Cape Hatteras National Seashore

Buxton, Dare County, North Carolina

Environmental Assessment

Beach Restoration to Protect NC Highway 12
Clean Water Act 404 and NPS Special Use Permits

At Buxton, Dare County, North Carolina

September 2015

Volume I

US ARMY CORPS OF ENGINEERS

US DEPARTMENT OF INTERIOR

NATIONAL PARK SERVICE

CAPE HATTERAS NATIONAL SEASHORE

NORTH CAROLINA

BEACH RESTORATION TO PROTECT NC HIGHWAY 12

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ENVIRONMENTAL ASSESSMENT

15 SEPTEMBER 2015

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ACRONYMS

AEC	Area of Environmental Concern
ASCE	American Society of Civil Engineers
BA	Biological Assessment
BAV	Beach Action Value
BC	Berm crest
BEACH	Beaches Environmental Assessment and Coastal Health (BEACH) Act of 2000
BO	Biological Opinion
CAMA	Coastal Area Management Act
CBIA	Coastal Barrier Improvement Act
CBRA	Coastal Barrier Resources Act
CEQ	Council on Environmental Quality
CERC	Coastal Engineering Research Center
CFR	Code of Federal Regulations
CHWA	Cape Hatteras Water Association
CSE	Coastal Science & Engineering Inc
CWA	Clean Water Act
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
CZR	CZR Incorporated
DPS	Designated Population Segment
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
GENESIS	Generalized model for simulating shoreline change
GIBA	Globally Important Bird Area
HAPC	Habitat Areas of Particular Concern
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
LEDPA	Least Environmentally Damaging Practicable Alternative
MBTA	Migratory Bird Treaty Act
MMMA	Marine Mammal Protection Act
MLW	Mean low water
MTL	Mean tide level
NAS	National Academy of Sciences
NAVD	North American Vertical Datum
NC 12	North Carolina State Highway 12
NCCRC	North Carolina Coastal Resources Commission
NCDCCPS	North Carolina Department of Crime Control and Public Safety
NCDCM	North Carolina Division of Coastal Management
NCDENR	North Carolina Department of Environment and Natural Resources
NCDMF	North Carolina Division of Marine Fisheries

NCDOT	North Carolina Department of Transportation
NCSG	North Carolina Sea Grant
NCDWR	North Carolina Division of Water Resources
NCNHP	North Carolina Natural Heritage Program
NCWRC	North Carolina Wildlife Resources Commission
NDBC	National Data Wave Buoy
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NMNH	National Museum of Natural History
NOAA	National Oceanic & Atmospheric Administration
NOI	Notice of Intent
NOS	National Ocean Service
NPS	National Park Service
NPS	Non-Point Source Pollution
NRC	National Research Council
NRCS	Natural Resources Conservation Service
OCRM	Office of Ocean & Coastal Resource Management
OPA	Otherwise Protected Area
OSHA	Occupational Safety and Health Administration
PEPC	Planning, Environmental and Public Comment
PRD	Protected Resource Division [National Marine Fisheries Service (NOAA)]
SARBO	South Atlantic Regional Biological Opinion
Seashore	Cape Hatteras National Seashore
SERO	Southeast Regional Office (NOAA)
SHPO	State Historic Preservation Office
SOSUS	Sound Surveillance System
STWAVE	Steady-state spectral wave model
USACE	US Army Corps of Engineers
USDA	US Department of Agriculture
USFWS	US Fish & Wildlife Service
USGS	US Geological Survey
WIS	Wave Information Study

BEACH RESTORATION

AT BUXTON, DARE COUNTY, NORTH CAROLINA

Environmental Assessment

CHAPTER 1 – PURPOSE AND NEED FOR ACTION

INTRODUCTION

This Environmental Assessment (EA) is prepared in connection with an application by Dare County, North Carolina (Applicant), for federal and state permits to place sand along a 3-mile length of Hatteras Island. This 3-mile beach includes ~2.2 miles in the Cape Hatteras National Seashore (Seashore) and ~0.8 mile along the village of Buxton (Fig 1.1), hereafter referred to as the Proposed Action Area or Buxton Action Area. The federal action analyzed in this Environmental Assessment is to decide whether or not, and under what conditions, to issue the permits the Applicant has requested.

This Environmental Assessment is prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 (as amended) to address environmental and public safety concerns (Figs. 1.1 and 1.2). If the permits are issued, the project would serve the following purposes according to the Applicant:

1) To provide a wider beach and buffer storm waves along a critically eroding section of Hatteras Island.

2) To reduce the frequency of storm damages to North Carolina Highway 12 (NC 12) and existing community infrastructure.

3) To replace erosion losses and augment the regional supply of beach sand by using a non-littoral borrow source of compatible sediments from an offshore borrow area.

The permitted project would encompass up to 15,500 linear feet of ocean beach (2.94 miles) and would call for up to 2.6 million cubic yards of beach quality sand to be pumped onto the beach via dredge. The Applicant's proposed source of sand for beach nourishment is from an offshore borrow area situated within state waters about 1.7 miles off the former site of the Cape Hatteras Lighthouse (Fig 1.1). The borrow site is an isolated shoal in water depths between ~32 and 45 feet. Sand would be discharged along the beach via hydraulic pipeline and spread by land-based equipment at grades and slopes similar to the natural dry-sand and wet-sand beach. According to the Applicant, no nourishment sand would be placed on existing vegetation, dunes, shore-protection structures, or upland property. If approved, the permits would allow one nourishment event up to the scale and extents outlined herein.

This Environmental Assessment discusses the purpose and need for the Proposed Action (Chapter 1), alternatives considered (Chapter 2), affected environment (Chapter 3), and environmental consequences (Chapter 4). In addition to the Applicant's selected action alternatives, this Environmental Assessment addresses the No-Action Alternative. Supplementary data and analyses pertinent to the Proposed Action are contained in Appendices A-G.

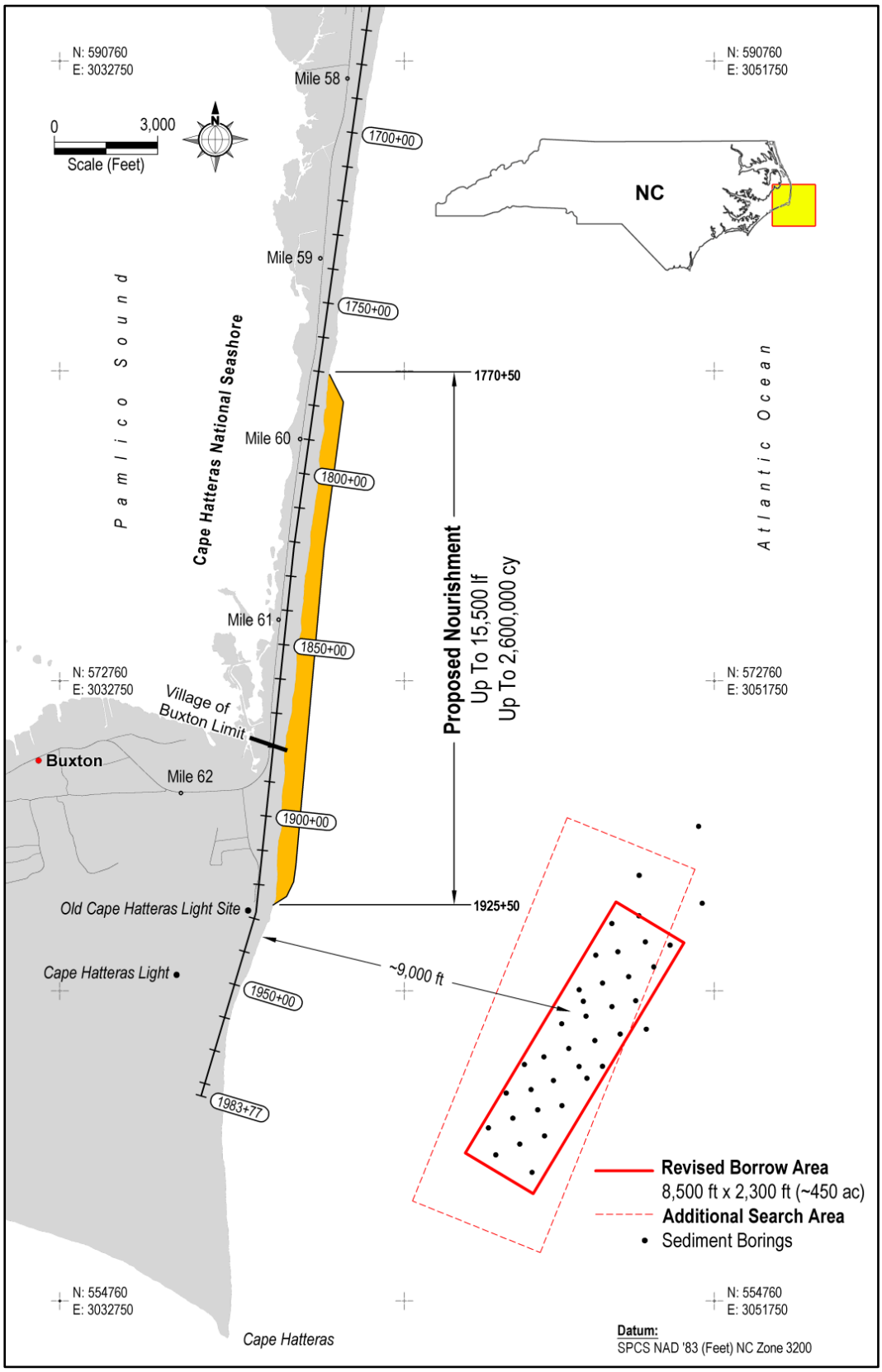

Figure 1.1. Map showing Applicant's Proposed Action illustrating maximum limits of nourishment along the oceanfront in the vicinity of Buxton, NC. The sand source is an offshore borrow area situated about 9,000 feet from the former site of the Cape Hatteras Lighthouse.

Figure 1.2. Oblique aerial photograph of Cape Hatteras National Seashore looking south in the vicinity of Buxton Village on 11 September 2014 showing the approximate limits of the proposed beach nourishment project. The northern project limit is in the vicinity of the Haulover Day Use Area of the Seashore. The southern project limit is in the vicinity of the former site of the Cape Hatteras Lighthouse site. (Image by Coastal Science & Engineering)

The alternatives, identification of the affected environment, and potential environmental consequences have been developed in coordination with the Applicant. The US Army Corps of Engineers (Wilmington District, North Carolina) is the lead agency, and the other principal federal agency is the National Park Service (Cape Hatteras National Seashore, Manteo, North Carolina). Primary corresponding federal resource agencies which have provided detailed guidance include US Fish & Wildlife Service (USFWS, Raleigh, North Carolina) and National Marine Fisheries Service (NMFS, Beaufort, North Carolina). The North Carolina Department of Environment & Natural Resources (NCDENR) and its various corresponding resource divisions have provided input to this National Environmental Policy Act document via pre-application meetings in Washington, North Carolina.

The public may review and comment on the Environmental Assessment via:

Beach Restoration to Protect NC 12 Permits EA
US Army Corps of Engineers–Wilmington District
Washington Regulatory Field Office
2407 West Fifth Street
Washington, NC 27889
Attn: Raleigh W Bland, PWS

In addition, a public forum(s) on the project will be convened prior to issuance of permits with press releases, notices published in local papers, and posted on the project website prior to each event.

PURPOSE AND NEED

The purpose of the federal action is to respond to Dare County's permit applications, considering the purposes and resources of the Cape Hatteras National Seashore as expressed in statute, regulation and policy, and the National Park Service's objectives in taking action, detailed later in this chapter. Federal action is required by the US Army Corps of Engineers (USACE) to determine whether the Proposed Action meets the standards and requirements for issuance of a major permit for construction activities in critical areas and in the coastal zone. State action and a permit for construction in state waters are required under the NC Coastal Zone Management Act (CAMA), which is a prerequisite for the federal permits.

The Applicant's stated purpose for submitting permit applications to federal and state agencies is to secure permission to conduct a beach nourishment project. The permit requests are seeking approval for a one-time event to address the immediate problem of beach erosion along critically eroding sections of Hatteras Island and to protect NC State Highway 12 (NC 12) and community infrastructure. Sand placed along portions of the Seashore would be expected to migrate south (downcoast) and to feed other sections of Hatteras Island, while reducing runup and damage to existing dunes, backshore habitat, and infrastructure in the Buxton area. The Proposed Action would provide a wider beach to serve as a critical buffer for storm waves between the ocean and NC 12, the main highway serving the Seashore.

Need for Action

Federal action is needed by US Army Corps of Engineers for reasons stated above in Purpose and Need. NPS action is needed because Dare County has submitted an application and a plan to expand beach areas under NPS jurisdiction, which includes widening Buxton beach. Before the National Park Service can issue a special use permit allowing beach expansion within the park, it must consider and assess the potential impacts of the action on the natural and human environments pursuant to the National Environmental Policy Act. The NPS permit would be issued in coordination with the USACE permit.

The Applicant has proposed the action because Buxton's beach is narrower than other sections of beach on Hatteras Island. Normal waves are directly impacting developed property, and highway NC 12 is frequently flooded (Fig 1.3). The only road providing access to historic villages and park resources along Hatteras Island, NC 12 accommodates millions of visitors each year and serves as a critical lifeline for the health and safety of Hatteras communities. Dare County holds no jurisdiction over the maintenance of NC 12, as it is the State's responsibility to maintain the highway. While Dare County is involved in meetings addressing the erosion at Buxton, the county is dependent on the NC Department of Transportation (NCDOT) to develop solutions regarding the highway itself and to act on them.

Figure 1.3. Flooding of NC 12 and damaging waves along the Buxton oceanfront during a northeaster on 8 December 2014. (a) NC 12 at the highway curve entering Buxton Village from the Seashore (photo by Brett Burley). (b) Wave breaking on emergency sand bags along a local oceanfront motel (photo by Danny Bowers). (c) Flooding on NC 12 near the Buxton Village-Seashore border looking northeast (photo by Danny Bowers). Erosion has left little sand on the beach along this section of Hatteras Island and, consequently, normal waves impact existing buildings.

A study commissioned by the Applicant has documented an estimated sand deficit that exceeded 900,000 cubic yards along the ocean beach in the Proposed Action Area (CSE 2013b). This deficit (i.e. the volume of sand needed to comprise a stable[1] beach) has developed over several decades. The foredune north of Buxton Village has breached frequently, damaging NC 12, often to the degree it is too dangerous or impossible to drive on. This has caused the NC Department of Transportation to conduct emergency repairs and push the dunes back up to keep NC 12 open (NCDOT, 2015 in prep, *Feasibility Study of Alternatives for NC 12 in the Buxton Area*). While efforts to maintain the protective dune have been successful for limited times between storm events, the condition of the beach has worsened. As beach width and sand volume decline, the vulnerability of NC 12 and infrastructure along the coast increases (NRC 1995). Sand losses due to chronic erosion in the Buxton Action Area have accumulated to the point where the amount of sand in the beach zone[2] is similar to that of Rodanthe in 2011 and is significantly lower than adjacent stable sections of Hatteras Island (see Appendix A - *Littoral Processes*).

Figure 1.4 shows the section of Hatteras Island about 20 miles north of the Buxton Action Area around the communities of the Tri-Villages (Rodanthe, Waves, and Salvo) along with the approximate width of the beach-dune system seaward of existing structures. Each community's vulnerability to storms is directly related to the condition of the littoral profile (ie the width and volume of sand seaward of buildings and infrastructure) as depicted in land cutaway diagrams (profiles) to left of the photo.

As depicted in Figure 1.4, Rodanthe has a narrow beach and negligible dune protection seaward of buildings. The communities of Waves and Salvo have increasingly wider beaches and dunes between buildings and the ocean. The latter two communities sustained Hurricane *Irene* (2011) and *Sandy* (2012) with little damage, whereas at Rodanthe numerous houses were damaged. Present conditions in the Proposed Action Area are similar to conditions in 2011 along parts of Pea Island, at Mirlo Beach, and at Rodanthe when breach inlets formed during Hurricane *Irene* (Fig 1.5) (CSE 2013b, USACE 2013a). The beach is narrow and highly vulnerable to breaching during storms.

The Applicant believes continued beach erosion would impact natural, cultural, and human resources in the Proposed Action Area. The narrow beach would allow waves to wash out the foredune during minor storms, leave steep escarpments, breach the dunes in places, and deposit sand on NC 12. There could be loss of bird and turtle nesting habitat seaward of the dune line and loss of vehicle access to communities at Cape Hatteras. Emergency repairs would be required to restore infrastructure and reopen NC 12; however, the underlying sand deficit along the Proposed Action Area would not change, leaving the area vulnerable to repeated damage.

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[1] *A stable beach is herein defined as a beach with sufficient width and sand volume to withstand normal yearly fluctuations in its profile without damage to the foredune. Beaches with insufficient sand volume in their profile have a deficit, which can be approximated by comparing stable beaches with eroded beaches as discussed in Appendix A.*

[2] *The active beach zone is considered to be the area between the toe of the foredune and some depth offshore where sediments are mobilized and shaped by waves, and the bottom elevation changes measurably at yearly to decadal scales.*

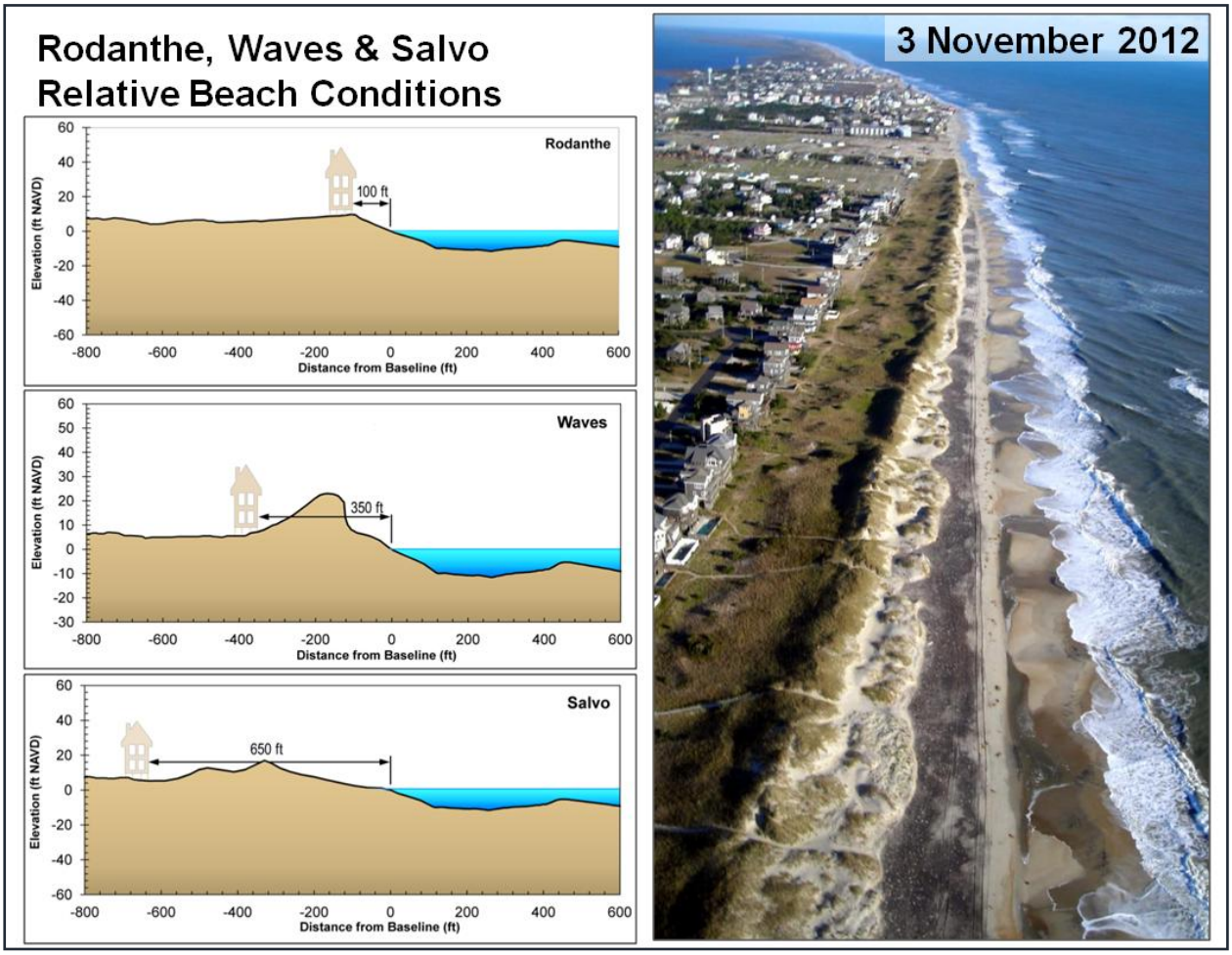

Figure 1.4. The shoreline along the village of Waves (NC) on Hatteras Island ~20 miles north of Buxton. The Village of Rodanthe is at the top of the photo, and the Village of Salvo is out of the picture below the bottom of the image. Photo was taken one week after Hurricane *Sandy* passed offshore (late October 2012). The side panels provide cutaway diagrams across the barrier beach and inshore area based on surveys by Coastal Science & Engineering in 2013. The panels show relative differences in beach and dune width seaward of buildings. Prior to Hurricanes *Irene* (27 August 2011) and *Sandy*, sections of Rodanthe lacked any dry-sand beach, whereas parts of Salvo had an ~400-foot wide dune field and dry beach seaward of development. Damages and overwash were severe along narrow sections of the island but negligible along stable areas of Hatteras Island such as Waves and Salvo. (Image by Coastal Science & Engineering)

Figure 1.5. Map illustrating the path of Hurricane *Irene* (27 August 2011). Dune breaches along low areas where the beach was narrow combined with peak tides in Pamlico Sound caused two inlet breaches:

Breach 1 (upper photo): ~29 miles north of Buxton Village along the Pea Island National Wildlife Refuge.
Breach 2 (middle photo): ~24 miles north of Buxton Village at Mirlo Beach (north end of Rodanthe).
Where the beach and foredune were wide between Waves and Salvo (lower photo), storm damage was negligible.

The worst oceanfront damage along the northern Outer Banks during *Irene* was at Mirlo Beach (middle photo). Storm waves eroded the foredune and washed into low areas along the barrier island, initiating breaches at several places. The lagoon surge and lower ocean tide on the evening of 27 August 2011 likely produced a sufficient head of water to cut the new inlets in the seaward direction at Rodanthe and along Pea Island. Both breaches closed naturally within weeks to a few months of the event with additional restoration work around the Mirlo Beach channel to rebuild the road bed.

(Images by Coastal Science & Engineering, Source: Kana et al. 2012)

Project Background

The location of the Proposed Action is on Hatteras Island in the Village of Buxton in the Outer Banks of North Carolina. Hatteras Island is part of a nearly continuous chain of barrier islands which extend from New York to Florida. As shown in Figure 1.6, the Cape Hatteras National Seashore includes portions of the islands of, Hatteras, Bodie, and Roanoke, which together offer about 70 miles of ocean shoreline. A similar length chain of barrier islands immediately to the south comprise the Cape Lookout National Seashore.

One of the largest preserved parcels of the Outer Banks, the Seashore offers beachcombing, birding, fishing, camping, wind-surfing, and kite-boarding to beachgoers and road trippers each year. The area is known for its abundant recreational, natural, and cultural resources, including such historic locations as the Cape Hatteras Lighthouse, the Chicamacomico Life Saving Station, the Wright Brothers National Memorial, and the Fort Raleigh National Historic Site (Cape Hatteras National Seashore, OuterBanks.com Visitor's Guide. http://www.outerbanks.com/cape-hatteras-national-seashore.html – accessed 17 April 2015).

There is only one highway linking all the Seashore islands and villages along the ocean. Before NC 12 was built, islanders drove on the beach to access homes and businesses. Seven villages—Hatteras, Frisco, Buxton, Avon, Salvo, Waves, and Rodanthe (from south to north)—occupy Hatteras Island, which includes a year-round population of ~ 4,300 people (2010 Census). Buxton is the largest of the villages, known for world-class surf fishing and the Cape Hatteras Lighthouse (Cape Hatteras National Seashore, OuterBanks.com Visitor's Guide. www.outerbanks.com/hatteras-island.html – accessed 14 April 2015). The Hatteras Lighthouse is a registered National Historic Landmark and a National Historic Civil Engineering Landmark, since its relocation inland in 1999 (Booher & Ezell 2001).

Hatteras Island has been positionally stable for over three centuries (Everts et al. 1983, Byrnes et al. 2003). Portions of the island, such as Waves, Salvo, and south Buxton, enjoy wide and stable beaches which have been accumulating sand. Other areas are narrow and have sustained extensive erosion along the oceanfront, notably around Rodanthe and East Buxton (NCDENR 2012).

Shoreline change rates along the Outer Banks oceanfront are variously reported to average 2.6 feet per year (Everts et al. 1983) to 4.5 feet per year (NCDENR 2012). At several localities, including south Nags Head, Pea Island, Mirlo Beach, and the Buxton Canadian Hole just north of the village, erosion rates have exceeded 10 feet per year over the past 50 years (NCDENR 2012). Coincidentally, these sites have experienced chronic dune breaching, over wash onto NC 12, or formation of temporary breach inlets.

Hatteras Island plays a vital economic role in the state and local economy. During peak tourist season, the Island receives up to 50,000 visitors daily which, in recent years, has stimulated notable growth in rental properties and businesses. A study for the Outer Banks Visitors Bureau (Lane 2013) found that Hatteras Island's tourism expenditures totaled $204 million in 2011, with a state tax contribution of $10.3 million and $9.4 million in local taxes. Also in 2011, island real estate generated >$9 million annually in Dare County property taxes and $2.1 million in occupancy tax collections. However, that same year, it was estimated that $2 million was lost in annual occupancy rates (in tourism terms shoulder season September and October), due to a two-month closure of NC 12 for dune rebuilding and road repairs.

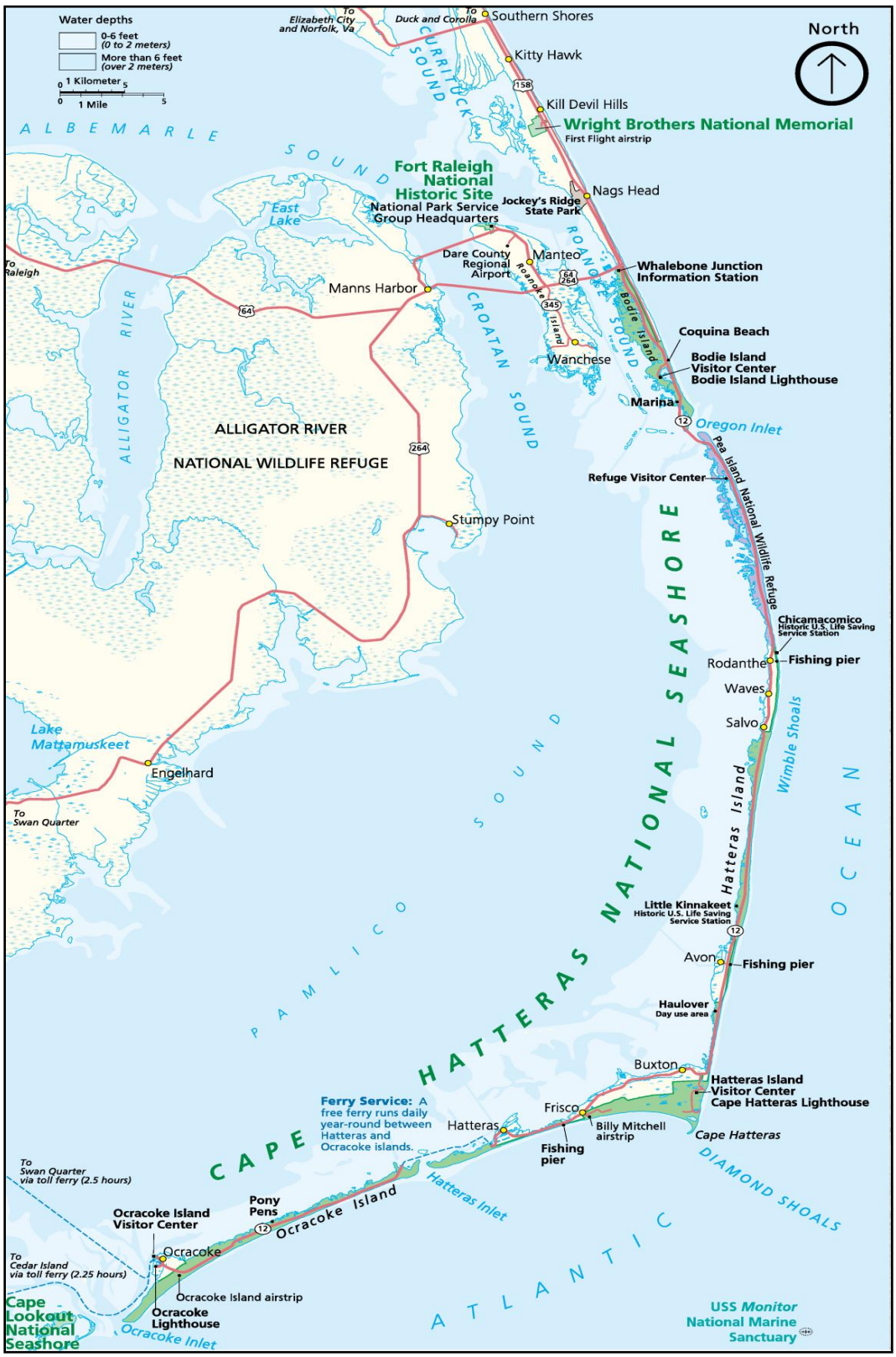

Figure 1.6. Map of Cape Hatteras National Seashore. The Buxton Action Area is situated between the Cape Hatteras Lighthouse and Haulover Day Use Area at the lower right corner of the map (NPS 2011).

In response to erosion, NC 12 has been realigned at some localities, including the Proposed Action Area north of Buxton Village. The highway was washed out by a breach inlet in 1962 (Fig 1.7) and was severely overwashed during other storms between 1962 and 1973 (Fisher 1967, Everts et al. 1983). After the 1960s storms, a realignment of NC 12 shifted the road as close as practicable to Pamlico Sound (NPS 1980). Beach nourishment between 1966 and 1973 reportedly helped mitigate breach events for over 20 years (Lighthouse View Motel, J. Hooper, former Dare County commissioner, pers. comm., April 2014). However, continued loss of sand along the Buxton Canadian Hole has resulted in more frequent road repairs by NCDOT as a result of foredune breaches. The most recent repairs were in response to Hurricane *Irene* (August 2011) and Hurricane *Sandy* (October 2012).

Maintenance of NC 12 has been an issue for decades and remains the subject of intensive study by NCDOT. Presently, NCDOT is developing a feasibility study for NC 12 in the Buxton area to consider alternatives for interim (5-year) protection and longer term (50-year) protection (NCDOT, J. Jennings, Division Director, pers. comm., February 2015). Any improvements or modifications to NC 12 are subject to existing Easements and agreements between the National Park Service and NCDOT. While NCDOT studies are underway, the Applicant has reviewed the options for protection of NC 12, infrastructure, and maintenance of the beach under present coastal zone management (CZM) rules and regulations. The Applicant has determined that a wider beach is needed in the Buxton area to restore the sand deficit, protect the foredune and infrastructure, and maintain access via NC 12 in the Buxton Action Area with minimum disruption to the economy and the environment.

Erosion has also undermined 51 houses and motel units along the Eastern shore of Buxton Village, leading to emergency measures. These include sand-bagging to protect structures along ~1,500 linear feet of oceanfront at the south end of the Proposed Action Area (see Fig 1.3). Sand bags have eliminated a recreational beach and related habitats along ~10% of the beach in the Proposed Action Area.

The County commissioned a feasibility study to evaluate erosion and beach restoration alternatives (CSE 2013b). Detailed surveys into deep water documented that erosion over several decades has left a major sand deficit in the Buxton area relative to adjacent sections of beach (see Appendix A – *Littoral Processes*). Dune-breach events have generally occurred in the areas of Hatteras Island where dunes are low, the beach is narrowest, and there is less sand seaward of buildings and infrastructure compared with a normal stable beach (see Fig 1.5). The breaches at Pea Island and Mirlo Beach during Hurricane *Irene* (2011) are examples.

PURPOSE AND SIGNIFICANCE OF THE PARK

In 1937, Congress authorized the establishment of a national park along the Outer Banks in the state of North Carolina to be administered under the Secretary of the Interior by the National Park Service. This park was designated a national seashore and established as the Cape Hatteras National Seashore 12 January 1953. The Seashore lands comprised ~100 square miles on the islands of Ocracoke, Hatteras, Bodie, Roanoke, and Colington, except those lands within the limits of established villages. Under the enabling legislation and later amendments, certain areas of the Seashore were designated for recreational use, hunting and fishing, primitive wilderness, and as a migratory bird refuge. As defined by the park service in the Seashore's *Foundation Statement*, the purpose of the park is (see Fig 1.6):

> *to permanently preserve the wild and primitive character of the ever- changing barrier islands, protect the diverse plant and animal communities sustained by the coastal island processes, and provide for recreational use and enjoyment that is compatible with preserving the distinctive natural and cultural resources of the nation's first national seashore.* (NPS 2011 pgs 9–11)

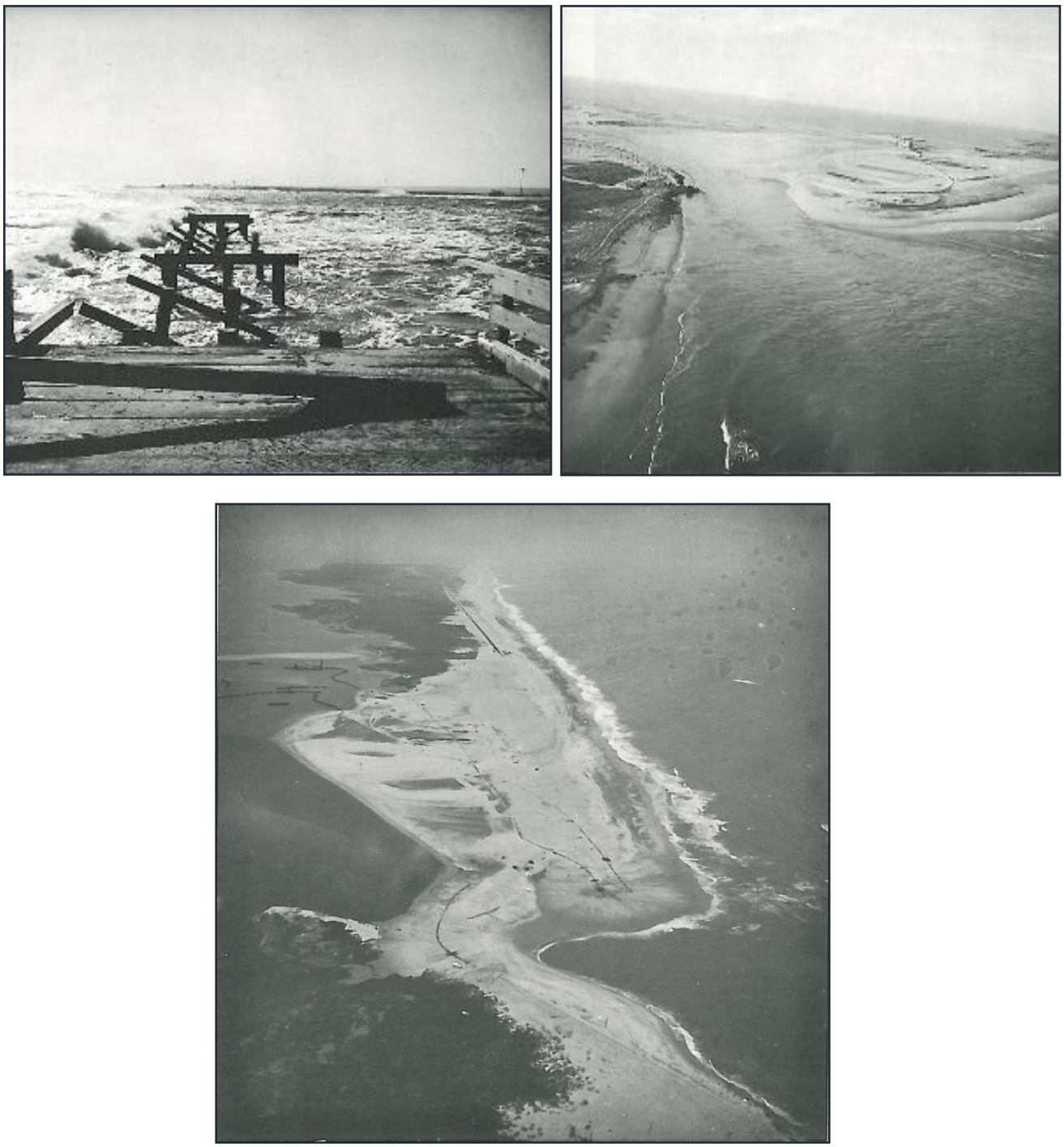

Figure 1.7. In March 1962, the mid-Atlantic northeaster of record, Ash Wednesday storm, breached the dunes at Buxton and opened an inlet within the Proposed Action Area. A temporary timber bridge was built over the inlet to restore access. However, a northeaster during the period 25 November to 3 December 1962 destroyed the bridge. The images show the inlet at Buxton (upper left) looking south (5 December 1962). Local interests (non-federal) closed the breach between (upper right) 29 January 1963 and (lower) 21 February 1963. The borrow source was in Pamlico Sound in close proximity to the project site. (From USACE 1963, Appendices 6-19)

Continuing in the *Foundation Statement*, the park service recognized seven areas of major coastal, biological, cultural, and historical significance. These included the preservation of unspoiled barrier islands, their associated flora and fauna, and recreational use; the inherent value as a living laboratory for physiographic, oceanographic and ecological research; the diversity of aquatic and terrestrial habitat which support a variety of marine and land-based wildlife, including protected and endangered species; the tangible archeological links to human survival and adaptation in a coastal environment isolated from the mainland; and historical events of national significance on or near its shores, including shipwrecks, wartime reconnaissance, and development of new technology (NPS 2011, pgs 10–11). The Applicant's Proposed Action could potentially impact each area of significance cited by the park service.

The National Park Service has designated ten national seashores including seven along the US East Coast. The four closest to Cape Hatteras are Fire Island (NY), Assateague Island (MD/VA), Cape Lookout (NC), and Cumberland Island (GA). Fire Island, Cape Lookout, and Cumberland Island are not accessible via road, while Cape Hatteras and Assateague Island are accessible. This difference in accessibility is reflected in the number of annual visitors (Table 1). During the past decade, Cape Hatteras and Assateague Island National Seashores have averaged over two million visitors per year. By comparison, Fire Island and Cape Lookout numbers around 500,000 visitors per year, and Cumberland Island sees less than 100,000 visitors per year.

The infrastructure along Hatteras Island that supports visitors and the long-established communities is far more extensive than that of the other national seashores referenced in Table 1. Roads, power lines, sewage treatment plants, parking areas, marinas, and extensive commercial activities have modified the natural setting. Unlike the Cape Hatteras National Seashore, the other seashores do not have a paved road spanning their lengths and are mainly undeveloped wildlife preserves.

TABLE 1.1 2010–2014 Average Annual National Seashore Attendance – US East Coast (http://irma.nps.gov/stats/)

Location	Ocean Shoreline (Miles)	Accessible by Car?	2010–2014 Avg. Annual Visitation
Cape Hatteras	70	Yes	2,164,792
Cumberland Island	18	No	68,121
Fire Island	32	No	458,825
Assateague Island	38	Yes	2,118,775
Cape Lookout	55	No	473,217

PREVIOUS AND RELATED PLANNING AND RESEARCH

An extensive literature review was conducted in the preparation of this Environmental Assessment, including several dozen articles and reports, EIS's, and EA's on similar projects along the Outer Banks and the Seashore, published between 1943 and 2014. Table 1.2 (next page) lists some of the key plans and studies which informed the development of alternatives for the Proposed Action. Additional background information and references are contained in Appendices A-G of this EA.

TABLE 1.2 Annotated list of plans and studies which informed and contributed to the development of alternatives according to the Applicant. USACE – US Army Corps of Engineers. CRA – Coastal Research Associates (Charlottesville, VA). ECU – East Carolina University (Greenville, NC.) CSE – Coastal Science & Engineering (Columbia, SC). CZR – CZR Incorporated (Wilmington, NC).

Date	Title	Source	Description
1963	**Report on Operation Five High. App 6-19. Closure of Buxton Inlet**	USACE	Documents impacts of March 1962 Ash Wednesday storm, which breached Hatteras north of Buxton Village within the Proposed Action Area (see Fig 1.7).
1974	**Buxton Beach 1973 Nourishment Project: An Annotated Photographic Atlas**	CRA	Prepared for NPS, report documents the 1973 beach nourishment project; ~1,300,000 cy pumped from Cape Point to Buxton Action Area; constructed between April and September.
1983	**Report on Shoreline Movement: Cape Henry (Virginia) to Cape Hatteras (North Carolina), 1849–1980**	USACE	Comprehensive shoreline change data spanning 130 years includes ocean and sound shorelines. Documents erosion of ocean shorelines averaging ~0.8 meter per year and sound shoreline at 0.1 meter per year. Documents 30 inlets opened and closed during the past ~400 years (i.e. ~7.5 inlets per century) with all but three of them (Oregon, Hatteras,) being short-lived.
2000	**FEIS on Hurricane Protection and Beach Erosion Control: Dare County Beaches (North Carolina)**	USACE	Recommends nourishment along ~14 miles of Bodie Island beaches including 10 miles along Nags Head. Addresses many of the environmental impacts that need to be considered for other nourishment projects in Dare County.
2006	**Management Policies – The Guide to Managing the National Park System**	NPS	Report outlines mandate for preserving and protecting America's national parks. For national seashores, the management policies discourage interference of natural barrier-island processes, in response to past modification of parks by development, construction/maintenance of roads, and rebuilding dunes.
2007	**The Creation and Establishment of Cape Hatteras National Seashore: The Great Depression through Mission 66**	NPS	Describes Seashore history, including early beach erosion control and dune restoration measures in the 1930s, the disposition of the Cape Hatteras Light Station, and efforts to improve park access by ferry and road construction.
2008	**North Carolina's Coasts in Crisis: A Vision for the Future**	ECU	Presents a theory that Hatteras Island is evolving toward a string of isolated islands separated by numerous tidal inlets, due principally to sea level rise.
2010	**FEIS: Beach Nourishment Project, Town of Nags Head (North Carolina)**	USACE	FEIS for the 4.6 million cy beach nourishment project completed between May and October 2011 along the Town of Nags Head. The 10-mile-long project used an offshore borrow source and was constructed by dredge with environmental protection measures prescribed under the permits. Project locally funded.
2012	**NPS Beach Nourishment Guide: Natural Resource Technical Report NPS/NRSS/GRD/NRTR-2012/581**	NPS	Provides guidance to better plan and manage beach nourishment projects when beach nourishment determined to be consistent with NPS management policies. Under NPS policies allowing intervention in natural geologic processes (pg 3), the Buxton Proposed Action must satisfy requirements for sediment quality, endangered species protection, and preservation of natural barrier-island processes.
2013	**Inventory of Coastal Engineering Projects in the Cape Hatteras National Seashore**	NPS	Provides information on prior coastal engineering projects identified in or immediately adjacent to the Seashore: 48 coastal structures, 17 beach nourishments, 5 dredging projects, and 2 dune construction projects.
2013	**Shoreline Erosion Assessment & Plan for Beach Restoration: Rodanthe & Buxton Areas, Dare County, North Carolina**	CSE	Evaluates the feasibility and probable costs of beach restoration and maintenance for up to ten years in the Rodanthe and Buxton areas on Hatteras Island. It serves as a primary reference for the Proposed Action and provides the preliminary technical basis for the Applicant's proposed plan.
2014	**Nags Head 2011 Beach Nourishment Project: Post-Year 2 and Final Report**	CZR-CSE	In accordance with benthic monitoring plan of NCDENR/NCDCM Permit 45-10, presents results of (1) pre- and post-nourishment biological sampling, (2) methodology and results from 4 seasonal pre-nourishment benthic sampling events and 8 seasonal post-nourishment benthic sampling events. Compares results of species abundance and diversity in the action area and adjacent unnourished areas.
2014	**Monitoring and Analysis of the 2011 Nags Head Beach Nourishment Project**	CSE	Presents beach-condition survey results covering three years of physical monitoring following construction of the 2011 beach nourishment project. Provides breakdowns of nourishment volumes remaining within four segments of the beach and six cross-shore zones. Data document the longshore and cross-shore adjustment of the nourishment and its response to storm events, including Hurricane *Irene* (27 August 2011) during construction and Hurricane *Sandy* (27 October 2012).

LAWS, REGULATIONS, AND POLICIES

Table 1.3 provides federal and state laws, regulations and policies relevant to this EA.

Table 1.3. US laws and regulations covering the coastal zone (presented in order of year passed)

Name	Administered by	Purpose
1968 National Flood Insurance Program (NFIP) (Created under the National Flood Insurance Act)	Federal Emergency Management Agency (FEMA)	- To reduce the loss of life and damage caused by flooding. - To help victims recover from floods. - To promote an equitable distribution of costs among those who are protecte by flood insurance and the general public. (NFIP Coastal Regulations–1968 to Present. (2011). NC Cooperating Tech. State. www.ncfloodmaps.com/pubdocs/fact_sheets/coastal_regs.pdf. Accessed 10 April 2015).
1969 National Environmental Policy Act (NEPA)	Council on Environmental Quality (CEQ)	- Prescribes requirements of federal agencies for reviews of proposed actions involving work in federal lands or where there is a federal interest.
1972 Clean Water Act (CWA)	Environmental Protection Agency (EPA)	- Establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface water Enacted in 1948 as the Federal Water Pollution Control Act, the CWA was reorganized and expanded in 1972.
1972 Coastal Zone Management Act (CZMA)	Office of Ocean & Coastal Resource Management (OCRM) / National Oceanic and Atmospheric Administration NOAA	- To manage the nation's coastal resources, including the Great Lakes. - To balance economic development with environmental conservation. - To preserve, protect, develop, and where possible, to restore/ enhance the resources of the nation's coastal zone. The CZMA also established: - National Coastal Zone Management Program to balance competing land and water issues in the coastal zone, and - National Estuarine Research Reserve System to identify field laboratories for research to arrive at a greater understanding of estuaries and how humans impact them. (NFIP Coastal Regulations–1968 to Present (2011). NC Cooperating Tech. State. www.ncfloodmaps.com/pubdocs/fact_sheets/coastal_regs.pdf. Accessed 10 April 2015)
1972 Marine Mammal Protection Act (MMPA)	National Marine Fisheries Service (NMFS)/ National Oceanic and Atmospheric Administration (NOAA)/ US Commerce Department	- To protect whales, dolphins, porpoises, seals, and sea lions by establishing a national policy: - To prevent marine mammal species and population stocks from declining to the degree they are no longer a significant part of their ecosystem. - To manage populations to maintain the health and stability of the marine ecosystem. - To set requirements for animal population management that places the benefit of the animal before commercial exploitation. - To prohibit the taking (harassment, injury, killing) of marine mammals unless exempted or specifically permitted or authorized as described in Section 101(a) (5) (A) and (D). - To require ESA Sect. 7 consultation for the issuance of incidental take authorizations under the MMPA. (www.nmfs.noaa.gov/pr/pdfs/mmpa_factsheet.pdf.; www.nmfs.noaa.gov/pr/. Accessed 13 August 2015.)
1973 Endangered Species Act (ESA)	US Fish and Wildlife Service (USFWS) / US Department of the Interior / National Marine Fisheries Service (NMFS) / US Commerce Department	- To designate/ conserve species that are endangered or threatened throughout all or a significant part of their range. - To conserve the ecosystems on which they depend. - To replace the Endangered Species Conservation Act of 1969. (Endangered Species Act (ESA). No pub date. NOAA Fisheries. www.nmfs.noaa.gov/pr/laws/esa/. Accessed 10 April 2015)
1982 Coastal Barrier Resources Act (CBRA)	USFWS / US Department of the Interior	- To designate relatively undeveloped coastal barrier areas along the Atlantic and Gulf Coast as part of the John H. Chafee CBRS. - To outline how to identify, map, and maintain CBRS areas. - To minimize the loss of human life, wasteful expenditure of Federal revenues and damage to fish, wildlife, and other natural resources. - To restrict future federal expenditures and financial assistance which have th effect of encouraging development in these sensitive areas. (NFIP Coastal Regulations–1968 to Present. (2010). NC Cooperating Tech. State. www.ncfloodmaps.com/pubdocs/fact_sheets/coastal_regs.pdf. Accessed 10 April 2015)

NC Laws and Regulations for Activities in the Coastal Zone (Table 1.3 continued)		
Name	**Administering Agency**	**Purpose**
1990 Coastal Barrier Improvement Act (CBIA) (Reauthorized the CBRA)	USFWS / US Department of the Interior	- To add new areas to the CBRS in Puerto Rico, the U.S. Virgin Islands, and the Great Lakes. - To expand the existing CBRS along the Atlantic and Gulf coasts. - To designate a new category called otherwise protected areas (OPAs),areas established under federal, state, or local law, or held by a qualified organization, primarily for wildlife refuge, sanctuary, recreational, or natural resource conservation purposes. (NFIP Coastal Regulations–1968 to Present. (2010). NC Cooperating Tech. State. www.ncfloodmaps.com/pubdocs/fact_sheets/coastal_regs.pdf. Accessed 10 April 2015).
Coastal Area Management Act (CAMA) (1974)	NC Division of Coastal Management (NCDCM) NC Department of Environment & Natural Resources (NCDENR)	- To establish a cooperative program of coastal area management between the state of North Carolina and local governments. o The state establishes Areas of Environmental Concern (AEC's), such as wetlands, estuarine waters, renewable resource areas, fragile or historic areas, waterways to which the public may have rights of access, natural hazard areas, and Primary Nursery Areas. o Local government takes initiative for planning. State government shall act primarily in a supportive standard-setting and review capacity, except where local governments do not exercise their initiative. - To apply to all 20 coastal counties and all municipalities located within them. - To develop a program of permit review and coordination within areas of environmental concern. (NFIP Coastal Regulations -1968 to Present. (2010). NC Cooperating Technical State. www.ncfloodmaps.com/pubdocs/fact_sheets/coastal_regs.pdf. Accessed 10 April 2015).
Specific coastal management provisions under CAMA are:		
Dredge and Fill Regulations	NCDCM / NCDENR	NC Admin. Code tit. 15A, r. 7H.1500. A general permit allowing excavation within existing canals, channels, basins and ditches in estuarine/ public trust waters to maintain previous water depths.
		NC Admin. Code tit. 15A, r. 7K.0401. Exempting the USACE from permit require-ments regarding maintenance of federal navigation channels, including dredging and disposal of dredged materials in Areas of Environmental Concern (AECs).
		NC Admin. Code tit. 15A, r. 7M.1100. Under General Policy Guide-lines (Coastal Area): Providing that excavation/ maintenance material from navigation channels be used in a beneficial way.
Dune Creation/ Restoration Regulations	NCDCM / NCDENR	NC Admin. Code tit. 15A, r. 7M.0202. Under General Policy Guide-lines (Coastal Area): Allowing dune creation as a temporary measure to counteract erosion, but only to the extent necessary to protect property for a short period of time until threatened structures may be relocated or until the effects of short-term erosion event are reversed.
Near Shore Sand Mining Regulations	NC Division of Marine Fisheries (NCDMF) NCDENR	NC Admin. Code tit. 15A, r. 7H.0106, 7H.0208. Submerged lands mining rules for estuarine and public trust waters.
		NC Admin. Code tit. 15A, r. 7M.1201-1202. General Policy Guidelines (Coastal Area): Ocean Mining Policies for federal and state waters (applicable for federal consistency).
Public Access Regulations	NCDCM / NCDENR	NC Admin. Code tit. 15A, r. 7M.0201-0202. Shoreline Erosion Policies. The following are required with state involvement (funding or sponsorship) in beach restoration or sand nourishment projects: (a) the entire restored portion of the beach shall be in permanent public ownership, and (b) it shall be a local government responsibility to provide adequate parking, public access and services for public recreational use of the restored bEAch.* *Exception: The National Park Service manages parking and public access within the Cape Hatteras National Seashore.
Sand Scraping/ Dune Reshaping Regulations	NCDCM/ NCDENR	NC Admin. Code tit. 15A, r. 7H.1800. N.C. A General permit allowing beach bulldozing needed to reconstruct or repair frontal and/or primary dune systems.

OBJECTIVES IN TAKING ACTION

Based on the needs for the Proposed Action listed previously, the following objectives have been identified for evaluating alternatives. The project should:

- Build a wider beach predicted to last up to ten years, addressing the sand deficit along a critically eroding section of Hatteras Island.
- Provide a more effective buffer during storms to reduce damages to NC 12, property, and infrastructure, which considers the natural flow of sand from north to south.
- Reduce the need and cost of providing repeated emergency repairs of the dune around Buxton Village and of providing repeated repairs of the physical damage caused by major storms to NC 12, water and power lines, and related infrastructure.
- Minimize the impact on marine and wildlife species and protect natural, cultural, and historical resources during construction within the regulations and guidelines of NEPA and other federal and state laws.
- Provide secure, reliable access for residents, workers, and visitors to Hatteras Island and the Seashore that is compatible with local land and water uses, including coastal and wildlife areas, year-round and vacation residences, businesses and commercial areas, and natural, cultural, and historic resources.
- Expand coastal habitat during and after project completion to provide improved nesting opportunities for threatened or endangered sea turtles and expanded nesting or roosting areas for piping plover, other threatened or endangered shorebirds, and other colonial water birds.

SCOPING PROCESS AND PUBLIC PARTICIPATION

Summary of Scoping

Scoping is an early and open process to determine the breadth of environmental issues and alternatives to be addressed in a National Environmental Policy Act document. Scoping is used to identify which issues need to be analyzed in detail and which can be eliminated from in-depth analysis. For this project, the interdisciplinary team used scoping to:

- allocate assignments among the NPS interdisciplinary team members, USACE officials, and/or other participating agencies;
- identify related projects and associated documents;
- identify permits, surveys, consultation, and other requirements; and
- create a schedule that allows adequate time to prepare and distribute the EA for public review and comment before a final decision is made.

Scoping activity may include any public, staff-interested agency, or any agency with jurisdiction by law or expertise (e.g. USFWS, NCDENR, and NCDCM).

The Proposed Action alternatives have been developed following a series of public discussions and community forums convened by Dare County (2012–2014), internal and interagency scoping meetings, and formal federal public scoping in January and February 2015. Dare County officials have met frequently (in person and via regular teleconference) with park service officials throughout 2014 and 2015 to discuss the purpose and need for the project and solicit input from NPS staff and the US Fish and Wildlife Service about issues of concern.

Internal and Agency Scoping

Three pre-application meetings were convened (22 October 2014, 8 January and 29 July 2015) at the offices of the NC Department of Environment & Natural Resources in Washington, North Carolina to solicit input from state and federal resource agencies and the principal permit-issuing agencies for projects of this type: US Army Corps of Engineers, National Park Service, and NC Department of Environment & Natural Resources (NCDENR)/Division of Coastal Management. In addition to the permit-issuing agencies, resource agencies in attendance included the US Fish & Wildlife Service, National Oceanic Atmospheric Administration/National Marine Fisheries Service, and NCDENR's Wildlife Resources Commission, Division of Marine Fisheries, and Division of Water Resources. The pre-application meetings provided opportunities for park service resource personnel, state resource agencies, and the principal permitting agencies to outline issues of concern and to identify environmental impacts to be addressed in project documents under the NEPA process.

Public Scoping

Dare County convened public forums in Manteo (county seat) and Buxton on 18-19 August 2014, and the park service convened public forums at the same localities on 27–28 January 2015. Public comments were solicited during a public scoping period between 12 January and 27 February 2015. These were invited under formal NPS public scoping in response to a Notice of Intent (NOI) published in the Federal Register on 29 December 2014, pursuant to Section 102(2)(c) of the National Environmental Policy Act (NEPA) of 1969. The Notice of Intent to prepare an Environmental Impact Statement (EIS) notified the public of a request from Dare County, North Carolina for a Special Use Permit from the National Park Service for activities related to beach widening in the Buxton area within and adjacent to Cape Hatteras National Seashore. The public comment period extended to 27 February 2015, and written comments were collected through the Planning, Environment, and Public Comment (PEPC) website (http://parkplanning.nps.gov/caha).

Following receipt of public comments in response to the Notice of Intent, the National Park Service met with the US Army Corps of Engineers officials and determined that the Proposed Action should be evaluated under one joint Environmental Assessment (EA) by the USACE and the National Park Service. Accordingly, the National Park Service issued a Public Notice of Termination (dated 17 June 2015) of the EIS and its intent to prepare the present EA (FR Vol 80, No 116, pg 34691).

Over 260 comments on the Proposed Action were received. The majority of comments were concerns about not implementing the project soon enough because of the situation's urgency. The public was alerted to watch for updates and information on the Cape Hatteras National Seashore website, at local media outlets, and on the PEPC website. A summary of comments received follows.

Socioeconomic Concerns

Most concerns were about the socioeconomic impacts caused by the loss of beach area due to the ongoing erosion and threat of increased erosion during storm events. These concerns were focused on the need to protect NC 12 and infrastructure in the Buxton area and to maintain the transportation corridor for residents and visitors to Hatteras Island. Ocean storm-caused flooding, overwash, and sand deposition are becoming more frequent and severe, which has further heightened concerns about the potential threats to public safety and to the island economy if a breach inlet occurs.

The main concerns cited were chronic erosion damages associated with the narrow beach, impassable conditions on NC 12 and other roads during storms, road closure and damage creating safety issues (such as risky travel conditions and limited access for emergency vehicles, hospitals, emergency

services, and supplies), and impeded access to schools, churches, jobs, businesses, and ferry service to Ocracoke Island. Other concerns expressed included cost of repeated road closures and repairs, unstable water and electricity supply, and total loss of water and electricity caused by storms damaging utility lines along NC 12. Also, concerns were expressed regarding loss of revenue for tourist-dependent businesses, county and state tax revenues, and jobs–particularly because visitors may be discouraged by storm damages causing limited access, smaller beach areas, and closed accommodations. Severe erosion is causing ongoing property damage to houses and business in Buxton and forcing emergency measures, such as sand-bagging, which blocks access along the beach.

Another concern stated that nourishing an erosional beach was a losing battle, and that a beach renourishment project to widen Buxton beach would be a short-term, expensive, and ineffectual solution. Others noted the favorable impact of the 1973 Buxton beach nourishment project and the more recent experience of the 2011 beach nourishment project at Nags Head, North Carolina. Generally, respondents expressed strong support of restoring the beach through nourishment for up to a predicted 10 years, while the NC Department of Transportation sought a more permanent solution.

Natural Resources Concerns

Concerns regarding impacts on natural resources were also expressed. These included the following: impacts on sensitive beach-nesting birds and sea turtle species during the breeding season through noise and physical disruption, increased sand compaction and hardness, and changes in moisture content and beach slope; impacts on fisheries from dredging during the seasonal moratorium (1 April – 30 September) by increases in turbidity and pollution at the site, and by physical harm caused by the operation of the dredge itself. One commenter stated that the summer season is considered critical to growth and reproduction of fish, shellfish, and their habitats, and the project would produce irrevocable, long-term impacts to the beach's biotic community through changes in sand characteristics, substrate composition, slope, or profile of the beach.

One commenter expressed concern that the project would increase erosion rates due to increased wave energy and prevent wave overwash of the narrow barrier island. Continuing, the commenter noted that this precludes accretion on the sound side of the island, causes the island to narrow, and diminishes the overwash fans that provide wildlife habitat on a barrier island. Other concerns expressed included potential loss of wildlife habitat for species that use the beach and nearshore waters and impacts of dredging at the borrow area offshore of Buxton Village, a high-relief sand shoal that could possibly be classified as Essential Fish Habitat (EFH). One commenter stated that dredging of Oregon Inlet and associated dune building has caused erosion of beaches. There is concern that the project is not a one-time beach nourishment project and that it would set a precedent for future beach nourishment.

A number of commenters stated that adding more dune and beach area would provide more breeding area for sea turtles and birds by creating a larger habitat for nesting.

Visitor Experience Concerns

Among the comments during public scoping were questions concerning why millions of dollars were spent to move the Cape Hatteras Lighthouse, if there was no intention of maintaining access via NC 12 in Buxton so that people can see it. One commenter stated the borrow area off Buxton is used by recreational and commercial anglers during the summer months, and user conflicts could be high during the proposed summer timeframe for construction. The habitat near shoals, such as the borrow area, was cited as a reason fishermen flock to this area. Another visitor-experience concern was beach closure during the high-use summer timeframe.

Alternatives and Mitigation

Many commenters recommended a declaration of a state of emergency so the project can be implemented in 2015 because delaying the project until 2016 would increase the risk of more storm-related damages. A few comments also recommended special-use permits be issued for other erosion hotspots, including within Hatteras Village and along Roanoke Island. Some commenters requested that in addition to beach nourishment, the project should include stabilization methods, such as groins, to stop beach erosion. Other comments included that the special-use permit for beach nourishment should be a one-time event and be designed to ensure that it would accomplish its stated purpose. Also stated was that the beach nourishment should take place between November and March, utilizing protective buffers to exclude beach nourishment activities from the areas around any unfledged shorebird broods and any unhatched sea turtle nests.

One commenter suggested that relief to the construction moratorium window might be considered in the beginning or in the end of the moratorium period if efforts are made to avoid working during the moratorium. Another commenter wants to limit the duration of the dredging and nourishment activities over the course of each day and limit the total number of days that the dredging and nourishment activities last, while reducing the overall scope of the project to the smallest scale possible. It was suggested by one commenter that other borrow areas offshore which are not essential fish habitat be considered.

Another commenter recommended that the design incorporate unnourished spans within the Proposed Action Area to foster the recovery of the biotic community on the beach. It was suggested by one commenter that negative effects from the dredge and fill operations could be minimized by taking shallower cuts from the borrow area to reduce negative impacts to benthic fauna while leaving some habitat relief. One commenter recommended biological monitoring to measure impacts of the project as well as habitat recovery and to contact US Fish & Wildlife Service and nearby municipalities that have completed recent nourishment projects within Pea Island National Wildlife Refuge and on Bodie Island.

Many issues of concern mentioned in the comment letters during the public scoping period were brought to the attention of the Applicant by the park service and the resource agencies at pre-application meetings. The next section identifies the issues and impact topics retained for detailed analysis in this document.

PLANNING ISSUES AND CONCERNS

Specific considerations and concerns were identified through public discussions and open forums convened by the Applicant, pre-application meetings with the US Army Corps of Engineers, other federal and state regulatory and resource agencies previously named, and the NPS scoping process. Those identified were considered critical to incorporate, while planning how to best manage erosion in the Buxton Action Area over a reasonable time period. The following were identified as most important to the design and planning process:

- Address the primary threat of erosion, which is loss of sand along the oceanfront and restore a viable, wide beach.
- Quantify the degree of erosion in an objective manner such that realistic projections of future changes with or without action can be made.
- Seek a solution which mimics natural processes while protecting natural and cultural resources to the extent possible, including anticipated downcoast movement of sand over time.

- Provide a solution which has significant longevity within a budget that considers the limited resources of the community and does not depend on subsidy support by the state or federal government.
- Anticipate that natural processes associated with a wider beach would potentially enhance the back beach and dune area, thereby reducing damages to existing infrastructure.

In addition to these primary planning considerations, the Applicant has considered logistics and site access, quality of materials, existing land use, recreation, natural features, and indigenous wildlife of the area. Along with the purpose and need for the Proposed Action, these topics guided the development of alternatives and contributed to selection of impact topics, as identified in this section.

Anticipated Sea-Level Rise

Drawing from tide gauge data from the National Oceanic & Atmospheric Administration (NOAA), the North Carolina Coastal Resources Commission (NCCRC) has determined that sea level in the Oregon Inlet area (~35 miles north of the Buxton Action Area) rose 3.65 millimeters (mm) per year (±1.36 mm) between 1977 and 2013 (NCCRC 2015). This equates to a 30-year rise of 4.3 inches (range 2.7–5.9 inches). Using that measurement rate and certain scenarios developed by the Intergovernmental Panel on Climate Change (IPCC 2013a, 2013b), the NC Coastal Resources Commission projects that by 2045 sea level will rise between 6.3 inches (range 3.9–8.7 inches) and 7.3 inches (range 4.7–9.9 inches). The IPCC scenarios consider a range of greenhouse gas emissions (Church et al. 2013). The resulting range in the NCCRC 30-year projections for the Oregon Inlet area represents the lowest and highest greenhouse–gas-emission scenarios adopted by IPCC (2013a).

As previously illustrated (see Fig 1.4), some segments of Hatteras Island have wider beaches and wider dunes which are building seaward, whereas other segments are narrow and highly erosional. Some studies (Leatherman et al. 1999, Riggs et al. 2008) suggest that sea-level rise is an important factor in explaining coastal erosion. Other studies (e.g. Hayes 1994, NRC 1995) suggest that erosion is site-specific and a function of many factors of which sea-level rise may be a minor one, compared with other factors such as sand trapping by jetties (Dean & Dalrymple 2002) or inlet sediment bypassing (Bruun & Gerritsen 1959, Kana et al. 1984). Due to broad concerns over the impact of sea-level rise on coastal areas and the varying scientific opinions specifically regarding its impact on the Proposed Action Area itself, sea-level rise has been considered in the planning process and would continue to be over the expected design life of the project.

The Proposed Action at Buxton is expected to have a limited design life of the order ten years in accordance with the Applicant's available funds and preliminary projections of design life for certain alternatives (CSE 2013b). Using the most current projections of sea-level rise and pro-rating them for a ten-year project design life, sea-level rise rates are expected in the range of 1.3 inch to 3.3 inches (range of means from 2.10 inches to 2.43 inches). It can be shown that a sea-level rise within these ranges equates to beach recession via inundation of the order ~1.6 feet to 4.1 feet over a ten-year period, assuming beach slopes of ~1 on 15, typical of Hatteras Island (Bruun 1962, Hands 1981, CSE 2013b).

Regulatory Role and Proposed Action Alternatives

The Applicant recognizes that the National Park Service administers the lands on which any proposed action along the oceanfront may occur in the Buxton area. NPS Management Policies (2006) provide guidance regarding protection and preservation of park resources. It is likely that the Proposed Action

alternatives would involve unavoidable temporary impacts associated with construction activities but would also potentially produce some beneficial impacts in the form of a wider beach.

Existing federal and state rules for activities in the coastal zone place a high burden on the Applicant to demonstrate that adverse impacts would be minimized to the extent practicable and that appropriate mitigation may be required in connection with execution of the Applicant's Proposed Action. The Proposed Action alternative must comply with NPS mandates for protection of park lands, preservation of habitats for threatened and endangered species, and the continued enjoyment of park visitors.

Site Constraints and Construction Logistics

Placement of sand in the beach zone is constrained by site conditions including continual exposure to waves, tides and currents. The Buxton Action Area is highly exposed to storm waves and does not offer a nearby safe harbor for dredging operations or convenient access for a trucking operation. The lack of nearby upland areas for sand mining is likely to make a trucking operation from far away sand pits prohibitively expensive. Other sand sources, such as Pamlico Sound deposits (see Fig 1.7) may produce greater environmental impacts or result in deposits of incompatible material on the beach. The Applicant's overarching goal is to execute the Proposed Action in the shortest time possible at a scale that provides significant longevity so that the action area can return to normal upon completion. This would lessen the need for frequent beach maintenance activities and reduce or eliminate frequent post-storm emergency measures, such as dune rebuilding and repairs to NC 12.

Existing Uses of the Area

Existing uses within the action area include nesting, foraging, and/or roosting activities for threatened and endangered species, fishing, beach recreation, surfing, picnicking, sightseeing, research, overnight visits, and permanent residence along the oceanfront. The Proposed Action and construction approach should be designed to avoid or minimize interference with these ongoing uses. Similarly, the Proposed Action should seek to preserve the general character of the setting or produce conditions which lead to a more natural character. For example, previous repairs after storms have restored the dune, pushed up asphalt and debris into its core, trucked in small quantities of sand, and left a relatively uniform, artificial dune along the critically eroding Buxton Action Area. Within the Village of Buxton, homes and businesses have required emergency sand bags to prevent major damage to buildings (see Fig 1.3). The Proposed Action alternatives should do nothing to exacerbate these conditions, and if possible, should provide improvements which ultimately yield a more natural character to the beach-dune system in the action area.

REGULATORY ISSUES AND MANAGEMENT CONCERNS

Based on discussions with federal and state regulatory agencies and the National Park Service, the beach construction activities described in this Environmental Assessment would not require any changes to existing legislation or management policies in order to be implemented. Prior to construction, the Applicant must follow all necessary procedures to apply for required permits and receive approvals from the US Army Corps of Engineers, National Park Service, and state authorizing agencies. These include the following:

- A USACE Individual Permit for impacts to navigable waters and wetlands of the United States pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act.

- A federal water quality permit pursuant to Section 401 of the Clean Water Act issued by the NCDENR Division of Water Resources (NCDWR).
- A North Carolina Individual Permit for impacts to critical areas pursuant to the Coastal Area Management Act (CAMA) issued by NCDENR Division of Coastal Management (NCDCM).
- A special use permit for activities within NPS lands pursuant to the National Environmental Protection Act (NEPA) issued by the National Park Service.

The USACE permit is conditioned on issuance of a Biological Opinion (BO) by US Fish & Wildlife Service on construction activities which are proposed to occur when protected species may be present. The permit is also subject to existing BOs issued by the National Marine Fisheries Service, if the Proposed Action alternative involves any offshore dredging during specified moratorium windows. In addition, project managers would coordinate activities and consult with NMFS as required regarding Critical Habitat dates for migrating loggerhead sea turtles.

ISSUES AND IMPACT TOPICS RETAINED FOR DETAILED ANALYSIS

Issues are potential environmental problems that may result from a proposed action. Issues were identified during scoping by specialists with USACE, NPS, USFWS, NMFS, NCDENR, academic institutions, and the public. Once issues were identified, they were used to help formulate the Proposed Action alternatives and mitigation measures. Impact topics were then selected for detailed analysis based on substantive issues, environmental statutes, regulations, and executive orders; and NPS (2006) management policies. A summary of specifics and rationale for their selection is given below.

Impact topics analyzed in this Environmental Assessment are listed below along with a brief rationale for the selection of each impact topic. They include coastal resources, sand resources, water quality, essential fish habitat, biological resources, cultural resources, socioeconomics, visitor use and experience, public safety, sustainability, and long-term management. In addition, cumulative impacts of the Proposed Action alternatives are addressed. Each topic is further discussed in detail in this document in Chapter 3: Affected Environment and Chapter 4: Environmental Consequences.

Coastal Resources (including Littoral Processes)

NPS Management Policies (NPS 2006) state that the National Park Service is charged with protecting barrier islands such as the Cape Hatteras National Seashore and allowing natural processes to proceed unimpeded to the greatest extent possible. Natural processes applicable in this case include barrier-island evolution, erosion, accretion, and longshore sediment transport in the littoral zone. Under certain circumstances, natural processes may be impacted for purposes of protecting important cultural resources or when existing development must be protected in the short-term to achieve park management objectives including high density visitor use (NPS 2006, Section 4.8.1.1).

Other interventions may be used when needed to protect other park resources, human health and safety, or facilities (NPS 2006, Section 4.1). In summary, impacts to park resources should be minimized to the greatest extent possible. The potential impact of the Proposed Action on littoral processes is addressed with supplemental information in Appendix A – *Littoral Processes*. Beach nourishment has been implemented on other NPS lands, including Assateague Island (Maryland), in response to erosion that is attributed to other man-induced changes to coastal resources (e.g. www.edi/nrs/classes/NRSS555/assets/rEAdings_08/schupp/Schupp_et_al_2007.pdf, accessed July 2015).

Sand Resources

The national seashores of the US East Coast are founded on unstable sandy soils which are subject to movement by winds, waves, and currents. The Proposed Action alternatives require identification of a suitable sand source(s) which may augment the natural beach system while not significantly changing the character of the beach or creating adverse impacts elsewhere. USACE and NPS guidelines for beach nourishment (USACE 2008, NPS 2012a) require that any sand considered for use as nourishment material must be similar in size, texture and quality to the existing (native) beach. In some settings where chronic erosion and shore protection structures have altered the normal distribution of sand size, it may be necessary or beneficial to re-introduce sands that match adjacent, undisturbed beaches. Potential sand sources for nourishment in the action area are evaluated in this EA and in Appendix C - *Geotechnical Data.*

Water Quality

NPS Management Policies (2006) and the Clean Water Act require that any action in the coastal zone shall safeguard and maintain or restore the quality of surface waters and ground waters and comply with all other applicable federal, state and local laws and regulations. The Proposed Action would involve dredging and placement of sediment in near shore waters of the beach zone. As such, construction operations have potential to introduce turbidity. Therefore, the impact topic of water quality is addressed.

Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires that federal agencies consult with the National Marine Fisheries Service to determine potential impacts on essential fish habitat (EFH) and what measures to avoid, minimize, mitigate and otherwise offset adverse effects on essential fish habitat. If an offshore borrow area is used for the Proposed Action (see Fig 1.1), potentially upward of 450 acres of ocean bottom may be altered. The dredging would impact benthic species living in surficial sediments upon which certain fish populations depend. An EFH assessment, in compliance with the Magnuson-Stevens Act, has been prepared and is included as Appendix D - *Essential Fish Habitat* in this Environmental Assessment. Because of its relevance to the Proposed Action, a biological monitoring report (CZR/CSE 2014) on the impacts of dredging and beach nourishment for the 2011 Nags Head beach nourishment project is included as Appendix E - *Biological Monitoring.*

Biological Resources

The Proposed Action would impact the beach and inshore zone where certain threatened and endangered species may be present during part of their life cycles. Because of the potential adverse impacts if construction occurs when certain species are present, the Applicant has identified and evaluated biological resources at risk under a *Biological Assessment* (*BA*) (Appendix B of this EA). Formal consultation with USFWS under Section 7 of the Endangered Species Act is required for projects of this type. The *Biological Assessment* (Appendix B) is required to assist federal resource agencies in evaluating the impacts of the project and to enable a biological opinion (BO) regarding whether the project would or would not jeopardize the continued existence of a threatened or endangered species. The BO is a prerequisite for a decision by the US Army Corps of Engineers to issue a permit for construction. Biological resources addressed in the BA and present Environmental Assessment include terrestrial, intertidal and subtidal species, along with identification and special attention to threatened and

endangered species, particularly nesting shorebirds and sea turtles. The BA addresses the habitats on which biological resources of the action area depend.

Cultural Resources

Cultural resources encompass archaeological and historic objects which may exist within the action area, including offshore waters where dredging operations may occur. The Applicant has consulted with the NC Historic Preservation Office regarding the Proposed Action in the action area and in the offshore borrow area. To supplement, the Applicant contracted for a cultural resources survey of the proposed borrow area and an inventory of historical buildings and shipwrecks that may be present in the Proposed Action Area (Appendix F – *Cultural Resources*). Per state requirements for borrow area confirmation (15A NCAC 07H.0312 Technical Standards for Beach Fill Projects, effective 1 February 2007, amended effective 1 August 2014), the survey included magnetometer, shallow seismic and side scan sonar geophysical data collection and identification of any targets which may represent debris, fishing gear, undersea cables or shipwreck remains. The survey provides specific recommendations for buffer zones (i.e. no-work areas) to avoid excavation and placement of non-compatible material on the beach. The only known historic landmark in the vicinity of the action area is the Cape Hatteras Lighthouse, which was moved from its historic position to a site ~1600 feet inland in 1999 (NRC 1988, Booher & Ezell 2001). Other structures of note are an abandoned and removed US Naval Facility adjacent to the old lighthouse site, which may have installed undersea cables and a sonar detection system for monitoring submarines after World War II (Appendix F – *Cultural Resources*).

Socioeconomics

NPS Management Policies (NPS 2006) require the National Park Service to identify impacts to socioeconomic resources when determining the feasibility of a proposed action. The purpose of the Proposed Action is to widen the beach and restore the sand deficit, which in turn would reduce potential storm damages to NC 12 and infrastructure on which the economy of Dare County depends. The project would not involve direct expenditures of state or federal funds, but may reduce or eliminate potential outlays by state and federal agencies following storm emergencies. Therefore, the cost of the proposed action is evaluated in relation to the economy at risk in this EA.

Visitor Use and Experience

Enjoyment of park resources and upholding the values of the people of the United States are part of the fundamental purpose of all parks (NPS 2006). The NPS mandate is to provide opportunities for forms of enjoyment that are uniquely suited and appropriate to the natural and cultural resources found in parks. The visitor experience encompasses interpretation, understanding, enjoyment, safety, circulation, and accessibility. While the Proposed Action may result in temporary impacts to these elements during the construction phase, the No-Action alternative may result in longer term and more adverse impacts to visitor use and experience. Therefore, this impact topic is addressed in this EA.

Public Safety

NPS Management Policies (NPS 2006) instructs the National Park Service to consider public safety in all proposed actions. NC 12 is used heavily by permanent residents, park visitors, vacationers renting homes and hotel rooms, suppliers, public safety personnel and motorists who seek to experience the iconic drive along the Outer Banks. Beach nourishment operations necessarily involve work under potentially dangerous conditions along exposed ocean beaches. The USACE must weigh potential

hazards to construction personnel when issuing permits, drawing on prior experience with accidents. USACE must also ensure that work is performed according to federal Occupational Safety and Health Administration (OSHA) laws and regulations. Because of its importance, Public Safety is retained for analysis in this EA.

Sustainability and Long-Term Management

Public scoping identified a common concern regarding beach nourishment—specifically, that project construction may last a long time and may have to be repeated every few years. The Applicant is aware of these concerns based on previous comments at public forums and articles in the popular press. Alternatives should address duration of construction as well as longevity in accordance with beach fill design guidance by the USACE (2008) and other guidance for beach nourishment (e.g. NRC 1995, Dean 2002). Long-term management of NC 12 is being investigated by NCDOT (NCDOT 2015, in preparation), has been taken into consideration by the Applicant, and is addressed in this EA.

IMPACT TOPICS DISMISSED FROM FURTHER ANALYSIS

Geologic Resources

The National Park System encompasses lands with significant geologic features, land forms and landscapes characteristic of the United States. The principal land form associated with Cape Hatteras National Seashore is the barrier island and its associated beaches, capes, inlets, sounds and related habitats. The Proposed Action Area does not represent any unique barrier island features that are only found within the ~3-mile-long Buxton segment of the Outer Banks. Further, the Buxton segment has been modified by sand scraping, dune re-construction after storms, installed vegetation and emergency shore protection devices, such as sand bags, to protect developed property. Any proposed action by the Applicant should seek to maintain or improve upon this altered landscape for the general benefit of park users and indigenous wildlife. No mineral resources, gas or oil reserves, or unique geologic features would be impacted by the project. Therefore, the impact topic of geologic resources is dismissed from further analysis. The impact of the project on the form and profile of the barrier island, beach, and borrow area is addressed under coastal resources.

Soils and Upland Topography

The Proposed Action would involve placement of beach quality sand in the active beach zone. It would not involve any direct sand placement on existing vegetation or modify the existing dune topography during construction. The sand placement would seek to match the natural elevation and slope of the dry sand beach while widening this zone without change in topography. The resulting intertidal area is expected to remain nearly equal to pre-project conditions as discussed under Coastal Resources impacts. Because the Proposed Action would not alter the basic topography of the action area or modify soils where vegetation exists, the issue of soils and upland topography are dismissed from further analysis.

Floodplains

All federal agencies are required by Executive Order 11988 (Floodplain Management) to evaluate the likely impacts of their actions in floodplains. The objectives of the EO 11988 are to avoid, as much as possible, the short- and long-term adverse impacts associated with occupancy, modification, or destruction of floodplains and to avoid indirect support of development and new construction in such

areas where there is a practicable alternative. NPS Director's Order #77-2 (Floodplain Management) provides NPS procedures for complying with EO 11988.

The barrier-island floodplains help to reduce the impact of hurricanes and other storms on the shorelines that they shelter. These floodplains provide storm-water holding capacity, reducing runoff that could otherwise flood developed areas. They also provide habitat for species adapted to the coastal barrier island environment. Storm events such as hurricanes and nor'easters (winter storms along the mid-Atlantic coast) and associated wave action and high precipitation are the prime sources of flooding in the Seashore. Additionally some areas are known to be susceptible to minor flooding without wave involvement when large amounts of rainfall occur.

North Carolina's barrier islands have historically been and continue to be affected by coastal forces and flooding events. The barrier islands of the Seashore are predominantly flat and narrow and lie adjacent to the shallow and wide Pamlico Sound. The widest part of the Seashore is near Cape Point, between the villages of Buxton and Frisco (Pendleton et al. 2005). According to Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps for Dare County (www.darenc.com/planning/floodmaps.asp, accessed May 2015), most of the Seashore is within the 100-year floodplain with the exception of some areas that are located at the Navy tower site on Bodie Island and a larger area on Hatteras Island near Buxton Village, which are within the 500-year floodplain (shaded X Zone). The Proposed Action Area itself lies completely within the 100-year floodplain (fris.nc.gov/fris/index.aspx?FIPS=055&ST=NC&user=General%20Public, accessed May 2015).

Generally, lands along the ocean beaches and adjacent to the sound (at wide points) are in flood zone VE, which is the flood insurance rate zone that corresponds to 100-year coastal floodplains that have additional hazards associated with storm waves, high water tables, and periodic flooding. Zone VE is also referred to as the Coastal High Hazard Area. Lands within the 100-year floodplain and not directly adjacent to the ocean or sound lie within the AE zone, which is subject to waves less than 3 feet high (NCDCCPS 2008); only zone VE is found within the Proposed Action Area.

None of the alternatives presented by the Applicant would elevate the action area above the floodplain or reduce the capacity and function of the affected floodplain. The Proposed Action can only occur within the floodplain, but it would not reduce the amount of floodplain. It would likely widen the recreational beach and potentially increase the capacity and function of the shoreface floodplain. The Proposed Action would not pose a risk to humans, a risk to investment, or impact floodplain processes and values. Therefore, the project is deemed exempt from the need to prepare a Floodplain Statement of Findings per NPS Director's Order #77-2 *Floodplain Procedures Manual* V. B Exemptions (National Park Service, Denver Service Center, Steven Culver, Natural Resource Specialist, pers. comm., 4 May 2015). The impact of floodplains is dismissed from further analysis.

Wetlands

Executive Order (EO) 11990 – *Protection of Wetlands*, directs all federal agencies to avoid, to the maximum extent possible, the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative. In the absence of such alternatives, parks must modify actions to preserve and enhance wetland values and minimize degradation. Consistent with EO 11990 and NPS Director's Order #77-1: *Wetland Protection*, the National Park Service adopted a goal of no net loss of wetlands. Director's Order #77-1 states that for new actions where impacts to wetlands cannot be avoided, proposals must include plans for compensatory mitigation that restores wetlands on NPS lands, at a minimum acreage ratio of 1:1.

For the purpose of implementing EO 11990 on NPS-managed lands, any area that is classified as a *wetland* according to the USFWS Classification of Wetlands and Deepwater Habitats of the United States (Report FWS/OBS-79/31 – Cowardin et al. 1979) is subject to NPS Director's Order #77-1 and its implementation procedures. Under the Cowardin definition, a wetland must have one or more of the following three attributes:

1) At least periodically, the land supports predominantly hydrophytes (wetland vegetation);
2) The substrate is predominantly undrained hydric soil; or
3) The substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year.

The Cowardin wetland definition encompasses more aquatic habitat types than the definition and delineation manual used by the Corps of Engineers for identification of wetlands under Section 404 of the Clean Water Act. Federal regulations define wetlands as:

> *Those areas that are inundated or saturated by surface or ground water (hydrology) at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation (hydrophytes) typically adapted for life in saturated soil conditions (hydric soils). Wetlands generally include swamps, marshes, bogs, and similar areas.* (40 CFR 232.2 (r)

Wetlands can be identified by the presence of those plants (hydrophytes) that are adapted to life in the soils that form under flooded or saturated conditions (hydric soils). The Proposed Action Area is a high-energy, active beach zone where mobile sandy sediments preclude the establishment of vegetation. The 1987 Corps of Engineers Wetlands Delineation Manual and its regional supplements require that *all three* of the parameters listed above (hydrophytic vegetation, hydric soil, wetland hydrology) be present in order for an area to be considered a wetland.

Under the Cowardin wetland definition, the intertidal beach is classified as a marine wetland. Marine wetlands are found along the entire length of ocean shoreline between extreme high tide and extreme low tide and are subject to high wind and wave energy. The intertidal beach zone (Cowardin marine wetland) continually adjusts to wave energy and sand supply, maintaining a profile under conditions of erosion or accretion. The intertidal zone in the Proposed Action Area is degraded (see Fig 1.3) by the presence of sand bags. Any activity that increases the sand supply within the action area is likely to maintain or incrementally increase the area of marine wetlands, provided the introduced sediments are similar in size and texture as the native beach.

Because the Proposed Action is water dependent (can only occur in proximity to an aquatic environment) and there is likely to be no change or an incremental increase in wetland habitat, the Proposed Action is an exception under the Restoration Exception in Section 4.2.1 (h) of NPS Procedural Manual #77-1: *Wetland Protection.* Therefore, under the restoration excepted action a Wetland Statement of Findings does not need to be prepared, and the impact of wetlands is dismissed from further analysis.

The following best-management practices would be observed:

- Nourished shoreline would have similar slopes as the existing shoreline.
- Use of heavy equipment to shape the pumped sand would leave no trace of disturbance when restoration efforts are complete.

Water Resources

The Proposed Action would not alter surface water and ground water, or the exchange of these water resources. Because the profile topography and elevation of the beach would be designed to match the natural (existing) profile, drainage would be similar to existing conditions. Impacts on water resources under the Proposed Action was considered, but dismissed from further analysis in this EA.

Energy Resources

There are no known fossil energy resources in the Proposed Action Area. Waves and winds are considered an energy resource with potential to augment local power supplies along the coast. The Proposed Action would not alter wave power or winds and would only impact a small area of ocean bottom for a few months during construction. Impacts on energy resources under the Proposed Action were considered, but dismissed from further analysis in this Environmental Assessment.

Visual Resources

The Proposed Action would create temporary, short-term impacts to the vistas characteristic of an undeveloped barrier island. Heavy equipment and a dredge pipeline would be placed on the beach and would be visible to beachgoers in the vicinity of the active construction area. These impacts are unavoidable and are associated with all earthmoving projects. However, upon project completion after a few months of local impacts, all equipment would be removed and the action area left to evolve naturally. The vistas after project completion are expected to remain the same as pre-project conditions or to improve along areas where emergency sand bags have been placed due to severe erosion. Extra sand added to the beach system is expected to eventually build up along the backshore and toe of the foredunes. If the sand placed on the beach closely matches the native sand in terms of color, texture, and grain size distribution, there would be no long-term adverse impacts on vistas or user experience. Visual resources of the action area were considered, but dismissed from further analysis in this EA.

Navigation

Dredging projects involving US waters are subject to navigation rules administered by the US Coast Guard. Notices to Mariners would be issued according to existing rules and regulations alerting recreational boaters, commercial fishermen, and merchant mariners of the temporary presence of dredging equipment, floating and submerged pipelines, and associated support equipment in the action area. Because work would take place in a limited area of open ocean waters and would not involve excavation in confined channels, impacts on navigation are expected to be minimal. Recreational use of the offshore borrow area during construction would be possible around the same time as dredging operations, subject to existing rules for right of way and mariner safety in the vicinity of operating dredges. Notices of the effects of the Proposed Action on navigation during construction are mandated under law and would be incorporated into project plans and construction documents to ensure compliance. However, upon completion and removal of dredge equipment, the offshore area would return to approximate pre-project conditions. Navigation impacts of the Proposed Action were considered but dismissed from further analysis in this EA.

Historic Structures

No historic structures are present in the Proposed Action Area. The closest historic structure, the Cape Hatteras Lighthouse, was moved away from the shoreline in 1999 (NRC 1988, Booher and Ezell 2001). Remaining buildings close to the beach are non-designated hotels and houses, some of which are

protected by emergency sand bags. Under state CZM regulations, no beach nourishment sand can be placed on private upland property or shore-protection structures. All work would be performed seaward of existing structures, buildings, and NC 12. Impacts to historic structures in the Action Area were considered but dismissed from further analysis in this Environmental Assessment.

Ethnographic Resources

An ethnographic resource is defined as any site, structure, object, landscape, or natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it (NPS 2002). There are no known ethnographic resources within the action area. Therefore, the impact topic of ethnographic resources is dismissed from further analysis in this EA. In the unlikely event that human remains, funerary objects, sacred objects, or objects of cultural patrimony (or matrimony) are discovered during construction, provisions outlined in the Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001) would be followed.

Indian Trust Resources

Secretarial Order 3175 requires that any anticipated impacts on Indian Trust resources from a proposed project or action by US Department of the Interior agencies be explicitly addressed in environmental documents. The federal Indian Trust responsibility is a legally enforceable obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights. It represents a duty to carry out the mandates of federal laws with respect to Native American tribes. No known Indian Trust resources are present in the Proposed Action Area, and the lands comprising the park are not held in trust by the Secretary of the Interior for the benefit of Indians due to their status as Indians. Therefore, the impact topic of Indian Trust resources is dismissed from further analysis.

Museum Collections

A museum collection is an assemblage of objects, works of art, historic documents, and/or natural history specimens collected according to a rational scheme and maintained so that they can be preserved, studied, and interpreted for public benefit (NPS 2002). No museum collections are present within the action area and none of the park's existing museum collections would be impacted by the Proposed Action. Therefore, the impact topic of museum collections is dismissed from further analysis.

Prime or Unique Farmland

In 1980, the Council on Environmental Quality (CEQ) directed federal agencies to assess the effects of their action on farmland soils classified as prime or unique by the US Department of Agriculture, Natural Resources Conservation Service. Prime or unique farmland is defined as soil that particularly produces general crops such as common foods, forage, fiber, and oil seed; unique farmland produces general crops such as fruits, vegetables, and nuts. No prime or unique farmlands are associated with the action area; therefore, prime or unique farmland was dismissed as an impact topic in this EA.

Air Quality

Currently, Cape Hatteras National Seashore is located in an area classified by the US Environmental Protection Agency (EPA) as being in attainment for all six criteria air pollutants. Activities associated with dredging and beach nourishment produce localized, temporary increases in pollutant levels associated with operation of heavy machinery mainly through the combustion of diesel fuel. Highest levels would occur at the dredge offshore and at the active work zone along the beach. Pollutant

concentrates are expected to diminish exponentially with distance from construction and return to ambient levels in close proximity to the work areas. Upon completion of the work, no additional discharges or sustained impacts would be associated with the Proposed Action. Windy conditions along the Outer Banks are expected to disperse pollutants rapidly from the area. Emissions are not expected to be at a level that would contribute measurably to greenhouse gases on a wider scale and are not expected to produce conditions that would alter the EPA classification of Dare County for being in attainment for all six criteria air pollutants. Impacts of the Proposed Action on air quality were considered but dismissed from further consideration in this EA.

Climate Change

Climate change refers to any significant changes in average climatic conditions (such as mean temperature, precipitation, or wind) or variability (such as seasonality, storm frequency, etc.) lasting for an extended period (decades or longer). Recent reports by the U.S. Climate Change Science Program, the National Academy of Sciences, and the United Nations Intergovernmental Panel on Climate Change (IPCC) provide evidence that climate change is occurring and may accelerate in the coming decades. There is strong evidence showing that global climate change is being driven by human activities worldwide, primarily the burning of fossil fuels and tropical deforestation. These activities release carbon dioxide and other heat-trapping gases, commonly called greenhouse gases, into the atmosphere (IPCC 2007).

Two aspects of climate change must be considered in an environmental impact analysis and is recommended for consideration in an Environmental Assessment:

- Human impact on climate change (i.e. through our actions, the potential to increase or decrease emissions of greenhouse gases that contribute to climate change).
- The impact of climate change on humans (i.e. how are the resources that we manage likely to change in response to changing climate conditions, and how does that change or otherwise affect our management actions and the impacts of those actions on the resource?).

The Proposed Action would neither result in the construction of any permanent carbon-emitting infrastructure, nor would it result in any enhancement of vehicular use or create any new recreational attraction that would increase vehicular carbon emissions. During the construction process, the Proposed Action could result in a temporary increase in emissions of greenhouse gases from the operation of construction equipment. However, because temporary construction impacts would cease on completion, the Proposed Action would have no affect on climate change. The Applicant has considered the impact of the Proposed Action on climate change, but dismissed it as an impact topic for further analysis.

Impacts of climate change on the project are likely to be of a subtle, gradual nature. A rise in sea level would modify the beach profile and may cause wave attack to occur at higher elevations and/or be translated farther inland. Changes in climate such as general warming, changes in water availability, and storm frequency, intensity, or duration could cause changes in the rate of sand loss within the park over decades. While most people visiting or passing through the park would be unaware of the changes, changes in shoreline position may occur as a result of sea-level rise. Sea level rise is addressed under Anticipated Sea Level Rise in this Environmental Assessment as one of the primary planning considerations for the Proposed Action. Because sea-level rise operates at long time scales and the

Proposed Action is anticipated to last over one decade, or so, the impact of sea level rise on the Proposed Action over one decade has been analyzed in relation to the scale and scope of the Action.

Soundscapes

The National Park Service strives to maintain or reduce existing noise impacts within its parks to preserve, to the greatest extent practicable, the natural park sounds. The Proposed Action Area is adjacent to NC 12 and is, therefore, subject to regular noise emissions from vehicles. During construction activities, a temporary, localized increase in noise generation would occur due to the use of heavy equipment; however, the soundscape of the project overall would not be noticeably altered. Therefore, the impact topic of soundscapes was considered, but dismissed from further analysis in this Environmental Assessment.

Noise

Noise associated with dredging operations may trigger avoidance reactions in marine mammals which rely on sound for purposes of navigation and communication. Reine et al. (2014) found that the frequency and peak pressure of noise generated during dredging varies depending on the type of dredge. Because sound plays an important role in the marine environment for certain species, potential impacts of elevated sound levels are addressed for a number of species that may be present in the action area including whales, birds, and sea turtles.

Lightscapes

In accordance with NPS Management Policies (NPS 2006), the National Park Service strives to preserve natural ambient lightscapes and other values that exist in the absence of manmade light. The Proposed Action would not change lightscapes within the action area upon completion, and therefore the impact topic of lightscapes is dismissed from further analysis in this EA.

Construction activities would temporarily impact lightscapes in the active work area as a result of the likely need to work 24/7 during a limited period of time when offshore dredging is feasible in the Buxton setting. Construction lighting at night is subject to OSHA regulations (CFR 1926.56). Because of potential impacts of construction lighting on threatened and endangered species, the US Fish & Wildlife Service has prescribed certain measures if these species are present in the action area. These include the prescribed use of certain types of lighting on the beach and instructions for directing lights in particular ways to minimize impacts. More detail on light minimization is provided in the threatened and endangered species impact topic analysis in Chapter 4 of this Environmental Assessment.

Land-Use Planning and Design

There are no identified conflicts between the Proposed Action and land use plans, policies, or controls for the action area. The design of the built environment would remain relatively constant throughout the action area, with most of the oceanfront remaining in trust under NPS jurisdiction. The remainder of the action area within the village of Buxton is built out. Existing CZM rules prohibit any new development on restored beaches. In accordance with North Carolina coastal zone management rules (portal.ncdenr.org/web/cm/coastal-area-mangemt-act1, accessed May 2015), a mean-high-water survey would be performed along the Proposed Action Area to record its location prior to placement of any sand. Accreted lands seaward of mean high water due to the project would accrue to the state or federal government (as applicable) and would not become part of an existing private property. Therefore, the impact topic of land use planning and design was considered but dismissed from further analysis.

Energy Requirements and Conservation Potential

The Council on Environmental Quality guidelines for implementation of the National Environmental Policy Act require an examination of energy requirements and conservation potential as a possible impact topic in environmental documents [40 CFR 1502.16(e)]. NPS staff strives to incorporate the principles of sustainable design and development into all Seashore facilities and operations. The objectives of sustainability are to design structures to minimize adverse impacts on natural and cultural values, to reflect their environmental setting, to maintain and encourage biodiversity, to construct and retrofit facilities using energy efficient materials and building techniques, to operate and maintain facilities to promote their sustainability, and to illustrate and promote conservation principles and practices through sustainable design and ecologically sensitive use. Essentially, sustainability is living within the environment with the least impact on the environment. The Proposed Action could potentially result in reduced use of energy and conservation over the design life of the project, if it reduces the frequency of storm repairs needed. Each emergency repair of NC 12 and infrastructure requires use of heavy equipment and importing of construction materials from distant sources. However, the Proposed Action would not result in noticeable changes to energy requirements or the ability to conserve energy resources during normal, daily activities common to the action area.Therefore, the topic of energy requirements and conservation potential was considered, but dismissed from further analysis in this Environmental Assessment.

Environmental Justice

Executive Order 12898, General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing the disproportionately high and/or adverse human health or environmental effects of their programs and policies on minorities and low income populations and communities. According to the Environmental Protection Agency, environmental justice is the ...*fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations and policies. Fair treatment means that no group of people, including a racial, ethnic, or socio-economic group, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies.*

The goal of fair treatment is not to shift risks among populations, but to identify potentially disproportionately high and adverse effects and identify alternatives that may mitigate these impacts. Environmental Justice is dismissed from further analysis for the following reasons:

- The park staff and planning team solicited public participation as part of the planning process and gave equal consideration to all input from persons regardless of age, race, income status, or other socioeconomic or demographic factors.
- Implementation of the Proposed Action would not result in any identifiable adverse human health effects. Therefore, there would be no direct or indirect adverse impacts on any minority or low-income population.
- The impacts associated with implementation of the Proposed Action would not disproportionately affect any minority or low-income population or community.
- Implementation of the Proposed Action would not result in any identified effects that would be specific to any minority or low-income community.

Infrastructure and Park Operations

No Seashore infrastructure is located within the immediate boundaries of the Proposed Action Area. Therefore, infrastructure is dismissed from further analysis. Park operations include certain monitoring and managing of threatened and endangered species, including patrols along the beach to locate and mark nests. These activities are expected to continue during and after the Proposed Action and to be a key means of minimizing impacts of the project by establishing no-work buffers and providing additional monitoring beyond that which is proposed by the Applicant. Following completion of construction, park operations, with respect to endangered species monitoring, are expected to remain the same, albeit along a wider beach with potentially more habitat area to consider. (See Chapter 4 for complete discussion of monitoring shorebird and sea turtle nests and relocating sea turtle nests.) The potential impact of the Proposed Action on park operations was considered but dismissed from further analysis.