APPENDIX A

SCOPING DOCUMENTS

orientation. Currently, Cambria has a population of approximately 6,400 permanent residents with a substantial tourist and second home population.

The CCSD provides water supply, wastewater collection and treatment, fire protection, garbage collection, and a limited amount of street lighting and recreation. The CCSD currently serves a population of about 6,400 as well as a large number of visitors to the Central Coast and covers approximately four square miles. The relatively remote location of Cambria has resulted in the area relying solely upon local groundwater for its water supply.

3. *Proposed Project.* To study, plan, and implement a project to provide for a reliable water supply for the community of Cambria in San Luis Obispo County, CA.

4. *Alternatives.* Potential water supply alternatives were compiled from studies conducted by the CCSD over a period of more than ten years identifying and evaluating potential sources of additional potable water for CCSD. The alternatives initially being considered for the proposed project include seawater desalination, local and imported surface water, groundwater, hard rock drilling, and seasonal reservoir storage.

5. *Scoping Process.*

a. Potential impacts associated with the proposed project will be fully evaluated. Resource categories that will be analyzed include: Physical environment, geology, biological resources, air quality, water quality, recreational usage, aesthetics, cultural resources, transportation, noise, hazardous waste, socioeconomics and safety.

b. The Corps intends to hold a public scoping meeting(s) for the EIS/EIR to aid in the determination of significant environmental issues associated with the proposed project. Affected federal, state and local resource agencies, Native American groups and concerned interest groups/individuals are encouraged to participate in the scoping process. Public participation is critical in defining the scope of analysis in the Draft EIS/EIR, identifying significant environmental issues in the Draft EIS/EIR, providing useful information such as published and unpublished data, and knowledge of relevant issues and recommending mitigation measures to offset potential impacts from proposed actions. The time and location of the public scoping meeting will be advertised in letters, public announcements and news releases.

c. Individuals and agencies may offer information or data relevant to the environmental or socioeconomic impacts of the proposed project by submitting comments, suggestions, and requests to be placed on the mailing list for announcements to (see **ADDRESSES**) or the following email address: *kathleen.s.anderson@usace.army.mil.*

d. The project will require concurrence by the California Coastal Commission with the federal Coastal Consistency Determination in accordance with the Coastal Zone Management Act, as well as certification under Section 401 of the Clean Water Act from the Regional Water Quality Control Board. Depending upon the recommended alternative, the project may also require additional real property rights for construction and operation of a facility, and compliance with the Endangered Species Act.

6. *Scoping Meeting Date, Time, and Location.* The Public Scoping Meeting will take place on March 15, 2012, 7 p.m. to 9 p.m., Veterans Hall, 1000 Main Street, Cambria, CA 93428.

7. *Availability of the Draft EIS/EIR.* The Draft EIS/EIR is scheduled to be published and circulated in September 2012. Pursuant to CEQA, a public hearing on the EIS/EIR will be held by the CCSD following its publication.

Dated: February 15, 2012.

R. Mark Toy,

Colonel, U.S. Army, Commander and District Engineer, Los Angeles District.

[FR Doc. 2012–4313 Filed 2–23–12; 8:45 am]

BILLING CODE 3720–58–P

DEPARTMENT OF DEFENSE

Department of the Army; Corps of Engineers

Intent To Prepare a Draft Environmental Impact Statement (EIS) for the Installation of a Terminal Groin Structure at Lockwood Folly Inlet and to Conduct Supplemental Beach Nourishment Along the Eastern Oceanfront Shoreline of Holden Beach, in Brunswick County, NC

AGENCY: Department of the Army, U.S. Army Corps of Engineers, DoD.

ACTION: Notice of intent.

SUMMARY: The U.S. Army Corps of Engineers (USACE), Wilmington District, Wilmington Regulatory Field Office has received a request for Department of the Army authorization, pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbor Act, from the Town of Holden Beach to develop and implement a shoreline protection plan that includes the installation of a terminal groin structure on the west side of Lockwood Folly Inlet (a federally maintained navigational channel) and the nourishment of the oceanfront shoreline along the eastern end of Holden Beach.

DATES: A public scoping meeting for the Draft EIS will be held at Holden Beach Town Hall, located at 110 Rothschild Street in Holden Beach, on March 8, 2012 at 6 p.m. Written comments will be received until March 26, 2012.

ADDRESSES: Copies of comments and questions regarding scoping of the Draft EIS may be submitted to: U.S. Army Corps of Engineers, Wilmington District, Regulatory Division. ATTN: File Number 2011–01914, 69 Darlington Avenue, Wilmington, NC 28403.

FOR FURTHER INFORMATION CONTACT: Questions about the proposed action and Draft EIS can be directed to Mr. Mickey Sugg, Project Manager, Wilmington Regulatory Field Office, telephone: (910) 251–4811. Additional description of the Town's proposal can be found at the following link, *http://www.saw.usace.army.mil/WETLANDS/Projects/index.html,* under Holden Beach Terminal Groin and Nourishment Project.

SUPPLEMENTARY INFORMATION: 1. *Project Description.* Over the past decades, the eastern end of Holden Beach has experienced consistent and relatively severe erosional conditions along the oceanfront shoreline and primary dune system. As a result of chronic erosion, the Town has implemented, typically in coordination with the U.S. Corps of Engineers federal channel maintenance dredging, periodic beach nourishment activities within this eastern stretch and near the inlet. These measures have been short-term in nature; and it is the Town's desire to implement a long-term beach and dune stabilization strategy. As stated by the Town, this strategy would help protect public and private infrastructure from future storms. Their proposal includes constructing a terminal groin near the Lockwood Folly Inlet (western side) and conducting supplemental sand placement along the eastern end of the island. Final locations and placement of sand will be determined during the project design process. For the groin structure, final location and design has yet to be determined. No groin structure is proposed on the opposite, or eastern, side of Lockwood Folly Inlet.

2. *Issues.* There are several potential environmental and public interest issues that will be addressed in the EIS. Additional issues may be identified during the scoping process. Issues initially identified as potentially significant include:

a. Potential impacts to marine biological resources (benthic organisms, passageway for fish and other marine life) and Essential Fish Habitat.

b. Potential impacts to threatened and endangered marine mammals, birds, fish, and plants.

c. Potential impacts associated with using inlets as a sand source.

d. Potential impacts to adjacent shoreline changes on the east side Lockwood Folly Inlet, or along the Town of Oak Island.

e. Potential impacts to Navigation, commercial and recreational.

f. Potential impacts to the long-term management of the inlet and oceanfront shorelines.

g. Potential effects on regional sand sources and how it relates to sand management practices and North Carolina's Beach Inlet Management Practices.

h. Potential effects of shoreline protection.

i. Potential impacts on public health and safety.

k. Potential impacts to recreational and commercial fishing.

l. The compatibility of the material for nourishment.

m. Potential impacts to cultural resources.

n. Cumulative impacts of past, present, and foreseeable future dredging and nourishment activities.

3. *Alternatives.* Several alternatives and sand sources are being considered for the development of the protection plan. These alternatives will be further formulated and developed during the scoping process and an appropriate range of alternatives, including the no federal action alternative, will be considered in the EIS.

4. *Scoping Process.* A public scoping meeting (see **DATES**) will be held to receive public comment and assess public concerns regarding the appropriate scope and preparation of the Draft EIS. Participation in the public meeting by federal, state, and local agencies and other interested organizations and persons is encouraged.

The USACE will consult with the U.S. Fish and Wildlife Service under the Endangered Species Act and the Fish and Wildlife Coordination Act; with the National Marine Fisheries Service under the Magnuson-Stevens Fishery Conservation and Management Act and the Endangered Species Act; and with the North Carolina State Historic Preservation Office under the National Historic Preservation Act. Additionally, the USACE will coordinate the Draft EIS with the North Carolina Division of Water Quality (NCDWQ) to assess the potential water quality impacts pursuant to Section 401 of the Clean Water Act, and with the North Carolina Division of Coastal Management (NCDCM) to determine the projects consistency with the Coastal Zone Management Act. The USACE will closely work with NCDCM and NCDWQ in the development of the EIS to ensure the process complies with all State Environmental Policy Act (SEPA) requirements. It is the intention of both the USACE and the State of North Carolina to consolidate the NEPA and SEPA processes thereby eliminating duplication.

6. *Availability of the Draft PEIS.* The Draft EIS is expected to be published and circulated by early 2013. A public hearing will be held after the publication of the Draft EIS.

Dated: February 14, 2012.

S. Kenneth Jolly,

Chief, Regulatory Division.

[FR Doc. 2012–4305 Filed 2–23–12; 8:45 am]

BILLING CODE 3720–58–P

DEPARTMENT OF DEFENSE

Department of the Army; Corps of Engineers

Revised Notice of Intent To Prepare a Draft Environmental Impact Statement for the Brunswick County Beaches, NC, Coastal Storm Damage Reduction Project

AGENCY: Department of the Army, U.S. Army Corps of Engineers, DoD.

ACTION: Notice of Intent.

SUMMARY: The U.S. Army Corps of Engineers (USACE), Wilmington District (Corps) is currently conducting a General Reevaluation Report (GRR) for the Brunswick County Beaches, NC, Coastal Storm Damage Reduction (CSDR) Project. The Corps intends to prepare a Draft Environmental Impact Statement (DEIS) to evaluate the impacts of the proposed CSDR alternatives to reduce coastal storm damages from beach erosion in the towns of Holden Beach, Oak Island, and Caswell Beach, North Carolina. An array of structural, non-structural, and no action alternatives are being evaluated. Current analyses suggest that the dune and berm beach fill alternative maximizes net CSDR benefits for the project area beaches and provides additional environmental and recreation benefits. An offshore borrow area has been identified within the Southwestern portion of Frying Pan Shoals (FPS) (located off the coast of Cape Fear, North Carolina) to provide beach compatible sediment for the 50-year life of the project.

The DEIS is being prepared in accordance with the requirements of the National Environmental Policy Act (NEPA) of 1969, as amended, and will address the relationship of the proposed action to all other applicable Federal and State Laws and Executive Orders.

DATES: The earliest the DEIS will be available for public review would be August 2013.

FOR FURTHER INFORMATION CONTACT: Questions about the proposed action and DEIS can be answered by Mr. Doug Piatkowski, Environmental Resources Section; U.S. Army Engineer District, Wilmington; 69 Darlington Avenue, Wilmington, North Carolina 28403; telephone: (910) 251–4908; email: *douglas.piatkowski@usace.army.mil.*

SUPPLEMENTARY INFORMATION:

1. Previous Notice of Intent (NOI) publication. This notice is a revision of an August 26, 2003, NOI (68 FR 51257) to prepare a DEIS and is prepared in response to changes in the proposed action, availability of new information relative to the proposal and associated impacts, and the significant amount of time which has passed since the last NOI.

2. Authority. Federal improvements for CSDR along a segment of the ocean shoreline in Brunswick County, North Carolina, were authorized by the Flood Control Act of 1966 (Pub. L. 89–789). The most applicable text is copied below.

The project for hurricane-flood control protection from Cape Fear to the North Carolina—South Carolina State line, North Carolina, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 511, Eighty-ninth Congress.

3. Project Purpose. The project purpose is reduction of damages from beach erosion for the towns of Caswell Beach, Oak Island (the former towns of Long Beach and Yaupon Beach have been incorporated as the Town of Oak Island), and Holden Beach, North Carolina. If implemented, the project would also enhance the beach area available for recreation use and provide habitat for a variety of plants and animals.

Significant environmental resources to be addressed in the DEIS include, but are not limited to: (1) Endangered and threatened species; (2) Marine and estuarine resources; (3) Upland beach and dune resources; (4) Fish and wildlife and their habitats; (5) Essential Fish Habitat (EFH) and Cape Fear Sandy Shoals; (6) Water and air quality; (7) Socioeconomic resources; (8) Cultural

US Army Corps
Of Engineers
Wilmington District

PUBLIC NOTICE

Issue Date: February 24, 2012
Comment Deadline: March 26, 2012
Corps Action ID #: SAW-2011-01914

All interested parties are herby advised that the Wilmington District, Corps of Engineers (Corps) is holding a scoping meeting for work within jurisdictional waters of the United States that is proposed by the Town of Holden Beach. Specific plans and location information are described below and are available on the Wilmington District Web Site at http://www.saw.usace.army.mil/WETLANDS/Projects/index.html

Applicant: Town of Holden Beach
C/o: Mr. David Hewett (Town Manager)
110 Rothschild Street
Holden Beach, North Carolina 28462

Contracting Engineer: Applied Technology & Management, Inc. (ATM)
C/o: Mr. Fran Way
360 Concord Street, #300
Charleston, South Carolina 29401

Authority

The Corps will evaluate this project pursuant to applicable procedures for Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbor; and will prepare an Environmental Impact Statement (EIS) to assess the proposal. The Corps will be coordinating with North Carolina Division of Coastal Management and North Carolina Division of Water Quality in the development of the EIS to ensure the process complies with all State Environmental Policy Act (SEPA) requirements.

Location

The project site is located at 33-54-53.59 N, 78-14-35.80 W, and encompasses approximately 0.75 miles of Holden Beach ocean and inlet shoreline, starting from the east side of Lockwood Folly Inlet and moving westward near Avenue B and McCray Street, in Brunswick County, North Carolina.

Existing Site Conditions

The Town of Holden Beach is an approximate 8.0-mile long barrier island with the Town of Ocean Isle Beach located to the west and Long Beach (Oak Island) to the east. The island is a south facing island, bordered by Shallotte Inlet to the west, Lockwood Folly Inlet to the east, Atlantic Intracoastal Waterway (AIWW) to the north, and the Atlantic Ocean to the south. It is a typical North Carolina barrier island that has undergone a variety of natural and anthropogenic changes. The majority of the island has been developed by residential activities, but does contain a small concentrated area of commercial buildings located near the high rise access bridge. Over the last decade, separate authorizations have been granted to the Town, as well as individual owners and developments, to conduct various activities, such as dredging, beach bulldozing, and shoreline nourishment, within waters of the U.S. along the ocean shoreline. It should also be noted that the Corps has performed several beach nourishment projects associated with its Federal navigation maintenance activities.

Applicant's Stated Purpose

The stated purpose of the project is to implement an erosion control and beach/dune restoration that will provide long-term protection to residential structures and Town infrastructure along the east end of Holden Beach. This proposal, which would complement existing island wide nourishment activities, is also expected to maintain and promote a recreational beach area along with public parking and access points.

Project Description

In the 1970s, a temporary terminal groin, consisting of 15 sand-filled nylon tubes, was constructed to protect the east end of the island from erosion. The Town deemed that the groin field was successful and economical, but was short-term in nature. With chronic erosion at the east end continuing, the Town is proposing a long-term shoreline protection solution by installing a single terminal groin and conducting supplemental beach nourishment. Plans for the terminal groin, at this time, are preliminary conceptual layouts based on shoreline movement and historic conditions. The general design goals include: protection of public access, stabilization of the east end of the island, improvement of recreational beach area, enhancement of upper beach/dune habitat, and to reduce beach and AIWW dredging maintenance costs.

Two conceptual terminal groin layouts have been evaluated: Groin Alternative 1 and Groin Alternative 2. Groin Alternative 1 consists of a groin structure approximately 1,600 linear feet long that would be directly located along Lockwood Folly Inlet shoulder. This rubble (rock) structure would include a 'spur' feature which extends out perpendicular near the base, or tie-in footing, of the groin. The terminal groin profile would be similar to the existing Fort Macon groin along Beaufort Inlet in Carteret County (i.e., crest height ~7 ft MLW, crest width ~10 ft, and 2:1 side slopes). Groin Alternative

2 would be located in the general area near the terminus of Ocean Boulevard East. The conceptual design for this rubble (rock) structure has the length between 400-600 linear feet with an asymmetric T-Head feature at the seaward end of the groin. The T-Head design is expected to enhance the fillet formation and to help minimize the formation of potential rip currents.

Both groin alternatives will involve supplemental beach nourishment to help form the structure's fillet area (or shoreline area adjacent to the structure). The beach fill footprint and volumes would be directly related to the size and configuration of the terminal groin, and therefore are also conceptual. Fill footprint for Groin Alternative 1 would encompass approximately 27 acres on the west side of the structure. Assuming a 40 cy/ft unit fill placement, approximately 160,000 cubic yards of material will be required for the fillet area. With Groin alternative 2 being shorter, the conceptual footprint contains approximately 14 acres and includes both the east and west sides of the structure. Assuming a 30 cy/ft unit fill placement for the fillet, approximately 80,000 cubic yards of material will be required. Potential options for sand sources are the following: 1) Corps Lockwood Folly Inlet AIWW dredging, 2) Corps Lockwood Folly Inlet outer channel dredging, 3) Upland Borrow Areas (Turkey Trap Road Site, Smith Borrow Site, & Tripp Site), and 4) Upland Dredge Disposal Islands (Monks Island & Sheep Island).

This notice is to inform interested parties that a scheduled public scoping meeting for drafting the EIS will be held on March 8, 2012 at 6:00 P.M in the Holden Beach Town Hall Public Assembly at 110 Rothschild Street in Holden Beach. The scoping meeting is designed to solicit comments from the public; Federal, State and local agencies and officials; and other interested parties to incorporate in the Draft EIS document. The purpose of these comments concerning public interest factors, ranging from navigation to biological resources to private and public lands, will identify issues to be addressed in the Draft EIS.

Additionally, this notice announces that our Notice of Intent to prepare an EIS for this project will be published in the Federal Register on February 24, 2012 and can be found on the Federal Register website, http://www.gpo.gov/fdsys/browse/collection.action?collectionCode=FR . After connecting with the website, click through the dates to February 24, 2012 (Friday). Click on "Army Department"; and locate the Holden Beach project.

As disclosed in the Notice of Intent, any written comments pertinent to the proposed work, as outlined above, must be submitted to this office, Attention: Mickey T. Sugg, and received by March 26, 2012. Questions can be directed to Mr. Sugg at telephone (910) 251-4811, Wilmington Regulatory Field Office.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
(727) 824-5317; FAX (727) 824-5300
http://sero.nmfs.noaa.gov/

March 26, 2012 F/SER4: RS/pw

(sent via electronic mail)

Colonel Steve Baker, District Engineer
US Army Corps of Engineers
P.O. Box 1890
Wilmington, North Carolina 28402-1890

Attention: Mickey Sugg

Dear Colonel Baker:

NOAA's National Marine Fisheries Service (NMFS) has reviewed Action ID No. SAW-2011-01914, dated February 24, 2012. The Town of Holden Beach proposes to construct a terminal groin at the Town's eastern end adjacent to Lockwood Folly Inlet in Brunswick County. In the public notice, the Wilmington District announces its intent to prepare an Environmental Impact Statement (EIS) for the permit action and requests the public and resource agencies identify relevant issues for the Draft EIS. As the nation's federal trustee for the conservation and management of marine, estuarine, and diadromous fishery resources, the following comments and recommendations are provided pursuant to the authorities of the Fish and Wildlife Coordination Act and the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act).

Description of the Proposed Project
To reduce chronic erosion on the eastern end of the Town of Holden Beach in the 1970s, the Town constructed a terminal groin with 15 sand-filled nylon tubes. The Town concluded the terminal groin abated the erosion, but the results were not long lasting and the erosion has continued with frequent beach nourishment used to provide limited protection. The Town is proposing a permanent terminal groin as a long-term solution. The terminal groin would be located along 0.75 miles of Holden Beach starting from the eastern side of Lockwood Folly Inlet and moving westward to near Avenue B and McCray Street. The purpose of the terminal groin would be to augment other efforts to control erosion and restore the beach and dunes to protect residential structures and Town infrastructure along the eastern end of Holden Beach. The other efforts primarily include beach nourishment.

The public notice describes two potential designs for a terminal groin. Groin Alternative 1 is a structure approximately 1,600 feet long adjacent to the south shoulder of Lockwood Folly Inlet. The rock rubble structure would include a "spar" that extends perpendicular from near the base or tie-in footing of the groin. The profile of the groin would be similar to the existing groin at Fort Macon adjacent to Beaufort Inlet. Groin Alternative 2 is a rock structure 400 to 600 feet long with an asymmetric T-Head feature on the seaward end; this groin would also be located near the terminus of Ocean Boulevard East. The T-Head is designed to enhance fillet formation and to minimize rip currents. Both groin alternatives involve

beach nourishment. Groin Alternative 1 would include a fill area of approximately 27 acres in the surf zone, while Groin Alternative 2 would fill approximately 14 acres. Up to 160,000 cubic yards of sandy fill would be required to create the fillet area alternatives.

Need for an Essential Fish Habitat Assessment

Hackney et al. (1996) provide the most recent review of the scant scientific literature that is available about the surf zone. Surf zones typically harbor a diverse fish fauna. Nearly 50 species of fish have been reported from the surf zone of North Carolina beaches, including many species that are commercially or recreationally important or serve as prey for such species. This number is suspected to be considerably lower than the actual number because over 130 species of fish have been recorded in studies of the surf zone with South Carolina and Georgia. Many of the life stages of fish found within the surf zone are also found in nearby estuaries, suggesting that the surf zone is a nursery habitat; Florida pompano and kingfish are the species most likely to rely upon the surf zone as their principal nursery habitat. Late spring to early summer is the major recruitment period for larval and juvenile fish to the surf zone, which is later than the period of maximal recruitment to estuarine nursery areas. In terms of biomass, peak use of the surf zone occurs in the fall when juvenile and adult fish leave estuaries and migrate along the coast. It is generally thought that use of the surf zone as a migratory corridor is vastly under documented with respect to their actual use. The more common fish within the surf zone consume both benthic invertebrates and plankton. Siphon cropping (grazing) also has been reported among surf zone fish when clams, such as coquina clams, were present. If siphon cropping is common, reported rates of secondary production within the surf zone would likely be underestimates if the measurements were based only on standing-stock biomass. In short, little is known about the value of surf zone habitat to fish, but the limited literature that is available suggests the value is high.

Based on coordination with your staff, we understand an essential fish habitat (EFH) assessment will be prepared for the project. Based on the location of the proposed project, we confirm that this assessment is necessary. The EFH assessment may be submitted as a standalone document or integrated with the EIS; 50 CFR § 600.920 describes the contents of an EFH assessment in a tiered manner. For all projects, the assessment should include: (i) a description of the action, (ii) an analysis of the potential adverse effects of the action on EFH and managed species, (iii) federal action agency's (i.e., Wilmington District's) conclusions regarding the effects of the action on EFH, and (iv) proposed mitigation, if applicable. For complex projects and projects expected to have major impacts to EFH, the assessment should also include: (v) results of an on-site inspection to evaluate the habitat and the site-specific effects of the project, (vi) views of recognized experts on the habitat or species that may be affected, (vii) a review of pertinent literature and related information, (viii) an analysis of alternatives to the action, and (ix) other relevant information needed to gauge the expected impacts and to assess potential alternatives.

Given the importance of surf zone habitat and tidal inlets to federally managed fishery species and to state managed fishery species, NMFS advises the Wilmington District to include all of the above items in the EFH Assessment. We recommend the focal species for the EFH assessment include: white shrimp, brown shrimp, pink shrimp, Spanish mackerel, sheepshead, gag grouper, sharpnose shark, summer flounder, and bluefish. In addition to these federally managed species, this area also likely provides habitat for red drum, black drum, Atlantic menhaden, blue crab, and grass shrimp, which are important prey for federally managed species and should be included in the assessment. Please note that the Atlantic populations of red drum were managed under the Magnuson-Stevens Act until November 5, 2008; hence guidance on EFH assessments prepared before that date may indicate a requirement to describe impacts to red drum EFH. For your EFH assessment, discussions of potential impacts to red drum should be grouped with the state-managed species.

NMFS recommends the following focal issues for the EIS:

- Use of surf zone and nearshore areas by larval fish. Abele et al. (2010)[1] provide an excellent example for how this study could be done.
- Characterization of the migration of larval and young juvenile fish through Lockwood Folly Inlet and Shallotte Inlet.
- Characterization of the ebb and flood tidal shoal complexes associated with Lockwood Folly Inlet and Shallotte Inlet and how the terminal groin would affect the size and location of these shoals.
- Examination of how the terminal groin would alter longshore sediment transport and the resulting points of erosion and accretion as well as the granulometry of the beach sediments.

Thank you for the opportunity to provide these comments. Related questions or comments should be directed to the attention of Mr. Ronald Sechler at our Beaufort Field Office, 101 Pivers Island Road, Beaufort, North Carolina 28516-9722, or at (252) 728-5090.

Sincerely,

/ for

Virginia M. Fay
Assistant Regional Administrator
Habitat Conservation Division

cc:

COE, Mickey.T.Sugg@usace.army.mil
USFWS, Pete_Benjamin@fws.gov
NCDCM, Doug.Huggett@ncmail.net
EPA, Fox.Rebecca@epa.gov
SAFMC, Roger.Pugliese@safmc.net
F/SER4, David.Dale@noaa.gov
F/SER47, Ron.Sechler@noaa.gov

[1] Kenneth W. Able, Dara H. Wilber, Angela Muzeni-Corino and Douglas G. Clarke. 2010. Spring and Summer Larval Fish Assemblages in the Surf Zone and Nearshore off Northern New Jersey, USA. Estuaries and Coasts 33:211-222

March 23, 2012

Mr. Mickey Sugg, Project Manager
U.S. Army Corps of Engineers
Wilmington District
69 Darlington Avenue
Wilmington, North Carolina 28403-1343

RE: HOLDEN BEACH TERMINAL GROIN STRUCTURE AND SUPPLEMENTAL BEACH NOURISHMENT
FILE NUMBER: 2011-01914

Dear Mr. Sugg:

The following comments/concerns regarding the referenced project are submitted on behalf of the Town of Oak Island.

Comments – Proposed Terminal Groin Structure

1. The potential short and long term impacts of the project concerning erosion/accretion along the shoreline of the west end of Oak Island should be studied and include modeling and a monitoring plan.
2. At a minimum, the shoreline-monitoring plan should extend to 13th Place West.
3. The modeling should predict the impact of the terminal groin on the ebb channel alignment and account for differences along a shallow draft inlet verses a deep draft inlet.

Comments - Proposed Holden Beach Supplemental Beach Nourishment

1. Impact on Brunswick County Beaches Coastal Storm Damage Reduction Project

   Please verify that this offshore borrow site has been eliminated from consideration as a sand resource for the Oak Island-Holden Beach portion of this project because of insufficient volumes of compatible sediment to support the project's volume needs. Also, please verify that this site is not an additional sand source identified as complementary sources with limited borrow capacity for this project.

4601 E. Oak Island Drive • Oak Island, North Carolina 28465
Phone: (910) 278-5011 • Fax: (910) 278-3400 • Website: www.oakislandnc.com

2. Impact on Oak Island shoreline

   Please verify that this offshore borrow site is beyond the depth of closure for the Oak Island shoreline so that the proposed dredging would not affect either the historical long-term erosion rates or short-term storm induced erosion and wave heights.

2. Impact on Lockwoods Folly Inlet

   Please verify that this offshore borrow site is beyond the zone of influence for Lockwoods Folly Inlet so that the proposed dredging would not affect either the symmetry of the ebb-tidal delta complex or the ebb channel alignment.

3. Potential for recharge and subsequent use of borrow site

   Please determine the potential for recharge of this borrow site after the proposed dredging occurs including the length of time to recharge and the sand source for recharge.

Thank you for your consideration.

Respectfully,

Teresa Frazier
for Carol Painter
Town Council
Town of Oak Island

Gene Kudgus
Gene Kudgus, PE
Public Services Director
Town of Oak Island

CC: Tom Hogg, Interim Town Manager, Oak Island
David Hewitt, Town Manager, Holden Beach

NCDENR
North Carolina Department of Environment and Natural Resources
Division of Marine Fisheries

Beverly Eaves Perdue
Governor

Dr. Louis B. Daniel III
Director

Dee Freeman
Secretary

MEMORANDUM:

TO: Mickey T. Sugg, Project Manager, Wilmington USACE Regulatory Field Office

THROUGH: Anne Deaton, DMF Habitat Section Chief

FROM: Jessi Baker, DMF Habitat Alteration Permit Reviewer

SUBJECT: Holden Beach Terminal Groin Draft EIS - Scoping

DATE: March 27, 2012

The North Carolina Division of Marine Fisheries (DMF) submits the following comments pursuant to General Statute 113-131. Representatives from DMF attended an agency scoping meeting in Wilmington, NC for the Holden Beach terminal groin on October 12, 2011. DMF has reviewed the Corps of Engineers Public Notice and the Holden Beach Work Plan for installing a terminal groin. Holden Beach proposes to install a terminal groin with supplemental beach nourishment at the east end of Holden Beach. Two groin alternatives are presented, a longer one close to the inlet and shorter one to the west and closer to existing ocean front homes.

The 2010 Coastal Habitat Protection Plan (CHPP) summarizes the latest scientific information available to assess the status and threats to marine fish habitats. The CHPP process brings state regulatory agencies together to implement the recommendations from the CHPP. The CHPP states that research is needed to determine when and where recruitment to adult fish stocks is limited by larval ingress to estuarine nursery habitats. The CHPP also states that the long-term consequences of hardened structures on larval transport and recruitment should also be thoroughly assessed prior to approval of such structures. DMF has concerns that terminal groins will alter larval transport and impact important fish habitats through altered beach and nearshore sediment and profile.

Impacts to Larval Transport

Terminal groins can potentially interfere with the passage of larvae and early juveniles from offshore spawning grounds into estuarine nursery areas. Successful transport of larvae through the inlet occurs within a narrow zone parallel to the shoreline and is highly dependent on along-shore transport processes (Blanton et al. 1999; Churchill et al. 1999; Hare et al. 1999). Obstacles such as jetties adjacent to inlets block the natural passage for larvae into inlets and reduce recruitment success (Kapolnai et al. 1996; Churchill et al. 1997; Blanton et al. 1999) (from 2010 CHPP).

DMF requests a detailed scientific field investigation, analysis, and modelling of larval transport dynamics that exist in and near Lockwoods Folly Inlet. This information should be used to model estimated impacts of a groin of different sizes and locations to larval ingress and egress through the inlet.

5285 Hwy 70 West, Morehead City, North Carolina 28557
Phone: 252-808-8066\ FAX: 252-727-5127\ Internet: www.ncdmf.net

NCDENR
North Carolina Department of Environment and Natural Resources
Division of Marine Fisheries

Beverly Eaves Perdue
Governor

Dr. Louis B. Daniel III
Director

Dee Freeman
Secretary

Impacts to Fish Habitat

DMF has significant concerns about the use of hardened shoreline stabilization techniques along high energy ocean shorelines due to accelerated erosion in some location along the shore as a result of the longshore sediment transport being altered. These structures may also modify sediment grain size, increases turbidity in the surf zone, narrow and steepen beaches, and result in reduced intertidal habitat and diversity and abundance of macroinvertebrates. Anchoring inlets may also prevent shoal formation and diminish ebb tidal deltas, which are important foraging grounds for many fish species (Deaton et al. 2010). Changes to the surf zone or inlet could affect species that depend on these areas for nursery, spawning, or foraging.

DMF requests a field investigation of the current distribution of larval and juvenile fishes in the vicinity of the inlet and proposed groin locations as well as another similar inlet as a control. These data can identify the most highly utilized habitat areas as well as serve as baseline data to compare to larval and juvenile fish monitoring data that should be collected after groin construction.

Due to the potential for altered sediment grain size, beach profile and intertidal habitat due to the influence of a groin, DMF requests benthic macroinvertebrate monitoring within the impact area of the proposed groins.

Based on these concerns, DMF also requests detailed discussions of the following be included in the EIS.

- All Essential Fish Habitat (EFH)and state protected habitats that occurs in this area
- All fish habitats outlined in the most recent NC Coastal Habitat Protection Plan (CHPP) that occur in the area
- Characterization of fish and invertebrate composition and abundance in the inlet and adjacent surf zone
- Compilation of relevant research regarding larval transport through inlets, especially inlets with hardened structures
- Potential impacts to the benthos of the surf/swash zone and nearshore areas and a detailed plan to monitor for impacts within the impact area of the proposed groins
- Potential impacts to wetlands due to anticipated erosion on the north end of the island
- Potential impacts to commercial or recreational fishing including any indirect economic impacts due to adverse impacts to fish and fish habitat
- Potential direct impacts from dredging, beach placement, and nearshore placement and how those impacts will be minimized
- Potential impacts on regional sand budgets

If the USACE would like assistance in locating information regarding the above topics or has any other questions, please contact Jessi Baker at (252) 808-8064 or jessi.baker@ncdenr.gov.

5285 Hwy 70 West, Morehead City, North Carolina 28557
Phone: 252-808-8066\ FAX: 252-727-5127\ Internet: www.ncdmf.net

From: Sugg, Mickey T SAW [Mickey.T.Sugg@usace.army.mil]
Sent: Wednesday, August 08, 2012 9:14 AM
To: Way, Francis; Dawn York
Cc: David Hewett
Subject: Comments for Holden Bch
Attachments: On the Continued Costs of Beach Upkeep Related to Groins and Jetties.doc

These are comments from Len Pietrafesa (Prof. at NCSU & Coastal Carolina) concerning the proposed TG at Holden. I had put these with Figure 8 proposal and didn't notice until last week that the comments were for Holden and not Figure 8.
-mickey

Mickey Sugg, Project Manager
US Army Corps of Engineers
69 Darlington Avenue
Wilmington NC 28403-1343
(910) 251-4811 (o)
(910) 251-4025 (fax)

-----Original Message-----
From: Len Pietrafesa [mailto:ljpietra@ncsu.edu]
Sent: Friday, July 06, 2012 7:29 AM
To: Sugg, Mickey T SAW
Subject: Re: Statement

Mickey:
Here is a more recent write-up, which will be published in a peer reviewed journal, for your interest.
Best regards,
Len

On 2/28/2012 10:27 AM, Sugg, Mickey T SAW wrote:
> Mr. Pietrafesa,
>
> Thank you for your interest in our review of the Town's proposal; and I hope that your family situation works out well. Your comments are appreciated and will be incorporated in the preparation of the Draft EIS. Please note that the public will also be given the opportunity to comment on the Draft and Final EIS, as well as when the Town's permit application is submitted to our office.
>
> If you have any questions regarding our review process, pls do not hesitate to call me anytime.
>
> Sincerely,
> Mickey
>
> Mickey Sugg, Project Manager
> US Army Corps of Engineers

> 69 Darlington Avenue
> Wilmington NC 28403-1343
> (910) 251-4811 (o)
> (910) 251-4025 (fax)
>
>
> -----Original Message-----
> From: Len Pietrafesa [mailto:ljpietra@ncsu.edu]
> Sent: Tuesday, February 28, 2012 10:01 AM
> To: Sugg, Mickey T SAW
> Subject: Statement
>
> Mr. Sugg:
> My name is Len Pietrafesa.
> I am a Professor Emeritus at North Carolina State University (NCSU) and a Burroughs & Chapin Scholar at Coastal Carolina University.
> I was Head of the Department of Marine, Earth & Atmospheric Sciences at NCSU for more than a decade, was the Chair of the NOAA Science Advisory Board and have served and continue to serve on numerous national and state (of NC) environmental and science policy committees and boards.
>
> Unfortunately I have a family situation that needs attending and I will not be able to attend the March 8 meeting. However I am submitting a "statement" regarding the Town of Holden Beach 's proposed East End Shoreline Terminal Groin.
>
> My statement regarding said groin is:
>
> "The placement of a terminal groin at the east end of Holden Beach will cause significant damage via destructive effects upon downstream beaches including those to the immediate west of the groin on Holden Beach and to all of the beaches of Ocean Isle Beach and Sunset Beach; both to the west of Holden Beach.
> The reason for the destructive effects is due to the blockage by the proposed groin of natural, westward moving sediments which emanate from the Cape Fear and Lockwoods Folly Rivers, from re-suspension of marine sediments during storm passages and from the natural flows of the wave and current fields.
> This will then result in an increasing number and more costly beach re-nourishment projects and also lawsuits against the Town of Holden Beach by homeowners on Holden Beach and Ocean Isle and Sunset Beaches. This scenario has occurred repeatedly wherever groins and jetties have been built along the eastern seaboard of the United States, including Fort Macon and Pea Island."
>
> Thank you,
> Len Pietrafesa
>
>
>

North Carolina
Coastal Federation
Working Together for a Healthy Coast

December 20, 2012

Mickey Sugg
Project Manager
U.S. Army Corps of Engineers
69 Darling Avenue
Wilmington, NC 28403-1343

RE: Holden Beach Terminal Groin Proposal Comment Letter on the Project Review Team's Meeting held on September 3, 2012: Corps Action ID#: SAW-2011-01914

Dear Mr. Sugg,

Please accept these comments regarding the Project Review Team (PRT) meeting held on September 6, 2012. These comments supplement our comment letter submitted to you on March 26, 2012. In that letter, among other issues, we expressed concerns about the application of the term "imminently threatened structure" as well as about the applicant's premature statement of the preferred alternative.

The Holden Beach Work Plan states that the purpose of the proposed project is to reduce high erosion losses at the east end of the island. In addition, the Plan states that "erosion rates through 2011 are slightly less than 2003 rates." Based on this information, during the PRT meeting the town claimed about 30 to 40 houses as "imminently threatened" in the proposed project area and in need of protection. Furthermore, during the meeting it was stated that 24 homes had been lost from 1995 to 2001, but that no homes were lost since 2001.

Rule (15A NCAC 07H .0308 (a)(2)(B)) states that: … *a structure shall be considered imminently threatened if its foundation, septic system, or right-of-way in the case of roads, is less than 20 feet away from the erosion scarp. Buildings and roads located more than 20 feet from the erosion scarp or in areas where there is no obvious erosion scarp may also be found to be imminently threatened when site conditions, such as a flat beach profile or accelerated erosion, increase the risk of imminent damage to the structure.*

The first part of this rule defines an "imminently threatened" structure in terms of its distance (20 feet) to the erosion scarp. There are currently no structures within 20 feet of the erosion scarp at Holden Beach within the project area. This is clearly shown by a distance approximation using Google Earth tool, which reveals that the average distance between 23 structures at the end of the island and the erosion escarpment is 222 feet and not 20 feet as prescribed by the rule.

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128 Grenville Street
Manteo, NC 27954
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NC Coastal Federation Headquarters and Central Regional Office
3609 Highway 24 (Ocean) • Newport, NC 28570 • 252.393.8185 • www.nccoast.org

Southeast Regional Office
530 Causeway Drive Suite F1
Wrightsville Beach, NC 28480
910.509.2838

The second part of the administrative code regarding "imminently threatened" structures allows for some structures located farther than 20 feet from the erosion scarp to be considered "imminently threatened" *when* the beach in front of them is in the process of accelerated erosion. However, this is not the case in Holden Beach. Close examination of the newly proposed erosion rates data provided by the Division of Coastal Management (DCM) reveals that the beach in front of the structures located on the east end of the island has accreted since 2009. This shows that the beach is not eroding in an accelerated rate as described by the rule.

Furthermore, the comparison of 1998 erosion rates and the 2009 rates shows that the erosion rate has decreased. Erosion rates for all the transect lines on the east end of the island decreased. This decrease ranges from 10 percent to 50 percent depending on the transect line, with an average of 32 percent of decrease in erosion rates from transects 520 to 560. This rate of decrease is rather more significant than "slightly less" as claimed in the project Work Plan and it supports the finding by the town that it has not lost any structure since 2001, expressed during the PRT meeting. For example, at the transect line #553 where the short version of a terminal groin is proposed the DCM is proposing a 10 percent lower erosion rate compared to the one in 2004.

Finally, the sandbags that have been placed on the eastern end of Holden Beach are currently covered by sand and vegetation and are not considered a priority for removal by the DCM. Current criterion for prioritization of sandbag removal followed by the DCM is beach access. Those sandbags that negatively affect and prevent beach access because they are exposed due to accelerated erosion are considered a priority for removal. This is characteristic of beaches that are either stable or accreting. On the other hand, on quickly eroding beaches sandbags are usually exposed and surrounded by erosion scarps. Clearly, that is not the case in Holden Beach.

For these reasons, the declared purpose of the project is misleading and fundamentally flawed. No structures in Holden Beach are "imminently threatened" under either definition of the rule. In order to support its claim the town should prepare a list of the structures it considers imminently threatened and support this claim with facts. The lack of "imminently threatened" structures or infrastructure means that the proposed project is not eligible for a permit under the state law that pertains to terminal groins. N.C. General Statute 113A-115.1(f)(2) requires the applicant to demonstrate that:

> *… structures or infrastructure are imminently threatened by erosion and that nonstructural approaches to erosion control, including relocation of threatened structures are impractical.*

Furthermore, the federation has already expressed, but would like to emphasize its concern with using modeling tools to project future inlet behavior. While these modeling tools can be useful in obtaining a general idea, they certainly cannot and should not be used as a case in point for predicting future events with certainty. The accuracy of these models is an important unknown and in highly complex and dynamic systems such as inlets and their surroundings, these models are unreliable tools for decision-making. Even the third

party contractor that used the modeling tools to estimate future inlet behavior was unable to give an answer when asked about the accuracy of the model during the PRT meeting. This shows that the town and the agency should not be placing significant amount of weight in their decision making on a tool whose accuracy is unknown.

We have been surprised to find that technical documentation about the calibration and sensitivity analyses of the models that could support their use is not provided to your agency or for public evaluation. We have sought this information directly from the third party contractor as well, and to date it has been non-responsive in providing this technical documentation that verifies the accuracy and limitations of these models as used.

It was explained during the PRT meeting that no maintenance cost is needed since the proposed structure needs basically no maintenance. The N.C. General Statute 113A-115.1(e)(6) clearly requires the applicant to show proof of financial assurance for a variety of actions related to the proposed structure: for long term maintenance and monitoring, implementation of mitigation measures, modification or removal of the structure and restoration of public, private and public trust properties. It is clear that in order to comply with this requirement of the law, the Town of Holden Beach needs to present the abovementioned financial assurance. If there is truly no maintenance cost associated with the project, that is a clear indication that the beach is not eroding and therefore no structures are "imminently threatened."

It is worrisome that during the PRT meeting the presenter of the proposed project already stated there was very little environmental impact from the preferred alternative, given that a full environmental analysis as required by the National Environmental Policy Act has not yet been done. The extent of the environmental impacts can only be assessed after a full Environmental Impact Statement has been performed as required by the NEPA.

The federation has significant concerns about the proposed project. The Corps must ensure that the NEPA process is applied correctly and that the issues described in this letter are addressed.

We appreciate the opportunity to comment and be involved in this project. Please do not hesitate to contact us if you have any questions of need any clarification of these preliminary comments. We intend to fully participate in the development of this EIS, the review of project permits, and any court proceedings that might follow.

Thank you.

Sincerely,

Ana Zivanovic-Nenadovic
Program and Policy Analyst

Cc: Todd Miller
Braxton Davis
Bob Emory
Joan Weld
Doug Hugget

From:	Sugg, Mickey T SAW
To:	"Ana Zivanovic-Nenadovic"
Cc:	Todd Miller; Bob Emory; Braxton C Davis; Griff & Joan Weld; Huggett, Doug; Pruitt, Carl E SAW
Subject:	RE: Holden Beach Terminal Groin PRT Comment Letter (UNCLASSIFIED)
Date:	Tuesday, March 05, 2013 2:24:00 PM

Classification: UNCLASSIFIED
Caveats: NONE

Ms. Ana,

Hope all is well; and as promised, this is my response to your December 20, 2012 e-mail and attached letter.

In your letter, the majority of the content references North Carolina statues and rules which are under the regulatory authority of NC Division of Coastal Management. As our regulations do not use the term "imminently threatened structure", I would refer you to DCM for the State's interpretation and implementation of the rule for the Holden Beach Terminal Groin Project. This recommendation would also hold the same for issues concerning sandbags and financial assurances or other requirements under SB110. Although our office does not interpret or enforce the mentioned state laws or statutes, we certainly do consider them in our permit review, especially in this case where the EIS is being developed to help satisfy both NEPA and SEPA requirements.

Please keep in mind, and as stated in the September 2012 PRT meeting, it is the Town's responsibility to define what their purpose and need is for the project. Our responsibility is to ensure that the applicant's stated P&N is not so narrowly defined that it will unfairly conclude that the least environmentally damaging practicable alternative (LEDPA) is automatically the applicant's.

Our office does concur with your statement that models are useful tools "in obtaining a general idea" and should not be used for "predicting future events with certainty". Please understand that models are used to help in our decision-making and are not used solely in our permit decision.

In ending, I would like to say that we share NCCF's position that the NEPA process must be applied correctly, and we take great strides in ensuring this.

I apologize for taking so long to provide you response. If you have any questions concerning this or any other aspect of our review for the project, pls don't hesitate to call me.

Sincerely,
-mickey

-----Original Message-----
From: Ana Zivanovic-Nenadovic [mailto:anaz@nccoast.org]
Sent: Thursday, December 20, 2012 2:42 PM
To: Sugg, Mickey T SAW
Cc: Todd Miller; Bob Emory; Braxton C Davis; Griff & Joan Weld; Huggett, Doug
Subject: Holden Beach Terminal Groin PRT Comment Letter

Dear Mickey:

Please find attache the N.C. Coastal Federation's Comment letter on Holden Beach Terminal Groin proposal PRT meeting held on September 3, 2012. If you have any questions, please do not hesitate to contact me.

Best regards,
Ana

_____

Ana Zivanovic-Nenadovic

Program and Policy Analyst
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Classification: UNCLASSIFIED
Caveats: NONE

Holden Beach East End Shore Protection Project

Project Review Team Meeting #2

May 30 2013

Meeting Minutes

These minutes represent a summary of the second Project Review Team meeting for the Holden Beach East End Shore Protection Project. A list of participants is provided at the end of this document.

Introduction

The second Holden Beach East End Shore Protection Project Review Team (PRT) meeting began approximately at 10:15 am with introductions. According to **Mickey Sugg**, the meeting will take approximately 3 hours including presentations and discussions. **Sugg** welcomed everyone for coming and their participation. As a review, **Sugg** stated the PRT is not a decision making body. The COE wants to capture all relevant issues involved with the Town's proposal and all other alternatives being evaluated. Input is valued and determined a high priority.

September 2012 was the last PRT meeting and since then, the 3rd party contractor, Dial Cordy and Associates Inc., has continued to gather relevant information and is in the process of developing a Draft EIS. ATM has developed the preliminary draft engineering report (ER). **Sugg** indicated there may be fine tuning with the ER, once that is complete it'll be posted for public review and feedback encouraged from the PRT.

Sugg stated the USACE website has been hacked in the past and destroyed the website, therefore Regulatory – Special Projects does not include all materials supporting ongoing projects. As an alternative to the USACE's website, materials can be provided on the Holden Beach website that is a likely option for minutes and presentations from today's meeting. **David Hewett** noted the slide presentations will be on the website; however links to modeling results will not be able to run on the website due to file size. **Dawn York** indicated the Draft ER is part of the EIS; therefore releasing the ER may be premature. **Sugg** stated the Draft ER will be available to only team members; however the USACE will work out the details. He then asked Doug Huggett if he'd like to include any statements.

Huggett reviewed recent ongoing proposed legislation changes in Raleigh which has passed through the Senate to change existing terminal groin law that is in the CAMA law. Coastal Management (NCDCM) is aware of proposed changes; however, unless legislation is ultimately passed by state then DCM is proceeding towards applying existing terminal groin bill and language, including financial assurances. Once a bill is passed, DCM will sit down with all four terminal groin project leads and state and federal agencies to determine how to proceed and apply the necessitated changes.

Sugg asked if anyone had any questions or comments at this point. He then introduced Fran Way with ATM who will proceed through the engineering presentation based on the Draft ER

including project site review, modeling of alternatives, and cost analysis. **Way** indicated they brought several hardcopies of the Draft ER for review.

Engineering Presentation

Introduction: General Location Map. In general, the sediment transport is from east to west. In the offshore, it is generally considered sand-starved.

Way stated the Lockwood Folly Inlet and crossing will be a focus of the presentation. Ongoing Holden Beach management activities include two general areas including the East End and the Central Reach, whereas the western 3 miles is unmanaged and doesn't need active management due to accretion rates. The Central Reach section has a currently-authorized permit for beach nourishment. Island-wide there have been FEMA engineered beach nourishment activities that have occurred based on past storms, such as Hurricane Hanna. Annual monitoring and reporting does occur to maintain FEMA status. The federal projects, such as AIWW dredging and placement, the Brunswick County Beaches 50-year project, and the Lockwood Folly Outer Channel dredging (via sidecast) does occur.

Sugg asked about construction dates for the FEMA Hurricane Irene project. **Hewett** responded a 6-month extension has been requested and will be constructed in conjunction with the Central Reach project. The Hurricane Irene project includes approximately 30,000 cy of material. The East End fared well post-Hurricane Irene due to a recent beach nourishment project (2010). What is the status of the USACE 50-year project, asked **Jay Holden**? It was stated the project is ongoing and the Alternative Formulation Briefing is the next step/milestone to complete project however funding is limited.

Overview of Past East End Activities

Way explained past nourishment activities. As stated before, Holden Beach has a beach management program that compliments ongoing USACE projects. East End nourishment is typically every other year, but the future trend is looking towards every two years if at all with a minimum volume to maintain navigation. Placing sand on the beach is secondary to navigation.

Oak Island fill and monitoring activities includes annual monitoring of Oak Island by Dr. Bill Cleary since 1999. The western end of Oak Island is relatively stable and considered accretional. ATM will closely monitor the western end of Oak Island and have initiated surveys on the west end of Oak Island to develop a baseline. Approximately two years of survey data have been collected. Transects monitor out to -25'.

Based on NCDCM setback factors and annual erosion rates, the East End is approximately 7'/year. At this time, the Inlet Hazard Areas are up in the air. Oak Island set back factor is 2' due to stable and accretional conditions.

Hurricane Hanna in November 2008 resulted in severe scarping/escarpments on the East End of Holden Beach. This severe erosion occurred after a successful beach management program that had been ongoing for 7 years. Approximately 27 structures have been lost on the East End

due to this erosion. Aerial photographs from the '80's depict early erosion control structures on the oceanfront. See NCBIMP for additional photos/information.

Based on shoreline delineations, Lockwood Folly Inlet has been positionally stable for the past 70 years due to anchoring from Lockwood Folly River and Sheeps Island. Inlet relocation is considered a potential alternative; however, it would have to be cut through Oak Island and therefore not deemed feasible for this project. It was asked if dredging maintenance keeps the inlet stable and **Way** responded no as the inlet channel has been in the same position since pre-Civil War. Outer bar channel dredging occurs in the outer area of the inlet throat, and the AIWW crossing is maintained, whereas the throat is naturally maintained. Annual surveys conducted by the USACE depict the throat of the inlet is naturally deep (approximately -20 feet).

Ana Zwanovic asked when the oceanfront houses were lost and **Way** indicated the loss occurred in 2001, a clarification due to the slide depicted a 2008 aerial photograph.

Sediment Transport Processes

Regional sediment transport may seem simple in a regional sense; however, the inlet is complex in a local sense. The flood shoal existing within the Lockwood Folly Inlet has been relatively stable and maintained over a long period of time. Bathymetry data sets from the USACE (2000 – 2012) were used to build the existing model for the East End project. Additional datasets include USACE survey, lidar, and topography used to create the bathymetry grid which depicts the natural hole created at the intersection of the AIWW and Lockwood Folly Inlet. The main channel trains up against the Holden Beach shoreline. **Way** confirmed that ATM is planning to develop a Lockwood Folly Inlet sediment budget based on the sediment budget developed by Offshore & Coastal Technologies, Inc. (OCTI) (2008). Arrows depict a general schematic of sediment transport rates and direction. ATM will utilize the OCTI design as a basis for Lockwood Folly Inlet.

Existing Dredging Features

The AIWW inlet crossing includes a 400-ft bend widener, known location of highly compatible beach material. According to **Way**, a successful beach nourishment placement project occurred in 2008 - 2009 as the USACE dredged the bend widener as well as the regularly-maintained navigation channel within the AIWW crossing. Typically, the USACE does not include the bend widener as part of their annual navigation maintenance. **Sugg** asked if the bend widener was part of the authorized USACE maintenance area, **Way** responded yes.

Cleary asked why the outer channel and ebb delta is skewed to the east. What does the model show, as the key player is the orientation of the outer bar channel. The ebb tidal delta is skewed towards Oak Island. **Cleary** indicated dominant regional drift of sediment transport is into the inlet although there is much more sand on the Oak Island side then Holden Beach side, as depicted by the regional drift of 30,000 cy difference between east and west in that one sediment compartment. **Way** explained the OCTI sediment budget volumes are a good starting point as approximately 80% of flow, based on the most current water flow study conducted by

CSE in 2008, is coming from Lockwood Folly River. These hydrodynamics allows the inlet outer bar channel to stay in the same orientation.

Way pointed out Lockwood Folly Inlet has a highly variable channel while the USACE maintains the channel in a stable location by following deep water during navigation maintenance. In addition, there are Civil War shipwrecks within the channel allowing the channel to remain locally stable. **Cleary** was unsure with that statement and said the shoals and shipwrecks may have an impact on the model. He then asked if the model was incorrect based on data input into the model. **Way** stated the model is calibrated to the data and is hydrologically correct. **Cleary** affirmed the dunes within Brunswick County are a good indicator of wind direction and they are blowing to the east, although sediment transport is depicted from west to east. Discussions between **Cleary** and **Way** indicate there may be differences between past data depicting via wave rose (directional waves) vs. wind rose.

Continuing with the presentation, **Way** depicted the inlet area the USACE's sidecast dredge follows deep water to maintain navigation. The Colregs Line, located at the intersection of the Atlantic Ocean and the Lockwood Folly Inlet, is the boundary in which smaller dredges that are not ocean-certified can work in the preferred borrow area within the AIWW Crossing.

Borrow Area Alternatives

Way summarized the four alternatives available to the East End Shore Protection Project include: upland, dredge spoil islands, offshore, and Lockwood Folly Inlet and AIWW crossing. There are about seven sand sources including confined disposal islands such as Sheeps Island and Monks Island.

In April 2010, the bend widener project by the USACE was conducted. Sand placement began at the first house on the east end of Holden Beach (Avenue E) and worked west until they ran out of material. Upland truck haul projects have occurred for smaller volume needs due to the low cost of mobilization/demobilization (mob/demob), which is a cost benefit. Cons to upland truck hauls include road wear, frequency of events, and incompatible sand color. Upland truck hauls have typically been left for emergency efforts. According to **Way**, all borrow sources are compliant with NCDCM sediment criteria.

A brief review of the proposed borrow source includes the Lockwood Folly Inlet/AIWW crossing. Based on recent survey data, this federally authorized navigation area currently has approximately 150,000 cy of material. Availability of material is expected to include 100,000 to 150,000 cy of material every few years, dependent upon the wave environment that year.

Terminal Groin Alternative

Way reviewed a recommendation by the National Research Council of the National Academy of Sciences which conclude the use of fixed structures in conjunction with beach nourishment projects should be analyzed. Several position papers for and against terminal groins exist on this topic. Journal of Coastal Research dedicated a book to the function and design of coastal groins was briefly discussed.

Way presented a USFWS 2008 recovery table for various impacts and conservation efforts. The table depicted groins as having less impact than other threats.

Way discussed briefly the updrift vs. downdrift effect and used Bald Head Island sand bag groins as an example. These types of effects can be dependent upon seasonal changes (winter vs. summer). He also discussed the differences between groins and jetties using Oregon Inlet vs. Masonboro Inlet jetty system. He mentioned some groins have spur features, and fields of terminal groins can also exist, not necessarily one groin located at the end of an island. Natural outcroppings, such as the ones located at Fort Fisher, are natural features which engineers attempt to mimic or replicate for the design and function of terminal groins. Aluminum sheet pile and rocks are also termed as rubble mound.

Conceptual alternatives include: Alternative 1) long groin which is approximately 1,600' long with a spur feature (similar to Fort Macon groin), landward end would be buried; Alternative 2) short groin, located closer to homes and has a T-head and is approximately 600' long. The short groin includes anchor that is buried in the upland to prevent flanking. **Sugg** asked if the 600' includes the buried portion, **Way** responded yes. **York** asked what the construction methodology is for placing material on the beach, **Way** indicated pipeline would be used.

Modeling Results (2nd slide presentation)

Way began the second slide presentation by describing the two different models run by ATM. The CMS Wave and CMS Flow, as well as the Genesis T model were used. These modeling techniques have been around for some time and have been developed by the USACE. In addition, NOAA WaveWatch data was used to include data from offshore into the model. The CMS wave grid is a bit larger than the CMS sediment grid. The model was calibrated to the CSE 2008 study, including flow and currents. Water level and flow measurements were collected in 2008 throughout the study area.

Cleary indicated the flow was moving quickly; thereby, skewing the channel heavily to the west (to the right if you're looking at the slide), which is why erosion began on Holden Beach approximately 30 years ago. Additionally, dominant drift causes an asymmetric delta with more sand on the right side of the channel, therefore, how do you get the channel to change direction. **Way** indicated the same situation occurs in the Shallotte Inlet during dredging (example is the 2001 project), and **Cleary** agreed, but stated Shallotte Inlet is a different situation because it is a bigger system although the channel has been skewed in the same direction for the past 60 years. **Cleary** continued by indicating models don't necessarily answer the question, if dominant transport is from east to west, then why is there so much material off the Cape Fear River? **Way** stated there is a difference between gross transport and net transport, as sand is transported in different directions and has an impact on these proposed structures.

The 27 structures lost occurred when the channel was skewed to the west, **Rich Weigand** pointed out; therefore, the consideration and importance of the terminal groin lies behind the fact protection of infrastructure is a major concern with terminal groin construction. **Way** agreed and said the channel is highly variable and can be trained towards Holden Beach or Oak Island.

It is a small inlet, therefore, yearly or even monthly aerial photographs would help determine changes with shoal attachments. **Cleary** agreed and indicated gross shoal changes are rapid and smaller, yearly photographs would be helpful in a smaller inlet, compared to a large inlet such as Oregon Inlet.

Way described modeling was used to analyze gross transport trends were analyzed with vector analyses. Significant volumes of sand are moving in and out of Lockwood Folly Inlet. Transport rates are calculated along numerous transects, with the inlet having a net 75,000 cy per year moving into the inlet.

CMS Alternatives Modeling – Part A

Way described the modeling used to analyze and compare results between three alternatives including the No Action, Beach Nourishment with Groin (short groin, intermediate groin and long groin), Inlet Relocation and Borrow Area/Inlet Crossing. The short groin includes a T-head which resulted in negligible differences vs. the No Action Alternative. The T-head resulted in sediment trapping/rip current effect around the sides of the groin. Length/size of T-head is approximately 160' which is very common, similar to terminal groin built on Hilton Head Island.

One-year post-construction results compare alternatives to No Action runs (white area = no change). Colors in the slides represent changes in depth. A comparison of the proposed borrow area, short groin, fill template, and relocated channel (towards Holden Beach) were modeled vs. No Action resulting in strong effects within the inlet channel and ebb shoal area. Channel relocation alternative effects are the strongest vs. No Action as the ebb shoal shows the biggest change. Localized effects (downdrift impacts), especially with currents, were seen around the groin.

Cleary asked if there was a 2 meter change in depth. **Sugg** asked if Way was going to review individual alternatives model results, **Way** responded yes. The Eastern Channel alternative was also modeled as a result of discussions during the last PRT meeting. After one year, Eastern Channel remains open, however flow of the AIWW seems to adjust although the nearshore area is unaffected. **York** asked Way to review the modeling results for the inlet relocation alternative, and **Way** explains the inlet channel migrates after 1 year post-construction. **Way** explains it is ideal to dredge the inlet channel every 3 months (about 4 times per year) because it is ephemeral and needs to be maintained.

Cleary asked Way if modeling results were analyzed beyond one year, **Way** responded yes. **Cleary** indicated the Eastern Channel model results shows over a period of time positive results, as there is a lag effect of two years for sand shoal movement from the right sand of the channel to the left side of the channel. **Way** indicated change is seen after approximately 6 months. A brief discussion ensued between Cleary and Way regarding tidal prism effects and the movement of sand shoals related to the inlet relocation alternative.

Nenadouc asked Way why model runs are only one year if this project is a 30-year project. **Way** explained all alternatives were modeled for four years as that is the anticipated

nourishment cycle for this project. **Weigand** then indicated, based on observational data, the results of the model runs for the Eastern Channel alternative is naturally occurring already. The channel is bending back towards Sheep Island. **Way** agreed, and stated the shoal off of Sheeps Island has two channels one either side of it. At the last PRT meeting, Steve Foster asked about Eastern Channel and therefore the model was run to analyze the effects around Eastern Channel. **Weigand** indicated a bird conservation area sign was posted in the shoal area. It is the east end of Holden Beach, not just where the homes are located but the tip of the island that is eroding away. There is no longer a straight channel, the Eastern Channel alternative is happening naturally.

Finalizing the discussion on one year model runs, **Way** described the dredged outer channel alternative, similar to Shallotte Inlet where approximately 500,000 cy of material was dredged, only 150,000 cy was placed as beach fill to remain consistent with realistic volumes. ATM wants to see what the channel would do with inlet relocation. Shipwrecks and debris fields are a concern for channel alignment and want to avoid. Results after one year depict significant change to system, whereby altering tidal prism will allow more water to get into system relative to the No Action Alternative. Due to the presence of the shipwrecks and the significant changes the Inlet Relocation alternative is not feasible. **Cleary** asked what the increase in the tidal prism is. **Cleary** indicated the tidal prism would have to increase by 20-30% to have such a significant change. **Way** responded the wider channel would have a significant impact on the inlet system. **Cleary** asked if it is the inlet itself or the thalweg. **Way** responded the thalweg, the deepest part of the channel. Inlet widening projects can result in seasonal disturbances and wave regimes. How would the tidal prism increase? If more water gets in then more water gets out. Deposition or change in elevation of the channel bottom then there is no thalweg, **Cleary** stated. **Way** responded this is only relative change compared to the No Action Alternative, and these results are only a summary. **Cleary** indicated the reader will be confused with these results and **Way** responded yes, it gets very technical.

Sugg asked if these results are only for one year, correct. Changes to tidal prism at Year 2 and Year 3 go back to natural conditions, **Way** responded. **Sugg** confirmed the beach nourishment cycle will be every 4 to 5 years.

Way then continued to show modeling results at Year 4 (post-construction) with each of the groin designs (short, intermediate, and long). Shoal attachments resulted over one year and agree with 2011 aerial photographs.

Huggett stated the T-head component of the groin does not necessarily agree to legislation that describes definition of terminal groin as a perpendicular structure. Terminal groin legislation defines a terminal groin as generally perpendicular to the shoreline. DCM reads that as not allowing the T-head design and meets the definition. Internal discussions as it relates to offsetting groins to certain degrees (30 degree offset or deflection is ok, not 90 degrees as shown by T-head design). DCM is ok with main structure, but initially T-head component is a concern to meeting definition of law. If the design does not meet the definition of the legislation, then DCM cannot permit it. **Huggett** read the definition, “a terminal groin is a structure

constructed at the side of inlet at terminus of island, generally perpendicular to shoreline to limit sediment passage into an inlet." **Huggett** understands there is flexibility of offset and there is latitude in the term "generally perpendicular" definition. **David Hewett** asked Huggett for a definitive definition from CAMA because the T-head design has been provided in previous presentations (September), and the T-head has been modeled and engineered for the past 6 months. Holden Beach has expended funds for these modeling runs. **Huggett** apologized and stated he did not remember the design being defined back in September. **Hewett** asked if DCM was going to pay the bill on it.

Nenaduouc asked how the terminus of the island is defined. **Huggett** stated the legislation does broadly define the terminus of an island, potential locations to date of terminal groins do comply with intended end of island definition. **Way** stated the short groin does have the longest T-head, the intermediate groin has a minor T-head. The seaward end takes the brunt of the wave forces and therefore it has to be designed more blunt-headed. A bulbous feature (not angular) is what the end of the groin would be shaped for the intermediate groin. **Cleary** indicated it would look like a light bulb. **Way** responded yes and an angular feature is what the model sees.

Way continued and described shoal attachment runs (movies) with each groin alternative (four year runs) resulting in relatively little adverse impact on the Oak Island side. Outputs are every 7 days. **Sugg** asked if the model encompasses the entire inlet including Oak Island, **Way** responded yes. The intermediate groin seemed to result in best shoal attachment (on either side of the groin) and least downdrift effects. After 4 year runs, there is less sedimentation behind Holden Beach; therefore, more sand is being held longer on the oceanfront. **York** asked if this model was used in South Carolina projects, such as Hilton Head, to confirm results became reality. **Way** explained that modeling is not a requirement, but most engineers use sediment budgets as a test. **Cleary** explained that CPE used a model at Bogue Inlet, but Ophelia blew the Coast Guard channel which was unpredictable.

Sugg asked how the Oak Island side of the inlet faired from various alternative model runs. Relatively insignificant effects were seen in all alternatives, stated **Heath Hansel**. The differences would be shown in the ebb shoals, rather than onshore, asked **Sugg**. **Hansel** responded insignificant shoreline changes resulted from model runs. **Cleary** asked if there was a visual of the entire system during one of the model runs. **Way** responded no, all changes occur within the screenshot shown during the presentation.

A question was asked about the effects of the intermediate groin on the remaining part of the island. **Way** responded he will discuss this later on in the presentation.

Way continued with the presentation and discussed how the terminal groin will increase nourishment intervals from 2 years with nourishment only alternative to 4 years with groin plus nourishment. The fillet formation is holding sand showing less sedimentation behind Holden Beach. Model runs also analyzed only groin without nourishment to show specific effects from only the groin. After Year 2, benefit to updrift and downdrift with intermediate groin alternative. **Sugg** asked if the results come from a leaky groin design and **Way** responded it comes from

shoal positions and position of terminal groin. An analysis of the shoreline width is calculated to see what the results are of the sediment transport. **Sugg** stated he assumes ATM is continuing to work with the position of the terminal groin. **Way** stated the intermediate groin is a bit longer and has similar effects of the short groin. Negligible changes in transport rates with terminal groins. With the Nourishment Only Alternative, twice as much sediment is transported into the inlet. **Way** stated the goal is to reduce transport rate after nourishment. **Jay Holden** made a comment that the No Action alternative is not an option.

Way described the results of a particle concentration tracking comparison as it relates to biological characteristics between No Action alternative and short groin/nourishment alternatives which resulted in negligible effects/changes besides localized effects. The intermediate groin results in localized current effects; however, there is a flood tide push of water. This is not conducive to rip tide currents therefore the groin will not prevent the flow of passive larvae into the inlet during flood tide stage.

The 7-m contour line (Blanton study – a larval transport study conducted in the South Atlantic Bight) is identified by the North Carolina Coastal Habitat Protection Plan as a significant delineator from a biological perspective with regards to larval transport. **Way** noted the proposed terminal groin structures are more than 500 m from this contour area. **Sugg** asked **York** to send the UNCW study identifying larval/fish impacts from beach nourishment projects at Wrightsville Beach. Several studies have identified five physical characteristics that contribute to the distribution of larvae in the intertidal zone including wave energy, bottom type, tidal exposure, temperature and salinity. The groin will affect bottom type (i.e. sediment) although sediment type updrift and downdrift will remain similar. It was asked whether larval species accumulate in the 7-m zone, and **Way** responded the positioning of the terminal groin will not affect larval passage.

Genesis T Model

Way continued and indicated net sediment transport varied in the vicinity of Lockwood Folly Inlet. These results agree with CMS results (not the 3D model). Measured and modeled shoreline change minus nourishment activities resulted in approximately 150’ of erosion on the east end. Modeling analyses indicate beach fill activities help offset background erosion Holden Beach experiences.

Short groin plus beach nourishment runs over a six-year timeframe with no fill placed downdrift (towards Lockwood Folly Inlet) of groin. Downdrift offset effects resulted based on Genesis-T model. Fillet formations occur updrift of the fillet. These results do provide evidence of the need for pre-placement of fillet material. Intermediate groin overlaid over historic shoreline variations result in the need for at least 300’ of anchor, with 700’ of groin (total 1,000’).

The Hilton Head groin, also a leaky design, was shown as an example of how construction would take place. The Hilton Head groin also includes a T-head. Huntington Island also includes a small T-head feature, or more like a circular mound of rocks.

Benefits and Monitoring Costs

Existing shoreline erosion rates over a long-term compared to sea level rise rates is much more significant. Therefore, sea level rise is considered, but is a small player. **Way** reviewed economic benefits and costs. He stated mob/demob costs are expensive and ATM is tracking closely the price of diesel fuel, inflation, and construction costs. Reducing nourishment intervals is key to reducing costs of construction.

Way described monitoring costs analysis by alternative using Beach and Inlet Management Plan costs. The COE study conducted an analysis of Holden Beach and indicated the east end project is not included in the 50-year project because sand leaves this area too quickly. **York** asked if discussions have been had with the USACE to include the east end in the Brunswick Beaches 50-year project. **Hewett** responded it hadn't been included because of the legality of the terminal groin.

Huggett stated legislation includes pre-fill terminal groin as a requirement and asked if the USACE would be willing to include the east end into the federal project if bypass processes would continue. One of the arguments about a groin is that once it is prefilled and starts to bypass, if sand movement is not disrupted, would that allow USACE to place material on the beach through the 50 year project. **Way** indicated more dry beach would develop, rather than trapping sand.

Way described costs from the 50-year project, from 2015 to 2044 (a 30-year project timeframe). The east end spreadsheet, based on USACE's 50-year Brunswick Beach's project included a 4% inflation rate; average annual cost (construction costs only and not related to benefits or damages) is approximately $1,540,000. A terminal groin is approximately $2.5 million as an initial construction cost. The longer the beach nourishment interval, money is saved annually. Indirect costs of damages and benefits also result in a significant cost, such as the preferred alternative of Beach Nourishment with Intermediate Terminal Groin $34 million vs. No Action of $76 million. **Way** reiterated the preferred project alternative is the intermediate groin with approximately 120,000 – 150,000 cy nourishment from the AIWW bend widener borrow area. Interval of nourishment is every 3 to 4 years. **Sugg** asked if the intermediate groin alternative is the preferred alternative from an engineering perspective and leaving all out other components (costs, resources, etc.). **Way** stated yes, since 1970's, this area has considered a groin or jetty. Geotech style tubes were placed on the east end and were considered temporary. This area has been considered for a groin for the past 4 decades.

Anchor section will be buried. Existing monitoring, to remain in compliant with FEMA, include volume and shoreline change through annual surveys on Holden Beach, the inlet, and Oak Island. This monitoring will be continued into the future. Biological monitoring has also been conducted on the island including surveys of mole crabs, ghost crabs, etc.

Way indicated some monitoring will be expanded into the inlet. He explained the profile data from Station 10 (downdrift of groin from 2000 to 2012) includes natural variability and an undulating nature in volume changes from erosion to accretion. The MHW line has a similar

pattern and changes by 100' (gain/loss) every year. Downdrift monitoring will include thresholds and need to take into account extreme variability (standard deviations) based on natural erosion events. Thresholds will be large as under natural conditions the shoreline changes.

Huggett stated that NCDCM realize the difficulties with removing natural variability from determining a threshold and monitoring regime. ATM will include a simplified sediment budget to include in monitoring plan. A four-year model run shows areas where monitoring should occur. Mitigation steps include 1) Placing additional sand, 2) Modify groin by notching or shortening, and 3) Remove the groin. **Way** indicated adding sand is the easiest.

Cleary asked how far on Holden Beach did ATM extend the monitoring based on modeling results? **Way** stated the Town surveys the entire island of Holden Beach. Semi-annual surveys will be developed every 10,000'. **Weigand** asked about studies of impacts of placement of groins on tourism, fishing, and recreation as the area proposed for placement of groin was slammed with people during Memorial Day weekend. **Sugg** indicated Fort Macon is a good example of an area that has a recreational area with groin and it doesn't seem to have an effect. **Huggett** stated he was at Fort Macon recently and there were as many people around the groin as there were on the beach. The NC Terminal Report does discuss indirect aspects. **Huggett** indicated there have been concerns of recreational loss from the movement or loss of intertidal shoals lost thru construction of groins. **Sugg** replied that the economic value of these losses will be analyzed and evaluated based on results of engineering report. The engineering report will be dissected and evaluated from a recreation perspective.

Weigand asked what is the timeframe of the beach portion of groin to cover rubble mass? **Simmons** replied the Amelia Island groin was covered up in less than 6 months. **Way** stated the prefill placement will cover up the rubble mass and monitoring will dictate when nourishment will occur. Monitoring needs to be dynamic.

Sugg stated the USACE is dependent on local residents to provide information on recreational and navigation uses and to what degree. The USACE needs evidence, such as number of boaters, tourism dollars, etc. to study specific areas/concerns. The USACE is dependent on users of proposed area. Huggett added that if the state hadn't received public comments on the Figure Eight project, then they wouldn't have known to study critical areas.

York then provided a brief presentation on affected resources from an environmental standpoint. The NEPA process is followed with feedback and coordination from state and federal resource agencies as well as the public. Some issues included benthic infauna, piping plover, cultural resources and essential fish habitat. The reason these projects take so long as there are many complex habitats and species. The study area includes all potential alternatives and encompasses approximately 1,700 acres. Preliminary habitat mapping has been conducted and includes low marsh, subtidal (largest habitat type in the study area, totaling approximately 1,000 acres), intertidal habitat, beach and foredune, submerged aquatic vegetation. Recent aerial images and NCDCM data was used to complete the GIS habitat map.

An Essential Fish Habitat Assessment will be developed. Primary nursery areas do occur in the upper reaches of the Lockwood Folly River. Known SAV mapping by DENR shows less than one acre of submerged aquatic vegetation within the Study Area. Hardbottoms are not a concern for the east end project as the project is contained within the inlet. Probable hardbottoms do occur offshore Holden Beach; however, they occur several miles outside of the seaward boundary of the Study Area.

Benthic infauna, primary productivity for beach communities, has been monitored sparingly on Holden Beach, close to the east end. ATM monitors a few species based on potential project related impacts.

Piping plover critical habitat does occur within the Study Area on Oak Island. Dial Cordy and Associates has coordinated with NCWRC for the review of piping plover data. The data does show piping plovers use the habitat in the winter. **Sugg** asked Jay Holden if there is a local name for the shoal within the inlet. Some residents call the area "The Pointe."

A volunteer program for collecting loggerhead sea turtle nesting data does exist on Holden Beach and current data shows few nests located on the island. In 2011, approximately 30 nests were identified, and most located on the west end of the island. Critical habitat designation has been proposed and will be considered in the EIS. **Hewett** stated that Holden Beach has submitted comments. **York** asked Sugg if formal consultation will be required. **Sugg** replied that USFWS indicated they will treat beach nourishment projects the same as they have in the past. The USACE will submit the Biological Assessment as an informal document. **Hewett** asked if this was for Section 7 consultation, **Sugg** replied yes.

York continued and provided seabeach amaranth data which shows plants on the west end of the island as well as on Oak Island due to the accretional/stable nature of those areas. In addition to environmental resources, Dr. Pete Schumann of UNCW will analyze the economic value of the alternatives based on the data provided in the engineering report. Dr. Schumann was not available at the time of the presentation, therefore York presented his slides. A detailed review of existing literature of economic considerations will also be included. It will not be a formal cost analysis, and alternatives will not be ranked on cost. Value of various components will be analyzed. Public interest factors will also be considered.

York asked the audience for additional data that would be related to the resources discussed and those present in the study area. **Sugg** added that personal observations can also be provided; it doesn't have to be a referenced/formal study. Photographs are also beneficial and valuable to USACE as evidence of value on a public interest factor. Email/phone calls are always accepted.

Sugg reiterated the reason for the PRT meeting is to gain feedback from the team. The timeframe of the project and next steps were briefly discussed. **Sugg** indicated the engineering report is an important tool for consideration of impacts in the EIS. The Draft EIS is currently being prepared by Dial Cordy and Associates. The USACE and NCDCM will review for accuracy and readability, and it will then be submitted to the public. The Draft EIS will be

submitted to the PRT prior to public review. A 45-day comment period will be held for review of the Draft EIS. A specific timeframe cannot be given on the EIS; it is dependent on the Town's construction timeframe. Section 7 consultation from NMFS and USFWS will be conducted after the Draft EIS has been submitted for public review. Jay Holden thanked everyone's contribution and participation in the project.

The meeting was adjourned at 1 pm.

Holden Beach Terminal Groin Project 5/30/13
PRT meeting (Holden Bch Town Hall)

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Jay Holden	Dunescape POA	holden3@ec.rr.com

Call-in participants

John Ellis & Kathy Matthews - US Fish & Wildlife Service (Raleigh Field office)
Maria Dunn - NC Wildlife Resource Commission (Washington Field Office)
Dan Holliman & Todd Bowers - EPA (Atlanta Regional office)
Craig Bromby - Holden Beach Property Owners Association

Affected Resources within the Holden Beach East End Shore Protection Project

Dawn York and Rahlff Ingle

Dial Cordy and Associates Inc.

Overview of NEPA Process

Heart of the NEPA Process

- Early Scoping of Issues
- Development of Acceptable and Clearly Defined Alternatives
- Impacts of Each Alternative (Including No Action) are then Determined
- Measures to Mitigate Potentially Adverse Impacts are Developed

Majority of Problems

- Inadequate Public Involvement and Issue Identification in the Early Phase of a Project (Scoping)
- Inadequate Development of Project Alternatives
- Use of Poor Quality Data in Defining Baseline Conditions
- Inadequate Assessment of Cumulative Impacts

Key Components to a Successful NEPA Project

- Early Planning
- Effective Coordination
- Use of Quality Baseline Data

Scoping of Issues

Resources of Holden Beach and Lockwoods Folly Inlet

- Infaunal Invertebrates
- Seabeach amaranth
- Piping plover and Other Migratory Birds
- Hardbottom and Artificial Reefs
- Shellfish Beds and Submerged Aquatic Vegetation
- Wetland Communities
- Sea Turtles
- Surf Zone Fishery Resources
- Oceanfront, Estuarine and Inlet Shorelines
- Commercial Fishery
- Significant Submerged Cultural Resources
- Fishery Nursery Areas
- Water Quality
- Significant Natural Heritage Areas
- Essential Fish Habitat

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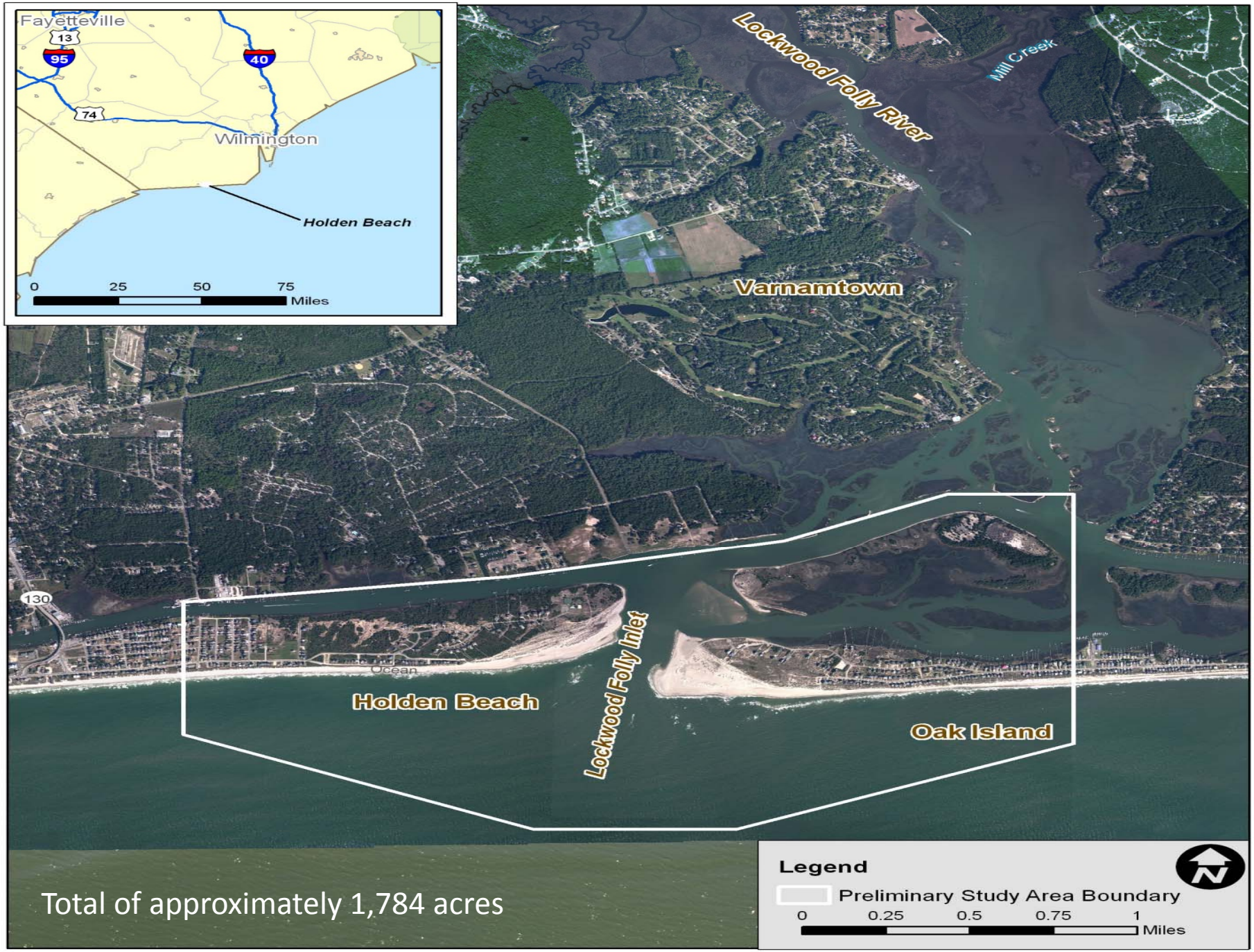
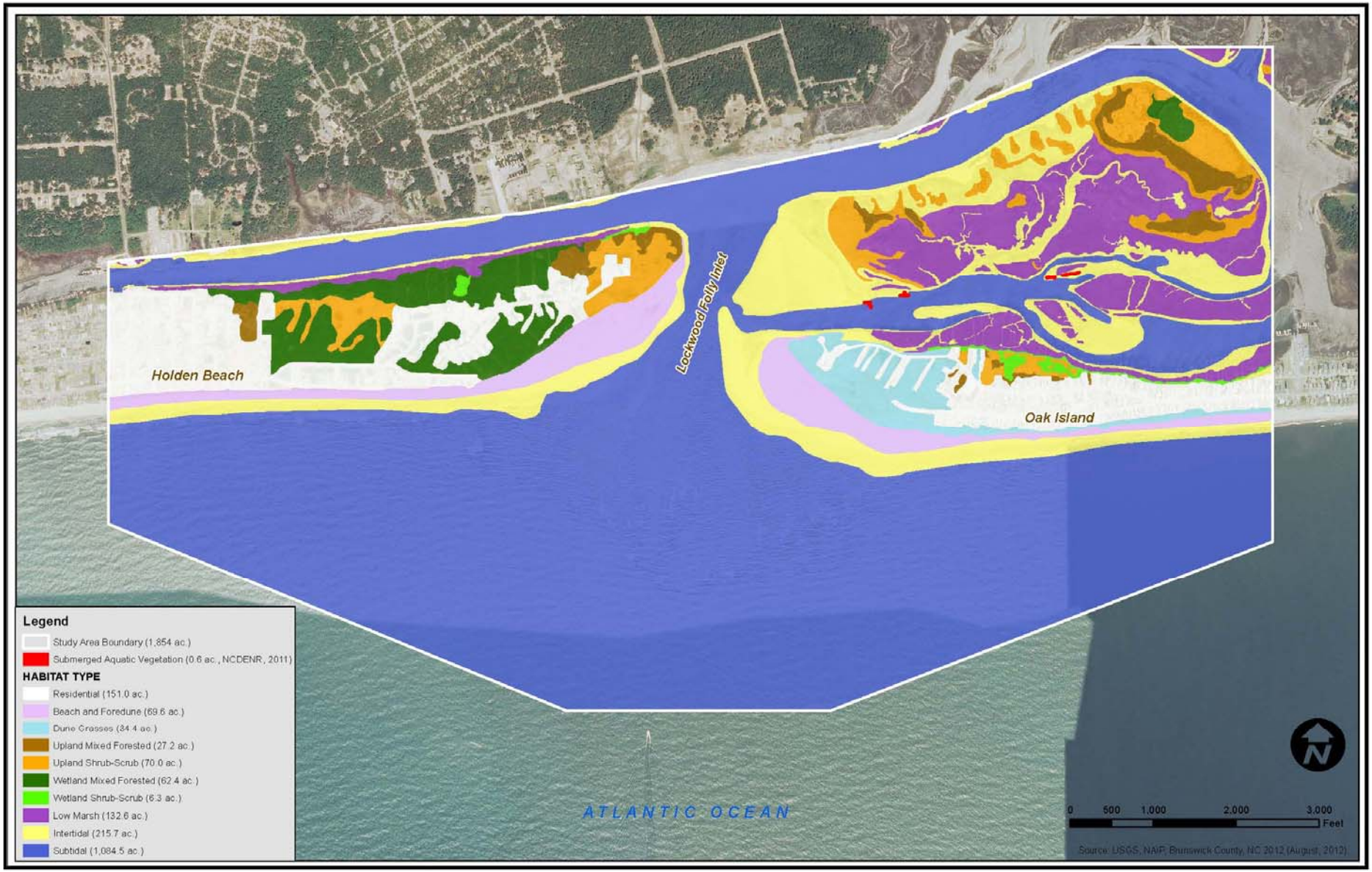


Source: NOAA Integrated Ocean and Coastal Mapping (IOCM) Aerial, GeoCue 2011

Environmental Setting - Tidal Areas

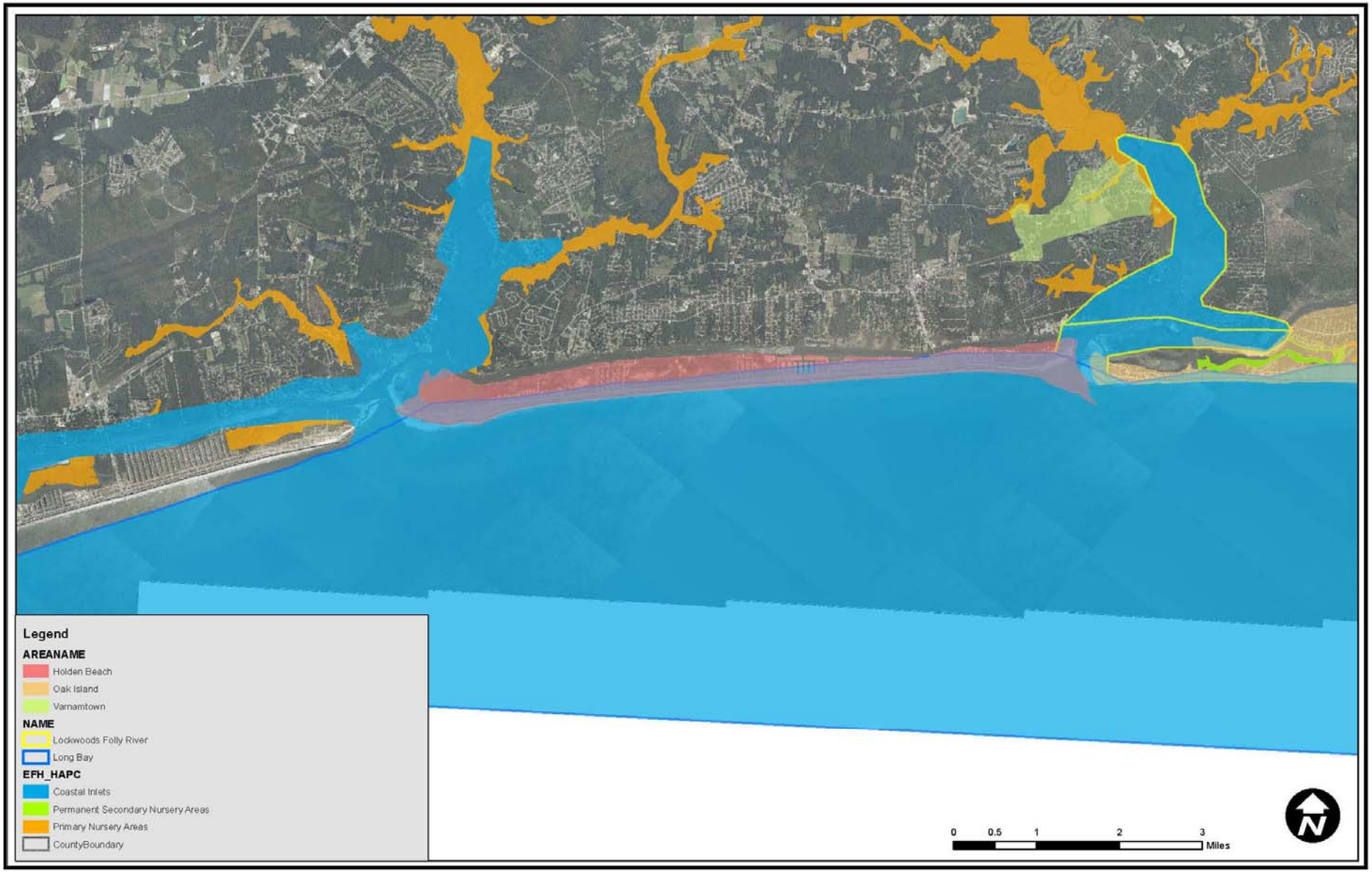
Environmental Setting – Habitats



Environmental Setting – Habitats

- Subtidal Marine (Ocean) Habitats
  - Marine Water Column
  - Soft Bottom/Benthic Habitats
  - Nearshore Hardbottom/Artificial Reef Communities
- Ocean Beach and Dune Habitats
  - Intertidal Ocean Beach
  - Dry Ocean Beach and Dune
  - Maritime Upland Forest Communities
- Inlet and Estuarine Communities
  - Lockwoods Folly Inlet Complex
  - Intertidal and Subtidal Flats and Shoals
  - Submerged Aquatic Vegetation (SAV)
  - Shell Bottom
  - Tidal Marsh

EFH Habitat


Legend
AREANAME
Holden Beach
Oak Island
Varnamtown
NAME
Lockwoods Folly River
Long Bay
EFH_HAPC
Coastal Inlets
Permanent Secondary Nursery Areas
Primary Nursery Areas
CountyBoundary
0 0.5 1 2 3
Miles
N

EFH Habitat – Submerged Aquatic Vegetation

Importance:

- Provides Important Structural Fish Habitat.
- Recognized as an Essential Fish Habitat.
- Water Quality Enhancement and Fish Utilization.

Projects:

- None

Prior Studies:

- Carraway and Priddy (1983)
- NCDMF Bottom Mapping Program (1989 - 1990, 1994 - 1996, 2000-2002, 2007, 2011)
- SAV Partners (APNEP) (2008)

Hardbottom: Artificial and Natural

Importance:

- Contribute Significant Volumes of New Sand.
- Exposed Hard Substrate Provides Stable Attachment Surfaces for Colonization.
- Vertical Relief and Irregularity of Hard Bottom Structure Affords Greater Habitat Complexity.

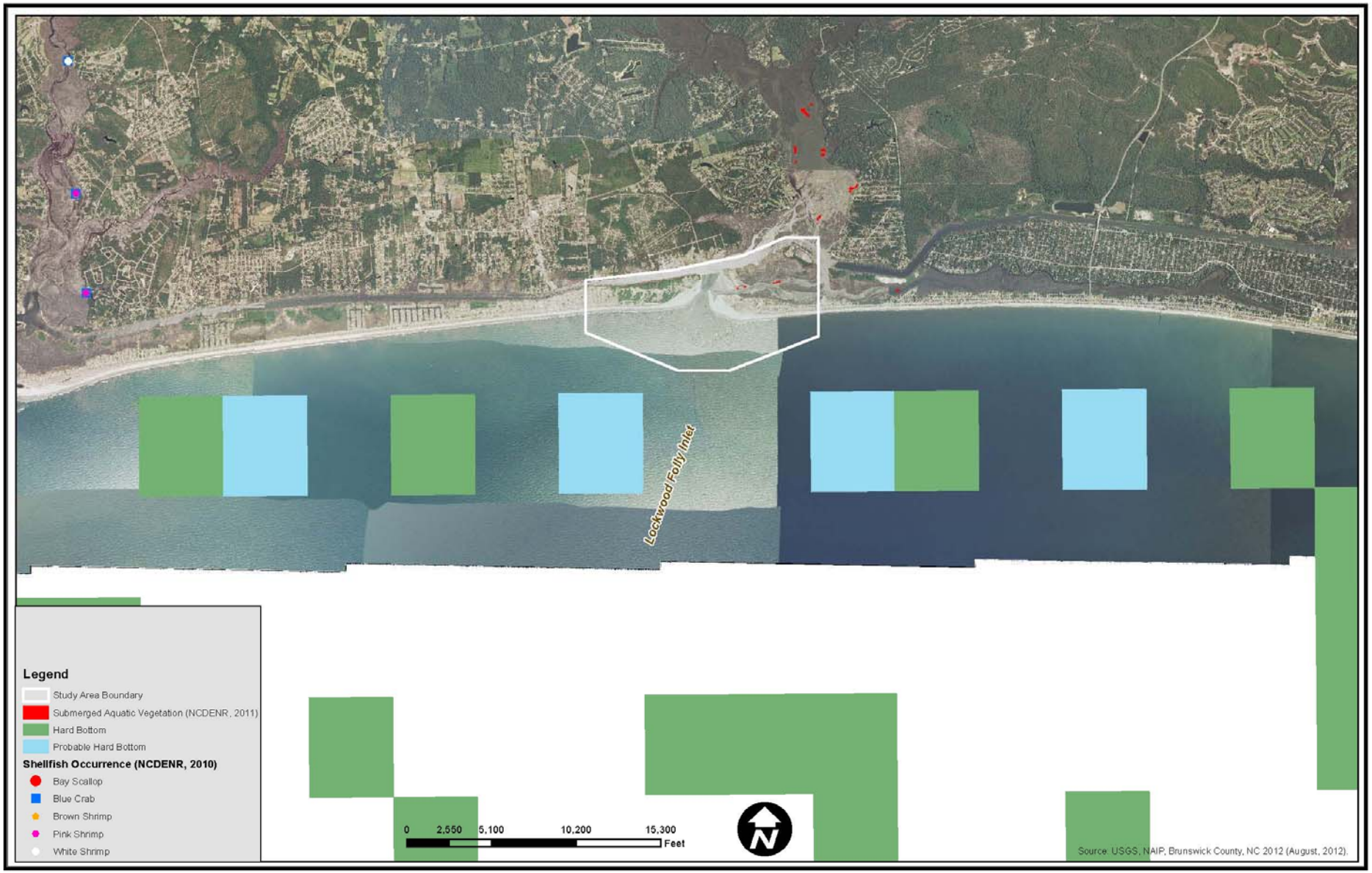
Projects:

- Federal and Non-federal Projects

Prior Studies:

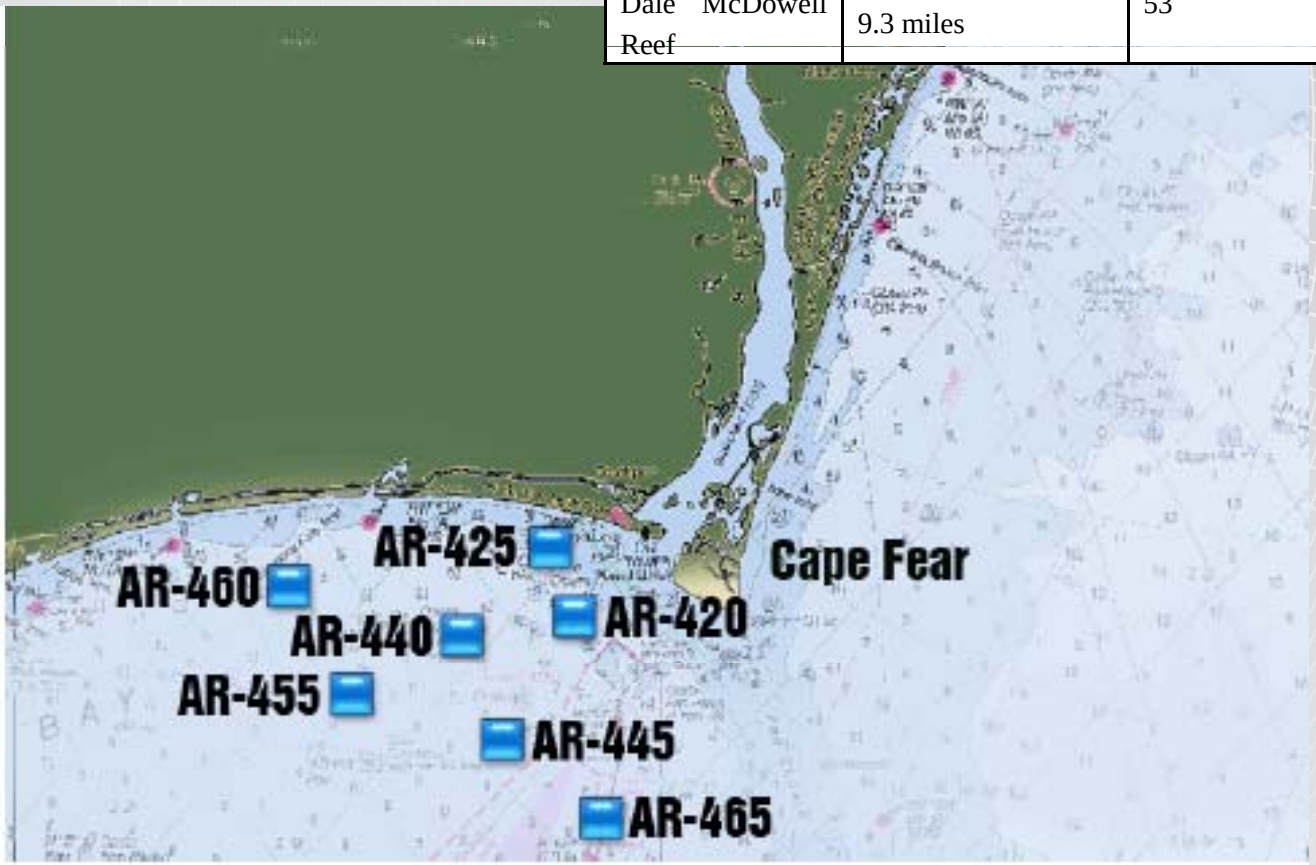
- Moser and Taylor (1995)
- SEAMAP-SA (2001, 2004)
- MATER (2007)
- TAR (2011)

Environmental Setting – Hardbottom



Environmental Setting – Artificial Reef

NC Reef Site No.	Nearest Inlet Access and Distance	Approx. Water Depth (ft.)	LORAN Position Coordinates	Latitude and Longitude
AR-440 Brunswick County Fishing Club Reef	Lockwoods Folly 4.5 miles	42	43365.8 59346.6	33°49.800’ 78°13.083’
AR-445 Dale McDowell Reef	Lockwoods Folly 9.3 miles	53	45352.0 59289.0	33°44.783’ 78°14.100’



Benthic Infauna

Importance:

- Critical in Maintaining High Primary Production Rates.
- Sensitive to Changes in Water Quality.
- Useful as Indicators of a Wide Range of Natural and Anthropogenic Disturbances.

Projects:

- Holden Beach – ongoing

Prior Studies:

- Versar (2003)
- ATM

Threatened and Endangered Species

Species Common Names	Scientific Name	Federal Status
Mammals		
West Indian Manatee	Trichechus manatus	Endangered
North Atlantic Right whale	Eubaleana glacialis	Endangered
Sei whale	Balaenoptera borealis	Endangered
Sperm whale	Physeter macrocephalus	Endangered
Finback whale	Balaenoptera physalus	Endangered
Humpback whale	Megaptera novaeangliae	Endangered
Blue Whale	Balaenoptera musculus	Endangered
Birds		
Roseate Tern	Sterna dougallii dougallii	Endangered
Wood Stork	Mycteria Americana	Endangered
Piping Plover	Charadrius melodus	Threatened
Red-cockaded woodpecker	Picoides borealis	Endangered
Reptiles		
Green sea turtle	Chelonia mydas	Threatened[1]
Hawksbill turtle	Eretmochelys imbricata	Endangered
Kemp's ridley sea turtle	Lepidochelys kempii	Endangered
Leatherback sea turtle	Dermochelys coriacea	Endangered
Loggerhead sea turtle	Caretta caretta	Threatened
Fish		
Atlantic Sturgeon	Acipenser oxyrhynchus oxyrhynchus	Endangered
Shortnose sturgeon	Acipenser brevirostrum	Endangered
Smalltooth sawfish	Pristis pectinata	Endangered
Vascular Plant		
Cooley's meadowrue	Thalictrum cooleyi	Endangered
Rough-leaved loosestrife	Lysimachia asperulaefolia	Endangered
Seabeach amaranth	Amaranthus pumilus	Threatened

Piping Plover Critical Wintering Habitat

Importance:
A Critical Habitat designation recognizes specific areas “that are essential to the conservation of a listed species, and that may require species management considerations or protection”.

Projects:
None

Prior Studies:
NCWRC (1970 – present)
Christmas Bird Counts

Scott Walker photographed these Piping Plovers on 19 Oct 2004 at the west end of Holden Beach, NC.

Piping Plover Critical Wintering Habitat

Important Critical Habitat Components: intertidal beaches and flats (mud flats, sand flats, algal flats, and washover passes); associated dune systems; and flats above high tide.

Loggerhead Sea Turtle

Beach	Year	Species	Nesting Activity		Total Relocated
			False Crawls	Nests	
Holden Beach	2010	Cc; Dc (1); Cm(1)	31	29	24
	2009	Cc	9	23	20
	2008	Cc	30	38	24
	2007	Cc	13	18	13
	2006	Cc	30	28	9

- The Holden Beach Turtle Watch Program currently operates along the entire Holden Beach shoreline in order to protect sea turtles by educating and by aiding stranded turtles.
- The entire ocean-facing length of Holden Beach is patrolled daily in the early morning, looking for fresh turtle crawls.
- All nests are marked and protected during incubation, and during emergence the hatchlings are provided safe passage to the ocean.
- 2011 documented 30 loggerhead nests. In 2010, 27 loggerhead nests, one green nest, and one leatherback nest on the west end were documented.

Loggerhead Turtle ***(Caretta caretta)***

Management / Regulatory Governance

"ON THE LAND"

- Federal (USF&WS)

- States

(NCWRC, Florida Fish & Wildlife Conservation Commission, SCDNR Marine Turtle Conservation Program, etc.).

Shore Protection Threats

Hard Structures – inhibit/prohibits nesting

Nourishment (twofold)

(1) equipment & construction area inhibit/prohibits ***nesting***

(2) equipment & construction area could result in mortality (***take***)

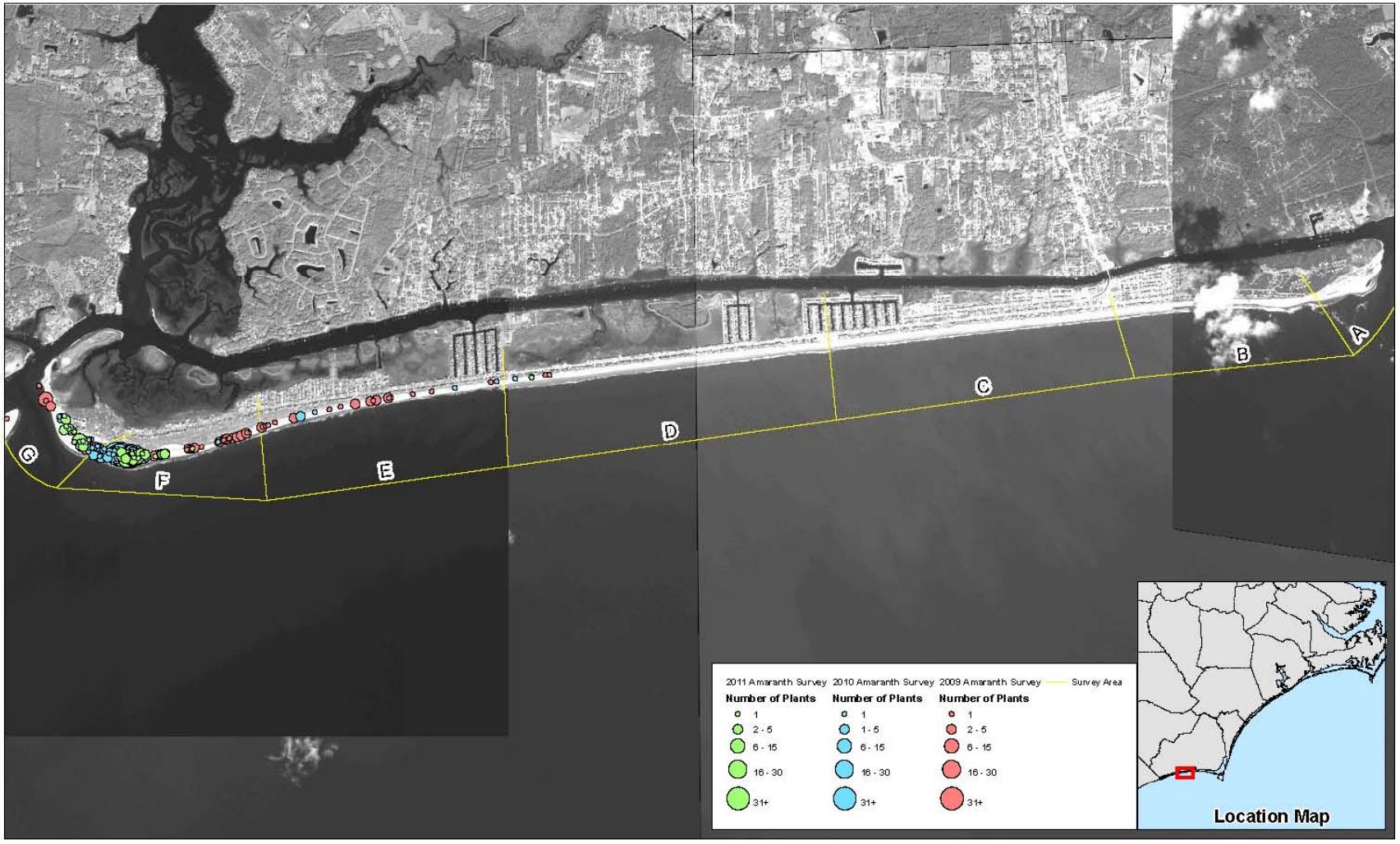
Sea Turtle – Critical Habitat Designation

Does not set up a preserve or refuge *per se*. Applies only when Federal funding, permits, or projects are involved.

(1) Specific areas within the geographical area occupied by the species at the time of listing, if they contain physical or biological features essential to conservation, and those features may require special management considerations or protection; and

(2) Specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation.

Seabeach Amaranth – Holden Beach



Seabeach Amaranth – Holden Beach

Beach	Sub-Part	Year																			Total
	(Reach)	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	All Yrs
Holden Beach	A	3	30	16	57	99	1	32	3	1	12	0	10	4	6	4	0	0	0	0	0	278
	B	18	22	223	2	0	0	0	0	0	0	0	8	0	2	5	0	0	0	0	0	280
	C								0	0	0	9	45	3	23	2	0	2	0	0	0	84
	D								0	1	0	4	39	1	70	88	11	0	2	2	1	219
	E								34	2	102	527	358	19	317	208	6	19	35	5	0	1,632
	F								192	6	109	>1,000	358	52	382	1,235	254	367	69	374	88	3,486
	G								39	^ ^ ^	0	162	25	0	^^^	412	10	186	17	53	27	931
	TOTAL	21	52	239	59	99	1	32	268	10	223	1,702	843	79	800	1,954	281	574	123	434	116	7,910

Source: Doug Piatkowski, USACE Civil Works, February 2012

NOTES

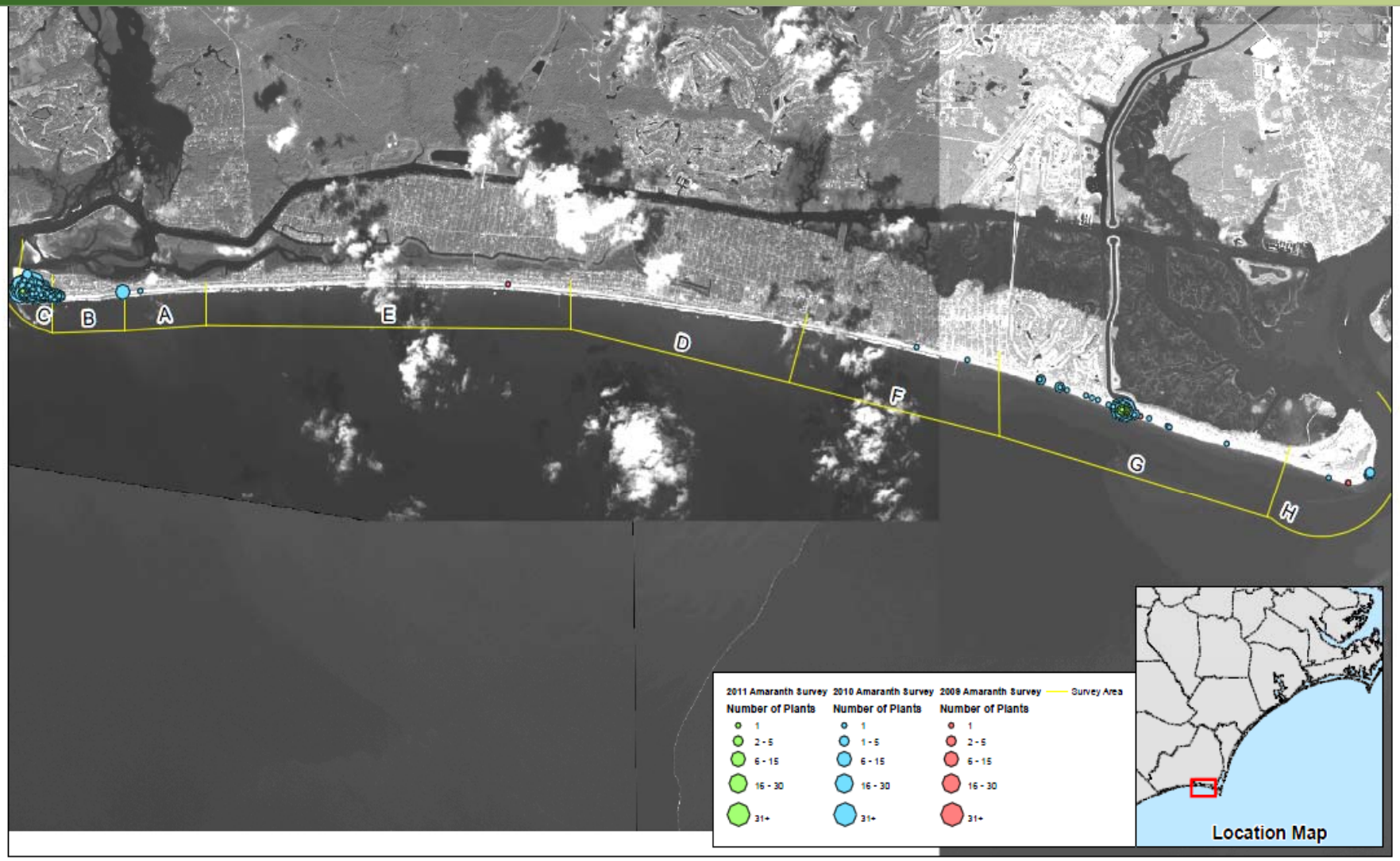
= Not surveyed

^ ^ ^ = Count combined in reach above

= Year of hurricane impact

= Count exceeding 1,000 Amaranthus

Seabeach Amaranth – Oak Island



U.S. Army Corps of Engineers
Wilmington District

Amaranth Survey 2009 - 2011
Oak Island

Imagery © Digital Globe 2011

N
W E
S

Scale 1:55,000
1 inch = 0.868056 miles

0 0.25 0.5 1 1.5 2
Miles

Seabeach Amaranth – Oak Island

Beach	Sub-Part	Year																			Total
	(Reach)	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	All Yrs
Oak Island / Caswell Beach	A	45	96	299	416	231	87	349	7	5	15	197	150	0	1	20	0	0	0	1	0	1,919
	B	839	181	1,336	3,328	1,092	438	3,030	4	2	15	216	135	4	78	18	0	0	0	34	0	10,750
	C	2,264	5,826	2,774	884	660	74	1,987	4	2	33	0	17	0	13	253	105	51	40	1,337	1	16,325
	D							1	0	0	0	36	916	0	7	33	8	0	0	0	0	1,001
	E								0	0	2	83	10	5	14	16	1	3	1	0	0	135
	F								0	0	0	0	3	1	43	20	0	11	0	2	0	80
	G								0	0	1	9	36	1	5	1	0	0	21	188	15	277
	H								0	0	0	1	0	0	13	101	2	0	2	14	0	133
	TOTAL	3,148	6,103	4,409	4,628	1,983	599	5,367	15	9	66	542	1,267	11	174	462	116	65	64	1,576	16	30,620

Source: Doug Piatkowski, USACE Civil Works, February 2012

NOTES

= Not surveyed

^ ^ ^ = Count combined in reach above

= Year of hurricane impact

= Count exceeding 1,000 Amaranthus

What are the public interest resources within the Permit Area?

Socioeconomic Resources

Population

- The 2010 US Census reported a total of 575 permanent residents on Holden Beach and a total of 1,648 permanent residents on western Oak Island.

Housing

- The 2010 US Census reported a total of 4,461 housing units on Holden Beach and western Oak Island; including 1,085 permanently occupied units, 2,877 seasonal units, and 499 vacant units.

Economy

- Economic impact of Holden Beach is reflected in contribution to the county tax base.
- According to the North Carolina Department of Revenue, the value of taxable real property on Holden Beach accounts for 16.7 percent ($1.2 billion) of the overall Brunswick County property tax base.
- In 2008, the estimated total economic impact of recreational fishing charters and private boating trips through Brunswick County's inlets exceeded $70 million, and commercial fishery activity associated with Lockwoods Folly Inlet generated $900,157 in total economic impacts (NCDENR 2011).

Economic Considerations for Project Alternatives

- Understanding the economic values associated with shoreline management alternatives is a complex and multifaceted undertaking.
  - Many affected user groups
  - Many levels of direct and indirect changes to economic values and economic impacts (construction, real estate, infrastructure, recreation & tourism, aesthetics, inlet maintenance, species, habitats & ecosystems…)

Economic Considerations for Project Alternatives

Part I:

- Summary of available evidence in the literature to frame and characterize the *potential scope* of economic costs and benefits associated with the proposed alternatives for the Holden Beach East End Shore Protection Project.
  - Description of costs and benefits by alternative
  - Summary scope of costs and benefits by alternative (matrix)

Economic Considerations for Project Alternatives

Part II (Appendix?):

- Detailed review of the extant literature regarding economic considerations and methodologies that are pertinent to the proposed management alternatives.

Economic Considerations for Project Alternatives

- The economics section of the EIS will *not* be a formal cost-benefit analysis of project alternatives.
- The full range of economic values associated with the management alternatives will not be estimated.
- Alternative actions will not be ranked based on total costs, total benefits or total net gains.

What are the public interest resources within the Permit Area?

Land Use

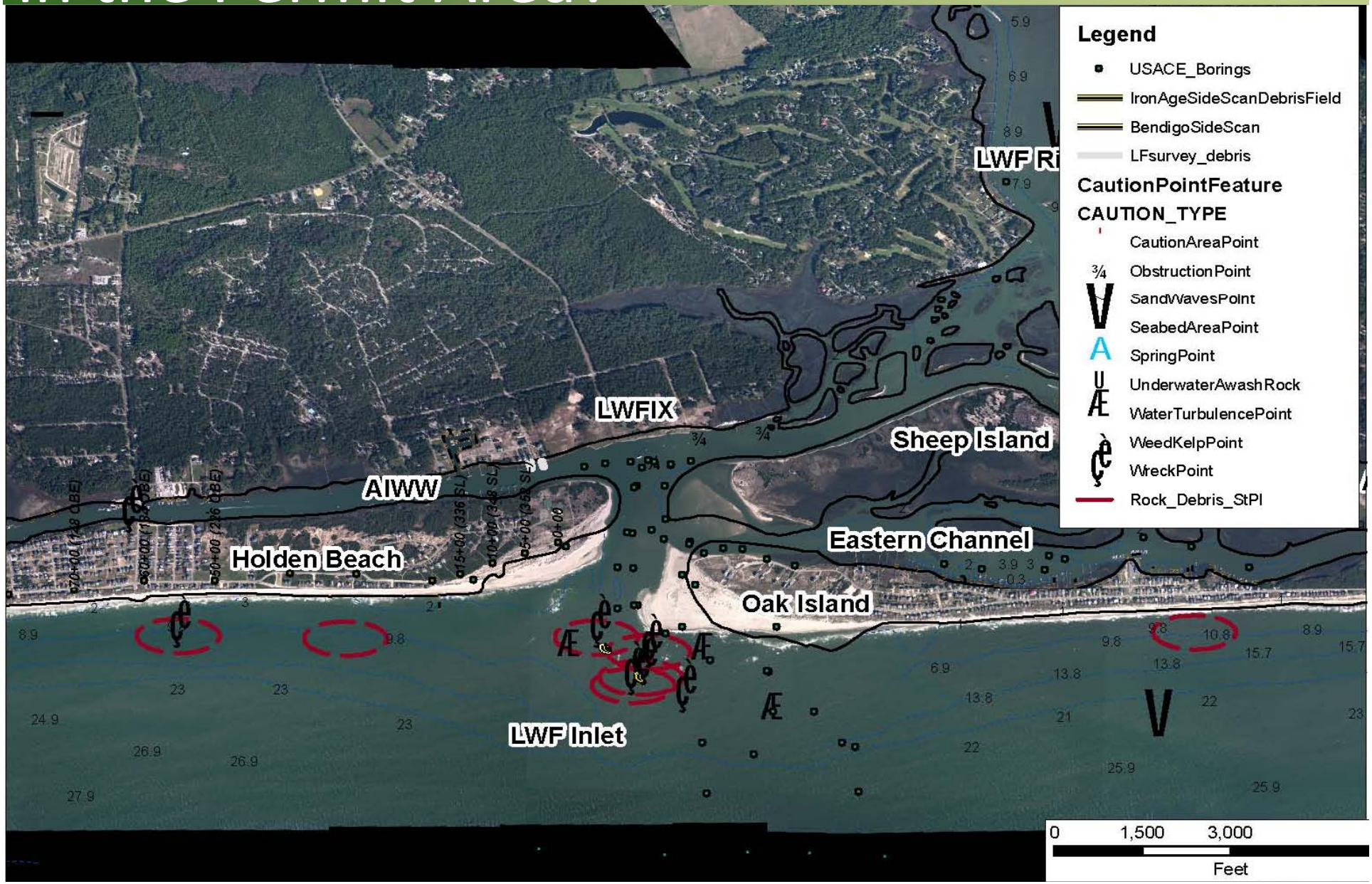
- Jurisdictional limits encompass a total area of 1,489 acres, including 809 acres of "usable" high ground and 680 acres of "unusable" conservation areas consisting of un-vegetated beaches (26 acres) and a combination of back-barrier tidal marshes and dredged material management areas (654 acres) (Imperial et al. 2009).

Infrastructure

- Water Supply and Wastewater Treatment
- Transportation

Scenic Resources - aesthetics
Light - construction
Water and Air Quality
Floodplains
Navigation – Lockwoods Folly Inlet
Noise - construction
Water Safety

What are the cultural resources that occur in the Permit Area?



Environmental Dredging Windows

- USFWS identifies May 1 – November 15 as the moratoria period for sea turtle nesting areas.
- USFWS identifies April 1 – July 15 as the moratoria period for piping plover nesting areas.
- Colonial waterbird nest site (April 1-August 31 moratoria in nesting areas)
- West Indian manatee occurrence (June –October moratoria)

What is the environmental setting?

According to the BIMP:

CHPP Elements

- Class SA waters
- Open shellfish waters surrounding inlet
- Salt marsh inside of inlet near AIWW
- Hard bottom approx. two miles southeast and 2.5 miles southwest of inlet
- Soft bottom habitat associated with ebb-shoal delta
- SAV mapping needed

Protected Species & Wildlife Elements

- West Indian manatee occurrence (June –October moratoria; observers possibly required)
- Green sea turtle and Atlantic Ridley sea turtle habitat (limit takes during dredging)
- Colonial waterbird nesting (shoal habitat; April 1-August 31 moratoria in nesting areas)
- EFH present for 25 species

Shipwrecks

- Moderate potential for eighteenth- and early nineteenth-century shipwrecks
- Moderate potential for Civil War shipwrecks
- Moderate potential for late nineteenth and twentieth century shipwrecks
- Potential for areas to have been subjected to underwater archaeological survey
- Section of Cape Fear Civil War Shipwreck National Register District to south of inlet

Other

- Primary nursery areas beginning at the mouth of Lockwoods Folly River, opposite the AIWW

On the Continued Cost of Upkeep Related to Groins and Jetties

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Abstract
So called "terminal groins" which are actually jetties at the terminus of barrier islands, where inlets are located, have been the subject of controversy for half a century in North Carolina. Coastal scientists have opposed these hardened structures and point to their destructive effects upon downstream beaches; requiring ever increasing and costly beach re-nourishment projects. Meanwhile, some coastal engineers have claimed that they can be used to "stabilize" migrating inlets. Local politicians, in response to real estate interests, have argued for the construction of the hardened structures, and in contrast to the claims of the scientists on the ground, have cited examples of success of both in North Carolina and at other locales on the US eastern seaboard. So what are the facts? This brief study presents the documented facts for North Carolina and these other US east coast locales.

Introduction

In 2003, the North Carolina (NC) Legislature voted, yet again, unanimously to ban the construction of new, permanent erosion control structures from North Carolina's ocean shorelines (including inlets) Session Law 2003-427. There were no dissenting votes in either chamber. This unanimity resulted from the recognition that the NC Coastal Resources Committees had imposed a ban on coastal hard structures, which was enacted in 1985. It was viewed as sound fiscal, environmental, and management policy. However, a new NC Legislature reconsidered the issue and in 2011 voted in favor of Bill S832 which would permit the construction of "terminal groins" along the NC coast.

In the December 2011 issue of News Breakers, Volume 1, Issue 1, Ocean Isle Beach (OIB), NC Mayor Debbie Smith (D. Smith, 2011) states that: "Ocean Isle Beach has had a very successful beach nourishment project covering three miles of our beach since 2001. However, beach nourishment adjacent to an inlet is difficult to be maintained because of the constant shifting nature of the adjacent Shallotte Inlet; at the mouth of the Shallotte River. Recently the NC Legislature passed legislation giving coastal towns and counties a tool to utilize the stabilization of beaches adjacent to inlets. Senate Bill 110 allows pilot projects of up to four terminal groins to be constructed in North Carolina". She also states that "these structures have been used successfully in many coastal states for years", and the says that "in fact there are two existing terminal groins built by the

State of NC that have protected historic Fort Macon on the north end of Atlantic Beach and another terminal groin that has secured the end of Bonner Bridge over Oregon Inlet." However, Mayor Smith's statements are misleading and misrepresent the facts.

In the article cited above, Mayor Smith then makes the claim that a terminal groin (or in classic definitions a "jetty") will stabilize Shallotte Inlet, NC at the east end of OIB, and thus, in her train of logic, eradicate beach erosion. She then reaches the conclusion that the terminal groin/jetty will eliminate the continual need for costly beach re-nourishment projects. In the words of Mayor Smith: "With a terminal groin in place we may reduce the re-nourishment cycles which will certainly be a substantial cost savings for our beach management program. Other viable benefits from construction of a terminal groin are elimination of unsightly sand bag installations, improvement of the natural habitat for birds and turtles and better protection of our roads, utilities and properties." Mayor Smith is not alone in her belief in the positive value of hardening the fragile beaches of NC. In the 12 January 2012 issue of the Brunswick Beacon (Lewis, 2012), Mayor Alan Holden is calling for a groin/jetty to be built at the east end of Holden Beach; which is east of OIB. There are also potential applications for hardened structures at Figure Eight Island NC, Bald Head Island NC, North Topsail Beach NC and Shackleford Banks NC.

It is of note here that the classic definition of a "jetty" is the emplacement of a solid structure, generally perpendicular to the coastline, and more often then not at the terminus of an island. The word jetty has taken on negative connotations from the coastal sciences community as the structures have come to be associated with many examples of having created more damage that then required ever costlier solutions that never worked permanently. Thus the reference in the Mayor's write-up to "re-nourishment cycles" is explained. Alternatively, the term "terminal groin" has been classically known as the last or "terminal groin" in a field of groins, and is thus far more palatable to the uninformed ear then is the alternative jetty. But the point here is not to debate definitions; rather it is to present the facts and thus expose the misrepresentations explicit in the Breakers article.

In her article, Mayor Smith provides aerial photos, one taken in 1993 of Fort Macon, NC at the eastern end of Atlantic Beach NC, with no beach obvious, east of the Fort Macon groin. The second aerial photo, taken in 2007, shows copious amounts of sand in place to the east of the groin leading to the obvious conclusion that the groin/jetty was responsible for the sand accretion. This all sounds and looks good but unfortunately the claims made by the Mayor are misrepresentative, incomplete and thus dangerously incorrect and misleading. So, just what are the facts of the matter for Fort Macon/Atlantic Beach, NC and for other locales along the eastern seaboard of the United States where groins – jetties have been placed at a tidal inlet or river mouth?

<u>The Facts</u>

From the early 19th Century and well into the 20th Century, there was a series of failed

engineering projects, all designed ostensibly to stabilize the inlet at the eastern end of Atlantic Beach, NC just beyond Fort Macon. The many prior projects had attempted to "stabilize", i.e. "stop", the migrating island end and thus, presumably prevent, the naturally occurring erosion of beach sediments at that locale. In 1960 a major, presumably more comprehensive, construction project was initiated and was completed in 1970, with the final stage of emplacement of a rock groin/jetty. So the groin that Mayor Smith alludes to in the 1993 photograph actually had been in place, in its entirety as far back as 1970.

It is of considerable note here that along the eastern seaboard of the United States (US), from Maine to the Florida Keys, coastal sediments move on average from north to south and east to west. These sediments emanate from coastal rivers and embayments and from marine sediments re-suspended during the passage of severe storms along the adjacent continental shelf. During the passages of atmospheric storms these sediments are carried in the directions of the ocean currents and waves which along the eastern seaboard of the US, are directed predominantly from north to south and east to west as the storms move predominantly from south to north. That is because winter storms, also called "nor-easters" and hurricanes move from southwest to northeast and the winds on the coastal sides of the storms blow towards the southwest quadrant. As a consequence barrier islands actually move or "migrate" from north to south and east to west; on average during the passages of these storms; which are highly persistent and energetic. Further the islands also move toward the mainland on the back or sound sides of the islands. These naturally occurring processes are well known to the coastal science community. It is also well known that when hardened structures are put in place in an effort to subvert or prevent the naturally occurring processes, they result in serious damage to the beaches and moreover could actually destroy the barrier islands. To counteract these destructive effects, what have been required have been massive expenditures of investments to accelerate the "beach re-nourishment" projects. The facts speak for themselves. Let us revisit Atlantic Beach/Fort Macon.

The completed construction of the Atlantic Beach/Fort Macon Groin/Jetty in 1970, was supposed to result in the salvation of the beach, which had a long documented history of being eroded, and the build-up and build-out of the east end of Atlantic Beach. In 1961, during the initial stages of Groin/Jetty construction, a $6.78 Million (in 2009 dollars, which will be the case for all figures quoted) beach re-nourishment project was also conducted and the beach was "restored". Yet, in 1973 just 12 years after the prior 1961 major beach re-nourishment project, and only 3 years after the groin was completed, a new beach re-nourishment project had to be staged. Why? The answer was, to deal with the exacerbated erosion that had occurred during and following Groin/Jetty construction-completion because of, not in lieu of, the Groin/Jetty. The cost of the project was $1.99 Million. So, did the new groin coupled with the $8.77M spent in beach re-nourishment solve the problem at Fort Macon NC? The answer is "no" as presented below.

From 1973 to 2007, there have been an additional seven re-nourishment projects that have had to staged at Fort Macon NC for a total expenditure of public dollars of $44,894,830. The beach re-nourishment project that occurred in 2007 is the reason that the aerial photo shown in the News Breakers article showed sand on the beaches. In fact the 1993 photo shows the situation in 1993 where no sand is present, some 24 years following Groin/Jetty construction. This was followed in 1994 by a $5.45 Million dollar re-nourishment project; the fruits of which disappeared within several years and had to be redone in 2002 and again in 2005. So from 1973 to 2007, a period of 34 years, nearly $45 Million of tax payer money has had to be spent on the beach east and west of the Fort Macon Groin/Jetty. That does not seem like a very good investment of precious public tax payer dollars and moreover totally refutes the argument that groin/jetties are "a" or "the" solution to the beach erosion. To the contrary, the case seems to have been built by this example is that the hardened structures are a major culprit and are a partial cause of the problem.

Mayor Smith also mentions the Groin/Jetty built at the terminus of Pea as another NC success story. Has this been the case for Pea Island? Well the facts are that from 1990 through 2004, $20.2 Million of public tax-payer money has been spent at Pea Island in re-nourishment projects. The table of the actual facts of re-nourishment projects and associated costs at Atlantic Beach/Fort Macon and Pea Island are presented below (Figure 1). The aerial photos shown were taken in 2009. Clearly Fort Macon will soon require another costly re-nourishment project. Moreover the beach to the west of the Groin/Jetty has undergone a stark recession and will also require costly re-nourishment. These data are from public records. The total costs of re-nourishment for the Fort Macon and Pea Island has been $64, 905,952 to date.

Mayor Smith also notes in her article that: "These structures have been used successfully in many coastal states for years. " Again, what are the facts? Well, as shown in the table below, the 15 such structures put in place from Ocean City, MD to Boca Grand Pass, FL (not including NC) have required $778,798,382 in beach re-nourishment projects. These numbers are well documented in Riggs (2009) and Riggs and Ames (2011).

So the total 17 Groin/Jetty structures from Florida to Maryland have required expenditures of $843,704,334 up through 2009. This is $49,629,431 per structure. In NC alone the rate of re-nourishment cost to the public has been $11,180,109 per decade or $5,900,055 per Groin/Jetty per decade. That is a daunting figure for an island such as Ocean Isle Beach. Who will pay those documented costs of approximately $6 Million per decade? And what land is being protected? Well if the photographs do not lie, then very few land owners are actually being protected. Certainly the land downstream of the structures will be deprived of sediments, as shown over and over. The classic, textbook example of the downstream damage affected by these structures is shown for the New Jersey coast below; a horrifying prospect for a small, 6.5 mile in length, Barrier Island. Pity the homeowners at the central and west end of Ocean Isle Beach and pity the homeowners of Sunset Beach, an island only 3.5 miles long and in the lee of OIB. Legal experts and banking interests fear that coming property owner law suits will surely bankrupt such small and resource limited barrier islands. Further, if a groin/jetty is built

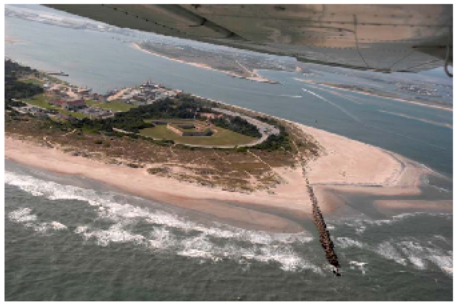
at the east end of Holden Beach, it will deprive Ocean Isle Beach of Cape Fear River sediment effluents as well those emanating from the Lockwood Folly Inlet. Both the Cape Fear River Plume and the Lockwood Folly Inlet Plume turn, on average, towards the west as they out-well onto the adjacent Continental Shelf. Thus OIB beaches will be further starved; including that of Sunset Beach.

The message to the public as regards Groins and Jetties are: 1) Individual snapshots to prove a particular perspective should not be used, when the photos only represent one particular time in a long series of groin/jetty and beach re-nourishment projects; 2) The true record of what has actually transpired and what the associated costs have been should be presented; 3) An honest, unbiased effort to understand naturally occurring processes, should be made by managers and decision makers. Naturally occurring processes, such as frequent atmospheric storms, will not be denied; 4) Public decision makers, who in many cases have a principal knowledge base that is real estate development, and who may have vested interests, should not be spending public funds nor advocating for the expenditure of public funds where a conflict of interest may exist; 5) The public should be fully informed of the folly of building on the tips of barrier islands, as these locales are highly, naturally unstable and cannot be stabilized in-place. The tips of barrier islands will and must move as the islands must migrate to survive rising sea level and continued atmospheric storms; 6) The NC Legislature nor any other state legislative body, should not be so controlled by the real estate and construction lobby that it makes ill-conceived decisions that put the public beaches at risk, which it has done in the case of NC; 7) The banking community should be fully aware of the risks of subsidizing housing at the tips of barrier islands and thus not make building loans for such construction; 8) Sea Level is rising and Groins and Jetties will exacerbate the erosion effects of storms occurring on a higher base of sea level; 9) Cost analyses of the continued costs of counter-acting the damage done by Groins and Jetties should be conducted using the facts; and 10) The tax value and taxes derived from properties purportedly to be protected by the structures should be part of a Cost-Benefit Analysis. The question should be are the taxes to be derived sufficient to cover the continuing costs associated with these structures? Here again, we consider public records.

Andy Coburn of Western Carolina University conducted the analysis summarized below. Basically, using the US Army Corps of Engineers figures of the property that will purportedly benefit from an Ocean Isle Beach (OIB) east end Groin/Jetty is shown in the ellipse. This is a government drawn figure. It is ambitious at best, but let us accept it at face value. The Total Properties in the ellipse number 60. Here we note that the assumption is that the Groin/Jetty will benefit all OIB properties in the ellipse but that is not a solid assumption. In fact the aerial photos of Fort Macon NC and the New Jersey coast speak to that untruth. Moreover the structure will hurt all OIB properties to the west of the ellipse. Basically: 1) the Total Appraised Value of Properties inside of the ellipse is $18,100,460 (2009 assessments); 2) the Average Appraised Value/Property inside of the ellipse is $301,674; 3) the County Tax Revenue/Year (@ 0.305/100) is $55,206; 4) the County Tax Revenue/Property/Year is $920; and 5) the Total OIB Tax Revenue/Year (@ 0.09/100) is $16,290. This cost –benefit analysis begs two questions: 1) How is a multi-tens of millions of dollars of costs of construction of value to the community; and

moreover, 2) How do the continuing costs of approximately $6,000,000 (at today's costs) per decade of value to barrier islands such as OIB? The answer to both questions is: It is not! The Public should resoundingly reject and vote down this ill-conceived, misguided initiative.
Figure 1.

Location	Date	Volume (cy)	Actual Cost	2009 Dollars*
Pea Island	1990	254,955	-	-
Pea Island	1991	282,600	-	-
Pea Island	1992	184,300	-	-
Pea Island	1992	1,078,000	-	-
Pea Island	1993	433,235	-	-
Pea Island	1995	203,191	$1,294,327	$1,806,528.88
Pea Island	1996	500,217	-	-
Pea Island	1997	294,000	$1,159,642	$1,536,861.62
Pea Island	1998	260,183	$637,448	$831,846.18
Pea Island	1999	328,919	$545,515	$696,494.30
Pea Island	2000	419,305	$1,228,564	$1,517,576.19
Pea Island	2001	513,706	$2,568,530	$3,084,977.12
Pea Island	2002	732,852	$2,822,329	$3,337,047.13
Pea Island	2003	1,029,543	$3,860,786	$4,463,173.53
Pea Island	2004	616,448	$2,510,229	$2,826,618.85
Pea Island		**7,131,454**	**$16,627,370**	**$20,101,123.80**



Location	Date	Volume (cy)	Actual Cost	2009 Dollars*
Fort Macon	1961	-	$952,000	$6,772,540.74
Atlantic Beach/Fort Macon	1973	504,266	$414,807	$1,987,233.83
Atlantic Beach/Fort Macon	1978	1,179,600	$1,565,177	$5,106,245.93
Atlantic Beach/Fort Macon	1986	4,168,600	$5,316,038	$10,317,236.56
Atlantic Beach/Fort Macon	1990	-	-	-
Atlantic Beach/Fort Macon	1994	4,664,000	$3,794,727	$5,446,508.67
Atlantic Beach/Fort Macon	2002	209,348	-	-
Atlantic Beach/Fort Macon	2005	2,800,000	$12,900,000	$14,049,903.23
Fort Macon	2007	211,000	$1,184,500	$1,215,160.51
		13,736,814	**$26,127,249.00**	**$44,894,829.47**

*The BLS CPI inflation calculator uses the average Consumer Price Index for a given calendar year. This data represents changes in prices of all goods and services purchased for consumption by urban households. This index value has been calculated every year since 1913. For the current year, the latest monthly index value is used.

Figure 2.

Location of Terminal Structure	Volume Emplaced	Cumulative Cost
BOCA GRANDE PASS (FL)	1,336,781	$17,542,500
JOHNS PASS (FL)	13,248,650	$162,417,417
BAKERS HAULOVER (FL)	17,150,775	$38,229,274
CLEARWATER PASS (FL)	10,902,450	$151,791,898
ST. LUCIE INLET (FL)	30,985,280	137,950,278
BIG CARLOS PASS (FL)	360,000	$3,237,280
BLIND PASS (FL)	5,506,700	$11,582,900
NASSAU SOUND (FL)	6,185,096	$10,874,735
PORT CANAVERAL (FL)	15,614,000	$92,748,198
REDFISH PASS (FL)	6,864,600	$20,222,483
ST. AUGUSTINE INLET (FL)	5,465,500	$12,662,600
MIDWAY INLET (SC)	530,700	$2,312,000
ST. HELENA SOUND (SC)	6,012,149	$17,778,553
TYBEE ISLAND (GA)	5,960,000	$9,736,000
OCEAN CITY INLET (MD)	14,366,391	$89,712,266
TOTAL	140,489,072	$778,798,382

Figure 3.

Figure 4.

Analysis done by Andy Coburn WCU

Shallotte Inlet/Ocean Isle Beach (within red circle):
Total Properties: 60
(NOTE: Terminal groin assumed to benefit all properties in red)

Assessed Value

2009 Assessed Value of Properties: $18,100,460 ($301,674/property)

2009 Brunswick County Assessed Value: $31,392,480,327.87
Percent of 2009 County Assessed Value: 0.058%

2009 OIB Assessed Value: $2,640,888,866
Percent of 2009 OIB Assessed Value: 0.685%

County Tax Value (@ .305/100)

- 2009 County Ad Valorem Tax Revenue: $95,747,065.00
- 2009 County Ad Valorem Tax Revenue Generated by Properties: $55,206 ($920/Property)
- 2009 County Ad Valorem Tax Revenue Generated by Properties: 0.058%

OIB Tax Value (@ .09/100)

- 2009 OIB Ad Valorem Tax Revenue: $2,376,800
- 2009 OIB Ad Valorem Tax Revenue Generated by Properties: $16,290 ($272/Property)
- 2009 OIB Ad Valorem Tax Revenue Generated by Properties: 0.685%

Occupancy Tax Revenue

- FY 2006-07 OIB Occupancy Tax Received: $1,134,847
- # of Structures Rented: 828 (p19 OIB LUP)
- Occupancy Tax/Structure: $1,371
- Estimated Occupancy Tax Revenue: (60x.33)x$1,371 = $27,145/Yr

Basically, it should be understood that beach migration is a naturally occurring process. The beaches move when energetic atmospheric storms which create highly energetic coastal ocean currents and large amplitude waves which then mechanically move sediments along, away from and towards the coast. The Egyptians Chinese, Greeks and Romans all understood this. Moreover Native American Indians, the earliest inhabitants of the coastal areas of the eastern seaboard of the US understood this. The approach taken by those cultures was to go wherever the beaches were. In fact the Romans were known to create rice fields in the wetlands behind European barrier islands; rice patties that are still lucrative enterprises today. The inlets, which must move as the islands migrate are also natural passageways for estuarine dependent finfish and are heavily used by marine wildlife for food and habitats. Any changes in the inlet functioning will necessarily impact wildlife balances and survival.

Well intentioned coastal engineers, whose business is construction, have tried many so-called solutions in attempts to take on, deal with and solve inlet migration, beach movements and sea level rise. But all efforts involving groins and jetties have failed. In the mid-1990s, the US National Academy of Sciences and the US Park Service asked a team of expert coastal scientists and engineers to study the issue of the Cape Hatteras Lighthouse NC, which was under threat of being destroyed by the encroaching Atlantic Ocean. This was after a period over which a series of groins had been built to protect the Lighthouse, by stabilizing the Hatteras shoreface and in building out the beaches. Unfortunately the erosion in front of the Lighthouse was exacerbated by the groins and the Expert Panel agreed that the only viable solution was to move the Lighthouse. The NAS and PS agreed with the recommendation, the Lighthouse was moved and the whole issue has gone away with movable beach resources being enjoyed by the public.

Given the well known effects of the passages of winter storms in causing coastal erosion and inlet migration, one would assume that the frequency occurrence of winter storms on an annual basis should correlate with any beach erosion and or beach re-nourishment projects. As it occurs, Riggs and Ames (2011) meticulously created an "erosion vs. accretion" profile for Pea Island NC using a combination of NC Department of Transportation aerial photographs and beach surveys over the years 1947 to 2006. However, if one looks at the beach re-nourishment campaigns that have been staged by NC for Pea Island (see Figure 1 above), one sees that from 1990 to 2005, there has been a series of yearly projects peaking in 1992 with 1.27 million yards of sediment dumped on the beaches. So a one to one annual comparison (Figure 5) is not mathematically tractable. However if we conduct an empirical ensemble modal decomposition (Huang et al, 1998) of the annual winter storm data set we find that there is a long period mode of about 30 years (IMF mode C4). If one compares the Riggs erosion-accretion data time series, one sees a clear relationship that suggests that over the long haul, the erosion vs. accretion curve is in keeping with the variability of the frequency of occurrence of US east coast winter storms (Figure 6, lower panel). Unfortunately, higher frequency modes of variability, such as IMF modes (C3 + C4) vs. the erosion-accretion curve (also Figure 6, upper panel) are masked by re-nourishment projects. It is of note that the Fort Macon time series of re-nourishment projects (Figure 1) seems to align very well with IMF mode C2, which nominally has about a 7-8 year cycle. This suggests that if the re-nourishment strategy of putting sediments on the Fort Macon beaches during particularly energetic storm years or actually a sequence of them, then there is a cleat argument that at a maximum, beach re-nourishment due to the combined effects of winter storm occurrence and the presence of groin/jetties will require major re-nourishment expenditures on no less than every 7 years and more likely more frequently.

The structures proposed in places like Figure 8 Island, Holden Beach and Ocean Isle are on the down-drift side of the neighboring inlet. A shore-perpendicular structure, placed at the down-drift side of an inlet, will block the natural flow of sand onto the island where the structure is located. This will cause an increase in shoreline erosion in front of oceanfront homes down-drift of the structure. Protecting homes at the inlet will be at the expense of a larger number of homes down the beach.

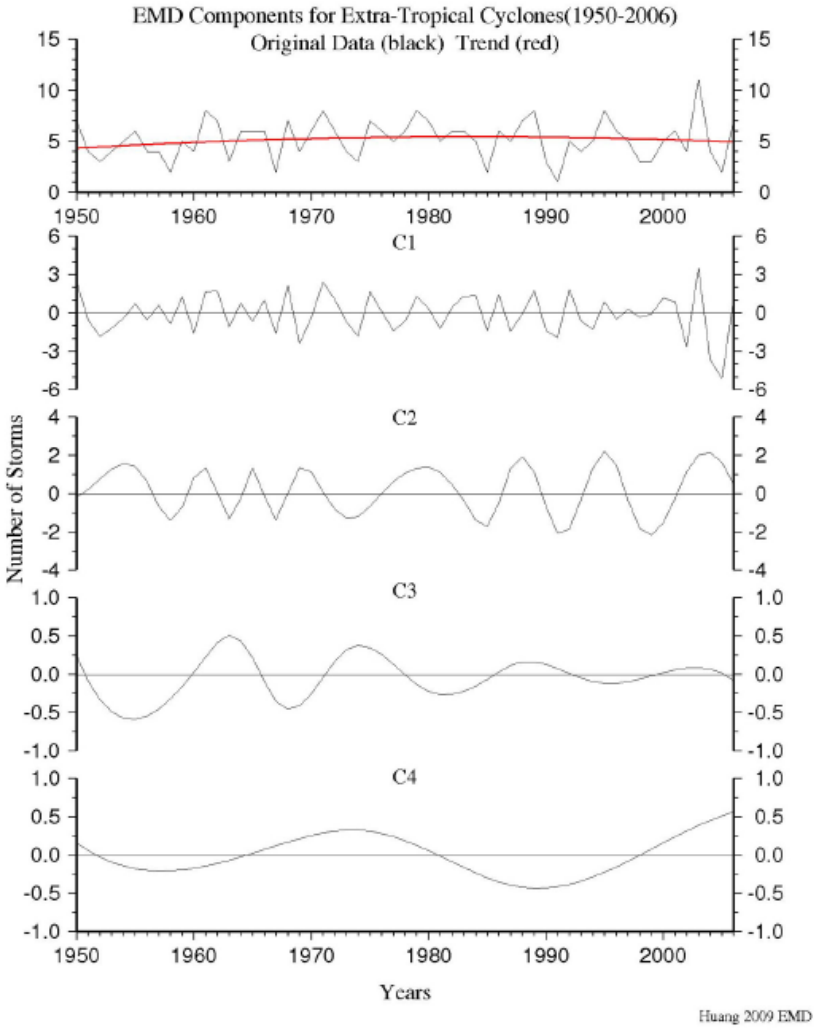
The unfettered flow of sand through natural inlets is an important mechanism maintaining barrier island health. Blocking this flow of sand will inhibit the ability of the barrier island to respond to rising sea level and storms. Also, Groins can impact near-shore circulation by directing currents offshore, especially during storms. Groins can be particularly destructive following storms if a significant portion of the nourishment project is transported offshore, leaving the groin uncovered. During this period, the groin will block all along-coast transport until the cell is filled in again.

Conclusions

The lessons learned by the examples presented above are: 1) The public will use beaches wherever they are; 2) Sediments are not lost from the total barrier island beach system during storm passage, rather they are relocated within the system; 3) Inlets, the tips of

islands, are sources of sediments that should be used naturally by the barrier island system per se to maintain itself; 4) There should be a moratorium on the public policy of allowing building on the ends or tips of barrier islands. Basically these lands should be viewed as being in a continual state of migration and should be allowed to move as necessary. Inlets do not close, they just relocate; 5) Hardened structures will not stabilize inlets or eliminate erosion, rather they will cause erosion and thus should be banned in perpetuity; 6) Public, elected officials should tell the whole story and not cherry-pick facts for their own use, and if they do, they should be held accountable; and 7) Public funds should not be used for either groin/jetty or re-nourishment projects. This is a misuse of public revenues and managers who do so should be held accountable.

Figure 5.


EMD Components for Extra-Tropical Cyclones(1950-2006)
Original Data (black) Trend (red)
C1
C2
C3
C4
Number of Storms
Years
1950
1960
1970
1980
1990
2000
Huang 2009 EMD

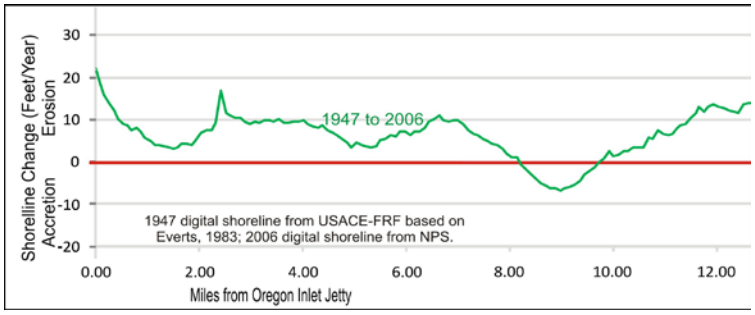

Shorelline Change (Feet/Year)
Erosion
Accretion
1947 to 2006
1947 digital shoreline from USACE-FRF based on
Everts, 1983; 2006 digital shoreline from NPS.
Miles from Oregon Inlet Jetty

Figure 6.

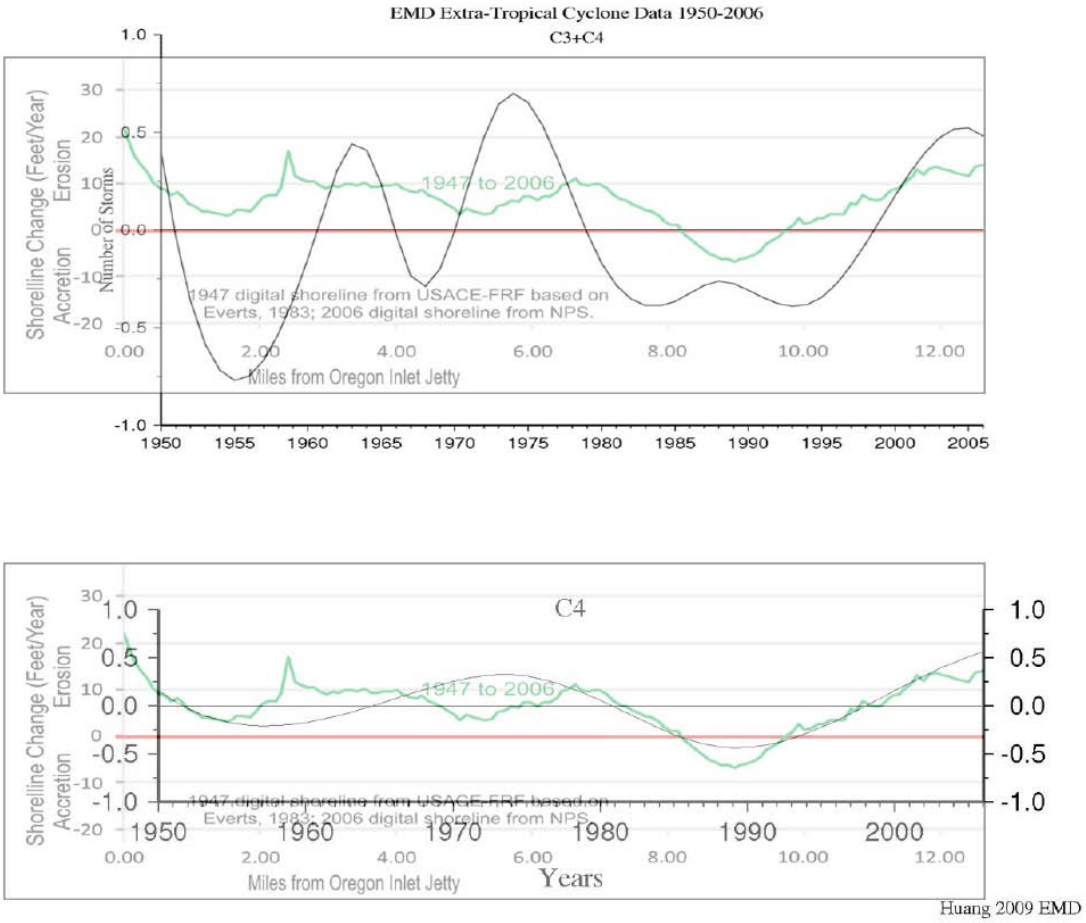


Figure Legends

Figure 1. Aerial photographs of Pea Island (left) and Atlantic Beach/Fort Macon (right) and table of beach re-nourishment projects for each by year and cost for each island terminus. Note the eroded, cuspate coastline downstream of the Pea Island groin and the eroded coast on the leeside of the Fort Macon groin.

Figure 2. Table of Florida, Georgia, South Carolina and Maryland groins and the re-nourishment projects required to replace eroded beaches, by volume of sediment and cost associated with each project.

Figure 3. Aerial photograph of New Jersey shoreline showing eroded, cuspate shoreline downstream of groins.

Figure 4. Ocean Isle Beach (OIB) NC Tax Value and Tax Benefits of proposed OIB groin. The US Army Corps of Engineers projected that 60 properties (in the red ellipse) would be protected by the proposed groin. Andrew Coburn of Western Carolina University conducted an analyses of county and town tax records which show that these properties 0.058% (or less than six hundredths of one percent) to the Brunswick County Tax Base and 0.685% (or less than seven tenths of one percent) to the OIB Tax Base.

Figure 5. Rate or shoreline erosion (above red line) and or accretion (below red line) of the coastline at Pea Island from 1947 through 2006 vs. the EEMD modal decomposition

of the frequency of occurrence of atmospheric winter storms in the vicinity of Cape Hatteras NC.
Figure 6. Rate of erosion/accretion of the coastline at Pea Island vs.: (upper panel) the decadal plus multi-decadal frequency of occurrence of winter storms (Modes C3 + C4) from Figure 5; and (lower panel) the multi-decadal frequency of occurrence (Mode C4) from Figure 5.

Acknowledgements
The authors acknowledge the tables and imagery provided by Dr. S. Riggs of East Carolina University (ECU) and Mr. A. Coburn (Western Carolina University, WCU). The authors also acknowledge the many discussions held with scientists Dr. O. Pilkey of Duke University (DU), Dr. R. Young (WCU), Dr. J.P. Walsh (ECU), Dr. Steve Culver (ECU), Dr. Dave Mallinson (ECU), Dr. P. Peterson (University of North Carolina-Chapel Hill, UNC-CH), Dr. Tony Rodriguez (UNC-CH), Dr. M. Stutz (Meredith College), Dr. D. Heron (DU). The collective group of scientists has stated: "We are not anti-development. Nor are we an environmental lobby. We are simply electing to play our role in helping the state develop sound, science-based policy". Mr. J. Epps is thanked for acquiring and processing the storm data from the National Oceanic & Atmospheric Administration - National Climatic Data Center.

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