3. PROBLEMS, NEEDS, AND OPPORTUNITIES

The main public concerns identified at Topsail Beach are economic losses resulting from (1) damages to structures and their contents due to hurricane and storm activity, and (2) the loss of beachfront land due to progressive shoreline erosion. In addition, periods of severe shoreline recession have adversely affected nesting habitat for endangered and threatened sea turtles. These economic losses and environmental concerns are discussed below.

3.01 Hurricane and Storm Damage

Being located between Cape Lookout and Cape Fear, Topsail Island is a frequent target for hurricanes and tropical storms tracking along the mid-Atlantic coast. Table 3.1 is excerpted from hurricane history information on the State Climate Office of North Carolina website and shows the frequency and severity of hurricanes and tropical storms directly affecting southeastern North Carolina since 1800. In addition to these direct landfalling storms, many storms that have passed offshore without making landfall have also impacted the study area. Local impacts to Topsail Beach varied depending on the landfall location and strength of the storm. However, Bertha and Fran in 1996 and Floyd in 1999 were among the most damaging and costly storms ever to hit North Carolina.

3.02 Beach Erosion

Over the last 40 years, the most serious long-term erosion has been occurring in the southern half of the study area, where erosion rates gradually increase from near zero in reach 13 to over 3 feet per year in reaches 5 to 7 (refer to Figure A-7 in Appendix A for reach locations). Long-term shoreline change rates along the northern half of the study area have remained relatively low, generally ranging from –1 to +1 foot per year. However, major storms in the late 1990s caused significant erosion and decimated the island's natural dunes, resulting in major property damage.

3.03 Beach Recreation

All reaches within the Topsail Beach study area are available for typical beach recreation activities – swimming, surfing, wading, walking, sightseeing, picnicking, sunbathing, surf fishing, jogging, and so on. The concern regarding beach recreation is that shore erosion will continue, resulting in a narrowing of the width between the surf, especially at high tide, and the landward limits of recreational use. Such landward limits are the toe of the dune, streets, or existing structures. As the available width decreases, some of these activities are hindered and eventually prevented.

Table 3.1 Direct Landfalling Hurricanes and Tropical Storms in Southeastern North Carolina Since 1800.

Approximate Date of Landfall	Storm Name	Saffir-Simpson Intensity at Landfall	Approximate Location of Landfall	Estimated Wind Speed (kt)	Storm Surge (ft.)
9/16/1999	Floyd	2	Topsail Island	95	
8/26/1998	Bonnie	3	Cape Fear	100	6-8
9/6/1996	Fran	3	Cape Fear	100	8-12
7/13/1996	Bertha	2	Topsail Beach	90	5
9/9/1984	Diana	1	Long Beach	80	5-6
9/11/1960	Donna	2	East of Wilmington	95	6-8
8/17/1955	Diane	1	Carolina Beach	75	5-9
10/15/1954	Hazel	4	NC/SC border	125	10-20
7/6/1946		Tropical Storm	Wilmington	60	
8/1/1944		1	Southport	80	
12/2/1925		1	Wilmington/Hatteras	65	
9/22/1920		1	Topsail Beach	65	
9/6/1916		Tropical Storm	Southport	35	
10/31/1899		1	Wrightsville Beach	80	8
9/11/1883		1	Southport	85	
9/9/1881		NA	Wilmington/Wrightsville		
08/18/1879		4	Wilmington/Cape Lookout	120	
9/17/1876		Tropical Storm	NC/SC border	60	
11/10/1875		NA	Long Beach		
9/28/1874		NA	Southport	60	
8/19/1871		NA	Southport		
9/4/1856		NA	Wrightsville Beach		
8/18/1837		NA	Cape Fear		
9/4/1834		NA	NC/SC border		
9/3/1815		NA	Wilmington/New Bern		10

3.04 Public Access

Many public beach access points and parking areas are present within the limits of the study area. The access points consist of small parking areas and wooden walkways to the beach. There are 22 beach access points located within the Topsail Beach study area, mostly in the southern part of town. There are only 2 areas of the study area, both near the north end of town, in which the distances between access points exceed ½ mile. The distance between access points O#4 and O#5 is 3,590 feet. This results in a 950 foot long

access deficiency in reaches 17 and 18 in the 1100 block of North Anderson Boulevard. The distance between access points O#2 and O#3 is 2,970 feet. This results in a 330 foot long access deficiency in reach 22, located near the 700 block of North Anderson Boulevard.

There are presently 374 public parking spaces available within 1/4 mile of the ocean-side access points. These public parking spaces are found at the following locations: 1) directly adjacent to the 22 access sites, 2) along nearby streets, 3) at 2 parking lots near the center of town, and 4) at sound side access points along the Banks Channel side of the island. The parking space count was conducted in June 2003 by the Wilmington District and a representative from the Town of Topsail Beach. In addition, the town has indicated in a more recent count during the summer of 2004, that there may be at least 300 additional parking spaces unaccounted for on the rights of way (ROW) along town streets. Currently, the town does meet the minimum requirement of 10 spaces per access point for parking at most of the established public access points. Figure 3.1 shows existing and proposed access locations. Appendix F describes the access and parking needs in detail.

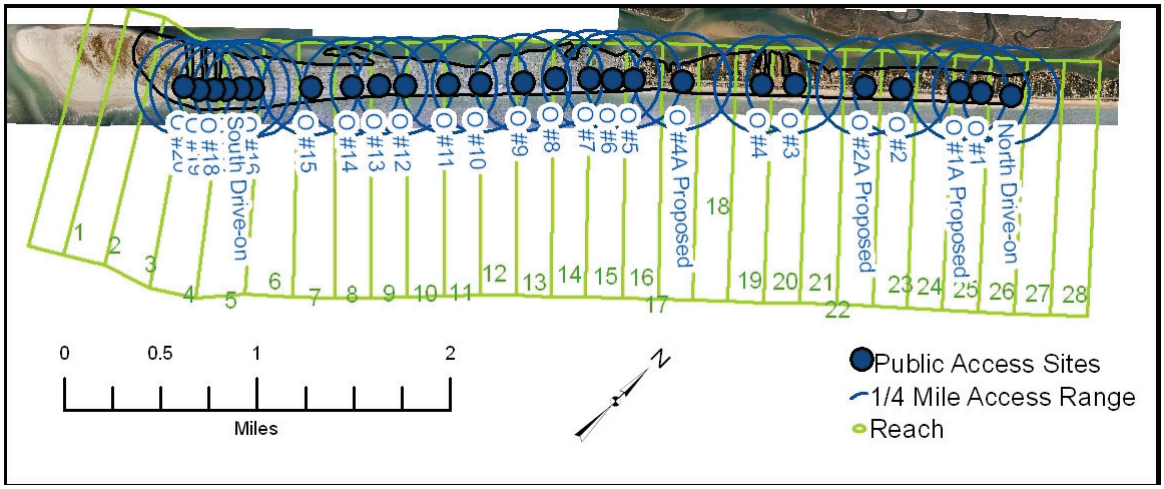

Figure 3.1 Existing and Proposed Public Access Locations.

3.05 Loss of Sea Turtle Nesting Habitat

A shoreface comprised of beach, berm, and dune components can provide valuable nesting habitat for sea turtles. The loggerhead and green sea turtles, which are on the Federal list of threatened and endangered species, have been documented to nest on Topsail Beach. However, long-term shoreline erosion processes coupled with historical short-term hurricane events have led to significant sediment losses from the shoreface. As a result of these existing erosional activities, substantial portions of the berm and dune system have been lost as the shoreline is being "squeezed" between the ocean and adjacent development. This puts nesting sea turtles at risk since little nesting habitat remains in these eroded areas. In some cases, nests laid in high erosion areas where available nesting habitat is lost need to be relocated to avoid tidal inundation (Jean Beasley, pers. comm.) (See Biological Assessment, Appendix I).

Persistent erosion along the town of Topsail Beach could lead to complete loss of nesting habitat; however, as short-term erosional processes scour the existing shoreface and the nesting beach environment slowly erodes away, large scarps may form at the toe of the primary dune; thus, preventing a turtle from encountering suitable nesting habitat above the mean high tide line. Re-establishment of a berm and dune system with a gradual slope can enhance nesting success of sea turtles by providing suitable nest sites without escarpment obstacles and away from tidal inundation.

3.06 Existing Shore Condition

In March 2002, beach profile surveys were taken along Topsail Beach at 1000-foot intervals to determine existing conditions of the project shoreline. Of the 26 shoreline profiles, 6 profiles were selected as representative of the existing condition and used for analysis. These typical profiles are shown in Figure 3.2.

The existing condition includes a fairly substantial constructed dune that was rebuilt following the decimation of the existing dune by Hurricane Fran in 1996. The existing dune varies in height from 15 to 20 feet along most of Topsail Beach, however, the dune has very little crest width, if any, and very steep side slopes. At the time of the surveys, the dry beach width from the base of the dune (at about elevation 7 ft-NGVD) out to the MHW line (at elevation 2.1 ft-NGVD) was rather narrow, generally averaging only about 60 feet. No well-defined berm feature existed either, with the beachface generally sloping directly from the base of the dune seaward.

Over the last 25 to 30 years, material resulting from maintenance dredging of the AIWW and connecting channels has been placed on the southern reaches of the study area in the vicinity of reaches 5 and 6. This placement has occurred on an irregular basis, however, placement has generally occurred every 3 to 4 years on average, with dredging quantities varying considerably from 15,000 to 150,000 cubic yards and averaging less than 100,000 cubic yards per event. An exception to this was a one-time emergency placement of over 200,000 cubic yards of dredged material in 1997 following hurricane Fran.

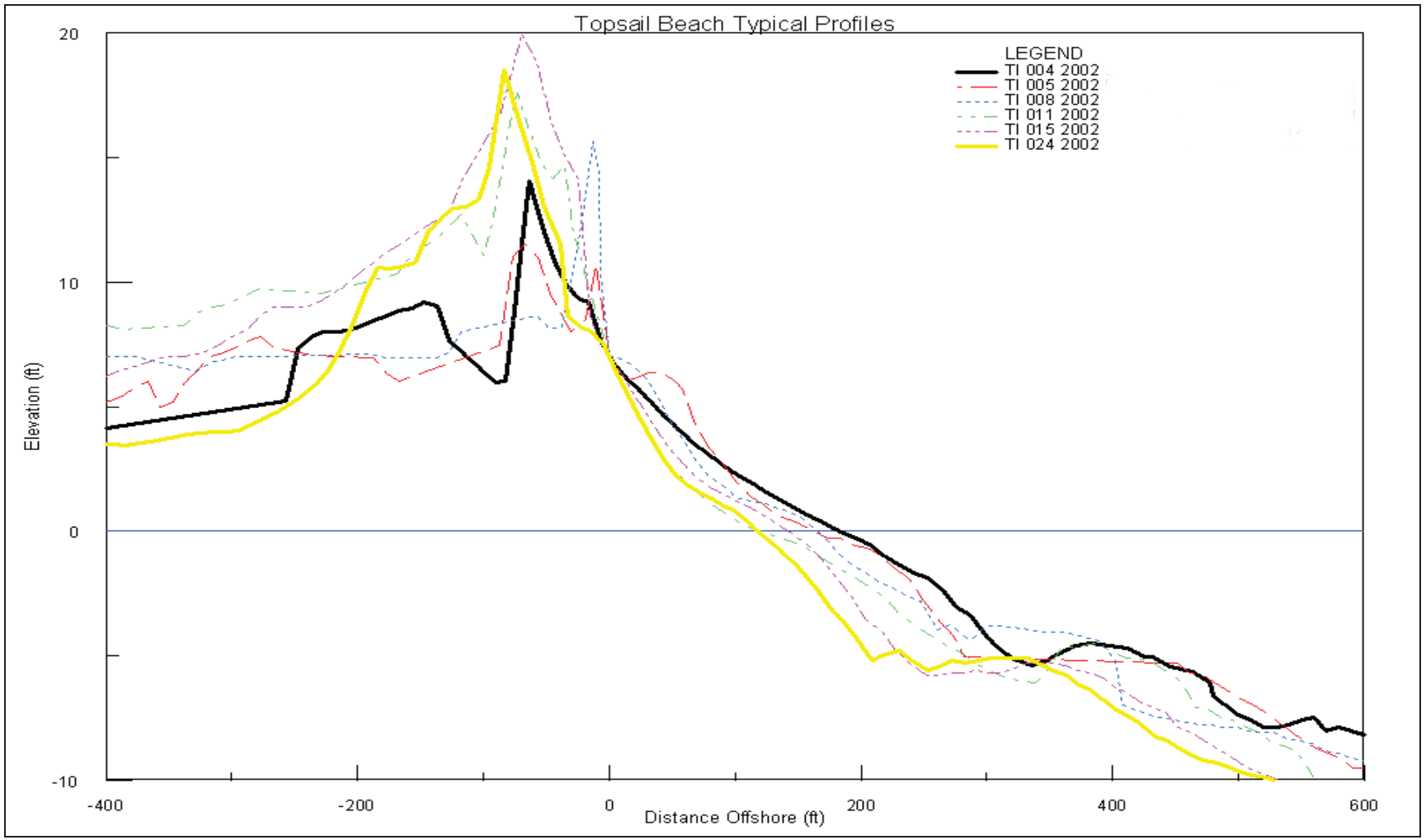

Figure 3.2. Topsail Beach Typical Profiles

3.07 Without Project Hydraulic Analysis

The without project condition was analyzed to establish the base condition for alternative evaluation. A range of storm responses (erosion distance, water level, volume lost, etc.) was determined for each of the typical existing profiles using several coastal engineering models, including SBEACH, GENESIS, and ADCIRC. The study area was subdivided into reaches of approximately 1,000 feet each. Reach 1 is located near New Topsail Inlet and reach 26 ends at the Topsail Beach – Surf City town boundary. Based on 1,000 different 50-year storm simulations, in conjunction with existing long-term erosion rates, average land losses and structure damages for each reach were computed to allow for comparative economic analysis of alternatives using the Generalized Risk AND Uncertainty - Coastal (GRANDUC) model. No allowance was made for future placement of maintenance dredging material because of the sporadic and variable nature of this work.

3.08 Without Project Economic Analysis

The study area will be fully developed and any remaining vacant lots are expected to be developed by the base year in 2011. New structures built on vacant lots or replacing existing structures will be required to meet certain building codes for reducing storm damages. There is a horizontal setback 60 feet landward from the established line of vegetation. Vertically, the first living floor will be elevated on pilings, well above the Base Flood Elevation. Additionally pilings for all first row replacement structures will be 16 feet below grade or 5 feet below mean sea level. Even with these building codes applied to new structures, the potential for hurricane-wave damage will increase without a project given the weakened natural dune system in this area. Unlike long-term erosion which can be predicted, to some extent, based on past trends and observed shore processes, damages from hurricane wave attack can occur in any year, and can be predicted only as a mathematical probability. Hurricane and storm damages in the Topsail Beach study area include damages to structures and contents, and to transportation infrastructure. Average annual hurricane and storm damages for the study area were computed using Wilmington District's computer models. These models integrate coastal engineering data, including storm frequency, storm surge, and long term erosion rates, with economic data, including the values of structures which could be damaged or destroyed, and the value of land which could be lost to erosion. This subject is addressed in greater detail in Appendix D, Coastal Processes.

Average annual hurricane and storm damages were estimated at $7,848,000 (see Table 3.2). This number includes damages to structures due to short-term erosion during storm events, as well as inundation damage due to storm surge. It also includes damages from long term, progressive erosion. Long-term erosion damages are discussed in Section 3.02. Without project damages will slightly increase because it will include structures expected to be built. Average annual preventable emergency costs from hurricanes and storms are estimated to be $87,000, based on records from hurricanes Bertha, Fran, Bonnie, and Floyd. All direct wind caused damages are excluded from the study.

Table 3.2 – Average annual damages, without project. October 2004 levels, 5.375% interest rate.

Reach	Storm Erosion	Flood	Wave	Land/LTE	Total Damage
3	$39,163	$9,209	$699	$71,710	$120,981
4	$136,475	$3,581	$38,714	$69,430	$248,201
5	$249,558	$5,224	$44,432	$86,664	$385,877
6	$536,534	$1,845	$30,386	$115,582	$684,348
7	$482,538	$6,179	$40,526	$109,582	$638,824
8	$437,188	$4,264	$30,803	$101,217	$573,472
9	$303,417	$4,337	$35,037	$111,059	$453,851
10	$446,482	$8,236	$55,345	$59,468	$569,531
11	$156,150	$2,898	$7,519	$26,922	$193,489
12	$123,686	$21,026	$7,557	$13,225	$165,495
13	$108,879	$5,925	$136	$5,549	$120,489
14	$123,360	$8,830	$70	$5,301	$137,561
15	$239,231	$11,318	$1,609	$5,613	$257,772
16	$303,811	$4,104	$163	$5,476	$313,554
17	$143,359	$629	$0	$5,336	$149,324
18	$158,376	$3,004	$433	$5,382	$167,195
19	$530,041	$4,726	$466	$7,448	$542,681
20	$582,645	$14	$0	$7,421	$590,080
21	$197,505	$18,257	$328	$5,411	$221,503
22	$273,698	$990	$0	$5,251	$279,939
23	$271,378	$1,726	$535	$5,450	$279,089
24	$293,849	$289	$380	$6,031	$300,548
25	$224,875	$4,972	$4,087	$5,920	$239,853
26	$200,400	$774	$3,113	$9,569	$213,855
Totals	$6,562,597	$132,360	$302,337	$850,217	$7,847,510

Included in the estimate of damages are the direct costs of rebuilding highway NC50, the only road linking Topsail Beach to Surf City and the mainland. Such costs include replacing fill, erosion protection for new fill, base course material, pavement, and associated utilities. The estimate omits the indirect costs incurred if NC50 is damaged to the point of being impassable. If NC50 should become impassable at the north end of town, then Topsail Beach loses all land access. This would create the need to use more expensive transportation alternatives to the highway, such as boats, barges, or helicopters. It also would limit the emergency response capabilities available in cases of medical emergencies or fires.

3.09 Without Project Environmental Analysis

Only those resources that have the potential to be affected by the no action alternative are included in the analysis, below.

Sea Turtles. There are no documented nesting attempts of hawksbill, leatherback, and Kemp's ridley sea turtles on Topsail Island. Topsail Island is considered to be one of the

more heavily nested areas along the North Carolina coast for loggerhead and green sea turtles, with an average of 98 nests per season. Without the proposed project, continued erosion of the beach would result in losses of sea turtle nesting habitat and possible poor nest site selection by females.

Seabeach Amaranth. Since 1992 the USACE has surveyed Topsail Beach for seabeach amaranth. From 1992 until 2004, the average number of plants found on Topsail Beach during any given year was 2687. The number of plants typically declines immediately following a hurricane, however, beach erosion is probably the primary threat to the continued presence of seabeach amaranth in the area. Failure to construct the proposed project could result in loss of seabeach amaranth habitat.

Water Resources. Continued erosion could result in the destruction of oceanfront residences, businesses and infrastructure, potentially resulting in pollution of the adjacent ocean waters.

Esthetic and Recreational Resources. Continued erosion of the beach would result in a continually narrowing beach front that is squeezed between the ocean and existing development, thus adversely affecting the recreation experience and esthetics of Topsail Beach.

Community Cohesion, public facilities and services. Ongoing erosion of the beach and degradation of the dune system by erosion and storms, could result in damage to public facilities, such as roads and utilities, and threats to human lives. All of which would adversely affect services and community cohesion.

Beach and Dune. The currently eroding beach and dune complex would continue to deteriorate, thus endangering public infrastructure, public and private property, human lives, and important habitat for a variety of plants and animals.