JOSH STEIN
Governor
D. REID WILSON
Secretary
TANCRED MILLER
Director

NORTH CAROLINA
Environmental Quality

CRC-25-23

April 14, 2025

MEMORANDUM

TO: Coastal Resources Commission
FROM: Ken Richardson
SUBJECT: Town of Ocean Isle Beach - Beach Management Plan

The Town of Ocean Isle Beach ("Town") submitted its Beach Management Plan (BMP) on April 3, 2025, and is requesting Coastal Resources Commission (CRC) approval under 15A NCAC 7J .1200 Beach Management Plan Approval Procedures. The Town is currently implementing a beach management plan in accordance with 15A NCAC 7J .1201(d) and 15A NCAC 7J .1201(e) to ensure a 30-year design life. The public comment period remains open until April 19, 2025; therefore, comments are not included in this version of the BMP. However, they will be provided to the Commission before the April meeting and incorporated into the Town's final BMP.

Authorized by Congress in 1966 (House Document Number 511, 89th Congress, 2nd Session), the Ocean Isle Beach federal storm damage reduction project design includes a dune with a crest width of 25 feet at an elevation of +8.5 feet NAVD88 covering 5,150 feet of the beach, a 4,200-foot transition on the east end, and a 2,800-foot transition on the west end, for a total project length of 17,150 feet. The east and west transitions have a variable width berm at an elevation of +6.0 feet NAVD88.

The Town's Pre-Project Vegetation Line marks the position of the vegetation line as of June 27, 1998, spanning 3.25 miles of the Town's 5.5-mile oceanfront shoreline. The CRC initially approved the Town's Static Line Exception on January 25, 2010, with reauthorizations following on December 17, 2016, and February 12, 2020.

This is the first BMP submitted by a Town transitioning from a CRC approved Static Line Exception to a CRC approved Beach Management Plan. You may recall that the BMP also requires: 1) identification of sediment volumetric triggers (historic and projected losses from erosion/storms) used to establish when the next maintenance project is needed, 2) inclusion of public comments collected by the Town, and (3) identification of financial resources specifics. The approval process defined in Rule 15A NCAC 07J.1204(b) requires that the Commission review a Beach Management Plan (15A NCAC 07J .1203) to approve and/or renew its findings for the conditions outlined in 15A NCAC 07J .1201(d) through (e). Specifically, the Town is required to show the following:

1. A review of all historical beach fill projects in the area proposed in the Beach Management Plan.
2. A review of maintenance plans needed to achieve a design life of no less than 30 years of shore protection.
3. Documentation showing the location and volume of compatible sediment necessary to construct and maintain the project over its design life.
4. Identification of the financial resources or funding sources to fund the project over its design life.
5. Public comments received on the draft plan at the local level.

If approved, 15A NCAC 07H.0306(a)(9) would apply to proposed development projects along the affected area of the Town and continue to allow setbacks to be measured from the Vegetation Line instead of the Pre-Project Vegetation Line defined in Rule 15A NCAC 07H.0305(a)(6).

After the initial BMP is approved, subsequent renewals may be requested every five years. Should the Town choose not to seek a future renewal, the regulatory benefits afforded by a CRC-approved approved BMP, including the ability to measure setbacks from the vegetation line, would expire. Consequently, the Town would revert to using the Pre-Project Vegetation Line as the measurement line for the determination of oceanfront development setbacks.

DCM staff have reviewed the Town's BMP and verified that the conditions in 15A NCAC 07J.1201 have been met, and recommends that the Commission approve the Town's Beach Management Plan.

ATTACHMENT A: 15A NCAC 07J.1201 Beach Management Plan Approval
ATTACHMENT B: Town of Ocean Isle Beach – 2025 Beach Management Plan

ATTACHMENT A: 15A NCAC 07J.1201 – Beach Management Plan Approval

SECTION .1200 – BEACH MANAGEMENT PLAN APPROVAL PROCEDURES

15A NCAC 07J .1201 BEACH MANAGEMENT PLAN APPROVAL

(a) A petitioner subject to a pre-project vegetation line pursuant to 15A NCAC 07H .0305 may petition the Coastal Resources Commission to approve a Beach Management Plan in accordance with the provisions of this Section. A "petitioner" shall be defined as:

(1) Any local government;

(2) Any group of local governments involved in a regional beach fill project; or

(3) Any qualified homeowner's association defined in G.S. 47F-1-103(3) that has the authority to approve the locations of structures on lots within the territorial jurisdiction of the association, and has jurisdiction over at least one mile of ocean shoreline.

(b) A petitioner shall be eligible to submit a request to approve a Beach Management Plan after the completion of construction of the initial large-scale beach fill project(s) as defined in 15A NCAC 07H .0305 that required the creation of a pre-project vegetation line(s). For a pre-project vegetation line in existence prior to the effective date of this Rule, the award-of-contract date of the initial large-scale beach fill project, or the date of the aerial photography or other survey data used to define the pre-project vegetation line, whichever is most recent, shall be used in lieu of the completion of construction date.

(c) A Beach Management Plan applies to all pre-project vegetation lines within the Ocean Hazard Area of the petitioner's jurisdiction.

(d) A complete Beach Management Plan shall consist of a comprehensive document with supporting appendices and data that includes the following:

(1) A review of all beach fill projects in the area of the Beach Management Plan including the initial large-scale beach fill project associated with the pre-project vegetation line, subsequent maintenance of the initial large-scale project(s), and beach fill projects occurring prior to the initial large-scale projects(s). To the extent historical data allows, the summary shall include construction dates, contract award dates, volume of sediment excavated, total cost of beach fill project(s), funding sources, maps, design schematics, pre-and post-project surveys, and a project footprint;

(2) A review of the maintenance needed to achieve a design life of no less than 30 years of shore protection. The plan shall include anticipated maintenance event volume triggers and schedules, long-term volumetric sand needs, annual monitoring protocols, an analysis of the impacts or any erosion control structures, and any relevant maps, tables, diagrams, studies, or reports. The plans and related materials shall be designed and prepared by the U.S. Army Corps of Engineers or persons meeting applicable State occupational licensing requirements for said work;

(3) Documentation, including maps, geophysical, and geological data, to delineate the planned location and volume of compatible sediment as defined in 15A NCAC 07H .0312 necessary to construct and maintain the large-scale beach fill project defined in Subparagraph (d)(2) of this Rule over its design life. This documentation shall be designed and prepared by the U.S. Army Corps of Engineers or persons meeting applicable State occupational licensing requirements for said work; and

(4) Identification of the financial resources or funding sources necessary to fund the large-scale beach fill project, over the project design life, such as a dedicated percentage of occupancy taxes, special tax districts, or anticipated federal funding.

(e) Public Comment Requirements. The local jurisdiction shall provide an opportunity for public comments on the Beach Management Plan prior to submission to the Coastal Resources Commission for approval. Written comments on the Beach Management Plan shall be submitted by the local jurisdiction to the Division along with the request to approve the Beach Management Plan.

(f) A request to approve a Beach Management Plan shall be submitted to the Director of the Division of Coastal Management, 400 Commerce Avenue, Morehead City, NC 28557. Written acknowledgement of the receipt of a completed request, including notification of the date of the meeting at which the request will be considered by the Coastal Resources Commission, shall be provided to the petitioner by the Division of Coastal Management.

(g) The Coastal Resources Commission shall consider a request to approve a Beach Management Plan no later than the second scheduled meeting following the date of receipt of a complete request by the Division of Coastal Management, except when the petitioner and the Division of Coastal Management agree upon a later date.

History Note: *Authority G.S. 113A-107; 113A-113(b)(6); 113A-124;*
Eff. March 23, 2009;
Amended Eff. April 1, 2016;
Readopted Eff. September 1, 2021;
Amended Eff. August 1, 2022.

TOWN OF OCEAN ISLE BEACH
2025 BEACH MANAGEMENT PLAN

(CPE Photograph taken on May 26, 2022 soon after the construction of the 2022 CSRM Maintenance Event and 2022 East End Shoreline Protection Project)

PREPARED FOR
TOWN OF OCEAN ISLE BEACH, NC

PREPARED BY
COASTAL PROTECTION ENGINEERING OF NORTH CAROLINA, INC.

March 2025

Town of Ocean Isle Beach 2025 Beach Management Plan

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES

1 INTRODUCTION

The Town of Ocean Isle Beach (Town) is located on a coastal barrier island along the Atlantic Ocean on the coastline of Brunswick County in southeastern North Carolina (Figure 1). The island is situated midway between the metropolitan cities of Wilmington, NC and Myrtle Beach, SC. Spanning approximately 5.5 miles, Ocean Isle Beach is oriented in an east/west direction with Shallotte Inlet located along its eastern end and Tubbs Inlet at its western end. The island has a year-round resident population of approximately 930, with a seasonal population of more than 25,000.

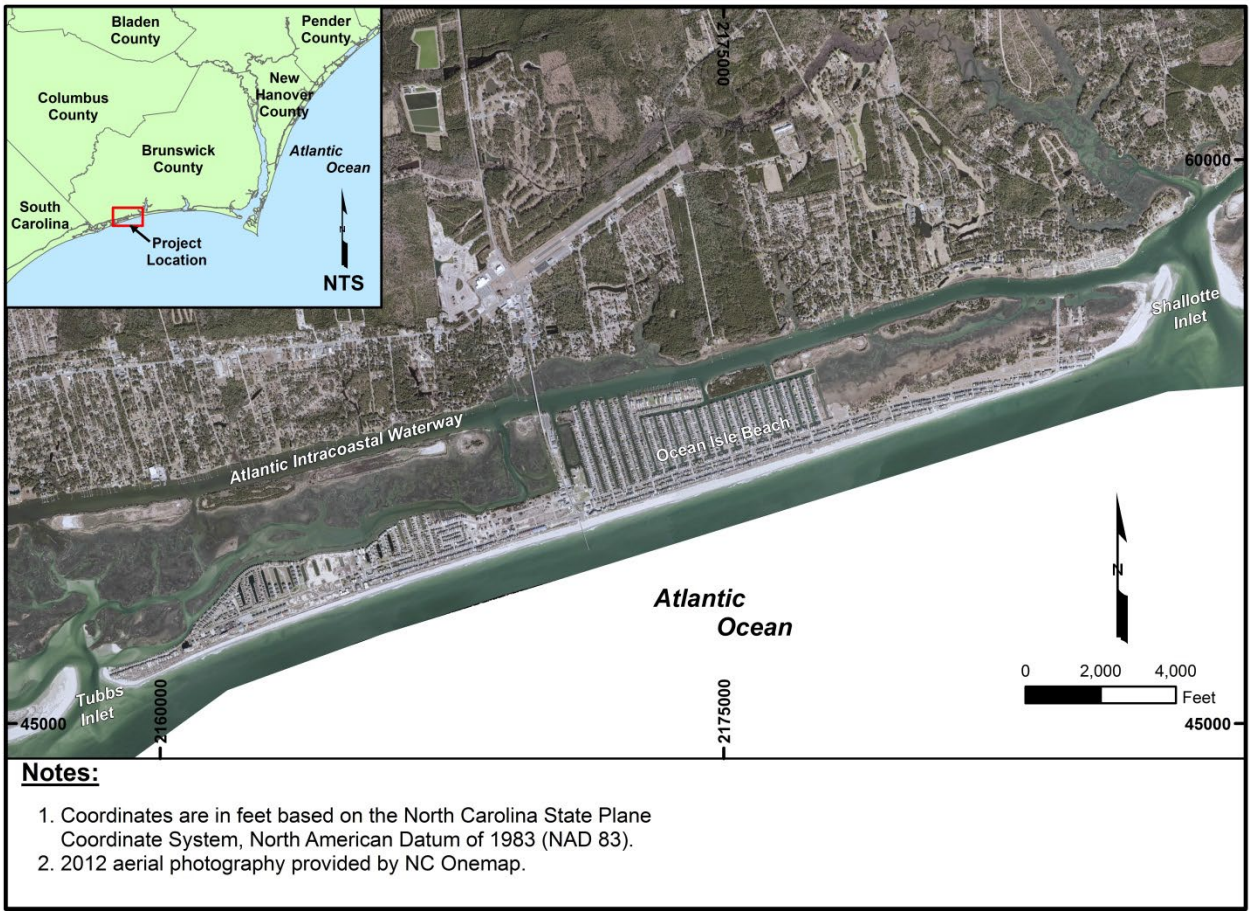


Figure 1. Location of Ocean Isle Beach, NC

In accordance with 15A NCAC 07H .0305 (North Carolina Administrative Code), a static vegetation line was established along 3.25 miles of oceanfront shoreline fronting the Town of Ocean Isle Beach following the construction of the federally authorized Coastal Storm Risk Mitigation (CSRM) project in 2001. The static vegetation line on Ocean Isle Beach was based on the shoreline as it appeared in June 1998, using aerial orthophotography, per 15A NCAC 07H .0305(a)(6). This was done to account for the landward relocation of the vegetation line caused by Hurricane Floyd in 1999. In 2009, the North Carolina Coastal Resources Commission (CRC) amended its rules to allow communities with static vegetation lines to apply for a static vegetation line exception. The Town

applied for and received an exception from the static vegetation line in accordance with procedures outlined in 15A NCAC 07J.1201 from the CRC on January 25, 2010. A second exception from the static line was subsequently applied for and approved on December 17, 2016. Five years later, in February 2020, the Town received its third exception from the static vegetation line.

In 2022, the North Carolina Coastal Resources Commission (CRC) implemented rule changes that redefined the "static vegetation line" as the "pre-project vegetation line". Further, the changes replaced the Static Line Exception policy with a more flexible, long-term management approach that encourages proactive, comprehensive beach management instead of focusing only on development restrictions. This new approach, as defined within 15A NCAC 07J .1201, allows a town to develop a Beach Management Plan (BMP) to request an exception from the pre-project vegetation line. Figures 2a-2f depict the location of the 1998 Pre-Project Vegetation Line spanning the length of the 3.25-mile CSRM project on Ocean Isle Beach.

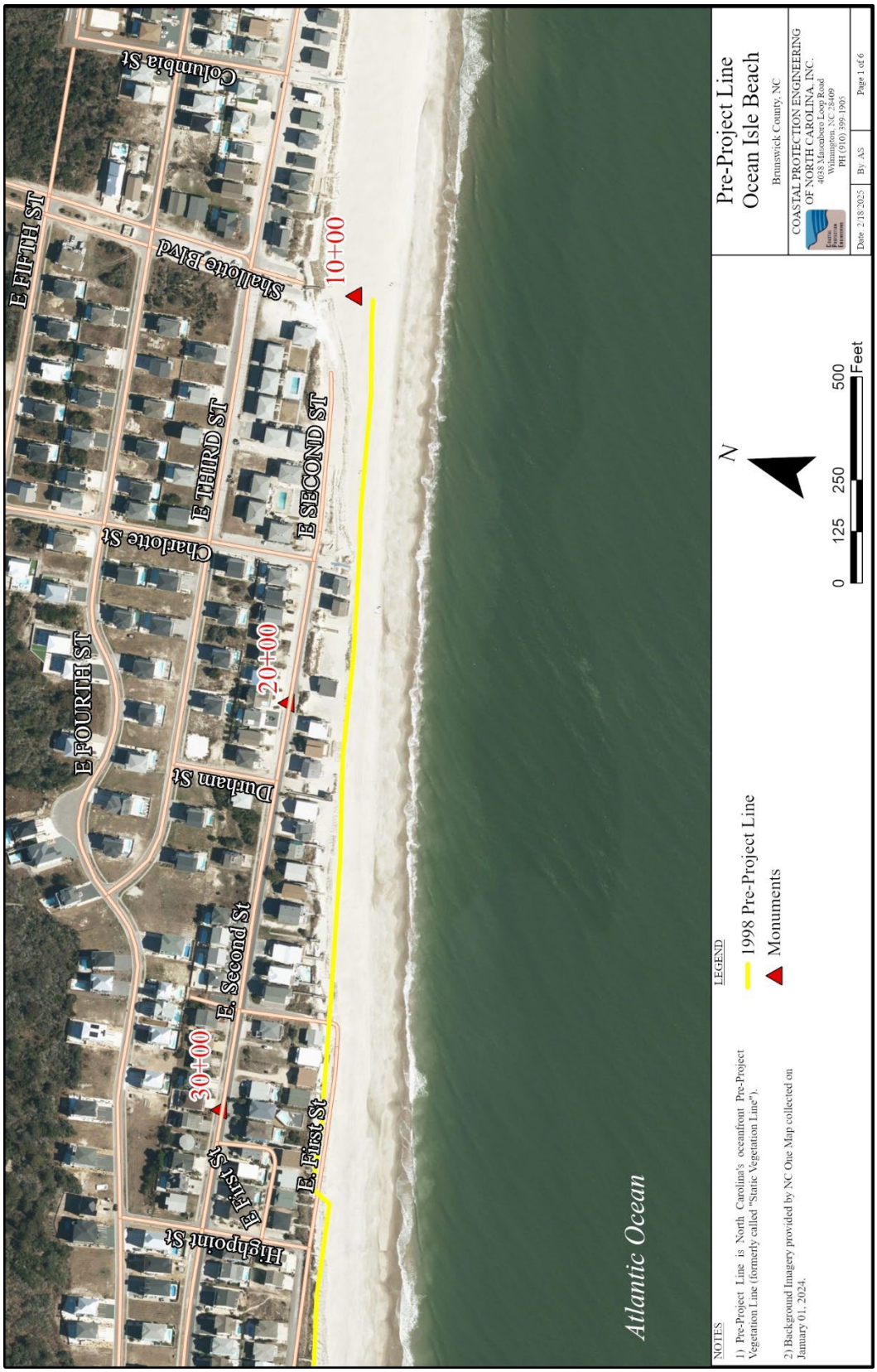


Figure 2a. Pre-Project Vegetation Line on Ocean Isle Beach

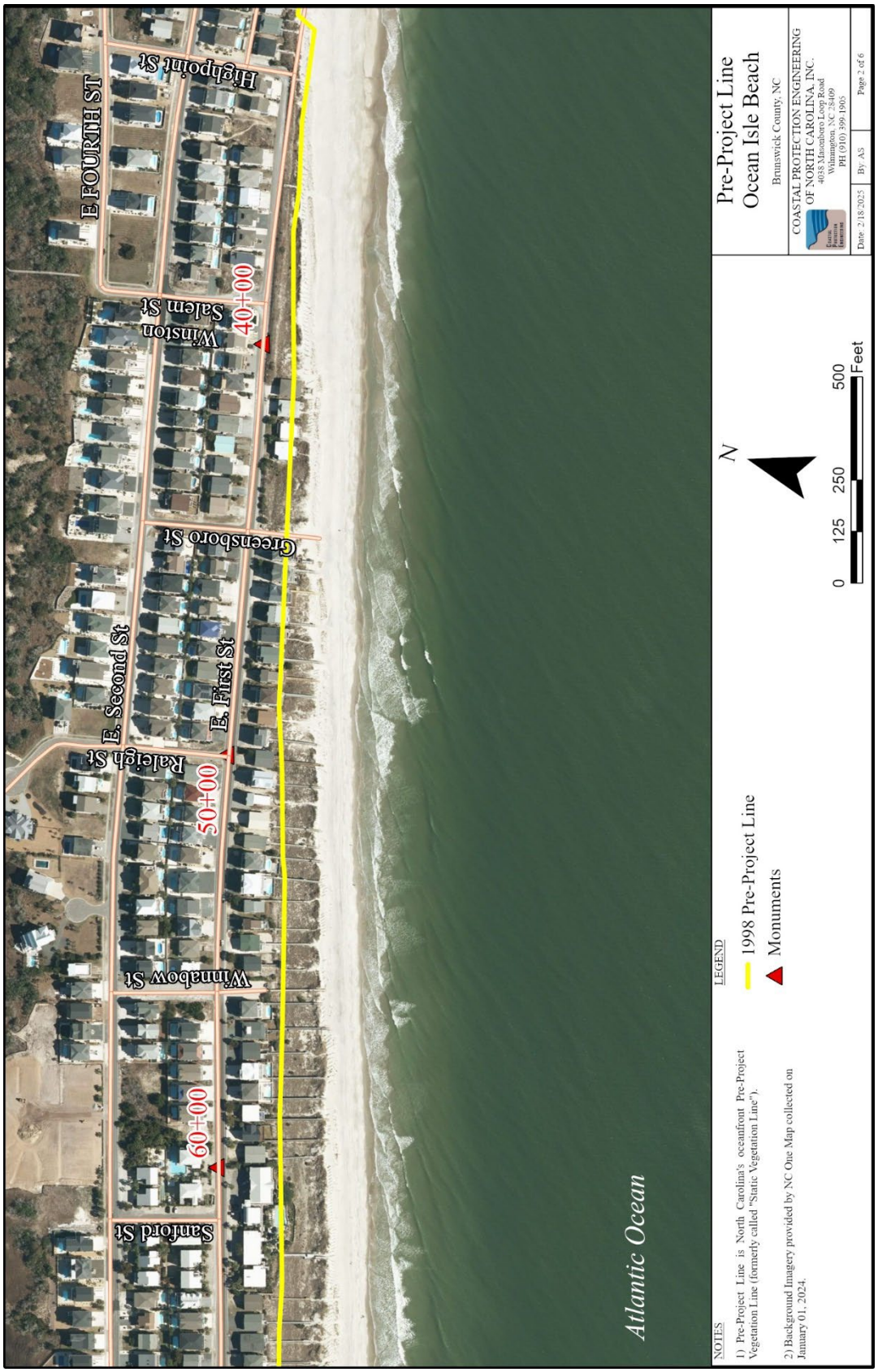


Figure 2b. Pre-Project Vegetation Line on Ocean Isle Beach

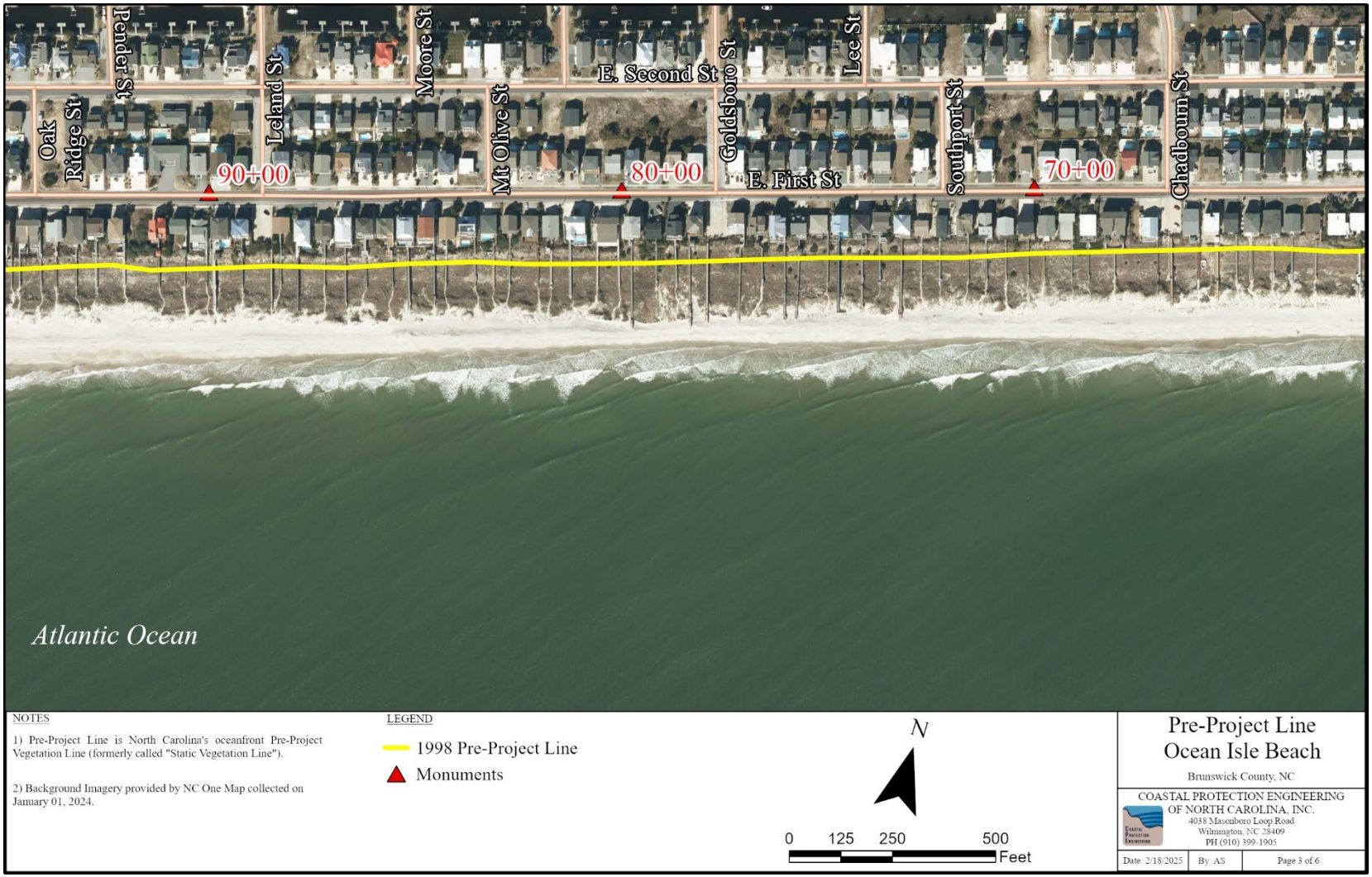


Figure 2c. Pre-Project Vegetation Line on Ocean Isle Beach

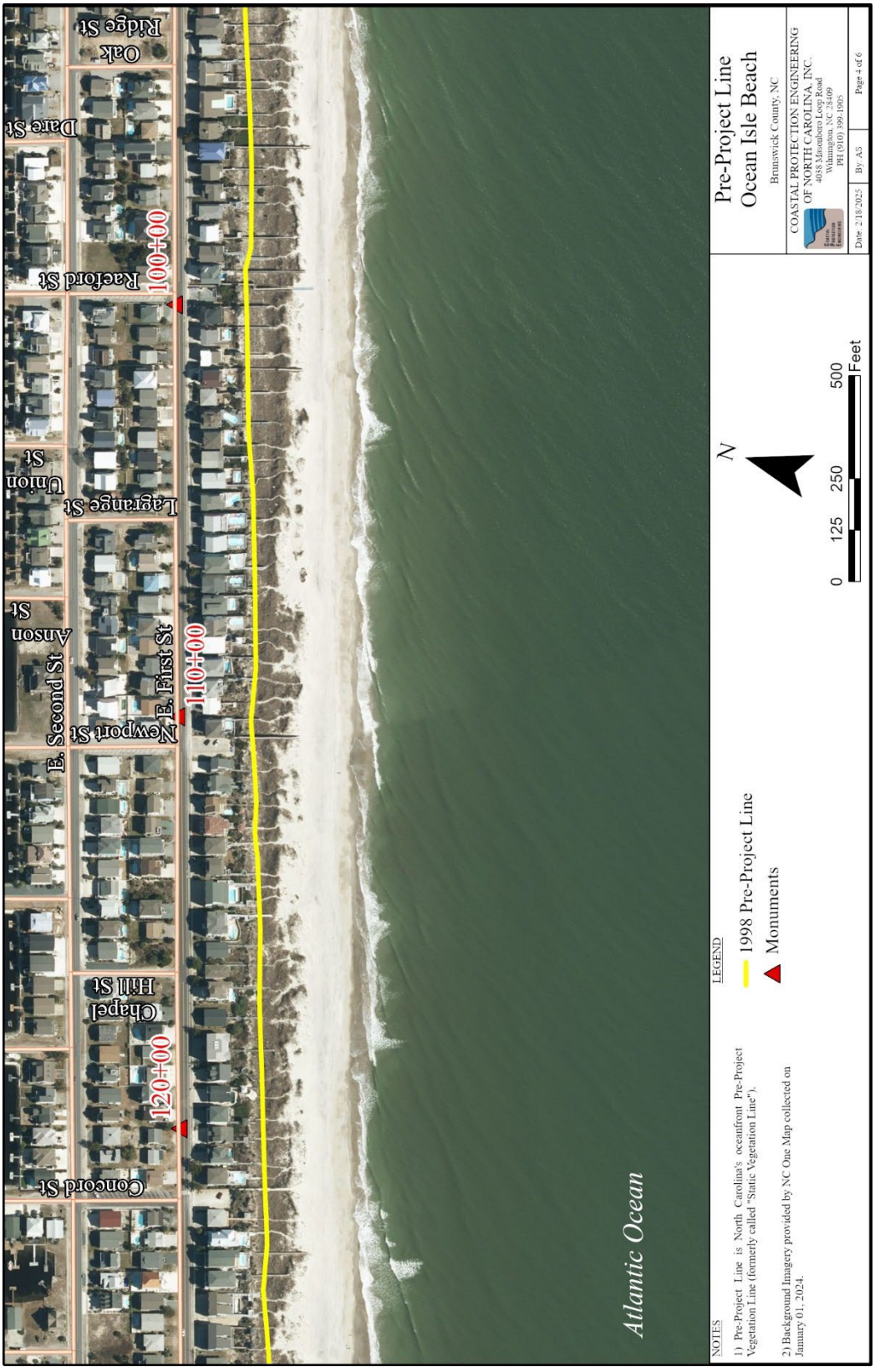


Figure 2d. Pre-Project Vegetation Line on Ocean Isle Beach

Figure 2e. Pre-Project Vegetation Line on Ocean Isle Beach

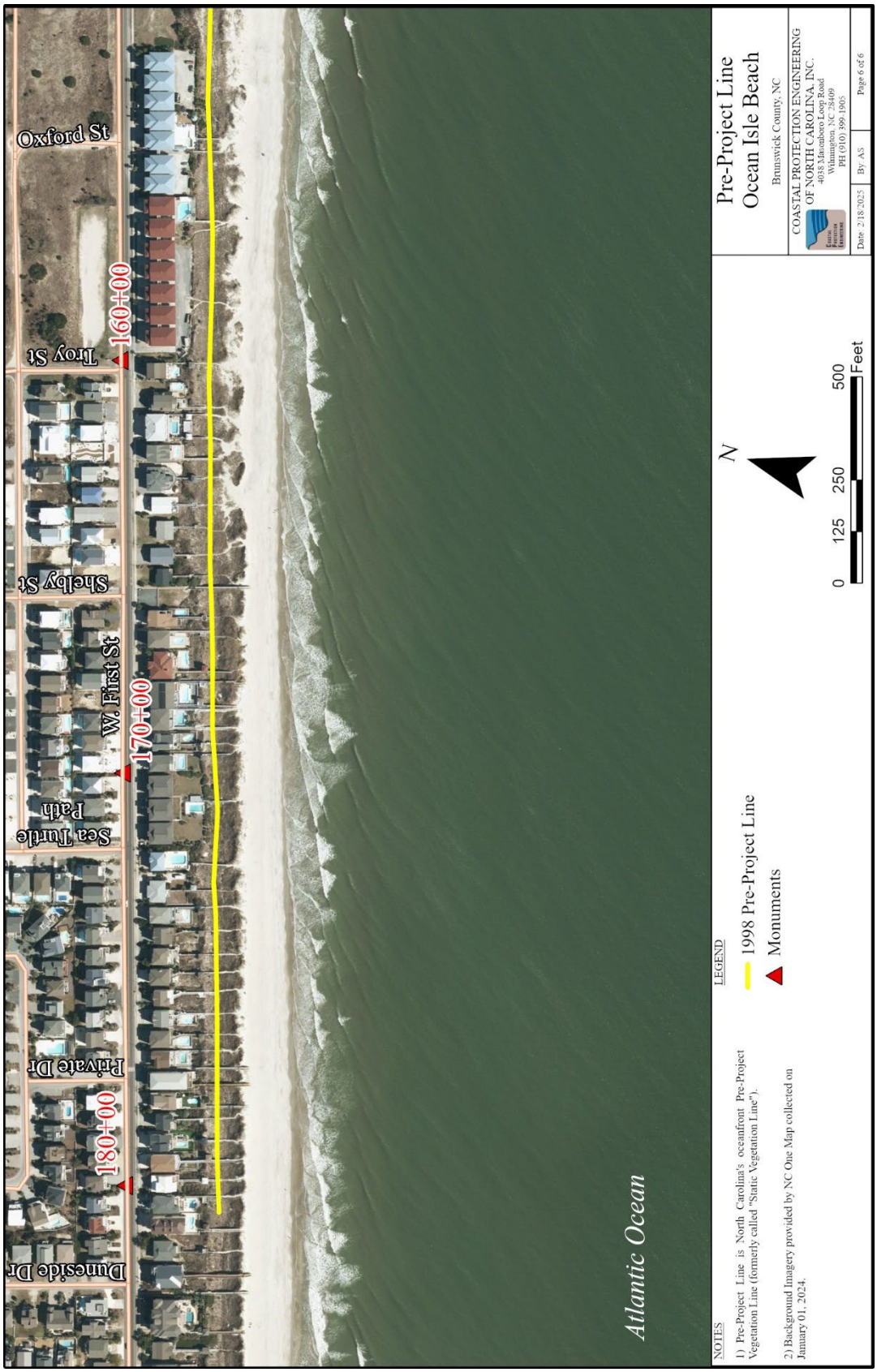


Figure 2f. Pre-Project Vegetation Line on Ocean Isle Beach

2 HISTORY OF SHORELINE MANAGEMENT

Over the years, several shoreline management initiatives have been implemented that serve to protect the Town's homes, businesses, and infrastructure from storm damage. These include the federally authorized CSRM project, the 2022 Shoreline Protection Project (terminal groin and accretion fillet), the East End Dune Project, and placement of beach fill along the east end of the island. This section serves to describe the history of these various projects.

In 2016, the Town obtained CAMA Major Permit #125-16 and Department of Army Individual Permit #SAW-2016-01642 which grants the Town the ability to construct a beach nourishment project and dune construction project along the majority of its oceanfront shoreline including the entirety of the CSRM project area. With these permits in place, should the USACE be unable to implement a CSRM maintenance event, the project may be constructed under the Town's permits.

2.1 Federal CSRM Project

The Brunswick County Beaches, NC Federal Storm Damage Reduction Project, later referred to as the "Coastal Storm Risk Management Project" or CSRM Project, was authorized by the 1966 Flood Control Act (H.D. 511, 89th Congress, 2nd session). This project, which includes a portion of the Town's oceanfront shoreline, was designed and constructed by the by the United States Army Corps of Engineers (USACE). The project encompassed 17,100 feet (3.25 miles) of the Town's shoreline beginning at Shallotte Boulevard (USACE baseline station 10+00) on the east and extends to a point approximately 3,700 feet west of the Ocean Isle Beach Pier & Arcade (USACE baseline station 181+00) (Figure 3).

The CSRM project design includes a dune with a crest width of 25 feet at an elevation of +8.5 feet NAVD88 covering 5,150 feet of the beach from station 51+50 (located just west of Raleigh St.) to station 103+00 (located about halfway between Raeford St. and Lagrange St.). The dune is fronted by a 50-foot-wide berm at elevation +6.0 feet NAVD88, and to the west a 2,600 foot long 50-foot-wide berm only section from station 103+00 to station 129+00 (Tarboro St.) followed by a 25-foot-wide berm only section from station 129+00 to station 153+00 (located about halfway between Clinton St. and Oxford St.). The design also includes a 4,200-foot transition on the east end, and a 2,800-foot transition on the west end, for a total project length of 17,150 feet. The east and west transitions have a variable width berm at an elevation of +6.0 feet NAVD88. Figure 4 shows a schematic of the project showing the extent of the various design sections and the transitions.

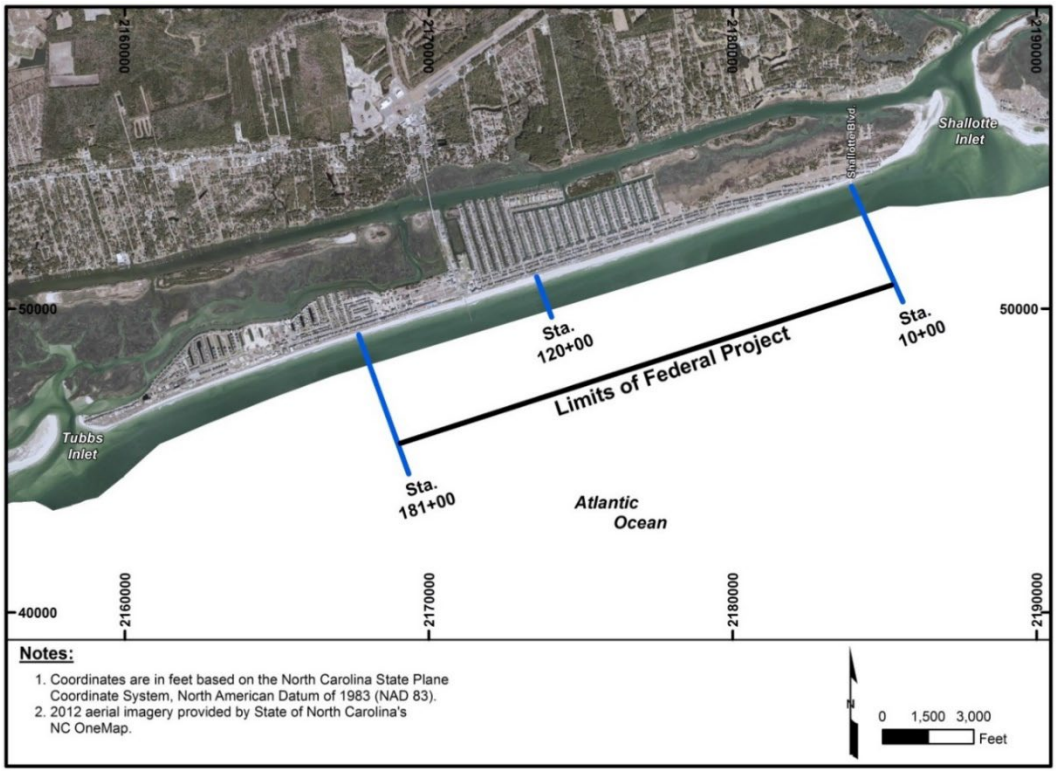


Figure 3. Authorized limits of the Ocean Isle Beach Storm Damage Reduction Project

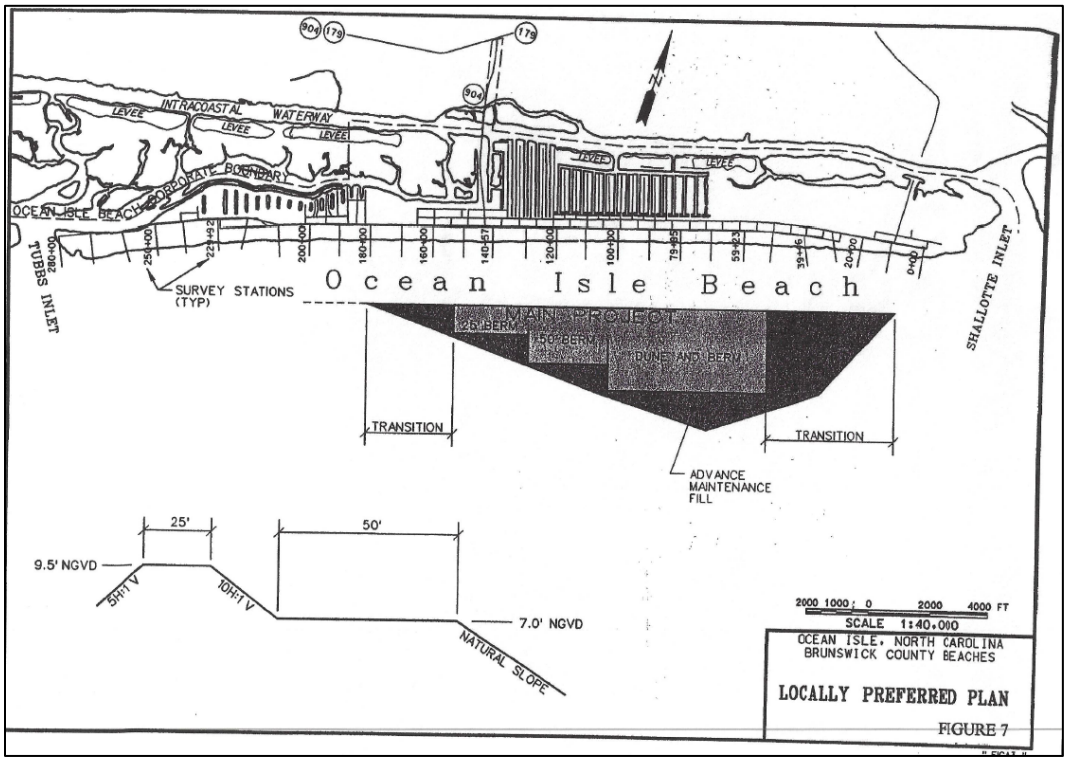


Figure 4. Schematic of the Ocean Isle Beach CSRM project

The westernmost 9,400 feet of the Town's shoreline was not included in the federal project as this area was fronted by an established dune system at the time the initial feasibility study was conducted and thus was determined to be stable during the project formulation. The extreme eastern end of Ocean Isle Beach between Shallotte Boulevard and Shallotte Inlet was not included in the federal project due to predicted high rates of loss that would occur from a beach fill placed in this area. Based on the USACE economic evaluation, the cost of protecting the extreme east end of the island exceeded the value of the development and infrastructure it would protect and was therefore excluded from the federal CSRM project.

The initial construction of the CSRM project occurred between March and May 2001 and involved the placement of 1,952,600 cubic yards of material. This initial construction volume included 3-years of advanced maintenance fill. The material was obtained from the borrow area located in Shallotte Inlet (Figure 5). The Shallotte Inlet borrow area was also designated as a source for future maintenance of the CSRM project, which, according to the USACE's project planning, was scheduled to occur every three years. Based on USACE estimates at the time, 300,000 cubic yards (100,000 cubic yards/year) of advanced maintenance fill would be needed for each maintenance event.

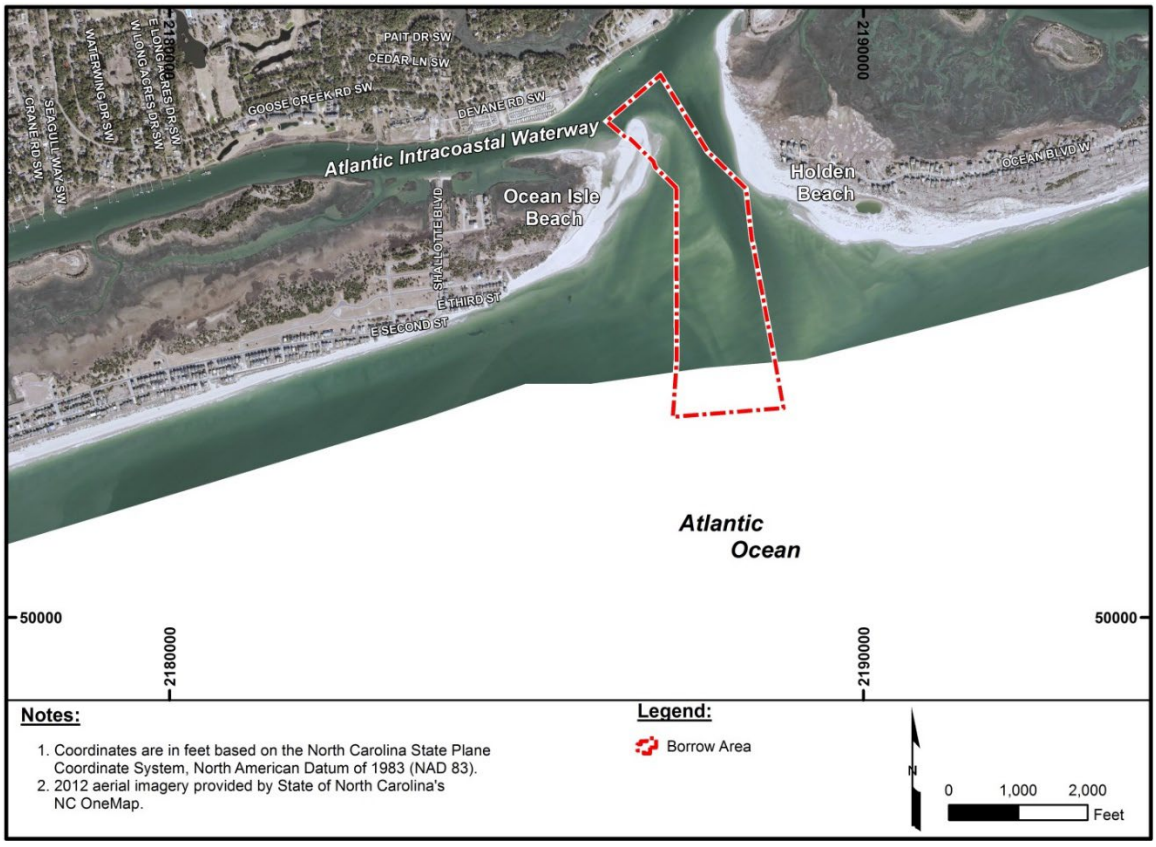


Figure 5. Location of the federally authorized Shallotte Inlet Borrow Area.

The total cost of the initial CSRM event was $5,135,338.00, or $2.63/cubic yard of material. The project is funded through a cost-sharing arrangement between federal and non-federal entities.

Specifically, the federal government covers 65% of the project costs, while the remaining 35% is the responsibility of the Town (the non-federal sponsor). Historically, the Town has received funds from the State of North Carolina to support 50% of the non-federal costs. Therefore, the Town contributed a total of 17.5%, or $898,684, for the construction of the 2001 CSRM Project.

2.1.1 Maintenance of the Federal CSRM Project

Since the initial construction, Ocean Isle Beach has been nourished five times by the USACE. The Shallotte Inlet Borrow Area was used as the source for fill material for each of these events. Although the maintenance interval established by the USACE during its project formulation was three years, the initial project was not maintained until nearly six years after the completion of the initial project construction and subsequent maintenance events have occurred on a 3 or 4-year interval. The following includes details on each of the five maintenance events:

- The first periodic nourishment operation was accomplished between November and December 2006. The project entailed the placement of 540,347 cubic yards of material between stations 10+00 and 72+00 (Shallotte Blvd. to approximately Southport St.). The cost of the event was $2,019,176.26, or $4.94/cy with the Town contributing $353,356 to the total.

- The second periodic nourishment operation occurred between April and May 2010 and involved the placement of 509,200 cubic yards of material between Stations 10+00 and 120+00 (Shallotte Blvd. to just east of Concord St.). The cost of the event was $5,923,077.00, or $7.00/cy with the Town contributing $1,036,539 to the total.

- The third periodic nourishment operation was completed in April 2014 with the placement of approximately 800,000 cubic yards of material between stations 10+00 and 90+00 (Shallotte Boulevard to Leland St.). The cost of the event was $7,045,750.00, or $8.81/cy with the Town contributing $1,233,006 to the total.

- The fourth periodic nourishment operation was completed in April 2018 with the placement of approximately 350,000 cubic yards of material between stations 10+00 and 59+00 (Shallotte Boulevard to Approximately 300 ft. east of Sanford St.). The cost of the event was $3,293,316.00, or $8.92/cy with the Town contributing $526,330 to the total.

- The fifth periodic nourishment operation was completed in April 2022. The Town's federally authorized Coastal Storm Risk Management (CSRM) project was constructed in tandem with the beach fill component of the Town's Shoreline Protection Project (terminal groin) and involved the placement of 484,211 cy of beach compatible sand from the west of the accretion fillet to Station 80+00 (approx. 250 ft west of Goldsboro St.). The cost of the event was $7,560,688, or $15.61/cy with the Town contributing $1,323,120 to the total.

The available drawings and figures depicting the plans, cross sections and pre/post construction photos from the first four maintenance events are provided in Appendix A, while the complete set of construction drawings associated with the fifth maintenance event is provided in Appendix B.

2.2 East End Shoreline Protection Project

Between November 2021 and April 2022, the Town constructed their "Ocean Isle Beach East End Shoreline Protection Project" which entailed two components: 1) the construction of a rubble mound terminal groin and 2) the pre-filling of an accretion fillet using beach fill (Figure 6). The primary purpose of the project was to provide a stable beach configuration (increased beach width) east of the Federal CSRM project. Specifically, the project along with the maintenance of the CSRM project served to help stabilize 3,214 linear feet of oceanfront shoreline between the terminal groin at Station -2+00 to an area just east of Highpoint Street at Station 30+00.

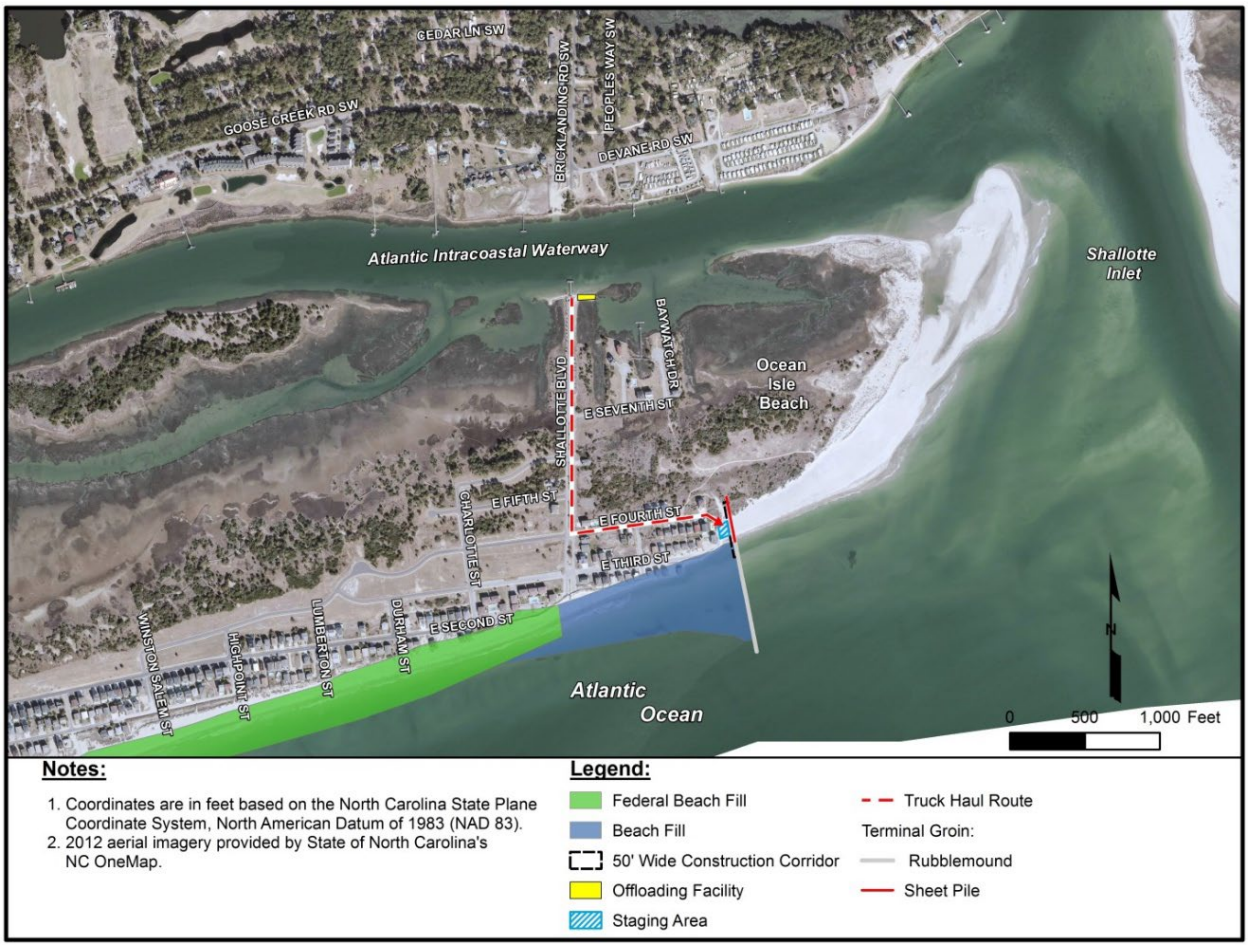


Figure 6. Location of the terminal groin and associated beach fill located on the eastern portion of Ocean Isle Beach

The accretion fillet component of the East End Shoreline Protection Project was constructed in March 2022 and contained a variable width berm at a crest elevation of +6.0 ft. NAVD88 along 3,214 feet of the Town of Ocean Isle Beach's oceanfront shoreline. The accretion fillet included placement of 272,936 cy of beach compatible sand, which equates to an average fill density of approximately 85 cy/ft. The volume placed was designed to provide enough sand to stabilize the

shoreline while the shoreline reaches equilibrium in response to the construction of the terminal groin. Sand used to construct the accretion fillet was dredged from within the federal borrow area in Shallotte Inlet by Norfolk Dredging Company under contract with the USACE as part of the 2022 CSRM maintenance event. See Appendix B for the complete set of construction drawings associated with the 2022 CSRM maintenance event which includes the design for the fill within the accretion fillet associated with the Town's 2022 Shoreline Protection Project.

The terminal groin structure was designed to retain sediment along the east end of the Town's developed oceanfront shoreline while reorienting the shore alignment comparable to that of the Federal CSRM Project. The construction of the 1,050 ft-long terminal groin component of the Town's Shoreline Protection Project began in November 2021 and was completed in April 2022. The 750-foot rubblemound portion of the terminal groin was constructed to a crest elevation of +4.9 ft. NAVD with loosely placed armor stone on top of a 1-foot-thick marine mattress foundation. Approximately 20,664 tons of armor stone were used to construct the rubblemound terminal groin structure. The rubblemound structure was constructed with two sizes of stone: Size B (3.1 to 5.1 tons) and Size A (5.5 tons to 8.9 tons). The landward 500 feet of the groin was constructed with Size B stone and the seaward 250 feet was constructed with Size A stone. The 300-foot shore anchorage section was constructed with steel sheet piles topped with a 2 ft. wide concrete cap. This shore anchorage section maintained an elevation of +4.9 feet NAVD88 for a distance of 130 feet extending from the landward end of the rubblemound section and was reduced to +4.5 feet NAVD88 for the remaining 170 feet. Figure 7 shows the cross-section of the terminal groin structure design template. With the construction of the terminal groin and the re-oriented shore alignment, the Ocean Isle Beach East End Shoreline Protection Project, the erosion rate on the east end of Ocean Isle Beach is expected to slow, given a reduction in the influence of Shallotte Inlet on sediment transport within the project area. In order to minimize potential impacts to the shoreline east of the structure, the design required that the rubblemound portion of the structure be constructed with loosely placed armor stones (no core) to create voids between the stones which would allow some sediment to pass through the structure. Also, in order to allow sediment to pass over the structure the crest elevation of the structure was designed to be approximately 1-foot below the natural beach elevation within the area. Furthermore, with the terminal groin in place, it is anticipated that the rates of erosion along the oceanfront shoreline west of the terminal groin will be reduced to a point in which the nourishment interval for the CSRM project (time between maintenance events) will be extended, thus resulting in a reduction of potential environmental impacts and resulting in cost savings for the Town and other cost share partners.

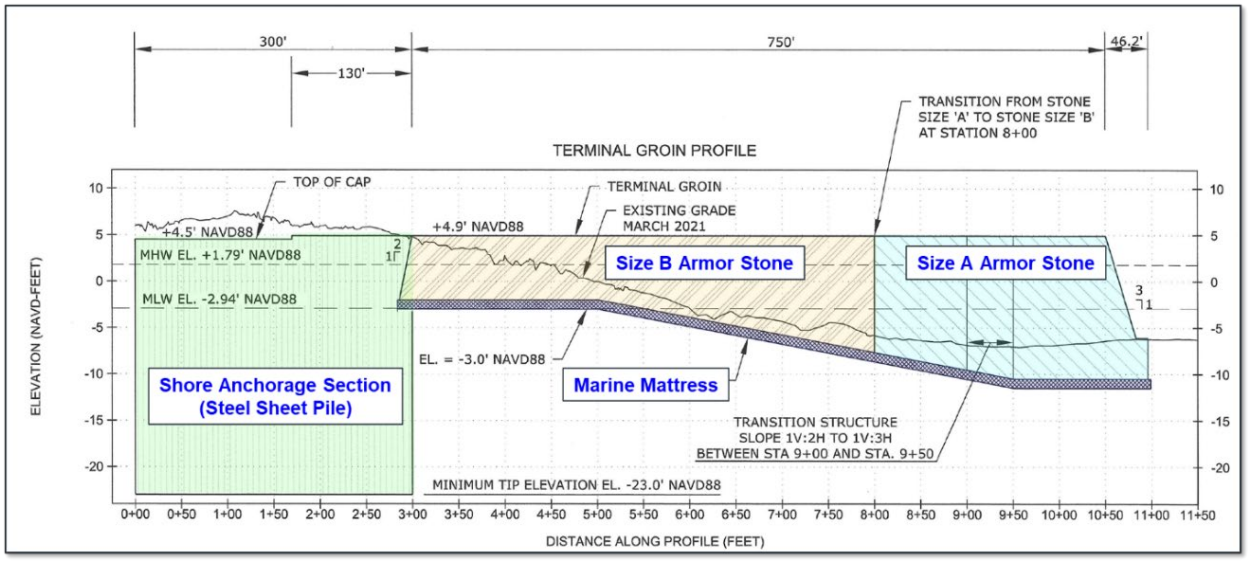


Figure 7. Cross-section of the terminal groin structure design template.

2.3 East End Dune Project

In 2025, the Town constructed a dune project to help bolster the protection afforded by the CSRM project and the East End Shoreline Protection project. The construction of the East End Dune Project consisted of placing approximately 11,100 cy of beach compatible material along approximately 3,500 linear feet of beach spanning from Station 0+00 (just west of the terminal groin) to Station 35+00 (just west of Highpoint Street). This project was constructed to provide additional fortification from storm and flood damage along the east end of the island following the construction of the 2022 Shoreline Protection Project.

The dune design includes a 10-foot-wide crest with a varying elevation of +11.5 ft. NAVD88 and +12.5 ft NAVD88 and 1V:4H front and back side slopes (Figure 8). The new dunes will be planted with native vegetation and sand fencing will be installed. The project also involves placement and grading of material to raise the elevation of the existing vehicle cross-over at the 4th St. beach access. The material used to construct the new dunes were obtained from a permitted upland sand mine and transported via dump trucks from the mine to the project site. See Appendix D for the project's construction drawings.

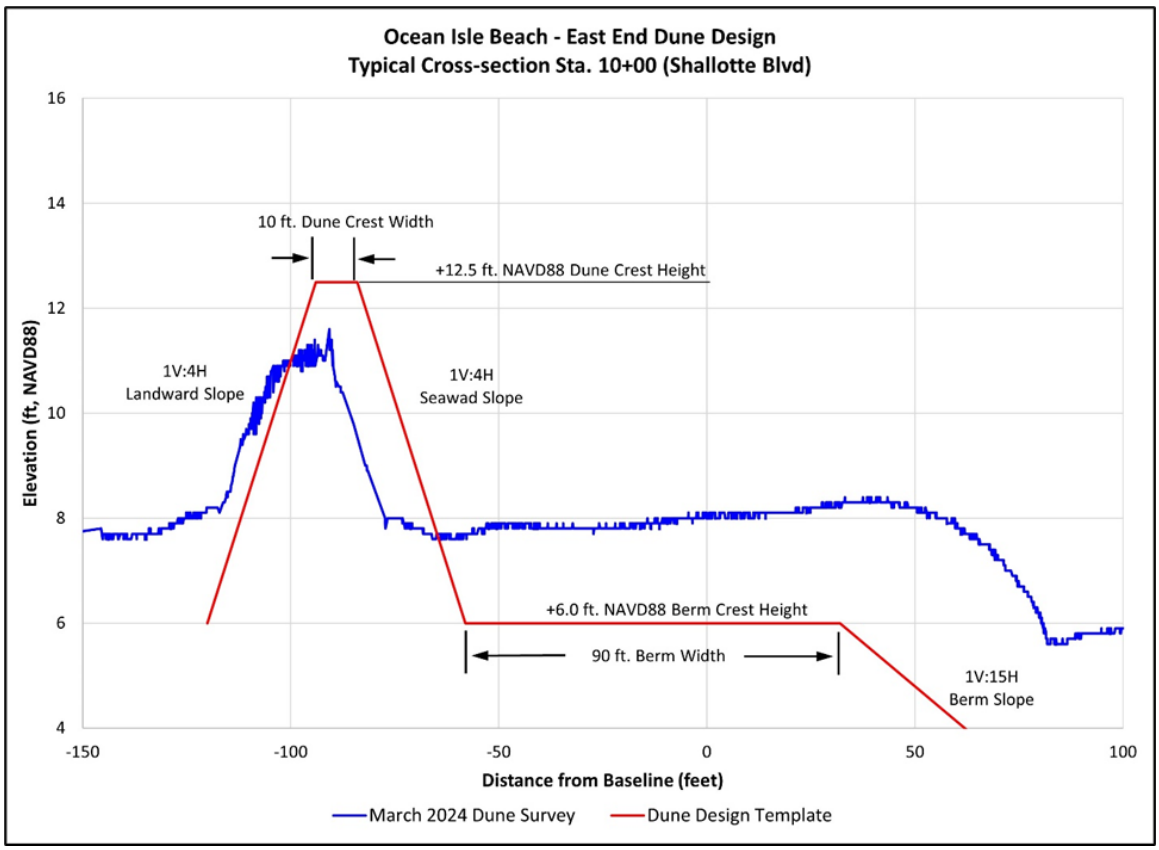


Figure 8. Cross section view of the proposed dune and typical berm template.

2.4 Beneficial Use Placement Along the East End

In addition to the beach fill placed by the USACE within the confines of the Town's CSRM project, the USACE has periodically deposited material dredged during the maintenance of the Atlantic Intracoastal Waterway (AIWW) at the intersection with Shallotte Inlet (Shallotte Inlet Crossing) and at the intersection of the Shallotte River (Shallotte River Crossing). The majority of this material has been deposited within the area fronting the development east of Shallotte Boulevard (i.e., outside the limits of the federal project) (Figure 9). Table 1 below details the available information from beneficial use placement events since 2016.

Figure 9. USACE Navigation maintenance material placed east of the terminal groin along the inlet shoreline (Photo taken 2/22/23)

Table 1. Recent USACE navigation dredging events in proximity to Ocean Isle Beach

Date	Dredge Area	Placement Area	Volume Placed
March 2017	Shallotte Inlet Crossing	2+00 to 18+00	39,200
March 2021	Shallotte Inlet Crossing	2+00 to 18+00	49,800
February 2023	Shallotte Inlet Crossing & Shallotte River Crossing	-5+00 to -20+00	72,000

Along with the placement of beneficially reused dredged material along the east end by the USACE, the Town sponsored the placement of beach fill material along the east end of the island as well in 2007. During that project, the Town placed 155,000 cubic yards between stations -3+00 and 17+00 (near Charlotte St.). Of this volume, approximately 115,000 cy of the fill was placed between stations 10+00 and -3+00, which was outside the authorized limits of the Federal project. This project was constructed to attempt to address the chronic erosion occurring along the east end, with beach nourishment alone. The project cost the Town $720,000 (including the cost of permitting). As a result, the Town determined continued nourishment of this portion of its oceanfront was not an economical measure to mitigate erosion.

3 MONITORING AND PROJECT PERFORMANCE

3.1 Monitoring Protocol

Historically, the USACE has conducted beach profile surveys along the portion of the Town included within the federal project. Initially these surveys were conducted annually, and two

monitoring reports were prepared by the USACE in the first 2 years following the initial federal project in 2001. However, the USACE survey frequency has been reduced due to federal funding shortfalls. The recent USACE survey frequency has been limited to a pre-construction survey every 3 to 4 years to allow for the design of periodic nourishment events.

In 2013, the Town initiated a contract with McKim & Creed to collect beach profile data to assess the portions of the Town's beach outside of the federal project area. This monitoring encompassed the eastern 5,000 ft. of beach and inlet shoreline from Stations -30+00 to 20+00 and the western 10,000 ft. of beach from stations 170+00 to 270+00 (Figure 10). These data allowed CPE to monitor the shoreline and volume changes along the historically dynamic east end of the island and assisted with the design and alternative analysis associated with the terminal groin project. In addition, data collected along the western 10,000 ft. of the Town's beach, from stations 170+00 to 270+00, was used by CPE to determine changes occurring along this portion of the Town in an effort to better understand the shoreline change and volume change taking place west of the federal project. This monitoring was modified following the construction of the terminal groin to include the entire Ocean Isle Beach shoreline as well as the western 10,000 feet of shoreline on Holden Beach.

As a condition of the terminal groin project, the Town has implemented a robust long-term monitoring program designed to assess the performance of the island's oceanfront shoreline and beyond and is inclusive of the footprints of the CSRM project, the 2022 Shoreline Protection Project, and the East End Dune Project. Specifically, and as stated in the Town of Ocean Isle Beach's Shoreline and Inlet Management Plan (Plan) (CPE-NC, 2016), the Plan includes the acquisition of beach profile survey data covering 27,000 feet of shoreline on Ocean Isle Beach and 10,000 feet of shoreline on the west end of Holden Beach (Figures 10 and 11), inlet radial profiles around the east and west shoulders of Shallotte Inlet (Figure 12), hydrographic survey of the inlet (Figure 13), and the acquisition of aerial imagery. Beach profile surveys, which are spaced at 500-foot intervals along the beach from the USACE baseline to a distance of at least 2,500 ft. offshore or to a depth of approximately -30 ft. NAVD88, are performed approximately every six months; once in the fall and once in the spring. The inlet radial profiles and the hydrographic survey of Shallotte inlet and shoals are conducted once each year during the spring. These surveys are supplemented with the acquisition of aerial imagery of the inlet and the terminal groin project area annually in the spring.

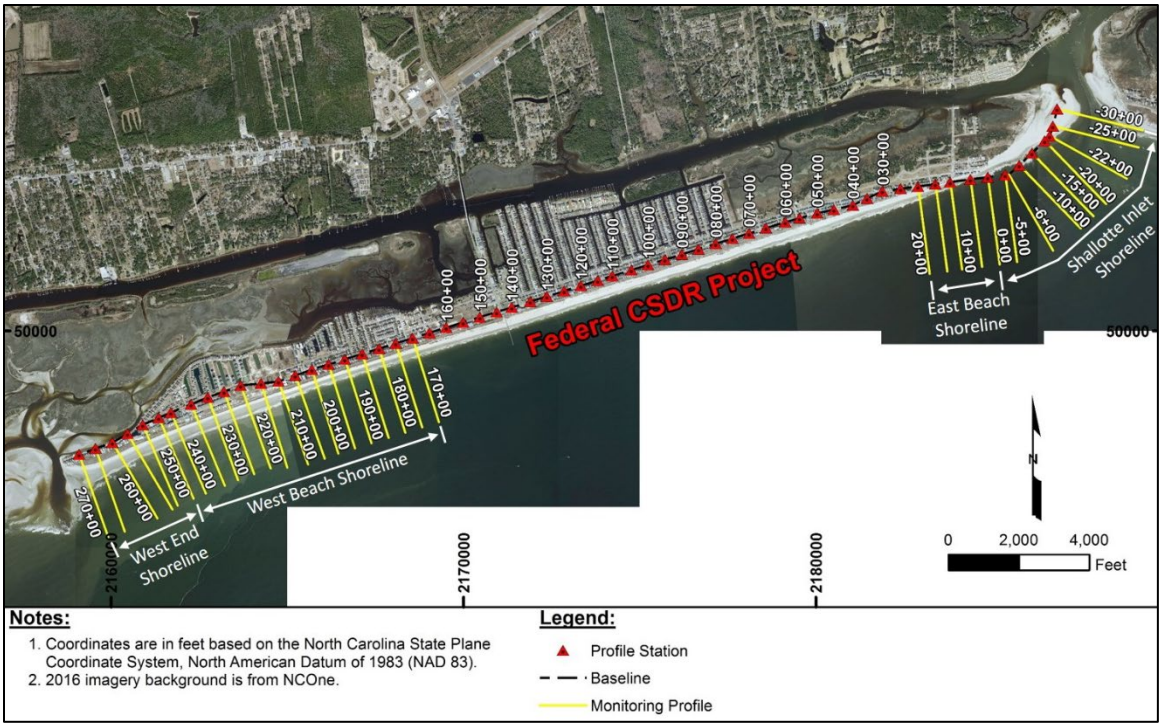


Figure 10. OIB Annual Monitoring Profiles (2013 to 2021).

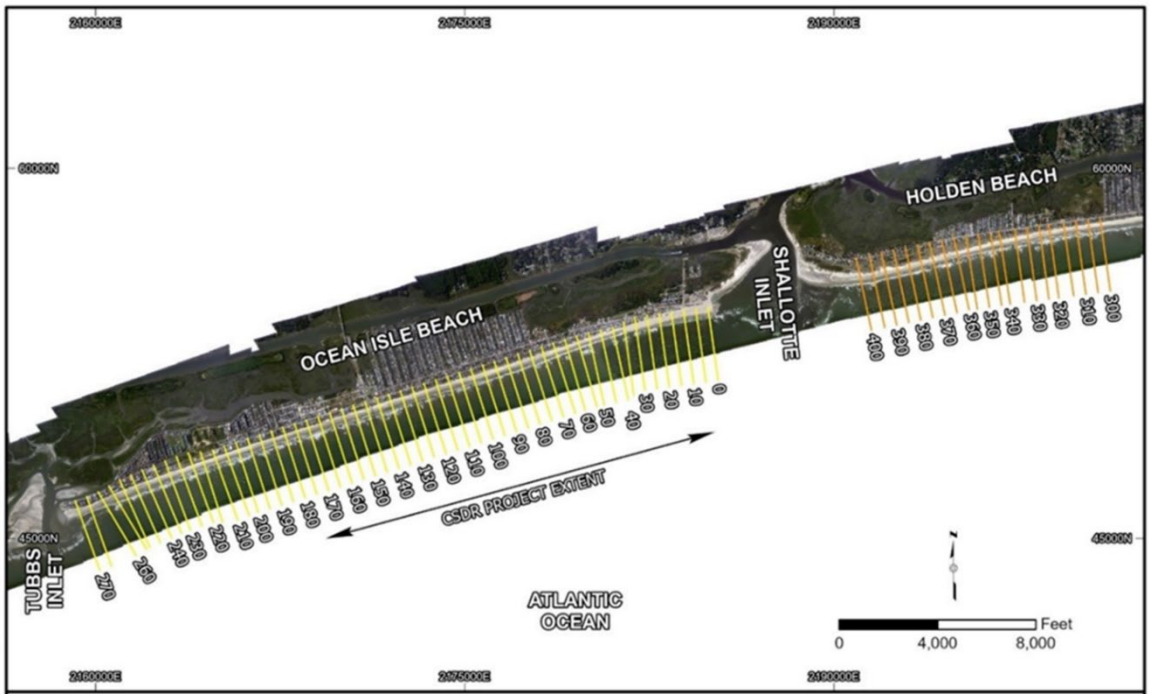


Figure 11. OIB and Holden Beach Annual Monitoring Beach Profiles.

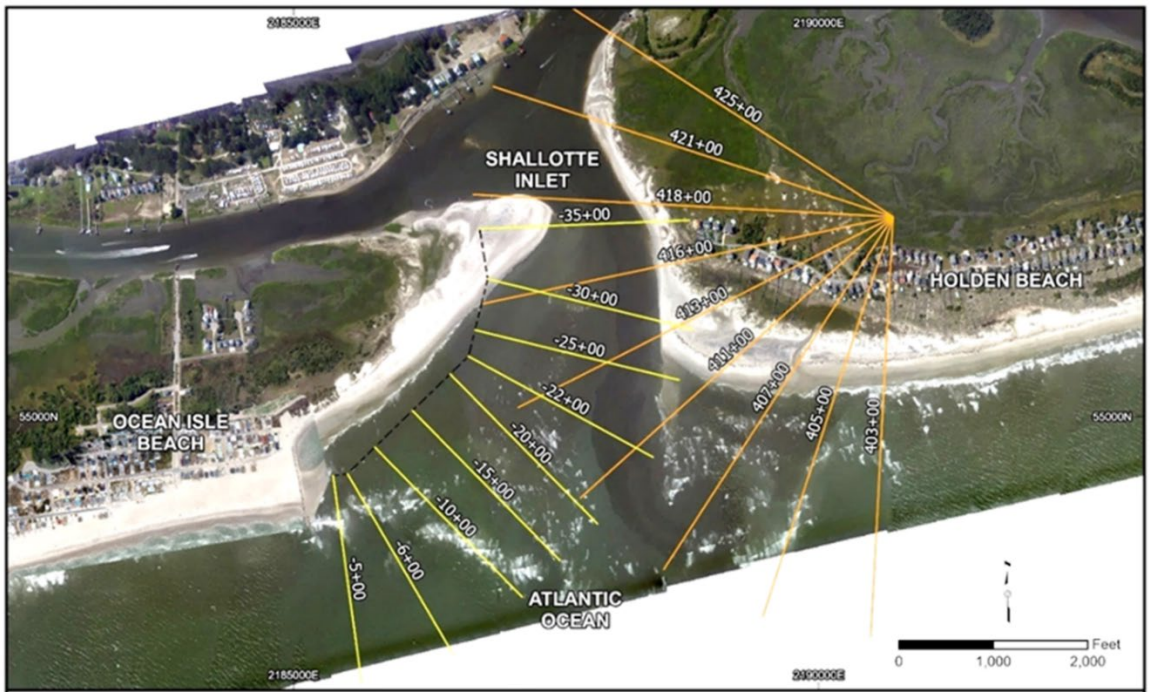


Figure 12 Shallotte Inlet – Inlet Shoreline Monitoring Radial Profiles.

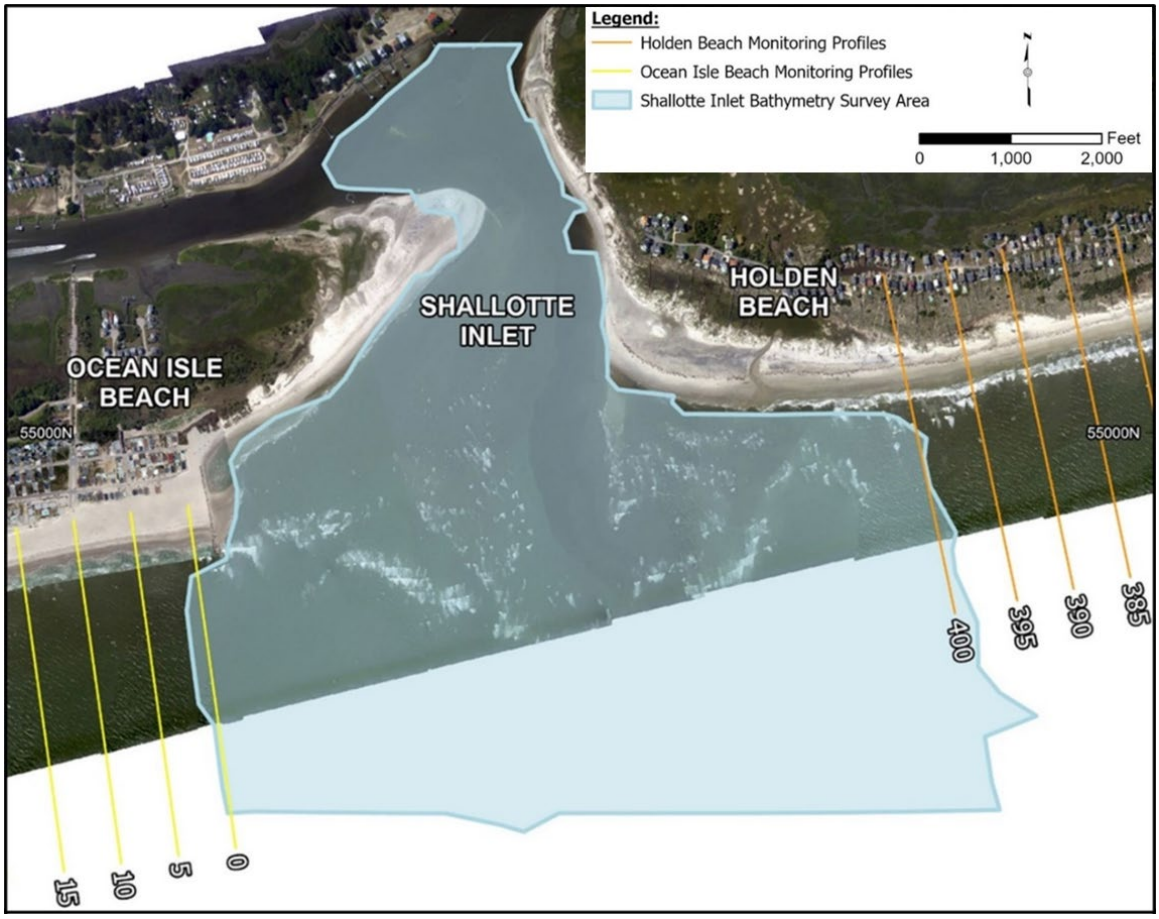


Figure 13. Shallotte Inlet Hydrographic Survey Area

Performance of the Ocean Isle Beach and Holden Beach oceanfront shorelines was determined based on an analysis of two metrics: 1) linear shoreline changes and 2) volumetric changes. Linear shoreline change was measured at each station based on the position of the Mean High Water (MHW) (+1.8 ft. NAVD88) contour during each survey event. Volumetric change was measured at each monitoring station from the baseline seaward to a depth of -18 ft. NAVD88 during each survey. The survey data from the inlet radial profiles was not used in the shoreline change or volumetric change analyses due to the variable/erratic nature of the changes within this area.

In addition to the linear shoreline change and volumetric change analyses, established shoreline change thresholds for the Ocean Isle Beach and Holden Beach ocean-facing shorelines and established inlet shoreline thresholds for the east and west shoulders of Shallotte Inlet were developed to assess whether unanticipated shoreline changes occurred and could be attributed to the construction of the Shoreline Protection Project.

In addition to the spring and fall beach profile monitoring surveys, the Plan also requires that a hydrographic survey of Shallotte Inlet and the acquisition of high-resolution aerial imagery of the Shallotte Inlet area is to be conducted during each spring event. The hydrographic survey limits cover the area within the inlet from approximately Station 400+00 on Holden Beach to Station 0+00 on Ocean Isle Beach and from the confluence of the inlet with the AIWW seaward to the -30-foot NAVD88 depth contour in the ocean. The hydrographic survey is used to document the post-construction condition of the borrow area, ebb shoal configuration, and the deep-water channel location. The aerial images are used to help document changes to the extent of the shorelines on the east and west shoulders of the inlet over time.

Analysis of the beach profile survey data has been used to determine the recent and long-term shoreline and volumetric changes as well as any erosional/accretional trends or patterns between the surveys. Table 2 provides a summary of the survey events to date.

Table 2. Summary of Survey Events

Survey Date	Stations Surveyed
June 2022 (Baseline)	-35+00 to 270+00 (OIB) and 300+00 to 425+00 (HB)
December 2022	0+00 to 270+00 (OIB) and 300+00 to 400+00 (HB)
May 2023	-35+00 to 270+00 (OIB) and 300+00 to 425+00 (HB)
November 2023	0+00 to 270+00 (OIB) and 300+00 to 400+00 (HB)
May 2024	-35+00 to 270+00 (OIB) and 300+00 to 425+00 (HB)
November 2024	0+00 to 270+00 (OIB) and 300+00 to 400+00 (HB)

Survey data collected in June 2022 serves as a baseline and is used in comparison with the most recent survey data to determine the long-term changes within the monitoring areas. In this instance, the November 2024 data is the most recent survey. Recent changes are determined based on a comparison between the two most recent surveys, in this case May 2024 and

November 2024. These two time periods will be referred to as "long-term" and “recent” monitoring periods, respectively, in the report.

In order to capture spatial variations along the Town’s oceanfront shoreline, the Ocean Isle Beach monitoring area has been subdivided into five (5) segments based on shoreline and volumetric change trends observed in the monitoring data. The segments, from east to west, are defined in Table 3 and shown in Figure 14.

Table 3. OIB Monitoring Segments

Monitoring Segments	Geographic Extent	Baseline Stations
OIB Inlet	Radial profiles on west side of Shallotte Inlet shoreline	-35+00 to -5+00
East Beach	Approximate location of the Terminal Groin to Goldsboro Street	0+00 to 80+00
Central Beach	Goldsboro Street to Sea Turtle Path	80+00 to 170+00
West Beach	Sea Turtle Path to Schooner Drive	170+00 to 245+00
West End	Schooner Drive to the end of Ocean Isle W Blvd	245+00 to 270+00

*Note -The CSRM Project Area is separated into two sections, the Eastern Project Area (stations 10+00 to 80+00) and the Western Project Area (stations 80+00 to 181+00).

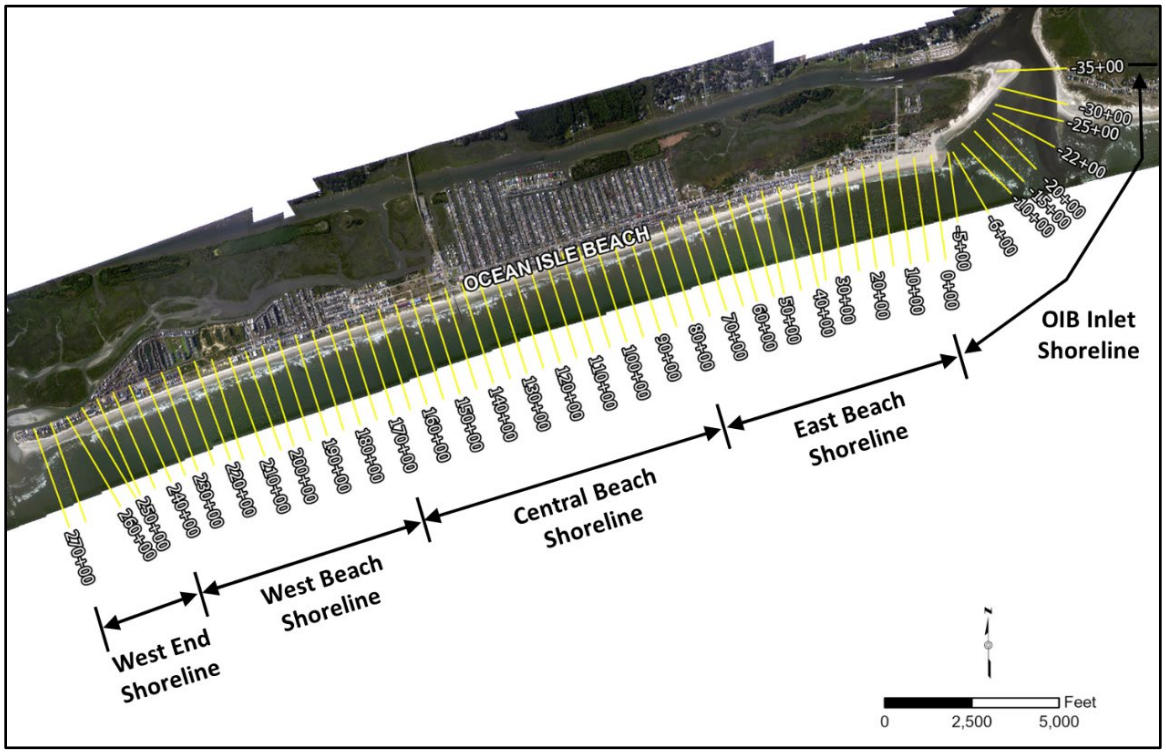


Figure 14. OIB Shoreline Monitoring Segments.

Beginning at the eastern limits of Ocean Isle Beach, the first shoreline segment is referenced as “OIB Inlet" shoreline. This area is located along the Shallotte Inlet western shoreline and is

represented by profiles located between Stations -35+00 (near the end of the spit) through -5+00 (just east of the terminal groin). The shoreline within this segment is presently designated as an Inlet Hazard Area (IHA) and was excluded from the shoreline change and volumetric analysis due to the variable/erratic nature of the changes within the IHA. Survey data from within this area is evaluated each spring based on an inlet shoreline threshold established within the Plan The second shoreline segment, designated as "East Beach", includes an approximate 8,000 ft. long extent of oceanfront shoreline along the easternmost developed portion of Ocean Isle Beach between Stations 0+00 (adjacent to the terminal groin) and 80+00 (Goldsboro Street). The shoreline within this segment encompasses the terminal groin accretion fillet (Station 0+00 to Station 30+00) as well as the domain of the 2022 federal CSRM project that terminated at Station 80+00. The third shoreline segment is referenced as the "Central Beach" and extends approximately 9,000 ft. between Stations 80+00 to 170+00 (Sea Turtle Path). This shoreline segment is also part of the extent of the template for the federal CSRM project; however, this portion of the federal CSRM project has not required maintenance since the project was initially constructed in 2001. The fourth shoreline segment located immediately west of the federal CSRM project limits is referenced as the "West Beach". This segment spans approximately 7,500 ft. between Stations 170+00 to 245+00 (near Schooner Drive.). The fifth and final shoreline segment designated as "West End" spans approximately 2,500 ft. long and is located at the western end of Ocean Isle Beach between Stations 245+00 and 270+00 in proximity to Tubbs Inlet.

The Holden Beach monitoring area is subdivided into two (2) segments. The westernmost shoreline segment on Holden Beach is referred to as the "HB Inlet" shoreline. This area is located along the Shallotte Inlet eastern shoreline and is represented by profiles located at Stations 403+00 through 425+00. The shoreline within this segment is presently designated as an Inlet Hazard Area (IHA) and, like the OIB Inlet segment, is excluded from the shoreline change and volumetric analysis due to the variable/erratic nature of the changes within the IHA. This area, however, is evaluated each spring based on an inlet shoreline threshold established within the Plan. The second shoreline segment is located directly to the east of HB Inlet and is designated as "Holden Beach". This segment spans approximately 10,000 ft. and covers the westernmost developed portion of Holden Beach between Stations 300+00 (Sailfish Street) and 400+00 (Ocean Blvd. W.). These two segments, from east to west, are defined in Table 4 and shown in Figure 15.

Table 4. Holden Beach Monitoring Segments

Monitoring Segments	Geographic Extent	Baseline Stations
HB Inlet	Radial profiles on east side of Shallotte Inlet shoreline	403+00 to 425+00
Holden Beach	Sailfish Street to end of Ocean Blvd W	300+00 to 400+00

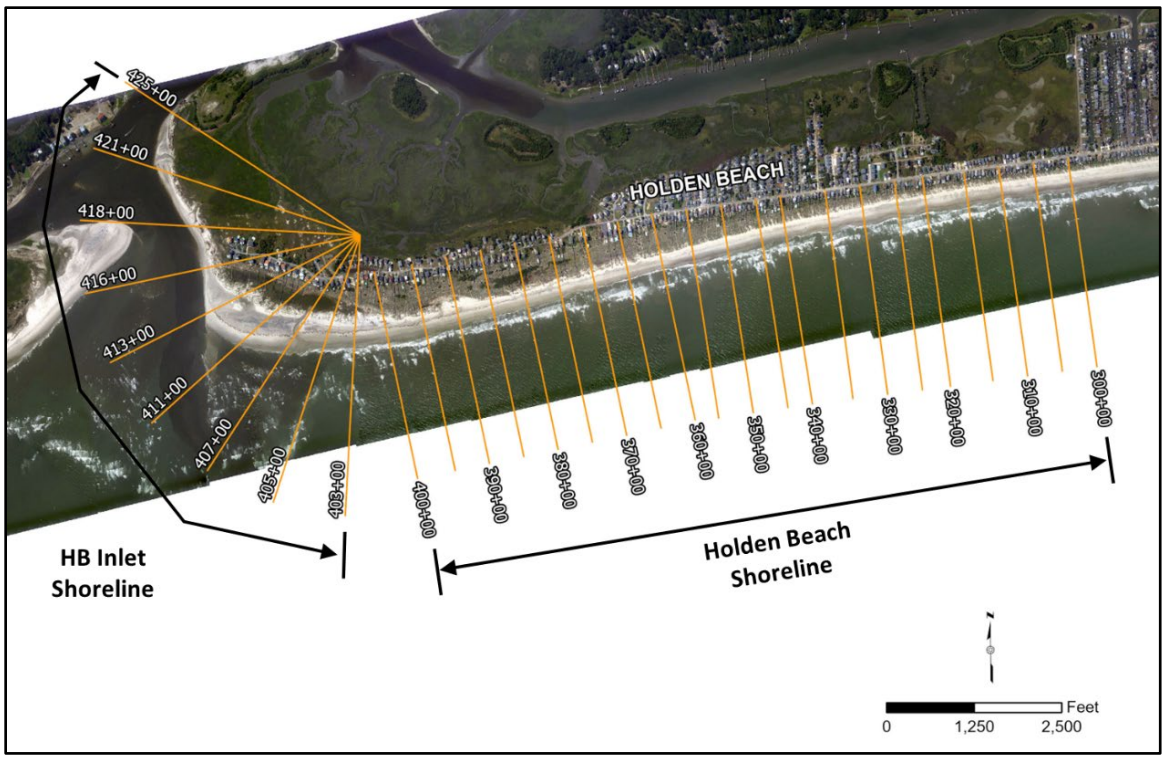


Figure 15. Holden Beach Shoreline Monitoring Segments.

3.2 Project Performance

As described in Section 2.1, the CSRM project design includes three (3) different segments, each with a slightly different design template. The largest section extends along the eastern 5,150 feet of the main fill footprint (station 51+50 to 103+00) and includes a 50-foot-wide berm at elevation +6 ft. NAVD88 and a dune with a 10-foot-wide crest at elevation +8.5 ft. NAVD88 and a 1V:5H back slope and a 1V:10 fore slope. The second segment extends approximately 2,600 feet to the west of the previously described section (station 103+00 to 129+00) and includes a 50-foot-wide berm only template. The third segment extends approximately 2,400 feet to the west of the second section (station 129+00 to 153+00) and includes a 25-foot-wide berm only template. The overall length of the 3 sections that collectively make up the main fill section is 10,150 ft. In addition to the main fill section, the project includes a 4,200-foot-long taper on the east end of the main fill section and a 2,800-foot-long taper on the west end for an overall length of 17,150 ft. It should be noted that no changes have been made to the CSRM design template since it was initially constructed in 2001.

As previously mentioned, the CSRM project has been periodically renourished five times by the USACE on an approximate 4-year maintenance interval using the Shallotte Inlet Borrow Area. However, since the initial construction, the western 6,100 feet of the CSRM project has performed exceptionally well and has not required any periodic nourishment. While this section of the project has experienced some losses over time, the losses have not compromised the level of protection provided by the beach fill design template. In contrast, the eastern 8,000 feet of the project area has experienced erosion rates that have warranted nourishment during all of the

periodic maintenance events. Given the fact that renourishment has not been required along the western portion of the project since the initial construction, the following project performance discussion refers separately to performance along the eastern section of the project (station 10+00 to 80+00) and the western section of the project (station 80+00 to 181+00).

3.2.1 Eastern CSRM Project Area (Station 10+00 to 80+00)

As discussed in Section 2.2, in 2022, the Town completed their East End Shoreline Protection Project, which included the construction of the terminal groin and re-orienting the shoreline between the terminal groin and station 30+00 and slowing erosion rates along this stretch. The project entailed the construction of a 1,050-foot-long terminal groin and an accretion fillet that placed 272,936 cy of fill west of the terminal groin. At the same time the Town was constructing the East End Shoreline Protection Project, the USACE performed its most recent renourishment of the Ocean Isle Beach CSRM Project. The federal project included the placement of 484,211 cy from station 80+00 east to the accretion fillet as shown in Figure 16.

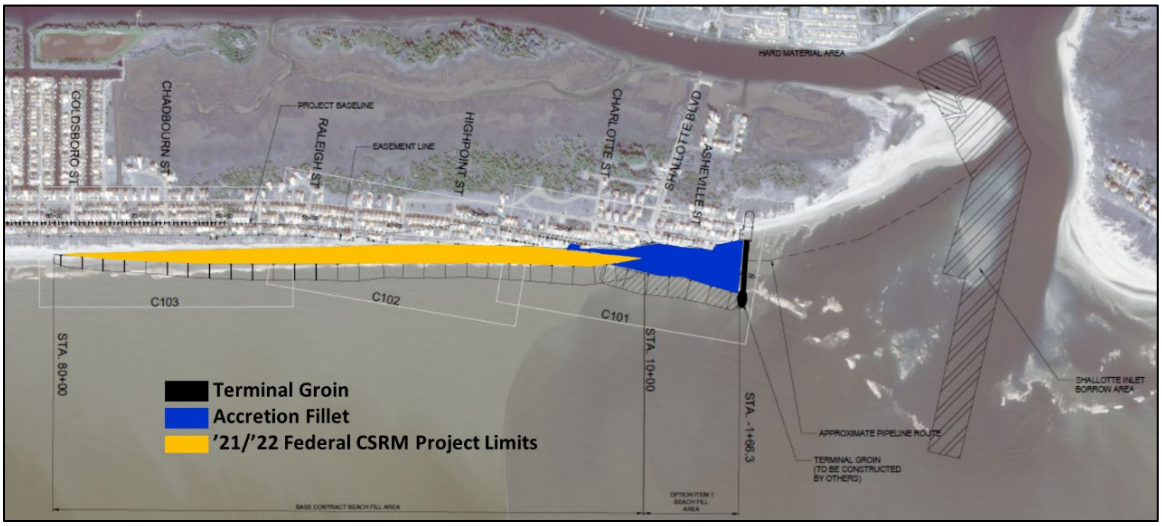


Figure 16. Extents of beach fill placement for the Accretion Fillet and the CSRM Project.

The Town conducts bi-annual beach profile monitoring surveys of the entire Ocean Isle Beach oceanfront. These surveys provide a means of monitoring the performance of the CSRM project, the Town's East End Shoreline Protection Project (terminal groin/accretion fillet), and areas outside of these established projects.

As stated above, since 2001, the USACE has routinely conducted periodic maintenance events of the CSRM project on an approximate 4-year interval. In order to assess whether the project is performing as expected, the Town's monitoring efforts include estimating the remaining design life of the project as a means to ensure the design template will be maintained throughout the duration of the maintenance interval. The design life estimates assist in forecasting how much time remains before the design template may be impacted by erosion. Accordingly, the design life estimate is used as a proxy to determine when the next maintenance event would need to be performed in order to preserve the design template. The remaining design life estimates are

determined by calculating the annualized volume rate of change and existing volume in excess of the design template at each monitoring station for each monitoring event.

Design life estimates were calculated by dividing the volume of fill remaining in excess of the CSRM design template by the volumetric change rates measured between June 2022 and November 2024 monitoring surveys. The rates were calculated based on the volume changes above the -8 ft. NAVD88 contour. The -8 ft. NAVD88 elevation is generally shared by all the design template profiles and provides a means for conducting comparable project design life comparisons between the surveys.

As of November 2024, the analysis calculated an average fill volume remaining of 260,500 cy above -8 ft. NAVD88, seaward of the design template, between stations 10+00 and 80+00. Between June 2022 and November 2024, the long-term volume change rate was calculated to be -132,400 cy/yr. over the 2.4-year monitoring period, following the construction of the 2022 CSRM project. The analysis of the volumetric changes for the CSRM project area between stations 10+00 and 80+00 estimated that this portion of the project has an estimated 2.0 years remaining considering the changes above -8 ft. NAVD88. Figures 17 through 20 provide a depiction of the volume remaining seaward of the CSRM project design template, where fill was placed in 2022, compared to the conditions surveyed in November 2024 at stations 10+00, 30+00, 50+00, and 70+00. The February 2001 survey is also included to show the conditions surveyed prior to the initiation of the CSRM project.

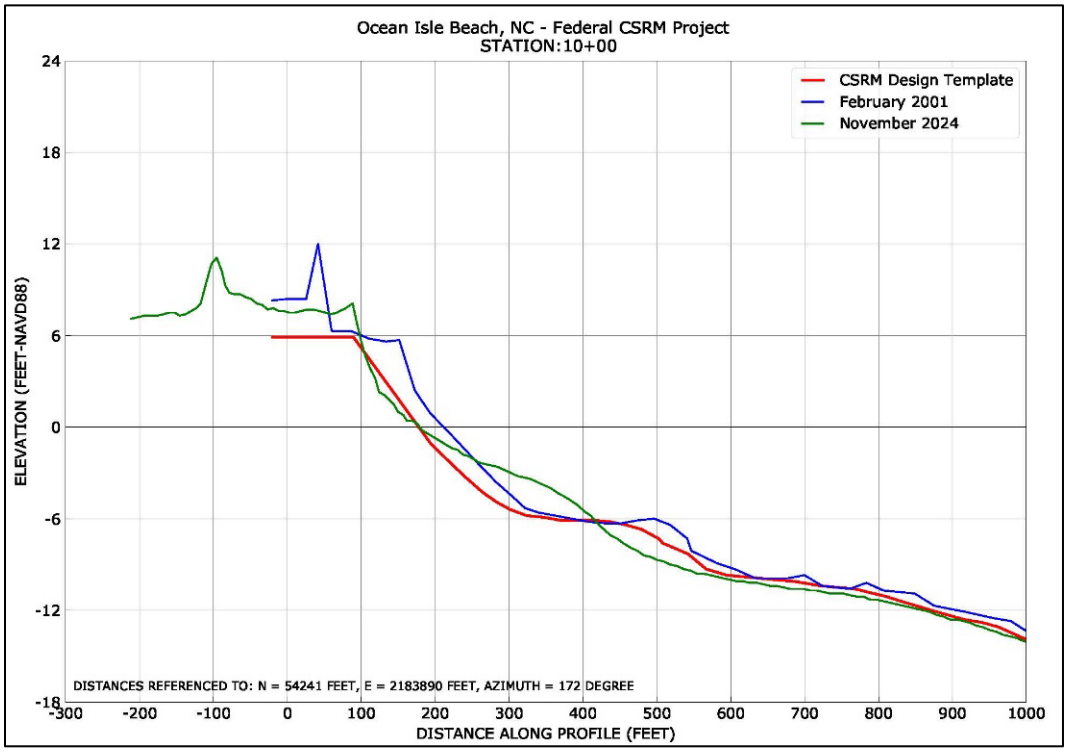


Figure 17. Station 10+00 - CSRM Design Template, February 2001 and November 2024 surveys.

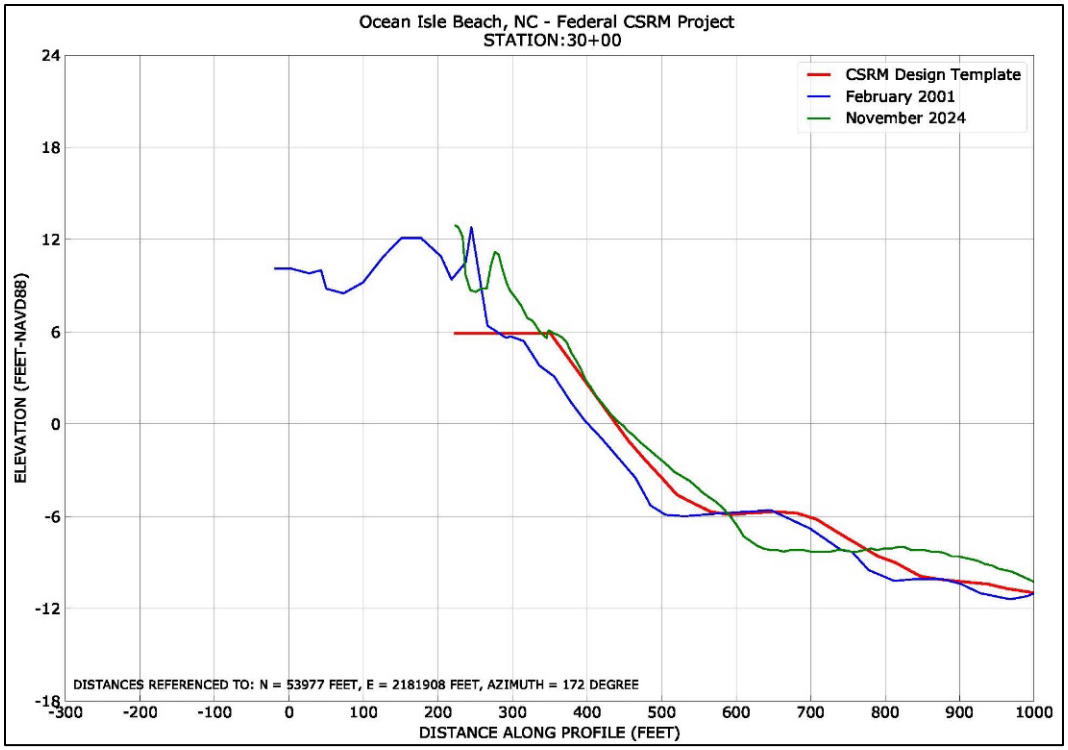


Figure 18. Station 30+00 - CSRM Design Template, February 2001 and November 2024 surveys.

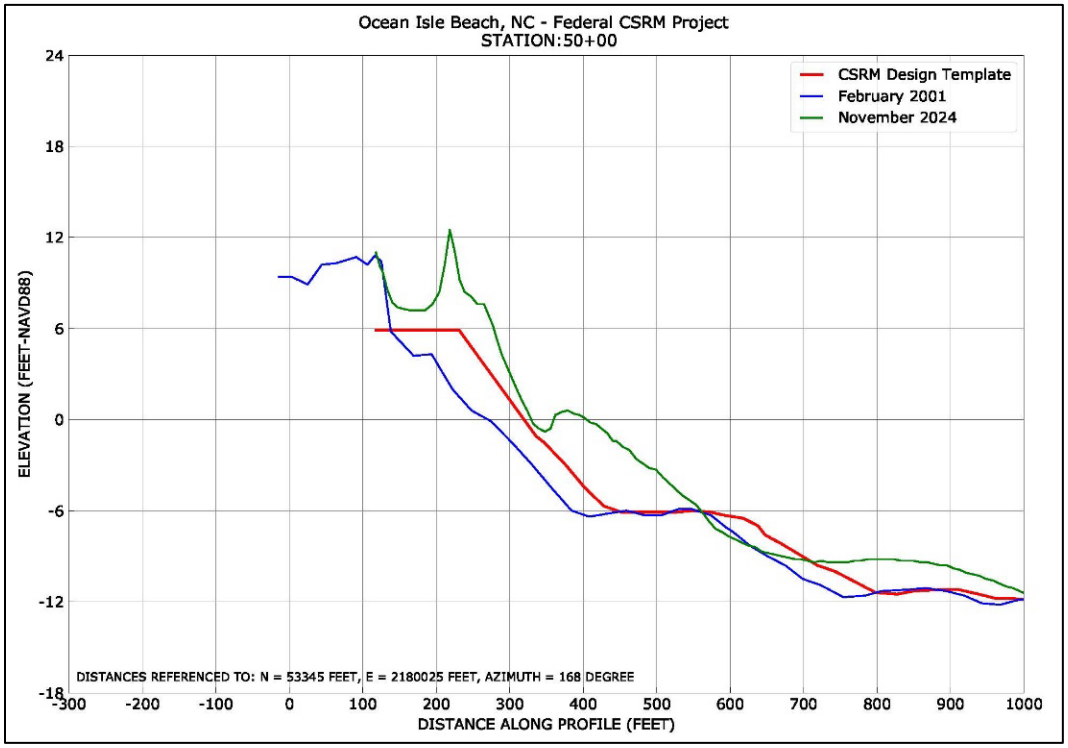


Figure 19. Station 50+00 - CSRM Design Template, February 2001 and November 2024 surveys.

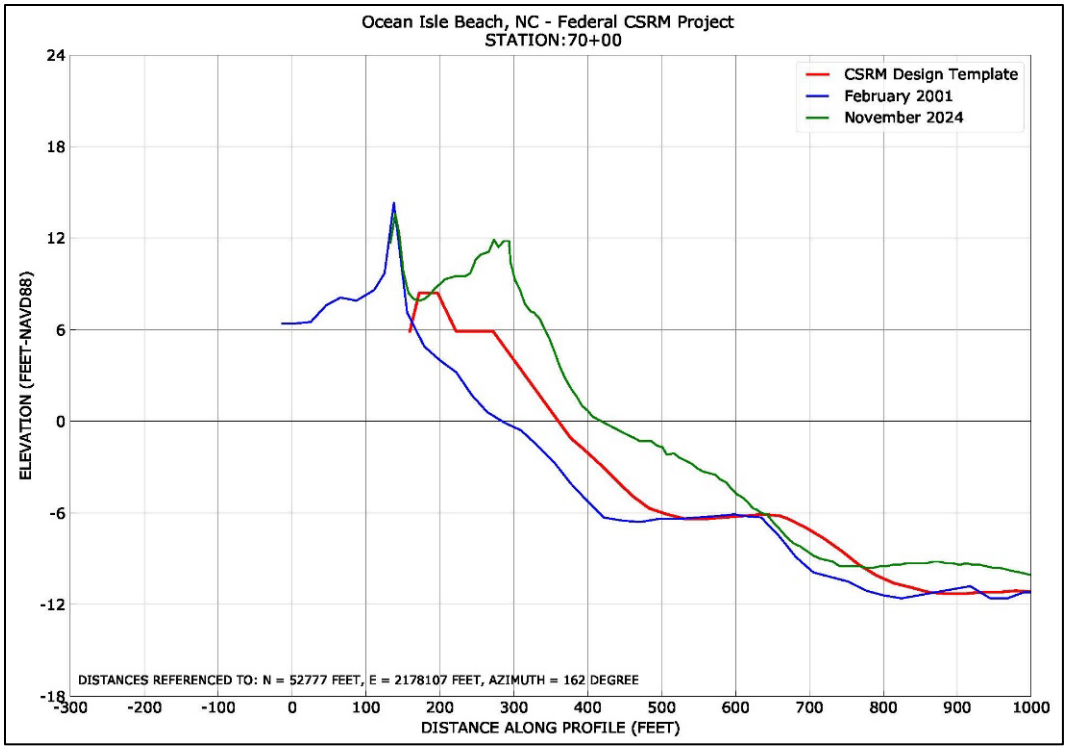


Figure 20. Station 70+00 - CSRM Design Template, February 2001 and November 2024 surveys.

3.2.2 Western CSRM Project Area (Station 80+00 to 181+00)

As previously described, the western portion of the CSRM project area has performed quite well since the initial construction. In fact, the last time renourishment was required anywhere along this area was in 2014, and only the portion from station 80+00 to 90+00 required maintenance.
In order to determine the remaining design life throughout the Western CSRM Project Area, a similar analysis was conducted by comparing the volume in excess of the design template with the observed erosion rate along this section of the project area. The volumetric change rate used for this analysis along the Western Project Area was -54,100 cy/yr. The rate was calculated based on the volume changes above the -8 ft. NAVD88 contour for the 2.4-year monitoring period between June 2022 and November 2024. The -8 ft. NAVD88 elevation is generally shared by all the design template profiles and provides a means for conducting comparable project design life comparisons between the surveys.

As of November 2024, the analysis calculated a remaining fill volume of approximately 774,000 cy above -8 ft. NAVD88 and seaward of the CSRM design template between stations 80+00 and 181+00. Based on the volumetric change rate of -54,100cy/yr above -8 ft. NAVD88, it is estimated that the Western CSRM Project Area has an estimated 14.3 years remaining.

4 COMPATIBLE SEDIMENT

Over the past several decades, beach-compatible material has been sourced from several sand sources to support shoreline nourishment efforts, including the federally authorized Shallotte Inlet Borrow Area and the Atlantic Intracoastal Waterway (AIWW) Shallotte Inlet Crossing. All material utilized for these projects has been in full compliance with the State of North Carolina's sediment compatibility standards, as outlined in 15A NCAC 07H .0312. Based on the proposed interval between nourishment events, these designated sand sources are expected to provide an adequate volume of material to support future nourishment efforts, ensuring the long-term stability and sustainability of the beach. This section provides an overview of the characteristics of the native beach sand and the material that may be used as beach fill within the footprint of the CSRM project.

4.1 Native Beach

North Carolina's sediment criteria for beach nourishment, outlined in 15A NCAC 07H .0312, ensures that sediment used a beach fill closely matches the native beach material to maintain environmental integrity and project effectiveness. Before placement, the recipient beach must be thoroughly analyzed by collecting sediment samples to determine baseline characteristics such as grain size distribution and composition. Compatibility standards require that fine-grained sediment, granular material, gravel content, and calcium carbonate levels in the borrow material do not exceed the native beach's levels by more than specific thresholds-5% for fine-grained and gravel content, 10% for granular particles, and 15% for calcium carbonate.

Over the years, several efforts were made to characterize the native beach sand on Ocean Isle Beach. In May of 1993, the USACE collected a set of surficial sand samples at stations 40+00, 80+00, and 130+00 to describe the native material. At least 18 samples were collected at each of the three stations at intervals from the top of berm to about -30 ft NAVD88. The composite native beach material properties from this assessment resulted in a median grain size of 0.18mm (2.44 phi units) with an average standard deviation (in phi units) of 0.55 with a silt content of 1.4% (Table 5).

Table 5. Native material grain size characteristics (samples collected by USACE in May 1994)

Native Material Grain Size Characteristics
(Samples Collected May 1994)

coord. station	samp. no.	d16 (mm)	d50 (mm)	d84 (mm)	phi16	phi50	phi84	mean =(phi16+ phi84)/2	std dev. (phi)	vari-ance (phi)	silt con-tent
40+00	1	0.10	0.16	0.22	3.32	2.64	2.18	2.75	0.57	0.32	2%
	2	0.13	0.19	0.24	2.94	2.40	2.06	2.50	0.44	0.20	1%
	3	0.16	0.19	0.24	2.64	2.40	2.06	2.35	0.29	0.09	0%
	4	0.17	0.23	0.33	2.56	2.12	1.60	2.08	0.48	0.23	1%
	5	0.17	0.25	0.43	2.56	2.00	1.22	1.89	0.67	0.45	1%
	6	0.15	0.21	0.34	2.74	2.25	1.56	2.15	0.59	0.35	1%
	7	0.19	0.28	0.47	2.40	1.84	1.09	1.74	0.65	0.43	1%
	8	0.16	0.23	0.39	2.64	2.12	1.36	2.00	0.64	0.41	1%
	9	0.13	0.19	0.26	2.94	2.40	1.94	2.44	0.50	0.25	1%
	10	0.11	0.17	0.25	3.18	2.56	2.00	2.59	0.59	0.35	1%
	11	0.09	0.14	0.21	3.47	2.84	2.25	2.86	0.61	0.37	2%
	12	0.09	0.13	0.20	3.47	2.94	2.32	2.90	0.58	0.33	2%
	13	0.08	0.12	0.18	3.64	3.06	2.47	3.06	0.58	0.34	4%
	14	0.08	0.11	0.17	3.64	3.18	2.56	3.10	0.54	0.30	6%
	15	0.08	0.13	0.22	3.64	2.94	2.18	2.91	0.73	0.53	6%
	16	0.08	0.16	0.27	3.64	2.64	1.89	2.77	0.88	0.77	12%
	17	0.08	0.18	0.29	3.64	2.47	1.79	2.71	0.93	0.86	13%
	18	0.10	0.20	0.43	3.32	2.32	1.22	2.27	1.05	1.11	10%
Averages:				(phi16+phi50+phi84)/3 =		2.51		2.50	0.63	0.43	3.6%
						0.18 mm		0.18 mm			
Using only samples 1-14 (in littoral zone):						2.47		**2.46**	**0.55**	**0.32**	**1.7%**
						0.18 mm		**0.18 mm**			

coord. station	samp. no.	d16 (mm)	d50 (mm)	d84 (mm)	phi16	phi50	phi84	mean =(phi16+ phi84)/2	std dev. (phi)	vari-ance (phi)	silt con-tent
80+00	1	0.14	0.19	0.24	2.84	2.40	2.06	2.45	0.39	0.15	0%
	2	0.13	0.19	0.24	2.94	2.40	2.06	2.50	0.44	0.20	0%
	3	0.12	0.18	0.23	3.06	2.47	2.12	2.59	0.47	0.22	0%
	4	0.16	0.19	0.24	2.64	2.40	2.06	2.35	0.29	0.09	1%
	5	0.19	0.29	0.43	2.40	1.79	1.22	1.81	0.59	0.35	1%
	6	0.18	0.26	0.45	2.47	1.94	1.15	1.81	0.66	0.44	1%
	7	0.18	0.27	0.45	2.47	1.89	1.15	1.81	0.66	0.44	1%
	8	0.14	0.20	0.35	2.84	2.32	1.51	2.18	0.66	0.44	1%
	9	0.18	0.28	0.50	2.47	1.84	1.00	1.74	0.74	0.54	1%
	10	0.12	0.18	0.26	3.06	2.47	1.94	2.50	0.56	0.31	2%
	11	0.11	0.18	0.26	3.18	2.47	1.94	2.56	0.62	0.39	2%
	12	0.09	0.13	0.20	3.56	2.94	2.32	2.94	0.62	0.38	2%
	13	0.08	0.13	0.19	3.64	2.94	2.40	3.02	0.62	0.39	2%
	14	0.09	0.14	0.21	3.47	2.84	2.25	2.86	0.61	0.37	2%
	15	0.08	0.11	0.17	3.64	3.18	2.56	3.10	0.54	0.30	4%
	16	0.08	0.12	0.19	3.64	3.06	2.40	3.02	0.62	0.39	9%
	17	0.08	0.15	0.23	3.64	2.74	2.12	2.88	0.76	0.58	8%
	18	0.10	0.17	0.25	3.32	2.56	2.00	2.66	0.66	0.44	5%
	19	0.11	0.19	0.31	3.18	2.40	1.69	2.44	0.75	0.56	7%
Averages:				(phi16+phi50+phi84)/3 =		2.48		2.49	0.59	0.37	2.6%
						0.18 mm		0.18 mm			
Using only samples 1-15 (in littoral zone):						2.42		**2.41**	**0.57**	**0.33**	**1.3%**
						0.19 mm		**0.19 mm**			

coord. station	samp. no.	d16 (mm)	d50 (mm)	d84 (mm)	phi16	phi50	phi84	mean =(phi16+ phi84)/2	std dev. (phi)	vari-ance (phi)	silt con-tent
130+00	1	0.13	0.19	0.23	2.94	2.40	2.12	2.53	0.41	0.17	0%
	2	0.15	0.19	0.23	2.74	2.40	2.12	2.43	0.31	0.10	0%
	3	0.16	0.19	0.24	2.64	2.40	2.06	2.35	0.29	0.09	0%
	4	0.16	0.19	0.23	2.64	2.40	2.12	2.38	0.26	0.07	0%
	5	0.15	0.20	0.28	2.74	2.32	1.84	2.29	0.45	0.20	1%
	6	0.17	0.26	0.40	2.56	1.94	1.32	1.94	0.62	0.38	1%
	7	0.17	0.26	0.38	2.56	1.94	1.40	1.98	0.58	0.34	2%
	8	0.17	0.25	0.43	2.56	2.00	1.22	1.89	0.67	0.45	1%
	9	0.16	0.20	0.26	2.64	2.32	1.94	2.29	0.35	0.12	0%
	10	0.17	0.23	0.42	2.56	2.12	1.25	1.90	0.65	0.43	1%
	11	0.09	0.16	0.25	3.47	2.64	2.00	2.74	0.74	0.54	1%
	12	0.09	0.14	0.21	3.51	2.84	2.25	2.88	0.63	0.39	2%
	13	0.09	0.14	0.20	3.51	2.84	2.32	2.91	0.59	0.35	2%
	14	0.10	0.16	0.22	3.40	2.64	2.18	2.79	0.61	0.37	2%
	15	0.09	0.14	0.20	3.56	2.84	2.32	2.94	0.62	0.38	3%
	16	0.08	0.11	0.17	3.64	3.18	2.56	3.10	0.54	0.30	4%
	17	0.09	0.16	0.22	3.47	2.64	2.18	2.83	0.64	0.42	7%
	18	0.11	0.17	0.24	3.18	2.56	2.06	2.62	0.56	0.32	3%
	19	0.13	0.19	0.27	2.94	2.40	1.89	2.42	0.53	0.28	2%
	20	0.16	0.29	0.55	2.64	1.79	0.86	1.75	0.89	0.79	3%
Averages:				(phi16+phi50+phi84)/3 =		2.44		2.45	0.55	0.32	1.8%
						0.18 mm		0.18 mm			
Using only samples 1-16 (in littoral zone):						2.46		**2.46**	**0.52**	**0.29**	**1.3%**
						0.18 mm		**0.18 mm**			

On April 5, 2013, April 17, 2013 and January 23, 2014, CPE collected additional beach samples and nearshore sediment samples along four (4) profiles (0+00, 10+00, 25+00, and 60+00 (Figure 21). Sediment samples were collected from these profiles at the dune, toe of dune, midberm, berm crest, Mean High Water (MHW), Mean Tide Level (MTL), Mean Low Water (MLW), trough, bar crest, and four (4) additional depths evenly spaced between the bar crest and -20 ft. NAVD88. Sediment characteristic data obtained by the USACE from the baseline station 40+00 were also used to determine composite beach characteristics.

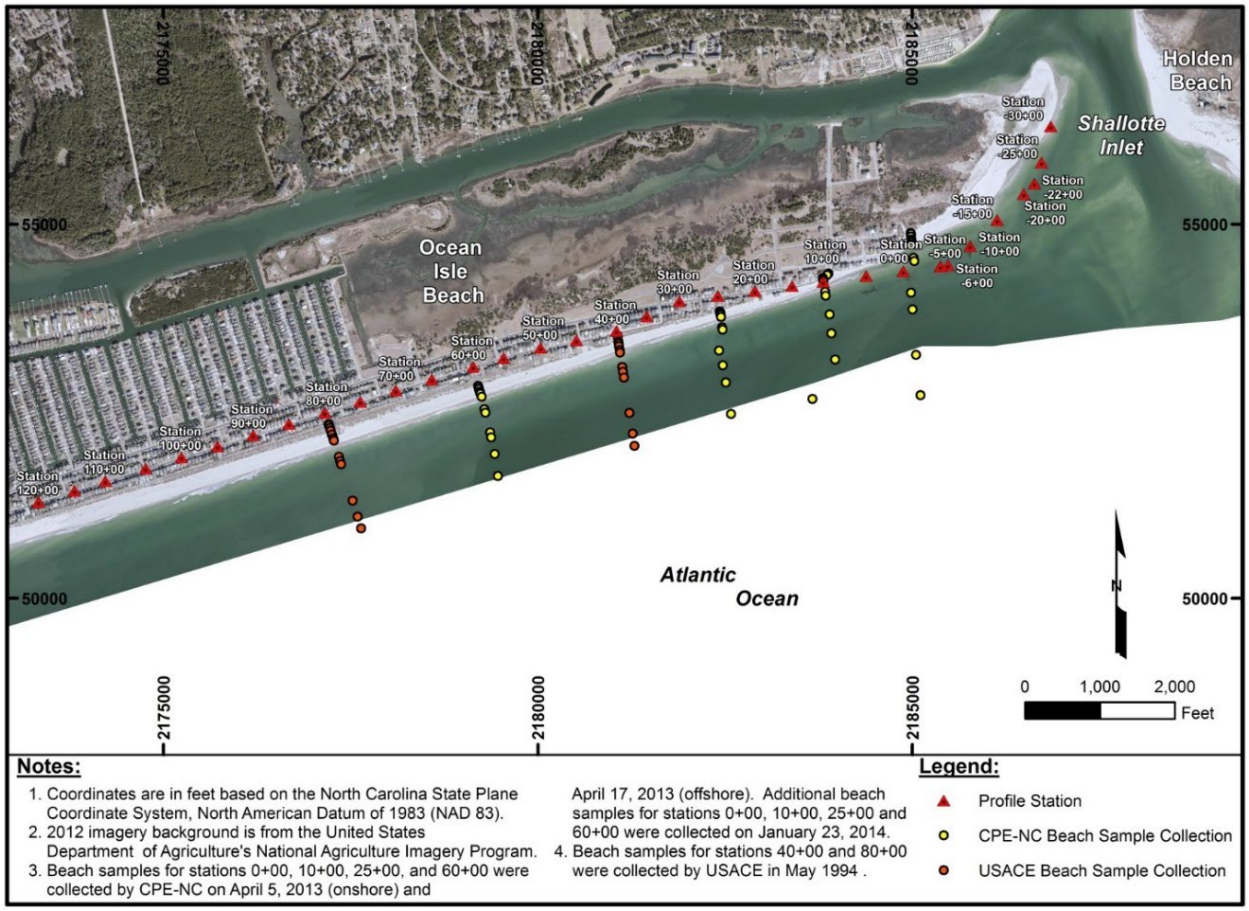


Figure 21. Locations of the beach sand samples collected to determine existing beach characteristics.

Analyses of these native beach samples collected indicate that sediment along the eastern end of Ocean Isle Beach has a mean grain size of 0.23mm. The percent by weight of fines (less than 0.0625 millimeters) for the sampled area was determined to be 1.34%. The percent by weight of granular (greater than or equal to 2 millimeters and <less than 4.76 millimeters) and gravel (greater than or equal to 4.76 millimeters) for the sampled area was 0.43% and 0.40%, respectively. The wet Munsell Color value ranges from 4 to 7, with a typical value of 5. The dry Munsell Color value ranges from 6 to 8, with a typical value of 7. These characteristics represent the existing beach, which is a composite of the characteristics of material that has been placed on the beach during past nourishment projects and native beach sediment.

4.2 Shallotte Inlet Borrow Area

The borrow area utilized by the USACE for the CSRM project is located within Shallotte Inlet, as depicted in Figure . The entire borrow area was originally approved for a dredge depth of -15 ft. MLW (-17.97 ft. NAVD88) and has been used for the initial construction in 2001 and each of the five subsequent maintenance events. In addition, the pre-filling of the accretion fillet associated with the Town's 2022 Shoreline Protection Project utilized material from this same sand source. Accordingly, this borrow area has historically proven to be a reliable source of beach compatible material for the Town's shoreline protection projects.

The North Carolina Coastal Resources Commission (CRC) adopted the State Sediment Criteria Rule language (15A NCAC 07H .0312) for borrow material aimed at preventing the disposal of incompatible material on the beach. The North Carolina State standards (15A NCAC 07H.0312) (2) (e) allow an applicant to use two sets of sampling data with at least one dredging event in between to characterize material for future nourishment events. If both sets of data are shown to be compatible as stated in the Rule, subsequent projects can use the material from the same borrow area. In addition, Section (3) (a) of the Rule states that sediment completely confined to the permitted dredge depth of a maintained sediment deposition basin within an inlet shoal system is considered compatible if the average percentage by weight of fine-grained (less than 0.0625 millimeters) sediment is less than 10%. These changes took effect in September 2013 after beach sampling and analysis were completed for this proposed project. This section provides the relevant geotechnical information that demonstrates the ability for the Shallotte Inlet Borrow Area to be utilized for future nourishment efforts.

In 1994, the USACE collected vibracores at 11 locations within Shallotte Inlet during their investigations to delineate borrow areas for the federal CSRM project (Figure 22). The material in the core samples was described as primarily gray or tan poorly graded sand with little silt content, underlain in some cases by layers of clay or silt. Some sand layers were described as containing pockets of clay and gravel sized shell. From these core data, the USACE developed composite values for the textural properties of the material in Shallotte Inlet. The mean grain size of the material above -15 ft. MLW (-17.97 ft. NAVD88) was stated as 0.38 mm with a standard deviation of 0.97 and a silt content of 1.1% (Appendix D).

Although the 1994 USACE data provided general information on the sediment characteristics in the vicinity of the federally approved Shallotte Inlet Borrow Area, these data did not include any samples from the outer portion of the ebb shoal. In order to determine sediment characteristics that better represent the entirety of the area dredged by the USACE in 2001, six (6) of the 13 vibracores collected by the USACE in 1998 were examined to determine the percent silt by weight (Figure 22). The six (6) vibracores were SHI-6, SHI-7, SHI-8, SHI-12, SHI-13, and SHI-14. Composite median grain size and percent silt content were computed for each of the six (6) vibracores representing the sand borrow area by calculating the weighted average (sample weighted by representative lengths of the sampled layer within the core). The composite median grain size for the area analyzed using the 1998 vibracores is 0.16 mm, with a percent fine by weight of 1.3%.

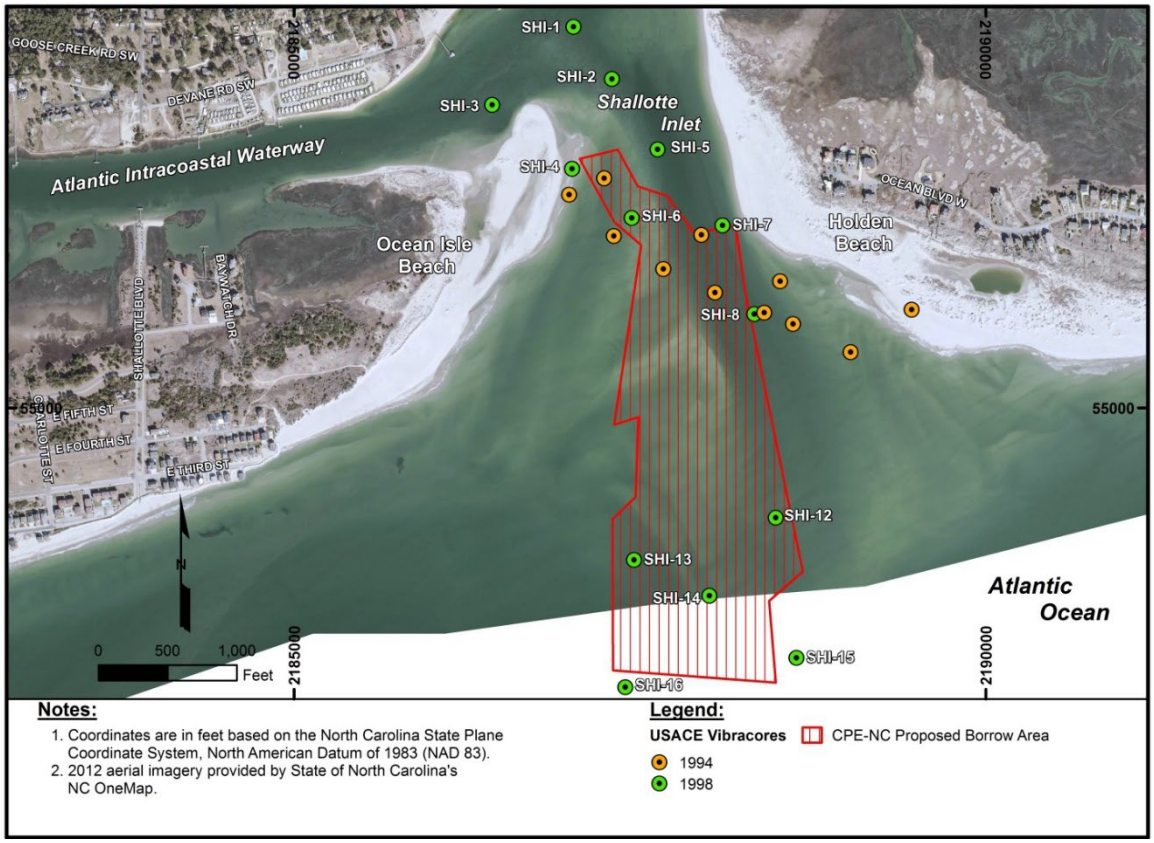


Figure 22. Map depicting the approximate area within the Shallotte Inlet Borrow Area that was dredged in 2001 and the location of vibracores collected by the USACE in 1994 and 1998.

Twenty-seven (27) additional vibracores were collected following the initial construction of the CSRM project in 2005 and 2009 from within and in proximity to the Shallotte Inlet Borrow Area (Figure 23). The twelve vibracores located within the footprint of the area excavated during the initial 2001 CSRM event were analyzed to determine composite sediment characteristics of the material that infilled following construction. The composite mean and median grain size, as well as percent by weight fine-grained sediments, were computed for each vibracore by calculating the weighted average (sample weighted by representative lengths of the sampled layer within the core). The composite statistics for the area were compiled by averaging the weighted results for all cores within the lateral and vertical limits of the borrow area. The composite mean grain size for the area analyzed using the 2005 and 2009 vibracores was determined to be 0.36 mm. The 12 vibracores used in the composite indicate that the sediment within the area dredged contains 1.95% fine-grained sediment by weight. Although no Munsell color values were available, the 2005 and 2009 vibracore logs describe the sediment as being tan to gray and tan to light gray, respectively.

Collectively, evaluations of vibracore data collected in 1994, 1998 as well as 2005 and 2009 show the sediment originating from within the Shallotte Inlet Borrow Area meet the criteria set forth in rule 15A NCAC 07H.0312.

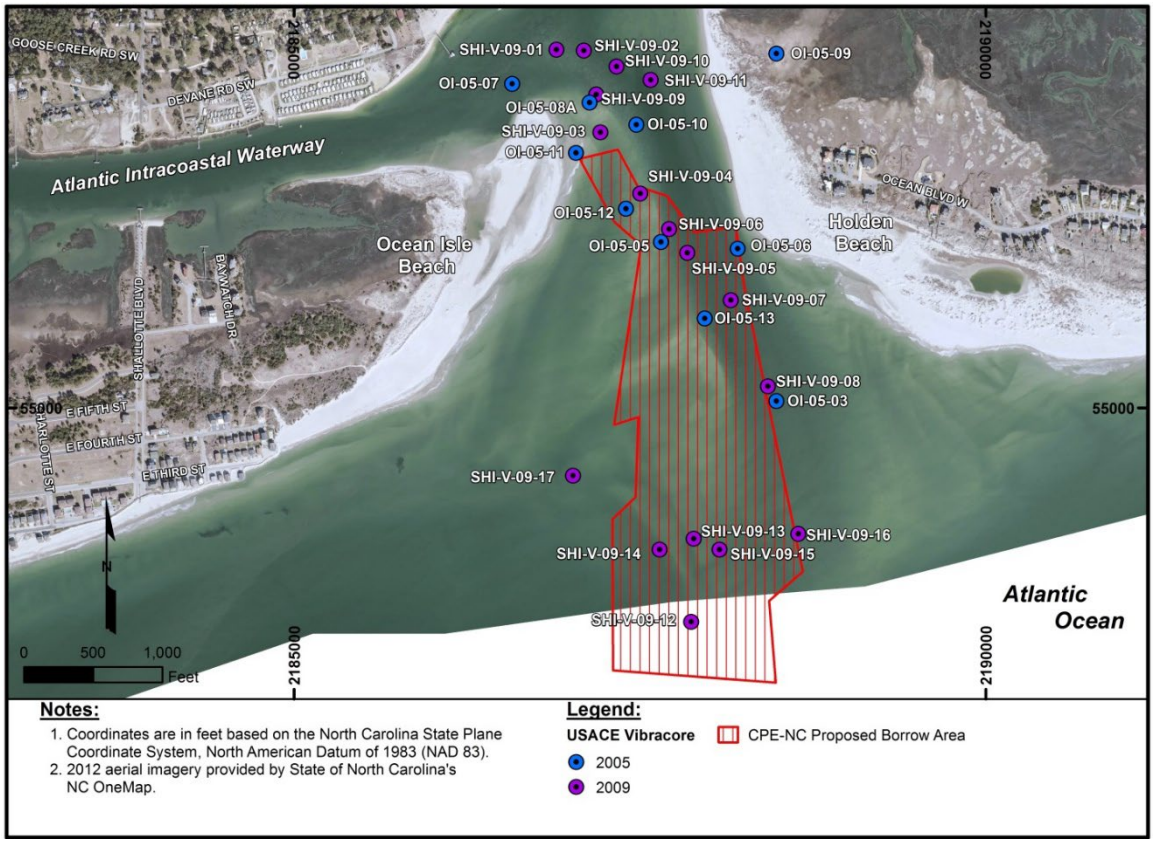


Figure 23. Map depicting the approximate area dredged in 2001 by the USACE and vibracores collected by the USACE in 2005 and 2009.

Due to longshore sediment transport in proximity to Shallotte Inlet, this borrow area serves as a "sand trap" and has demonstrated significant infilling following each dredging operation. As stated in the USACE's 2005 CSRM Monitoring Report, "*overall, the dredged borrow area has worked as an effective sediment trap with the total volume change between May 2001 and May 2004 being an increase of nearly 709,000 cubic yards*". This amounts to an infilling rate of approximately 236,000 cy per year. Between June 2022 (soon after the 5th CSRM maintenance event) and May 2024, approximately 319,000 cy of material filled into the borrow area, based on an assessment of survey data. This suggests an infilling rate of approximately 160,000 cy per year during that period of time. The average annual rate of infilling based on both data sets amounts to approximately 206,000 cy per year.

Between 2006 and 2022, a total of 2,957,694 cy of material was excavated from within the Shallotte Inlet Borrow Area as a result of five (5) CSRM maintenance events and the pre-filling of the terminal groin accretion fillet. This equates to an annual removal of 184,885 cy from the borrow area over this 16-year period. However, with the terminal groin in place, the erosion rate along the eastern portion of the CSRM project is expected to decrease, thereby reducing the amount of material that needs to be dredged on an annual basis. Based on this, along with the historical rate of dredging and the infilling rates described above, it is anticipated that the Shallotte

Inlet Borrow Area will continue to support the volumetric needs for beach nourishment within the footprint of the CSRM project.

4.3 AIWW Dredged Material

The USACE has periodically placed beneficially reused dredged material originating from the Shallotte River Crossing (Tangents 17 and 19) and/or the Shallotte Inlet Crossing (Tangents 19 and 20 including the widener) along the oceanfront shoreline at the east end of Ocean Isle Beach (Figure 24). Specifically, it is estimated that since 2001 approximately 425,000 to 525,000 cubic yards of navigation maintenance material have been deposited generally within the area east of Shallotte Boulevard by the USACE. The most recent beach placement utilizing material dredged from these navigation channels was in February 2023 when 72,000 cy was placed east of the terminal groin between Sta. -5+00 and -20+00. A cursory review of historical geotechnical data obtained by the USACE's assessment of 36 vibracores collected within the Shallotte Inlet Crossing and Shallotte River Crossing collected between 1998 and 2021 indicated that the material within these areas generally contain low percentages of fine material.

Based on the available data from the USACE for the time period of 2017 through 2023, an average of 26,800 cubic yards of material dredged annually from the AIWW has been placed on the east end of Ocean Isle Beach.

Figure 24. Location of Shallotte River Crossing (Tangents 17 and 18) and Shallotte Inlet Crossing (Tangents 19-20 including the widener) in the AIWW.

5 FINANCIAL RESOURCES

As stated in Section 1, the USACE's CSRM project is funded through a cost-sharing arrangement between federal and non-federal entities. Specifically, the federal government covers 65% of the project costs, while the remaining 35% is the responsibility of non-federal partners, which includes the State of North Carolina and the Town. The State and the Town each contribute 50% of this non-federal share. Therefore, the Town contributes a total of 17.5% of the total cost towards the maintenance of the CSRM project. Although the CSRM project was authorized by the Water Resources Development Act (WRDA) of 1996, the project's 50-year lifespan began with its initial construction in 2001. In this regard, the authorization will remain in effect until 2051, barring any modifications or deauthorization by Congress. Therefore, this cost sharing agreement is anticipated to remain in place for an additional 26 years. Prior to the expiration, however, the Town will begin coordinating with the USACE to help facilitate the reauthorization of the project.

The Town has an established Beach Nourishment/Erosion Fund that is used to fund shore protection projects on Ocean Isle Beach. This fund is presently funded through contributions from the Town's General Fund and Accommodations Tax funds. House Bill 426 allowed the Town of Ocean Isle Beach the authority to levy a room occupancy and tourism development tax in the amount of three percent (3%) to be used for "tourism-related expenditures". Session Law 1997-364 Section 11(b) authorized the Town of Ocean Isle Beach Board of Commissioners to levy an additional room occupancy tax of up to two percent (2%) of the gross receipts from the rental of accommodations. The proceeds of this additional tax can only be used for beach renourishment and shoreline protection. On July 13, 2010, the Town's Board of Commissioners voted to levy the additional two percent (2%) occupancy tax. This tax became effective on January 1, 2011. If it is determined that over the course of coordination efforts with the USACE to reauthorize the CSRM project beyond 2051 that reauthorization is unlikely, the Town will implement efforts to adjust the rate of its Beach Nourishment/Erosion Fund accordingly such that they will have the ability to support the USACE's cost share.

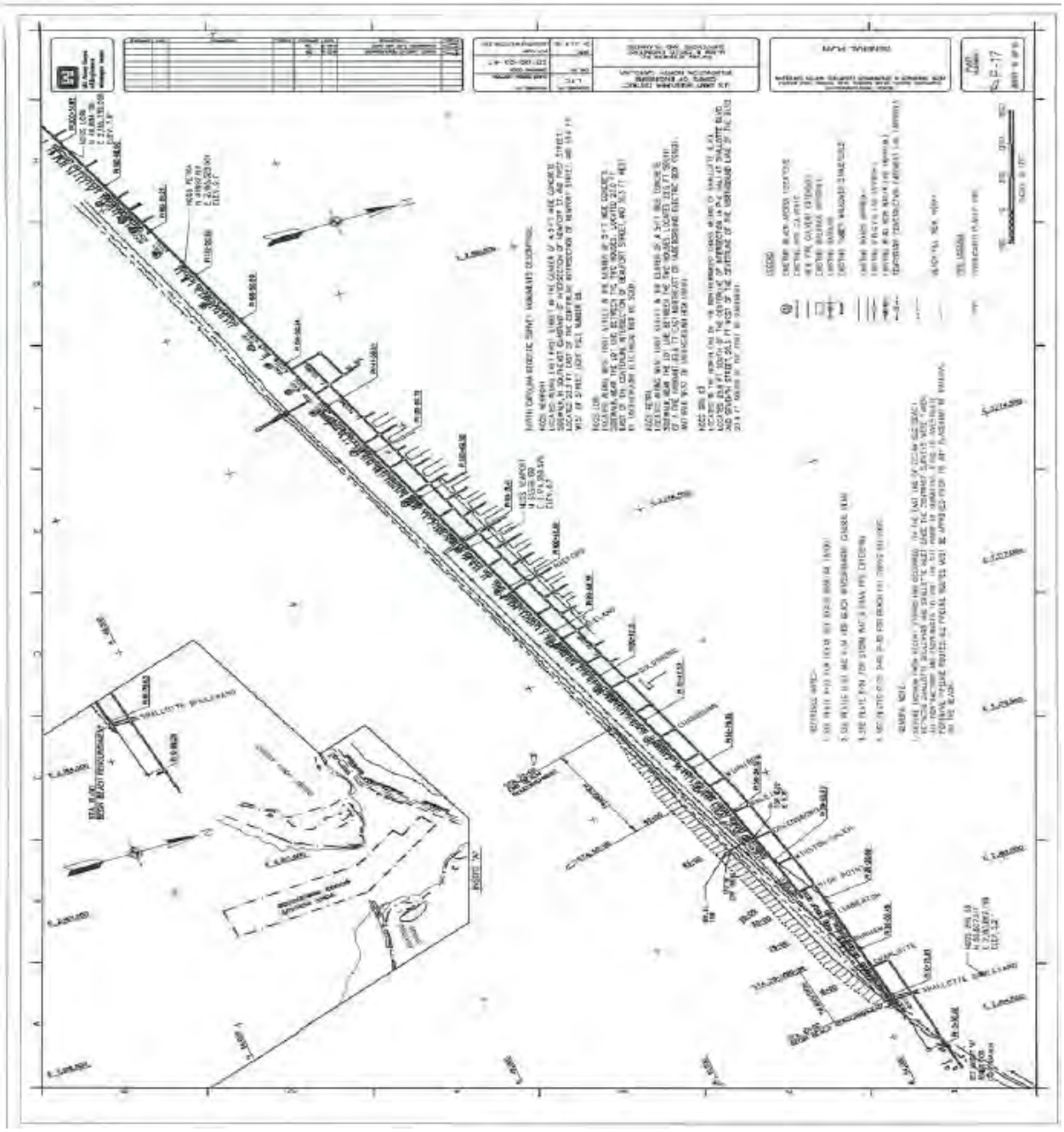
As of April 3, 2025, the balance of the Town's Beach Renourishment/Erosion Fund was $9,365,098.11. During FY25/26, the Town anticipates contributing $1,575,000 (2%) into this account from their Accommodation Tax Fund. The Beach Renourishment/Erosion Fund also receives an additional contribution of $500,000 annually from either the General Fund or Accommodations Tax Fund. The balance of the Beach Renourishment/Erosion Fund will be maintained by the Town such that future they will have the ability to support the construction of future CSRM nourishment events.

6 PUBLIC COMMENTS RECEIVED

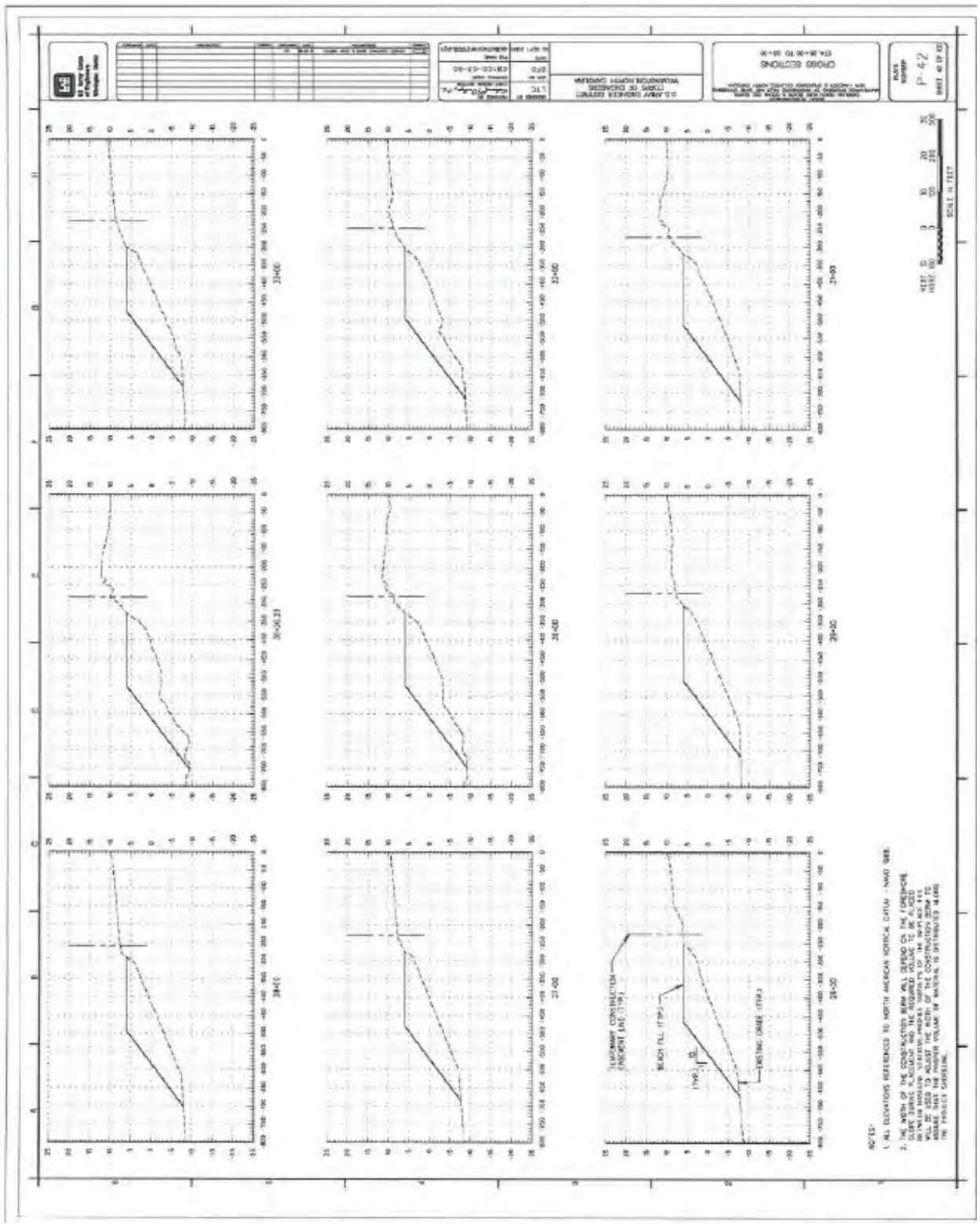
APPENDIX A:

2006, 2009/2010, 2014, AND 2018 CSRM PROJECT Drawings

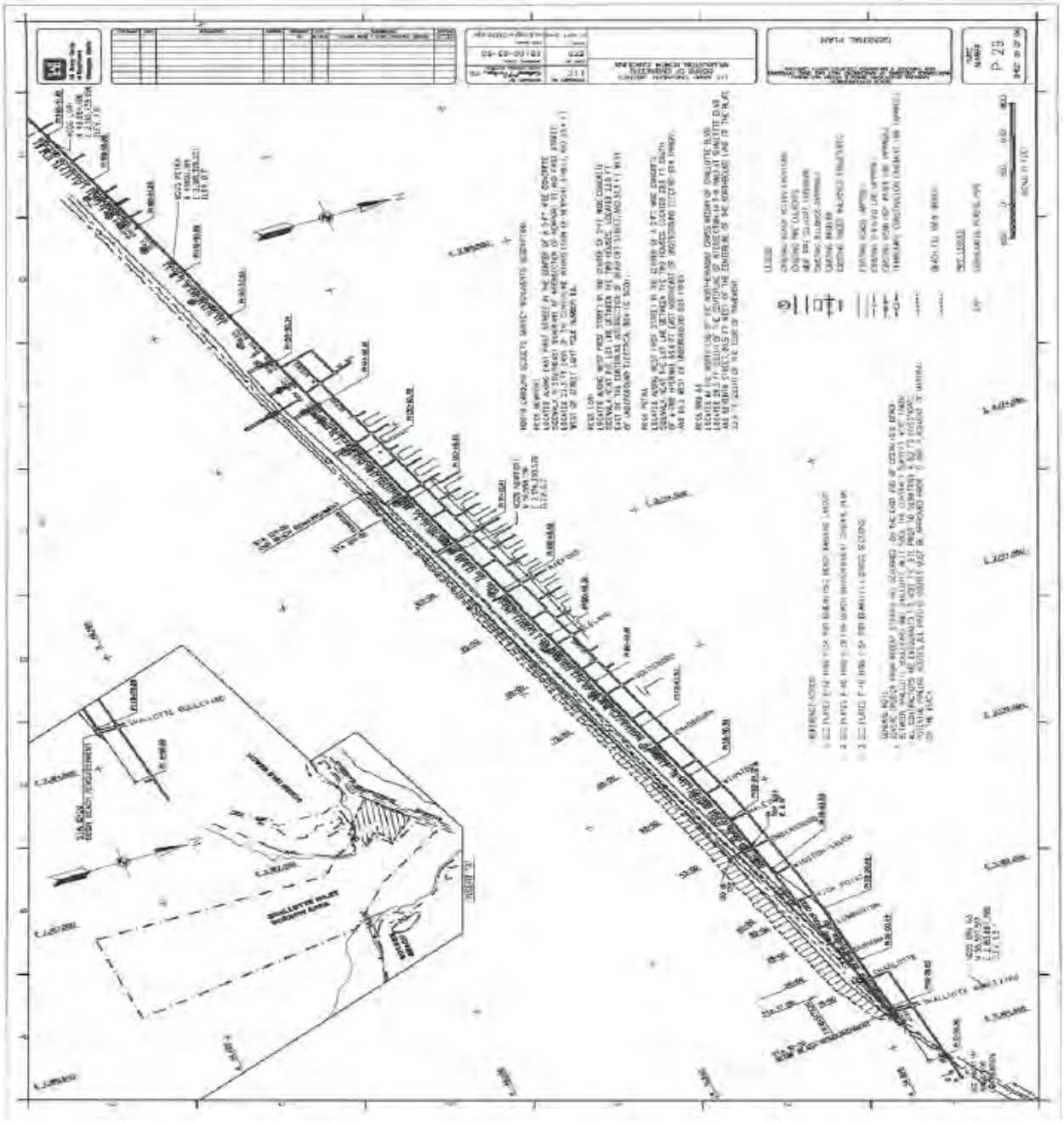
2006 CSRM Project Plan



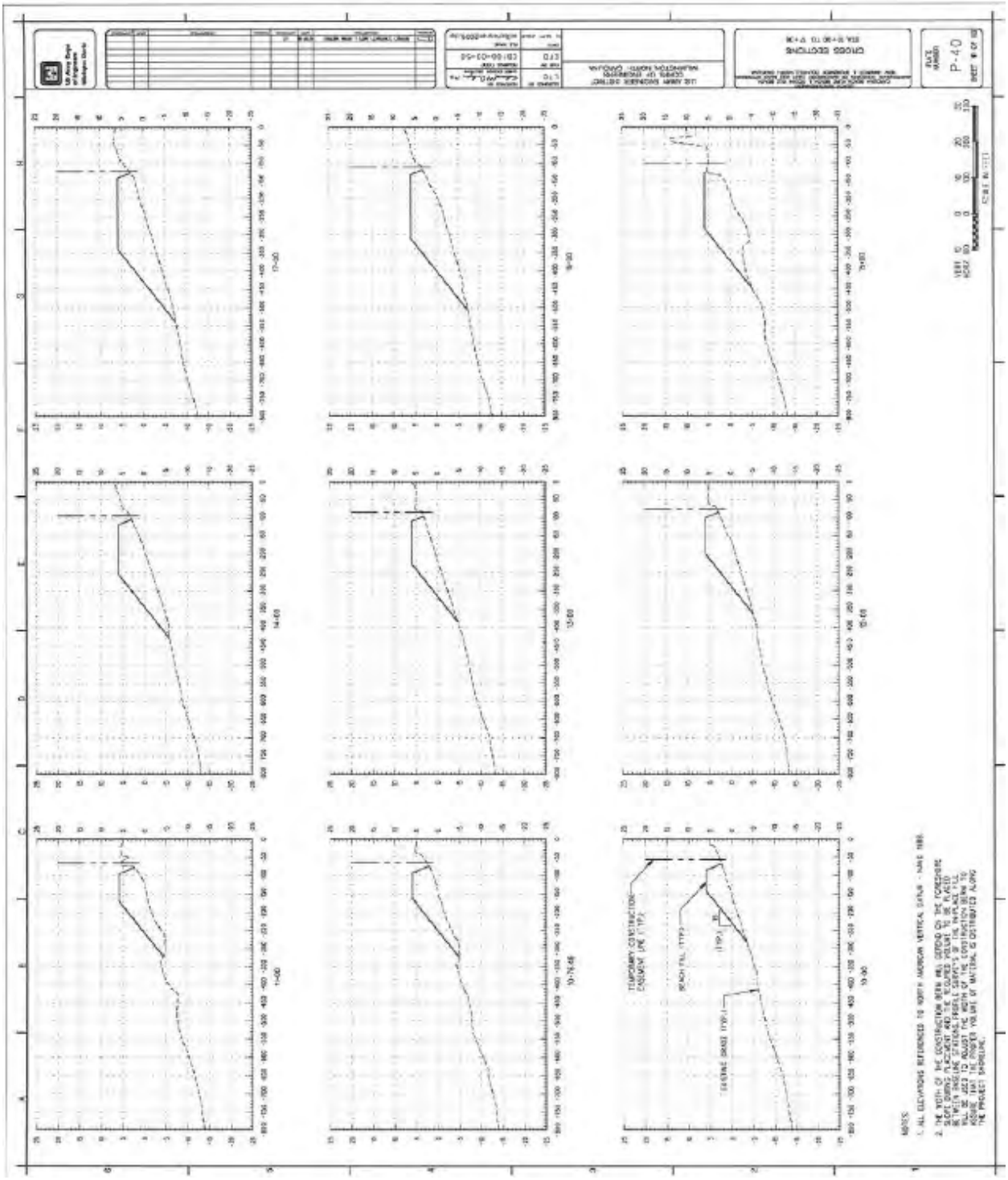
2006 CSRM Post-Construction Station Profile Plots



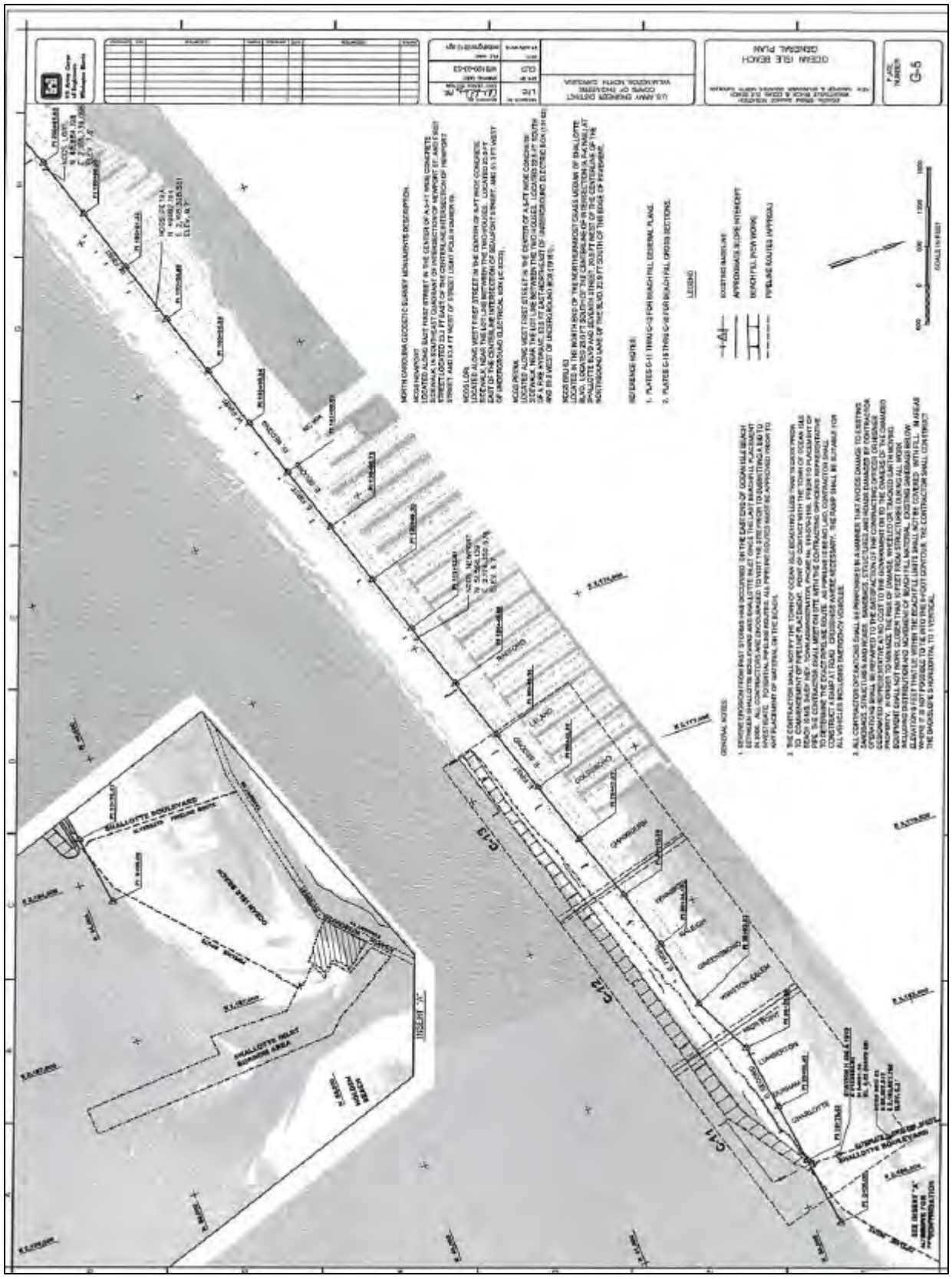
2009/2010 CSRM Project Plan



2009/2010 CSRM Post-Construction Station Profile Plots

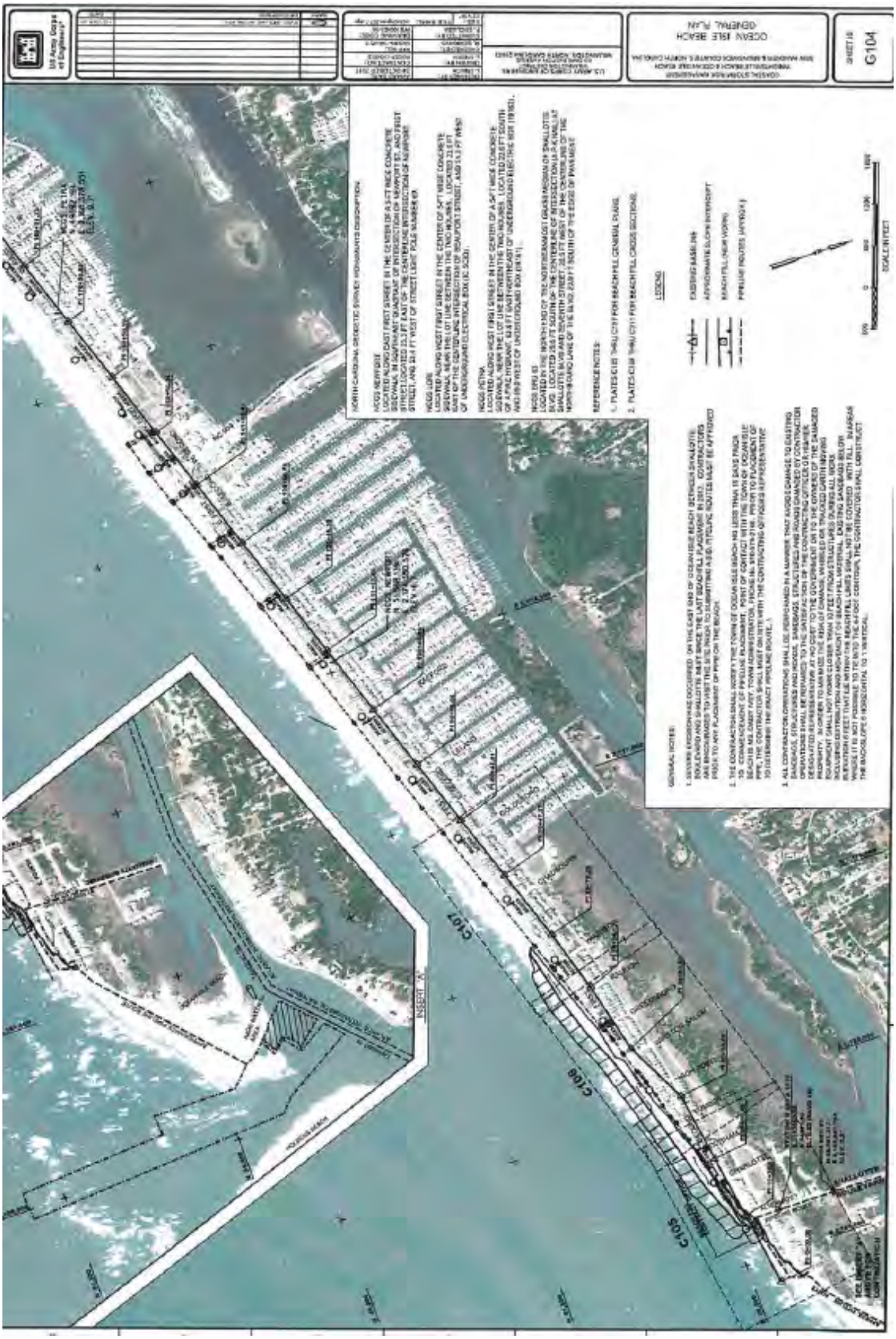


2014 CSRM Project Plan



2014 CSRM Pre and Post Construction Images

2018 CSRM Project Plan



2018 CSRM Pre and Post Construction Images

APPENDIX B:

2022 CSRM PROJECT DRAWINGS

US Army Corps of Engineers®
Wilmington District

COASTAL STORM RISK MANAGEMENT
OCEAN ISLE BEACH
BRUNSWICK COUNTY, NORTH CAROLINA

CONTRACT NO.:

IFB NO.: W912PM21B0010

ISSUE DATE: AUGUST 2021

AMENDMENTS:

SIGNATURES AFFIXED BELOW INDICATE OFFICIAL RECOMMENDATION AND APPROVAL OF ALL DRAWINGS IN THIS SET AS INDEXED ON SHEET G-001-O.

Approval Recommended: *
CHIEF, DESIGN and GENERAL ENGINEERING SECTION — P.E. — 13 AUGUST 2021 DATE

Approved: *
Gregory D. Williams P.E. — 13 AUGUST 2021
CHIEF, ENGINEERING BRANCH — DATE

* THIS PROJECT WAS DESIGNED BY THE U.S. ARMY CORPS OF ENGINEERS, WILMINGTON DISTRICT. INDIVIDUALS WHOSE SIGNATURES AND REGISTRATION DESIGNATIONS APPEAR ON THESE DOCUMENTS ARE OPERATING WITHIN THE SCOPE OF THEIR EMPLOYMENT. SIGNATURES ARE REQUIRED BY ER 1110-1-8152.

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: D. CARTER
DRAWN BY: J. CARTER
CHECKED BY: H. WILDE
SUBMITTED BY: S. MANNING
SIZE: 22"x34"
FILE NAME: C-001.dwg
ISSUE DATE: AUGUST 2021
SOLICITATION NO.: W912PM21B0010
CONTRACT NO.: TBD
DRAWING CODE: O/B 100-13-42

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403

COASTAL STORM RISK MANAGEMENT
OCEAN ISLE BEACH,
BRUNSWICK COUNTY, NORTH CAROLINA

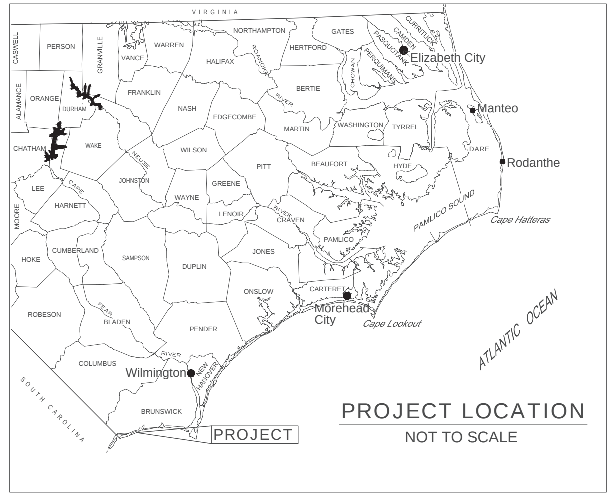
COVER SHEET

SHEET ID
G-000-O

CONTROLLED UNCLASSIFIED INFORMATION (CUI)

RTA

PROJECT OVERVIEW



PROJECT LOCATION
NOT TO SCALE

DRAWING INDEX

PLATE	TITLE
G-000-O	COVER SHEET
G-001-O	DRAWING INDEX
OCEAN ISLE BEACH	
G-101-O	SHALLOTTE INLET BORROW AREA
G-102-O	OCEAN ISLE BEACH LOCATION MAP
C-101-O	OCEAN ISLE BEACH GENERAL PLAN STA. -1+66.3 TO STA 25+00
C-102-O	OCEAN ISLE BEACH GENERAL PLAN STA. 25+00 TO STA. 53+00
C-103-O	OCEAN ISLE BEACH GENERAL PLAN STA. 53+00 TO STA. 80+00
C-301-O	OCEAN ISLE BEACH TYPICAL SECTIONS
C-302-O	OCEAN ISLE BEACH CROSS SECTIONS STA. -1+66.30 TO STA. 14+00
C-303-O	OCEAN ISLE BEACH CROSS SECTIONS STA. 16+00 TO STA. 32+00
C-304-O	OCEAN ISLE BEACH CROSS SECTIONS STA. 34+00 TO STA. 50+00
C-305-O	OCEAN ISLE BEACH CROSS SECTIONS STA. 52+00 TO STA. 68+00
C-306-O	OCEAN ISLE BEACH CROSS SECTIONS STA. 70+00 TO STA. 80+00

0 10 20
SCALE IN MILES

US Army Corps of Engineers®

MARK | DESCRIPTION | DATE

ISSUE DATE: JULY 2021
SOLICITATION NO.: W912PM21B0010
CONTRACT NO.: TBD
DRAWING CODE: OIB 100-03-62
DESIGNED BY: J. CARTER
DRAWN BY: J. CARTER
CHECKED BY: H. WILDE
SUBMITTED BY: J. MANNING
SIZE: 22"x34"
FILE NAME: G001.DWG

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403

COASTAL STORM RISK MANAGEMENT
OCEAN ISLE BEACH,
BRUNSWICK COUNTY, NORTH CAROLINA

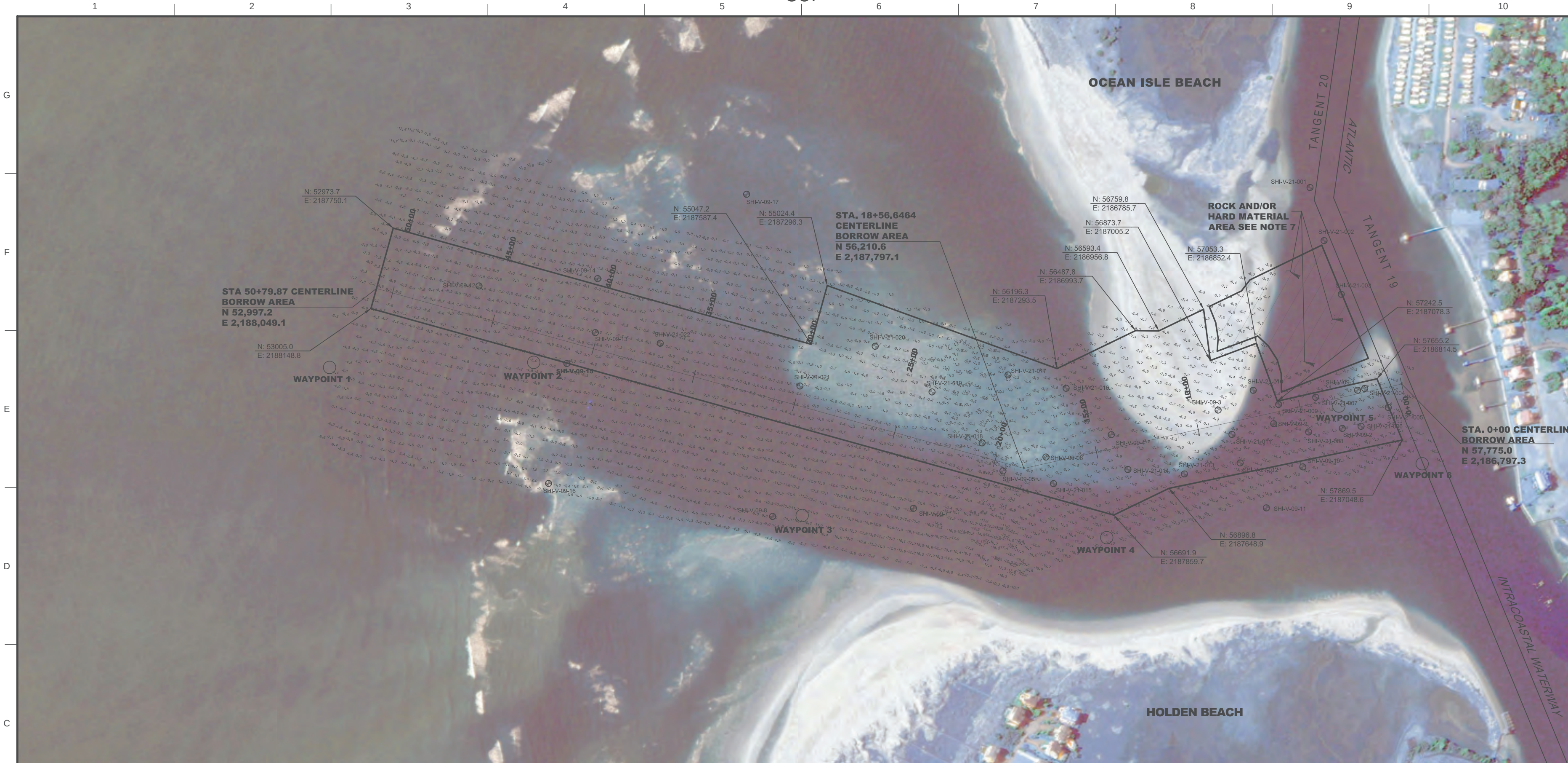
DRAWING INDEX

SHEET ID
G-001-O

CONTROLLED UNCLASSIFIED INFORMATION (CUI)

RTA

CUI



NOTES:

1. ELEVATIONS ARE IN FEET AND REFER TO NOAA'S REPORTED MEAN LOWER LOW WATER (MLLW) RELATIVE TO THE 1983-2001 TIDAL EPOCH.

2. DATE OF IMAGERY: JANUARY 2021.

3. DATE OF SURVEY: APRIL 26, 2021 AND JUNE 16 AND 30, 2021.

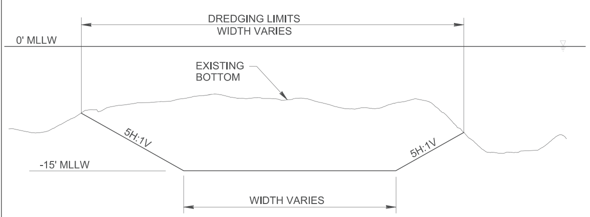
4. PROJECT SURVEYED WITH DISTRICT SURVEY VESSEL "POTTER" AND "ROGERS", USING RTK-G.P.S. HORIZONTAL POSITIONING EQUIPMENT AND 200 KHZ SOUNDING EQUIPMENT.

5. ALL COORDINATES ARE BASED ON NORTH CAROLINA STATE PLANE FEET (NAD83). VERTICAL DATUM BASED ON MLLW, FEET.

6. TIDE GAGE FOR SHALLOTTE INLET SURVEY LOCATED AT: LIGHT 83.

7. THE DREDGING SHALL BE ACCOMPLISHED SO THAT THE MOST SUITABLE MATERIAL AVAILABLE FOR BEACH RENOURISHMENT IS PLACED WITHIN THE PRESCRIBED SECTION. THIS MATERIAL SHOULD BE PREDOMINATELY OF SAND (SP, SP-SM) GRAIN SIZE WITH NO MORE THAN 10% BY WEIGHT PASSING THE NO. 200 SIEVE. SHOULD THE MATERIAL BEING PLACED ON THE BEACH CONTAIN AN AMOUNT OF SILT AND CLAY THAT EXCEEDS THE 10% BY WEIGHT PASSING THE NO. 200 SEIVE AND CONSIDERED NOT SUITABLE FOR PLACEMENT ON THE BEACH , THE CONTRACTOR SHALL MOVE THE DREDGE TO A MORE SUITABLE LOCATION WITHIN THE BORROW AREA AND NOTIFY THE CONTRACTING OFFICER OF THE LOCATION OF THE UNSUITABLE MATERIAL WITHIN THE BORROW AREA.

8. CONTRACTORS DREDGING SHALLOTTE INLET AND THE AIWW IN THE PAST HAVE ENCOUNTERED ROCK AND/OR HARD MATERIAL WITHIN THE HATCHED AREA AS SHOWN AND AT ELEVATIONS ABOVE THE BORROW AREA EXCAVATION LIMITS (-15' MLW) AS SHOWN ON THE PLANS. THE APPROXIMATE LOCATION OF THIS ROCK AND/OR HARD MATERIAL IS WITHIN THE HATCHED AREA AND BETWEEN THE EAST END OF OCEAN ISLE BEACH AND THE BORROW AREA DREDGING LIMITS AND WITHIN THE AREA BETWEEN THE BORROW AREA DREDGING LIMITS AND THE ADJACENT AIWW CHANNEL LIMITS.



A / G103 **TYPICAL SECTION - SHALLOTTE INLET**

NOT TO SCALE

ELEVATIONS OF TIDAL DATUMS REFERRED TO NORTH AMERICAN VERTICAL DATUM-1988 (NAVD 88) ARE AS FOLLOWS:

MEAN HIGHER HIGH WATER (MHHW)	= 4.73'
MEAN HIGH WATER (MHW)	= 4.40'
NORTH AMERICAN VERTICAL DATUM-1988 (NAVD)	= 2.78'
MEAN SEA LEVEL (MSL)	= 2.32'
MEAN TIDE LEVEL (MTL)	= 2.28'
NATIONAL GEODETIC VERTICAL DATUM-1929 (NGVD)	= 1.72'
LOCAL MEAN LOW WATER (MLW)	= 0.15'
MEAN LOWER LOW WATER (MLLW)	= 0.00'

LEGEND

- DREDGING LIMITS
- HARD MATERIAL AREA
- PIPELINE ROUTE
- BOREHOLE LOCATION (2009)
- BOREHOLE LOCATION (2021)

0 250 500
SCALE: 1" = 250'

US Army Corps of Engineers®

MARK | DESCRIPTION | DATE

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403

DESIGNED BY: J. CARTER	ISSUE DATE: JULY 2021
DRAWN BY: J. CARTER	SOLICITATION NO.: W912PM21B0010
CHECKED BY: H. WILDE	CONTRACT NO.: TBD
SUBMITTED BY: J. MANNING	DRAWING CODE: OIB 100-03-62
SIZE: 22"x34"	FILE NAME:

COASTAL STORM RISK MANAGEMENT
OCEAN ISLE BEACH,
BRUNSWICK COUNTY, NORTH CAROLINA

SHALLOTTE INLET
BORROW AREA

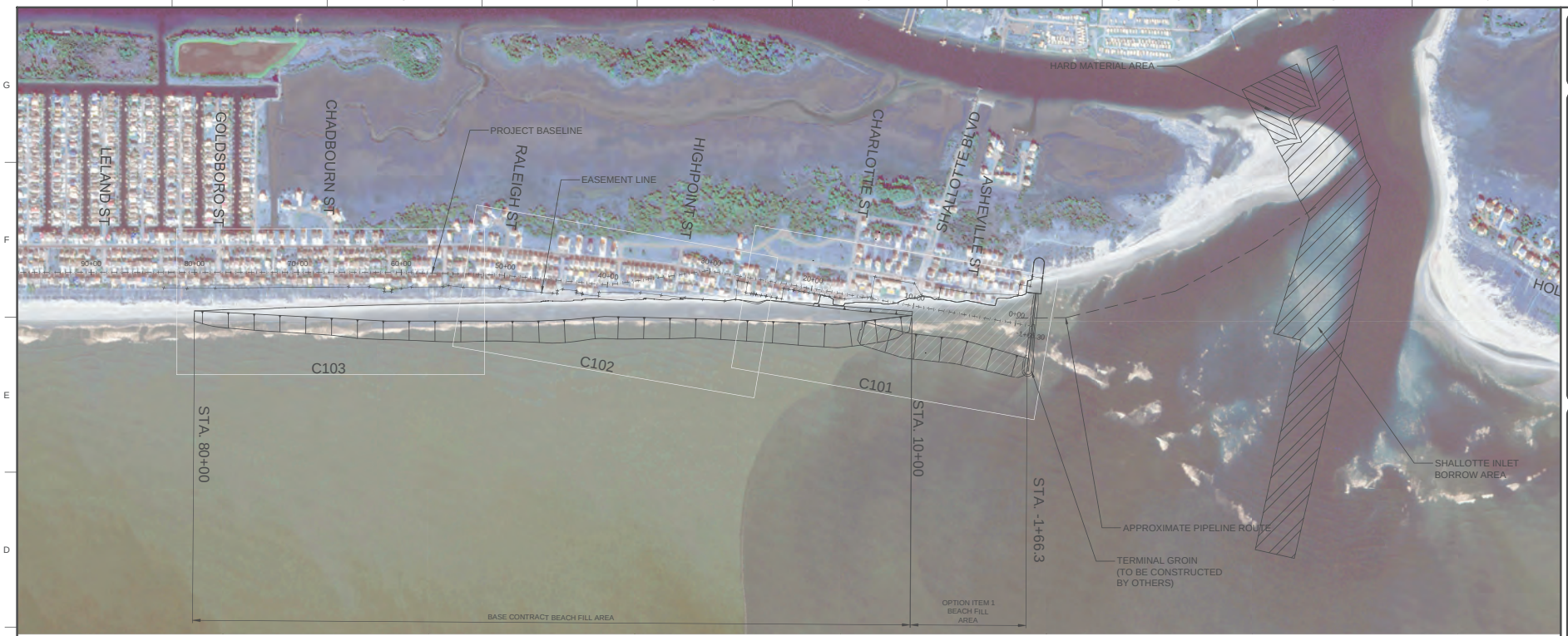
SHEET ID
G-101-O

CONTROLLED UNCLASSIFIED INFORMATION (CUI)

CUI

RTA

CUI



OCEAN ISLE BEACH EASEMENT LINE		
POINT	EASTING(FT)	NORTHING(FT)
1	2,184,996.2	54,868.5
2	2,184,899.9	54,857.4
3	2,184,912.6	54,758.1
4	2,184,812.8	54,744.9
5	2,184,825.9	54,645.0
6	2,184,387.1	54,525.0
7	2,184,337.6	54,518.0
8	2,184,089.7	54,518.0
9	2,184,102.8	54,386.1
10	2,183,934.8	54,364.2
11	2,183,835.0	54,451.3
12	2,183,450.6	54,399,7
13	2,183,473.6	54,201.2
14	2,183,234.1	54,107.5
15	2,183,185.7	54,101.0
16	2,183,135.8	54,094.5
17	2,183,085.6	54,087.9
18	2,183,036.2	54,081.4
19	2,182,986.6	54,074,9
20	2,182,938.2	54,068.5
21	2,180,887.6	54,061.9
22	2,182,839.6	54,055.6
23	2,182,789.0	54,049.0
24	2,182,738.2	54,042.3
25	2,182,738.3	54,041.9
26	2,182,689.9	54,035.9
27	2,182,639.5	54,028.9
28	2,182,652.5	53,926.9
29	2,182,604.4	53,920.7
30	2,182,601.9	53,894.0
31	2,182,552.5	53,890.6
32	2,182,503.7	53,887.2
33	2,182,500.0	53,880.4
34	2,182,453.3	53,981.1
35	2,182,404.0	53,969.5

OCEAN ISLE BEACH EASEMENT LINE		
POINT	EASTING(FT)	NORTHING(FT)
36	2,182,403.3	53,894.0
37	2,182,378.5	53,890.6
38	2,182,353.8	53,887.2
39	2,182,303.5	53,880.4
40	2,182,291.3	53,981.1
41	2,182,194.3	53,969.5
42	2,182,230.8	53,790.2
43	2,182,132.4	53,743.7
44	2,181,925.1	53,693.4
45	2,181,756.9	53,659.5
46	2,181,528.9	53,613.4
47	2,181,330.4	53,576.4
48	2,180,945.7	53,460.5
49	2,180,953.2	53,425.2
50	2,180,797.5	53,392.8
51	2,180,794.9	53,402.2
52	2,180,740.3	53,390.0
53	2,180,735.5	53,411.6
54	2,180,603.2	53,385.5
55	2,180,557.3	53,356.6
56	2,180,563.5	53,329.1
57	2,180,520.5	53,319.4
58	2,180,416.8	53,293.7
59	2,180,102.9	53,228.1
60	2,180,016.6	53,229.0
61	2,180,018.7	53,212.8
62	2,179,677.7	53,115.7
63	2,179,538.3	53,091.1
64	2,179,489.5	53,062.1
65	2,179,199.4	52,969.9
66	2,179,109.5	52,926.6
67	2,179,022.5	52,889.9
68	2,179,028.8	52,868.5
69	2,178,961.5	52,848.7
70	2,178,953.1	52,877.2

OCEAN ISLE BEACH EASEMENT LINE		
POINT	EASTING(FT)	NORTHING(FT)
71	2,178,811.3	52,850.1
72	2,178,618.5	52,790.3
73	2,178,476.1	52,751.5
74	2,178,435.6	52,730.2
75	2,178,100.4	52,622.7
76	2,177,677.2	52,486.5
77	2,177,434.8	52,410.4
78	2,177,388.5	52,393.9
79	2,177,129.7	52,309.3
80	2,176,914.2	52,248.1

OCEAN ISLE BEACH BASELINE STATION G.P.S. POINTS		
STATION	EASTING(FT)	NORTHING(FT)
-1+66.30	2,185,047-X	54,395-Y
0+00.76	2,184,881-X	54,374-Y
9+99.99	2,183,890-X	54,241-Y
20+00.00	2,182,898-X	54,109-Y
30+20.99	2,181,887-X	53,974-Y
39+92.97	2,181,010-X	53,555-Y
50+34.10	2,179,991-X	53,338-Y
59+70.37	2,179,090-X	53,084-Y
70+47.24	2,178,062-X	52,763-Y
80+42.34	2,178,062-X	52,467-Y

NOTES

1. SAND RAMPS SHALL BE CONSTRUCTED OVER PIPE ALONG THE PIPELINE ROUTE AT EACH BEACH ACCESS. IN NO CASE SHALL DISTANCE BETWEEN RAMPS EXCEED 400 FEET. CONTRACTOR MAY BE REQUIRED TO BURY PIPE AT HANDICAPPED RAMPS OR VEHICULAR BEACH ACCESS POINTS.
2. TILLING OF THE BEACH FILL SHALL BE PERFORMED IN ACCORDANCE WITH CONTRACT SPECIFICATION SECTION 01 57 19 AS DIRECTED BY THE CONTRACTING OFFICER REPRESENTATIVE.
3. HORIZONTAL CONTROL IN FEET, N.C. STATE PLANE COORDINATES NAD 83. VERTICAL CONTROL IN FEET NAVD 88.
4. IMAGERY DATE: JANUARY 2021.
5. PIPELINE ROUTE ON THE OCEAN ISLE BEACH PORTION OF THE PROJECT SHALL BE COORDINATED WITH THE TOWN OF OCEAN ISLE BEACH AND RESOURCE AGENCIES AND BE APPROVED BY THE CONTRACTING OFFICER PRIOR TO CONSTRUCTION. POINT OF CONTACT WITH THE TOWN OF OCEAN ISLE BEACH IS MS. DAISEY IVEY, TOWN ADMINISTRATOR PHONE No. 910-579-2166. THE CONTRACTOR IS REQUIRED TO GIVE CONTRACTING OFFICER 15 DAY ADVANCE NOTICE OF NEED OF PIPELINE DELINEATION .
6. ALL CONTRACTOR OPERATIONS SHALL BE PERFORMED IN A MANNER THAT AVOIDS DAMAGE TO EXISTING SANDBAGS, STRUCTURES AND ROADS. SANDBAGS, STRUCTURES AND ROADS DAMAGED BY CONTRACTOR OPERATIONS SHALL BE REPAIRED TO THE SATISFACTION OF THE CONTRACTING OFFICER OR HIS/HER DESIGNATED REPRESENTATIVE AT NO COST TO GOVERNMENT OR THE OWNERS OF THE DAMAGED PROPERTY. IN ORDER TO MINIMIZE THE RISK OF DAMAGE, WHEELED OR TRACKED EARTH MOVING EQUIPMENT SHALL NOT WORK CLOSER THAN 10 FEET FROM SANDBAGS AND STRUCTURES DURING ALL WORK INCLUDING DISTRIBUTION AND MOVEMENT OF BEACH FILL MATERIAL. IN AREAS WHERE IT IS NOT POSSIBLE TO TIE INTO THE 6-FOOT CONTOUR, THE CONTRACTOR SHALL CONSTRUCT THE BACKSLOPE AT 5 HORIZONTAL TO 1 VERTICAL.
7. PAST STORMS IN THE NORTH CAROLINA AREA SINCE THE CONTRACT SURVEYS WERE TAKEN MAY HAVE ERODED PORTIONS OF THE PROJECT AREA AND PIPELINE ROUTE. ALL CONTRACTORS ARE ENCOURAGED TO VISIT THE SITE PRIOR TO SUBMITTING A BID TO INVESTIGATE POTENTIAL PIPELINE ROUTES. ALL PIPELINE ROUTES MUST BE APPROVED PRIOR TO ANY PLACEMENT OF MATERIAL ON THE BEACH.

LEGEND

- EXISTING BASELINE
- PROPOSED PIPELINE ROUTE
- APPROXIMATE SLOPE INTERCEPT
- BEACH FILL (NEW WORK)
- BORROW AREA
- HARD MATERIAL
- OPTION ITEM 1 AREA

0 1000 2000 Feet

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: J. CARTER
DRAWN BY: J. CARTER
CHECKED BY: H. WILDE
SUBMITTED BY: J. MANNING
SIZE: 22"x34"
FILE NAME:
ISSUE DATE: JULY 2021
SOLICITATION NO: W912BV21B0010
CONTRACT NO.: TBD
DRAWING CODE: D18 210 G02

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403

COASTAL STORM RISK MANAGEMENT
OCEAN ISLE BEACH
BRUNSWICK COUNTY, NORTH CAROLINA

OCEAN ISLE BEACH
LOCATION MAP

SHEET ID
G-102-O

CONTROLLED UNCLASSIFIED INFORMATION (CUI)

CUI

RTA

CUI

NOTES:

1. THE WIDTH OF THE CONSTRUCTION BERM IS DEPENDENT UPON THE PROPORTIONAL QUANTITY OF SAND TO BE PLACED AT THE TIME OF CONSTRUCTION. THE WIDTH OF THE CONSTRUCTION BERM MAY BE ADJUSTED DURING CONSTRUCTION BASED ON THE CONTRACT BEACH PROFILE SURVEY AND THE SLOPE OF THE MATERIAL DURING PLACEMENT.
2. THE CONSTRUCTION BERM SLOPE IS DEPENDENT UPON MATERIAL PROPERTIES AND WAVE ENVIRONMENT DURING PLACEMENT.
3. EXISTING BEACH SURVEY CONDUCTED IN MAY 2021. HORIZONTAL DATUM IS IN FEET, NAD 83 AND VERTICAL DATUM IS IN FEET, NAVD 88.
4. THE CONTRACTOR SHALL CONSTRUCT SAND RAMPS OVER PIPE ALONG THE BEACH PIPELINE ROUTE. SAND RAMPS SHALL BE PLACED AT EACH BEACH ACCESS AS A MINIMUM, BUT IN NO CASE SHALL DISTANCE BETWEEN RAMPS EXCEED 400 FEET. THE SAND RAMPS SHALL BE REPAIRED IF ERODED BY WEATHER OR BEACH TRAFFIC.
5. EXISTING DUNES AND BEACH GRASS SHALL BE PROTECTED FROM DAMAGE DUE TO CONSTRUCTION. THE CONTRACTOR SHALL PROTECT ALL EXISTING STRUCTURES ON THE BEACH, INCLUDING ACCESS RAMPS, SIGNAGE, FENCES, ETC. FROM DAMAGE DUE TO CONSTRUCTION.
6. THE CONTRACTOR SHALL CONDUCT DAILY OPERATIONS TO CLEAN UP TRASH AND DEBRIS PUMPED ON TO THE BEACH BY DREDGING OPERATIONS AND/OR FOUND ON THE BEACH WITHIN THE LIMITS OF CONSTRUCTION. DEBRIS AND WASTE SHALL BE PROPERLY SECURED AND DISPOSED OF ON A WEEKLY BASIS.
7. THE CONTRACTOR SHALL BE REQUIRED TO PERFORM SAFETY PATROL TO MINIMIZE PEDESTRIAN TRAFFIC THRU THE LIMITS OF CONSTRUCTION AT LEAST 500' AHEAD AND BEHIND THE POINT OF DISCHARGE. MEASURES TO INCLUDE MOVEABLE SAFETY FENCE AT THESE LMITS TO EXTEND FROM DUNE TO THE WATERS EDGE, CLOSURE OF ANY PEDESTRIAN ACCESS RAMPS WITHIN THE DIRECT VICINITY OF THE DREDGING OPERATIONS, AND WARNING SIGNS AT ALL PEDESTRIAN RAMPS AND PUBLIC ACCESS WAYS.

NOTES CONTINUED:

8. NO BEACH FILL MATERIAL SHALL BE PLACED LANDWARD OF THE TEMPORARY CONSTRUCTION EASEMENT LINE, OR WITHIN 10 FEET OF OR UNDERNEATH ANY RESIDENTIAL BUILDINGS. THE CONTRACTOR SHALL BE REQUIRED TO SLOPE (5H:1V) THE LANDWARD SIDE OF THE BERM WHERE NECESSARY TO AVOID PLACING BEACH FILL MATERIAL LANDWARD OF THE TEMPORARY CONSTRUCTION EASEMENT LINE, OR WITHIN 10 FEET OF OR UNDERNEATH ANY RESIDENTIAL BUILDINGS.
9. THE CONTRACTOR SHALL EXTEND 6.0' NAVD BERM CREST HORIZONTALLY LANDWARD, WHERE POSSIBLE TO THE POINT OF INTERSECTION WITH THE EXISTING GROUND OR DUNE EXCEPT AT LOCATIONS AS NOTED BY THE TYPICAL SECTIONS AND/OR AS DIRECTED BY THE CONTRACTING OFFICER.
10. SANDBAGS HAVE BEEN PLACED ALONG THE BEACH AND IN FRONT OF EXISTING STRUCTURES BETWEEN THE PROJECT START AND DURHAM ST. THE CONTRACTOR SHALL NOT DIRECTLY PLACE SAND EITHER HYDRAULICALLY OR MECHANICALLY , ON ANY EXPOSED SANDBAGS, PRIOR TO BEGINNING WORK ON OCEAN ISLE BEACH, THE CONTRACTOR SHALL CONDUCT AN ONSITE MEETING WITH THE CONTRACTING OFFICER OR HIS/HER REPRESENTATIVE AND A REPRESENTATIVE FROM THE NC DIVISION OF COASTAL MANAGEMENT TO IDENTIFY AND DISCUSS NECESSARY MEASURES TO BE TAKEN REGARDING WORK AROUND THE SAND BAGS.

LEGEND

- EXISTING BASELINE
- EXISTING INDEX CONTOURS
- EXISTING INTERMEDIATE CONTOURS
- MHW — EXISTING MEAN HIGH WATER LINE (APPROX.)
- APPROXIMATE SLOPE INTERCEPT
- BEACH FILL (NEW WORK)
- CONTRACT OPTION WORK AREA
- ★V PUBLIC BEACH ACCESS (STAR) IF VEHICLE ACCESS (V)

0 100 200 Feet

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: J. CARTER
DRAWN BY: J. CARTER
CHECKED BY: H. WILDE
SUBMITTED BY: M. HAWKINS
SIZE: 22"x34"
ISSUE DATE: JULY 2021
SOLICITATION NO: W912BV21B0010
CONTRACT NO.: TBD
DRAWING CODE: D18 210 0812
FILE NAME:

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403

COASTAL STORM RISK MANAGEMENT
OCEAN ISLE BEACH
BRUNSWICK COUNTY, NORTH CAROLINA

OCEAN ISLE BEACH
GENERAL PLAN
STA. -1+66.3 TO STA. 25+00

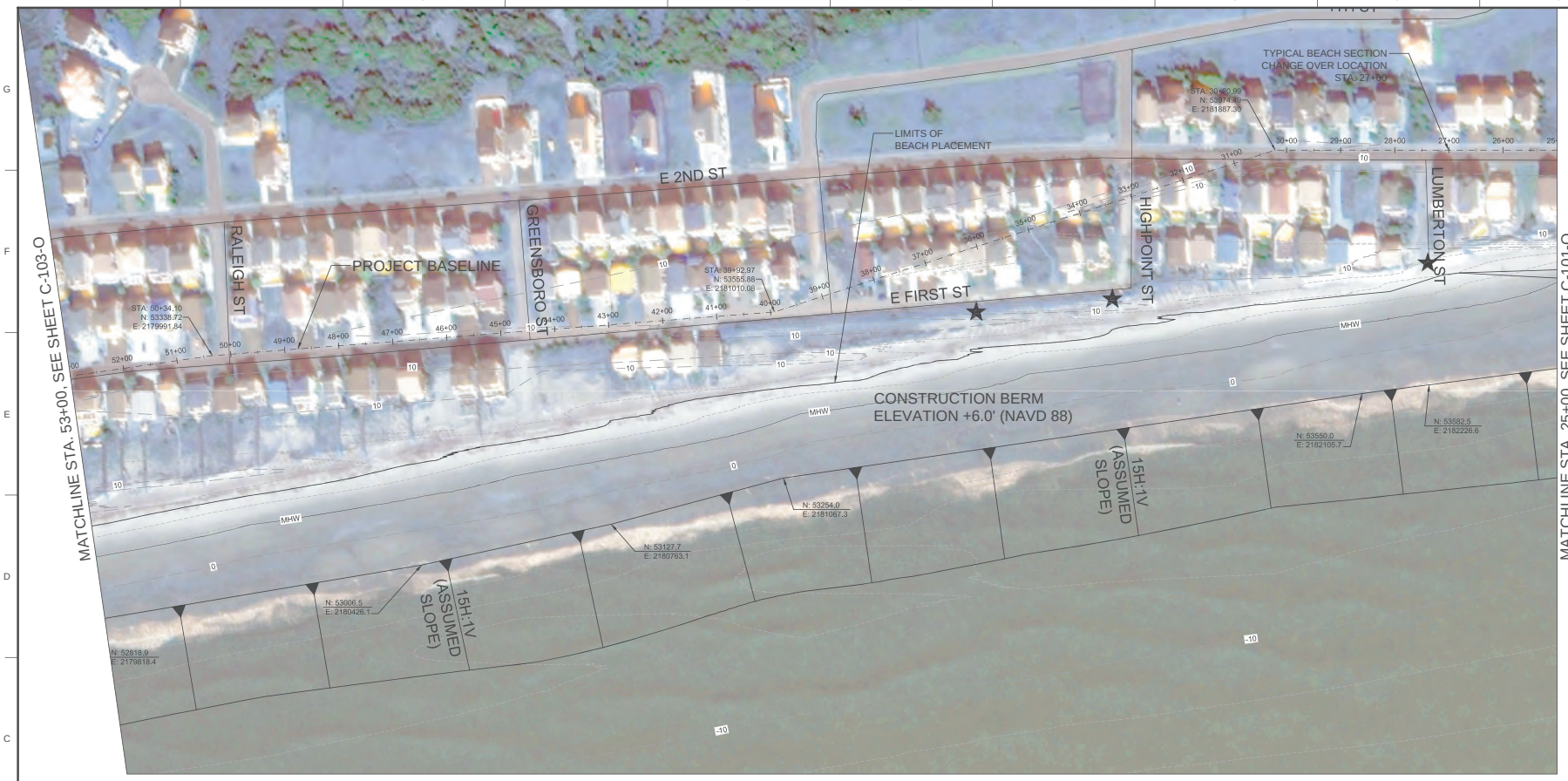
SHEET ID
C-101-O

CONTROLLED UNCLASSIFIED INFORMATION (CUI)

CUI

RTA

CUI



NOTES:

1. THE WIDTH OF THE CONSTRUCTION BERM IS DEPENDENT UPON THE PROPORTIONAL QUANTITY OF SAND TO BE PLACED AT THE TIME OF CONSTRUCTION. THE WIDTH OF THE CONSTRUCTION BERM MAY BE ADJUSTED DURING CONSTRUCTION BASED ON THE CONTRACT BEACH PROFILE SURVEY AND THE SLOPE OF THE MATERIAL DURING PLACEMENT.
2. THE CONSTRUCTION BERM SLOPE IS DEPENDENT UPON MATERIAL PROPERTIES AND WAVE ENVIRONMENT DURING PLACEMENT.
3. EXISTING BEACH SURVEY CONDUCTED IN MAY 2021. HORIZONTAL DATUM IS IN FEET, NAD 83 AND VERTICAL DATUM IS IN FEET, NAVD 88.
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5. EXISTING DUNES AND BEACH GRASS SHALL BE PROTECTED FROM DAMAGE DUE TO CONSTRUCTION. THE CONTRACTOR SHALL PROTECT ALL EXISTING STRUCTURES ON THE BEACH, INCLUDING ACCESS RAMPS, SIGNAGE, FENCES, ETC. FROM DAMAGE DUE TO CONSTRUCTION.
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7. THE CONTRACTOR SHALL BE REQUIRED TO PERFORM SAFETY PATROL TO MINIMIZE PEDESTRIAN TRAFFIC THRU THE LIMITS OF CONSTRUCTION AT LEAST 500' AHEAD AND BEHIND THE POINT OF DISCHARGE. MEASURES TO INCLUDE MOVEABLE SAFETY FENCE AT THESE LMITS TO EXTEND FROM DUNE TO THE WATERS EDGE, CLOSURE OF ANY PEDESTRIAN ACCESS RAMPS WITHIN THE DIRECT VICINITY OF THE DREDGING OPERATIONS, AND WARNING SIGNS AT ALL PEDESTRIAN RAMPS AND PUBLIC ACCESS WAYS.

NOTES CONTINUED:

8. NO BEACH FILL MATERIAL SHALL BE PLACED LANDWARD OF THE TEMPORARY CONSTRUCTION EASEMENT LINE, OR WITHIN 10 FEET OF OR UNDERNEATH ANY RESIDENTIAL BUILDINGS. THE CONTRACTOR SHALL BE REQUIRED TO SLOPE (5H:1V) THE LANDWARD SIDE OF THE BERM WHERE NECESSARY TO AVOID PLACING BEACH FILL MATERIAL LANDWARD OF THE TEMPORARY CONSTRUCTION EASEMENT LINE, OR WITHIN 10 FEET OF OR UNDERNEATH ANY RESIDENTIAL BUILDINGS.
9. THE CONTRACTOR SHALL EXTEND 6.0' NAVD BERM CREST HORIZONTALLY LANDWARD, WHERE POSSIBLE TO THE POINT OF INTERSECTION WITH THE EXISTING GROUND OR DUNE EXCEPT AT LOCATIONS AS NOTED BY THE TYPICAL SECTIONS AND/OR AS DIRECTED BY THE CONTRACTING OFFICER.
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LEGEND

- EXISTING BASELINE
- EXISTING INDEX CONTOURS
- EXISTING INTERMEDIATE CONTOURS
- MHW — EXISTING MEAN HIGH WATER LINE (APPROX.)
- APPROXIMATE SLOPE INTERCEPT
- BEACH FILL (NEW WORK)
- PUBLIC BEACH ACCESS (STAR) IF VEHICLE ACCESS (V)

0 100 200 Feet

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403

DESIGNED BY: J. CARTER
DRAWN BY: J. CARTER
CHECKED BY: H. WILDE
SUBMITTED BY: J. MANNING
SIZE: 22"x34"
ISSUE DATE: JULY 2021
SOLICITATION NO.: W912BV21B0010
CONTRACT NO.: TBD
DRAWING CODE: 018 105 0402
FILE NAME:

COASTAL STORM RISK MANAGEMENT
OCEAN ISLE BEACH
BRUNSWICK COUNTY, NORTH CAROLINA

OCEAN ISLE BEACH
GENERAL PLAN
STA. 25+00 TO STA. 53+00

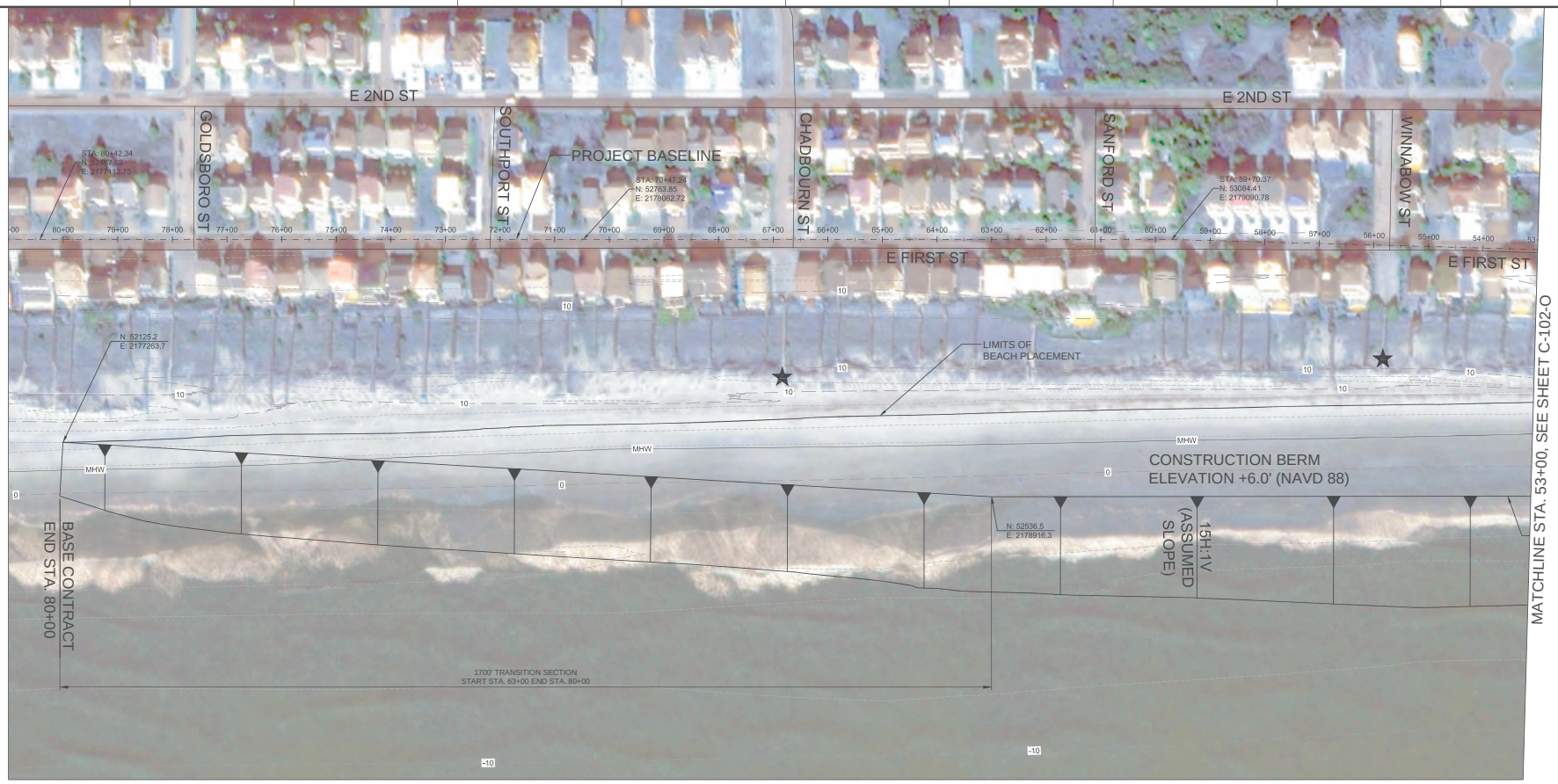
SHEET ID
C-102-O

CONTROLLED UNCLASSIFIED INFORMATION (CUI)

CUI

RTA

CUI



NOTES:

1. THE WIDTH OF THE CONSTRUCTION BERM IS DEPENDENT UPON THE PROPORTIONAL QUANTITY OF SAND TO BE PLACED AT THE TIME OF CONSTRUCTION. THE WIDTH OF THE CONSTRUCTION BERM MAY BE ADJUSTED DURING CONSTRUCTION BASED ON THE CONTRACT BEACH PROFILE SURVEY AND THE SLOPE OF THE MATERIAL DURING PLACEMENT.
2. THE CONSTRUCTION BERM SLOPE IS DEPENDENT UPON MATERIAL PROPERTIES AND WAVE ENVIRONMENT DURING PLACEMENT.
3. EXISTING BEACH SURVEY CONDUCTED IN MAY 2021. HORIZONTAL DATUM IS IN FEET, NAD 83 AND VERTICAL DATUM IS IN FEET, NAVD 88.
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NOTES CONTINUED:

8. NO BEACH FILL MATERIAL SHALL BE PLACED LANDWARD OF THE TEMPORARY CONSTRUCTION EASEMENT LINE, OR WITHIN 10 FEET OF OR UNDERNEATH ANY RESIDENTIAL BUILDINGS. THE CONTRACTOR SHALL BE REQUIRED TO SLOPE (5H:1V) THE LANDWARD SIDE OF THE BERM WHERE NECESSARY TO AVOID PLACING BEACH FILL MATERIAL LANDWARD OF THE TEMPORARY CONSTRUCTION EASEMENT LINE, OR WITHIN 10 FEET OF OR UNDERNEATH ANY RESIDENTIAL BUILDINGS.
9. THE CONTRACTOR SHALL EXTEND 6.0' NAVD BERM CREST HORIZONTALLY LANDWARD, WHERE POSSIBLE TO THE POINT OF INTERSECTION WITH THE EXISTING GROUND OR DUNE EXCEPT AT LOCATIONS AS NOTED BY THE TYPICAL SECTIONS AND/OR AS DIRECTED BY THE CONTRACTING OFFICER.
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LEGEND

- EXISTING BASELINE
- EXISTING INDEX CONTOURS
- EXISTING INTERMEDIATE CONTOURS
- MHW — EXISTING MEAN HIGH WATER LINE (APPROX.)
- APPROXIMATE SLOPE INTERCEPT
- BEACH FILL (NEW WORK)
- PUBLIC BEACH ACCESS (STAR) IF VEHICLE ACCESS (V)

N

0 100 200 Feet

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403

DESIGNED BY: J. CARTER
DRAWN BY: J. CARTER
CHECKED BY: H. WILDE
SUBMITTED BY: MATTHEW GRAY
SIZE: 22"x34"

ISSUE DATE: JULY 2021
SOLICITATION NO: W912HN-21-B-0010
CONTRACT NO.: TBD
DRAWING CODE: D18 210 0812
FILE NAME:

COASTAL STORM RISK MANAGEMENT
OCEAN ISLE BEACH,
BRUNSWICK COUNTY, NORTH CAROLINA

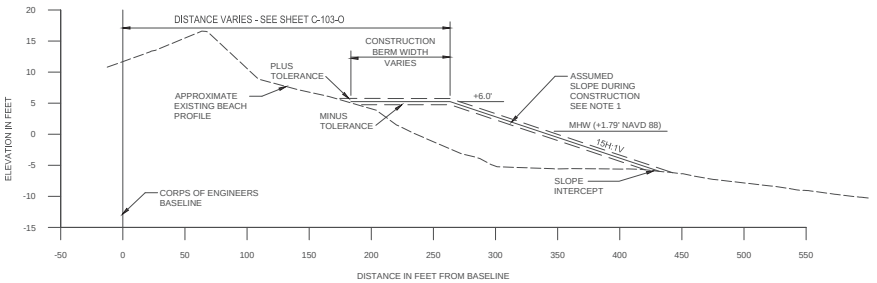
OCEAN ISLE BEACH
GENERAL PLAN
STA. 53+00 TO STA. 81+00

SHEET ID
C-103-O

CONTROLLED UNCLASSIFIED INFORMATION (CUI)

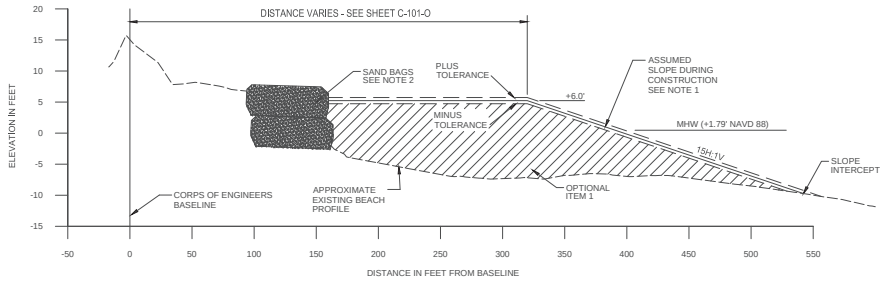
CUI

RTA



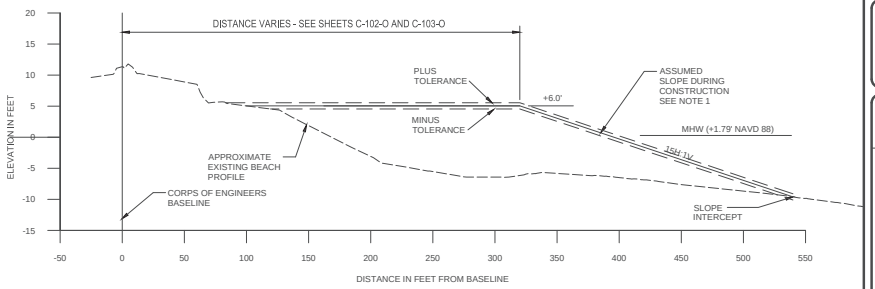
TYPICAL BEACH TRANSITION SECTION
SOUTH END

STA. 63+00 TO STA. 80+00



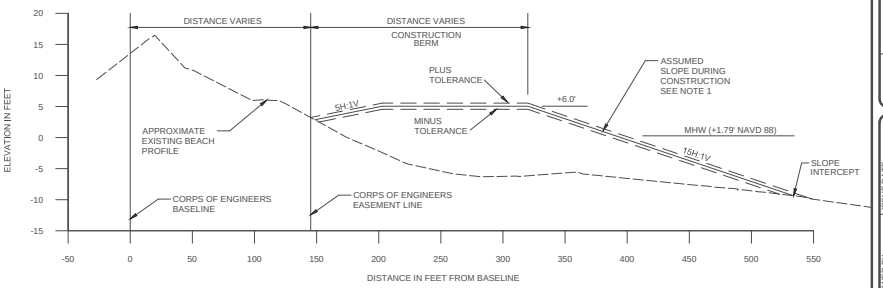
TYPICAL OPTIONAL BEACH BERM SECTION

STA. -1+66.3 TO STA. 10+00



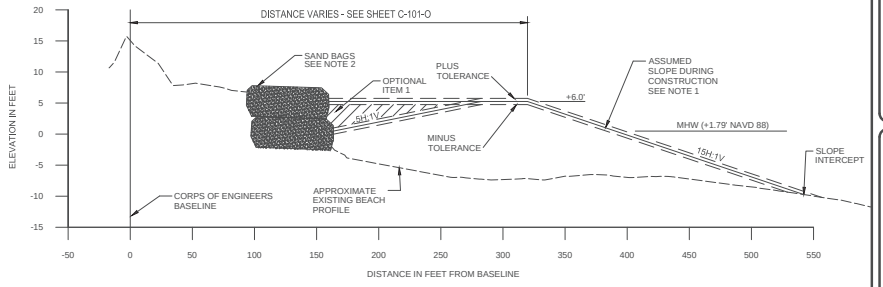
TYPICAL BEACH BERM SECTION

STA. 27+00 TO STA. 63+00



TYPICAL BEACH BERM SECTION

STA. 19+50 TO STA. 27+00



TYPICAL BEACH BERM SECTION

STA. 10+00 TO STA. 19+50

NOTES:

1. THE WIDTH OF THE CONSTRUCTION BERM IS DEPENDENT UPON THE PROPORTIONAL QUANTITY OF SAND TO BE PLACED AT THE TIME OF CONSTRUCTION. THE BASIS FOR DETERMINING THE WIDTH OF THE CONSTRUCTION BERM WILL BE THE GOVERNMENT'S INTERPRETATION OF THE BORROW AREA AND BEACH PROFILE SURVEY, AND THE SLOPE OF THE MATERIAL DURING PLACEMENT.
2. THERE SHALL BE NO CONSTRUCTION OR BEACH FILL PLACED BEYOND THE LANDWARD SIDE OF THE SANDBAGS. SANDBAG LIMITS SHOWN ARE APPROXIMATE AND SHALL BE FIELD VERIFIED BY THE CONTRACTOR.
3. THE CONSTRUCTION BERM SLOPE IS DEPENDENT UPON MATERIAL PROPERTIES AND WAVE ENVIRONMENT DURING PLACEMENT. THE 15H:1V SEAWARD SLOPE IS THE INITIAL ASSUMED SLOPE FOR PAYMENT AND QUANTITY PURPOSES.
4. EXISTING BEACH SURVEY COMPLETED IS MAY 2021. HORIZONTAL DATUM IS IN FEET, NAD 83 AND VERTICAL DATUM IS IN FEET, NAVD 88.
5. TYPICAL BEACH SECTION STATION LIMITS ARE APPROXIMATE AND ARE SUBJECT TO CHANGE BASED ON EXISTING BEACH CONDITIONS.
6. THE CONTRACTOR SHALL NOT REMOVE OR RELOCATE ANY EXISTING BEACH MATERIAL THAT IS ABOVE THE BEACH FILL PROFILE PRIOR TO CONSTRUCTION.
7. AS AN OPTION TO THE CONTRACT AND AT THE DIRECTION OF THE CONTRACTING OFFICER, THE CONTRACTOR SHALL TILL ANY FILL AREAS IDENTIFIED BY THE CONTRACTING OFFICER. BEACH TILLING LIMITS SHALL BE ALONG THE ENTIRE LENGTH OF THE BEACH FILL AREA FROM THE SEAWARD TOE OF THE STORM BERM TO MEAN HIGH WATER (ELEV. +1.79' NAVD88)
8. A VERTICAL TOLERANCE OF +/- 0.5' ABOVE AND BELOW THE PRESCRIBED BERM AND DUNE GRADE AND SLOPES LINE SHALL BE PERMITTED IN THE FINISHED SURFACE. BELOW THE MEAN HIGH WATER LINE (+/-1.79' NAVD88) THE FILL MATERIAL WILL BE ALLOWED TO ASSUME ITS NATURAL SLOPE RESULTING FROM THE EFFECTS OF WAVE AND WATER LEVEL CONDITIONS. FOR PAYMENT PURPOSES, THE TOLERANCE LINE SHALL EXTEND THE ENTIRE BERM AND SLOPES (LANDWARD, INTERMEDIATE, AND ASSUMED SEAWARD SLOPE) TO THE INTERSECTION OF THE LANDWARD AND ASSUMED SEAWARD SLOPE AND PRE-CONSTRUCTION SURVEYED CONDITION, SEE SPECIFICATION SECTION 35 20 23 FOR MEASUREMENT AND PAYMENT AND ALLOWABLE TOLERANCE.

VERT. 10 0 10 20 30
HORZ. 50 0 50 100 150
SCALE IN FEET

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: J. CARTER
DRAWN BY: J. CARTER
CHECKED BY: H. WILDE
SUBMITTED BY: J. MANNING
SCALE: 2"x3/4"
ISSUE DATE: JULY 2021
SOLICITATION NO: W912PM21B0010
CONTRACT NO.: TBD
DRAWING CODE: O/B 100-13-02
FILE NAME: C301.DWG

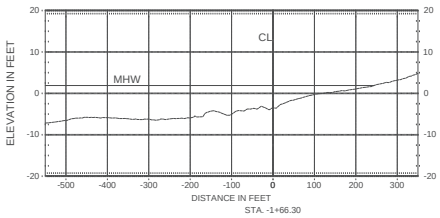
U.S. ARMY, CORPS OF ENGINEERS
WILMINGTON DISTRICT
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403

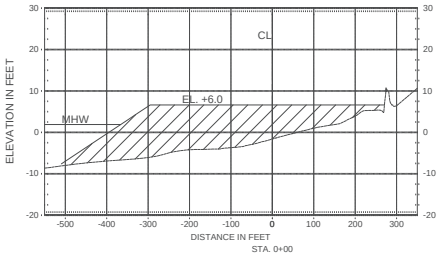
COASTAL STORM RISK MANAGEMENT
OCEAN ISLE BEACH,
BRUNSWICK COUNTY, NORTH CAROLINA

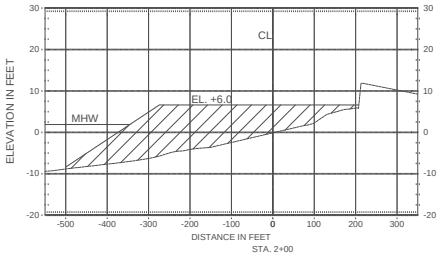
OCEAN ISLE BEACH
TYPICAL SECTIONS

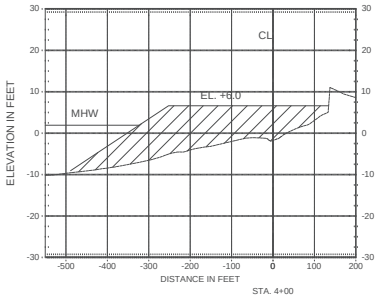
SHEET ID
C-301-O

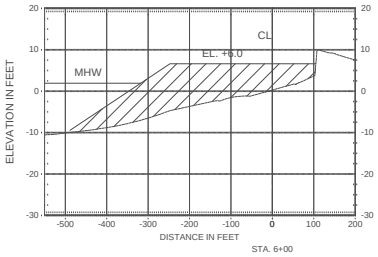
CONTROLLED UNCLASSIFIED INFORMATION (CUI)

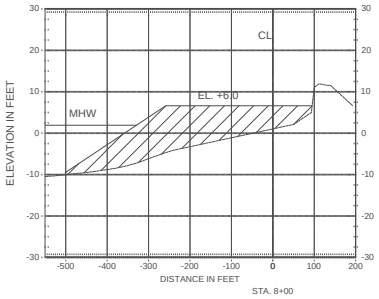


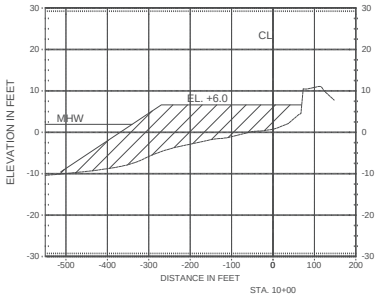


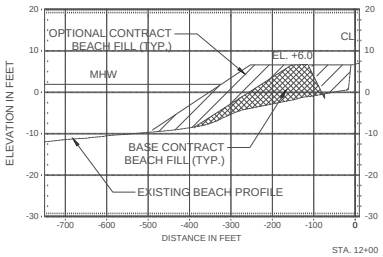


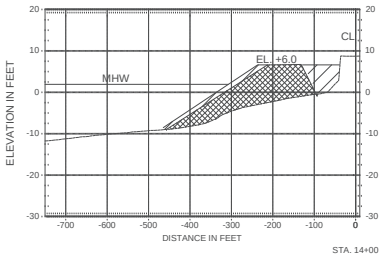












NOTES:
1. SANDBAGS NOT SHOWN FOR CLARITY.
2. VERTICAL DATUM IS IN FEET, NAVD 88.

0 30 60 Feet
VERTICAL UNITS: 1" = 15'

0 300 600 Feet
HORIZONTAL UNITS: 1" = 150'

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403

DESIGNED BY: J. CARTER
DRAWN BY: J. CARTER
CHECKED BY: H. WILDE
SUBMITTED BY: J. MANNING
SIZE: 22"X34"

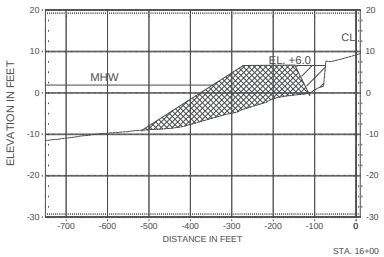
ISSUE DATE: MM/MM/MMM YYYY
SOLICITATION NO.: XXXXXXXX-XX-XXXX
CONTRACT NO.: XXXXXX-XX-X-XXXX

COASTAL STORM RISK MANAGEMENT
OCEAN ISLE BEACH, NC
BRUNSWICK COUNTY, NORTH CAROLINA

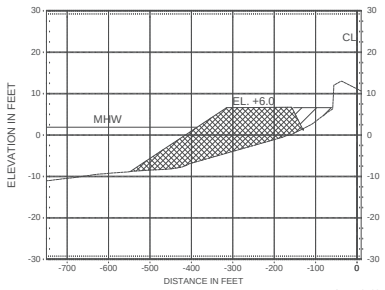
OCEAN ISLE BEACH
CROSS SECTIONS
STA. -1+66.30 TO STA. 14+00

SHEET ID
C-302

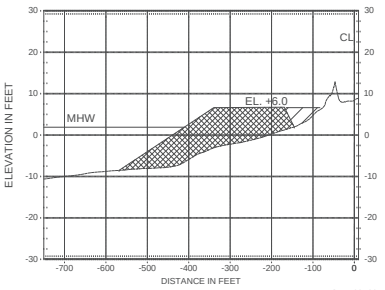
BCOES REVIEW



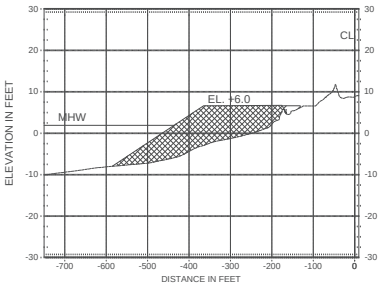
STA. 16+00



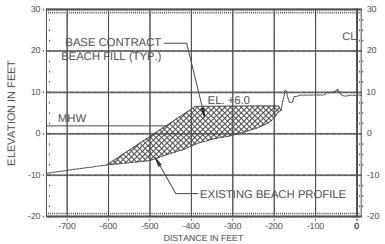
STA. 18+00



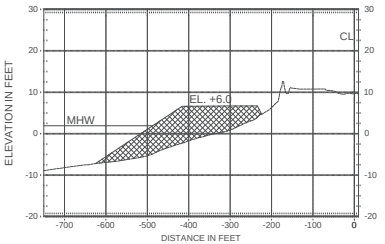
STA. 20+00



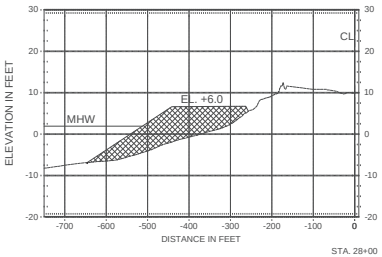
STA. 22+00



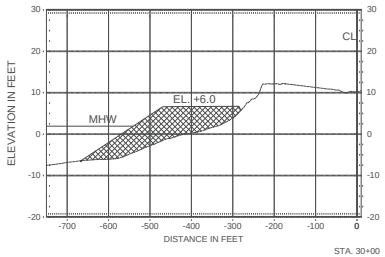
STA. 24+00



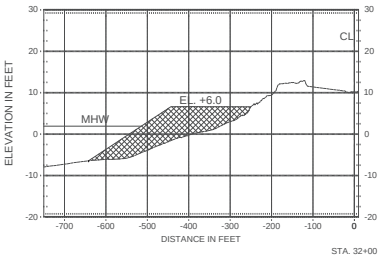
STA. 26+00



STA. 28+00



STA. 30+00



STA. 32+00

NOTES:
1. SANDBAGS NOT SHOWN FOR CLARITY.
2. VERTICAL DATUM IS IN FEET, NAVD 88.

0 30 60 Feet
VERTICAL UNITS: 1" = 15'

0 300 600 Feet
HORIZONTAL UNITS: 1" = 150'

US Army Corps of Engineers

MARK	DESCRIPTION	DATE

DESIGNED BY: J. CARTER
DRAWN BY: J. CARTER
CHECKED BY: H. WILDE
SUBMITTED BY: J. MAWKINS
SIZE: 22"X34"
ISSUE DATE: MM/MM/MMM YYYY
SOLICITATION NO.: XXXXXXXX-XX-XXXX
CONTRACT NO.: XXXXXX-X-X-XXXX

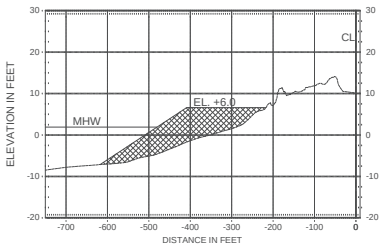
U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403

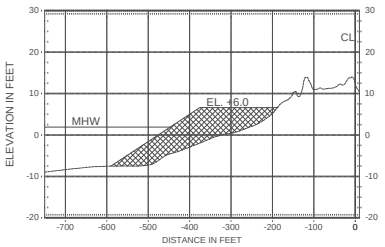
COASTAL STORM RISK MANAGEMENT
OCEAN ISLE BEACH
BRUNSWICK COUNTY, NORTH CAROLINA

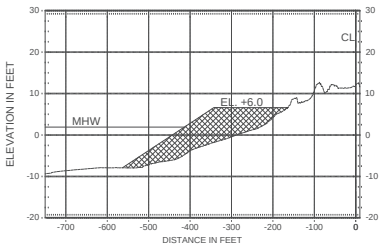
OCEAN ISLE BEACH
CROSS SECTIONS
STA. 16+00 TO STA. 32+00

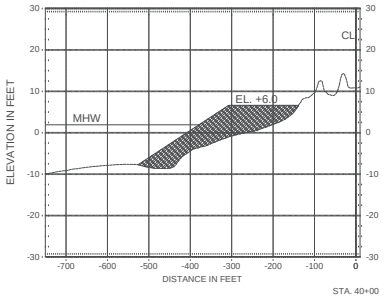
SHEET ID
C-303

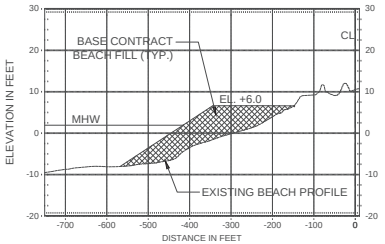
BCOES REVIEW

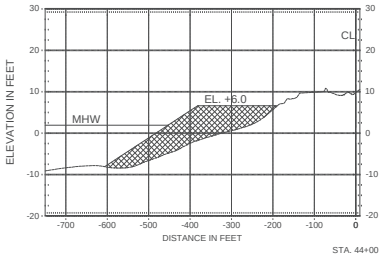


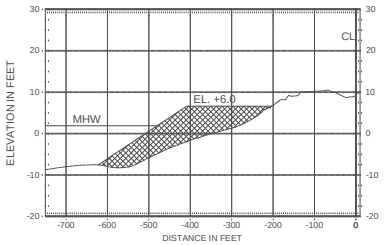


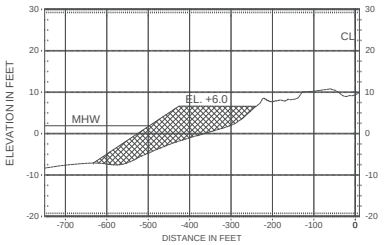


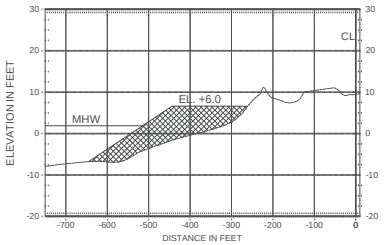












NOTES:
1. VERTICAL DATUM IS IN FEET, NAVD 88.

0 30 60 Feet
VERTICAL UNITS: 1" = 15'

0 300 600 Feet
HORIZONTAL UNITS: 1" = 150'

US Army Corps of Engineers

MARK	DESCRIPTION	DATE

DESIGNED BY: J. CARTER
DRAWN BY: J. CARTER
CHECKED BY: H. WILDE
SUBMITTED BY: J. MAWKINS
SIZE: 22"X34"

ISSUE DATE: MM/MM/MMM YYYY
SOLICITATION NO.: XXXTACX-X-XXXX
CONTRACT NO.: XXXXX-XX-X-XXXX

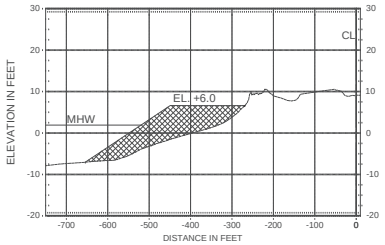
U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403

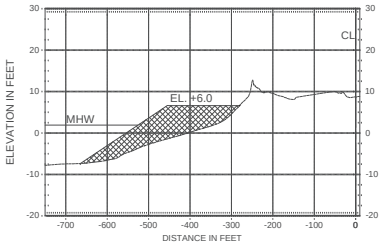
COASTAL STORM RISK MANAGEMENT
OCEAN ISLE BEACH
BRUNSWICK COUNTY, NORTH CAROLINA

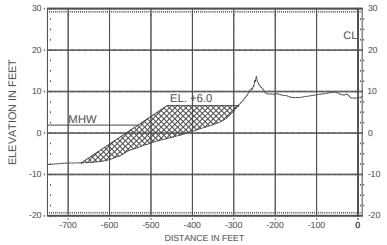
OCEAN ISLE BEACH
CROSS SECTIONS
STA. 34+00 TO STA. 50+00

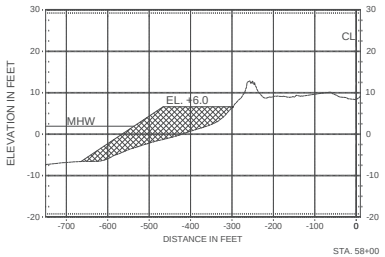
SHEET ID
C-304

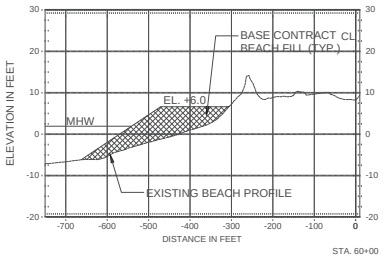
BCOES REVIEW

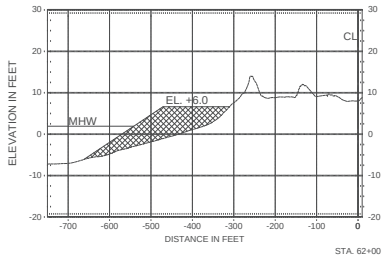


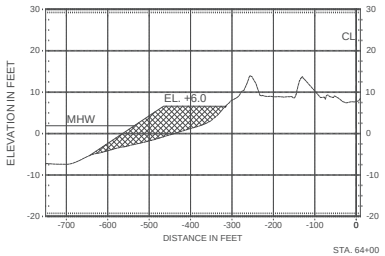


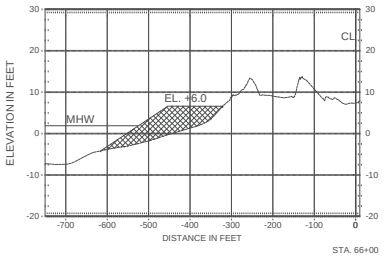


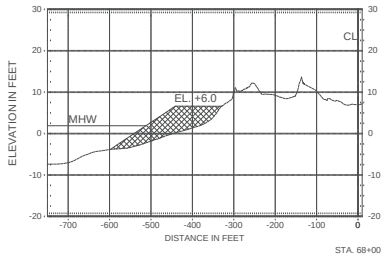




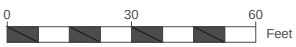




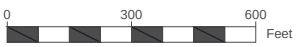




NOTES:
1. VERTICAL DATUM IS IN FEET, NAVD 88.



VERTICAL UNITS: 1" = 15'



HORIZONTAL UNITS: 1" = 150'

US Army Corps of Engineers

MARK	DESCRIPTION	DATE

DESIGNED BY: J. CARTER
DRAWN BY: J. CARTER
CHECKED BY: H. WILDE
SUBMITTED BY: J. MAYNARD
SIZE: 22"X34"

ISSUE DATE: MM/MM/MMMM YYYY
SOLICITATION NO.: XXXXXXXX-XX-XXXX
CONTRACT NO.XXX
XXXXXX-XX-X-XXXX

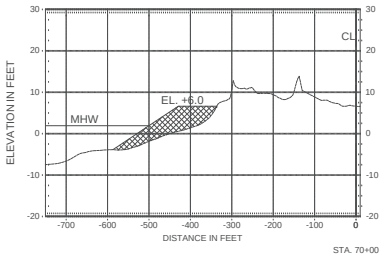
U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403

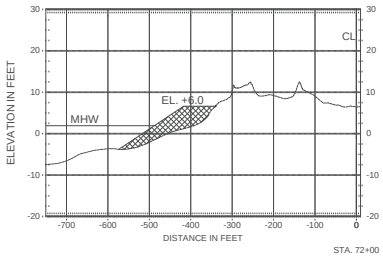
COASTAL STORM RISK MANAGEMENT
OCEAN ISLE BEACH
BRUNSWICK COUNTY, NORTH CAROLINA

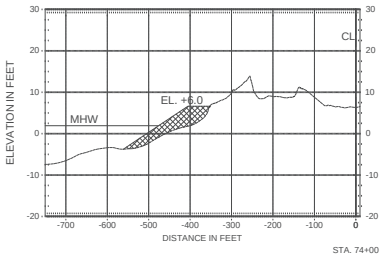
OCEAN ISLE BEACH
CROSS SECTION
STA. 52+00 TO STA. 68+00

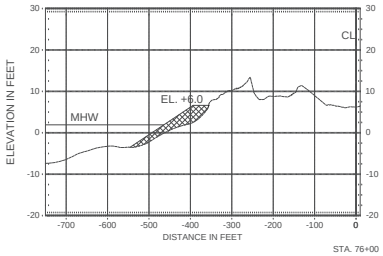
SHEET ID
C-305

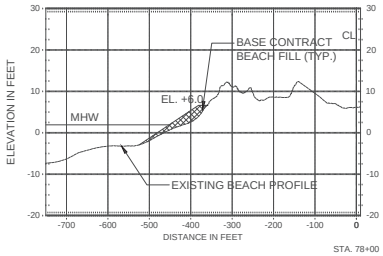
BCOES REVIEW

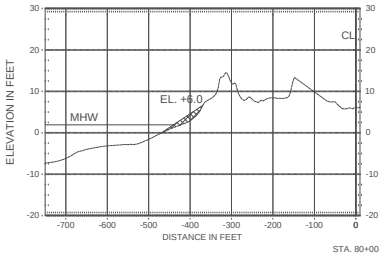












NOTES:
1. VERTICAL DATUM IS IN FEET, NAVD 88.

0 30 60 Feet
VERTICAL UNITS: 1" = 15'

0 300 600 Feet
HORIZONTAL UNITS: 1" = 150'

US Army Corps of Engineers

MARK	DESCRIPTION	DATE

DESIGNED BY: J. CARTER
DRAWN BY: J. CARTER
CHECKED BY: H. WILDE
SUBMITTED BY: J. MANNING
SIZE: 22"X34"

ISSUE DATE: MMMMMMMM YYYY
SOLICITATION NO.: XXXXXXXX-XX-XXXX
CONTRACT NO.: XXXXXX-XX-X-XXXX

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403

COASTAL STORM RISK MANAGEMENT
OCEAN ISLE BEACH
BRUNSWICK COUNTY, NORTH CAROLINA

OCEAN ISLE BEACH
CROSS SECTIONS
STA. 70+00 TO STA. 86+00

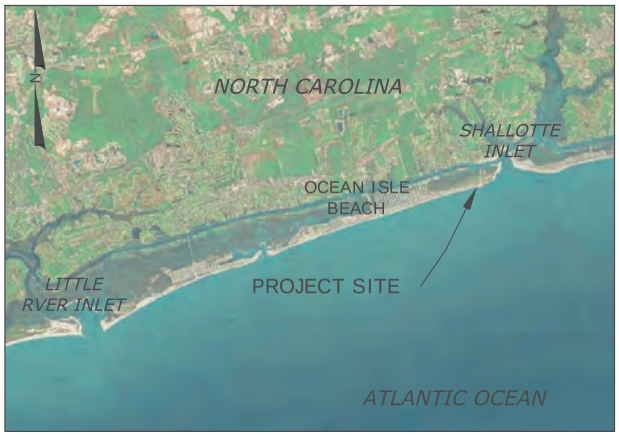
SHEET ID
C-306

BCOES REVIEW

APPENDIX C:

2025 EAST END DUNE PROJECT DRAWINGS

OCEAN ISLE BEACH SHORELINE PROTECTION
EAST END DUNE PROJECT
PRE-CONSTRUCTION UPDATE
BRUNSWICK COUNTY, NORTH CAROLINA



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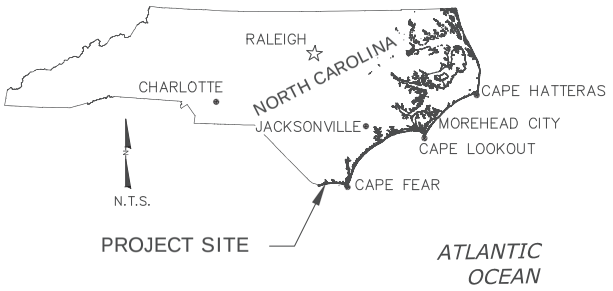
GRAPHIC SCALE IN FT



SHEET INDEX

GENERAL NOTES:

1. COORDINATES ARE IN FEET BASED ON NORTH CAROLINA STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM 1983, (NAD83).
2. ELEVATIONS ARE REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

COASTAL PROTECTION ENGINEERING OF NORTH CAROLINA, INC
4038 MASONBORO LOOP RD.
WILMINGTON, NORTH CAROLINA 28409 PH. (910)399-1905
ENGINEERING LICENSE CERTIFICATE #: C-2331

REVISIONS

No.	Date	Description

Designed by:
Drawn by: JG, SL
Date: 2/17/2025
Pilot Scale: AS NOTED
Checked by:
Reviewed by:
Submitted by:
Comm. No.:
Reference Files:

OCEAN ISLE BEACH SHORELINE PROTECTION EAST END DUNE PROJECT
BRUNSWICK COUNTY, NORTH CAROLINA
COVER SHEET

SHEET 1 OF 6

CONTROL DATA TABLE

STATION	EASTING	NORTHING	AZIMUTH	PAYMENT DISTANCE TO NEXT
0+00	2184731.45	54600.40	121.1°	100.0
1+00	2184679.96	54514.67	121.1°	100.0
2+00	2184606.11	54463.23	172.4°	100.0
3+00	2184506.99	54449.99	172.4°	100.0
4+00	2184407.86	54436.79	172.4°	100.0
5+00	2184309.22	54420.54	169.5°	100.0
6+00	2184210.89	54402.37	169.5°	100.0
7+00	2184112.55	54384.21	169.5°	100.0
8+00	2184013.41	54372.11	175.3°	100.0
9+00	2183913.75	54363.88	175.3°	100.0
10+00	2183828.52	54321.09	139.4°	100.0
11+00	2183752.61	54255.99	139.4°	100.0
12+00	2183664.65	54212.44	163.8°	100.0
13+00	2183568.42	54185.26	165.3°	100.0
14+00	2183471.70	54159.86	165.3°	100.0
15+00	2183378.72	54126.38	145.1°	100.0
16+00	2183296.71	54069.15	145.1°	100.0
17+00	2183207.44	54029.31	169.5°	100.0
18+00	2183109.10	54011.14	169.5°	100.0
19+00	2183010.77	53992.98	169.5°	100.0
20+00	2182912.43	53974.81	169.5°	100.0
21+00	2182814.09	53956.66	169.5°	100.0
22+00	2182715.75	53938.51	169.5°	100.0
23+00	2182617.42	53920.35	169.5°	100.0
24+00	2182519.08	53902.20	169.5°	100.0
25+00	2182420.99	53883.20	157.5°	100.0
26+00	2182328.62	53844.88	157.4°	100.0
27+00	2182236.26	53806.56	157.5°	100.0
28+00	2182143.89	53768.24	157.5°	100.0

CONTROL DATA TABLE

STATION	EASTING	NORTHING	AZIMUTH	PAYMENT DISTANCE TO NEXT
29+00	2182045.19	53753.44	172.4°	100.0
30+00	2181946.07	53740.24	172.4°	100.0
31+00	2181848.64	53717.86	166.7°	100.0
32+00	2181751.31	53694.87	166.7°	100.0
33+00	2181654.04	53671.69	164.7°	100.0
34+00	2181557.58	53645.33	164.7°	100.0
35+00	2181461.11	53618.97	164.7°	50.0
35+50	2181412.88	53605.79	164.7°	-

NOTES:

1. ALL CROSS SECTIONS SHALL BE SURVEYED AT AN AZIMUTH PERPENDICULAR TO THE PROFILE BASELINE SHOWN ON SHEETS 4 AND 5.
2. COORDINATES ARE IN FEET BASED ON THE NORTH CAROLINA STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM OF 1983 (NAD83) (2011).
3. ELEVATIONS ARE IN FEET REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
4. SURVEYS FOR PAYMENT (BEFORE AND AFTER PLACEMENT) SHALL COMMENCE AT THE COORDINATES SHOWN AND CONTINUE A MINIMUM DISTANCE OF 50 FT. SEAWARD OF THE CONSTRUCTION TOE OF FILL ALONG THE AZIMUTH PROVIDED.
5. EACH STATION DESIGNATED AS A PAYMENT PROFILE SHALL BE SURVEYED BY THE CONTRACTOR BEFORE AND AFTER FILL PLACEMENT FOR THE PURPOSE OF CALCULATING PAYMENT QUANTITIES. NO SUBSTITUTES IN PAY PROFILE STATIONS OR AZIMUTHS SHALL BE CONSIDERED.

VERTICAL CONTROL DATA

ELEVATIONS REFER TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). THE APPROXIMATE RELATION BETWEEN NAVD88 AND OTHER DATUMS AT NOAA TIDAL BENCHMARK 8661070 (SPRINGMAID, SC) FOR THE PROJECT AREA AS FOLLOWS:

MEAN HIGHER HIGH WATER	2.44 FEET
MEAN HIGH WATER	2.05 FEET
NAVD88	0.00 FEET
MEAN SEA LEVEL	-0.45 FEET
MEAN LOW WATER	-2.97 FEET
MEAN LOWER LOW WATER	-3.16 FEET

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REVISIONS		
No.	Date	Description

Designed by: | Drawn by: JG, SL | Date: 2/17/2025 | Plot Scale: AS NOTED
Checked by: | Reviewed by: | Submitted by: | Comm. No.:
Reference Files:

OCEAN ISLE BEACH SHORELINE PROTECTION EAST END DUNE PROJECT
BRUNSWICK COUNTY, NORTH CAROLINA

CONTROL DATA SHEET

COASTAL PROTECTION ENGINEERING OF NORTH CAROLINA, INC
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WILMINGTON, NORTH CAROLINA 28409 PH. (910)399-1905
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REVISIONS

No.	Date	Description
1	2/17/2025	Pre-Construction Template Updates Based on Pre-Construction Survey

Designed by:
Drawn by: JG, SL
Date: 2/17/2025
Plot Scale: AS NOTED
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Reviewed by:
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Reference Files:

OCEAN ISLE BEACH SHORELINE PROTECTION EAST END DUNE PROJECT
BRUNSWICK COUNTY, NORTH CAROLINA
PROJECT OVERVIEW

SHEET 3 OF 6

NOTES:

1. ELEVATIONS IN US FEET REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
2. THE LANDWARD TIE-IN OF THE CONSTRUCTION TEMPLATE TO THE EXISTING DUNE OR GRADE MAY BE FIELD ADJUSTED BY THE ENGINEER BASED ON THE CONDITIONS AT THE TIME OF CONSTRUCTION.
3. ALL CONTRACTOR OPERATIONS SHALL BE PERFORMED IN A MANNER THAT AVOIDS DAMAGE TO EXISTING SANDBAGS, STRUCTURES AND ROADS. SANDBAGS, STRUCTURES AND ROADS DAMAGED BY CONTRACTOR OPERATIONS SHALL BE REPAIRED TO THE SATISFACTION OF THE ENGINEER AT NO COST TO THE OWNER OR TO THE OWNERS OF THE DAMAGED PROPERTY. IN ORDER TO MINIMIZE THE RISK OF DAMAGE, WHEELED OR TRACKED EARTH MOVING EQUIPMENT SHALL NOT WORK CLOSER THAN 10 FEET FROM STRUCTURES DURING ALL WORK INCLUDING DISTRIBUTION AND MOVEMENT OF DUNE FILL MATERIAL, UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
4. THE CONSTRUCTED DUNE FOOTPRINT SHALL BE PLANTED WITH NATIVE DUNE VEGETATION IN ACCORDANCE WITH THE SPECIFICATIONS.
5. A SINGLE ROW OF SAND FENCING SHALL BE INSTALLED ALONG THE LENGTH OF THE PROJECT AREA PER CAMA REQUIREMENTS IN ACCORDANCE WITH 15A NCAC 7K.0212.
6. A MEETING BETWEEN REPRESENTATIVES OF THE CONTRACTOR AND THE DCM MUST BE HELD PRIOR TO SAND FENCE INSTALLATION.

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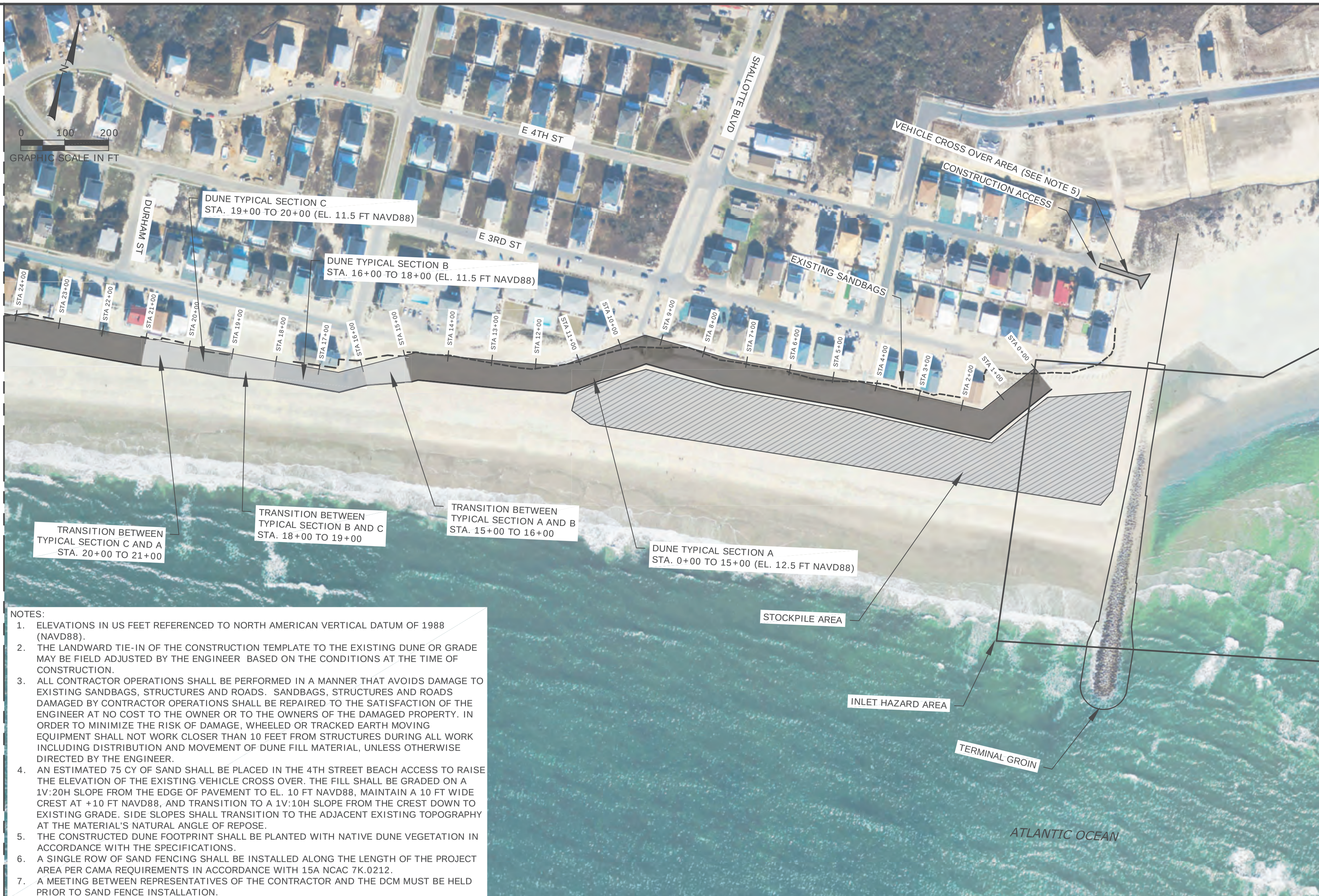
Date: 2/17/2025	Submitted by:
Plot Scale: AS NOTED	Comm. No.:

Reference Files:

OCEAN ISLE BEACH SHORELINE PROTECTION EAST END DUNE PROJECT
BRUNSWICK COUNTY, NORTH CAROLINA

PLAN VIEW

SHEET 4 OF 6



NOTES:

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4. AN ESTIMATED 75 CY OF SAND SHALL BE PLACED IN THE 4TH STREET BEACH ACCESS TO RAISE THE ELEVATION OF THE EXISTING VEHICLE CROSS OVER. THE FILL SHALL BE GRADED ON A 1V:20H SLOPE FROM THE EDGE OF PAVEMENT TO EL. 10 FT NAVD88, MAINTAIN A 10 FT WIDE CREST AT +10 FT NAVD88, AND TRANSITION TO A 1V:10H SLOPE FROM THE CREST DOWN TO EXISTING GRADE. SIDE SLOPES SHALL TRANSITION TO THE ADJACENT EXISTING TOPOGRAPHY AT THE MATERIAL'S NATURAL ANGLE OF REPOSE.
5. THE CONSTRUCTED DUNE FOOTPRINT SHALL BE PLANTED WITH NATIVE DUNE VEGETATION IN ACCORDANCE WITH THE SPECIFICATIONS.
6. A SINGLE ROW OF SAND FENCING SHALL BE INSTALLED ALONG THE LENGTH OF THE PROJECT AREA PER CAMA REQUIREMENTS IN ACCORDANCE WITH 15A NCAC 7K.0212.
7. A MEETING BETWEEN REPRESENTATIVES OF THE CONTRACTOR AND THE DCM MUST BE HELD PRIOR TO SAND FENCE INSTALLATION.

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WILMINGTON, NORTH CAROLINA 28409 PH. (910)399-1905
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REVISIONS

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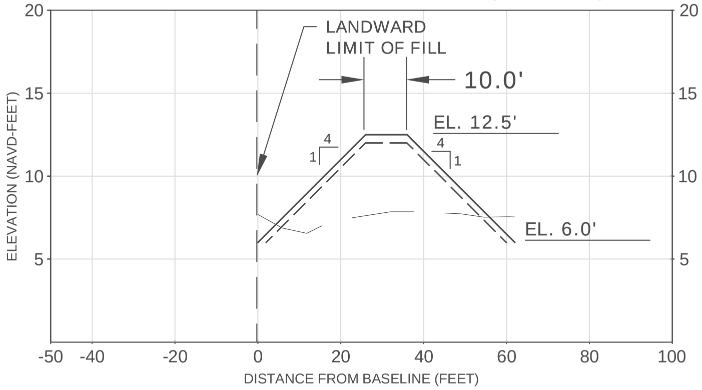
Designed by: | Checked by:
Drawn by: JG, SL | Reviewed by:
Date: 2/17/2025 | Submitted by:
Plot Scale: AS NOTED | Comm. No.:

Reference Files:

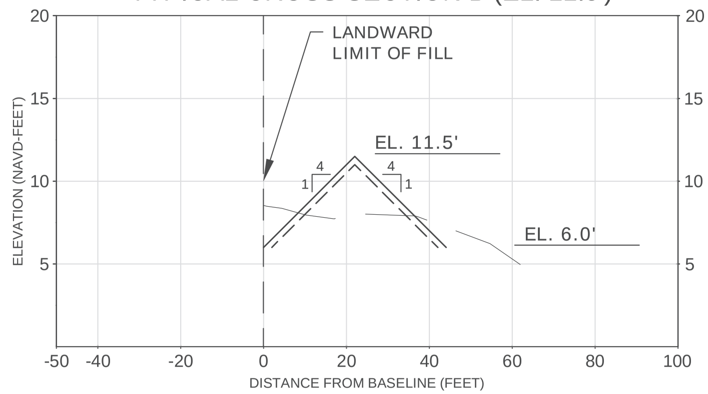
OCEAN ISLE BEACH SHORELINE PROTECTION EAST END DUNE PROJECT
BRUNSWICK COUNTY, NORTH CAROLINA

PLAN VIEW

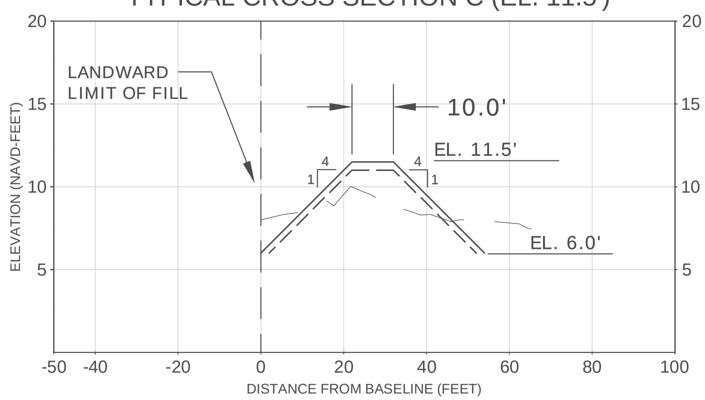
TYPICAL CROSS SECTION A (EL. 12.5')



TYPICAL CROSS SECTION B (EL. 11.5')



TYPICAL CROSS SECTION C (EL. 11.5')



LEGEND

- EXISTING GRADE FEBRUARY 2025
- TYPICAL DESIGN TEMPLATE
- TOLERANCE LINE -0.5'

NOTES:

1. ELEVATIONS SHOWN ARE IN FEET REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
2. SURVEY PERFORMED IN FEBRUARY 2025 BY MCKIM & CREED.

COASTAL PROTECTION ENGINEERING OF NORTH CAROLINA, INC
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Drawn by: JG, SL | Reviewed by:
Date: 2/17/2025 | Submitted by:
Plot Scale: AS NOTED | Comm. No.:
Reference Files:

OCEAN ISLE BEACH SHORELINE PROTECTION EAST END DUNE PROJECT
BRUNSWICK COUNTY, NORTH CAROLINA
PLACEMENT AREA
TYPICAL CROSS SECTIONS

APPENDIX D:

1994 SHALLOTTE INELT BORROW AREA GEOTECHNICAL DATA

Table B-2
Shallotte Inlet Vibracore Samples (Samples Collected May 1994)

core no. and location	sample or layer depth (ft.)	sample average depth(ft)	depth to bottom of layer	samp. or layer no.	layer thickness (feet)	d16 mm	d50 mm	d84 mm	phi16	phi50	phi84	mean =phi16+ phi84)/2	std d	K**2	weight mean	wtd std d	wtd. K**2	silt con-tent	wtd. silt
SI-1-94																			
	1.0-1.6	1.30	1.7	A	1.7	0.26	0.44	8.60	1.94	1.18	-3.10	-0.58	2.52	6.37	-0.99	4.29	10.83	1%	0.02
	3.2-3.5	3.35	3.8	B	2.1	0.17	0.22	0.32	2.56	2.18	1.64	2.10	0.46	0.21	4.46	0.97	0.44	1%	0.02
	4.2-4.4	4.30	4.8	C	1.0	0.16	0.24	1.20	2.64	2.06	-0.26	1.19	1.45	2.11	1.16	1.42	2.06	1%	0.01
	5.3-5.5	5.40	6.1	D	1.3	0.07	0.10	0.14	3.84	3.40	2.84	3.34	0.50	0.25	4.34	0.65	0.33	15%	0.20
	6.7-6.9	6.80	7.6	E	1.5	0.05	0.12	0.50	4.32	3.06	1.00	2.66	1.66	2.76	4.06	2.53	4.21	43%	0.66
	8.3-8.6	8.45	9.0	F	1.4	0.05	0.14	0.60	4.32	2.84	0.74	2.53	1.79	3.21	3.48	2.46	4.42	42%	0.58
	For all:				9.0		(phi16+phi50+phi84)/3=			2.07		1.87	1.40	2.49	**1.83**	**1.37**	**2.48**		**16.4%**
										0.24 mm		0.27 mm			**0.28 mm**				
	For the top 4.8 feet:									1.21		0.90	1.48	2.90	0.97	1.39	2.78		1.0%
										0.43 mm		0.53 mm			0.51 mm				
	For the top 6.1 feet:									1.74		1.51	1.23	2.24	1.47	1.20	2.24		4.0%
										0.30 mm		0.35 mm			0.36 mm				
	For the top 7.6 feet:									1.95		1.74	1.32	2.34	1.71	1.29	2.34		11.8%
										0.26 mm		0.30 mm			0.31 mm				
SI-2-94																			
	0.9-1.3	1.10	2.3	A	2.3	0.35	0.63	4.80	1.51	0.67	-2.26	-0.37	1.89	3.57	-0.85	4.30	8.12	1%	0.02
	3.3-3.6	3.45	4.1	B	1.9	0.27	0.43	0.80	1.89	1.22	0.32	1.11	0.78	0.61	2.05	1.45	1.14	1%	0.02
	4.6-5.0	4.80	5.8	C	1.7	0.35	0.60	1.40	1.51	0.74	-0.49	0.51	1.00	1.00	0.86	1.68	1.68	1%	0.02
	6.1-6.3	6.20	6.9	D	1.1	0.26	0.34	0.55	1.94	1.56	0.86	1.40	0.54	0.29	1.54	0.59	0.32	1%	0.01
	7.6-7.9	7.75	8.4	E	1.5	0.42	0.68	1.70	1.25	0.56	-0.77	0.24	1.01	1.02	0.36	1.51	1.53	1%	0.02
	9.3-9.9	9.60	10.7	F	2.3	0.11	0.39	4.20	3.18	1.36	-2.07	0.56	2.63	6.90	1.28	6.04	15.88	9%	0.21
	11.3-11.5	11.40	12.2	G	1.5	0.05	0.05	0.05	4.32	4.32	4.32	4.32	0.00	0.00	6.59	0.00	0.00	91%	1.39
	12.9-13.2	13.05	13.5	H	1.3	0.05	0.05	0.18	4.32	4.32	2.47	3.40	0.92	0.85	4.33	1.18	1.09	59%	0.75
	14.4-14.6	14.50	15.3	I	1.8	0.05	0.07	0.23	4.32	3.84	2.12	3.22	1.10	1.21	5.80	1.98	2.18	51%	0.92
	For all:				15.3		(phi16+phi50+phi84)/3=			1.75		1.60	1.10	1.72	**1.44**	**1.22**	**2.09**		**21.9%**
										0.30 mm		0.33 mm			**0.37 mm**				
	For the top 4.1 feet:									0.56		0.37	1.34	2.09	0.29	1.39	2.24		1.0%
										0.68 mm		0.78 mm			0.82 mm				
	For the top 5.8 feet:									0.57		0.42	1.22	1.73	0.35	1.28	1.88		1.0%
										0.67 mm		0.75 mm			0.78 mm				
	For the top 8.4 feet:									0.70		0.58	1.04	1.30	0.47	1.13	1.52		1.0%
										0.62 mm		0.67 mm			0.72 mm				
	For the top 10.7 feet:									0.72		0.57	1.31	2.23	0.49	1.46	2.68		2.7%
										0.61 mm		0.67 mm			0.71 mm				
	For the top 12.2 feet:									1.24		1.11	1.12	1.91	0.97	1.27	2.34		13.7%
										0.42 mm		0.46 mm			0.51 mm				

Table B-2
Shallotte Inlet Vibracore Samples (Samples Collected May 1994)

core no. and location	sample or layer depth (ft.)	sample average depth(ft)	depth to bottom of layer	samp. or layer no.	layer thickness (feet)	d16 mm	d50 mm	d84 mm	phi16	phi50	phi84	mean =phi16+ phi84)/2	std d	K**2	weight mean	wtd std d	wtd. K**2	silt con-tent	wtd. silt
SI-3-94																			
	0.7-1.2	0.95	1.2	A	1.2	0.35	0.60	4.90	1.51	0.74	-2.29	-0.39	1.90	3.62	-0.47	2.28	4.35	1%	0.01
	3.1-3.4	3.25	4.1	B	2.9	0.28	0.45	0.98	1.84	1.15	0.03	0.93	0.90	0.82	2.73	2.64	2.39	1%	0.03
	4.8-5.2	5.00	6.2	C	2.1	0.18	0.31	9.20	2.47	1.69	-3.20	-0.36	2.84	8.05	-0.75	5.82	16.51	1%	0.02
	7.2-7.5	7.35	8.2	D	2.0	0.26	0.45	0.94	1.94	1.15	0.09	1.02	0.93	0.86	2.06	1.88	1.74	3%	0.06
	8.8-9.3	9.05	9.7	E	1.5	0.26	0.43	13.00	1.94	1.22	-3.70	-0.88	2.82	7.96	-1.34	4.30	12.14	1%	0.02
	10.3-10.5	10.40	10.9	F	1.2	0.05	0.07	0.14	4.32	3.84	2.84	3.58	0.74	0.55	4.21	0.87	0.65	52%	0.61
	11.7-12.0	11.85	12.0	G	1.1	0.17	0.22	0.30	2.56	2.18	1.74	2.15	0.41	0.17	2.36	0.45	0.18	1%	0.01
	12.5-12.7	12.60	12.7	H	0.7	0.07	0.05	0.05	3.84	4.32	4.32	4.08	-0.24	0.06	2.86	-0.17	0.04	87%	0.61
	13.2-13.4	13.30	13.5	I	0.8	0.47	0.88	1.60	1.09	0.18	-0.68	0.21	0.88	0.78	0.16	0.71	0.62	4%	0.03
	14.0-14.2	14.10	14.6	J	1.1	0.05	0.07	0.24	4.32	3.84	2.06	3.19	1.13	1.28	3.51	1.24	1.41	51%	0.56
	For all:				14.6		(phi16+phi50+phi84)/3=			1.58		1.35	1.23	2.42	**1.05**	**1.37**	**2.74**		**13.4%**
										0.33 mm		0.39 mm			**0.48 mm**				
	For the top 4.1 feet:									0.50		0.27	1.40	2.22	0.55	1.19	1.63		1.0%
										0.71 mm		0.83 mm			0.68 mm				
	For the top 9.7 feet:									0.44		0.06	1.88	4.26	0.23	1.74	3.82		1.4%
										0.74 mm		0.96 mm			0.85 mm				
	For the top 12.0 feet:									1.15		0.86	1.51	3.15	0.73	1.52	3.16		6.3%
										0.45 mm		0.55 mm			0.60 mm				
SI-4-94																			
	1.3-1.9	1.60	2.1	A	2.1	0.33	0.60	7.00	1.60	0.74	-2.81	-0.60	2.20	4.86	-1.27	4.63	10.20	1%	0.02
	2.3-2.5	2.40	3.2	B	1.1	0.15	0.21	0.32	2.74	2.25	1.64	2.19	0.55	0.30	2.41	0.60	0.33	1%	0.01
	4.3-4.6	4.45	6.0	C	2.8	0.24	0.47	4.20	2.06	1.09	-2.07	-0.01	2.06	4.26	-0.02	5.78	11.94	1%	0.03
	6.3-6.6	6.45	7.6	D	1.6	0.20	0.35	0.73	2.32	1.51	0.45	1.39	0.93	0.87	2.22	1.49	1.40	2%	0.03
	8.0-8.5	8.25	9.0	E	1.4	0.27	0.56	3.80	1.89	0.84	-1.93	-0.02	1.91	3.64	-0.02	2.58	4.91	1%	0.01
	9.4-9.9	9.65	10.2	F	1.3	0.18	0.30	2.00	2.47	1.74	-1.00	0.74	1.74	3.02	0.92	2.17	3.77	1%	0.01
	For all:				10.2		(phi16+phi50+phi84)/3=			0.86		0.61	1.57	2.82	**0.42**	**1.69**	**3.19**		**1.2%**
										0.55 mm		0.65 mm			**0.75 mm**				
	For the top 7.6 feet:									0.96		0.74	1.44	2.57	0.44	1.65	3.14		1.2%
										0.51 mm		0.60 mm			0.74 mm				
SI-5-94																			
	1.0-1.2	1.10	2.1	A	2.1	0.16	0.20	0.28	2.64	2.32	1.84	2.24	0.40	0.16	4.70	0.85	0.34	1%	0.02
	3.0-3.2	3.10	4.1	B	2.0	0.17	0.20	0.27	2.56	2.32	1.89	2.22	0.33	0.11	4.45	0.67	0.22	1%	0.02
	5.0-5.2	5.10	6.1	C	2.0	0.14	0.20	0.33	2.84	2.32	1.60	2.22	0.62	0.38	4.44	1.24	0.77	1%	0.02
	7.0-7.2	7.10	8.4	D	2.3	0.22	0.30	0.39	2.18	1.74	1.36	1.77	0.41	0.17	4.07	0.95	0.39	1%	0.02
	8.7-9.0	8.85	9.4	E	0.9	0.25	0.37	0.80	2.00	1.43	0.32	1.16	0.84	0.70	1.10	0.80	0.67	1%	0.01
	9.6-10.1	9.85	10.6	F	1.3	0.32	0.66	11.00	1.64	0.60	-3.46	-0.91	2.55	6.51	-1.13	3.19	8.14	1%	0.01
	For all:				10.6		(phi16+phi50+phi84)/3=			1.56		1.45	0.86	1.34	**1.66**	**0.73**	**0.99**		**1.0%**
										0.34 mm		0.37 mm			**0.32 mm**				
	For the top 8.4 feet:									2.13		2.11	0.44	0.21	2.10	0.44	0.21		1.0%
										0.23 mm		0.23 mm			0.23 mm				
	For the top 9.4 feet:									1.96		1.92	0.52	0.31	2.01	0.48	0.26		1.0%
										0.26 mm		0.26 mm			0.25 mm				

Table B-2
Shallotte Inlet Vibracore Samples (Samples Collected May 1994)

core no. and location	sample or layer depth (ft.)	sample average depth(ft)	depth to bottom of layer	samp. or layer no.	layer thickness (feet)	d16 mm	d50 mm	d84 mm	phi16	phi50	phi84	mean =phi16+ phi84)/2	std d	K**2	weight mean	wtd std d	wtd. K**2	silt con-tent	wtd. silt
SI-6-94																			
	2.2-2.5	2.35	2.8	A	2.8	0.14	0.19	0.25	2.84	2.40	2.00	2.42	0.42	0.17	6.77	1.17	0.49	1%	0.03
	2.8-4.1	3.45	4.7	B	1.9	0.16	0.19	0.25	2.64	2.40	2.00	2.32	0.32	0.10	4.35	0.60	0.19	1%	0.02
	5.8-6.0	5.90	6.6	C	1.9	0.13	0.19	0.26	2.94	2.40	1.94	2.44	0.50	0.25	4.70	0.96	0.48	1%	0.02
	7.1-7.5	7.30	8.2	D	1.6	0.14	0.19	0.30	2.84	2.40	1.74	2.29	0.55	0.30	3.60	0.87	0.48	1%	0.02
	8.9-9.2	9.05	10.9	E	2.7	0.19	0.30	0.48	2.40	1.74	1.06	1.73	0.67	0.45	4.71	1.82	1.22	1%	0.03
	11.1-11.4	11.25	12.1	F	1.2	0.25	0.33	0.46	2.00	1.60	1.12	1.56	0.44	0.19	1.91	0.54	0.24	1%	0.01
	12.8-13.2	13.00	13.8	G	1.7	0.29	0.47	0.98	1.79	1.09	0.03	0.91	0.88	0.77	1.52	1.47	1.29	1%	0.02
	For all:				13.8		(phi16+phi50+phi84)/3=		1.97			1.95	0.54	0.32	**2.00**	**0.54**	**0.32**		**1.0%**
									0.26 mm			0.26 mm			**0.25 mm**				
	For the top 6.6 feet:								2.39			2.39	0.41	0.18	2.40	0.41	0.18		1.0%
									0.19 mm			0.19 mm			0.19 mm				
	For the top 8.2 feet:								2.38			2.37	0.45	0.21	2.38	0.44	0.20		1.0%
									0.19 mm			0.19 mm			0.19 mm				
	For the top 10.9 feet:								2.25			2.24	0.49	0.26	2.21	0.50	0.26		1.0%
									0.21 mm			0.21 mm			0.22 mm				
SI-7-94																			
	1.1-1.4	1.25	2.3	A	2.3	0.15	0.19	0.25	2.74	2.40	2.00	2.37	0.37	0.14	5.45	0.85	0.31	1%	0.02
	3.2-3.5	3.35	4.5	B	2.2	0.13	0.19	0.25	2.94	2.40	2.00	2.47	0.47	0.22	5.44	1.04	0.49	1%	0.02
	5.5-5.8	5.65	6.9	C	2.4	0.13	0.18	0.26	2.94	2.47	1.94	2.44	0.50	0.25	5.86	1.20	0.60	1%	0.02
	7.8-8.0	7.90	9.0	D	2.1	0.19	0.29	0.40	2.40	1.79	1.32	1.86	0.54	0.29	3.81	1.10	0.59	1%	0.02
	9.8-10.2	10.00	11.2	E	2.3	0.35	0.60	1.40	1.51	0.74	-0.49	0.51	1.00	1.00	1.17	2.28	2.28	1%	0.02
	12.3-12.6	12.45	13.5	F	2.3	0.25	0.45	1.20	2.00	1.15	-0.26	0.87	1.13	1.28	2.00	2.60	2.94	1%	0.02
	14.5-14.7	14.60	15.5	G	1.9	0.24	0.36	0.68	2.06	1.47	0.56	1.31	0.75	0.56	2.52	1.45	1.09	1%	0.02
	16.2-16.4	16.30	17.2	H	1.7	0.17	0.22	0.31	2.56	2.18	1.69	2.12	0.43	0.19	3.66	0.75	0.32	1%	0.02
	17.8-18.3	18.05	18.6	I	1.4	0.30	0.55	6.20	1.74	0.86	-2.63	-0.45	2.18	4.77	-0.64	3.11	6.80	1%	0.01
	For all:				18.6		(phi16+phi50+phi84)/3=		1.57			1.50	0.82	0.97	**1.57**	**0.77**	**0.83**		**1.0%**
									0.34 mm			0.35 mm			**0.34 mm**				
	For the top 9.0 feet:								2.28			2.29	0.47	0.22	2.30	0.47	0.22		1.0%
									0.21 mm			0.21 mm			0.20 mm				
	For the top 11.2 feet:								1.94			1.93	0.58	0.38	1.94	0.58	0.38		1.0%
									0.26 mm			0.26 mm			0.26 mm				
	For the top 17.2 feet:								1.77			1.74	0.65	0.49	1.74	0.66	0.50		1.0%
									0.29 mm			0.30 mm			0.30 mm				

Table B-2
Shallotte Inlet Vibracore Samples (Samples Collected May 1994)

core no. and location	sample or layer depth (ft.)	sample average depth(ft)	depth to bottom of layer	samp. or layer no.	layer thickness (feet)	d16 mm	d50 mm	d84 mm	phi16	phi50	phi84	mean =phi16+ phi84)/2	std d	K**2	weight mean	wtd std d	wtd. K**2	silt con-tent	wtd. silt
SI-8-94																			
	1.0-1.3	1.15	2.3	A	2.3	0.17	0.25	0.37	2.56	2.00	1.43	2.00	0.56	0.31	4.59	1.29	0.72	1%	0.02
	3.3-3.6	3.45	3.9	B	1.6	0.17	0.27	0.39	2.56	1.89	1.36	1.96	0.60	0.36	3.13	0.96	0.57	1%	0.02
	5.5-5.8	5.65	6.6	C	2.7	0.15	0.20	0.29	2.74	2.32	1.79	2.26	0.48	0.23	6.11	1.28	0.61	1%	0.03
	7.4-7.7	7.55	9.0	D	2.4	0.18	0.20	0.38	2.47	2.32	1.40	1.93	0.54	0.29	4.64	1.29	0.70	1%	0.02
	9.0-9.4	9.20	10.3	E	1.3	0.21	0.39	1.10	2.25	1.36	-0.14	1.06	1.19	1.43	1.35	1.52	1.82	1%	0.01
	11.1-11.6	11.35	12.4	F	2.1	0.33	0.58	3.50	1.60	0.79	-1.81	-0.10	1.70	2.90	-0.22	3.58	6.09	1%	0.02
	13.2-13.6	13.40	14.5	G	2.1	0.25	0.39	0.64	2.00	1.36	0.64	1.32	0.68	0.46	2.81	1.44	0.98	1%	0.02
	For all:				14.5		(phi16+phi50+phi84)/3=			1.57		1.49	0.82	0.85	**1.55**	**0.78**	**0.79**		**1.0%**
										0.34 mm		0.36 mm			**0.34 mm**				
	For the top 9.0 feet:									2.07		2.04	0.54	0.30	2.05	0.54	0.29		1.0%
										0.24 mm		0.24 mm			0.24 mm				
	For the top 10.3 feet:									1.89		1.84	0.67	0.52	1.93	0.62	0.43		1.0%
										0.27 mm		0.28 mm			0.26 mm				
SI-9-94																			
	0.5-0.7	0.60	2.2	A	2.2	0.15	0.22	0.42	2.74	2.18	1.25	1.99	0.74	0.55	4.39	1.63	1.21	1%	0.02
	2.2-2.5	2.35	3.2	B	1.0	0.11	0.17	0.24	3.18	2.56	2.06	2.62	0.56	0.32	2.62	0.56	0.32	1%	0.01
	3.2-3.6	3.40	4.5	C	1.3	0.19	0.33	0.69	2.40	1.60	0.54	1.47	0.93	0.87	1.94	1.23	1.15	1%	0.01
	5.4-5.9	5.65	6.8	D	2.2	0.19	0.42	1.10	2.40	1.25	-0.14	1.13	1.27	1.60	2.51	2.82	3.57	1%	0.02
	7.6-8.1	7.85	9.1	E	2.4	0.19	0.39	1.50	2.40	1.36	-0.58	0.91	1.49	2.22	2.13	3.50	5.22	1%	0.02
	10.2-10.5	10.35	11.5	F	2.4	0.20	0.43	1.10	2.32	1.22	-0.14	1.09	1.23	1.51	2.57	2.89	3.55	1%	0.02
	12.3-12.8	12.55	14.0	G	2.6	0.33	0.66	2.00	1.60	0.60	-1.00	0.30	1.30	1.69	0.76	3.31	4.31	1%	0.03
	14.5-15.0	14.75	16.0	H	2.0	0.19	0.30	0.53	2.40	1.74	0.92	1.66	0.74	0.55	3.31	1.48	1.10	1%	0.02
	16.3-16.9	16.60	17.2	I	1.2	0.47	0.83	5.30	1.09	0.27	-2.41	-0.66	1.75	3.05	-0.79	2.10	3.67	1%	0.01
	17.5-18.1	17.80	18.1	J	0.9	0.44	0.70	2.90	1.18	0.51	-1.54	-0.18	1.36	1.85	-0.16	1.22	1.67	1%	0.01
	18.5-18.8	18.65	19.2	K	1.1	0.05	0.05	0.12	4.32	4.32	3.06	3.69	0.63	0.40	4.06	0.69	0.44	81%	0.89
	For all:				19.2		(phi16+phi50+phi84)/3=			1.38		1.27	1.09	1.33	**1.22**	**1.12**	**1.36**		**5.6%**
										0.38 mm		0.41 mm			**0.43 mm**				
	For the top 3.2 feet:									2.33		2.31	0.65	0.43	2.19	0.69	0.48		1.0%
										0.20 mm		0.20 mm			0.22 mm				
	For the top 4.5 feet:									2.06		2.03	0.75	0.58	1.98	0.76	0.59		1.0%
										0.24 mm		0.25 mm			0.25 mm				
	For the top 6.8 feet:									1.83		1.80	0.88	0.83	1.70	0.93	0.93		1.0%
										0.28 mm		0.29 mm			0.31 mm				
	For the top 9.1 feet:									1.68		1.62	1.00	1.11	1.49	1.07	1.26		1.0%
										0.31 mm		0.32 mm			0.36 mm				
	For the top 11.5 feet:									1.59		1.53	1.04	1.18	1.41	1.10	1.31		1.0%
										0.33 mm		0.35 mm			0.38 mm				
	For the top 14.0 feet:									1.42		1.36	1.07	1.25	1.21	1.14	1.38		1.0%
										0.37 mm		0.39 mm			0.43 mm				
	For the top 16.0 feet:									1.45		1.40	1.03	1.16	1.26	1.09	1.28		1.0%
										0.37 mm		0.38 mm			0.42 mm				

Table B-2
Shallotte Inlet Vibracore Samples (Samples Collected May 1994)

core no. and location	sample or layer depth (ft.)	sample average depth(ft)	depth to bottom of layer	samp. or layer no.	layer thickness (feet)	d16 mm	d50 mm	d84 mm	phi16	phi50	phi84	mean =phi16+ phi84)/2	std d	K**2	weight mean	wtd std d	wtd. K**2	silt con-tent	wtd. silt
SI-10-94																			
	0.5-0.8	0.65	1.3	A	1.3	0.26	0.41	0.70	1.94	1.29	0.51	1.23	0.71	0.51	1.60	0.93	0.66	1%	0.01
	1.9-2.4	2.15	3.8	B	2.5	0.26	0.54	5.80	1.94	0.89	-2.54	-0.30	2.24	5.02	-0.74	5.60	12.54	1%	0.03
	2.4-2.7	2.55	6.3	C	2.8	0.18	0.30	0.63	2.32	1.47	0.49	1.41	0.91	0.84	4.36	2.83	2.59	1%	0.03
	6.3-6.9	6.60	7.6	D	1.0	0.19	0.42	1.20	2.40	1.25	-0.26	1.07	1.33	1.77	1.04	1.30	1.72	1%	0.01
	8.4-8.7	8.55	9.3	E	1.8	0.24	0.39	0.93	2.06	1.36	0.10	1.08	0.98	0.95	1.89	1.71	1.67	1%	0.02
	10.0-10.2	10.10	11.7	F	2.4	0.24	0.43	1.00	2.06	1.22	0.00	1.03	1.03	1.06	2.44	2.44	2.52	1%	0.02
	11.7-12.3	12.00	13.1	G	1.4	0.27	0.59	3.40	1.89	0.76	-1.77	0.06	1.83	3.34	0.08	2.51	4.59	1%	0.01
	14.0-14.3	14.15	15.0	H	1.9	0.32	0.49	0.80	1.64	1.03	0.32	0.98	0.66	0.44	1.84	1.24	0.82	1%	0.02
	15.5-16.0	15.75	16.5	I	1.6	0.36	0.64	2.50	1.47	0.64	-1.32	0.08	1.40	1.95	0.12	2.20	3.08	1%	0.02
	17.0-17.6	17.30	17.6	J	1.1	0.40	0.70	4.50	1.32	0.51	-2.17	-0.42	1.75	3.05	-0.46	1.88	3.28	1%	0.01
	For all:				17.6		(phi16+phi50+phi84)/3=			0.76		0.62	1.28	1.89	**0.69**	**1.29**	**1.90**		**1.0%**
										0.59 mm		0.65 mm			**0.62 mm**				
	For the top 6.3 feet:									0.93		0.78	1.29	2.12	0.83	1.49	2.51		1.1%
										0.53 mm		0.58 mm			0.56 mm				
	For the top 11.7 feet:									1.03		0.92	1.20	1.69	0.91	1.27	1.86		1.0%
										0.49 mm		0.53 mm			0.53 mm				
	For the top 15.0 feet:									0.93		0.82	1.21	1.74	0.84	1.24	1.81		1.0%
										0.52 mm		0.57 mm			0.56 mm				
SI-11-94																			
	1.1-1.4	1.25	1.6	A	1.6	0.24	0.40	0.80	2.06	1.32	0.32	1.19	0.87	0.75	1.90	1.39	1.21	1%	0.02
	2.7-3.2	2.95	3.5	B	1.9	0.20	0.38	0.93	2.32	1.40	0.10	1.21	1.11	1.23	2.31	2.11	2.34	1%	0.02
	5.3-5.6	5.45	6.6	C	3.1	0.20	0.36	0.71	2.32	1.47	0.49	1.41	0.91	0.84	4.36	2.83	2.59	1%	0.03
	7.6-7.9	7.75	8.7	D	2.1	0.17	0.27	0.60	2.56	1.89	0.74	1.65	0.91	0.83	3.50	1.93	1.76	1%	0.02
	9.4-10.0	9.70	10.0	E	1.3	0.28	0.58	4.80	1.84	0.79	-2.26	-0.21	2.05	4.20	-0.27	2.61	5.36	1%	0.01
	10.6-10.9	10.75	11.2	F	1.2	0.08	0.11	0.19	3.64	3.18	2.40	3.02	0.62	0.39	3.62	0.75	0.47	6%	0.07
	12.8-13.1	12.95	14.5	G	3.3	0.20	0.35	1.40	2.32	1.51	-0.49	0.92	1.40	1.97	3.03	4.63	6.50	1%	0.03
	14.8-15.1	14.95	15.7	H	1.2	0.41	0.60	0.93	1.29	0.74	0.10	0.70	0.59	0.35	0.80	0.68	0.40	1%	0.01
	16.2-16.5	16.35	16.8	I	1.2	0.30	0.46	0.71	1.74	1.12	0.49	1.12	0.62	0.39	1.28	0.71	0.44	1%	0.01
	For all:				16.8		(phi16+phi50+phi84)/3=			1.31		1.22	1.01	1.22	**1.22**	**1.05**	**1.25**		**1.4%**
										0.40 mm		0.43 mm			**0.43 mm**				
	For the top 6.6 feet:									1.31		1.27	0.96	0.94	1.30	0.96	0.93		1.0%
										0.40 mm		0.41 mm			0.41 mm				
	For the top 8.7 feet:									1.42		1.36	0.95	0.91	1.38	0.95	0.90		1.0%
										0.37 mm		0.39 mm			0.38 mm				
	For the top 11.2 feet:									1.48		1.38	1.08	1.37	1.38	1.04	1.22		1.5%
										0.36 mm		0.38 mm			0.38 mm				

Table B-2
Shallotte Inlet Vibracore Samples (Samples Collected May 1994)

SUMMARY TABLE

core no. and location	sample or layer depth (ft.)	sample average depth(ft)	depth to bottom of layer	samp. or layer no.	layer thickness (feet)	d16 mm	d50 mm	d84 mm	phi16	phi50	phi84	mean =phi16+ phi84)/2	std d	K**2	weight mean	wtd std d	wtd. K**2	silt con-tent	wtd. silt
SI-1-94	9.0				9.0		0.24			2.07		1.83	1.37	2.48	16.51	12.32	22.28	16%	1.48
SI-2-94	15.3				15.3		0.30			1.75		1.44	1.22	2.09	21.97	18.73	31.92	22%	3.35
SI-3-94	14.6				14.6		0.33			1.58		1.05	1.37	2.74	15.33	20.03	40.04	13%	1.96
SI-4-94	10.2				10.2		0.55			0.86		0.42	1.69	3.19	4.24	17.25	32.54	1%	0.12
SI-5-94	10.6				10.6		0.34			1.56		1.66	0.73	0.99	17.63	7.69	10.53	1%	0.11
SI-6-94	13.8				13.8		0.26			1.97		2.00	0.54	0.32	27.57	7.43	4.39	1%	0.14
SI-7-94	18.6				18.6		0.34			1.57		1.57	0.77	0.83	29.27	14.37	15.42	1%	0.19
SI-8-94	14.5				14.5		0.34			1.57		1.55	0.78	0.79	22.41	11.37	11.50	1%	0.15
SI-9-94	19.2				19.2		0.38			1.38		1.22	1.12	1.36	23.35	21.45	26.19	6%	1.07
SI-10-94	17.6				17.6		0.59			0.76		0.69	1.29	1.90	12.19	22.64	33.47	1%	0.18
SI-11-94	16.8				16.8		0.40			1.31		1.22	1.05	1.25	20.54	17.65	21.06	1%	0.23
					160.2		0.37 mm			1.49		1.33	1.08	1.63	**1.32**	**1.07**	**1.56**	6%	**5.6%**
										0.36 mm		0.40 mm			**0.40 mm**				

SUMMARY TABLE -- DOWN TO ABOUT -15 FEET NGVD

core no. and location	sample or layer depth (ft.)	sample average depth(ft)	depth to bottom of layer	samp. or layer no.	layer thickness (feet)	d16 mm	d50 mm	d84 mm	phi16	phi50	phi84	mean =phi16+ phi84)/2	std d	K**2	weight mean	wtd std d	wtd. K**2	silt con-tent	wtd. silt
SI-1-94	4.8				4.8		0.43			1.21		0.97	1.39	2.78	4.64	6.68	13.33	1%	0.05
SI-2-94	5.0				5.0		0.68			0.56		0.32	1.34	2.06	1.60	6.63	10.24	1%	0.05
SI-3-94	4.1				4.1		0.71			0.50		0.55	1.19	1.63	2.26	4.93	6.74	1%	0.04
SI-4-94	7.6				7.6		0.51			0.96		0.44	1.65	3.14	3.35	12.50	23.86	1%	0.09
SI-5-94	10.6				10.6		0.34			1.56		1.66	0.73	0.99	17.63	7.69	10.53	1%	0.11
SI-6-94	10.9				10.9		0.21			2.25		2.21	0.50	0.26	24.14	5.42	2.86	1%	0.11
SI-7-94	11.2				11.2		0.26			1.94		1.94	0.58	0.38	21.73	6.46	4.27	1%	0.11
SI-8-94	10.3				10.3		0.27			1.89		1.93	0.62	0.43	19.82	6.35	4.42	1%	0.10
SI-9-94	11.5				11.5		0.33			1.59		1.41	1.10	1.31	16.16	12.64	15.02	1%	0.11
SI-10-94	11.7				11.7		0.49			1.03		0.91	1.27	1.86	10.60	14.81	21.70	1%	0.12
SI-11-94	11.2				11.2		0.36			1.48		1.38	1.04	1.22	15.43	11.62	13.71	2%	0.17
					98.8		0.42 mm			1.36		1.25	1.04	1.46	**1.39**	**0.97**	**1.28**	1%	**1.1%**
										0.39 mm		0.42 mm			**0.38 mm**				