

EXECUTIVE SUMMARY

The Town of Duck is located on the Outer Banks of North Carolina, roughly 27 miles south-southeast of the North Carolina and Virginia border. The Town extends along 5.9 miles of Atlantic Ocean shoreline from the Dare County and Currituck County line south to the Town of Southern Shores.

The Town of Duck is focused on a long-term shoreline management program that will serve to sustain the beaches that support a significant portion of their local economy and maintains the tax base of the Town. In May and June 2017, the Town constructed a beach nourishment project along 1.6 miles of its ocean shoreline that was shown to be the most vulnerable portion of the Town's oceanfront. Approximately 1.26 million cubic yards of fill was distributed between Skimmer Way (station D-10) and the northern USACE Field Research Facility (FRF) property boundary (station D-19).

As part of its long-term shoreline management program, the Town has implemented an annual monitoring program to assess both the performance of the beach nourishment project and to track the overall health of the beach along the entire Town. The annual monitoring focusses on analyzing shoreline and volume changes. The monitoring area is divided into three areas designated as the Project Area (station D-10 to D-19); the area North of the Beach Project (D-01 to D-10), which extends south from the Town limit to Skimmer Way; and the area South of the Beach Project (D-19 to D-34), which extends from the northern boundary of the FRF property south to the Town boundary with Southern Shores.

For purposes of tracking the performance of the beach fill, the initial volume of material within the limits of the Project Area is defined as the volume change measured between April 2017 and December 2017. As noted in the report, beach fills undergo an initial period of adjustment during which time material is redistributed by wave action from the upper portion of the profile to deeper portions of the active profile as well as along the shore out of the placement area. This initial adjustment normally takes several months depending on wave conditions. Once the initial adjustments are completed, the beach fill typically begins to mimic the behavior of the native beach.

The profile surveys between April 2017 (Pre-Construction) and December 2017 (Post-Construction), selected to determine the pre- and post-beach fill conditions, indicated that 963,100 cubic yards of fill was measured within the limits of the Project Area as a result of the 2017 beach nourishment project. Beach profile surveys conducted during the recent survey interval, between June 2018 and May 2019, indicated that the Project Area experienced a volumetric loss of 126,200 cubic yards above the -24 ft. NAVD88 contour. The highest losses occurred along the southern 2,600 ft. of the Project Area between Pintail Dr. and the northern border of the FRF property (D-16 to D-19). Some of the volume loss from the Project Area may have resulted from spreading losses, typical of a beach nourishment project. Since the Post-construction survey (December 2017), the Project Area has lost a total of 225,900 cubic yards as of May 2019. This equates to approximately 23% of the fill measured as placed in the Project Area in December 2017. As of May 2019, the analysis indicates that the Town of Duck beach nourishment project had 77% of the initial fill volume remaining as measured above the -24-foot NAVD88 contour.

The following table summarizes the average shoreline changes (ft.) in the position of the +6.0 ft. NAVD88 contour measured between the recent and long-term periods used to evaluate the Project Area and areas North and South of the Project. Average shoreline changes are shown for the periods from September 2013 to May 2019, which represents long-term changes that include the construction of the beach nourishment project, December 2017 (Post-construction) to May 2019 (updated changes since project construction), and June 2018 to May 2019 (recent changes).

Table ES-1
Summary of Average Shoreline Changes (ft.) within the Project Area and North and South Monitoring Areas

MONITORING AREAS	Sept. 2013 (Baseline) to May 2019 (Year-2)	Dec. 2017 (Post-Con) to May 2019 (Year-2)	June 2018 (Year-1) to May 2019 (Year-2)
PROJECT AREA (D-10 TO D-19)	52.9	-25.8	7.1
AREA NORTH OF PROJECT (D-01 TO D-10)	-9.1	5.5	-8.7
AREA SOUTH OF PROJECT (D-19 TO D-34)	6.2	19.1	8.5

Average volumetric changes above the -24' NAVD contour (cubic yards/ft./year) for the Project Area and areas North and South of the Project are provided below for the following periods: September 2013 to May 2015 (prior to the construction of the project); December 2017 (Post-construction) to May 2019 (changes since project construction); and the recent volumetric changes measure between June 2018 and May 2019.

Table ES-2
Summary of Average Volume Changes (cy/ft./yr.) within the Project Area and North and South Monitoring Areas

ONITORING AREAS	Sept. 2013 (Baseline) to May 2019 (Year-2)	Dec. 2017 (Post-Con) to May 2019 (Year-2)	June 2018 (Year-1) to May 2019 (Year-2)
PROJECT AREA (D-10 TO D-19)	-3.7	-18.3	-17.9
AREA NORTH OF PROJECT (D-01 TO D-10)	-21.5	1.7	8.0
AREA SOUTH OF PROJECT (D-19 TO D-34)	1.1	-2.8	6.8