APPENDIX K

FIMP COASTAL PROCESS FEATURES

K.1 DESCRIPTION OF FIMP HEP COASTAL PROCESS FEATURES

The Team identified the following conceptual coastal process features (CPF) for 6 sites. Descriptions of the sites and photographs (when available) are based on the site conditions observed/documented during field visits.

The objective in evaluating conceptual restoration designs with the Habitat Evaluation Procedure (HEP) was to assess a broad spectrum of conceptual ideas that could be carried out at locations across the barrier island, to evaluate extremes of alternatives (e.g., full restoration versus reduced area), and to present a range of possible options, costs, etc.

In this evaluation, is assumed that any maintenance events needed to ensure the habitat conditions at a site following restoration are maintained over the life of the project (i.e., vegetation removal, invasive species control, minimization of human impacts, etc.) would occur. It is recognized that should maintenance activities not occur, a general decrease in habitat quality would likely occur over time and these conditions are not accounted for in the HEP method. Although management will be necessary to ensure long-term sustainability of restored sites, it is assumed that management activities will be funded by project sponsors or funded under separate USACE authority.

For HEP analysis, six barrier island communities have been identified and include UPLAND, DUNEGRASS, VEGBEACH, OCEANBEACH, BAYBEACH and BAYSUBSAV. Community definitions were based upon cover types as determined by data collection at representative transects. In general, habitats representative of each of these communities are found along each of the 6 potential CPF areas selected for HEP and their general locations on the barrier island are shown in Figure K-1. The exception are sites located along the mainland and on islands, in which case the OCEANBEACH and VEGBEACH communities are not applicable, and in areas where natural or manmade disturbance has eliminated a community. In general, the following descriptions of habitats are applicable to the six communities when present in a CPF unless otherwise noted in the description of the CPF.

OCEANBEACH

This community includes the nearshore zone of the ocean and the beach intertidal zone extending from 30 feet (ft) (10 meters [m]) depth in the ocean landward to the average daily high tide line (i.e., wrack line). The community is characterized by unvegetated areas that are dominated by sand

VEGBEACH

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.

DUNEGRASS

The DUNEGRASS community includes the face of the primary dune (i.e., fore dune), dunes, interdunes, and swales that are dominated by sand or herbaceous cover. In general, this community is found in areas extending from the seaward toe of the primary dune landward to the bayside storm high water mark, or landward to the seaward edge of upland community. Dune grass is typically the dominant species, but the community often also 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. The dominant vegetation is American beachgrass, but beach plum (*Prunus maritima*), sand bur (*Cenchrus tribulides*), seaside goldenrod, beach heather, switch grass (*Panicum virgatum*), and vines/shrubs such as poison ivy (*Toxicodendron radicans*), multiflora rose (*Rosa multiflora*), bayberry (*Myrica pennsylvanica*), and wax myrtle (*Myrica cyrifera*) also are found in this community type. Areas of the secondary dune with shrub densities > 20% are included in the UPLAND community type.

UPLAND

The UPLAND 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. Herbs and/or vines are also common components of this community, but do not dominate (< 20% cover). Dominant species in this community include pitch pine (*Pinus rigida*), post oak (*Quercus stellata*), red cedar (*Juniperus virginiana*), American holly (*Ilex opaca*), sassafras (*Sassafras albidum),* and cherry (*Prunus virginiana*). Dominant shrub/vine species include poison ivy, greenbriar (*Smilax rotundifolia*), serviceberry (*Amelanchier canadensis),* multiflora rose, bayberry, and wax myrtle.

BAYBEACH

The BAYBEACH community includes bay intertidal areas and the bay side upper shore zone and extends from the bay LLW (low-low water) 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 herb and/or wetland shrub communities and includes wetland and beach areas that are hydrologically connected to the bay and are not permanently inundated. Often, the invasive species common reed (*Phragmites australis*) dominates these wetland areas. However, these wetlands can be very diverse in terms of species composition and depending on hydrologic regime include the following species: salt marsh cordgrass (*Spartina alterniflora),* salt meadow hay *(Spartina patens),* seashore saltgrass *(Distichli spicata),* black grass *(Juncus gerardi),* sea lavender *(Limonium carolinianum),* seabeach orach *(Atriplex arenaria),* glasswort *(Salicornia spp.),* cattail *(Typha spp.),* American three-square (Schoenoplectus pungens), salt marsh bulrush *(Schoenoplectus robustus*), salt marsh fleabane *(Pluchea odorata),* saltmarsh aster *(Aster novae-angliae),* and shrubs such as blueberry (*Vaccinium corymbosum),* arrowwood (*Viburnum dentatum*), inkberry (*Ilex glabra*), marsh elder *(Iva frutescens)* and groundsel tree *(Baccharis halimifolia).*

BAYSUBSAV

The BAYSUBSAV community includes permanently inundated areas from the bay LLW line bay ward to 500 feet from the shoreline and includes permanently inundated impounded areas (i.e., ponds). The 500-foot distance is arbitrary and was selected to facilitate HEP analysis of the BAYSUBSAV community, which could extend for several thousand feet in some areas of the study area. The BAYSUBSAV community is typically not vegetated and is dominated by bare sand substrate. However, submergent aquatic vegetation (SAV) beds, dominated by eelgrass (*Zostera marina*), are found in some areas of the BAYSUBSAV community.

K.2 SELECTED CPFS/ALTERNATIVES (RANKED AS HIGHEST PRIORITY: TABLE K-1)

K.2.1 CPF T-2 Sunken Forest

The Sunken Forest site includes all six HEP community model types. The most notable restoration needs at this location are the severely eroding and steep bayside shoreline banks, a bulkhead, and scattered invasive common reed (*Phragmites australis)* also referred to as *Phragmites,* along the bayside shoreline. In addition, an active public marina and numerous buildings and recreational facilities associated with the National Park Service are also located on approximately 25 percent of the site. The site is dominated by maritime upland forest. Sand trails and wooden boardwalks traverse much of the site and provide access to the beach.

Recreational use of the area is high. Trash was noted along the bay and ocean shorelines and evidence of vehicle use of the beach was documented. Vehicle access to the beach is provided via open cuts in the dune located beyond the area surveyed for the CPF. In general, bayside shoreline and estuarine processes have been negatively impacted in this area and appear to be most affected by hard structures such as a marina, bulk heading, buildings and various human activities along the shoreline and in aquatic and intertidal areas. Additionally, the dune development and evolution and cross-island sediment transport processes have also been negatively affected by placements of buildings and walkways within upland and dune areas and overall direct human use of the area. The negative impacts to cross-island transport may be somewhat offset by man-made cuts in the primary dune that allow for vehicle access to beach areas.

K.2.1.1 *CPF T-2-1, Eroding Bayside Shoreline*

The goal of T-2-1 is to enhance the eroding bayside shoreline and intertidal zone and remove bulkhead material located west of the marina. Components include:

- Remove 210 lf (1 ac) of bulkhead
- Regrade 900 lf (4.3 ac) of shoreline
- Add 2.2 ac of sand fill material to restore the intertidal zone along 900 lf of shoreline
- Remove 0.25 ac of debris from shoreline
- Manually remove 0.5 ac of *Phragmites*
- Stabilize 900 lf (4.3 ac) of shoreline with coir log bioengineering measures
- Plant 2.2 ac of the 900 lf shoreline, allow other disturbed areas to revegetate naturally

Specific activities would include regrading approximately 900 lf the shoreline to a slope < 2:1 and placement of sand material over approximately a 2.2-acre (ac) area to enhance the interidal zone and provide bay sediment. Approximately 2.2 ac of fill material will be used to restore the shoreline grade; of this, potentially 1.1 ac can be taken from the area of the existing bulkhead. Dredge material would be used onsite for additional gradient alterations and would support dredge material management activities. The bulkhead and other debris along the shoreline would be removed and disposed of in a suitable location. Coir logs and plantings would be utilized to stabilize the 900 lf of shoreline and minimize further erosion and loss of habitat (assuming that velocities and slope or conducive to this stabilization measure). Approximately 0.5 ac of *Phragmites* and 0.25 ac of debris would be removed manually as part of shoreline modification efforts. Desirable vegetation and faunal species are expected to recolonize communities of the site naturally once suitable habitat conditions are established.

Restoration measures are expected to enhance the existing BAYBEACH community and result in some improvements to the BAYBEACH HSI variables for invasive species, species richness, erosion, shoreline modifications, and barriers to wildlife. The grade of the existing BAYBEACH community will be modified, but the overall width/size would not. There will be no changes in acreages of community types with this alternative.

By stabilizing the bay side shoreline and restoring the intertidal zone and intertidal vegetation, this alternative is expected to positively affect the bayside shoreline and estuarine coastal processes.

K.2.1.2 CPF T-2-2, Upper Beach and Dune

The goal of T-2-2 is to enhance the existing beach and dune system. Components of T-2-2 include:

- Regrade 1,800 lf (8.6 ac) of the dune face and slope
- Add additional 8.6 ac of fill material to restore dune, and area beneath walkway and at cuts
- Plant 3.2 acres of dune grass along 1,800 lf of ocean shoreline and in disturbed areas at cuts
- Raise and restore a 300 ft wooden boardwalk

Specific tasks would be to improve the slope of approximately 1,800 feet of the existing dune face to approximately 20-25% slope, plant the dune face with approximately 40% cover of vegetation, widen the VEGBEACH community to 120 feet, and plant the upper 40 feet of the VEGBEACH community with dune grass species such as beachgrass, beach plum, seaside goldenrod, and beach heather, and switch grass. Measures would also include raising the existing beach access boardwalk and restoring the dune/upland beneath it to a slope and width matching the adjacent

dunes and replanting as needed to stabilize the area. Approximately 8.6 ac of sand material will be needed for regrading dunes and dune replacement. In addition, open cuts through the due to the beach would be restored and planted to stabilize, and the overall area of disturbance would be reduced by restricting access to these areas and planting an additional 1 ac of dune grass. Structures associated with the NPS service and recreational facilities would remain, as would boardwalks and the sand road oriented east-west through the center of the site. Alternative natural materials such as rock, logs, etc. would be used to restrict access where feasible.

Restoration measures are expected to enhance the existing DUNEGRASS, and VEGBEACH communities and would result in some improvements to the HSI variables for percent cover of vegetation, slope, and minor improvements to impacts from human disturbance and shoreline modifications. Width would be increased, however, the HSI score for this variable was already at maximum score (1.0) prior to restoration and would not be changed. The size of each of these communities and the OCEANBEACH community is expected to change slightly and this change is reflected in HEP HU calculations. There will be no changes in acreages of community types with this alternative.

This alternative would make dunes more stable (i.e., by improving dune slope), restore the dune in access areas, and widen the beach and is expected to positively affect the longshore sediment transport and dune development and evolution processes. However, the activity would also have a negative effect on dune development and evolution by artificially modifying the dune structure and would negatively affect the cross-island transport process by closing off the area's most susceptible to overwashing. Components of this alternative (i.e., dune enhancement and replacement) would support storm damage reduction project objectives.

K.2.1.3 CPF T-2-3, Upland and Interior Dune Areas

The goal of T-2-3 is to restore upland and dune areas of the site to natural conditions. Components of T-2-3 include:

- Remove 4.1 ac of hard structures such as buildings, boardwalks, parking lots, paved areas
- Close off and regrade 4.1 ac of disturbed areas and trails (except one sand trail to provide access from marina to beach)

The effort includes the removal of several man-made structures on the site (covering approximately 4.1 ac), which includes 1,200 linear feet of wooden boardwalks, approximately 1,900 feet of linear paved areas, three large buildings, three maintenance buildings, and a bath house associated with recreational facilities. This measure includes regrading 4.1 ac of disturbed areas and allowing the site to return to conditions of natural barrier island communities such as dune and upland. Disturbed areas would be left to revegetate naturally. Access via one existing sand trail would be permitted on site to provide access to the Marina.

Restoration measures are expected to improve HSI scores for the UPLAND, DUNEGRASS, and VEGBEACH communities. Hard structures will be removed from existing disturbed areas but otherwise the site is expected to revert to natural conditions naturally. Improvements to the HSI variables include species richness, percent cover of vegetation, percent cover of trees and shrubs,

and barriers to wildlife, although increases will be relatively minor because the site overall scores relatively high in these areas prior to restoration. All communities will see some improvement in the HSI variables for magnitude of human impacts because fewer disturbances from humans is expected on site due to the removal of some facilities and public access ways and boardwalks. The DUNEGRASS community would increase by 0.3 ac, UPLAND would increase by 3.8 ac, and disturbed would decrease by 4.1 ac and this change is reflected in HEP HU calculations.

This alternative is expected to somewhat positively affect the cross-island transport process by removing hard structures that might impede overwashing of some portions of the site. However, overwashing is not likely in this area due to existing dune height, island width and presence of well-established upland communities.

K.2.2 CPF T-3 REAGAN PROPERTY

The Reagan site is similar to the Sunken forest in that a predominant restoration need at the site is the severely eroding bayside shoreline banks as well as scattered invasive *Phragmites* along the bayside shoreline. In addition, a significant portion of the site includes the highly developed community of Fire Island Pines. The entire bayside shoreline along this community is bulkheaded and as a result lacks a bayside intertidal zone. Vehicle cuts, pathways, sand fence, hard structures, and walkways from residential areas, heavily impact dunes along the ocean side of the site.

Upland areas adjacent to the residential community include sandy roads and trails, a power station, a helipad, and sand fence. Recreational use of the area is high and evidence of trash and vehicle use of the beach was documented. Access to the beach through the dune is via one wooden boardwalk, several small sand trails, and a major vehicle access point that connects the beach, residential area, and helipad.

Similar to the Sunken Forest site, the bayside shoreline and estuarine processes at the Reagan site have been negatively impacted and appear to be most affected by hard structures such as extensive bulk heading, boat slips, buildings and various human activities in the area, particularly those associated with the highly developed community of Fire Island Pines. Impacts have directly and indirectly affected the shoreline, intertidal, and aquatic areas of the site. Additionally, the dune development and evolution and cross-island sediment transport processes have also been significantly negatively affected by placements of boardwalks, sand fence, residential housing, and other hard structures within upland and dune areas, and overall direct human use of the area. The negative impacts to cross-island transport may be somewhat offset by man-made cuts in the primary dune that allow for vehicle access to beach areas.

CPF T-3-1, Eroding Bayside Shoreline
The goal of T-3-1 is to enhance the eroding bayside shoreline and intertidal zone. Components of T-3-1 include:

- Regrade slope of 1,00 lf (4.8 ac) of bay shoreline and upland
- Add 2.2 ac of sand fill to enhance/restore shoreline
- Install coir log bioengineering structures along 1,000 lf of shoreline
- Plant 1.2 ac of shoreline to stabilize

Specific measures would be to regrade the upland edge/shoreline to a slope < 2:1 and place sand material over approximately a 2.2 ac area to enhance the interidal zone and provide bay sediment. Dredge material may be utilized to restore grade in support of dredge material management activities. Soft bioengineering structures such as coir logs (or other) bioengineering measures and plantings would be installed to stabilize 1,000 feet of the shoreline. However, due to the velocity of water flow in this area, vegetated gabion bioengineering structures may be necessary to ensure the long-term stability of the site and protection of upland habitat. The shoreline would be planted with 2.2 ac of wetlands shrub and emergent vegetation to facilitate stabilization.

Restoration measures are expected to enhance the existing BAYBEACH community and would result in some improvements to the BAYBEACH HSI variables for invasive species, species richness, erosion, shoreline modifications, and barriers to wildlife. The grade of the existing BAYBEACH community will be modified, but the overall width/size would not.

By stabilizing the bay side shoreline and recreating the intertidal zone and vegetation, this activity is expected to result in positive impacts to the bayside shoreline and estuarine coastal processes.

CPF Regan Property T-3-2, Upper Beach and Dune
The goal of T-3-2 is to enhance the existing beach and dune system and improve conditions within upland areas of the site. Components of T-3-2 include:

- Remove 400 lf (2 ac) of sand fence on dunes
- Regrade 1,300 lf (6.2 ac) of dune to improve slope, height, width
- Add 6.5 ac of fill material to enhance dune and close or reduce roads, trails, and dune cuts
- Raise one walkway over dune

Specific tasks would be to remove sand fence from dunes, improve the slope of the existing dune face to approximately 20-25% slope and 50 foot width (i.e., fore dune characteristics), plant the dune face with approximately 40% cover of vegetation, and widen the VEGBEACH community to 120 feet and planting the upper 40 feet (from the toe of dune slope toward the ocean) with dune vegetation. Several existing sand roads and trails would be closed off or reduced in width. Approximately 6.5 acres of sand fill material would be needed for dune restoration and to minimize sand roads and trails. Structures and access roads associated with the residential area, power station, and helipad would remain on site. One existing walkway from the residential area to the beach would be raised and the dune would be restored to a slope and width matching the adjacent dunes and replanted as needed to stabilize the area.

Restoration measures are expected to enhance the existing DUNEGRASS, and VEGBEACH communities and would result in some improvements to the HSI variables for percent cover of vegetation, slope, and minor improvements to impacts from human disturbance and shoreline modifications. Width would be increased for the dune face, however, the HSI score for this variable was already at maximum score (1.0) prior to restoration and would not be changed as a result. The size of each of these communities and the OCEANBEACH community is expected to change slightly and this change is reflected in HEP HU calculations. There will be no changes in acreages of community types with this alternative.

This alternative would make dunes more stable (i.e., by improving dune slope), restore the dune in access areas, and widen the beach and is expected to positively affect the longshore sediment transport and dune development and evolution processes. However, the activity would also have a negative effect on dune development and evolution by artificially modifying the dune structure and would negatively affect the cross-island transport process by closing off the area's most susceptible to overwashing. Although a relatively large cut in the dune would remain to provide access to residential areas and the helipad. Components of this alternative (i.e., dune enhancement) would support storm damage reduction project objectives.

CPF T-3-3, Bury Bulkhead and Restore Shoreline

The goal of T-3-3 is to bury the existing bulkhead along Fire Island Pines, regrade the shoreline to restore the intertidal zone, and to stabilize the area using bioengineering. Components of T-3-3 include:

- Regrade 2.9 ac area
- Add 5 ac of sand fill to bury bulkhead and extend shoreline
- Apply coir log bioengineering methods to stabilize 300 lf of shoreline
- Plant 1 ac of shoreline to stabilize
- Extend intertidal zone along 600 lf of shoreline

Bioengineering structures such as coir logs and plantings would be installed to stabilize the toe of the 300-foot section of sand that is placed over the bulkhead. However, due to the velocity of water flow in this area, vegetated gabion (or other) bioengineering structures may be necessary to ensure the long-term stability of the site and protection of upland habitat. The intertidal zone will be extended over approximately 600 feet of the site and 1 ac of it will be planted with salt marsh species to stabilize the site. Dredge material would be utilized to restore grade in support of dredge material management activities. Approximately 5 ac of fill would be needed to restore bury the bulkhead, rebuild the shoreline and extend the intertidal zone.

Restoration measures are expected to restore/enhance the existing BAYBEACH community and would result in some improvements to the BAYBEACH HSI variables for invasive species, species richness, shoreline modifications, erosion, and barriers to wildlife, The size of the BAYBEACH and BAYSUBSAV communities are not expected to change and this change is reflected in HEP HU calculations.

Removal of hard structures and the recreation of intertidal areas and salt marsh along the bay shoreline is expected to positively affect the bayside shoreline and estuarine coastal processes.

K.2.3 CPF T-5 GREAT GUN

Great Gun recreational use area includes a major boat dock, helipad, wooden boardwalk, and several structures associated with the recreational area (i.e., outhouses, picnic tables, storage sheds). Numerous sand roads and trails are found throughout the site and numerous access roads and trails cut through the dune. The site also is characterized by a tidal marsh system comprised of an inundated saltwater pond and saltmarsh. However, due to tidal restrictions the tidal pond associated with this marsh is relatively stagnant and a significant component of the upper zones of the high marsh is dominated by invasive *Phragmites*.

This area is a public recreational facility, and use of the area is high. Vegetation loss and substrate disturbance from pedestrian and vehicle use of uplands and dune areas is significant throughout the site. Despite the recreational uses of the area, the dunes and beach are of relatively high quality in terms of vegetation, slope and width. The bayside shoreline and estuarine processes at the site have been negatively impacted and appear to be most affected by hard structures such as extensive bulk heading, boat slips, buildings, a playground/recreational area, and general impact from various human uses the area. Impacts have directly and indirectly affected the shoreline, intertidal, and aquatic areas of the site and in particular have altered hydrologic connection to a relatively large salt marsh community on site. Evidence of erosion is present on the bayside shoreline, but is not as severe as other sites such as Reagan and Sunken Forest. The dune development and evolution and cross-island sediment transport processes have also been significantly negatively affected by placements of boardwalks, sand fence, other hard structures within upland and dune areas, and overall direct human use of the area. However, the negative impacts to cross-island transport may be somewhat offset by man-made cuts in the primary dune that allow for vehicle access to beach.

CPF T-5-1, Existing Salt Marsh

The goal of T-5-1 is to restore the 1.14-acre degraded salt marsh and tidal pond at Great Gun. Components of T-5-1 include:

- Install a 48-inch culvert to reestablish hydrologic connection to the existing marsh
- Excavate 0.2 ac of the area to achieve suitable elevations for culvert installation
- Add 0.3 ac of sand fill over culvert to raise and restore sand road
- Plant excavated areas (0.2 ac) with salt marsh species

Specifically, a 48-inch metal culvert would be placed beneath a sand road to connect the existing marsh located on the western portion of the site with the degraded marsh located in the center and

eastern portion of the site. Some excavation may be required on 0.2 acres of the site to achieve desirable elevations for culvert installation and tidal flow. Approximately 0.3 ac of fill will be added above culvert to raise and replace sand access road. Some of excavated material may be resused on site. Planting is not proposed with this alternative since the increase in tidal flow is expected to create conditions favorable for desirable salt marsh species currently found on site to flourish, and to reduce the presence of *Phragmites*. However, areas disturbed during construction would be replanted. The existing sand road and boardwalk, which bisect the marsh system, would remain.

Restoration measures are expected to enhance the existing BAYBEACH community and would result in some improvements to the BAYBEACH HSI variables for percent cover of vegetation, invasive species, species richness, and some reduction in the magnitude of impacts from human disturbance to the marsh (road will be raised). The size of the BAYBEACH community would increase by 1.14 ac and UPLAND would decrease slightly as flooding is expected to result in the conversion of some fringe upland areas along the marsh to wetland shrub.

The enhancement of the existing degraded salt marsh is expected to positively affect the estuarine coastal process.

K.2.4 CPF T-7 TIANA

The Tiana CPF currently provides parking and access to the beach for recreational activities. The site is at a relatively narrow portion of the barrier island, however, the dunes and beach in this area are relatively wide and stable. On the bayside, overall the salt marsh is of relatively high quality. However, a portion of the site has been degraded due to flooding and runoff from the paved road, and use of the area as a boat launch point. Recreational use of the area is high and includes vehicle access to the beach. Access to the beach is provided by a large cut in the dune that extends from the end of the asphalt parking area.

Overall the bayside shoreline and estuarine processes at the site appear to be functioning naturally, considering the overall setting of the site. However, a small portion of the salt marsh and bay shoreline has been directly impacted by vehicles accessing the area to launch watercraft and from runoff from the adjacent road surface. The dune development and evolution process is affected by vehicle traffic on the upper beach and beach maintenance activities (i.e., sand deposition and dune building). This activity mimics sand accretion, which may or may not be the "natural trend in this area". Cross-island sediment transport processes have been negatively affected by beach maintenance activities and other hard structures (i.e., asphalt parking lot and roads) within upland and dune areas. The negative impacts to cross-island transport may be somewhat offset by man-made cuts in the primary dune that allow for vehicle access to beach areas.

CPF T-7-1, Bayside Shoreline, Salt Marsh, and Upper Beach and Dune

The goal of T-7-1 is to restore salt marsh by removing fill material, regrading and replanting to area, restoring the dune at an oceanside access cut and providing access via a dune walkover, and restoring dunegrass/upland in those areas. Specific components of T-7-1 include:

- Remove 0.2 ac of fill bayside
- Regrade 0.2 ac area
- Plant 0.1 ac of regraded bayside shoreline
- Regrade and restore 200 foot wide vehicle access cut in the dune to slope and width of adjacent dune
- Fill cut with 1 ac of sand
- Plant 0.25 ac of restored dune with dune grass
- Install one dune walkover

On the bayside, approximately 0.2 ac of gravel, asphalt, and fill material, would be removed from the salt marsh and upland community. This portion of the site would be regraded and planted as needed to restore salt marsh and a narrow upland community along the road edge. On the oceanside, approximately a 200 foot-wide area of the dune and upper beach located at the vehicle cut would be restored to fore dune conditions such that approximately 200 feet of the existing dune face would be regraded to a slope of approximately 20-25%, planting the dune face with approximately 40% cover of vegetation, widening the VEGBEACH community to 120 feet, and planting the upper 40 feet of the VEGBEACH community with dune grass species that include beachgrass, beach plum, seaside goldenrod, and beach heather, and switch grass. One walkover would be installed to provide pedestrian access to the beach.

Restoration measures are expected to enhance, and in some cases restore, four of the six HEP communities (OCEANBEACH and BAYSUBSAV excluded), and would result in some improvements to the HSI variables for percent cover of vegetation, percent cover of trees and shrubs, species richness, erosion, shoreline modification, barriers to wildlife, and human factors/magnitude of human impacts. However, due to the small size of upland and salt marsh creation in disturbed areas, this alternative is expected to have an overall low change in habitat quality (HSI scores) for these habitats. This measure is expected to convert 0.38 of disturbed area to intertidal area (0.04), salt marsh vegetation (0.05), and dune grass (0.29)

The removal of fill and restoration of salt marsh in intertidal areas is expected to have a positive effect on the bayside shoreline and estuarine coastal processes. On one hand, dune development and evolution processes would be positively affected by restoring the dune in the open cut area. But, this would also negatively affect the cross-island transport process by closing off the area's most susceptible to overwashing. Components of this alternative (i.e., dune enhancement and replacement) would support storm damage reduction project objectives.

CPF T-7-2, Upland and Interior Dune
The goals of T-7-2 would be to remove all manmade structures from the interior areas of the site to allow the site to revert to more natural conditions. Specific components include:

- Remove 0.2 ac asphalt lot and regrade area
- Plant 0.2 ac of disturbed area with dune grass

Specifically, the 2 ac asphalt lot would be removed entirely and there would be no walkovers installed to provide access to the beach or bay shoreline. The primary asphalt road through the site would remain.

Restoration measures are expected to convert existing disturbed areas to DUNEGRASS, and would result in improvements to the HSI variables for, percent cover of vegetation, species richness, barriers to wildlife, and human factors/magnitude of human impacts. HSI scores for magnitude of impacts from humans and percent vegetation will also improve for most communities as less human activity is expected on site due to parking lot removal. This measure would convert 0.4 ac of disturbed area to dune grass.

The removal of the parking lot would positively affect the cross-island transport process by replacing disturbed area with natural habitat, particularly since the large dune cut would be left open under this scenario.

CPF T-7-3, Bay Submergent
The goals of T-7-3 are to enhance conditions of the BAYSUBSAV community by:

- Plant 1 ac of submergent aquatic vegetation

Restoration measures are expected to enhance the existing BAYSUBSAV community and would result in improvements to the following BAYSUBSAV HSI variables, percent cover of eelgrass and species richness. The community would be enhanced through this action, but the size of the BAYSUBSAV community would not change.

This alternative is expected to positively affect estuarine coastal processes by increasing the amount of desirable submergent aquatic vegetation in the area.

K.2.5 CPF T-8 WEST OF SHINNECOCK INLET (WOSI)

The WOSI CPF currently provides parking and access to the beach for recreational activities. The site is at a relatively narrow portion of the barrier island, however, the dunes and beach in this area are relatively wide and stable due to beach renourishment activities that were recently completed for the site. The dune currently has a wooden walkover that provides access for pedestrians to the beach. However, washouts have been occurring through the dune at this location and the foundation of the walkover is located within, rather than above, the dune.

Bayside, the site is characterized by an asphalt parking lot, relatively steep bayside dunes, and impacts to bayside dunes caused by pedestrian access from the parking lot to the bay shoreline. A relatively high quality salt marsh is located in the northeastern portion of the site, however the marsh does contain invasive *Phragmites*.

Recreational use of the bay and ocean shorelines areas is high. No vehicle access points are located within the CPF, but vehicle access is provided elsewhere along the beach and tire ruts have been documented on the beach. The state and Federally-listed seabeach amaranth and piping plover have been documented in the VEGBEACH community in the vicinity of this location.

Overall the bayside shoreline and estuarine processes at the site appear to be functioning naturally, considering the overall setting of the site. A small portion of the salt marsh and bay shoreline has been directly impacted by human use of the area for recreation, but impacts overall are relatively minor. The dune development and evolution process is affected by vehicle traffic on the upper beach, hard structures (i.e., boardwalk), and beach maintenance activities (i.e., sand deposition and dune building). This activity mimic's sand accretion, which may or may not be the "natural trend in this area". Cross-island sediment transport processes have been negatively affected by beach maintenance activities and other hard structures (i.e., asphalt parking lot, boardwalk, and roads) within upland and dune areas.

CPF T-8-1, *Phragmites* Control

The goal of T-8-1 is to use herbicides to control *Phragmites* in the existing 5 ac salt marsh and 4 ac of adjacent upland shrub communities. Specific components include:

- Apply herbicides to 9 ac area to control *Phragmites*

Restoration measures are expected to enhance the existing BAYBEACH community by removing the invasive species *Phragmites* from the site and making conditions more favorable for establishment of desirable native species. Restoration is expected to result in some improvements to the BAYBEACH HSI variables for invasive species, barriers to wildlife, and species richness. The size of the HEP communities would not change as a result of this measure.

The removal of *Phragmites* in the existing marsh is expected to positively affect the estuarine coastal process.

CPF T-8-2, Bayside Shoreline and Upper Beach and Dune
The goals of T-8-2 are to restore the dunes and shoreline at pedestrian access points currently located on the bay and ocean shorelines, install/raise pedestrian access walkovers, and reshape and stabilize the bayside shoreline to reduce erosion and improve wildlife access. Specific components of T-8-2 include:

- Regrade 1,400 lf (6.7 ac) of bayside shoreline slope to improve stability and intertidal zone and 0.2 ac of Oceanside shoreline to restore dune cut
- Add 0.1 ac of fill bayside to fill opening in bay shoreline and 0.5 ac of fill oceanside to fill dune cut
- Install a 30 lf wooden walkway to the bay
- Raise existing 200 lf walkway ocean side
- Plant 0.1 ac of dune oceanside with dune grass, and 1.7 ac of bay shoreline with emergents and shrubs to stabilize

Bayside, restoration measures include restoring a 0.2 ac pedestrian access area at the northern end of the parking lot and regrading approximately 1,400 feet of the bay side shoreline to a slope < 2:1, and placing approximately 3.4 ac of sand material to enhance the intertidal zone and provide bay sediment. Dredge material may be utilized to restore grade in support of dredge material management activities. A wooden walkway would be installed above the restored bayside dune to provide pedestrian access from the lot to the bay shoreline. Oceanside, the existing walkway would be raised above the dune and 0.5 ac of the dune would be restored to a slope and width matching the adjacent dunes and replanted as needed to stabilize the area. HSI scores for DUNEGRASS and VEGBEACH slope, height, and width are not expected to change due to the small size (< 10' wide cut) of the affected area. This measure would result in conversion on 0.19 ac of disturbed habitat to dune grass habitat.

Restoration measures are expected to enhance four of the six HEP communities (OCEANBEACH and BAYSUBSAV excluded), and would result in improvements to the HSI variables for, percent cover of vegetation, species richness, erosion, shoreline modification, barriers to wildlife, and magnitude of human impacts. Approximately 0.19 ac of disturbed area would be converted to dune habitat with this alternative and this change is reflected in HEP HU calculations.

Regrading the bayside shoreline slope and increasing the shoreline intertidal areas is expected to have a positive effect on the bayside shoreline and estuarine coastal processes. Dune development and evolution processes would be positively affected by restoring the dune in the area of the existing boardwalk. But, this would also negatively affect the cross-island transport process by closing off the area's most susceptible to overwashing. Components of this alternative (i.e., dune enhancement and replacement) would support storm damage reduction project objectives.

CPF T-8-3, Removal of all Hard Structures on Site
The goal of T-8-3 is to remove manmade structures from the site and allow the site to revert to natural conditions. Specific components include:

- Remove 0.4 ac asphalt parking lot
- Removal of walkway on oceanside
- Plant 0.4 ac of dune and plant species

Specifically, the 0.40-acre asphalt parking lot would be removed entirely and the regraded to mimic adjacent communities and the 200-foot long wooden walkover would be removed from the site. The disturbed area would be replanted with 0.15 ac of dune grass and 0.25 ac of upland species. No measures would be taken to regrade the bayside shoreline. The area beneath the walkway through the dune would be restored to conditions similar to adjacent dunes and the walkway would be removed. Due to the small size of impact from the walkover, the overall HSI scores for the slope, height and width of the DUNEGRASS and VEGBEACH communities are not expected to change as a result of this action. The primary asphalt road through the site would remain.

Restoration measures are expected to enhance dune and upland habitats on the site and would result in improvements to the HSI variables for percent cover of vegetation, percent cover of trees and shrubs, species richness, erosion, shoreline modification, barriers to wildlife, and human factors/magnitude of human impacts. The conversion of disturbed area would result in 0.13 additional acres of dunegrass and 0.27 acres of upland. Other HEP communities would also see some slight improvements due to the reduction of human activity in the area as a result of removing public access and parking.

The removal of the parking lot would somewhat positively affect the cross-island transport process by replacing disturbed area with natural habitat. Although the cut in the dune would not be restored under this scenario, the elevation and condition of the dune at this location is likely not conducive to breaching.

K.2.8 CPF T-25 ATLANTIQUE TO CORNEILLE

The area from Atlantique to Corneille (T-25) includes habitat representative of the six HEP community model types. The site is similar to the Reagan site in that well-vegetated upland and dune areas characterize the site and these communities are located adjacent to densely populated residential communities. Bayside portions of the shoreline are bulkheaded and include boat docks and commercial development. Other areas of the shoreline are experiencing accelerated rates of erosion, which is severe in some areas. Vehicle cuts and pathways are interspersed throughout the upland and dune communities and cuts in the dune provide access to the beach. Overall the dunes and beach in the area are of moderate size and width and experience moderate recreational use. Several buildings have been built within the fore dune area and appear to extend into the upper beach zone. The highly developed communities of Atlantiqe (to the west) and Corneille Estates (to the east) abut the site.

This site closely resembles the Reagan site. Bayside shoreline and estuarine processes have been negatively impacted and appear to be most affected by hard structures such as extensive bulk heading, boat slips, buildings and various human activities in the area, particularly those associated with the highly developed community of Fire Island Pines. Impacts have resulted in accelerated

shoreline erosion in unprotected areas and direct loss of shoreline and intertidal areas. Additionally, the dune development and evolution and cross-island sediment transport processes have also been significantly negatively affected by placements of boardwalks, sand fence, residential housing, and other hard structures within upland and dune areas, and overall direct human use of the area. However, some of the negative impacts to processes from the development may be somewhat offset by the presence of large undeveloped upland and dune areas within the site. These low-lying areas are relatively natural and likely have a positive effect on the five coastal processes.

CPF T-25-2, SALT MARSH CREATION

The goal of T-25-2 is to create new salt marsh by excavating and regrading upland areas and bay shoreline, and planting native salt marsh species. Specific components of T-25-2 include:

- Excavate 1.22 ac of upland along the bay shoreline to create salt marsh habitat
- Regrade 1.22 ac area
- Plant 1.22 ac of salt marsh vegetation

Approximately 1.22 ac of upland and bay shoreline would be excavated and planted with native salt marsh species such as cordgrass, salt meadow hay, black grass, and marsh elder shrub to promote salt marsh in this area.

Restoration measures are expected to restore/enhance the existing BAYBEACH community and would result in some improvements to the BAYBEACH HSI variables for invasive species, species richness, shoreline modifications, and barriers to wildlife. Approximately 1.22 ac of upland area would be converted to intertidal salt marsh habitat.

The creation of salt marsh along the bay shoreline is expected to positively affect the bayside shoreline and estuarine coastal processes.

Table K-1: Summary of Restoration Ranks and Scores (1 highest to 57 lowest)

Site Name	HEP Site ID	Alternative Number	RANK - Net Gain in AAHU Score	RANK - Cost Per Habitat Unit	RANK - Matrix	HEP Prioritization Exercise	Process Targeted*
Tiana	T-7	1	21	10	6	1	B,E
Tiana	T-7	2	23	4	34	1	C,U
Tiana	T-7	3	24	7	2	1	B
Atlantique	T-28	1	55	43	33	1	D
Atlantique	T-28	2	49	53	3	1	D,L
Seatuck Refuge	T-23	1	8	20	22	1	B,E

Great Gunn	T-5	1	30	12	7	1	E
Great Gunn	T-5	2	25	13	24	1	D,U
Great Gunn	T-5	3	16	18	56	1	U
WOSI	T-8	1	10	1	30	1	E
WOSI	T-8	2	4	9	32	1	D
WOSI	T-8	3	6	3	35	1	D,U
WOSI	T-8	4	5	31	9	1	B,E
Seatuck Refuge	T-23	2	9	44	14	1	E
Atlantique to Corneille Estates	T-25	1	38	37	16	1	B,E
Islip Meadows	T-22	1	36	21	27	1	B,E
East Inlet Island	T-10	1	22	8	21	1	U,R
Seatuck Refuge	T-23	3	12	34	4	1	B,E
New Made Island	T-15	1	51	33	23	1	U,R
Islip Meadows	T-22	3	37	14	17	1	B,E
John Boyle Island	T-11	1	27	5	29	1	U,R
Atlantique to Corneille Estates	T-25	2	33	17	41	1	B,E
East Inlet Island	T-10	2	14	2	38	1	E
Atlantique to Corneille Estates	T-25	3	28	28	37	1	D,U
Reagan Property	T-3	2	32	30	47	1	D,U
Fair Harbor	T-29	1	54	45	40	2	D
Islip Meadows	T-22	2	41	51	20	2	E
Fair Harbor	T-29	2	48	55	10	2	L,D
New Made Island	T-15	2	53	26	49	2	U,R
New Made Island	T-15	3	56	25	52	2	U
John Boyle	T-11	2	34	15	53	2	U,R
East Inlet Island	T-10	3	11	16	54	2	U
John Boyle	T-11	3	26	11	55	2	U
Kismet	T-26	2	40	54	5	u	D,L

Kismet	T-26	3	42	50	19	u	D,L
Davis Park	T-24	1	18	6	39	u	D
Davis Park	T-24	2	13	36	44	u	D
Davis Park	T-24	3	17	35	18	u	D,L,U
Great Gunn	T-5	4	15	32	8	u	B,E
Georgica	T-9	3	1	27	31	u	D,L,E
Ocean Beach	T-14	1	7	47	11	u	D,L
Sunken Forest	T-2	4	19	41	15	u	B,E
Kismet	T-26	1	44	40	25	u	D
Ocean Beach	T-14	2	47	42	28	u	D
Ocean Beach	T-14	3	43	52	1	u	D,L
Sunken Forest	T-2	1	31	24	48	u	B,E
Reagan	T-3	1	39	19	45	u	B,E
Reagan	T-3	3	35	23	36	u	B,E
Atlantique	T-28	3	50	57	13	3	D,L
Fair Harbor	T-29	3	45	56	12	3	D,L
Sunken Forest	T-2	3	20	39	51	3	D,U
Sunken Forest	T-2	2	29	29	57	3	D
Warners Island	T-27	1	52	48	26	3	U,R
Warners Island	T-27	2	46	46	46	3	U,R
Warners Island	T-27	3	57	49	50	3	U
Georgica	T-9	1	2	38	43	3	E
Georgica	T-9	2	3	22	42	3	E

Notes:

High priority based on HEP Team prioritization assignment or rank between 1 and 19, or has NY DEC approval

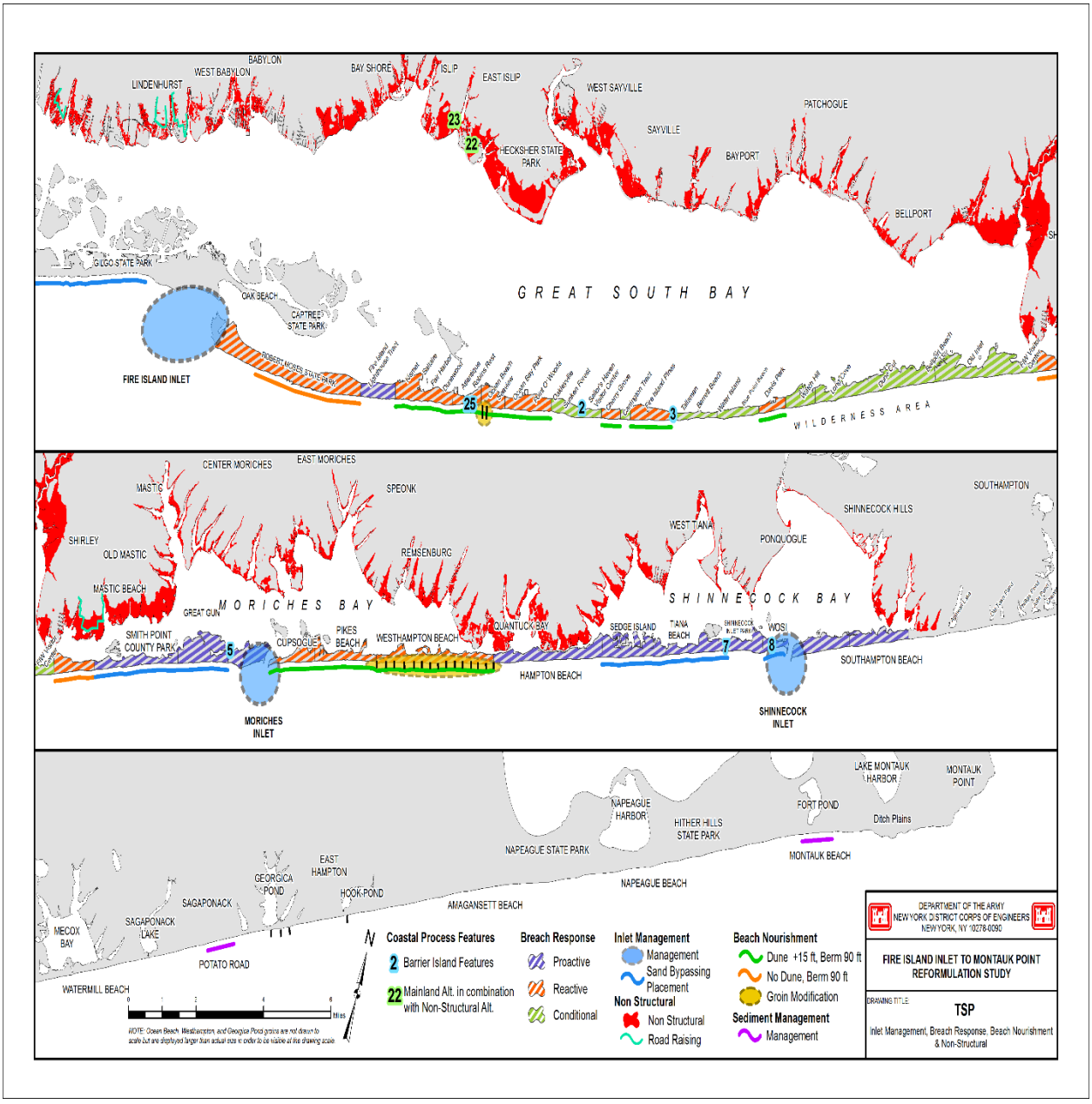
Moderate priority based on HEP Team prioritization assignment or rank between 20 and 38

Low priority based on HEP Team prioritization assignment or rank between 39 and 57, or not approved by NY DEC

Unknown priority - additional information is needed

*B = Bayside Process, C = Cross Island Transport, D = Dune Growth and Evolution, E = Estuarine Processes, L = Longshore Transport, R = Rare Species, U = Upland

Figure K-1: Site Locations



GPS Locations of the CPFs

Sunken Forest T-2		1
N	W	
40 39. 387	73 06.264	
Regan Property T-3		2
40 40.071	73 03.301	
Great Gun T-5		3
40 45.704	72 46.511	
Tiana T-7		4
40 49.976	72 30.659	
WOSI T-8		5
40 50.398	72 29.214	
Atlantigue to Cornielle T-25		6
40 38.616	73 09.910	