I. Introduction

North Carolina's beaches and inlets have tremendous economic value and serve as important habitat for fish and wildlife resources. Beaches and inlets support millions of recreational visitors every year, provide billions of dollars in economic value through business and tourism as well as residential and commercial property value, provide ocean access for commercial and recreational fishermen, and are an integral part of the state's history, culture, identity, and way of life.

However, without effective planning and management, the future of the state's coastal communities and a significant portion of its economic base could be adversely affected by coastal erosion, accelerated sea-level rise, shifting shorelines, and storms. The North Carolina Department of Environment and Natural Resources (DENR) is committed to the long-term conservation and management of the state's beaches and inlets. As part of this commitment, the N.C. Beach and Inlet Management Plan (BIMP) is a joint initiative undertaken by the Division of Water Resources (DWR) and the Division of Coastal Management (DCM), to develop a comprehensive management plan to address the natural resources, funding mechanisms and management strategies for these areas.

In September 2007, DENR hired the engineering firm of Moffatt & Nichol to assist the state with the following tasks over an 18-month period: 1) data identification and acquisition of existing datasets, 2) determination of beach and inlet management regions, 3) scheduling and facilitation of stakeholder meetings, 4) development of draft beach and inlet management strategies, and 5) preparation of a final report. In addition, two groups were established to guide BIMP development: a BIMP Advisory Committee and a DENR Technical Work Group. The Advisory Committee was composed of representatives from federal and state agencies, local governments, academic institutions, and non-profit organizations. The Technical Work Group was comprised of DENR division representatives. The two groups met periodically to review progress and provide suggestions on the project. Public stakeholder meetings were held in the coastal region and in Raleigh, to share information on the data compiled for this effort and to solicit comments on the proposed beach management regions as well as management strategies for those regions. It is envisioned that this initial effort to develop a BIMP will be the foundation for a long-term Beach and Inlet Management Program.

The Framework for a Comprehensive Coastal Management Plan

The purpose of the BIMP is to preserve and enhance the value of the coastal resources of North Carolina, through the development of a systematic management strategy for the oceanfront beaches and active tidal inlet complexes of the state. Prioritizing actions and balancing competing management objectives at all levels of decision-making is essential, especially in the midst of shifting budgets.

The BIMP uses a comprehensive, system-wide approach incorporating the regional context of coastal processes (as opposed to the traditional beach-by-beach or inlet-by-inlet approach). The desired result of this approach is more cost-effective management of our oceanfront beaches and inlets, a reduction in project costs and environmental impacts, and a long-term, sustainable management plan for the state's beaches and inlets.

The long-term goal of the BIMP is to establish a foundation for effective, continuing management of North Carolina's beaches and inlets by:

- Improving coordination between the state, federal, and local agencies responsible for managing North Carolina's beaches and inlets.
- Presenting the current state of knowledge regarding beach and inlet processes (both biological and physical).
- Identifying data gaps and research needs related to beach and inlet management.
- Establishing management regions; identifying viable management strategies considering the economics and ecology of these regions; and addressing the need for long-term funding that is both predictable and stable.
- Recommending a long-term implementation strategy for the BIMP that includes ways to address other major beach and inlet management issues, such as sea-level rise, land conservation, recreational beach access, and local, state and federal regulation of beach and inlet management activities.
- Identifying ways in which coastal communities could improve their resiliency to coastal hazards.
- Recommending ways to maximize the beneficial use of dredged material within sediment management regions, assessing the availability, accessibility, and compatibility of inlet and offshore sand sources.
- Recommending ways to minimize the potential ecological impacts of beach and inlet management activities.
- Establishing a method for prioritizing projects for funding.

The framework for the BIMP's development is the culmination of past efforts, legislative actions, studies and recommendations. A few of the major legislative efforts, studies and bills related to beach and inlet management were used as the building blocks for this initiative.

In 1971, the importance of North Carolina beaches was recognized in Article XIV, Section 5 of the North Carolina Constitution, which states "the beaches of the state are to be preserved as part of our common natural heritage." In 1974, the General Assembly enacted the state's Coastal Area Management Act (CAMA) which established the North Carolina Coastal Management Program as the planning and regulatory program for the state's coastal region. CAMA identifies Areas of Environmental Concern (AECs), and gives the Coastal Resources Commission (CRC) authority, with input from the Coastal Resources Advisory Council (CRAC), to develop policies and rules for development activities in these areas. The rules adopted by the CRC ensure that protection of the recreational use of the state's shorelines is in the public interest.

A report entitled "Coastal Erosion" was completed by Dr. Jerry L. Machemehl of North Carolina State University (1974), in which he summarized the status of the beaches and inlets in North Carolina and made conceptual-level recommendations for potential strategies. In most cases "natural processes" together with beach nourishment and dredging strategies were the recommended policies.

A 1999 study authorized by the Legislative Research Commission on Coastal Beach Movement, Beach Renourishment and Storm Mitigation concluded that there was a need to:

- Provide a legislative mandate that acknowledges the value of the beaches to the people of the state and declare that it is in the public interest to preserve and restore the beaches of the state.
- That where beach preservation and restoration projects are found to be economically, environmentally and socially justified, beach preservation and restoration projects should be considered a public purpose and state funding made available.
- The need for a thorough economic study that assesses the role and value of the state's beaches with regard to local, regional, and state economies, and that provides a cost benefits analysis of current and anticipated beach preservation and restoration projects.
- A critical need for a dedicated source of funding for beach preservation and beach restoration projects in the coastal area.

The most pertinent legislative action was House Bill 1840 (Session law 2000-67), passed in 2000. The session law required DENR to develop a state beach management and restoration strategy that could also be used for local government planning purposes. The law declared that it is a necessary governmental responsibility to properly manage and protect North Carolina's beaches from erosion and that good planning is needed to assure a cost-effective and equitable approach to beach management and restoration. The law also states that as part of a comprehensive response to beach erosion, sound policies are needed to facilitate the ability of landowners to move threatened structures and to allow public acquisition of appropriate parcels of land for public beach access. While passed in 2000, HB 1840 was not funded by the General Assembly until 2007. Germane portions of HB 1840 concerning the BIMP are outlined below:

(1) Utilizes the data and expertise available in the Divisions of Water Resources, Coastal Management, and Land Resources.

(2) Identifies the erosion rate at each beach community and estimates the degree of vulnerability to storm and hurricane damage.

(3) Uses the best available geological and geographical information to determine the need for and probable effectiveness of beach nourishment.

(4) Provides for coordination with the U.S. Army Corps of Engineers, the North Carolina Department of Transportation, the North Carolina Division of Emergency Management, and other state and federal agencies concerned with beach management issues.

(5) Provides a status report on all U.S. Army Corps of Engineers' beach protection projects in the planning, construction, or operational stages.

(6) Makes maximum feasible use of suitable sand dredged from navigation channels for beach nourishment to avoid the loss of this resource and to reduce equipment mobilization costs.

(7) Promotes inlet sand bypassing where needed to replicate the natural flow of sand interrupted by inlets.

(8) Provides for geological and environmental assessments to locate suitable materials for beach nourishment.

(9) Considers the regional context of beach communities to determine the most cost-effective approach to beach nourishment.

(10) Provides for and requires adequate public beach access, including handicapped access.

(11) Recommends priorities for state funding for beach nourishment projects, based on the amount of erosion occurring, the potential damage to property and to the economy, the benefits for recreation and tourism, the adequacy of public access, the availability of local government matching funds, the status of project planning, the adequacy of project engineering, the cost-effectiveness of the project, and the environmental impacts.

(12) Includes recommendations on obtaining the maximum available federal financial assistance for beach nourishment.

(13) Is subject to a public hearing to receive citizen input.

During the spring of 2001, the U.S. Fish and Wildlife Service and the Wilmington District of the U.S. Army Corps of Engineers convened a group of stakeholders (local, state and federal government officials, non-governmental organizations, individual citizens, and university researchers) concerned about ocean beach management issues in North Carolina. The primary concerns of the stakeholders included:

- Management of the ocean beaches and the nearby infrastructure on which the coastal tourism and retirement industries depend.
- Management (including restoration in some cases) of the living marine and wildlife resources dependent on the beaches and inlets.
- Maintenance of the physical integrity of the coastal barrier system for the protection it provides to local infrastructure on which the coastal tourism and retirement industries depend, as well as to inland areas.
- Erosion management and storm damage reduction options for at-risk ocean beach communities.
- Cumulative impacts of ocean beach management options.
- Federal and state permitting processes.
- Coordination among the various state, federal, and local government agencies, as well as with non-government groups.

Other relevant recommendations included: the development of strategies that minimize environmental impacts and enhance public access, development of a long-term state and local funding process to support the state-led planning program, and the idea of developing a “new” systematic approach to project reviews and how they could be cumulatively permitted.

A recommendation for a comprehensive beach and inlet management plan is also found in the Coastal Habitat Protection Plan (CHPP) completed in 2005. Recognizing the need to both protect habitat and prevent overfishing, in 1997 the North Carolina General Assembly passed the Fisheries Reform Act, which called for the development of a CHPP with the purpose of preserving and enhancing recreational and commercial fisheries. Specifically, CHPP Goal 3 Enhance Habitat and Protect It From Physical Impacts, recommends that DENR “(p)repare and implement a comprehensive beach and inlet management plan that addresses ecologically-based guidelines, socio-economic concerns, and fish habitat.”

USACE Regional Sediment Management Initiatives and Integration of the BIMP

The state of North Carolina and the U.S. Army Corps of Engineers-Wilmington District have partnered in the development of Regional Sediment Management (RSM) principles for state, federal and joint projects. A fundamental tenet of RSM in North Carolina is an understanding of sediment budgets incorporating coastal process analysis of the shoreline and inlets and the movement of sediment (quantities and direction) along the shoreline.

By definition, the USACE RSM effort is a "system-based approach" that seeks to address sediment-related issues by designing solutions within the context of a regional strategy. The state and USACE recognize the importance of a cooperative relationship for successful implementation of the BIMP and RSM. The re-authorization of the federal Water Resources Development Act (WRDA 2007) gave the USACE authority to implement RSM within its programs and operating framework.

In 2008, regional sediment management demonstration funds derived from the national program were allocated to the USACE-Wilmington District for gathering a detailed sediment transport and sediment budget for Brunswick County, and hydrographic surveys at inlets in the Bogue Banks (Carteret County) region. In 2009, the USACE-Wilmington District continued development of a detailed sediment budget from Cape Fear to the Bogue Banks region of Cape Lookout, by quantifying inlet sediment budgets, and conducting coastal process modeling and data analyses. In addition, a final data mining effort to capture remaining survey data from 2000 to 2005 will be completed in the near future.

Project Objectives

The objectives for the BIMP are to meet the requirements of HB 1840, and to include strategies that would enable the state to set priorities for beach and inlet management projects. This first BIMP includes the oceanfront shorelines for Brunswick, New Hanover, Pender, Onslow, Carteret, Hyde, Dare, and Currituck Counties as well as the inlets, inlet crossings, and minor portions of the Atlantic Intracoastal Waterway (AIWW).

The BIMP addresses the following information relevant to beach and inlet management in North Carolina:

- *Compilation of Currently Available Coastal Datasets Relevant To Beach and Inlet Management*

  Municipalities, state and federal agencies, public and private universities and non-profit organizations were contacted to identify the extent of the available coastal data.

- *Development of Beach and Inlet Management Regions Based On the Natural Coastal Processes Affecting Each Region*

  Sediment management regions are defined based on coastal physiography and natural processes. Along the North Carolina coast, inlets, headlands, embayments and the capes (Cape Hatteras, Cape Fear and Cape Lookout) all serve as logical boundaries for delineating littoral cells and sediment management regions. Sediment management regions are further delineated into sub-regions based on local physical processes, ecological considerations, and social/political management boundaries.

- *Development of Preliminary Beach and Inlet Management Strategies for Each Region*

  Development of beach and inlet management strategies for the comprehensive plan based on current North Carolina coastal policies and DENR objectives. Objectives include: restore natural pathways of sediment transport, encourage regional approaches to geographic coordination and sequencing of priorities, compare costs estimates for alternatives to beach nourishment, and develop ideas and principles needed for a long-term predictable and stable funding foundation.

- *Incorporation of Stakeholder Input for Proposed Management Regions*

  An integral component of the BIMP planning process is public education and stakeholder involvement. The process included input through facilitated stakeholder meetings on the general approach and specific strategies facilitate a series of stakeholder meetings in each beach and inlet management region.