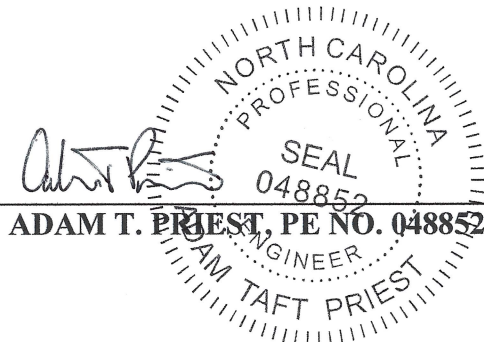
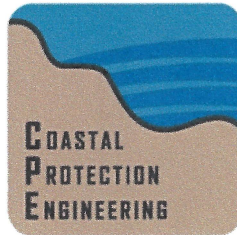


NATIVE BEACH LARGE SEDIMENT AND SHELL
MATERIAL CHARACTERIZATION REPORT:
CURRITUCK COUNTY BEACHES
CURRITUCK COUNTY, NORTH CAROLINA

PREPARED FOR
CURRITUCK COUNTY

PREPARED BY
COASTAL PROTECTION ENGINEERING OF NORTH CAROLINA,
INC.
ENGINEERING LICENSE CERTIFICATE #: C-2331



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10/21/22

DATE

OCTOBER 2022

EXECUTIVE SUMMARY

In February 2022, Coastal Protection Engineering of North Carolina, Inc. (CPE) was authorized to provide services in support of the effort by Currituck County (County) to characterize the number of large sediments and shell material on the County's beaches between the North Carolina – Virginia border and Currituck – Dare County border. As part of these efforts, CPE conducted visual observation surveys within the designated area to quantify the number of sediments greater than or equal to one inch and shell material greater than or equal to three inches in diameter.

In 2020, CPE began a three-year monitoring program of the County's beaches, which includes annual acquisition of topographic and bathymetric data as well as storm and erosion modeling. If in the future, the County were to pursue a beach nourishment program the number of large sediments and shell material must be quantified in accordance with the State of North Carolina's Technical Standards for Beach Fill Projects (15A NCAC 07H .0312) (Technical Standards). The Technical Standards were originally adopted by the Coastal Resource Commission (CRC) in February 2007, which aimed to prevent the disposal of incompatible material on the beach. In February 2021, the CRC adopted amendments of the Technical Standards which modified the sampling protocol for large sediments and shell material.



In May 2022, CPE conducted visual observation surveys of the County's beaches to quantify the number of sediments greater than or equal to one inch and shell material greater than or equal to three inches in diameter. A total of nine (9) transects were surveyed between the North Carolina – Virginia border and the Currituck – Dare County border. This report outlines the methodology and results of CPE's visual observation surveys along the County's beaches. The summary table below provides the mean number of sediments greater than or equal to one inch and the mean number of shell material greater than or equal to three inches in diameter per profile throughout the project area.

	Currituck County
Mean Number of Sediments (≥ 1 inch)	20.1
Mean Number of Shells (≥ 3 inches)	93.7

NATIVE BEACH LARGE SEDIMENT AND SHELL MATERIAL CHARACTERIZATION REPORT: CURRITUCK COUNTY BEACHES CURRITUCK COUNTY, NORTH CAROLINA

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1. INTRODUCTION

Currituck County’s oceanfront beaches are located in northeast North Carolina. Separated from the mainland of Currituck County (County), the oceanfront beaches are part of the Outer Banks and are bounded by Virginia to the north, Dare County to the south, the Atlantic Ocean to the east, and the Albemarle Sound to the west as shown in Figure 1. The Currituck National Wildlife Refuge and the villages of Corolla and Carova Beach are located within this portion of the County.

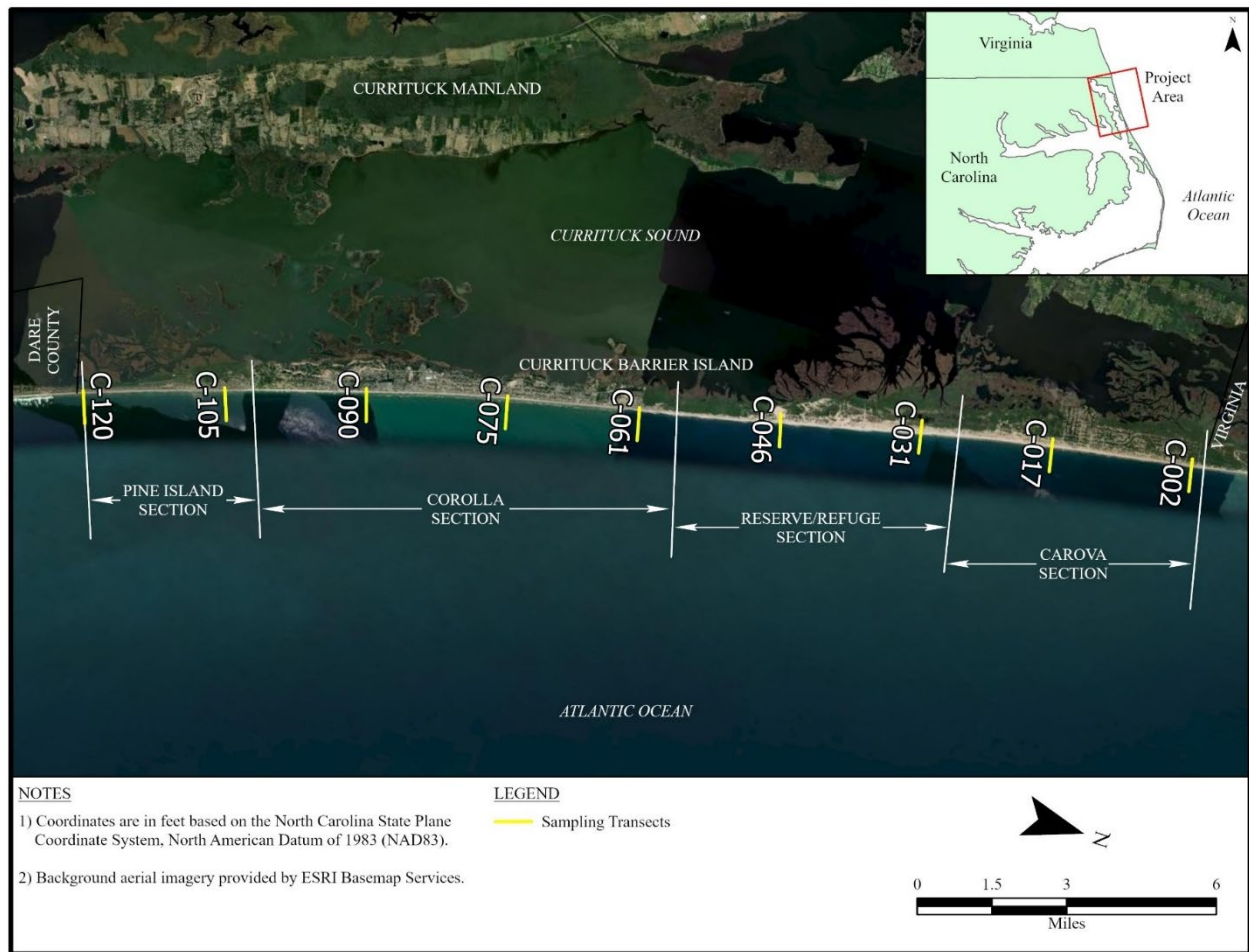


Figure 1. Project location in Currituck County, North Carolina.

In 2020, Coastal Protection Engineering of North Carolina, Inc. (CPE) began a three-year monitoring program of the County’s beaches to investigate long-term and short-term shoreline and volumetric changes occurring along the oceanfront beaches. The monitoring efforts include annual acquisition of topographic and bathymetric data as well as storm erosion and long-term shoreline change modeling. If in the future, the County were to pursue a beach nourishment program, the number of large sediments and shell material must be quantified in accordance with the State of North Carolina’s Technical Standards for Beach Fill Projects (15A NCAC 07H .0312) (Technical Standards). As part of the 2022 field campaign, CPE conducted visual observation surveys on May 23, 2022, to identify the number of large sediments and shell material in accordance with the Technical Standards.

The Technical Standards were originally adopted by the Coastal Resource Commission (CRC) in February 2007 and aimed to prevent the disposal of incompatible material on the beach. In February 2021, the CRC adopted amendments to the Technical Standards which modified the sampling protocol for large sediments and shell material (Appendix 1). One specific change within section (1)(h) deals with quantifying the number of large sediments and shell material. The amended rule requires:

The number of sediments greater than or equal to one inch (25.4 millimeters) in diameter, and shell material greater than or equal to three inches (76 millimeters) in diameter shall be differentiated and calculated through visual observation of an area of 10,000 square feet centered on each transect, and between mean tide level (MTL) and the frontal dune toe within the beach fill project boundaries. A simple arithmetic mean shall be calculated for both sediments and shell by summing the totals for each across all transects and dividing by the total number of transects, and these values shall be considered representative of the entire project area, and referred to as the “background” values for large sediment and large shell material;

The results of the visual observation surveys conducted on May 23, 2022, may be used to establish the baseline “background” values for sediments and shell material for future beach nourishment projects in the area. However, it should be noted that depending on the location of any future beach nourishment project, supplemental visual surveys may be required to adhere to the spacing requirements defined by the Technical Standards.

2. LARGE SEDIMENT AND SHELL MATERIAL CHARACTERIZATION

As previously stated, in February 2021, the CRC announced an amendment of the Technical Standards, requiring the number of large sediments greater than or equal to one inch in diameter and shell material greater than or equal to three inches in diameter on the recipient beach be counted by a visual observation survey. Surveys are to be conducted along a minimum of five (5) shore-perpendicular transects evenly spaced throughout the entire project area with distance between transects not exceeding an alongshore spacing of 5,000 feet. At each transect, a 10,000 square foot area between the toe of dune and mean tide level (MTL) shall be surveyed for sediments and shells by visual observation that meet or exceed the Technical Standard criteria. The arithmetic mean computed for both sediments and shell material by summing the totals for each across all transects and dividing by the number of transects will then serve as the background value for the recipient beach.

2.1 Methodology

CPE conducted the visual observation surveys along the County’s beaches between the North Carolina – Virginia border and the Currituck – Dare County border on May 23, 2022. Nine (9) sampling transects (C-002, C-017, C-031, C-046, C-061, C-075, C-090, C-105, C-120) were evenly spaced across the entire length of beach (Figure 1). The transects selected were the same transects where sediment samples were collected as part of the three-year monitoring effort.

These transects are spaced approximately 14,000 to 15,000 feet apart along the project area. Transect locations (i.e., coordinates) are provided in Appendix 2.

At each transect, a 10,000 square foot area was staked out between the toe of dune and the mean tide level. The mean tide level used for this analysis is -0.41 ft. NAVD88. The coordinates of the four (4) corners of each area were measured using a Real Time Kinematic (RTK) Global Positioning System (GPS) and are presented in Appendix 3. Horizontal data were collected in the North Carolina State Plane Coordinate System, North American Datum of 1983 (NAD83). Vertical data were collected in the North American Vertical Datum of 1988 (NAVD88). To ensure the accuracy of the RTK GPS equipment, horizontal and vertical positioning checks were conducted at the beginning and end of each day using a minimum of two 2nd order monuments from the National Geodetic Survey (NGS) in the project area. These monuments include ADRIATIC and RADIO. The RTK GPS was used within a virtual reference station (VRS) network to locate and confirm survey control for this project. The horizontal and vertical accuracy of control data meets the accuracy requirements as set forth in the Engineering and Design Hydrographic Surveying Manual (EM 1110-2-1003). Results from 2nd order control checks are presented in the Monument Information Report in Appendix 4, which includes information such as northing, easting, monument elevation, inverse, horizontal and vertical root mean square error, location description and photographs.

After the delineation of the visual observation survey area, the number of sediments greater than or equal to one inch and shell material greater than or equal to three inches in diameter were visually identified and counted in the area (Figure 2, Figure 3, and Figure 4). Upon completion of the visual observation surveys, an arithmetic mean was computed for both the number sediments and shell material meeting the Technical Standard criteria for the entire project area. Additionally, the arithmetic mean was computed for the number of sediments and shell material counted within each of the four sub-sections within the project area, which include the Carova (C-002, C-017), Reserve/Refuge (C-031, C-046), Corolla (C-061, C-075, C-090), and Pine Island (C-105, C-120).



Figure 2. Photo of CPE representatives performing a visual observation for large clasts.



Figure 3. Photo of the 10,000 square foot large clast survey area.



Figure 4. Photo of sediments (≥ 1 inch) and shells (≥ 3 inches) counted at Station C-090.

2.2 Large Sediment and Shell Material Survey Results

A total of 181 sediments greater than or equal to one inch and 843 shells greater than or equal to three inches were counted across all nine transects surveyed (C-002, C-017, C-031, C-046, C-061, C-075, C-090, C-105, C-120). The arithmetic mean for large sediments and shell material along the nine transects were 20.1 and 93.7, respectively. Results for each individual transect as well as the arithmetic mean for sediments and shell material for each sub-section are shown in Table 1 and Appendix 3. Note that a high variability of the sediments and shell material are seen in the Corolla Section while the other three sub-sections were relatively consistent. The high sediment and shell material count outlier at transect C-075, within the Corolla Section, heavily influenced the overall mean value for the County's shoreline.

Table 1. Currituck County Data Summary

STATION	Number of Clasts	
	Sediments (≥ 1 inch)	Shell Material (≥ 3 inch)
C-002	0	14
C-017	0	5
C-031	3	5
C-046	1	6
C-061	24	62
C-075	138	546
C-090	7	132
C-105	3	38
C-120	5	35
Total Project Sum	181	843
Total Project Mean	20.1	93.7
Carova Mean (C-002 & C-017)	0.0	9.5
Reserve/Refuge Mean (C-031 & C-046)	2.0	5.5
Corolla Mean (C-061, C-075, C-090)	56.3	246.7
Pine Island Mean (C-105 & C-120)	4.0	36.5

3. CONCLUSIONS

On May 23, 2022, CPE conducted visual observation surveys for large sediments and shell material along 9 transects on the County’s oceanfront beaches between the North Carolina – Virginia border and the Currituck – Dare County border. The surveys were conducted in accordance with the CRC’s adopted amendments to the Rule 15A NCAC 07H .0312 – Technical Standards for Beach Fill Projects. Sediments greater than or equal to one inch in diameter and shell material greater than or equal to three inches in diameter were counted during the survey. Following the survey, an arithmetic mean was computed for both sediments and shell material for all nine transects and each of the four sub-sections. Table 2 provides the mean number of sediments greater than or equal to inch and the shell material greater than or equal to 3 inches in diameter per profile throughout the project area.

Table 2. Summary of CPE’s visual observation survey results.

	Currituck County
Mean Number of Sediments (≥ 1 inch)	20.1
Mean Number of Shells (≥ 3 inches)	93.7

APPENDIX 1
PROPOSED AMENDMENTS FOR NORTH CAROLINA'S
TECHNICAL STANDARDS FOR BEACH FILL
PROJECTS – 15A NCAC 07H .0312

1 15A NCAC 07H .0312 is proposed for amendment as follows:

2
3 **15A NCAC 07H .0312 TECHNICAL STANDARDS FOR BEACH FILL PROJECTS**

4 Placement of sediment along the oceanfront shoreline is referred to in this Rule as "beach fill." Sediment used solely
5 to establish or strengthen dunes ~~or shall conform to the standards contained in 15A NCAC 07H .0308(b).~~ Sediment
6 used to re-establish state-maintained transportation corridors across a barrier island breach in a disaster area as
7 declared by the Governor is not considered a beach fill project under this Rule. Beach fill projects including beach
8 nourishment, dredged material disposal, habitat restoration, storm protection, and erosion control may be permitted
9 under the following conditions:

10 (1) The applicant shall characterize the recipient beach according to the following ~~methodology:~~
11 methodology. Initial characterizations of the recipient beach shall serve as the baseline for
12 subsequent beach fill projects:

13 (a) Characterization of the recipient beach is not required for the placement of sediment
14 directly from and completely confined to a cape shoal system, or maintained navigation
15 channel or associated sediment basins within the active nearshore, beach or inlet shoal
16 ~~system; system.~~ For purposes of this Rule, "cape shoal systems" include Frying Pan Shoals
17 at Cape Fear, Lookout Shoals at Cape Lookout, and Diamond Shoals at Cape Hatteras;

18 (b) Sediment sampling and analysis shall be used to capture the ~~three-dimensional~~ spatial
19 variability of the sediment characteristics including grain size, sorting and mineralogy
20 within the natural system;

21 (c) Shore-perpendicular transects shall be established for topographic and bathymetric
22 surveying of the recipient ~~beach shall be conducted to determine the beach profile.~~
23 beach. Topographic and bathymetric surveying shall occur along a minimum of five shore-
24 perpendicular transects evenly spaced throughout the entire project ~~area.~~ area with spacing
25 not to exceed 5,000 feet (1,524 meters) in the shore-parallel direction. Each transect shall
26 extend from the frontal dune crest seaward to a depth of 20 feet (6.1 meters) or to the shore-
27 perpendicular distance 2,400 feet (732 meters) seaward of mean low water, whichever is
28 in a more landward position. ~~Transect spacing shall not exceed 5,000 feet (1,524 meters)~~
29 ~~in the shore-parallel direction.~~ Elevation data for all transects shall be ~~referenced to the~~
30 ~~North American Vertical Datum of 1988 (NAVD 88) and the North American Datum of~~
31 ~~1983 (NAD 83);~~ compliant with Chapter 56 (21 NCAC 56.1600) of the N.C. General
32 Statutes;

33 (d) ~~No fewer than 13 sediment samples shall be taken along each beach profile transect. At~~
34 Along each transect, at least one sample shall be taken from each of the following
35 morphodynamic zones where present: frontal dune, frontal dune toe, mid berm, mean high
36 water (MHW), mid tide (MT), mean low water (MLW), trough, bar crest and at even depth
37 increments from 6 feet (1.8 meters) to 20 feet (6.1 meters) or to a shore-perpendicular

1 distance 2,400 feet (732 meters) seaward of mean low water, whichever is in a more
2 landward position. The total number of samples taken landward of MLW shall equal the
3 total number of samples taken seaward of MLW;

4 (e) For the purpose of this Rule, "sediment grain size categories" are defined as "fine" (less
5 than 0.0625 millimeters), "sand" (greater than or equal to 0.0625 millimeters and less than
6 2 millimeters), "granular" (greater than or equal to 2 millimeters and less than 4.76
7 millimeters) and "gravel" (greater than or equal to 4.76 millimeters and less than 76
8 millimeters). Each sediment sample shall report percentage by weight of each of these four
9 grain size categories;

10 (f) A composite of the simple arithmetic mean for each of the four grain size categories defined
11 in Sub-Item (1)(e) of this Rule shall be calculated for each transect. A grand mean shall
12 be established for each of the four grain size categories by summing the mean for each
13 transect and dividing by the total number of transects. The value that characterizes grain
14 size values for the recipient beach is the grand mean of percentage by weight for each grain
15 size category defined in Sub-Item (1)(e) of this Rule;

16 (g) Percentage by weight calcium carbonate shall be calculated from a composite of all
17 sediment ~~samples along each transect defined in Sub-Item (1)(d) of this Rule.~~ samples.
18 The value that characterizes the carbonate content of the recipient beach is a grand mean
19 calculated by summing the average percentage by weight calcium carbonate for each
20 transect and dividing by the total number of transects. ~~For beaches on which fill activities~~
21 ~~have taken place prior to the effective date of this Rule, the Division of Coastal~~
22 ~~Management shall consider visual estimates of shell content as a proxy for carbonate~~
23 ~~weight percent;~~

24 (h) The ~~total~~ number of sediments greater than or equal to one inch (25.4 millimeters) in
25 diameter, and shell material greater than or equal to three inches (76 millimeters) in
26 diameter, ~~observable on the surface of the beach between mean low water (MLW) and the~~
27 ~~frontal dune toe, shall be calculated for an area of 50,000 square feet (4,645 square meters)~~
28 ~~within the beach fill project boundaries. This area is considered a representative sample of~~
29 ~~the entire project area and referred to as the "background" value;~~ diameter shall be
30 differentiated and calculated through visual observation of an area of 10,000 square feet
31 centered on each transect, and between mean tide level (MTL) and the frontal dune toe
32 within the beach fill project boundaries. A simple arithmetic mean shall be calculated for
33 both sediments and shell by summing the totals for each across all transects and dividing
34 by the total number of transects, and these values shall be considered representative of the
35 entire project area, and referred to as the "background" values for large sediment and large
36 shell material;

- 1 (i) Beaches that received sediment prior to the effective date of this Rule shall be characterized
2 in a way that is consistent with Sub-Items (1)(a) through (1)(h) of this Rule and ~~shall~~ may
3 use data collected from the recipient beach prior to the addition of beach fill. ~~If such data~~
4 ~~were not collected or are unavailable, a dataset best reflecting the sediment characteristics~~
5 ~~of the recipient beach prior to beach fill shall be developed in coordination with the~~
6 ~~Division of Coastal Management; and~~ fill where data are available, and in coordination
7 with the Division of Coastal Management; and
- 8 (j) All data used to characterize the recipient beach shall be provided in digital and hardcopy
9 format to the Division of Coastal Management upon request.
- 10 (2) Characterization of borrow areas is not required if completely confined to a cape shoal system. For
11 the purposes of this Rule, “cape shoal systems” include the Frying Pan Shoals at Cape Fear, Lookout
12 Shoals at Cape Lookout, and Diamond Shoals at Cape Hatteras. The applicant shall characterize the
13 sediment to be placed on the recipient beach according to the following methodology:
- 14 (a) The characterization of borrow areas including submarine sites, upland sites, and dredged
15 material disposal areas shall be designed to capture the ~~three-dimensional~~ spatial variability
16 of the sediment characteristics including grain size, sorting and mineralogy within the
17 natural system or dredged material disposal area;
- 18 (b) The characterization of borrow sites ~~shall~~ may include ~~sediment characterization data~~
19 ~~provided by the Division of Coastal Management where available. These data can be found~~
20 ~~in individual project reports and studies, and shall be provided by the Division of Coastal~~
21 ~~Management upon request and where available;~~ historical sediment characterization data
22 where available and collected using methods consistent with Sub-Items (2)(c) through
23 (2)(g) of this Rule, and in coordination with the Division of Coastal Management.
- 24 (c) Seafloor surveys shall measure elevation and capture acoustic imagery of the seafloor.
25 Measurement of seafloor elevation shall cover 100 ~~percent~~ percent, or the maximum extent
26 practicable, of each submarine borrow site and use survey-grade swath sonar (*e.g.*
27 multibeam or similar ~~technologies~~) ~~in accordance with current US Army Corps of~~
28 ~~Engineers standards for navigation and dredging.~~ technologies). Seafloor imaging without
29 an elevation component (*e.g.* sidescan sonar or similar technologies) shall also cover 100
30 ~~percent~~ percent, or the maximum extent practicable, of each ~~borrow site and be performed~~
31 ~~in accordance with US Army Corps of Engineers standards for navigation and dredging.~~
32 site. Because shallow submarine areas can provide technical challenges and physical
33 limitations for acoustic measurements, seafloor imaging without an elevation component
34 may not be required for water depths less than 10 feet (3 meters). Alternative elevation
35 surveying methods for water depths less than 10 feet (3 meters) may be evaluated on a
36 case-by-case basis by the Division of Coastal Management. Elevation data shall be tide-
37 and motion-corrected and ~~referenced to NAVD 88 and NAD 83.~~ Compliant with Chapter

1 56 (21 NCAC 56 .1600) of the N.C. General Statutes. Seafloor imaging data without an
2 elevation component shall ~~be referenced to the NAD 83. All final seafloor survey data shall~~
3 ~~conform to standards for accuracy, quality control and quality assurance as set forth by the~~
4 ~~US Army Corps of Engineers (USACE). The current surveying standards for navigation~~
5 ~~and dredging can be obtained from the Wilmington District of the USACE. Also be~~
6 compliant with Chapter 56 (21 NCAC 56 .1600) of the N.C. General Statutes. For offshore
7 dredged material disposal sites, only one set of imagery without elevation is required.
8 Sonar imaging of the seafloor without elevation is also not required for borrow sites
9 completely confined to maintained navigation channels, and for sediment deposition basins
10 within the active nearshore, beach or inlet shoal system;

11 (d) Geophysical imaging of the seafloor subsurface shall be used to characterize each borrow
12 site ~~and shall use survey grids with a line spacing not to exceed 1,000 feet (305 meters).~~
13 ~~Offshore dredged material disposal sites shall use a survey grid not to exceed 2,000 feet~~
14 ~~(610 meters) and only one set of geophysical imaging of the seafloor subsurface is required.~~
15 ~~Survey grids shall incorporate at least one tie point per survey line. site.~~ Because shallow
16 submarine areas can pose technical challenges and physical limitations for geophysical
17 techniques, subsurface data may not be required in water depths less than 10 feet (3 meters),
18 and the Division of Coastal Management shall evaluate these areas on a case-by-case basis.
19 Subsurface geophysical imaging shall not be required for borrow sites completely confined
20 to maintained navigation channels, and for sediment deposition basins within the active
21 nearshore, beach or inlet shoal system, or upland sites. All final subsurface geophysical
22 data shall use accurate sediment velocity models for time-depth conversions and be
23 ~~referenced to NAD 83;~~ compliant with Chapter 56 (21 NCAC 56 .1600) of the N.C. General
24 Statutes;

25 (e) ~~Sediment~~ With the exception of upland borrow sites, sediment sampling of all borrow sites
26 shall use a vertical sampling device no less than 3 inches (76 millimeters) in diameter.
27 Characterization of each borrow site shall use no fewer than five evenly spaced cores or
28 one core per 23 acres (grid spacing of 1,000 feet or 305 meters), whichever is greater.
29 Characterization of borrow sites completely confined to maintained navigation channels or
30 sediment deposition basins within the active nearshore, beach or inlet shoal system shall
31 use no fewer than five evenly spaced vertical samples per channel or sediment basin, or
32 sample spacing of no more than 5,000 linear feet (1,524 meters), whichever is greater. Two
33 sets of sampling data (with at least one dredging event in between) from maintained
34 navigation channels or sediment deposition basins within the active nearshore, beach or
35 inlet shoal ~~system~~ system, or offshore dredged material disposal site (ODMDS) may be
36 used to characterize material for subsequent nourishment events from those areas if the
37 sampling results are found to be compatible with Sub-Item (3)(a) of this Rule. ~~In submarine~~

1 ~~borrow sites other than maintained navigation channels or associated sediment deposition~~
2 ~~basins within the active nearshore, beach or inlet shoal system where water depths are no~~
3 ~~greater than 10 feet (3 meters), geophysical data of and below the seafloor are not required,~~
4 ~~and sediment sample spacing shall be no less than one core per six acres (grid spacing of~~
5 ~~500 feet or 152 meters). Vertical sampling shall penetrate to a depth equal to or greater~~
6 ~~than permitted dredge or excavation depth or expected dredge or excavation depths for~~
7 ~~pending permit applications. All sediment samples shall be integrated with geophysical~~
8 ~~data to constrain the surficial, horizontal and vertical extent of lithologic units and~~
9 ~~determine excavation volumes of compatible sediment as defined in Item (3) of this Rule;~~
10 Because shallow submarine areas completely confined to a maintained navigation channel
11 or associated sediment basins within the active nearshore, beach or inlet shoal system can
12 pose technical challenges and physical limitations for vertical sampling techniques,
13 geophysical data of and below the seafloor may not be required in water depths less than
14 10 feet (3 meters), and shall be evaluated by the Division of Coastal Management on a
15 case-by-case basis;

16 ~~(f) For offshore dredged material disposal sites, the grid spacing shall not exceed 2,000 feet~~
17 ~~(610 meters). Characterization of material deposited at offshore dredged material disposal~~
18 ~~sites after the initial characterization are not required if all of the material deposited~~
19 ~~complies with Sub-Item (3)(a) of this Rule as demonstrated by at least two sets of sampling~~
20 ~~data with at least one dredging event in between;~~

21 ~~(g)~~ (f) Grain size distributions shall be reported for all sub-samples taken within each vertical
22 sample for each of the four grain size categories defined in Sub-Item (1)(e) of this Rule.
23 Weighted averages for each core shall be calculated based on the total number of samples
24 and the thickness of each sampled interval. A simple arithmetic mean of the weighted
25 averages for each grain size category shall be calculated to represent the average grain size
26 values for each borrow site. Vertical samples shall be geo-referenced and digitally imaged
27 using scaled, color-calibrated photography;

28 ~~(h)~~ (g) Percentage by weight of calcium carbonate shall be calculated from a composite sample of
29 each core. A weighted average of calcium carbonate percentage by weight shall be
30 calculated for each borrow site based on the composite sample thickness of each core.
31 Carbonate analysis is not required for sediment confined to maintained navigation channels
32 or associated sediment deposition basins within the active nearshore, beach or inlet shoal
33 system; and

34 ~~(i)~~ (h) All data used to characterize the borrow site shall be provided in digital and hardcopy
35 format to the Division of Coastal Management upon request.

1 (3) ~~The Division of Coastal Management shall determine sediment~~ Compliance with these sediment
2 standards shall be certified by an individual licensed pursuant to Chapter 89C or 89E of the N.C.
3 General Statutes. Sediment compatibility is determined according to the following criteria:

- 4 (a) Sediment completely confined to the permitted dredge depth of a maintained navigation
5 channel or associated sediment deposition basins within the active nearshore, beach or inlet
6 shoal system is considered compatible if the average percentage by weight of fine-grained
7 (less than 0.0625 millimeters) sediment is less than 10 percent;
- 8 (b) The average percentage by weight of fine-grained sediment (less than 0.0625 millimeters)
9 in each borrow site shall not exceed the average percentage by weight of fine-grained
10 sediment of the recipient beach characterization plus five percent;
- 11 (c) The average percentage by weight of granular sediment (greater than or equal to 2
12 millimeters and less than 4.76 millimeters) in a borrow site shall not exceed the average
13 percentage by weight of coarse-sand sediment of the recipient beach characterization plus
14 10 percent;
- 15 (d) The average percentage by weight of gravel (greater than or equal to 4.76 millimeters and
16 less than 76 millimeters) in a borrow site shall not exceed the average percentage by weight
17 of gravel-sized sediment for the recipient beach characterization plus five percent;
- 18 (e) The average percentage by weight of calcium carbonate in a borrow site shall not exceed
19 the average percentage by weight of calcium carbonate of the recipient beach
20 characterization plus 15 percent; and
- 21 (f) Techniques that take incompatible sediment within a borrow site or combination of sites
22 and make it compatible with that of the recipient beach characterization shall be evaluated
23 on a case-by-case basis by the Division of Coastal Management.

24 (4) Excavation and placement of sediment shall conform to the following criteria:

- 25 ~~(a) Sediment excavation depths for all borrow sites shall not exceed the maximum depth of~~
26 ~~recovered core at each coring location;~~
- 27 ~~(b)~~ (a) In order to protect threatened and endangered species, and to minimize impacts to fish,
28 shellfish and wildlife resources, no excavation or placement of sediment shall occur within
29 the project area during ~~times~~ any seasonal environmental moratoria designated by the
30 Division of Coastal Management in consultation with other State and Federal ~~agencies.~~
31 Agencies, unless specifically approved by the Division of Coastal Management in
32 consultation with other State and Federal agencies. The time limitations shall be established
33 during the permitting process and shall be made known prior to permit issuance; and
- 34 ~~(c)~~ (b) ~~Sediment~~ The total sediments with a diameter greater than or equal to one inch (25.4
35 millimeters), and shell material with a diameter greater than or equal to three inches (76
36 millimeters) is considered incompatible if it has been placed on the beach during the beach
37 fill project, is observed between MLW MTL and the frontal dune toe, and is in excess of

1 twice the background value of material of the same size along any ~~50,000 square foot~~
2 ~~(4,645 square meter)~~ 10,000 square feet section of ~~beach~~ beach within the beach fill project
3 boundaries. In the event that more than twice the background value of incompatible
4 material is placed on the beach, it shall be the permittee's responsibility to remove the
5 incompatible material in coordination with the Division of Coastal Management and other
6 State and Federal resource agencies.

7
8 *History Note: Authority G.S. 113-229; 113A-102(b)(1); 113A-103(5)(a); 113A-107(a); 113A-113(b)(5) and (6);*
9 *113A-118; 113A-124;*
10 *Eff. February 1, 2007;*
11 *Amended Eff. April 1, 2021; August 1, 2014; September 1, 2013; April 1, 2008.*

APPENDIX 2
CURRITUCK COUNTY BEACH SAMPLING TRANSECTS FOR
LARGE SEDIMENTS AND SHELL MATERIAL

Station	Easting	Northing	Azimuth
C-002	2919457.8	1032585.8	79
C-017	2922307.4	1017926.0	79
C-031	2924973.6	1004209.6	79
C-046	2929257.6	989839.7	75
C-061	2933537.1	975487.8	77
C-075	2936929.2	961883.0	77
C-090	2941113.0	947482.5	73
C-105	2945935.5	933285.3	70
C-120	2951140.4	919217.0	70

Note: Coordinates are in feet based on the North Carolina State Plane Coordinate System, FIPS 3200, North American Datum of 1983 (NAD 83).

APPENDIX 3
CPE LARGE SEDIMENT AND SHELL MATERIAL SURVEY RESULTS
FOR CURRITUCK COUNTY'S BEACHES

Currituck County, NC					
Station	Number of Clasts		Corner Coordinates		
	Sediment ≥ 1 Inch	Shell ≥ 3 Inch		x	y
C-002	0	14	1	1032802.1	2920278.5
			2	1032685.8	2920292.4
			3	1032671.9	2920208.9
			4	1032786.4	2920188.5
C-017	0	5	1	1018138.1	2923251.4
			2	1018085.9	2923266.7
			3	1018046.8	2923047.5
			4	1018090.9	2923037.0
C-031	3	5	1	1004518.9	2926436.4
			2	1004476.8	2926438.5
			3	1004428.6	2926202.9
			4	1004467.7	2926190.7
C-046	1	6	1	990121.9	2930235.8
			2	990083.1	2930237.1
			3	990046.7	2930103.0
			4	990085.0	2930094.8
C-061	24	62	1	975599.0	2933837.3
			2	975518.1	2933859.0
			3	975490.4	2933732.6
			4	975569.7	2933715.1
C-075	138	546	1	961998.8	2937247.7
			2	961921.2	2937278.4
			3	961892.8	2937155.9
			4	961972.2	2937132.5
C-090	7	132	1	947659.3	2941571.6
			2	947591.1	2941583.0
			3	947548.0	2941437.3
			4	947608.8	2941413.8
C-105	3	38	1	933451.0	2946257.8
			2	933365.4	2946292.2
			3	933326.9	2946172.3
			4	933405.6	2946143.8
C-120	5	35	1	919371.1	2951416.2
			2	919278.3	2951453.5
			3	919243.3	2951342.5
			4	919325.8	2951309.2
Total	181	843			
Total Project Mean	20.1	93.7			
Carova Mean	0.0	9.5			
Reserve/Refuge Mean	2.0	5.5			
Corolla Mean	56.3	246.7			
Pine Island Mean	4.0	36.5			

APPENDIX 4
CURRITUCK COUNTY BEACH MONUMENT INFORMATION REPORT



CONTROL MONUMENT USED BY CPE for CURRITUCK COUNTY NATIVE BEACH SEDIMENT CHARACTERIZATION SURVEY MAY 2022	
DATUMS: NAD83/90 - NAVD88	
Designation	ADRIATIC
Stamping	ADRIATIC 1996
Northing	974,203.77
Easting	2,933,858.46
Elevation	6.6
Description	This benchmark is located near the intersection of Adriatic Ave. and Atlantic Ave. It is approximately 14 feet east of the centerline of Atlantic Ave. and 6 ft north of the center of public beach access.



Monument: ADRIATIC

Mean of Inverse Shots - Published Versus CPE Found				
Monument	No. of Shots	ΔN	ΔE	ΔZ
ADRIATIC	4	0.004	-0.017	-0.100



CONTROL MONUMENT USED BY CPE for for CURRITUCK COUNTY NATIVE BEACH SEDIMENT CHARACTERIZATION SURVEY April 2021	
DATUMS: NAD83/90 - NAVD88	
Designation	RADIO
Stamping	RADIO 1962
Northing	935,113.16
Easting	2,944,087.11
Elevation	9.22
Description	This benchmark is located approximately 7 miles south of the Currituck Beach Lighthouse. Specifically, it is located approximately 260 feet to the east of Highway 12 and 265 feet north of the Corolla Fire and Rescue building. The benchmark is a standard disk clamped to the top of a 1-inch copperweld pipe which is set in a 2-inch galvanized pipe.



Monument: RADIO

Mean of Inverse Shots - Published Versus CPE Found				
Monument	No. of Shots	ΔN	ΔE	ΔZ
RADIO	4	0.037	0.022	0.005

APPENDIX 5
DIGITAL FILES
(Digital Copy Only)

- Shapefiles of the survey areas
- Excel file with data for client
- Project photos