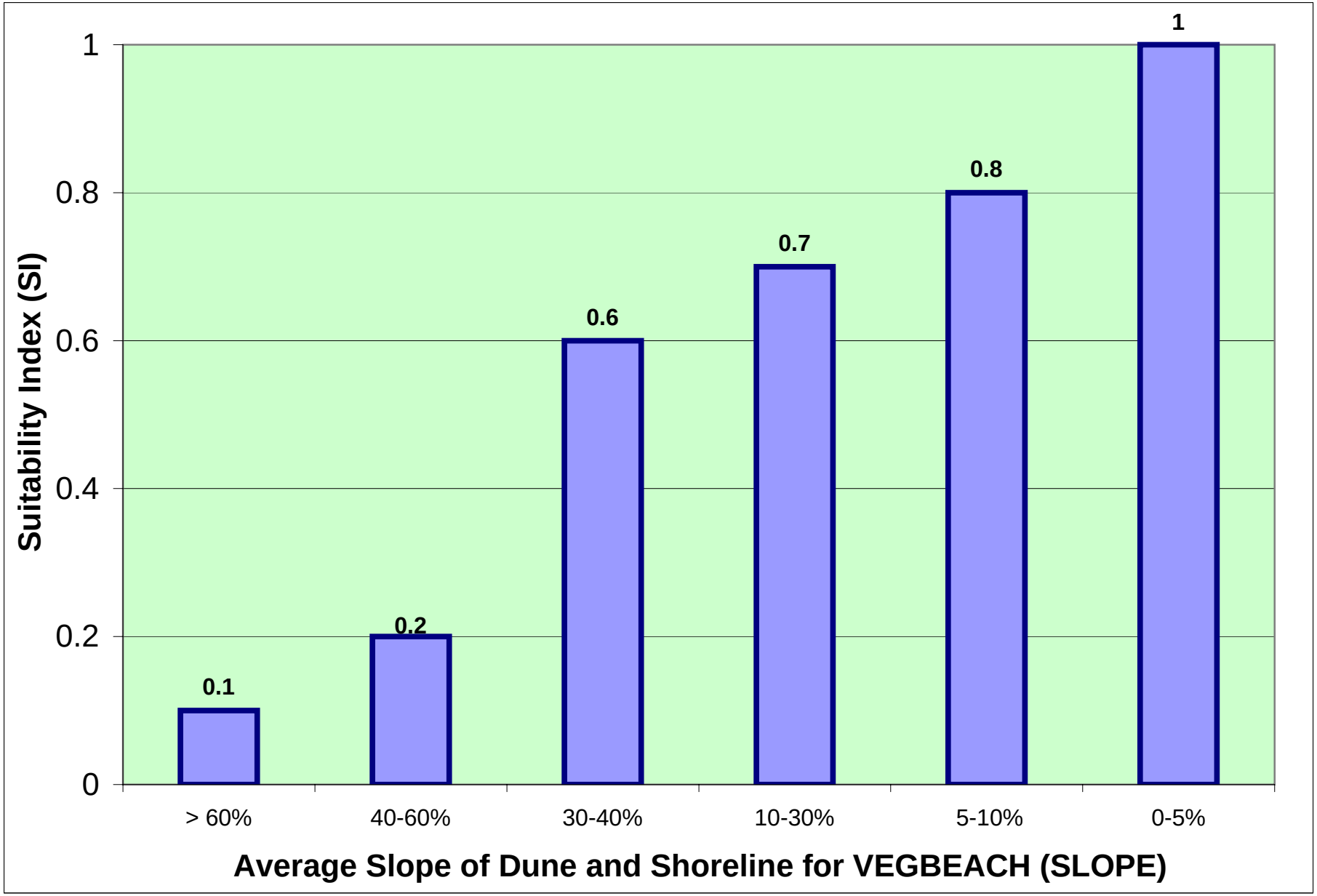

1
0.8
0.6
0.4
0.2
0
Suitability Index (SI)
0.1
0.2
0.4
0.7
0.9
1
Very High
High
Moderate
Low
Very Low
None or Trace
Magnitude of Impact From Human Disturbance (HUMMAGNIT)

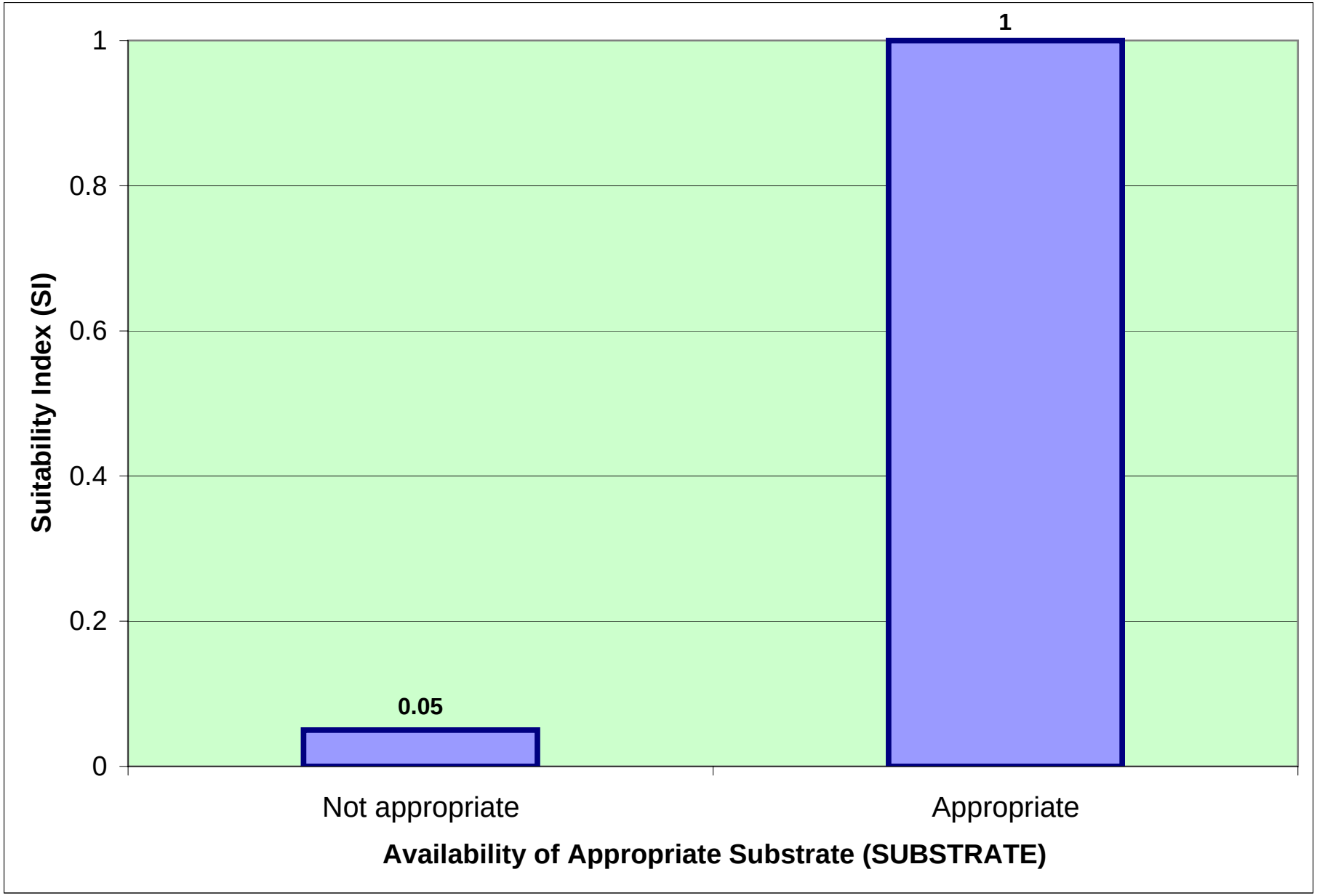

Suitability Index (SI)
1
0.8
0.6
0.4
0.2
0
0.05
0.2
0.4
0.8
1
> 50%
> 25 - 50%
>5% - 25%
> 0 - 5%
0
Percent Cover of Non-desirable, Invasive, and/or Exotic Species (INVASIVES)

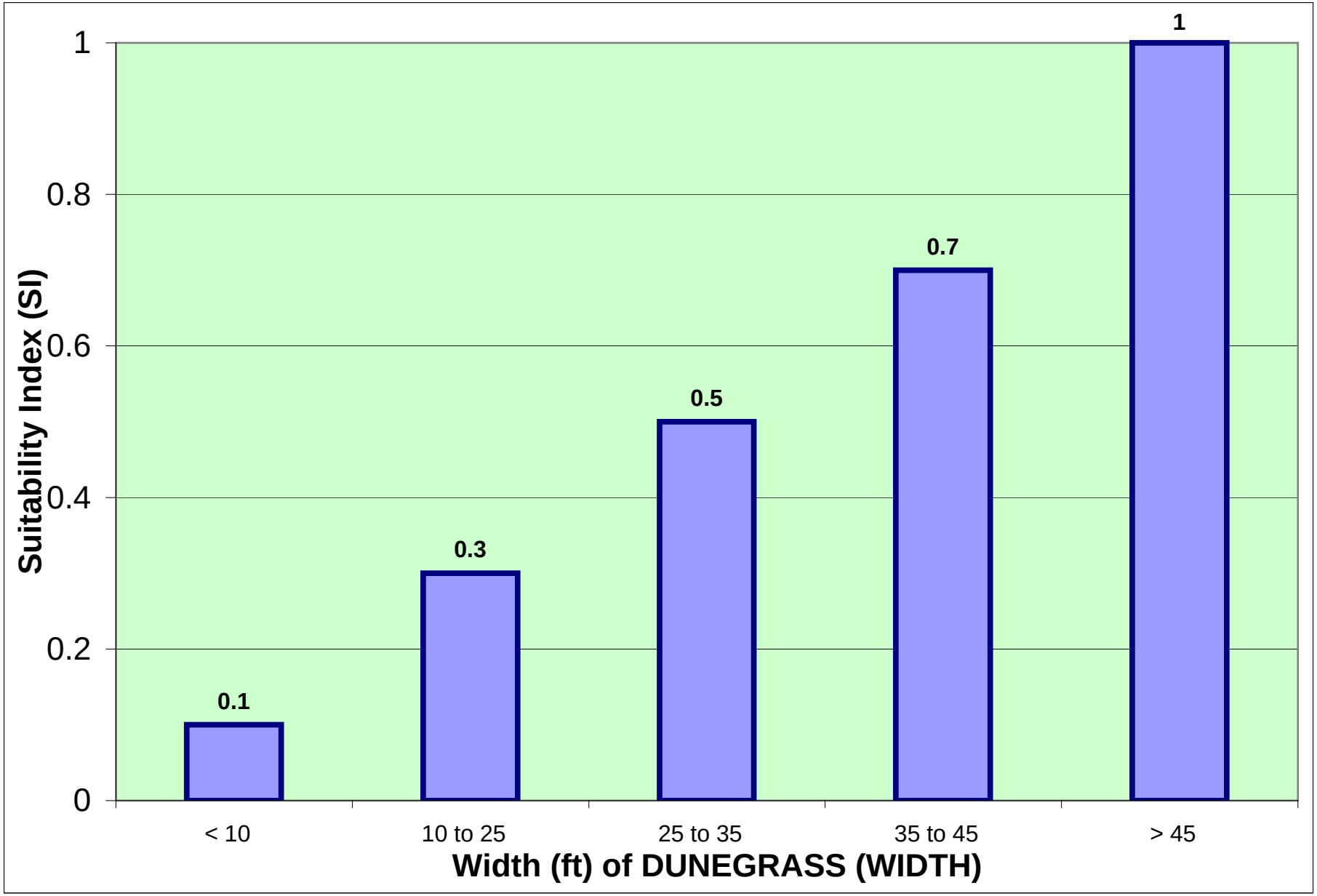

Suitability Index (SI)
1
0.8
0.6
0.4
0.2
0
0.05
0.2
0.4
0.6
0.8
1
1 or no species present
> 1 to 8 species present
> 8 to 16 species present
> 16 to 24 species present
> 24 to 32 species present
>32 species present
Species Richness (RICHSPP)


1
0.8
0.6
0.4
0.2
0
Suitability Index (SI)
0.05
0.5
1
Present, potential high impact (bulkheads, groin)
Present, relatively low impact assumed (boardwalks)
Not Present
Presence of Modified Shoreline (SHOREMOD)


Suitability Index (SI)
1
0.8
0.6
0.4
0.2
0
0.2
0.4
0.6
0.8
1
0.6
0.4
0.2
0.1
0-5%
5-10%
10-15%
15-20%
20-25%
25-40%
40-60%
60-08%
>80%
Average Slope of Dune and Shoreline (%) (DUNEGRASS)


Suitability Index (SI)
1
0.8
0.6
0.4
0.2
0
0.1
0.2
0.6
0.7
0.8
1
> 60%
40-60%
30-40%
10-30%
5-10%
0-5%
Average Slope of Dune and Shoreline for VEGBEACH (SLOPE)


1
0.8
0.6
0.4
0.2
0
Suitability Index (SI)
0.05
1
Not appropriate
Appropriate
Availability of Appropriate Substrate (SUBSTRATE)


1
0.8
0.6
0.4
0.2
0
Suitability Index (SI)
0.1
0.3
0.5
0.7
1
< 10
10 to 25
25 to 35
35 to 45
> 45
Width (ft) of DUNEGRASS (WIDTH)

APPENDIX F

EXAMPLE FIELD DATA COLLECTION FORMS

CONTENTS:

Data Collection Form (1 per Each of 7 HEP Variables) ..... 14 Pages

FIMP HEP Sampling Data Form

Site ID:	**Community type: NEARBEACH**	**Date:**
Team members:	**Tide condition: (high low mid storm surge)**	
Weather: temp: ____ °F, wind: (calm slight breeze windy), precip: (sunny drizzle rain)		
Should this community type be changed on the cover type map: Y or N	**New community type:**	
Dominant Species:		
GPS coordinate of transect start and transect bearing:		
Photographic documentation:		

Human disturbance factors (check all that apply, circle rank for severity of impact, and circle or list specific factors)

_ 1. Evidence of vehicle use (tracks, ruts, boat access areas) < 5% > 5%–< 25% > 25%–< 45% > 45%

_ 2. Hard structures (groins, jetties, walls, docks, marinas) < 5% > 5%–< 25% > 25%–< 45% > 45%

_ 3. Developed A (permanent buildings, bulkheads, paved roads) < 5% > 5%–< 25% > 25%–< 45% > 45%

_ 4. Developed B (fences, unimproved roads, boardwalks, access points, landscaping/ornamental plantings) < 5% > 5%–< 25% > 25%–< 45% > 45%

_ 5. Evidence of periodic maintenance (mowing, cutting, beach cleaning) < 5% > 5%–< 25% > 25%–< 45% > 5%

_ 6. Trash, debris < 5% > 5%–< 25% > 25%–< 45% > 45%

_ 7. Presence of outfall pipes or other potential sources of pollution < 5% > 5%–< 25% > 25%–< 45% > 45%

_ 8. Human activities in close proximity (boat traffic, jet skis, various beach activities, residential areas, pedestrian traffic, picnic grounds, campsites) < 5% > 5%–< 25% > 25%–< 45% >45%

_ 9. Area tilled, filled, logged, cleared, or excavated < 5% > 5%–< 25% > 25%–< 45% > 45%

Notes:

Width of area from llw to wrack line _____

FROM LIDAR/GIS DATA

Presence of modified shoreline < 5% > 5%–< 25% > 25%–< 45% >45%

Percent of community type that restricts terrapin access _____(list barriers observed)

Percent of community type that restricts shorebird chick access _____(list barriers observed)

Dense vegetation such as *Phragmites* and/or shrubs, nearly vertical feature > 2 ft in height (curbs, walls, roads, steep/eroded banks), improved and unimproved roadways

FIMP HEP Sampling Data Form

Site ID:	**Community type: VEGBEACH**	**Date:**
Team members:	**Tide condition: (high low mid storm surge)**	
Weather: temp: ____ ^{o}F, wind: (calm slight breeze windy), precip: (sunny drizzle rain)		
Should this community type be changed on the cover type map: Y or N	**New community type:**	
Dominant species:		
GPS coordinate of transect start and transect bearing:		
Photographic documentation:		

Human disturbance factors (check all that apply, circle rank for severity of impact, and circle or list specific factors)

1. Evidence of vehicle use (tracks, ruts, boat access areas) < 5% > 5%–< 25% > 25%–< 45% > 45%
2. Hard structures (groins, jetties, walls, docks, marinas) < 5% > 5%–< 25% > 25%–< 45% > 45%
3. Developed A (permanent buildings, bulkheads, paved roads) < 5% > 5%–< 25% > 25%–< 45% > 45%
4. Developed B (fences, unimproved roads, boardwalks, access points, landscaping/ornamental plantings) < 5% > 5%–< 25% > 25%–< 45% > 45%
5. Evidence of periodic maintenance (mowing, cutting, beach cleaning) < 5% > 5%–< 25% > 25%–< 45% > 5%
6. Trash, debris < 5% > 5%–< 25% > 25%–< 45% > 45%
7. Presence of outfall pipes or other potential sources of pollution < 5% > 5%–< 25% > 25%–< 45% > 45%
8. Human activities in close proximity (boat traffic, jet skis, various beach activities, residential areas, pedestrian traffic, picnic grounds, campsites) < 5% > 5%–< 25% > 25%–< 45% >45%
9. Area tilled, filled, logged, cleared, or excavated < 5% > 5%–< 25% > 25%–< 45% > 45%

Vegbeach/foredune profile:

Linear characterization of VEGBEACH zone (from wrack line to top of primary dune)

Zone	Average % Cover of Veg.	Average Slope	Width	Comments

Average height of vegetation (feet):

Percent of community type that restricts terrapin access _____(list barriers observed)
Percent of community type that restricts shorebird chick access _____(list barriers observed)
Dense vegetation such as *Phragmites* and/or shrubs, nearly vertical feature > 2 ft in height (curbs, walls, roads, steep/eroded banks), improved and unimproved roadways

Species richness of insects (average from 4 pit-fall trap locations):
Grain size (from benthic grab):
Species richness of benthic invertebrates (from benthic invert core sample):

FIMP HEP Sampling Data Form

Site ID:	**Community type: DUNEGRASS**	**Date:**
Team members:	**Tide condition: (high low mid storm surge)**	
Weather: temp: ____ °F, wind: (calm slight breeze windy), precip: (sunny drizzle rain)		
Should this community type be changed on the cover type map: Y or N	**New community type:**	
Dominant species:		
GPS coordinate of transect start and transect bearing:		
Photographic documentation:		

Human disturbance factors (check all that apply, circle rank for severity of impact, and circle or list specific factors)

_ 1. Evidence of vehicle use (tracks, ruts, boat access areas) < 5% > 5%–< 25% > 25%–< 45% > 45%

_ 2. Hard structures (groins, jetties, walls, docks, marinas) < 5% > 5%–< 25% > 25%–< 45% > 45%

_ 3. Developed A (permanent buildings, bulkheads, paved roads) < 5% > 5%–< 25% > 25%–< 45% > 45%

_ 4. Developed B (fences, unimproved roads, boardwalks, access points, landscaping/ornamental plantings) < 5% > 5%–< 25% > 25%–< 45% > 45%

_ 5. Evidence of periodic maintenance (mowing, cutting, beach cleaning) < 5% > 5%–< 25% > 25%–< 45% >45%

_ 6. Trash, debris < 5% > 5%–< 25% > 25%–< 45% > 45%

_ 7. Presence of outfall pipes or other potential sources of pollution < 5% > 5%–< 25% > 25%–< 45% > 45%

_ 8. Human activities in close proximity (boat traffic, jet skis, various beach activities, residential areas, pedestrian traffic, picnic grounds, campsites) < 5% > 5%–< 25% > 25%–< 45% > 45%

_ 9. Area tilled, filled, logged, cleared, or excavated < 5% > 5%–< 25% > 25%–< 45% > 45%

Notes:

Height and slope of dune face (in feet and degree of slope)

Height										
Slope										

Average height of vegetation (feet):

Presence of modified shoreline < 5% > 5%–< 25% > 25%–< 45% >45%

Presence of erosion: low (< 10%) moderate (>10% to 50%) high (>50%)

Percent of community type that restricts terrapin access _____(list barriers observed)

Percent of community type that restricts shorebird chick access _____(list barriers observed)

Dense vegetation such as *Phragmites* and/or shrubs, nearly vertical feature > 2 ft in height (curbs, walls, roads, steep/eroded banks), improved and unimproved roadways

Draw average dune shape here:

FIMP HEP Sampling Data Form

Site ID:	**Community type: UPLAND**	**Date:**
Team members:	**Tide condition: (high low mid storm surge)**	
Weather: temp: ____ ^{o}F, wind: (calm slight breeze windy), precip: (sunny drizzle rain)		
Dominant Species:		
Should this community type be changed on the cover type map: Y or N	**New community type:**	
Photographic documentation:		

Human disturbance factors (check all that apply, circle rank for severity of impact, and circle or list specific factors)

1. Evidence of vehicle use (tracks, ruts, boat access areas) < 5% > 5%–< 25% > 25%–< 45% > 45%
2. Hard structures (groins, jetties, walls, docks, marinas) < 5% > 5%–< 25% > 25%–< 45% > 45%
3. Developed A (permanent buildings, bulkheads, paved roads) < 5% > 5%–< 25% > 25%–< 45% > 45%
4. Developed B (fences, unimproved roads, boardwalks, access points, landscaping/ornamental plantings) < 5% > 5%–< 25% > 25%–< 45% > 45%
5. Evidence of periodic maintenance (mowing, cutting, beach cleaning) < 5% > 5%–< 25% > 25%–< 45% > 5%
6. Trash, debris < 5% > 5%–< 25% > 25%–< 45% > 45%
7. Presence of outfall pipes or other potential sources of pollution < 5% > 5%–< 25% > 25%–< 45% > 45%
8. Human activities in close proximity (boat traffic, jet skis, various beach activities, residential areas, pedestrian traffic, picnic grounds, campsites) < 5% > 5%–< 25% > 25%–< 45% >45%
9. Area tilled, filled, logged, cleared, or excavated < 5% > 5%–< 25% > 25%–< 45% > 45%

Notes:

Presence of non-desirable secies (circle or list specific examples)

_ 1. Percent of community impacted by herbivory (white-tailed deer, Canada geese, muskrat, snails) _____

_ 2. Percent of community covered by invasive/exotic vegetation (*Phragmites*, Japanese knotweed, mussel) _____

_ 3. Predators (feral cats, dogs, fox, crows, grackles, rats, coyote, gulls, raccoon, aquatic spp**)**

_ circle rank for predator threat 1 2 3 4 5

Height and slope of dune face (in feet and degree of slope)

Height										
Slope										

Average height of vegetation (feet):

Presence of modified shoreline < 5% > 5%–< 25% > 25%–< 45% >45%

Percent of community type that restricts terrapin access _____(list barriers observed)

Percent of community type that restricts shorebird chick access _____(list barriers observed)

Dense vegetation such as *Phragmites* and/or shrubs, nearly vertical feature > 2 ft in height (curbs, walls, roads, steep/eroded banks), improved and unimproved roadways

FIMP HEP Sampling Data Form

Site ID:	**Community type: BAYBEACH**	**Date:**
Team members:	**Tide condition: (high low mid storm surge)**	
Weather: temp: ____ ^{o}F, wind: (calm slight breeze windy), precip: (sunny drizzle rain)		
Should this community type be changed on the cover type map: Y or N	**New community type:**	
Dominant species:		
Photographic documentation:		

Human disturbance factors (check all that apply, circle rank for severity of impact, and circle or list specific factors)

1. Evidence of vehicle use (tracks, ruts, boat access areas) < 5% > 5%–< 25% > 25%–< 45% > 45%
2. Hard structures (groins, jetties, walls, docks, marinas) < 5% > 5%–< 25% > 25%–< 45% > 45%
3. Developed A (permanent buildings, bulkheads, paved roads) < 5% > 5%–< 25% > 25%–< 45% > 45%
4. Developed B (fences, unimproved roads, boardwalks, access points, landscaping/ornamental plantings) < 5% > 5%–< 25% > 25%–< 45% > 45%
5. Evidence of periodic maintenance (mowing, cutting, beach cleaning) < 5% > 5%–< 25% > 25%–< 45% > 5%
6. Trash, debris < 5% > 5%–< 25% > 25%–< 45% > 45%
7. Presence of outfall pipes or other potential sources of pollution < 5% > 5%–< 25% > 25%–< 45% > 45%
8. Human activities in close proximity (boat traffic, jet skis, various beach activities, residential areas, pedestrian traffic, picnic grounds, campsites) < 5% > 5%–< 25% > 25%–< 45% >45%
9. Area tilled, filled, logged, cleared, or excavated < 5% > 5%–< 25% > 25%–< 45% > 45%

Notes:

Presence of non-desirable species (circle or list specific examples)

_ 1. Percent of community impacted by herbivory (white-tailed deer, Canada geese, muskrat, snails) _____

_ 2. Percent of community covered by invasive/exotic vegetation (*Phragmites*, Japanese knotweed, mussel spp.) _____

_ 3. Predators (feral cats, dogs, fox, crows, grackles, rats, coyote, gulls, raccoon, aquatic spp.)

_ 4. Circle rank for predator threat 1 2 3 4 5

Notes:

Species richness of insects (average from 4 pit-fall trap locations):

Grain size (from benthic grab):

Species richness of benthic invertebrates (from benthic invert core sample):

FIMP HEP Sampling Data Form (continued)

1m Quadrats **(use for vegetation sampling)**

Community Type: **Average Height:**

Quadrat	Species	% Cover	Species	% Cover
Percent cover of overall community type **(top down, % bare ground not visible)**				

1m Quadrats **(use for vegetation sampling)**

Community Type: **Average Height:**

Quadrat	Species	% Cover	Species	% Cover
Percent cover of overall community type **(top down, % bare ground not visible)**				

Seine captures (use for fish sampling) 5 50-m tows using 50 foot seine net

Species	Avg. #/Tow	Species	Avg. #/Tow

Average shoreline shape (in feet and degree of slope)

Height										
Slope										

Average height of vegetation (feet):

Presence of modified shoreline < 5% > 5%–< 25% > 25%–< 45% >45%

Shoreline profile:

Presence of erosion: **low (< 10%)** **moderate (> 10% to 50%)** **high (> 50%)**

Percent of community type that restricts terrapin access _____(list barriers observed)

Percent of community type that restricts shorebird chick access _____(list barriers observed)

Dense vegetation such as *Phragmites* and/or shrubs, nearly vertical feature > 2 ft in height (curbs, walls, roads, steep/eroded banks), improved and unimproved roadways

FIMP HEP Sampling Data Form

Site ID:	**Community type: BAYSUBSAV**	**Date:**
Team members:	**Tide condition: (high low mid storm surge)**	
Weather: temp: ____ ^{o}F, wind: (calm slight breeze windy), precip: (sunny drizzle rain)		
Should this community type be changed on the cover type map: Y or N	**New community type:**	
Dominant species:		
Photographic documentation:		

Human disturbance factors (check all that apply, circle rank for severity of impact, and circle or list specific factors)

1. Evidence of vehicle use (tracks, ruts, boat access areas) < 5% > 5%–< 25% > 25%–< 45% > 45%
2. Hard structures (groins, jetties, walls, docks, marinas) < 5% > 5%–< 25% > 25%–< 45% > 45%
3. Developed A (permanent buildings, bulkheads, paved roads) < 5% > 5%–< 25% > 25%–< 45% > 45%
4. Developed B (fences, unimproved roads, boardwalks, access points, landscaping/ornamental plantings) < 5% > 5%–< 25% > 25%–< 45% > 45%
5. Evidence of periodic maintenance (mowing, cutting, beach cleaning) < 5% > 5%–< 25% > 25%–< 45% > 5%
6. Trash, debris < 5% > 5%–< 25% > 25%–< 45% > 45%
7. Presence of outfall pipes or other potential sources of pollution < 5% > 5%–< 25% > 25%–< 45% > 45%
8. Human activities in close proximity (boat traffic, jet skis, various beach activities, residential areas, pedestrian traffic, picnic grounds, campsites) < 5% > 5%–< 25% > 25%–< 45% >45%
9. Area tilled, filled, logged, cleared, or excavated < 5% > 5%–< 25% > 25%–< 45% > 45%

Notes:

Presence of non-desirable species (circle or list specific examples)

_ 1. Percent of community impacted by herbivory (white-tailed deer, Canada geese, muskrat, snails) _____

_ 2. Percent of community covered by invasive/exotic vegetation (*Phragmites*, Japanese knotweed, mussel spp.) _____

_ 3. Predators (feral cats, dogs, fox, crows, grackles, rats, coyote, gulls, raccoon, aquatic spp.)

_ circle rank for predator threat 1 2 3 4 5

Notes:

Grain size (from benthic grab):

Species richness of macro-infauna (from 5 50-m long clam rake transects)

Species	Average/Sample	Species	Average/Sample

FIMP HEP Sampling Data Form (continued)

Average percent cover of SAV:

Average height of SAV:

Seine captures (use for fish sampling) 5 50-m tows using 50 foot seine net

Species	Avg. #/Tow	Species	Avg. #/Tow

Presence of degraded conditions (check all that apply, circle or list specific examples)

_ 1. Poor water quality (turbidity, nutrient load, salinity) 1 2 3 4 5

_ 2. Significant physical disturbance (boat traffic, clamming activities) 1 2 3 4 5

_ 3. Low-quality substrate 1 2 3 4 5

_ 4. Less than optimal depth 1 2 3 4 5

Notes:

Percent of community type that restricts terrapin access _____(list barriers observed)

Percent of community type that restricts shorebird chick access _____(list barriers observed)

Dense vegetation such as *Phragmites* and/or shrubs, nearly vertical feature > 2 ft in height (curbs, walls, roads, steep/eroded banks), improved and unimproved roadways

FIMP HEP Sampling Data Form

Site ID:	**Community type: ISLAND**	**Date:**
Team members:	**Tide Condition: (high low mid storm surge)**	
Weather: temp: ____ ^{o}F, wind: (calm slight breeze windy), precip: (sunny drizzle rain)		
Should this community type be changed on the cover type map: Y or N	**New community type:**	
Dominant Species:		
Photographic documentation:		

Human Disturbance Factors (check all that apply, circle rank for severity of impact, and circle or list specific factors)

1. Evidence of vehicle use (tracks, ruts, boat access areas) < 5% > 5%–< 25% > 25%–< 45% > 45%
2. Hard structures (groins, jetties, walls, docks, marinas) < 5% > 5%–< 25% > 25%–< 45% > 45%
3. Developed A (permanent buildings, bulkheads, paved roads) < 5% > 5%–< 25% > 25%–< 45% > 45%
4. Developed B (fences, unimproved roads, boardwalks, access points, landscaping/ornamental plantings) < 5% > 5%–< 25% > 25%–< 45% > 45%
5. Evidence of periodic maintenance (mowing, cutting, beach cleaning) < 5% > 5%–< 25% > 25%–< 45% > 5%
6. Trash, debris < 5% > 5%–< 25% > 25%–< 45% > 45%
7. Presence of outfall pipes or other potential sources of pollution < 5% > 5%–< 25% > 25%–< 45% > 45%
8. Human activities in close proximity (boat traffic, jet skis, various beach activities, residential areas, pedestrian traffic, picnic grounds, campsites) < 5% > 5%–< 25% > 25%–< 45% >45%
9. Area tilled, filled, logged, cleared, or excavated < 5% > 5%–< 25% > 25%–< 45% > 45%

Notes:

Presence of Non-desirable Species (circle or list specific examples)

_ 1. Percent of community impacted by herbivory (white-tailed deer, Canada geese, muskrat, **snails?**) _____

_ 2. Percent of community covered by invasive/exotic vegetation (*Phragmites*, Japanese knotweed, poison ivy, **mussel spp**.) _____

_ 3. Predators (feral cats, dogs, fox, crows, grackles, rats, coyote, gulls, raccoon, **any aquatic spp?)**

_ circle rank for predator threat 1 2 3 4 5

Notes:

Species Richness of Insects (average from 4 pit-fall trap locations):

Grain Size (from benthic grab):

Species Richness of Benthic Invertebrates (from benthic invert core sample):

Species Richness of Macro-infauna (from 5 50-m long clam rake transects)

Species	Average/Sample	Species	Average/Sample

FIMP HEP Sampling Data Form (continued)

1m Quadrats **(use for vegetation sampling)**

Community Type: **Average Height:**

Quadrat	Species	% Cover	Species	% Cover
Percent cover of overall community type **(top down, % bare ground not visible)**				

1m Quadrats **(use for vegetation sampling)**

Community Type: **Average Height:**

Quadrat	Species	% Cover	Species	% Cover

1m Quadrats **(use for vegetation sampling)**

Community Type: **Average Height:**

Quadrat	Species	% Cover	Species	% Cover
Percent cover of overall community type **(top down, % bare ground not visible)**				

Seine Captures **(use for fish sampling) 5 50-m tows using 50 foot seine net**

Species	Avg. #/Tow	Species	Avg. #/Tow

Height and slope of southward facing dune or shoreline(in feet and degree of slope)

Height										
Slope										

Dune Profile:

Average Height of Vegetation (feet):

Height and slope of northward facing dune or shoreline (in feet and degree of slope)

Height										
Slope										

Dune Profile:

Average Morphological Stage of Dune (circle dominant condition) Early Mid Late

Average Height of Vegetation (feet):

Presence of modified shoreline < 5% > 5%–< 25% > 25%–< 45% >45%

Percent of community type that restricts terrapin access _____(list barriers observed)

Percent of community type that restricts shorebird chick access _____(list barriers observed)

Dense vegetation such as *Phragmites* and/or shrubs, nearly vertical feature > 2 ft in height (curbs, walls, roads, steep/eroded banks), improved and unimproved roadways

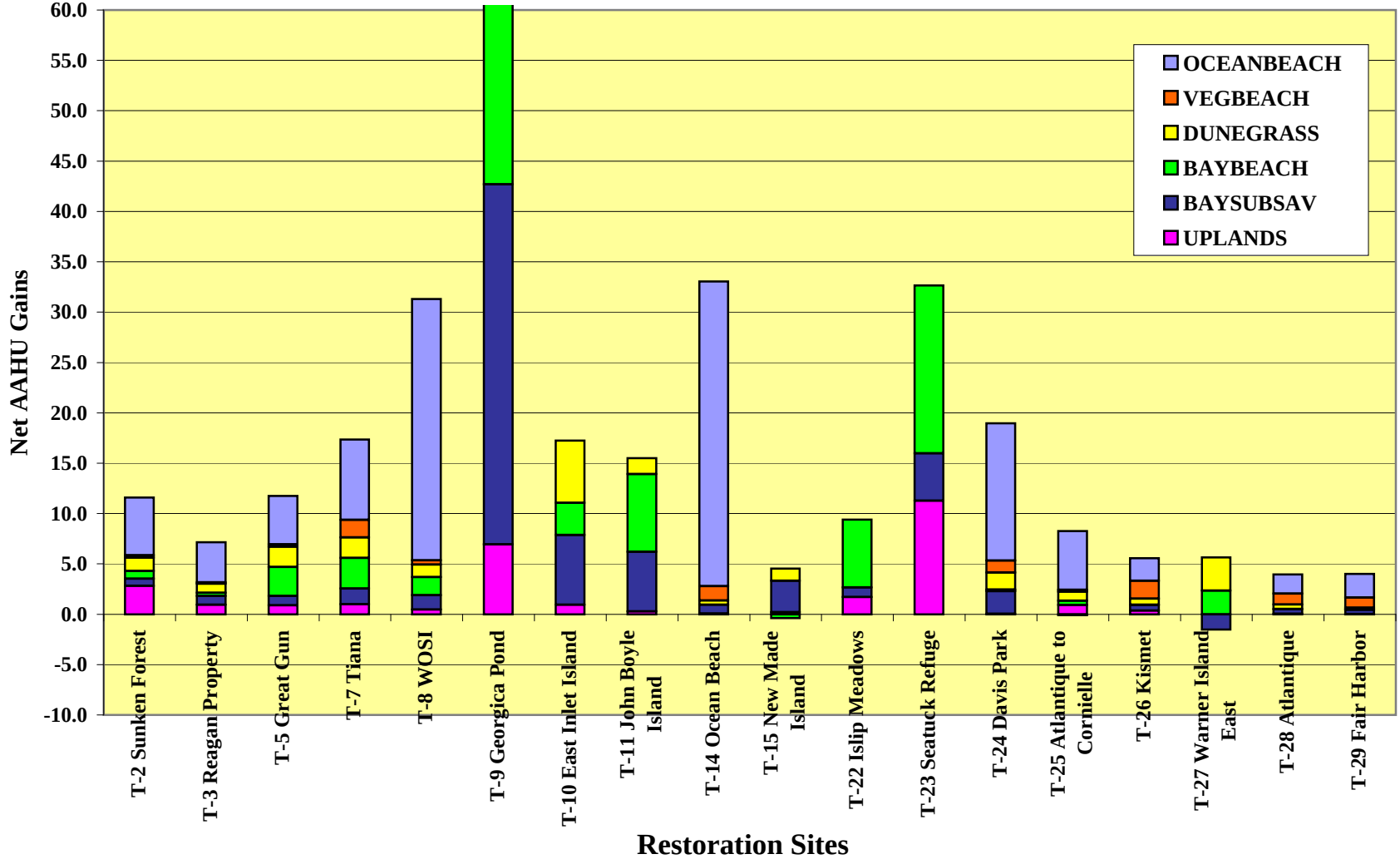
APPENDIX G

HABITAT EVALUATION PROCEDURES
ANALYSIS RESULTS

CONTENTS:

Section 1. HSI, HU, and Acres for baseline, future no-action and future with-action (restoration) scenarios ..... 3 Pages
Section 2. AAHU Results Alternative 1 ..... 38 Pages
Section 3. AAHU Results Alternative 2 ..... 38 Pages
Section 4. AAHU Results Alternative 3 ..... 38 Pages
Section 5. AAHU Results Alternative 4 ..... 38 Pages

Net AAHU Gains For Restoration Alternative 1



Fire Island to Montauk Point, NY Reformulation Study

T-2 Sunken Forest

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.545	0.545	109	109	59	59.11	0	1	0.545	0.545	109	109	59
1	5	0.545	0.545	109	109	236		1	5	0.545	0.545	109	109	236
5	50	0.545	0.477	109	98	2,373	46.6	5	50	0.545	0.545	109	109	2,660
						Without Project AAHUs:	**53**							**With Project AAHUs:**	**59**
														Net AAHUs:	**6**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.567	0.567	5	5	3		0	1	0.567	0.567	5	5	3
1	5	0.567	0.567	5	5	11		1	5	0.567	0.567	5	5	11
5	50	0.567	0.523	5	5	118	2.379	5	50	0.567	0.567	5	5	129
						Without Project AAHUs:	**2.641**							**With Project AAHUs:**	**2.862**
														Net AAHUs:	**0.221**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.687	0.687	8	8	6		0	1	0.687	0.687	8	8	6
1	5	0.687	0.687	8	8	23		1	5	0.687	0.687	8	8	23
5	50	0.687	0.388	8	8	195	2.953	5	50	0.687	0.687	8	8	261
						Without Project AAHUs:	**4**							**With Project AAHUs:**	**6**
														Net AAHUs:	**1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.198	0.198	2	2	0		0	1	0.198	0.198	2	2	0
1	5	0.198	0.198	2	2	1		1	5	0.198	0.662	2	2	3
5	50	0.198	0.123	2	2	12	0.206	5	50	0.662	0.662	2	2	50
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**1**
														Net AAHUs:	**1**

Fire Island to Montauk Point, NY Reformulation Study

T-2 Sunken Forest

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.638	0.638	22	22	14		0	1	0.638	0.638	22	22	14
1	5	0.638	0.638	22	22	57		1	5	0.638	0.638	22	22	57
5	50	0.638	0.513	22	25	606	12.6	5	50	0.638	0.638	22	22	641
						Without Project AAHUs:	**14**							**With Project AAHUs:**	**14**
														Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.783	0.783	15	15	12		0	1	0.783	0.783	15	15	12
1	5	0.783	0.783	15	15	47		1	5	0.783	0.783	15	15	47
5	50	0.783	0.423	15	14	393	5.768	5	50	0.783	0.783	15	15	534
						Without Project AAHUs:	**9**							**With Project AAHUs:**	**12**
														Net AAHUs:	**3**

Total No-Action AAHUs	**83.35**	**Total With-Action AAHUs**	**94.93**
		Net AAHUs	**12**

Fire Island to Montauk Point, NY Reformulation Study

T-3 Reagan

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	77	77	44	43.73	0	1	0.572	0.572	77	77	44
1	5	0.572	0.572	77	77	175		1	5	0.572	0.572	77	77	175
5	50	0.572	0.509	77	69	1,768	35.02	5	50	0.572	0.572	77	77	1,968
						Without Project AAHUs:	**40**							**With Project AAHUs:**	**44**
														Net AAHUs:	**4**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.396	0.396	4	4	1		0	1	0.396	0.396	4	4	1
1	5	0.396	0.396	4	4	6		1	5	0.396	0.396	4	4	6
5	50	0.396	0.353	4	3	59	1.17	5	50	0.396	0.396	4	4	66
						Without Project AAHUs:	**1.326**							**With Project AAHUs:**	**1.459**
														Net AAHUs:	**0.133**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.443	0.443	8	8	3		0	1	0.443	0.443	8	8	3
1	5	0.443	0.443	8	8	14		1	5	0.443	0.443	8	8	14
5	50	0.443	0.216	8	7	112	1.536	5	50	0.443	0.443	8	8	157
						Without Project AAHUs:	**3**							**With Project AAHUs:**	**3**
														Net AAHUs:	**1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.209	0.209	1	1	0		0	1	0.209	0.209	1	1	0
1	5	0.209	0.209	1	1	1		1	5	0.209	0.561	1	1	1
5	50	0.209	0.127	1	1	6	0.105	5	50	0.561	0.561	1	1	21
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
														Net AAHUs:	**0**

Fire Island to Montauk Point, NY Reformulation Study

T-3 Reagan

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.347	0.347	16	16	5		0	1	0.347	0.347	16	16	5
1	5	0.347	0.347	16	16	22		1	5	0.347	0.347	16	16	22
5	50	0.347	0.197	16	17	201	3.392	5	50	0.347	0.347	16	16	245
						Without Project AAHUs:	**5**							**With Project AAHUs:**	**5**
														Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.673	0.673	5	5	3		0	1	0.673	0.673	5	5	3
1	5	0.673	0.673	5	5	14		1	5	0.673	0.673	5	5	14
5	50	0.673	0.318	5	5	110	1.484	5	50	0.673	0.673	5	5	157
						Without Project AAHUs:	**3**							**With Project AAHUs:**	**3**
														Net AAHUs:	**1**

Total No-Action AAHUs	**50.91**	**Total With-Action AAHUs**	**58.07**
		Net AAHUs	**7**

Fire Island to Montauk Point, NY Reformulation Study

T-5 Great Gun

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.545	0.545	91	91	50	49.57	0	1	0.545	0.545	91	91	50
1	5	0.545	0.545	91	91	198		1	5	0.545	0.545	91	91	198
5	50	0.545	0.477	91	82	1,990	39.08	5	50	0.545	0.545	91	91	2,231
						Without Project AAHUs:	**45**							**With Project AAHUs:**	**50**
														Net AAHUs:	**5**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.483	0.483	6	6	3		0	1	0.483	0.483	6	6	3
1	5	0.483	0.483	6	6	12		1	5	0.483	0.483	6	6	12
5	50	0.483	0.453	6	6	128	2.603	5	50	0.483	0.483	6	6	139
						Without Project AAHUs:	**2.865**							**With Project AAHUs:**	**3.084**
														Net AAHUs:	**0.219**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.564	0.564	14	14	8		0	1	0.564	0.564	14	14	8
1	5	0.564	0.564	14	14	32		1	5	0.564	0.564	14	14	32
5	50	0.564	0.288	14	13	261	3.691	5	50	0.564	0.564	14	14	362
						Without Project AAHUs:	**6**							**With Project AAHUs:**	**8**
														Net AAHUs:	**2**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.243	0.243	11	11	3		0	1	0.243	0.243	11	11	3
1	5	0.243	0.243	11	11	11		1	5	0.243	0.442	11	12	16
5	50	0.243	0.196	11	10	104	1.953	5	50	0.442	0.442	12	12	243
						Without Project AAHUs:	**2**							**With Project AAHUs:**	**5**
														Net AAHUs:	**3**

Fire Island to Montauk Point, NY Reformulation Study

T-5 Great Gun

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.544	0.544	17	17	9		0	1	0.544	0.544	17	17	9
1	5	0.544	0.544	17	17	36		1	5	0.544	0.544	17	16	36
5	50	0.544	0.399	17	17	352	6.624	5	50	0.544	0.544	16	16	399
						Without Project AAHUs:	**8**							**With Project AAHUs:**	**9**
														Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.417	0.417	7	7	3		0	1	0.417	0.417	7	7	3
1	5	0.417	0.417	7	7	12		1	5	0.417	0.417	7	7	12
5	50	0.417	0.123	7	7	86	0.818	5	50	0.417	0.417	7	7	131
						Without Project AAHUs:	**2**							**With Project AAHUs:**	**3**
														Net AAHUs:	**1**

Total No-Action AAHUs	**65.98**	**Total With-Action AAHUs**	**77.72**
		Net AAHUs	**12**

Fire Island to Montauk Point, NY Reformulation Study

T-7 Tiana

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.558	0.558	86	86	48	48.03	0	1	0.558	0.558	86	86	48
1	5	0.558	0.558	86	86	192		1	5	0.558	0.570	86	86	194
5	50	0.558	0.424	86	77	1,811	32.82	5	50	0.570	0.570	86	86	2,208
						Without Project AAHUs:	**41**							**With Project AAHUs:**	**49**
														Net AAHUs:	**8**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.593	0.593	7	7	4		0	1	0.593	0.593	7	7	4
1	5	0.593	0.593	7	7	16		1	5	0.593	0.845	7	7	20
5	50	0.593	0.556	7	7	179	3.85	5	50	0.845	0.845	7	7	263
						Without Project AAHUs:	**3.989**							**With Project AAHUs:**	**5.744**
														Net AAHUs:	**1.755**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.703	0.703	6	6	4		0	1	0.703	0.703	6	6	4
1	5	0.703	0.703	6	6	17		1	5	0.703	0.882	6	6	20
5	50	0.703	0.440	6	6	150	2.423	5	50	0.882	0.882	6	6	249
						Without Project AAHUs:	**3**							**With Project AAHUs:**	**5**
														Net AAHUs:	**2**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.671	0.671	11	11	7		0	1	0.671	0.671	11	11	7
1	5	0.671	0.671	11	11	29		1	5	0.671	0.876	11	11	33
5	50	0.671	0.531	11	10	277	5.145	5	50	0.876	0.876	11	11	425
						Without Project AAHUs:	**6**							**With Project AAHUs:**	**9**
														Net AAHUs:	**3**

Fire Island to Montauk Point, NY Reformulation Study

T-7 Tiana

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.614	0.614	19	19	12		0	1	0.614	0.614	19	19	12
1	5	0.614	0.614	19	19	46		1	5	0.614	0.614	19	19	46
5	50	0.614	0.430	19	19	440	8.058	5	50	0.614	0.614	19	19	518
						Without Project AAHUs:	**10**							**With Project AAHUs:**	**12**
														Net AAHUs:	**2**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.350	0.350	4	4	1		0	1	0.350	0.350	4	4	1
1	5	0.350	0.350	4	4	6		1	5	0.350	0.450	4	0	4
5	50	0.350	0.023	4	4	34	0.089	5	50	0.450	0.450	4	4	86
						Without Project AAHUs:	**1**							**With Project AAHUs:**	**2**
														Net AAHUs:	**1**

Total No-Action AAHUs	**65.50**	**Total With-Action AAHUs**	**82.86**
		Net AAHUs	**17**

Fire Island to Montauk Point, NY Reformulation Study

T-8 WOSI (West of Shinnecock Inlet)

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.930	0.930	154	154	143	142.9	0	1	0.930	0.930	154	154	143
1	5	0.930	0.930	154	154	572		1	5	0.930	0.953	154	154	579
5	50	0.930	0.678	154	138	5,296	93.77	5	50	0.953	0.953	154	154	6,587
						Without Project AAHUs:	**120**							**With Project AAHUs:**	**146**
														Net AAHUs:	**26**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.458	0.458	9	9	4		0	1	0.458	0.458	9	9	4
1	5	0.458	0.458	9	9	17		1	5	0.458	0.458	9	9	17
5	50	0.458	0.397	9	8	168	3.27	5	50	0.458	0.458	9	9	189
						Without Project AAHUs:	**3.772**							**With Project AAHUs:**	**4.198**
														Net AAHUs:	**0.426**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.441	0.441	13	13	6		0	1	0.441	0.441	13	13	6
1	5	0.441	0.441	13	13	23		1	5	0.441	0.441	13	13	23
5	50	0.441	0.226	13	13	193	2.907	5	50	0.441	0.441	13	13	255
						Without Project AAHUs:	**4**							**With Project AAHUs:**	**6**
														Net AAHUs:	**1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.567	0.567	8	8	5		0	1	0.567	0.567	8	8	5
1	5	0.567	0.567	8	8	19		1	5	0.567	0.760	8	8	22
5	50	0.567	0.493	8	8	201	4.154	5	50	0.760	0.760	8	8	288
						Without Project AAHUs:	**4**							**With Project AAHUs:**	**6**
														Net AAHUs:	**2**

Fire Island to Montauk Point, NY Reformulation Study

T-8 WOSI (West of Shinnecock Inlet)

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.436	0.436	20	20	9		0	1	0.436	0.436	20	20	9
1	5	0.436	0.436	20	20	34		1	5	0.436	0.436	20	20	34
5	50	0.436	0.274	20	20	314	5.39	5	50	0.436	0.436	20	20	385
						Without Project AAHUs:	**7**							**With Project AAHUs:**	**9**
														Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.217	0.217	5	5	1		0	1	0.217	0.217	5	5	1
1	5	0.217	0.217	5	5	4		1	5	0.217	0.217	5	5	4
5	50	0.217	0.000	5	4	22	0	5	50	0.217	0.217	5	5	45
						Without Project AAHUs:	**1**							**With Project AAHUs:**	**1**
														Net AAHUs:	**0**

Total No-Action AAHUs	**140.58**	**Total With-Action AAHUs**	**171.88**
		Net AAHUs	**31**

Fire Island to Montauk Point, NY Reformulation Study

T-10 East Inlet Island

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:								**With Project AAHUs:**	**0**
														Net AAHUs:	**0**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:								**With Project AAHUs:**	**0.000**
														Net AAHUs:	**0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.385	0.385	11	11	4		0	1	0.385	0.385	11	11	4
1	5	0.385	0.385	11	11	18		1	5	0.385	0.829	11	11	28
5	50	0.385	0.168	11	9	127	1.439	5	50	0.829	0.829	11	11	425
						Without Project AAHUs:								**With Project AAHUs:**	**9**
														Net AAHUs:	**6**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.526	0.526	67	67	35		0	1	0.526	0.526	67	67	35
1	5	0.526	0.526	67	67	142		1	5	0.526	0.526	67	67	142
5	50	0.526	0.399	67	71	1,435	28.19	5	50	0.526	0.526	67	67	1,594
						Without Project AAHUs:								**With Project AAHUs:**	**35**
														Net AAHUs:	**3**

Fire Island to Montauk Point, NY Reformulation Study

T-10 East Inlet Island

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.497	0.497	83	83	42		0	1	0.497	0.497	83	83	42
1	5	0.497	0.497	83	83	166		1	5	0.497	0.497	83	83	166
5	50	0.497	0.313	83	83	1,523	26.15	5	50	0.497	0.497	83	83	1,868
						Without Project AAHUs: **35**								**With Project AAHUs:** **42**
														Net AAHUs: **7**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.452	0.452	2	2	1		0	1	0.452	0.452	2	2	1
1	5	0.452	0.452	2	2	4		1	5	0.452	0.652	2	2	5
5	50	0.452	0.148	2	1	24	0.124	5	50	0.652	0.652	2	2	70
						Without Project AAHUs: **1**								**With Project AAHUs:** **2**
														Net AAHUs: **1**

Total No-Action AAHUs	**70.39**	**Total With-Action AAHUs**	**87.63**
		Net AAHUs	**17**

Fire Island to Montauk Point, NY Reformulation Study

T-11 John Boyle Island

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0**							**With Project AAHUs:** **0**
														Net AAHUs: **0**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0.000**							**With Project AAHUs:** **0.000**
														Net AAHUs: **0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.385	0.385	3	3	1		0	1	0.385	0.385	3	3	1
1	5	0.385	0.385	3	3	4		1	5	0.385	0.829	3	3	7
5	50	0.385	0.168	3	2	32	0.367	5	50	0.829	0.829	3	3	109
						Without Project AAHUs:	**1**							**With Project AAHUs:** **2**
														Net AAHUs: **2**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.526	0.526	31	31	17		0	1	0.526	0.526	31	31	17
1	5	0.526	0.526	31	31	66		1	5	0.526	0.737	31	31	79
5	50	0.526	0.399	31	33	668	13.13	5	50	0.737	0.737	31	31	1,041
						Without Project AAHUs:	**15**							**With Project AAHUs:** **23**
														Net AAHUs: **8**

Fire Island to Montauk Point, NY Reformulation Study

T-11 John Boyle Island

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.497	0.497	72	72	36		0	1	0.497	0.497	72	72	36
1	5	0.497	0.497	72	72	142		1	5	0.497	0.497	72	72	142
5	50	0.497	0.313	72	72	1,304	22.4	5	50	0.497	0.497	72	72	1,601
						Without Project AAHUs:	**30**							**With Project AAHUs:**	**36**
														Net AAHUs:	**6**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.452	0.452	1	1	0		0	1	0.452	0.452	1	1	0
1	5	0.452	0.452	1	1	1		1	5	0.452	0.652	1	1	2
5	50	0.452	0.148	1	0	7	0.037	5	50	0.652	0.652	1	1	21
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
														Net AAHUs:	**0**

Total No-Action AAHUs	**45.60**	**Total With-Action AAHUs**	**61.10**
		Net AAHUs	**16**

Fire Island to Montauk Point, NY Reformulation Study

T-14 Ocean Beach

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.239	0.239	93	93	22	22.29	0	1	0.239	0.239	93	93	22
1	5	0.239	0.239	93	93	89		1	5	0.239	0.572	93	94	152
5	50	0.239	0.240	93	84	956	20.19	5	50	0.572	0.572	93	94	2,406
						Without Project AAHUs:	**21**							**With Project AAHUs:**	**52**
														Net AAHUs:	**30**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.220	0.220	4	4	1		0	1	0.220	0.220	4	4	1
1	5	0.220	0.220	4	4	3		1	5	0.220	0.575	4	4	6
5	50	0.220	0.178	4	4	33	0.627	5	50	0.575	0.575	4	4	103
						Without Project AAHUs:	**0.754**							**With Project AAHUs:**	**2.194**
														Net AAHUs:	**1.440**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.434	0.434	3	3	1		0	1	0.434	0.434	3	3	1
1	5	0.434	0.434	3	3	5		1	5	0.434	0.434	3	3	6
5	50	0.434	0.208	3	3	44	0.593	5	50	0.434	0.434	3	3	64
						Without Project AAHUs:	**1**							**With Project AAHUs:**	**1**
														Net AAHUs:	**0**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.153	0.153	0	0	0		0	1	0.153	0.153	0	0	0
1	5	0.153	0.153	0	0	0		1	5	0.153	0.153	0	0	0
5	50	0.153	0.101	0	0	2	0.031	5	50	0.153	0.153	0	0	2
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
														Net AAHUs:	**0**

Fire Island to Montauk Point, NY Reformulation Study

T-14 Ocean Beach

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.529	0.529	23	23	12		0	1	0.529	0.529	23	23	12
1	5	0.529	0.529	23	23	48		1	5	0.529	0.529	23	23	48
5	50	0.529	0.444	23	23	497	10.08	5	50	0.529	0.529	23	23	540
						Without Project AAHUs:	**11**							**With Project AAHUs:**	**12**
														Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.187	1	1	0		0	1	0.187	0.187	1	1	0
1	5	0.187	0.187	1	1	1		1	5	0.187	0.187	1	1	1
5	50	0.187	0.000	1	1	3	0	5	50	0.187	0.187	1	1	7
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
														Net AAHUs:	**0**

Total No-Action AAHUs	**34.37**	**Total With-Action AAHUs**	**67.40**
		Net AAHUs	**33**

Fire Island to Montauk Point, NY Reformulation Study

T-15 New Made Island

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0**							**With Project AAHUs:** **0**
														Net AAHUs: **0**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0.000**							**With Project AAHUs:** **0.000**
														Net AAHUs: **0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.318	0.318	1	1	0		0	1	0.318	0.318	1	1	0
1	5	0.318	0.318	1	1	1		1	5	0.318	0.829	1	2	3
5	50	0.318	0.165	1	0	6	0.075	5	50	0.829	0.829	2	2	65
						Without Project AAHUs:	**0**							**With Project AAHUs:** **1**
														Net AAHUs: **1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.462	0.462	3	3	2		0	1	0.462	0.462	3	3	2
1	5	0.462	0.462	3	3	6		1	5	0.462	0.462	3	2	5
5	50	0.462	0.384	3	3	64	1.319	5	50	0.462	0.462	2	2	45
						Without Project AAHUs:	**1**							**With Project AAHUs:** **1**
														Net AAHUs: **0**

Fire Island to Montauk Point, NY Reformulation Study

T-15 New Made Island

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.497	0.497	38	38	19		0	1	0.497	0.497	38	38	19
1	5	0.497	0.497	38	38	75		1	5	0.497	0.497	38	38	75
5	50	0.497	0.313	38	38	689	11.83	5	50	0.497	0.497	38	38	845
						Without Project AAHUs:	**16**							**With Project AAHUs:**	**19**
														Net AAHUs:	**3**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.452	0.452	1	1	0		0	1	0.452	0.452	1	1	0
1	5	0.452	0.452	1	1	2		1	5	0.452	0.452	1	1	2
5	50	0.452	0.148	1	0	9	0.047	5	50	0.452	0.452	1	1	18
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
														Net AAHUs:	**0**

Total No-Action AAHUs	**17.43**	**Total With-Action AAHUs**	**21.57**
		Net AAHUs	**4**

Fire Island to Montauk Point, NY Reformulation Study

T-9 Georgica Pond

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.173	0.173	351	351	61	60.75	0	1	0.173	0.173	351	351	61
1	5	0.173	0.173	351	351	243		1	5	0.173	0.173	351	351	243
5	50	0.173	0.068	351	351	1,900	23.7	5	50	0.173	0.173	351	351	2,734
						Without Project AAHUs:	**44**							**With Project AAHUs:**	**61**
														Net AAHUs:	**17**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.250	0.250	16	16	4		0	1	0.250	0.250	16	16	4
1	5	0.250	0.250	16	16	16		1	5	0.250	0.250	16	16	16
5	50	0.250	0.198	16	16	161	3.17	5	50	0.250	0.250	16	16	180
						Without Project AAHUs:	**3.631**							**With Project AAHUs:**	**4.008**
														Net AAHUs:	**0.377**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.470	0.470	13	13	6		0	1	0.470	0.470	13	13	6
1	5	0.470	0.470	13	13	24		1	5	0.470	0.470	13	13	24
5	50	0.470	0.207	13	13	198	2.693	5	50	0.470	0.470	13	13	276
						Without Project AAHUs:	**5**							**With Project AAHUs:**	**6**
														Net AAHUs:	**2**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.778	0.778	134	134	104		0	1	0.778	0.778	134	134	104
1	5	0.778	0.778	134	134	417		1	5	0.778	0.941	134	134	461
5	50	0.778	0.641	134	134	4,279	85.89	5	50	0.941	0.941	134	134	5,677
						Without Project AAHUs:	**96**							**With Project AAHUs:**	**125**
														Net AAHUs:	**29**

Fire Island to Montauk Point, NY Reformulation Study

T-9 Georgica Pond

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.752	0.752	184	184	138		0	1	0.752	0.752	184	184	138
1	5	0.752	0.752	184	184	553		1	5	0.752	0.882	184	184	600
5	50	0.752	0.591	184	184	5,549	108.5	5	50	0.882	0.882	184	184	7,289
						Without Project AAHUs: **125**								**With Project AAHUs:** **161**
														Net AAHUs: **36**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.473	0.473	90	90	43		0	1	0.473	0.473	90	90	43
1	5	0.473	0.473	90	90	170		1	5	0.473	0.473	90	90	170
5	50	0.473	0.302	90	90	1,566	27.09	5	50	0.473	0.473	90	90	1,913
						Without Project AAHUs: **36**								**With Project AAHUs:** **43**
														Net AAHUs: **7**

Total No-Action AAHUs	**308.66**	**Total With-Action AAHUs**	**398.76**
		Net AAHUs	**90**

Fire Island to Montauk Point, NY Reformulation Study

T-22 Islip Meadows

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0**							**With Project AAHUs:** **0**
														Net AAHUs: **0**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0.000**							**With Project AAHUs:** **0.000**
														Net AAHUs: **0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0**							**With Project AAHUs:** **0**
														Net AAHUs: **0**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.609	0.609	45	45	27		0	1	0.609	0.609	45	45	27
1	5	0.609	0.609	45	45	109		1	5	0.609	0.700	45	45	117
5	50	0.609	0.465	45	45	1,081	20.8	5	50	0.700	0.700	45	45	1,409
						Without Project AAHUs:	**24**							**With Project AAHUs:** **31**
														Net AAHUs: **7**

Fire Island to Montauk Point, NY Reformulation Study

T-22 Islip Meadows

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.485	0.485	11	11	6		0	1	0.485	0.485	11	11	6
1	5	0.485	0.485	11	11	22		1	5	0.485	0.485	11	11	22
5	50	0.485	0.297	11	11	202	3.402	5	50	0.485	0.485	11	11	250
						Without Project AAHUs:	**5**							**With Project AAHUs:**	**6**
														Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.783	0.783	12	12	9		0	1	0.783	0.783	12	12	9
1	5	0.783	0.783	12	12	37		1	5	0.783	0.783	12	12	37
5	50	0.783	0.523	12	11	330	5.539	5	50	0.783	0.783	12	12	415
						Without Project AAHUs:	**8**							**With Project AAHUs:**	**9**
														Net AAHUs:	**2**

Total No-Action AAHUs	**36.44**	**Total With-Action AAHUs**	**45.83**
		Net AAHUs	**9**

Fire Island to Montauk Point, NY Reformulation Study

T-23 Seatuck Refuge

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:							**With Project AAHUs:**	**0**
													Net AAHUs:	**0**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:							**With Project AAHUs:**	**0.000**
													Net AAHUs:	**0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:							**With Project AAHUs:**	**0**
													Net AAHUs:	**0**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.609	0.609	85	85	52		0	1	0.609	0.609	85	85	52
1	5	0.609	0.609	85	85	208		1	5	0.609	0.700	85	91	231
5	50	0.609	0.465	85	85	2,059	39.64	5	50	0.700	0.700	91	91	2,869
						Without Project AAHUs:							**With Project AAHUs:**	**63**
													Net AAHUs:	**17**

Fire Island to Montauk Point, NY Reformulation Study

T-23 Seatuck Refuge

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.485	0.485	55	55	27		0	1	0.485	0.485	55	55	27
1	5	0.485	0.485	55	55	108		1	5	0.485	0.485	55	55	108
5	50	0.485	0.297	55	55	975	16.44	5	50	0.485	0.485	55	55	1,209
						Without Project AAHUs:	**22**							**With Project AAHUs:**	**27**
														Net AAHUs:	**5**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.783	0.783	78	78	61		0	1	0.783	0.783	78	78	61
1	5	0.783	0.783	78	78	245		1	5	0.783	0.783	78	78	245
5	50	0.783	0.523	78	70	2,190	36.79	5	50	0.783	0.783	78	78	2,754
						Without Project AAHUs:	**50**							**With Project AAHUs:**	**61**
														Net AAHUs:	**11**

Total No-Action AAHUs	**118.47**	**Total With-Action AAHUs**	**151.11**
		Net AAHUs	**33**

Fire Island to Montauk Point, NY Reformulation Study

T-24 Davis Park

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	261	261	149	149.4	0	1	0.572	0.572	261	261	149
1	5	0.572	0.572	261	261	598		1	5	0.572	0.572	261	261	598
5	50	0.572	0.509	261	235	6,041	119.6	5	50	0.572	0.572	261	261	6,723
						Without Project AAHUs:	**136**							**With Project AAHUs:**	**149**
														Net AAHUs:	**14**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.370	0.370	10	10	4		0	1	0.370	0.370	10	10	4
1	5	0.370	0.370	10	10	14		1	5	0.370	0.463	10	10	16
5	50	0.370	0.328	10	9	146	2.882	5	50	0.463	0.463	10	10	203
						Without Project AAHUs:	**3.278**							**With Project AAHUs:**	**4.467**
														Net AAHUs:	**1.189**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.434	0.434	5	5	2		0	1	0.434	0.434	5	5	2
1	5	0.434	0.434	5	5	8		1	5	0.434	0.566	5	6	11
5	50	0.434	0.208	5	4	66	0.901	5	50	0.566	0.566	6	6	148
						Without Project AAHUs:	**2**							**With Project AAHUs:**	**3**
														Net AAHUs:	**2**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.153	0.153	8	8	1		0	1	0.153	0.153	8	8	1
1	5	0.153	0.153	8	8	5		1	5	0.153	0.153	8	8	5
5	50	0.153	0.101	8	8	43	0.768	5	50	0.153	0.153	8	8	52
						Without Project AAHUs:	**1**							**With Project AAHUs:**	**1**
														Net AAHUs:	**0**

Fire Island to Montauk Point, NY Reformulation Study

T-24 Davis Park

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.529	0.529	58	58	31		0	1	0.529	0.529	58	58	31
1	5	0.529	0.529	58	58	124		1	5	0.529	0.529	58	58	124
5	50	0.529	0.444	58	58	1,281	25.98	5	50	0.529	0.529	58	58	1,392
						Without Project AAHUs:	**29**							**With Project AAHUs:**	**31**
														Net AAHUs:	**2**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.187	1	1	0		0	1	0.187	0.187	1	1	0
1	5	0.187	0.187	1	1	1		1	5	0.187	0.187	1	1	1
5	50	0.187	0.068	1	1	4	0.05	5	50	0.187	0.187	1	1	7
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
														Net AAHUs:	**0**

Total No-Action AAHUs	**170.37**	**Total With-Action AAHUs**	**189.33**
		Net AAHUs	**19**

Fire Island to Montauk Point, NY Reformulation Study

T-25 Atlantique to Cornielle

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	112	112	64	63.92	0	1	0.572	0.572	112	112	64
1	5	0.572	0.572	112	112	256		1	5	0.572	0.572	112	112	256
5	50	0.572	0.509	112	101	2,585	51.19	5	50	0.572	0.572	112	112	2,877
						Without Project AAHUs:	**58**							**With Project AAHUs:**	**64**
														Net AAHUs:	**6**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.370	0.370	6	6	2		0	1	0.370	0.370	6	6	2
1	5	0.370	0.370	6	6	8		1	5	0.370	0.370	6	6	8
5	50	0.370	0.328	6	5	82	1.625	5	50	0.370	0.370	6	6	92
						Without Project AAHUs:	**1.849**							**With Project AAHUs:**	**2.038**
														Net AAHUs:	**0.189**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.434	0.434	9	9	4		0	1	0.434	0.434	9	9	4
1	5	0.434	0.434	9	9	15		1	5	0.153	0.434	9	9	10
5	50	0.434	0.208	9	8	120	1.627	5	50	0.434	0.434	9	9	169
						Without Project AAHUs:	**3**							**With Project AAHUs:**	**4**
														Net AAHUs:	**1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.153	0.153	4	4	1		0	1	0.153	0.153	4	4	1
1	5	0.153	0.153	4	4	2		1	5	0.153	0.153	4	6	3
5	50	0.153	0.101	4	4	22	0.388	5	50	0.153	0.153	6	6	42
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**1**
														Net AAHUs:	**0**

Fire Island to Montauk Point, NY Reformulation Study

T-25 Atlantique to Cornielle

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.529	0.529	27	27	14		0	1	0.529	0.529	27	27	14
1	5	0.529	0.529	27	27	58		1	5	0.529	0.529	27	25	55
5	50	0.529	0.444	27	27	597	12.11	5	50	0.529	0.529	25	25	593
						Without Project AAHUs:	**13**							**With Project AAHUs:**	**13**
														Net AAHUs:	**0**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.187	16	16	3		0	1	0.187	0.187	16	16	3
1	5	0.187	0.187	16	16	12		1	5	0.187	0.187	16	16	12
5	50	0.187	0.068	16	14	87	0.97	5	50	0.187	0.187	16	16	133
						Without Project AAHUs:	**2**							**With Project AAHUs:**	**3**
														Net AAHUs:	**1**

Total No-Action AAHUs	**78.62**	**Total With-Action AAHUs**	**86.75**
		Net AAHUs	**8**

Fire Island to Montauk Point, NY Reformulation Study

T-26 Kismet

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	65	65	37	37	0	1	0.572	0.572	65	65	37
1	5	0.572	0.572	65	65	148		1	5	0.572	0.572	65	63	146
5	50	0.572	0.509	65	58	1,496	29.63	5	50	0.572	0.572	63	63	1,610
						Without Project AAHUs:	**34**							**With Project AAHUs:**	**36**
														Net AAHUs:	**2**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.370	0.370	2	2	1		0	1	0.370	0.370	2	2	1
1	5	0.370	0.370	2	2	3		1	5	0.370	0.615	2	4	6
5	50	0.370	0.328	2	2	31	0.608	5	50	0.615	0.615	4	4	116
						Without Project AAHUs:	**0.691**							**With Project AAHUs:**	**2.467**
														Net AAHUs:	**1.776**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.434	0.434	2	2	1		0	1	0.434	0.434	2	2	1
1	5	0.434	0.434	2	2	4		1	5	0.434	0.582	2	2	5
5	50	0.434	0.208	2	2	32	0.435	5	50	0.582	0.582	2	2	62
						Without Project AAHUs:	**1**							**With Project AAHUs:**	**1**
														Net AAHUs:	**1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.153	0.153	1	1	0		0	1	0.153	0.153	1	1	0
1	5	0.153	0.153	1	1	1		1	5	0.153	0.153	1	1	1
5	50	0.153	0.101	1	1	6	0.101	5	50	0.153	0.153	1	1	7
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
														Net AAHUs:	**0**

Fire Island to Montauk Point, NY Reformulation Study

T-26 Kismet

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.529	0.529	15	15	8		0	1	0.529	0.529	15	15	8
1	5	0.529	0.529	15	15	32		1	5	0.529	0.529	15	15	32
5	50	0.529	0.444	15	15	330	6.686	5	50	0.529	0.529	15	15	358
						Without Project AAHUs:	**7**							**With Project AAHUs:**	**8**
														Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.187	6	6	1		0	1	0.187	0.187	6	6	1
1	5	0.187	0.187	6	6	4		1	5	0.187	0.187	6	6	4
5	50	0.187	0.068	6	5	33	0.37	5	50	0.187	0.187	6	6	50
						Without Project AAHUs:	**1**							**With Project AAHUs:**	**1**
														Net AAHUs:	**0**

Total No-Action AAHUs	**43.34**	**Total With-Action AAHUs**	**48.90**
		Net AAHUs	**6**

Fire Island to Montauk Point, NY Reformulation Study

T-27 Warner Island East

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0**							**With Project AAHUs:** **0**
														Net AAHUs: **0**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0.000**							**With Project AAHUs:** **0.000**
														Net AAHUs: **0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.618	0	6	5
5	50	0.000	0.000	0	0	0	0	5	50	0.618	0.618	6	6	161
						Without Project AAHUs:	**0**							**With Project AAHUs:** **3**
														Net AAHUs: **3**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.914	0.914	2	2	2		0	1	0.914	0.914	2	2	2
1	5	0.914	0.914	2	2	8		1	5	0.914	0.914	2	5	13
5	50	0.914	0.749	2	2	85	1.692	5	50	0.914	0.914	5	5	197
						Without Project AAHUs:	**2**							**With Project AAHUs:** **4**
														Net AAHUs: **2**

Fire Island to Montauk Point, NY Reformulation Study

T-27 Warner Island East

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.497	0.497	28	28	14		0	1	0.497	0.497	28	28	14
1	5	0.497	0.497	28	28	56		1	5	0.497	0.497	28	20	48
5	50	0.497	0.313	28	28	514	8.836	5	50	0.497	0.497	20	20	445
						Without Project AAHUs:	**12**							**With Project AAHUs:**	**10**
														Net AAHUs:	**-2**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
														Net AAHUs:	**0**

Total No-Action AAHUs	**13.59**	**Total With-Action AAHUs**	**17.68**
		Net AAHUs	**4**

Fire Island to Montauk Point, NY Reformulation Study

T-28 Atlantique

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	46	46	26	26.41	0	1	0.572	0.572	46	46	26
1	5	0.572	0.572	46	46	106		1	5	0.572	0.572	46	45	105
5	50	0.572	0.509	46	42	1,068	21.15	5	50	0.572	0.572	45	45	1,164
						Without Project AAHUs:	**24.003**							**With Project AAHUs:**	**25.904**
														Net AAHUs:	**1.901**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.370	0.370	2	2	1		0	1	0.370	0.370	2	2	1
1	5	0.370	0.370	2	2	3		1	5	0.370	0.615	2	3	5
5	50	0.370	0.328	2	2	30	0.599	5	50	0.615	0.615	3	3	82
						Without Project AAHUs:	**0.675**							**With Project AAHUs:**	**1.759**
														Net AAHUs:	**1.084**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.434	0.434	2	2	1		0	1	0.434	0.434	2	2	1
1	5	0.434	0.434	2	2	3		1	5	0.434	0.582	2	2	3
5	50	0.434	0.208	2	1	22	0.304	5	50	0.582	0.582	2	2	44
						Without Project AAHUs:	**0.518**							**With Project AAHUs:**	**0.956**
														Net AAHUs:	**0.438**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.153	0.153	1	1	0		0	1	0.153	0.153	1	1	0
1	5	0.153	0.153	1	1	1		1	5	0.153	0.153	1	1	1
5	50	0.153	0.101	1	1	8	0.143	5	50	0.153	0.153	1	1	10
						Without Project AAHUs:	**0.183**							**With Project AAHUs:**	**0.215**
														Net AAHUs:	**0.033**

Fire Island to Montauk Point, NY Reformulation Study

T-28 Atlantique

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.529	0.529	12	12	6		0	1	0.529	0.529	12	12	6
1	5	0.529	0.529	12	12	25		1	5	0.529	0.529	12	12	25
5	50	0.529	0.444	12	12	261	5.305	5	50	0.529	0.529	12	12	284
						Without Project AAHUs:	**5.862**							**With Project AAHUs:**	**6.317**
														Net AAHUs:	**0.456**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.187	1	1	0		0	1	0.187	0.187	1	1	0
1	5	0.187	0.187	1	1	0		1	5	0.187	0.187	1	1	0
5	50	0.187	0.068	1	1	3	0.036	5	50	0.187	0.187	1	1	5
						Without Project AAHUs:	**0.075**							**With Project AAHUs:**	**0.108**
														Net AAHUs:	**0.034**

Total No-Action AAHUs	**31.31**	**Total With-Action AAHUs**	**35.26**
		Net AAHUs	**4**

Fire Island to Montauk Point, NY Reformulation Study

T-29 Fair Harbor

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	51	51	29	29.14	0	1	0.572	0.572	51	51	29
1	5	0.572	0.572	51	51	117		1	5	0.572	0.572	51	50	116
5	50	0.572	0.509	51	46	1,178	23.33	5	50	0.572	0.572	50	50	1,296
						Without Project AAHUs:	**26.475**							**With Project AAHUs:**	**28.829**
														Net AAHUs:	**2.354**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.370	0.370	3	3	1		0	1	0.370	0.370	3	3	1
1	5	0.370	0.370	3	3	4		1	5	0.370	0.615	3	3	6
5	50	0.370	0.328	3	2	39	0.776	5	50	0.615	0.615	3	3	88
						Without Project AAHUs:	**0.882**							**With Project AAHUs:**	**1.901**
														Net AAHUs:	**1.018**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.434	0.434	1	1	0		0	1	0.434	0.434	1	1	0
1	5	0.434	0.434	1	1	1		1	5	0.434	0.582	1	1	1
5	50	0.434	0.208	1	1	8	0.114	5	50	0.582	0.582	1	1	16
						Without Project AAHUs:	**0.195**							**With Project AAHUs:**	**0.349**
														Net AAHUs:	**0.154**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.153	0.153	2	2	0		0	1	0.153	0.153	2	2	0
1	5	0.153	0.153	2	2	1		1	5	0.153	0.153	2	2	1
5	50	0.153	0.101	2	2	10	0.17	5	50	0.153	0.153	2	2	12
						Without Project AAHUs:	**0.217**							**With Project AAHUs:**	**0.256**
														Net AAHUs:	**0.039**

Fire Island to Montauk Point, NY Reformulation Study

T-29 Fair Harbor

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.529	0.529	11	11	6		0	1	0.529	0.529	11	11	6
1	5	0.529	0.529	11	11	23		1	5	0.529	0.529	11	11	23
5	50	0.529	0.444	11	11	243	4.927	5	50	0.529	0.529	11	11	264
						Without Project AAHUs:	**5.444**							**With Project AAHUs:**	**5.867**
														Net AAHUs:	**0.423**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.187	0	0	0		0	1	0.187	0.187	0	0	0
1	5	0.187	0.187	0	0	0		1	5	0.187	0.187	0	0	0
5	50	0.187	0.068	0	0	2	0.022	5	50	0.187	0.187	0	0	3
						Without Project AAHUs:	**0.046**							**With Project AAHUs:**	**0.067**
														Net AAHUs:	**0.021**

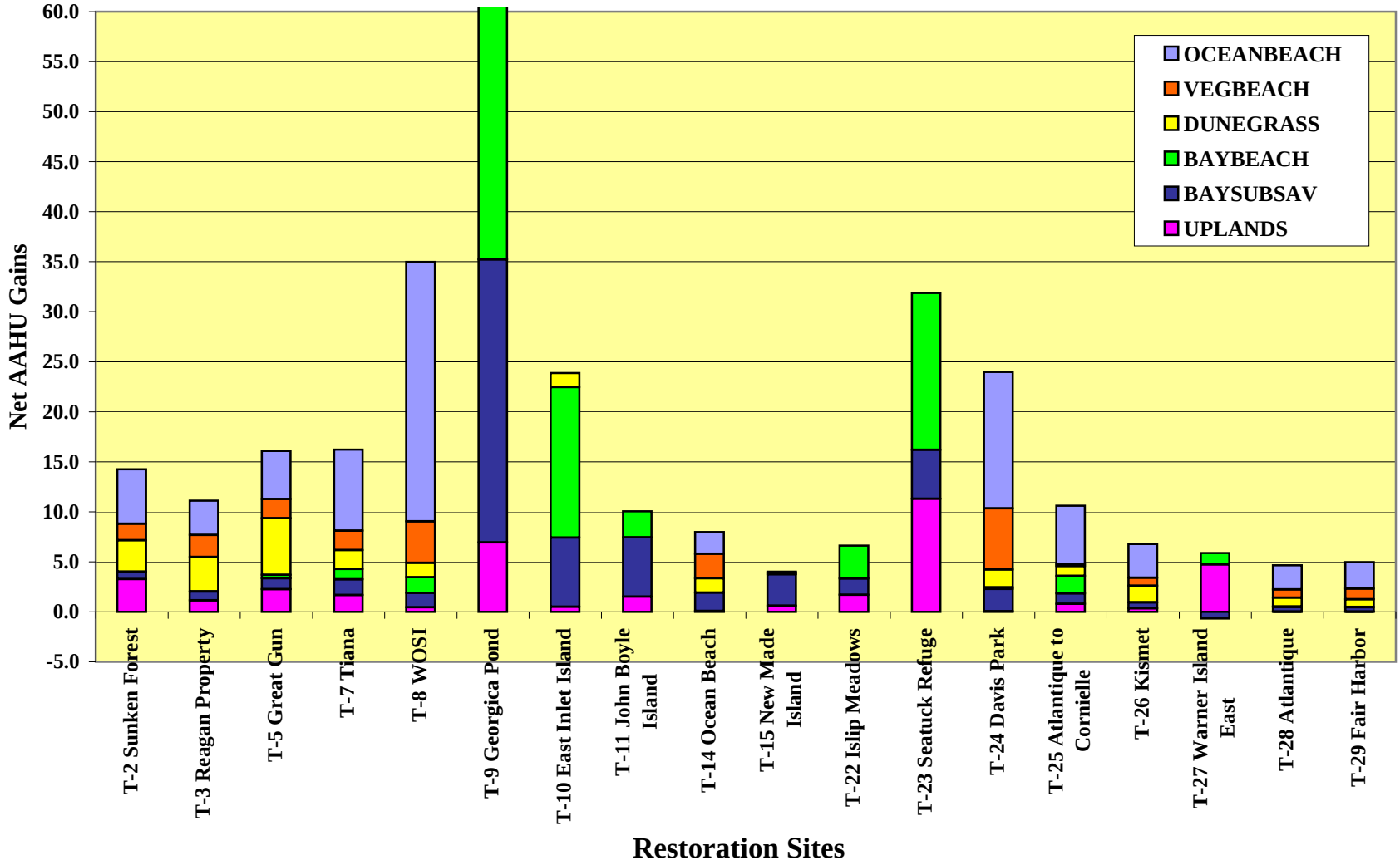
Total No-Action AAHUs	**33.26**	**Total With-Action AAHUs**	**37.27**
		Net AAHUs	**4**

Restoration Alternative 1 AAHUs per Transect and Per Community

RESTORATION	No-Action AAHUs	Alt 1 AAHUs	Net Gain in AAHUs	Average Annual Habitat Units (AAHUs)					
				OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS
T-2 Sunken Forest	83.35	94.93	12	5.7	0.2	1.3	0.8	0.7	2.8
T-3 Reagan Property	50.91	58.07	7	4.0	0.1	0.9	0.3	0.9	0.9
T-5 Great Gun	65.98	77.72	12	4.8	0.2	2.0	2.9	0.9	0.9
T-7 Tiana	65.50	82.86	17	8.0	1.8	2.0	3.1	1.6	1.0
T-8 WOSI	140.58	171.88	31	25.9	0.4	1.2	1.8	1.4	0.5
T-9 Georgica Pond	308.66	398.76	90	16.7	0.4	1.5	28.8	35.7	6.9
T-10 East Inlet Island	70.39	87.63	17			6.2	3.2	6.9	0.9
T-11 John Boyle Island	45.60	61.10	16			1.6	7.7	5.9	0.3
T-14 Ocean Beach	34.37	67.40	33	30.2	1.4	0.4	0.0	0.9	0.1
T-15 New Made Island	17.43	21.57	4			1.2	-0.4	3.1	0.2
T-22 Islip Meadows	36.44	45.83	9				6.7	1.0	1.7
T-23 Seatuck Refuge	118.47	151.11	33				16.7	4.7	11.3
T-24 Davis Park	170.37	189.33	19	13.6	1.2	1.7	0.2	2.2	0.0
T-25 Atlantique to Cornielle	78.62	86.75	8	5.8	0.2	0.9	0.4	-0.1	0.9
T-26 Kismet	43.34	48.90	6	2.2	1.8	0.6	0.0	0.6	0.3
T-27 Warner Island East	13.59	17.68	4			3.3	2.3	-1.5	0.0
T-28 Atlantique	31.31	35.26	4	1.9	1.1	0.4	0.0	0.5	0.0
T-29 Fair Harbor	33.26	37.27	4	2.4	1.0	0.2	0.0	0.4	0.0
Average			**22**	**10**	**1**	**2**	**4**	**4**	**2**

Habitats not applicable

Net AAHU Gains For Restoration Alternative 2



Fire Island to Montauk Point, NY Reformulation Study

T-2 Sunken Forest

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.545	0.545	109	109	59	59.11	0	1	0.545	0.545	109	109	59
1	5	0.545	0.545	109	109	236		1	5	0.545	0.545	109	108	235
5	50	0.545	0.477	109	98	2,373	46.6	5	50	0.545	0.545	109	108	2,647
						Without Project AAHUs:	**53**							**With Project AAHUs:** **59**
														Net AAHUs: **5**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.567	0.567	5	5	3		0	1	0.567	0.567	5	5	3
1	5	0.567	0.567	5	5	11		1	5	0.567	0.783	5	6	15
5	50	0.567	0.523	5	5	118	2.379	5	50	0.783	0.783	5	6	196
						Without Project AAHUs:	**2.641**							**With Project AAHUs:** **4.283**
														Net AAHUs: **1.642**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.687	0.687	8	8	6		0	1	0.687	0.687	8	8	6
1	5	0.687	0.687	8	8	23		1	5	0.687	0.877	8	9	28
5	50	0.687	0.388	8	8	195	2.953	5	50	0.877	0.877	8	9	348
						Without Project AAHUs:	**4**							**With Project AAHUs:** **8**
														Net AAHUs: **3**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.198	0.198	2	2	0		0	1	0.198	0.198	2	2	0
1	5	0.198	0.198	2	2	1		1	5	0.198	0.198	2	2	1
5	50	0.198	0.123	2	2	12	0.206	5	50	0.198	0.198	2	2	15
						Without Project AAHUs:	**0**							**With Project AAHUs:** **0**
														Net AAHUs: **0**

Fire Island to Montauk Point, NY Reformulation Study

T-2 Sunken Forest

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.638	0.638	22	22	14		0	1	0.638	0.638	22	22	14
1	5	0.638	0.638	22	22	57		1	5	0.638	0.638	22	22	57
5	50	0.638	0.513	22	25	606	12.6	5	50	0.638	0.638	22	22	641
						Without Project AAHUs:	**14**							**With Project AAHUs:**	**14**
														Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.783	0.783	15	15	12		0	1	0.783	0.783	15	15	12
1	5	0.783	0.783	15	15	47		1	5	0.783	0.783	15	16	49
5	50	0.783	0.423	15	14	393	5.768	5	50	0.783	0.783	15	16	554
						Without Project AAHUs:	**9**							**With Project AAHUs:**	**12**
														Net AAHUs:	**3**

Total No-Action AAHUs	**83.35**	**Total With-Action AAHUs**	**97.61**
		Net AAHUs	**14**

Fire Island to Montauk Point, NY Reformulation Study

T-3 Reagan

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	77	77	44	43.73	0	1	0.572	0.572	77	77	44
1	5	0.572	0.572	77	77	175		1	5	0.572	0.572	77	75	174
5	50	0.572	0.509	77	69	1,768	35.02	5	50	0.572	0.572	75	75	1,940
						Without Project AAHUs:	**39.7**							**With Project AAHUs:**	**43**
														Net AAHUs:	**3**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.396	0.396	4	4	1		0	1	0.396	0.396	4	4	1
1	5	0.396	0.396	4	4	6		1	5	0.396	0.775	4	5	10
5	50	0.396	0.353	4	3	59	1.17	5	50	0.775	0.775	5	5	166
						Without Project AAHUs:	**1.326**							**With Project AAHUs:**	**3.543**
														Net AAHUs:	**2.216**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.443	0.443	8	8	3		0	1	0.443	0.443	8	8	3
1	5	0.443	0.443	8	8	14		1	5	0.443	0.775	8	8	19
5	50	0.443	0.216	8	7	112	1.536	5	50	0.775	0.775	8	8	277
						Without Project AAHUs:	**3**							**With Project AAHUs:**	**6**
														Net AAHUs:	**3**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.209	0.209	1	1	0		0	1	0.209	0.209	1	1	0
1	5	0.209	0.209	1	1	1		1	5	0.209	0.209	1	1	1
5	50	0.209	0.127	1	1	6	0.105	5	50	0.209	0.209	1	1	8
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
														Net AAHUs:	**0**

Fire Island to Montauk Point, NY Reformulation Study

T-3 Reagan

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.347	0.347	16	16	5		0	1	0.347	0.347	16	16	5
1	5	0.347	0.347	16	16	22		1	5	0.347	0.347	16	16	22
5	50	0.347	0.197	16	17	201	3.392	5	50	0.347	0.347	16	16	245
						Without Project AAHUs:	**5**							**With Project AAHUs:**	**5**
														Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.673	0.673	5	5	3		0	1	0.673	0.673	5	5	3
1	5	0.673	0.673	5	5	14		1	5	0.673	0.673	5	6	14
5	50	0.673	0.318	5	5	110	1.484	5	50	0.673	0.673	6	6	167
						Without Project AAHUs:	**3**							**With Project AAHUs:**	**4**
														Net AAHUs:	**1**

Total No-Action AAHUs	**50.91**	**Total With-Action AAHUs**	**62.01**
		Net AAHUs	**11**

Fire Island to Montauk Point, NY Reformulation Study

T-5 Great Gun

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.545	0.545	91	91	50	49.57	0	1	0.545	0.545	91	91	50
1	5	0.545	0.545	91	91	198		1	5	0.545	0.545	91	91	198
5	50	0.545	0.477	91	82	1,990	39.08	5	50	0.545	0.545	91	91	2,231
						Without Project AAHUs:	**45**							**With Project AAHUs:**	**50**
														Net AAHUs:	**5**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.483	0.483	6	6	3		0	1	0.483	0.483	6	6	3
1	5	0.483	0.483	6	6	12		1	5	0.483	0.767	6	6	16
5	50	0.483	0.453	6	6	128	2.603	5	50	0.767	0.767	6	6	220
						Without Project AAHUs:	**2.865**							**With Project AAHUs:**	**4.783**
														Net AAHUs:	**1.918**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.564	0.564	14	14	8		0	1	0.564	0.564	14	14	8
1	5	0.564	0.564	14	14	32		1	5	0.564	0.783	14	15	40
5	50	0.564	0.288	14	13	261	3.691	5	50	0.783	0.783	15	15	537
						Without Project AAHUs:	**6**							**With Project AAHUs:**	**12**
														Net AAHUs:	**6**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.243	0.243	11	11	3		0	1	0.243	0.243	11	11	3
1	5	0.243	0.243	11	11	11		1	5	0.243	0.243	11	11	11
5	50	0.243	0.196	11	10	104	1.953	5	50	0.243	0.243	11	11	121
						Without Project AAHUs:	**2**							**With Project AAHUs:**	**3**
														Net AAHUs:	**0**

Fire Island to Montauk Point, NY Reformulation Study

T-5 Great Gun

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.544	0.544	17	17	9		0	1	0.544	0.544	17	17	9
1	5	0.544	0.544	17	17	36		1	5	0.544	0.544	17	17	36
5	50	0.544	0.399	17	17	352	6.624	5	50	0.544	0.544	17	17	407
						Without Project AAHUs:	**8**							**With Project AAHUs:**	**9**
														Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.417	0.417	7	7	3		0	1	0.417	0.417	7	7	3
1	5	0.417	0.417	7	7	12		1	5	0.417	0.417	7	10	15
5	50	0.417	0.123	7	7	86	0.818	5	50	0.417	0.417	10	10	197
						Without Project AAHUs:	**2**							**With Project AAHUs:**	**4**
														Net AAHUs:	**2**

Total No-Action AAHUs	**65.98**	**Total With-Action AAHUs**	**82.07**
		Net AAHUs	**16**

Fire Island to Montauk Point, NY Reformulation Study

T-7 Tiana

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.558	0.558	86	86	48	48.03	0	1	0.558	0.558	86	86	48
1	5	0.558	0.558	86	86	192		1	5	0.558	0.572	86	86	194
5	50	0.558	0.424	86	77	1,811	32.82	5	50	0.572	0.572	86	86	2,214
						Without Project AAHUs:	**41**							**With Project AAHUs:** **49**
														Net AAHUs: **8**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.593	0.593	7	7	4		0	1	0.593	0.593	7	7	4
1	5	0.593	0.593	7	7	16		1	5	0.593	0.874	7	7	20
5	50	0.593	0.556	7	7	179	3.85	5	50	0.874	0.874	7	7	272
						Without Project AAHUs:	**3.989**							**With Project AAHUs:** **5.928**
														Net AAHUs: **1.939**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.703	0.703	6	6	4		0	1	0.703	0.703	6	6	4
1	5	0.703	0.703	6	6	17		1	5	0.703	0.877	6	6	19
5	50	0.703	0.440	6	6	150	2.423	5	50	0.877	0.877	6	6	243
						Without Project AAHUs:	**3**							**With Project AAHUs:** **5**
														Net AAHUs: **2**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.671	0.671	11	11	7		0	1	0.671	0.671	11	11	7
1	5	0.671	0.671	11	11	29		1	5	0.671	0.680	11	11	29
5	50	0.671	0.531	11	10	277	5.145	5	50	0.680	0.680	11	11	330
						Without Project AAHUs:	**6**							**With Project AAHUs:** **7**
														Net AAHUs: **1**

Fire Island to Montauk Point, NY Reformulation Study

T-7 Tiana

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.614	0.614	19	19	12		0	1	0.614	0.614	19	19	12
1	5	0.614	0.614	19	19	46		1	5	0.614	0.614	19	19	46
5	50	0.614	0.430	19	19	440	8.058	5	50	0.614	0.614	19	19	518
						Without Project AAHUs:	**10**							**With Project AAHUs:**	**12**
														Net AAHUs:	**2**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.350	0.350	4	4	1		0	1	0.350	0.350	4	4	1
1	5	0.350	0.350	4	4	6		1	5	0.350	0.602	4	4	8
5	50	0.350	0.023	4	4	34	0.089	5	50	0.602	0.602	4	4	116
						Without Project AAHUs:	**1**							**With Project AAHUs:**	**3**
														Net AAHUs:	**2**

Total No-Action AAHUs	**65.50**	**Total With-Action AAHUs**	**81.71**
		Net AAHUs	**16**

Fire Island to Montauk Point, NY Reformulation Study

T-8 WOSI (West of Shinnecock Inlet)

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.930	0.930	154	154	143	142.9	0	1	0.930	0.930	154	154	143
1	5	0.930	0.930	154	154	572		1	5	0.930	0.953	154	154	579
5	50	0.930	0.678	154	138	5,296	93.77	5	50	0.953	0.953	154	154	6,587
						Without Project AAHUs:	**120**							**With Project AAHUs:**	**146**
														Net AAHUs:	**26**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.458	0.458	9	9	4		0	1	0.458	0.458	9	9	4
1	5	0.458	0.458	9	9	17		1	5	0.458	0.892	9	9	25
5	50	0.458	0.397	9	8	168	3.27	5	50	0.892	0.892	9	9	368
						Without Project AAHUs:	**3.772**							**With Project AAHUs:**	**7.930**
														Net AAHUs:	**4.157**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.441	0.441	13	13	6		0	1	0.441	0.441	13	13	6
1	5	0.441	0.441	13	13	23		1	5	0.441	0.453	13	13	23
5	50	0.441	0.226	13	13	193	2.907	5	50	0.453	0.453	13	13	264
						Without Project AAHUs:	**4**							**With Project AAHUs:**	**6**
														Net AAHUs:	**1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.567	0.567	8	8	5		0	1	0.567	0.567	8	8	5
1	5	0.567	0.567	8	8	19		1	5	0.567	0.730	8	8	22
5	50	0.567	0.493	8	8	201	4.154	5	50	0.730	0.730	8	8	276
						Without Project AAHUs:	**4**							**With Project AAHUs:**	**6**
														Net AAHUs:	**2**

Fire Island to Montauk Point, NY Reformulation Study

T-8 WOSI (West of Shinnecock Inlet)

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.436	0.436	20	20	9		0	1	0.436	0.436	20	20	9
1	5	0.436	0.436	20	20	34		1	5	0.436	0.436	20	20	34
5	50	0.436	0.274	20	20	314	5.39	5	50	0.436	0.436	20	20	385
						Without Project AAHUs:	**7**							**With Project AAHUs:**	**9**
														Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.217	0.217	5	5	1		0	1	0.217	0.217	5	5	1
1	5	0.217	0.217	5	5	4		1	5	0.217	0.217	5	5	4
5	50	0.217	0.000	5	4	22	0	5	50	0.217	0.217	5	5	45
						Without Project AAHUs:	**1**							**With Project AAHUs:**	**1**
														Net AAHUs:	**0**

Total No-Action AAHUs	**140.58**	**Total With-Action AAHUs**	**175.56**
		Net AAHUs	**35**

Fire Island to Montauk Point, NY Reformulation Study

T-10 East Inlet Island

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:								**With Project AAHUs:**	**0**
														Net AAHUs:	**0**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:								**With Project AAHUs:**	**0.000**
														Net AAHUs:	**0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.385	0.385	11	11	4		0	1	0.385	0.385	11	11	4
1	5	0.385	0.385	11	11	18		1	5	0.385	0.385	11	11	18
5	50	0.385	0.168	11	9	127	1.439	5	50	0.385	0.385	11	11	198
						Without Project AAHUs:								**With Project AAHUs:**	**4**
														Net AAHUs:	**1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.526	0.526	67	67	35		0	1	0.526	0.526	67	67	35
1	5	0.526	0.526	67	67	142		1	5	0.526	0.713	67	67	167
5	50	0.526	0.399	67	71	1,435	28.19	5	50	0.713	0.713	67	67	2,162
						Without Project AAHUs:								**With Project AAHUs:**	**47**
														Net AAHUs:	**15**

Fire Island to Montauk Point, NY Reformulation Study

T-10 East Inlet Island

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.497	0.497	83	83	42		0	1	0.497	0.497	83	83	42
1	5	0.497	0.497	83	83	166		1	5	0.497	0.497	83	83	166
5	50	0.497	0.313	83	83	1,523	26.15	5	50	0.497	0.497	83	83	1,868
						Without Project AAHUs:	**35**						**With Project AAHUs:**	**42**
													Net AAHUs:	**7**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.452	0.452	2	2	1		0	1	0.452	0.452	2	2	1
1	5	0.452	0.452	2	2	4		1	5	0.452	0.452	2	2	4
5	50	0.452	0.148	2	1	24	0.124	5	50	0.452	0.452	2	2	49
						Without Project AAHUs:	**1**						**With Project AAHUs:**	**1**
													Net AAHUs:	**1**

Total No-Action AAHUs	**70.39**	**Total With-Action AAHUs**	**94.27**
		Net AAHUs	**24**

Fire Island to Montauk Point, NY Reformulation Study

T-11 John Boyle Island

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0**							**With Project AAHUs:** **0**
														Net AAHUs: **0**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0.000**							**With Project AAHUs:** **0.000**
														Net AAHUs: **0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.385	0.385	3	3	1		0	1	0.385	0.385	3	3	1
1	5	0.385	0.385	3	3	4		1	5	0.385	0.418	3	2	4
5	50	0.385	0.168	3	2	32	0.367	5	50	0.418	0.418	2	2	33
						Without Project AAHUs:	**1**							**With Project AAHUs:** **1**
														Net AAHUs: **0**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.526	0.526	31	31	17		0	1	0.526	0.526	31	31	17
1	5	0.526	0.526	31	31	66		1	5	0.526	0.564	31	31	68
5	50	0.526	0.399	31	33	668	13.13	5	50	0.564	0.564	31	31	796
						Without Project AAHUs:	**15**							**With Project AAHUs:** **18**
														Net AAHUs: **3**

Fire Island to Montauk Point, NY Reformulation Study

T-11 John Boyle Island

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.497	0.497	72	72	36		0	1	0.497	0.497	72	72	36
1	5	0.497	0.497	72	72	142		1	5	0.497	0.497	72	72	142
5	50	0.497	0.313	72	72	1,304	22.4	5	50	0.497	0.497	72	72	1,601
						Without Project AAHUs:	**30**							**With Project AAHUs:**	**36**
														Net AAHUs:	**6**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.452	0.452	1	1	0		0	1	0.452	0.452	1	1	0
1	5	0.452	0.452	1	1	1		1	5	0.452	0.952	1	2	4
5	50	0.452	0.148	1	0	7	0.037	5	50	0.952	0.952	2	2	81
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**2**
														Net AAHUs:	**2**

Total No-Action AAHUs	**45.60**	**Total With-Action AAHUs**	**55.63**
		Net AAHUs	**10**

Fire Island to Montauk Point, NY Reformulation Study

T-14 Ocean Beach

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.239	0.239	93	93	22	22.29	0	1	0.239	0.239	93	93	22
1	5	0.239	0.239	93	93			1	5	0.239	0.239	93	91	88
5	50	0.239	0.240	93	84	956	20.19	5	50	0.239	0.239	91	91	977
						Without Project AAHUs:	**20**							**With Project AAHUs:**	**22**
														Net AAHUs:	**2**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.220	0.220	4	4	1		0	1	0.220	0.220	4	4	1
1	5	0.220	0.220	4	4			1	5	0.220	0.532	4	6	8
5	50	0.220	0.178	4	4	33	0.627	5	50	0.532	0.532	6	6	147
						Without Project AAHUs:	**0.685**							**With Project AAHUs:**	**3.116**
														Net AAHUs:	**2.431**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.434	0.434	3	3	1		0	1	0.434	0.434	3	3	1
1	5	0.434	0.434	3	3			1	5	0.434	0.670	3	4	7
5	50	0.434	0.208	3	3	44	0.593	5	50	0.670	0.670	4	4	108
						Without Project AAHUs:	**1**							**With Project AAHUs:**	**2**
														Net AAHUs:	**1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.153	0.153	0	0	0		0	1	0.153	0.153	0	0	0
1	5	0.153	0.153	0	0			1	5	0.153	0.153	0	0	0
5	50	0.153	0.101	0	0	2	0.031	5	50	0.153	0.153	0	0	2
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
														Net AAHUs:	**0**

Fire Island to Montauk Point, NY Reformulation Study

T-14 Ocean Beach

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.529	0.529	23	23	12		0	1	0.529	0.529	23	23	12
1	5	0.529	0.529	23	23			1	5	0.529	0.529	23	23	48
5	50	0.529	0.444	23	23	497	10.08	5	50	0.529	0.529	23	23	540
						Without Project AAHUs:	**10**							**With Project AAHUs:**	**12**
														Net AAHUs:	**2**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.187	1	1	0		0	1	0.187	0.187	1	1	0
1	5	0.187	0.187	1	1			1	5	0.187	0.187	1	1	1
5	50	0.187	0.000	1	1	3	0	5	50	0.187	0.187	1	1	7
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
														Net AAHUs:	**0**

Total No-Action AAHUs	**31.43**	**Total With-Action AAHUs**	**39.40**
		Net AAHUs	**8**

Fire Island to Montauk Point, NY Reformulation Study

T-15 New Made Island

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0**							**With Project AAHUs:** **0**
														Net AAHUs: **0**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0.000**							**With Project AAHUs:** **0.000**
														Net AAHUs: **0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.318	0.318	1	1	0		0	1	0.318	0.318	1	1	0
1	5	0.318	0.318	1	1	1		1	5	0.318	0.352	1	1	1
5	50	0.318	0.165	1	0	6	0.075	5	50	0.352	0.352	1	1	10
						Without Project AAHUs:	**0**							**With Project AAHUs:** **0**
														Net AAHUs: **0**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.462	0.462	3	3	2		0	1	0.462	0.462	3	3	2
1	5	0.462	0.462	3	3	6		1	5	0.462	0.499	3	3	6
5	50	0.462	0.384	3	3	64	1.319	5	50	0.499	0.499	3	3	73
						Without Project AAHUs:	**1**							**With Project AAHUs:** **2**
														Net AAHUs: **0**

Fire Island to Montauk Point, NY Reformulation Study

T-15 New Made Island

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.497	0.497	38	38	19		0	1	0.497	0.497	38	38	19
1	5	0.497	0.497	38	38	75		1	5	0.497	0.497	38	38	75
5	50	0.497	0.313	38	38	689	11.83	5	50	0.497	0.497	38	38	845
						Without Project AAHUs:	**16**							**With Project AAHUs:**	**19**
														Net AAHUs:	**3**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.452	0.452	1	1	0		0	1	0.452	0.452	1	1	0
1	5	0.452	0.452	1	1	2		1	5	0.452	0.952	1	1	3
5	50	0.452	0.148	1	0	9	0.047	5	50	0.952	0.952	1	1	39
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**1**
														Net AAHUs:	**1**

Total No-Action AAHUs	**17.43**	**Total With-Action AAHUs**	**21.45**
		Net AAHUs	**4**

Fire Island to Montauk Point, NY Reformulation Study

T-22 Islip Meadows

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0**							**With Project AAHUs:** **0**
														Net AAHUs: **0**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0.000**							**With Project AAHUs:** **0.000**
														Net AAHUs: **0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0**							**With Project AAHUs:** **0**
														Net AAHUs: **0**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.609	0.609	45	45	27		0	1	0.609	0.609	45	45	27
1	5	0.609	0.609	45	45	109		1	5	0.609	0.638	45	43	110
5	50	0.609	0.465	45	45	1,081	20.8	5	50	0.638	0.638	43	43	1,245
						Without Project AAHUs:	**24**							**With Project AAHUs:** **28**
														Net AAHUs: **3**

Fire Island to Montauk Point, NY Reformulation Study

T-22 Islip Meadows

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.485	0.485	11	11	6		0	1	0.485	0.485	11	11	6
1	5	0.485	0.485	11	11	22		1	5	0.485	0.485	11	13	24
5	50	0.485	0.297	11	11	202	3.402	5	50	0.485	0.485	13	13	281
						Without Project AAHUs:	**5**							**With Project AAHUs:**	**6**
														Net AAHUs:	**2**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.783	0.783	12	12	9		0	1	0.783	0.783	12	12	9
1	5	0.783	0.783	12	12	37		1	5	0.783	0.783	12	12	37
5	50	0.783	0.523	12	11	330	5.539	5	50	0.783	0.783	12	12	415
						Without Project AAHUs:	**8**							**With Project AAHUs:**	**9**
														Net AAHUs:	**2**

Total No-Action AAHUs	**36.44**	**Total With-Action AAHUs**	**43.05**
		Net AAHUs	**7**

Fire Island to Montauk Point, NY Reformulation Study

T-9 Georgica Pond

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.173	0.173	351	351	61	60.75	0	1	0.173	0.173	351	351	61
1	5	0.173	0.173	351	351	243		1	5	0.173	0.173	351	351	243
5	50	0.173	0.068	351	351	1,900	23.7	5	50	0.173	0.173	351	351	2,734
						Without Project AAHUs:	**44**							**With Project AAHUs:**	**61**
														Net AAHUs:	**17**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.250	0.250	16	16	4		0	1	0.250	0.250	16	16	4
1	5	0.250	0.250	16	16	16		1	5	0.250	0.250	16	16	16
5	50	0.250	0.198	16	16	161	3.17	5	50	0.250	0.250	16	16	180
						Without Project AAHUs:	**3.631**							**With Project AAHUs:**	**4.008**
														Net AAHUs:	**0.377**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.470	0.470	13	13	6		0	1	0.470	0.470	13	13	6
1	5	0.470	0.470	13	13	24		1	5	0.470	0.470	13	13	24
5	50	0.470	0.207	13	13	198	2.693	5	50	0.470	0.470	13	13	276
						Without Project AAHUs:	**5**							**With Project AAHUs:**	**6**
														Net AAHUs:	**2**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.778	0.778	134	134	104		0	1	0.778	0.778	134	134	104
1	5	0.778	0.778	134	134	417		1	5	0.778	0.941	134	134	461
5	50	0.778	0.641	134	134	4,279	85.89	5	50	0.941	0.941	134	134	5,677
						Without Project AAHUs:	**96**							**With Project AAHUs:**	**125**
														Net AAHUs:	**29**

Fire Island to Montauk Point, NY Reformulation Study

T-9 Georgica Pond

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.752	0.752	184	184	138		0	1	0.752	0.752	184	184	138
1	5	0.752	0.752	184	184	553		1	5	0.752	0.839	184	184	584
5	50	0.752	0.591	184	184	5,549	108.5	5	50	0.839	0.839	184	184	6,932
						Without Project AAHUs: **125**								**With Project AAHUs:** **153**
														Net AAHUs: **28**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.473	0.473	90	90	43		0	1	0.473	0.473	90	90	43
1	5	0.473	0.473	90	90	170		1	5	0.473	0.473	90	90	170
5	50	0.473	0.302	90	90	1,566	27.09	5	50	0.473	0.473	90	90	1,913
						Without Project AAHUs: **36**								**With Project AAHUs:** **43**
														Net AAHUs: **7**

Total No-Action AAHUs	**308.66**	**Total With-Action AAHUs**	**391.31**
		Net AAHUs	**83**

Fire Island to Montauk Point, NY Reformulation Study

T-23 Seatuck Refuge

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0**						**With Project AAHUs:**	**0**
													Net AAHUs:	**0**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0.000**						**With Project AAHUs:**	**0.000**
													Net AAHUs:	**0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0**						**With Project AAHUs:**	**0**
													Net AAHUs:	**0**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.609	0.609	85	85	52		0	1	0.609	0.609	85	85	52
1	5	0.609	0.609	85	85	208		1	5	0.609	0.700	85	90	229
5	50	0.609	0.465	85	85	2,059	39.64	5	50	0.700	0.700	90	90	2,823
						Without Project AAHUs:	**46**						**With Project AAHUs:**	**62**
													Net AAHUs:	**16**

Fire Island to Montauk Point, NY Reformulation Study

T-23 Seatuck Refuge

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.485	0.485	55	55	27		0	1	0.485	0.485	55	55	27
1	5	0.485	0.485	55	55	108		1	5	0.485	0.485	55	56	108
5	50	0.485	0.297	55	55	975	16.44	5	50	0.485	0.485	55	56	1,219
						Without Project AAHUs:	**22**							**With Project AAHUs:**	**27**
														Net AAHUs:	**5**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.783	0.783	78	78	61		0	1	0.783	0.783	78	78	61
1	5	0.783	0.783	78	78	245		1	5	0.783	0.783	78	78	245
5	50	0.783	0.523	78	70	2,190	36.79	5	50	0.783	0.783	78	78	2,754
						Without Project AAHUs:	**50**							**With Project AAHUs:**	**61**
														Net AAHUs:	**11**

Total No-Action AAHUs	**118.47**	**Total With-Action AAHUs**	**150.34**
		Net AAHUs	**32**

Fire Island to Montauk Point, NY Reformulation Study

T-24 Davis Park

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	261	261	149	149.4	0	1	0.572	0.572	261	261	149
1	5	0.572	0.572	261	261	598		1	5	0.572	0.572	261	261	598
5	50	0.572	0.509	261	235	6,041	119.6	5	50	0.572	0.572	261	261	6,723
						Without Project AAHUs:	**136**							**With Project AAHUs:**	**149**
														Net AAHUs:	**14**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.370	0.370	10	10	4		0	1	0.370	0.370	10	10	4
1	5	0.370	0.370	10	10	14		1	5	0.370	1.000	10	10	27
5	50	0.370	0.328	10	9	146	2.882	5	50	1.000	1.000	10	10	440
						Without Project AAHUs:	**3.278**							**With Project AAHUs:**	**9.401**
														Net AAHUs:	**6.123**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.434	0.434	5	5	2		0	1	0.434	0.434	5	5	2
1	5	0.434	0.434	5	5	8		1	5	0.434	0.673	5	5	11
5	50	0.434	0.208	5	4	66	0.901	5	50	0.673	0.673	5	5	152
						Without Project AAHUs:	**2**							**With Project AAHUs:**	**3**
														Net AAHUs:	**2**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.153	0.153	8	8	1		0	1	0.153	0.153	8	8	1
1	5	0.153	0.153	8	8	5		1	5	0.153	0.153	8	8	5
5	50	0.153	0.101	8	8	43	0.768	5	50	0.153	0.153	8	8	52
						Without Project AAHUs:	**1**							**With Project AAHUs:**	**1**
														Net AAHUs:	**0**

Fire Island to Montauk Point, NY Reformulation Study

T-24 Davis Park

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.529	0.529	58	58	31		0	1	0.529	0.529	58	58	31
1	5	0.529	0.529	58	58	124		1	5	0.529	0.529	58	58	124
5	50	0.529	0.444	58	58	1,281	25.98	5	50	0.529	0.529	58	58	1,392
						Without Project AAHUs:	**29**							**With Project AAHUs:**	**31**
														Net AAHUs:	**2**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.187	1	1	0		0	1	0.187	0.187	1	1	0
1	5	0.187	0.187	1	1	1		1	5	0.187	0.187	1	1	1
5	50	0.187	0.068	1	1	4	0.05	5	50	0.187	0.187	1	1	7
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
														Net AAHUs:	**0**

Total No-Action AAHUs	**170.37**	**Total With-Action AAHUs**	**194.35**
		Net AAHUs	**24**

Fire Island to Montauk Point, NY Reformulation Study

T-25 Atlantique to Cornielle

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	112	112	64	63.92	0	1	0.572	0.572	112	112	64
1	5	0.572	0.572	112	112	256		1	5	0.572	0.572	112	112	256
5	50	0.572	0.509	112	101	2,585	51.19	5	50	0.572	0.572	112	112	2,877
						Without Project AAHUs:	**58**							**With Project AAHUs:**	**64**
														Net AAHUs:	**6**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.370	0.370	6	6	2		0	1	0.370	0.370	6	6	2
1	5	0.370	0.370	6	6	8		1	5	0.370	0.370	6	6	8
5	50	0.370	0.328	6	5	82	1.625	5	50	0.370	0.370	6	6	92
						Without Project AAHUs:	**1.849**							**With Project AAHUs:**	**2.038**
														Net AAHUs:	**0.189**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.434	0.434	9	9	4		0	1	0.434	0.434	9	9	4
1	5	0.434	0.434	9	9	15		1	5	0.434	0.434	9	9	15
5	50	0.434	0.208	9	8	120	1.627	5	50	0.434	0.434	9	9	169
						Without Project AAHUs:	**3**							**With Project AAHUs:**	**4**
														Net AAHUs:	**1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.153	0.153	4	4	1		0	1	0.153	0.153	4	4	1
1	5	0.153	0.153	4	4	2		1	5	0.153	0.465	4	5	6
5	50	0.153	0.101	4	4	22	0.388	5	50	0.465	0.465	5	5	106
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**2**
														Net AAHUs:	**2**

Fire Island to Montauk Point, NY Reformulation Study

T-25 Atlantique to Cornielle

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.529	0.529	27	27	14		0	1	0.529	0.529	27	27	14
1	5	0.529	0.529	27	27	58		1	5	0.529	0.529	27	27	58
5	50	0.529	0.444	27	27	597	12.11	5	50	0.529	0.529	27	27	649
						Without Project AAHUs:	**13**							**With Project AAHUs:**	**14**
														Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.187	16	16	3		0	1	0.187	0.187	16	16	3
1	5	0.187	0.187	16	16	12		1	5	0.187	0.187	16	15	11
5	50	0.187	0.068	16	14	87	0.97	5	50	0.187	0.187	16	15	127
						Without Project AAHUs:	**2**							**With Project AAHUs:**	**3**
														Net AAHUs:	**1**

Total No-Action AAHUs	**78.62**	**Total With-Action AAHUs**	**89.22**
		Net AAHUs	**11**

Fire Island to Montauk Point, NY Reformulation Study

T-26 Kismet

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	65	65	37	37	0	1	0.572	0.572	65	65	37
1	5	0.572	0.572	65	65	148		1	5	0.572	0.572	65	65	148
5	50	0.572	0.509	65	58	1,496	29.63	5	50	0.572	0.572	65	65	1,665
						Without Project AAHUs:	**34**							**With Project AAHUs:**	**37**
														Net AAHUs:	**3**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.370	0.370	2	2	1		0	1	0.370	0.370	2	2	1
1	5	0.370	0.370	2	2	3		1	5	0.370	0.707	2	2	4
1	50	0.370	0.328	2	2	33	0.608	1	50	0.707	0.707	2	2	71
						Without Project AAHUs:	**0.746**							**With Project AAHUs:**	**1.531**
														Net AAHUs:	**0.785**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.434	0.434	2	2	1		0	1	0.434	0.434	2	2	1
1	5	0.434	0.434	2	2	4		1	5	0.434	0.727	2	3	7
5	50	0.434	0.208	2	2	32	0.435	5	50	0.727	0.727	3	3	112
						Without Project AAHUs:	**1**							**With Project AAHUs:**	**2**
														Net AAHUs:	**2**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.153	0.153	1	1	0		0	1	0.153	0.153	1	1	0
1	5	0.153	0.153	1	1	1		1	5	0.153	0.153	1	1	1
5	50	0.153	0.101	1	1	6	0.101	5	50	0.153	0.153	1	1	7
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
														Net AAHUs:	**0**

Fire Island to Montauk Point, NY Reformulation Study

T-26 Kismet

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.529	0.529	15	15	8		0	1	0.529	0.529	15	15	8
1	5	0.529	0.529	15	15	32		1	5	0.529	0.529	15	15	32
5	50	0.529	0.444	15	15	330	6.686	5	50	0.529	0.529	15	15	358
						Without Project AAHUs:	**7**							**With Project AAHUs:**	**8**
														Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.187	6	6	1		0	1	0.187	0.187	6	6	1
1	5	0.187	0.187	6	6	4		1	5	0.187	0.187	6	6	4
5	50	0.187	0.068	6	5	33	0.37	5	50	0.187	0.187	6	6	50
						Without Project AAHUs:	**1**							**With Project AAHUs:**	**1**
														Net AAHUs:	**0**

Total No-Action AAHUs	**43.40**	**Total With-Action AAHUs**	**50.17**
		Net AAHUs	**7**

Fire Island to Montauk Point, NY Reformulation Study

T-27 Warner Island East

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0**							**With Project AAHUs:** **0**
														Net AAHUs: **0**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0.000**							**With Project AAHUs:** **0.000**
														Net AAHUs: **0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0**							**With Project AAHUs:** **0**
														Net AAHUs: **0**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.914	0.914	2	2	2		0	1	0.914	0.914	2	2	2
1	5	0.914	0.914	2	2	8		1	5	0.914	0.914	2	3	10
5	50	0.914	0.749	2	2	85	1.692	5	50	0.914	0.914	3	3	139
						Without Project AAHUs:	**2**							**With Project AAHUs:** **3**
														Net AAHUs: **1**

Fire Island to Montauk Point, NY Reformulation Study

T-27 Warner Island East

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.497	0.497	28	28	14		0	1	0.497	0.497	28	28	14
1	5	0.497	0.497	28	28	56		1	5	0.497	0.497	28	22	50
5	50	0.497	0.313	28	28	514	8.836	5	50	0.497	0.497	22	22	486
						Without Project AAHUs:	**12**							**With Project AAHUs:**	**11**
														Net AAHUs:	**-1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.952	0	5	7
5	50	0.000	0.000	0	0	0	0	5	50	0.952	0.952	5	5	230
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**5**
														Net AAHUs:	**5**

Total No-Action AAHUs	**13.59**	**Total With-Action AAHUs**	**18.76**
		Net AAHUs	**5**

Fire Island to Montauk Point, NY Reformulation Study

T-28 Atlantique

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	46	46	26	26.41	0	1	0.572	0.572	46	46	26
1	5	0.572	0.572	46	46	106		1	5	0.572	0.572	46	46	106
5	50	0.572	0.509	46	42	1,068	21.15	5	50	0.572	0.572	46	46	1,189
						Without Project AAHUs:	**24.003**							**With Project AAHUs:**	**26.415**
														Net AAHUs:	**2.412**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.370	0.370	2	2	1		0	1	0.370	0.370	2	2	1
1	5	0.370	0.370	2	2	3		1	5	0.370	0.707	2	2	4
1	50	0.370	0.328	2	2	30	0.599	1	50	0.707	0.707	2	2	70
						Without Project AAHUs:	**0.675**							**With Project AAHUs:**	**1.508**
														Net AAHUs:	**0.833**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.434	0.434	2	2	1		0	1	0.434	0.434	2	2	1
1	5	0.434	0.434	2	2	3		1	5	0.434	0.727	2	2	4
5	50	0.434	0.208	2	1	22	0.304	5	50	0.727	0.727	2	2	65
						Without Project AAHUs:	**0.518**							**With Project AAHUs:**	**1.400**
														Net AAHUs:	**0.882**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.153	0.153	1	1	0		0	1	0.153	0.153	1	1	0
1	5	0.153	0.153	1	1	1		1	5	0.153	0.153	1	1	1
5	50	0.153	0.101	1	1	8	0.143	5	50	0.153	0.153	1	1	10
						Without Project AAHUs:	**0.183**							**With Project AAHUs:**	**0.215**
														Net AAHUs:	**0.033**

Fire Island to Montauk Point, NY Reformulation Study

T-28 Atlantique

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.529	0.529	12	12	6		0	1	0.529	0.529	12	12	6
1	5	0.529	0.529	12	12	25		1	5	0.529	0.529	12	12	25
5	50	0.529	0.444	12	12	261	5.305	5	50	0.529	0.529	12	12	284
						Without Project AAHUs:	**5.862**							**With Project AAHUs:**	**6.317**
														Net AAHUs:	**0.456**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.187	1	1	0		0	1	0.187	0.187	1	1	0
1	5	0.187	0.187	1	1	0		1	5	0.187	0.187	1	1	0
5	50	0.187	0.068	1	1	3	0.036	5	50	0.187	0.187	1	1	5
						Without Project AAHUs:	**0.075**							**With Project AAHUs:**	**0.108**
														Net AAHUs:	**0.034**

Total No-Action AAHUs	**31.31**	**Total With-Action AAHUs**	**35.96**
		Net AAHUs	**5**

Fire Island to Montauk Point, NY Reformulation Study

T-29 Fair Harbor

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	51	51	29	29.14	0	1	0.572	0.572	51	51	29
1	5	0.572	0.572	51	51	117		1	5	0.572	0.572	51	51	117
5	50	0.572	0.509	51	46	1,178	23.33	5	50	0.572	0.572	51	51	1,311
						Without Project AAHUs:	**26.475**							**With Project AAHUs:**	**29.135**
														Net AAHUs:	**2.660**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.370	0.370	3	3	1		0	1	0.370	0.370	3	3	1
1	5	0.370	0.370	3	3	4		1	5	0.370	0.700	3	3	6
1	50	0.370	0.328	3	2	39	0.776	1	50	0.700	0.700	3	3	90
						Without Project AAHUs:	**0.877**							**With Project AAHUs:**	**1.936**
														Net AAHUs:	**1.059**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.434	0.434	1	1	0		0	1	0.434	0.434	1	1	0
1	5	0.434	0.434	1	1	1		1	5	0.434	0.708	1	1	2
5	50	0.434	0.208	1	1	8	0.114	5	50	0.708	0.708	1	1	45
						Without Project AAHUs:	**0.195**							**With Project AAHUs:**	**0.952**
														Net AAHUs:	**0.757**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.153	0.153	2	2	0		0	1	0.153	0.153	2	2	0
1	5	0.153	0.153	2	2	1		1	5	0.153	0.153	2	2	1
5	50	0.153	0.101	2	2	10	0.17	5	50	0.153	0.153	2	2	12
						Without Project AAHUs:	**0.217**							**With Project AAHUs:**	**0.256**
														Net AAHUs:	**0.039**

Fire Island to Montauk Point, NY Reformulation Study

T-29 Fair Harbor

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.529	0.529	11	11	6		0	1	0.529	0.529	11	11	6
1	5	0.529	0.529	11	11	23		1	5	0.529	0.529	11	11	23
5	50	0.529	0.444	11	11	243	4.927	5	50	0.529	0.529	11	11	264
						Without Project AAHUs:	**5.444**							**With Project AAHUs:**	**5.867**
														Net AAHUs:	**0.423**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.187	0	0	0		0	1	0.187	0.187	0	0	0
1	5	0.187	0.187	0	0	0		1	5	0.187	0.187	0	0	0
5	50	0.187	0.068	0	0	2	0.022	5	50	0.187	0.187	0	0	3
						Without Project AAHUs:	**0.046**							**With Project AAHUs:**	**0.067**
														Net AAHUs:	**0.021**

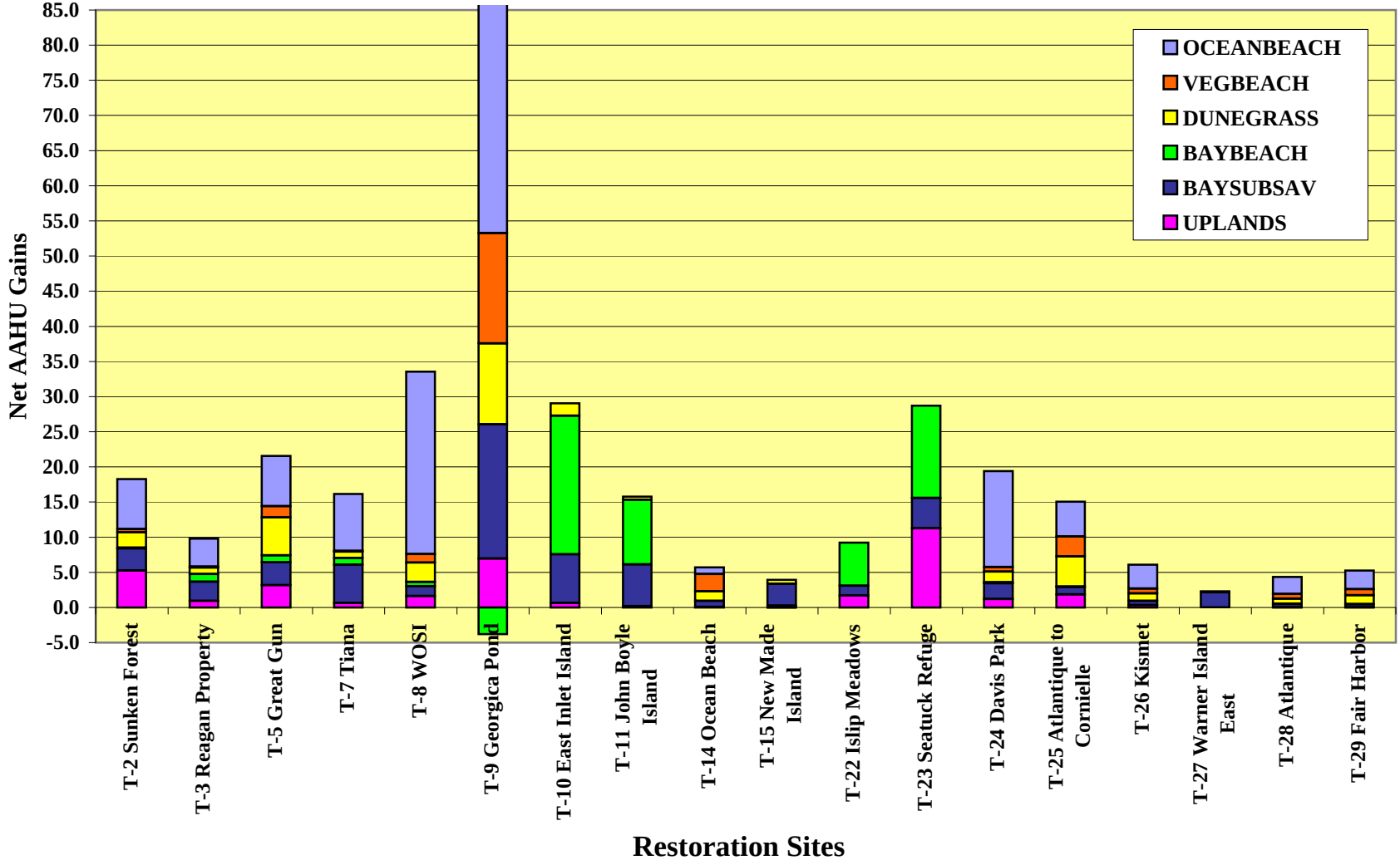
Total No-Action AAHUs	**33.26**	**Total With-Action AAHUs**	**38.21**
		Net AAHUs	**5**

Restoration Alternative 2 AAHUs per Transect and Per Community

RESTORATION	No-Action AAHUs	Alt 2 AAHUs	Net Gain in AAHUs	Average Annual Habitat Units (AAHUs)					
				OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS
T-2 Sunken Forest	83.35	97.61	14	5.5	1.6	3.1	0.1	0.7	3.3
T-3 Reagan Property	50.91	62.01	11	3.4	2.2	3.4	0.0	0.9	1.1
T-5 Great Gun	65.98	82.07	16	4.8	1.9	5.7	0.3	1.1	2.3
T-7 Tiana	65.50	81.71	16	8.1	1.9	1.9	1.0	1.6	1.7
T-8 WOSI	140.58	175.56	35	25.9	4.2	1.4	1.6	1.4	0.5
T-9 Georgica Pond	308.66	391.31	83	16.7	0.4	1.5	28.8	28.3	6.9
T-10 East Inlet Island	70.39	94.27	24			1.4	15.0	6.9	0.5
T-11 John Boyle Island	45.60	55.63	10			0.0	2.6	5.9	1.5
T-14 Ocean Beach	31.43	39.40	8	2.2	2.4	1.4	0.0	1.8	0.1
T-15 New Made Island	17.43	21.45	4			0.1	0.2	3.1	0.6
T-22 Islip Meadows	36.44	43.05	7				3.3	1.6	1.7
T-23 Seatuck Refuge	118.47	150.34	32				15.7	4.9	11.3
T-24 Davis Park	170.37	194.35	24	13.6	6.1	1.8	0.2	2.2	0.0
T-25 Atlantique to Cornielle	78.62	89.22	11	5.8	0.2	1.0	1.7	1.0	0.8
T-26 Kismet	43.40	50.17	7	3.4	0.8	1.7	0.0	0.6	0.3
T-27 Warner Island East	13.59	18.76	5			0.0	1.1	-0.7	4.7
T-28 Atlantique	31.31	35.96	5	2.4	0.8	0.9	0.0	0.5	0.0
T-29 Fair Harbor	33.26	38.21	5	2.7	1.1	0.8	0.0	0.4	0.0
Average			**21**	8	2	2	4	3	2

Habitats not applicable

Net AAHU Gains For Restoration Alternative 3



Fire Island to Montauk Point, NY Reformulation Study

T-2 Sunken Forest

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.545	0.545	109	109	59	59.11	0	1	0.545	0.545	109	109	59
1	5	0.545	0.545	109	109	236		1	5	0.545	0.558	109	109	239
5	50	0.545	0.477	109	98	2,373	46.6	5	50	0.558	0.558	109	109	2,726
						Without Project AAHUs:	**53**							**With Project AAHUs:**	**60**
														Net AAHUs:	**7**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.567	0.567	5	5	3		0	1	0.567	0.567	5	5	3
1	5	0.567	0.567	5	5	11		1	5	0.567	0.615	5	5	12
5	50	0.567	0.523	5	5	118	2.379	5	50	0.615	0.615	5	5	140
						Without Project AAHUs:	**2.641**							**With Project AAHUs:**	**3.091**
														Net AAHUs:	**0.450**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.687	0.687	8	8	6		0	1	0.687	0.687	8	8	6
1	5	0.687	0.687	8	8	23		1	5	0.687	0.784	8	9	25
5	50	0.687	0.388	8	8	195	2.953	5	50	0.784	0.784	8	9	303
						Without Project AAHUs:	**4**							**With Project AAHUs:**	**7**
														Net AAHUs:	**2**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.198	0.198	2	2	0		0	1	0.198	0.198	2	2	0
1	5	0.198	0.198	2	2	1		1	5	0.198	0.235	2	2	1
5	50	0.198	0.123	2	2	12	0.206	5	50	0.235	0.235	2	2	18
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
														Net AAHUs:	**0**

Fire Island to Montauk Point, NY Reformulation Study

T-2 Sunken Forest

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.638	0.638	22	22	14		0	1	0.638	0.638	22	22	14
1	5	0.638	0.638	22	22	57		1	5	0.638	0.755	22	22	62
5	50	0.638	0.513	22	25	606	12.6	5	50	0.755	0.755	22	22	758
						Without Project AAHUs:	**14**							**With Project AAHUs:**	**17**
														Net AAHUs:	**3**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.783	0.783	15	15	12		0	1	0.783	0.783	15	15	12
1	5	0.783	0.783	15	15	47		1	5	0.783	0.843	15	19	55
5	50	0.783	0.423	15	14	393	5.768	5	50	0.843	0.843	15	19	646
						Without Project AAHUs:	**9**							**With Project AAHUs:**	**14**
														Net AAHUs:	**5**

Total No-Action AAHUs	**83.35**	**Total With-Action AAHUs**	**101.62**
		Net AAHUs	**18**

Fire Island to Montauk Point, NY Reformulation Study

T-3 Reagan

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	77	77	44	43.73	0	1	0.572	0.572	77	77	44
1	5	0.572	0.572	77	77	175		1	5	0.572	0.572	77	77	175
5	50	0.572	0.509	77	69	1,768	35.02	5	50	0.572	0.572	77	77	1,968
						Without Project AAHUs:	**40**							**With Project AAHUs:**	**44**
														Net AAHUs:	**4**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.396	0.396	4	4	1		0	1	0.396	0.396	4	4	1
1	5	0.396	0.396	4	4	6		1	5	0.396	0.396	4	4	6
5	50	0.396	0.353	4	3	59	1.17	5	50	0.396	0.396	4	4	66
						Without Project AAHUs:	**1.326**							**With Project AAHUs:**	**1.459**
														Net AAHUs:	**0.133**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.443	0.443	8	8	3		0	1	0.443	0.443	8	8	3
1	5	0.443	0.443	8	8	14		1	5	0.443	0.443	8	8	14
5	50	0.443	0.216	8	7	112	1.536	5	50	0.443	0.443	8	8	157
						Without Project AAHUs:	**3**							**With Project AAHUs:**	**3**
														Net AAHUs:	**1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.209	0.209	1	1	0		0	1	0.209	0.209	1	1	0
1	5	0.209	0.209	1	1	1		1	5	0.209	0.721	1	2	3
5	50	0.209	0.127	1	1	6	0.105	5	50	0.721	0.721	2	2	60
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**1**
														Net AAHUs:	**1**

Fire Island to Montauk Point, NY Reformulation Study

T-3 Reagan

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.347	0.347	16	16	5		0	1	0.347	0.347	16	16	5
1	5	0.347	0.347	16	16	22		1	5	0.347	0.505	16	15	26
5	50	0.347	0.197	16	17	201	3.392	5	50	0.505	0.505	15	15	333
						Without Project AAHUs:	**5**							**With Project AAHUs:**	**7**
														Net AAHUs:	**3**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.673	0.673	5	5	3		0	1	0.673	0.673	5	5	3
1	5	0.673	0.673	5	5	14		1	5	0.673	0.673	5	5	14
5	50	0.673	0.318	5	5	110	1.484	5	50	0.673	0.673	5	5	157
						Without Project AAHUs:	**3**							**With Project AAHUs:**	**3**
														Net AAHUs:	**1**

Total No-Action AAHUs	**50.91**	**Total With-Action AAHUs**	**60.72**
		Net AAHUs	**10**

Fire Island to Montauk Point, NY Reformulation Study

T-5 Great Gun

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.545	0.545	91	91	50	49.57	0	1	0.545	0.545	91	91	50
1	5	0.545	0.545	91	91	198		1	5	0.545	0.572	91	91	203
5	50	0.545	0.477	91	82	1,990	39.08	5	50	0.572	0.572	91	91	2,341
						Without Project AAHUs:	**45**							**With Project AAHUs:**	**52**
														Net AAHUs:	**7**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.483	0.483	6	6	3		0	1	0.483	0.483	6	6	3
1	5	0.483	0.483	6	6	12		1	5	0.483	0.715	6	6	15
5	50	0.483	0.453	6	6	128	2.603	5	50	0.715	0.715	6	6	205
						Without Project AAHUs:	**2.865**							**With Project AAHUs:**	**4.473**
														Net AAHUs:	**1.609**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.564	0.564	14	14	8		0	1	0.564	0.564	14	14	8
1	5	0.564	0.564	14	14	32		1	5	0.564	0.705	14	17	39
5	50	0.564	0.288	14	13	261	3.691	5	50	0.705	0.705	17	17	525
						Without Project AAHUs:	**6**							**With Project AAHUs:**	**11**
														Net AAHUs:	**5**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.243	0.243	11	11	3		0	1	0.243	0.243	11	11	3
1	5	0.243	0.243	11	11	11		1	5	0.243	0.298	11	11	12
5	50	0.243	0.196	11	10	104	1.953	5	50	0.298	0.298	11	11	151
						Without Project AAHUs:	**2**							**With Project AAHUs:**	**3**
														Net AAHUs:	**1**

Fire Island to Montauk Point, NY Reformulation Study

T-5 Great Gun

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.544	0.544	17	17	9		0	1	0.544	0.544	17	17	9
1	5	0.544	0.544	17	17	36		1	5	0.544	0.684	17	17	41
5	50	0.544	0.399	17	17	352	6.624	5	50	0.684	0.684	17	17	511
						Without Project AAHUs:	**8**							**With Project AAHUs:**	**11**
														Net AAHUs:	**3**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.417	0.417	7	7	3		0	1	0.417	0.417	7	7	3
1	5	0.417	0.417	7	7	12		1	5	0.417	0.552	7	10	17
5	50	0.417	0.123	7	7	86	0.818	5	50	0.552	0.552	10	10	240
						Without Project AAHUs:	**2**							**With Project AAHUs:**	**5**
														Net AAHUs:	**3**

Total No-Action AAHUs	**65.98**	**Total With-Action AAHUs**	**87.52**
		Net AAHUs	**22**

Fire Island to Montauk Point, NY Reformulation Study

T-7 Tiana

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.558	0.558	86	86	48	48.03	0	1	0.558	0.558	86	86	48
1	5	0.558	0.558	86	86	192		1	5	0.558	0.572	86	86	194
5	50	0.558	0.424	86	77	1,811	32.82	5	50	0.572	0.572	86	86	2,214
						Without Project AAHUs:	**41**							**With Project AAHUs:**	**49**
														Net AAHUs:	**8**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.593	0.593	7	7	4		0	1	0.593	0.593	7	7	4
1	5	0.593	0.593	7	7	16		1	5	0.593	0.593	7	7	16
5	50	0.593	0.556	7	7	179	3.85	5	50	0.593	0.593	7	7	185
						Without Project AAHUs:	**3.989**							**With Project AAHUs:**	**4.103**
														Net AAHUs:	**0.114**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.703	0.703	6	6	4		0	1	0.703	0.703	6	6	4
1	5	0.703	0.703	6	6	17		1	5	0.703	0.703	6	6	17
5	50	0.703	0.440	6	6	150	2.423	5	50	0.703	0.703	6	6	194
						Without Project AAHUs:	**3**							**With Project AAHUs:**	**4**
														Net AAHUs:	**1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.671	0.671	11	11	7		0	1	0.671	0.671	11	11	7
1	5	0.671	0.671	11	11	29		1	5	0.671	0.671	11	11	29
5	50	0.671	0.531	11	10	277	5.145	5	50	0.671	0.671	11	11	325
						Without Project AAHUs:	**6**							**With Project AAHUs:**	**7**
														Net AAHUs:	**1**

Fire Island to Montauk Point, NY Reformulation Study

T-7 Tiana

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.614	0.614	19	19	12		0	1	0.614	0.614	19	19	12
1	5	0.614	0.614	19	19	46		1	5	0.614	0.835	19	19	54
5	50	0.614	0.430	19	19	440	8.058	5	50	0.835	0.835	19	19	704
						Without Project AAHUs:	**10**							**With Project AAHUs:**	**15**
														Net AAHUs:	**5**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.350	0.350	4	4	1		0	1	0.350	0.350	4	4	1
1	5	0.350	0.350	4	4	6		1	5	0.350	0.350	4	4	6
5	50	0.350	0.023	4	4	34	0.089	5	50	0.350	0.350	4	4	67
						Without Project AAHUs:	**1**							**With Project AAHUs:**	**1**
														Net AAHUs:	**1**

Total No-Action AAHUs	**65.50**	**Total With-Action AAHUs**	**81.64**
		Net AAHUs	**16**

Fire Island to Montauk Point, NY Reformulation Study

T-8 WOSI (West of Shinnecock Inlet)

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.930	0.930	154	154	143	142.9	0	1	0.930	0.930	154	154	143
1	5	0.930	0.930	154	154	572		1	5	0.930	0.953	154	154	579
5	50	0.930	0.678	154	138	5,296	93.77	5	50	0.953	0.953	154	154	6,587
						Without Project AAHUs:	**120**							**With Project AAHUs:**	**146**
														Net AAHUs:	**26**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.458	0.458	9	9	4		0	1	0.458	0.458	9	9	4
1	5	0.458	0.458	9	9	17		1	5	0.458	0.547	9	9	18
5	50	0.458	0.397	9	8	168	3.27	5	50	0.547	0.547	9	9	225
						Without Project AAHUs:	**3.772**							**With Project AAHUs:**	**4.959**
														Net AAHUs:	**1.187**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.441	0.441	13	13	6		0	1	0.441	0.441	13	13	6
1	5	0.441	0.441	13	13	23		1	5	0.441	0.564	13	13	26
5	50	0.441	0.226	13	13	193	2.907	5	50	0.564	0.564	13	13	328
						Without Project AAHUs:	**4**							**With Project AAHUs:**	**7**
														Net AAHUs:	**3**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.567	0.567	8	8	5		0	1	0.567	0.567	8	8	5
1	5	0.567	0.567	8	8	19		1	5	0.567	0.608	8	8	20
5	50	0.567	0.493	8	8	201	4.154	5	50	0.608	0.608	8	8	230
						Without Project AAHUs:	**4**							**With Project AAHUs:**	**5**
														Net AAHUs:	**1**

Fire Island to Montauk Point, NY Reformulation Study

T-8 WOSI (West of Shinnecock Inlet)

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.436	0.436	20	20	9		0	1	0.436	0.436	20	20	9
1	5	0.436	0.436	20	20	34		1	5	0.436	0.436	20	20	34
5	50	0.436	0.274	20	20	314	5.39	5	50	0.436	0.436	20	20	385
						Without Project AAHUs:	**7**							**With Project AAHUs:**	**9**
														Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.217	0.217	5	5	1		0	1	0.217	0.217	5	5	1
1	5	0.217	0.217	5	5	4		1	5	0.217	0.468	5	5	6
5	50	0.217	0.000	5	4	22	0	5	50	0.468	0.468	5	5	99
						Without Project AAHUs:	**1**							**With Project AAHUs:**	**2**
														Net AAHUs:	**2**

Total No-Action AAHUs	**140.58**	**Total With-Action AAHUs**	**174.11**
		Net AAHUs	**34**

Fire Island to Montauk Point, NY Reformulation Study

T-10 East Inlet Island

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:								**With Project AAHUs:**	**0**
														Net AAHUs:	**0**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:								**With Project AAHUs:**	**0.000**
														Net AAHUs:	**0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.385	0.385	11	11	4		0	1	0.385	0.385	11	11	4
1	5	0.385	0.385	11	11	18		1	5	0.385	0.418	11	11	18
5	50	0.385	0.168	11	9	127	1.439	5	50	0.418	0.418	11	11	215
						Without Project AAHUs:								**With Project AAHUs:**	**5**
														Net AAHUs:	**2**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.526	0.526	67	67	35		0	1	0.526	0.526	67	67	35
1	5	0.526	0.526	67	67	142		1	5	0.526	0.787	67	67	177
5	50	0.526	0.399	67	71	1,435	28.19	5	50	0.787	0.787	67	67	2,386
						Without Project AAHUs:								**With Project AAHUs:**	**52**
														Net AAHUs:	**20**

Fire Island to Montauk Point, NY Reformulation Study

T-10 East Inlet Island

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.497	0.497	83	83	42		0	1	0.497	0.497	83	83	42
1	5	0.497	0.497	83	83	166		1	5	0.497	0.497	83	83	166
5	50	0.497	0.313	83	83	1,523	26.15	5	50	0.497	0.497	83	83	1,868
						Without Project AAHUs:	**35**							**With Project AAHUs:**	**42**
														Net AAHUs:	**7**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.452	0.452	2	2	1		0	1	0.452	0.452	2	2	1
1	5	0.452	0.452	2	2	4		1	5	0.452	0.518	2	2	5
5	50	0.452	0.148	2	1	24	0.124	5	50	0.518	0.518	2	2	56
						Without Project AAHUs:	**1**							**With Project AAHUs:**	**1**
														Net AAHUs:	**1**

Total No-Action AAHUs	**70.39**	**Total With-Action AAHUs**	**99.45**
		Net AAHUs	**29**

Fire Island to Montauk Point, NY Reformulation Study

T-11 John Boyle Island

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0**							**With Project AAHUs:** **0**
														Net AAHUs: **0**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0.000**							**With Project AAHUs:** **0.000**
														Net AAHUs: **0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.385	0.385	3	3	1		0	1	0.385	0.385	3	3	1
1	5	0.385	0.385	3	3	4		1	5	0.385	0.418	3	3	5
5	50	0.385	0.168	3	2	32	0.367	5	50	0.418	0.418	3	3	55
						Without Project AAHUs:	**1**							**With Project AAHUs:** **1**
														Net AAHUs: **0**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.526	0.526	31	31	17		0	1	0.526	0.526	31	31	17
1	5	0.526	0.526	31	31	66		1	5	0.526	0.787	31	31	82
5	50	0.526	0.399	31	33	668	13.13	5	50	0.787	0.787	31	31	1,111
						Without Project AAHUs:	**15**							**With Project AAHUs:** **24**
														Net AAHUs: **9**

Fire Island to Montauk Point, NY Reformulation Study

T-11 John Boyle Island

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.497	0.497	72	72	36		0	1	0.497	0.497	72	72	36
1	5	0.497	0.497	72	72	142		1	5	0.497	0.497	72	72	142
5	50	0.497	0.313	72	72	1,304	22.4	5	50	0.497	0.497	72	72	1,601
						Without Project AAHUs:	**30**							**With Project AAHUs:**	**36**
														Net AAHUs:	**6**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.452	0.452	1	1	0		0	1	0.452	0.452	1	1	0
1	5	0.452	0.452	1	1	1		1	5	0.452	0.518	1	1	1
5	50	0.452	0.148	1	0	7	0.037	5	50	0.518	0.518	1	1	17
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
														Net AAHUs:	**0**

Total No-Action AAHUs	**45.60**	**Total With-Action AAHUs**	**61.36**
		Net AAHUs	**16**

Fire Island to Montauk Point, NY Reformulation Study

T-14 Ocean Beach

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.239	0.239	93	93	22	22.29	0	1	0.239	0.239	93	93	22
1	5	0.239	0.239	93	93	89		1	5	0.239	0.239	93	93	89
5	50	0.239	0.240	93	84	956	20.19	5	50	0.239	0.239	93	93	1,003
						Without Project AAHUs:	**21**							**With Project AAHUs:**	**22**
														Net AAHUs:	**1**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.220	0.220	4	4	1		0	1	0.220	0.220	4	4	1
1	5	0.220	0.220	4	4	3		1	5	0.220	0.856	4	4	8
5	50	0.220	0.178	4	4	33	0.627	5	50	0.856	0.856	4	4	151
						Without Project AAHUs:	**0.754**							**With Project AAHUs:**	**3.207**
														Net AAHUs:	**2.453**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.434	0.434	3	3	1		0	1	0.434	0.434	3	3	1
1	5	0.434	0.434	3	3	5		1	5	0.434	0.641	3	4	8
5	50	0.434	0.208	3	3	44	0.593	5	50	0.641	0.641	3	4	110
						Without Project AAHUs:	**1**							**With Project AAHUs:**	**2**
														Net AAHUs:	**1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.153	0.153	0	0	0		0	1	0.153	0.153	0	0	0
1	5	0.153	0.153	0	0	0		1	5	0.153	0.153	0	0	0
5	50	0.153	0.101	0	0	2	0.031	5	50	0.153	0.153	0	0	2
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
														Net AAHUs:	**0**

Fire Island to Montauk Point, NY Reformulation Study

T-14 Ocean Beach

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.529	0.529	23	23	12		0	1	0.529	0.529	23	23	12
1	5	0.529	0.529	23	23	48		1	5	0.529	0.529	23	23	48
5	50	0.529	0.444	23	23	497	10.08	5	50	0.529	0.529	23	23	540
						Without Project AAHUs:	**11**							**With Project AAHUs:**	**12**
														Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.187	1	1	0		0	1	0.187	0.187	1	1	0
1	5	0.187	0.187	1	1	1		1	5	0.187	0.187	1	1	1
5	50	0.187	0.000	1	1	3	0	5	50	0.187	0.187	1	1	7
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
														Net AAHUs:	**0**

Total No-Action AAHUs	**34.37**	**Total With-Action AAHUs**	**40.08**
		Net AAHUs	**6**

Fire Island to Montauk Point, NY Reformulation Study

T-15 New Made Island

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0**							**With Project AAHUs:** **0**
														Net AAHUs: **0**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0.000**							**With Project AAHUs:** **0.000**
														Net AAHUs: **0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.318	0.318	1	1	0		0	1	0.318	0.318	1	1	0
1	5	0.318	0.318	1	1	1		1	5	0.318	0.352	1	2	2
5	50	0.318	0.165	1	0	6	0.075	5	50	0.352	0.352	2	2	32
						Without Project AAHUs:	**0**							**With Project AAHUs:** **1**
														Net AAHUs: **1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.462	0.462	3	3	2		0	1	0.462	0.462	3	3	2
1	5	0.462	0.462	3	3	6		1	5	0.462	0.722	3	2	6
5	50	0.462	0.384	3	3	64	1.319	5	50	0.722	0.722	2	2	61
						Without Project AAHUs:	**1**							**With Project AAHUs:** **1**
														Net AAHUs: **0**

Fire Island to Montauk Point, NY Reformulation Study

T-15 New Made Island

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.497	0.497	38	38	19		0	1	0.497	0.497	38	38	19
1	5	0.497	0.497	38	38	75		1	5	0.497	0.497	38	38	75
5	50	0.497	0.313	38	38	689	11.83	5	50	0.497	0.497	38	38	845
						Without Project AAHUs:	**16**							**With Project AAHUs:**	**19**
														Net AAHUs:	**3**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.452	0.452	1	1	0		0	1	0.452	0.452	1	1	0
1	5	0.452	0.452	1	1	2		1	5	0.452	0.518	1	1	2
5	50	0.452	0.148	1	0	9	0.047	5	50	0.518	0.518	1	1	21
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
														Net AAHUs:	**0**

Total No-Action AAHUs	**17.43**	**Total With-Action AAHUs**	**21.28**
		Net AAHUs	**4**

Fire Island to Montauk Point, NY Reformulation Study

T-9 Georgica Pond

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.173	0.173	351	351	61	60.75	0	1	0.173	0.173	351	351	61
1	5	0.173	0.173	351	351	243		1	5	0.173	0.381	351	342	383
5	50	0.173	0.068	351	351	1,900	23.7	5	50	0.381	0.381	351	342	5,938
						Without Project AAHUs:	**44**							**With Project AAHUs:**	**128**
														Net AAHUs:	**84**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.250	0.250	16	16	4		0	1	0.250	0.250	16	16	4
1	5	0.250	0.250	16	16	16		1	5	0.250	0.867	16	24	46
5	50	0.250	0.198	16	16	161	3.17	5	50	0.867	0.867	24	24	917
						Without Project AAHUs:	**3.631**							**With Project AAHUs:**	**19.324**
														Net AAHUs:	**15.693**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.470	0.470	13	13	6		0	1	0.470	0.470	13	13	6
1	5	0.470	0.470	13	13	24		1	5	0.470	0.817	13	21	44
5	50	0.470	0.207	13	13	198	2.693	5	50	0.817	0.817	21	21	753
						Without Project AAHUs:	**5**							**With Project AAHUs:**	**16**
														Net AAHUs:	**11**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.778	0.778	134	134	104		0	1	0.778	0.778	134	134	104
1	5	0.778	0.778	134	134	417		1	5	0.778	0.699	134	131	391
5	50	0.778	0.641	134	134	4,279	85.89	5	50	0.699	0.699	131	131	4,113
						Without Project AAHUs:	**96**							**With Project AAHUs:**	**92**
														Net AAHUs:	**-4**

Fire Island to Montauk Point, NY Reformulation Study

T-9 Georgica Pond

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.752	0.752	184	184	138		0	1	0.752	0.752	184	184	138
1	5	0.752	0.752	184	184	553		1	5	0.752	0.786	184	184	565
5	50	0.752	0.591	184	184	5,549	108.5	5	50	0.786	0.786	184	184	6,493
						Without Project AAHUs: **125**								**With Project AAHUs:** **144**
														Net AAHUs: **19**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.473	0.473	90	90	43		0	1	0.473	0.473	90	90	43
1	5	0.473	0.473	90	90	170		1	5	0.473	0.473	90	90	170
5	50	0.473	0.302	90	90	1,566	27.09	5	50	0.473	0.473	90	90	1,913
						Without Project AAHUs: **36**								**With Project AAHUs:** **43**
														Net AAHUs: **7**

Total No-Action AAHUs	**308.66**	**Total With-Action AAHUs**	**441.62**
		Net AAHUs	**133**

Fire Island to Montauk Point, NY Reformulation Study

T-22 Islip Meadows

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0**							**With Project AAHUs:** **0**
														Net AAHUs: **0**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0.000**							**With Project AAHUs:** **0.000**
														Net AAHUs: **0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0**							**With Project AAHUs:** **0**
														Net AAHUs: **0**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.609	0.609	45	45	27		0	1	0.609	0.609	45	45	27
1	5	0.609	0.609	45	45	109		1	5	0.609	0.700	45	44	116
5	50	0.609	0.465	45	45	1,081	20.8	5	50	0.700	0.700	44	44	1,380
						Without Project AAHUs:	**24**							**With Project AAHUs:** **30**
														Net AAHUs: **6**

Fire Island to Montauk Point, NY Reformulation Study

T-22 Islip Meadows

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.485	0.485	11	11	6		0	1	0.485	0.485	11	11	6
1	5	0.485	0.485	11	11	22		1	5	0.485	0.485	11	12	23
5	50	0.485	0.297	11	11	202	3.402	5	50	0.485	0.485	12	12	270
						Without Project AAHUs:	**5**							**With Project AAHUs:**	**6**
														Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.783	0.783	12	12	9		0	1	0.783	0.783	12	12	9
1	5	0.783	0.783	12	12	37		1	5	0.783	0.783	12	12	37
5	50	0.783	0.523	12	11	330	5.539	5	50	0.783	0.783	12	12	415
						Without Project AAHUs:	**8**							**With Project AAHUs:**	**9**
														Net AAHUs:	**2**

Total No-Action AAHUs	**36.44**	**Total With-Action AAHUs**	**45.65**
		Net AAHUs	**9**

Fire Island to Montauk Point, NY Reformulation Study

T-23 Seatuck Refuge

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:							**With Project AAHUs:**	**0**
													Net AAHUs:	**0**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:							**With Project AAHUs:**	**0.000**
													Net AAHUs:	**0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:							**With Project AAHUs:**	**0**
													Net AAHUs:	**0**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.609	0.609	85	85	52		0	1	0.609	0.609	85	85	52
1	5	0.609	0.609	85	85	208		1	5	0.609	0.690	85	87	224
5	50	0.609	0.465	85	85	2,059	39.64	5	50	0.690	0.690	87	87	2,699
						Without Project AAHUs:							**With Project AAHUs:**	**60**
													Net AAHUs:	**13**

Fire Island to Montauk Point, NY Reformulation Study

T-23 Seatuck Refuge

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.485	0.485	55	55	27		0	1	0.485	0.485	55	55	27
1	5	0.485	0.485	55	55	108		1	5	0.485	0.485	55	55	107
5	50	0.485	0.297	55	55	975	16.44	5	50	0.485	0.485	55	55	1,190
						Without Project AAHUs:	**22**							**With Project AAHUs:**	**26**
														Net AAHUs:	**4**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.783	0.783	78	78	61		0	1	0.783	0.783	78	78	61
1	5	0.783	0.783	78	78	245		1	5	0.783	0.783	78	78	245
5	50	0.783	0.523	78	70	2,190	36.79	5	50	0.783	0.783	78	78	2,754
						Without Project AAHUs:	**50**							**With Project AAHUs:**	**61**
														Net AAHUs:	**11**

Total No-Action AAHUs	**118.47**	**Total With-Action AAHUs**	**147.17**
		Net AAHUs	**29**

Fire Island to Montauk Point, NY Reformulation Study

T-24 Davis Park

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	261	261	149	149.4	0	1	0.572	0.572	261	261	149
1	5	0.572	0.572	261	261	598		1	5	0.572	0.572	261	261	598
5	50	0.572	0.509	261	235	6,041	119.6	5	50	0.572	0.572	261	261	6,723
						Without Project AAHUs:	**136**							**With Project AAHUs:**	**149**
														Net AAHUs:	**14**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.370	0.370	10	10	4		0	1	0.370	0.370	10	10	4
1	5	0.370	0.370	10	10	14		1	5	0.370	0.403	10	10	15
5	50	0.370	0.328	10	9	146	2.882	5	50	0.403	0.403	10	10	177
						Without Project AAHUs:	**3.278**							**With Project AAHUs:**	**3.919**
														Net AAHUs:	**0.641**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.434	0.434	5	5	2		0	1	0.434	0.434	5	5	2
1	5	0.434	0.434	5	5	8		1	5	0.434	0.560	5	6	10
5	50	0.434	0.208	5	4	66	0.901	5	50	0.560	0.560	6	6	140
						Without Project AAHUs:	**2**							**With Project AAHUs:**	**3**
														Net AAHUs:	**2**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.153	0.153	8	8	1		0	1	0.153	0.153	8	8	1
1	5	0.153	0.153	8	8	5		1	5	0.153	0.153	8	8	5
5	50	0.153	0.101	8	8	43	0.768	5	50	0.153	0.153	8	8	52
						Without Project AAHUs:	**1**							**With Project AAHUs:**	**1**
														Net AAHUs:	**0**

Fire Island to Montauk Point, NY Reformulation Study

T-24 Davis Park

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.529	0.529	58	58	31		0	1	0.529	0.529	58	58	31
1	5	0.529	0.529	58	58	124		1	5	0.529	0.529	58	58	124
5	50	0.529	0.444	58	58	1,281	25.98	5	50	0.529	0.529	58	58	1,392
						Without Project AAHUs:	**29**							**With Project AAHUs:**	**31**
														Net AAHUs:	**2**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.187	1	1	0		0	1	0.187	0.187	1	1	0
1	5	0.187	0.187	1	1	1		1	5	0.187	0.475	1	3	3
5	50	0.187	0.068	1	1	4	0.05	5	50	0.475	0.475	3	3	62
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**1**
														Net AAHUs:	**1**

Total No-Action AAHUs	**170.37**	**Total With-Action AAHUs**	**189.76**
		Net AAHUs	**19**

Fire Island to Montauk Point, NY Reformulation Study

T-25 Atlantique to Cornielle

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	112	112	64	63.92	0	1	0.572	0.572	112	112	64
1	5	0.572	0.572	112	112	256		1	5	0.572	0.572	112	109	252
5	50	0.572	0.509	112	101	2,585	51.19	5	50	0.572	0.572	112	109	2,837
						Without Project AAHUs:	**58**							**With Project AAHUs:**	**63**
														Net AAHUs:	**5**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.370	0.370	6	6	2		0	1	0.370	0.370	6	6	2
1	5	0.370	0.370	6	6	8		1	5	0.370	0.700	6	7	13
5	50	0.370	0.328	6	5	82	1.625	5	50	0.700	0.700	7	7	218
						Without Project AAHUs:	**1.849**							**With Project AAHUs:**	**4.663**
														Net AAHUs:	**2.814**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.434	0.434	9	9	4		0	1	0.434	0.434	9	9	4
1	5	0.434	0.434	9	9	15		1	5	0.434	0.633	9	11	22
5	50	0.434	0.208	9	8	120	1.627	5	50	0.633	0.633	11	11	327
						Without Project AAHUs:	**3**							**With Project AAHUs:**	**7**
														Net AAHUs:	**4**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.153	0.153	4	4	1		0	1	0.153	0.153	4	4	1
1	5	0.153	0.153	4	4	2		1	5	0.153	0.153	4	4	2
5	50	0.153	0.101	4	4	22	0.388	5	50	0.153	0.153	4	4	26
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**1**
														Net AAHUs:	**0**

Fire Island to Montauk Point, NY Reformulation Study

T-25 Atlantique to Cornielle

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.529	0.529	27	27	14		0	1	0.529	0.529	27	27	14
1	5	0.529	0.529	27	27	58		1	5	0.529	0.529	27	27	58
5	50	0.529	0.444	27	27	597	12.11	5	50	0.529	0.529	27	27	649
						Without Project AAHUs:	**13**							**With Project AAHUs:**	**14**
														Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.187	16	16	3		0	1	0.187	0.187	16	16	3
1	5	0.187	0.187	16	16	12		1	5	0.187	0.243	16	17	14
5	50	0.187	0.068	16	14	87	0.97	5	50	0.243	0.243	16	17	177
						Without Project AAHUs:	**2**							**With Project AAHUs:**	**4**
														Net AAHUs:	**2**

Total No-Action AAHUs	**78.62**	**Total With-Action AAHUs**	**93.66**
		Net AAHUs	**15**

Fire Island to Montauk Point, NY Reformulation Study

T-26 Kismet

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	65	65	37	37	0	1	0.572	0.572	65	65	37
1	5	0.572	0.572	65	65	148		1	5	0.572	0.572	65	65	148
5	50	0.572	0.509	65	58	1,496	29.63	5	50	0.572	0.572	65	65	1,665
						Without Project AAHUs:	**34**							**With Project AAHUs:**	**37**
														Net AAHUs:	**3**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.370	0.370	2	2	1		0	1	0.370	0.370	2	2	1
1	5	0.370	0.370	2	2	3		1	5	0.370	0.687	2	2	4
5	50	0.370	0.328	2	2	31	0.608	5	50	0.687	0.687	2	2	64
						Without Project AAHUs:	**0.691**							**With Project AAHUs:**	**1.375**
														Net AAHUs:	**0.684**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.434	0.434	2	2	1		0	1	0.434	0.434	2	2	1
1	5	0.434	0.434	2	2	4		1	5	0.434	0.677	2	3	6
5	50	0.434	0.208	2	2	32	0.435	5	50	0.677	0.677	3	3	83
						Without Project AAHUs:	**1**							**With Project AAHUs:**	**2**
														Net AAHUs:	**1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.153	0.153	1	1	0		0	1	0.153	0.153	1	1	0
1	5	0.153	0.153	1	1	1		1	5	0.153	0.153	1	1	1
5	50	0.153	0.101	1	1	6	0.101	5	50	0.153	0.153	1	1	7
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
														Net AAHUs:	**0**

Fire Island to Montauk Point, NY Reformulation Study

T-26 Kismet

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.529	0.529	15	15	8		0	1	0.529	0.529	15	15	8
1	5	0.529	0.529	15	15	32		1	5	0.529	0.529	15	15	32
5	50	0.529	0.444	15	15	330	6.686	5	50	0.529	0.529	15	15	358
						Without Project AAHUs:	**7**							**With Project AAHUs:**	**8**
														Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.187	6	6	1		0	1	0.187	0.187	6	6	1
1	5	0.187	0.187	6	6	4		1	5	0.187	0.187	6	6	4
5	50	0.187	0.068	6	5	33	0.37	5	50	0.187	0.187	6	6	50
						Without Project AAHUs:	**1**							**With Project AAHUs:**	**1**
														Net AAHUs:	**0**

Total No-Action AAHUs	**43.34**	**Total With-Action AAHUs**	**49.41**
		Net AAHUs	**6**

Fire Island to Montauk Point, NY Reformulation Study

T-27 Warner Island East

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0**							**With Project AAHUs:** **0**
														Net AAHUs: **0**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0.000**							**With Project AAHUs:** **0.000**
														Net AAHUs: **0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0**							**With Project AAHUs:** **0**
														Net AAHUs: **0**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.914	0.914	2	2	2		0	1	0.914	0.914	2	2	2
1	5	0.914	0.914	2	2	8		1	5	0.914	0.764	2	3	8
5	50	0.914	0.749	2	2	85	1.692	5	50	0.764	0.764	3	3	92
						Without Project AAHUs:	**2**							**With Project AAHUs:** **2**
														Net AAHUs: **0**

Fire Island to Montauk Point, NY Reformulation Study

T-27 Warner Island East

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.497	0.497	28	28	14		0	1	0.497	0.497	28	28	14
1	5	0.497	0.497	28	28	56		1	5	0.497	0.497	28	28	56
5	50	0.497	0.313	28	28	514	8.836	5	50	0.497	0.497	28	28	622
						Without Project AAHUs:	**12**							**With Project AAHUs:**	**14**
														Net AAHUs:	**2**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
														Net AAHUs:	**0**

Total No-Action AAHUs	**13.59**	**Total With-Action AAHUs**	**15.87**
		Net AAHUs	**2**

Fire Island to Montauk Point, NY Reformulation Study

T-28 Atlantique

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	46	46	26	26.41	0	1	0.572	0.572	46	46	26
1	5	0.572	0.572	46	46	106		1	5	0.572	0.572	46	46	106
5	50	0.572	0.509	46	42	1,068	21.15	5	50	0.572	0.572	46	46	1,189
						Without Project AAHUs:	**24**							**With Project AAHUs:**	**26**
														Net AAHUs:	**2**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.370	0.370	2	2	1		0	1	0.370	0.370	2	2	1
1	5	0.370	0.370	2	2	3		1	5	0.370	0.687	2	2	4
5	50	0.370	0.328	2	2	30	0.599	5	50	0.687	0.687	2	2	63
						Without Project AAHUs:	**0.681**							**With Project AAHUs:**	**1.355**
														Net AAHUs:	**0.674**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.434	0.434	2	2	1		0	1	0.434	0.434	2	2	1
1	5	0.434	0.434	2	2	3		1	5	0.434	0.677	2	2	4
5	50	0.434	0.208	2	1	22	0.304	5	50	0.677	0.677	2	2	57
						Without Project AAHUs:	**1**							**With Project AAHUs:**	**1**
														Net AAHUs:	**1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.153	0.153	1	1	0		0	1	0.153	0.153	1	1	0
1	5	0.153	0.153	1	1	1		1	5	0.153	0.153	1	1	1
5	50	0.153	0.101	1	1	8	0.143	5	50	0.153	0.153	1	1	10
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
														Net AAHUs:	**0**

Fire Island to Montauk Point, NY Reformulation Study

T-28 Atlantique

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.529	0.529	12	12	6		0	1	0.529	0.529	12	12	6
1	5	0.529	0.529	12	12	25		1	5	0.529	0.529	12	12	25
5	50	0.529	0.444	12	12	261	5.305	5	50	0.529	0.529	12	12	284
						Without Project AAHUs:	**6**							**With Project AAHUs:**	**6**
														Net AAHUs:	**0**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.187	1	1	0		0	1	0.187	0.187	1	1	0
1	5	0.187	0.187	1	1	0		1	5	0.187	0.187	1	1	0
5	50	0.187	0.068	1	1	3	0.036	5	50	0.187	0.187	1	1	5
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
														Net AAHUs:	**0**

Total No-Action AAHUs	**31.32**	**Total With-Action AAHUs**	**35.65**
		Net AAHUs	**4**

Fire Island to Montauk Point, NY Reformulation Study

T-29 Fair Harbor

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	51	51	29	29.14	0	1	0.572	0.572	51	51	29
1	5	0.572	0.572	51	51	117		1	5	0.572	0.572	51	51	117
5	50	0.572	0.509	51	46	1,178	23.33	5	50	0.572	0.572	51	51	1,311
						Without Project AAHUs:	**26**							**With Project AAHUs:**	**29**
														Net AAHUs:	**3**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.370	0.370	3	3	1		0	1	0.370	0.370	3	3	1
1	5	0.370	0.370	3	3	4		1	5	0.370	0.687	3	3	6
5	50	0.370	0.328	3	2	39	0.776	5	50	0.687	0.687	3	3	81
						Without Project AAHUs:	**0.882**							**With Project AAHUs:**	**1.756**
														Net AAHUs:	**0.874**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.434	0.434	1	1	0		0	1	0.434	0.434	1	1	0
1	5	0.434	0.434	1	1	1		1	5	0.434	0.677	1	2	3
5	50	0.434	0.208	1	1	8	0.114	5	50	0.677	0.677	2	2	69
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**1**
														Net AAHUs:	**1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.153	0.153	2	2	0		0	1	0.153	0.153	2	2	0
1	5	0.153	0.153	2	2	1		1	5	0.153	0.153	2	2	1
5	50	0.153	0.101	2	2	10	0.17	5	50	0.153	0.153	2	2	12
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
														Net AAHUs:	**0**

Fire Island to Montauk Point, NY Reformulation Study

T-29 Fair Harbor

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.529	0.529	11	11	6		0	1	0.529	0.529	11	11	6
1	5	0.529	0.529	11	11	23		1	5	0.529	0.529	11	11	23
5	50	0.529	0.444	11	11	243	4.927	5	50	0.529	0.529	11	11	264
						Without Project AAHUs:	**5**							**With Project AAHUs:**	**6**
														Net AAHUs:	**0**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.187	0	0	0		0	1	0.187	0.187	0	0	0
1	5	0.187	0.187	0	0	0		1	5	0.187	0.187	0	0	0
5	50	0.187	0.068	0	0	2	0.022	5	50	0.187	0.187	0	0	3
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
														Net AAHUs:	**0**

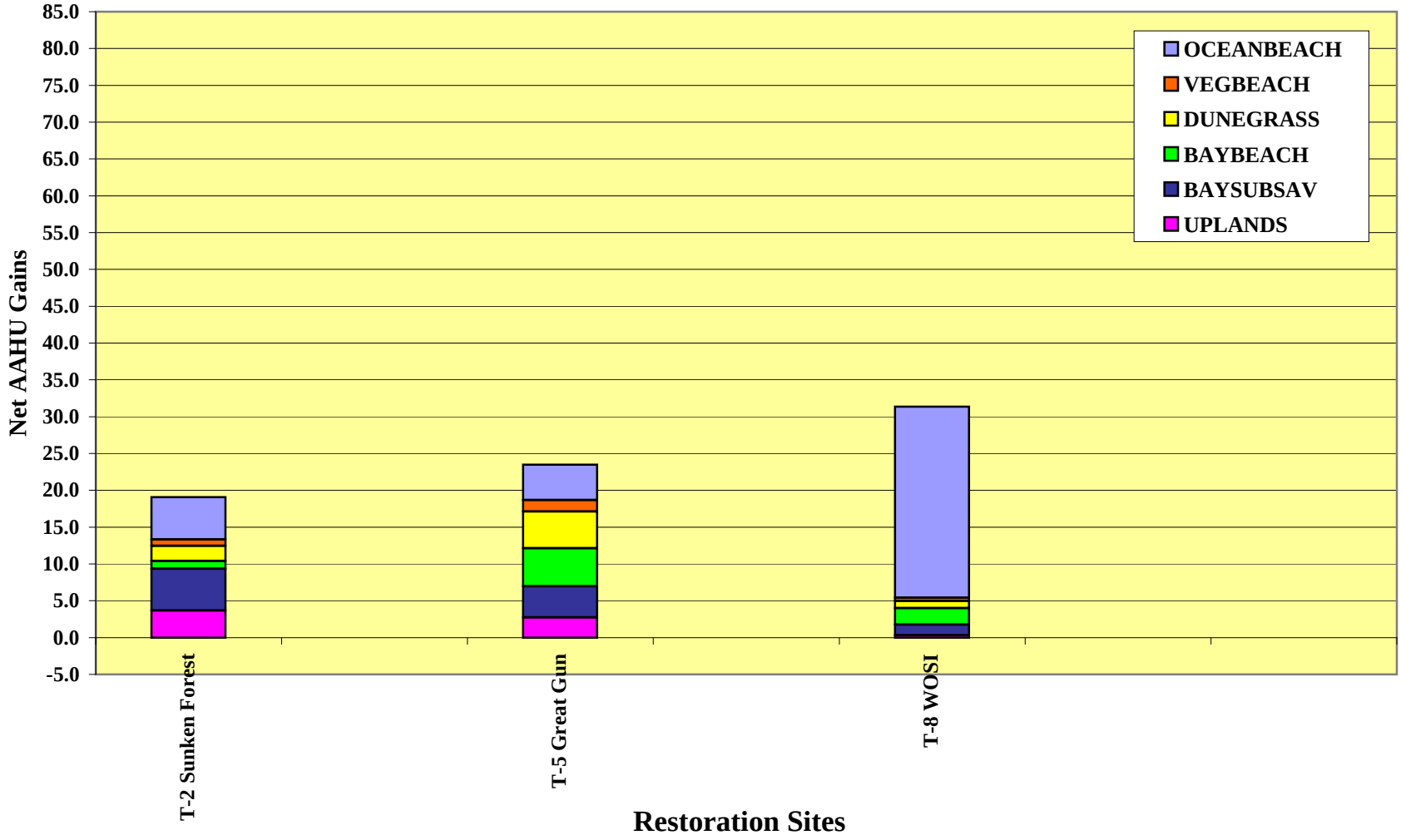
Total No-Action AAHUs	**33.26**	**Total With-Action AAHUs**	**38.53**
		Net AAHUs	**5**

Restoration Alternative 3 AAHUs per Transect and Per Community

RESTORATION	No-action AAHUs	Alt 3 AAHUs	Net Gain in AAHUs	Average Annual Habitat Units (AAHUs)					
				OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS
T-2 Sunken Forest	83.35	101.62	18	7.1	0.5	2.2	0.1	3.1	5.2
T-3 Reagan Property	50.91	60.72	10	4.0	0.1	0.9	1.1	2.7	0.9
T-5 Great Gun	65.98	87.52	22	7.1	1.6	5.4	1.0	3.3	3.2
T-7 Tiana	65.50	81.64	16	8.1	0.1	0.9	1.0	5.4	0.6
T-8 WOSI	140.58	174.11	34	25.9	1.2	2.8	0.6	1.4	1.6
T-9 Georgica Pond	308.66	441.62	133	83.6	15.7	11.5	-3.8	19.1	6.9
T-10 East Inlet Island	70.39	99.45	29			1.8	19.7	6.9	0.7
T-11 John Boyle Island	45.60	61.36	16			0.5	9.2	5.9	0.2
T-14 Ocean Beach	34.37	40.08	6	0.9	2.5	1.4	0.0	0.9	0.1
T-15 New Made Island	17.43	21.28	4			0.5	-0.1	3.1	0.2
T-22 Islip Meadows	36.44	45.65	9				6.1	1.4	1.7
T-23 Seatuck Refuge	118.47	147.17	29				13.1	4.3	11.3
T-24 Davis Park	170.37	189.76	19	13.6	0.6	1.5	0.2	2.2	1.2
T-25 Atlantique to Cornielle	78.62	93.66	15	5.0	2.8	4.3	0.1	1.0	1.8
T-26 Kismet	43.34	49.41	6	3.4	0.7	1.1	0.0	0.6	0.3
T-27 Warner Island East	13.59	15.87	2			0.0	0.1	2.1	0.0
T-28 Atlantique	31.32	35.65	4	2.4	0.7	0.7	0.0	0.5	0.0
T-29 Fair Harbor	33.26	38.53	5	2.7	0.9	1.3	0.0	0.4	0.0
Average			**27**	14	2	2	3	4	2

Habitats not applicable

Net AAHU Gains For Restoration Alternative 4



Fire Island to Montauk Point, NY Reformulation Study

T-2 Sunken Forest

AAHU Calculation Summary (Restoration Alternative 4)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.545	0.545	109	109	59	59.11	0	1	0.545	0.545	109	109	59
1	5	0.545	0.545	109	109	236		1	5	0.545	0.545	109	109	236
5	50	0.545	0.477	109	98	2,373	46.6	5	50	0.545	0.545	109	109	2,660
						Without Project AAHUs:	**53**							**With Project AAHUs:**	**59**
														Net AAHUs:	**6**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.567	0.567	5	5	3		0	1	0.567	0.567	5	5	3
1	5	0.567	0.567	5	5	11		1	5	0.567	0.705	5	5	13
5	50	0.567	0.523	5	5	118	2.379	5	50	0.705	0.705	5	5	160
						Without Project AAHUs:	**2.641**							**With Project AAHUs:**	**3.518**
														Net AAHUs:	**0.877**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.687	0.687	8	8	6		0	1	0.687	0.687	8	8	6
1	5	0.687	0.687	8	8	23		1	5	0.687	0.777	8	8	25
5	50	0.687	0.388	8	8	195	2.953	5	50	0.777	0.777	8	8	295
						Without Project AAHUs:	**4**							**With Project AAHUs:**	**7**
														Net AAHUs:	**2**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.198	0.198	2	2	0		0	1	0.198	0.198	2	2	0
1	5	0.198	0.198	2	2	1		1	5	0.198	0.755	2	2	4
5	50	0.198	0.123	2	2	12	0.206	5	50	0.755	0.755	2	2	63
						Without Project AAHUs:	**0**							**With Project AAHUs:**	**1**
														Net AAHUs:	**1**

Fire Island to Montauk Point, NY Reformulation Study

T-2 Sunken Forest

AAHU Calculation Summary (Restoration Alternative 4)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.638	0.638	22	22	14		0	1	0.638	0.638	22	22	14
1	5	0.638	0.638	22	22	57		1	5	0.638	0.845	22	24	69
5	50	0.638	0.513	22	25	606	12.6	5	50	0.845	0.845	22	24	878
						Without Project AAHUs:	**14**							**With Project AAHUs:**	**19**
														Net AAHUs:	**6**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.783	0.783	15	15	12		0	1	0.783	0.783	15	15	12
1	5	0.783	0.783	15	15	47		1	5	0.783	0.843	15	15	49
5	50	0.783	0.423	15	14	393	5.768	5	50	0.843	0.843	15	15	575
						Without Project AAHUs:	**9**							**With Project AAHUs:**	**13**
														Net AAHUs:	**4**

Total No-Action AAHUs	**83.35**	**Total With-Action AAHUs**	**102.41**
		Net AAHUs	**19**

Fire Island to Montauk Point, NY Reformulation Study

T-5 Great Gun

AAHU Calculation Summary (Restoration Alternative 4)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.545	0.545	91	91	50	49.57	0	1	0.545	0.545	91	91	50
1	5	0.545	0.545	91	91	198		1	5	0.545	0.545	91	91	198
5	50	0.545	0.477	91	82	1,990	39.08	5	50	0.545	0.545	91	91	2,231
						Without Project AAHUs:	**45**							**With Project AAHUs:**	**50**
														Net AAHUs:	**5**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.483	0.483	6	6	3		0	1	0.483	0.483	6	6	3
1	5	0.483	0.483	6	6	12		1	5	0.483	0.705	6	6	15
5	50	0.483	0.453	6	6	128	2.603	5	50	0.705	0.705	6	6	202
						Without Project AAHUs:	**2.865**							**With Project AAHUs:**	**4.413**
														Net AAHUs:	**1.549**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.564	0.564	14	14	8		0	1	0.564	0.564	14	14	8
1	5	0.564	0.564	14	14	32		1	5	0.564	0.772	14	15	38
5	50	0.564	0.288	14	13	261	3.691	5	50	0.772	0.772	15	15	504
						Without Project AAHUs:	**6**							**With Project AAHUs:**	**11**
														Net AAHUs:	**5**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.243	0.243	11	11	3		0	1	0.243	0.243	11	11	3
1	5	0.243	0.243	11	11	11		1	5	0.243	0.661	11	12	21
5	50	0.243	0.196	11	10	104	1.953	5	50	0.661	0.661	12	12	352
						Without Project AAHUs:	**2**							**With Project AAHUs:**	**8**
														Net AAHUs:	**5**

Fire Island to Montauk Point, NY Reformulation Study

T-5 Great Gun

AAHU Calculation Summary (Restoration Alternative 4)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.544	0.544	17	17	9		0	1	0.544	0.544	17	17	9
1	5	0.544	0.544	17	17	36		1	5	0.544	0.747	17	17	43
5	50	0.544	0.399	17	17	352	6.624	5	50	0.747	0.747	17	17	558
						Without Project AAHUs:	**8**							**With Project AAHUs:**	**12**
														Net AAHUs:	**4**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.417	0.417	7	7	3		0	1	0.417	0.417	7	7	3
1	5	0.417	0.417	7	7	12		1	5	0.417	0.643	7	8	16
5	50	0.417	0.123	7	7	86	0.818	5	50	0.643	0.643	8	8	219
						Without Project AAHUs:	**2**							**With Project AAHUs:**	**5**
														Net AAHUs:	**3**

Total No-Action AAHUs	**65.98**	**Total With-Action AAHUs**	**89.46**
		Net AAHUs	**23**

Fire Island to Montauk Point, NY Reformulation Study

T-8 WOSI (West of Shinnecock Inlet)

AAHU Calculation Summary (Restoration Alternative 4)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.930	0.930	154	154	143	142.9	0	1	0.930	0.930	154	154	143
1	5	0.930	0.930	154	154	572		1	5	0.930	0.953	154	154	579
5	50	0.930	0.678	154	138	5,296	93.77	5	50	0.953	0.953	154	154	6,587
						Without Project AAHUs:	**120**							**With Project AAHUs:**	**146**
														Net AAHUs:	**26**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.458	0.458	9	9	4		0	1	0.458	0.458	9	9	4
1	5	0.458	0.458	9	9	17		1	5	0.458	0.458	9	9	17
5	50	0.458	0.397	9	8	168	3.27	5	50	0.458	0.458	9	9	189
						Without Project AAHUs:	**3.772**							**With Project AAHUs:**	**4.198**
														Net AAHUs:	**0.426**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.441	0.441	13	13	6		0	1	0.441	0.441	13	13	6
1	5	0.441	0.441	13	13	23		1	5	0.441	0.453	13	11	21
5	50	0.441	0.226	13	13	193	2.907	5	50	0.453	0.453	13	11	243
						Without Project AAHUs:	**4**							**With Project AAHUs:**	**5**
														Net AAHUs:	**1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.567	0.567	8	8	5		0	1	0.567	0.567	8	8	5
1	5	0.567	0.567	8	8	19		1	5	0.567	0.686	8	12	25
5	50	0.567	0.493	8	8	201	4.154	5	50	0.686	0.686	8	12	308
						Without Project AAHUs:	**4**							**With Project AAHUs:**	**7**
														Net AAHUs:	**2**

Fire Island to Montauk Point, NY Reformulation Study

T-8 WOSI (West of Shinnecock Inlet)

AAHU Calculation Summary (Restoration Alternative 4)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.436	0.436	20	20	9		0	1	0.436	0.436	20	20	9
1	5	0.436	0.436	20	20	34		1	5	0.436	0.436	20	20	34
5	50	0.436	0.274	20	20	314	5.39	5	50	0.436	0.436	20	20	385
						Without Project AAHUs:	**7**							**With Project AAHUs:**	**9**
														Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.217	0.217	5	5	1		0	1	0.217	0.217	5	5	1
1	5	0.217	0.217	5	5	4		1	5	0.217	0.217	5	3	3
5	50	0.217	0.000	5	4	22	0	5	50	0.217	0.217	5	3	38
						Without Project AAHUs:	**1**							**With Project AAHUs:**	**1**
														Net AAHUs:	**0**

Total No-Action AAHUs	**140.58**	**Total With-Action AAHUs**	**171.94**
		Net AAHUs	**31**

Restoration Alternative 4 AAHUs per Transect and Per Community

RESTORATION	No-action AAHUs	Alt 4 AAHUs	Net Gain in AAHUs	Average Annual Habitat Units (AAHUs)					
				OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS
T-2 Sunken Forest	83.35	101.62	19	5.7	0.9	2.0	1.1	5.7	3.7
T-5 Great Gun	65.98	87.52	23	4.8	1.5	5.0	5.2	4.2	2.7
T-8 WOSI	140.58	174.11	31	25.9	0.4	1.0	2.3	1.4	0.3
Average			**25**	12	1	3	3	4	2

Comparison of Average HSI Scores for Baseline, Future no-action, and Future with-restoration Scenarios.

	Baseline	No Action	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Sunken Forest	0.569	0.408	0.647	0.637	0.632	0.749
Reagan Property	0.440	0.287	0.499	0.559	0.552	
Great Gunn	0.466	0.323	0.499	0.550	0.588	0.683
Tiana	0.582	0.401	0.706	0.703	0.621	
WOSI	0.508	0.345	0.544	0.613	0.596	0.534
East Inlet Island	0.310	0.171	0.417	0.341	0.370	
John Boyle Island	0.310	0.171	0.453	0.405	0.370	
Ocean Beach	0.293	0.195	0.408	0.385	0.421	
New Made Island	0.288	0.168	0.373	0.383	0.348	
Georgica Pond	0.483	0.334	0.532	0.524	0.670	
Islip Meadows	0.313	0.214	0.328	0.318	0.328	
Seatuck Refuge	0.313	0.214	0.328	0.328	0.326	
Davis Park	0.374	0.276	0.411	0.519	0.449	
Atlantique to Corneille	0.374	0.276	0.374	0.426	0.472	
Kismet	0.374	0.276	0.439	0.479	0.467	
Warner Island East	0.235	0.177	0.338	0.394	0.210	
Atlantique	0.374	0.276	0.439	0.479	0.467	
Fair Harbor	0.374	0.276	0.439	0.475	0.467	

Comparison of Acres for Baseline, Future no-action, and Future with-restoration Scenarios.

	Baseline	No Action*	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Sunken Forest	167.7	156.2	167.7	167.7	167.7	0.7
Reagan Property	117.1	109.4	117.1	117.1	117.1	
Great Gunn	152.8	139.8	152.8	152.8	152.8	0.6
Tiana	134.4	123.7	134.4	134.4	134.4	
WOSI	210.1	193.4	210.1	210.1	210.1	0.7
East Inlet Island	164.6	163.5	164.6	164.6	164.6	
John Boyle Island	106.5	106.9	106.5	106.5	106.5	
Ocean Beach	206.2	196.1	206.2	206.2	206.2	
New Made Island	42.5	41.9	42.5	42.5	42.5	
Georgica Pond	1776.2	1776.2	1776.2	1776.2	1776.2	
Islip Meadows	68.6	67.4	68.6	68.6	68.5	
Seatuck Refuge	234.2	226.4	234.2	234.2	234.2	
Davis Park	405.7	378.0	405.7	405.7	405.7	
Atlantique to Corneille	188.7	174.5	188.7	188.7	188.7	
Kismet	128.150	120.637	128.150	128.160	128.160	
Warner Island East	30.460	46.270	46.260	30.460	30.450	
Atlantique	73.760	95.725	73.730	73.750	73.750	
Fair Harbor	92.430	98.862	92.420	92.420	92.430	

Comparison of HUs for Baseline, Future no-action, and Future with-restoration Scenarios.

	Baseline	No Action	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Sunken Forest	94.20	70.51	94.98	98.68	103.73	106.64
Reagan Property	57.80	42.71	58.09	62.33	60.91	
Great Gunn	75.50	54.77	77.70	82.49	88.30	92.81
Tiana	76.66	52.39	83.47	82.09	81.95	
WOSI	167.11	109.49	172.19	176.14	174.65	172.74
East Inlet Island	82.42	55.90	87.96	95.02	100.54	
John Boyle Island	53.52	35.94	61.58	55.78	61.86	
Ocean Beach	36.73	31.52	69.47	39.59	33.26	
New Made Island	20.89	13.27	21.62	21.49	21.30	
Georgica Pond	355.80	251.05	401.51	393.58	445.42	
Islip Meadows	42.00	29.74	46.08	43.11	45.88	
Seatuck Refuge	139.96	92.88	151.83	151.21	147.63	
Davis Park	187.35	150.22	189.46	194.79	189.93	
Atlantique to Corneille	87.68	67.91	86.79	89.21	93.30	
Kismet	48.005	37.829	48.980	50.191	49.504	
Warner Island East	16.094	10.528	17.837	19.003	15.859	
Atlantique	34.509	27.538	35.339	35.936	35.721	
Fair Harbor	36.563	29.341	37.317	38.166	38.661	

Summary of Net Gain in AAHUs for Each Restoration Alternative

Restoration Site	No-action AAHU	Alternative 1 AAHU	Net Gain in AAHU Alternative 1	Alternative 2 AAHU	Net Gain in AAHU Alternative 2	Alternative 3 AAHU	Net Gain in AAHU Alternative 3	Alternative 4 AAHU	Net Gain in AAHU Alternative 4
T-2 Sunken Forest	83.35	94.93	11.58	97.61	14.26	101.62	18.27	101.62	18.27
T-3 Reagan Property	50.91	58.07	7.16	62.01	11.10	60.72	9.80		
T-5 Great Gun	65.98	77.72	11.74	82.07	16.09	87.52	21.54	87.52	21.54
T-7 Tiana	65.50	82.86	17.36	81.71	16.22	81.64	16.14		
T-8 WOSI	140.58	171.88	31.31	175.56	34.98	174.11	33.54	174.11	33.54
T-9 Georgica Pond	308.66	398.76	90.10	391.31	82.65	441.62	132.96		
T-10 East Inlet Island	70.39	87.63	17.24	94.27	23.88	99.45	29.06		
T-11 John Boyle Island	45.60	61.10	15.50	55.63	10.04	61.36	15.76		
T-14 Ocean Beach	34.37	67.40	33.03	39.40	5.03	40.08	5.71		
T-15 New Made Island	17.43	21.57	4.14	21.45	4.02	21.28	3.85		
T-22 Islip Meadows	36.44	45.83	9.40	43.05	6.61	45.65	9.21		
T-23 Seatuck Refuge	118.47	151.11	32.64	150.34	31.88	147.17	28.70		
T-24 Davis Park	170.37	189.33	18.96	194.35	23.98	189.76	19.39		
T-25 Atlantique to Cornielle	78.62	86.75	8.13	89.22	10.60	93.66	15.05		
T-26 Kismet	43.34	48.90	5.55	50.17	6.83	49.41	6.07		
T-27 Warner Island East	13.59	17.68	4.10	18.76	5.17	15.87	2.28		
T-28 Atlantique	31.31	35.26	3.95	35.96	4.65	35.65	4.33		
T-29 Fair Harbor	33.26	37.27	4.01	38.21	4.95	38.53	5.27		

APPENDIX H

COST ESTIMATES FOR CONCEPTUAL DESIGNS

CONTENTS:

Completed Cost Estimates for Conceptual Designs ..... 6 Pages

Table 2. Summary of Conceptual Cost Estimates for Fire Island to Montauk Point HEP Restoration Alternatives.

	Sunken Forest			Reagan Property			Great Gun			Tiana			WOSI			Georgica Pond		
	T-2			T-3			T-5			T-7			T-8			T-9		
	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3
Remove	$ 45,562	$ -	$ 1,153,576	$ -	$ 5,109	$ -	$ -	$ -	$ 279,890	$ 18,096	$ 24,128	$ -	$ -	$ -	$ 26,463	$ -	$ -	$ 45,045
Regrade	$ 14,644	$ 30,650	$ 26,223	$ 14,644	$ 30,650	$ 26,223	$ -	$ 3,406	$ 6,811	$ 3,406	$ 4,087	$ -	$ 3,406	$ 22,818	$ 1,703	$ -	$ -	$ 122,602
Fill	$ 23,958	$ 93,654	$ -	$ 47,916	$ 141,570	$ 81,675	$ -	$ 21,780	$ -	$ 27,427	$ 27,427	$ -	$ -	$ 37,026	$ 2,178	$ -	$ -	$ 784,078
Relocate	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Install	$ -	$ 41,976	$ -	$ -	$ 39,889	$ -	$ 31,712	$ 32,755	$ -	$ 38,846	$ -	$ -	$ -	$ 58,269	$ -	$ -	$ -	$ 101,994
Excavate & Move Material	$ -	$ -	$ -	$ -	$ -	$ -	$ 24,010	$ 24,010	$ -	$ -	$ -	$ -	$ 561,927	$ -	$ -	$ 2,554,212	$ 3,065,054	$ -
Invasive Species Control	$ 25,542	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 7,161	$ -	$ -	$ 2,554,212	$ 3,065,054	$ -
Plants & Bioengineering	$ 8,242	$ 36,635	$ -	$ 6,611	$ 26,459	$ 8,764	$ 1,516	$ 3,551	$ 2,442	$ 4,714	$ 5,121	$ 37,000	$ 101,957	$ 814	$ 1,005	$ 141,720	$ 167,413	$ 73,270
Mob & Demob (2%)	$ 2,359	$ 4,058	$ 23,596	$ 1,383	$ 4,703	$ 2,197	$ 1,145	$ 1,710	$ 5,783	$ 1,850	$ 1,215	$ 740	$ 13,489	$ 2,379	$ 627	$ 105,003	$ 125,950	$ 22,540
Contingency (20%)	$ 23,590	$ 40,583	$ 235,960	$ 13,834	$ 47,033	$ 21,970	$ 11,447	$ 17,100	$ 57,829	$ 18,498	$ 12,152	$ 7,400	$ 134,890	$ 23,785	$ 6,270	$ 1,050,029	$ 1,259,504	$ 225,398
E&D and S&A (15%)(2)	$ 21,584	$ 37,133	$ 215,903	$ 12,658	$ 43,035	$ 20,103	$ 10,474	$ 15,647	$ 52,913	$ 16,925	$ 11,119	$ 6,771	$ 123,424	$ 21,764	$ 5,737	$ 960,776	$ 1,152,446	$ 206,239
TOTAL (3)	**$ 165,481**	**$ 284,689**	**$ 1,655,258**	**$ 97,047**	**$ 338,447**	**$ 160,932**	**$ 80,304**	**$ 119,958**	**$ 405,669**	**$ 129,761**	**$ 85,249**	**$ 51,911**	**$ 946,254**	**$ 166,854**	**$ 43,982**	**$ 7,365,951**	**$ 8,835,421**	**$ 1,581,166**

	East Inlet Island			John Boyle Island			Ocean Beach			New Made Island			Islip Meadows			Seatuck Refuge		
	T-10			T-11			T-14			T-15			T-22			T-23		
	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3
Remove	$ 8,765	$ 8,765	$ 8,765	$ 8,765	$ -	$ 8,765	$ 13,682	$ 30,577	$ 30,577	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 771,373
Regrade	$ 18,731	$ 18,731	$ 78,329	$ 3,746	$ 10,217	$ 3,746	$ -	$ 25,883	$ 25,883	$ 4,087	$ -	$ 4,087	$ -	$ -	$ -	$ -	$ -	$ 28,948
Fill	$ 304,919	$ -	$ 370,259	$ -	$ 84,700	$ -	$ -	$ 165,528	$ 82,764	$ 26,136	$ -	$ 26,136	$ -	$ -	$ -	$ -	$ -	$ 91,476
Relocate	$ -	$ -	$ -	$ -	$ -	$ -	$ 82,358	$ 82,358	$ 82,358	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Install	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 271,921	$ 271,921	$ -	$ -	$ -	$ 24,388	$ 24,388	$ -	$ 31,712	$ 31,712	$ 31,712
Excavate & Move Material	$ 2,205,198	$ 2,205,198	$ 2,205,198	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 94,506	$ 1,396,622	$ 14,900	$ 306,505	$ 1,566,618	$ 1,566,618
Invasive Species Control	$ 6,763	$ 19,893	$ 6,763	$ 3,183	$ 1,989	$ 3,183	$ -	$ -	$ -	$ 1,432	$ 2,387	$ 1,432	$ -	$ -	$ 35,807	$ -	$ 71,613	$ 71,613
Plants & Bioengineering	$ -	$ -	$ 27,675	$ -	$ -	$ 10,763	$ -	$ 16,282	$ 8,141	$ -	$ -	$ 7,380	$ -	$ -	$ -	$ 51,386	$ 51,386	$ 83,521
Mob & Demob (2%)	$ 50,888	$ 45,052	$ 53,940	$ 314	$ 1,938	$ 529	$ 1,921	$ 11,851	$ 10,033	$ 633	$ 48	$ 781	$ 2,378	$ 28,420	$ 1,014	$ 7,792	$ 34,427	$ 52,905
Contingency (20%)	$ 508,875	$ 450,517	$ 539,398	$ 3,139	$ 19,381	$ 5,291	$ 19,208	$ 118,510	$ 100,329	$ 6,331	$ 477	$ 7,807	$ 23,779	$ 284,202	$ 10,141	$ 77,921	$ 344,266	$ 529,052
E&D and S&A (15%)(2)	$ 465,621	$ 412,223	$ 493,549	$ 2,872	$ 17,734	$ 4,842	$ 17,575	$ 108,436	$ 91,801	$ 5,793	$ 437	$ 7,143	$ 21,757	$ 260,045	$ 9,279	$ 71,297	$ 315,003	$ 484,083
TOTAL (3)	**$ 3,569,760**	**$ 3,160,378**	**$ 3,783,876**	**$ 22,019**	**$ 135,959**	**$ 37,119**	**$ 134,743**	**$ 831,345**	**$ 703,806**	**$ 44,412**	**$ 3,349**	**$ 54,766**	**$ 166,807**	**$ 1,993,677**	**$ 71,141**	**$ 546,613**	**$ 2,415,026**	**$ 3,711,301**

	Davis Park			Atlantique to Corneille			Kismet, Atlantique, Fair Harbor			Warner Island East		
	T-24			T-25			T-26			T-27		
	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3
Remove	$ -	$ 42,659	$ 66,007	$ -	$ -	$ -	$ 150,306	$ 245,524	$ 404,950	$ -	$ -	$ -
Regrade	$ 3,406	$ 80,032	$ 88,546	$ 30,650	$ 30,650	$ 32,694	$ 19,412	$ 33,034	$ 46,997	$ 10,217	$ 10,217	$ 10,217
Fill	$ 10,890	$ 243,935	$ 296,046	$ 326,699	$ 980,098	$ 209,088	$ 124,146	$ 211,266	$ 300,563	$ 65,340	$ 65,340	$ 65,340
Relocate	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Install	$ -	$ 504,997	$ 504,997	$ -	$ -	$ -	$ 194,230	$ 349,613	$ 427,305	$ -	$ -	$ -
Excavate & Move Material	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Invasive Species Control	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Plants & Bioengineering	$ 2,035	$ 48,847	$ 51,027	$ -	$ -	$ 43,206	$ 12,212	$ 28,494	$ 36,635	$ 24,423	$ 3,270	$ 34,725
Mob & Demob (2%)	$ 327	$ 18,409	$ 20,132	$ 7,147	$ 20,215	$ 5,700	$ 10,006	$ 17,359	$ 24,329	$ 2,000	$ 1,577	$ 2,206
Contingency (20%)	$ 3,266	$ 184,094	$ 201,324	$ 71,470	$ 202,150	$ 56,997	$ 100,061	$ 173,586	$ 243,290	$ 19,996	$ 15,765	$ 22,056
E&D and S&A (15%)(2)	$ 2,989	$ 168,446	$ 184,212	$ 65,395	$ 184,967	$ 52,153	$ 91,556	$ 158,831	$ 222,610	$ 18,296	$ 14,425	$ 20,181
TOTAL (3)	**$ 22,912**	**$ 1,291,419**	**$ 1,412,291**	**$ 501,362**	**$ 1,418,080**	**$ 399,837**	**$ 701,928**	**$ 1,217,708**	**$ 1,706,680**	**$ 140,272**	**$ 110,594**	**$ 154,725**

Notes

(1) For the Final Design of the Proposed Alternative, more detailed plans/specifications and construction procedures/equipment will be necessary. These costs are considered preliminary, conceptual level, costs, for comparison of alternatives only.

(2) Engineering & Design (E&D) and Supervision & Administration (S&A) costs are calculated as 15% of the Subtotal *plus* Mob & Demob and Contingency cost.

(3) Real Estate Costs for buy-out of houses are not currently included in the Total Cost (in particular, this applies to: T-14 (RA3), T-24 (RA3), and T-26).

Table 2. Conceptual Cost Calculations and Assumptions for Fire Island to Montauk Point HEP Restoration Alternatives.

Line Item	Item	Description	Source	Page #	Line Item #	Material	Labor	Equipment	Total	Total Incl O&P	Year of Estimate	Current Year 2006 Cost Adjusted to 2006 Dollars(2)	Units	Cost Adjusted to Acres or Each (3)	Units	Location Adjustment Cost Adjusted to Fire Island, NY (4)	Units	Notes	Assumptions
A	**Remove**																		
A1		Bulkhead (incl. disposal)	RS Means	62	02390 150 0210	$ 54.00	$ 69.50	$ 74.00	$ 197.50	**$ 254.00**	2001	**$ 324.18**	**LF**	**$ 67,659**	**AC**	**$ 84,776**	**AC**	Estimate using bulkhead installation cost minus material cost but plus disposal cost is assumed equal	Assume sq.rt. 43560 is # LF of bulkhead = 208.71 LF/AC
A2		Rubbish handling, loading & trucking, incl 2 mi haul, machine load truck	RS Means	42	02225 730 3080		$ 6.55	$ 4.59	$ 11.14	**$ 15.15**	2001	**$ 19.34**	**CY**	**$ 4,834**	**AC**	**$ 12,693**	**AC**	Debris handling, machine load dump truck, haul to dump, & disposal	Assume 250 CY rubbish per acre
		Dump charges - rubbish only	RS Means	42	02225 740 0300					**$ 50.00**	2001	**$ 63.81**	**Ton**	**$ 5,297**	**AC**				Assume 3 CY/ton; 250/3 = 83 ton/AC
A3		Remove sod, by hand	RS Means	133	02930 680 4200		$ 1.52		$ 1.52	**$ 1.52**	2001	**$ 1.94**	**SY**	**$ 9,389**	**AC**	**$ 80,995**	**AC**	Plant removal, hand load dump truck, haul to dump, & disposal	Assume # SY/AC is # SY sod removal = 4840 SY/AC
		& Rubbish handling, loading & trucking, incl 2 mi haul, hand loading truck, 50' haul		42	02225 730 3040		$ 15.75	$ 10.05	$ 27.55	**$ 35.50**	2001	**$ 45.31**	**Ton**	**$ 24,366**	**AC**				Assume 3 CY/ton; # CY/AC = 4840/3 = 1613.33 CY/AC = 537.78 ton/AC disposal
		Dump charges - trees, brush, lumber		42	02225 740 0200					**$ 45.00**	2001	**$ 57.43**	**Ton**	**$ 30,886**	**AC**				Assume 3 CY/ton; # CY/AC = 4840/3 = 1613.33 CY/AC = 537.78 ton/AC disposal
A4		Building demolition, large urban project, incl. 20 mi haul, 2 family, 2 story house, wood, maximum	RS Means	36	02220 100 1220				$ 5,800.00	**$ 7,000.00**	2001	**$ 8,933.97**	**Ea**	**$ 8,934**	**Each**	**$ 23,348**	**Each**	Building demolition, load and haul, & disposal	
		Disposal only, urban building with salvage value allowed, including loading and 5 mi haul to dump, wood frame		42	02225 720 0500		$ 4.82	$ 7.05	$ 11.87	**$ 15.20**	2001	**$ 19.40**	**CY**	**$ 9,700**	**Each**				Assume 500 CY debris/building
A5		Fencing, wood, all types, 4' to 6' high	RS Means	37	02200 875 0775		$ 0.85		$ 0.85	**$ 1.32**	2001	**$ 1.68**	**LF**	**$ 352**	**AC**	**$ 2,554**	**AC**	Fence removal, hand load dump truck, haul to dump, & disposal cost	Assume sq.rt. 43560 is # LF of fencing = 208.71 LF/AC
		& Rubbish handling, loading & trucking, incl 2 mi haul, hand loading truck, 50' haul		42	02225 730 3040					**$ 35.50**	2001	**$ 45.31**	**Ton**	**$ 700**	**AC**				Assume 208.71 LF/AC x 6' = 1252.26 CF/AC; /27 CF/CY = 46.38 CY/AC; /3 CY/ton) = 15.46 ton/AC
		Dump charges - rubbish only		42	02225 740 0300					**$ 50.00**	2001	**$ 63.81**	**Ton**	**$ 987**	**AC**				Assume 208.71 LF/AC x 6' = 1252.26 CF/AC; /27 CF/CY = 46.38 CY/AC; /3 CY/ton) = 15.46 ton/AC
A6		Pavement removal, bituminous roads, 3" thick	RS Means	38	02220 875 1710		$ 1.50	$ 1.36	$ 2.86	**$ 3.81**	2001	**$ 4.86**	**SY**	**$ 23,535**	**AC**	**$ 60,321**	**AC**	Pavement removal & disposal cost, included removal of pad sites in this	Assume # SY/AC is # SY pavement removal = 4840 SY/AC
		& For disposal to 5 miles, add			02220 875 5600		$ 2.52	$ 7.35	$ 9.87	**$ 11.95**	2001	**$ 15.25**	**CY**	**$ 24,606**	**AC**				Assume # CY/AC = 4840/3 = 1613.33 CY/AC
A7		Groin removal	USACE						$ 150,000.00			**$ 166,000.00**	**Ea**	**$ 166,000**		$ 166,000	Each	Cost provided by Lynn B. at USACE	Assumes removal, regrading, disposal costs included
A8		Rip-rap, random, broken stone (incl. disposal)	RS Means	62	02370 300 0100	$ 18.80	$ 7.35	$ 6.25	$ 32.40	**$ 38.50**	2001	**$ 49.14**	**CY**	**$ 5,460**	**Each**	**$ 6,841**	**Each**	Groin removal; Estimate using rip-rap placement cost minus material cost but plus disposal cost is assumed equal	Assume avg groin is 5' wide x 30' long x 20' deep = 3000 cu.ft. = 111.11 CY
B	**Regrade**																		
B1		Grading at dump, or embankment if required, by dozer	RS Means	60	02320 200 1600		$ 0.33	$ 0.74	$ 1.07	**$ 1.32**	2001	**$ 1.68**	**CY**	**$ 2,718**	**AC**	**$ 3,406**	**AC**		Assume grading 1' over 1 AC = 1613.33 CY/AC
C	**Fill**																		
C1		Sand, using dredge material	DMMP							**$ 13.50**	2006	**$ 13.50**	**CY**	**$ 21,780**	**AC**	**$ 21,780**	**AC**	Beach/dune bird habitat creation; assumes 1' depth over 1 AC = 1613.33 CY/AC	Assume Beneficial Use of dredge material - Bird Habitat Creation
C2		Loam, using dredge material	DMMP							**$ 17.50**	2006	**$ 17.50**	**CY**	**$ 28,233**	**AC**	**$ 28,233**	**AC**	Salt marsh creation/restoration; assumes 1' depth over 1 AC = 1613.33 CY/AC	Assume Beneficial Use of dredge material - Marsh Creation, combined cap ($5/CY) and subfill ($30/CY) material
D	**Relocate**																		
D1		Wells, domestic water, gravel pack well, 40' deep, incl. gravel & casing, complete, 24" diam. casing x 18" diam screen	RS Means	79	02520 900 0500	$ 21,000.00	$ 7,150.00	$ 15,800.00	$ 43,950.00	**$ 51,500.00**	2001	**$ 65,728.50**	**Each**	**$ 65,729**	**Each**	**$ 82,358**	**Each**	Water Supply Well	

Table 2. Conceptual Cost Calculations and Assumptions for Fire Island to Montauk Point HEP Restoration Alternatives.

Line Item	Item	Description	Source	Page #	Line Item #	Material	Labor	Equipment	Total	Total Incl O&P	Year of Estimate	Current Year 2006 Cost Adjusted to 2006 Dollars(2)	Units	Cost Adjusted to Acres or Each (3)	Units	Location Adjustment Cost Adjusted to Fire Island, NY (4)	Units	Notes	Assumptions
E	**Install**																		
E1		Culvert/headwall, 1-1/2 to 1 slope soil, CIP concrete, 48" diam pipe, 4'-6' long wing walls	RS Means	443	A12.3-750 2060	$ 830.00	$	$ 2,475.00	$ 3,305.00	**$ 3,305.00**	2001	**$ 4,218.11**	**Each End**	**$ 8,436**	**Each**	**$ 10,571**	**Each**		Assume that two culvert/headwall set ups are needed for a complete culvert
E2		Flap Gate, Aluminum, 48" diam	RS Means	308	11285 190 0150	$ 5,575.00	$ 620.00	$ 355.00	$ 6,550.00	**$ 7,625.00**	2001	**$ 9,731.65**	**Each**	**$ 9,732**	**Each**	**$ 12,194**	**Each**	Presume cost does not include site preparation?	
E3		24" diam Self-regulating Tide (SRT) Gate	Waterman			$ 37,000.00			$ 74,000.00	**$ 81,400.00**	2006	**$ 81,400.00**	**Each**	**$ 81,400**	**Each**	**$ 101,994**	**Each**		
E4		36" diam SRT Gate	Waterman			$ 44,000.00			$ 88,000.00	**$ 96,800.00**	2006	**$ 96,800.00**	**Each**	**$ 96,800**	**Each**	**$ 121,290**	**Each**		
E5		Sand fencing	Port Monmouth			$ 1.06	$ 1.40		$ 2.46	**$ 2.70**	1998	**$ 3.99**	**LF**	**$ 833**	**AC**	**$ 1,043**	**AC**		Assume sq.rt. 43560 is # LF of sand fencing = 208.71 LF/AC
E6		Boardwalk/recreational access	Port Monmouth			$ 18,600.00	$ 476.00		$ 19,076.00	**$ 20,983.60**	1998	**$ 31,002.33**	**Each**	**$ 31,002**	**Each**	**$ 38,846**	**Each**		
F	**Excavate & Move Material**																		
F1		To tidal elevation w/ offsite disposal	South River						$ 29,040.00	**$ 31,944.00**	2001	**$ 40,769.54**	**AC**	**$ 40,770**	**AC**	**$ 51,084**	**AC**	$29,040/AC + 10% O&P	Assume avg of 1 ft removal; $18/CY (2001 dollars)
F2		To subtidal elevation w/ offsite disposal	South River						$ 107,448.00	**$ 118,192.80**	2001	**$ 150,847.29**	**AC**	**$ 150,847**	**AC**	**$ 189,012**	**AC**	$29,040/AC x 3.7 ft avg depth of removal + 10% O&P	Assume avg of 3.7 ft removal; $18/CY (2001 dollars)
F3		To salt marsh elevation w/ onsite use	South River						$ 16,940.00	**$ 18,634.00**	2001	**$ 23,782.23**	**AC**	**$ 23,782**	**AC**	**$ 29,799**	**AC**	($8,873 + $4,840 + $3,227 [2001 dollars]) + 10% O&P	Assume avg of 1.1 ft removal; Onsite use for filling old channels, ditch plugging; excavation ($5/CY), hauling ($3/CY), and grading ($2/CY) (2001 dollars)
F4		To (sinuous) tidal creek elevation w/ onsite use	South River						$ 59,695.00	**$ 65,664.50**	2001	**$ 83,806.39**	**AC**	**$ 83,806**	**AC**	**$ 105,009**	**AC**	($29,847 + $17,908 + $11,940 [2001 dollars]) + 10% O&P	Assume avg of 3.7 ft removal; Onsite use for filling old channels, ditch plugging; excavation ($5/CY), hauling ($3/CY), and grading ($2/CY) (2001 dollars)
G	**Invasive Species Control**																		
G1		Herbicide	Cape May (Allied Biological)						$ 576.00	**$ 576.00**	2004	**$ 635.04**	**AC**	**$ 635**	**AC**	**$ 796**	**AC**		
G2		Manual removal	South River						$ 29,040.00	**$ 31,944.00**	2001	**$ 40,769.54**	**AC**	**$ 40,770**	**AC**	**$ 51,084**	**AC**	$29,040/AC + 10% O&P	Assume avg of 1 ft removal of thatch material & offsite disposal
H	**Plants & Bioengineering**																		
H1		Dune grass	Pinelands Nursery and Supply													**$ 8,141**	**AC**	2" plugs, 24" on center	
H2		Upland	Various													**$ 1,090**	**AC**	6"-24" high, 10' on center	
H3		Bay Beach- Emergents	Pinelands Nursery and Supply													**$ 12,439**	**AC**	2" plugs, 18" on center	
H4		Bay Beach - Shrubs	Pinelands Nursery and Supply													**$ 816**	**AC**	6"-24" high, 6' and 10' on center	
H5		BaySub SAV	Fonseca et al.													**$ 37,000**	**AC**	harvest SAV from donor bed & transplant	
H6		Coir logs	Eco-Building and Forestry,LLC.													**$ 4,124**	**AC**	44 12" x 20 ft length rolls per acre	209 lf - 1 ac, 4 12" x 20 ft rolls high
H7		Gabion basket	Eco-Building and Forestry,LLC.													**$ 6,678**	**AC**	53 12x3x3 baskets per acre	209 lf - 1 ac, 3 baskets high
H8		Supporting Products - coir log	Eco-Building and Forestry,LLC.													**$ 74**	**Ac**	21 poles per acre	1 pole sufficient for every 10 lf (4 rolls high)
H9		Supporting Products - gabion	Eco-Building and Forestry,LLC.													**$ 298**	**AC**	70 poles per acre	4 poles per 12 lf (3 baskets high)
I	**Other**																		
I1		Mobilization & Demobilization	Lincoln Park								N/A					**2%**		2% of Total Construction Cost	
I2		Contingency	Port Monmouth & South River								N/A					**20%**		20% of Total Construction Cost	
I3		Engineering & Design (E&D) and Supervision & Administration (S&A)	USACE								N/A					**15%**		15% of Total Construction Cost	

Acronyms & Abbreviations

AC	acres
CIP	cast in place
CY	cubic yards
diam	diameter
E&D	Engineering & Design
LF	linear feet
mi	mile
MSF	Thousand square feet
N/A	Not applicable
O&P	operating contractor's overhead & profit
S&A	Supervision & Administration
SRT Gate	Self-regulating tide gate
SY	square yards
USACE	U.S. Army Corps of Engineers

Notes

(1) Costs are preliminary, and are for comparison of alternatives only.

(2) Dollar estimates extrapolated to Year 2006 using the following equation (Miller 1997):

$Vx = PV*((1+i)^{(x-y)})$ — Vx = Value at Year x; x = Year of Interest (i.e., 2006); y = Year of Estimate (i.e., 2001); PV = Value Provided; i = interest rate (i.e., 5%)

Interest Rate: 5%

(3) See Assumptions for cost adjustment to Acres or Each

(4) Location Adjustment (R.S. Means 2001) for Long Island is equivalent to multiplying cost by 125.3/100

Sources:

Cape May — Estimate from previous USACE project cost estimate (Cape May September 2004).
DMMP — Estimate from previous USACE project cost estimate (DMMP, March 2006)
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Fonseca, et al. 2001. Handbook of Ecological Restoration, Chapter 7: Seagrasses. Cambridge University Press. Cambridge.
Lincoln Park — Estimate from previous USACE project cost estimate (Lincoln Park February 2004).
New England Wetland Plants, Inc., 820 West Street, Amherst, MA 01002. Ph: (413) 548-8000
Miller, R.L. 1997. Economics Today: The Micro View. 9th Edition. Addison Wesley Longman, Inc., New York.
Pinelands Nursery and Supply, 323 Island Rd., Columbus, NJ 08022. Ph: (609) 291-9486 www.pinelandsnursery.com
Port Monmouth — Estimate from previous USACE project cost estimate (Port Monmouth, June 1998).
R.S. Means Site Work & Landscape Cost Data 20th Annual Edition (2001).
South River — Estimate from previous USACE project cost estimate (South River, October 2001).
Sylva Native Nursery and Seed Co., 3815 Roser Road, Glen Rock, PA 17327. Ph: (717) 227-0486 http://www.sylvanative.com/
Waterman. 2006. Waterman/Nekton, Self-Regulating Tidegate for Tidal Wetlands Preservation & Restoration. Available: www.watermanusa.com.

Table 3. Matrix of Conceptual Size Estimates for Fire Island to Montauk Point HEP Restoration Alternatives.

Line Item	Item	Description	Cost Adjusted to Fire Island, NY (2006 dollars)	Units	Sunken Forest T-2 RA1	Sunken Forest T-2 RA2	Sunken Forest T-2 RA3	Sunken Forest T-2 RA4	Reagan Property T-3 RA1	Reagan Property T-3 RA2	Reagan Property T-3 RA3	Great Gun T-5 RA1	Great Gun T-5 RA2	Great Gun T-5 RA3	Great Gun T-5 RA4	Tiana T-7 RA1	Tiana T-7 RA2	Tiana T-7 RA3	WOSI T-8 RA1	WOSI T-8 RA2	WOSI T-8 RA3	WOSI T-8 RA4	Georgica Pond T-9 RA1	Georgica Pond T-9 RA2	Georgica Pond T-9 RA3	East Inlet Island T-10 RA1	East Inlet Island T-10 RA2	East Inlet Island T-10 RA3	John Boyle Island T-11 RA1	John Boyle Island T-11 RA2	John Boyle Island T-11 RA3	Ocean Beach T-14 RA1	Ocean Beach T-14 RA2	Ocean Beach T-14 RA3	New Made Island T-15 RA1	New Made Island T-15 RA2	New Made Island T-15 RA3	Islip Meadows T-22 RA1	Islip Meadows T-22 RA2	Islip Meadows T-22 RA3	Seatuck Refuge T-23 RA1	Seatuck Refuge T-23 RA2	Seatuck Refuge T-23 RA3	Davis Park T-24 RA1	Davis Park T-24 RA2	Davis Park T-24 RA3	Atlantique to Corneille T-25 RA1	Atlantique to Corneille T-25 RA2	Atlantique to Corneille T-25 RA3	Kismet T-26 RA1	Kismet T-26 RA2	Kismet T-26 RA3	Warner Island East T-27 RA1	Warner Island East T-27 RA2	Warner Island East T-27 RA3	Atlantique T-28 RA1	Atlantique T-28 RA2	Atlantique T-28 RA3	Fair Harbor T-29 RA1	Fair Harbor T-29 RA2	Fair Harbor T-29 RA3
A	**Remove**																																																																				
A1		Bulkhead (incl. disposal)	$ 84,776	AC	1.00			11.00							4.60																													8.10																							
A2		Rubbish handling, loading & trucking, incl 2 mi haul, machine load truck Dump charges - rubbish only	$ 12,693	AC	0.25		0.75	1.00						3.00	1.50											2.00			1.00	0.25					0.75	0.20					1.50					**0.50**																				
A3		Remove sod, by hand & Rubbish handling, loading & trucking, incl 2 mi haul, hand loading truck, 50' haul Dump charges - trees, brush, lumber	$ 87,652	AC																																																																	
A4		Building demolition, large urban project, incl. 20 mi haul, 2 family, 2 story house, wood, maximum Disposal only, urban building with salvage value allowed, including loading and 5 mi haul to dump, wood frame	$ 42,000	Each			25.00	5.00						3.00																				8.00											2.00						5.00	3.00					4.00	2.00		7.00	15.00
A5		Fencing, wood, all types, 4' to 6' high & Rubbish handling, loading & trucking, incl 2 mi haul, hand loading truck, 50' haul Dump charges - rubbish only	$ 2,554	AC						2.00			1.00												9.50							5.70											13.00																						
A6		Pavement removal, bituminous roads, 3" thick & For disposal to 5 miles, add	$ 60,321	AC			0.50									0.20	0.20				0.40												1.00											0.20						0.75	0.30					0.60	0.10		1.25	2.00
A7		Groins (including disposal)	$ 166,000	Each																					3.00						2.00																																		
A8		Rip-rap, random, broken stone (incl. disposal)	$ 6,841	Lf				2.00							0.25																																																			
B	**Regrade**																																																																			
B1		Grading at dump, or embankment if required, by dozer	$ 3,406	AC	4.30	8.60	3.00	3.60	4.80	6.50	2.90		1.00	4.70	0.72	1.20	0.20			6.90	0.40	11.00			34.30	5.00		18.00	2.90	1.80	7.20	0.10	7.60	4.80	1.20	0.60	6.70					8.10	2.40	16.80	2.10	15.00	1.22	13.20	5.70	1.10	0.42	8.30	6.50		4.10	0.37	0.26	4.50	0.80	1.65
C	**Fill**																																																																			
C1		Sand, using dredge material	$ 21,780	AC	1.10	8.60			2.40	6.50	5.00	0.30	1.00	1.00		1.00				0.60					61.00								7.60	4.80	4.00						2.00	1.20	8.40		15.00		9.00	5.70	1.10	0.42	25.00	20.00	15.00	4.10	0.37	0.26	4.50	0.80	1.65
C2		Loam, using dredge material	$ 28,233	AC																									1.70						2.00																														
D	**Relocate**																																																																			
D1		Wells, domestic water, gravel pack well, 40' deep, incl. gravel & casing, complete, 24" diam. casing x 18" diam screen	$ 4,000,000	Each																											1.00																																			
E	**Install**																																																																			
E1		Culvert/headwall, 1-1/2 to 1 slope soil, CIP concrete, 48" diam pipe, 4'-6' long wing walls	$ 10,571	Each								3.00																											3.00																												
E2		Flap Gate, Aluminum, 48" diam	$ 12,194	Each																																	2.00																															
E3		24" diam Self-regulating Tide (SRT) Gate	$ 101,994	Each																																																																
E4		36" diam SRT Gate	$ 121,290	Each																					1.00																																									
E6		Boardwalk/recreational access	$ 38,846	Each		1.00				1.00			1.50			1.00				1.50												3.00												16.00						5.00						4.00			5.00		
F	**Excavate & Move Material**																																																																			
F1		To tidal elevation w/ offsite disposal	$ 51,084	AC								0.10			1.20							11.00	50.00	10.00																	6.00					1.22																			
F2		To subtidal elevation w/ offsite disposal	$ 189,012	AC								0.10																									0.50	12.50			12.00																									
F3		To salt marsh elevation w/ onsite use	$ 29,799	AC																																			0.50																									
F4		To (sinuous) tidal creek elevation w/ onsite use	$ 105,009	AC																																																																
G	**Invasive Species Control**																																																																			
G1		Herbicide	$ 796	AC															9.00							16.00		4.00		4.00				1.20					45.00		90.00																									
G2		Manual removal	$ 51,084	AC	0.50																		50.00	10.00																																												
H	**Plants & Bioengineering**																																																																			
H1		Dune grass	$ 8,141	AC		3.20				1.60			0.25	0.30		0.25				0.10					9.00							2.00	3.00										0.60	4.20	2.10			5.20	1.40	1.10	0.42	1.00		3.00	1.00	0.37	0.26	1.10	0.80	1.65
H2		Upland	$ 1,090	AC													0.10				0.25									1.70						2.00											0.80					5.40										
H3		Bay Beach- Emergents	$ 12,439	AC				0.50	0.40		0.40	0.10			0.10	0.05				1.20		8.00	11.00	2.00																4.00		1.00					1.00						0.50	0.25	2.00							
H4		Bay Beach - Shrubs	$815.50	AC	2.20			0.50	0.80		0.60	0.10			0.10	0.05				0.50		3.00	6.00	1.00				13.00		0.10	5.20						4.80			2.00		1.00					0.22						1.00	0.50	13.00							
H5		BaySub SAV	$37,000.00	AC														1.00																																															
H6		Coir logs	$4,124.00	AC	4.30			3.60	4.80		1.40																														8.10																							
H7		Gabion basket - wire mesh, 8" stone	$6,678.00	AC																								18.00			7.20						4.80																						7.50					
H8		rebar/anchor - small diameter	$73.50	AC	4.30																																				8.10																							
H9		rebar/anchor - large diameter	$297.50	AC				3.60	4.80		1.40																	18.00			7.20						4.80																						7.50					
I	**Other**																																																																		
I1		Mobilization & Demobilization		2%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
I2		Contingency		20%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
I3		E&D and S&A		15%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J	**Real Estate**																																																																			
J1		Buy-out Houses/Properties - USACE Real Estate to provide																															8.00												1.00					5.00	3.00					4.00	2.00		7.00	15.00

Assumptions: Sand fill - assumed 1/2 AC per 209 LF of shoreline bayside
1/2 AC per 209 LF of shoreline oceanside for insipient dunes
1 AC per 209 LF of shoreline oceanside for foredunes
Plantings - assume 1/4 of each AC graded/restored will be planted
Assumed structure and boardwalk removal under A4, but costs probably very low for these tasks
Adjusted # of units of bulkhead removal to account for Marina removal
Adjusted # units of building demolition to account for sheds/small wooden structures
Included boardwalk removal, shed removal, in structure demolition and disposal costs
Costs for house removal seemed low - bumped up from $23,348
Assume removed marina property and associated recreational structures would be donated (not purchased) in T-2 (RA3) and T-5 (RA3)

Table 4. Matrix of Conceptual Cost Estimates for Fire Island to Montauk Point HEP Restoration Alternatives.

Line Item	Item	Description	Cost Adjusted to Fire Island, NY (2006 dollars)	Units	Sunken Forest T-2 RA1	Sunken Forest T-2 RA2	Sunken Forest T-2 RA3	Sunken Forest T-2 RA4	Reagan Property T-3 RA1	Reagan Property T-3 RA2	Reagan Property T-3 RA3	Great Gun T-5 RA1	Great Gun T-5 RA2	Great Gun T-5 RA3	Great Gun T-5 RA4	Tiana T-7 RA1	Tiana T-7 RA2	Tiana T-7 RA3	WOSI T-8 RA1	WOSI T-8 RA2	WOSI T-8 RA3	WOSI T-8 RA4	Georgica Pond T-9 RA1	Georgica Pond T-9 RA2	Georgica Pond T-9 RA3	East Inlet Island T-10 RA1	East Inlet Island T-10 RA2	East Inlet Island T-10 RA3	John Boyle Island T-11 RA1	John Boyle Island T-11 RA2	John Boyle Island T-11 RA3	Ocean Beach T-14 RA1	Ocean Beach T-14 RA2	Ocean Beach T-14 RA3
A	**Remove**																																	
A1		Bulkhead (incl. disposal)	$ 84,776	AC	$ 84,776	$ -	$ -	$ 932,539	$ -	$ -	$ -	$ -	$ -	$ -	$ 389,971	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
A2		Rubbish handling, loading & trucking, incl 2 mi haul, machine load truck Dump charges - rubbish only	$ 12,693	AC	$ 3,173	$ -	$ 9,520	$ 12,693	$ -	$ -	$ -	$ -	$ -	$ 38,080	$ 19,040	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 25,387	$ -	$ -	$ 12,693	$ 3,173	$ -	$ -	$ -	$ -
A3		Remove sod, by hand & Rubbish handling, loading & trucking, incl 2 mi haul, hand loading truck, 50' haul Dump charges - trees, brush, lumber	$ 87,652	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
A4		Building demolition, large urban project, incl. 20 mi haul, 2 family, 2 story house, wood, maximum Disposal only, urban building with salvage value allowed, including loading and 5 mi haul to dump, wood frame	$ 23,348	Each	$ -	$ -	$ 1,050,000	$ 210,000	$ -	$ -	$ -	$ -	$ -	$ 126,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 336,000
A5		Fencing, wood, all types, 4' to 6' high & Rubbish handling, loading & trucking, incl 2 mi haul, hand loading truck, 50' haul Dump charges - rubbish only	$ 2,554	AC	$ -	$ -	$ -	$ -	$ -	$ 5,109	$ -	$ -	$ 2,554	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 24,267	$ -	$ -	$ -	$ -	$ -	$ -	$ 14,560	$ -
A6		Pavement removal, bituminous roads, 3" thick & For disposal to 5 miles, add	$ 60,321	AC	$ -	$ -	$ 30,160	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 12,064	$ 12,064	$ -	$ -	$ -	$ 24,128	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 60,321
A7		Groins (including disposal)	$ 166,000	Each	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 498,000	$ -	$ -	$ -	$ -	$ -	$ -	$ 332,000	$ -	$ -
A8		Rip-rap, random, broken stone (incl. disposal)	$ 6,841	Lf	$ -	$ -	$ -	$ 13,682	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,710	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
B	**Regrade**																																	
B1		Grading at dump, or embankment if required, by dozer	$ 3,406	AC	$ 14,644	$ 29,288	$ 10,217	$ 12,260	$ 16,347	$ 22,136	$ 9,876	$ -	$ 3,406	$ 16,006	$ 2,452	$ 4,087	$ 681	$ -	$ -	$ 23,499	$ 1,362	$ 37,462	$ -	$ -	$ 116,812	$ 17,028	$ -	$ 61,301	$ 9,876	$ 6,130	$ 24,520	$ 341	$ 25,883	$ 16,347
C	**Fill**																																	
C1		Sand, using dredge material	$ 21,780	AC	$ 23,958	$ 187,308	$ -	$ -	$ 52,272	$ 141,570	$ 108,900	$ 6,534	$ 21,780	$ 21,780	$ -	$ 21,780	$ -	$ -	$ -	$ 13,068	$ -	$ -	$ -	$ -	$ 1,328,577	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 165,528	$ 104,544
C2		Loam, using dredge material	$ 28,233	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 47,997	$ -	$ -	$ -	$ -
D	**Relocate**																																	
D1		Wells, domestic water, gravel pack well, 40' deep, incl. gravel & casing, complete, 24" diam. casing x 18" diam screen	$ 4,000,000	Each	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4,000,000	$ -	$ -
E	**Install**																																	
E1		Culvert/headwall, 1-1/2 to 1 slope soil, CIP concrete, 48" diam pipe, 4'-6' long wing walls	$ 10,571	Each	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 31,712	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
E2		Flap Gate, Aluminum, 48" diam	$ 12,194	Each	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
E3		24" diam Self-regulating Tide (SRT) Gate	$ 101,994	Each	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
E4		36" diam SRT Gate	$ 121,290	Each	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 121,290	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
E6		Boardwalk/recreational access	$ 38,846	Each	$ -	$ 38,846	$ -	$ -	$ -	$ 38,846	$ -	$ -	$ 58,269	$ -	$ -	$ 38,846	$ -	$ -	$ -	$ 58,269	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 116,538	$ -
F	**Excavate & Move Material**																																	
F1		To tidal elevation w/ offsite disposal	$ 51,084	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,108	$ -	$ -	$ 61,301	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 561,927	$ 2,554,212	$ 510,842	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
F2		To subtidal elevation w/ offsite disposal	$ 189,012	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 18,901	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
F3		To salt marsh elevation w/ onsite use	$ 29,799	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
F4		To (sinuous) tidal creek elevation w/ onsite use	$ 105,009	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
G	**Invasive Species Control**																																	
G1		Herbicide	$ 796	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 7,161	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 12,731	$ -	$ 3,183	$ -	$ 3,183	$ -	$ -	$ -
G2		Manual removal	$ 51,084	AC	$ 25,542	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,554,212	$ 510,842	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
H	**Plants & Bioengineering**																																	
H1		Dune grass	$ 8,141	AC	$ -	$ 26,051	$ -	$ -	$ -	$ 13,026	$ -	$ -	$ 2,035	$ 2,442	$ -	$ 2,035	$ -	$ -	$ -	$ 814	$ -	$ -	$ -	$ -	$ 73,270	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 16,282	$ 24,423
H2		Upland	$ 1,090	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 109	$ -	$ -	$ -	$ 273	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,853	$ -	$ -	$ -	$ -
H3		Bay Beach- Emergents	$ 12,439	AC	$ -	$ -	$ -	$ 6,219	$ 4,976	$ -	$ 4,976	$ 1,244	$ -	$ -	$ 1,244	$ 622	$ -	$ -	$ -	$ 14,927	$ -	$ 99,510	$ 136,827	$ 24,878	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
H4		Bay Beach - Shrubs	$ 816	AC	$ 1,794	$ -	$ -	$ 408	$ 652	$ -	$ 489	$ 82	$ -	$ -	$ 82	$ 41	$ -	$ -	$ -	$ 408	$ -	$ 2,447	$ 4,893	$ 816	$ -	$ -	$ -	$ 10,602	$ -	$ 82	$ 4,241	$ -	$ -	$ -
H5		BaySub SAV	$ 37,000	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 37,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
H6		Coir logs	$4,124.00																															
H7		Gabion basket - wire mesh, 8" stone	$6,678.00	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 120,204	$ -	$ -	$ 48,082	$ -	$ -	$ -
H8		rebar/anchor - small diameter	$73.50																															
H9		rebar/anchor - large diameter	$297.50	AC	$ -	$ -	$ -	$ 1,071	$ 1,428	$ -	$ 417	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,355	$ -	$ -	$ 2,142	$ -	$ -	$ -
		SUBTOTAL			$ 153,888	$ 281,493	$ 1,099,897	$ 1,188,873	$ 75,675	$ 220,687	$ 124,657	$ 63,581	$ 88,044	$ 204,309	$ 475,800	$ 79,475	$ 12,854	$ 37,000	$ 7,161	$ 110,984	$ 25,763	$ 701,345	$ 5,250,143	$ 1,047,378	$ 2,162,217	$ 42,415	$ 12,731	$ 197,461	$ 25,753	$ 59,235	$ 82,167	$ 4,332,341	$ 338,790	$ 541,635
I	**Other**																																	
I1		Mobilization & Demobilization	2%		$ 3,078	$ 5,630	$ 21,998	$ 23,777	$ 1,513	$ 4,414	$ 2,493	$ 1,272	$ 1,761	$ 4,086	$ 9,516	$ 1,589	$ 257	$ 740	$ 143	$ 2,220	$ 515	$ 14,027	$ 105,003	$ 20,948	$ 43,244	$ 848	$ 255	$ 3,949	$ 515	$ 1,185	$ 1,643	$ 86,647	$ 6,776	$ 10,833
I2		Contingency	20%		$ 30,778	$ 56,299	$ 219,979	$ 237,775	$ 15,135	$ 44,137	$ 24,931	$ 12,716	$ 17,609	$ 40,862	$ 95,160	$ 15,895	$ 2,571	$ 7,400	$ 1,432	$ 22,197	$ 5,153	$ 140,269	$ 1,050,029	$ 209,476	$ 432,443	$ 8,483	$ 2,546	$ 39,492	$ 5,151	$ 11,847	$ 16,433	$ 866,468	$ 67,758	$ 108,327
I3		E&D and S&A (2)	15%		$ 28,161	$ 51,513	$ 201,281	$ 217,564	$ 13,848	$ 40,386	$ 22,812	$ 11,635	$ 16,112	$ 37,389	$ 87,071	$ 14,544	$ 2,352	$ 6,771	$ 1,311	$ 20,310	$ 4,715	$ 128,346	$ 960,776	$ 191,670	$ 395,686	$ 7,762	$ 2,330	$ 36,135	$ 4,713	$ 10,840	$ 15,037	$ 792,818	$ 61,999	$ 99,119
		TOTAL			**$ 215,905**	**$ 394,935**	**$ 1,543,156**	**$ 1,667,989**	**$ 106,172**	**$ 309,623**	**$ 174,894**	**$ 89,204**	**$ 123,526**	**$ 286,646**	**$ 667,547**	**$ 111,503**	**$ 18,035**	**$ 51,911**	**$ 10,047**	**$ 155,711**	**$ 36,145**	**$ 983,987**	**$ 7,365,951**	**$ 1,469,471**	**$ 3,033,590**	**$ 59,508**	**$ 17,862**	**$ 277,038**	**$ 36,131**	**$ 83,106**	**$ 115,281**	**$ 6,078,274**	**$ 475,323**	**$ 759,913**
J	**Real Estate (3)**																																	
J1		Buy-out Houses/Structures																																$6,300,000
		TOTAL			**$ 244,066**	**$ 394,935**	**$ 1,543,156**	**$ 1,667,989**	**$ 106,172**	**$ 309,623**	**$ 174,894**	**$ 89,204**	**$ 123,526**	**$ 286,646**	**$ 667,547**	**$ 111,503**	**$ 18,035**	**$ 51,911**	**$ 10,047**	**$ 155,711**	**$ 36,145**	**$ 983,987**	**$ 7,365,951**	**$ 1,469,471**	**$ 3,033,590**	**$ 59,508**	**$ 17,862**	**$ 277,038**	**$ 36,131**	**$ 83,106**	**$ 115,281**	**$ 6,078,274**	**$ 475,323**	**$ 7,059,913**

Notes

(1) Costs are preliminary, and are for comparison of alternatives only.

(2) Engineering & Design (E&D) and Supervision & Administration (S&A) costs are calculated as 15% of the Subtotal *plus* Mob & Demob and Contingency cost.

Table 4. Matrix of Conceptual Cost Estimates for Fire Island to Montauk Point HEI

Line Item	Item	Description	Cost Adjusted to Fire Island, NY (2006 dollars)	Units	New Made Island T-15 RA1	New Made Island T-15 RA2	New Made Island T-15 RA3	Islip Meadows T-22 RA1	Islip Meadows T-22 RA2	Islip Meadows T-22 RA3	Seatuck Refuge T-23 RA1	Seatuck Refuge T-23 RA2	Seatuck Refuge T-23 RA3	Davis Park T-24 RA1	Davis Park T-24 RA2	Davis Park T-24 RA3	Atlantique to Corneille T-25 RA1	Atlantique to Corneille T-25 RA2	Atlantique to Corneille T-25 RA3	Kismet T-26 RA1	Kismet T-26 RA2	Kismet T-26 RA3	Warner Island East T-27 RA1	Warner Island East T-27 RA2	Warner Island East T-27 RA3	Atlantique T-28 RA1	Atlantique T-28 RA2	Atlantique T-28 RA3	Fair Harbor T-29 RA1	Fair Harbor T-29 RA2	Fair Harbor T-29 RA3
A	**Remove**																														
A1		Bulkhead (incl. disposal)	$ 84,776	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 686,688	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
A2		Rubbish handling, loading & trucking, incl 2 mi haul, machine load truck Dump charges - rubbish only	$ 12,693	AC	$ 9,520	$ 2,539	$ -	$ -	$ -	$ -	$ 19,040	$ -	$ -	$ -	$ -	$ 6,347	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
A3		Remove sod, by hand & Rubbish handling, loading & trucking, incl 2 mi haul, hand loading truck, 50' haul Dump charges - trees, brush, lumber	$ 87,652	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
A4		Building demolition, large urban project, incl. 20 mi haul, 2 family, 2 story house, wood, maximum Disposal only, urban building with salvage value allowed, including loading and 5 mi haul to dump, wood frame	$ 23,348	Each	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 84,000	$ -	$ -	$ -	$ -	$ 210,000	$ 126,000	$ -	$ -	$ -	$ -	$ 168,000	$ 84,000	$ -	$ 294,000	$ 630,000
A5		Fencing, wood, all types, 4' to 6' high & Rubbish handling, loading & trucking, incl 2 mi haul, hand loading truck, 50' haul Dump charges - rubbish only	$ 2,554	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 33,207	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
A6		Pavement removal, bituminous roads, 3" thick & For disposal to 5 miles, add	$ 60,321	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 12,064	$ -	$ -	$ -	$ -	$ 45,240	$ 18,096	$ -	$ -	$ -	$ -	$ 36,192	$ 6,032	$ -	$ 75,401	$ 120,641
A7		Groins (including disposal)	$ 166,000	Each	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
A8		Rip-rap, random, broken stone (incl. disposal)	$ 6,841	Lf	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
B	**Regrade**																														
B1		Grading at dump, or embankment if required, by dozer	$ 3,406	AC	$ 4,087	$ 2,043	$ 22,818	$ -	$ -	$ -	$ -	$ -	$ 27,585	$ 8,173	$ 57,214	$ 7,152	$ 51,084	$ 4,155	$ 44,954	$ 19,412	$ 3,746	$ 1,430	$ 28,267	$ 22,136	$ -	$ 13,963	$ 1,260	$ 885	$ 15,325	$ 2,724	$ 5,619
C	**Fill**																														
C1		Sand, using dredge material	$ 21,780	AC	$ 87,120	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 43,560	$ 26,136	$ 182,952	$ -	$ 326,699	$ -	$ 196,020	$124,146	$ 23,958	$ 9,148	$ 544,499	$ 435,599	$ 326,699	$ 89,298	$ 8,059	$ 5,663	$ 98,010	$ 17,424	$ 35,937
C2		Loam, using dredge material	$ 28,233	AC	$ -	$ 56,467	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
D	**Relocate**																														
D1		Wells, domestic water, gravel pack well, 40' deep, incl. gravel & casing, complete, 24" diam. casing x 18" diam screen	$ 4,000,000	Each	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
E	**Install**																														
E1		Culvert/headwall, 1-1/2 to 1 slope soil, CIP concrete, 48" diam pipe, 4'-6' long wing walls	$ 10,571	Each	$ -	$ -	$ -	$ -	$ -	$ -	$ 31,712	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
E2		Flap Gate, Aluminum, 48" diam	$ 12,194	Each	$ -	$ -	$ -	$ 24,388	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
E3		24" diam Self-regulating Tide (SRT) Gate	$ 101,994	Each	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
E4		36" diam SRT Gate	$ 121,290	Each	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
E6		Boardwalk/recreational access	$ 38,846	Each	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 621,535	$ -	$ -	$ -	$ -	$194,230	$ -	$ -	$ -	$ -	$ -	$ 155,384	$ -	$ -	$ 194,230	$ -	$ -
F	**Excavate & Move Material**																														
F1		To tidal elevation w/ offsite disposal	$ 51,084	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ 306,505	$ -	$ -	$ -	$ -	$ -	$ -	$ 62,323	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
F2		To subtidal elevation w/ offsite disposal	$ 189,012	AC	$ -	$ -	$ -	$ 94,506	$ 2,362,646	$ -	$ -	$ 2,268,140	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
F3		To salt marsh elevation w/ onsite use	$ 29,799	AC	$ -	$ -	$ -	$ -	$ -	$ 14,900	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
F4		To (sinuous) tidal creek elevation w/ onsite use	$ 105,009	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
G	**Invasive Species Control**																														
G1		Herbicide	$ 796	AC	$ 955	$ -	$ -	$ -	$ -	$ 35,807	$ -	$ 71,613	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
G2		Manual removal	$ 51,084	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
H	**Plants & Bioengineering**																														
H1		Dune grass	$ 8,141	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4,885	$ 34,193	$ 17,096	$ -	$ -	$ 42,334	$ 11,398	$ 8,955	$ 3,419	$ 8,141	$ -	$ 24,423	$ 8,141	$ 3,012	$ 2,117	$ 8,955	$ 6,513	$ 13,433
H2		Upland	$ 1,090	AC	$ -	$ 2,180	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 872	$ -	$ -	$ -	$ -	$ 5,886	$ -	$ -	$ -	$ -	$ -	$ -	$ -
H3		Bay Beach- Emergents	$ 12,439	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ 49,755	$ -	$ 12,439	$ -	$ -	$ -	$ -	$ 12,439	$ -	$ -	$ -	$ -	$ 6,219	$ 3,110	$ 24,878	$ -	$ -	$ -	$ -	$ -	$ -
H4		Bay Beach - Shrubs	$ 816	AC	$ -	$ -	$ 3,914	$ -	$ -	$ -	$ 1,631	$ -	$ 816	$ -	$ -	$ -	$ -	$ 179	$ -	$ -	$ -	$ -	$ 816	$ 408	$ 10,602	$ -	$ -	$ -	$ -	$ -	$ -
H5		BaySub SAV	$ 37,000	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
H6		Coir logs	$4,124.00																												
H7		Gabion basket - wire mesh, 8" stone	$6,678.00	AC	$ -	$ -	$ 32,054	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 50,085	$ -	$ -	$ -	$ -	$ -	$ -
H8		rebar/anchor - small diameter	$73.50																												
H9		rebar/anchor - large diameter	$297.50	AC	$ -	$ -	$ 1,428	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,231	$ -	$ -	$ -	$ -	$ -	$ -
		SUBTOTAL			$ 101,682	$ 63,229	$ 60,214	$ 118,893	$ 2,362,646	$ 50,706	$ 408,644	$ 2,339,753	$ 771,088	$ 39,194	$ 929,101	$ 126,659	$ 377,783	$ 79,096	$ 284,179	$349,185	$ 291,900	$ 158,093	$ 587,941	$ 467,139	$ 438,918	$ 266,786	$ 216,523	$ 98,697	$ 316,520	$ 396,062	$ 805,630
I	**Other**																														
I1		Mobilization & Demobilization	2%		$ 2,034	$ 1,265	$ 1,204	$ 2,378	$ 47,253	$ 1,014	$ 8,173	$ 46,795	$ 15,422	$ 784	$ 18,582	$ 2,533	$ 7,556	$ 1,582	$ 5,684	$ 6,984	$ 5,838	$ 3,162	$ 11,759	$ 9,343	$ 8,778	$ 5,336	$ 4,330	$ 1,974	$ 6,330	$ 7,921	$ 16,113
I2		Contingency	20%		$ 20,336	$ 12,646	$ 12,043	$ 23,779	$ 472,529	$ 10,141	$ 81,729	$ 467,951	$ 154,218	$ 7,839	$ 185,820	$ 25,332	$ 75,557	$ 15,819	$ 56,836	$ 69,837	$ 58,380	$ 31,619	$ 117,588	$ 93,428	$ 87,784	$ 53,357	$ 43,305	$ 19,739	$ 63,304	$ 79,212	$ 161,126
I3		E&D and S&A (2)	15%		$ 18,608	$ 11,571	$ 11,019	$ 21,757	$ 432,364	$ 9,279	$ 74,782	$ 428,175	$ 141,109	$ 7,173	$ 170,025	$ 23,179	$ 69,134	$ 14,475	$ 52,005	$ 63,901	$ 53,418	$ 28,931	$ 107,593	$ 85,486	$ 80,322	$ 48,822	$ 39,624	$ 18,062	$ 57,923	$ 72,479	$ 147,430
		TOTAL			**$ 142,659**	**$ 88,710**	**$ 84,481**	**$ 166,807**	**$ 3,314,792**	**$ 71,141**	**$ 573,327**	**$ 3,282,674**	**$ 1,081,836**	**$ 54,989**	**$ 1,303,528**	**$ 177,702**	**$ 530,030**	**$ 110,971**	**$ 398,704**	**$489,906**	**$ 409,535**	**$ 221,805**	**$ 824,882**	**$ 655,396**	**$ 615,802**	**$ 374,300**	**$ 303,782**	**$ 138,472**	**$ 444,077**	**$ 555,675**	**$ 1,130,299**
J	**Real Estate (3)**																														
J1		Buy-out Houses/Structures														$750,000					$6,440,000	$2,600,000					$2,670,000	$15,000,000		$7,100,000	$16,250,000
		TOTAL			**$ 142,659**	**$ 88,710**	**$ 84,481**	**$ 166,807**	**$ 3,314,792**	**$ 71,141**	**$ 573,327**	**$ 3,282,674**	**$ 1,081,836**	**$ 54,989**	**$ 1,303,528**	**$ 927,702**	**$ 530,030**	**$ 110,971**	**$ 398,704**	**$489,906**	**$ 6,849,535**	**$ 2,821,805**	**$ 824,882**	**$ 655,396**	**$ 615,802**	**$ 374,300**	**$ 2,973,782**	**$ 15,138,472**	**$ 444,077**	**$ 7,655,675**	**$ 17,380,299**

Notes

(1) Costs are preliminary, and are for comparison of alternatives only.

(2) Engineering & Design (E&D) and Supervision & Administration (S&A) costs are calculated as 15%

APPENDIX I

INCREMENTAL COST ANALYSIS

Cost Analysis Results for Restoration Alternatives at Transect T-2, Sunken Forest

Each of the 4 alternatives was input into IWR-Plan, allowing each alternative to be combined with any other alternative. The input information is as follows.

Site	Alternative	Cost	Annual Cost	AAHU's	Net AAHU's	Annual Cost Per HU Gained
T-2 Sunken Forest	0			83.35		
T-2 Sunken Forest	1	$215,905	$11,599	94.93	11.58	$1,001
T-2 Sunken Forest	2	$394,935	$21,217	97.61	14.26	$1,488
T-2 Sunken Forest	3	$1,543,156	$82,902	101.62	18.27	$4,538
T-2 Sunken Forest	4	$1,667,989	$89,608	101.62	18.27	$4,905

The analyses show the following results:

The following are identified as Best Buy Plans: Alternative 1: Bayside Shoreline Restoration Alternative 1 and 2 combined: Bayside shoreline and Dune / Beach Restoration Alternative 1, 2, and 3 combined: Bayside shoreline, dune/beach, and interior upland restoration Alternative 1, 2, 3, and 4 combined: Bayside shoreline, dune/beach, upland, and marina removal

The following are identified as Cost effective Plans:
Alternative 2 Alternative 1 and 3 combined
Alternative 2 and 3 combined Alternative 1, 3 and 4 combined Alternative 2, 3 and 4 combined

The Incremental Cost Analysis tends to indicate the following as the preferred alternative, in comparison of the costs and habitat gains of the best-buy alternatives: Alternative 1 and 2 combined (Bayside shoreline and Dune / Beach Restoration) would be the preferred plan. Incremental costs increase greatly with larger alternatives.

Cost Analysis Results for Restoration Alternatives at Transect T-3, Reagan Property

Each of the 3 alternatives was input into IWR-Plan, allowing each alternative to be combined with any other alternative. The input information is as follows.

	Alternative	Cost	Annual Cost	AAHU's	Net AAHU's	Annual Cost Per HU Gained
T-3 Reagan Property	0			50.91		
T-3 Reagan Property	1	$104,469	$5,612	58.07	7.16	$784
T-3 Reagan Property	2	$316,775	$17,018	62.01	11.10	$1,533
T-3 Reagan Property	3	$177,278	$9,524	60.72	9.80	$971

The analyses show the following results:

The following are identified as Best Buy Plans: Alternative 1: Bayside Shoreline Restoration
Alternative 1 and 3 combined: Bayside shoreline and Bury Bulkhead / Shoreline Alternative 1, 2, and 3 combined: Bayside shoreline, dune/beach, and Bury Bulkhead / Shoreline

The following are identified as Cost effective Plans:
Alternative 3 Alternative 1 and 2 combined
Alternative 2 and 3 combined

The Incremental Cost Analysis tends to indicate the following as the preferred alternative, in comparison of the costs and habitat gains of the best-buy alternatives: Alternative 1 and 3 combined (Bayside shoreline and Bury Bulkhead / Shoreline) would be the preferred plan. Incremental costs increase with the larger alternatives.

Cost Analysis Results for Restoration Alternatives at Transect T-5, Great Gun

Each of the 4 alternatives was input into IWR-Plan, allowing each alternative to be combined with any other alternative. The input information is as follows.

	Alternative	Cost	Annual Cost	AAHU's	Net AAHU's	Annual Cost Per HU Gained
T-5 Great Gun	0			65.98		
T-5 Great Gun	1	$89,204	$4,792	77.72	11.74	$408
T-5 Great Gun	2	$41,775	$2,244	82.07	16.09	$139
T-5 Great Gun	3	$286,646	$15,399	87.52	21.54	$715
T-5 Great Gun	4	$667,547	$35,862	87.52	21.54	$1,665

The analyses show the following results:

The following are identified as Best Buy Plans: Alternative 2: Dune Beach Alternative 1 and 2 combined: Marsh Restoration and dune/beach Alternative 1, 2, and 3 combined: Marsh Restoration, dune/beach, and Upland Restoration Alternative 1, 2, 3, and 4 combined: Marsh Restoration, dune/beach, Upland Restoration and Marina Removal

The following are identified as Cost effective Plans:
Alternative 2 and 3 combined Alternative 2, 3 and 4 combined

The Incremental Cost Analysis tends to indicate the following as the preferred alternative, in comparison of the costs and habitat gains of the best-buy alternatives: Alternative 1, 2, and 3 combined (Marsh Restoration, dune/beach, and Upland Restoration) would be the preferred plan. Incremental costs increase with the larger alternative.

Cost Analysis Results for Restoration Alternatives at Transect T-7, Tiana

Each of the 3 alternatives was input into IWR-Plan. Each alternative was allowed to be combined with any other alternative. *For this site, this may not be correct, with respect to alternatives 1 and 2*. The input information is as follows.

	Alternative	Cost	Annual Cost	AAHU's	Net AAHU's	Annual Cost Per HU Gained
T-7 Tiana	0			65.50		
T-7 Tiana	1	$111,503	$5,990	82.86	17.36	$345
T-7 Tiana	2	$19,177	$1,030	81.71	16.22	$64
T-7 Tiana	3	$51,911	$2,789	81.64	16.14	$173

The analyses show the following results:

The following are identified as Best Buy Plans: Alternative 2: Upland Restoration Alternative 2 and 3 combined: Upland Restoration and Bay Submergent Alternative 1, 2, and 3 combined: Bay Shoreline / Marsh Restoration, Upland Restoration, and Bay Submergent

The following are identified as Cost effective Plans:
Alternative 1 and 2 combined

The Incremental Cost Analysis tends to indicate the following as the preferred alternative, in comparison of the costs and habitat gains of the best-buy alternatives: Alternative 2 and 3 combined (Upland Restoration and Bay Submergent) appears to be the preferred plan. Incremental costs increase with the larger alternative.

Cost Analysis Results for Restoration Alternatives at Transect T-8, WOSI

Each of the 4 alternatives was input into IWR-Plan, allowing each alternative to be combined with any other alternative. The input information is as follows.

	Alternative	Cost	Annual Cost	AAHU's	Net AAHU's	Annual Cost Per HU Gained
T-8 WOSI	0			140.58		
T-8 WOSI	1	$10,047	$540	171.88	31.31	$17
T-8 WOSI	2	$155,711	$8,365	175.56	34.98	$239
T-8 WOSI	3	$37,859	$2,034	174.11	33.54	$61
T-8 WOSI	4	$983,987	$52,862	174.11	33.54	$1,576

The analyses show the following results:

<u>The following are identified as Best Buy Plans:</u> Alternative 1: *Phragmites* Control Alternative 1 and 3 combined: *Phragmites* Control and Hard Structure Removal Alternative 1, 2, and 3 combined: *Phragmites* Control, Beach/Dune, and Hard Structure Removal Alternative 1, 2, 3, and 4 combined: *Phragmites* Control, Beach/Dune, Hard Structure Removal, and Salt Marsh Restoration

<u>The following are identified as Cost effective Plans:</u>
Alternative 3 Alternative 1 and 2 combined
Alternative 2 and 3 combined Alternative 2, 3 and 4 combined

<u>The Incremental Cost Analysis tends to indicate the following as the preferred alternative, in comparison of the costs and habitat gains of the best-buy alternatives:</u> Alternative 1, 2, and 3 combined (*Phragmites* Control, Beach/Dune, and Hard Structure Removal) would be the preferred plan. Incremental costs increase with the larger alternative.

Cost Analysis Results for Restoration Alternatives at Transect T-9, Georgica Pond

Each of the 3 alternatives was input into IWR-Plan, allowing each alternative to be combined with any other alternative. *It may be possible to reconfigure the alternatives, such that alternative 3 could be broken into multiple components.* The input information is as follows.

	Alternative	Cost	Annual Cost	AAHU's	Net AAHU's	Annual Cost Per HU Gained
T-9 Georgica Pond	0			308.66		
T-9 Georgica Pond	1	$7,365,951	$395,716	398.76	90.10	$4,392
T-9 Georgica Pond	2	$1,469,471	$78,943	391.31	82.65	$955
T-9 Georgica Pond	3	$3,033,590	$162,971	441.62	132.96	$1,226

The analyses show the following results:

<u>The following are identified as Best Buy Plans:</u> Alternative 2: *Phragmites* Control in Cove
Alternative 2 and 3 combined: *Phragmites* Control in Cove and Groin Removal, Beach / Dune
Alternative 1, 2, and 3 combined: *Phragmites* Control in Pond and Cove, and Groin Removal, Beach / Dune

<u>The following are identified as Cost effective Plans:</u>
Alternative 3 Alternative 1 and 3 combined

<u>The Incremental Cost Analysis tends to indicate the following as the preferred alternative, in comparison of the costs and habitat gains of the best-buy alternatives:</u> Alternative 2 and 3 combined (*Phragmites* Control in Cove and Groin Removal, Beach / Dune) would be the preferred plan. Incremental costs increase with the larger alternative.

The HU's or costs for Alternative 2 should be verified, as 1 and 2 are similar alternatives of varying scale.

Cost Analysis Results for Restoration Alternatives at Transect T-10, East Inlet Island

Each of the 3 alternatives was input into IWR-Plan, allowing each alternative to be combined with any other alternative. *This may need to be looked at closer as 1 and 2 appear to be alternates to each other, and since Alternative 3 is intended to complement 1 or 2.* The input information is as follows.

	Alternative	Cost	Annual Cost	AAHU's	Net AAHU's	Annual Cost Per HU Gained
T-10 East Inlet Island	0			70.39		
T-10 East Inlet Island	1	$59,508	$3,197	87.63	17.24	$185
T-10 East Inlet Island	2	$17,862	$960	94.27	23.88	$40
T-10 East Inlet Island	3	$277,038	$14,883	99.45	29.06	$512

The analyses show the following results:

<u>The following are identified as Best Buy Plans:</u> Alternative 2: *Phragmites* Control Alternative 1 and 2 combined: Shorebird Restoration and *Phragmites* Control Alternative 1, 2, and 3 combined: Shorebird Restoration, *Phragmites* Control, and Shoreline Stabilization

<u>The following are identified as Cost effective Plans:</u>
Alternative 2 and 3 combined

<u>The Incremental Cost Analysis tends to indicate the following as the preferred alternative, in comparison of the costs and habitat gains of the best-buy alternatives:</u> Alternative 1 and 2 combined (Shorebird Restoration and *Phragmites* Control) would be the preferred plan. Incremental costs increase with the larger alternative. If this combination is not viable, Alternative 1 (*Phragmites* control) would be the preferred alternative.

Cost Analysis Results for Restoration Alternatives at Transect T-11, John Boyle Island

Each of the 3 alternatives was input into IWR-Plan. *Alternative 1 and 2 were not allowed to be combined with each other*. The input information is as follows.

	Alternative	Cost	Annual Cost	AAHU's	Net AAHU's	Annual Cost Per HU Gained
T-11 John Boyle Island	0			45.60		
T-11 John Boyle Island	1	$36,131	$1,941	61.10	15.50	$125
T-11 John Boyle Island	2	$83,106	$4,465	55.63	10.04	$445
T-11 John Boyle Island	3	$115,281	$6,193	61.36	15.76	$393

The analyses show the following results:

The following are identified as Best Buy Plans: Alternative 1: Shorebird Habitat
Alternative 1 and 3 combined: Shorebird Habitat and Shoreline Stabilization

The following are identified as Cost effective Plans:
Alternative 3

The Incremental Cost Analysis tends to indicate the following as the preferred alternative, in comparison of the costs and habitat gains of the best-buy alternatives: Alternative 1 (Shorebird Restoration) would be the preferred plan. Incremental costs increase with the larger alternative.

Cost Analysis Results for Restoration Alternatives at Transect T-14, Ocean Beach

Each of the 3 alternatives was input into IWR-Plan, each alternative was allowed to be combined with any other alternative. The input information is as follows.

	Alternative	Cost	Annual Cost	AAHU's	Net AAHU's	Annual Cost Per HU Gained
T-14 Ocean Beach	0			34.37		
T-14 Ocean Beach	1	$6,078,274	$326,539	67.40	33.03	$9,885
T-14 Ocean Beach	2	$475,323	$25,535	39.40	5.03	$5,072
T-14 Ocean Beach	3	$3,059,913	$164,386	30.30	-4.07	-$40,402

The analyses show the following results:

The following are identified as Best Buy Plans: Alternative 2: Dune Restoration Alternative 1 and 2 combined: Groin Removal and Dune Restoration

The following are identified as Cost effective Plans:
Alternative 1

The Incremental Cost Analysis tends to indicate the following as the preferred alternative, in comparison of the costs and habitat gains of the best-buy alternatives: Alternative 2 (Dune Restoration) would be the preferred plan. Incremental costs increase with the larger alternative.

Note: Alternative 3 shows negative net HU's – which eliminates it as cost-effective.

Cost Analysis Results for Restoration Alternatives at Transect T-15, New Made Island

Each of the 3 alternatives was input into IWR-Plan. *Alternative 1 and 2 were not allowed to be combined with each other.* The input information is as follows.

	Alternative	Cost	Annual Cost	AAHU's	Net AAHU's	Annual Cost Per HU Gained
T-15 New Made Island	0			17.43		
T-15 New Made Island	1	$142,659	$7,664	21.57	4.14	$1,852
T-15 New Made Island	2	$88,710	$4,766	21.45	4.02	$1,185
T-15 New Made Island	3	$84,481	$4,538	21.28	3.85	$1,178

The analyses show the following results:

<u>The following are identified as Best Buy Plans:</u> Alternative 3: Shoreline Stabilization Alternative 2 and 3 combined: Heron Habitat and Shoreline Stabilization Alternative 1 and 3 combined: Shorebird Habitat and Shoreline Stabilization

<u>The following are identified as Cost effective Plans:</u>
Alternative 2 Alternative 1

<u>The Incremental Cost Analysis tends to indicate the following as the preferred alternative, in comparison of the costs and habitat gains of the best-buy alternatives:</u> Alternative 2, and 3 combined (Heron Habitat and Shoreline Stabilization) would be the preferred plan. Incremental costs increase with the larger alternative.

Cost Analysis Results for Restoration Alternatives at Transect T-22, Islip Meadows

Each of the 3 alternatives was input into IWR-Plan, allowing each alternative to be combined with any other alternative. *It may be possible to reconfigure the alternatives, such that alternative 3 could be broken into multiple components.* The input information is as follows.

	Alternative	Cost	Annual Cost	AAHU's	Net AAHU's	Annual Cost Per HU Gained
T-22 Islip Meadows	0			36.44		
T-22 Islip Meadows	1	$166,807	$8,961	45.83	9.40	$954
T-22 Islip Meadows	2	$3,314,792	$178,078	43.05	6.61	$26,935
T-22 Islip Meadows	3	$71,141	$3,822	45.65	9.21	$415

The analyses show the following results:

<u>The following are identified as Best Buy Plans:</u> Alternative 3: Pools / *Phragmites* Control
Alternative 1 and 3 combined: Improved Hydrology and Pools / *Phragmites* Control Alternative 1, 2, and 3 combined: Improved Hydrology, Reconfigure Tidal Channels, and Pools / *Phragmites* Control

<u>The following are identified as Cost effective Plans:</u>
Alternative 1

<u>The Incremental Cost Analysis tends to indicate the following as the preferred alternative, in comparison of the costs and habitat gains of the best-buy alternatives:</u> Alternative 1 and 3 combined (Improved Hydrology and Pools / *Phragmites* Control) would be the preferred plan. Incremental costs increase with the larger alternative.

Cost Analysis Results for Restoration Alternatives at Transect T-23, Seatuck Refuge

Each of the 3 alternatives was input into IWR-Plan, allowing each alternative to be combined with any other alternative. The input information is as follows.

	Alternative	Cost	Annual Cost	AAHU's	Net AAHU's	Annual Cost Per HU Gained
T-23 Seatuck Refuge	0			118.47		
T-23 Seatuck Refuge	1	$573,327	$30,800	151.11	32.64	$944
T-23 Seatuck Refuge	2	$3,282,674	$176,353	150.34	31.88	$5,532
T-23 Seatuck Refuge	3	$1,081,836	$58,119	147.17	28.70	$2,025

The analyses show the following results:

The following are identified as Best Buy Plans: Alternative 1: Improved Hydrology Alternative 1 and 3 combined: Improved Hydrology and Bulkead Removal, Marsh Alternative 1, 2, and 3 combined: Improved Hydrology, Saltmarsh and *Phragmites* Control, and Bulkead Removal, Marsh

The following are identified as Cost effective Plans:
Alternative 1 and 2 combined

The Incremental Cost Analysis tends to indicate the following as the preferred alternative, in comparison of the costs and habitat gains of the best-buy alternatives: Alternative 1 and 3 combined (Improved Hydrology and Bulkead Removal, Marsh) would be the preferred plan. Incremental costs increase with the larger alternative.

Cost Analysis Results for Restoration Alternatives at Transect T-24, Davis Park

Each of the 3 alternatives was input into IWR-Plan, allowing each alternative to be combined with any other alternative. The input information is as follows.

	Alternative	Cost	Annual Cost	AAHU's	Net AAHU's	Annual Cost Per HU Gained
T-24 Davis Park	0			170.37		
T-24 Davis Park	1	$54,989	$2,954	189.33	18.96	$156
T-24 Davis Park	2	$1,303,528	$70,029	194.35	23.98	$2,921
T-24 Davis Park	3	$927,702	$49,838	189.76	19.39	$2,570

The analyses show the following results:

The following are identified as Best Buy Plans: Alternative 1: Create Dune Alternative 1 and 3 combined: Create Dune, and Buyouts Alternative 1, 2, and 3 combined: Create Dune, Upper Beach and Dune, and Buyouts

The following are identified as Cost effective Plans:
Alternative 3 Alternative 1 and 2 combined
Alternative 2 and 3 combined

The Incremental Cost Analysis tends to indicate the following as the preferred alternative, in comparison of the costs and habitat gains of the best-buy alternatives: Alternative 1 (Create Dune) would be the preferred plan. Incremental costs increase with the larger alternatives.

Need to verify the RE costs for acquiring the Casino in Alt 2, would likely influence the results.

Cost Analysis Results for Restoration Alternatives at Transect T-25, Atlantique to Corneille

Each of the 3 alternatives was input into IWR-Plan, allowing each alternative to be combined with any other alternative. The input information is as follows.

	Alternative	Cost	Annual Cost	AAHU's	Net AAHU's	Annual Cost Per HU Gained
T-25 Atlantique to Corneille	0			78.62		
T-25 Atlantique to Corneille	1	$530,030	$28,474	86.75	8.13	$3,501
T-25 Atlantique to Corneille	2	$110,971	$5,962	89.22	10.60	$562
T-25 Atlantique to Corneille	3	$398,704	$21,419	93.66	15.05	$1,424

The analyses show the following results:

The following are identified as Best Buy Plans: Alternative 2: Saltmarsh Creation Alternative 2 and 3 combined: Saltmarsh Creation, and Upper Beach and Dune Alternative 1, 2, and 3 combined: Sand Lobe, Saltmarsh Creation, and Upper Beach and Dune

The following are identified as Cost effective Plans:
Alternative 3

The Incremental Cost Analysis tends to indicate the following as the preferred alternative, in comparison of the costs and habitat gains of the best-buy alternatives: Alternative 2 and 3 combined (Saltmarsh Creation, and Upper Beach and Dune) would be the preferred plan. Incremental costs increase with the larger alternative.

Cost Analysis Results for Restoration Alternatives at Transect T-26, Kismet

Each of the 3 alternatives was input into IWR-Plan. *Alternatives were input so that Alternative 3 would only be implemented if Alternative 2 was first implemented.* The input information is as follows.

Site	Alternative	Cost	Annual Cost	AAHU's	Net AAHU's	Annual Cost Per HU Gained
T-26 Kismet	0			43.34		
T-26 Kismet	1	$489,906	$26,319	48.90	5.55	$4,741
T-26 Kismet	2	$6,849,535	$367,973	50.17	6.83	$53,895
T-26 Kismet	3	$2,821,805	$151,594	49.41	6.07	$24,981

The analyses show the following results:

<u>The following are identified as Best Buy Plans:</u> Alternative 1: Upper Beach and Dune
Alternative 1, 2 and 3 combined: Upper Beach and Dune, Seaward Buyouts, CEHA Buyouts

<u>The following are identified as Cost effective Plans:</u>
Alternative 2 Alternatives 1 and 2 combined
Alternatives 2 and 3 combined

<u>The Incremental Cost Analysis tends to indicate the following as the preferred alternative, in comparison of the costs and habitat gains of the best-buy alternatives:</u> Alternative 1 (Upper Beach and Dune) would be the preferred plan. Incremental costs increase with the larger alternative.

Cost Analysis Results for Restoration Alternatives at Transect T-27, Warner Island East

Each of the 3 alternatives was input into IWR-Plan. *Alternative 1 and 2 were not allowed to be combined with each other.* The input information is as follows.

	Alternative	Cost	Annual Cost	AAHU's	Net AAHU's	Annual Cost Per HU Gained
T-27 Warner Island East	0			13.59		
T-27 Warner Island East	1	$824,882	$44,315	17.68	4.10	$10,822
T-27 Warner Island East	2	$655,396	$35,209	18.76	5.17	$6,809

The analyses show the following results:

The following are identified as Best Buy Plans: Alternative 2: Heron Habitat
Alternative 2 and 3 combined: Heron Habitat and Shoreline Stabilization

The following are identified as Cost effective Plans:
Alternative 3

The Incremental Cost Analysis tends to indicate the following as the preferred alternative, in comparison of the costs and habitat gains of the best-buy alternatives: Alternative 2 (Heron Habitat) would be the preferred plan. Incremental costs increase with the larger alternative.

Cost Analysis Results for Restoration Alternatives at Transect T-28, Atlantique

Each of the 3 alternatives was input into IWR-Plan. *Alternatives were input so that Alternative 3 would only be implemented if Alternative 2 was also implemented.* The input information is as follows.

	Alternative	Cost	Annual Cost	AAHU's	Net AAHU's	Annual Cost Per HU Gained
T-28 Atlantique	0			31.31		
T-28 Atlantique	1	$374,300	$20,108	35.26	3.95	$5,097
T-28 Atlantique	2	$2,973,782	$159,758	35.96	4.65	$34,368
T-28 Atlantique	3	$15,138,472	$813,273	35.65	4.33	$187,707

The analyses show the following results:

<u>The following are identified as Best Buy Plans:</u> Alternative 1: Upper Beach and Dune Alternative 1 and 2 combined: Upper Beach and Dune, Seaward Buyouts Alternative 1, 2 and 3 combined: Upper Beach and Dune, Seaward Buyouts, CEHA Buyouts

<u>The following are identified as Cost effective Plans:</u>
Alternative 2 Alternatives 2 and 3 combined

<u>The Incremental Cost Analysis tends to indicate the following as the preferred alternative, in comparison of the costs and habitat gains of the best-buy alternatives:</u> Alternative 1 and 2 combined (Upper Beach and Dune, Seaward Buyouts) would be the preferred plan. Incremental costs increase with the larger alternative.

Cost Analysis Results for Restoration Alternatives at Transect T-29, Fair Harbor

Each of the 3 alternatives was input into IWR-Plan. *Alternatives were input so that Alternative 3 would only be implemented if Alternative 2 was also implemented.* The input information is as follows.

	Alternative	Cost	Annual Cost	AAHU's	Net AAHU's	Annual Cost Per HU Gained
T-29 Fair Harbor	0			33.26		
T-29 Fair Harbor	1	$444,077	$23,857	37.27	4.01	$5,951
T-29 Fair Harbor	2	$7,655,675	$411,280	38.21	4.95	$83,032
T-29 Fair Harbor	3	$17,380,299	$933,709	38.53	5.27	$177,198

The analyses show the following results:

<u>The following are identified as Best Buy Plans:</u> Alternative 1: Upper Beach and Dune
Alternative 1 and 2 combined: Upper Beach and Dune, Seaward Buyouts Alternative 1, 2 and 3 combined: Upper Beach and Dune, Seaward Buyouts, CEHA Buyouts

<u>The following are identified as Cost effective Plans:</u>
Alternative 2 Alternatives 2 and 3 combined

<u>The Incremental Cost Analysis tends to indicate the following as the preferred alternative, in comparison of the costs and habitat gains of the best-buy alternatives:</u> Alternative 1 (Upper Beach and Dune) would be the preferred plan. Incremental costs increase with the larger alternatives.

The following provides a listing of the alternative supported by the CE/ICA at each site.

Sunken Forest, Transect 2.
Alternative 1 and 2 combined (Bayside shoreline and Dune / Beach Restoration)

Reagan Property, Transect 3.
Alternative 1 and 3 combined (Bayside shoreline and Bury Bulkhead / Shoreline)

Great Gun, Transect 5.
Alternative 1, 2, and 3 combined (Marsh Restoration, dune/beach, and Upland Restoration)

Tiana, Transect 7.
Alternative 2 and 3 combined (Upland Restoration and Bay Submergent)

West of Shinnecock Inlet, Transect 8.
Alternative 1, 2, and 3 combined (*Phragmites* Control, Beach/Dune, and Hard Structure Removal)

Georgica Pond, Transect 9.
Alternative 2 and 3 combined (*Phragmites* Control in Cove and Groin Removal, Beach / Dune)

East Inlet Island, Transect 10.
Alternative 1 and 2 combined (Shorebird Restoration and *Phragmites* Control

John Boyle Island, Transect 11.
Alternative 1 (Shorebird Restoration)

Ocean Beach, Transect 14.
Alternative 2 (Dune Restoration)

New Made Island, Transect 15.
Alternative 2, and 3 combined (Heron Habitat and Shoreline Stabilization)

Islip Meadows, Transect 22.
Alternative 1 and 3 combined (Improved Hydrology and Pools / *Phragmites* Control

Seatuck Refuge, Transect 23.
Alternative 1 and 3 combined (Improved Hydrology and Bulkead Removal, Marsh)

Davis Park, Transect 24.
Alternative 1 (Create Dune)

Atlantique to Corneille, Transect 25.
Alternative 2 and 3 combined (Saltmarsh Creation, and Upper Beach and Dune)

Kismet, Transect 26.
Alternative 1 (Upper Beach and Dune)

Warners Island East, Transect 27.
Alternative 2 (Heron Habitat)

Atlantique, Transect 28.
Alternative 1 and 2 combined (Upper Beach and Dune, Seaward Buyouts)

Fair Harbor, Transect 29.
Alternative 1 (Upper Beach and Dune)

SOLUTION LEGEND

Solution / Scale Code		Solution Description	Scale Description
A	0	Sunken Forest	No Action
A	1	Sunken Forest	
A	2	Sunken Forest	
A	3	Sunken Forest	
B	0	Reagan Property	No Action
B	1	Reagan Property	
B	2	Reagan Property	
B	3	Reagan Property	
C	0	Great Gunn	No Action
C	1	Great Gunn	
C	2	Great Gunn	
C	3	Great Gunn	
D	0	Tiana	No Action
D	1	Tiana	
D	2	Tiana	
D	3	Tiana	
E	0	WOSI	No Action
E	1	WOSI	
E	2	WOSI	
E	3	WOSI	
E	4	WOSI	
F	0	Georgica Pond	No Action
F	1	Georgica Pond	
G	0	East Inlet Island	No Action
G	1	East Inlet Island	
G	2	East Inlet Island	
H	0	John Boyle Island	No Action
H	1	John Boyle Island	
H	2	John Boyle Island	
I	0	Ocean Beach	No Action
I	1	Ocean Beach	
J	0	New Made Island	No Action
J	1	New Made Island	
J	2	New Made Island	
J	3	New Made Island	
K	0	Islip Meadows	No Action
K	1	Islip Meadows	

K	2	Islip Meadows	
K	3	Islip Meadows	
L	0	Seatuck Refuge	No Action
L	1	Seatuck Refuge	
L	2	Seatuck Refuge	
L	3	Seatuck Refuge	
N	0	Atlantique to Corneille	No Action
N	1	Atlantique to Corneille	
N	2	Atlantique to Corneille	
N	3	Atlantique to Corneille	
O	0	Kismet	No Action
O	1	Kismet	
P	0	Warner Island East	No Action
P	1	Warner Island East	
P	2	Warner Island East	
Q	0	Atlantique	No Action
Q	1	Atlantique	
Q	2	Atlantique	
Q	3	Atlantique	
R	0	Fair Harbor	No Action
R	1	Fair Harbor	
R	2	Fair Harbor	
R	3	Fair Harbor	

Restoration Site	Alternative Number	Cost Effective	Moderately Cost-Effective	Not Cost-Effective	Rank Cost per Habitat Unit
Atlantique	1			X	43
Atlantique	2			X	53
Atlantique	3			X	57
Atlantique to Corneille	1		X		37
Atlantique to Corneille	2	X			17
Atlantique to Corneille	3	X			28
East Inlet Island	1	X			8
East Inlet Island	2	X			2
East Inlet Island	3			X	16
Fair Harbor	1			X	45
Fair Harbor	2			X	55
Fair Harbor	3			X	56
Georgica Pond	1			X	38
Georgica Pond	2		X		22
Georgica Pond	3				27
Great Gun	1	X			12
Great Gun	2	X			13
Great Gun	3	X			18
Islip Meadows	1	X			21
Islip Meadows	2			X	51
Islip Meadows	3	X			14
John Boyle	1	X			5
John Boyle	2	X			15
John Boyle	3	X			11
Kismet	1		X		40
Kismet	2				54
Kismet	3				50
New Made Island	1		X		33
New Made Island	2	X			26
New Made Island	3	X			25
Ocean Beach	1			X	47
Ocean Beach	2			X	42
Ocean Beach	3				52
Reagan Property	1	X			19
Reagan Property	2	X			30
Reagan Property	3	X			23
Seatuck Meadows	1	X			20
Seatuck Meadows	2			X	44
Seatuck Meadows	3	X			34
Sunken Forest	1	X			24
Sunken Forest	2	X			29
Sunken Forest	3			X	39
Sunken Forest	4				41
Tiana	1	X			10
Tiana	2	X			4
Tiana	3	X			7

Restoration Site	Alternative Number	Cost Effective	Moderately Cost-Effective	Not Cost-Effective	Rank Cost per Habitat Unit
Warner's Island East	1			X	49
Warner's Island East	2			X	46
Warner's Island East	3			X	49
WOSI	1	X			1
WOSI	2	X			9
WOSI	3	X			3
WOSI	4	X			31

APPENDIX J

RAW RANKING MATRIX SCORES

CONTENTS:

Completed Ranking Matrix..... 2 Pages

Combined Agency Results - Ranking Matrix for Evaluation of FIMP Restoration Sites and Alternatives (Part I).

		Restoration Site	Sunken Forest T-2												Reagan Property T-3											
		Alternative	1				2				3				4				1				2			
			A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
THREATENED AND ENDANGERED SPECIES	Likelihood that the proposed activity would benefit Federal or state-listed species or species of special concern.	low = 0 high = 5	2	2	0	0	2	0	1	0	3	4	0	0	1	4	0	1	2	2	0	0	3	0	0	0
			1.00				0.75				1.75				1.50				1.00				0.75			
LAND OWNERSHIP	Likelihood that a landowner will support the proposed activity.	low = 0 high = 5	3	2	1	3	2	1	0	0	1	3	0	0	0	u	0	0	3	2	3	1	1	1	2	0
			2.25				0.75				1.00				0.00				2.25				1.00			
NATURAL SUSTAINABILITY	Likelihood that high-quality habitats and site conditions envisioned from the proposed activity are sustainable without intensive management and maintenance for at least 50 years.	low = 0 high = 5	0	1	0	0	4	1	4	0	4	4	0	1	4	4	0	5	0	1	0	0	4	1	4	0
			0.25				2.25				2.25				3.25				0.25				2.25			
NATURALNESS	Degree that proposed activity will replicate naturally occurring conditions in the vicinity of the site.	low = 0 high = 5	3	3	0	1	3	1	4	0	4	4	0	1	4	5	5	5	3	3	1	0	4	1	5	1
			1.75				2.00				2.25				4.75				1.75				2.75			
MAINTENANCE and MANAGEMENT	Likelihood that a project sponsor would assume responsibility for long-term maintenance/management.	low = 0 high = 5	2	u	2	1	2	1	0	0	2	4	0	0	2	u	0	0	2	u	3	1	2	1	4	1
			1.67				0.75				1.50				0.67				2.00				2.00			
ANTHROPOGENIC EFFECTS	Likelihood that proposed activity would help to reduce the overall affects of human activities on the environment.	low = 0 high = 5	4	3	3	1	1	1	1	0	4	4	0	0	5	5	5	5	4	3	2	0	4	1	5	1
			2.75				0.75				2.00				5.00				2.25				2.75			
COMBINED BENEFIT	Likelihood that proposed activity would support a combined project + restoration effort.	low = 0 high = 5	2	4	0	0	2	4	1	1	1	3	0	0	0	2	1	1	2	4	0	0	1	4	4	1
			1.50				2.00				1.00				1.00				1.50				2.50			
LONGSHORE SEDIMENT TRANSPORT PROCESSES	Likelihood that the proposed activity would support natural movement of sediment along the ocean side shoreline.	low = 0 high = 5	0	u	0	0	4	u	0	1	0	u	0	0	0	u	0	0	0	u	0	0	0	u	0	1
			0.00				1.67				0.00				0.00				0.00				0.33			
CROSS-ISLAND SEDIMENT TRANSPORT PROCESSES	Likelihood that activity would support the natural movement of sand back and forth across the barrier island, between the offshore bar, beach face, berm, dune, island core, bayshore, and bay.	low = 0 high = 5	2	0	0	0	2	0	3	1	2	3	0	1	2	3	0	0	2	0	0	0	2	0	4	1
			0.50				1.50				1.50				1.25				0.50				1.75			
DUNE DEVELOPMENT and EVOLUTION PROCESSES	Likelihood that activity would support the natural process of sand transport and recovery associated with natural dune growth and formation.	low = 0 high = 5	0	1	0	0	3	2	5	1	2	4	0	0	0	3	0	0	0	1	0	0	2	2	5	0
			0.25				2.75				1.50				0.75				0.25				2.25			
BAYSIDE SHORELINE PROCESSES	Likelihood that activity will support the natural process of longshore currents along the bay shorelines and the natural creation of narrow sandy beaches, tidal creeks, mud and sand tidal flats, salt marshes, and eelgrass beds.	low = 0 high = 5	5	3	2	1	0	u	1	0	1	3	0	0	5	5	5	5	5	3	2	1	1	u	0	0
			2.75				0.33				1.00				5.00				2.75				0.33			
ESTUARINE PROCESSES	Likelihood that activity would support the circulation of water and the movement of sediments, in support of natural ecological functioning of the habitats and species within the estuary.	low = 0 high = 5	4	3	1	1	0	na	0	0	0	3	0	0	5	5	5	2	4	3	0	2	0	na	0	0
			2.25				0.00				0.75				4.25				2.25				0.00			
INSTITUTIONAL RECOGNITION	The importance of the environmental resource being created as evidenced by existing laws, plans, and policy statements from international, national, regional, state, local and tribal entities. Consider both habitats and species that may be affected by the activity and identified as "significant".	low = 0 high = 5	5	3	2	1	3	2	3	0	4	2	1	0	2	3	4	1	5	3	2	1	4	2	3	0
			2.75				2.00				1.75				2.50				2.75				2.25			
PUBLIC RECOGNITION	The importance of the environmental resource being created as evidenced by general public interest, participation, and funding by resource related groups.	low = 0 high = 5	5	4	3	1	3	1	5	0	4	2	2	0	2	3	2	0	5	4	2	3	4	1	4	0
			3.25				2.25				2.00				1.75				3.50				2.25			
TECHNICAL RECOGNITION	Importance of the environmental resource being created as evidenced by the scientific knowledge and understanding of critical characteristics of the resource, such as its scarcity, representativeness, status of disturbance, level of biodiversity, use for RTE animals and plants, etc.	low = 0 high = 5	5	4	1	1	3	2	2	0	4	3	0	0	4	4	4	0	5	4	2	2	4	2	2	0
			2.75				1.75				1.75				3.00				3.25				2.00			
ACCEPTABILITY	Is the plan acceptable to Federal and state resource agencies, and local government?	low = 0 high = 5	2	2	1	u	4	2	0	0	4	4	0	0	0	4	0	0	2	2	u	u	4	2	4	u
			1.67				1.50				2.00				1.00				2.00				3.33			
EFFECTIVENESS	Does the plan make a significant contribution to addressing the specified restoration problems or opportunities?	low = 0 high = 5	3	3	2	1	3	1	0	0	4	4	0	1	5	5	5	3	3	3	2	1	4	1	3	1
			2.25				1.00				2.25				4.50				2.25				2.25			
LANDSCAPE DIVERSITY	Does the plan make a significant contribution to the overall diversity of habitats and features (mosaic) across the barrier island?	low = 0 high = 5	3	3	0	1	2	1	0	0	4	4	0	0	3	5	2	1	3	3	1	1	4	1	0	0
			1.75				0.75				2.00				2.75				2.00				1.25			
TOTAL:			**31.33**				**24.75**				**28.25**				**42.92**				**32.50**				**32.00**			
AVERAGE:			**1.65**				**1.30**				**1.49**				**2.26**				**1.71**				**1.68**			

		Restoration Site	Great Gun T-5												Tiana T-7											
		Alternative	1				2				3				4				1				2			
			A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
THREATENED AND ENDANGERED SPECIES	Likelihood that the proposed activity would benefit Federal or state-listed species or species of special concern.	low = 0 high = 5	2	2	0	0	3	1	1	0	1	2	0	0	1	4	0	1	3	2	3	u	1	2	4	u
			1.00				1.25				0.75				1.50				2.67				2.33			
LAND OWNERSHIP	Likelihood that a landowner will support the proposed activity.	low = 0 high = 5	2	4	3	u	2	u	3	u	1	u	0	u	u	3	0	0	4	2	u	u	2	4	u	u
			3.00				2.50				0.50				1.00				3.00				3.00			
NATURAL SUSTAINABILITY	Likelihood that high-quality habitats and site conditions envisioned from the proposed activity are sustainable without intensive management and maintenance for at least 50 years.	low = 0 high = 5	3	4	5	2	3	2	5	1	2	3	1	0	3	4	5	5	3	3	3	u	3	3	5	u
			3.00				3.50				2.75				1.50				4.25				3.67			
NATURALNESS	Degree that proposed activity will replicate naturally occurring conditions in the vicinity of the site.	low = 0 high = 5	4	4	4	3	3	3	5	2	3	4	0	0	3	5	5	5	3	2	5	2	3	3	5	0
			3.50				3.25				3.00				4.50				3.00				2.75			
MAINTENANCE and MANAGEMENT	Likelihood that a project sponsor would assume responsibility for long-term maintenance/management.	low = 0 high = 5	2	3	5	u	2	u	5	0	2	u	0	0	2	u	na	0	3	u	1	3	1	3	3	0
			3.75				3.25				1.75				4.50				3.00				2.75			
ANTHROPOGENIC EFFECTS	Likelihood that proposed activity would help to reduce the overall affects of human activities on the environment.	low = 0 high = 5	4	4	5	1	4	2	5	1	4	3	1	0	4	5	5	5	4	3	4	1	3	4	2	1
			3.33				2.33				0.67				1.00				2.33				1.75			
COMBINED BENEFIT	Likelihood that proposed activity would support a combined project + restoration effort.	low = 0 high = 5	3	3	0	0	4	4	2	1	1	4	0	0	2	2	0	1	4	4	0	1	3	0	0	3
			3.50				3.00				2.00				4.75				3.00				2.50			
LONGSHORE SEDIMENT TRANSPORT PROCESSES	Likelihood that the proposed activity would support natural movement of sediment along the ocean side shoreline.	low = 0 high = 5	0	na	0	0	5	na	0	1	1	na	0	1	0	na	0	0	5	na	1	0	0	na	0	0
			1.50				2.75				1.25				1.25				3.00				1.00			
CROSS-ISLAND SEDIMENT TRANSPORT PROCESSES	Likelihood that activity would support the natural movement of sand back and forth across the barrier island, between the offshore bar, beach face, berm, dune, island core, bayshore, and bay.	low = 0 high = 5	3	1	0	0	2	0	2	1	2	1	0	1	2	3	0	0	3	1	1	0	3	3	0	3
			1.50				2.00				0.67				0.00				2.00				0.00			
DUNE DEVELOPMENT and EVOLUTION PROCESSES	Likelihood that activity would support the natural process of sand transport and recovery associated with natural dune growth and formation.	low = 0 high = 5	0	1	0	0	4	3	5	1	3	3	0	1	0	3	0	0	4	2	5	1	0	3	1	0
			1.00				1.25				1.00				1.25				1.25				2.25			
BAYSIDE SHORELINE PROCESSES	Likelihood that activity will support the natural process of longshore currents along the bay shorelines and the natural creation of narrow sandy beaches, tidal creeks, mud and sand tidal flats, salt marshes, and eelgrass beds.	low = 0 high = 5	5	2	0	0	1	0	0	0	1	0	0	5	5	2	5	1	3	4	0	1	0	3	4	0
			3.00				3.25				1.75				0.75				3.00				1.00			
ESTUARINE PROCESSES	Likelihood that activity would support the circulation of water and the movement of sediments, in support of natural ecological functioning of the habitats and species within the estuary.	low = 0 high = 5	5	4	2	1	0	1	0	0	0	1	0	0	5	5	4	2	5	3	0	0	4	1	0	0
			3.00				0.25				0.25				4.25				1.75				1.25			
INSTITUTIONAL RECOGNITION	The importance of the environmental resource being created as evidenced by existing laws, plans, and policy statements from international, national, regional, state, local and tribal entities. Consider both habitats and species that may be affected by the activity and identified as "significant".	low = 0 high = 5	5	4	u	1	4	2	u	1	2	3	u	0	3	4	u	1	4	3	u	1	3	2	u	0
			3.33				2.33				1.67				2.67				2.67				1.67			
PUBLIC RECOGNITION	The importance of the environmental resource being created as evidenced by general public interest, participation, and funding by resource related groups.	low = 0 high = 5	5	4	3	1	4	2	4	1	2	2	1	0	3	3	1	1	4	3	4	1	3	3	2	0
			3.25				2.75				1.25				2.00				3.00				2.00			
TECHNICAL RECOGNITION	Importance of the environmental resource being created as evidenced by the scientific knowledge and understanding of critical characteristics of the resource, such as its scarcity, representativeness, status of disturbance, level of biodiversity, use for RTE animals and plants, etc.	low = 0 high = 5	5	4	1	0	4	2	3	0	2	3	1	0	3	4	3	1	4	3	2	1	3	3	0	5
			3.50				2.75				1.25				2.00				3.00				2.25			
ACCEPTABILITY	Is the plan acceptable to Federal and state resource agencies, and local government?	low = 0 high = 5	2	4	u	u	3	3	u	u	2	4	u	u	1	4	u	u	4	3	u	u	3	4	u	u
			4.00				3.00				2.50				2.50				3.50				3.50			
EFFECTIVENESS	Does the plan make a significant contribution to addressing the specified restoration problems or opportunities?	low = 0 high = 5	5	4	2	1	4	2	3	1	2	3	4	1	3	5	5	2	4	3	3	1	3	3	3	0
			3.50				2.50				2.00				3.75				2.75				2.25			
LANDSCAPE DIVERSITY	Does the plan make a significant contribution to the overall diversity of habitats and features (mosaic) across the barrier island?	low = 0 high = 5	5	4	1	1	3	2	1	0	3	2	2	0	3	5	2	1	4	3	2	1	3	4	1	0
			2.50				2.25				1.50				2.75				2.50				2.00			
TOTAL:			**46.92**				**36.42**				**39.17**				**44.92**				**49.33**				**36.25**			
AVERAGE:			**2.47**				**1.92**				**2.06**				**2.36**				**2.60**				**1.91**			

		Restoration Site	WOSI T-8												Georgical Pond T-9											
		Alternative	1				2				3				4				1				2			
			A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
THREATENED AND ENDANGERED SPECIES	Likelihood that the proposed activity would benefit Federal or state-listed species or species of special concern.	low = 0 high = 5	2	0	1	2	2	1	0	2	3	1	1	2	3	0	1	1	3	0	u	1	3	0	u	3
			2.67				2.33				2.33				1.25				1.33				1.33			
LAND OWNERSHIP	Likelihood that a landowner will support the proposed activity.	low = 0 high = 5	3	3	u	g	2	2	u	u	u	u	u	u	u	u	u	u	0	4	u	u	0	4	u	u
			3.00				3.00				4.50				3.00				2.00				2.00			
NATURAL SUSTAINABILITY	Likelihood that high-quality habitats and site conditions envisioned from the proposed activity are sustainable without intensive management and maintenance for at least 50 years.	low = 0 high = 5	3	3	3	u	3	3	5	u	5	4	1	u	3	3	3	0	2	2	3	0	2	3	4	0
			2.25				1.75				2.25				4.50				3.00				3.67			
NATURALNESS	Degree that proposed activity will replicate naturally occurring conditions in the vicinity of the site.	low = 0 high = 5	4	4	4	1	4	3	4	0	4	4	5	1	5	4	5	4	3	4	0	4	4	5	1	5
			3.25				2.75				3.50				4.67				3.00				3.25			
MAINTENANCE and MANAGEMENT	Likelihood that a project sponsor would assume responsibility for long-term maintenance/management.	low = 0 high = 5	3	u	1	3	3	3	0	5	3	1	3	u	u	1	u	u	3	u	u	1	u	u	u	2
			1.00				3.00				4.50				2.00				3.00				3.00			
ANTHROPOGENIC EFFECTS	Likelihood that proposed activity would help to reduce the overall affects of human activities on the environment.	low = 0 high = 5	4	4	0	0	4	3	3	1	5	4	4	1	5	4	1	0	3	3	4	2	3	3	4	2
			2.33				1.75				3.00				2.50				2.50				2.50			
COMBINED BENEFIT	Likelihood that proposed activity would support a combined project + restoration effort.	low = 0 high = 5	2	2	0	0	3	3	4	0	2	2	4	0	2	0	1	1	0	2	0	0	0	2	0	0
			1.00				2.50				2.00				1.25				3.00				3.00			
LONGSHORE SEDIMENT TRANSPORT PROCESSES	Likelihood that the proposed activity would support natural movement of sediment along the ocean side shoreline.	low = 0 high = 5	0	0	u	0	0	2	u	1	0	0	u	0	0	0	0	0	0	0	0	0	0	0	0	0
			0.50				0.50				1.75				1.25				0.50				0.50			
CROSS-ISLAND SEDIMENT TRANSPORT PROCESSES	Likelihood that activity would support the natural movement of sand back and forth across the barrier island, between the offshore bar, beach face, berm, dune, island core, bayshore, and bay.	low = 0 high = 5	3	1	0	0	2	1	2	0	2	3	4	0	3	2	0	0	0	2	0	0	0	2	0	0
			1.00				1.25				2.00				0.00				0.00				0.00			
DUNE DEVELOPMENT and EVOLUTION PROCESSES	Likelihood that activity would support the natural process of sand transport and recovery associated with natural dune growth and formation.	low = 0 high = 5	2	1	0	0	2	2	4	1	4	4	2	0	2	2	0	0	0	1	0	0	0	1	0	0
			1.25				2.25				1.25				1.00				0.50				0.50			
BAYSIDE SHORELINE PROCESSES	Likelihood that activity will support the natural process of longshore currents along the bay shorelines and the natural creation of narrow sandy beaches, tidal creeks, mud and sand tidal flats, salt marshes, and eelgrass beds.	low = 0 high = 5	5	4	0	0	3	4	0	1	5	4	4	0	4	4	3	0	4	3	4	3	0	3	3	0
			1.75				2.50				1.00				0.75				0.25				0.25			
ESTUARINE PROCESSES	Likelihood that activity would support the circulation of water and the movement of sediments, in support of natural ecological functioning of the habitats and species within the estuary.	low = 0 high = 5	5	3	0	0	4	1	0	0	5	5	2	2	5	3	0	0	3	3	0	0	4	1	4	1
			2.25				1.50				2.00				3.50				2.25				2.25			
INSTITUTIONAL RECOGNITION	The importance of the environmental resource being created as evidenced by existing laws, plans, and policy statements from international, national, regional, state, local and tribal entities. Consider both habitats and species that may be affected by the activity and identified as "significant".	low = 0 high = 5	2	2	0	1	2	2	4	1	4	2	3	1	3	3	0	1	3	3	0	0	5	3	3	1
			2.00				1.25				2.75				2.25				2.25				2.25			
PUBLIC RECOGNITION	The importance of the environmental resource being created as evidenced by general public interest, participation, and funding by resource related groups.	low = 0 high = 5	4	3	4	1	3	3	2	0	5	4	1	2	5	3	u	1	3	3	2	1	3	2	0	0
			2.67				1.50				3.00				2.33				2.33				2.00			
TECHNICAL RECOGNITION	Importance of the environmental resource being created as evidenced by the scientific knowledge and understanding of critical characteristics of the resource, such as its scarcity, representativeness, status of disturbance, level of biodiversity, use for RTE animals and plants, etc.	low = 0 high = 5	4	2	1	3	3	3	0	5	5	3	2	5	4	2	0	3	3	0	0	3	3	3	0	3
			3.00				2.25				1.25				3.00				1.75				1.75			
ACCEPTABILITY	Is the plan acceptable to Federal and state resource agencies, and local government?	low = 0 high = 5	5	2	u	u	5	2	u	u	5	3	u	u	5	3	u	u	3	2	u	u	3	2	u	u
			3.50				3.50				4.00				4.00				2.50				2.50			
EFFECTIVENESS	Does the plan make a significant contribution to addressing the specified restoration problems or opportunities?	low = 0 high = 5	5	4	0	0	3	2	2	0	4	4	2	0	5	4	4	1	4	4	0	2	4	4	0	2
			3.50				3.50				4.00				4.00				2.50				2.50			
LANDSCAPE DIVERSITY	Does the plan make a significant contribution to the overall diversity of habitats and features (mosaic) across the barrier island?	low = 0 high = 5	5	2	1	4	3	2	1	0	4	3	0	0	4	4	0	0	5	4	3	1	4	5	2	1
			2.75				1.50				2.00				3.50				2.25				2.25			
TOTAL:			**36.25**				**34.75**				**44.67**				**34.17**				**34.42**				**37.92**			
AVERAGE:			**1.91**				**1.83**				**2.35**				**1.80**				**1.81**				**2.00**			

		Restoration Site	East Inlet Island T-10												John Boyle Island T-11											
		Alternative	1				2				3				1				2				3			
			A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
THREATENED AND ENDANGERED SPECIES	Likelihood that the proposed activity would benefit Federal or state-listed species or species of special concern.	low = 0 high = 5	3	5	4	2	3	2	3	3	3	2	2	0	3	5	4	2	4	0	0	2	3	2	1	0
			3.50				2.75				1.75				3.50				1.50				1.50			
LAND OWNERSHIP	Likelihood that a landowner will support the proposed activity.	low = 0 high = 5	3	4	u	u	3	4	u	u	3	u	u	u	3	4	u	u	3	u	u	u	3	u	u	u
			3.50				3.50				3.00				0.00				0.67				1.00			
NATURAL SUSTAINABILITY	Likelihood that high-quality habitats and site conditions envisioned from the proposed activity are sustainable without intensive management and maintenance for at least 50 years.	low = 0 high = 5	2	3	4	0	3	3	1	0	2	3	2	0	2	3	3	0	3	4	2	0	2	3	1	0
			2.25				1.75				1.75				2.00				2.25				2.50			
NATURALNESS	Degree that proposed activity will replicate naturally occurring conditions in the vicinity of the site.	low = 0 high = 5	4	3	3	0	4	4	1	0	3	2	0	0	4	4	2	0	4	3	0	0	3	2	0	0
			2.50				2.25				1.75				1.25				1.50				1.25			
MAINTENANCE and MANAGEMENT	Likelihood that a project sponsor would assume responsibility for long-term maintenance/management.	low = 0 high = 5	u	u	3	0	u	u	3	1	0	u	u	0	u	3	2	0	u	u	u	1	0	u	u	0
			2.50				1.50				0.00				1.50				0.50				0.00			
ANTHROPOGENIC EFFECTS	Likelihood that proposed activity would help to reduce the overall affects of human activities on the environment.	low = 0 high = 5	4	3	2	0	4	3	1	0	4	1	0	0	4	2	2	0	3	2	0	0	4	2	0	0
			2.25				2.00				1.25				1.50				1.00				0.50			
COMBINED BENEFIT	Likelihood that proposed activity would support a combined project + restoration effort.	low = 0 high = 5	1	4	0	0	1	3	0	0	1	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0
			1.25				1.00				0.50				0.25				0.25				0.25			
LONGSHORE SEDIMENT TRANSPORT PROCESSES	Likelihood that the proposed activity would support natural movement of sediment along the ocean side shoreline.	low = 0 high = 5	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
			na				na				na				na				na				na			
CROSS-ISLAND SEDIMENT TRANSPORT PROCESSES	Likelihood that activity would support the natural movement of sand back and forth across the barrier island, between the offshore bar, beach face, berm, dune, island core, bayshore, and bay.	low = 0 high = 5	0	na	5	0	0	na	2	0	0	na	1	0	0	u	3	0	0	u	0	0	0	u	1	0
			1.67				0.67				0.33				1.00				0.00				0.33			
DUNE DEVELOPMENT and EVOLUTION PROCESSES	Likelihood that activity would support the natural process of sand transport and recovery associated with natural dune growth and formation.	low = 0 high = 5	0	u	0	0	0	u	0	0	0	u	1	0	0	u	0	0	0	u	0	0	0	u	2	0
			0.00				0.00				0.33				0.00				0.00				0.67			
BAYSIDE SHORELINE PROCESSES	Likelihood that activity will support the natural process of longshore currents along the bay shorelines and the natural creation of narrow sandy beaches, tidal creeks, mud and sand tidal flats, salt marshes, and eelgrass beds.	low = 0 high = 5	2	3	4	0	4	3	0	0	5	3	1	1	2	3	3	0	0	3	1	0	5	3	2	0
			0.00				0.00				0.33				0.00				0.00				0.67			
ESTUARINE PROCESSES	Likelihood that activity would support the circulation of water and the movement of sediments, in support of natural ecological functioning of the habitats and species within the estuary.	low = 0 high = 5	5	2

Combined Agency Results - Ranking Matrix for Evaluation of FIMP Restoration Sites and Alternatives (Part II).

		Restoration Site	New Made Island T-15												Islip Meadows T-22											
		Alternative	1				2				3				1				2				3			
			A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
THREATENED AND ENDANGERED SPECIES	Likelihood that the proposed activity would benefit Federal or state-listed species or species of special concern.	low = 0 high = 5	3	5	5	1	4	1	3	2	3	1	2	0	u	2	0	0	u	2	0	0	u	3	2	0
			3.50				2.50				1.50				0.67				0.67				1.67			
LAND OWNERSHIP	Likelihood that a landowner will support the proposed activity.	low = 0 high = 5	3	4	u	u	3	u	u	u	3	u	u	u	5	4	u	u	5	3	u	u	5	4	u	u
			3.50				3.00				3.00				4.50				4.00				4.50			
NATURAL SUSTAINABILITY	Likelihood that high-quality habitats and site conditions envisioned from the proposed activity are sustainable without intensive management and maintenance for at least 50 years.	low = 0 high = 5	2	2	2	0	3	4	0	3	2	3	1	0	2	4	1	0	3	3	1	2	2	3	1	1
			1.50				2.50				1.50				1.75				2.25				1.75			
NATURALNESS	Degree that proposed activity will replicate naturally occurring conditions in the vicinity of the site.	low = 0 high = 5	4	3	2	0	4	3	0	0	3	2	1	0	3	3	0	3	3	4	2	2	2	4	3	1
			2.25				1.75				1.50				2.25				2.75				2.50			
MAINTENANCE and MANAGEMENT	Likelihood that a project sponsor would assume responsibility for long-term maintenance/management.	low = 0 high = 5	u	3	u	0	u	u	u	0	u	u	u	0	5	3	u	0	5	4	u	u	5	4	u	u
			1.50				0.00				0.00				2.67				4.50				4.50			
ANTHROPOGENIC EFFECTS	Likelihood that proposed activity would help to reduce the overall affects of human activities on the environment.	low = 0 high = 5	4	3	4	0	3	3	0	0	4	3	1	0	3	4	1	0	3	4	2	2	2	4	2	1
			2.75				1.50				2.00				2.00				2.75				2.25			
COMBINED BENEFIT	Likelihood that proposed activity would support a combined project + restoration effort.	low = 0 high = 5	0	2	0	0	0	2	0	0	0	3	0	0	0	2	0	0	0	2	0	0	0	2	0	0
			0.50				0.50				0.75				0.50				0.50				0.50			
LONGSHORE SEDIMENT TRANSPORT PROCESSES	Likelihood that the proposed activity would support natural movement of sediment along the ocean side shoreline.	low = 0 high = 5	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
			na				na				na				na				na				na			
CROSS-ISLAND SEDIMENT TRANSPORT PROCESSES	Likelihood that activity would support the natural movement of sand back and forth across the barrier island, between the offshore bar, beach face, berm, dune, island core, bayshore, and bay	low = 0 high = 5	0	u	3	0	0	u	0	0	0	u	1	0	na	na	na	na	na	na	na	na	na	na	na	na
			1.00				0.00				0.33				na				na				na			
DUNE DEVELOPMENT and EVOLUTION PROCESSES	Likelihood that activity would support the natural process of sand transport and recovery associated with natural dune growth and formation.	low = 0 high = 5	0	u	0	0	0	u	0	0	0	u	1	0	na	na	na	na	na	na	na	na	na	na	na	na
			0.00				0.00				0.33				na				na				na			
BAYSIDE SHORELINE PROCESSES	Likelihood that activity will support the natural process of longshore currents along the bay shorelines and the natural creation of narrow sandy beaches, tidal creeks, mud and sand tidal flats, salt marshes, and eelgrass beds.	low = 0 high = 5	2	4	5	0	0	4	0	0	5	3	2	0	5	4	3	0	4	3	4	2	2	4	4	1
			2.75				1.00				2.50				3.00				3.25				2.75			
ESTUARINE PROCESSES	Likelihood that activity would support the circulation of water and the movement of sediments in support of natural ecological functioning of the habitats and species within the estuary.	low = 0 high = 5	5	4	5	0	3	4	0	0	3	3	1	0	5	4	3	2	5	3	4	2	3	4	4	1
			3.50				1.75				1.75				3.50				3.50				3.00			
INSTITUTIONAL RECOGNITION	The importance of the environmental resource being created as evidenced by existing laws, plans and policy statements from international, national, regional, state, local and tribal entities. Consider both habitats and species that may be affected by the activity and identified as "significant".	low = 0 high = 5	3	4	3	1	3	3	1	1	3	3	0	0	5	4	u	1	5	3	u	1	5	4	u	1
			2.75				2.00				1.50				3.33				3.00				3.33			
PUBLIC RECOGNITION	The importance of the environmental resource being created as evidenced by general public interest, participation, and funding by resource related groups.	low = 0 high = 5	3	3	u	1	3	3	u	1	3	3	u	0	5	3	2	1	5	2	2	1	5	3	2	1
			2.33				2.33				2.00				2.75				2.50				2.75			
TECHNICAL RECOGNITION	Importance of the environmental resource being created as evidenced by the scientific knowledge and understanding of critical characteristics of the resource, such as its scarcity, representativeness, status of disturbance, level of biodiversity, use for RTE animals and plants, etc.	low = 0 high = 5	3	4	2	0	3	3	1	0	3	3	1	0	5	4	2	0	5	3	2	1	5	4	2	1
			2.25				1.75				1.75				2.75				2.75				3.00			
ACCEPTABILITY	Is the plan acceptable to Federal and state resource agencies, and local government?	low = 0 high = 5	u	3	u	u	u	3	u	u	u	2	u	u	3	4	u	u	3	4	u	u	3	3	u	u
			3.00				3.00				2.00				3.50				3.50				3.00			
EFFECTIVENESS	Does the plan make a significant contribution to addressing the specified restoration problems and opportunities?	low = 0 high = 5	3	4	4	0	3	3	2	1	4	4	2	0	3	3	0	1	4	3	0	1	4	4	1	1
			2.75				2.25				2.50				1.75				2.00				2.50			
LANDSCAPE DIVERSITY	Does the plan make a significant contribution to the overall diversity of habitats and features (mosaic) across the barrier island?	low = 0 high = 5	5	5	4	0	5	5	4	0	3	3	0	0	4	4	0	0	4	3	0	2	5	5	1	1
			3.50				3.50				1.50				2.00				2.25				3.00			
TOTAL:			**39.33**				**29.33**				**26.42**				**36.92**				**40.17**				**41.00**			
AVERAGE:			**2.07**				**1.54**				**1.39**				**1.94**				**2.11**				**2.16**			

		Restoration Site	Seatuck Meadows T-23												Davis Park T-24											
		Alternative	1				2				3				1				2				3			
			A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
THREATENED AND ENDANGERED SPECIES	Likelihood that the proposed activity would benefit Federal or state-listed species or species of special concern.	low = 0 high = 5	u	3	0	0	u	3	1	0	u	3	1	0	4	1	0	0	3	1	0	0	5	2	0	0
			1.00				1.33				1.33				1.25				1.00				1.75			
LAND OWNERSHIP	Likelihood that a landowner will support the proposed activity.	low = 0 high = 5	5	4	u	3	5	4	u	3	5	3	u	3	u	u	0	u	u	u	0	u	u	u	0	u
			4.00				4.00				3.67				0.00				0.00				0.00			
NATURAL SUSTAINABILITY	Likelihood that high-quality habitats and site conditions envisioned from the proposed activity are sustainable without intensive management and maintenance for at least 50 years.	low = 0 high = 5	4	3	2	1	3	3	2	3	4	3	3	1	4	3	2	2	4	3	3	0	5	4	4	0
			2.50				2.75				2.75				2.75				2.50				3.25			
NATURALNESS	Degree that proposed activity will replicate naturally occurring conditions in the vicinity of the site.	low = 0 high = 5	4	4	1	1	3	4	2	3	4	5	2	3	4	2	3	2	4	2	4	0	5	3	5	1
			2.50				3.00				3.50				2.75				2.50				3.50			
MAINTENANCE and MANAGEMENT	Likelihood that a project sponsor would assume responsibility for long-term maintenance/management.	low = 0 high = 5	5	4	u	1	5	4	u	1	5	4	u	1	u	u	u	0	u	u	u	0	u	u	u	0
			3.33				3.33				3.33				0.00				0.00				0.00			
ANTHROPOGENIC EFFECTS	Likelihood that proposed activity would help to reduce the overall affects of human activities on the environment.	low = 0 high = 5	4	4	3	1	3	4	4	1	5	5	4	3	4	3	4	1	4	4	4	0	5	5	5	1
			3.00				3.00				4.25				3.00				3.00				4.00			
COMBINED BENEFIT	Likelihood that proposed activity would support a combined project + restoration effort.	low = 0 high = 5	0	2	0	0	0	2	0	0	0	3	0	0	5	4	5	1	4	4	5	1	5	4	5	2
			0.50				0.50				0.75				3.75				3.50				4.00			
LONGSHORE SEDIMENT TRANSPORT PROCESSES	Likelihood that the proposed activity would support natural movement of sediment along the ocean side shoreline.	low = 0 high = 5	na	na	na	na	na	na	na	na	na	na	na	na	5	u	1	0	4	u	1	0	5	u	1	0
			na				na				na				2.00				1.67				2.00			
CROSS-ISLAND SEDIMENT TRANSPORT PROCESSES	Likelihood that activity would support the natural movement of sand back and forth across the barrier island, between the offshore bar, beach face, berm, dune, island core, bayshore, and bay	low = 0 high = 5	na	na	na	na	na	na	na	na	na	na	na	na	4	0	1	0	4	0	1	0	4	2	1	0
			na				na				na				1.25				1.25				1.75			
DUNE DEVELOPMENT and EVOLUTION PROCESSES	Likelihood that activity would support the natural process of sand transport and recovery associated with natural dune growth and formation.	low = 0 high = 5	na	na	na	na	na	na	na	na	na	na	na	na	5	3	4	1	4	3	5	1	5	3	5	2
			na				na				na				3.25				3.25				3.75			
BAYSIDE SHORELINE PROCESSES	Likelihood that activity will support the natural process of longshore currents along the bay shorelines and the natural creation of narrow sandy beaches, tidal creeks, mud and sand tidal flats, salt marshes, and eelgrass beds.	low = 0 high = 5	3	4	2	0	4	4	3	2	5	5	2	3	0	0	0	0	0	0	0	0	1	0	0	0
			2.25				3.25				3.75				0.00				0.00				0.25			
ESTUARINE PROCESSES	Likelihood that activity would support the circulation of water and the movement of sediments in support of natural ecological functioning of the habitats and species within the estuary.	low = 0 high = 5	5	4	2	2	5	4	3	2	5	4	2	2	0	0	0	0	0	0	0	0	1	0	0	0
			3.25				3.50				3.25				0.00				0.00				0.25			
INSTITUTIONAL RECOGNITION	The importance of the environmental resource being created as evidenced by existing laws, plans and policy statements from international, national, regional, state, local and tribal entities. Consider both habitats and species that may be affected by the activity and identified as "significant".	low = 0 high = 5	5	4	u	1	5	4	u	1	5	4	u	3	3	2	3	1	4	2	3	0	3	3	4	1
			3.33				3.33				4.00				2.25				2.25				2.75			
PUBLIC RECOGNITION	The importance of the environmental resource being created as evidenced by general public interest, participation, and funding by resource related groups.	low = 0 high = 5	5	3	3	1	5	3	3	1	5	3	3	3	3	2	3	0	4	2	4	1	3	3	5	1
			3.00				3.00				3.50				2.00				2.75				3.00			
TECHNICAL RECOGNITION	Importance of the environmental resource being created as evidenced by the scientific knowledge and understanding of critical characteristics of the resource, such as its scarcity, representativeness, status of disturbance, level of biodiversity, use for RTE animals and plants, etc.	low = 0 high = 5	5	4	3	1	5	4	3	1	5	4	3	1	3	2	4	0	4	2	4	0	3	3	5	0
			3.25				3.25				3.25				2.25				2.50				2.75			
ACCEPTABILITY	Is the plan acceptable to Federal and state resource agencies, and local government?	low = 0 high = 5	3	4	u	u	3	3	u	u	3	3	u	u	4	3	u	4	3	2	u	u	3	1	u	1
			3.50				3.00				3.00				3.33				3.00				2.00			
EFFECTIVENESS	Does the plan make a significant contribution to addressing the specified restoration problems and opportunities?	low = 0 high = 5	4	4	1	1	4	4	2	1	5	5	2	2	4	2	3	2	4	2	4	1	4	4	5	2
			2.50				2.75				3.50				2.75				2.75				3.75			
LANDSCAPE DIVERSITY	Does the plan make a significant contribution to the overall diversity of habitats and features (mosaic) across the barrier island?	low = 0 high = 5	4	4	1	1	4	5	2	1	5	5	1	2	2	2	4	0	2	1	5	0	4	4	5	0
			2.50				3.00				3.25				2.00				2.00				3.25			
TOTAL:			**40.42**				**43.00**				**47.08**				**34.58**				**33.92**				**42.00**			
AVERAGE:			**2.13**				**2.26**				**2.48**				**1.82**				**1.79**				**2.21**			

		Restoration Site	Atlantique to Cornielle T-25												Kismet T-26											
		Alternative	1				2				3x				1				2				3			
			A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
THREATENED AND ENDANGERED SPECIES	Likelihood that the proposed activity would benefit Federal or state-listed species or species of special concern.	low = 0 high = 5	4	4	1	0	3	1	0	2	1	4	0	2	2	0	4	0	3	1	3	0	2	1	3	0
			2.50				1.25				1.75				1.50				1.75				1.50			
LAND OWNERSHIP	Likelihood that a landowner will support the proposed activity.	low = 0 high = 5	1	u	u	u	2	u	u	0	2	u	u	0	2	u	u	3	u	u	u	0	u	u	u	0
			1.00				1.00				1.00				2.50				0.00				0.00			
NATURAL SUSTAINABILITY	Likelihood that high-quality habitats and site conditions envisioned from the proposed activity are sustainable without intensive management and maintenance for at least 50 years.	low = 0 high = 5	3	3	1	2	3	3	2	1	3	2	2	0	3	2	4	0	3	3	5	3	3	3	5	2
			2.25				2.25				1.75				2.50				3.50				3.25			
NATURALNESS	Degree that proposed activity will replicate naturally occurring conditions in the vicinity of the site.	low = 0 high = 5	2	4	3	1	3	3	3	0	3	2	5	0	3	3	4	0	4	4	5	3	4	4	5	1
			2.50				2.25				2.50				2.50				4.00				3.50			
MAINTENANCE and MANAGEMENT	Likelihood that a project sponsor would assume responsibility for long-term maintenance/management.	low = 0 high = 5	u	u	u	0	u	u	u	0	u	u	u	0	u	u	u	1	u	u	u	0	u	u	u	0
			0.00				0.00				0.00				1.00				0.00				0.00			
ANTHROPOGENIC EFFECTS	Likelihood that proposed activity would help to reduce the overall affects of human activities on the environment.	low = 0 high = 5	3	3	1	1	3	2	3	0	3	2	4	0	3	3	4	0	4	4	5	3	4	4	5	1
			2.50				2.00				2.25				2.50				4.00				3.50			
COMBINED BENEFIT	Likelihood that proposed activity would support a combined project + restoration effort.	low = 0 high = 5	2	4	0	2	2	3	0	0	3	4	4	1	4	4	5	1	5	3	5	3	2	3	5	2
			2.00				1.25				3.00				3.50				4.00				3.00			
LONGSHORE SEDIMENT TRANSPORT PROCESSES	Likelihood that the proposed activity would support natural movement of sediment along the ocean side shoreline.	low = 0 high = 5	0	u	0	0	u	0	0	5	u	2	0	5	u	5	0	5	4	5	3	2	3	5	1	na
			2.25				1.00				1.75				2.00				3.50				2.50			
CROSS-ISLAND SEDIMENT TRANSPORT PROCESSES	Likelihood that activity would support the natural movement of sand back and forth across the barrier island, between the offshore bar, beach face, berm, dune, island core, bayshore, and bay	low = 0 high = 5	4	5	1	4	4	5	1	5	4	5	2	0	3	5	0	3	3	5	0	2	3	5	0	0
			0.00				0.00				2.33				3.33				4.25				2.75			
DUNE DEVELOPMENT and EVOLUTION PROCESSES	Likelihood that activity would support the natural process of sand transport and recovery associated with natural dune growth and formation.	low = 0 high = 5	0	3	0	0	0	2	0	0	5	3	5	1	5	3	5	1	5	3	5	3	3	3	5	2
			2.25				1.00				1.75				2.00				2.75				2.50			
BAYSIDE SHORELINE PROCESSES	Likelihood that activity will support the natural process of longshore currents along the bay shorelines and the natural creation of narrow sandy beaches, tidal creeks, mud and sand tidal flats, salt marshes, and eelgrass beds.	low = 0 high = 5	5	4	5	5	4	2	0	0	1	0	0	0	0	1	0	0	0	1	0	0	2	0	0	0
			0.75				0.50				3.50				3.50				4.00				3.25			
ESTUARINE PROCESSES	Likelihood that activity would support the circulation of water and the movement of sediments in support of natural ecological functioning of the habitats and species within the estuary.	low = 0 high = 5	5	4	5	3	5	4	3	0	0	1	0	0	0	1	0	0	0	1	0	0	1	0	0	0
			4.75				2.75				0.25				0.25				0.50				1.00			
INSTITUTIONAL RECOGNITION	The importance of the environmental resource being created as evidenced by existing laws, plans and policy statements from international, national, regional, state, local and tribal entities. Consider both habitats and species that may be affected by the activity and identified as "significant".	low = 0 high = 5	1	3	u	3	3	4	u	1	3	2	u	1	3	2	4	0	3	3	4	2	3	3	4	2
			4.25				3.00				0.25				0.25				0.25				0.25			
PUBLIC RECOGNITION	The importance of the environmental resource being created as evidenced by general public interest, participation, and funding by resource related groups.	low = 0 high = 5	1	3	2	0	0	3	2	3	0	3	2	4	3	2	u	2	3	2	u	1	3	2	u	1
			2.50				2.00				3.00				2.33				2.00				2.00			
TECHNICAL RECOGNITION	Importance of the environmental resource being created as evidenced by the scientific knowledge and understanding of critical characteristics of the resource, such as its scarcity, representativeness, status of disturbance, level of biodiversity, use for RTE animals and plants, etc.	low = 0 high = 5	3	3	2	3	3	2	3	0	3	2	4	0	3	2	5	0	3	3	2	0	3	3	2	0
			2.75				2.00				2.25				2.50				2.00				2.00			
ACCEPTABILITY	Is the plan acceptable to Federal and state resource agencies, and local government?	low = 0 high = 5	1	2	u	u	3	3	u	u	3	3	u	u	3	u	u	u	3	u	u	u	3	u	u	u
			1.50				3.00				3.00				3.00				3.00				3.00			
EFFECTIVENESS	Does the plan make a significant contribution to addressing the specified restoration problems and opportunities?	low = 0 high = 5	3	4	5	3	3	3	3	0	3	3	5	0	3	4	0	4	4	5	1	4	4	5	1	1
			3.75				2.25				2.75				2.50				3.50				3.50			
LANDSCAPE DIVERSITY	Does the plan make a significant contribution to the overall diversity of habitats and features (mosaic) across the barrier island?	low = 0 high = 5	5	4	4	3	4	4	2	0	3	3	3	0	3	3	4	0	4	4	5	1	4	4	5	1
			4.00				2.50				2.25				2.50				3.50				3.50			
TOTAL:			**41.00**				**31.67**				**35.58**				**40.17**				**46.00**				**41.50**			
AVERAGE:			**2.16**				**1.67**				**1.87**				**2.11**				**2.42**				**2.18**			

		Restoration Site	Warner Island T-27												Atlantique T-28											
		Alternative	1				2				3				1				2				3			
			A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
THREATENED AND ENDANGERED SPECIES	Likelihood that the proposed activity would benefit Federal or state-listed species or species of special concern.	low = 0 high = 5	3	4	3	1	4	2	2	0	3	3	0	0	2	1	3	0	3	2	4	0	2	2	5	0
			2.75				2.00				1.50				1.50				2.25				2.25			
LAND OWNERSHIP	Likelihood that a landowner will support the proposed activity.	low = 0 high = 5	3	4	u	u	3	u	u	u	3	4	u	u	2	u	u	u	4	u	u	u	4	u	u	u
			3.50				3.00				3.00				2.00				4.00				4.00			
NATURAL SUSTAINABILITY	Likelihood that high-quality habitats and site conditions envisioned from the proposed activity are sustainable without intensive management and maintenance for at least 50 years.	low = 0 high = 5	2	2	1	0	3	3	2	2	2	4	1	0	3	3	4	0	3	4	5	3	3	3	5	2
			1.25				2.50				1.75				2.50				3.75				3.25			
NATURALNESS	Degree that proposed activity will replicate naturally occurring conditions in the vicinity of the site.	low = 0 high = 5	4	4	3	u	4	3	2	0	3	2	0	0	3	5	0	4	4	5	3	4	4	4	5	2
			3.67				2.25				1.25				2.75				4.00				3.75			
MAINTENANCE and MANAGEMENT	Likelihood that a project sponsor would assume responsibility for long-term maintenance/management.	low = 0 high = 5	u	4	0	0	u	u	0	0	u	4	u	0	u	u	0	0	u	u	u	0	u	u	u	0
			2.00				0.00				0.00				0.00				0.00				0.00			
ANTHROPOGENIC EFFECTS	Likelihood that proposed activity would help to reduce the overall affects of human activities on the environment.	low = 0 high = 5	4	3	3	0	3	3	1	0	4	3	1	0	3	2	4	0	4	4	5	2	4	3	5	1
			2.50				1.75				2.00				2.25				3.75				3.25			
COMBINED BENEFIT	Likelihood that proposed activity would support a combined project + restoration effort.	low = 0 high = 5	0	3	0	0	0	3	0	0	0	3	0	0	4	4	5	1	5	3	5	2	4	5	2	2
			0.75				0.75				0.75				3.50				4.25				3.25			
LONGSHORE SEDIMENT TRANSPORT PROCESSES	Likelihood that the proposed activity would support natural movement of sediment along the ocean side shoreline.	low = 0 high = 5	na	na	na	na	na	na	na	na	na	na	na	na	5	u	4	0	5	4	5	0	2	3	5	0
			2.00				2.00				2.00				3.50				4.25				3.25			
CROSS-ISLAND SEDIMENT TRANSPORT PROCESSES	Likelihood that activity would support the natural movement of sand back and forth across the barrier island, between the offshore bar, beach face, berm, dune, island core, bayshore, and bay	low = 0 high = 5	0	u	2	0	0	u	1	0	0	u	0	0	3	1	4	0	3	2	4	0	2	2	4	0
			na				na				na				3.00				3.50				2.50			
DUNE DEVELOPMENT and EVOLUTION PROCESSES	Likelihood that activity would support the natural process of sand transport and recovery associated with natural dune growth and formation.	low = 0 high = 5	0	u	0	0	0	u	0	0	0	u	0	0	5	3	5	1	5	2	5	3	3	2	5	2
			0.67				0.33				0.00				2.00				2.25				2.00			
BAYSIDE SHORELINE PROCESSES	Likelihood that activity will support the natural process of longshore currents along the bay shorelines and the natural creation of narrow sandy beaches, tidal creeks, mud and sand tidal flats, salt marshes, and eelgrass beds.	low = 0 high = 5	2	4	5	1	0	4	2	1	5	3	1	0	0	1	0	0	0	2	0	0	2	0	0	0
			0.00				0.00				0.00				3.50				3.75				3.00			
ESTUARINE PROCESSES	Likelihood that activity would support the circulation of water and the movement of sediments in support of natural ecological functioning of the habitats and species within the estuary.	low = 0 high = 5	5	4	5	0	3	4	2	0	3	4	1	0	0	1	0	0	0	1	0	0	1	0	0	0
			3.00				1.75				2.25				0.25				0.50				1.00			
INSTITUTIONAL RECOGNITION	The importance of the environmental resource being created as evidenced by existing laws, plans and policy statements from international, national, regional, state, local and tribal entities. Consider both habitats and species that may be affected by the activity and identified as "significant".	low = 0 high = 5	3	4	u	1	3	3	u	1	3	4	u	0	3	2	u	0	3	3

APPENDIX K

PHOTOGRAPHIC DOCUMENTATION OF HEP SURVEY TRANSECTS

ROBERT MOSES (T-1)

SUNKEN FOREST (T-2)

REAGAN (T-3)

OLD INLET (T-4)

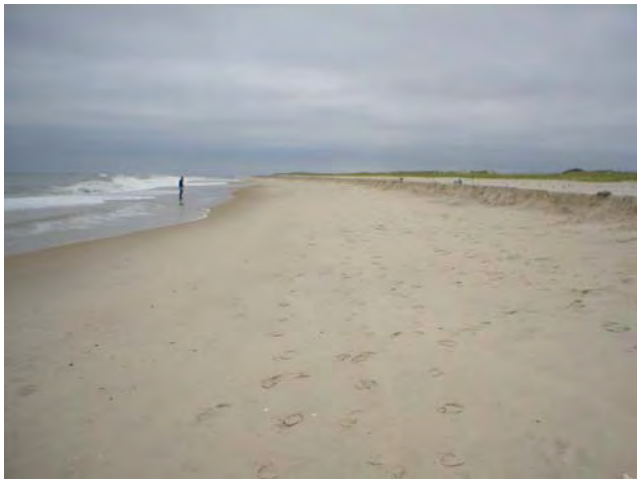
GREAT GUN (T-5)

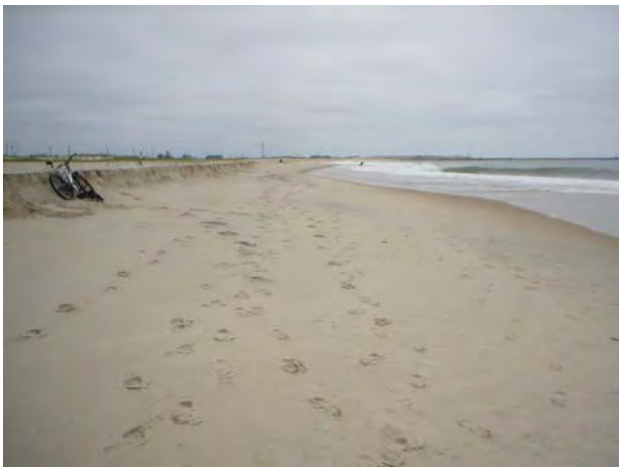
PIKES BEACH (T-6)

TIANA (T-7)

WOSI (T-8)

WARNING





GEORGICA POND (T-9)

EAST INLET ISLAND (T-10)

JOHN BOYLE ISLAND (T-11)

WARNER ISLAND (T-12)

PONQUOGUE SPOIL ISLAND (T-13)

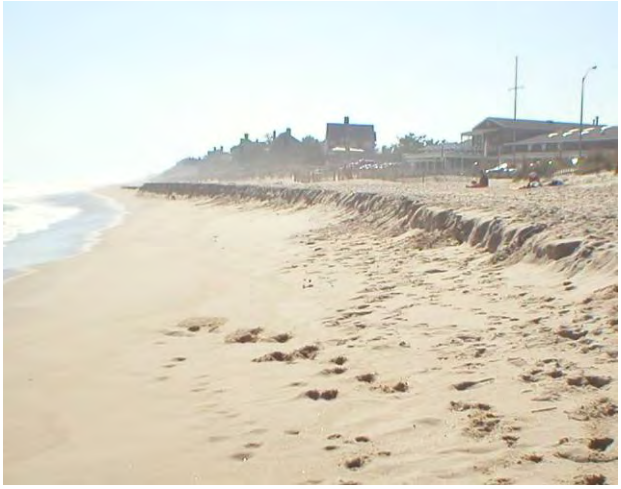
OCEAN BEACH (T-14)

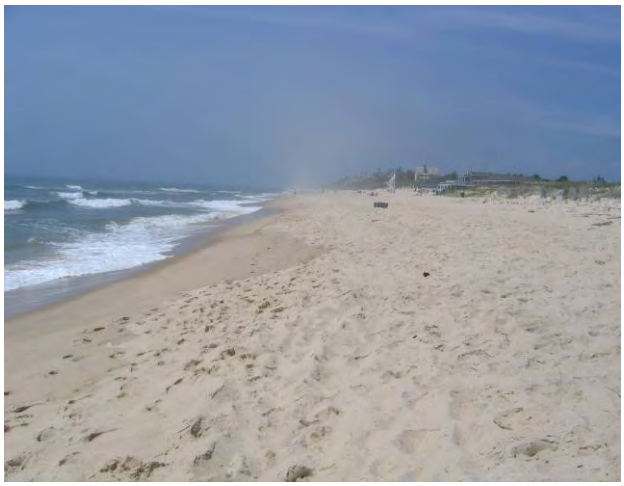
NEW MADE ISLAND (T-15)

DITCH PLAINS (T-16)

RANCH ROAD BLUFFS (T-17)

HOOK POND (T-18)





MASTIC COMMUNITY (T-19)

DEMOCRAT POINT (T-20)

OAK BEACH (T-21)