

2.0 PURPOSE AND NEED

2.1 What Is the Purpose of the Proposed Action?

The Bogue Banks shoreline has been managed in some capacity by the USACE, county, and local municipalities for over 35 years. Past management efforts have largely consisted of stand-alone projects that were undertaken to address site-specific erosional problems. This stand-alone approach, especially in regard to federal Section 10/Section 404 permitting processes and other regulatory requirements (e.g., NEPA, ESA Section 7), has limited the efficiency and effectiveness of past and current efforts by the County and island municipalities to implement shore protection projects and maintain the beaches of Bogue Banks. In order to address ongoing shoreline erosion in a more effective manner, the County and municipalities are proposing to combine their shore protection efforts under a more efficient comprehensive beach and inlet management program known as the Bogue Banks Master Beach Nourishment Plan (MBNP). The purpose of the proposed action is to establish and implement a comprehensive, long-term, non-federal beach and inlet management program that will restore and maintain the beaches of Bogue Banks; provide shore protection for residential structures, infrastructure, and recreational assets; and preserve the local tourism-based economy. As agreed upon through an Interlocal Agreement (Appendix D), the proposed action would consolidate the shore protection planning and management activities of the County and the Bogue Banks municipalities under a unified, regional beach and inlet management program. Furthermore, the proposed action will address the ongoing trend of declining federal shore protection funding by establishing a non-federal management program under the autonomous control of the County and the island municipalities.

The County (Applicant) is seeking a USACE Regulatory 50-year authorization pursuant to Section 10 of the RHA and Section 404 of the CWA, a BOEM-negotiated lease agreement for the use of OCS sand resources, and a NCDCEM CAMA Major Permit to allow the implementation of a long-term non-federal shoreline protection and inlet management program that would preserve Bogue Banks' tax base, protect its infrastructure, and maintain its tourism-based economy. An island-wide regional strategy was developed with a purpose to do the following:

- establish a regional approach by consolidating local community resources, both financially and logistically, to manage Bogue Inlet and the beaches on Bogue Banks in an effective manner;
- provide long-term shoreline stabilization and an equivalent level of protection along Bogue Banks' 25-mile oceanfront/inlet shorelines addressing long-term erosion;
- provide long-term protection to Bogue Banks' tourism industry;

- provide short and long-term protection to residential and commercial structures and island infrastructure;
- provide long-term protection to the local tax base by protecting existing and future tax bases and public access/use;
- maintain and improve natural resources along Bogue Banks' oceanfront and inlet shoreline by using compatible beach material in compliance with the NC State Sediment Criteria for shore protection;
- maintain and improve recreational uses of Bogue Banks' oceanfront/inlet shorelines;
- maintain navigation conditions within Bogue Inlet; and
- balance the needs of the human environment with the protection of existing natural resources.

2.2 Where Is the Project's Location?

Bogue Banks is an approximately 25-mile-long barrier island located entirely within Carteret County on NC's central coast (see Figure 1.1). The island faces the Atlantic Ocean to the south and is bound to the east by Beaufort Inlet and to the west by Bogue Inlet. Bogue Banks is backed to the north by Bogue Sound, a relatively shallow estuarine water body through which the Atlantic Intracoastal Waterway (AIWW) passes. Fort Macon State Park occupies the easternmost 1.4-mile portion of the island. Political subdivisions on the remainder of the island include from east to west: Atlantic Beach; Pine Knoll Shores; Indian Beach; the unincorporated community of Salter Path; and Emerald Isle. In addition to the island of Bogue Banks, the "study area" that was initially evaluated for purposes of scoping and the identification of alternatives encompasses Bogue Sound, Beaufort Inlet and the adjacent west end of Shackleford Banks, Bogue Inlet and the adjacent east end of Bear Island, and the ocean waters and seafloor offshore of Bogue Banks out to distance of approximately 5 nm (Figure 2.1). The inclusion of Beaufort Inlet, Bogue Inlet, and the adjacent ends of Shackleford Banks and Bear Island in the study area is related to potential inlet management activities that were evaluated as part of the scoping and alternatives analysis process. Shackleford Banks to the east is an undeveloped island within the Cape Lookout National Seashore, and Bear Island to the west is an undeveloped island within the NC State Park system (i.e., Hammocks Beach State Park). The offshore portion of the study area encompasses state waters out to the 3 nm limit as well as adjoining federal waters and the underlying OCS out to a depth of approximately -50 to -60 feet (ft) North American Vertical Datum (NAVD) 88. The offshore area encompasses all potential ocean borrow sites that were investigated as part of the scoping and alternatives analysis

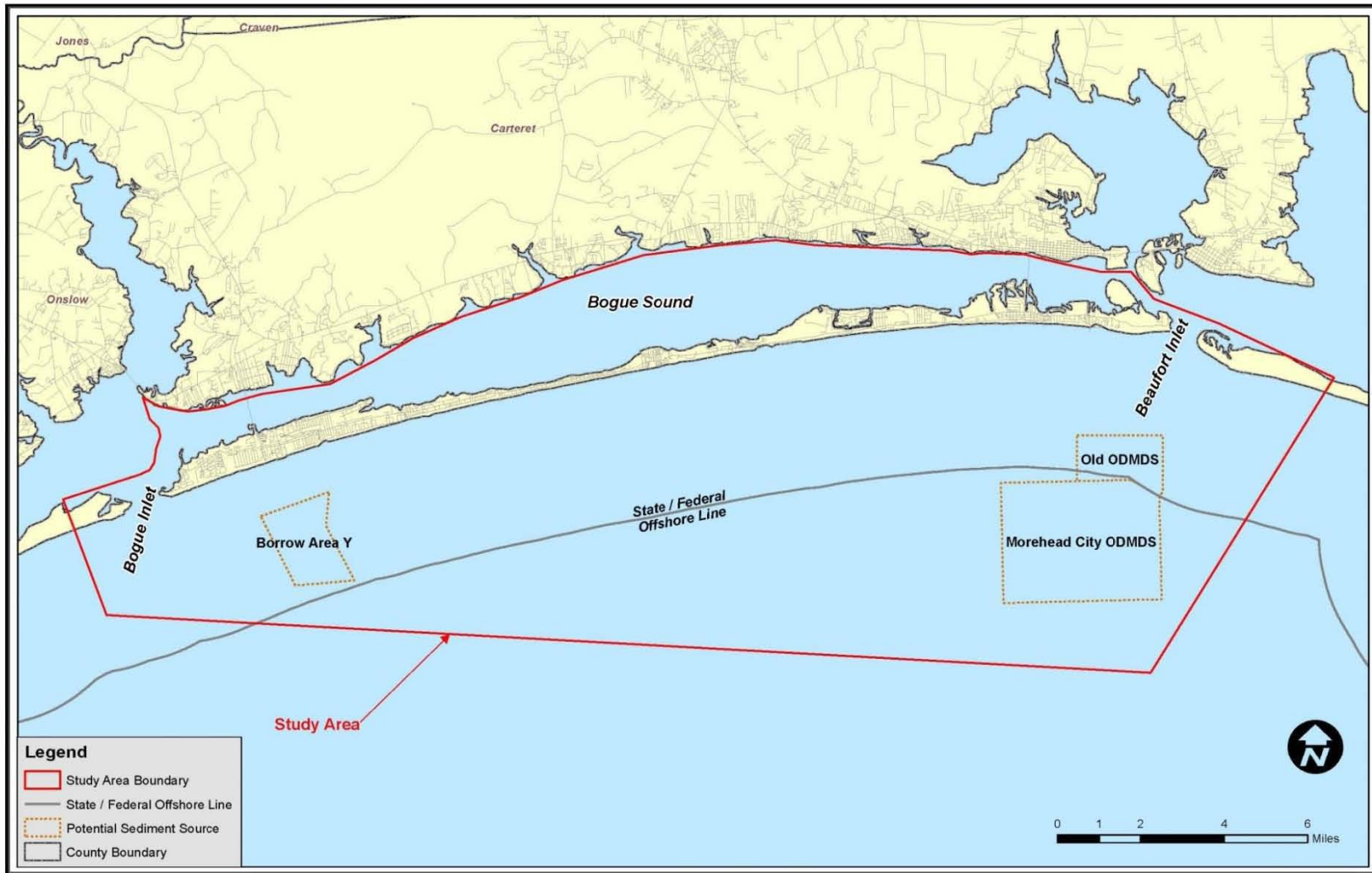


Figure 2.1. Bogue Banks EIS Study Area

process; including the former and current Morehead City Harbor (MCH) Ocean Dredged Material Disposal Site (ODMDS) facilities. The study area was refined and reduced in area during the scoping process as the alternatives were developed and additional engineering analyses were completed. As described in Section 4, the refined study area (i.e., “Permit Area”) represents the area evaluated in the analyses of effects.

2.3 What Is the Need for the Proposed Action?

The Bogue Banks barrier island has experienced long term and episodic erosion that has damaged upland property, recreational use of the beach, and coastal resources. A need exists to effectively abate future erosion through a regional coordinated plan. After pronounced hurricane activity in the 1990s (Hurricanes Bertha, Fran, Dennis, and Floyd), County leadership began to take formal steps to address erosion concerns along the ~25-mile long island of Bogue Banks (Photo 2.1 shows some of the damage from these hurricanes).

The USACE Wilmington District through USACE's Civil Works Program has been evaluating long-term shore protection needs of Bogue Banks pursuant to the USACE's General Investigation (GI) Program for over 30 years. In 1984, the USACE conducted a *Reconnaissance Study* relative to the USACE Civil Work's CSDR for Bogue Banks, but none of the analyzed CSDR plans were found to be economically feasible at that time (USACE 2013). A USACE Feasibility Study and EIS was authorized by congressional resolution in 1998 and a Feasibility Study Agreement was executed in February 2001, after which federal funding became available to evaluate a long-term storm protection program. A completed Integrated Feasibility Report and EIS was released in August 2014 (USACE 2014). Congressional authorization and federal funding for the implementation of this 50-year project are uncertain due to lack of financial support by the present and prior administrations. Given the future funding ambiguity for future Coastal Storm Risk Management (CSRM) projects, the County is concerned that much of its existing development and infrastructure could experience significant storm damage prior to the federal project's implementation. Accordingly, the County initiated the development of a non-federal long-term shoreline protection plan to protect Bogue Banks' housing, development, infrastructure, and industrial base (Appendix H - MBNP). Implementation of the MBNP would not impact the federal CSDR project, as the County would defer to the federal project, when federal funding becomes available in the future.



Photo 2.1. 1990s hurricane damage.

Based on the most recent surveys and spatial data available from the NCDCM (<https://deq.nc.gov/about/divisions/coastal-management/coastal-management-data/spatial-data-maps>), approximately 25 residential structures along Bogue Banks, primarily Pine Knoll Shores and Emerald Isle, were confirmed as maintaining issued sandbag permits (Figure 2.2). In addition, seven (7) sandbag permits have been issued in Atlantic Beach and Emerald Isle to protect infrastructure (i.e., roads) (Figure 2.2). The NCDCM's sandbag permit criteria includes the distinguishing characteristic of being imminently threatened as defined by State Standard Rule 15A NCAC 7H.0308. The basic premise of this rule is that a structure in the Ocean Hazard Area is considered imminently threatened when its foundation is less than 20 feet from the toe of the erosion scarp. Beach bulldozing is another site by site, temporary action where general permits are issued individually or by municipal reaches along Bogue Banks. Beach bulldozing immediately after storms is a common practice.

To develop estimates for future beach nourishment needs, historical surveyed beach profiles and volume changes were analyzed between 1999 and 2013. Annual surveys (since 2004) have been performed along Bogue Banks, Bear Island, and Shackleford Banks as part of Carteret County's Bogue Banks Beach and Nearshore Mapping Program. The analytical/empirical and numerical modeling portions of the study to develop estimates considered historical and present volumetric change rates, sand volumes existing as of the June 2011 beach profile survey, and forward-looking sand volumes required to achieve an equal level of protection for property and infrastructure along developed reaches of the shoreline. To develop an accurate basis of volume loss and ultimately sediment needs over the next 50 years for continued maintenance, Crystal Ball statistical software was used to quantify the variability inherent within the existing data.

The engineering analysis, conducted by the County's Shore Protection Office's engineer, Moffatt & Nichol (M&N), for the proposed action, resulted in an overall annual background erosion loss along Bogue Banks (excluding Fort Macon) of roughly 452,200 cubic yards per year (cy/yr) (Table 2.1; Appendix H – MBNP). The analysis determined a total 50-year renourishment need for the proposed action area of 22.6 million cubic yards (MCY) to match historical erosion patterns ($452,200 \text{ cy/yr} \times 50\text{-year planning horizon} = 22.6 \text{ MCY}$) (Appendix H – MBNP). To estimate potential storm losses in addition to the annual background erosion loss, the overall monitoring profile dataset was restricted to the three storm years, 2003 to 2005, which covered Hurricanes Isabel, Ophelia, and Irene. Based on the results, it is expected that the volume required to address the losses following a given named storm may range between 1.4-1.7 MCY. Given that named land falling storms have occurred once every three years or so since the early 1990's within southeastern NC, the storm need over the 50-year planning horizon at this rate may range between 22.4 – 27.2 MCY. This volume is equivalent to the background erosion loss/need for the proposed action area. Sediment volume calculations are further described in Section 3.3.3.

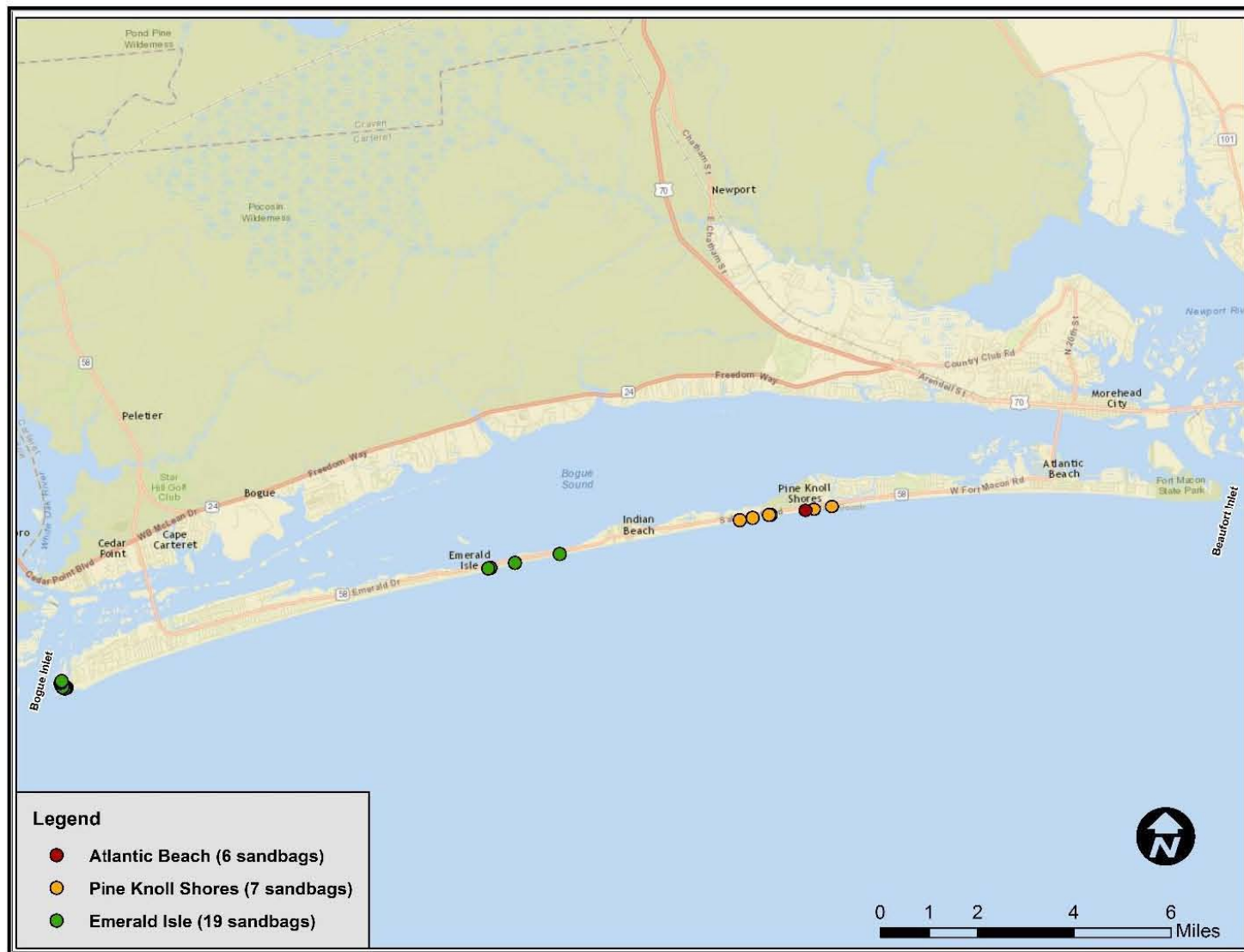


Figure 2.2. Location of Sandbags along Bogue Banks

Table 2.1. Average annual background erosion rate.

Reach	Length (ft)	Volume Change Above -12 ft NAVD88 (cy) (1999-2012)	Nourishment Volume (cy)	Background Erosion (cy)	Average Annual Background Erosion Rates (cy/ft/yr)
Bogue Inlet-Ocean	7,432	-212,839	59,272	-272,111	-2.82
Emerald Isle West	22,344	811,451	935,633	-124,182	-0.43
Emerald Isle Central & East	29,022	1,231,310	2,368,136	-1,136,826	-3.01
Indian Beach/Salter Path	12,850	693,714	1,358,842	-665,128	-3.98
Pine Knoll Shores	23,878	1,084,840	2,311,741	-1,226,901	-3.95
Atlantic Beach	26,176	1,323,201	3,189,504	-1,866,303	-5.48
Fort Macon State Park	6,691	314,190	1,472,101	-1,157,911	-13.31
Total	128,393	5,245,869	11,695,229	-6,449,360	-3.86

The overall (background and storm) sediment need over the 50-year planning horizon based on the analytical/empirical analysis is between 45.0 and 49.8 MCY. Accounting for sea level change, based on the Engineer Circular 1165-2-212 USACE guidance for incorporating effects of projected future sea level change in the engineering, planning, design, and management of USACE projects, the volume need increases to 46.8 to 51.6 MCY if levels rise at the rate recommended for use by the USACE (USACE 2011).

To further clarify, USACE guidance on inclusion of sea level rise in federal planning and design studies (USACE 2011) indicates that USACE projects in tidal waters must include potential relative sea-level change in planning and design. The guidance specifies that planning and design must consider the sensitivity and adaptability of projects to relative sea level change. The uncertainty in the rate of sea level change to be applied is accounted for by considering three scenarios described by “low,” “intermediate,” and “high” sea level change rate curves (Table 2.2).

Table 2.2. Additional volumes needed to adapt design scenarios to relative sea level change scenarios.

Design Scenario	Low SLC: +0.57 feet	Intermediate SLC: +1.01 feet	High SLC: +2.39 feet
Design Scenarios #1, #2, and #3	1,030,000 cubic yards	1,825,000 cubic yards	4,300,000 cubic yards

Based on USACE guidance provided at the PRT Meetings, the intermediate value should be used for planning purposes. Therefore, the additional need to account for potential sea level change would be 1,825,000 cy, equating to 46.8 to 51.6 MCY.

Hotspots, defined as oceanfront shoreline areas with increased and more wildly varying erosion rates (as compared to the entire island), are also included in the overall sediment need. As for the existing beach profiles, numerical modeling was completed to determine that the 2012 beach and dune system (based upon the pre-Hurricane Irene 2011 beach profile survey) are considered to provide a sufficient level of protection along all the Bogue Banks reaches for a 25-year return period design storm event, or its equivalent. It is desirable by the County to maintain this level of protection for 50 years.

Hotspots Investigation

It is important to understand the existing hotspots and why they may be present given these areas will likely require more frequent nourishments to maintain an equal level of protection as compared to more stable reaches within the proposed action area. Available multibeam surveys in the hotspot areas were reviewed to determine if localized bathymetric features were present that may affect these hotspot areas. A primary hotspot under investigation has been historically observed approximately between survey Transects 37 and 52 in Emerald Isle-East and Indian Beach/Salter Path-West (Figure 2.3). As can be seen in Figure 2.3, there appears to be some dredge cuts (dark blue area pointed out by arrow), from within the borrow area of the 2001, 2002, and 2003 County nourishment events, in deeper waters that may allow increased wave energy to influence this area (Appendix I – Engineering Report) as well as smaller nearshore features between Transects 40 – 43 that also allow additional wave energy closer to shore. An additional potential hotspot can also be observed in beach profile monitoring data from 2008 – 2012 in Pine Knoll Shores - East (between Transects 66 and 76).

As described in Appendix H, the results of wave transformation modeling show a sharply-defined increasing wave energy gradient of from east-to-west along Bogue Banks. This gradient is apparently related to the sheltering influence of Cape Lookout, which decreases from east-to-west along Bogue Banks. The modeling results also show a gradient in net accumulated alongshore sediment transport, including zones corresponding to the hotspot reaches where the rate of sediment removal is greater than the rate of supply from updrift reaches. The principal causes of relatively high erosion rates along both the Emerald Isle and Pine Knoll Shores hotspot reaches appear to be the wave energy and sediment transport gradients, as well as local bathymetric variability. The Emerald Isle hotspot reach corresponds to a transitional wave energy zone where the sheltering effect of the cape rapidly dissipates. There are a number of localized areas along the Emerald Isle hotspot reach where higher wave height contours intrude towards the shoreline (Figure 2.4). Although some of these contour intrusions correspond to the nearshore dredge cuts described above, these intrusions can be seen along the majority of the hotspot reach. Thus, the extent to which these dredge cuts contribute to relatively high erosion rates along the Emerald Isle hotspot is unclear.

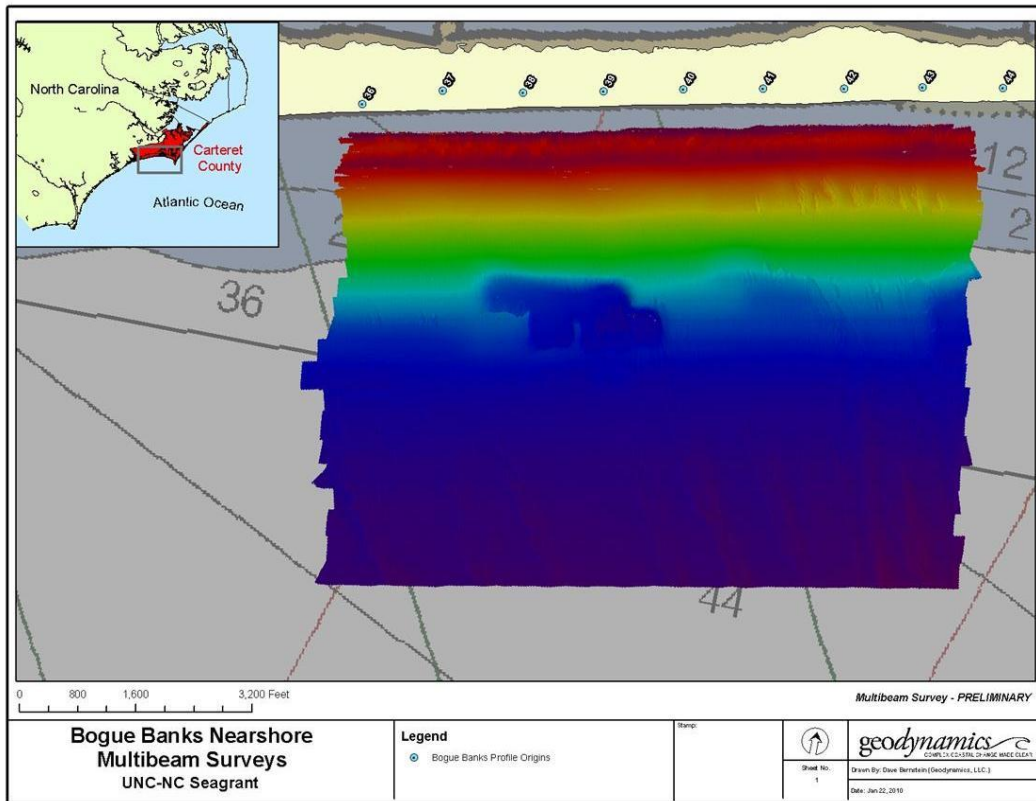


Figure 2.3. Detailed Multibeam Survey of Area within Emerald Isle East Hotspot

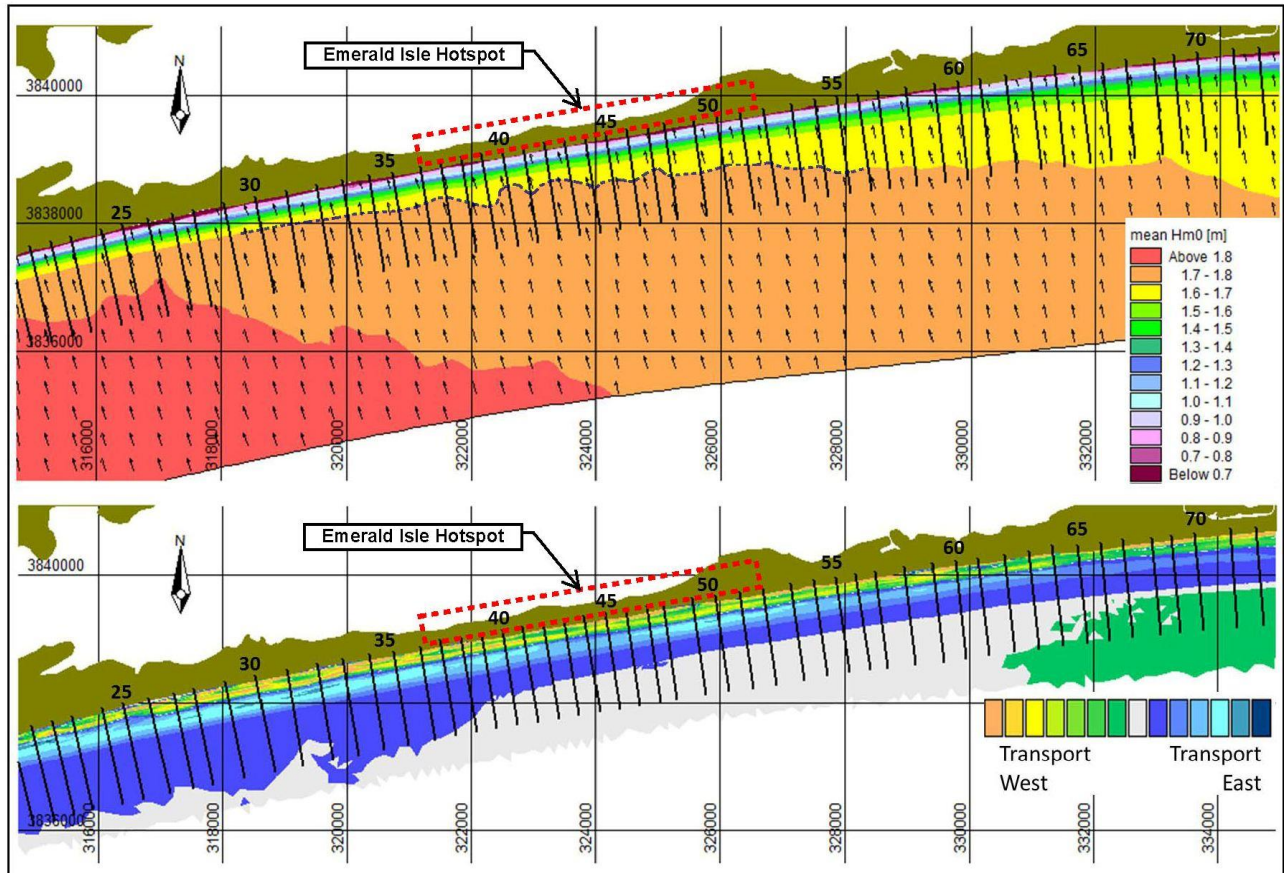
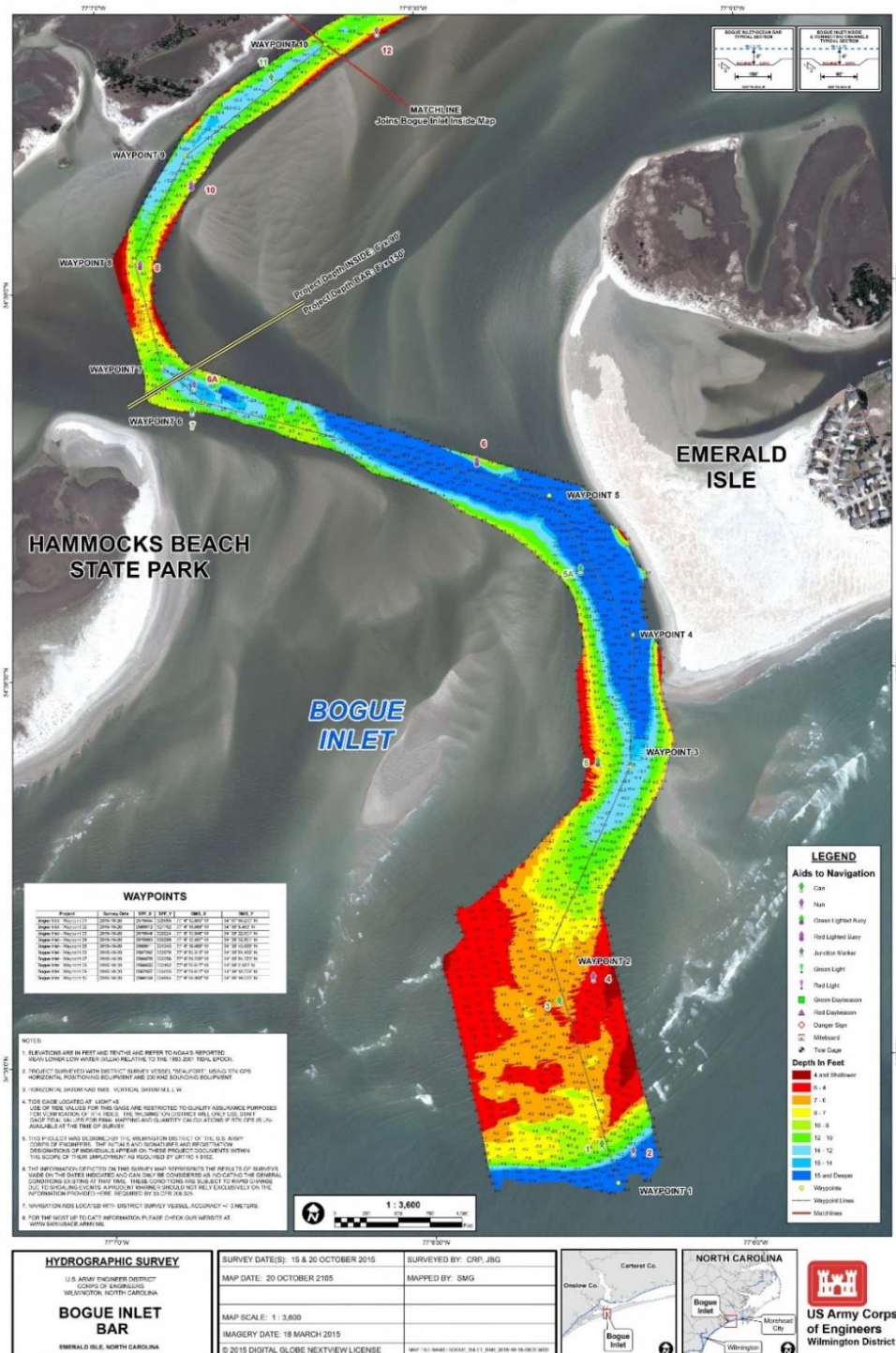


Figure 2.4. Mean Wave Height (Top) and Accumulated Alongshore Sediment Transport Magnitude (Bottom) Simulation

Bogue Inlet Management

Although the overall inlet has been a relatively stable feature over the last few centuries, the unstable ebb channel has a history of migration related to spit growth on the opposing inlet shorelines. Ebb channel breaching of the inlet shoals on several occasions since the late 1800s has led to rapid repositioning of the ebb channel (Cleary 2003). Rapid eastward migration of the throat ebb channel during the 1980s and 1990s resulted in chronic erosion of the Bogue Banks inlet shoreline, eventually threatening residential development on the west end of the island. In 2005, the ebb channel was relocated approximately 3,500 ft to the west towards Bear Island. The 2005 alignment was based on a long-term shoreline change analysis, which indicated that an alignment approximating the 1978 ebb channel configuration would provide optimal benefits for both inlet shoulders and both flanking oceanfront shoreline segments (Cleary 2008).

The depth of the main Bogue Inlet ebb channel is maintained long-term under an ongoing USACE navigation project (Figure 2.5). The project authorizes maintenance of a channel six



Note: Elevations relative to mean low low water (MLLW)

Figure 2.5. Bogue Inlet Hydrographic Survey as of October 2015

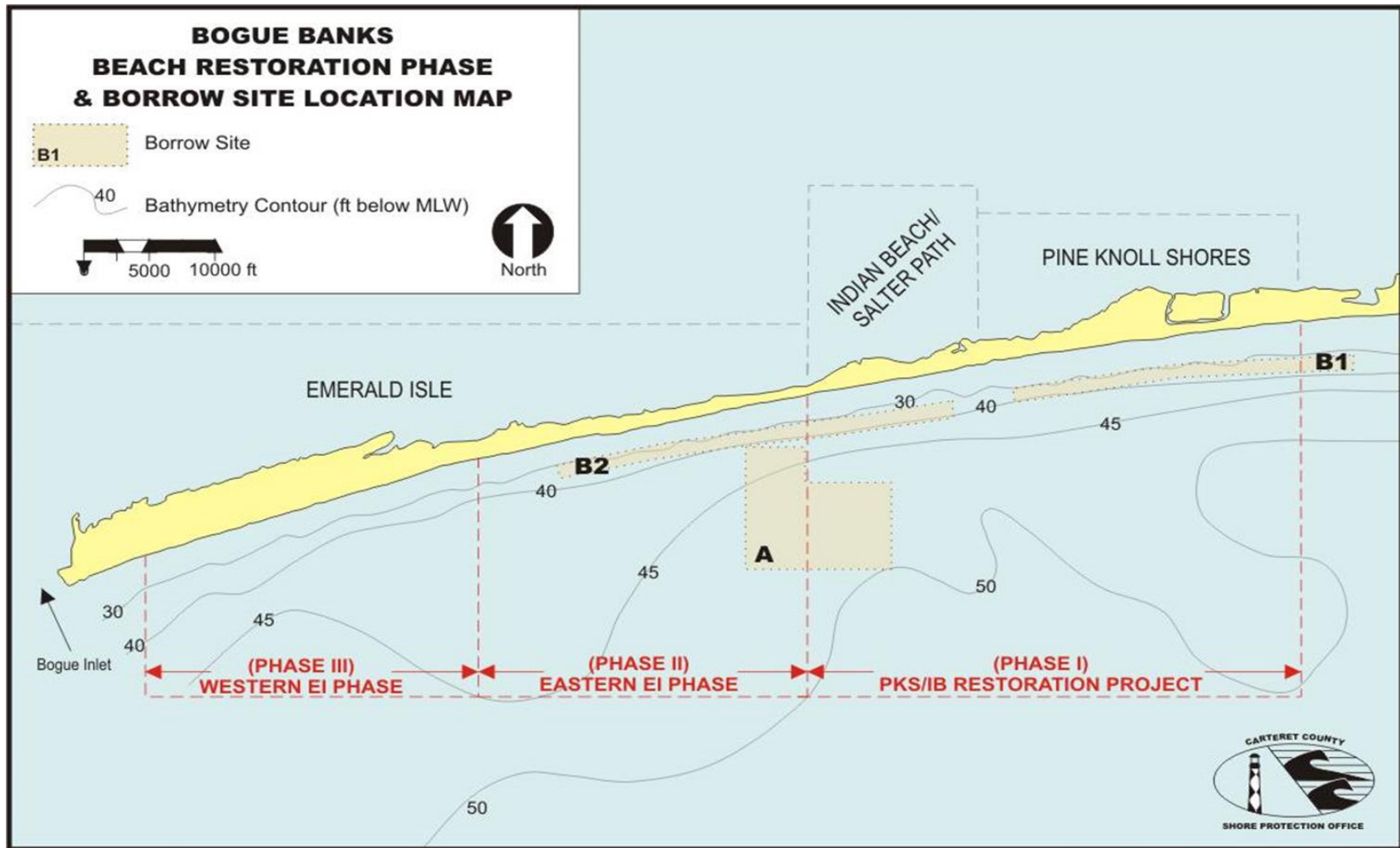
ft deep and 90 ft wide between the AIWW and Bogue Inlet as well as inlet channel eight ft deep and 150 ft wide across the ocean bar. The USACE project does not include maintenance of a fixed channel alignment, as dredging is restricted to the deep water channel that exists at the time of the maintenance event (Figure 2.5). Bogue Inlet was dredged 79 times between 1975 and 2010, with an average of 82,510 cubic yards (cy) of material removed per dredging event. Dredging has been performed primarily by sidecast dredges, with dredged materials being discharged to open waters adjacent to the navigation channel. Due to the historical migration and dynamics of Bogue Inlet, a need exists to manage the inlet to maintain navigation and minimize adverse effects upon the adjacent shorelines.

2.4 How Has the Bogue Banks Oceanfront and Inlet Shoreline Been Managed in the Past?

The NCDOT's current oceanfront management policies allow for multiple strategies to be utilized along NC's beaches and inlets. Except for temporary sandbags, the currently allowed strategies are "soft" solutions (mainly consisting of beach nourishment, inlet dredging/bypassing/management, setbacks, and structure relocation). Since 2001, roughly 13.2 MCY of sand have been placed upon the beaches of Bogue Banks at a total cost of approximately \$114.4M. In 1999, the County, acting through its Beach Preservation Task Force (a forerunner to the SPO) initiated planning for an island-wide, locally funded shore protection project called the Bogue Banks Restoration Project. The Bogue Banks Restoration Project, permitted in 2001 through the Section 10/404 regulatory program administered by the USACE's Regulatory Division, provided interim protection to development and infrastructure along the island. The local and County-led regulatory authorized projects were a means of proactive measures until the long-term USACE Civil Work's CSDR could be designed and implemented. Carteret County moved forward with state occupancy tax legislation creating a beach nourishment reserve fund, a Beach Commission, and establishing NC's first SPO.

As further described in the CSDR EIS (USACE 2014), the County has indicated a commitment to comply with federal government requirements in anticipation of the implementation of the 50-year CSDR project. The County and local municipalities-initiated efforts to secure additional public parking facilities and public parking access at numerous locations along Bogue Banks to meet federal parking requirements if the USACE project is funded.

The Bogue Banks Restoration Project was a local initiative with a cost totaling approximately \$33M (Figure 2.6). The entire project consisted of an approximate 16.8-mile stretch of Bogue Banks extending from the Atlantic Beach/Pine Knoll Shores town boundary westward, to approximately one mile east of Bogue Inlet.



Source: USACE Hydrographic Survey, October 2015

Figure 2.6. Bogue Banks Beach Restoration Phase and Borrow Site Location Map

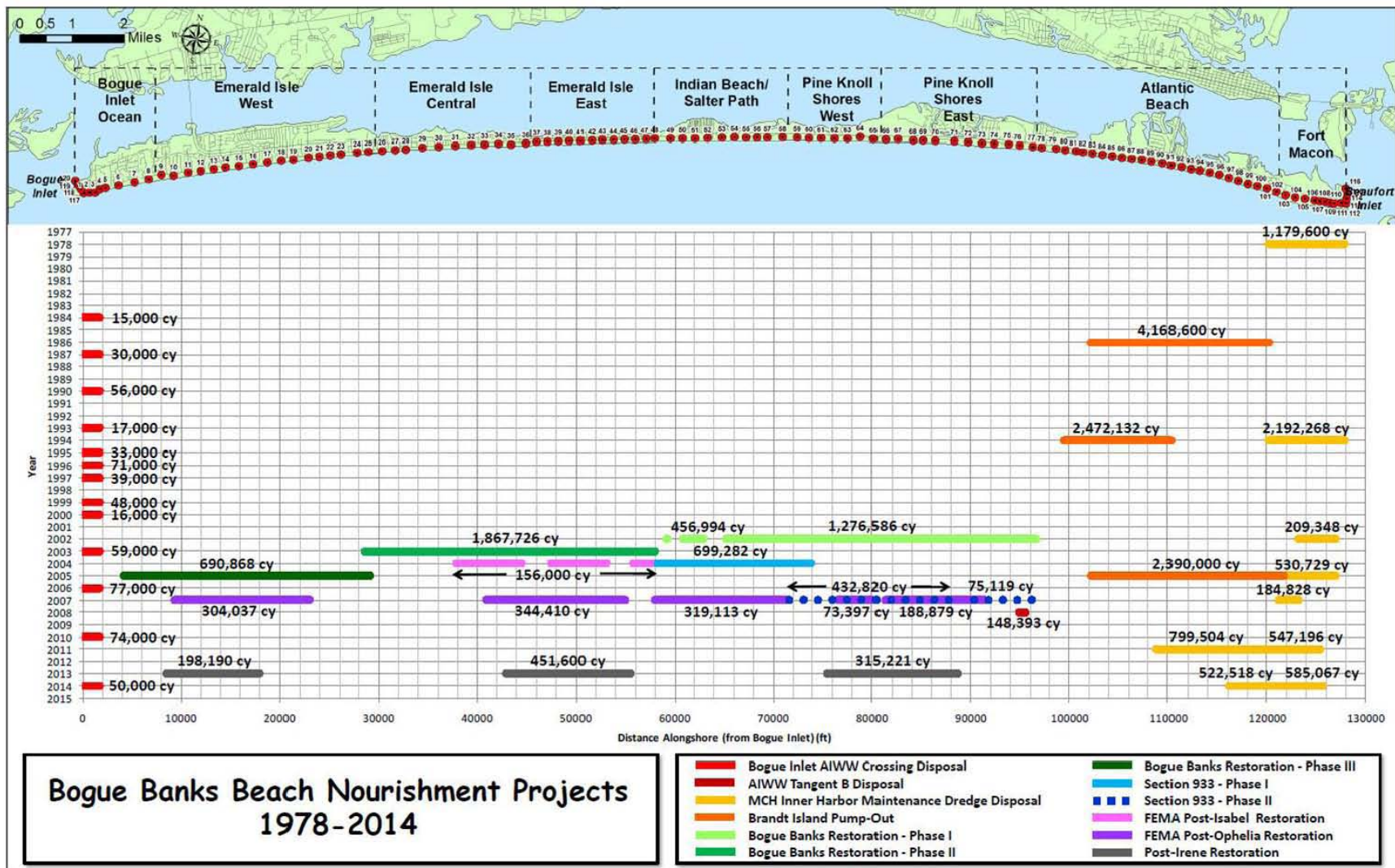
The project, for the most part, was sponsored by the towns of Pine Knoll Shores, Indian Beach, and Emerald Isle in conjunction with Carteret County. The project was constructed in three distinct phases. "Phase I" represented the Pine Knoll Shores/Indian Beach Joint Restoration Project that was constructed in 2001-02; "Phase II" represented the Eastern Emerald Isle Restoration Project (2002-03); and "Phase III," constructed in winter 2005, represented the Western Emerald Isle Restoration Project that entailed the realignment of Bogue Inlet bar channel and the use of the shoal material dredged for beach nourishment along the westernmost 4.5 miles of Emerald Isle.

The County, acting through the SPO, established a detailed beach profile monitoring program (with surveys being completed annually) documenting the condition of the local beach fills placed along the island in compliance with Federal Emergency Management Agency (FEMA) reimbursement guidelines for named storm impacts. In addition to the profile monitoring program, static vegetation line exception requests submitted by the communities of Atlantic Beach, Pine Knoll Shores, Indian Beach/Salter Path, and Emerald Isle were approved by the state's Coastal Resource Commission (CRC) on 24 March 2010 and updated in 2015. Both annual beach profile monitoring and exception request actions have been proactive attempts by the County to assist in maintaining a viable beach. Additionally, locally funded and beneficial use federal projects have been undertaken, serving as interim measures keeping county beaches viable until the USACE's CSDR federal project could be constructed (Figure 2.7). Through these local efforts, roughly seven MCY of sand have been placed along Bogue Banks and \$39M spent in concert with these local shore protection activities.

Concurrent to the County's actions above, several federal projects managed by the USACE have been initiated and are in various stages of planning, design, and implementation, including:

- Feasibility Report and Final EIS for the 50-year CSDR Project (USACE 2014),
- Section 111 Report (USACE 2001) addressing MCH dredging effects on Bogue Banks' beaches
- Integrated Dredged Material Management Plan (DMMP) and EIS (USACE 2013), and
- Section 933 beneficial use of dredged material projects in association with maintenance dredging of MCH channel.

However; for the past decade, the County has served as the local sponsor for a federally cost-shared, 50-year CSDR project addressing the County's long-term erosion problems, infrastructure protection, and natural resource management needs. To date, the USACE 50-year CSDR project appears as an uncertainty, lacking federal funding support by present and past administrations. While the recent USACE's dredged material management plan (DMMP) and Interim Operation Plan (IOP) for the MCH Federal Navigation Project provides planned nourishment for eastern Bogue Banks, the entire island's long-term shore protection needs require consideration.



Source: M&N

Figure 2.7. Beach Nourishment Projects Completed Since 1978 along Bogue Banks

The proposed borrow sources would include specific reaches of the MCH federal navigation channels, the AIWW Bogue Inlet crossing, the former and current MCH ODMDS facilities, the Area Y borrow site offshore of Emerald Isle, Bogue Inlet, AIWW disposal islands, and upland sand mines. Current dredging of sediment from MCH navigation reaches is for the purpose of safe navigation requirements in accordance with authorized dredging depths/widths. The least cost alternative for dredge material disposal is on the beaches directly adjacent to the dredge area, which also allows for the beneficial use of material. However, these dredging actions are for the purpose of navigation and placement in the project area is limited based on least cost disposal of dredged material. Therefore, potential recipient beaches associated with dredging conducted for navigation would be limited to Fort Macon west through Atlantic Beach.

In 1994, a USACE Section 111 Study was requested by Pine Knoll Shores to determine if damages to the beach can be directly attributable to the Federal Navigation Project (<http://www.carteretcountync.gov/313/Preservation-Plan>). In 2001, the USACE completed a Section 111 study that addressed the impacts of dredging MCH upon the beaches of Bogue Banks. The study found no direct evidence that the harbor project has had a negative impact on any of the shorelines in the vicinity, including Pine Knoll Shores. However, the report suggested that alternative sand management practices in conjunction with harbor maintenance may be beneficial with regard to long-term stability of the shoreline (USACE 2001).

With the increase in frequency of the hurricanes in the 1990s, County and municipal leaders recognized a need to be more independently prepared to maintain shoreline protection projects along Bogue Banks. Occupancy tax legislation was developed to create a beach nourishment reserve fund, and a County Beach Commission was formed in 2001 which legislatively mandates participation from Atlantic Beach, Pine Knoll Shores, Emerald Isle, Indian Beach, Island at-large, a County Board member, Tourist Development Agency (TDA), and a County At-large individual; to manage the funds and coastal resources along Bogue Banks. Consultants were retained by the municipalities to develop and implement maintenance of the previous locally funded Bogue Banks Restoration Project which placed material, in three phases, along Bogue Banks: Phase I) Indian Beach/Salter Path and Pine Knoll Shores (1.73 MCY, 2002); Phase II) Emerald Isle Central and Emerald Isle East (1.87 MCY, 2003); and Phase III) Emerald Isle West (0.69 MCY, 2005) (see Figure 2.5).

In 2003, the USACE completed a Section 933 study investigating the beneficial placement of beach fill to be obtained by maintenance dredging of the MCH navigation project and by recycling previously dredged material from the adjacent Brandt Island confined disposal area (USACE 2013). Phase I of the Section 933 Project (2004) placed approximately 700,000 cy of material on Indian Beach/Salter Path while Phase II (2007) placed approximately 508,000 cy of material on Pine Knoll Shores (see Figure 2.7).

In 2004 and 2007, two FEMA-funded restoration efforts were undertaken due to storm damage from Hurricanes Isabel and Ophelia, respectively. These efforts resulted in the placement of

approximately 1.4 MCY of sand along Bogue Banks. Most recently, in 2013, a post-Hurricane Irene restoration project, partially funded by the FEMA, was constructed, placing approximately 965,000 cy of sand from the ODMS located within the OCS, along Emerald Isle and Pine Knoll Shores (see Figure 2.7).

In 2010 and updated in 2016, the USACE completed a DMMP for the inner harbor MCH navigation project. The base plan includes periodic placement of material on Fort Macon, Atlantic Beach, and west through Pine Knoll Shores at regular intervals (USACE 2010 and 2016). While the USACE's DMMP and IOP for the MCH Federal Navigation Project provide for some periodic beneficial placement of beach compatible material along eastern Bogue Banks, a comprehensive plan for long-term beach nourishment for the entire island is needed to provide for proactive management of county beaches and Bogue Inlet. As defined previously, the Engineering Report (Appendix I) includes a comprehensive review of present-day beach conditions, a review of the County's and USACE's previous beach nourishment and beneficial use projects, and development of a regional, multi-decadal shore protection plan (MBNP, summarized in Appendix H). The MBNP is based on volumetric/beach elevation thresholds, reach-specific erosion rates, and accessibility of beach-quality sand volumes for Fort Macon/Atlantic Beach, Pine Knoll Shores, Indian Beach/Salter Path, and Emerald Isle. The engineering report addresses all anticipated beach nourishment/maintenance activities likely but not limited to; AIWW dredging with concurrent beach disposal, beneficial use dredging projects/opportunities including federal efforts/Section 933 events, relocation of Bogue Inlet, FEMA reimbursement projects, and other potential sand placement or beach maintenance activities (beach bulldozing, sand fencing, etc.).

The County, the Carteret County Beach Commission, and the SPO seek to provide long-term, sustaining management of Bogue Banks beaches. The County intends to maintain Bogue Banks beaches and adjacent inlets via implementation of the proposed action with guidance from the SPO and oversight by the Beach Commission. In the process of completing past projects and monitoring, Bogue Banks has developed a comprehensive dataset that was the underpinning of all the analyses in the Engineering Report (Appendix I) (Table 2.3). Major findings of these datasets and analyses completed for the proposed action are summarized in Chapter 3, the MBNP (Appendix H) and Engineering Report (Appendix I). Many previous studies and assessments have been conducted for various actions by various entities along Bogue Banks since 1978. Such assessments and studies range from navigational dredging effects on shoreline erosion to potential natural resources effects from the Fort Macon terminal groin (Table 2.3). These previous assessments/studies provide historic and present insight regarding the natural resources and shoreline behaviors and trends along Bogue Banks. Additionally, the SPO has provided on-going shoreline elevation monitoring surveys, participated in detailed biological monitoring (including academia research efforts), overseen detailed inlet surveys; and provided stakeholder input on numerous studies along Bogue Banks as well as for both Bogue and Beaufort Inlets.

Table 2.3. Past and current Bogue Banks sand placement projects.

Project Name	Year	Sand Placement Volume (cy)	Citation	Report Type
MCH – DMMP	NA	1,200,000 every 3 years	USACE 2016	Feasibility Study/EIS
CSDR Bogue Banks	NA	1,070,000 every 3 years	USACE 2014	Feasibility Study/EIS
MCH - Inner Harbor Maintenance	2014	1,107,585	USACE 2009	Interim Operations Plan/ EA-FONSI
Post-Irene Replenishment	2013	965,000	USACE-DCA 2013	EA-FONSI
MCH - Inner Harbor Maintenance	2011	1,346,700	USACE 2009	Interim Operations Plan/ EA-FONSI
AIWW Section 1 - Tangent B	2008	148,393	USACE 2008	NA
MCH Section 933 - Phase II	2007	507,939	USACE 2003	Evaluation Report/ EA-FONSI
Post-Ophelia Replenishment	2007	1,229,836	USACE-CSE 2007	EA-FONSI
MCH - Inner Harbor Maintenance	2007	184,828	USACE 1993	EA-FONSI
Bogue Banks Restoration - Phase III	2005	690,868	USACE-CSE 2005	EIS
MCH - Brandt Island Pump-Out	2005	2,390,000	USACE 1993	EA-FONSI
MCH - Inner Harbor Maintenance	2005	530,729	USACE 1993	EA-FONSI
MCH Section 933 - Phase I	2004	699,282	USACE 2003	Evaluation Report/ EA-FONSI
Post-Isabel Replenishment	2004	156,000	USACE-CSE 2004	EA-FONSI
Bogue Banks Restoration - Phase II	2003	1,867,726	USACE-CSE 2001	EA-FONSI/State EIS
Bogue Banks Restoration - Phase I	2002	1,733,580	USACE-CSE 2001	EA-FONSI/State EIS
MCH - Inner Harbor Maintenance	2002	209,348	USACE 1993	EA-FONSI
MCH - Brandt Island Pump-Out	1994	2,472,132	USACE 1993	EA-FONSI

Note: FONSI = Findings of no Significant Impact

Bogue Inlet, an integral element of the proposed action, is considered a federal shallow draft inlet with authorized dimensions of 150 feet wide and eight feet deep. Bogue Inlet has historically been dredged by the USACE through the use of sidecast dredges. In the late 1990s through the early 2000s, the inlet shifted east toward the Point at Emerald Isle and seriously threatened homes and infrastructure along the inlet shoreline (Photos 2.2 and 2.3). The inlet was relocated in early 2005 by the Town of Emerald Isle and the adjacent inlet shoreline has been relatively stable ever since (Photo 2.4).



November 2003

Photo 2.2. Imminently threatened home adjacent to Bogue Inlet.



May 2005

Photo 2.3. Imminently threatened home adjacent to Bogue Inlet post-restoration efforts.



March 2006

Photo 2.4. Aerial view of Emerald Isle's western shoreline post-restoration efforts.

2.5 What Are the County's Capabilities and Capacities in Implementing a Long-term Management Plan?

Carteret County, the Carteret County Beach Commission, and the SPO have taken steps providing Bogue Banks beaches long-term self-sustaining shoreline management. By state legislation, the Carteret County Beach Commission, an 11-member group entrusted with decisions concerning the Beach Fund, was formed in 2001 and a Room Occupancy and Tourism Tax (ROT) for funding beach nourishment and related functions was enacted. The ROT, enacted in 2001 (SL 2001-381) and codified as State Law (SL) 2013-223, is currently at six percent (%) with three percent remitted to the "Beach Fund." The town of Bogue Banks and Carteret County has the legislative, institutional, and economic capabilities for implementing and maintaining the MBNP with guidance from the SPO and oversight by the Beach Commission. The cumulative cost of past renourishment projects is summarized in Table 2.4. The local municipalities have provided 35% of the total costs over the past 15 years to proactively manage Bogue Banks; State and Federal sources have funded the balance of these costs.

Table 2.4. Cumulative costs and volume of past renourishment efforts.

Project	Local (\$)	State (\$)	Federal (\$)	Total (\$)	cubic yards
Phase I ('01-'02)	\$11,700,000	\$900,000	\$0	\$12,600,000	1,733,580
Phase II ('03)	\$11,800,000	\$0	\$0	\$11,800,000	1,867,726
Phase III ('05)	\$7,100,000	\$3,800,000	\$0	\$10,900,000	690,868
933 Phase I ('04)	\$400,000	\$1,200,000	\$3,800,000	\$5,400,000	699,282
Pump-Out ('04-'05)	\$0	\$1,000,000	\$9,600,000	\$10,600,000	2,920,729
933 Phase II ('07)	\$678,000	\$2,000,000	\$7,600,000	\$10,278,000	507,939
Harbor ('10-'11)	\$0	\$0	\$12,762,429	\$12,762,429	1,346,700
Harbor ('14)	\$0	\$0	\$9,415,774	\$9,415,774	1,107,585
Isabel ('04)	\$0	\$0	\$1,956,175	\$1,956,175	156,000
Ophelia ('07)	\$0	\$0	\$13,773,768	\$13,773,768	1,229,836
Irene ('13)	\$7,875,810	\$0	\$7,076,155	\$14,951,965	965,011
TOTALS	\$39,553,810	\$8,900,000	\$65,984,301	\$114,438,111	13,225,256
%	35%	8%	58%	100%	

Source: SPO