

**National Park Service
U.S. Department of the Interior**



Cape Hatteras National Seashore

Joint Record of Decision Sediment Management Framework

May 2021

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Cooperating Federal Agency: US Fish and Wildlife Service

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RECORD OF DECISION
Cape Hatteras National Seashore
Final Environmental Impact Statement for a Sediment Management Framework

INTRODUCTION

The Department of the Interior, National Park Service (NPS), prepared this Joint Record of Decision (ROD) on the final Sediment Management Framework Environmental Impact Statement (EIS) in cooperation with the US Fish and Wildlife Service (FWS). This ROD was prepared in accordance with the requirements of the National Environmental Policy Act of 1969, as amended (NEPA), its implementing regulations (40 CFR 1500-1508), the Department of Interior's NEPA regulations (43 CFR 46), and NPS Director's Order 12: Conservation Planning, Environmental Impact Analysis and Decision-making and accompanying handbook. This ROD includes a summary of the purpose and need for action, synopses of alternatives considered and analyzed in detail, a description of the selected alternative, the basis for the decision, and a description of the environmentally preferable alternative. Citations can be found in the References section of the EIS.

BACKGROUND

Cape Hatteras National Seashore (the Seashore) is located along the Outer Banks of North Carolina and is the nation's first national seashore, authorized in 1937, reauthorized as Cape Hatteras National Seashore Recreational Area in 1940, and established in 1953. Consisting of more than 30,000 acres distributed along approximately 67 miles of ocean-facing shoreline, the Seashore is part of a dynamic barrier island system. Nine villages, including Nags Head, Rodanthe, Waves, Salvo, Avon, Buxton, Frisco, Hatteras, and Ocracoke, are located adjacent to or within the Seashore. The Seashore and villages are accessible by North Carolina Highway 12 (NC 12); private boat; two airports; and the Hatteras-Ocracoke, Swan Quarter, and Cedar Island ferries. Given its local and regional popularity, the Seashore draws over 2 million visitors a year with opportunities to experience the ocean and sound beaches. Tourism is the largest industry in the Outer Banks, and Seashore visitors contribute substantially to the local economy (MAI 2015).

At the Seashore, human activities and structures have contributed to the alteration of natural shoreline processes. These activities and structures include dredging of navigation channels, hardened structures such as groins, dune building, overwash scraping (the process of removing/scraping overwash sand deposition off the road or other built features), and relative sea-level rise resulting from the warming temperatures caused by human-driven emissions (NPS 2015c). Sand fencing, grass planting, and dune building occurred in the 1930s and continued into the 1960s at the Seashore. Beach nourishment began in the 1960s and continues today. These human activities change the pace, magnitude, timing, and other aspects of natural ecosystem processes at the Seashore (NPS 2016c). Increased storm frequency and intensity have also impacted the natural migration and evolution of the barrier island environments at the Seashore (NPS 2015c). Erosion rates are as high as 10 feet per year in some areas of the Seashore

(NCDENR 2012). Over the next 30 years, sea level rise is projected to continue to impact Seashore resources, private property, and NC 12. Numerous actions have been taken to protect and repair areas after high water events. Areas of frequent erosion within the Seashore that are identified for potential sediment management are based on repeated observations over the past several decades by NPS staff and state agencies; feasibility studies conducted by the North Carolina Department of Transportation (NCDOT); erosion studies; local residents; consulting engineers; geologists; and surveyors. In some locations (e.g., portions of Ocracoke Island and the end of Hatteras Island), areas of frequent erosion result in the loss of shoreline and upland habitats.

PURPOSE AND NEED FOR ACTION

The purpose of taking action is to develop a framework for issuing special use permits for sediment management at the Seashore to mitigate impacts of human-altered shoreline processes, consistent with applicable NPS management policies and with the mission of the Seashore and, for Pea Island National Wildlife Refuge (Pea Island NWR or Refuge), consistent with applicable National Wildlife Refuge System management policies and with the purposes of the Refuge. This framework includes anticipated methods, locations, and frequency for sediment management actions that may be permitted over the next 20 years. By developing a framework, the Seashore can consider the impacts of multiple sediment management actions over many years in a more comprehensive context and cumulative manner, helping to bolster resilience to the impacts of climate change. The Seashore has received requests and anticipates future requests for sediment management activities to protect critical infrastructure such as roads, bridges, electrical transmission facilities, and other public transportation facilities; to repair island damages, including breaches that also affect transportation; and to restore habitat through the placement of dredged sediment along eroded sections of barrier islands. The Seashore needs a sediment management framework to assist in guiding partnership/agreements and addressing permit requests in a timely manner, while avoiding and minimizing impacts associated with such actions.

ALTERNATIVES CONSIDERED

Alternatives analyzed in the EIS were developed based on agency, and public scoping. The action alternatives, alternatives B and C, allow NPS to permit agencies, municipalities, and others to conduct, with conditions, sediment management in the form of sound side and ocean side beach nourishment, dune restoration, and filling island breaches at the Seashore. Sediment characteristics, project volume, and borrow area parameters would be the same for both action alternatives. Under the no-action alternative, agencies, municipalities, and others would not be permitted to conduct sediment management over the next two decades. A detailed description of the alternatives carried forward is provided in chapter 2 of the EIS. Alternatives analyzed in the EIS included the following:

- Alternative A. In Alternative A, the no-action alternative, no framework would apply and NPS would be precluded from permitting sediment management activities at the Seashore over the next two decades. NCDOT currently operates and maintains NC-12 within a right of way (ROW) easement through the Seashore. Alternative A would preclude NCDOT from implementing sediment management to protect NC 12 outside of its existing ROW. Partners

would not be permitted to perform beach nourishment projects or implement habitat restoration projects along the Seashore. Permits also would not be issued for any sediment management activities in the Refuge section of the Seashore.

- Alternative B (Selected Alternative). Under alternative B, the NPS could permit agencies, municipalities, and others to conduct, with conditions, sediment management in the form of sound side and ocean side beach nourishment, dune restoration, and filling island breaches. A special use permit application package would be provided to each project proponent detailing information the NPS may require as part of the project. Permitted sediment management activities would require mitigation measures to reduce the impacts on park resources. Alternative B would permit sediment management on up to 6 miles of the Seashore annually, recurring at individual sites as frequently as every three years. If an emergency is declared, an additional 6 miles of sediment management may be permitted. Monitoring would be implemented before and after sediment management projects (based on the resources present at the project site) to learn and improve conditions associated with future projects. NPS would require monitoring of resources within its jurisdiction consistent with information provided in appendix B of this ROD. Additionally, the NPS would set aside five sections totaling approximately 12-13 Seashore miles from consideration for sediment management activities (in all cases except for emergencies) to study their ecology and provide reference zones used in comparative studies with nourishment study areas. Those comparisons may warrant future modification of the frequency, timing, and other methods associated with nourishment projects. In addition to evaluating and, in appropriate cases, permitting projects that may be proposed by other entities, the NPS would work with other agencies to use dredged sediment to restore habitat for nesting wildlife including shorebirds at the southern end of the Hatteras Island area and Green Island in Oregon Inlet.
- Alternative C. Alternative C is similar to alternative B in that it includes beach nourishment, dune nourishment and sand relocation, and emergency breach repairs as described under alternative B. Sediment characteristics, volume, borrow areas, time of year, and mitigation measures would be the same as described under alternative B. The frequency and extent of nourishment projects would differ under this alternative; sediment management may occur on up to 6 miles of beach every five years. The establishment of exclusion areas for reference monitoring and habitat restoration stated in alternative B would not take place under this alternative.

SELECTED ALTERNATIVE

The NPS selected alternative B (hereinafter referred to as the selected alternative), as described in the EIS, for implementation. The selected alternative will implement a streamlined framework for issuing special use permits for sediment management actions at the Seashore. Over the next 20 years, the selected alternative will assist the Seashore in addressing requests for sediment management activities in a timely manner, while avoiding and minimizing impacts associated with such actions. Permitted actions must comply with all conditions outlined below, and those specifically developed by state and federal agencies, to minimize impacts to natural and cultural resources, recreation, and public access, and protect health and safety near the proposed project.

As mentioned above, the NPS will set aside five reference monitoring areas or zones that may be used to perform comparative studies with nourishment project areas. The reference monitoring areas are subject to refinement during implementation, particularly due to the dynamic nature of the Seashore, but would not change substantially as to alter the impacts described in the FEIS. The reference zones are as follows: Pea Island NWR (approximately 2 miles from the start of the Jug Handle Bridge to where it ends at Mirlo Beach); Between Salvo and Avon (2 miles from Village of Salvo to 1 mile south of Ramp 25); Cape Hatteras Point to Frisco (5 miles from the point to an area west of Ramp 49); Hatteras Island terminus (approximately 1 mile from Ramp 55 toward the terminus of Hatteras Island (excluding the end of the island for habitat restoration projects)); and Ocracoke Island terminus (2 miles from Ramp 72 to the intersection with Ocracoke Inlet). The primary purpose of excluding these areas is to study their ecology and provide reference zones that will be used in comparative studies with areas within which sediment management activities (e.g., beach nourishment) take place. Those comparisons may provide information that influences future modification of the frequency, timing, and other methods associated with nourishment projects. Additional purposes behind setting aside the reference areas are (1) to reduce overall potential impacts by removing from consideration areas that are historical wildlife nesting hotspots and (2) to remove from consideration areas that, based on their geography, are unlikely to be proposed for sediment management.

Beach Nourishment - Beach nourishment may be permitted by the NPS at vulnerable sites along the Seashore oceanfront and sound side. Beach nourishment may include placement of sediment dredged from offshore waters or trucked in from other locations (anticipated to be outside of NPS property boundaries). The NPS may also undertake beach nourishment on the sound side of the Seashore.

Habitat Restoration - The NPS may work with other agencies to use sediment to restore habitat for nesting wildlife including shorebirds, in locations such as the end of the Hatteras Island area or Green Island in Oregon Inlet. NPS may also consider wildlife habitat restoration elsewhere at the Seashore through the placement of sediment.

Dune Nourishment and Sand Relocation – The NPS may permit dune reconstruction and/or enhancement in some areas and moving or regrading sand to protect natural and cultural resources, existing access, and public facilities. Actions that promote dune building processes, such as beach grass planting and sand fencing installation, may be carried out by the NPS or by a permittee.

Emergency Breach Repairs - When storm events create inlets or overwash areas that damage roadways, these geologic features may be addressed by trucking, staging, and pumping sand in from nearby or other locations to fill in the island breach. A breach is a condition where a channel across the island permits the exchange of ocean and sound waters under normal tidal conditions – there can be a partial or full breach (USACE 2016).

Sediment management activities permitted under the selected alternative must comply with the following parameters, detailed below:

Sediment Characteristics (Grain Size and Slope) - The grain size, color, texture, and geologic characteristics of the sediment from the borrow site must be a close match to the native beach or shore conditions found at the proposed project site, following the NPS Beach Nourishment Guidance (NPS 2012). Additionally, grain characteristic criteria for sediment compatibility must comply with the standards outlined in the North Carolina Administrative Code (NCAC), at 15A NCAC 07H.0312,

Technical Standards for Beach Fill Projects (North Carolina OAH 2014). Grain characteristic requirements are also outlined in the North Carolina Coastal Beach Sand Placement Statewide Programmatic Biological Opinion (SPBO) (FWS 2017).

Sediment will be considered from upland or offshore borrow sites and dredged sediment sources as long as the sediment is clean (e.g., similar grain size and no toxic and/or fine-grained sediment) and meets the grain characteristic requirements. NPS will require that sediment for beach nourishment projects be sourced from outside the active beach profile or the underwater area within which sand moves onto and off the visible dry beach. This requirement prevents projects from simply recycling sediment within the beach profile and ensures outside sediment will be deposited, increasing the total beach volume. Specific recommendations from FWS for beach profiles to avoid and minimize impacts to nesting sea turtles are included in appendix B. Constructed dunes should have a relatively steep slope (e.g., 1.5 to 1) to discourage nesting female sea turtles from going up and over the dune. A back slope is not recommended unless needed to tie into the existing elevation.

Dune and sound side nourishment projects must include similar quality controls as beach nourishment projects. In general, dunes contain more fine-grained sediment than most of the beach profile. Sound side shorelines can vary between sand-, silt-, and clay-sized grains depending on site-specific conditions. Sediment characteristics and slope must match either “native” pre-project conditions or represent a “restoration” to some previous or desired state.

Volume - Projects must be between approximately 50-250 cubic yards/foot and range from less than a mile to a maximum of approximately 6 miles in length annually for ocean side sites. Annually, no more than 7.92 million cubic yards (cy) will be placed along the ocean side of the Seashore. If an emergency is declared, an additional 6 miles of sediment management (an additional 7.92 million cy) may be considered after completing necessary regulatory permit processes.

Other sediment management actions such as dune nourishment and sound side nourishment will require smaller volumes commensurate with the purpose and site conditions. Dune restoration or nourishment projects often fill an eroded gap within a larger pre-existing dune. The post-project dune’s width and height will be determined based upon site-specific conditions using historical surveys or photography. Project volumes for dune nourishment activities will likely vary from approximately 1,000 cy to more than 100,000 cy.

Sound side nourishment volumes will also be determined on a site-specific basis. Beach and dune nourishment projects construct a template for a relatively limited number of habitats within sandy areas like the dry/upper beach, dune ridges, and intertidal beach. However, sound side projects may involve the placement of sand, silt, or mud to promote different habitats along Pamlico Sound. Volumes associated with sound side nourishment will likely vary from approximately 1,000 cy to more than 100,000 cy.

Breach fill operations often require larger volumes of sediment to fill the breach channels. Volumes associated with breach fills can range from approximately 100,000 cy to over 1,000,000 cy (USACE 2005, 2017; NPS 2003), although it is possible some relatively minor breaches could be addressed with thousands of cubic yards.

Borrow Areas - Over the last decade, sediment used for projects at the Seashore has been dredged from locations in the North Carolina Exclusive Economic Zone (Nags Head 2011; Buxton 2017; Nags Head

2019), which is the inshore portion of the continental shelf, extending from the shoreline to 3 miles offshore. Sediment for future projects may be sourced from these borrow areas or from borrow areas located beyond 3 nautical miles offshore, in federal waters on the Outer Continental Shelf (OCS), where BOEM holds the authority to authorize the use of OCS sand. Alternately, projects can consider bringing in sediment from existing stockpiles via trucks or other methods.

Frequency and Extent – The NPS will limit the frequency of nourishment projects permitted at a specific site to allow re-establishment of intertidal and nearshore benthic communities following sediment placement. The NPS may permit sediment management on up to 6 miles of the Seashore annually, recurring at individual sites as frequently as every three years. A nourished area will not be eligible to receive sediment within the three years unless permitted under an emergency declaration. If an emergency is declared, an additional 6 miles of sediment management may be permitted. It is assumed these emergencies may occur once every five years. When issuing a permit, the NPS will require sand placement at 500-800-foot intervals for Atlantic-facing nourishment projects. In fair weather, more than 300 ft of nourishment could be completed per day. Sound side projects are anticipated to be smaller in extent.

Time of Year - The NPS will recommend that proposed projects at the Seashore occur between November 16 and April 1 to avoid breeding and migration periods for listed shorebird species and nesting seasons for sea turtles. However, where safety conditions or other logistical considerations may preclude winter-time activities (e.g., emergency response, projects that require open-ocean dredging), the Seashore may permit summertime work, with the requirement that permittees implement a series of permit conditions to avoid and minimize impacts to nesting wildlife, including those applicable mitigations listed in appendix B.

Ongoing Scientific Review- Every two years following this ROD, the Seashore and the Refuge will convene agency regulatory partners (i.e. US Army Corp of Engineers, FWS, North Carolina (NC) Department of Environmental Quality, NC Wildlife Resources Commission, National Marine Fisheries Service (NMFS)) to review the results of monitoring, emerging scientific information, new regulatory requirements, and new erosion and transportation management solutions (such as proposed bridge building). A summary of the state of the science and any potential changes to sediment management conditions would also be prepared as a brief report and distributed to the public. While the report is available for public review, stakeholders may share ideas and information, and provide reflections on framework implementation during specific projects.

Mitigation Measures- Mandatory mitigation measures are listed in appendix B to this ROD, and it is expected that regulatory agencies will require additional specific conditions for projects taking place under this EIS, including relevant project design criteria (PDCs) of the 2020 National Oceanic and Atmospheric Administration (NOAA) NMFS South Atlantic Regional Biological Opinion (SARBO). NPS specifically incorporates all of the terms, requirements, obligations, and conditions of the permits, certifications, letters and documents, mitigation and consultation requirements for all the activities before, during, and after construction as specifically developed and prepared by state and federal agencies to maximize protection and minimize impacts to the physical environment, threatened and endangered species, and people in and near the project, as if fully written in their entirety in the SUP.

BASIS OF DECISION

Alternative B is selected for implementation. In identifying its selected alternative, the NPS considered factors such as the extent to which alternatives meet the purpose of and need for action, create unnecessary or excessive adverse impacts on resources, or conflict with the overall management of the Seashore or its resources. The selected alternative best meets the purpose and need for taking action by: 1) providing a streamlined framework for permitting sediment management activities at the Seashore, allowing the NPS to comprehensively consider the cumulative impacts of multiple sediment management activities over the next 20 years; 2) avoiding and minimizing impacts associated with sediment management by requiring a comprehensive suite of mitigation measures that avoid and minimize impacts to Seashore resources and visitors; 3) allowing for continual improvement by implementing a robust and comprehensive monitoring program, including numerous reference/exclusion zones that allow for science-based improvement of the framework and its conditions over time; 4) allowing habitat restoration projects that can benefit migratory wildlife species that may lose habitat in the future due to sea level rise and climate change; and 5) anticipating an increased number of sediment management requests as a result of climate change and sea level rise.

The selected alternative provides an efficient process for permitting sediment management activities that protect critical infrastructure such as roads, bridges, electrical transmission facilities, and other public transportation facilities; repair island damages, including breaches that also affect transportation; and restore habitat through the placement of dredged sediment along eroded sections of barrier islands. This will be a beneficial change from the current method of reviewing sediment management requests on a project by project basis, both from an administrative efficiency perspective and because of the comprehensive consideration of impacts the framework provides. Additionally, the reference area monitoring sites established under the selected alternative will help continually improve the framework by providing information that may further minimize and avoid negative impacts that may be associated with nourishment projects. Information gained from these studies may warrant future modification of the frequency, timing, and other methods associated with nourishment projects.

The selected alternative allows NPS to authorize sediment management activities to protect and repair areas of frequent erosion, consistent with NPS policy to investigate alternatives for mitigating the effects of sea level rise and climate change, human activities or structures on shoreline processes and restoring natural conditions. The selected alternative will likely help maintain continuity of the processes and habitats that have been in place along the Seashore in recent years.

Overall, under the selected alternative, a sediment management framework will streamline NPS's process for issuing special use permits to applicants to conduct, with conditions, sediment management in the form of sound side and ocean side beach nourishment, dune restoration, and filling island breaches. This will reduce delays and redundancy in reviewing similar project applications and outline the required conditions for future sediment management projects. For these reasons, the NPS selected alternative B for implementation.

The NPS did not select alternative A because it would not meet the purpose and need for taking action. Under alternative A, no framework would exist, and no permits would be issued for any sediment management activities at the Seashore or Refuge outside of NCDOT's existing ROW. Local jurisdictions, the State of North Carolina, and the NPS would not be able to respond to future maintenance needs

associated with erosion along the Seashore. If transportation routes are closed due to major storm events or chronic erosion, communities, seashore staff, and visitors at the Seashore would be isolated from the mainland and the county, state and NPS would have to seek alternative ways of transporting goods, service providers, NPS staff, and residents including sick or injured persons. If a breach were to occur that affects NC 12, NCDOT would be required to work within its existing ROW, which extends 60-150 feet from the centerline of NC 12. It is unlikely that a breach would be closed without an NPS permit to work outside of this ROW. Road-based travel would cease, and transporting goods, services, and personnel may occur by boat, ferry, small plane, or helicopter. For these reasons, alternative A would not ensure access to the Seashore and would create conditions that would make it challenging to implement the Seashore's enabling legislation to provide for recreational use and enjoyment of the area.

The NPS did not select alternative C because the frequency and extent of sediment management projects are more limited than under the selected alternative. NOAA reports sea level rise projections at Oregon Inlet between approximately 0.25 meters (m) and 1.1 m by 2050 (NOAA 2020a1). Given this projected rise in sea level and more frequent and extreme storm events anticipated, it is unlikely that the frequency at which projects have been permitted in the past and are described in Alternative C would adequately aid in protecting critical infrastructure and access to the Seashore. Alternative C could reduce NPS's and its partner's ability to re-nourish vulnerable areas throughout the Seashore as they continue to experience the potential for enhanced erosion due to historic manipulation of the area and sea level rise and climate change. The selected alternative allows the frequency and extent necessary to address frequent erosion areas, making alternative C less desirable for permitting future projects. Alternative C would not permit habitat restoration projects that may become increasingly important over time to provide habitat for beach-dependent species that may lose habitat as sea level rise and climate change threatens coastal barrier island habitats. Alternative C also would not implement reference zones and a robust monitoring program that sets the state for continual science-based improvement over time with regular and frequent opportunities for public input and review.

The selected action is grounded in the best available science. It represents a balanced approach to natural resource management and policy while providing for the preservation of the Seashore's wild and primitive character and recreational use and enjoyment. For these reasons, the NPS selected alternative B for implementation.

ENVIRONMENTALLY PREFERABLE ALTERNATIVE

The NPS is required to identify the environmentally preferable alternative in the ROD. The NPS, in accordance with the NEPA regulations, defines the environmentally preferable alternative (or alternatives) as the alternative that causes the least damage to the biological and physical environment and best protects, preserves, and enhances historical, cultural, and natural resources (43 CFR 46.30).

After completing the environmental analysis, NPS identified the selected alternative as the environmentally preferable alternative. Over the next 20 years, the selected alternative will provide a streamlined framework for permitting sediment management activities at the Seashore in a timely manner, while avoiding and minimizing impacts associated with such actions.

¹ https://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?id=8652587

The NPS considered the adverse and beneficial impacts of each alternative when selecting the environmentally preferable alternative. Under alternative A, littoral processes and barrier island morphology would continue to evolve naturally, but as influenced by climate change and sea level rise, from a previously modified and engineered system to a dynamic barrier island system with increased erosion, island narrowing, and increased overwash events. There is a debate among scientists as to which is preferable for the Seashore, its resources, infrastructure, and those communities within the Seashore. Whether this is beneficial or adverse for littoral processes and barrier island morphology depends on whether there is a preference for a system more influenced by barrier island processes, as influence by sea level rise and climate change, or a system engineered to provide temporary shoreline stabilization while other alternatives are evaluated. Under alternative A, short-term impacts from construction would not impact sea turtles and shorebirds, and benthic communities would not be impacted from the placement of sediment. Long-term, however, it is likely that future storm events coupled with relative sea-level rise would continue erosional littoral processes and alter the footprint of the Seashore's barrier islands, reducing available habitat.

There are short-term environmentally adverse impacts associated with the selected action and alternative C, primarily from beach nourishment actions. These impacts generally last from the length of construction to several years post- construction. While impacts may occur in the short-term under the selected action, alternative C may allow erosion to continue at current or increased rates in some areas, reducing available Seashore habitat to a greater extent than under the selected action. Erosion rates are as high as 10 ft per year in some areas of the Seashore (NCDENR 2012) and projections estimate a rise of sea level of between 0.25 meters (m) and 1.1 m by 2050 (NOAA 2020a). Although it is difficult to predict the specific consequences of relative sea-level rise, modeling studies of relative sea level rise have predicted a reduction in intertidal habitat.

The selected action would help maintain the continuity of the barrier island system at a management scale (months to years) by increasing or maintaining the volume of sediment available for erosion along some sections of the beach, dune, and sound side shorelines, thus creating and maintaining habitat for species at the Seashore. FWS concluded beneficial effects would result from an increase in sea turtle nesting habitat; and that a nourished beach designed and constructed to mimic a natural beach system would benefit sea turtles more than an existing eroded beach (FWS 2017). Ensuring protection of shorebird habitat is critical to the recovery of listed species, as outlined in relevant recovery plans, and beach nourishment activities would increase the longevity of shorebird habitats. The extent of this benefit would depend upon the number and extent of projects proposed. While Alternative C may realize some similar benefits, sediment management would occur at fewer locations and less often, resulting in less sediment available in the littoral system to offset erosion than the selected action. The long-term implications of not having a framework and not permitting these activities may be more damaging than the short-term effects to the environment from each sediment management project. Neither alternative A, nor C would allow for habitat restoration projects which may become increasingly important to consider as climate change and sea level rise affects beach habitats. For these reasons, we identified the selected alternative as environmentally preferable.

The selected alternative allows the NPS to work with other agencies to use dredged sediment from navigational channels or other locations to restore habitat for nesting wildlife, including shorebirds at the southern end of Hatteras Island area and Green Island in Oregon Inlet. It also sets aside reference areas that will be used to perform comparative studies with nourishment project study areas and establishes an

ongoing scientific review to evaluate the results of monitoring, emerging scientific information, new regulatory requirements, and new erosion and transportation management solutions.

Once implemented, the selected action will better enable the Seashore and its partners to mitigate the impacts of altered shoreline processes by conducting sediment management activities that will protect critical infrastructure, repair island damages, and restore habitat through the placement of sediment along eroded sections of barrier islands. Permitted sediment management activities will require mitigation measures to reduce the impacts on park resources.

CONCLUSION

Overall, among the three alternatives considered, the selected alternative (alternative B) best meets the purpose and need of the EIS, is expected to streamline the sediment management permitting process, and fulfills the NPS's statutory mission and responsibilities, considering economic, environmental, technical, and other factors. The selected alternative incorporates all practical means to avoid or minimize environmental harm. It will not result in the impairment of park resources or values or violate the NPS Organic Act.

The required "no-action period" before approval of the ROD was initiated on March 26, 2021 with the US Environmental Protection Agency's Federal Register notification of the filing of the final EIS (Vol. 86 No. 57, Federal Register 16207).

FINAL AGENCY AUTHORIZATIONS

NPS'S AUTHORIZATION

Recommended:

Date:

DAVID HALLAC Digitally signed by DAVID HALLAC
Date: 2021.05.12 08:01:28 -04'00'

David E. Hallac
Superintendent
Cape Hatteras National Seashore

Approved:

Date:

Stan Austin
Regional Director, NPS
Interior Region 2, South Atlantic Gulf

FWS- PEA ISLAND NWR'S AUTHORIZATION

Pea Island NWR is managed by the FWS. Executive Order 7864 established Pea Island NWR on April 8, 1938, as a refuge and breeding ground for migratory birds and other wildlife. Presidential Proclamation 2284 closed a 25,700-acre area encompassing the refuge and a portion of the Pamlico Sound west of and adjacent to the refuge to migratory bird hunting. The refuge covers approximately 5,000 acres (reduced by erosion from the original 5,915 acres). The purpose of Pea Island NWR is to protect and conserve migratory birds and other wildlife resources through the protection of wetlands, in accordance with the following: "...as a refuge and breeding ground for migratory waterfowl and other wildlife..." (Executive Order 7864, August 8, 1938). Additionally, the Seashore's 1937 enabling legislation and Secretary of Interior's 1953 order establishing the Seashore described the NPS as having a role at Pea Island NWR in the administration of the lands for recreational uses not inconsistent with the purposes of the Refuge.

The FWS agreed to serve as a cooperating Federal agency in the development of this EIS and may undertake actions on the Pea Island NWR portion of the Seashore as described in this ROD. Proposed uses or projects on the Pea Island NWR portion of the Seashore will require a permit from FWS after completion of a compatibility determination. Sediment management activities, either large scale management actions or small-scale projects (i.e., dune stabilization projects, overwash mitigation), will only be permitted on the Pea Island NWR portion of the Seashore if found compatible with the purposes for which the refuge was established and either in the case of an official declaration of emergency or in advance of planned or scheduled longer term solutions that relocate the highway off the refuge.

Approved:

Date:

Leopoldo Miranda-Castro
Regional Director, USFWS
Interior Regions 2 and 4, South Atlantic Gulf and Mississippi Basin

APPENDIX A – NON-IMPAIRMENT DETERMINATION

This non-impairment determination has been prepared for the selected alternative, as described in the Record of Decision (ROD) for the *Cape Hatteras National Seashore Sediment Management Framework Final Environmental Impact Statement* (EIS).

By enacting the National Park Service (NPS) Organic Act of 1916 (Organic Act), Congress directed the US Department of the Interior and the NPS to manage units "to conserve the scenery, natural and historic objects, and wild life in the System units and to provide for the enjoyment of the scenery, natural and historic objects, and wild life in such manner and by such means as will leave them unimpaired for the enjoyment of future generations" (54 USC 100101).

NPS *Management Policies 2006*, section 1.4.4, explains the prohibition on impairment of park resources and values:

While Congress has given the Service the management discretion to allow impacts within parks, that discretion is limited by the statutory requirement (generally enforceable by the federal courts) that the Park Service must leave park resources and values unimpaired unless a particular law directly and specifically provides otherwise. This, the cornerstone of the Organic Act, establishes the primary responsibility of the National Park Service. It ensures that park resources and values will continue to exist in a condition that will allow the American people to have present and future opportunities for enjoyment of them.

An action constitutes impairment when its impacts "harm the integrity of park resources or values, including the opportunities that otherwise will be present for the enjoyment of those resources or values" (NPS 2006 Section 1.4.5). To determine impairment, the NPS must evaluate the "particular resources and values that will be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts."

An impact on any park resource or value may constitute an impairment, but an impact would be more likely to constitute an impairment to the extent that it affects a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park; or
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
- identified in the park's general management plan or other relevant NPS planning documents as being of significance (NPS 2006 Section 1.4.5).

The significance and importance of each resource analyzed, based on the Cape Hatteras National Seashore (the Seashore) enabling legislation and its 2011 Foundation Statement¹, is discussed in the following sections.

The resource topics carried forward and analyzed for the NPS selected alternative and for which an impairment determination is made are littoral processes and barrier island morphology, benthic organisms, essential fish habitat, sea turtles, and listed shorebirds. A non-impairment determination is not made for structures and infrastructure because these are not considered to be a park resource or value subject to the non-impairment standard established by the Organic Act and clarified further in Section 1.4.6 of NPS Management Policies. Additionally, a non-impairment determination is not made for resources that are outside the boundaries of the Seashore.

LITTORAL PROCESSES AND BARRIER ISLAND MORPHOLOGY

The Seashore represents a unique natural system made up of a micro-tidal, wave-dominated coast (Hayes 1994; Riggs and Ames 2003), which features elongated barrier islands separated from the mainland by a wide shallow lagoon (sound). As a wave-dominated coast, the primary drivers of morphological change are wind, wind-driven waves, currents, and storm surge.

The selected alternative may impact some elements of natural littoral processes and barrier island morphology in some areas by continuing to engineer and manipulate the shoreline over the next 20 years. The injection of thousands to millions of cubic yards of beach sand through nourishment may initially change the slope of the beach as compared to pre-project conditions (Dean 2002). Over time, the nourished beach will gradually adjust back to its pre-project slope, so long as wave conditions and sediment grain characteristics remain similar to pre-project conditions (de Schipper et al. 2012). This process is known as “equilibration” of the beach profile and can occur in as little as a few weeks or as long as multiple years. Sound side sediment placement will increase the ability of sound side shorelines to adjust to future changes in water levels by incrementally raising the back-barrier elevation similar to what nourishment does on the beach side.

Offshore dredging can alter wave patterns and sea floor topography, potentially interrupting nearshore sediment transport. Project specific modeling to support the 2017 Beach Restoration to Protect NC Highway 12 at Buxton Project simulated wave patterns and longshore sediment transport rates before and after dredging and found no measurable wave-pattern changes at the Seashore beach. As described in Chapter 1 of the Final EIS, no measurable wave-pattern changes or changes to nearshore sediment transport are expected to result from the selected alternative, and the sediment exchange between the beach and offshore environments will not be interrupted and therefore left unimpacted.

While some features of littoral processes and barrier island morphology may be altered under the selected alternative, the fundamental role of natural processes will continue. Adding new sand to the barrier island system at a higher rate may help maintain the continuity of the island at a management scale (months to years) by increasing or maintaining the volume of sediments available for erosion along some sections of the beach, dune, and sound side shorelines. This may reduce the frequency of overwash and breach

¹ National Park Service (NPS). 2011. Foundation Statement. Cape Hatteras National Seashore, North Carolina. <http://www.npshistory.com/publications/foundation-documents/caha-fd-2011.pdf>

events, which may be beneficial in allowing barrier systems to respond to relative sea-level rise. Habitat restoration, dune nourishment, and sound side sediment placement would likely create additional sources of erodible sediments to help the Seashore mitigate land loss over the lifetime of the proposed framework. At geologic time scales, many barrier islands are currently migrating landward or struggling to reconstitute through rising sea levels (Cooper et al. 2016; Riggs et al. 1995; Swift 1975). The selected alternative will likely create an increase in the sand supply along the Seashore.

The selected alternative supports maintaining one of the park's fundamental resources of large expanses of undeveloped shorelines that offer opportunities for solitude and isolation in nature and provide for various types of recreation use that are compatible with the preservation of the distinctive barrier island plants, wildlife, and coastal processes (NPS 2011). Under the selected alternative, there will be a moderate change from the current condition since sediment management activities will occur at a higher frequency than presently occurs along the Seashore. However, sediment management activities along the Seashore will likely be able to mitigate some of the erosional effects of relative sea-level rise. Under the selected alternative, the Seashore will continue to be shaped by coastal geologic, hydrologic, and weather processes, which together contribute to the evolution of these barrier islands (NPS 2011). Because these processes will continue, the selected alternative will not result in impairment of littoral processes and barrier island morphology.

BENTHIC ORGANISMS

Benthic organisms are located on the ocean side, sound side, and inlets at the Seashore and may be affected by the selected alternative. Benthic organisms at offshore dredge locations are not included in this non-impairment determination as they are outside the boundaries of the Seashore.

Under the selected alternative, there will be temporary adverse impacts lasting six months to several years to benthic organisms through the burial of benthic communities at the project site, and localized impacts from turbidity. Because most sediment management activities under the selected alternative will completely bury, and therefore remove, the existing benthic community within the footprint of each individual project, those populations will be lost; however, recovery of the impacted community will occur through recruitment due to the settlement of larval life stages or migration from adjacent areas (Greene 2002; Speybroeck et al. 2006; Wilber and Clark 2007; Baptist et al. 2009; Wilber et al. 2009; Rosov et al. 2016; Wooldridge et al. 2016). Sand placed on the beach will be clean sand that closely matches sand present at the placement site in size and texture. Sediment size and type, and similarity to native sediments existing on the receiving beach, have a determining effect on the recovery time of benthic communities (McLachlan 1996; Rakocinski et al. 1996; Peterson and Manning 2001; Peterson et al. 2014; Wooldridge et al. 2016; Corbett and Walsh 2017). Studies of the results of benthic community monitoring subsequent to beach nourishment indicate that, when nourishment sand of similar size and texture to the target beach is used, community recovery times are generally anticipated to be between six months to several years for benthic fauna common to the wet beach environment, including amphipods, mole crabs, bean clams, and polychaetes (Peterson and Manning 2001; Greene 2002; Speybroeck et al. 2006; Wilber and Clark 2007; Baptist et al. 2009; Wilber et al. 2009; Leewis et al. 2012; Rosov et al. 2016; Wooldridge et al. 2016).

Under the selected alternative, a nourished beach will not be eligible to receive material again within three years unless permitted under an emergency. The frequency of nourishment projects is designed to allow re-establishment of benthic communities following sediment placement. Additionally, there may be a few locations where beach nourishment will occur every three years over the lifetime of the sediment management framework due to high erosion rates and proximity to shorefront development, although this is unlikely. Little is known about the effect of extended periods of repeated sand placement on benthic communities; but assuming benthic recovery could take several years, the benthic community in these confined areas could exhibit reduced abundance and diversity over the life of the sediment management framework. Pre- and post-project monitoring of intertidal benthic organisms will be used to evaluate rates of recovery in nourishment areas. Information gained from ecological monitoring will be used to further improve conditions associated with future projects, including modifications of frequency, timing, and other methods associated with nourishment projects to further reduce impacts.

The selected alternative will likely provide a wider dry-sand beach and restore a more natural, gradual beach profile. This will increase the areal extent of wet beach habitat for benthic organisms compared to existing conditions. Furthermore, the beach will develop a less steep profile, which will reduce the wave energy in the intertidal and subtidal habitats (Speybroeck et al. 2006). A less steeply sloped wet beach zone may increase the diversity and abundance of benthic communities (McLachlan 1996).

The selected alternative reserves approximately 12-13 noncontiguous miles, including a section of Pea Island NWR portion of the Seashore, as reference areas and removes them from consideration for sediment management activities in all cases except emergencies. The selected alternative allows the NPS to permit up to 6 miles of sediment management activities each year, including an additional 6 miles in emergency situations. In year one, 61 miles of Seashore, and an additional 13 miles of Pea Island NWR shoreline, will be undisturbed as habitat for benthic organisms. Assuming a recovery window of two-three years for benthic species following a nourishment event and the maximum amount of permitting allowed, between 43-49 miles of Seashore, including an additional 13 miles of habitat on the Pea Island NWR portion of the Seashore, will be unimpacted and available for benthic community recruitment and establishment over the course of the framework.

Impacts resulting from sediment management activities are considered temporary (anticipated to last from six months to several years) and limited in spatial extent (i.e., within the project footprint). Over the 20-year life of the framework, it is anticipated the completion of sediment management activities may also benefit the intertidal and subtidal benthic communities at the Seashore, as it may reduce some impacts from relative sea-level rise, storm and tidal events, and climate change. Furthermore, the benefits associated with the selected alternative are consistent with fundamental resources and values, such as preserving terrestrial and aquatic habitats of the Seashore (NPS 2011). Because impacts will be temporary, lasting from six months to several years, spatially confined (at or near the project location), and long-term benefits are anticipated, the implementation of the selected alternative will not impair benthic organisms at the Seashore.

ESSENTIAL FISH HABITAT

Essential fish habitat (EFH), including habitat areas of particular concern (HAPCs) are located on the ocean side, sound side, and inlets at the Seashore and may be affected by the selected alternative. Twelve

EFHs and seven HAPCs are present within the general vicinity of the Seashore. This determination includes EFHs and HAPCs that may be impacted from the placement of sediment in the intertidal zone and inlets within or near the boundaries of the Seashore. This determination does not include those EFHs or HAPCs at offshore locations where dredging may occur as these resources are not subject to the impairment standard because they are outside the boundaries of the Seashore.

Sediment management activities at the Seashore will temporarily (lasting a few days) introduce more turbidity into the water column, adversely impacting EFH and HAPCs. Increases in suspended sediments could reduce visibility, leading to a decrease in foraging and predator avoidance capabilities (Peterson and Manning 2001; Greene 2002; NMFS 2003). Reduced feeding ability could result in decreased growth rates and limited resistance to disease if high levels of suspended sediments persist (Greene 2002; NMFS 2003). Higher turbidity may also decrease impacts to some surf zone fish by temporarily reducing predation from other species (Beyst et al. 2002). Increased turbidity in HAPCs will reduce water clarity, which limits light availability for submerged aquatic vegetation (SAV) (SAFMC 2009b; Gregg 2013). The settlement of suspended sediments may cover SAV and tidal marsh plants for a short time, reducing photosynthetic production, but it is likely the sediment will settle to the substrate where it will contribute to the accretion that typically occurs in SAV and tidal marsh habitats (Michener et al. 1997; SAFMC 2009b). Turbidity will return to normal within a few days and mitigation measures required under the selected alternative could help reduce physical and biological impacts to EFH to ensure that these impacts are short-term and localized.

Given the temporary nature (lasting a few days for turbidity to return to normal) of the impacts to EFH for any individual project, including an increase of sediment load in the water column and reduction of prey species, it is unlikely the overall quality of EFH at or near the Seashore will be reduced by the selected alternative. For the reasons described above, the selected alternative will not inhibit the Seashore's ability to preserve aquatic habitats as a fundamental resource and will not impair essential fish habitat or HAPCs.

SEA TURTLES

The Seashore contains ecologically important habitats for federally listed sea turtles. Sea turtles nest annually from May to October at the Seashore and occur within the waters adjacent to the Seashore on the ocean side, sound side, and within the inlets. The species found at the Seashore include the loggerhead sea turtle (*Caretta caretta*), green sea turtle (*Chelonia mydas*), Kemp's ridley sea turtle (*Lepidochelys kempii*), leatherback sea turtle (*Dermochelys coriacea*), and the hawksbill sea turtle (*Eretmochelys imbricata*) (NPS 2019d). This non-impairment determination includes sea turtles that may be impacted from the placement of sediment on the beach and at dredging locations. Impacts from dredging operations were included, although outside the boundary of the Seashore, because sea turtles affected by this action also nest at the Seashore. Accordingly, park resources may be impacted by dredging operations outside the boundary of the Seashore.

Changes in beach conditions under the selected alternative may disturb sea turtles during sand deposition (FWS 2017). Changes include artificial light exposure (temporarily from construction and from changes to beach profile after construction) (Mann 1978; Nelson et al. 2000; NMFS and FWS 2008) and changes to conditions on the nesting beach including the potential for compaction, composition, beach slope, sand grain size, and sand color (USACE 1988b; FWS 2017; Cisneros et al. 2017). Changes in beach conditions

at a project site could impact nest site selection, digging behavior, clutch viability, and hatchling emergence (Nelson and Dickerson 1987; USACE 1988a; FWS 2017; Cisneros et al. 2017); increase false crawls and nest attempt abandonment (Ernest and Martin 1999; Rumbold et al. 2001; FWS 2017); and increase nest temperature which could change the sex ratio of hatchlings (Nelson and Dickerson 1987; USACE 1988a; Ernest and Martin 1999; NMFS and FWS 2008; Holloman and Godfrey 2008; FWS 2017). These impacts may last two to three years at a project location, and the impacts will be mitigated by using sand with matching grain size, composition, and color of the existing sand and reducing sediment compaction by testing and tilling the placement sand (Nelson and Dickerson 1987; USACE 1988b; Ernest and Martin 1999; NMFS and FWS 2008; FWS 2017). To mitigate impacts to nests at a project location, all sea turtle nests laid within a sediment management project area before or during construction will be relocated to areas outside of active sand placement. Additional mitigation measures detailed in Appendix B further reduce impacts associated with sediment management.

Dredging could also adversely impact sea turtles through disturbance, placement of obstacles in migratory corridors, stress effects during relocation trawling, and direct take by a hopper dredge draghead. Dredging could entrain sea turtles in the draghead during dredge operation and it could also present obstructions or increase vessel strikes to sea turtles in transit through offshore borrow areas (NMFS and FWS 2008). As stated in the EIS, entrainment in the draghead is expected to be low. Dredging of sediment within borrow areas may also disturb Northwest Atlantic loggerhead distinct population segment (DPS) critical habitat, specifically migratory and sargassum habitat. However, the potential impacts associated with dredging, transporting, and/or disposal activities related to sediment management activities is not expected to occur at levels that will affect or modify the physical and biological features of the critical habitat. Additionally, dredging operations could adversely affect offshore habitats by contributing noise, altering or damaging hardbottom and reef habitats, directly removing important benthic prey organisms, and increasing turbidity (BOEM 2017). Dredging will avoid hard bottom habitats and impacts from dredging will be localized to the footprint of the project. Additionally, prey species abundance and biomass within the dredged area are expected to recover within two years after dredging occurs. Dredging activities associated with sediment management projects permitted at the Seashore will follow all conservation recommendations and Project Design Criteria set forth by the National Marine Fisheries Service (NMFS) and the US Army Corps of Engineers (USACE) in the South Atlantic Regional Biological Opinion (SARBO) operating procedures. Mitigation measures specific to dredging impacts are detailed in Appendix B and further reduce impacts associated with this action.

Impacts due to sea-level rise, storm activity, and erosion will continue to occur similar to what has been observed in the recent past. This could include increased occurrence and severity of storm events, inundation of nests, loss of nests to erosion, a narrower steeper beach that could increase false crawls and density dependent impacts, and elevating nest temperatures to levels that alter sex ratios or hatching success. It is anticipated that the impacts from these events will be lessened under the selected alternative (i.e. overwashes and island breaches occur less frequently, wider dry beaches remain available for nesting sea turtles, and fewer nests are inundated or lost to erosion), because the proposed increase in sediment management activities will help mitigate for the loss of sand from beaches. The US Fish and Wildlife Service (FWS) concluded that beneficial effects will result from an increase in nesting habitat, and that a nourished beach designed and constructed to mimic a natural beach system will benefit sea turtles more than an existing eroding beach (FWS 2017).

The potential restoration of habitat on Green Island and at the south end of Hatteras Island is unlikely to adversely impact sea turtles or sea turtle nesting. Currently, sea turtles do not nest in these areas because they are inundated by daily tides (NPS 2017c, 2017j, 2017k, 2018d, 2019d). Restoration of these areas could provide a small amount of sea turtle nesting habitat, relative to the 67 miles of existing shoreline at the Seashore, and additional 13 miles of shoreline at Pea Island NWR. With mitigation measures in place, habitat restoration and beach nourishment under the selected alternative will help maintain sea turtle nesting habitat, prevent density dependent nest impacts, and ensure sea turtles continue to use the Seashore for nesting.

The Seashore encompasses 67 miles of shoreline and Pea Island NWR encompasses 13 miles of shoreline, with some areas more suitable for sea turtle nesting than others. The selected alternative may impact up to 6 miles of shoreline in any year, with the potential for an additional 6 miles of sediment management activities no more frequently than every 5 years in emergency situations. At least 61 miles of the Seashore (91%), and an additional 13 miles of Pea Island NWR will remain available at any point, and 12-13 miles will be set aside as reference zones, including a section of the Pea Island NWR portion of the Seashore, and not considered for sediment management activities (in all cases except for emergencies). With impacts potentially lasting through the second nesting season after project completion, a maximum of 18 miles of beach could exhibit some changes as a result of beach nourishment. In the 2021 FWS biological opinion (BO) prepared for the NPS² (FWS 2021 BO), the FWS concluded that the actions presented in the selected alternative are not likely to jeopardize the continued existence of the sea turtles at the Seashore.

Although there will be intermittent and temporary impacts (potentially lasting until the second or third nesting season after project completion) resulting from potential compaction and modification of substrate characteristics, and dredging, the selected alternative is not expected to negatively affect the population viability of sea turtles. The beneficial impact of the selected alternative will contribute to the Seashore's fundamental value of protecting federal and state listed species and other species of special management concern (NPS 2011). Conservation of sea turtles at the Seashore is key to maintaining the natural integrity of the Seashore and implementation of the selected alternative will help promote the protection of terrestrial and aquatic habitats for this resource (NPS 2011). Therefore, implementation of the selected alternative will not impair sea turtles at the Seashore.

LISTED SHOREBIRD SPECIES

The Seashore is a designated Important Bird Area (BirdLife International 2019a) and a critical natural landform along the Atlantic Flyway (Ducks Unlimited 2019). It serves as major resting, breeding, and feeding grounds for migratory birds throughout the year (CSE 2015). Three shorebird species protected under the Endangered Species Act (ESA) are known to use the study area. These species are piping plover (*Charadrius melodus*), roseate tern (*Sterna dougallii dougallii*), and rufa red knot (*Calidris canutus rufa*). State-listed shorebird species analyzed in the EIS include the American oystercatcher (*Haematopus palliatus*), the black skimmer (*Rynchops niger*), the common tern (*Sterna hirundo*), the gull-billed tern (*Gelochelidon nilotica*), the least tern (*Sternula antillarum*), and Wilson's plover (*Charadrius wilsonia*).

² US Fish and Wildlife Service. 2021. *Biological Opinion for the Cape Hatteras National Seashore Sediment Management Framework within Dare and Hyde Counties, North Carolina*. Raleigh, North Carolina.

Many of these species exhibit similar preferences for nesting habitat and share nesting locations within the sediment management areas and exclusion zones.

The selected alternative may result in adverse impacts to listed shorebird species, including disturbance and alteration of their habitat at the Seashore. The addition of sediment to the shorelines may decrease habitat quality by altering sediment particle sizes (mitigated by the requirement for sediment to be a close match to native sediment), potentially eliminating sparse vegetation (near dune habitats), and burying benthic invertebrate prey species. The selected alternative will have additional short-term effects (lasting during project activities) on listed shorebird species, including displacement of nesting, foraging, and wintering birds due to disturbance by equipment use (FWS 2017). Disruptions to listed shorebirds and their habitat may occur but is unlikely as mitigation measures are designed to keep sediment management activities away from these species so that nesting may continue. Disruptions to available prey may occur during project implementation and for six months to several years after. Appendix B includes mitigation measures such as standard wildlife protection buffers around nests and chicks, compatible sediment specifications, and avoidance of high-value inlet complex habitats for piping plovers to the maximum extent practicable for construction staging areas and pipeline routes. Implementing these mitigation measures during project implementation will reduce potential impacts to listed shorebird species. In the FWS 2021 BO, the FWS concluded that the actions presented in the selected alternative are not likely to jeopardize the continued existence of the piping plover or rufa red knot.

The implementation of up to 6 miles of sediment management activities each year over the span of 20 years under the selected alternative may result in greater availability of dry beach for resting and nesting habitat. It may also increase the availability of a wider (lower-sloped) intertidal beach and increase foraging habitat for species that prey on the invertebrate community. A study conducted near Cape Fear, North Carolina, south of the Seashore, following a beach nourishment project conducted by USACE concluded that there were no significant changes in total shorebird abundance after nourishment and that habitat use may have increased at this beach (Grippio et al. 2007). Although this study determined that feeding behavior declined after nourishment, there was no clear effect on shorebird behavior as a result of the project. The study also noted that a decline in shorebird feeding behavior could be short in duration. It is also likely that an increase in the sediment budget along the Seashore may result in accretion in some areas where nourishment is not proposed, potentially expanding habitat for shorebird species. Furthermore, the habitat restoration projects proposed under the selected alternative will also create suitable habitat for foraging and nesting. The selected alternative will preserve approximately 13 noncontiguous miles as reference areas and will remove these areas from consideration for sediment management activities in all cases except for emergencies. These areas will remain open to shorebird use, and in general, shorebird activities within these areas will be unimpeded. The benefits of the selected alternative will help protect the diverse plant and animal communities sustained by the coastal island processes at the Seashore, which is a key element of the Seashore's purpose (NPS 2011).

Under the selected alternative, sediment management activities to restore wintering and nesting habitat may occur within piping plover critical wintering habitat (CWH) unit NC-1, on Green Island, and unit NC-4, at the south end of Hatteras Island. Over the last 15 years, Green Island has eroded and is now completely gone, most likely due to boat traffic in Oregon Inlet increasing wave (or wake) energy, climate change causing relative sea-level rise, and increased storm frequency and severity. Unit NC-4 on the south end of Hatteras Island has lost approximately one mile of sand beach and nearly all suitable piping plover habitat since 2001, when the designated CWH was last revised (NASA and USGS 1998;

NASA, USDA Farm Service Agency, and USGS 2006; USDA Farm Service Agency and Maxar Technologies 2011; Maxar Technologies 2016, 2019). Because little to no habitat remains within these CWH units, sand placement and shaping activities will benefit piping plover by restoring historic wintering and nesting habitat. Additionally, FWS concluded in the FWS 2021 BO that the actions presented in the selected alternative are not likely to destroy or adversely modify designated critical habitat for wintering piping plover.

The Seashore and permittees will complete ecological studies in the reserved reference areas that could be used for comparison to areas impacted by sediment management activities. In addition, the selected alternative will require ecological monitoring before and after sediment management projects for the purposes of learning and improving conditions associated with future projects. This monitoring could include studies of intertidal benthic communities, wildlife use, sediment characteristics such as grain size and density, and other metrics that may affect shorebird use of the beach. This monitoring in combination with the shorebird monitoring and management activities normally conducted by the Seashore could be used to inform current knowledge of shorebird use in areas where sediment management activities have occurred and the impacts of sediment placement on the beach to shorebird nesting, behavior, and foraging. Information gained from ecological monitoring could further improve conditions associated with future projects including modification of the frequency and timing of sediment management activities, sediment characteristics, and other project parameters.

As impacts from sea-level rise, storm and tidal activity, and erosion will continue to occur, it is anticipated that the selected alternative will help reduce these impacts on listed shorebird species (i.e., overwashes and island breaches occur less frequently, wider dry beaches remain available for shorebirds, and fewer nests are inundated or lost to erosion), because the proposed increase of sediment management activities will help mitigate for the loss of sand from the beaches. Ensuring protection of shorebird habitats is critical to the recovery of listed species and beach nourishment activities will increase the longevity of shorebird habitats. Implementation of the selected alternative supports the Seashore's fundamental value of maintaining important sites for coastal bird migration, breeding, and wintering along the Atlantic flyway, and preserving terrestrial habitats (NPS 2011). The selected alternative also contributes to the Seashore's fundamental value of protecting federal and state listed species and other species of special management concern because it helps protect shorebird habitats as outlined in relevant recovery plans. Therefore, implementation of the selected alternative will not result in impairment to listed shorebird species.

SUMMARY

The National Park Service has determined that implementation of the selected alternative will not constitute impairment of the resources of Cape Hatteras National Seashore. This conclusion is based on consideration of the Seashore's purpose and significance, a thorough analysis of the environmental impacts described in the EIS, comments provided by the public and others, and the professional judgement of the decision maker guided by the direction of the NPS Management Policies 2006.

APPENDIX B – SPECIAL USE APPLICATION PROCESS, MITIGATION MEASURES, AND MONITORING STRATEGY

Under the selected alternative, as described in the Record of Decision (ROD) for the *Cape Hatteras National Seashore Sediment Management Framework Final Environmental Impact Statement (EIS)*, Cape Hatteras National Seashore (Seashore) will use the National Park Service (NPS) Special Use Permitting (SUP) process to allow agencies, municipalities, and others to conduct sediment management activities at the Seashore. This appendix describes how the Seashore will manage the SUP process, mitigation measures to be included as part of SUPs, and the ecological monitoring strategy for larger-scale sediment management activities, such as beach nourishment and breach repair.

Special Use Permit Process

The following section describes the process the Seashore will follow for reviewing, issuing, and managing SUPs for larger-scale sediment management activities under the selected alternative, such as beach nourishment. As needed, the Seashore will update this process to comply with any applicable law, regulation, and policy, for example NPS Special Park Uses policies. The Seashore may also update the process, based on routine review of ecological monitoring data (as described below in the *Monitoring Strategy* section), review of peer reviewed and gray literature reports on sediment management activities, changing site conditions, and/or information obtained from the public and partner agencies and stakeholder groups.

Step 1: The NPS provides an information package for SUP applicants

- If an agency or other organization expresses interest in submitting a special use permit application for a sediment management project, the Seashore will develop a package of documents for project proponents/permit applicants with information on what activities may be permitted under the Final Environmental Impact Statement (FEIS) and Record of Decision (ROD) and under what conditions. The Seashore will provide the information package to interested parties upon request and may also post it on the Seashore’s website for easy public access. The package may include, but is not limited to:
 - Map of areas of likely sediment management and reference areas identified in the FEIS and ROD;
 - Map of known sea turtle and shorebird nesting habitat;
 - List of mitigation measures from NPS and consulting agencies including, but not limited to, the 2021 FWS biological opinion (BO) prepared for the NPS¹ (FWS 2021 BO), and additional measures identified in the FEIS and ROD and listed below in the *Mitigation Measures* section;
 - List of approved activities identified in the ROD; and
 - List of monitoring metrics listed below in the *Monitoring Strategy* section.

¹ US Fish and Wildlife Service. 2021. *Biological Opinion for the Cape Hatteras National Seashore Sediment Management Framework within Dare and Hyde Counties, North Carolina*. Raleigh, North Carolina.

Step 2: The applicant prepares and submits the SUP application to the NPS

- After reviewing the document package described above and deciding to proceed with a request to the NPS for the sediment management activity, the project proponent will submit an SUP application form (OMB Control #1024-0026/NPS 10-930) to the Seashore and include relevant supporting documentation. The types of supporting documentation the Seashore may require could include:
 - Description of proposed project;
 - Description of the coastal processes in the project area, including shoreline change rates (if known);
 - Technical analysis information of identified potential sand sources and suitability for beach placement;
 - Pre-nourishment beach and offshore topographic/bathymetric survey data, aerial photography, and sediment-related information;
 - An ecological monitoring plan including a proposed reference zone to monitor ecological resources post project;
 - Project design and construction parameters (e.g., project length, beach width, berm height, filled volume density, sediment characteristics, date of construction) and regional/site-specific conditions (e.g., background shoreline erosion rates, alongshore sediment transport rates, wave conditions).
- If the application is for repeat nourishment:
 - Post-nourishment beach and offshore topographic/bathymetric survey data, aerial photography, and sediment-related information related to former project;
 - Annual post-construction surveys and aerial photos and performance assessment reports;
 - Pre- and post-nourishment benthic invertebrate surveys.
- Note: If the SUP applicant needs to collect data at the Seashore in order to prepare the SUP application, a NPS Scientific Research and Collecting Permit may be required for scientific activities that involve fieldwork, specimen collection, or have the potential to disturb resources or visitors. Information on this process is available at: <https://irma.nps.gov/rprs>.

Step 3: The NPS reviews the SUP application

- Upon receipt of a complete SUP application, NPS will review supplemental documentation to determine if the proposal is an appropriate action identified in the FEIS and ROD.
 - The NPS will:
 - Determine if proposed project type (e.g., beach nourishment, dune nourishment, breach repair, habitat restoration) is included in the FEIS and ROD:
 - Yes – proceed to next section
 - No –
 - If the proposal is different than actions disclosed in FEIS and ROD, determine if the proposed action will have the same impacts as identified in FEIS or;
 - Return the proposal to the applicant to adjust the proposed project to meet the sediment management framework
 - Determine if the proposal will occur within Pea Island NWR:
 - Yes- refer applicant to Pea Island NWR for review
 - No- proceed to next section
 - Determine if proposal is located outside a reference zone identified in the FEIS and ROD:
 - Yes – proceed to next section
 - No – advise applicant that permit may be denied or if new site conditions have been identified which warrant sediment management

actions, additional NEPA compliance may be required before NPS will consider the permit application. Also, additional compliance may not be limited to NEPA.

- Determine if the size (volume and length) of the proposal is within the parameters identified within the FEIS and ROD:
 - Yes – proceed to next section
 - No – if the proposal is different than actions disclosed in FEIS and ROD, determine if the proposed project will have the same impacts as identified in FEIS or;
 - return the proposal to the applicant to adjust the proposed project to meet the sediment management framework
- Determine if the proposal is within the total annual limit for linear length of impacted shoreline identified in the FEIS and ROD:
 - Yes – proceed to next section
 - No – if the proposal is different than actions disclosed in FEIS and ROD, determine if the proposed project will have the same impacts as identified in FEIS or;
 - return the proposal to the applicant to adjust the proposed project to meet the sediment management framework
- Determine time of year of the proposal:
 - Is the construction window between November 16 and April 1?
 - Yes – proceed to next section
 - No – work with the applicant to determine if they can conduct the project between November 16 and April 1; however, if not feasible due to safety or other logistical considerations, include additional mitigation measures
- Determine if the applicant provided an appropriate pre-site assessment and surveys:
 - Yes – proceed to next section
 - No – require the applicant to provide these assessments and surveys
- If the NPS has determined the permit applicant has satisfied the above criteria, the NPS proceeds to the site resource review.

Step 4: The NPS conducts site resource review where sediment management activities are proposed

- Through the Seashore’s internal scoping process with interdisciplinary staff, the NPS will:
 - Determine if site conditions are similar to those discussed in the FEIS and ROD (assessment of current condition of resources)
 - Review NPS policies and reference manuals for the appropriate site resource conditions present in the project area and assess impacts to determine if additional compliance is needed.
 - Director’s Order #77-1: Wetland Protection, PM #77-1, Director’s Order #28: Cultural Resources.
 - Determine if there is potential for the presence of wildlife during proposal timelines by reviewing NPS historical wildlife activity data for appropriate species within the project area.
 - Survey for sensitive plant species and delineate no-work buffers if these species are within the project area.

- Determine if known cultural resources are present by reviewing known archeological data and delineate no-work buffer zones if cultural resources are present within the project area.
 - If cultural resources are unknown, permit applicant may be required to perform an archeological site survey which may require an Archeological Resources Protection Act (ARPA) permit
 - The NPS will consult with the State Historic Preservation Office (SHPO) before SUP issuance, as appropriate
 - Identify monitoring responsibilities for the project;
 - NPS point-of-contact (POC)
 - Request Applicant and Contractor POC
 - Determine interagency (e.g., FWS, USACE, NCDWR, NMFS, etc.) POC, if applicable
 - Review appropriate reference zone for ecological monitoring
 - Incorporate all mitigation measures applicable to the project activities, found in the next section, in SUP general conditions
 - If sediment management is proposed for habitat restoration, the following actions may be required and may be expanded to include additional requirements/mitigation measures based on the project's site resources review:
 - Habitat restoration projects proposed by the NPS and other agencies or organizations may require an Interagency Agreement (federal) or Memorandum of Understanding (state and county) outlining each agency's role and responsibility for implementing the project
 - Interagency agreement may include the requirement of a maintenance and restoration plan for the project site
 - Applicable mitigation measures detailed below will be included in the interagency agreement, as appropriate
 - Agency permittee and the NPS will conduct habitat restoration efficacy monitoring which may include components of the monitoring strategy described below.

Step 5: The NPS approves the SUP for sediment management activities

- If proposal meets and includes all criteria above and mitigations identified in the FEIS and ROD, then NPS may approve and issue an SUP (excluding habitat restoration activities which may require an interagency agreement).
 - NPS may issue an SUP in advance of the permittee acquiring other necessary permits and approvals and will require the permittee to submit proof of those permits before commencing activities under the NPS SUP.
- The NPS identifies visitor use issues at project locations and issues press release(s) notifying the public of closures.

Step 6: The permittee implements the sediment management project

- After the NPS SUP has been issued and prior to project implementation, the following actions may be required and may be expanded to include additional requirements/mitigation measures based on the project's site resources review.
 - The permittee provides copies of the following permits, if applicable, to the NPS:
 - North Carolina Department of Environmental Quality (NCDEQ) Major Development and Excavation/Filling Permit (i.e., CAMA permit);
 - NCDEQ Individual 401 Water Quality Certification;

- US Army Corps of Engineers 404 Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899;
 - Bureau of Ocean Energy Management Lease agreement for dredging in the Outer Continental Shelf.
- The permittee will schedule a pre-construction meeting with NPS and may invite other agencies to review all agency permits with contractor
- The permittee will submit a project schedule to the NPS
- The permittee will be responsible for developing public notices and scheduling public meetings with NPS participation
- The NPS or permittee's trained wildlife monitor will conduct daily wildlife surveys and monitoring activities which may include relocating sea turtle nests found within project areas or adjusting no-work buffers around shorebird and sea turtle nesting areas.
- The permittee must conduct weekly, or more frequently, project meetings with NPS throughout the duration of the project. NPS may require weekly reports of on-site inspections during project implementation.

Step 7: The permittee completes the sediment management project

- The NPS and permittee notifies FWS- Ecological Services Field Office of any incidental take during the project activities.
- The permittee conducts post project monitoring and surveys for two years unless monitoring indicates that additional years are necessary and submits reports to NPS.
- The permittee conducts a post project review meeting with the NPS.
 - The permittee will conduct nourishment site monitoring to evaluate sediment grain size, the recovery of benthic organisms, and post project beach profile surveys within project area for two years unless monitoring indicates that additional years are necessary.
 - The permittee will conduct monitoring on grain size and benthic organisms within reference area for two years unless monitoring indicates that additional years are necessary.
 - The NPS will continue to conduct routine sea turtle, shorebird, and shoreline monitoring within project sites and reference areas.
 - For more details on monitoring and surveys, see *Monitoring Strategy Section* below.

Step 8: The NPS to conduct ongoing scientific review after sediment management activities

- Every two years, the NPS will convene agency regulatory partners, including cooperating agencies, to review the results of project monitoring of all previously permitted sediment management projects, emerging scientific information, new regulatory requirements, and new erosion and transportation management solutions. A summary of these findings will be posted on the Seashore's website to provide an opportunity for the public to review and provide input.
- If biological and physical monitoring data indicate that recovery rates are longer than anticipated or impacts are occurring that were not accounted for in the FEIS and ROD, the NPS may consider reducing the frequency or modifying the locations or project conditions of future projects.

Mitigation Measures

The mitigation measures described below will become part of the permit conditions for approved SUPs for sediment management activities. These mitigation measures were developed as part of the FEIS, however, it is important to note that the means and methods of these mitigation measures may change over time, based on site specific reviews.

- In addition to the mandatory mitigation measures listed below (where applicable), the NPS specifically incorporates all of the terms, requirements, obligations and conditions of the permits, certifications, letters and documents, mitigation and consultation requirements for all the activities before, during, and after construction as specifically developed and prepared by state and federal agencies to maximize protection and minimize impact to the physical environment, threatened and endangered species, and people in and near the project, as if fully written into their entirety in the NPS SUP. The NPS will ensure that the permittee is aware of the conservation measures described in the FWS 2021 BO (Reasonable and Prudent Measure (RPM) #1 Sections 8.2.1, 8.2.2, 8.2.3, 8.2.4, and Terms and Conditions (T&C) #1 Section 8.3.1, FWS 2021 BO). The NPS or a permittee will be required to accomplish the monitoring and reporting requirements described in the FWS 2021 BO, including the requirement to immediately notify the NPS and FWS if the amount or extent of incidental take specified in the Incidental Take Statement is exceeded during project implementation.
- General Permit Conditions
 - The permittee, in coordination with USACE and the NPS, will notify the FWS of the commencement of projects for the purposes of tracking incidental take of all listed species. If project-related activities will potentially adversely affect nesting shorebirds or active nesting habitat, the permittee must coordinate with the NPS, FWS, and NCWRC prior to proceeding (RPM #8 Section 8.2.1, FWS 2021 BO). If the project is ongoing and shorebirds begin territorial or other nesting behaviors within the project area, the NPS will implement no-work buffers around this activity.
 - The permittee must organize a meeting between representatives of the permittee's contractor(s), FWS, NCWRC, NPS, the trained sea turtle monitor if it is other than the NPS, and other species surveyors, as appropriate, to be held prior to the commencement of the work on any project (RPM #4 Section 8.2.1, FWS 2021 BO). The meeting will provide an opportunity for explanation and/or clarification of the conservation measures and T&Cs, and will include the following, as appropriate:
 - Staging locations, and storing of equipment, including fuel stations;
 - Coordination with the surveyors on required species surveys;
 - Pipeline placement;
 - Minimization of driving within and around the Action Area;
 - Follow up coordination during construction and post construction;
 - Direction of the work including progression of beach nourishment along the beach;
 - Plans for compaction monitoring;
 - Plans for escarpment surveys and
 - Names and qualifications of personnel involved in any required species surveys.
 - The permittee's access points for construction vehicles should be as close to the project site as possible. Construction vehicle travel down the beach should be limited to the maximum extent possible (RPM #5 Section 8.2.1, FWS 2021 BO).

- The permittee may only use vehicles on the beach at night if escorted by trained endangered species observers.
 - The permittee must reduce the use of bulldozers at night to the minimum use required for safe operations as sand is being discharged.
 - During construction, the permittee must properly dispose of trash and food items either in predator-proof receptacles, or in receptacles that are emptied each night to minimize the potential for attracting predators of piping plovers, red knots, and sea turtles.
 - Prior to sand placement, the permittee must remove to the maximum extent possible all derelict material, large amounts of rock, or other debris from the project area (RPM #2 Section 8.2.1, FWS 2021 BO).
 - The permittee must coordinate pipeline placement with the NPS, NCDCM, USACE, FWS, and the NCWRC (RPM #3 Section 8.2.1, FWS 2021 BO).
 - During dredging operations, the permittee must inspect material placed on the beach daily to ensure compatibility. If during the sampling process non-beach compatible material, including large amounts of shell or rock, is or has been placed on the beach the permittee must stop work immediately and the NPS will be notified by the permittee and/or its contractors to determine the appropriate plan of action.
 - The permittee should advise construction personnel that there are civil and criminal penalties for harming, harassing, or killing ESA-listed species, which are protected under the Endangered Species Act of 1973.
 - The permittee will not use siltation barriers during construction due to high tidal flows and coarse sediment present within the action area so that ESA-listed species cannot become entangled or entrapped.
 - Sand fencing will be installed at an angle no less than 45 degrees to the shoreline (RPM #1 Section 8.2.2, FWS 2021 BO).
- Sea Turtles
 - The permittee is responsible for ensuring continuous nightly beach patrols are performed by trained sea turtle monitors to locate any turtles that are stranded behind the dredge pipe on the beach and relocate them to the water's edge or resolve the situation according to directions by and in consultation with NPS.
 - No-work buffers along the beach will be established around sea turtle nests by trained sea turtle monitors in coordination with NPS.
 - Immediately after construction and to the maximum extent practicable prior to May 1, the limits of construction areas will be evaluated by the permittee for compaction in coordination with the NPS. If the NPS, in consultation with FWS and NCWRC, determines that additional inspections are needed, a second inspection may be required prior to May 1 of the following year. Compaction monitoring and remediation are not required if the placed material no longer remains on the beach. Within 14 days of completion of beach nourishment and prior to any tilling (if needed), a field meeting will be held between the permittee and NPS, FWS and/or NCWRC to inspect the project area for compaction and determine whether tilling is needed. If it is determined that tilling is required for sea turtle nesting habitat suitability, the construction areas will be tilled to a depth of 36 inches. Tilling must occur landward of the wrack line and avoid all vegetated areas that are three square feet or greater, with a three-foot buffer around all vegetation. All tilling activity shall be completed prior to May 1 to the maximum extent practicable. In the case of projects that run until the April 30 nesting timeframe, any tilling activities required after

May 1 will be coordinated with the NPS, FWS, or NCWRC. If tilling occurs during shorebird nesting season, shorebird surveys are required prior to tilling. Additionally, sand compaction must be qualitatively evaluated at least once after each beach nourishment event (RPM #7 Section 8.2.1, FWS 2021 BO). A summary of compaction assessments and the actions taken will be included in an annual report to NPS, NCDCEM, USACE, and FWS. These conditions will be evaluated and may be modified if necessary, to address and identify sand compaction problems (T&C #7, Section 8.3.1, FWS 2021 BO).

- Visual surveys for escarpments along the area of sediment management must be made by the permittee in consultation with NPS immediately after completion of sand placement, and within 30 days prior to May 1 for two subsequent years after any construction or sand placement event. Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet must be leveled and the beach profile must be reconfigured to minimize scarp formation by the dates listed above. If the sand placement activities are completed during the early part of the sea turtle nesting and hatching season (May 1 through May 30), escarpments must be leveled immediately, while protecting nests that have been relocated or left in place. If it is determined that escarpment leveling is required during the nesting or hatching season, the FWS or NCWRC will provide a brief written authorization to the NPS within 30 days that describes methods to be used to reduce the likelihood of impacting existing nests. An annual summary of escarpment surveys and actions taken will be submitted to the NPS and FWS. (RPM #6 Section 8.2.1, FWS 2021 BO).
- Sea turtle nesting surveys will be conducted by the NPS within the project area between May 1 and November 15 of each year, for at least two consecutive nesting seasons after completion, if the sand remains on the beach (FWS 2017).
- The permittee will coordinate any sediment management activities with the NPS, regarding the need to restrict construction in the vicinity of active nest building by sea turtles.
- The permittee will only place beach compatible fill on the beach or in any associated dune system.
 - Beach compatible fill must be sand comprised solely of natural sediment and shell material, containing no construction debris, toxic material, or other foreign matter, or large amounts of granular material, gravel, or rock. The beach compatible fill must be similar in both color and grain size distribution (sand grain frequency, mean and median grain size and sorting coefficient) to the native material in the area of proposed action. Beach compatible fill maintains the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system and meets the following criteria:
 - Beach compatible fill containing less than or equal to 5% fine-grained sediment (less than 0.0625 mm, considered silt, clay and colloids) by weight, unless sufficient sampling of the project area indicates that the native sediment grain size distribution contains greater than 5% fine-grained material, in which case compatible material should be considered the percentage of fine-grained native material plus no more than an additional 5% by weight;
 - Beach compatible fill containing coarse gravel, cobbles or material retained on a .75-inch sieve in a percentage or size not greater than found on the native beach; and

- Beach compatible fill that does not contain carbonate (i.e., shell) material that exceeds the average percentage of carbonate material on the native beach by more than 15% by weight.
- From May 1 through November 15, to the maximum extent practicable, excavations and temporary alteration of beach topography (outside of the active construction zone) by the permittee will be filled or leveled to the natural beach profile prior to 9:00 p.m. each day. This will help make the beach suitable for the sea turtles trying to nest (RPM #10 Section 8.2.1, FWS 2021 BO).
- During the sea turtle nesting season, the permittee must not extend the beach fill more than 500 feet along the shoreline and must confine work activities to this area between dusk and dawn of the following day until the daily nesting survey has been completed and the beach cleared for fill advancement. A trained sea turtle monitor must be present on-site to ensure no nesting and hatchling sea turtles are present within the work area. Once the beach has been cleared and the necessary nest relocations have been completed, the permit applicant / contractor will be allowed to proceed with the placement of fill and work activities during daylight hours until dusk, at which time the 500-foot length limitation must apply. If a nesting sea turtle is sighted on the beach within the immediate construction area, activities must cease immediately until the turtle has returned to the water and the party responsible for nest monitoring has relocated the nest.
- If any work on the beach is conducted during the sea turtle nesting season (May 1 through November 15), the permittee shall submit a lighting plan for the equipment and dredge that will be used in the project. The plan shall include a description of each light source that will be visible on or from the beach and the measures implemented to minimize this lighting. The plan shall be reviewed for approval by the NPS. During the nesting season, lighting associated with the project must be minimized to reduce the possibility of disrupting and misdirecting nesting and/or hatchling sea turtles (RPM #12 Section 8.2.1, FWS 2021 BO).
- If any nesting turtles are sighted on the beach during construction by the NPS or the permittee's trained sea turtle monitor, construction activities must cease immediately until the turtle has returned to the water, and the site has been marked for avoidance or any nest(s) that may have been laid has been relocated. All sea turtle nests within the proposed work areas will be relocated by the NPS. If a nesting sea turtle is observed at night, all work on the beach must cease and all lights must be extinguished (except for those absolutely necessary for safety) until after the female has finished laying eggs and returned to the water (RPM #11 Section 8.2.1, FWS 2021 BO).
- Daily (before 9:00 am) nesting surveys and egg relocation will be conducted by the NPS if any portion of the sand placement occurs during the period from May 1 through November 15. If sand is placed on the beach at night, a nighttime monitor must survey the beach area that is affected that night, prior to the morning's normal nesting activity survey. No daytime movement of equipment up or down the beach may commence until completion of the sea turtle nesting survey each morning. If nests are laid within the project area, the nests must be marked by the NPS and either avoided by the permittee until completion of the project or relocated by the NPS (RPM #4, Sections 8.2.2 and 8.2.3, RPM #3, Section 8.2.4, FWS 2021 BO). Daily coordination must be conducted between sea turtle volunteers, the contractor, and NPS to ensure that the beach has been adequately surveyed and nests marked, prior to beginning of work (RPM #5, Section 8.2.2, RPM #4, Section 8.2.4, FWS 2021 BO).

- Nesting surveys and nest marking will only be conducted by personnel with prior experience and training in these activities, and who are duly authorized to conduct such activities through a valid permit issued by the FWS or the NCWRC.
 - Nesting surveys must be initiated by the NPS or the permittee's trained sea turtle monitor by May 1 and must continue through the end of the project. If nests are constructed in areas where they may be affected by construction activities, the eggs must be relocated to minimize sea turtle nest burial, crushing of eggs, or nest excavation.
 - Site selection for the relocated nest and methodology will follow the Handbook for Sea Turtle Volunteers in North Carolina.
 - Only those nests that may be affected by construction or sand placement activities will be relocated by the NPS or permittee's trained sea turtle monitor. Nest relocation must not occur upon completion of the project. For demobilization, nests will be marked and avoided, if possible. Nests requiring relocation must be moved no later than 9:00 am the morning following deposition to a nearby self-release beach site in a secure setting where artificial lighting will not interfere with hatchling orientation. Relocated nests must not be placed in organized groupings. Relocated nests must be randomly staggered along the length and width of the beach in settings that are not expected to experience daily inundation by high tides or known to routinely experience severe erosion and egg loss, predation, or are subject to artificial lighting.
 - Nests deposited within areas where construction activities have ceased or will not occur for 65 days must be marked for avoidance and left in situ unless other factors threaten the success of the nest by the NPS or permittee's trained sea turtle monitor. Nests must be marked with four stakes at a 10-foot distance around the perimeter of the nest for the buffer zone. The turtle permit holder must install an on-beach marker at the nest site and a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. No activities that could result in impacts to the nest occur within the marked area. Nest sites must be inspected daily to assure nest markers remain in place and the nest has not been disturbed by the project activity.
- The permittee must ensure, from May 1 through November 15, staging areas for construction equipment must be located off the beach to the maximum extent possible. Nighttime storage of construction equipment not in use must be off the beach unless it is stored within 500 feet of the active construction zone, to minimize disturbance to sea turtle nesting and hatching activities. In addition, all construction pipes placed on the beach must be located as far landward as possible without compromising the integrity of the dune system. Pipes placed parallel to the dune must be 5 to 10 feet away from the toe of the dune if the width of the beach allows. If pipes are stored on the beach, they must be placed in a manner that will minimize the impact to nesting habitat and must not compromise the integrity of the dune systems.
 - The permittee must conduct demobilization of equipment from the beach only during daylight hours, after the daily survey for sea turtle nests has been completed. Any nests that are identified must be marked by NPS for avoidance and avoided during all demobilization activities. If it is expected that a nest cannot be avoided during demobilization, then it must be relocated by the NPS.

- Permittee will comply with the following protected species construction conditions as described in NMFS’s “*Sea Turtle and Smalltooth Sawfish Construction Conditions*” and apply these conditions to listed species of sea turtles.
 - No sea turtle nests will be relocated for sand fence installation, dune vegetation planting, sand scraping, sand relocation, or emergency breach repair. If work is conducted between May 1 and November 15, the sea turtle surveyor must mark nests for avoidance. Sand fencing, dune planting, sand scraping, sand relocation and emergency breach repair work will not be conducted at night (RPM #3, Section 8.2.2, RPM # 2, Section 8.2.3, RPM #2, Section 8.2.4, FWS 2021 BO).
 - For sand fence installation, dune planting, sand scraping, sand relocation, and emergency breach repair, a buffer distance of 50 feet must be marked at all nests and false crawls identified within the work area, in which no power equipment or vehicles should be used. Specific to sand fence installation and dune planting, a buffer distance of 20 feet should be marked at all sea turtle nests and false crawls identified within the work area, in which no hand tools should be used for digging (RPM #6, Section 8.2.2, RPM #5, Section 8.2.3, FWS 2021 BO).
 - During the sea turtle nesting season, the limits of the expected dune planting area for each day should be marked on the beach the night before, to inform the sea turtle patrol of the limits of the day’s work (RPM #3, Section 8.2.3, FWS 2021 BO).
 - To the extent possible, during sea turtle nesting season, watering for dune planting should be accomplished from the landward side of dunes and an irrigation system must not be installed (RPM #6 and #7, Section 8.2.3, FWS 2021 BO).
 - Between May 1 and November 15, once an area of beach is completed with dune planting, all equipment will be prohibited from that area and all sand ruts created by traveling or parking on the beach must be removed by the end of each day (RPM #8 and #9, Section 8.2.3, FWS 2021 BO).
- Shorebirds
 - The order of work (sections to be filled by the permittee) will be accomplished so that there will be the least practicable disruption to bird-nesting activities along the Seashore.
 - Before start of work each morning, a visual survey must be conducted by the NPS or in the area of work for that day, to determine if piping plovers and red knots are present.
 - If shorebirds are present in the work area, the permittee must ensure careful movement of equipment in the early morning hours to allow those individuals to move out of the area.
 - The permittee’s construction operations shall always be carried out in a manner as to avoid negatively impacting shorebirds and allowing them to exit the area.
 - The NPS will implement standard wildlife protection buffers around piping plover nests and chicks and exclude sediment management activities within those protection areas as authorized in the 2010 ORV Management Plan and BO.
 - The NPS will recommend that proposed actions at the Seashore occur between November 16 and April 1 to avoid most of the piping plover breeding season, a portion of the piping plover migration period in North Carolina, and peak spring and fall migration of the red knot. The avoidance of breeding and migration periods for these species is an important management tool to minimize impacts. However, the NPS will consider, through agency consultation and incorporating mitigation measures, allowing work outside of this timeframe if seasonal conditions threaten project feasibility and/or human safety. Additional mitigation measures may include surveys, monitoring, research studies, and

construction methodologies. Allowance to work within the migratory and nesting seasons may include only a portion of the season.

- Sediment management activities will not occur in approximately 13 noncontiguous miles (approximately 20% of the Seashore). These areas will serve as reference zones (illustrated as zone 2 in figures 3 and 4 in appendix A).
- As a means of minimizing the extent and/or duration of adverse effects on habitats and benthic prey resources, all material placed on the beach and in associated dune systems by the permittee will consist of beach compatible sediment. Beach compatible material will consist of sediments that are similar in composition, grain size distribution, and color to the native sediments of the recipient beaches.
- The permittee's construction staging areas and pipeline routes will be located to avoid high-value inlet complex habitats for piping plovers and red knots to the maximum extent practicable.
- The permittee's personnel involved in the construction or sand placement process along the beach shall be trained to recognize the presence of piping plovers and red knots prior to initiation of work on the beach. Before start of work each morning, a visual survey must be conducted in the area of work for that day, to determine if piping plovers and red knots are present. If piping plovers or red knots are present in the work area, careful movement of equipment in the early morning hours should allow those individuals to move out of the area. Construction operations shall not begin until individual plovers have exited the work area for the day.
- Work areas within piping plover critical habitat, such as dredge footprint(s), pipeline corridors, travel corridors, and access points must be clearly delineated. Disturbance within those delineated work areas must be limited to the maximum extent possible, thereby minimizing effects to sandy, sparsely vegetated habitat within the project footprint. Driving on the beach for construction will be limited to the minimum necessary within the designated travel corridor (RPM #9 Section 8.2.1, FWS 2021 BO).
- Permittee work must limit the creation of pits and steep side slopes by ploughing immediately following nourishment and selecting nourishment techniques based on site features to minimize the impact on benthic communities and the time for recovery.
- Project sites will be surveyed for cultural resources by the NPS or other trained specialists if sites have not been previously surveyed.
- No-work buffers may be established by the NPS around known cultural resources, in consultation with the SHPO.
- Should permitted sediment management activities unearth previously undiscovered archeological resources, work will be stopped immediately in the area of such discovery, and the permittee will immediately contact the NPS. The NPS will consult with the SHPO and the Advisory Council on Historic Preservation as necessary.
- The permittee will be required to seek state and federal permit authorizations for project actions including but not limited to Section 404, Section 401 Water Quality Certification, and a Coastal Area Management Act (CAMA) Major permit.
- The permittee will forward a copy of all other agency permits related to the undertaking of the project. Copies will be forwarded to the Seashore's compliance office for inclusion in the project's administrative record.

- The permittee must locate any temporary storage areas for construction equipment and pipelines off the beach to the maximum extent practicable.
- A plan for post-project dune planting or sand fencing will be developed by the permittee and approved by the NPS after the nourished beach undergoes natural equilibration only if it is determined that planting or fencing will help stabilize the beach.
- The permittee shall provide to the NPS's POC all daily and weekly reports that it may receive from any entity pertaining to any of the project's operational and/or permitting requirements while the project is ongoing, including but not limited to: the contractor's daily quality control report, the daily and weekly dredging quality management report, the daily and weekly endangered species observation report, and the daily trawling report, including daily and weekly day-time turtle and bird monitoring reports, and daily and weekly night-time turtle monitoring reports.
- In addition to any other reviews or post construction monitoring that may be called for in other applicable permits, the NPS recommends that at least one post efficacy review, made during the required monitoring period pertaining to the volume of beach sand remaining on the beach, must be accomplished by an independent third party or company, and not affiliated in any way with the project. Copies of all reviews and reports following the project are to be provided to the NPS.
- Additional mitigation measures which may be required and enforced by other agencies include:
 - The permittee will provide protected species observers to be stationed on dredges to alert dredging personnel and record encounters. This will include authority to suspend operations while wildlife resources officials are contacted in the event of a take as defined under any consultation requirements.
 - The permittee must ensure that if a North Atlantic right whale is spotted or reported within 28 nautical miles of a vessel, all vessels must slow to 10 knots or slowest safe navigable speed for 36 hours.
 - The permittee may retain trained trawlers to trawl for sea turtles ahead of operating hopper dredges and relocate turtles if encountered or operate as non-capture trawling per final recommendations of NMFS.
 - The permittee may be required to ensure proper installation and function of a rigid draghead deflector.
 - The permittee must follow the FWS *Guidelines for Avoiding Impacts to the West Indian Manatee-Precautionary Measures for Construction Activities in North Carolina Waters*.
 - Prior to any permitted dredging activities, proposed dredge areas will be surveyed for hard bottom habitat, and no-dredge buffers will be established around it, if found.
 - Borrow areas will be subject to state requirements which include a survey for the borrow site and pipeline location.

MONITORING STRATEGY

Under the selected alternative, the NPS will set aside five segments, totaling approximately 12-13 Seashore miles (including a section of the Pea Island NWR portion of the Seashore), to provide reference zones that will be used to perform comparative ecological monitoring studies with nourishment project

areas. The areas designated for these reference zones² are illustrated as zone 2 in figures 3 and 4 in appendix A of the FEIS, and include:

- Pea Island NWR: Approximately 2 miles from the start of the Jug Handle Bridge to at the boundary of Mirlo Beach/Rodanthe Village. (Any studies or monitoring on the Refuge will require coordination with FWS and adherence to Refuge guidelines and applicable policies (e.g., compatibility, research SUPs, etc.))
- Between Salvo and Avon: 2 miles from Village of Salvo to 1 mile south of Ramp 25
- Cape Hatteras Point to Frisco: 5 miles from the point to an area west of Ramp 49
- Hatteras Island terminus: Approximately 1 mile from Ramp 55 toward the terminus (excluding the end of the island for habitat restoration projects)
- Ocracoke Island terminus: 2 miles from Ramp 72 to the intersection with Ocracoke Inlet

Long-term studies of intertidal invertebrates, erosion, storm impacts, and other metrics may be used to evaluate rates of recovery in nourishment areas. Information gained from ecological monitoring can be used to further improve conditions associated with future projects, including modification of the frequency, timing, and other methods associated with nourishment projects.

The NPS will require the applicant/permittee to conduct a pre-project physical assessment, pre-project ecological monitoring (where appropriate) and post-nourishment ecological monitoring at the sediment management project site location. The purpose of the monitoring program is to evaluate the recovery of physical and biological components of the beach ecosystem following sediment management activities. The ecological monitoring project will be required at the project site and at an approved reference zone location (control) to evaluate possible changes to beach characteristics including, but not limited to, beach grain size and benthic organisms. Specific monitoring efforts could include identifying differences in sediment (i.e., grain size, mineral content, compaction) between the control site and the nourished area; and measuring impacts on the abundance and distribution of swash zone benthic organisms (i.e., mole crabs, coquina clams, amphipods, and polychaete worms). The NPS does not intend to duplicate monitoring efforts at the nourished beach required by other agencies as part of the permitting process, but rather, will work in collaboration with the permittee and other agencies to determine an appropriate monitoring approach. Specific monitoring efforts at the nourished beach and the control site are intended to track longer-term evolution of morphology and habitat restoration between the two locations (nourished beach and control). The NPS will conduct sea turtle and shorebird monitoring within the project site and reference zone. The permittee will be required to submit an ecological monitoring report annually following data collection for two years following project implementation. Longer monitoring may be required if reports indicate that additional years are necessary.

Sample Monitoring Methods:

The following beach nourishment monitoring method was adapted from Corbett and Walsh (2017) after successful completion of post beach nourishment monitoring at Pea Island NWR.

The NPS may require the permittee to implement an ecological monitoring program designed to answer the following questions:

² The reference zones are subject to refinement during implementation, particularly due to the dynamic nature of the Seashore, but would not change substantially as to alter the impacts described in the FEIS.

- Were there differences in sediment (i.e., grain size, heavy mineral content, compaction) between the control area (reference zone) and nourished areas?
- Did nourishment have an impact on the distribution of swash zone macro-invertebrates?
- Was there “recovery” of the sediment and biological community following the nourishment?

Samples should be collected before and within two weeks after the nourishment process is complete. Following nourishment, samples should be collected seasonally (i.e., in fall, winter, spring, and summer) for two years. Longer monitoring may be required if reports indicate that additional years are necessary.

Sampling transects should be established by the permittee prior to the nourishment project and include a reference zone location (control area) and the nourished beach. Transects should be spaced at 0.1-mile intervals beginning at one end the beach nourishment project, extending to the other end of the beach nourishment project, including a gap to separate the treatment and control areas, if necessary.

Transects should extend from the toe of the primary dune to the oceanward end of the lower swash zone. Each transect should be numbered and locations recorded using GPS technology.

Along each transect location, samples should be taken at several geomorphic positions, including the dune toe, upper swash, mid-swash, and lower swash zones, and mid-beach (mid-way between the toe of the primary dune and top of the swash zone).

Swash zone invertebrate sampling should be conducted and organism abundance in the sample should be recorded. The physical characteristics of each transect site should be characterized. Measurements could include beach slope, compaction (via cone penetrometer), tide stage, foreshore and scarp slope and height. Air temperature, water temperature, wave height, and salinity should also be evaluated.

Sand samples should be dried and split into fractions suitable for grain size and heavy mineral volume analysis.

The permittee will submit data and reports of post project monitoring to the SUP coordinator or, if an NPS research permit was required for the project, the park Research Coordinator. The name of the appropriate NPS employee will be included in the SUP conditions.

All results and raw data collected during the monitoring effort should be available electronically. This data should include sand sample analyses, cone penetrometer measurements, elevation profiles, and macroinvertebrate counts collected by the permittee. A report should be produced by the permittee at the end of each individual year required for post nourishment monitoring. Each report should detail answers to the questions identified above and be shared with the NPS.