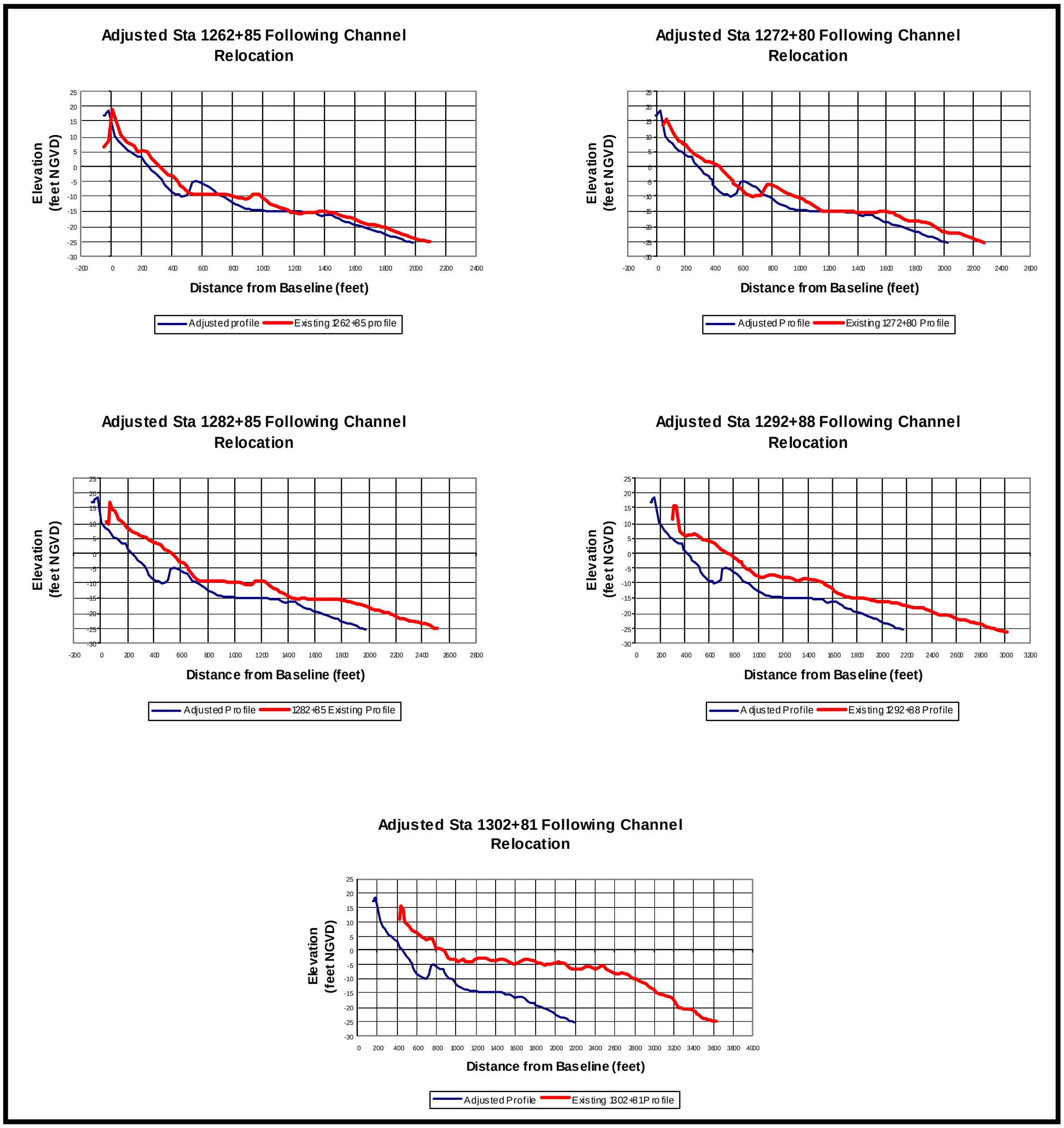

Figure 3.28 Predicted Profile Adjustments Following Relocation of the Bogue Inlet Ebb Channel

3.29. Shoreline Adjustments on Bear Island. The westward repositioning of the ebb channel and the associated reconfiguration of the ebb-tidal delta will have the opposite effect on the Bear Island shoulder. The movement of the ebb delta's apex farther to the west will lead to a seaward movement of the ebb delta's western segment outer margin (zone of breaking waves). This seaward extension of the platform will have a positive influence on the adjacent Bear Island oceanfront by altering the wave refraction patterns and ultimately leading to a reversal of the historic shoreline change trend. Again, based on the amount of shoreline recession that occurred between 1978 and 2001 on Bear Island (see paragraph 3.12), various sections of the oceanfront shoreline on Bear Island (Hammocks Beach State Park) could accrete by the following amounts:

For Transects 25 to 27: Average accretion [a] = +470 feet; Maximum accretion = 520 feet
For Transects 28 to 32: Average accretion [a] = +230 feet; Maximum accretion = 280 feet
For Transects 33 to 37: Average accretion [a] = +130 feet; Maximum accretion = 200 feet
[a] Average accretions rounded from those presented in paragraph 3.12.

The volume of material required to effect these shoreline adjustments on Bear Island would range between 1.5 and 2.0 million cubic yards. The buildup of this volume of material would come directly from the accumulation of littoral sediment presently being transported into Bogue Inlet that would be prevented from doing so once the ebb tide delta of Bogue Inlet readjusts to the new channel position and alignment. The accretion on Bear Island will be rather slow and could take up to 10 years to occur. Apart from the positive impacts on the ocean shoreline of Bear Island, a relatively wide marginal flood channel is likely to develop that will separate the evolving ebb channel from the Bear Island inlet shoreline. As a consequence, eastward spit growth on the western shoulder of the inlet (Bear Island) will be very limited.

3.30. Scenario No. 2 – Close the Existing Channel with Dredged Material. Closure of the existing ebb channel by the construction of a sand dike with dredged material will significantly reduce the likelihood of additional erosion along the inlet shoulder in vicinity of the Pointe. As will be noted later in the discussion of the numerical model results, some flow would persist in the existing channel for a period of time even with the construction of a sand dike. However, these persistent flows would have low velocities and should not negatively impact the Pointe shoreline. A sand dike would forcibly redirect the ebb flow toward the new channel and aid in the demise and abandonment of the former ebb channel. The cessation or reduction of ebb tidal flow in the existing channel would accelerate the reorganization and eventual collapse of the fronting ebb delta segment. The relatively rapid landward transport of the materials comprising the shoal segment would result in rapid spit growth on the Bogue Banks shoulder and infilling of the seaward portion of the former ebb channel. The aforementioned post-relocation scenario will also involve a significant transport of sand into the estuary through the marginal flood channel that will develop between the newly relocated ebb channel and the eastern shoulder.

3.31. Shoreline Adjustments on Bogue Banks and Bear Island. The adjustments of the ocean shoreline along Emerald Isle would be the same as predicted for Scenario No. 1, however, the more rapid collapse of the ebb tide delta fronting the west end of Bogue Banks could actually decrease the amount of time necessary for the shoreline adjustment to occur. The predicted time for these adjustments under Scenario No. 1 was 8 to 10 years. For Scenario No. 2, the adjustments could be completed in about 6 years. The shoreline adjustments on Bear Island for Scenario No. 2 are the same as those predicted for Scenario No. 1.

3.32. Neither scenario is expected to have a direct negative impact on the integrity of Island 2. However, the continued westward growth of the estuarine portion of the Bogue Banks spit may eventually lead to the deflection of the ebb channel to a position adjacent to the eastern portion of Island 2. With regard to Scenario No. 2, the growth of the sand spit would not resume until the new sand spit builds past the sand dike. The eventual erosion of this ephemeral island will likely occur with or without channel relocation. As discussed previously, Island 2 migrated a significant distance to the west between September 2001 and September 2002.

4.0 GEOTECHNICAL INVESTIGATIONS AND COMPATIBILITY ANALYSIS

4.1. Subsurface Investigations and Material Characteristics. During the month of July 2002, Coastal Planning and Engineering (CPE) obtained 27 jet probes and 5 vibracores in Bogue Inlet. The geotechnical investigations were carried out to define the size characteristics of the material that would be removed during the channel relocation project. The size characteristics of the material to be removed from the inlet was compared to the size characteristics of the native beach material in order to determine the suitability and compatibility of the inlet material for use as beach nourishment. The location of the jet probes and vibracores are shown on Figure 4.1. Most of the jet probes and vibracores were located within a corridor around the centerline of the proposed channel. In addition to the jet probes and vibracores obtained by CPE, the Corps of Engineers (COE) drilled 7 vibracores in the inlet complex with the location of the COE vibracores also shown on Figure 4.1. For the most part, the COE vibracores are located outside the corridor of the proposed channel. Coastal Science and Engineering PLLC (CSE) obtained 10 vibracores in Bogue Inlet as part of its preliminary analysis of inlet alternatives. The locations of the 10 CSE vibracores are shown on Figure 4.2. Details of the geotechnical investigation conducted by CPE, including logs for the jet probes and vibracores and grain size analyses are provided in Appendix B.

4.2. Jet Probes. Jet probes consist of jetting a 20-foot long PVC pipe into the seafloor using a water pump. As the probe penetrates into the sediment, a CPE geologist/diver observes the depth of the probe and the associated material characteristics of the subsurface sediment. The geologist/diver obtains an idea of the subsurface sediment characteristics based on the resistance and feel of the probe as it penetrates the subsurface and from the sediment being flushed out of the jet probe hole. A second diver records the turbidity level, which indicates the presence of silts/clays, by observing the plume created during the jet probing process.

4.3. A small deposit mound is formed around the jet probe site as jetted water carries sediment to the surface. Three sediment samples were collected from these mound deposits. The three samples obtained were: (a) an undisturbed bottom surface sample, (b) a sample from the mound created when the probe penetrated the seafloor to 20 feet or when the probe hit refusal; and (c) a sample from a second jet probe that was created when the probe penetrated to a depth half that of the first probe. One of the three sediment samples collected for each jet probe site was analyzed by standard sieve analysis and the other two samples characterized by visual estimates. Table 4.1 provides a summary of the grain size analyses (both sieve and visual) for the samples collected from the jet probes located on or near the centerline of the proposed channel. A few of the jet probes encountered some small pockets of shell and shell hash (generally less than 1-foot thick) but overall the jet probes consisted of fine to medium sand with minor amounts of shell (5 percent or less). The average mean grain size for all of the jet probe samples subjected to a sieve analysis was 0.27 mm. The silt content of the jet probe samples analyzed by standard sieves was generally below 2 percent, however, since most of the fine grained material is washed out of the sediment during the jet probe process, the silt content indicated by the jet probe samples may not necessarily be indicative of the in situ silt content.