

SECTION 6.0 – AVOIDANCE, MINIMIZATION AND MITIGATIVE MEASURES

CEQ regulations (40 CFR 1508.20) define mitigation to include: (1) avoiding the impact altogether by not taking a certain action or parts of an action; (2) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (3) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (4) reducing or eliminating the impact over time by preservation and maintenance operations during the lifetime of the action; and (5) compensating for the impact by replacing or providing substitute resources or environments.

The following section describes the avoidance, minimization and mitigation measures related to terminal groin design, construction, monitoring, cultural resources, and threatened and endangered species.

6.1 TERMINAL GROIN DESIGN

The Applicant's engineer (Olsen Associates, Inc.) considered and evaluated several design parameters influencing structure performance while concurrently minimizing potential adverse effects to resources of the project area. Varying options related to structure template (length and width), elevation, and permeability have been evaluated to determine the level of performance relative to the design goals (see Appendix F and Engineering Report – Olsen 2013). Design goals relevant to reducing adverse effects included, but were not limited to, the following: (1) reduce sediment transport rates from the westernmost segment of South Beach to the Cape Fear River and thus avoid potential navigation impacts

associated with increased shoaling; (2) minimize the potential for adverse impacts to a downdrift shoreline (e.g. West Beach); (3) preclude impacts to other coastal barrier islands; (4) minimize or reduce future maintenance requirements for portions of an existing sand tube groinfield located along South Beach; (5) reduce the need for future dredge and fill projects by extending the effective life and benefit level of federal disposal and Village-sponsored nourishment.

In order to achieve the design goals as outlined above, the following design precepts were considered and evaluated:

(1) Porosity – the structure should be sufficiently permeable (or “leaky”) as to limit its effectiveness in the long-term impoundment of sand.

(2) Template (length and width) – the direct, as well as synergistic effects of the groin structure should provide an equilibrated profile or template for the stabilization of the updrift South Beach shoreline sufficient to last between federal beach disposal events, *i.e.*, nominally two to three years. The beach profile is expected to progressively reduce in size between sand placement events.

(3) Elevation – portions of the groin should be sufficiently low such that wave overtopping and resultant sediment transport can occur past the structure during periods of energetic wave conditions.

(4) Settlement – the structure should have a foundation designed to be highly resistant to long-term settlement so as to substantially reduce future maintenance requirements.

(5) Adjustment – the structure should be capable of post-construction “tuning” if deemed necessary to refine performance characteristics.

(6) Constructability – the structure should be adequately robust so as to resist damage during low probability storm events, but at the same time sufficiently straight forward in design to assure cost-effective constructability in a highly energetic and dynamic environment.

The precepts above have been used by the applicant's engineer to develop a structural design that meets the applicant's goals regarding optimal performance while concurrently reducing potential adverse effects to both natural resources and the human environment. The design process itself considers various structural characteristics that ultimately define performance relative to the design goals. Evaluations of design characteristics such as permeability and length are described in Appendix F and the Engineering Report (Olsen 2013).

The engineer has identified a 1,900 lf terminal groin as the most appropriate length offering an apparent acceptable balance between maintaining the updrift objective of the structure while minimizing the possibility of downdrift impacts (Olsen 2012). In contrast to conventional groin or jetty structures which are typically designed to be sand-tight, the proposed terminal groin is relatively permeable, or leaky, allowing some level of sand and water transport over and through the structure. The mid-length structure coupled with a semi-permeable design would avoid any potential adverse effects to active and passage migration of surf zone fishes and larvae and minimize potential erosion to downdrift beaches. In addition, the Applicant proposes to construct the groin in two phases, with the Phase I structure being approximately 1,300 lf in length. The phased construction approach is discussed further below as well as in Section 3.2.5.

6.2 CONSTRUCTION METHODS AND SEQUENCING

It is the intent of the applicant to utilize sand from the next Wilmington Harbor maintenance event as the principal source to meet the sand fillet requirement of SB 151. Doing so would potentially avoid, or at least minimize disturbance to other potential sand source sites and would make use of a disposal event that will occur irrespective of the Village's Shoreline Protection Project. Maintenance dredging of the Wilmington Harbor navigation project and associated disposal is conducted in accordance with environmental commitments identified

in the Environmental Assessment (EA) for preconstruction modifications of the authorized improvements to Wilmington Harbor (USACE 2000). In addition, federal disposal would allow retention of material within the littoral system and thus likewise ensure the placement of beach-compatible sand on recipient sites.

In the event that the Village is unable to make use of, or is required to supplement a SMP disposal event for the sand fillet, four prospective sand source sites have been identified (as described in prior sections of this EIS). All of the borrow sites are depositional features containing sediments of high sand content (>90%). As such, the site conditions are more favorable for both physical recovery (through infilling of sediments of similar texture) and biological recovery (through recruitment of benthic infauna of adjacent undisturbed areas) (Pullen and Naqvi 1983; Posey and Alphin 2002). Prior to dredging any one of these sites (for the initial sand fillet or for future beach nourishment actions), the Village will be required to collect sufficient geotechnical data to ensure compatibility of the dredge sediments with the recipient beaches and to comply with state sediment criteria. Geotechnical sampling and analyses have been completed for Jay Bird Shoals (Olsen 2007) and Bald Head Creek Shoal (Athena 2009). These data confirm the presence of beach-compatible sand in volumes sufficient for the proposed nourishment. A complete geotechnical investigation would be necessary for the future Frying Pan Shoal site. It is expected that physical monitoring will be required post-construction to evaluate the recovery rate of the source site.

All beach fill material would comply with the State of North Carolina Technical Standards for Beach Fill Projects (15A NCAC 07H .0312). The Technical Standards require the characterization of sediments from the recipient beach and the proposed borrow sites. Sediment characteristics that are considered include percent weight of fine-grained sediment, percent weight of granular sediment, percent weight of gravel, and percent weight of calcium carbonate. Temporary shore-parallel dikes would be constructed in the immediate construction area as needed to control the effluent, decrease turbidity levels in

the water, and maximize the settling of sediments from the discharge before entering the ocean.

The timing and sequencing of nourishment actions for both the initial required fillet and for subsequent adaptive management would reduce potential adverse impacts to natural resources. Proposed dredge operations and sand placement would be confined to the period of the year between November 15th and April 1st. Since groin installation would occur concurrent with, and subsequent to sand placement, proposed construction would extend beyond April 1. The actual zone of spatial impact associated with construction would be relatively limited.

Specific construction measures will be employed to minimize the potential adverse effects of construction activities on the beachfront and nearshore waters during the late spring and early summer months (see below). In addition, the applicant has prepared a Biological Assessment (BA) for the project and would initiate consultation, in cooperation with the USACE, with the US Fish and Wildlife Services (USFWS) to determine specific conservation measures for the project. Preliminary avoidance and minimization measures specific to project construction are described below.

The Applicant proposes to construct the groin in two phases, with Phase I consisting of the installation of an approximate 1,300 lf structure. The phased approach would reduce the sand volume requirement for the fillet and thus minimizes the need for any supplemental sand from the proposed sand source sites for the initial construction. The Phase I structure would require considerably less rock and therefore would reduce the time necessary for construction. This, in turn, would help to limit the period of work performed during the bird and turtle nesting seasons. Phasing would also promote more rapid activation of sand bypassing and limit any potential downdrift effects to West Beach. Lastly, the Phase I structure would provide the opportunity for monitoring to determine the timing and physical extent of the Phase II structure (which would not exceed a combined 1,900 lf).

Through coordination with permitting and resource agencies, a staging and construction area would be established prior to project implementation. All project-related construction activities would remain within an established construction area to minimize impacts to environmental resources. All construction pipes that would be placed on the beach would be located as far landward as possible without compromising the integrity of the dune system. Temporary storage of pipes on the beach would be in such a manner so as not to compromise the integrity of the dune systems.

6.3 POST-CONSTRUCTION MONITORING

The Village of Bald Head Island, NC (Village) has performed comprehensive beach monitoring of South Beach, The Point and West Beach since 1999. Prior to that date, less formal surveys of the “dry” beach (only) were also accomplished at varying dates in time. In 2008, East Beach was added to the current monitoring plan. Elements of the present day survey program under the SMP include the nearshore portions of Bald Head Shoal and the abutting federal navigation project. Borrow sites are likewise monitored for a typical three-year period post-excavation. Post-construction monitoring (both biological and physical) has been conducted by the Village for prior nourishment projects that utilized sand from Jay Bird Shoals and from the shoals of Bald Head Creek.

In accordance with the requirements of SB110, the Village formulated an Inlet Management Plan for management and monitoring of the inlet, estuarine and ocean shorelines immediately adjacent to and under the influence of the inlet. The Inlet Management Plan details the following monitoring and mitigation actions:

1. Describes the post-construction activities that the applicant will undertake to monitor the impacts on coastal resources;

2. Defines the baseline for assessing any adverse impacts and the thresholds for when the adverse impacts must be mitigated;
3. Provides for mitigation measures to be implemented if adverse impacts reach the thresholds defined in the plan; and
4. Provides for modification or removal of the terminal groin if the adverse impacts cannot be mitigated.

Detailed monitoring and mitigation efforts associated with construction of the terminal groin are included within the Inlet Management Plan (Appendix B). In addition to the monitoring and mitigation elements described in the Inlet Management Plan, beach compaction and post-nourishment beach profiles would be evaluated to ensure that potential adverse effects to sea turtle nesting and hatchling emergence are minimized. Visual inspections will be conducted with resource agency personnel (including the NC Wildlife Resources Commission and USFWS) to determine if any corrective actions are required. It is generally acknowledged that sand tilling should be avoided unless compaction is of a degree that would require such. Beach foreshore escarpments will be identified and re-graded before May 1 of each year (ahead of the sea turtle nesting period).

6.4 CULTURAL RESOURCE AVOIDANCE

A 2012 marine remote-sensing survey identified the remains of a 160 to 190 ft sailing vessel within the VBHI Shoreline Protection Project Study area. The groin structure is designed to create a minimum of 150 ft of clearance from the identified vessel remains. During construction, the contractor will be made aware of the location of the wreck and be required to maintain a minimum 150 ft buffer to the wreck, as required by the NC SHPO. The groin structure, as proposed, will result in accretion of sediment along the southwestern shoreline of Bald Head Island. Burial of the remains will offer protection from further degradation thereby resulting in a positive impact to the archeological site. Post-construction monitoring of the shoreline updrift of the groin would identify if any of the shipwreck remains were to

become exposed at any point in the future. If this were to occur, the Village would contact SHPO and the USACE to identify appropriate protective measures.

6.5 AVOIDANCE AND MINIMIZATION TO THREATENED AND ENDANGERED SPECIES

The following section describes the avoidance, minimization and mitigation measures that would be implemented for threatened and endangered species related to the VBHI Shoreline Protection Project. Any proposed dredging and beach disposal/nourishment activities are to occur during time periods (November 16th – April 30th) when regional populations of a number of faunal species are low thereby minimizing the potential for impacts to the species. While it is expected that the proposed groin construction activities would extend into bird and sea turtles nesting seasons, coordinated efforts would be required to minimize disturbance to these species. In addition, the Applicant has prepared a Biological Assessment (BA) and would consult, in cooperation with the USACE, with the USFWS for specific conservation recommendations.

6.5.1 Sea Turtles

The Bald Head Island Conservancy (BHIC) coordinates the local Sea Turtle Protection Program and has since worked in conjunction with the VBHI during prior shoreline restoration efforts to minimize adverse impacts to sea turtles. The BHIC routinely monitors sea turtles nests along the beachfront, tagging nesting females when possible and relocating nests susceptible to erosion. Nesting surveys would continue during proposed dredge disposal, beach nourishment and groin construction activities. Eggs would be relocated by trained personnel per USFWS recommendations in the event that a nest is identified in an impacted area and needs to be relocated.

Beach quality sand with similar grain size and composition to that of the existing beach will be used to reduce any changes in physical characteristics of the beach that may affect sea

turtle nesting, successful incubation and/or hatchling emergence. Nourishment material will meet the Technical Standards for Beach Fill Projects as published in the North Carolina Administrative Code (15A NCAC 07H .0312).

The proposed physical monitoring of the beach and construction staging areas would also serve to offset adverse impacts to the sea turtle population on the island. Immediately after completion of this project and prior to May 1 for three subsequent years, sand compaction would be monitored in the area of restoration in accordance with a protocol agreed to by the USACE, USFWS, and state agencies. Any proposed tilling would not be performed unless assessments of beach compaction by resources agencies determined that tilling is required. Any required tilling would occur to a maximum depth of 36 inches. All required tilling activity would be completed prior to May 1.

Visual surveys for escarpments along the project area would be made immediately after completion of every beach nourishment project. Beach escarpments resulting from construction that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet would be leveled to the natural beach contour by May 1st of any year. The USFWS would be contacted immediately if subsequent reformation of escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet occurs during the nesting and hatching season to determine the appropriate action to be taken. An annual summary of escarpment surveys and corrective actions employed will be prepared by the applicant submitted to the USFWS, Corps of Engineers, and state resource agencies.

A more detailed description of specific terms and conditions of minimization efforts can be found in the Biological Assessment of the Village of Bald Head Island Shoreline Protection Project (to be available through the USACE Wilmington Regulatory Field Office).

6.5.2 Manatees

As a precautionary measure, the contractor performing this work will follow guidelines established by the USFWS entitled *“Precautions for General Construction in Areas Which May Be Used by the West Indian Manatee in North Carolina.”* Minimization and avoidance efforts identified in these guidelines include actions such as; educating personnel on manatee identification and observance, avoidance and civil penalties for harming, harassing or killing manatees under the Marine Mammal Protection Act and the Endangered Species Act. These guidelines also detail specific actions required in the event that a manatee is identified in the project area and resultant documentation regarding sightings, construction related collisions and/or injuries.

6.5.3 Whales

An endangered species observer with at sea large whale identification experience would be onboard the dredge to conduct observations for large whales. If a whale is sighted within 500 yards during dredging operations, operations will cease until the observers are confident that the whale has left the area. If a whale is sighted during transit, the crew would reduce speed to less than 10 knots (if this can be done safely) and alter course as necessary to maintain an approximate distance of 500 yards between the vessel and the whale. Dredges would also operate at slow speeds during dredging operations and transit between the borrow area and pump-out sites to reduce the incidence of collision.

6.5.4 Sturgeon

Avoidance and minimization efforts for impacts to Atlantic and shortnose sturgeon are mainly related to minimization of impacts to foraging habitat. Beach quality sand with similar grain size and composition to that of the existing beach will be utilized for nourishment efforts reducing impacts to potential prey species and facilitating recovery of the benthos. Additional conservation measures including the use of temporary dikes to control effluent would further reduce foraging impacts. Maintaining slow speeds during

mobilization to the dredge site and during active dredging would also minimize the likelihood of collision.

6.5.5 Piping Plover

Bird monitoring results on the island has indicated that piping plovers do not nest within the project boundaries and only occasionally winter and/or forage in this area. Prior to implementation of the project and during active construction, the impact area would be monitored by trained environmental professionals to determine the presence/absence of piping plovers and/or nests. In the event that piping plovers are identified in the project area, the staging and construction area would be situated in a location so as to minimize impacts to the species. Restricting heavy machinery, pipes and associated construction equipment to a specified corridor would also minimize impacts to beach habitat that could potentially be utilized for piping plover nesting, wintering and foraging in the future.

6.5.6 Seabeach Amaranth

Prior to implementation of the project and during active construction the impact area would be monitored by trained environmental professionals to determine the presence/absence of seabeach amaranth. In the event that seabeach amaranth is identified in the project area, the staging and construction area would be situated in a location so as to minimize impacts to the species. Restricting heavy machinery, pipes and associated construction equipment to a specified corridor would also minimize impacts to beach habitat that could potentially be utilized for seabeach amaranth recruitment in the future.