

SUMMER 2020 ANNUAL BEACH MONITORING SURVEY EVALUATION TOWN OF NAGS HEAD, NORTH CAROLINA

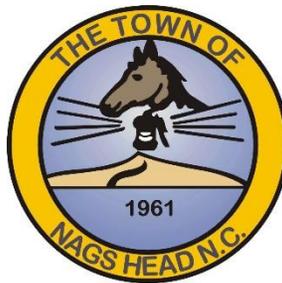
OCTOBER 2020 | FINAL REPORT



TOWN OF NAGS HEAD

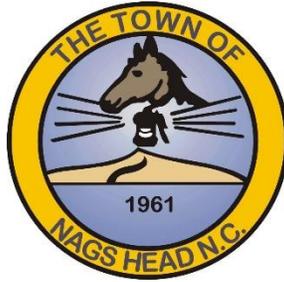
2020 SUMMER ANNUAL MONITORING SURVEY EVALUATION

Prepared for:



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Prepared by:



TOWN OF NAGS HEAD

**2020 SUMMER ANNUAL MONITORING
SURVEY EVALUATION**

EXECUTIVE SUMMARY

The Town of Nags Head Beach Monitoring and Analysis Program (NHBMAP) is sponsored by the Town of Nags Head (Town) as a continuation of the 2011 monitoring program initiated for assessing beach conditions. The primary purpose of the program is to assess current and historical shoreline conditions, determine shoreline and volumetric changes and evaluate the performance of beach nourishment and other restoration efforts. Evaluating and documenting these changes consistently over successive years provides information necessary to plan for future beach nourishments and to support development of the Town's multi-decadal Beach Nourishment Master Plan.

The most recent annual survey occurred during the summer of 2020 (June) and was performed by McKim & Creed. This report documents the data sources, methods, and results of a survey evaluation by Moffatt & Nichol performed to compare the June 2020 survey with a previous survey performed by Coastal Science & Engineering (CSE) in August 2019. It is noted that CSE performed an intermediate survey in November 2019 to document changes to the beach as a result of Hurricane Dorian. Therefore, in this report, impacts from Hurricane Dorian will be noted within the context of the annual analysis.

The survey data was used to compute shoreline change at Mean High Water (MHW), which is designated as +1.18 ft NAVD88 for Nags Head, and volume change above +6 ft NAVD88 (berm), MHW, -6 ft NAVD88 (wading depth), -14 ft NAVD88 (outer bar), -19 ft NAVD88 (approximate depth of closure), and -30 ft NAVD88 (offshore). This allows a detailed review of the shoreline and active profile performance during the 2019-2020 monitoring period.

During 2019 Beach Nourishment Project approximately 4.0 million cy of material was placed along approximately 10 miles of shoreline. The shoreline position and volume changes above six elevations relative to pre-nourishment conditions (April 2019) along the Nourished Oceanfront (Station 495+00 – 1025+00) are illustrated below.

Figure ES-1 shows the shoreline changes relative to pre-nourishment condition (April 2019) along the Nourished Oceanfront. The shoreline experienced a significant landward recession along the Nourished Oceanfront since the completion of nourishment project. Most of the recession that has occurred since nourishment occurred before the post-Dorian survey which indicates that most of the shoreline recession can be attributed to Hurricane Dorian. Additionally, no significant shoreline position recovery is observed after Hurricane Dorian.

Figure ES-2 illustrates that the overall changes in sand volume vary with the depth. The results confirmed the total volume change above -19 ft NAVD88 since pre-nourishment was +4,114,182 cy (107 percent of the project volume). After the completion of the 2019 Beach Nourishment project approximately 273,078 cy (+5.1 cy/ft) volume gain was observed above -19ft NAVD88 along the Nourished Oceanfront. However, the results show large-scale shifts of sand cross-shore, across different elevations.

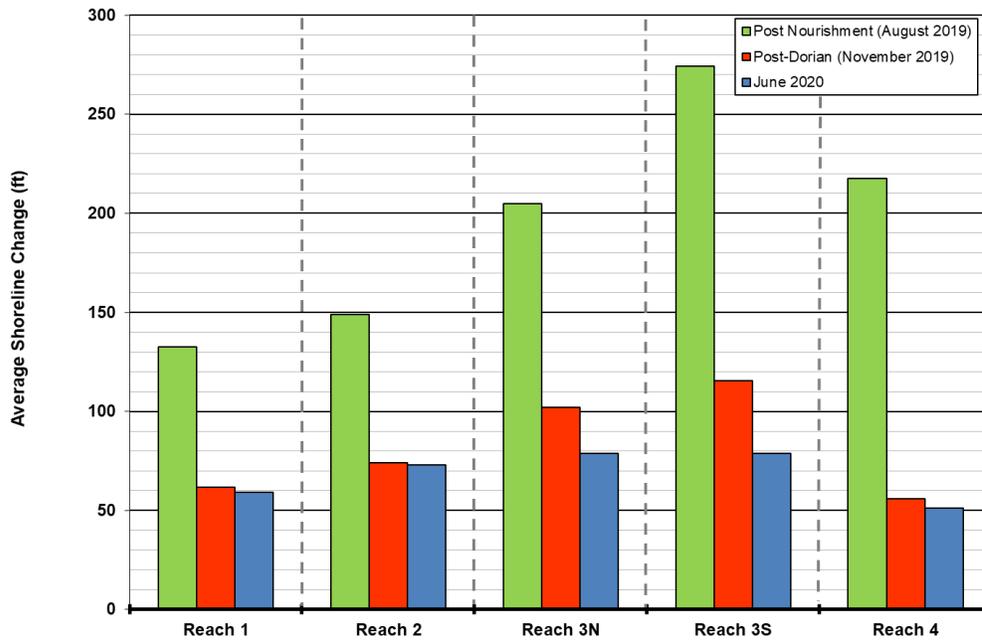


Figure ES-1. Nourished Oceanfront Average Shoreline Change Relative to April 2019 Pre-Nourishment Conditions

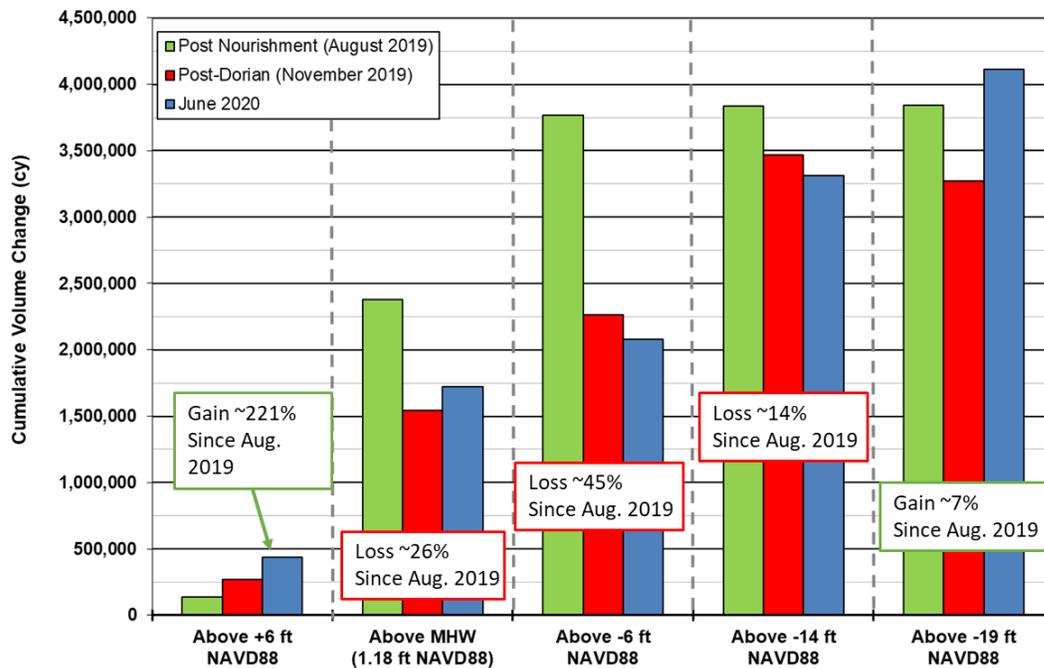


Figure ES-2. Nourished Oceanfront Cumulative Volume Change Relative to April 2019 Pre-Nourishment Conditions

Volume changes during the monitoring period indicated that the Nourished Oceanfront experienced gains in material along the upper (+6 ft NAVD88) and lower (-19 ft NAVD88)

portions of the profiles. Volume losses were experienced above MHW, above -6 ft NAVD88, and above -14 ft NAVD88. The volume losses can be attributed to Hurricane Dorian and the Nor'easter event. This behavior might be exasperated at some elevations due to equilibration of the 2019 Beach Nourishment project.

Key statistics for individual reaches along Nags Head along with the entire oceanfront shoreline were as follows:

Table ES-1. Nags Head Shoreline and Average Unit Volume Change Statistics (2019 – 2020)

| 2019 vs. 2020 (Total Change) | Transects | Reach Length | avg shoreline change @ +1.18 ft NAVD88 | avg volume change above +6 ft NAVD88 | avg volume change above +1.18 ft NAVD88 | avg volume change above -6 ft NAVD88 | avg volume change above -14 ft NAVD88 | avg volume change above -19 ft NAVD88 | avg volume change above -30 ft NAVD88 |
|-----------------------------------|-------------------------|---------------|--|--------------------------------------|---|--------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| Reach | # | ft | ft | cy/ft | cy/ft | cy/ft | cy/ft | cy/ft | cy/ft |
| Nags Head - North | 430+00 - 495+00 | 6,500 | -53.0 | -0.8 | -7.5 | -24.3 | -1.4 | 3.5 | 10.9 |
| Nags Head - Reach 1 | 495+00 - 790+00 | 29,500 | -73.4 | 4.9 | -10.8 | -24.9 | -5.3 | 8.7 | 12.5 |
| Nags Head - Reach 2 | 790+00 - 920+00 | 13,000 | -76.0 | 7.1 | -8.5 | -28.8 | -1.3 | 11.9 | 7.3 |
| Nags Head - Reach 3N | 920+00 - 975+00 | 5,500 | -125.9 | 6.2 | -16.9 | -46.0 | -20.3 | 6.1 | -5.0 |
| Nags Head - Reach 3S | 975+00 - 1010+00 | 3,500 | -195.6 | 6.9 | -28.0 | -69.0 | -46.9 | -34.7 | -39.2 |
| Nags Head - Reach 4 | 1010+00 - 1025+00 | 1,500 | -166.5 | 5.3 | -25.2 | -61.9 | -48.2 | -34.0 | -28.7 |
| Nags Head - Oregon Inlet | 1025+00 - 1200+00 | 17,500 | -42.0 | 2.1 | -2.6 | -13.9 | 3.8 | 0.1 | -5.7 |
| | Transects | Reach Length | weighted avg | weighted avg | weighted avg | weighted avg | weighted avg | weighted avg | weighted avg |
| Nourished Oceanfront | 495+00 - 1025+00 | 53,000 | -90.2 | 5.7 | -12.4 | -32.0 | -9.8 | 5.1 | 4.8 |
| Total Monitored Oceanfront | 430+00 - 1200+00 | 77,000 | -76.1 | 4.4 | -9.7 | -27.2 | -6.0 | 3.9 | 2.9 |

Table ES-2. Nags Head Cumulative Volume Change Statistics (2019 – 2020)

| 2019 vs. 2020 (Total Change) | Transects | Reach Length | cumulative volume change above +6 ft NAVD88 | cumulative volume change above +1.18 ft NAVD88 | cumulative volume change above -6 ft NAVD88 | cumulative volume change above -14 ft NAVD88 | cumulative volume change above -19 ft NAVD88 | cumulative volume change above -30 ft NAVD88 |
|-----------------------------------|-------------------------|---------------|---|--|---|--|--|--|
| Reach | # | ft | cy | cy | cy | cy | cy | cy |
| Nags Head - North | 430+00 - 495+00 | 6,500 | -5,081 | -48,568 | -157,819 | -9,067 | 22,945 | 70,672 |
| Nags Head - Reach 1 | 495+00 - 790+00 | 29,500 | 144,242 | -317,435 | -733,688 | -155,164 | 257,446 | 368,393 |
| Nags Head - Reach 2 | 790+00 - 920+00 | 13,000 | 92,898 | -110,725 | -374,783 | -16,854 | 154,134 | 94,514 |
| Nags Head - Reach 3N | 920+00 - 975+00 | 5,500 | 33,997 | -92,703 | -252,767 | -111,474 | 33,664 | -27,755 |
| Nags Head - Reach 3S | 975+00 - 1010+00 | 3,500 | 20,806 | -83,915 | -207,063 | -140,727 | -104,238 | -117,480 |
| Nags Head - Reach 4 | 1010+00 - 1025+00 | 1,500 | 10,545 | -50,381 | -123,858 | -96,436 | -67,929 | -57,307 |
| Nags Head - Oregon Inlet | 1025+00 - 1200+00 | 17,500 | 36,929 | -45,373 | -243,843 | 66,763 | 1,734 | -100,269 |
| | Transects | Reach Length | total | total | total | total | total | total |
| Nourished Oceanfront | 495+00 - 1025+00 | 53,000 | 302,486 | -655,158 | -1,692,158 | -520,654 | 273,078 | 260,365 |
| Total Monitored Oceanfront | 430+00 - 1200+00 | 77,000 | 334,334 | -749,098 | -2,093,819 | -462,958 | 297,756 | 230,769 |

The Nourished Oceanfront shoreline experienced a significant overall average landward recession at MHW of -90.2 ft over the past year. This is influenced by Hurricane Dorian and equilibration of the summer 2019 Beach nourishment project. A similar shoreline trend was experienced in the Total Monitored Oceanfront with landward MHW shoreline recession of -76.1 ft during the annual monitoring period. No shoreline position recovery was observed after Hurricane Dorian.

All reaches except Reach 3-South and Reach 4 saw recovery of the loss material above depth of closure (-19 ft NAVD88) after Hurricane Dorian as evidenced by gains above -19 ft NAVD88 following losses observed post-Dorian. In all management reaches except Reach 3-South and Reach 4, the material lost between + 6 ft NAVD88 and -14 ft NAVD88 was captured above -19 ft NAVD88 indicating that the material remained within the system. In Reach 3-South and Reach 4 volume losses were observed extending below -30 ft NAVD88 indicating volume loss well beyond the depth of closure, and it is not expected that this material would migrate back onshore. Accelerated longshore transport rates in these reaches also contributes to the lack of recovery of eroded material within its reach.

The vulnerable locations with respect to dune erosion were also analyzed, and two locations were determined as long-term dune erosion locations. The first location is observed at Reach 1, in front of the Jockey's Ridge State Park, between East Hollowell Street and East Soundside Road. The second area covered the south part of the monitoring area starting from the hotspot location at Reach 3-South and extending south through Reach 4.

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1.0 OBJECTIVE

The Town of Nags Head Beach Monitoring and Analysis Program (NHBMAP) is sponsored by the Town of Nags Head (Town) as a continuation of the 2011 monitoring program initiated for assessing beach conditions. The primary purpose of the program is to assess current and historical shoreline conditions, determine shoreline and volumetric changes and evaluate the performance of beach nourishment and other restoration efforts. Evaluating and documenting these changes consistently over successive years provides information necessary to plan for future beach nourishments and to support development of the Town's multi-decadal Beach Nourishment Master Plan.

The most recent annual survey occurred during the summer of 2020 (June) and was performed by McKim & Creed. This report documents the data sources, methods, and results of a survey evaluation by Moffatt & Nichol performed to compare the June 2020 survey with a previous survey performed by Coastal Science & Engineering (CSE) in August 2019. It is noted that CSE performed an intermediate survey in November 2019 to document changes to the beach as a result of Hurricane Dorian. Therefore, within this report, impacts from Hurricane Dorian will be noted within the context of the annual analysis.

2.0 SUMMARY OF PREVIOUS WORK

Previous beach monitoring studies performed by CSE between 2010 and 2018 were reviewed to gain an understanding of previous survey methods, associated coastal analysis, and observed trends. Shoreline and volume change data for each year was compared to an initial survey performed in 2010, taken before the 2011 beach nourishment project providing for some long-term analysis. **Figure 2-1** presents the extents of each of the monitoring shoreline reaches. It should be noted that the monitoring Reach 1 begins from Station 495+00 while the 2011 construction reach began from 497+00. **Table 2-1** shows the long-term volume changes over the various reaches of shoreline.



Figure 2-1: Prior Established Monitoring Reaches

Table 2-1. Long-term Volume Change (Previous Studies: 2010-2018)

| | | Nov 2010- Nov 2011 | Nov 2010- Jun 2012 | Nov 2010- Nov 2012 | Nov 2010- Jun 2013 | Nov 2010- Jun 2014 | Nov 2010- Jun 2015 | Nov 2010- Jun 2016 | Nov 2010- July 2017 | Nov 2010- May 2018 |
|----------------------------------|---------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|-----------------------|
| | | cy | cy |
| Dune to +6 ft NAVD88 | Reach 1 (495- 790) | 135,789 | 213,713 | 124,589 | 344,963 | 456,407 | 466,904 | 505,144 | 551,781 | 526,825 |
| | Reach 2 (790-920) | 117,999 | 164,846 | 145,705 | 254,009 | 287,513 | 281,663 | 302,382 | 328,262 | 293,650 |
| | Reach 3 (920-1010) | 85,345 | 100,273 | 144,338 | 243,163 | 221,848 | 211,574 | 221,481 | 237,733 | 227,253 |
| | Reach 4 (1010-1025) | 10,824 | 17,767 | 13,678 | 26,771 | 35,216 | 18,915 | 5,486 | 9,292 | 2,746 |
| | Project Oceanfront | 349,957 | 496,599 | 428,310 | 868,906 | 1,000,984 | 979,056 | 1,034,493 | 1,127,068 | 1,050,474 |
| Dune to -6 ft NAVD88 | Reach 1 (495- 790) | 1,138,026 | 1,032,425 | 1,014,648 | 1,219,411 | 1,085,981 | 1,079,356 | 1,086,961 | 1,194,858 | 985,588 |
| | Reach 2 (790-920) | 967,742 | 902,188 | 883,008 | 1,002,007 | 844,702 | 809,453 | 783,717 | 721,915 | 599,858 |
| | Reach 3 (920-1010) | 1,026,681 | 904,870 | 789,190 | 823,748 | 669,903 | 658,157 | 579,130 | 604,978 | 420,428 |
| | Reach 4 (1010-1025) | 110,880 | 118,284 | 93,392 | 90,268 | 77,033 | 31,752 | 29,024 | 22,168 | -14,344 |
| | Project Oceanfront | 3,243,329 | 2,957,767 | 2,780,238 | 3,135,434 | 2,677,619 | 2,578,718 | 2,478,832 | 2,543,919 | 1,991,530 |
| Dune to -19 ft NAVD88 | Reach 1 (495- 790) | 1,700,982 | 2,101,133 | 1,713,410 | 1,911,609 | 1,908,360 | 1,790,705 | 2,088,642 | 1,699,296 | 1,053,383 |
| | Reach 2 (790-920) | 1,297,082 | 1,373,586 | 1,141,685 | 1,292,398 | 1,346,691 | 1,268,412 | 1,305,026 | 888,118 | 573,200 |
| | Reach 3 (920-1010) | 1,281,379 | 1,296,493 | 1,003,944 | 1,137,586 | 1,025,817 | 799,182 | 760,191 | 408,100 | 157,253 |
| | Reach 4 (1010-1025) | 173,344 | 207,830 | 176,447 | 137,614 | 114,850 | 61,492 | 16,051 | -59,743 | -114,154 |
| | Project Oceanfront | 4,452,787 | 4,979,042 | 4,035,486 | 4,479,207 | 4,395,718 | 3,919,791 | 4,169,910 | 2,935,771 | 1,669,682 |

3.0 SURVEY PROCEDURES AND DATA PROCESSING

3.1 Survey Transects and Reaches

The present monitoring survey and evaluation continue to use the existing transect lines and origins established by CSE in monitoring periods prior to 2020. Additional monitoring transects were added in 2020 as recommended by Moffatt & Nichol to better understand sand movement and trends at hotspots and south of the Town. McKim & Creed conducted the survey in June 2020, including both the additional transects and the previously established transect lines. **Figure 3-1** shows the location of the original and additional survey lines and origins applied by McKim & Creed and Moffatt & Nichol for the surveying. As shown, survey transect lines were stationed from north to south along Nags Head. Historically the Nags Head – Oregon Inlet reach extended between Stations 1025+00 and 1230+00, however in 2019 summer survey Station 1230+00 was not surveyed. Therefore, in the current annual monitoring report, Nags Head – Oregon Inlet reach was limited to Stations 1025+00 to 1200+00. A summary of streets/landmarks present at the start and end of each reach are provided in **Table 3-1**.

Table 3-1. Reach Start and End Points

| Reach | Stations | Length (ft) | Start Point | End Point |
|--------------------------|-----------------|-------------|--------------------------|-----------------|
| Nags Head - North | 430+00-495+00 | 6,750 | E 8 th Street | Bonnett Street |
| Reach 1 | 495+00-790+00 | 29,000 | Bonnett Street | Governor Street |
| Reach 2 | 790+00-920+00 | 13,000 | Governor Street | James Street |
| Reach 3 - North | 920+00-975+00 | 5,500 | James Street | Limulus Drive |
| Reach 3 - South | 975+00-1010+00 | 3,500 | Limulus Drive | Loon Court |
| Reach 4 | 1010+00-1025+00 | 2,000 | Loon Court | McCall Court |
| Nags Head - Oregon Inlet | 1025+00-1200+00 | 17,250 | McCall Court | Oregon Inlet |

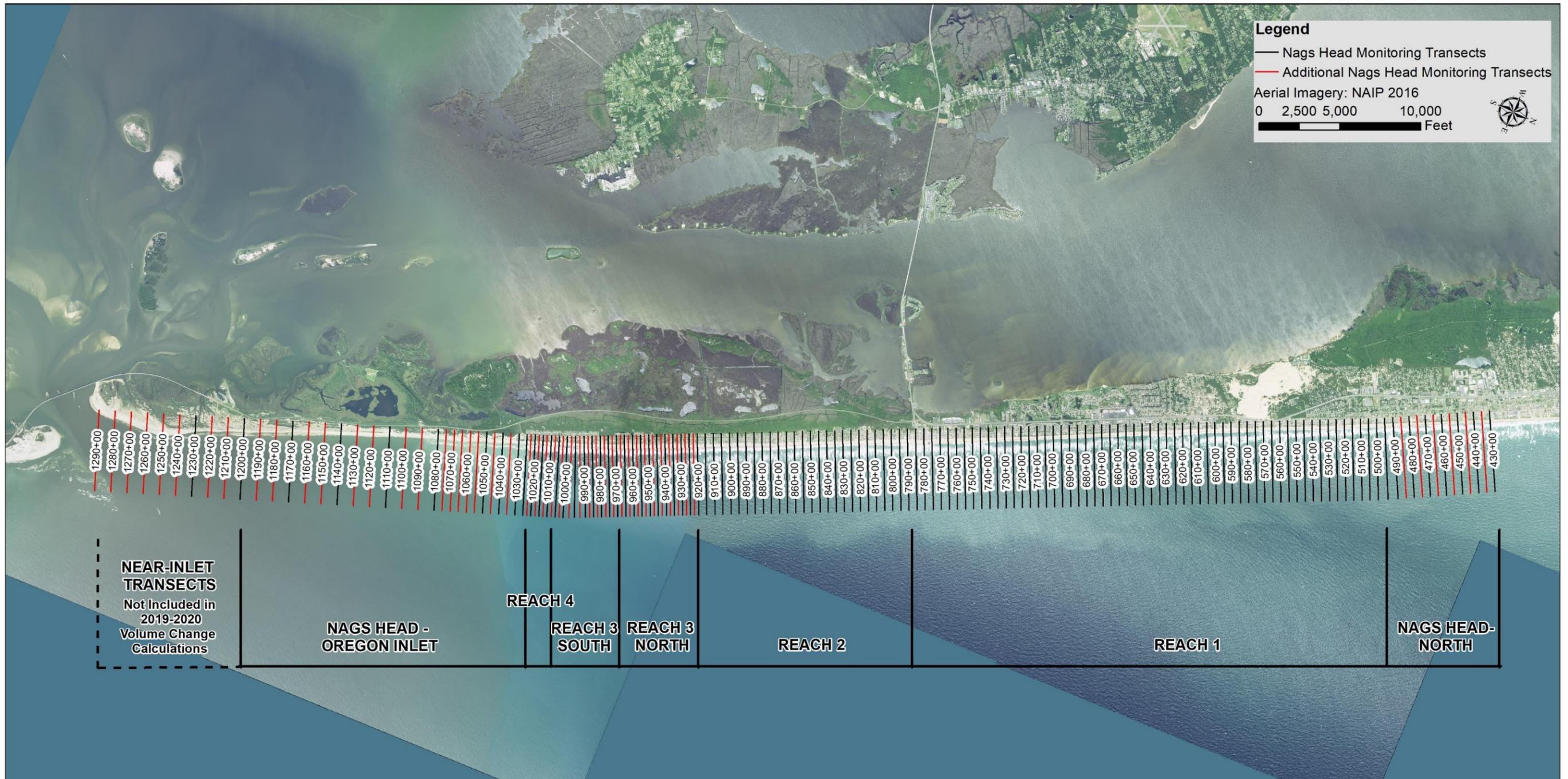


Figure 3-1. Nags Head Profile Line Locations

3.2 Survey Data Acquisition

To enable a reproducible and consistent result for the monitoring analysis, the survey events for each shoreline segment are assigned a single date for their completion. Assigning the survey date allows the determination of a consistent timeframe for each monitoring period between survey events for use in calculating shoreline and volumetric change rates.

2020 Survey Event

The most recent set of annual survey data was collected by McKim & Creed on June 18-24. The date used for the 2020 Nags Head profiles for this report is June 24, 2020, when surveying was completed.

2019 Post-Dorian Survey Event

After Hurricane Dorian's passage in September 2019, CSE conducted a post-storm survey on November 24-27, 2019. The date used for the 2020 Nags Head profiles for this report is June 27, 2020, when surveying was completed.

2019 Post – Nourishment Survey Event

The previous set of annual survey data was collected by CSE in August 2019 soon after the completion of the 2019 Nags Head Beach Nourishment Project. The date used for the 2019 Nags Head profiles for this report is August 21, 2019, when surveying was completed.

2019 Pre – Nourishment Survey Event

Before the 2019 Beach Nourishment Project CSE conducted a pre-nourishment survey in April 2019. The date used for the 2019 Nags Head profiles for this report is April 8.

McKim & Creed provided the processed survey data to Moffatt & Nichol in ASCII (xyz), Excel (xyz), BMAP (free format), and GIS (shapefile, grid) formats allowing for compatibility with multiple programs. The data referenced the horizontal North American Datum 1983 (NAD83) State Plane North Carolina (U.S. survey feet) and elevations were provided in feet relative to the North American Vertical Datum of 1988 (NAVD88). A copy of the survey data files is included on the attached CD also containing an electronic copy of the report.

Appendix A contains the McKim & Creed Field Report which discusses, in detail, the singlebeam (bathymetric) and topographic data acquisition. The field report also provides the associated equipment and quality control procedures (QA/QC) utilized in the data collection and processing tasks.

4.0 SURVEY EVALUATION METHODS

4.1 Shoreline Change

Shoreline change designated at the MHW contour, defined as +1.18 ft NAVD88, was calculated at each transect between the August 2019 and June 2020 surveys. The MHW elevation is based on National Oceanic and Atmospheric Administration (NOAA) tidal benchmark at Duck, NC shown in **Figure 4-1**. The resulting values represent the shoreline change (ft) over the time between surveys.

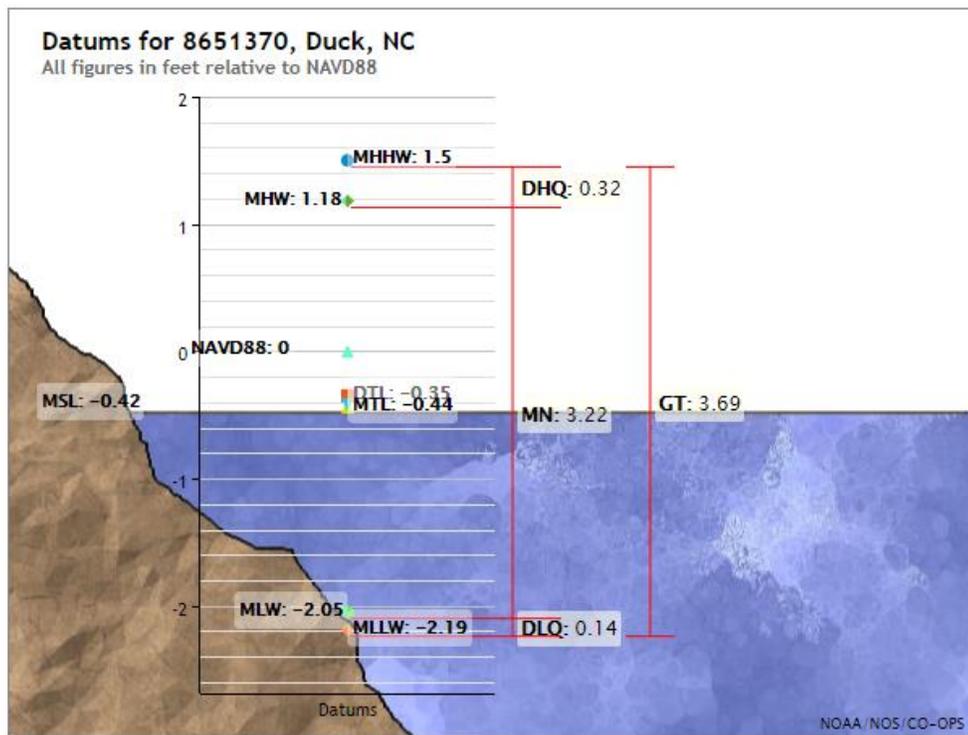


Figure 4-1. Tidal Datum for Duck, NC Station 8651370

4.2 Volume Change

Representative volume changes were calculated at each transect between the 2019 and 2020 surveys. Volume changes were calculated for six different elevation extents in order to better understand the processes occurring onshore and offshore of Nags Head. Calculations included volume change above the following elevations:

- above +6 ft NAVD88 (berm),
- above +1.18 ft NAVD88 (MHW),
- above -6 ft NAVD88 (wading depth/recreational beach),
- above -14 ft NAVD88 (outer bar),
- above -19 ft NAVD88 (depth of closure), and
- above -30 ft NAVD88.

For those profiles which did not extend to -30 ft NAVD88, volume calculations were performed above -30 ft NAVD88 out to the extent of the shortest survey. **Figure 4-2** presents a graphical display of the various elevations for which volume change calculations were made.

As with the shoreline change, the results represent volume change (cy/ft) over the period of time between surveys. In addition, the volume changes were converted to cumulative changes over each of the management reaches and for the entire shoreline. This was done by applying the average end area method to the unit volume changes (cy/ft) computed at each transect and summing the total volume changes between each neighboring pair of transects. The resulting value indicated the total loss or gain of material between survey periods based on the applicable profile extents.

It should be noted that the uncertainty in the hydrographic portion of the survey can result in a significant volumetric change in offshore areas where the slope of the seafloor declines gradually. If an uncertainty of ± 0.11 ft is applied along the portion of the profile between the seaward side of the depth of closure (approximately 2,050 ft offshore) and a depth of -30 ft NAVD88 (approximately 2,950 ft offshore) along all 77,000 ft of oceanfront shoreline, this lends itself to an uncertainty of approximately $\pm 282,300$ cy. For this reason, more attention is given to the volume change calculations at -19 ft NAVD88 and above.

The profile volume calculation lenses (see **Figure 4-2**) were strategically chosen to help understand and track the movement of sand onshore and offshore. Volume changes calculated for portions of the profiles above +6 ft NAVD88 and above MHW are representative of changes in the amount of material in the dune system and on the subaerial beach. These areas of the profile are highly influenced by storm activity, and they are both very significant in the ability of the beach and dune to mitigate storm surge and wave impacts on landward structures and infrastructure. Volume comparisons for portions of the profiles above -6 ft NAVD88, an approximate wading depth, represent changes in the recreational beach area. Volume comparisons above -14 ft NAVD88 help to track sand movement to and from the outer sand bar and are valuable in decision making for future beach nourishment projects. Wave energy from storms is expected to be absorbed by the profile out to -14 ft NAVD88, making the volume above that depth an important indicator of storm protection. Therefore, in the master plan, the volume above -14 ft NAVD88 will likely be used as a nourishment trigger. Volume comparisons above -19 ft NAVD88 provide general estimates of the total volumetric change along the respective profile out to the depth of closure. Finally, volume comparisons above -30 ft NAVD88 allow the complete tracking of sand movement offshore. However, hydrographic survey measurement accuracy may impact these calculations. This is a proven, comprehensive way to assess the impact of storm activity on the subaerial beach and dune system as well as track the movement of sand offshore and quantify total gains and losses in the entire system.

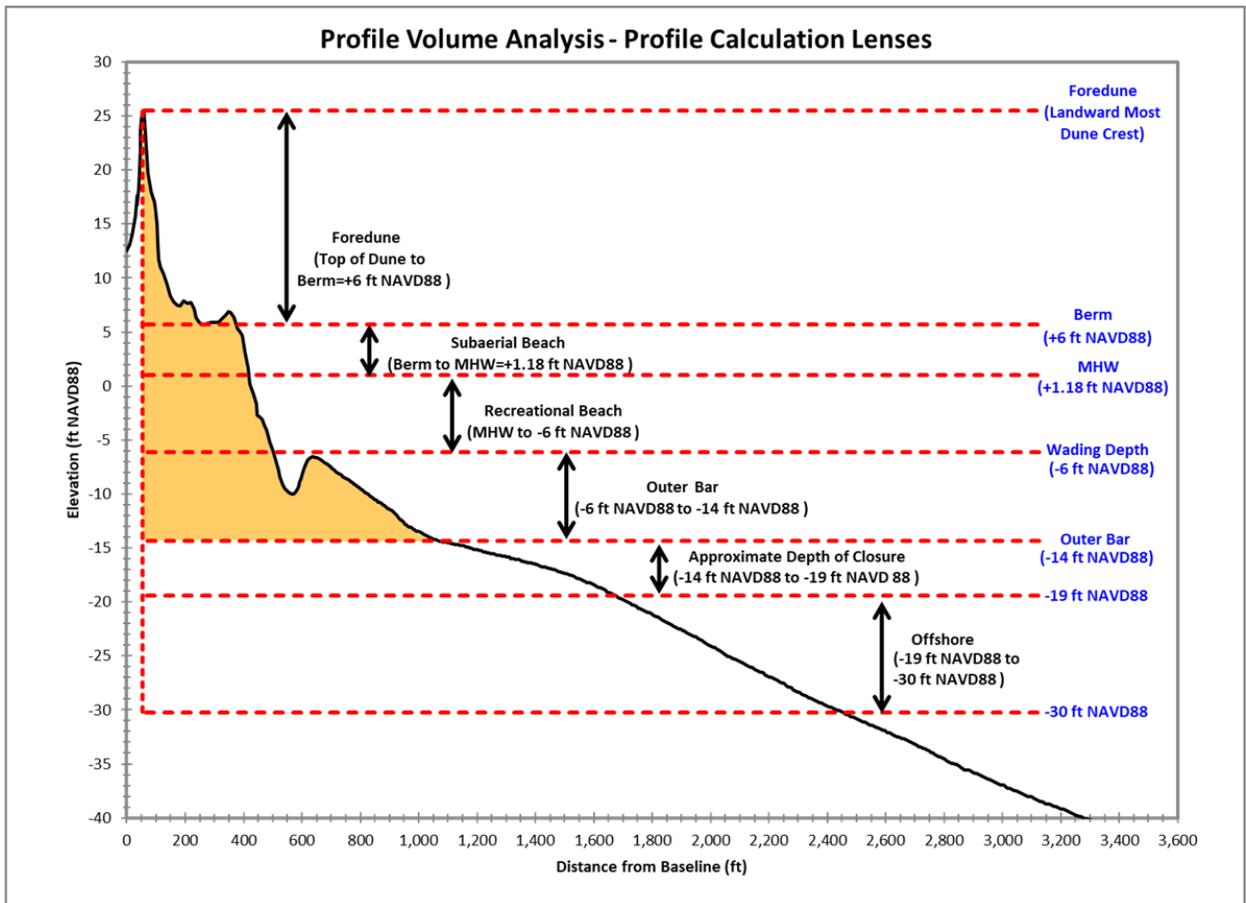


Figure 4-2. Profile Volume Calculation Lenses

5.0 DISCUSSION OF ANNUAL SURVEYING EVALUATION

This section discusses key events in the past year which influence the results of the annual analysis (i.e. nourishment projects, storms, etc.), development of background erosion rates, annual shoreline and volume change trends (2019 – 2020), and analysis of long-term trends (2011 – 2020).

5.1 Key Events During the Reporting Period

Beach changes are greatly influenced by natural and engineered processes. This section describes key events that occurred during the reporting period that likely had an impact on shoreline change as well as profile volume gains and losses.

5.1.1 Sand Placement Events

Construction of the 2019 Nags Head Beach Nourishment Project began on May 1, 2019 and was completed on August 18, 2019, immediately before the 2019-2020 annual monitoring period. During the project, a total of 4 million cy of material was placed along approximately 10 miles of shoreline. Though it occurred prior to the 2019-2020 monitoring period, the relatively rapid changes that such projects go through in the first several months post-construction are relevant to the understanding of shoreline and volume changes that occurred within the present monitoring period.

The 2019 nourishment project limits, reaches and borrow areas are shown in **Figure 5-1**. Two borrow sources were used for the project. The borrow area 3A was located in the USACE designated borrow area S1. The borrow area 4 was located approximately 1.5 miles offshore from the north central portion of Nags Head beach. The entire project took just under 16 weeks, and 4,004,634 cy of material was placed along the five reaches of Nags Head with 1,762,213 cy being placed in Reach 1, 885,587 cy placed in Reach 2, 576,703 cy placed in Reach 3 – North, 540,833 cy placed in Reach 3 -South, and 239,298 cy placed in Reach 4. **Figure 5-1** presents the approximate placement locations and quantities along all five reaches of shoreline.

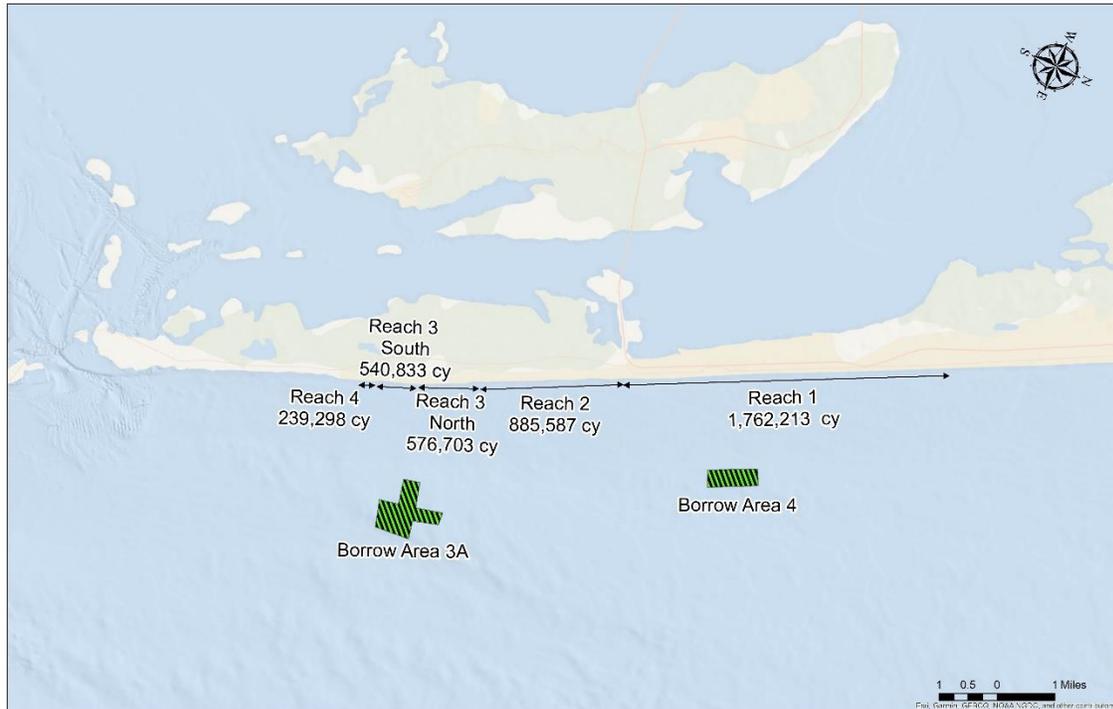


Figure 5-1. 2019 Beach Nourishment Placement Locations

5.1.2 Wave Climate and Storm Events

Wave data from the USACE Field Research Facility (FRF), located approximately 15 miles north of the Town, was downloaded for August 2019 through June 2020 to cover the period of time between the 2019 and 2020 surveys. The wave data was then plotted in order to analyze storm activity which may have impacted the study area. **Figure 5-2** shows the location of the buoy while **Figure 5-3** presents a plot of the wave heights during the reporting period. The 2019 Atlantic hurricane season (June 2019 – November 2019) was signified by the passage of Hurricane Dorian which impacted the North Carolina coast from September 5 – 6, 2019. In addition, a Nor'easter storm occurred from November 16-19 with wave heights exceeding those observed during Hurricane Dorian. The peak surge water levels observed were 3.7 ft NAVD88 during Hurricane Dorian and 2.6 ft NAVD88 during the November 2019 Nor'easter storm. The winter and spring storm activity saw about a dozen instances of the offshore significant wave heights (H_s) reaching 8 – 12 ft. Even though these events were smaller than a hurricane, the recurrence of them can also have a significant impact on the beach system.

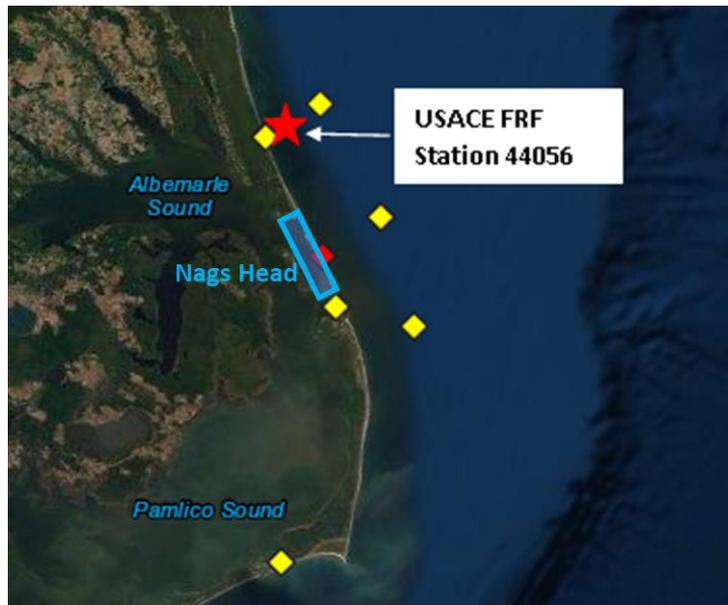


Figure 5-2. USACE FRF -51 ft Depth Waverider Buoy Location

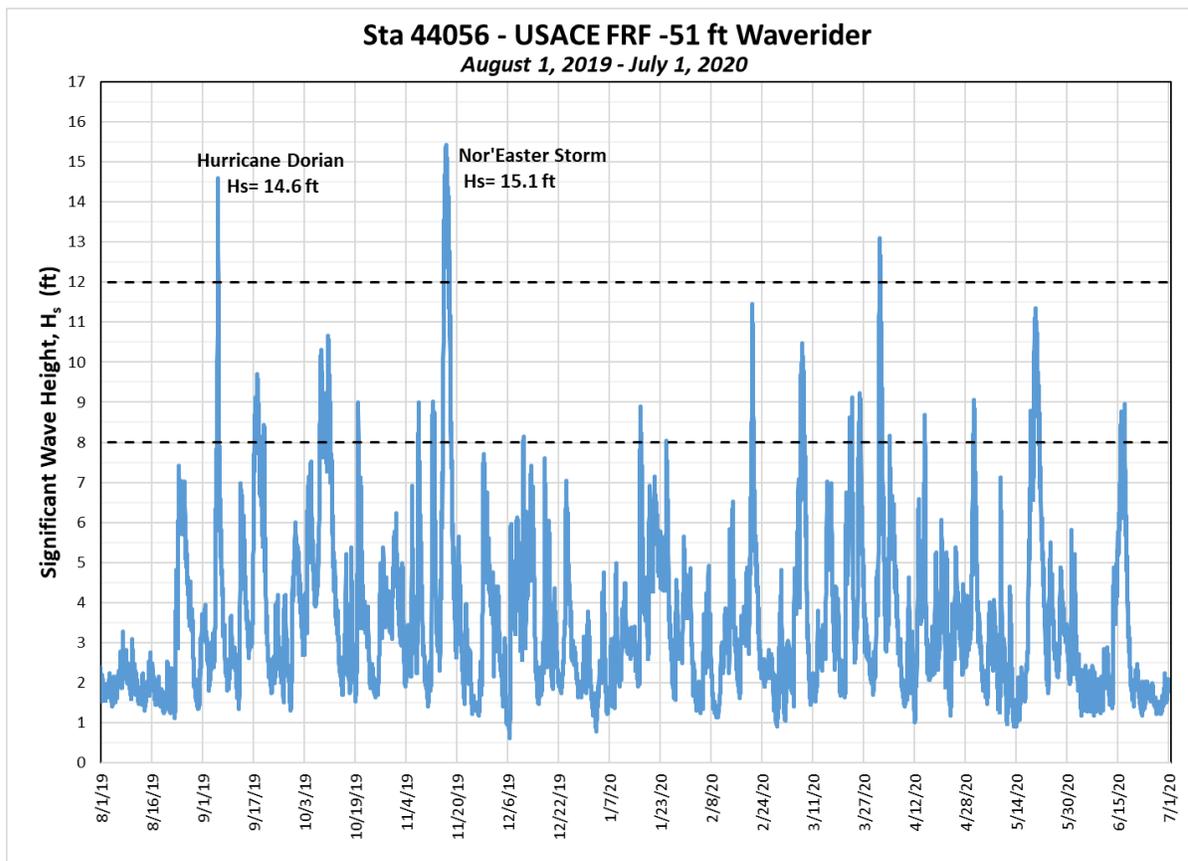


Figure 5-3. USACE FRF Station 44056 Wave Height

Figure 5-4 and **Figure 5-5** presents the directional wave roses for the annual monitoring period and for the time period between January 1997 (wave direction was not recorded prior to 1997) and July 2020 respectively. Based on the statistics, for both time periods the prevailing waves are from east-northeast to the east-southeast directions. Higher waves are from the east to the northeast direction.

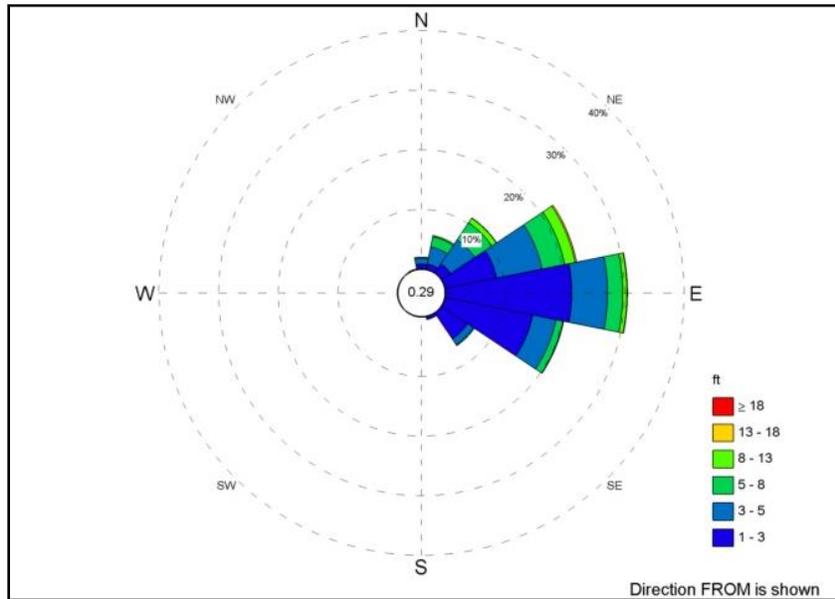


Figure 5-4. Station 44056 Offshore Significant Wave Height Rose from August 2019 – August 2020

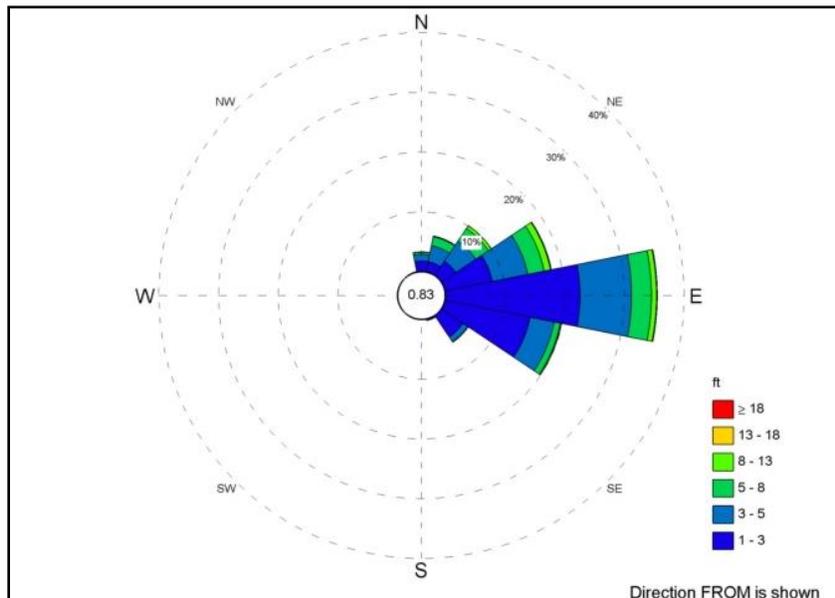


Figure 5-5. Station 44056 Offshore Significant Wave Height Rose from January 1997 – August 2020

Figure 5-6 presents the annual histograms of significant wave heights recorded for the annual monitoring period and for the time period between January 1997 and July 2020. As can be seen the distribution of wave heights during the monitoring period is very similar to the historical distribution. The similar trends observed in wave direction distributions and wave height distributions suggests that a typical wave climate occurred over the monitoring period.

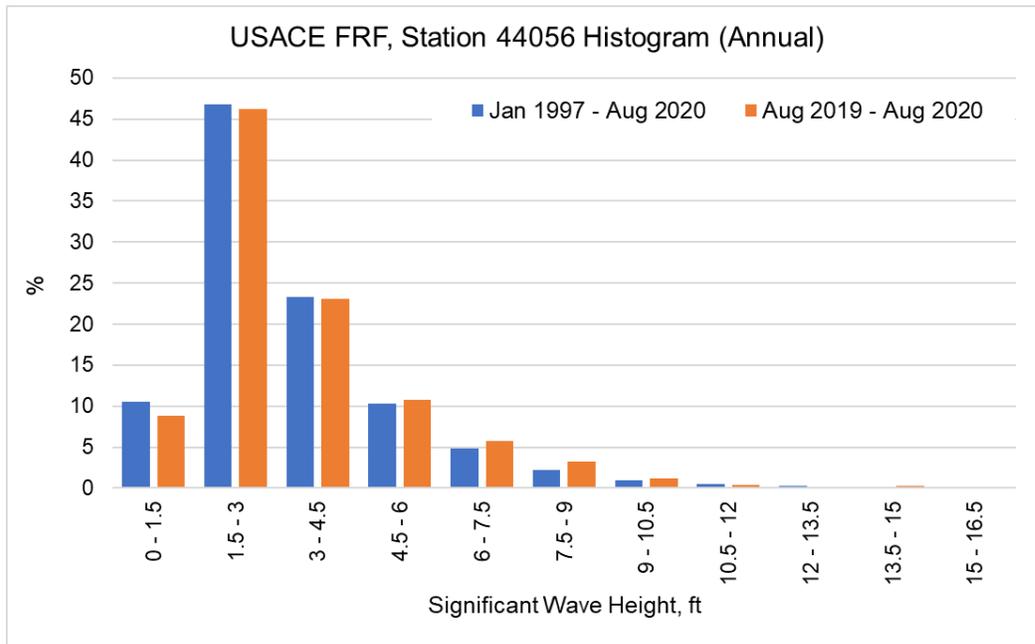


Figure 5-6. Station 44056 Significant Wave Height Histogram

5.2 Determination of Background Erosion Rates for Town of Nags Head (2011 – 2020)

To develop long-term trends in volume losses/gains, it is important to determine background erosion rates which do not include the volume gains from nourishment events. Since the establishment of the beach monitoring program immediately after the construction of the 2011 Beach Nourishment project, the Nags Head oceanfront has undergone only one other beach nourishment project in 2019. **Table 5-1** shows the nourishment volume placed at each reach within the monitoring program during the 2019 nourishment project.

Table 5-1. Nourishment Volumes by Management Reach

| Reach | Transects | Length | Nourishment Volume (cy) |
|--------------------------|-------------------|---------------|-------------------------|
| Nags Head - North | 430+00 - 495+00 | 6,750 | 0 |
| Nags Head - Reach 1 | 495+00 - 790+00 | 29,500 | 1,762,213 |
| Nags Head - Reach 2 | 790+00 - 920+00 | 13,000 | 885,587 |
| Nags Head - Reach 3N | 920+00 - 975+00 | 5,500 | 576,703 |
| Nags Head - Reach 3S | 975+00 - 1010+00 | 3,500 | 540,833 |
| Nags Head - Reach 4 | 1010+00 - 1025+00 | 1,500 | 239,298 |
| Nags Head - Oregon Inlet | 1025+00 - 1200+00 | 17,250 | 0 |
| Total | | 77,000 | 4,004,634 |

Historical volume changes above -19 ft NAVD88 were documented from 2011 through 2020. **Table 5-2** shows the computed volume change (including nourishments) above -19 ft NAVD88 from 2011-2020 for the defined monitoring reaches.

Table 5-2. Volume Change by Reach Above -19 ft NAVD88

| Reach | Volume Change (cy) 2011-2012 | Volume Change (cy) 2012-2013 | Volume Change (cy) 2013-2014 | Volume Change (cy) 2014-2015 | Volume Change (cy) 2015-2016 | Volume Change (cy) 2016-2017 | Volume Change (cy) 2017-2018 | Volume Change (cy) 2018-2019 | Volume Change (cy) 2019-2020 |
|--|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| Nags Head - North (430+00 - 495+00) | 12,512 | 459 | -61,997 | 42,855 | -21,464 | -107,963 | -76,609 | -273 | 14,451 |
| Nags Head - Reach 1 (495+00 - 790+00) | 199,722 | -210,804 | 16,718 | -110,558 | 294,941 | -418,152 | -644,783 | 1,441,871 | 253,604 |
| Nags Head - Reach 2 (790+00 - 920+00) | 117,215 | -195,136 | 54,157 | -81,138 | 33,499 | -429,523 | -328,626 | 696,896 | 156,913 |
| Nags Head - Reach 3N (920+00 - 975+00) | 85,381 | -144,828 | -13,818 | -133,901 | 15,540 | -252,798 | -168,797 | 423,513 | 21,457 |
| Nags Head - Reach 3S (975+00 - 1010+00) | -32,942 | -48,873 | -101,531 | -89,412 | -54,799 | -104,590 | -84,187 | 383,465 | -106,581 |
| Nags Head - Reach 4 (1010+00 - 1025+00) | 71,930 | -105,463 | -14,079 | -33,271 | -42,050 | -57,636 | -31,569 | 136,047 | -42,197 |
| Nags Head - Oregon Inlet (1025+00 - 1200+00) | 107,833 | -235,944 | 153,705 | -442,192 | 3,220 | -470,987 | -520,298 | -181,579 | -93,041 |
| Nourished Oceanfront (495+00 - 1025+00) | 441,306 | -705,102 | -58,553 | -448,280 | 247,132 | -1,262,698 | -1,257,961 | 3,081,792 | 283,196 |
| Total Monitored Oceanfront (430+00 - 1200+00) | 561,651 | -940,588 | 33,154 | -847,616 | 228,887 | -1,841,647 | -1,854,868 | 2,899,940 | 204,606 |

To calculate the background erosion rate, the documented nourishment volumes were subtracted from total volume changes above -19 ft NAVD88 between 2011 and 2020 and annualized over the nine-year time period. **Table 5-3** shows the average annual background erosion rates for each management reach of the Nags Head oceanfront. The average background erosion rate for the Town's Nourished Oceanfront and the Total Monitored Oceanfront shoreline is approximately -7.7 cy/ft/yr and -8.0 cy/ft/yr, respectively. Nags Head Reaches 3N, 3S, and 4 have considerably higher background erosion rates than the remainder of the oceanfront shoreline, signifying these areas need to be monitored closely and taken into special consideration during future planning and nourishment efforts.

Table 5-3. Average Annual Background Erosion Rates (2011 - 2020)

| Reach (Transects) | Length | Volume Change Above -19 ft NAVD88 (cy) 2011-2020 | Nourishment Volume (cy) | Background Erosion (cy) | Average Annual Background Erosion Rates (cy/ft/yr) |
|--|---------------|--|-------------------------|-------------------------|--|
| Nags Head - North (430+00 - 495+00) | 6,500 | -198,028 | 0 | -198,028 | -3.4 |
| Nags Head - Reach 1 (495+00 - 790+00) | 29,500 | 822,560 | 1,762,213 | -939,653 | -3.5 |
| Nags Head - Reach 2 (790+00 - 920+00) | 13,000 | 24,257 | 885,587 | -861,330 | -7.4 |
| Nags Head - Reach 3N (920+00 - 975+00) | 5,500 | -168,250 | 576,703 | -744,953 | -15.0 |
| Nags Head - Reach 3S (975+00 - 1010+00) | 3,500 | -239,449 | 540,833 | -780,282 | -24.8 |
| Nags Head - Reach 4 (1010+00 - 1025+00) | 1,500 | -118,289 | 239,298 | -357,587 | -26.5 |
| Nags Head - Oregon Inlet (1030+00 - 1200+00) | 17,500 | -1,679,282 | 0 | -1,679,282 | -10.7 |
| Nourished Oceanfront (495+00 - 1025+00) | 53,000 | 320,830 | 4,004,634 | -3,683,804 | -7.7 |
| Total Monitored Oceanfront (430+00 - 1200+00) | 77,000 | -1,556,481 | 4,004,634 | -5,561,115 | -8.0 |

5.3 Nags Head Shoreline and Volume Change Analysis (2019 – 2020)

This section discusses the results of the shoreline and volume change analysis for the defined monitoring reaches along Nags Head (see **Figure 3-1**). Key statistics were calculated to quantify average shoreline and volume changes for individual monitoring reaches as well as the entire oceanfront shoreline for Nags Head. The computed statistics include average shoreline change, average unit volume change, and cumulative volume change (e.g. total volume of material lost or gained along a section of shoreline). Evaluation of the computed statistics takes into account volume changes computed for portions of the profile above the berm (+6 ft NAVD88), above MHW (+1.18 ft NAVD88), above -6 ft NAVD88, above -14 ft NAVD88, above -19 ft NAVD88, and above -30 ft NAVD88 in order to better understand onshore and offshore processes.

Appendix B presents profile comparison plots for individual transects for the summer 2019, post-Dorian (where applicable), and the summer 2020 surveys. **Appendix C** provides the computed shoreline changes and volume changes measured at each individual transect between the summer 2019 and the summer 2020 surveys in tabular format.

5.3.1 Post-Dorian Summary

Hurricane Dorian impacted the North Carolina coast in September 2019, early in the annual surveying period and soon after completion of the 2019 beach nourishment project. After Hurricane Dorian’s passage, CSE conducted a post-storm survey on November 24-27,

2019. To quantify the impacts from Hurricane Dorian, the volume changes between the summer 2019 and the post-storm survey were analyzed. The post-storm survey only included the Town’s project limits (Station 495+00 – 1025+00), therefore Nags Head-North and Nags Head-Oregon Inlet reaches were not included in the calculations. The impacts of Hurricane Dorian greatly influenced the beach changes experienced between the summer 2019 and summer 2020 surveys. **Table 5-4** and **Table 5-5** presents a summary of the key changes indicated by the post-Dorian survey evaluation for the reaches along the Nags Head shoreline. These values will be addressed throughout the report as they are important in understanding the total changes that occurred throughout the 2019-2020 monitoring period.

Table 5-4. Post-Dorian Shoreline and Average Unit Volume Change Summary

| August 2019 vs. Post Dorian | Transects | Reach Length | avg shoreline change @ +1.18 ft NAVD88 | avg volume change above +6 ft NAVD88 | avg volume change above +1.18 ft NAVD88 | avg volume change above -6 ft NAVD88 | avg volume change above -14 ft NAVD88 | avg volume change above -19 ft NAVD88 | avg volume change above -30 ft NAVD88 |
|-----------------------------|-------------------------|---------------|--|--------------------------------------|---|--------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| Reach | # | ft | ft | cy/ft | cy/ft | cy/ft | cy/ft | cy/ft | cy/ft |
| Nags Head - Reach 1 | 495+00 - 790+00 | 29,500 | -70.5 | 2.5 | -13.3 | -23.1 | -4.0 | -4.9 | 3.1 |
| Nags Head - Reach 2 | 790+00 - 920+00 | 13,000 | -74.2 | 2.8 | -13.2 | -29.1 | -3.5 | -10.6 | -7.3 |
| Nags Head - Reach 3N | 920+00 - 975+00 | 5,500 | -105.5 | 2.7 | -19.7 | -38.2 | -14.5 | -18.9 | -16.7 |
| Nags Head - Reach 3S | 975+00 - 1010+00 | 3,500 | -157.7 | 3.0 | -31.3 | -49.0 | -23.0 | -35.8 | -33.0 |
| Nags Head - Reach 4 | 1010+00 - 1025+00 | 1,500 | -169.8 | -0.3 | -34.5 | -45.0 | -28.0 | -38.4 | -40.3 |
| | Transects | Reach Length | weighted avg | weighted avg | weighted avg | weighted avg | weighted avg | weighted avg | weighted avg |
| Nourished Oceanfront | 495+00 - 1025+00 | 53,000 | -83.6 | 2.5 | -15.7 | -28.5 | -6.9 | -10.8 | -5.1 |

Table 5-5. Post-Dorian Cumulative Volume Change Summary

| August 2019 vs. Post Dorian | Transects | Reach Length | cumulative volume change above +6 ft NAVD88 | cumulative volume change above +1.18 ft NAVD88 | cumulative volume change above -6 ft NAVD88 | cumulative volume change above -14 ft NAVD88 | cumulative volume change above -19 ft NAVD88 | cumulative volume change above -30 ft NAVD88 |
|-----------------------------|-------------------------|---------------|---|--|---|--|--|--|
| Reach | # | ft | cy | cy | cy | cy | cy | cy |
| Nags Head - Reach 1 | 495+00 - 790+00 | 29,500 | 73,927 | -391,487 | -682,039 | -117,605 | -145,216 | 92,749 |
| Nags Head - Reach 2 | 790+00 - 920+00 | 13,000 | 36,372 | -171,245 | -378,682 | -46,069 | -138,212 | -95,209 |
| Nags Head - Reach 3N | 920+00 - 975+00 | 5,500 | 14,765 | -108,497 | -210,071 | -79,677 | -103,968 | -91,734 |
| Nags Head - Reach 3S | 975+00 - 1010+00 | 3,500 | 8,910 | -93,931 | -147,048 | -68,909 | -107,497 | -99,113 |
| Nags Head - Reach 4 | 1010+00 - 1025+00 | 1,500 | -527 | -69,091 | -90,053 | -56,076 | -76,774 | -80,508 |
| | Transects | Reach Length | total | total | total | total | total | total |
| Nourished Oceanfront | 495+00 - 1025+00 | 53,000 | 133,446 | -834,251 | -1,507,893 | -368,336 | -571,667 | -273,816 |

The post-Dorian survey data indicated that the Nags Head Nourished Oceanfront experienced an average landward recession of the shoreline at MHW of -83.6 ft with volume losses throughout the profile below +6 ft NAVD88. The Nourished Oceanfront lost -834,251 cy above MHW, -1,507,893 cy above -6 ft NAVD88, -368,336 cy above -14 ft NAVD88, -571,667 cy above -19 ft NAVD88, and -273,816 cy above -30 ft NAVD88. Above the berm (+6 ft NAVD88) the Nourished Oceanfront gained 133,446 cy of material,

likely due to storm waves pushing material upward. At a majority of transects along the beach, there was significant erosion of the berm and beachface down to approximately -6 ft NAVD88. Beyond this, a significant amount of material was captured by formation of an offshore bar, as signified by much lower volume losses above -14 ft NAVD88. **Figure 5-7** presents an example profile showing movement of the sand along the profile that was evident in a majority of oceanfront transects.

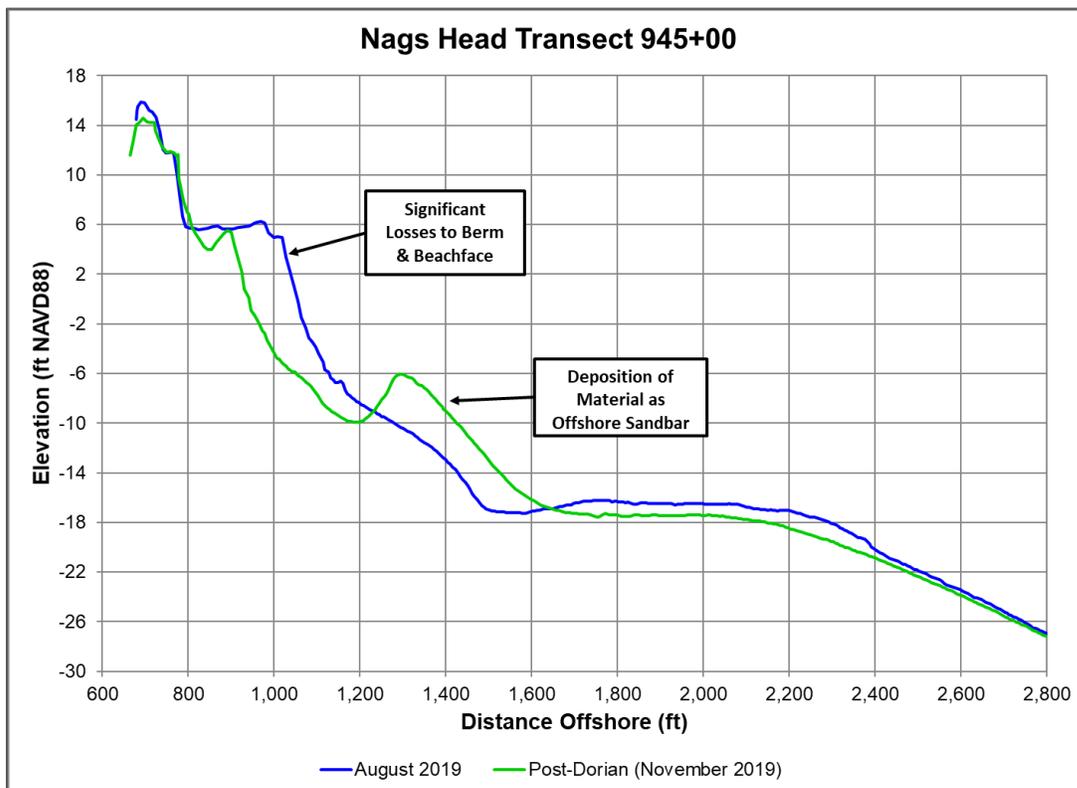


Figure 5-7. Example Post-Dorian Profile, Station 945+00 (E Spencer St.)

5.3.2 Nags Head - North Reach (2019 - 2020)

The Nags Head – North survey reach extends approximately 6,500 ft between E 8th Street and Bonnett Street, containing seven survey transects (Station 430+00 – 495+00) at approximately 1000 ft spacing (see **Figure 3-1**). As a reminder, six transects were added to this reach during the 2020 surveying effort, creating 500 ft spacing for the whole reach, and these will be included in the comparative analysis during the 2021 monitoring report. This reach did not receive any direct sand placement during the 2011 and 2019 beach nourishment projects. A summary of average shoreline and volume changes between 2019 and 2020 for Nags Head – North in comparison with the Total Monitored Oceanfront is presented in **Table 5-6** and **Table 5-7**.

Table 5-6. Average Shoreline and Average Unit Volume Change for Nags Head – North Reach (2019 – 2020)

| 2019 vs. 2020 (Total Change) | Transects | Reach Length | avg shoreline change @ +1.18 ft NAVD88 | avg volume change above +6 ft NAVD88 | avg volume change above +1.18 ft NAVD88 | avg volume change above -6 ft NAVD88 | avg volume change above -14 ft NAVD88 | avg volume change above -19 ft NAVD88 | avg volume change above -30 ft NAVD88 |
|------------------------------|------------------|--------------|--|--------------------------------------|---|--------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| Reach | # | ft | ft | cy/ft | cy/ft | cy/ft | cy/ft | cy/ft | cy/ft |
| Nags Head - North | 430+00 - 495+00 | 6,500 | -53.0 | -0.8 | -7.5 | -24.3 | -1.4 | 3.5 | 10.9 |
| Total Monitored Oceanfront | 430+00 - 1200+00 | 77,000 | -76.1 | 4.4 | -9.7 | -27.2 | -6.0 | 3.9 | 2.9 |

Table 5-7. Cumulative Volume Change for Nags Head – North Reach (2019 – 2020)

| 2019 vs. 2020 (Total Change) | Transects | Reach Length | cumulative volume change above +6 ft NAVD88 | cumulative volume change above +1.18 ft NAVD88 | cumulative volume change above -6 ft NAVD88 | cumulative volume change above -14 ft NAVD88 | cumulative volume change above -19 ft NAVD88 | cumulative volume change above -30 ft NAVD88 |
|------------------------------|------------------|--------------|---|--|---|--|--|--|
| Reach | # | ft | cy | cy | cy | cy | cy | cy |
| Nags Head - North | 430+00 - 495+00 | 6,500 | -5,081 | -48,568 | -157,819 | -9,067 | 22,945 | 70,672 |
| Total Monitored Oceanfront | 430+00 - 1200+00 | 77,000 | 334,334 | -749,098 | -2,093,819 | -462,958 | 297,756 | 230,769 |

Table 5-6 indicates that there was a significant landward recession of the shoreline position at MHW. It is likely that the shoreline was heavily impacted by Hurricane Dorian. **Figure 5-8** presents the shoreline changes at each transect, indicating landward recession across the entire survey reach.

Table 5-6 and **Table 5-7** indicates that the Nags Head – North reach experienced volume loss over the past year of approximately -157,189 cy (-24.3 cy/ft) above -6 ft NAVD88. At a majority of transects along the beach, there was significant erosion of the berm and beachface down to approximately -6 ft NAVD88. Beyond this, a significant amount of material was captured by formation of an offshore bar, as indicated by smaller volume losses of -9,067 cy (-1.4 cy/ft) above -14 ft NAVD88. **Figure 5-9** displays the unit volume change at each transect for the Nags Head – North reach. Apparent from this figure is the consistent trend of loss of material above -6 ft NAVD88 and recovery of it at deeper elevations across the reach.

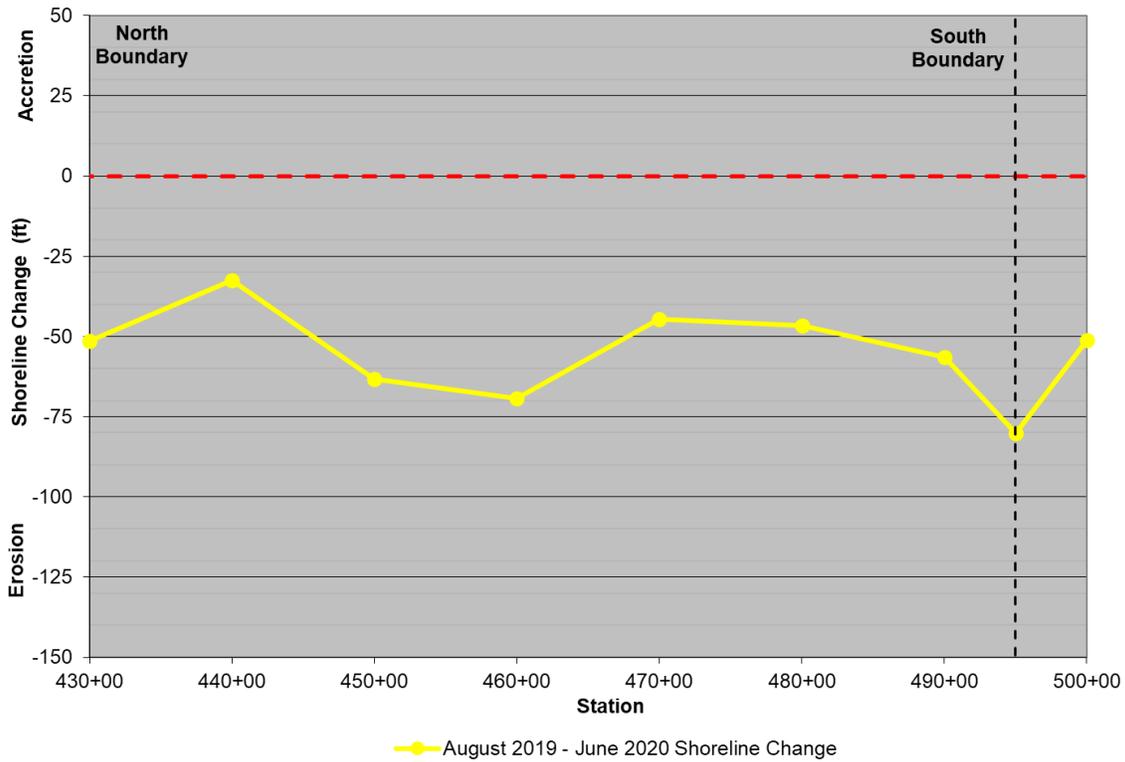


Figure 5-8. Nags Head – North Shoreline Change (2019 – 2020)

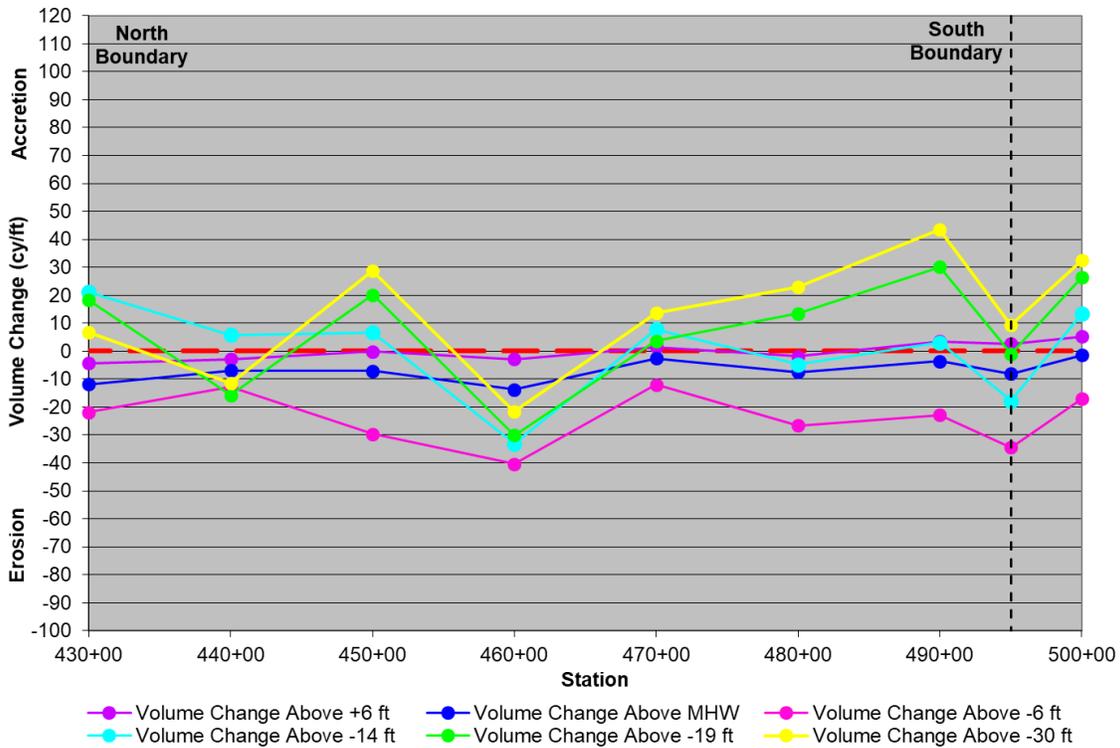


Figure 5-9. Nags Head – North Unit Volume Change (2019 – 2020)

5.3.3 Nags Head - Reach 1 (2019 - 2020)

The Nags Head – Reach 1 survey reach extends approximately 29,500 ft between Bonnett Street and Governor Street, containing 59 survey transects (Station 495+00 – 790+00), at 500 ft spacing (see **Figure 3-1**). During May through August 2019, approximately 1,762,213 cy was placed across the entire reach (495+00 – 790+00) as part of the 2019 Beach Nourishment Project (see **Figure 5-1**). A summary of average shoreline and volume changes between 2019 and 2020 for Reach 1 in comparison with the Total Monitored Oceanfront is presented in **Table 5-8** and **Table 5-9**.

Table 5-8. Average Shoreline and Average Unit Volume Change for Reach 1 (2019 – 2020)

| 2019 vs. 2020 (Total Change) | Transects | Reach Length | avg shoreline change @ +1.18 ft NAVD88 | avg volume change above +6 ft NAVD88 | avg volume change above +1.18 ft NAVD88 | avg volume change above -6 ft NAVD88 | avg volume change above -14 ft NAVD88 | avg volume change above -19 ft NAVD88 | avg volume change above -30 ft NAVD88 |
|------------------------------|------------------|--------------|--|--------------------------------------|---|--------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| Reach | # | ft | ft | cy/ft | cy/ft | cy/ft | cy/ft | cy/ft | cy/ft |
| Nags Head - Reach 1 | 495+00 - 790+00 | 29,500 | -73.4 | 4.9 | -10.8 | -24.9 | -5.3 | 8.7 | 12.5 |
| Total Monitored Oceanfront | 430+00 - 1200+00 | 77,000 | -76.1 | 4.4 | -9.7 | -27.2 | -6.0 | 3.9 | 2.9 |

Table 5-9. Cumulative Volume Change for Reach 1 (2019 – 2020)

| 2019 vs. 2020 (Total Change) | Transects | Reach Length | cumulative volume change above +6 ft NAVD88 | cumulative volume change above +1.18 ft NAVD88 | cumulative volume change above -6 ft NAVD88 | cumulative volume change above -14 ft NAVD88 | cumulative volume change above -19 ft NAVD88 | cumulative volume change above -30 ft NAVD88 |
|------------------------------|------------------|--------------|---|--|---|--|--|--|
| Reach | # | ft | cy | cy | cy | cy | cy | cy |
| Nags Head - Reach 1 | 495+00 - 790+00 | 29,500 | 144,242 | -317,435 | -733,688 | -155,164 | 257,446 | 368,393 |
| Total Monitored Oceanfront | 430+00 - 1200+00 | 77,000 | 334,334 | -749,098 | -2,093,819 | -462,958 | 297,756 | 230,769 |

Shoreline change at MHW showed an overall average landward recession of -73.4 ft. **Figure 5-10** presents the shoreline changes at each transect from 2019 to 2020 in comparison with post-Dorian. As can be seen from the figure, a majority of transects experienced recession. Most of this landward recession can be attributed to Hurricane Dorian, given that landward recession at MHW immediately post-Dorian (**Table 5-4**) was similar to the total August 2019 to June 2020 recession.

Table 5-8 and **Table 5-9** indicates that Reach 1 experienced gains in material along the upper (+6 ft NAVD88) and lower (-19 ft NAVD88, -30 ft NAVD88) portions of the profiles. Volume losses were experienced above MHW, -6 ft NAVD88, -14 ft NAVD88. The largest volume losses were experienced above -6 ft NAVD88 (-733,688 cy or -24.9 cy/ft). Smaller losses above -14 ft NAVD88 (-155,164 cy) and gains above -19 ft NAVD88 (+257,446 cy) indicate the transport and capture of eroded material at the offshore bar and beyond. A majority of the volume losses can be attributed to Hurricane Dorian and the Nor'easter event since the volume losses along the profiles post-Dorian were only slightly lower than the losses observed during the monitoring period. The erosion observed at some elevations might be exacerbated due to equilibration of the 2019 Nags Head Beach Nourishment project.

There is evidence of some recovery of the berm since Hurricane Dorian given that the annual volume changes above +6 ft NAVD88 are larger than they were immediately post-Dorian (see **Table 5-4**). Additionally, there is evidence of some recovery along the profiles since Hurricane Dorian given that the annual volume changes above -19 ft NAVD88 indicate volume gains whereas there were losses above -19 ft NAVD88 after Hurricane Dorian (**Table 5-4**). **Figure 5-11** displays the unit volume change at each transect above the six elevations analyzed. As can be seen, a majority of transects experienced volume losses above MHW, -6 ft NAVD88, and -14 ft NAVD88. For the majority of transects these losses were contained to above -19 ft NAVD88. Profile plots in **Appendix B** show many instances where sand is being pushed above berm at the upper portions of the profile and formation of an offshore bar that captured losses between the berm and -6 ft NAVD88.

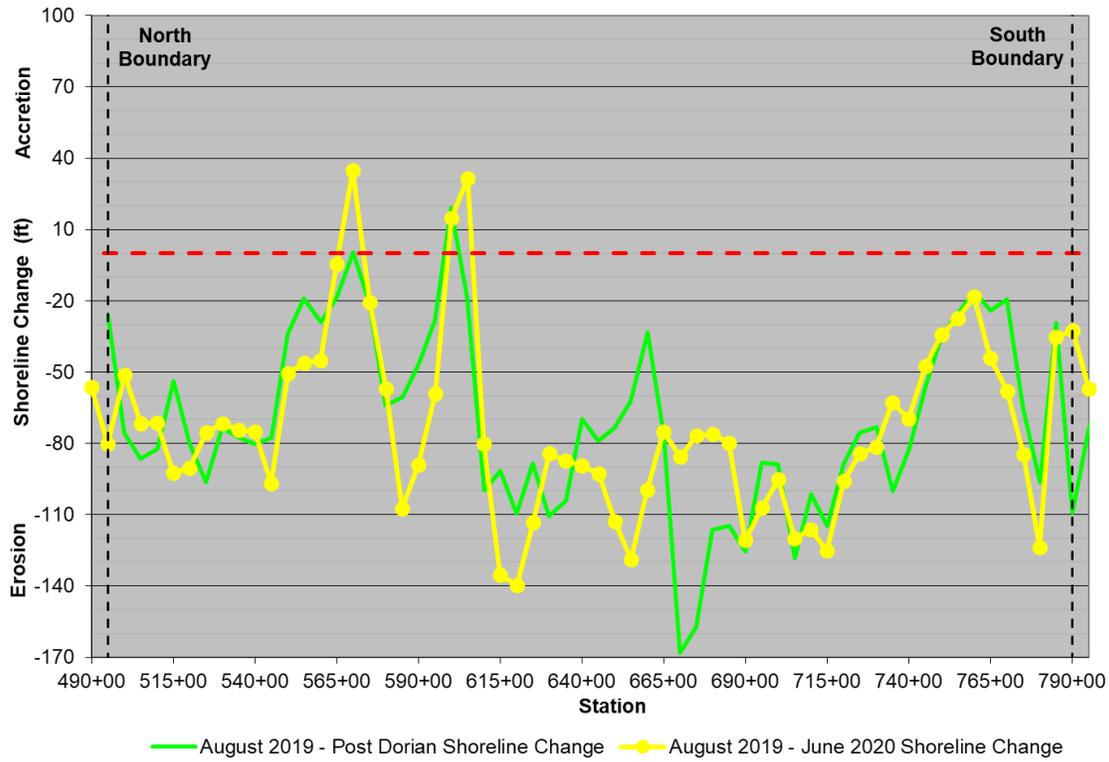


Figure 5-10. Nags Head – Reach 1 Shoreline Change (2019 – 2020)

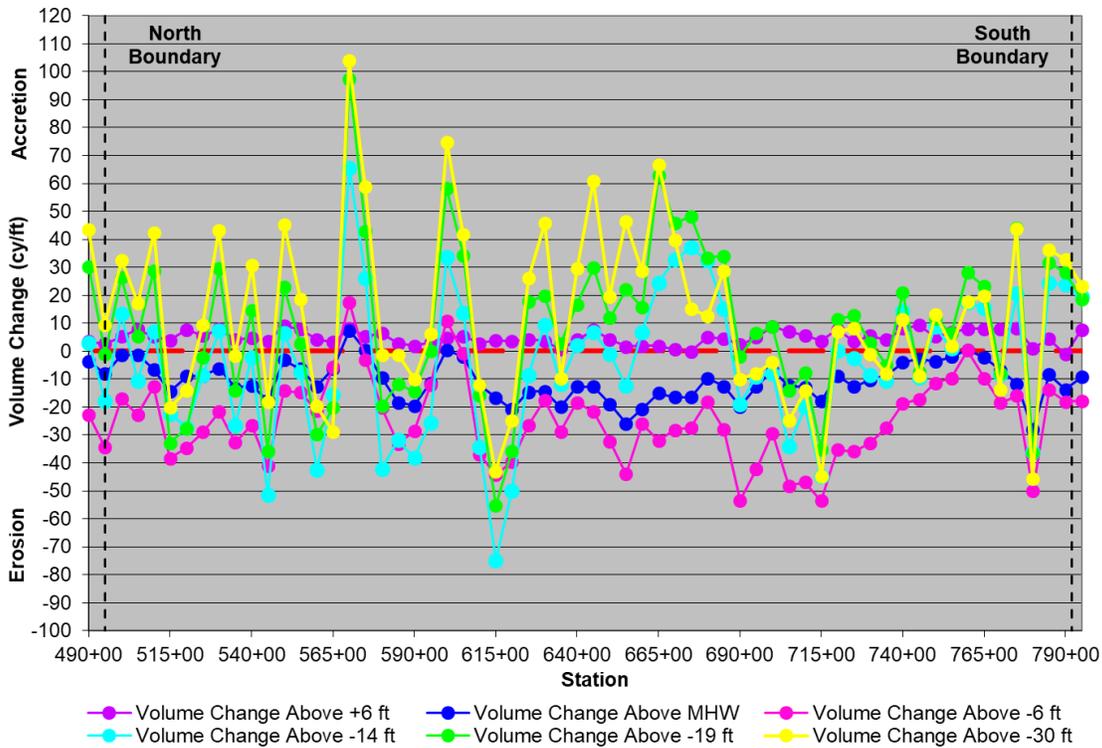


Figure 5-11. Nags Head – Reach 1 Unit Volume Change (2019 – 2020)

5.3.4 Nags Head - Reach 2 (2019 - 2020)

The Nags Head – Reach 2 survey reach extends approximately 13,000 ft between Governor Street and James Street, containing 26 survey transects (Station 790+00 – 920+00), at 500 ft spacing (see **Figure 3-1**). Most recently, during May through August 2019, approximately 885,587 cy was placed across the entire reach as part of the 2019 Beach Nourishment Project (see **Figure 5-1**). A summary of average shoreline and volume changes between 2019 and 2020 for Nags Head – Reach 2 in comparison with the Total Monitored Oceanfront is presented in **Table 5-10** and **Table 5-11**.

Table 5-10. Average Shoreline and Average Unit Volume Change for Reach 2 (2019 – 2020)

| 2019 vs. 2020 (Total Change) | Transects | Reach Length | avg shoreline change @ +1.18 ft NAVD88 | avg volume change above +6 ft NAVD88 | avg volume change above +1.18 ft NAVD88 | avg volume change above -6 ft NAVD88 | avg volume change above -14 ft NAVD88 | avg volume change above -19 ft NAVD88 | avg volume change above -30 ft NAVD88 |
|------------------------------|------------------|--------------|--|--------------------------------------|---|--------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| Reach | # | ft | ft | cy/ft | cy/ft | cy/ft | cy/ft | cy/ft | cy/ft |
| Nags Head - Reach 2 | 790+00 - 920+00 | 13,000 | -76.0 | 7.1 | -8.5 | -28.8 | -1.3 | 11.9 | 7.3 |
| Total Monitored Oceanfront | 430+00 - 1200+00 | 77,000 | -76.1 | 4.4 | -9.7 | -27.2 | -6.0 | 3.9 | 2.9 |

Table 5-11. Cumulative Volume Change for Reach 2 (2019 – 2020)

| 2019 vs. 2020 (Total Change) | Transects | Reach Length | cumulative volume change above +6 ft NAVD88 | cumulative volume change above +1.18 ft NAVD88 | cumulative volume change above -6 ft NAVD88 | cumulative volume change above -14 ft NAVD88 | cumulative volume change above -19 ft NAVD88 | cumulative volume change above -30 ft NAVD88 |
|------------------------------|------------------|--------------|---|--|---|--|--|--|
| Reach | # | ft | cy | cy | cy | cy | cy | cy |
| Nags Head - Reach 2 | 790+00 - 920+00 | 13,000 | 92,898 | -110,725 | -374,783 | -16,854 | 154,134 | 94,514 |
| Total Monitored Oceanfront | 430+00 - 1200+00 | 77,000 | 334,334 | -749,098 | -2,093,819 | -462,958 | 297,756 | 230,769 |

Shoreline change at MHW showed an overall average recession of -76 ft. **Figure 5-12** presents the shoreline changes at each transect from 2019 to 2020 in comparison with post-Dorian, showing erosion along all transects. Most of this landward recession can be attributed to Hurricane Dorian, given that landward recession at MHW immediately post-Dorian (**Table 5-4**) was similar to June 2020 recession.

Overall, Reach 2 experienced volume losses above MHW (-110,725 cy or -8.5 cy/ft), -6 ft NAVD88 (-374,783 cy or -28.8 cy/ft), and -14 ft NAVD88 (-16,854 cy or -1.3 cy/ft). The smaller losses above -14 ft NAVD88 and the gains above -19 ft NAVD88 (+154,134 cy or 11.9 cy/ft) indicate the transport and capture of eroded material at the offshore bar and beyond. Many of the volume losses can be attributed to Hurricane Dorian and the Nor'easter event as the annual losses are similar to the post-Dorian losses. This erosional behavior might also be enhanced at some elevations due to equilibration of the 2019 Beach Nourishment project. Similar to Reach 1, volume gain was also observed above berm (+6 ft NAVD88) which can be explained by storm waves pushing material up. There is evidence of some recovery along the profiles since Hurricane Dorian given that the annual volume changes above -19 ft NAVD88 indicate volume gains whereas there were losses above -19 ft NAVD88 after Hurricane Dorian (**Table 5-4**).

Figure 5-13 displays the unit volume change at each transect above the six elevations analyzed. As can be seen, a majority of transects experienced volume losses between elevations +6 ft NAVD88 and -14 ft NAVD88. For the majority of transects these losses were contained to above -14 ft NAVD88, with recovery at lower elevations. Profile plots in **Appendix B** show many instances where sand being pushed above berm at the upper portions of the profile and captured as an offshore bar at the lower elevations.

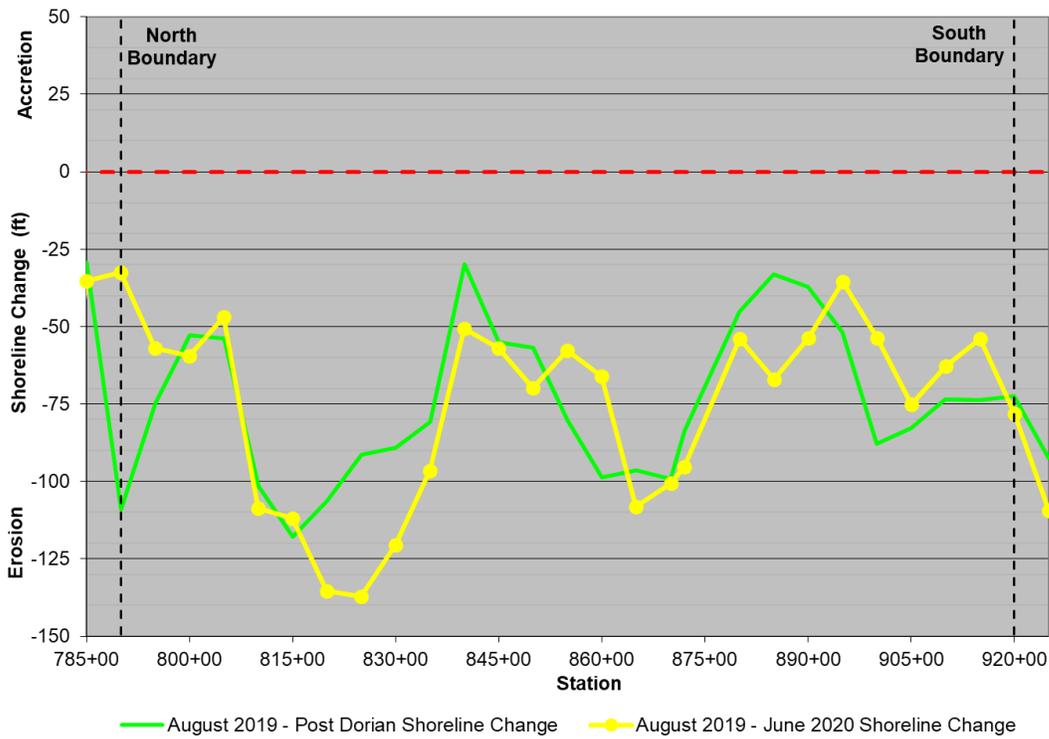


Figure 5-12. Nags Head – Reach 2 Shoreline Change (2019 – 2020)

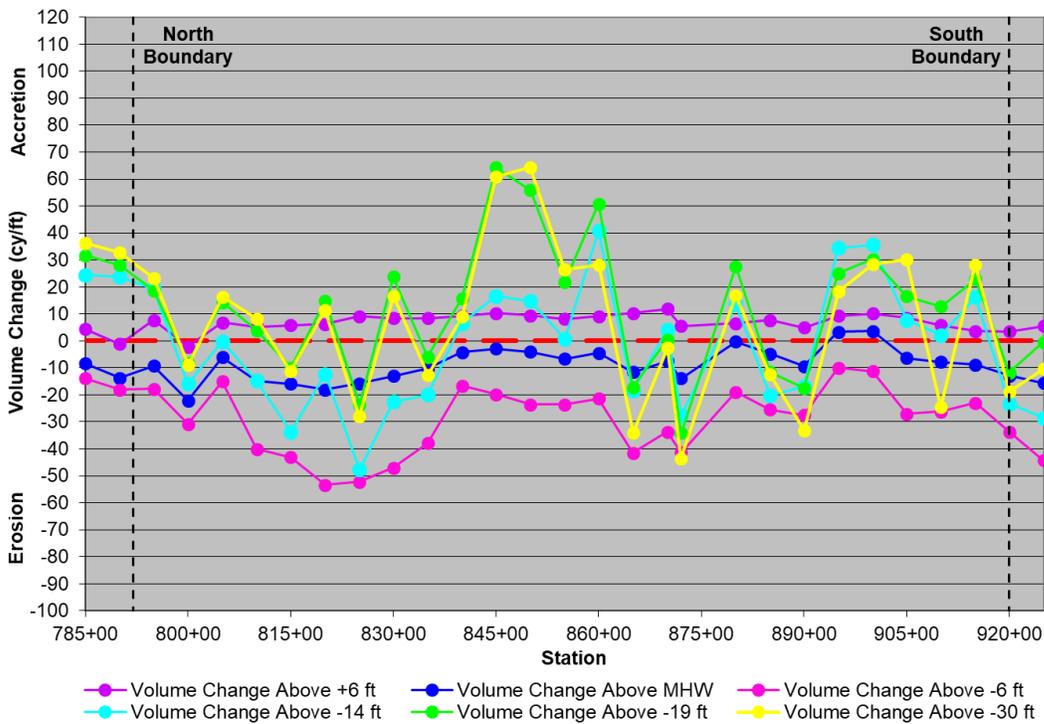


Figure 5-13. Nags Head – Reach 2 Unit Volume Change (2019 – 2020)

5.3.5 Nags Head - Reach 3 - North (2019 - 2020)

The Nags Head – Reach 3 - North survey reach extends approximately 5,500 ft between James Street and Limulus Drive, containing 11 survey transects (Station 920+00 – 975+00), at 500 ft spacing (see **Figure 3-1**). As a reminder, 11 transects were added to this reach during the 2020 surveying effort, creating 250 ft spacing for the whole reach, and will be included in the analysis during the 2021 monitoring report. Most recently, during May through August 2019, approximately 576,703 cy was placed across the entire reach as part of the 2019 Beach Nourishment Project (see **Figure 5-1**). A summary of average shoreline and volume changes between 2019 and 2020 for Nags Head – Reach 3 - North in comparison with the Total Monitored Oceanfront is presented in **Table 5-12** and **Table 5-13**.

Table 5-12. Average Shoreline and Average Unit Volume Change for Reach 3 - North (2019 – 2020)

| 2019 vs. 2020 (Total Change) | Transects | Reach Length | avg shoreline change @ +1.18 ft NAVD88 | avg volume change above +6 ft NAVD88 | avg volume change above +1.18 ft NAVD88 | avg volume change above -6 ft NAVD88 | avg volume change above -14 ft NAVD88 | avg volume change above -19 ft NAVD88 | avg volume change above -30 ft NAVD88 |
|------------------------------|------------------|--------------|--|--------------------------------------|---|--------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| Reach | # | ft | ft | cy/ft | cy/ft | cy/ft | cy/ft | cy/ft | cy/ft |
| Nags Head - Reach 3 - North | 920+00 - 975+00 | 5,500 | -125.9 | 6.2 | -16.9 | -46.0 | -20.3 | 6.1 | -5.0 |
| Total Monitored Oceanfront | 430+00 - 1200+00 | 77,000 | -76.1 | 4.4 | -9.7 | -27.2 | -6.0 | 3.9 | 2.9 |

Table 5-13. Cumulative Volume Change for Reach 3 - North (2019 – 2020)

| 2019 vs. 2020 (Total Change) | Transects | Reach Length | cumulative volume change above +6 ft NAVD88 | cumulative volume change above +1.18 ft NAVD88 | cumulative volume change above -6 ft NAVD88 | cumulative volume change above -14 ft NAVD88 | cumulative volume change above -19 ft NAVD88 | cumulative volume change above -30 ft NAVD88 |
|------------------------------|------------------|--------------|---|--|---|--|--|--|
| Reach | # | ft | cy | cy | cy | cy | cy | cy |
| Nags Head - Reach 3 - North | 920+00 - 975+00 | 5,500 | 33,997 | -92,703 | -252,767 | -111,474 | 33,664 | -27,755 |
| Total Monitored Oceanfront | 430+00 - 1200+00 | 77,000 | 334,334 | -749,098 | -2,093,819 | -462,958 | 297,756 | 230,769 |

Shoreline change at MHW showed an overall average landward recession of -125.9 ft. **Figure 5-14** presents the shoreline changes at each transect from 2019 to 2020 in comparison with post-Dorian, showing erosion along all transects. Most of this landward recession can be attributed to Hurricane Dorian, given that landward recession at MHW was very similar (-105.5 ft) immediately post-Dorian (**Table 5-4**).

Volumetrically, **Table 5-12** and **Table 5-13** indicates that Reach 3 - North experienced overall volume losses throughout the monitoring period. As can be seen, the annual changes in Reach 3 – North indicate significant erosion of which can be attributed to Hurricane Dorian and the Nor’easter event. The equilibration of the 2019 Beach Nourishment project might have also caused loss of material along the profiles. Overall, Reach 3- North experienced the largest volume losses above -6 ft NAVD88 (-252,767 cy or -46 cy/ft) with smaller losses of approximately -111,474 cy (-20.3 cy/ft) of material above -14 ft NAVD88 and minor material gain above -19 ft NAVD88 (+33,664 cy). Gains above -19 ft NAVD88 indicate the transport and capture of eroded material at the offshore bar and above the depth of closure. Similar to previous monitoring reaches, volume gain

was also observed above berm (+6 ft NAVD88) which can be explained by waves pushing material onshore. There is evidence of some recovery along the profiles since Hurricane Dorian given that the annual volume changes above -19 ft NAVD88 indicate volume gains whereas there were losses above -19 ft NAV88 after Hurricane Dorian (see **Table 5-4**).

Figure 5-15 displays the unit volume change at each transect above the six elevations analyzed. As can be seen, a majority of transects experienced volume losses between elevations +6 ft NAVD88 and -14 ft NAVD88. Profile plots in **Appendix B** show many instances where sand being pushed above berm at the upper portions of the profile and captured as an offshore bar at the lower elevations.

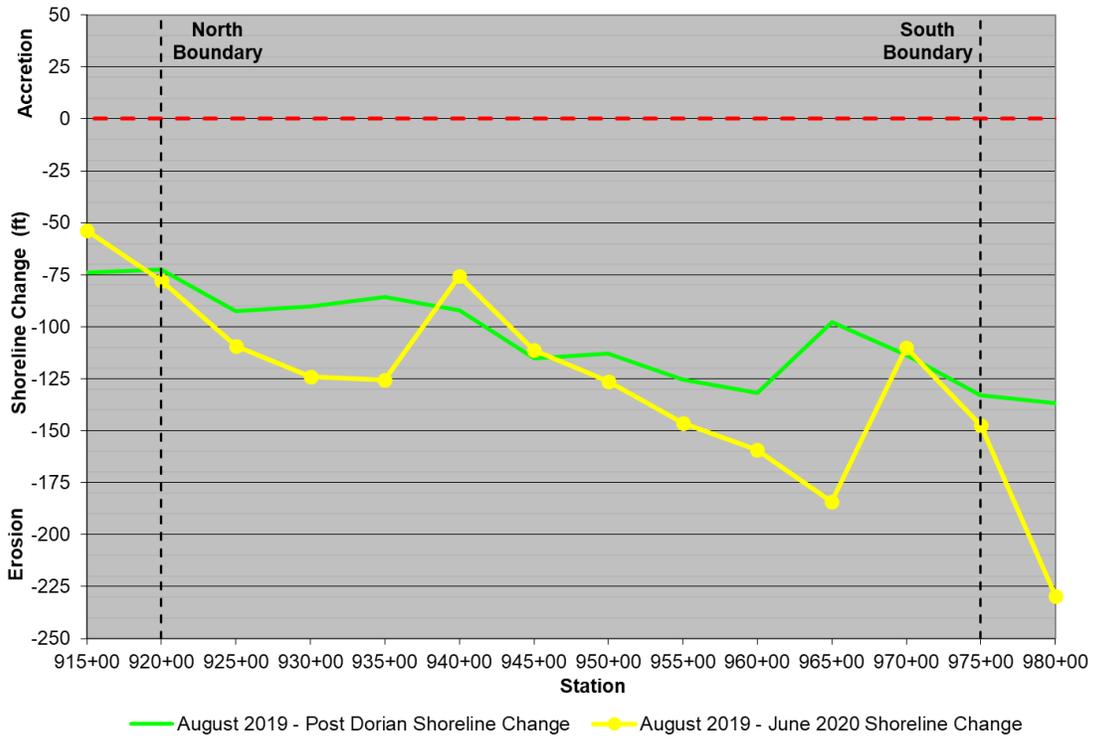


Figure 5-14. Nags Head – Reach 3 - North Shoreline Change (2019 – 2020)

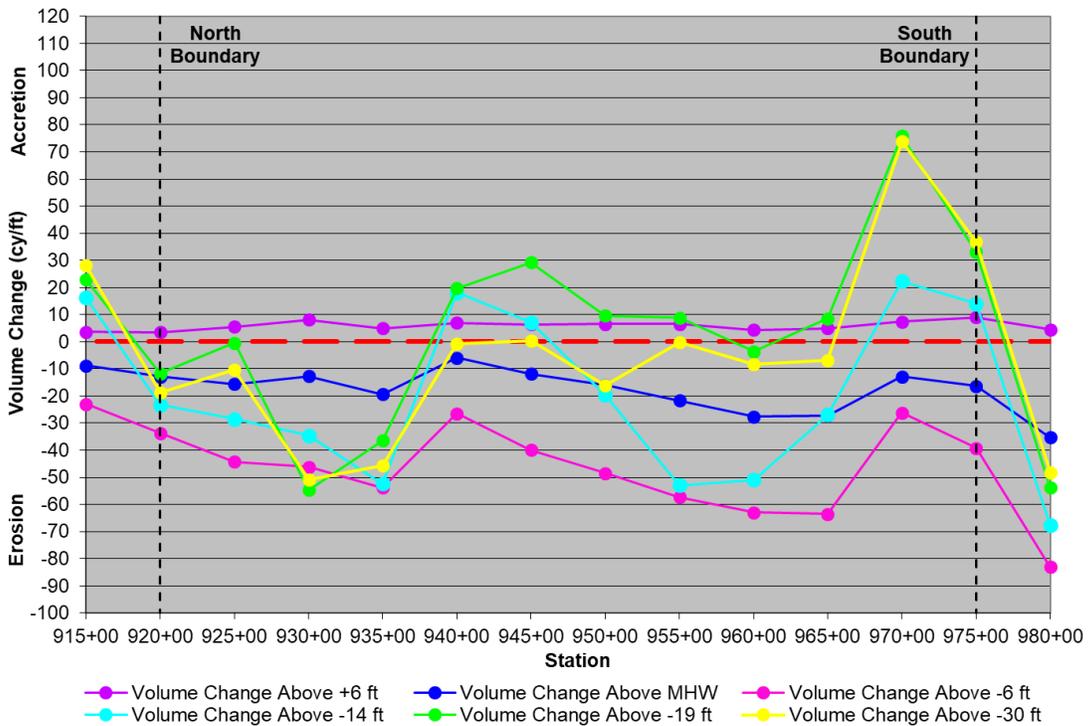


Figure 5-15. Nags Head – Reach 3 - North Unit Volume Change (2019 – 2020)

5.3.6 Nags Head - Reach 3 - South (2019 - 2020)

The Nags Head – Reach 3 - South survey reach extends approximately 3,500 ft between Limulus Drive and Loon Court, containing 7 survey transects (Station 975+00 – 1010+00) (see **Figure 3-1**). As a reminder, 7 transects were added to this reach during the 2020 surveying effort, creating 250 ft spacing for the whole reach, and will be included in the analysis during the 2021 monitoring report. Most recently, during May through August 2019, approximately 540,833 cy was placed across the entire reach as part of the 2019 Beach Nourishment Project (see **Figure 5-1**). A summary of average shoreline and volume changes between 2019 and 2020 for Nags Head – Reach 3 – South in comparison with the Total Monitored Oceanfront is presented in **Table 5-14** and **Table 5-15**.

Table 5-14. Average Shoreline and Average Unit Volume Change for Reach 3 - South (2019 – 2020)

| 2019 vs. 2020 (Total Change) | Transects | Reach Length | avg shoreline change @ +1.18 ft NAVD88 | avg volume change above +6 ft NAVD88 | avg volume change above +1.18 ft NAVD88 | avg volume change above -6 ft NAVD88 | avg volume change above -14 ft NAVD88 | avg volume change above -19 ft NAVD88 | avg volume change above -30 ft NAVD88 |
|------------------------------|------------------|--------------|--|--------------------------------------|---|--------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| Reach | # | ft | ft | cy/ft | cy/ft | cy/ft | cy/ft | cy/ft | cy/ft |
| Nags Head - Reach 3 - South | 975+00 - 1010+00 | 3,500 | -195.6 | 6.9 | -28.0 | -69.0 | -46.9 | -34.7 | -39.2 |
| Total Monitored Oceanfront | 430+00 - 1200+00 | 77,000 | -76.1 | 4.4 | -9.7 | -27.2 | -6.0 | 3.9 | 2.9 |

Table 5-15. Cumulative Volume Change for Reach 3 - South (2019 – 2020)

| 2019 vs. 2020 (Total Change) | Transects | Reach Length | cumulative volume change above +6 ft NAVD88 | cumulative volume change above +1.18 ft NAVD88 | cumulative volume change above -6 ft NAVD88 | cumulative volume change above -14 ft NAVD88 | cumulative volume change above -19 ft NAVD88 | cumulative volume change above -30 ft NAVD88 |
|------------------------------|------------------|--------------|---|--|---|--|--|--|
| Reach | # | ft | cy | cy | cy | cy | cy | cy |
| Nags Head - Reach 3 - South | 975+00 - 1010+00 | 3,500 | 20,806 | -83,915 | -207,063 | -140,727 | -104,238 | -117,480 |
| Total Monitored Oceanfront | 430+00 - 1200+00 | 77,000 | 334,334 | -749,098 | -2,093,819 | -462,958 | 297,756 | 230,769 |

Shoreline change at MHW showed a significant overall average recession of -195.6 ft. **Figure 5-16** presents the shoreline changes at each transect from 2019 to 2020 in comparison with post-Dorian, showing erosion along all transects. Most of this landward recession can be attributed to Hurricane Dorian, given that landward recession at MHW was -157.7 ft immediately post-Dorian (**Table 5-4**).

Volumetrically, **Table 5-14** and **Table 5-15** indicates that Reach 3 - South experienced significant volume losses throughout the monitoring period which can be attributed to Hurricane Dorian and Nor'easter event. The equilibration the 2019 Beach Nourishment project might have also caused loss of material along the profiles. Overall, Reach 3 - South experienced the largest volume losses above -6 ft NAVD88 (-207,063 cy or -69 cy/ft). Losses above -14 ft NAVD88 (-140,727 cy or -46.9 cy/ft) and -19 ft NAVD88 (-104,238 cy or -34.7 cy/ft) were also significant although slightly smaller than losses above -6 ft NAVD88, indicating recovery of only a small portion of the losses at the offshore bar and beyond. Volume losses were also observed above -30 ft NAVD88 which indicates that some of the material was transported offshore completely or to adjacent reaches, as

longshore transport rates in this area start to accelerate in comparison with the more stable northern reaches. Similar to previous monitoring reaches, volume gain was observed above berm (+6 ft NAVD88) which can be explained by waves pushing material onshore. **Figure 5-17** displays the unit volume change at each transect above the six elevations analyzed. As can be seen, a majority of transects experienced volume losses below +6 ft NAVD88.

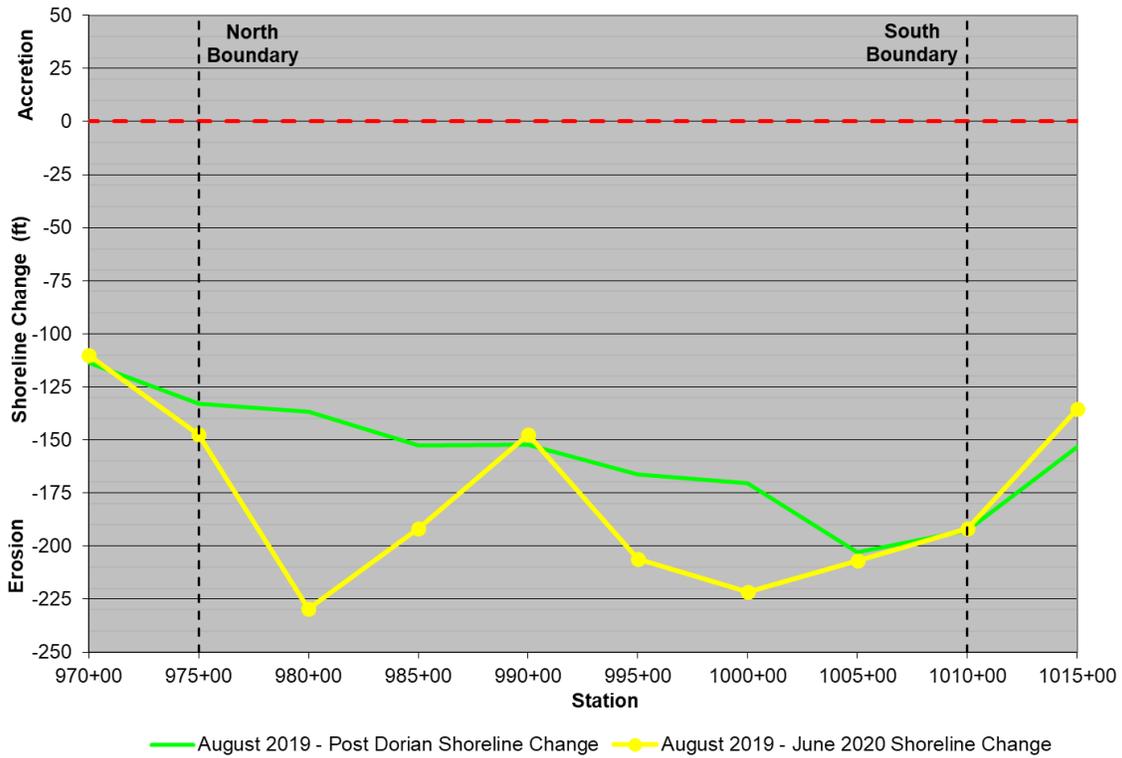


Figure 5-16. Nags Head – Reach 3 – South Shoreline Change (2019 – 2020)

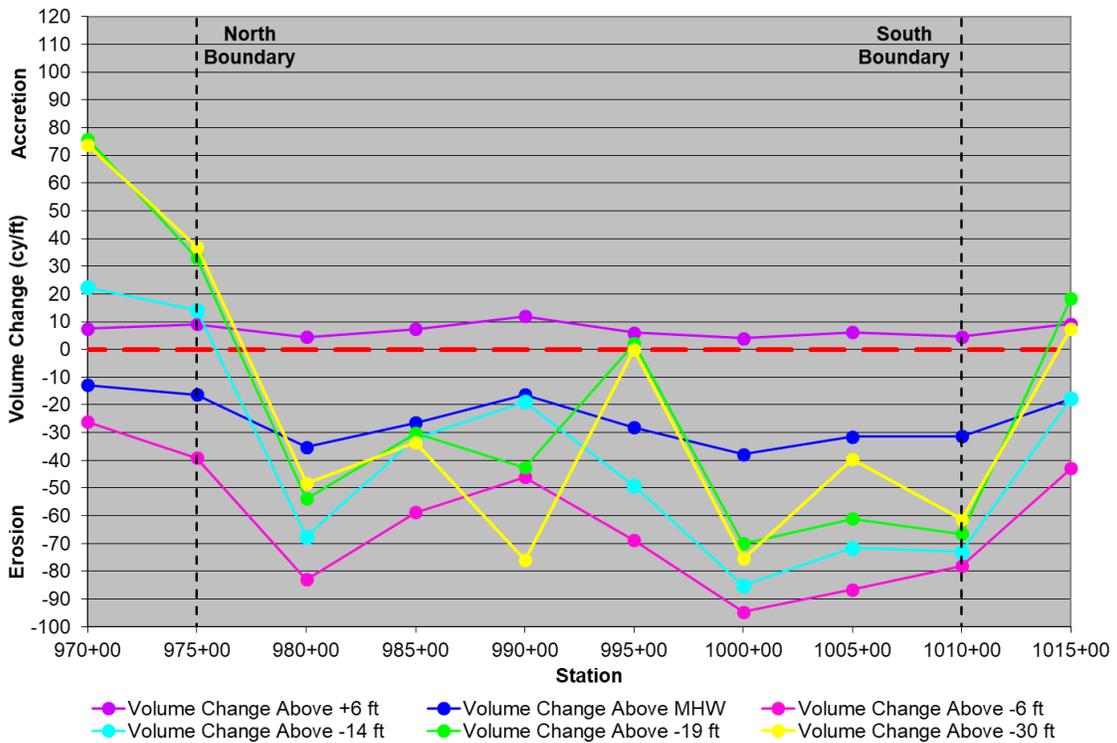


Figure 5-17. Nags Head – Reach 3 – South Unit Volume Change (2019 – 2020)

5.3.7 Nags Head - Reach 4 (2019 - 2020)

The Nags Head – Reach 4 survey reach extends approximately 1,500 ft between Loon Court and McCall Court, containing four survey transects (Station 1010+00 – 1025+00), at 500 ft spacing (see **Figure 3-1**). As a reminder, three transects were added to this reach during the 2020 surveying effort, creating 250 ft spacing for the whole reach, and will be included in the analysis during the 2021 monitoring report. Most recently, during May through August 2019, approximately 239,298 cy was placed across the entire reach as part of the 2019 Beach Nourishment Project (see **Figure 5-1**). A summary of average shoreline and volume changes between 2019 and 2020 for Nags Head – Reach 4 in comparison with the Total Monitored Oceanfront is presented in **Table 5-16** and **Table 5-17**.

Table 5-16. Average Shoreline and Average Unit Volume Change for Reach 4 (2019 – 2020)

| 2019 vs. 2020 (Total Change) | Transects | Reach Length | avg shoreline change @ +1.18 ft NAVD88 | avg volume change above +6 ft NAVD88 | avg volume change above +1.18 ft NAVD88 | avg volume change above -6 ft NAVD88 | avg volume change above -14 ft NAVD88 | avg volume change above -19 ft NAVD88 | avg volume change above -30 ft NAVD88 |
|------------------------------|-------------------|--------------|--|--------------------------------------|---|--------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| Reach | # | ft | ft | cy/ft | cy/ft | cy/ft | cy/ft | cy/ft | cy/ft |
| Nags Head - Reach 4 | 1010+00 - 1025+00 | 1,500 | -166.5 | 5.3 | -25.2 | -61.9 | -48.2 | -34.0 | -28.7 |
| Total Monitored Oceanfront | 430+00 - 1200+00 | 77,000 | -76.1 | 4.4 | -9.7 | -27.2 | -6.0 | 3.9 | 2.9 |

Table 5-17. Cumulative Volume Change for Reach 4 (2019 – 2020)

| 2019 vs. 2020 (Total Change) | Transects | Reach Length | cumulative volume change above +6 ft NAVD88 | cumulative volume change above +1.18 ft NAVD88 | cumulative volume change above -6 ft NAVD88 | cumulative volume change above -14 ft NAVD88 | cumulative volume change above -19 ft NAVD88 | cumulative volume change above -30 ft NAVD88 |
|------------------------------|-------------------|--------------|---|--|---|--|--|--|
| Reach | # | ft | cy | cy | cy | cy | cy | cy |
| Nags Head - Reach 4 | 1010+00 - 1025+00 | 1,500 | 10,545 | -50,381 | -123,858 | -96,436 | -67,929 | -57,307 |
| Total Monitored Oceanfront | 430+00 - 1200+00 | 77,000 | 334,334 | -749,098 | -2,093,819 | -462,958 | 297,756 | 230,769 |

Shoreline change at MHW showed a significant overall average recession of -166.5 ft. **Figure 5-18** presents the shoreline changes at each transect from 2019 to 2020 in comparison with post-Dorian, showing significant erosion along all transects. Most of this landward recession can be attributed to Hurricane Dorian, given that landward recession at MHW immediately post-Dorian (**Table 5-4**) was similar to June 2020 recession.

Volumetrically, **Table 5-16** and **Table 5-17** indicates that Reach 4 experienced significant volume losses throughout the monitoring period. A majority of these losses can be attributed to Hurricane Dorian and Nor’easter event. The equilibration of the 2019 Beach Nourishment project might have also caused loss of material along the profiles. Overall, Reach 4 experienced the largest losses above -6 ft NAVD88 (-123,858 cy or -61.9 cy/ft). Losses above -14 ft NAVD88 (-96,436 cy or -48.2 cy/ft) and above -19 ft NAVD88 (-67,929 cy or -34 cy/ft) were also significant although slightly smaller than losses above -6 ft NAVD88, indicating recovery of only a small portion of the losses at the offshore bar and beyond. Volume losses were also observed above -30 ft NAVD88 which indicates that some of the material was transported offshore completely or to adjacent reaches, as

longshore transport rates in this area start to accelerate in comparison with the more stable northern reaches. Similar to previous monitoring reaches, volume gain was observed above berm (+6 ft NAVD88) which can be explained by waves pushing material onshore. Since Hurricane Dorian no significant recovery was observed along the profiles, as volume losses above -19 ft NAVD88 remain large (see **Table 5-4**). **Figure 5-19** displays the unit volume change at each transect above the six elevations analyzed. As can be seen, volume losses are evident at every transect in Reach 4, with just a few exceptions of small offshore gains beyond the depth of closure.

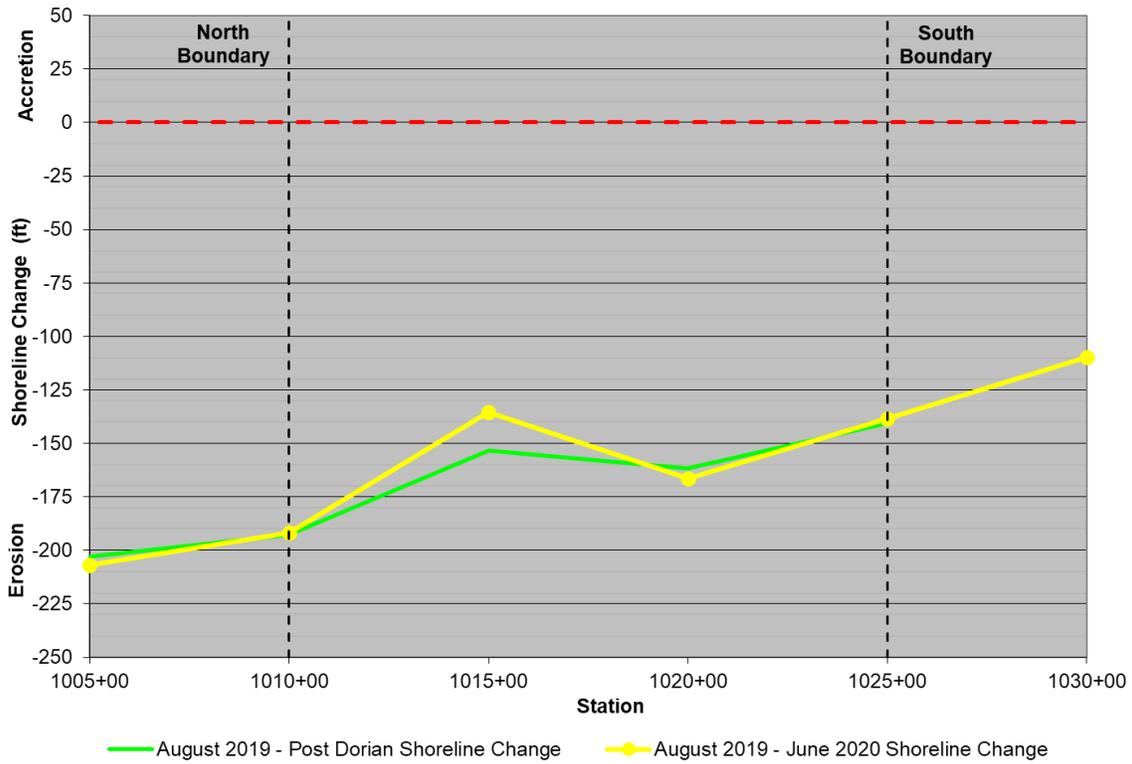


Figure 5-18. Nags Head – Reach 4 Shoreline Change (2019 – 2020)

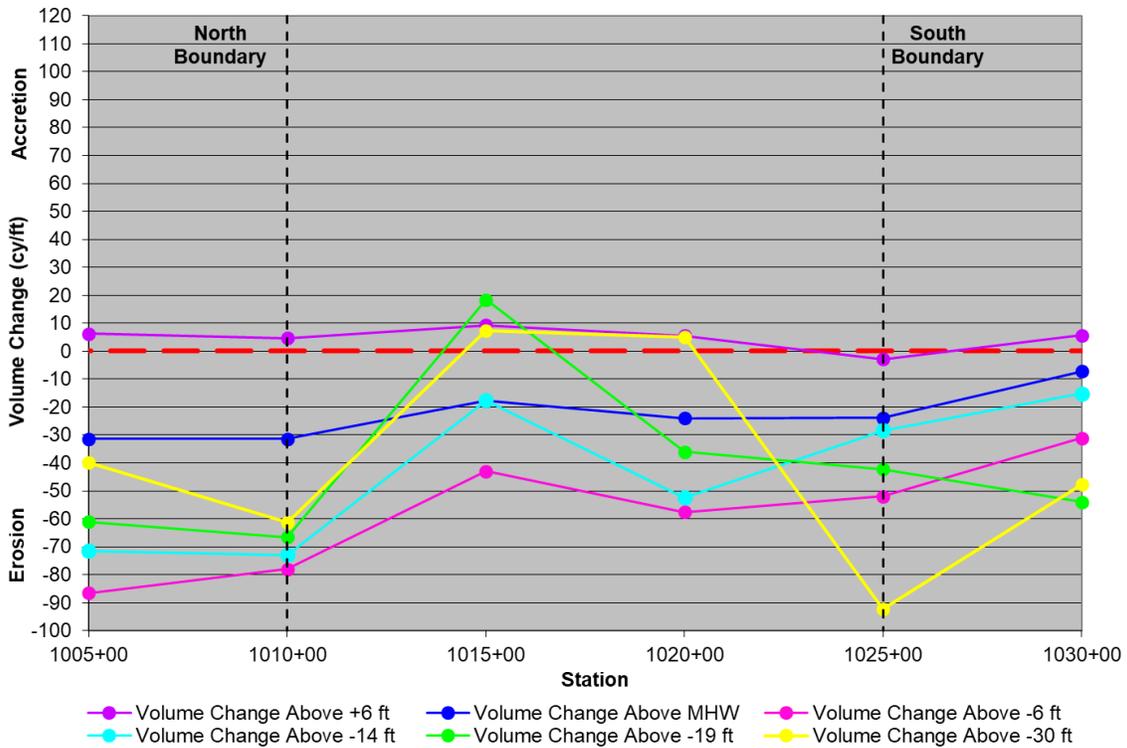


Figure 5-19. Nags Head – Reach 4 Unit Volume Change (2019 – 2020)

5.3.8 Nags Head – Oregon Inlet (2019 - 2020)

The Nags Head – Oregon Inlet survey reach extends approximately 17,500 ft between McCall Court and Oregon Inlet, containing seven survey transects (Station 1025+00 – 1200+00), varying in spacing between 1,000 ft and 3,000 ft (see **Figure 3-1**). In the future 2021 report, with the addition of 23 transects this reach will be extended south towards Oregon Inlet to Station 1290+00, and the spacing between the transects will be reduced to a consistent 1,000 ft. This reach has not received any material during the 2011 and 2019 beach nourishment projects. A summary of average shoreline and volume changes between 2019 and 2020 for the Nags Head – Oregon Inlet Reach is presented along with total oceanfront changes in **Table 5-18** and **Table 5-19**.

Table 5-18. Average Shoreline and Average Unit Volume Change for Nags Head – Oregon Inlet (2019 – 2020)

| 2019 vs. 2020 (Total Change) | Transects | Reach Length | avg shoreline change @ +1.18 ft NAVD88 | avg volume change above +6 ft NAVD88 | avg volume change above +1.18 ft NAVD88 | avg volume change above -6 ft NAVD88 | avg volume change above -14 ft NAVD88 | avg volume change above -19 ft NAVD88 | avg volume change above -30 ft NAVD88 |
|------------------------------|-------------------|--------------|--|--------------------------------------|---|--------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| Reach | # | ft | ft | cy/ft | cy/ft | cy/ft | cy/ft | cy/ft | cy/ft |
| Nags Head - Oregon Inlet | 1025+00 - 1200+00 | 17,500 | -42.0 | 2.1 | -2.6 | -13.9 | 3.8 | 0.1 | -5.7 |
| Total Monitored Oceanfront | 430+00 - 1200+00 | 77,000 | -76.1 | 4.4 | -9.7 | -27.2 | -6.0 | 3.9 | 2.9 |

Table 5-19. Cumulative Volume Change for Nags Head – Oregon Inlet (2019 – 2020)

| 2019 vs. 2020 (Total Change) | Transects | Reach Length | cumulative volume change above +6 ft NAVD88 | cumulative volume change above +1.18 ft NAVD88 | cumulative volume change above -6 ft NAVD88 | cumulative volume change above -14 ft NAVD88 | cumulative volume change above -19 ft NAVD88 | cumulative volume change above -30 ft NAVD88 |
|------------------------------|-------------------|--------------|---|--|---|--|--|--|
| Reach | # | ft | cy | cy | cy | cy | cy | cy |
| Nags Head - Oregon Inlet | 1025+00 - 1200+00 | 17,500 | 36,929 | -45,373 | -243,843 | 66,763 | 1,734 | -100,269 |
| Total Monitored Oceanfront | 430+00 - 1200+00 | 77,000 | 334,334 | -749,098 | -2,093,819 | -462,958 | 297,756 | 230,769 |

Shoreline change at MHW showed an overall average recession of -42 ft. **Figure 5-20** presents the shoreline changes at each transect, showing erosion along majority of transects. It is likely that the shoreline was heavily impacted by Hurricane Dorian.

Overall, the Nags Head – Oregon Inlet reach experienced the largest volume losses above -6 ft NAVD88 of -243,843 cy (-13.9 cy/ft). The volume losses can likely be attributed to Hurricane Dorian. Volume gains above -14 ft NAVD88 (66,763 cy or 3.8 cy/ft) and -19 ft NAVD88 (1,734 cy or 0.1 cy/ft) indicate the capture of eroded material at offshore bar and above the depth of closure. Similar to previous reaches, volume gain was also observed above the berm (+6 ft NAVD88) which can be explained by storm waves pushing material onshore. The volume gains and smaller volume losses at Nags Head – Oregon Inlet reach compared to the other reaches are likely caused by littoral transport of material to the south from Reach 3 and Reach 4. **Figure 5-21** displays the unit volume change at each transect above the six elevations analyzed. As can be seen, a majority of transects experienced volume losses above MHW and above -6 ft NAVD88 and volume gains above the remaining elevations. The accretion observed at the southernmost transect might be an

evidence of shoaling close to the mouth of Oregon Inlet. In future surveys, when data from the additional transects closer to the Oregon Inlet become available, this behavior can be investigated in more detail and better understood. For the majority of transects these losses were contained to above -6 ft NAVD88.

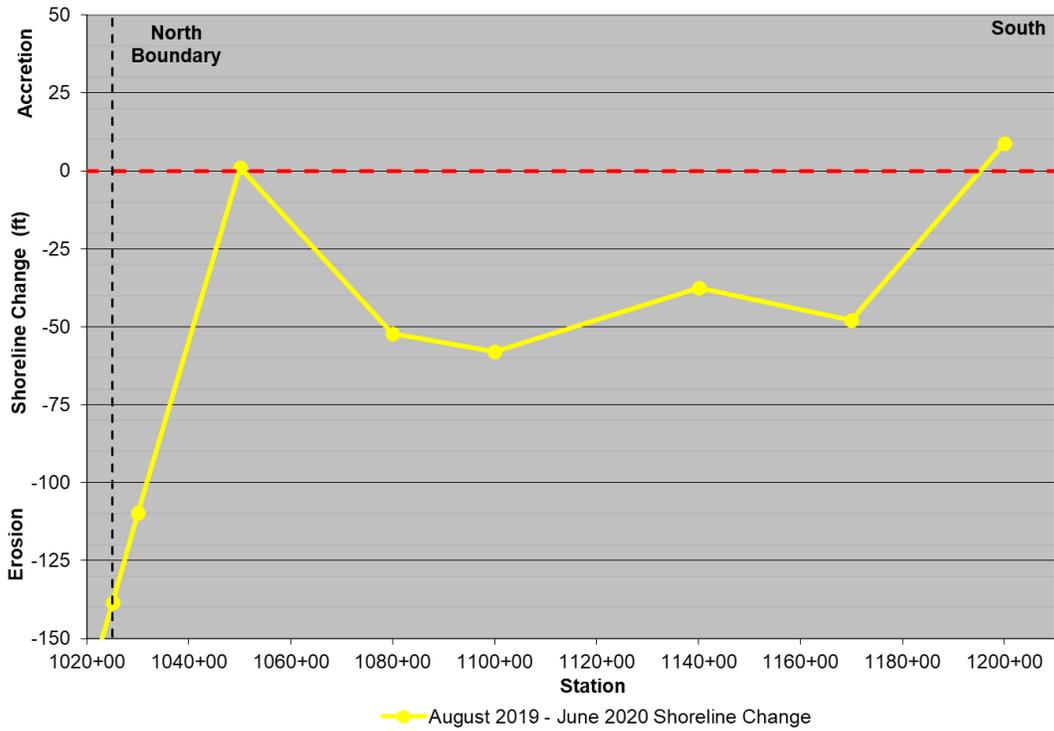


Figure 5-20. Nags Head – Oregon Inlet Shoreline Change (2019 – 2020)

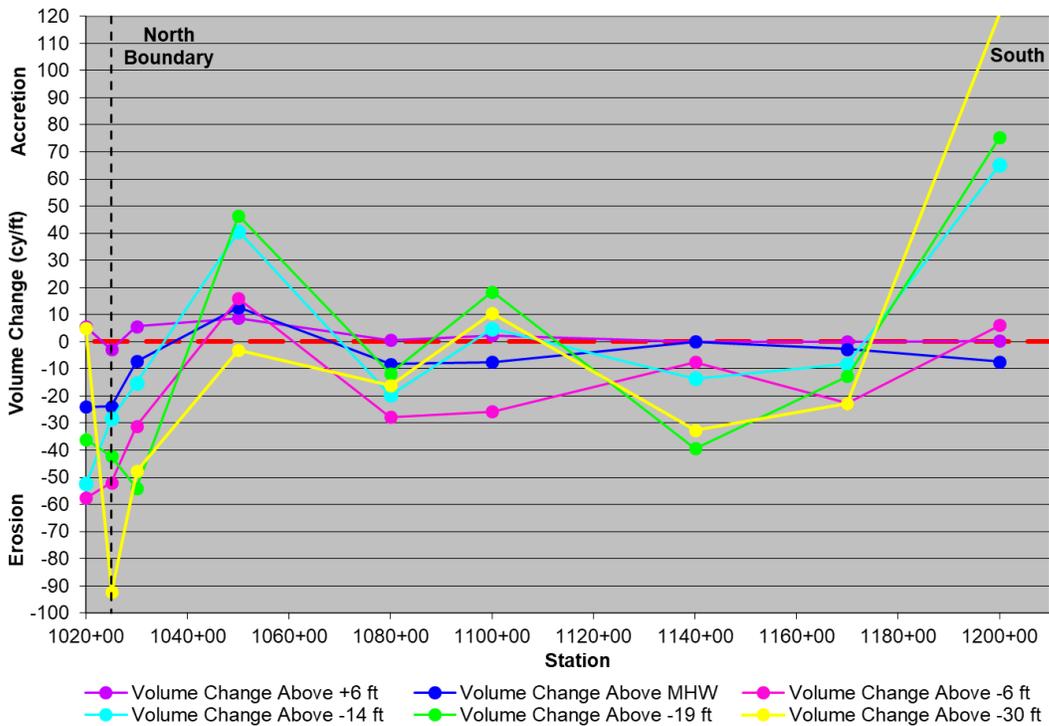


Figure 5-21. Nags Head – Oregon Inlet Unit Volume Change (2019 – 2020)

5.3.9 Oceanfront Trends Summary for All Reaches (2019 - 2020)

Table 5-20 and **Table 5-21** provides a summary of the shoreline and volume changes along Nags Head as presented in the previous sections along with average and total oceanfront values. For Nags Head, since each reach consists of a different length of shoreline, the calculations provide a weighted average for unit shoreline change (ft) and unit volume change (cy/ft) along the Nags Head oceanfront. The weighted average also accounts for differences in the shoreline length between each transect. For reaches surveyed during Post Dorian Survey (Reaches 1-4) values presented in red indicate increased losses/erosion since Hurricane Dorian while values represented in blue indicate some recovery/accretion since Hurricane Dorian. **Figure 5-24** and **Figure 5-25** contains plots of the shoreline and volume changes between the summer 2019 and the summer 2020 surveys at each transect along Nags Head.

Table 5-20. Nags Head Shoreline and Average Unit Volume Change Statistics (2019 – 2020)

| 2019 vs. 2020 (Total Change) | Transects | Reach Length | avg shoreline change @ +1.18 ft NAVD88 | avg volume change above +6 ft NAVD88 | avg volume change above +1.18 ft NAVD88 | avg volume change above -6 ft NAVD88 | avg volume change above -14 ft NAVD88 | avg volume change above -19 ft NAVD88 | avg volume change above -30 ft NAVD88 |
|-----------------------------------|-------------------------|---------------|--|--------------------------------------|---|--------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| Reach | # | ft | ft | cy/ft | cy/ft | cy/ft | cy/ft | cy/ft | cy/ft |
| Nags Head - North | 430+00 - 495+00 | 6,500 | -53.0 | -0.8 | -7.5 | -24.3 | -1.4 | 3.5 | 10.9 |
| Nags Head - Reach 1 | 495+00 - 790+00 | 29,500 | -73.4 | 4.9 | -10.8 | -24.9 | -5.3 | 8.7 | 12.5 |
| Nags Head - Reach 2 | 790+00 - 920+00 | 13,000 | -76.0 | 7.1 | -8.5 | -28.8 | -1.3 | 11.9 | 7.3 |
| Nags Head - Reach 3N | 920+00 - 975+00 | 5,500 | -125.9 | 6.2 | -16.9 | -46.0 | -20.3 | 6.1 | -5.0 |
| Nags Head - Reach 3S | 975+00 - 1010+00 | 3,500 | -195.6 | 6.9 | -28.0 | -69.0 | -46.9 | -34.7 | -39.2 |
| Nags Head - Reach 4 | 1010+00 - 1025+00 | 1,500 | -166.5 | 5.3 | -25.2 | -61.9 | -48.2 | -34.0 | -28.7 |
| Nags Head - Oregon Inlet | 1025+00 - 1200+00 | 17,500 | -42.0 | 2.1 | -2.6 | -13.9 | 3.8 | 0.1 | -5.7 |
| | Transects | Reach Length | weighted avg | weighted avg | weighted avg | weighted avg | weighted avg | weighted avg | weighted avg |
| Nourished Oceanfront | 495+00 - 1025+00 | 53,000 | -90.2 | 5.7 | -12.4 | -32.0 | -9.8 | 5.1 | 4.8 |
| Total Monitored Oceanfront | 430+00 - 1200+00 | 77,000 | -76.1 | 4.4 | -9.7 | -27.2 | -6.0 | 3.9 | 2.9 |

Table 5-21. Nags Head Cumulative Volume Change Statistics (2019 – 2020)

| 2019 vs. 2020 (Total Change) | Transects | Reach Length | cumulative volume change above +6 ft NAVD88 | cumulative volume change above +1.18 ft NAVD88 | cumulative volume change above -6 ft NAVD88 | cumulative volume change above -14 ft NAVD88 | cumulative volume change above -19 ft NAVD88 | cumulative volume change above -30 ft NAVD88 |
|---------------------------------------|-----------------------------|-----------------|--|---|---|--|--|--|
| Reach | # | ft | cy | cy | cy | cy | cy | cy |
| Nags Head - North | 430+00 - 495+00 | 6,500 | -5,081 | -48,568 | -157,819 | -9,067 | 22,945 | 70,672 |
| Nags Head - Reach 1 | 500+00 - 785+00 | 29,500 | 144,242 | -317,435 | -733,688 | -155,164 | 257,446 | 368,393 |
| Nags Head - Reach 2 | 790+00 - 915+00 | 13,000 | 92,898 | -110,725 | -374,783 | -16,854 | 154,134 | 94,514 |
| Nags Head - Reach 3N | 920+00 - 970+00 | 5,500 | 33,997 | -92,703 | -252,767 | -111,474 | 33,664 | -27,755 |
| Nags Head - Reach 3S | 975+00 - 1005+00 | 3,500 | 20,806 | -83,915 | -207,063 | -140,727 | -104,238 | -117,480 |
| Nags Head - Reach 4 | 1010+00 - 1025+00 | 1,500 | 10,545 | -50,381 | -123,858 | -96,436 | -67,929 | -57,307 |
| Nags Head - Oregon Inlet | 1030+00 - 1200+00 | 17,500 | 36,929 | -45,373 | -243,843 | 66,763 | 1,734 | -100,269 |
| | Transects | Reach Length | total | total | total | total | total | total |
| Nourished Oceanfront | 495+00 - 1025+00 | 53,000 | 302,486 | -655,158 | -1,692,158 | -520,654 | 273,078 | 260,365 |
| Total Monitored Oceanfront | 430+00 - 1200+00 | 77,000 | 334,334 | -749,098 | -2,093,819 | -462,958 | 297,756 | 230,769 |

The Total Monitored Oceanfront shoreline experienced a significant overall average landward recession at MHW of -76.1 ft over the past year. This is likely influenced by Hurricane Dorian and equilibration of the 2019 Beach nourishment project. No shoreline position recovery was observed after Hurricane Dorian.

Table 5-20 and **Table 5-21** indicate that Nags Head Oceanfront experienced gains in material along the upper (+6 ft NAVD88) and lower (-19 ft NAVD88, -30 ft NAVD88) portions of the profiles. Volume losses were experienced above MHW, -6 ft NAVD88, -14 ft NAVD88. The volume losses can be attributed to Hurricane Dorian and the Nor'easter event. This behavior might be exasperated at some elevations due to equilibration of the 2019 Beach Nourishment project. **Table 5-20** and **Table 5-21** indicate that all reaches saw some recovery of the eroded material above depth of closure (-19 ft NAVD88) as evidenced by smaller annual losses or volume gains above -19 ft NAVD88 than what was experienced post-Dorian. In all management reaches except Reach 3-South and Reach 4, the material lost between + 6 ft NAVD88 and -14 ft NAVD88 was captured above -19 ft NAVD88 indicating that the material remained within the system. **Figure 5-22** presents an example profile showing movement of the sand along the profile that was evident at a majority of transects along the northern portion of the Town. In Reach 3-South and Reach 4 volume losses were observed extending below -30 ft NAVD88 indicating volume loss well beyond the depth of closure that will likely not migrate back onshore. **Figure 5-23** presents an example profile showing this behavior of the sand movement at Reach-3 South and Reach 4.

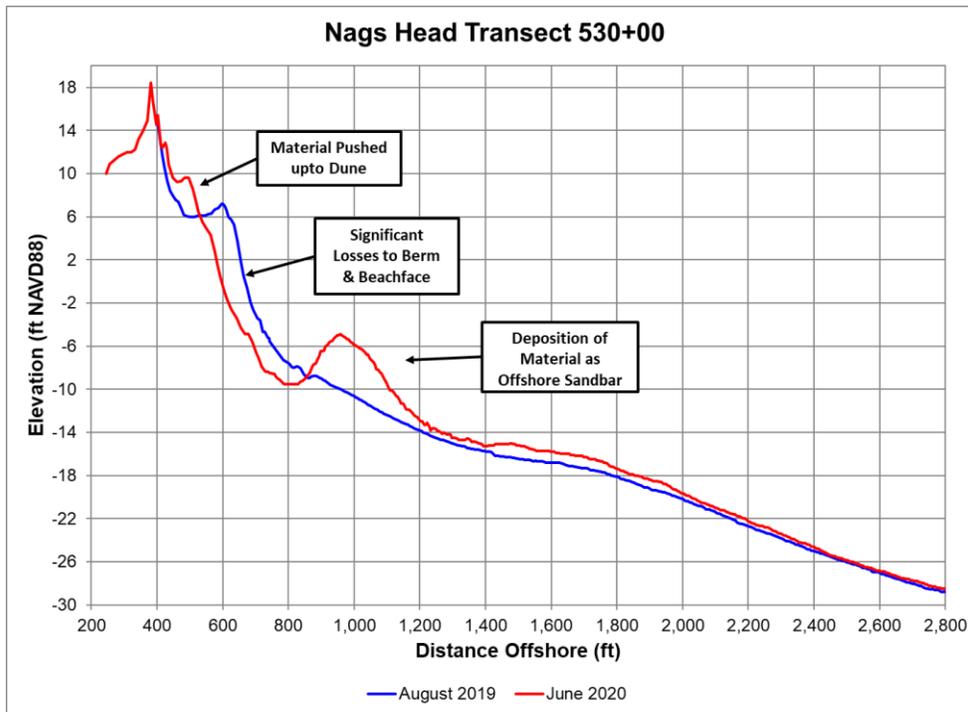


Figure 5-22. Example Reach 1 Profile, Station 530+00 (Curlew St.)

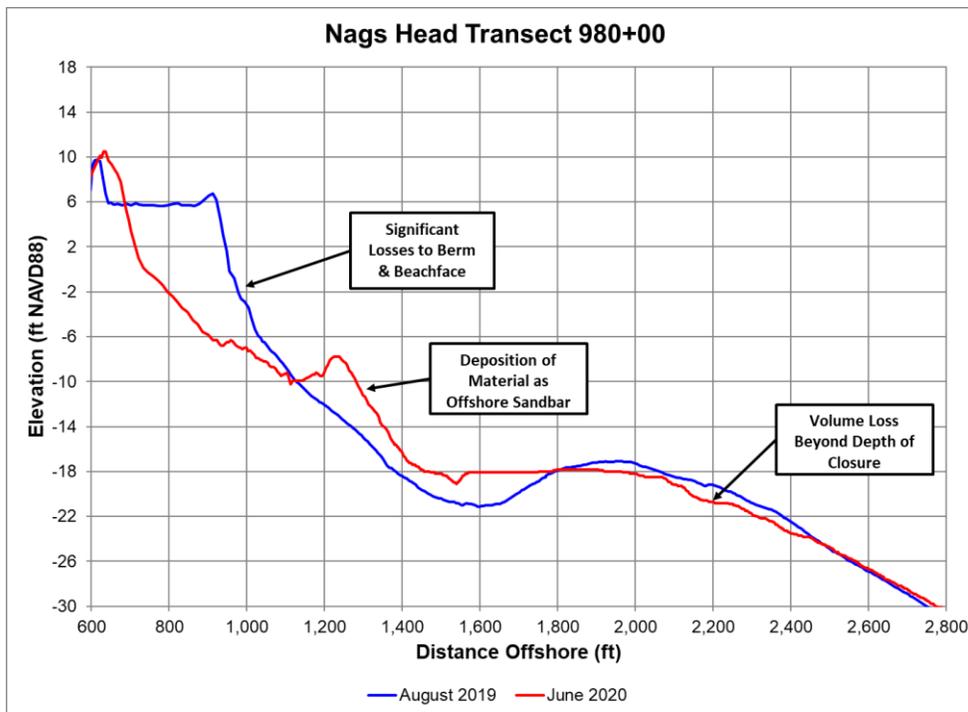


Figure 5-23. Example Reach 3-South Profile, Station 980+00 (E Altoona St.)

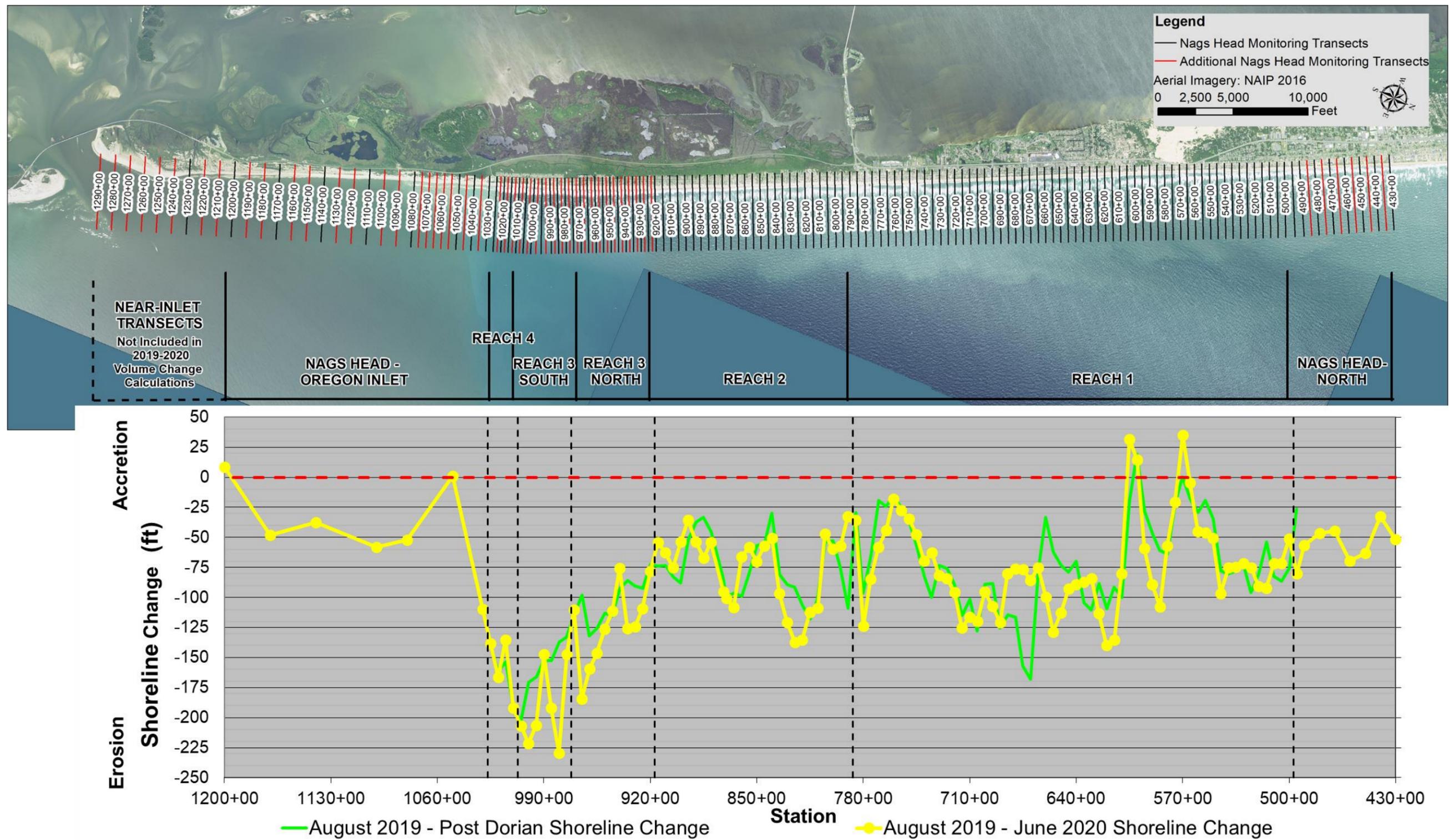


Figure 5-24. Nags Head – Oceanfront Shoreline Change (2019 – 2020)

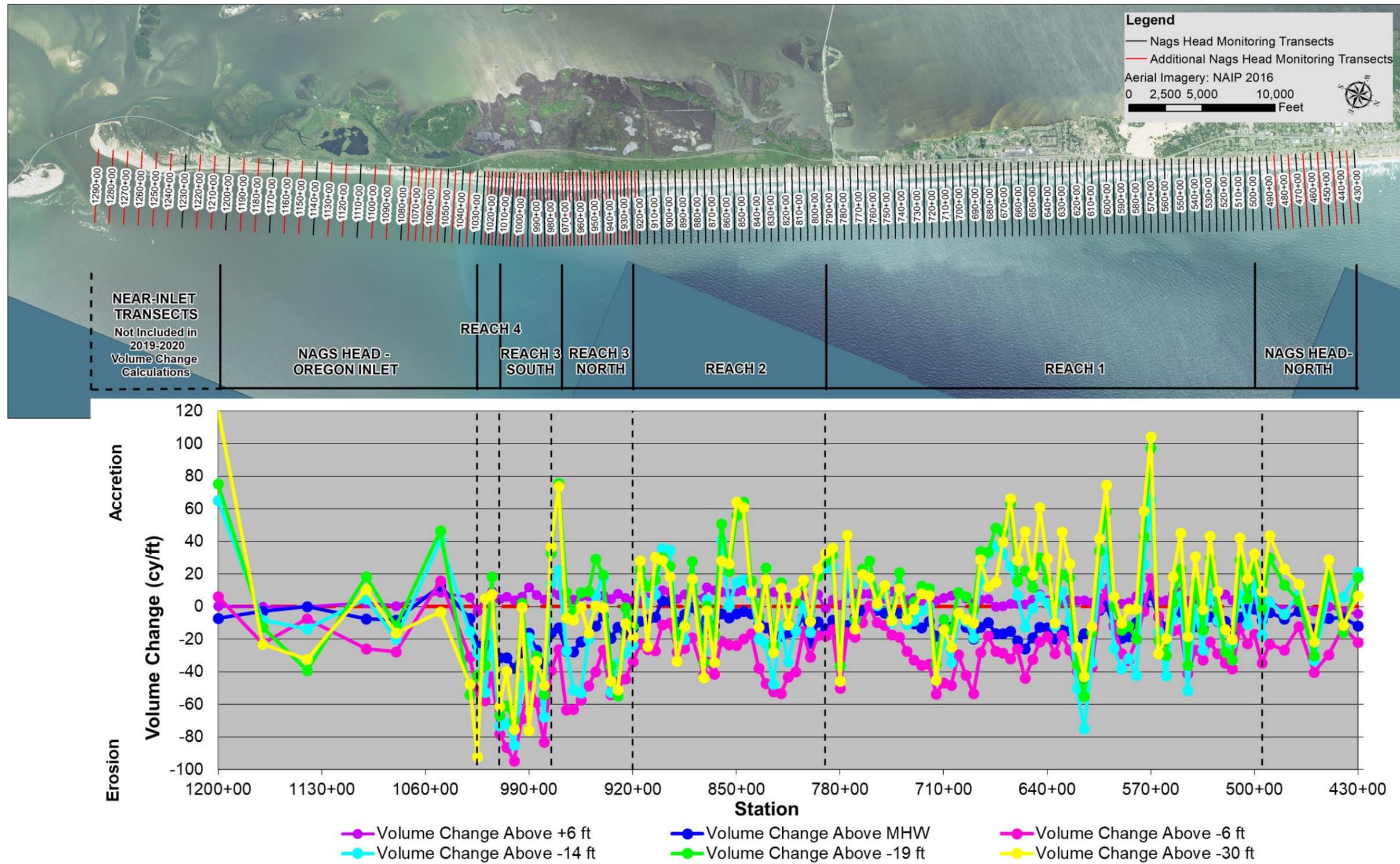


Figure 5-25. Nags Head – Unit Volume Change (2019 – 2020)

Figure 5-26 and **Figure 5-27** display the trends seen in **Table 5-20** and **Table 5-21** with bar plots of the average unit volume changes as well as total cumulative volume changes at each sub-reach to help visualize changes that occurred to the Nags Head monitoring area as a whole and how the magnitude of changes compares from one reach to the next. Apparent from these figures are the significant volume losses along a majority of Nags Head, most of which was due to Hurricane Dorian and the Nor'easter event. However, equilibration of the 2019 nourishment project likely contributed to the large losses. It can also be seen that the reaches that received nourishment gained material above +6 ft NAVD88, which may be due to storm waves pushing material above the berm.

The survey data can indicate the volume changed experienced across the surveyed area, but analysis of the data alone is not always sufficient to determine how or why these changes occurred. A detailed explanation of the processes by which the indicated gains and losses occurred is beyond the scope of this monitoring evaluation report. Numerical modeling and coastal engineering analysis taking place as part of the Town's ongoing beach nourishment master planning project may further investigate those sediment movement processes.

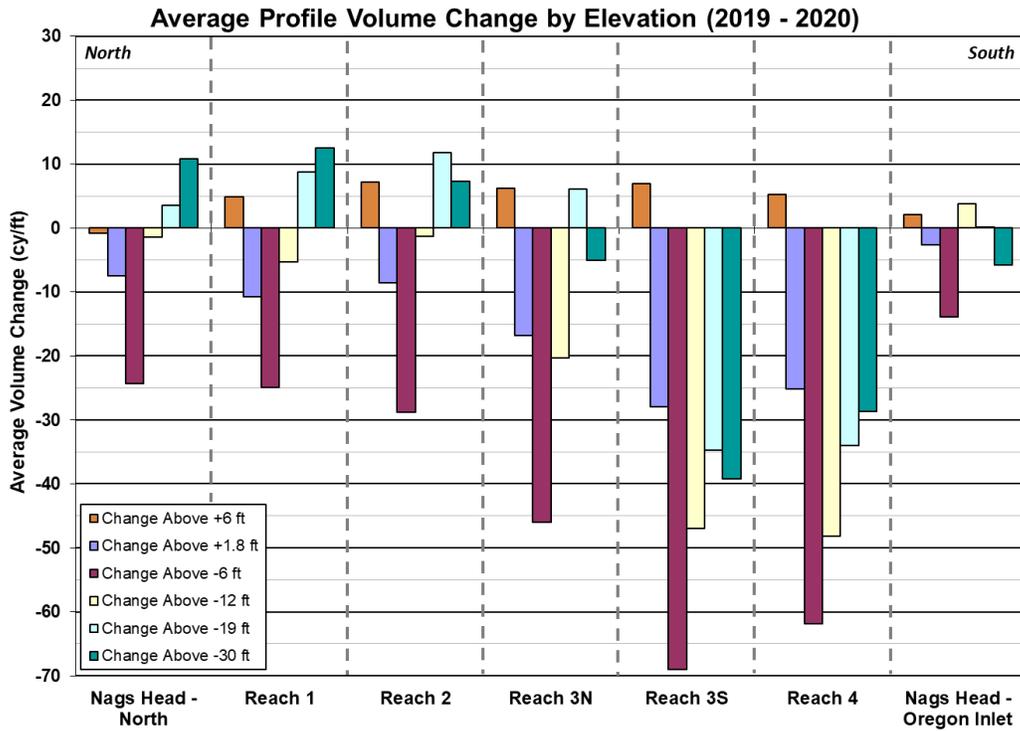


Figure 5-26. Average Unit Volume Change Within Each Reach (2019 – 2020)

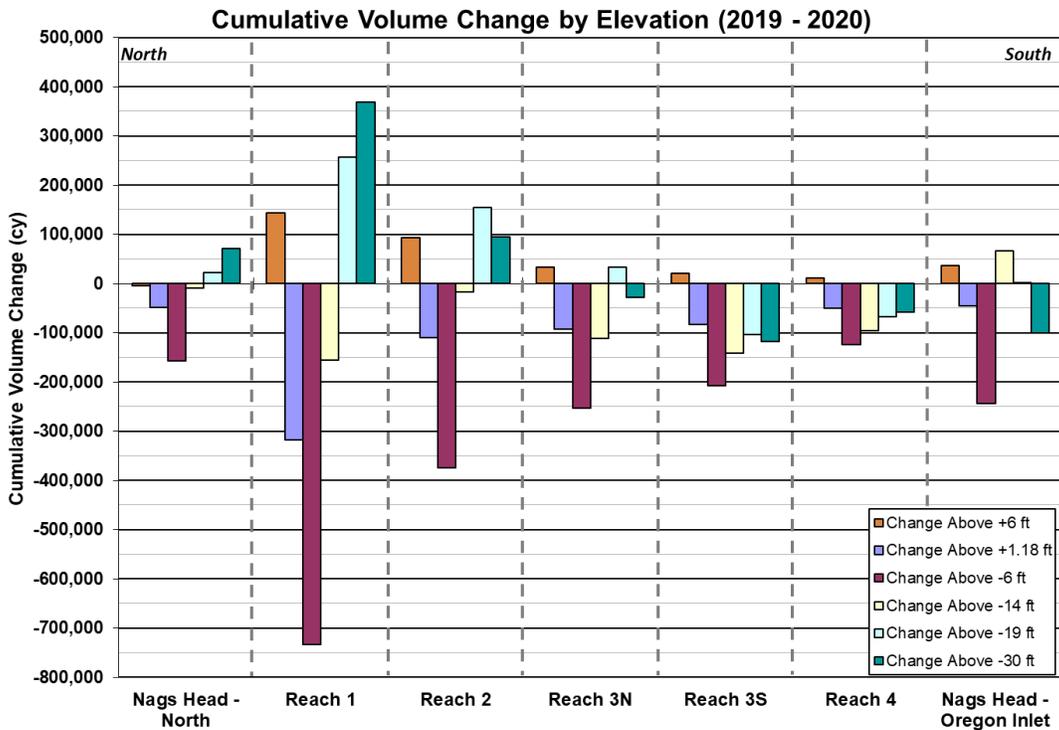


Figure 5-27. Cumulative Volume Change Within Each Reach (2019 – 2020)

5.4 Nourished Oceanfront Performance Relative to Pre-Nourishment

Construction of the 2019 Nags Head Beach Nourishment Project was carried out between May 1, 2019 and August 18, 2019. During the project, a total of 4 million cy of material was placed along approximately 10 miles of shoreline. CSE conducted a pre-construction survey in April 2019. To quantify the performance of the nourishment project, the volume changes between the pre-nourishment survey, August 2019 survey (post nourishment survey) the post-Dorian survey and the June 2020 survey were analyzed.

Figure 5-28 illustrates the shoreline changes relative to pre-nourishment condition (April 2019) along the Nourished Oceanfront. As can be seen from the figure, the shoreline experienced a significant landward recession along the Nourished Oceanfront since the completion of nourishment project. Most of the recession that has occurred since nourishment occurred before the post-Dorian survey which indicates that most of the recession can be attributed to Hurricane Dorian. Additionally, no significant shoreline position recovery is observed after Hurricane Dorian.

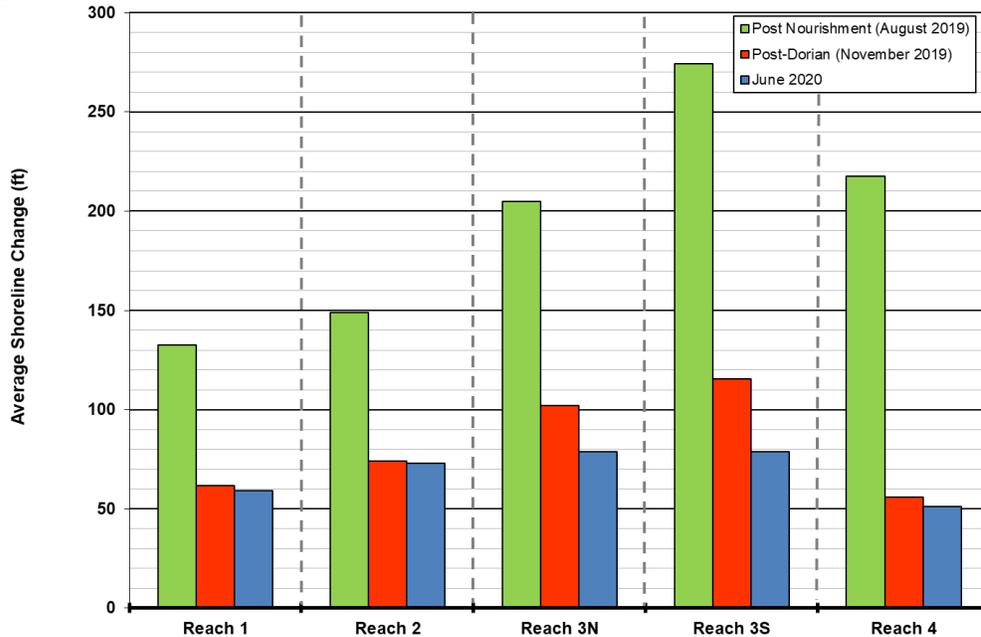


Figure 5-28. Nourished Oceanfront Average Shoreline Change Relative to Pre-Nourishment Conditions

Figure 5-29 and **Table 5-22** presents the volume changes relative to pre-nourishment conditions (April 2019) above six elevations along the Nourished Oceanfront. The Nourished Oceanfront experienced gains in material along the upper (+6 ft NAVD88) and lower (-19 ft NAVD88) portions of the profiles. It can be seen that the volume losses can mainly be attributed to Hurricane Dorian since the majority of volume loss can be seen at the post-Dorian survey. This behavior might be exasperated at some elevations due to equilibration of the 2019 Beach Nourishment project.

Table 5-22. Nourished Oceanfront Cumulative Volume Change Relative to Pre-Nourishment Conditions

| | Reaches | Stations | cumulative volume change above +6 ft NAVD88 | cumulative volume change above +1.18 ft NAVD88 | cumulative volume change above -6 ft NAVD88 | cumulative volume change above -14 ft NAVD88 | cumulative volume change above -19 ft NAVD88 |
|--|-----------------------------|-------------------------|---|--|---|--|--|
| Pre-Nourishment (April 2019) -Post Nourishment (August 2019) | Reach 1 | 495+00 - 790+00 | 48,815 | 1,281,699 | 1,725,297 | 1,788,187 | 1,795,175 |
| | Reach 2 | 790+00 - 920+00 | 17,218 | 612,985 | 929,222 | 952,787 | 955,405 |
| | Reach 3N | 920+00 - 975+00 | 38,435 | 381,697 | 514,686 | 494,606 | 492,375 |
| | Reach 3S | 975+00 - 1010+00 | 20,844 | 79,833 | 442,278 | 456,810 | 458,425 |
| | Reach 4 | 1010+00 - 1025+00 | 11,451 | 21,641 | 157,842 | 141,537 | 139,725 |
| | Nourished Oceanfront | 495+00 - 1025+00 | 136,762 | 2,377,855 | 3,769,324 | 3,833,927 | 3,841,105 |
| Pre-Nourishment (April 2019) -Post Dorian (November 2019) | Reach 1 | 495+00 - 790+00 | 122,742 | 890,211 | 1,043,259 | 1,670,583 | 1,649,959 |
| | Reach 2 | 790+00 - 920+00 | 53,589 | 441,740 | 550,539 | 906,718 | 817,193 |
| | Reach 3N | 920+00 - 975+00 | 53,200 | 273,200 | 304,616 | 414,929 | 388,407 |
| | Reach 3S | 975+00 - 1010+00 | 29,753 | -14,098 | 295,230 | 387,901 | 350,928 |
| | Reach 4 | 1010+00 - 1025+00 | 10,924 | -47,450 | 67,788 | 85,461 | 62,951 |
| | Nourished Oceanfront | 495+00 - 1025+00 | 270,208 | 1,543,604 | 2,261,432 | 3,465,591 | 3,269,438 |
| Pre-Nourishment (April 2019) - June 2020 | Reach 1 | 495+00 - 790+00 | 193,057 | 964,264 | 991,610 | 1,633,023 | 2,052,621 |
| | Reach 2 | 790+00 - 920+00 | 110,115 | 502,260 | 554,438 | 935,933 | 1,109,539 |
| | Reach 3N | 920+00 - 975+00 | 72,432 | 288,994 | 261,920 | 383,133 | 526,039 |
| | Reach 3S | 975+00 - 1010+00 | 41,649 | -4,082 | 235,215 | 316,084 | 354,188 |
| | Reach 4 | 1010+00 - 1025+00 | 21,996 | -28,740 | 33,984 | 45,101 | 71,796 |
| | Nourished Oceanfront | 495+00 - 1025+00 | 439,248 | 1,722,697 | 2,077,167 | 3,313,273 | 4,114,183 |

Table 5-22 shows that the total volume change above -19 ft NAVD88 since pre-nourishment was +4,114,182 cy (107 percent of the project volume). After the completion of the 2019 Beach Nourishment project approximately 273,078 cy (+5.1 cy/ft) volume gain was observed above -19ft NAVD88 along the Nourished Oceanfront. However, the results show large-scale shifts of sand cross-shore, across different elevations.

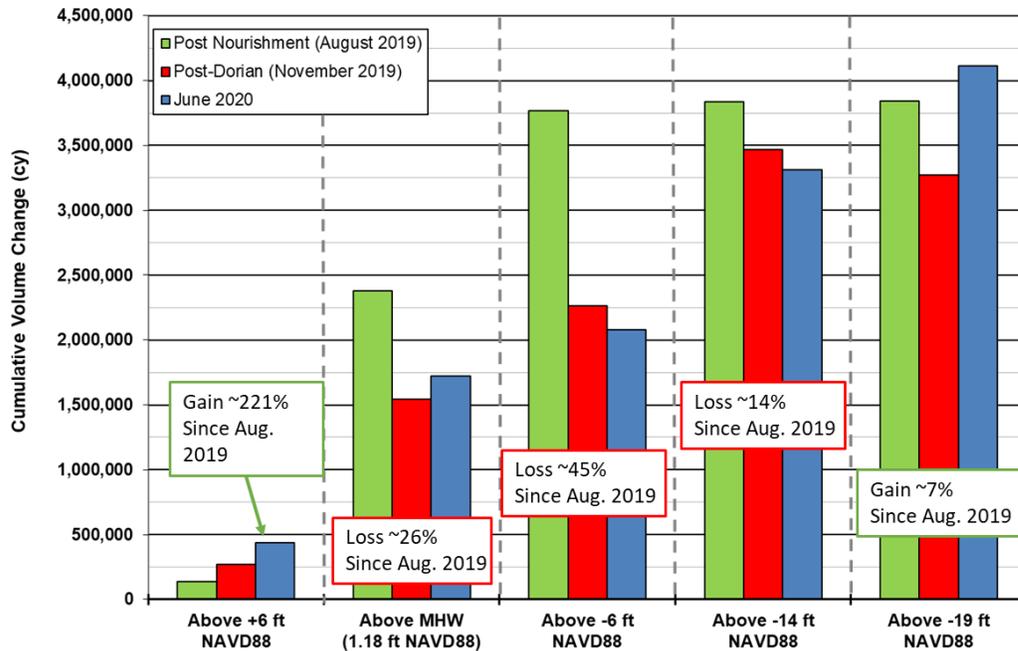


Figure 5-29. Nourished Oceanfront Cumulative Volume Change Relative to Pre-Nourishment

Figure 5-30 illustrates the volume changes relative to pre-nourishment conditions (April 2019) above +6 ft NAVD88 along the Nourished Oceanfront. All the reaches gained

material above +6 ft NAVD88 since the completion of nourishment project, which may be due to sand fencing capturing the wind-blown sand from the widened beaches and storm waves pushing material above the berm.

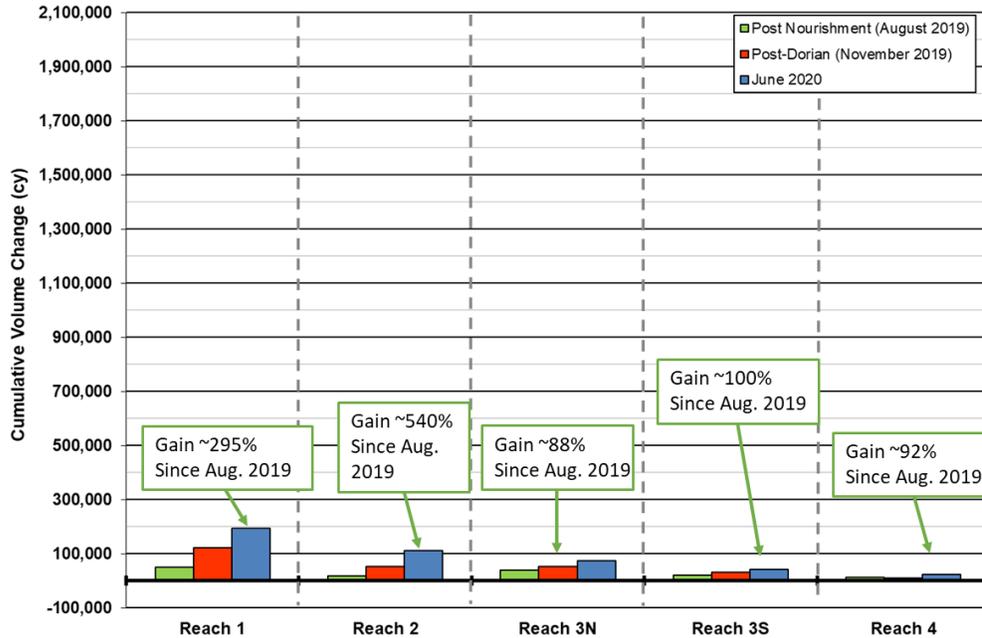


Figure 5-30. Cumulative Volume Change Above +6 ft NAVD88 Relative to Pre-Nourishment

Figure 5-31 shows the volume changes relative to pre-nourishment conditions (April 2019) above MHW (+1.18 ft NAVD88) along the Nourished Oceanfront. All the reaches lost material above MHW since the completion of nourishment project. Most of this can be observed at Post-Dorian survey results which indicates that most of the volume loss over the monitoring period can be attributed to erosion caused by the storm waves pushing the material offshore. It should be noted that although Reach 3S and Reach 4 volume loss indicates volume loss compared to the pre-nourishment conditions, the shoreline at these reaches has not receded compared to pre-nourishment position.

Figure 5-32 presents the volume changes relative to pre-nourishment conditions (April 2019) above -19 ft NAVD88 along the Nourished Oceanfront. Except Reach 4 all the reaches show recovery of material after Hurricane Dorian. The reaches north of the hotspot at Reach 3S show volume gain above -19 ft NAVD88 relative to the pre-nourishment conditions. However, in Reach 3-South and Reach 4 volume losses were observed extending below -19 ft NAVD88 indicating material loss well beyond the depth of closure that will likely not migrate back onshore.

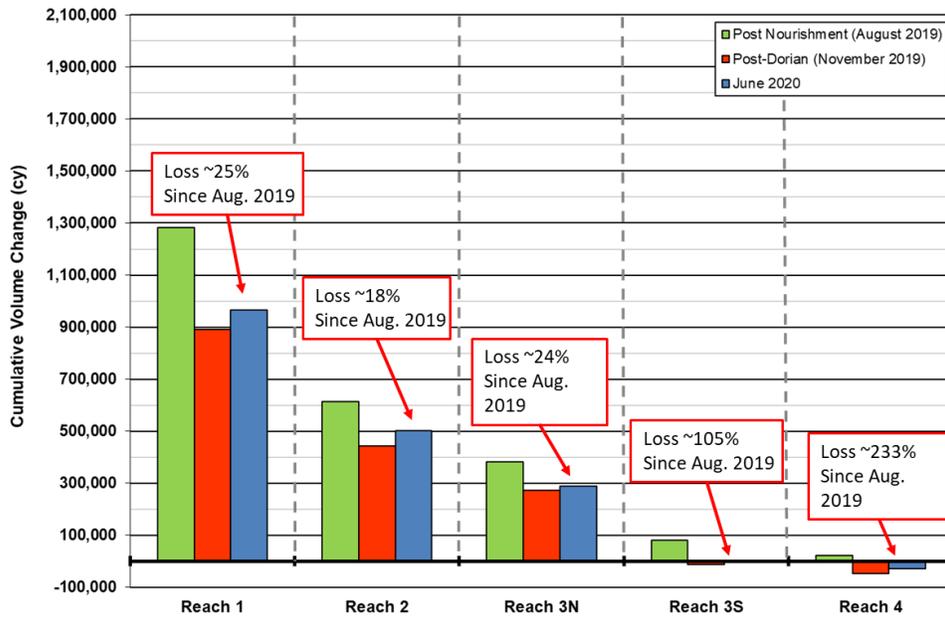


Figure 5-31. Cumulative Volume Change Above MHW Relative to Pre-Nourishment

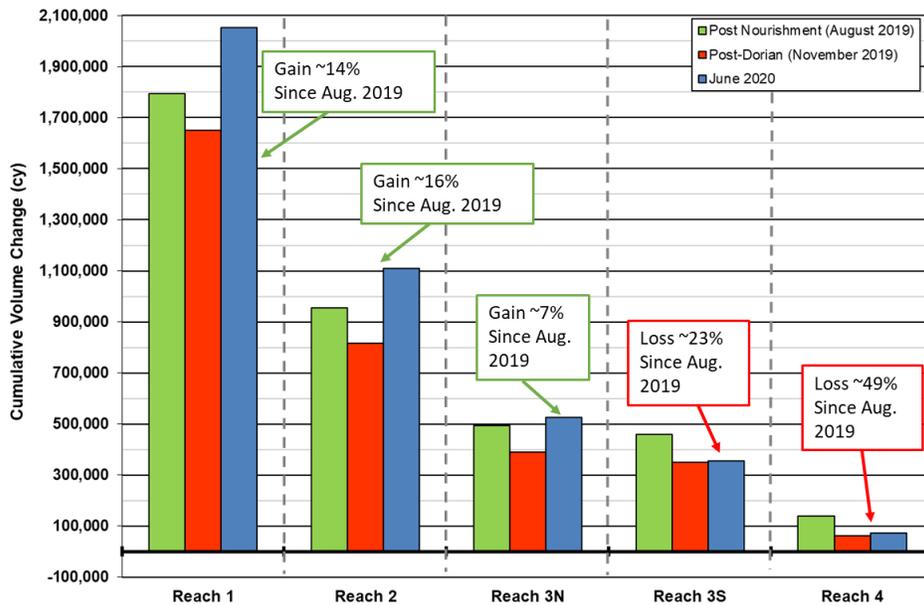


Figure 5-32. Cumulative Volume Change Above -19 ft NAVD88 Relative to Pre-Nourishment

5.5 Long-Term Change Trends (2010 – 2020)

To determine the long-term trends along Nags Head, annual volume changes from the present and previous monitoring reports were averaged at each transect. Material placed during the 2019 Beach Nourishment project was subtracted out of the total volume change at each transect in order to determine the background erosion rate. **Figure 5-33** shows the mean volume change from 2011 to 2020 with nourishment, and **Figure 5-34** shows the mean volume change over the same years with the nourishment subtracted out. In comparison of the two figures, the hotspot at Reach 3-South is very visible when nourishment effects are subtracted out. In both figures increases in volume losses from north to south can be observed. The majority of profiles to the south of Reach 2 experience volume losses above all elevations analyzed when the nourishment material is subtracted. From **Table 5-20** and **Figure 5-26** it can be seen that 2019-2020 shoreline volume trends followed a similar behavior to the long-term trends. The reaches to the south of Reach 2 except the Nags Head-Oregon Inlet reach showed significantly more unit volume loss compared to the northern reaches. The volume gains at Nags Head – Oregon Inlet reach were likely caused by littoral transport of the material placed during the 2019 Beach Nourishment Project to the south from Reach 3 and Reach 4.

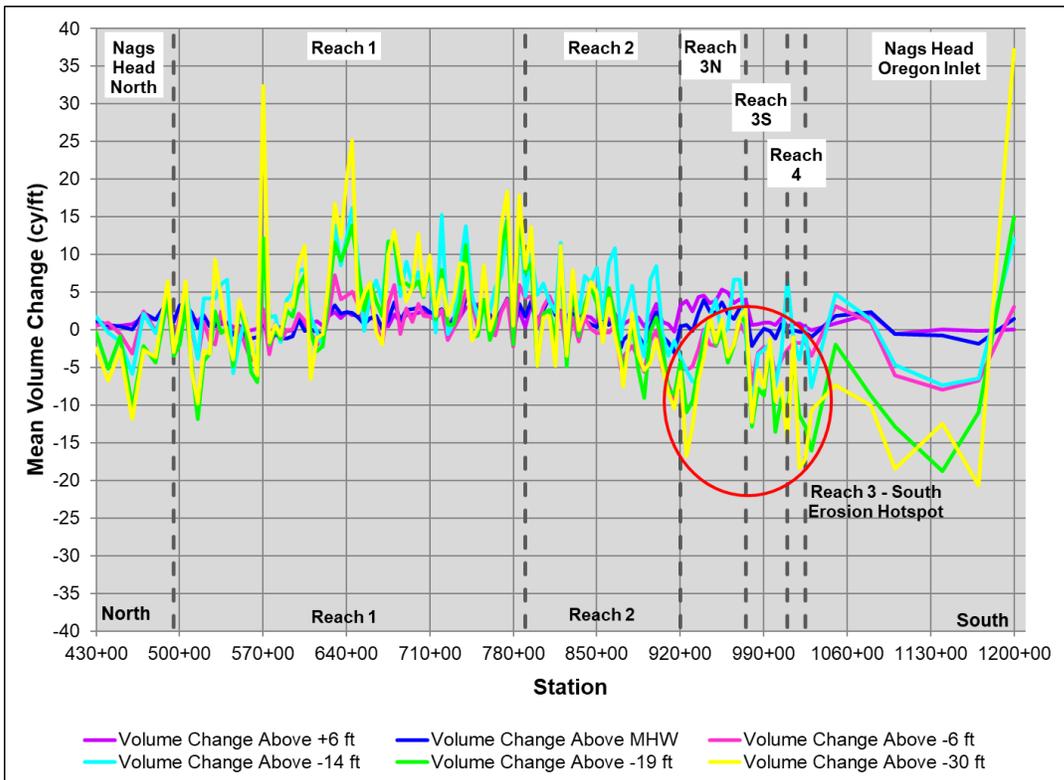


Figure 5-33. Mean Volume Change per year (2011 – 2020) (With Nourishment)

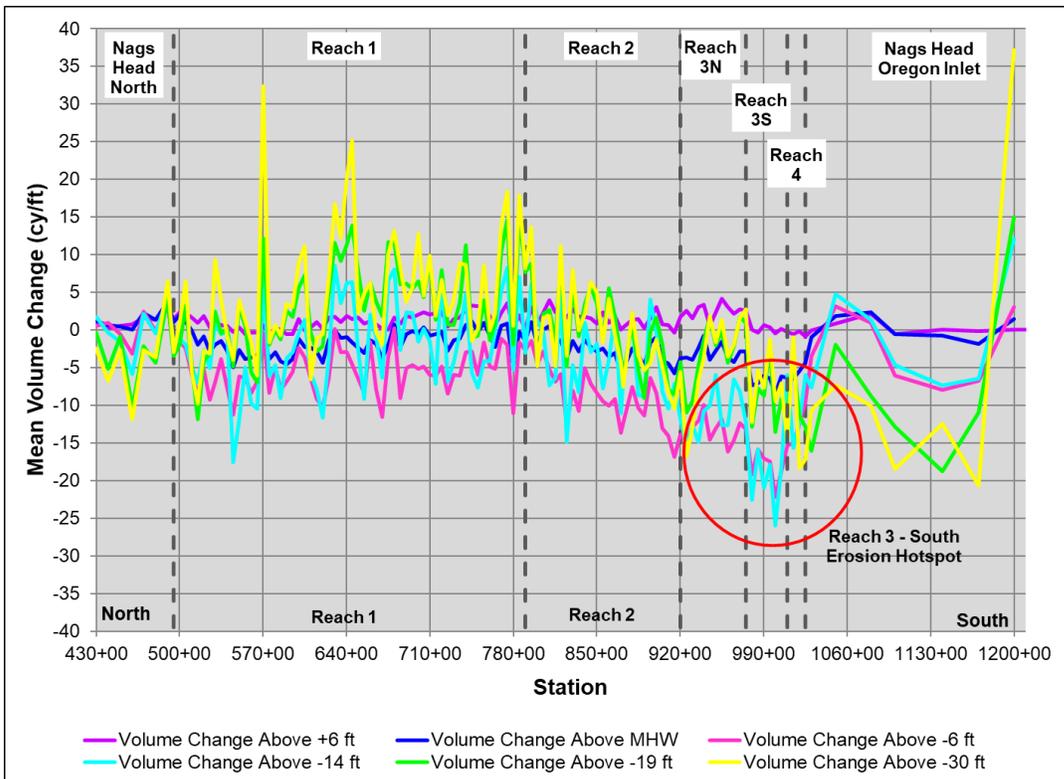


Figure 5-34. Mean Volume Change (Without Nourishment)

5.6 Dune Volume Trends

After the 2011 Beach Nourishment study it was noted (CSE 2018) that sand fencing has managed to capture the wind-blown sand and caused steady dune growth until 2014. The dune growth rates declined after 2014 as the available sand for aeolian transport decreased. Shoreline recession and reduction in dry beach width for aeolian transport caused dunes to lose sand from 2016 to 2018. The wider beaches created by the 2019 Beach Nourishment Project allowed for aeolian transport, and the 2019-2020 annual monitoring period observed dune growth above +6ft NAVD88 of 302,486 cy (+5.7 cy/ft) along the Nourished Oceanfront. Only the Nags Head – North reach which did not receive any sand during the 2019 Beach Nourishment Project did not experience any dune growth (**Table 5-20**).

In an attempt to determine the vulnerable locations, mean volume change +6 ft NAVD88 in between 2011 and 2019 beach nourishment projects was examined. **Figure 5-35** shows the mean volume change above +6 ft NAVD88, indicating two erosional locations. The first location is observed at Reach 1, in front of the Jockey’s Ridge State Park, between E Hollowell Street and E Soundside Road. The second area covers the south part of the monitoring area starting from the hotspot location at Reach 3-South and extending south to Nags Head - Oregon Inlet reach. The rest of the dunes across the Nags Head Oceanfront displays either volume gain or no overall change.

To investigate how the volume changes occurred over time a moving average analysis was done by averaging the unit volume of a profile with profiles within 1,000 ft distance to it. Using moving average helps visualize the trends by displaying the localized trends while smoothing the instantaneous changes of volume between profiles. **Figure 5-36** presents the moving average analysis of unit volumes above +6 NAVD88 ft along the monitoring shoreline from 2011 to 2020, displaying the same dune erosion locations. At the Reach 1 erosion location, the 2019 dune volumes are smaller compared to 2011, whereas at the second location 2019 volumes are in between 2011 and 2012 volumes. Similar to the mean volume change trends the over the rest of the oceanfront majority of the profiles display volume gains compared to 2011.

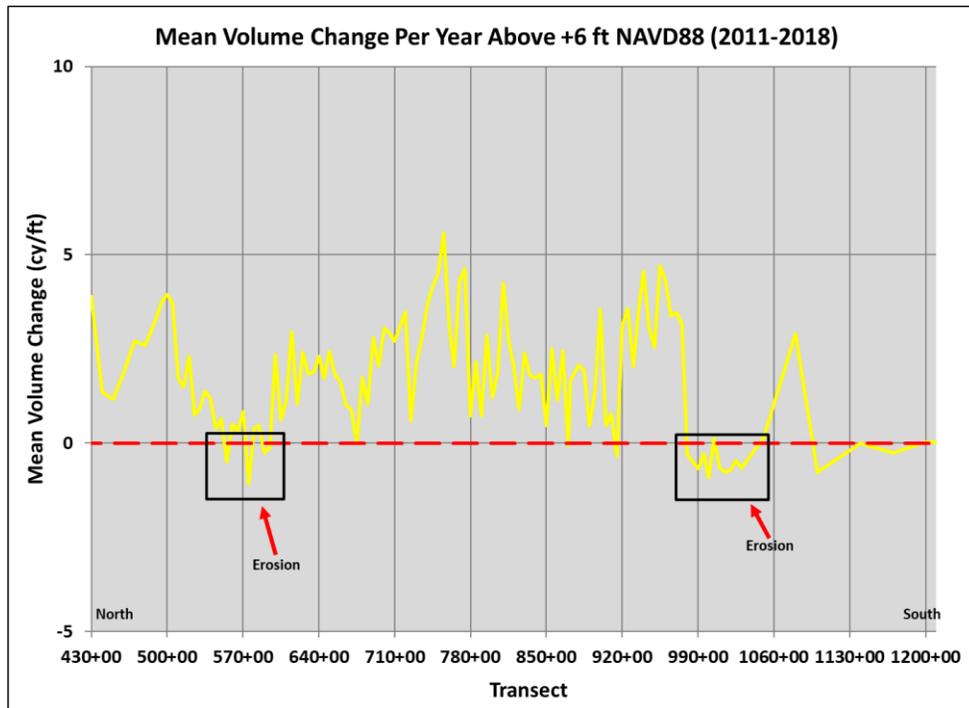


Figure 5-35. Unit Dune Volume Change from 2011 to 2018 (Moving Average Trend Above +6 ft NAVD88)

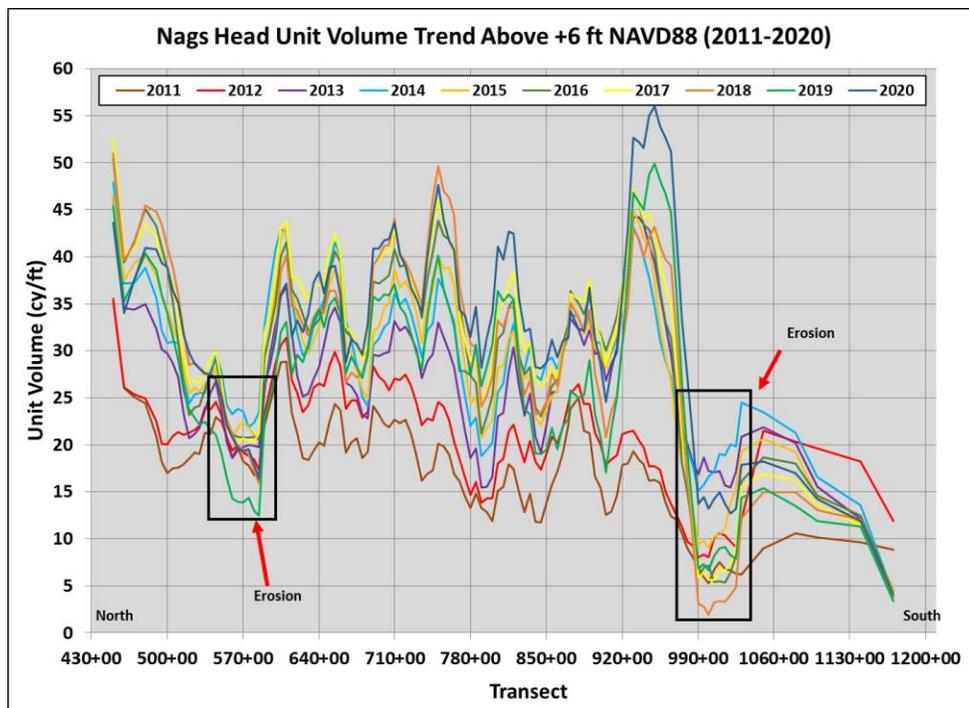


Figure 5-36. Unit Dune Volume by Year (Moving Average Trend Above +6 ft NAVD88)

6.0 SUMMARY

The Town of Nags Head Beach Monitoring and Analysis Program (NHBMAP) is sponsored by the Town of Nags Head (Town) as a continuation of the 2011 monitoring program initiated for assessing beach conditions. The primary purpose of the program is to assess current and historical shoreline conditions, determine shoreline and volumetric changes and evaluate the performance of beach nourishment and other restoration efforts. Evaluating and documenting these changes consistently over successive years provides information necessary to plan for future beach nourishments and to support development of the Town's multi-decadal Beach Nourishment Master Plan.

The most recent annual survey occurred during the summer of 2020 (June) and was performed by McKim & Creed. This report documents the data sources, methods, and results of a survey evaluation by Moffatt & Nichol performed to compare the June 2020 survey with a previous survey performed by Coastal Science & Engineering (CSE) in August 2019. It is noted that CSE performed an intermediate survey in November 2019 to document changes to the beach as a result of Hurricane Dorian. Therefore, within this report, impacts from Hurricane Dorian will be noted within the context of the annual analysis.

The survey data was used to compute shoreline change at Mean High Water (MHW), which is designated as +1.18 ft NAVD88 for Nags Head, and volume change above +6 ft NAVD88 (berm), MHW, -6 ft NAVD88 (wading depth), -14 ft NAVD88 (outer bar), -19 ft NAVD88 (approximate depth of closure), and -30 ft NAVD88 (offshore). This allows a detailed review of the shoreline and active profile performance during the 2019-2020 monitoring period.

During 2019 Beach Nourishment Project approximately 4.0 million cy of material was placed along approximately 10 miles of shoreline. The shoreline position and volume changes above six elevations relative to pre-nourishment conditions (April 2019) along the Nourished Oceanfront (Station 495+00 – 1025+00) are illustrated below.

Figure 6-1 shows the shoreline changes relative to pre-nourishment condition (April 2019) along the Nourished Oceanfront. The shoreline experienced a significant landward recession along the Nourished Oceanfront since the completion of nourishment project. Most of the recession that has occurred since nourishment occurred before the post-Dorian survey which indicates that most of the shoreline recession can be attributed to Hurricane Dorian. Additionally, no significant shoreline position recovery is observed after Hurricane Dorian.

Figure 6-2 illustrates that the overall changes in sand volume vary with the depth. The results confirmed the total volume change above -19 ft NAVD88 since pre-nourishment was +4,114,182 cy (107 percent of the project volume). After the completion of the 2019 Beach Nourishment project approximately 273,078 cy (+5.1 cy/ft) volume gain was observed above -19ft NAVD88 along the Nourished Oceanfront. However, the results show large-scale shifts of sand cross-shore, across different elevations.

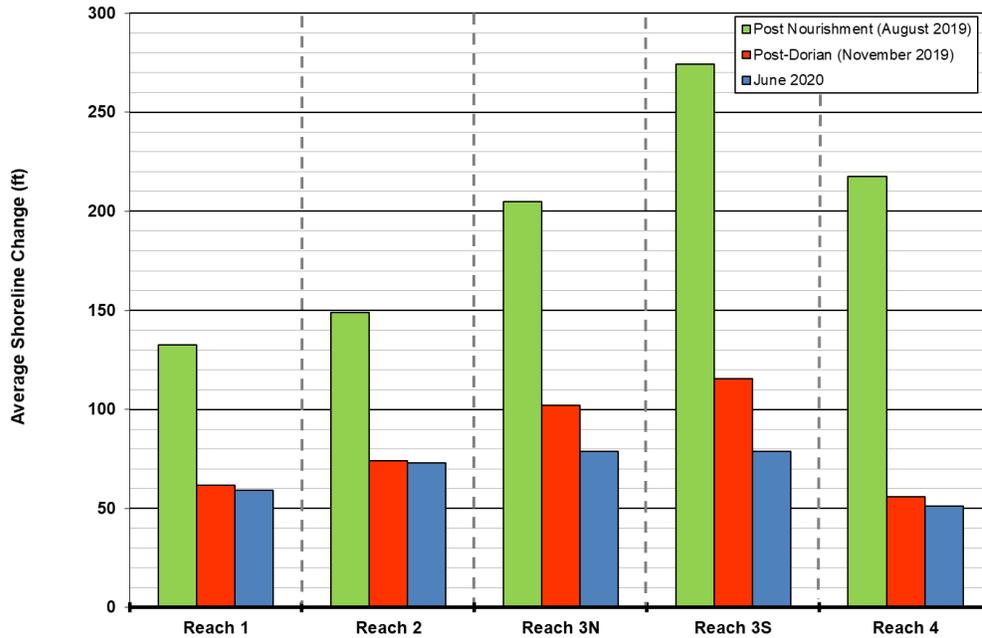


Figure 6-1. Nourished Oceanfront Average Shoreline Change Relative to April 2019 Pre-Nourishment Conditions

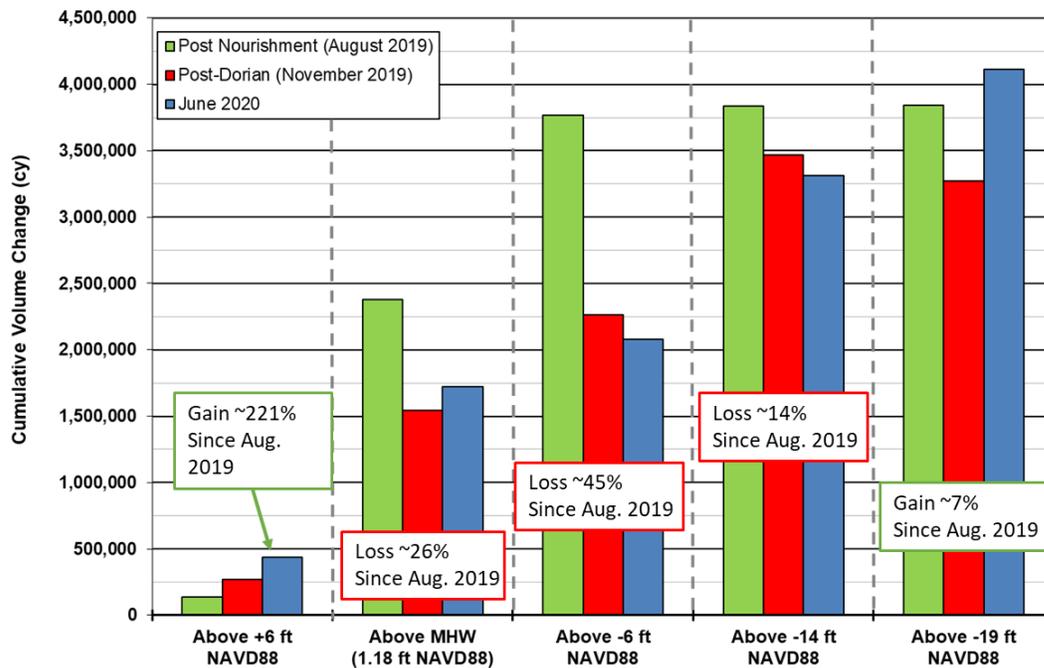


Figure 6-2. Nourished Oceanfront Cumulative Volume Change Relative to April 2019 Pre-Nourishment Conditions

Volume changes during the monitoring period indicated that the Nourished Oceanfront experienced gains in material along the upper (+6 ft NAVD88) and lower (-19 ft NAVD88)

portions of the profiles. Volume losses were experienced above MHW, above -6 ft NAVD88, and above -14 ft NAVD88. The volume losses can be attributed to Hurricane Dorian and the Nor'easter event. This behavior might be exasperated at some elevations due to equilibration of the 2019 Beach Nourishment project.

Key statistics for individual reaches along Nags Head along with the entire oceanfront shoreline were as follows:

Table 6-1. Nags Head Shoreline and Average Unit Volume Change Statistics (2019 – 2020)

| 2019 vs. 2020 (Total Change) | Transects | Reach Length | avg shoreline change @ +1.18 ft NAVD88 | avg volume change above +6 ft NAVD88 | avg volume change above +1.18 ft NAVD88 | avg volume change above -6 ft NAVD88 | avg volume change above -14 ft NAVD88 | avg volume change above -19 ft NAVD88 | avg volume change above -30 ft NAVD88 |
|-----------------------------------|-------------------------|---------------|--|--------------------------------------|---|--------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| Reach | # | ft | ft | cy/ft | cy/ft | cy/ft | cy/ft | cy/ft | cy/ft |
| Nags Head - North | 430+00 - 495+00 | 6,500 | -53.0 | -0.8 | -7.5 | -24.3 | -1.4 | 3.5 | 10.9 |
| Nags Head - Reach 1 | 495+00 - 790+00 | 29,500 | -73.4 | 4.9 | -10.8 | -24.9 | -5.3 | 8.7 | 12.5 |
| Nags Head - Reach 2 | 790+00 - 920+00 | 13,000 | -76.0 | 7.1 | -8.5 | -28.8 | -1.3 | 11.9 | 7.3 |
| Nags Head - Reach 3N | 920+00 - 975+00 | 5,500 | -125.9 | 6.2 | -16.9 | -46.0 | -20.3 | 6.1 | -5.0 |
| Nags Head - Reach 3S | 975+00 - 1010+00 | 3,500 | -195.6 | 6.9 | -28.0 | -69.0 | -46.9 | -34.7 | -39.2 |
| Nags Head - Reach 4 | 1010+00 - 1025+00 | 1,500 | -166.5 | 5.3 | -25.2 | -61.9 | -48.2 | -34.0 | -28.7 |
| Nags Head - Oregon Inlet | 1025+00 - 1200+00 | 17,500 | -42.0 | 2.1 | -2.6 | -13.9 | 3.8 | 0.1 | -5.7 |
| | Transects | Reach Length | weighted avg | weighted avg | weighted avg | weighted avg | weighted avg | weighted avg | weighted avg |
| Nourished Oceanfront | 495+00 - 1025+00 | 53,000 | -90.2 | 5.7 | -12.4 | -32.0 | -9.8 | 5.1 | 4.8 |
| Total Monitored Oceanfront | 430+00 - 1200+00 | 77,000 | -76.1 | 4.4 | -9.7 | -27.2 | -6.0 | 3.9 | 2.9 |

Table 6-2. Nags Head Cumulative Volume Change Statistics (2019 – 2020)

| 2019 vs. 2020 (Total Change) | Transects | Reach Length | cumulative volume change above +6 ft NAVD88 | cumulative volume change above +1.18 ft NAVD88 | cumulative volume change above -6 ft NAVD88 | cumulative volume change above -14 ft NAVD88 | cumulative volume change above -19 ft NAVD88 | cumulative volume change above -30 ft NAVD88 |
|-----------------------------------|-------------------------|---------------|---|--|---|--|--|--|
| Reach | # | ft | cy | cy | cy | cy | cy | cy |
| Nags Head - North | 430+00 - 495+00 | 6,500 | -5,081 | -48,568 | -157,819 | -9,067 | 22,945 | 70,672 |
| Nags Head - Reach 1 | 495+00 - 790+00 | 29,500 | 144,242 | -317,435 | -733,688 | -155,164 | 257,446 | 368,393 |
| Nags Head - Reach 2 | 790+00 - 920+00 | 13,000 | 92,898 | -110,725 | -374,783 | -16,854 | 154,134 | 94,514 |
| Nags Head - Reach 3N | 920+00 - 975+00 | 5,500 | 33,997 | -92,703 | -252,767 | -111,474 | 33,664 | -27,755 |
| Nags Head - Reach 3S | 975+00 - 1010+00 | 3,500 | 20,806 | -83,915 | -207,063 | -140,727 | -104,238 | -117,480 |
| Nags Head - Reach 4 | 1010+00 - 1025+00 | 1,500 | 10,545 | -50,381 | -123,858 | -96,436 | -67,929 | -57,307 |
| Nags Head - Oregon Inlet | 1025+00 - 1200+00 | 17,500 | 36,929 | -45,373 | -243,843 | 66,763 | 1,734 | -100,269 |
| | Transects | Reach Length | total | total | total | total | total | total |
| Nourished Oceanfront | 495+00 - 1025+00 | 53,000 | 302,486 | -655,158 | -1,692,158 | -520,654 | 273,078 | 260,365 |
| Total Monitored Oceanfront | 430+00 - 1200+00 | 77,000 | 334,334 | -749,098 | -2,093,819 | -462,958 | 297,756 | 230,769 |

The Nourished Oceanfront shoreline experienced a significant overall average landward recession at MHW of -90.2 ft over the past year. This is influenced by Hurricane Dorian and equilibration of the summer 2019 Beach nourishment project. A similar shoreline trend was experienced in the Total Monitored Oceanfront with landward MHW shoreline recession of -76.1 ft during the annual monitoring period. No shoreline position recovery was observed after Hurricane Dorian.

All reaches except Reach 3-South and Reach 4 saw recovery of the loss material above depth of closure (-19 ft NAVD88) after Hurricane Dorian as evidenced by gains above -19 ft NAVD88 following losses observed post-Dorian. In all management reaches except Reach 3-South and Reach 4, the material lost between + 6 ft NAVD88 and -14 ft NAVD88 was captured above -19 ft NAVD88 indicating that the material remained within the system. In Reach 3-South and Reach 4 volume losses were observed extending below -30 ft NAVD88 indicating volume loss well beyond the depth of closure, and it is not expected that this material would migrate back onshore. Accelerated longshore transport rates in these reaches also contributes to the lack of recovery of eroded material within its reach.

The vulnerable locations with respect to dune erosion were also analyzed, and two locations were determined as long-term dune erosion locations. The first location is observed at Reach 1, in front of the Jockey's Ridge State Park, between East Hollowell Street and East Soundside Road. The second area covered the south part of the monitoring area starting from the hotspot location at Reach 3-South and extending south through Reach 4.

7.0 REFERENCES

Coastal Science & Engineering Inc. (CSE), 2018. Monitoring and Analyses of the 2011 Nags Head Beach Nourishment Project. Year 7 (2018) Beach Monitoring Report for Town of Nags Head., NC. Columbia, SC. October 2018.

APPENDIX A

MCKIM & CREED SURVEY REPORT





July 10, 2020

TOWN OF NAGS HEAD, NORTH CAROLINA BEACH MONITORING SURVEY

GENERAL SCOPE OF WORK

The work under the Task Order shall consist of performing topographic and hydrographic surveys along 125 historic profile lines and another 48 optional lines, bringing the number of lines to be surveyed to a total of 173.

SURVEY AREA

The study area starts on the North between the Town of Nags Head and Kill Devil Hills and ends South at Oregon Inlet. This area has total linear distance of approximately 18 statute miles.

PLANNING

On June 15th, 2020 McKim & Creed held a meeting to discuss the scope of work entailing the 173 beach monitoring profiles survey to be conducted in Nags Head, North Carolina. In the three weeks prior to the meeting preparations started to get the boat ready, arrange accommodations, gather control point information, create line files, etc.

FIELD WORK

The field team started monitoring the weather conditions in the beginning of June to decide when it would be the best time to mobilize to the survey area. The crew traveled on June 17th and recovered control points on the same day.

All profile lines were surveyed from June 18th to 24th. Below is the timeline for the field work.



| DATE | ACTIVITIES |
|------------|---|
| 06/17/2020 | Two survey crews mobilized to the job site. Control points were searched for. |
| 06/18/2020 | Survey was performed on lines: Topo - 880+00 to 1022+50, 1090+00 to 1160+00, and 1180+00 Wade - 1190+00 to 1290+00 Hydro - Offshore 937+50 to 1210+00 |
| 06/19/2020 | Survey was performed on lines: Topo - 780+00 to 1025+00 (only lines skipped on previous day) Wade - 947+50 to 1025+00 Hydro - Offshore 700+00 to 935+00, Nearshore 885+00 to 1210+00 |
| 06/20/2020 | Survey was performed on lines: Topo - 655+00 to 775+00 Wade - 835+00 to 945+00 Hydro - Offshore 460+00 to 695+00, Nearshore 750+00 to 880+00 |
| 06/21/2020 | Survey was performed on lines: Topo - 505+00 to 650+00 Wade - 620+00 to 830+00 Hydro - Offshore 430+00 to 455+00, Nearshore 460+00 to 685+00 |
| 06/22/2020 | Survey was performed on lines: Topo - 430+00 to 500+00, and 872+00 Wade - 430+00 to 615+00, and 872+00 Hydro - Full line 1220+00 to 1290+00 and 872+00 (offset from line 875+00 d/t pier online), Nearshore 430+00 to 455+00, and 485+00 |
| 06/23/2020 | Hydrographic survey crew demobilized from survey area. Obtained ORV permit to enter Cape Hatteras National Seashore |
| 06/24/2020 | Survey was performed on lines: Topo - 1030+00 to 1080+00, 1170+00, and 1190+00 to 1250+00 Wade - 1025+00 to 1180+00 |
| 06/25/2020 | Land survey crew demobilized from survey area. |

Special considerations:

- Line 872+00 was ran in place of 875+00 due to Jennette's pier online.
- Lines 450+00, 525+00, 950+00, 1140+00, and 1150+00 have no overlap data between wade and hydro due to strong rip current at location.
- There is a gap of more than 20 feet between wade and hydro on lines 460+00 (approx. 40'), 1025+00 (approx. 100'), 1055+00 (approx. 30'), 1065+00 (approx. 30'), and 1130+00 (approx. 95') due to strong rip current at location.
- Line 1170+00 has a gap on land data of approximately 200' due to bird's sanctuary.
- Lines 1025+00 to 1290+00 are inside the Cape Hatteras National Seashore and the National Park requires a permit to enter.

CONTROL

On June 17th, 2020 the monuments used in the prior year's survey were searched for, some control monuments were recovered, other were not found or had been destroyed, see list below.

| Control Monuments in NAD 1983/86 NGVD 29 - US Survey Feet | | | | | |
|---|-------------|---------------|-----------|---------------------|--|
| Station | Northing | Easting | Elevation | Comments | Station Description |
| W 168 | 806,505.663 | 3,005,849.363 | 8.51 | Recovered | NGS Monument, concrete 11"x12" oval, 10" above surrounding grade. |
| Brew | 823,220.387 | 2,997,818.026 | 17.91 | Destroyed/Hole was | CSE Base Station Monument. Hole in walkway, possibly nail rusted out |
| Loggerhead | 814,707.576 | 3,001,986.071 | 16.47 | Not found | CSE Base Station Monument. Almost 6' under dune |
| Eden | 799,348.283 | 3,009,247.099 | 33.64 | Recovered | CSE Base Station Monument. Nail on deck of crow's nest on top of Sun Realty house |
| Brooke | 774,770.243 | 3,020,428.253 | 20.36 | Not Found/Destroyed | CSE Base Station Monument. Unable to locate |

| Control Monuments in NAD 1983/2011 NAVD88 - US Survey Feet | | | | | |
|--|-------------|---------------|-----------|-----------------------------|---|
| Station | Northing | Easting | Elevation | Comments | Station Description |
| W 168* | 806,503.64 | 3,005,850.14 | 7.53 | Recovered | NGS Monument, concrete 11"x12" oval. |
| Brew** | 823,218.517 | 2,997,818.794 | 16.93 | Destroyed/Hole was measured | CSE Base Station Monument. Hole in walkway, possibly nail rusted out. |
| Loggerhead** | 814,705.667 | 3,001,986.833 | 15.49 | Not found | CSE Base Station Monument. Almost 6' under dune. |
| Eden** | 799,346.335 | 3,009,247.873 | 32.65 | Recovered | CSE Base Station Monument. Nail on deck of crow's nest on top of Sun Realty house. |

| | | | | | |
|----------|-------------|---------------|-------|---------------------|--|
| Brooke** | 774,768.508 | 3,020,429.101 | 19.36 | Not Found/Destroyed | CSE Base Station Monument. Unable to locate. |
|----------|-------------|---------------|-------|---------------------|--|

*Information was retrieved from the most recent NGS Monument Datasheet.

**Points were converted using NGS Coordinate Conversion and Transformation Tool (NCAT)

Using RTK GPS, a 7-minute observation was performed in each monument that was recovered. See below measured observations:

| Measured - June 2020 - RTK GPS - 7 min. Obs. - NAD83/2011 NAVD88 - US Survey Feet | | | |
|--|------------|-------------|-----------|
| Station | Northing | Easting | Elevation |
| W 168 | 806503.647 | 3005850.161 | 7.307 |
| Loggerhead | | | |
| Brew | 823218.425 | 2997818.811 | 16.664 |
| Eden | 799346.421 | 3009247.802 | 32.467 |
| Brooke | | | |

Upon comparing the monument information provided and the data measured in the field, the variations below were found:

| Variation from information provided to points measured by McKim & Creed - US Survey Feet | | | |
|---|----------|---------|-----------|
| Station | Northing | Easting | Elevation |
| W 168 | -0.007 | -0.021 | 0.223 |
| Loggerhead | | | |
| Brew | 0.092 | -0.017 | 0.267 |
| Eden | -0.086 | 0.071 | 0.185 |
| Brooke | | | |

LIST OF EQUIPMENT USED DURING THE SURVEY

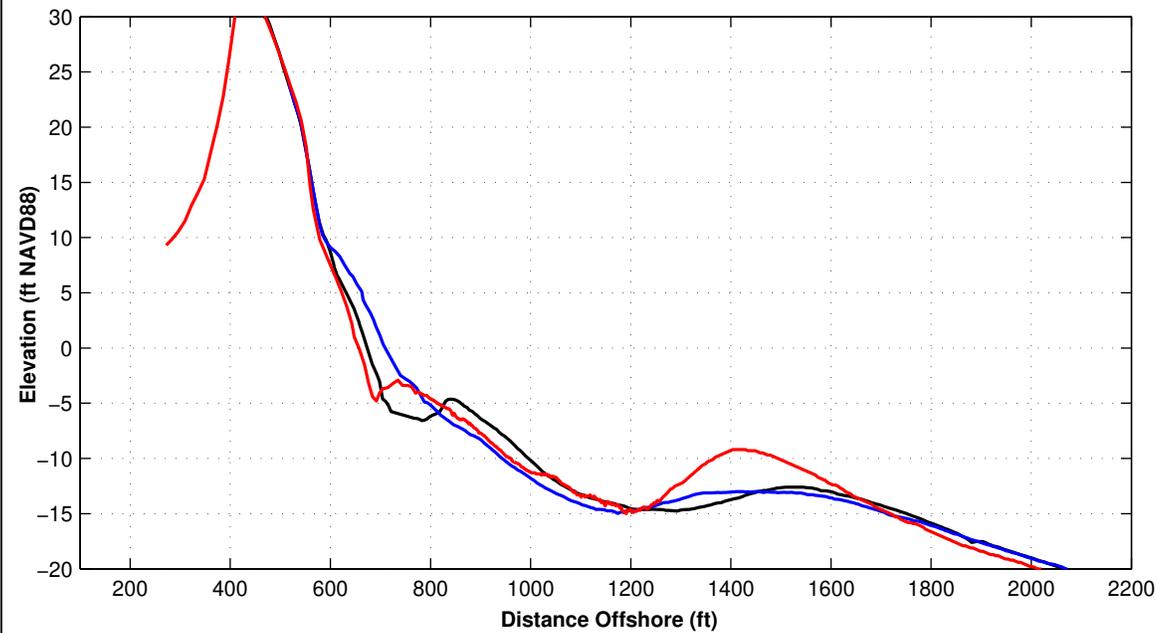
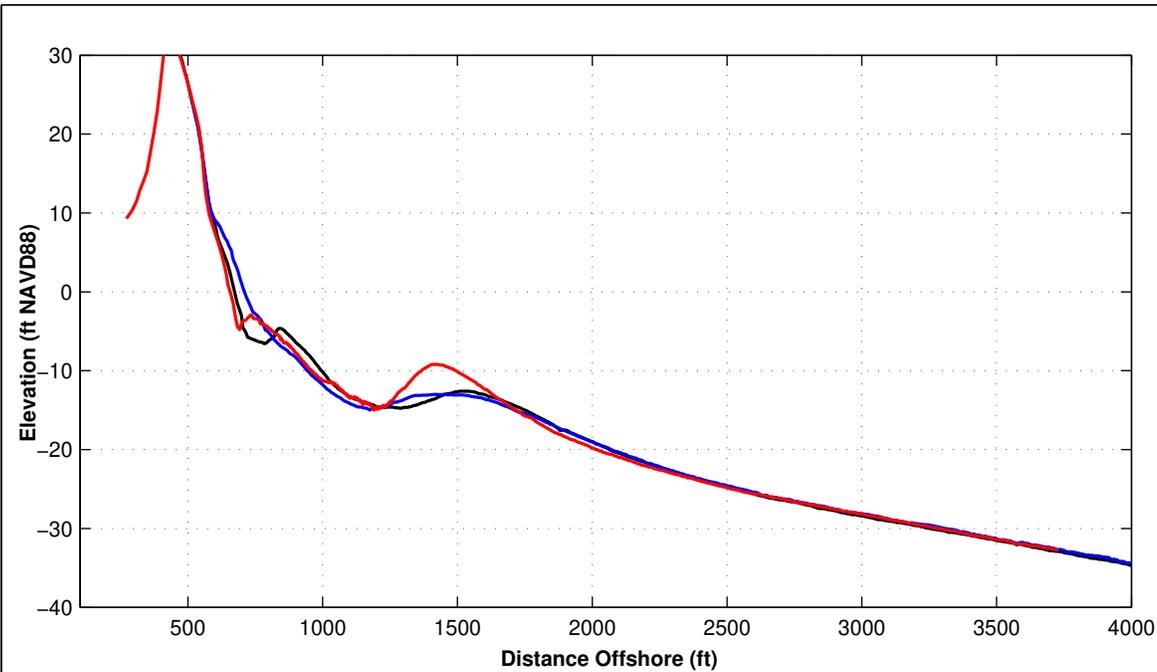
Below is a list of equipment used during the survey:

- 28' Survey Vessel Clock
- Odom CV200 and Odom transducer 200 kHz
- TSS DMS-05 Motion Sensor
- Sound Velocity Profiler Digibar S
- Sound Velocity Profiler SV Caster
- Trimble SPS 855, Trimble SPS 555H
- Hypack 2020 for hydrographic data collection and processing
- Trimble R8 GNSS Receiver/ TSC3 data collector
- Trimble R10 GNSS Receiver/ TSC3 data collector

APPENDIX B

SURVEY PROFILE COMPARISON PLOTS





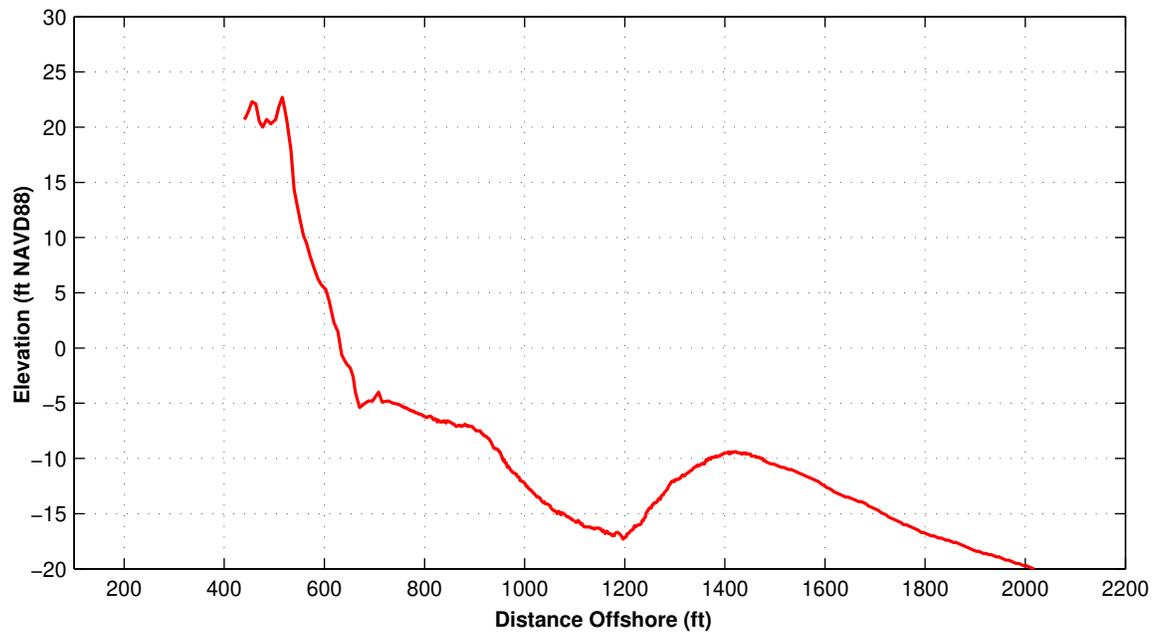
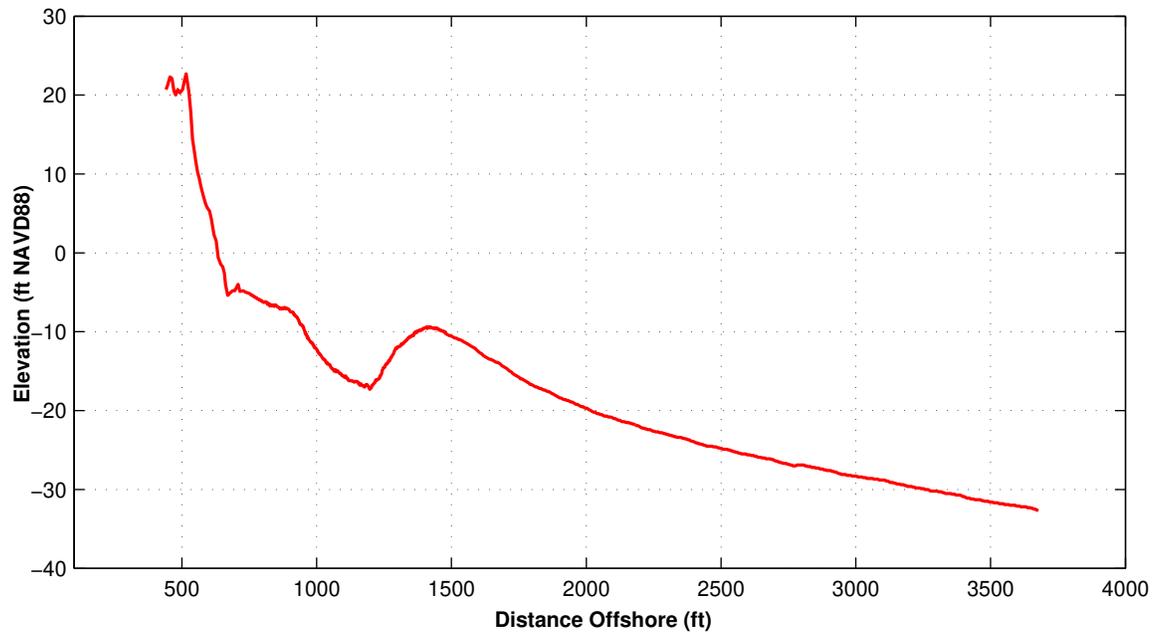
| Survey Transect 430+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | - ft | -51.49 ft |
| Volume Change Above +6 ft NAVD88 | - cy/ft | -4.32 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | - cy/ft | -11.87 cy/ft |
| Volume Change Above -6 ft NAVD88 | - cy/ft | -21.77 cy/ft |
| Volume Change Above -14 ft NAVD88 | - cy/ft | 21.22 cy/ft |
| Volume Change Above -19 ft NAVD88 | - cy/ft | 18.21 cy/ft |
| Volume Change Above -30 ft NAVD88 | - cy/ft | 6.67 cy/ft |

LEGEND:

JUNE 2020 — AUGUST 2019 —
 APRIL 2019 —

- Notes:
1. Station From North To South At Varying Intervals.
 2. Post-Dorian Survey Extends Between Station 495+00 to 1025+00
 3. All Survey Elevations In Feet Referenced to NAVD88.





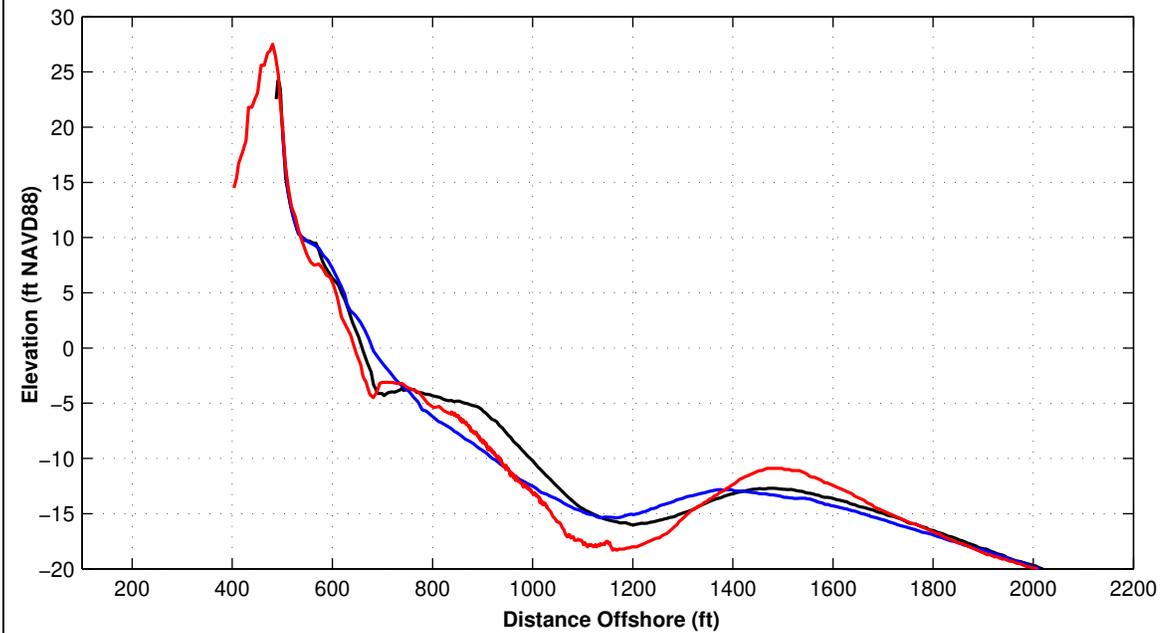
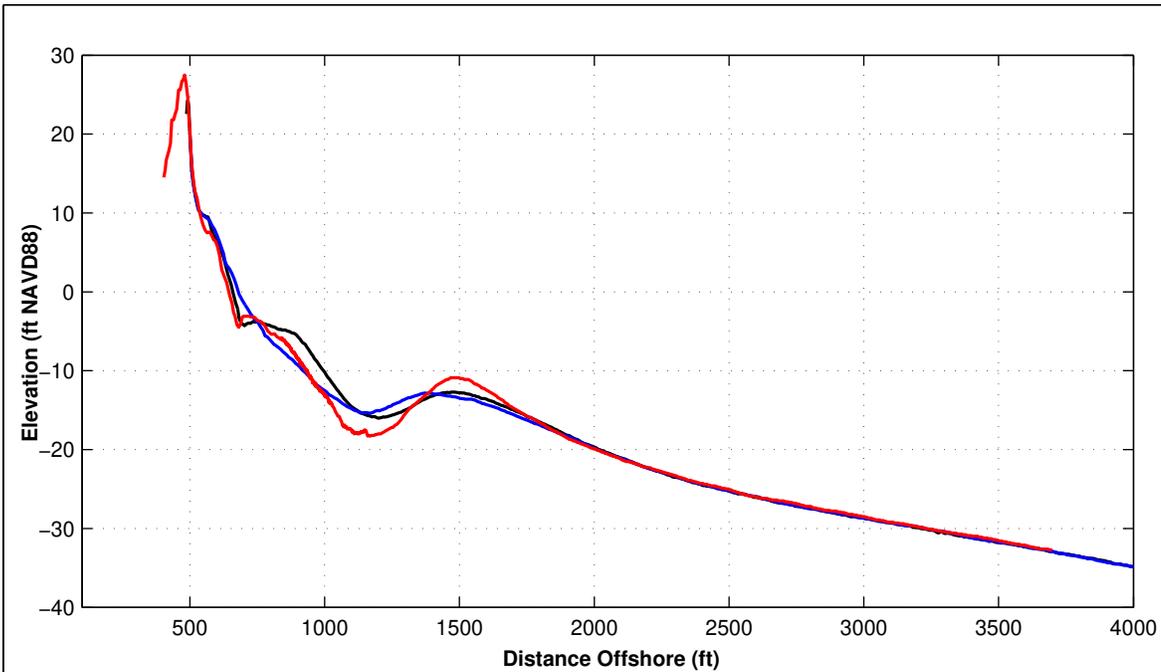
| | | |
|--|----------------------------|----------------------------|
| Survey Transect 435+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.

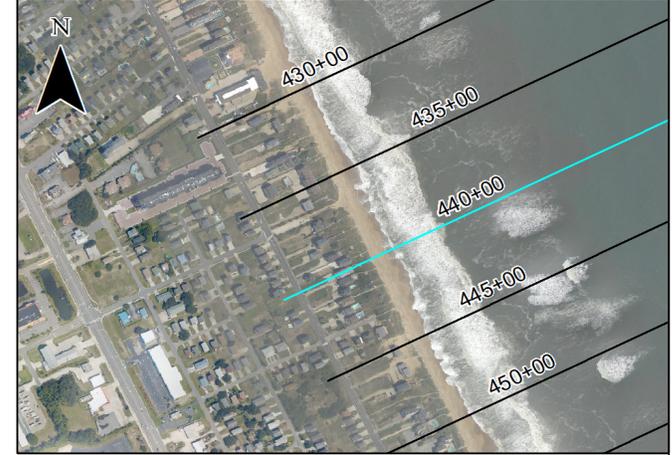


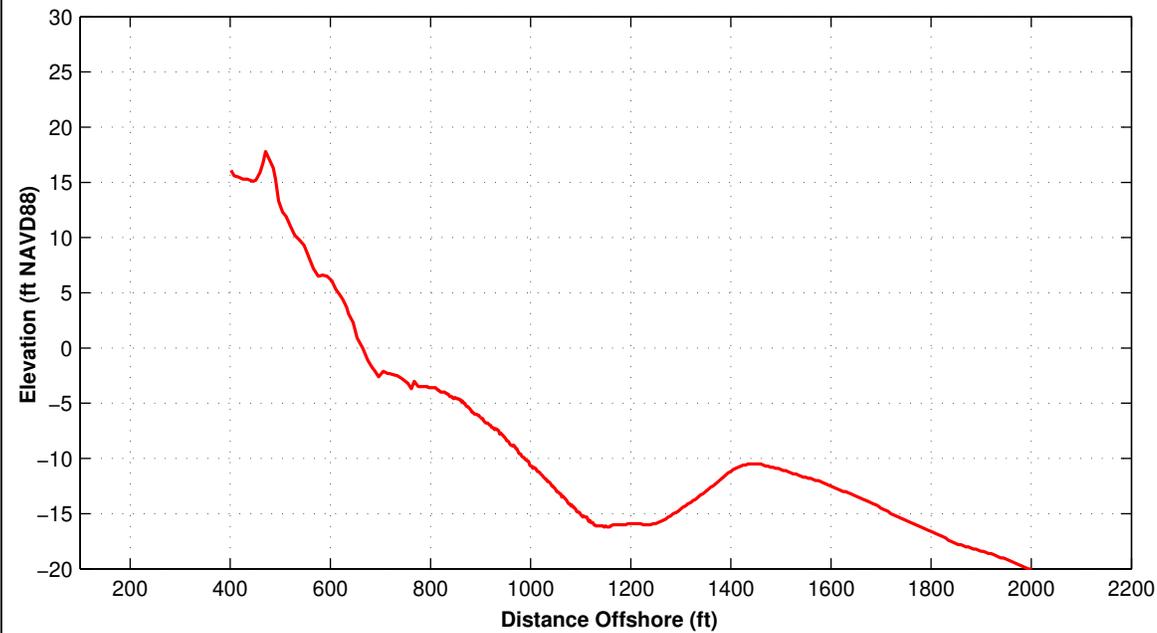
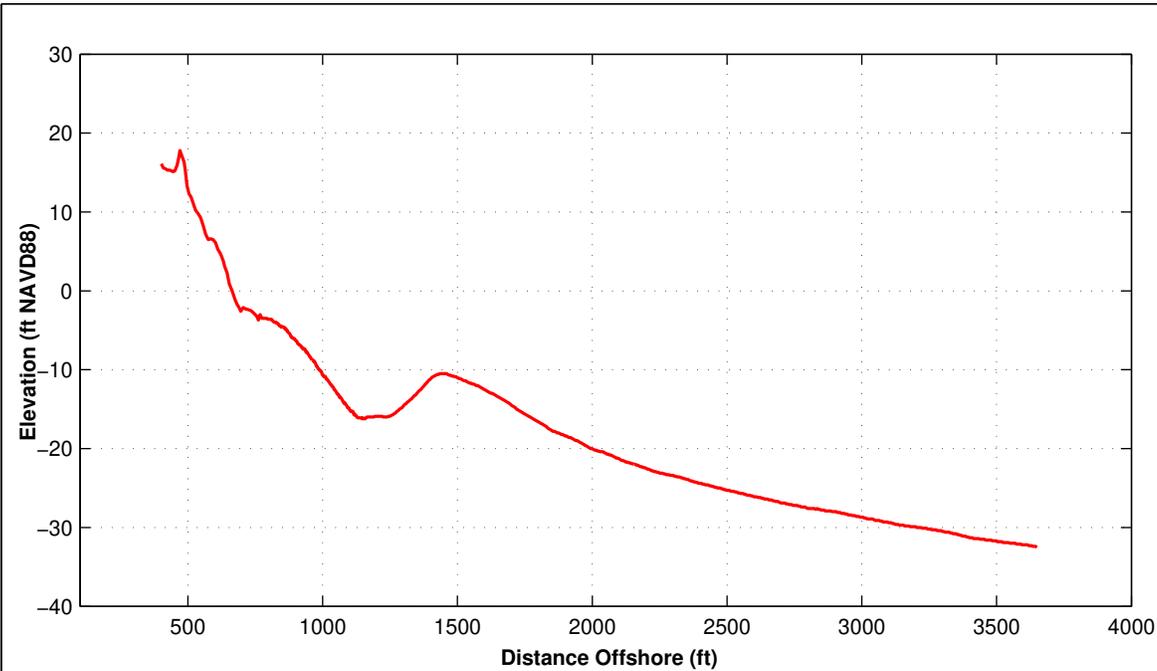


| Survey Transect 440+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | - ft | -32.63 ft |
| Volume Change Above +6 ft NAVD88 | - cy/ft | -2.82 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | - cy/ft | -6.89 cy/ft |
| Volume Change Above -6 ft NAVD88 | - cy/ft | -12.66 cy/ft |
| Volume Change Above -14 ft NAVD88 | - cy/ft | 5.79 cy/ft |
| Volume Change Above -19 ft NAVD88 | - cy/ft | -15.78 cy/ft |
| Volume Change Above -30 ft NAVD88 | - cy/ft | -11.62 cy/ft |

LEGEND:
 JUNE 2020 ——— (red line)
 AUGUST 2019 ——— (blue line)
 APRIL 2019 ——— (black line)

- Notes:
 1. Station From North To South At Varying Intervals.
 2. Post-Dorian Survey Extends Between Station 495+00 to 1025+00
 3. All Survey Elevations In Feet Referenced to NAVD88.



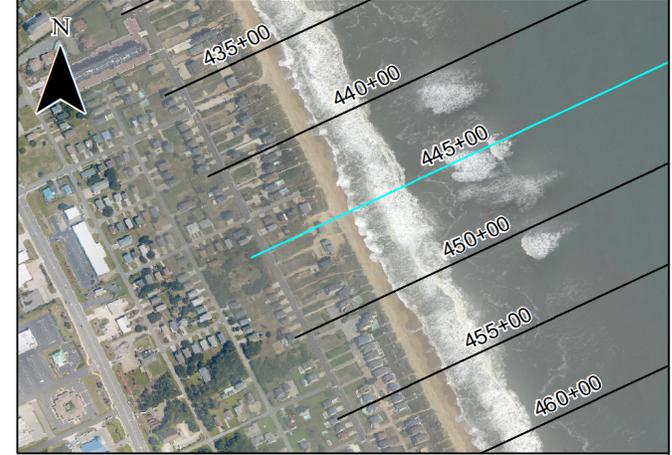


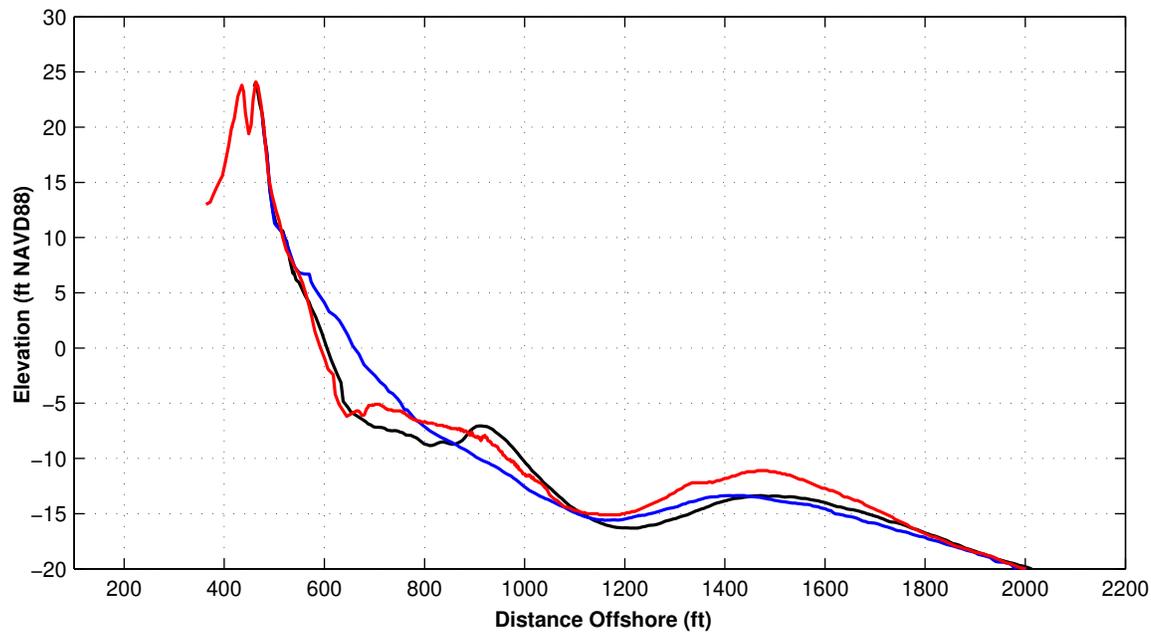
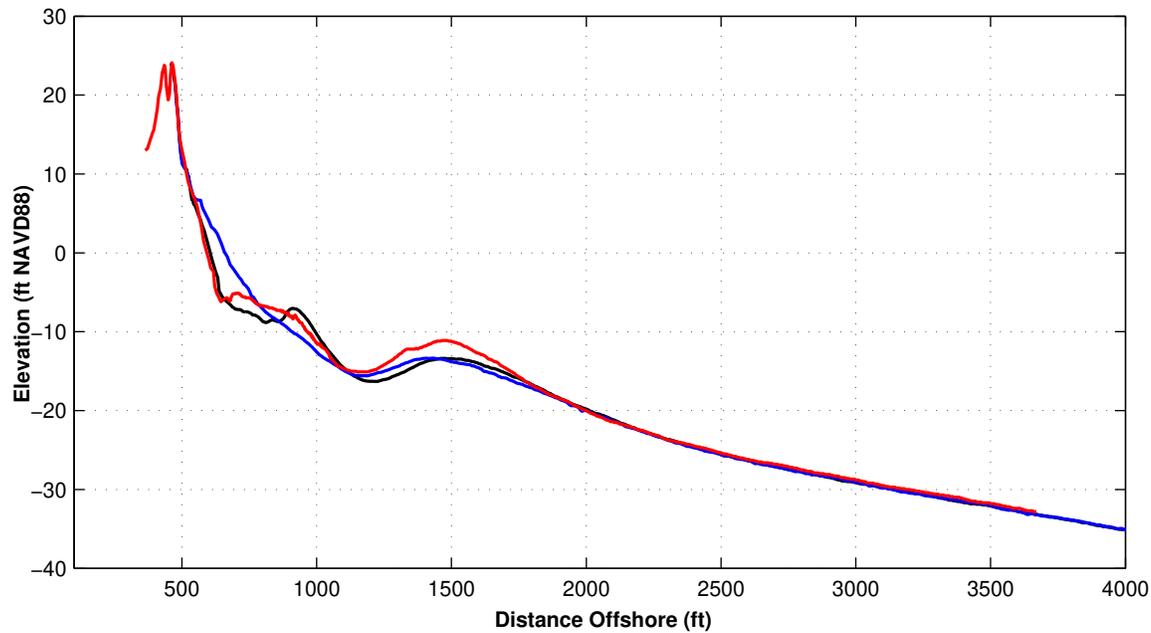
| | | |
|--|----------------------------|----------------------------|
| Survey Transect 445+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.



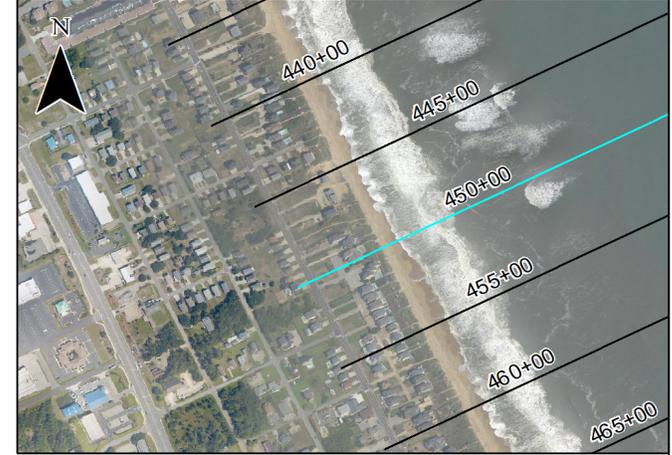


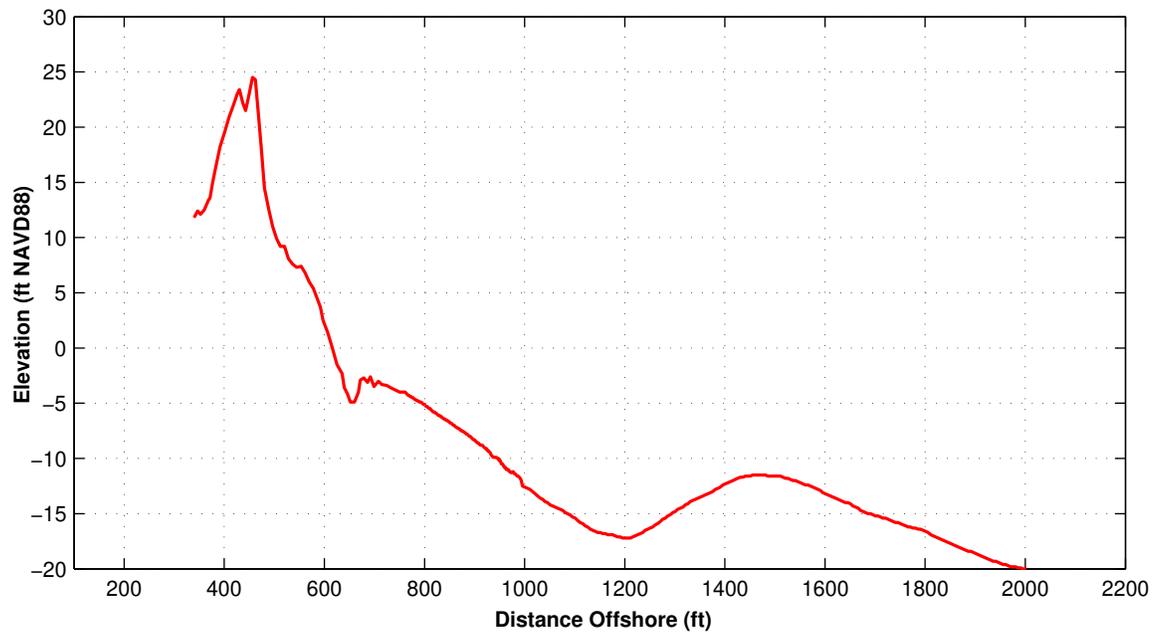
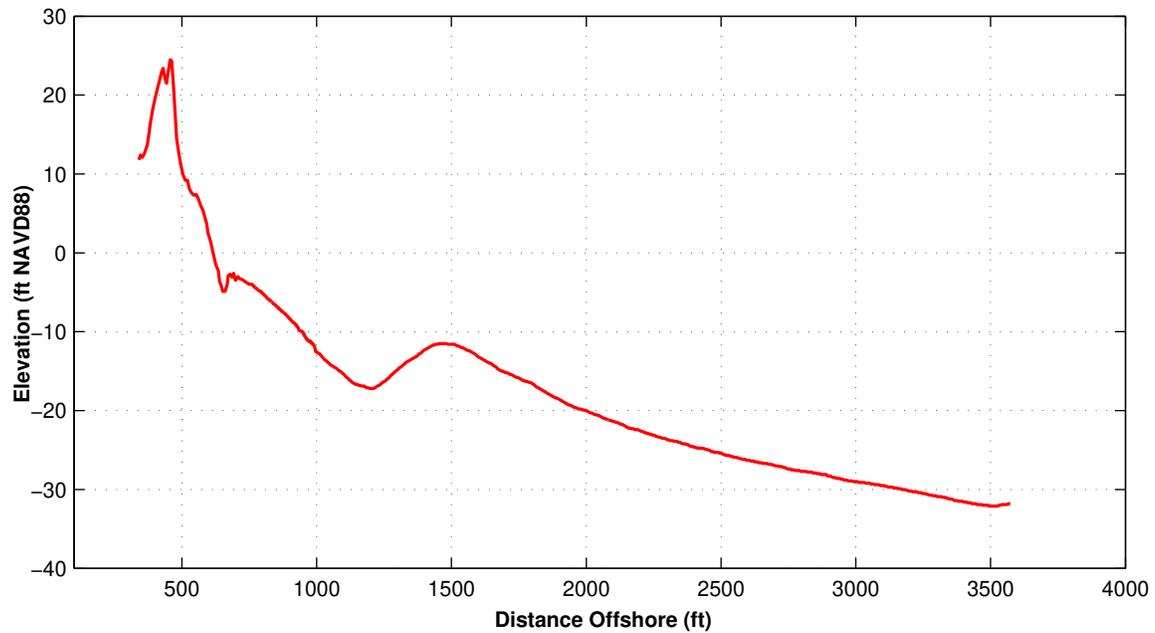
| Survey Transect 450+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | - ft | -63.15 ft |
| Volume Change Above +6 ft NAVD88 | - cy/ft | -0.08 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | - cy/ft | -7.08 cy/ft |
| Volume Change Above -6 ft NAVD88 | - cy/ft | -29.60 cy/ft |
| Volume Change Above -14 ft NAVD88 | - cy/ft | 6.75 cy/ft |
| Volume Change Above -19 ft NAVD88 | - cy/ft | 20.18 cy/ft |
| Volume Change Above -30 ft NAVD88 | - cy/ft | 28.85 cy/ft |

LEGEND:

| | | | |
|-----------|------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| | | APRIL 2019 | — |

- Notes:
1. Station From North To South At Varying Intervals.
 2. Post-Dorian Survey Extends Between Station 495+00 to 1025+00
 3. All Survey Elevations In Feet Referenced to NAVD88.



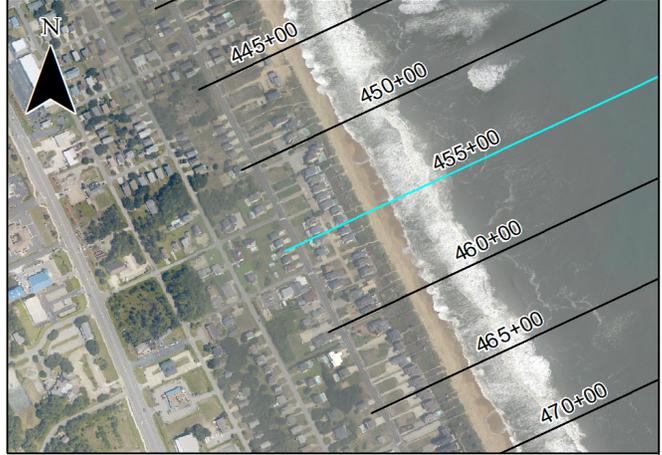


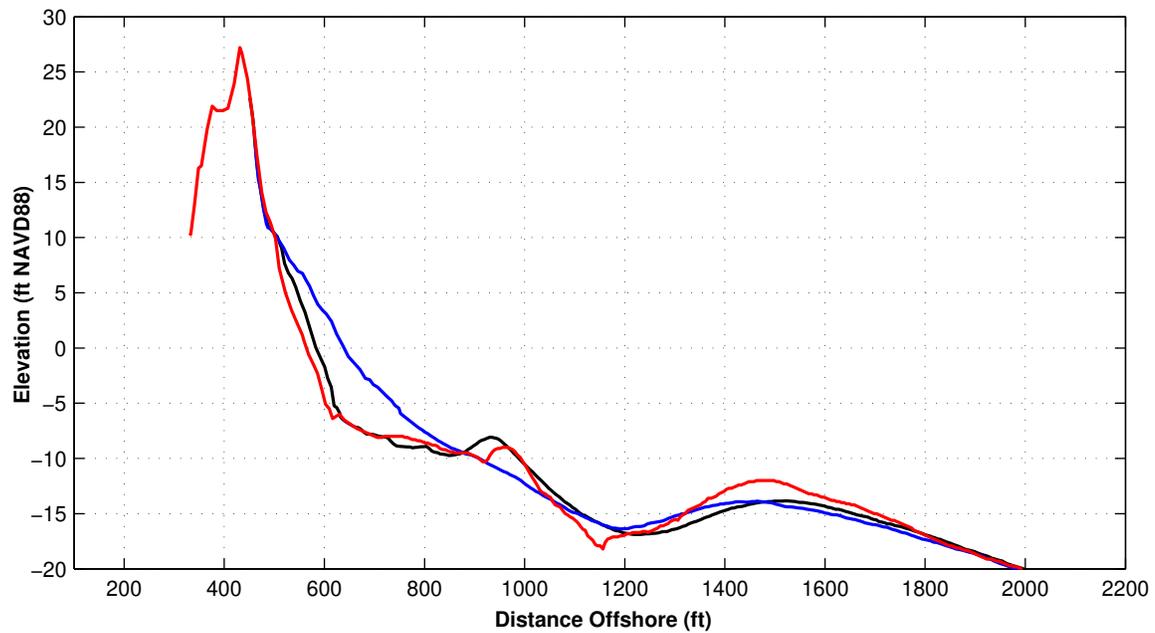
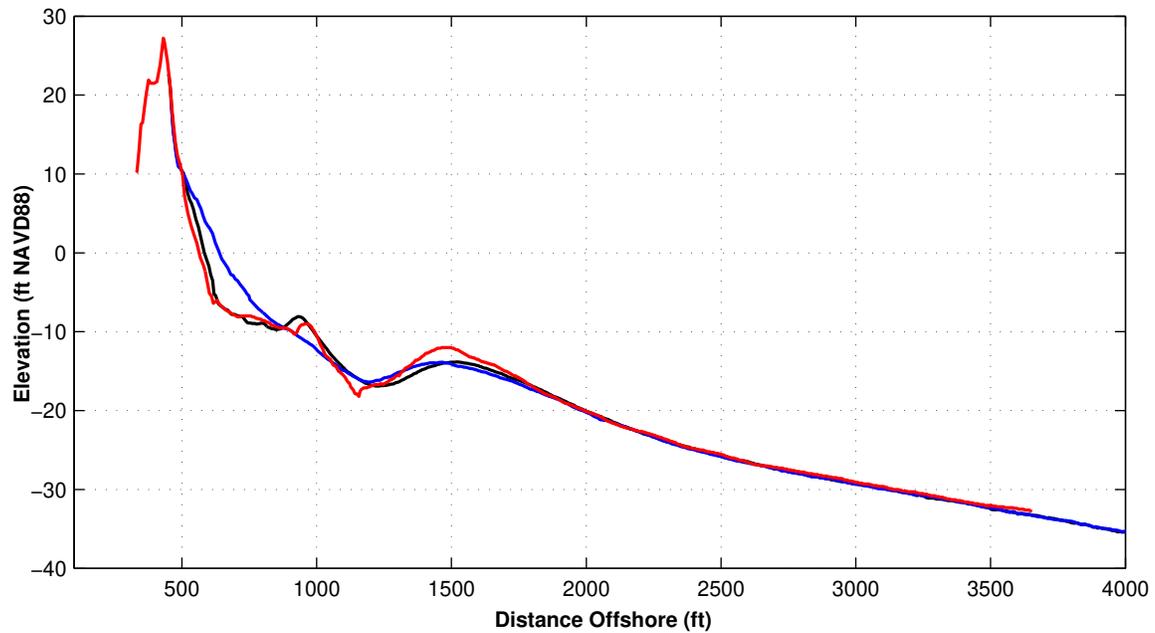
| | | |
|--|----------------------------|----------------------------|
| Survey Transect 455+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.

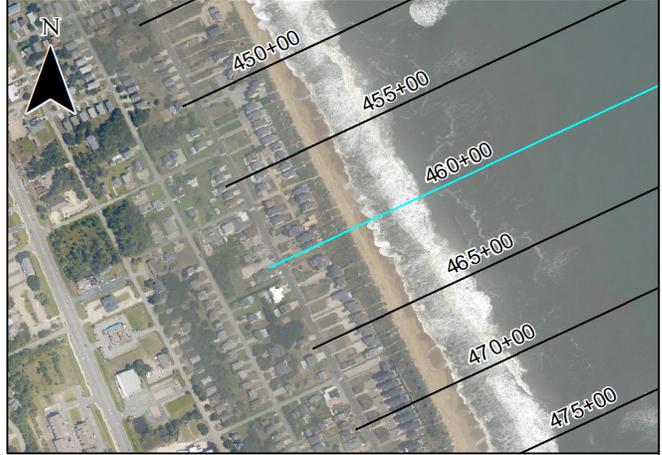


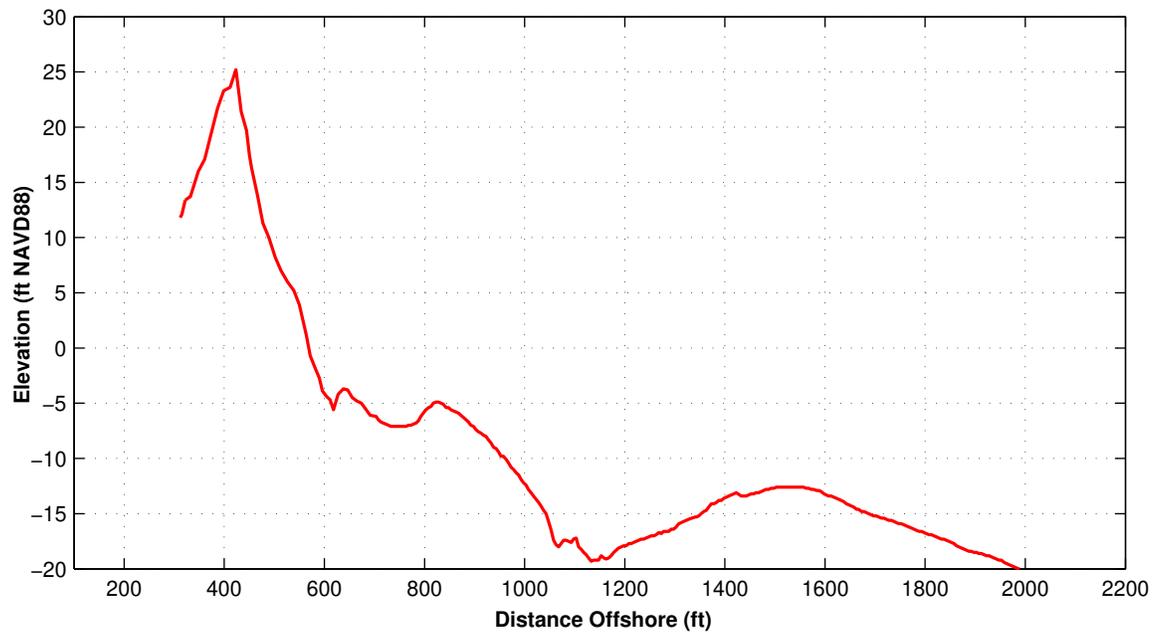
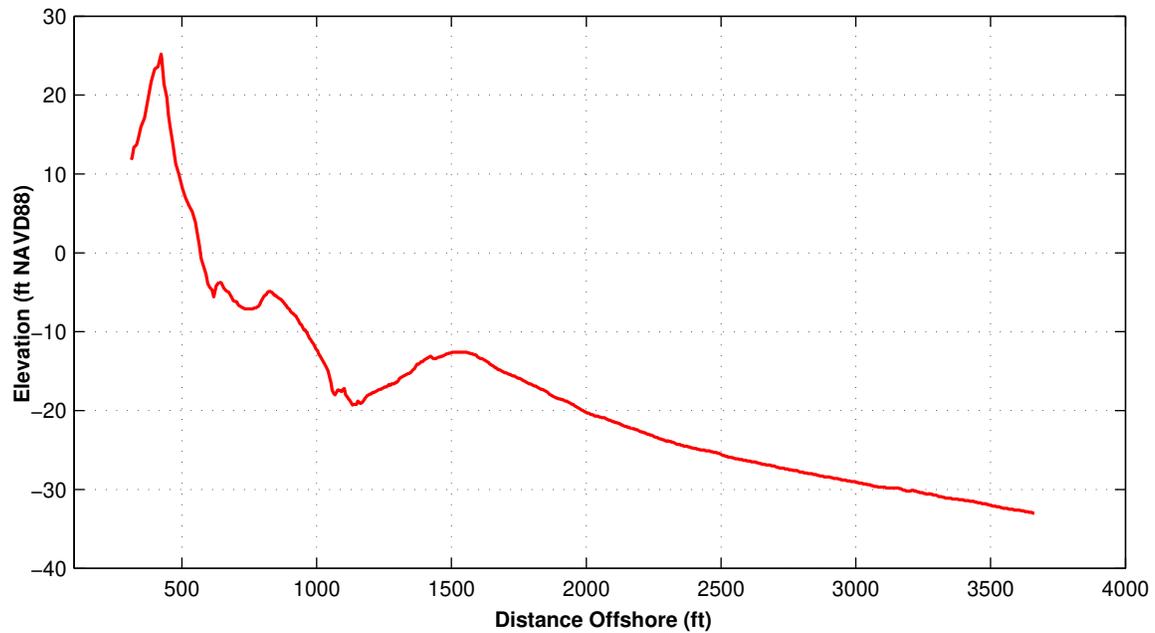


| Survey Transect 460+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | - ft | -69.42 ft |
| Volume Change Above +6 ft NAVD88 | - cy/ft | -2.83 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | - cy/ft | -13.72 cy/ft |
| Volume Change Above -6 ft NAVD88 | - cy/ft | -40.31 cy/ft |
| Volume Change Above -14 ft NAVD88 | - cy/ft | -33.10 cy/ft |
| Volume Change Above -19 ft NAVD88 | - cy/ft | -30.08 cy/ft |
| Volume Change Above -30 ft NAVD88 | - cy/ft | -21.58 cy/ft |

LEGEND:
 JUNE 2020 — AUGUST 2019 —
 APRIL 2019 —

- Notes:
 1. Station From North To South At Varying Intervals.
 2. Post-Dorian Survey Extends Between Station 495+00 to 1025+00
 3. All Survey Elevations In Feet Referenced to NAVD88.



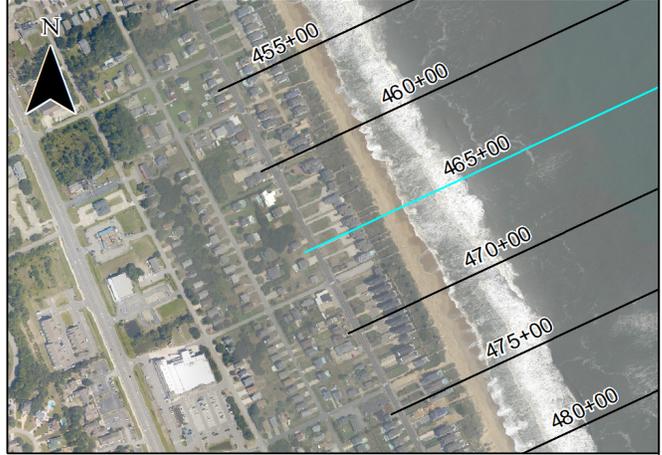


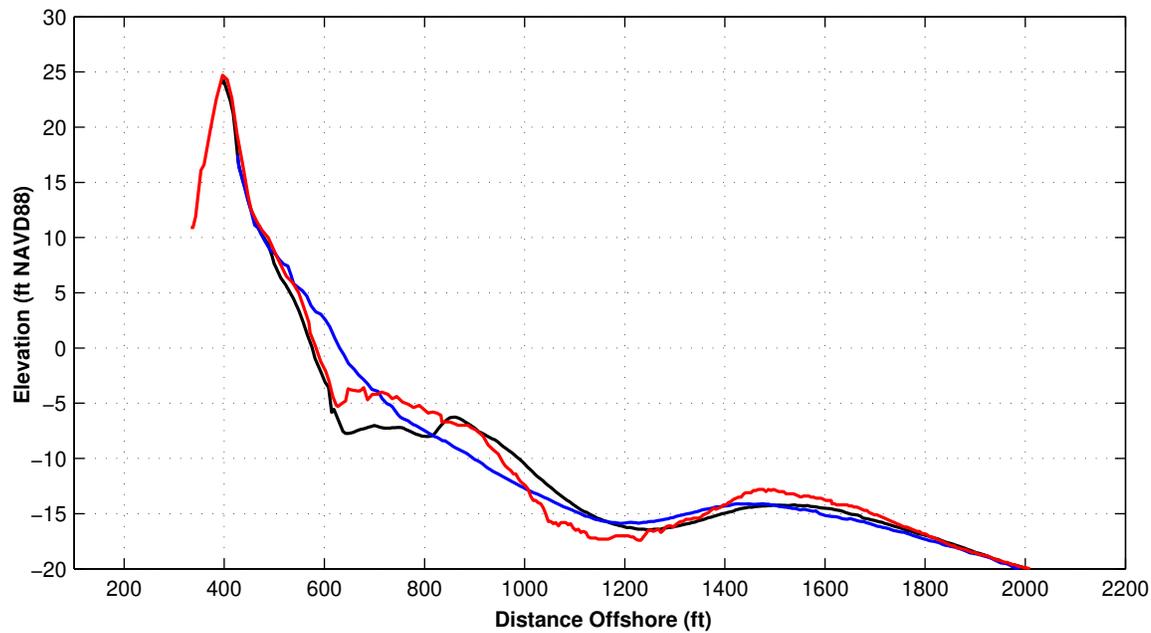
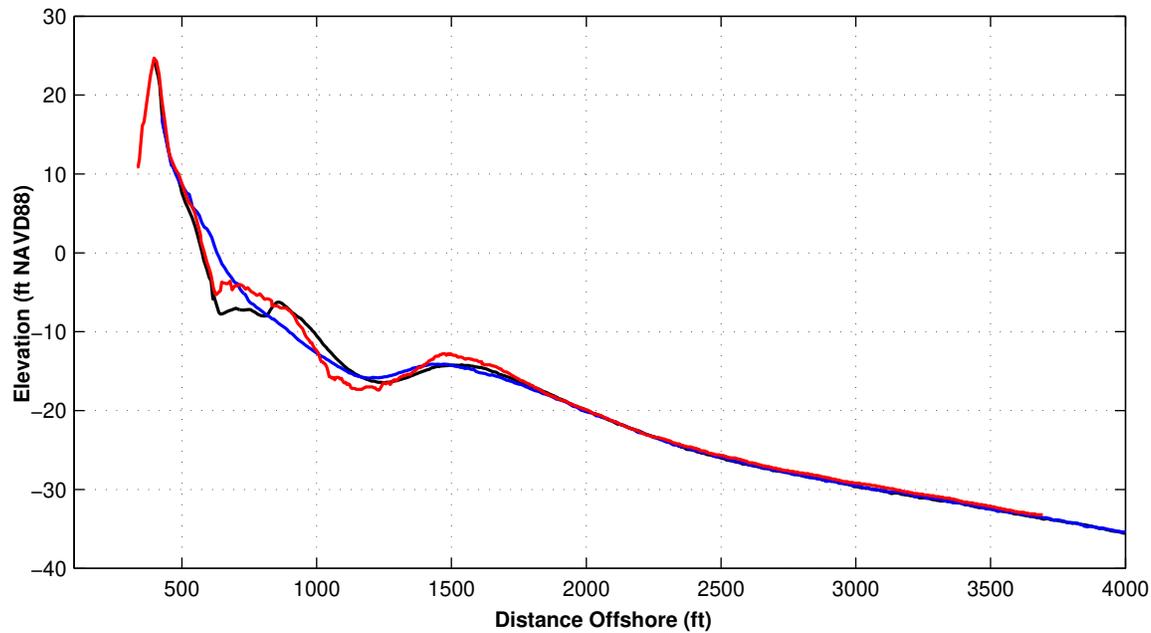
| | | |
|--|----------------------------|----------------------------|
| Survey Transect 465+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.

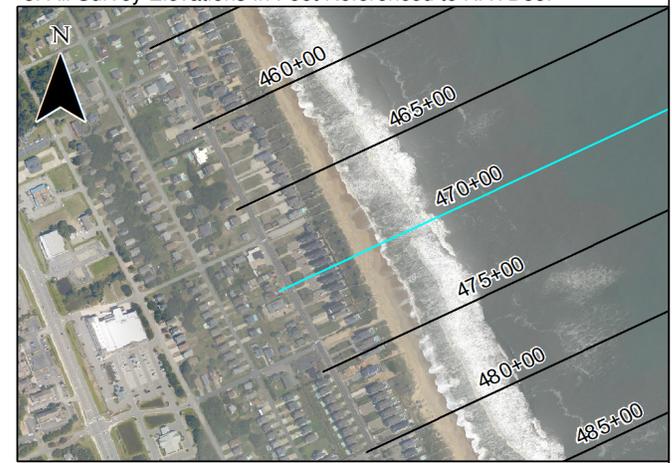


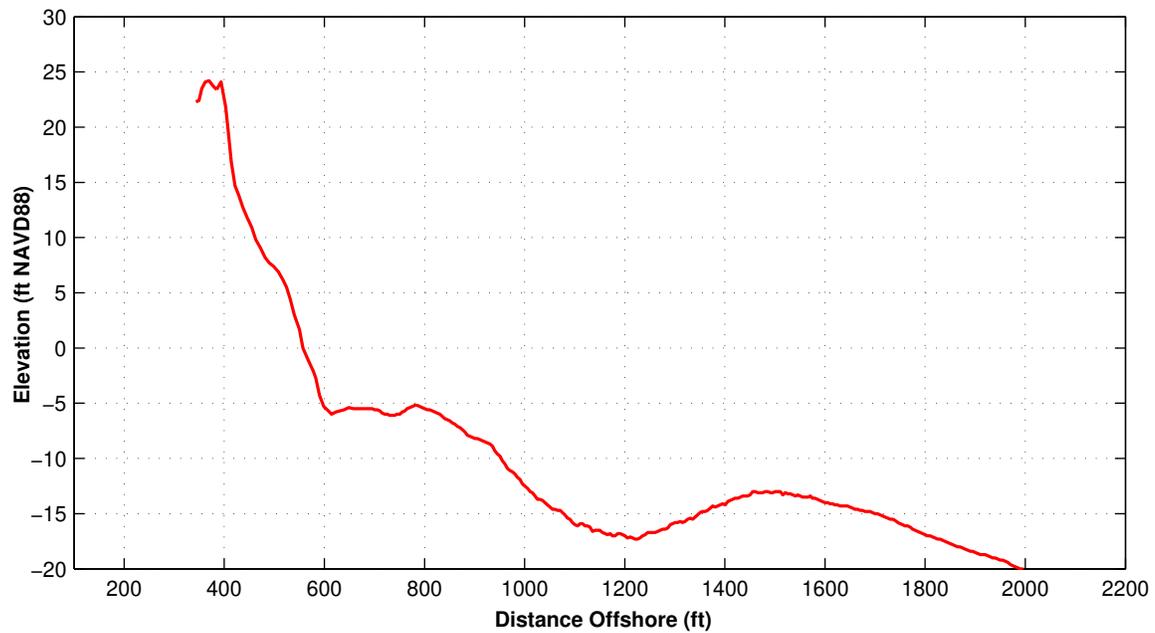
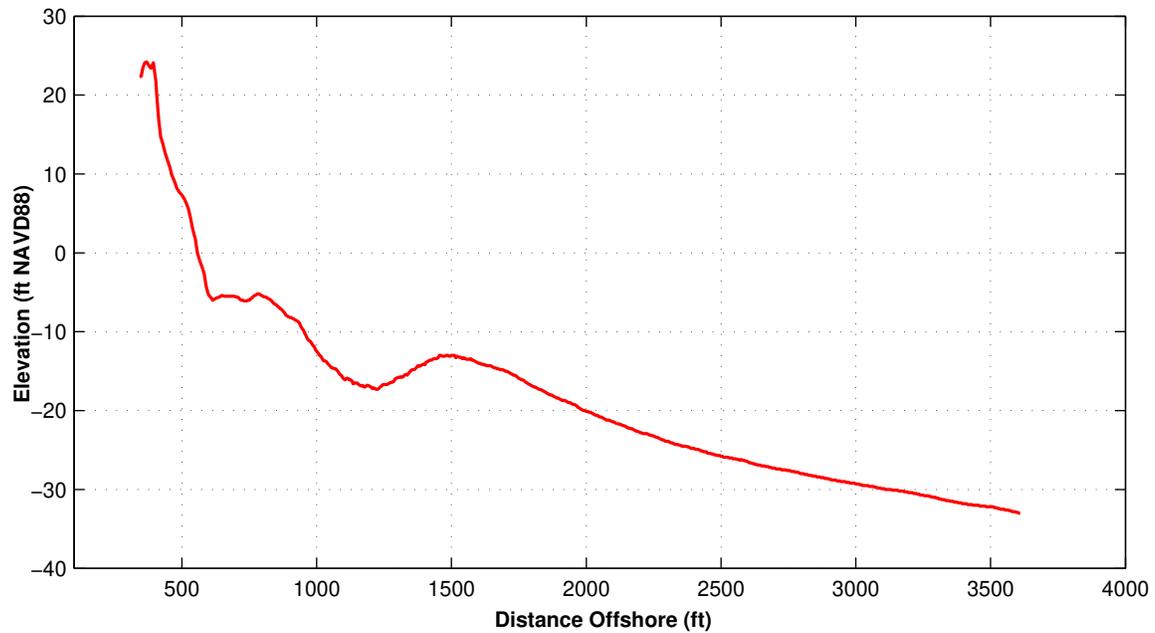


| Survey Transect 470+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | - ft | -44.72 ft |
| Volume Change Above +6 ft NAVD88 | - cy/ft | 1.42 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | - cy/ft | -2.64 cy/ft |
| Volume Change Above -6 ft NAVD88 | - cy/ft | -12.02 cy/ft |
| Volume Change Above -14 ft NAVD88 | - cy/ft | 7.76 cy/ft |
| Volume Change Above -19 ft NAVD88 | - cy/ft | 3.63 cy/ft |
| Volume Change Above -30 ft NAVD88 | - cy/ft | 13.69 cy/ft |

LEGEND:
 JUNE 2020 ——— (red line)
 AUGUST 2019 ——— (blue line)
 APRIL 2019 ——— (black line)

- Notes:
1. Station From North To South At Varying Intervals.
 2. Post-Dorian Survey Extends Between Station 495+00 to 1025+00
 3. All Survey Elevations In Feet Referenced to NAVD88.



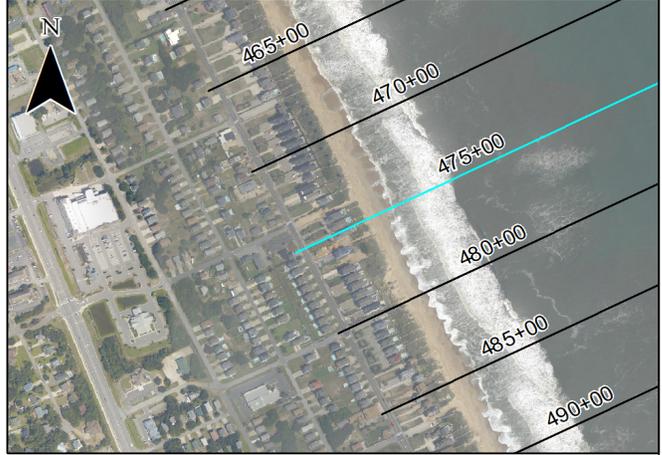


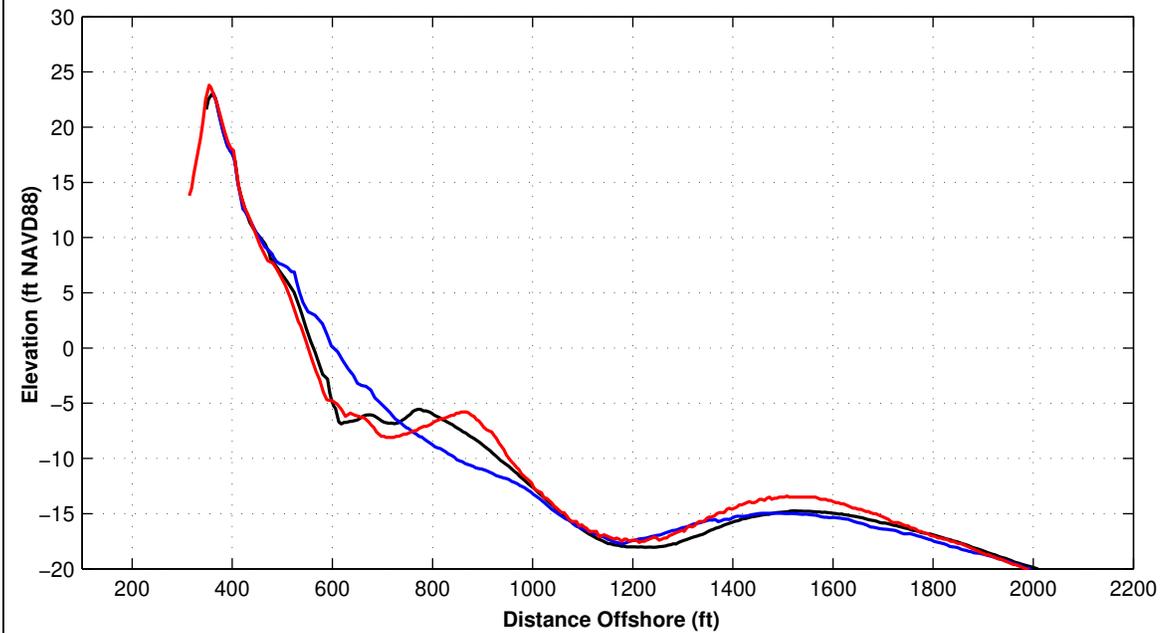
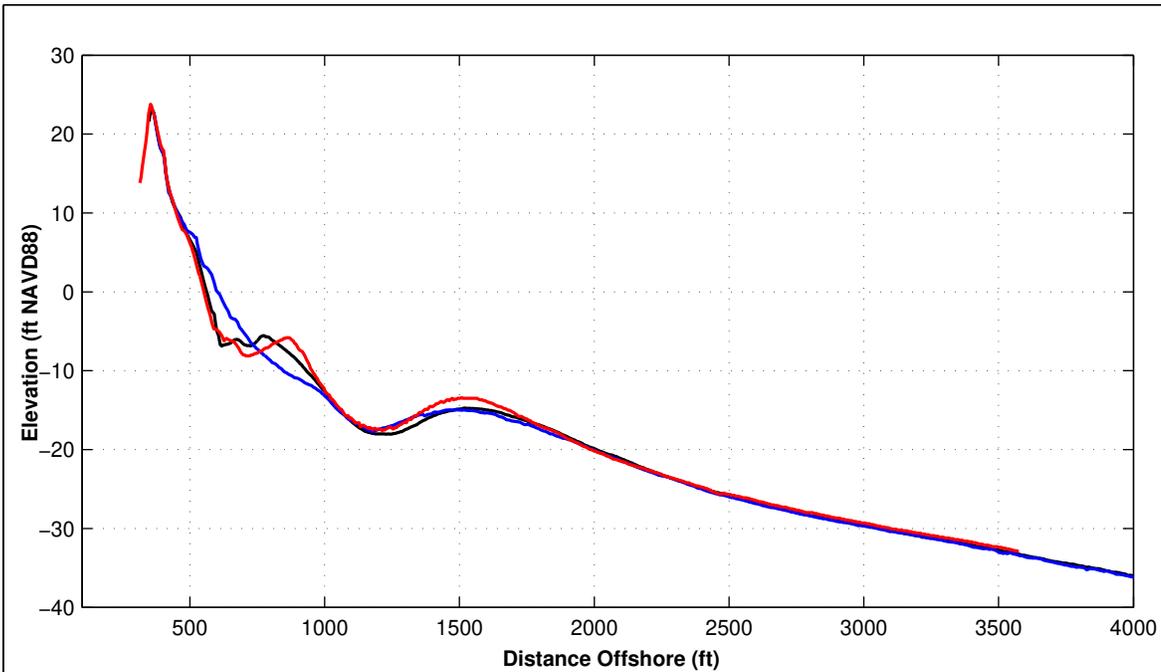
| | | |
|--|----------------------------|----------------------------|
| Survey Transect 475+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.





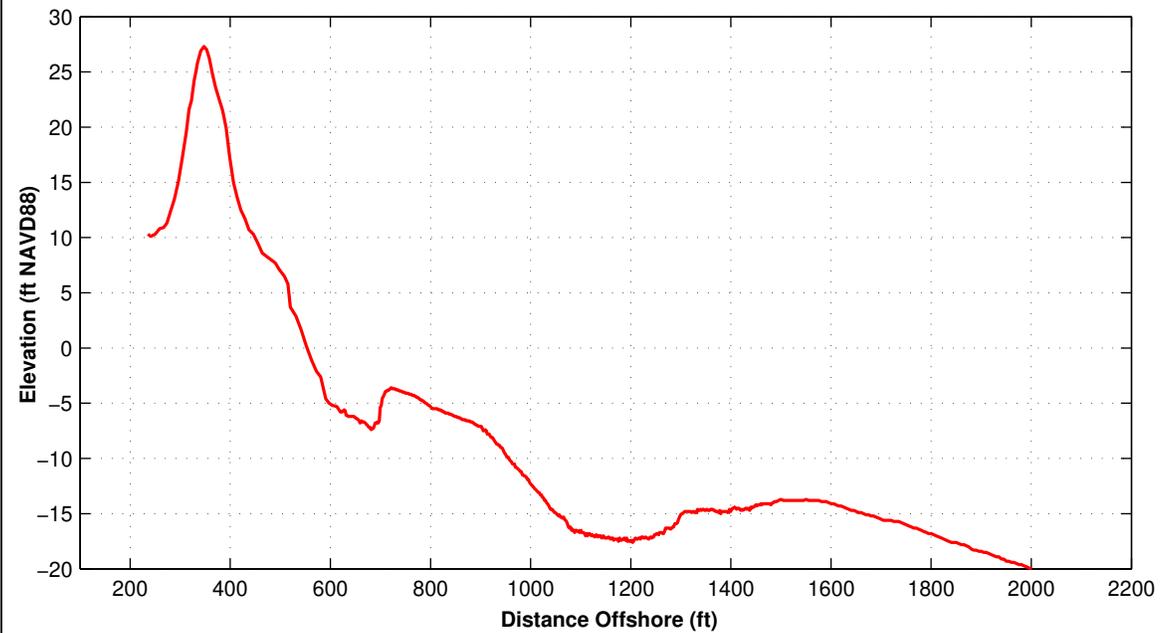
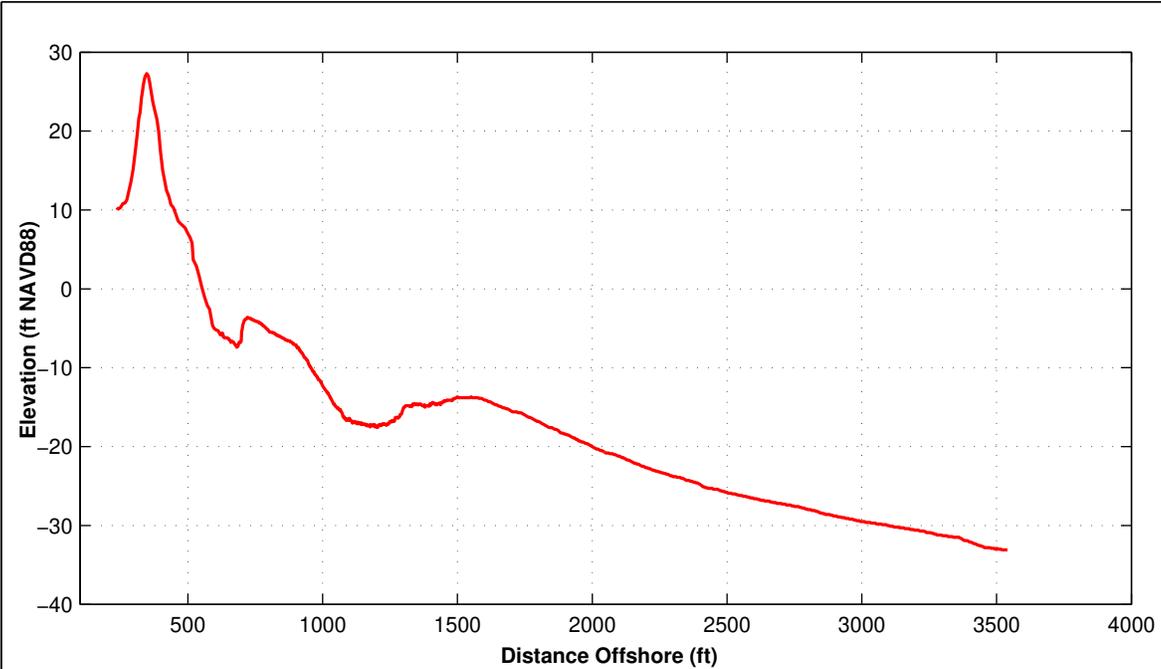
| Survey Transect 480+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | - ft | -46.73 ft |
| Volume Change Above +6 ft NAVD88 | - cy/ft | -1.87 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | - cy/ft | -7.53 cy/ft |
| Volume Change Above -6 ft NAVD88 | - cy/ft | -26.59 cy/ft |
| Volume Change Above -14 ft NAVD88 | - cy/ft | -4.74 cy/ft |
| Volume Change Above -19 ft NAVD88 | - cy/ft | 13.54 cy/ft |
| Volume Change Above -30 ft NAVD88 | - cy/ft | 22.98 cy/ft |

LEGEND:

| | | | |
|-----------|--|-------------|--|
| JUNE 2020 | | AUGUST 2019 | |
| | | APRIL 2019 | |

- Notes:
1. Station From North To South At Varying Intervals.
 2. Post-Dorian Survey Extends Between Station 495+00 to 1025+00
 3. All Survey Elevations In Feet Referenced to NAVD88.

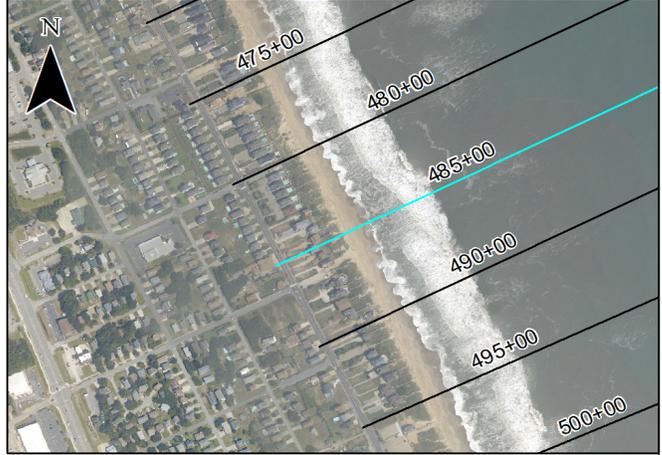


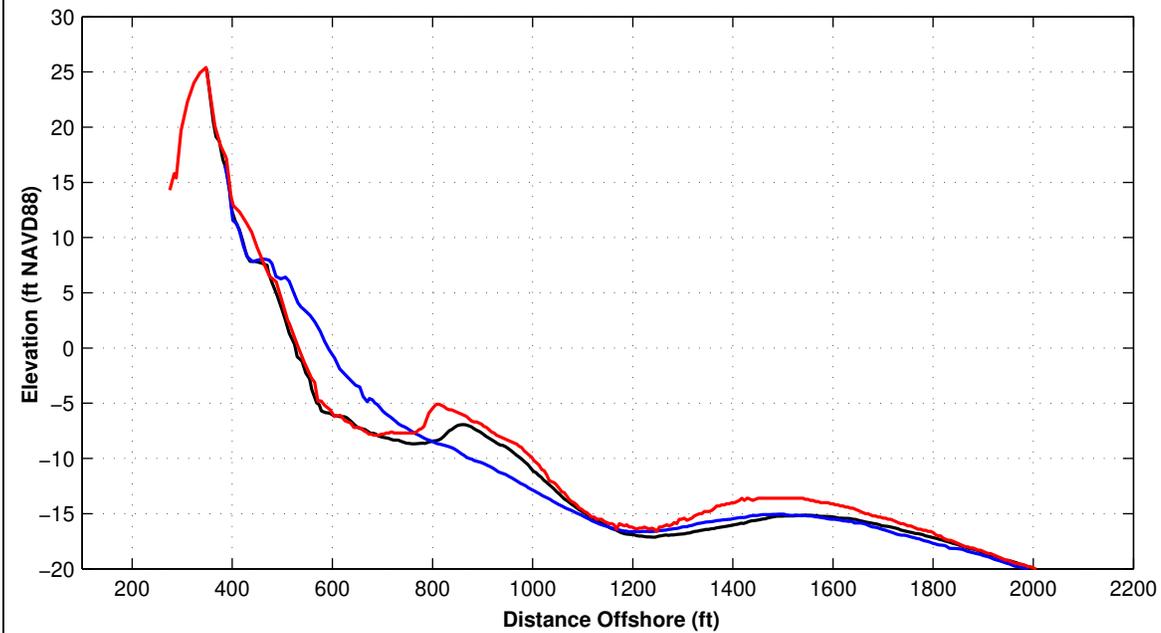
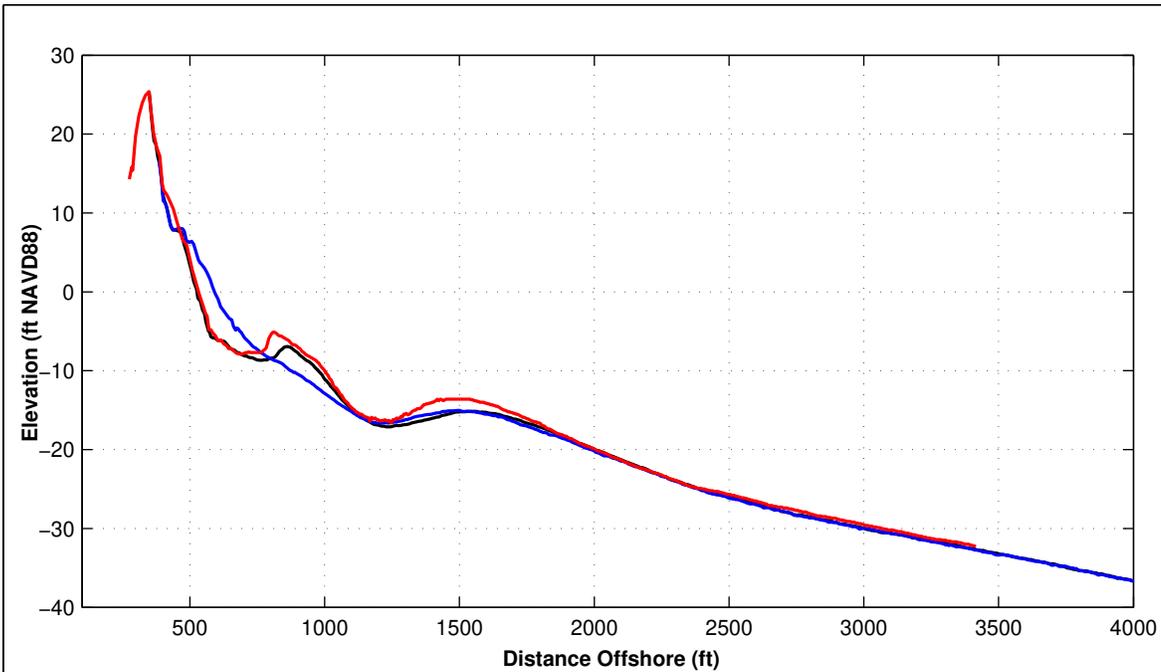


| | | |
|--|----------------------------|----------------------------|
| Survey Transect 485+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:
 JUNE 2020 ————

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.

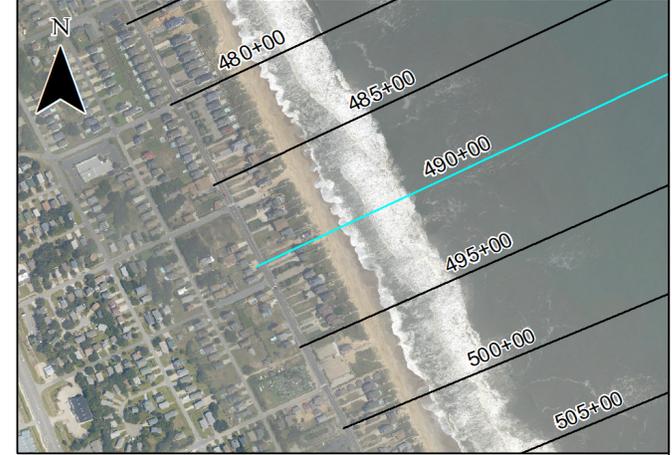


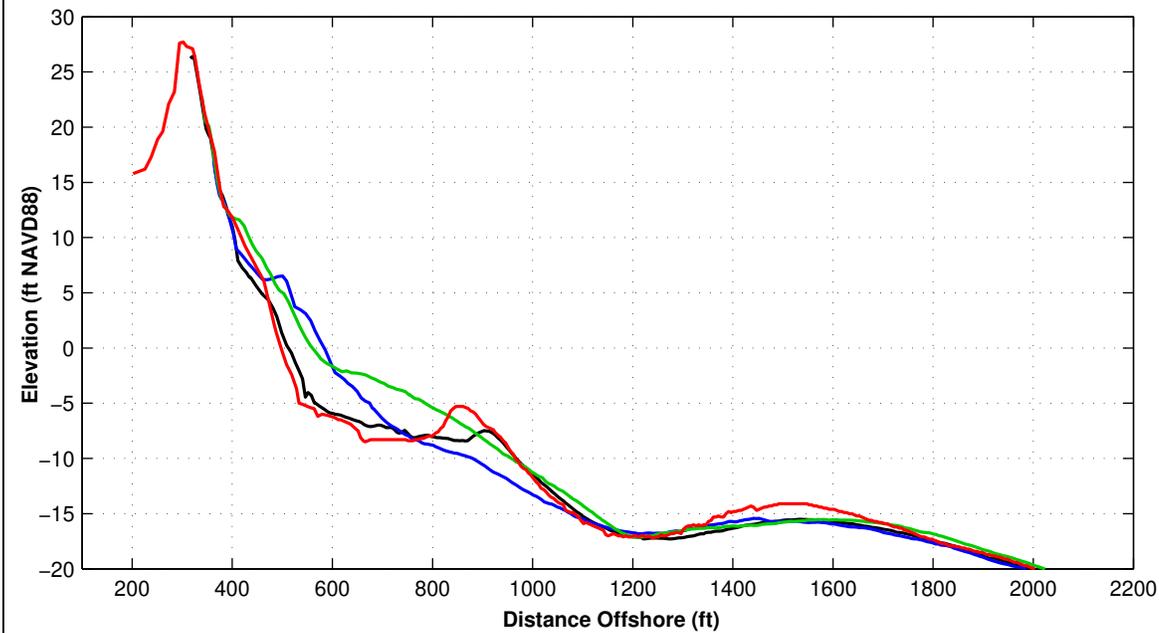
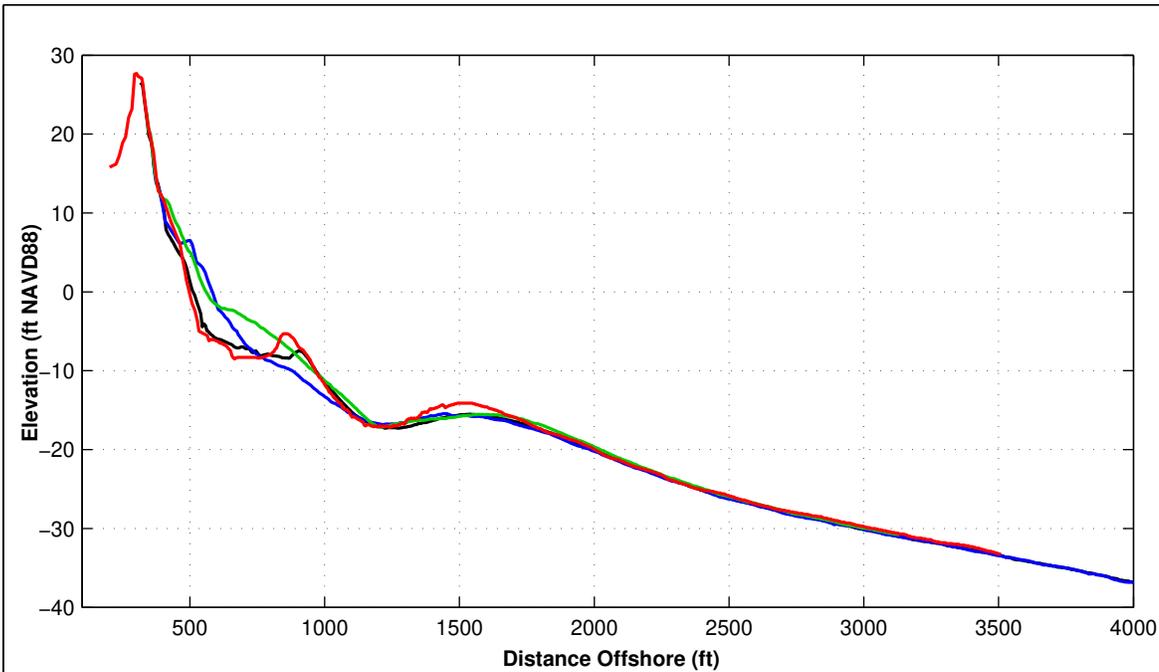


| Survey Transect 490+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | - ft | -56.39 ft |
| Volume Change Above +6 ft NAVD88 | - cy/ft | 3.46 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | - cy/ft | -3.64 cy/ft |
| Volume Change Above -6 ft NAVD88 | - cy/ft | -22.87 cy/ft |
| Volume Change Above -14 ft NAVD88 | - cy/ft | 3.04 cy/ft |
| Volume Change Above -19 ft NAVD88 | - cy/ft | 30.10 cy/ft |
| Volume Change Above -30 ft NAVD88 | - cy/ft | 43.57 cy/ft |

LEGEND:
 JUNE 2020 ————
 AUGUST 2019 ————
 APRIL 2019 ————

- Notes:
 1. Station From North To South At Varying Intervals.
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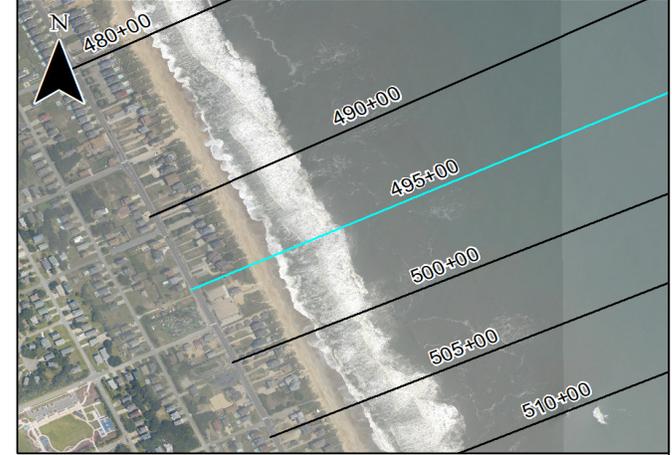


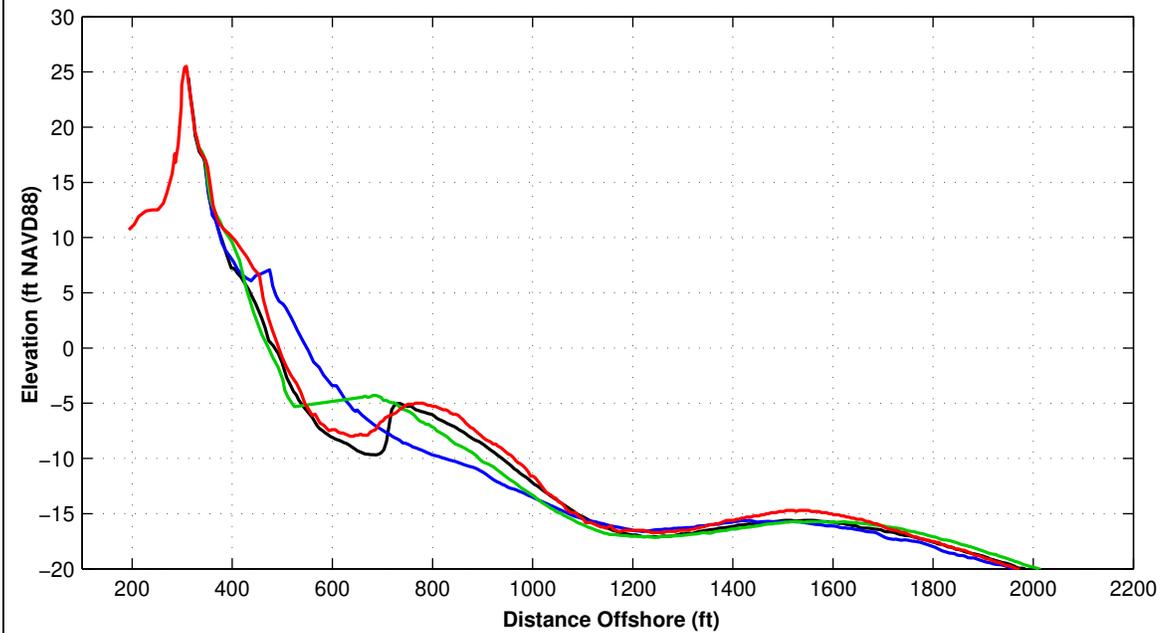
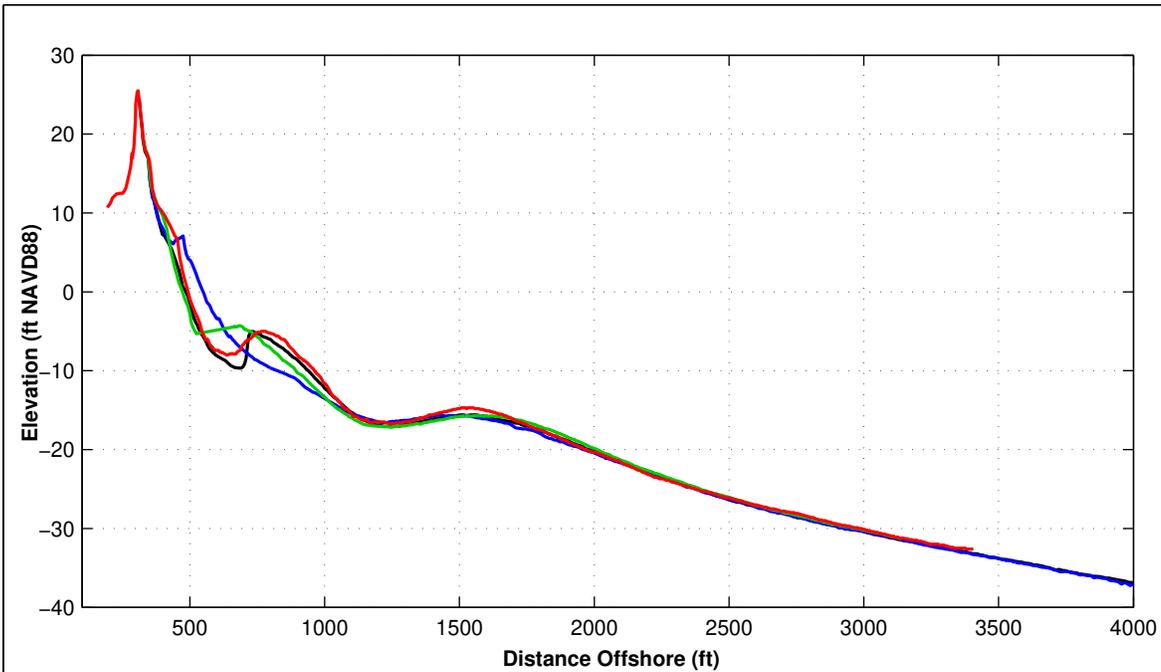
| Survey Transect 495+00 | POST-DORIAN - AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|--|---------------------------|-------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -26.13 ft | -80.14 ft |
| Volume Change Above +6 ft NAVD88 | 8.57 cy/ft | 2.65 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | 4.95 cy/ft | -8.14 cy/ft |
| Volume Change Above -6 ft NAVD88 | 16.08 cy/ft | -34.42 cy/ft |
| Volume Change Above -14 ft NAVD88 | 45.89 cy/ft | -17.72 cy/ft |
| Volume Change Above -19 ft NAVD88 | 55.65 cy/ft | -0.93 cy/ft |
| Volume Change Above -30 ft NAVD88 | 67.97 cy/ft | 9.36 cy/ft |

LEGEND:

| | | | |
|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
1. Station From North To South At Varying Intervals.
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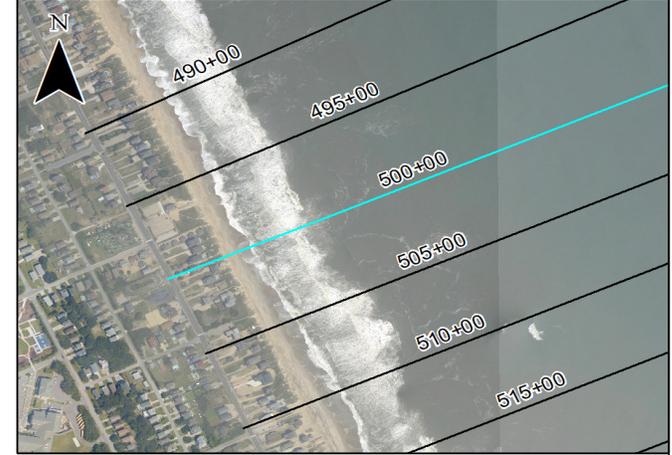


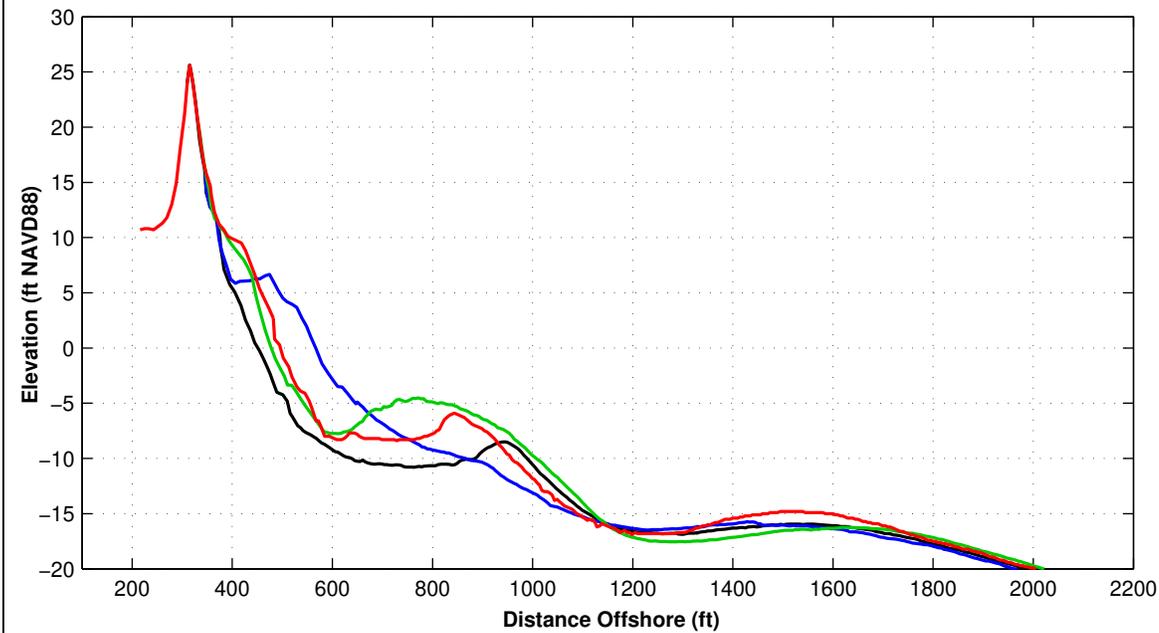
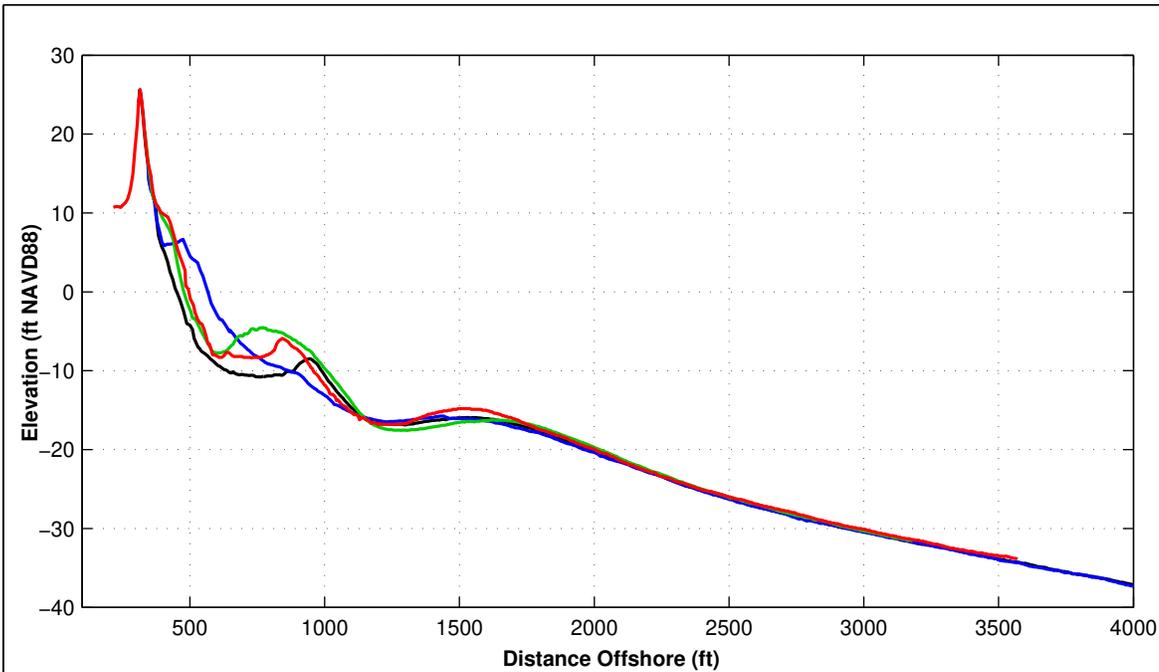
| Survey Transect 500+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -75.52 ft | -51.16 ft |
| Volume Change Above +6 ft NAVD88 | 6.34 cy/ft | 5.23 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -5.21 cy/ft | -1.47 cy/ft |
| Volume Change Above -6 ft NAVD88 | -20.14 cy/ft | -17.04 cy/ft |
| Volume Change Above -14 ft NAVD88 | -1.05 cy/ft | 13.28 cy/ft |
| Volume Change Above -19 ft NAVD88 | -0.41 cy/ft | 26.32 cy/ft |
| Volume Change Above -30 ft NAVD88 | 11.29 cy/ft | 32.53 cy/ft |

LEGEND:

| | | | |
|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
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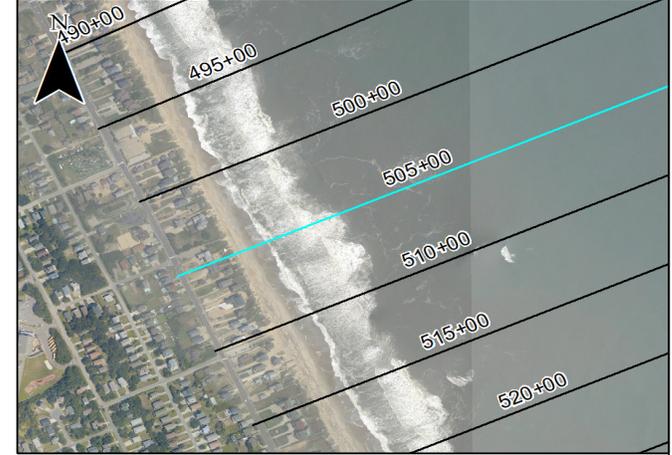


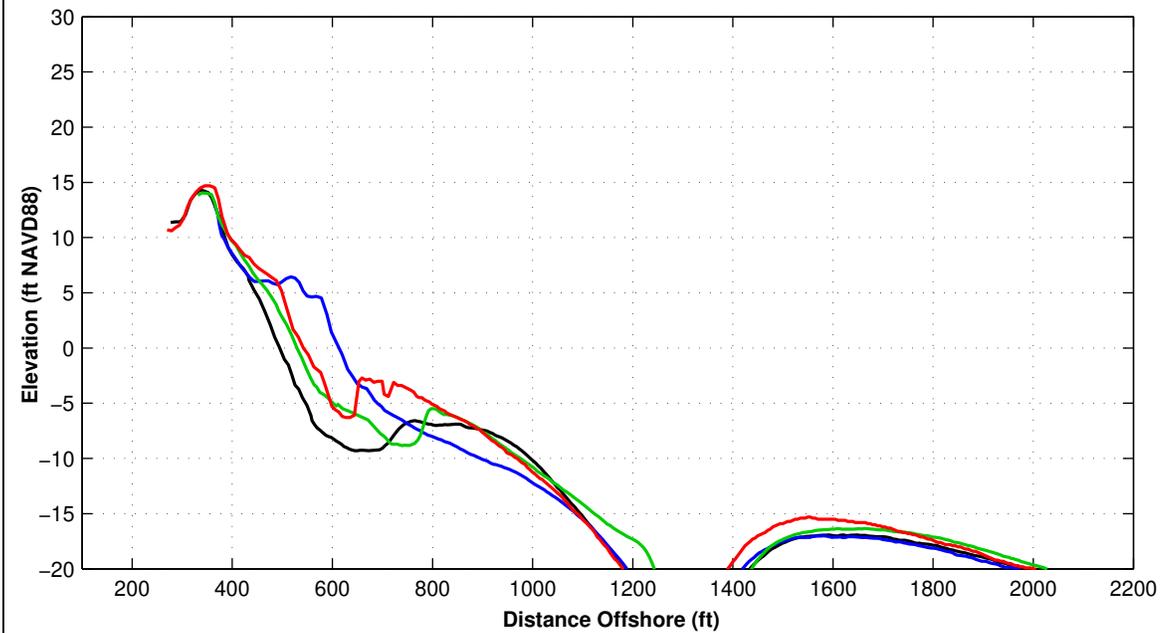
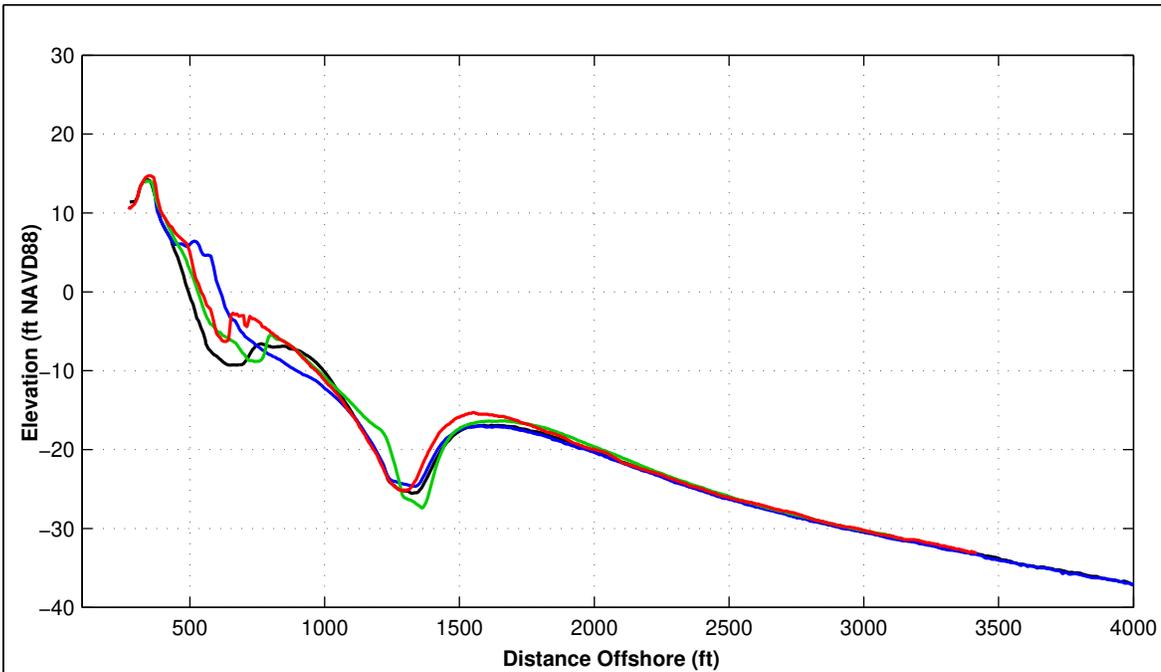
| Survey Transect 505+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -86.44 ft | -71.50 ft |
| Volume Change Above +6 ft NAVD88 | 10.69 cy/ft | 7.85 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -1.34 cy/ft | -1.23 cy/ft |
| Volume Change Above -6 ft NAVD88 | -19.95 cy/ft | -22.71 cy/ft |
| Volume Change Above -14 ft NAVD88 | 19.85 cy/ft | -10.59 cy/ft |
| Volume Change Above -19 ft NAVD88 | 16.62 cy/ft | 5.17 cy/ft |
| Volume Change Above -30 ft NAVD88 | 30.49 cy/ft | 17.25 cy/ft |

LEGEND:

| | | | |
|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
1. Station From North To South At Varying Intervals.
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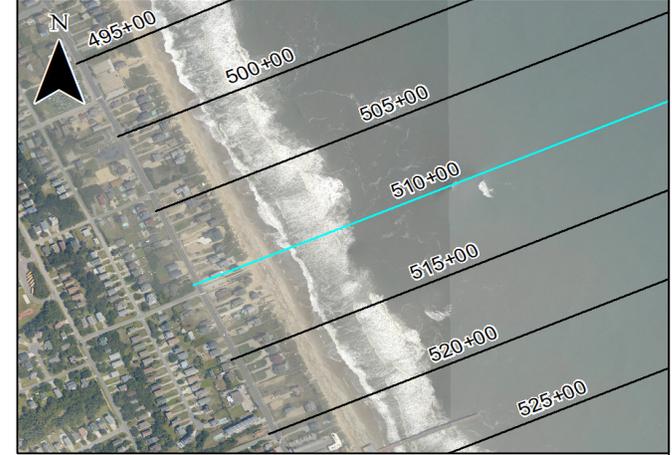


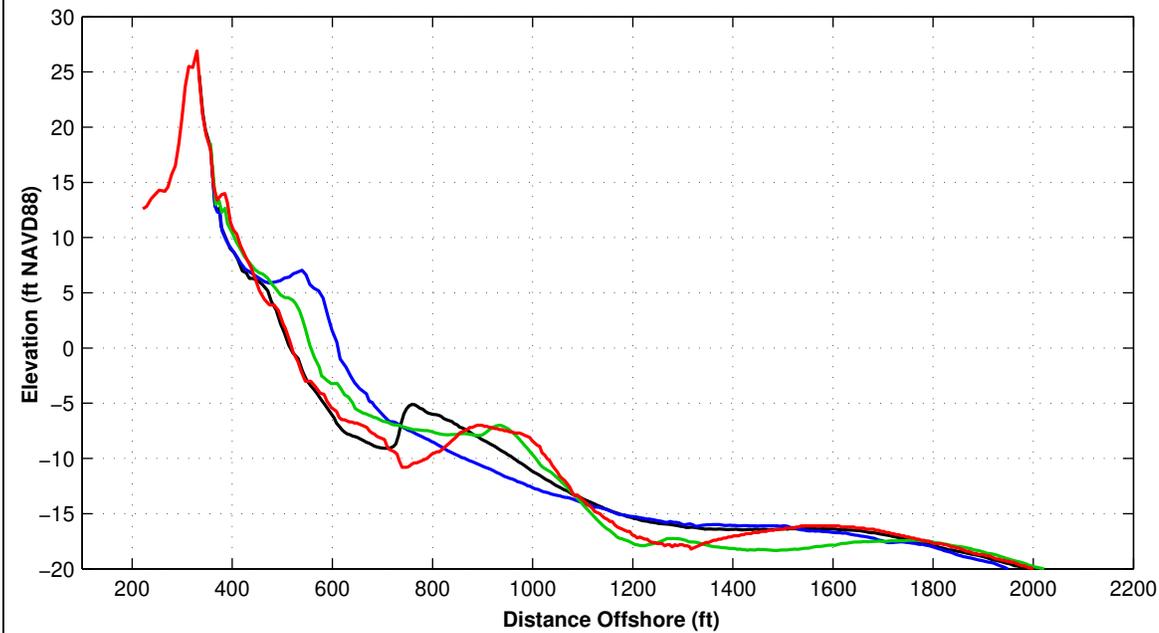
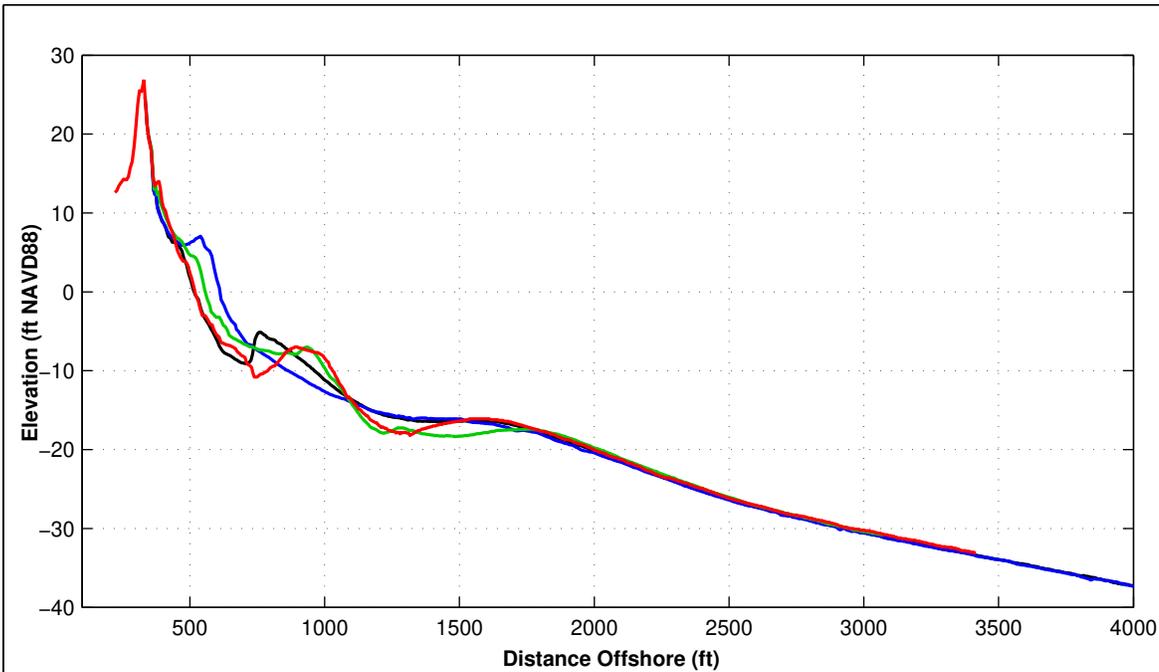
| Survey Transect 510+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -82.27 ft | -71.43 ft |
| Volume Change Above +6 ft NAVD88 | 2.23 cy/ft | 5.20 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -12.90 cy/ft | -6.54 cy/ft |
| Volume Change Above -6 ft NAVD88 | -35.19 cy/ft | -12.77 cy/ft |
| Volume Change Above -14 ft NAVD88 | -21.32 cy/ft | 7.17 cy/ft |
| Volume Change Above -19 ft NAVD88 | 0.26 cy/ft | 28.69 cy/ft |
| Volume Change Above -30 ft NAVD88 | 11.90 cy/ft | 42.30 cy/ft |

LEGEND:

| | | | |
|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
1. Station From North To South At Varying Intervals.
 2. Post-Dorian Survey Extends Between Station 495+00 to 1025+00
 3. All Survey Elevations In Feet Referenced to NAVD88.



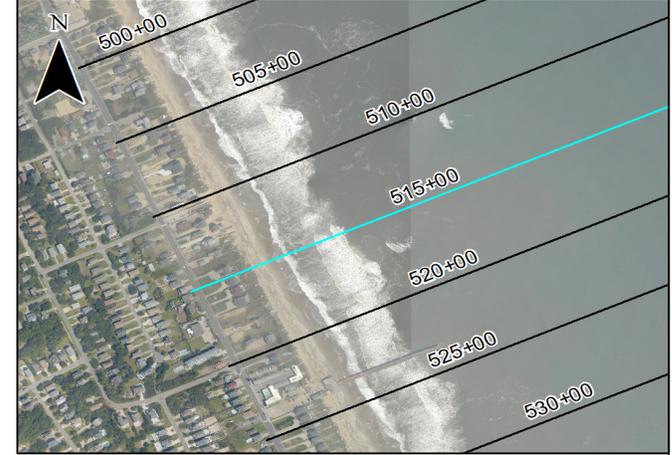


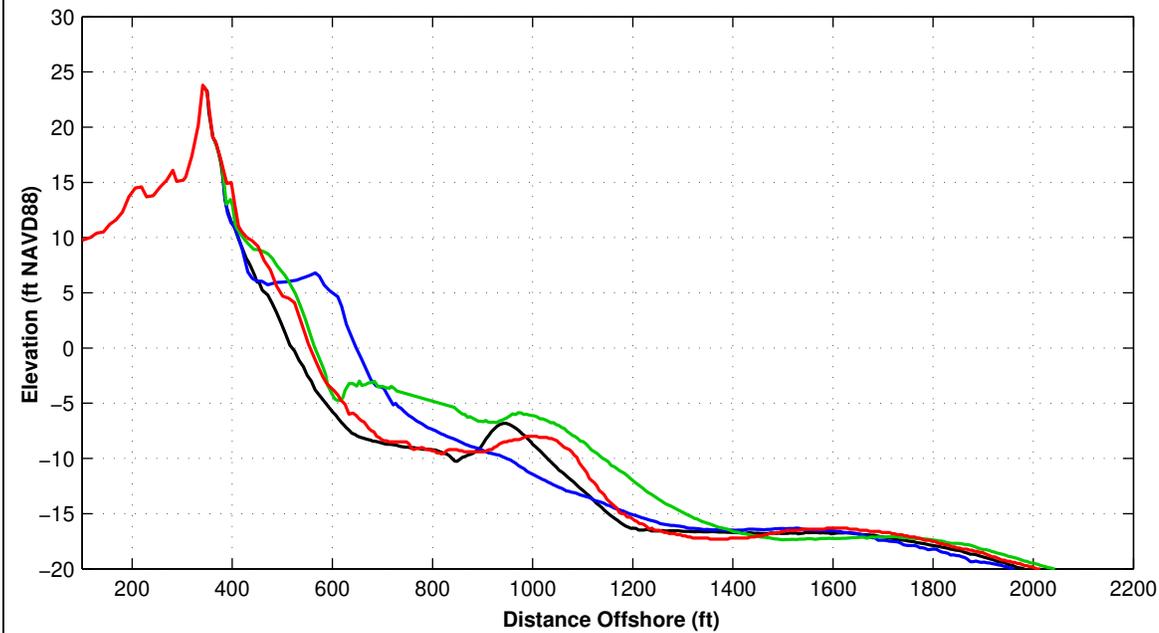
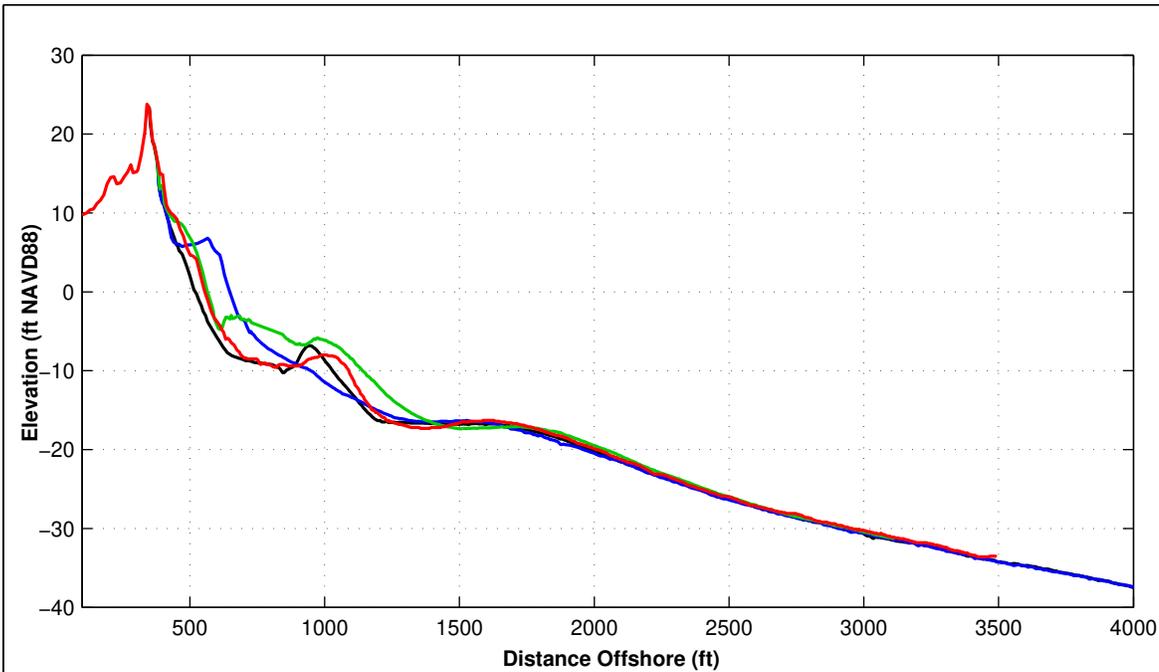
| Survey Transect 515+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -53.61 ft | -92.35 ft |
| Volume Change Above +6 ft NAVD88 | 3.23 cy/ft | 3.91 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -7.78 cy/ft | -14.43 cy/ft |
| Volume Change Above -6 ft NAVD88 | -20.54 cy/ft | -38.31 cy/ft |
| Volume Change Above -14 ft NAVD88 | 6.36 cy/ft | -22.48 cy/ft |
| Volume Change Above -19 ft NAVD88 | -25.71 cy/ft | -32.82 cy/ft |
| Volume Change Above -30 ft NAVD88 | -9.76 cy/ft | -20.21 cy/ft |

LEGEND:

| | | | |
|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
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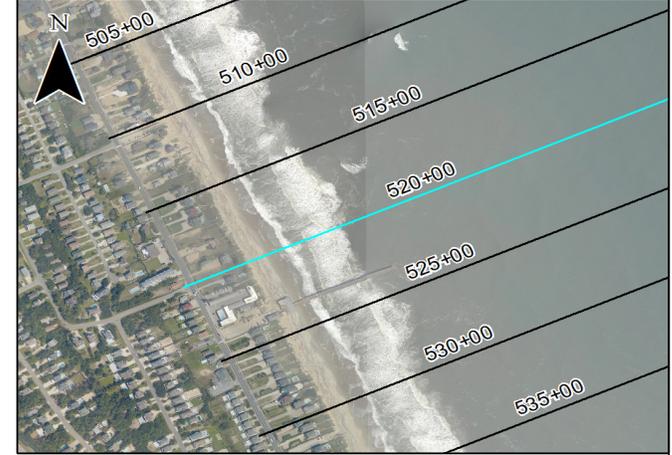


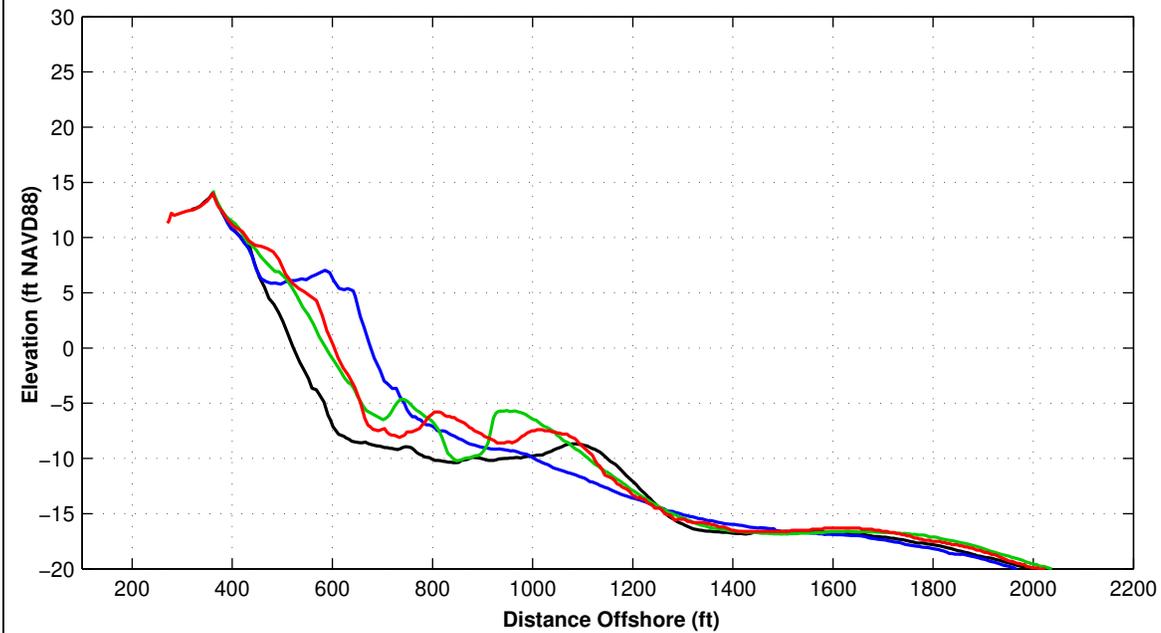
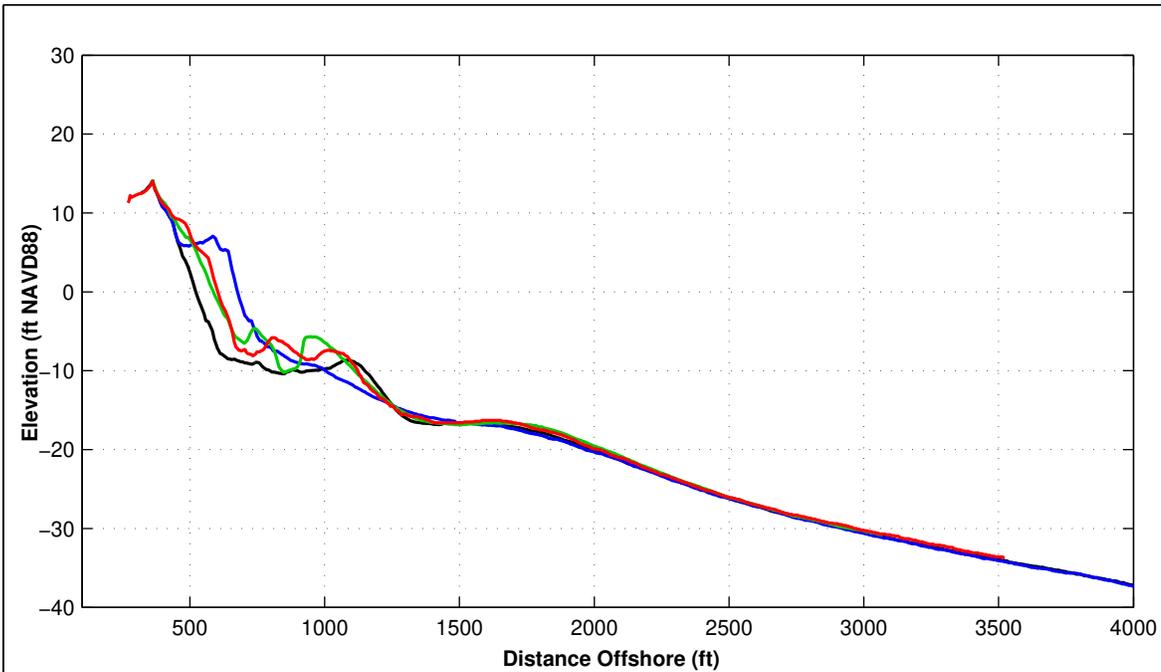
| Survey Transect 520+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -80.42 ft | -90.52 ft |
| Volume Change Above +6 ft NAVD88 | 5.34 cy/ft | 7.63 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -8.38 cy/ft | -8.93 cy/ft |
| Volume Change Above -6 ft NAVD88 | -16.92 cy/ft | -34.58 cy/ft |
| Volume Change Above -14 ft NAVD88 | 42.39 cy/ft | -27.32 cy/ft |
| Volume Change Above -19 ft NAVD88 | 52.30 cy/ft | -27.67 cy/ft |
| Volume Change Above -30 ft NAVD88 | 70.81 cy/ft | -14.16 cy/ft |

LEGEND:

| | | | |
|-------------|--|-------------|--|
| JUNE 2020 | | AUGUST 2019 | |
| POST-DORIAN | | APRIL 2019 | |

- Notes:
1. Station From North To South At Varying Intervals.
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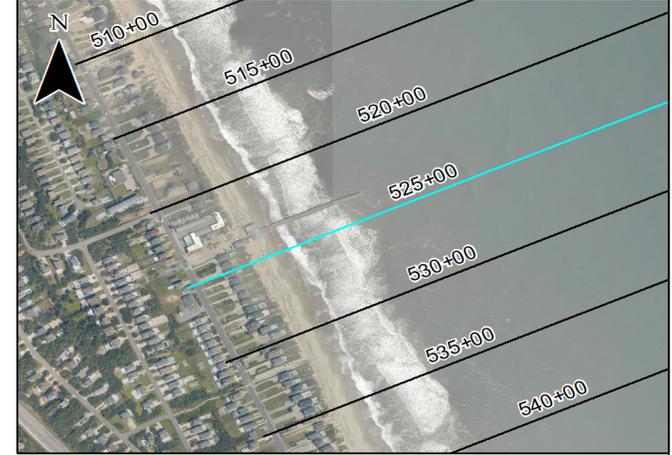


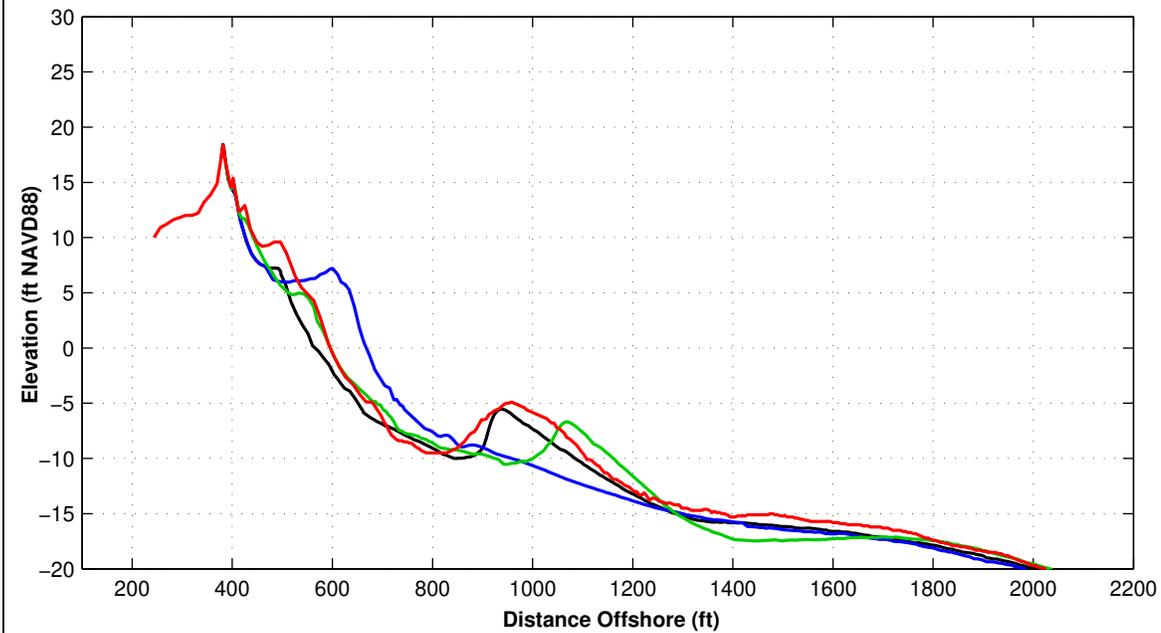
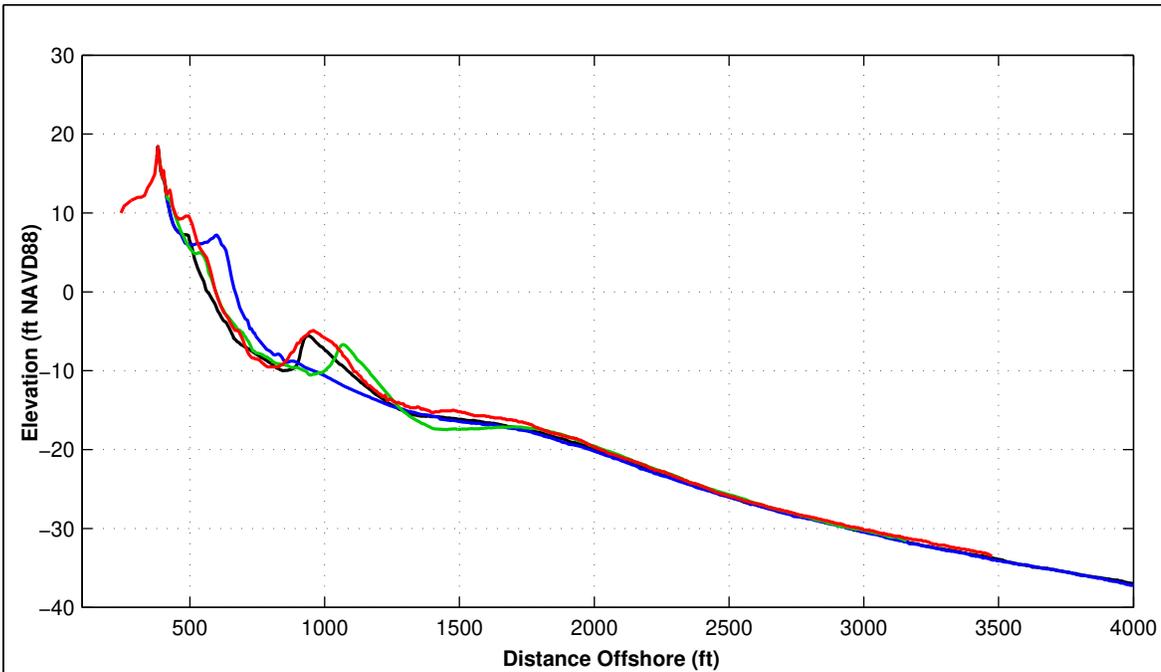
| Survey Transect 525+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -96.14 ft | -75.27 ft |
| Volume Change Above +6 ft NAVD88 | 2.99 cy/ft | 5.46 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -15.53 cy/ft | -8.81 cy/ft |
| Volume Change Above -6 ft NAVD88 | -35.44 cy/ft | -28.92 cy/ft |
| Volume Change Above -14 ft NAVD88 | -12.15 cy/ft | -8.46 cy/ft |
| Volume Change Above -19 ft NAVD88 | -6.14 cy/ft | -2.15 cy/ft |
| Volume Change Above -30 ft NAVD88 | 7.26 cy/ft | 9.48 cy/ft |

LEGEND:

| | | | |
|-------------|--|-------------|--|
| JUNE 2020 | | AUGUST 2019 | |
| POST-DORIAN | | APRIL 2019 | |

- Notes:
1. Station From North To South At Varying Intervals.
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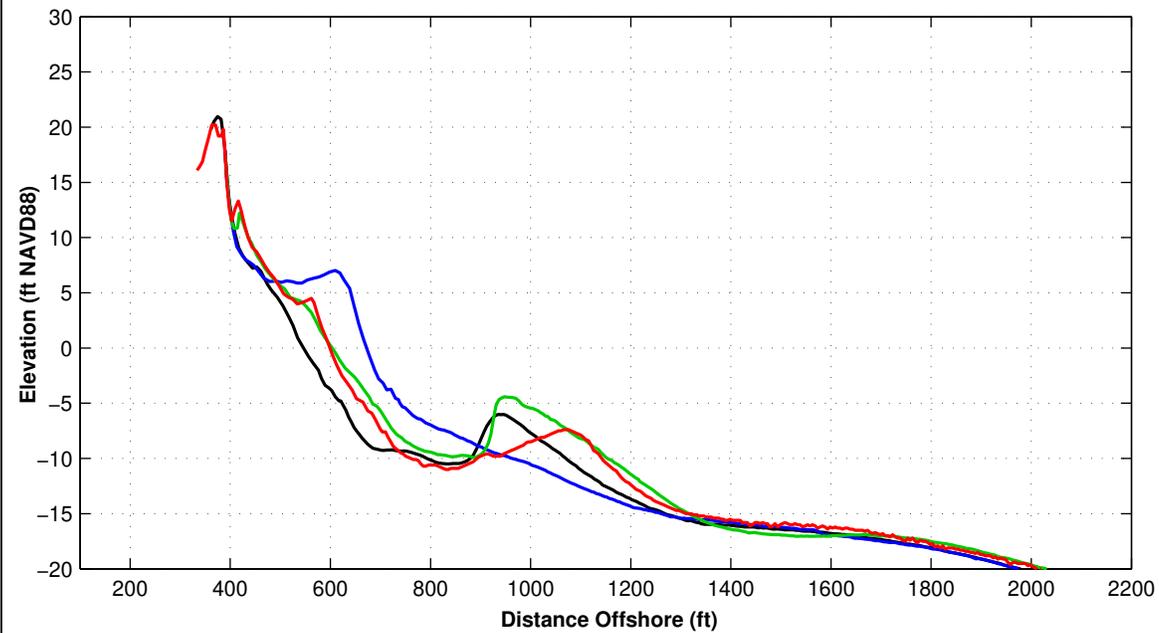
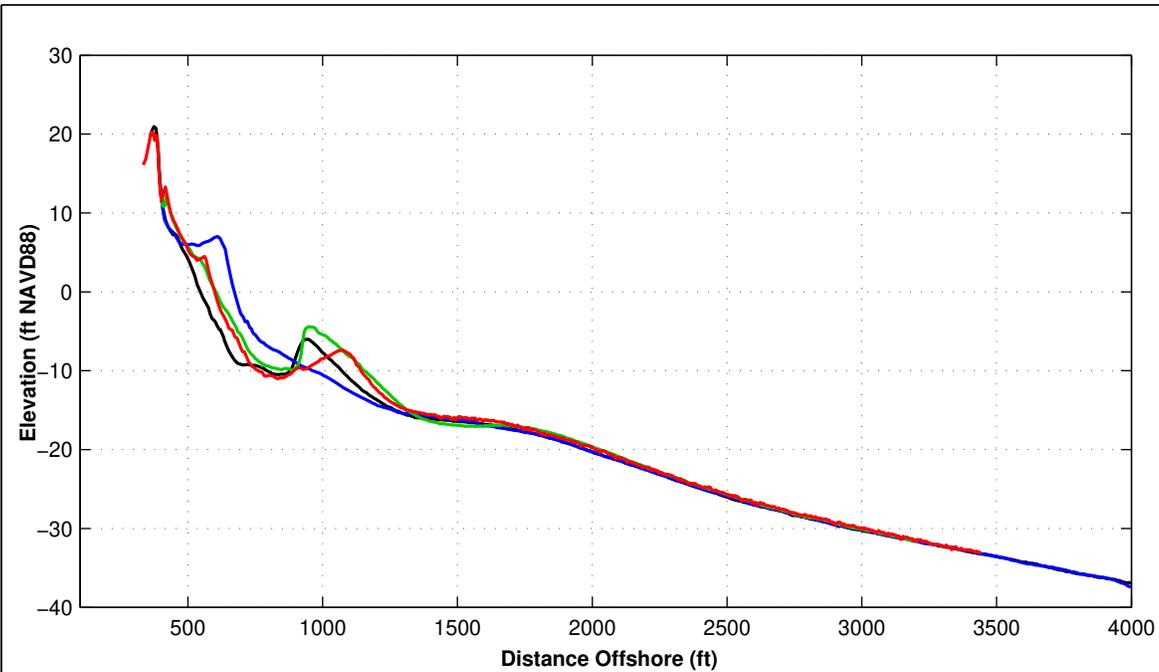
| Survey Transect 530+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -73.56 ft | -71.58 ft |
| Volume Change Above +6 ft NAVD88 | 1.98 cy/ft | 7.84 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -14.34 cy/ft | -6.14 cy/ft |
| Volume Change Above -6 ft NAVD88 | -30.70 cy/ft | -21.72 cy/ft |
| Volume Change Above -14 ft NAVD88 | -10.15 cy/ft | 7.20 cy/ft |
| Volume Change Above -19 ft NAVD88 | -15.73 cy/ft | 29.60 cy/ft |
| Volume Change Above -30 ft NAVD88 | -1.10 cy/ft | 43.32 cy/ft |

LEGEND:

| | | | |
|-------------|--|-------------|--|
| JUNE 2020 | | AUGUST 2019 | |
| POST-DORIAN | | APRIL 2019 | |

- Notes:
1. Station From North To South At Varying Intervals.
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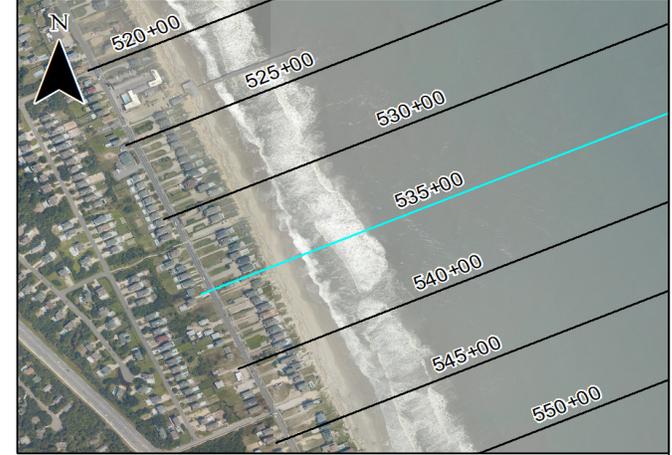


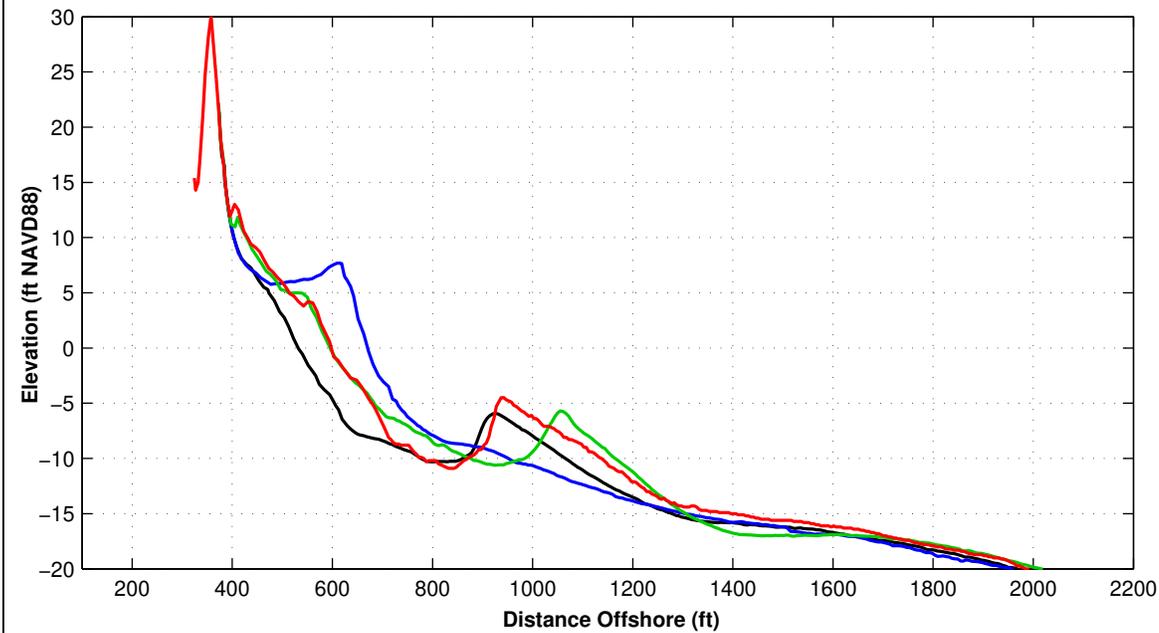
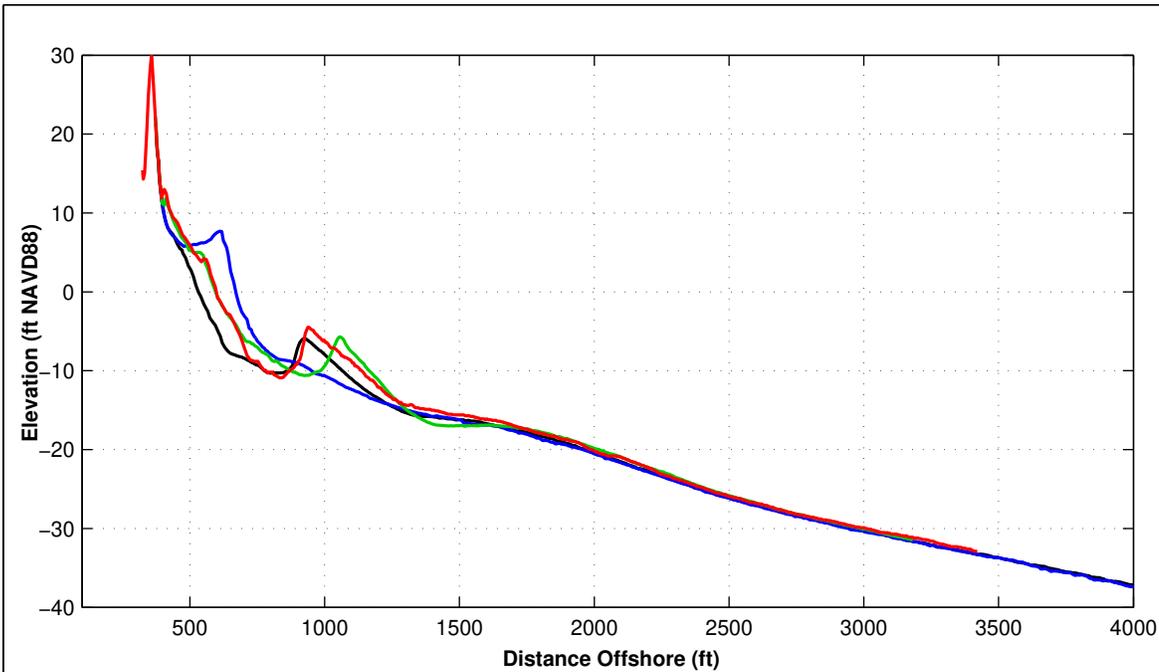
| Survey Transect 535+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -77.69 ft | -74.45 ft |
| Volume Change Above +6 ft NAVD88 | 3.12 cy/ft | 4.21 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -15.02 cy/ft | -13.10 cy/ft |
| Volume Change Above -6 ft NAVD88 | -27.01 cy/ft | -32.69 cy/ft |
| Volume Change Above -14 ft NAVD88 | 5.35 cy/ft | -26.44 cy/ft |
| Volume Change Above -19 ft NAVD88 | 9.82 cy/ft | -14.20 cy/ft |
| Volume Change Above -30 ft NAVD88 | 21.80 cy/ft | -1.67 cy/ft |

LEGEND:

| | | | |
|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
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 3. All Survey Elevations In Feet Referenced to NAVD88.





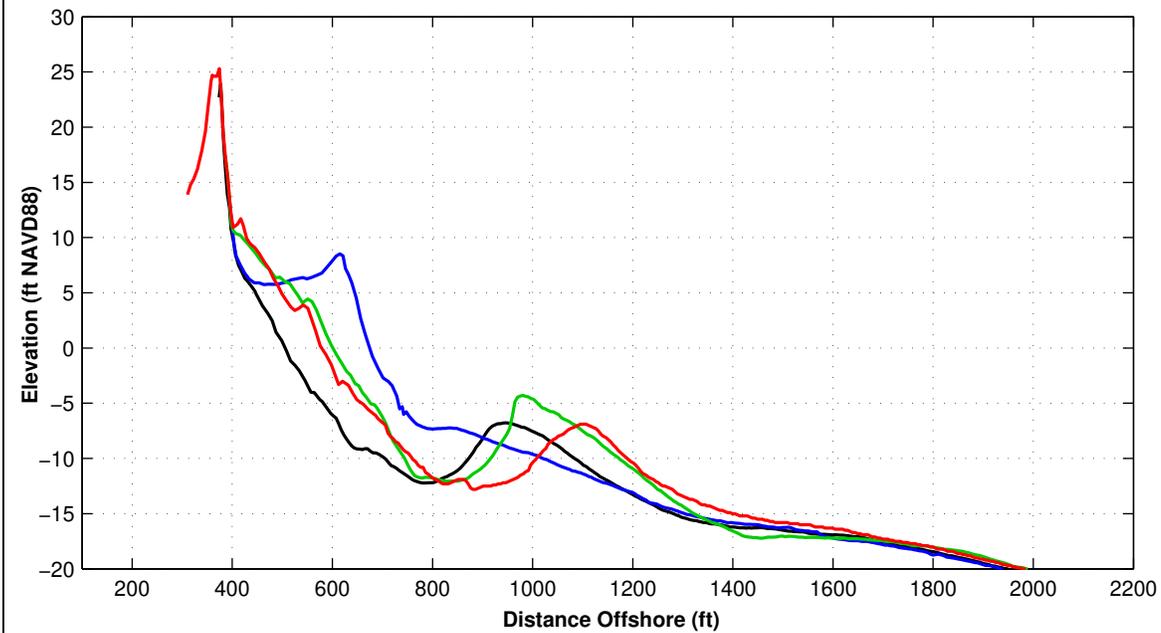
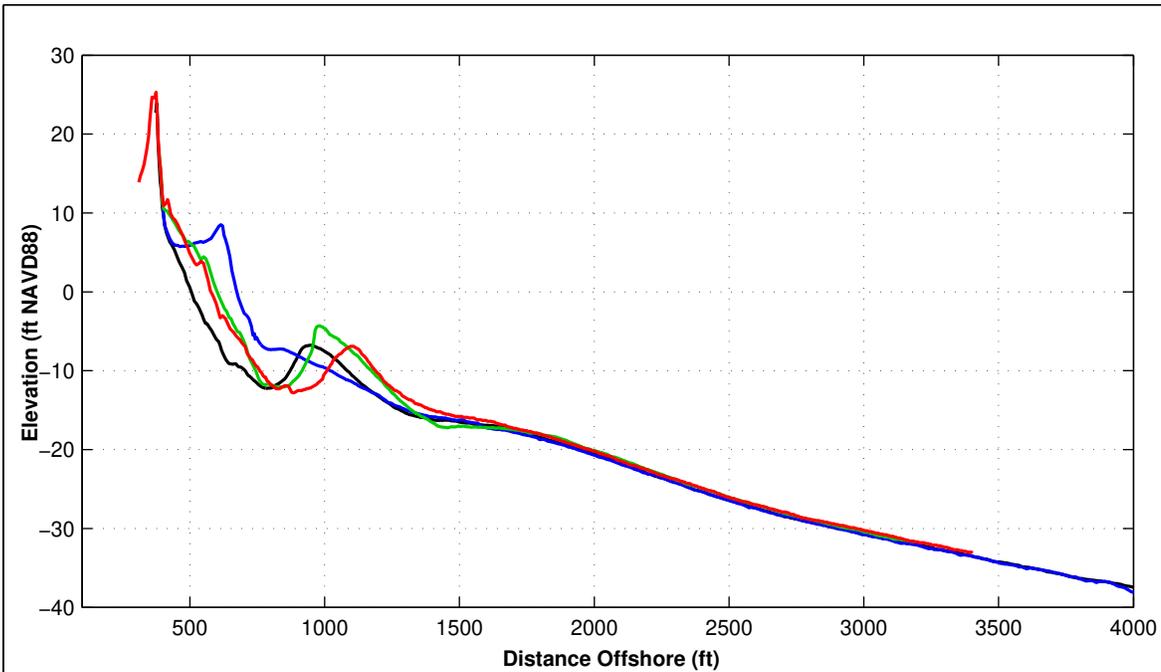
| Survey Transect 540+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -80.17 ft | -75.09 ft |
| Volume Change Above +6 ft NAVD88 | 6.71 cy/ft | 4.69 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -10.52 cy/ft | -12.35 cy/ft |
| Volume Change Above -6 ft NAVD88 | -26.49 cy/ft | -26.47 cy/ft |
| Volume Change Above -14 ft NAVD88 | 0.58 cy/ft | -2.12 cy/ft |
| Volume Change Above -19 ft NAVD88 | 1.24 cy/ft | 14.54 cy/ft |
| Volume Change Above -30 ft NAVD88 | 20.17 cy/ft | 30.68 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
1. Station From North To South At Varying Intervals.
 2. Post-Dorian Survey Extends Between Station 495+00 to 1025+00
 3. All Survey Elevations In Feet Referenced to NAVD88.





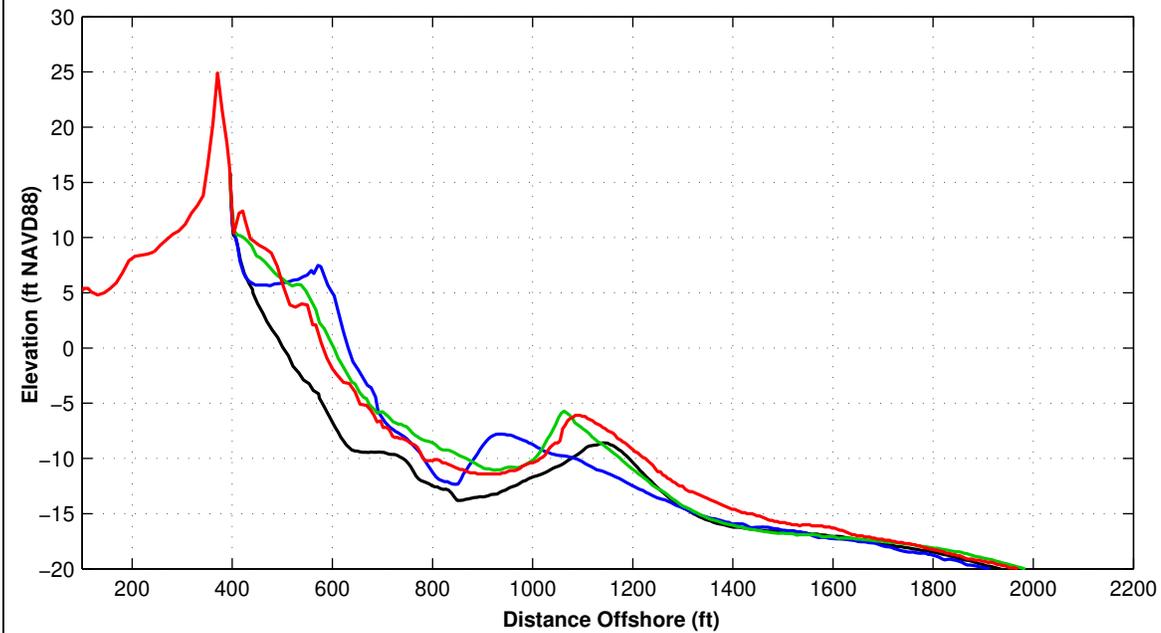
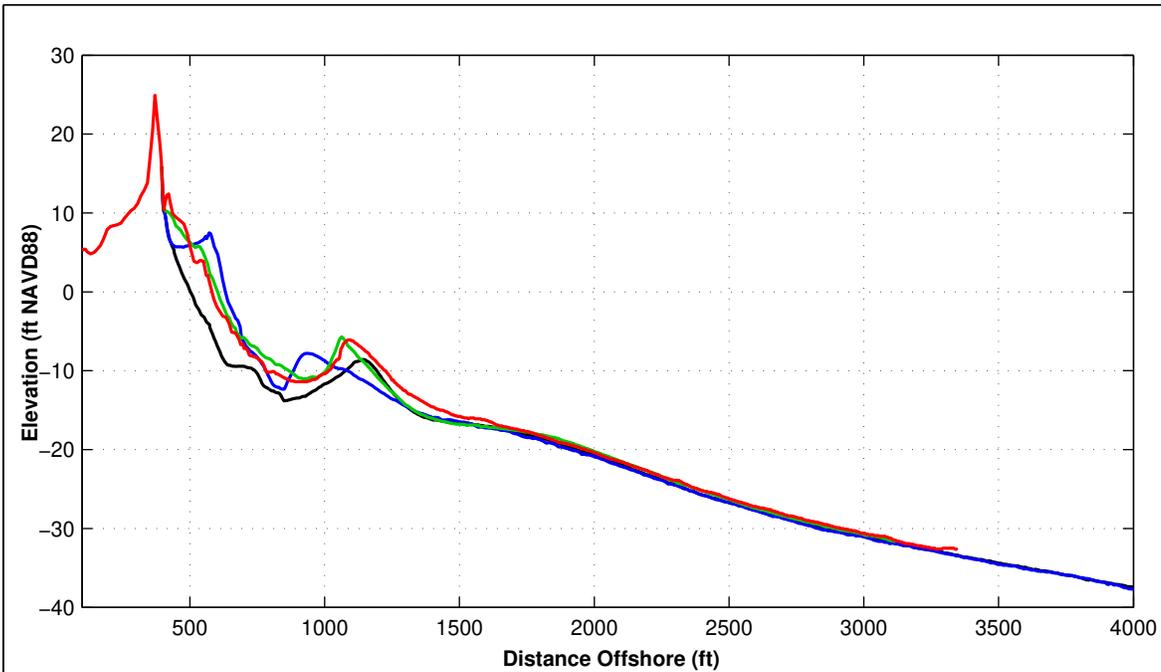
| Survey Transect 545+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -77.71 ft | -96.75 ft |
| Volume Change Above +6 ft NAVD88 | 2.67 cy/ft | 3.54 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -13.97 cy/ft | -17.60 cy/ft |
| Volume Change Above -6 ft NAVD88 | -28.17 cy/ft | -40.90 cy/ft |
| Volume Change Above -14 ft NAVD88 | -21.87 cy/ft | -51.40 cy/ft |
| Volume Change Above -19 ft NAVD88 | -22.52 cy/ft | -35.91 cy/ft |
| Volume Change Above -30 ft NAVD88 | -4.96 cy/ft | -18.23 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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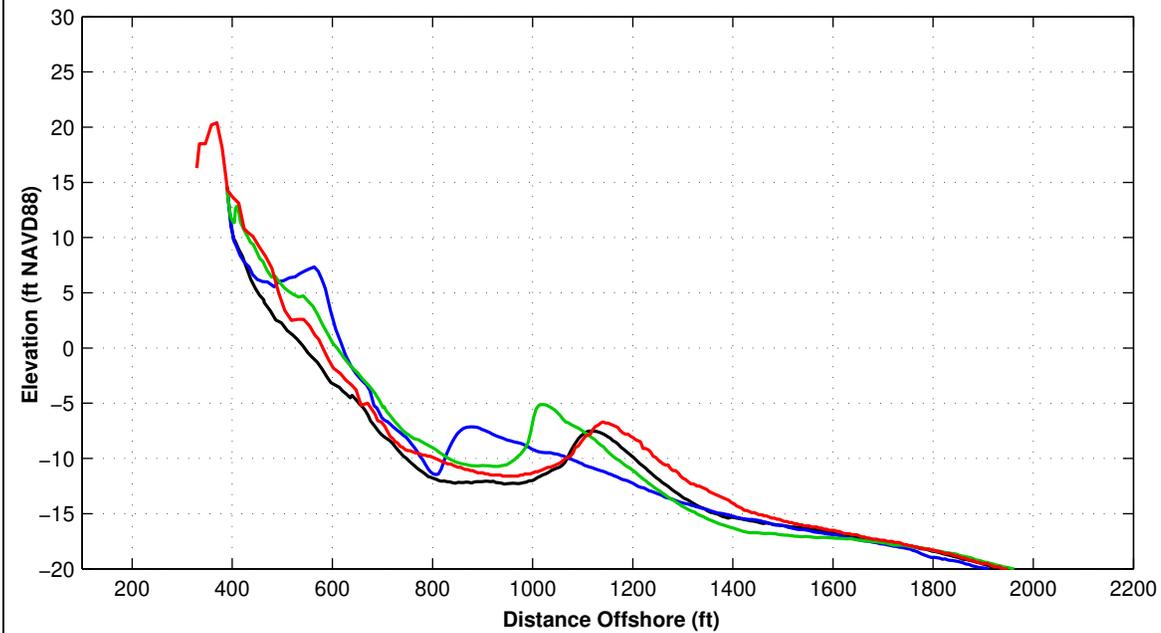
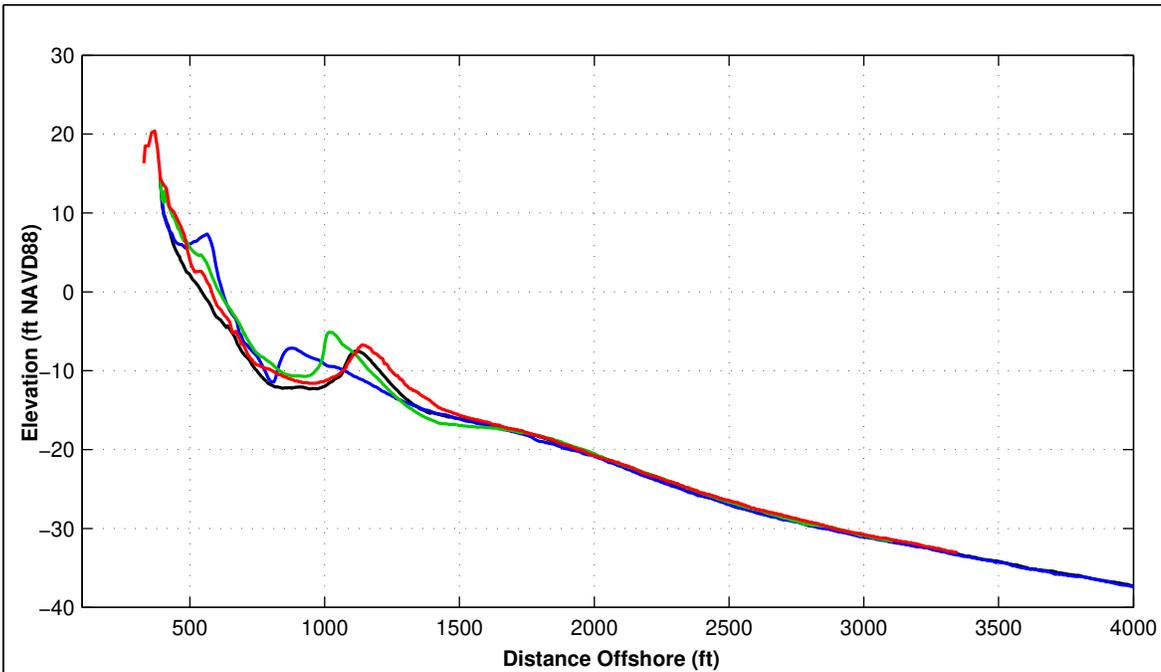
| Survey Transect 550+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -34.02 ft | -50.69 ft |
| Volume Change Above +6 ft NAVD88 | 5.52 cy/ft | 9.14 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -2.23 cy/ft | -3.11 cy/ft |
| Volume Change Above -6 ft NAVD88 | -8.50 cy/ft | -14.12 cy/ft |
| Volume Change Above -14 ft NAVD88 | 11.15 cy/ft | 6.41 cy/ft |
| Volume Change Above -19 ft NAVD88 | 14.60 cy/ft | 23.04 cy/ft |
| Volume Change Above -30 ft NAVD88 | 34.00 cy/ft | 45.12 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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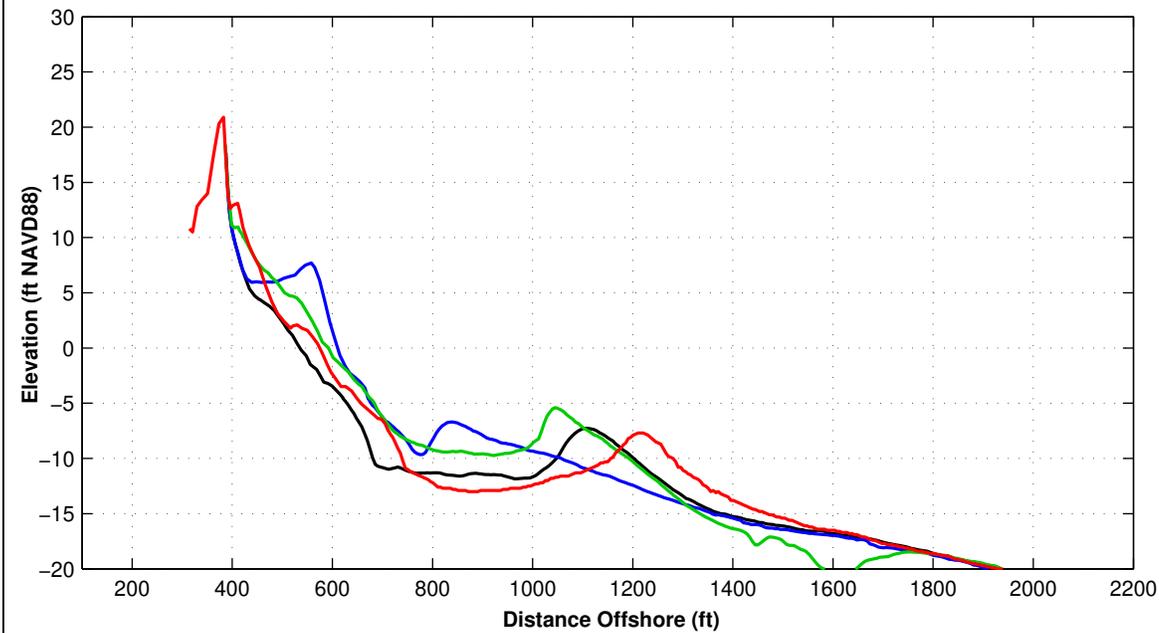
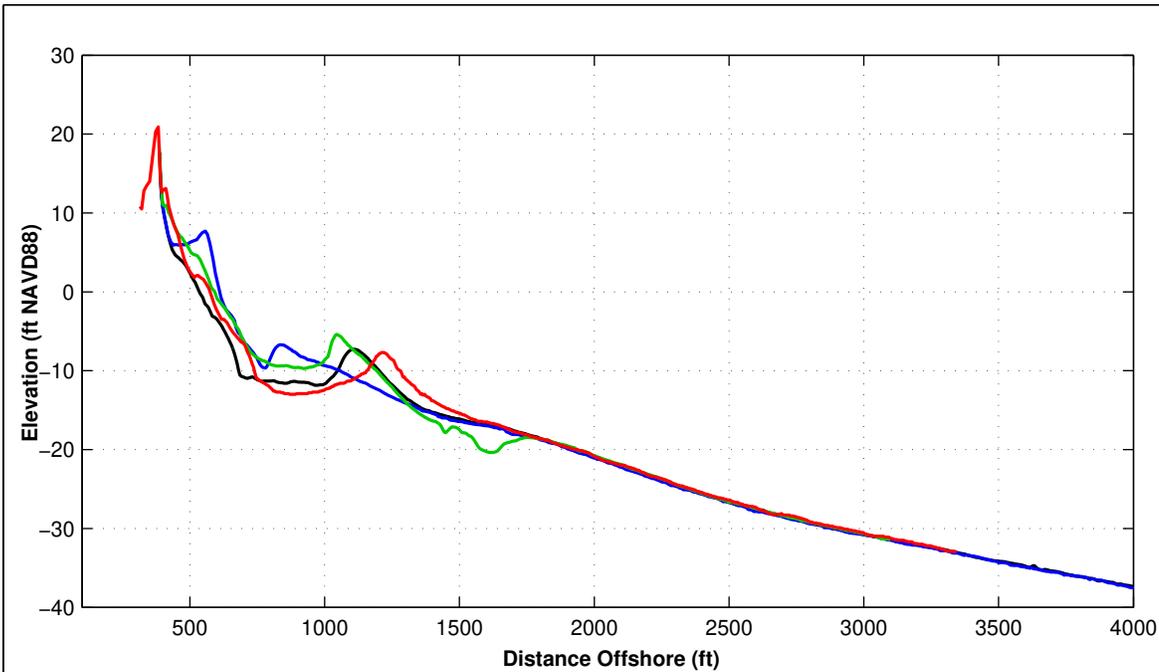
| Survey Transect 555+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -19.08 ft | -46.06 ft |
| Volume Change Above +6 ft NAVD88 | 4.79 cy/ft | 7.79 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -2.58 cy/ft | -6.34 cy/ft |
| Volume Change Above -6 ft NAVD88 | -1.25 cy/ft | -14.68 cy/ft |
| Volume Change Above -14 ft NAVD88 | 11.46 cy/ft | -7.43 cy/ft |
| Volume Change Above -19 ft NAVD88 | 4.64 cy/ft | 2.79 cy/ft |
| Volume Change Above -30 ft NAVD88 | 18.29 cy/ft | 18.53 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
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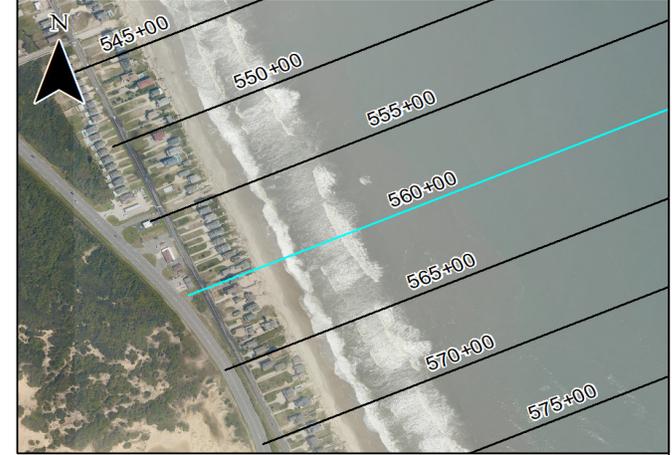


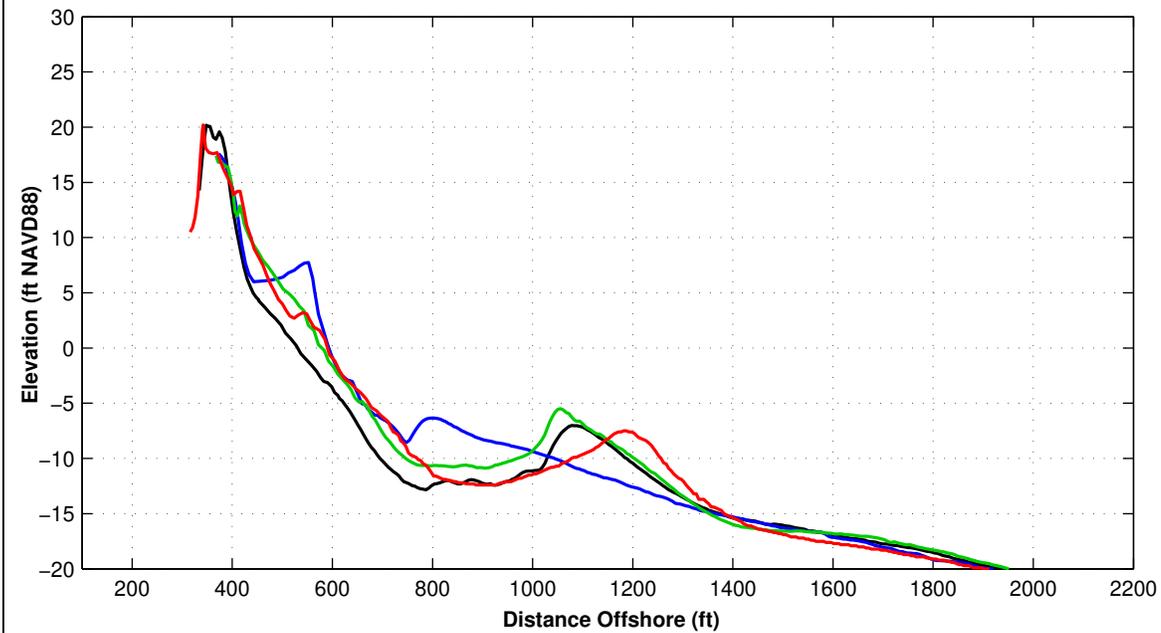
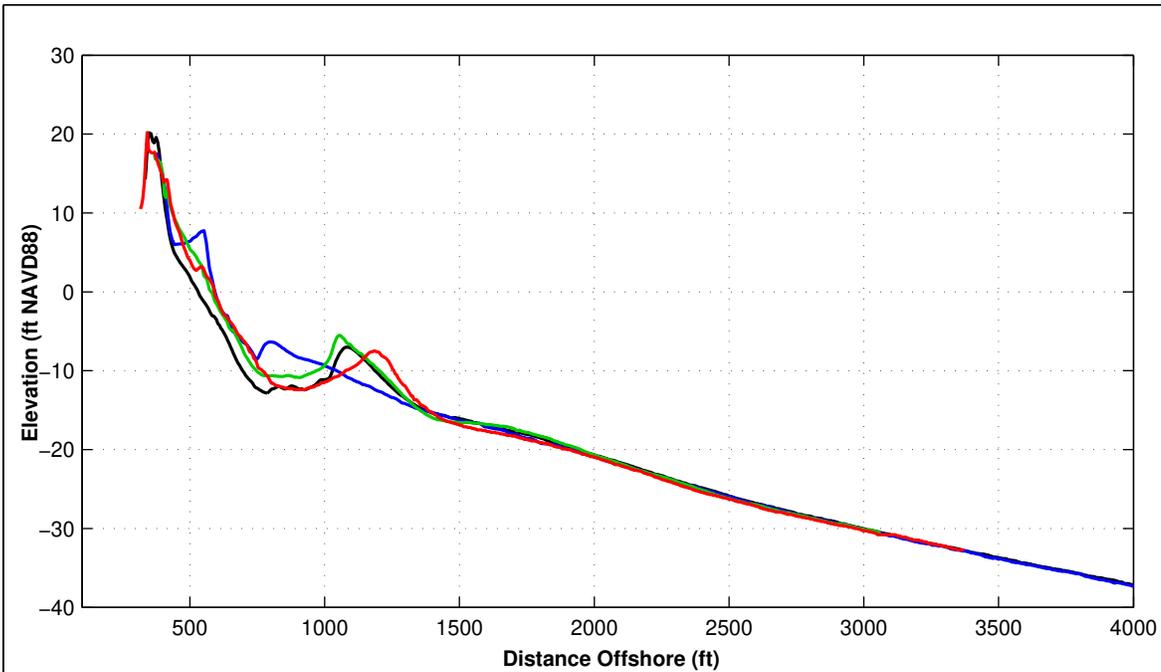
| Survey Transect 560+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 – AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -29.03 ft | -45.13 ft |
| Volume Change Above +6 ft NAVD88 | 4.05 cy/ft | 4.21 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -4.91 cy/ft | -12.59 cy/ft |
| Volume Change Above -6 ft NAVD88 | -6.58 cy/ft | -21.26 cy/ft |
| Volume Change Above -14 ft NAVD88 | 10.32 cy/ft | -42.54 cy/ft |
| Volume Change Above -19 ft NAVD88 | -8.83 cy/ft | -29.80 cy/ft |
| Volume Change Above -30 ft NAVD88 | -3.64 cy/ft | -19.48 cy/ft |

LEGEND:

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| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
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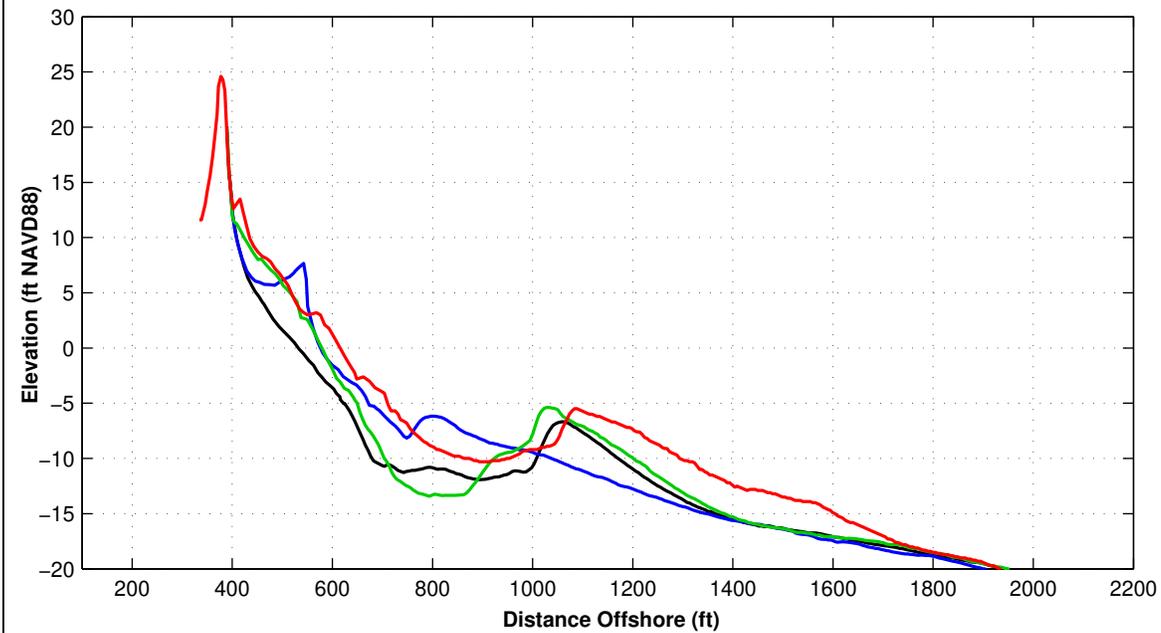
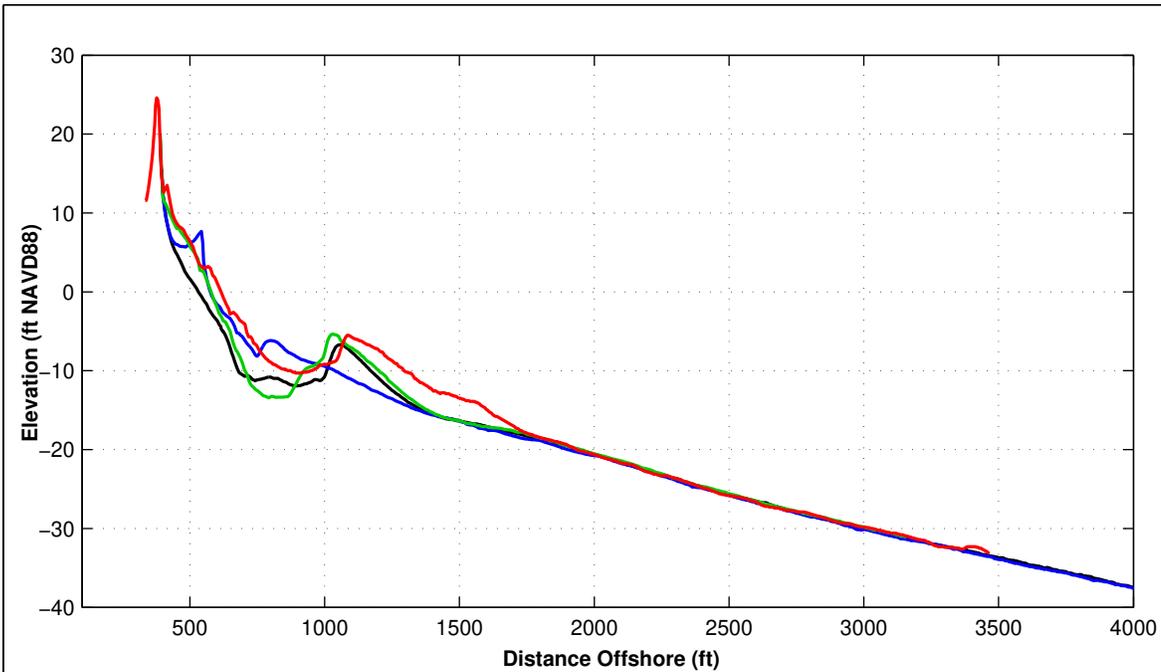
| Survey Transect 565+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -18.40 ft | -4.64 ft |
| Volume Change Above +6 ft NAVD88 | 3.29 cy/ft | 3.18 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -3.51 cy/ft | -6.17 cy/ft |
| Volume Change Above -6 ft NAVD88 | -5.66 cy/ft | -5.58 cy/ft |
| Volume Change Above -14 ft NAVD88 | -2.36 cy/ft | -15.44 cy/ft |
| Volume Change Above -19 ft NAVD88 | 0.60 cy/ft | -20.31 cy/ft |
| Volume Change Above -30 ft NAVD88 | 2.15 cy/ft | -28.78 cy/ft |

LEGEND:

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| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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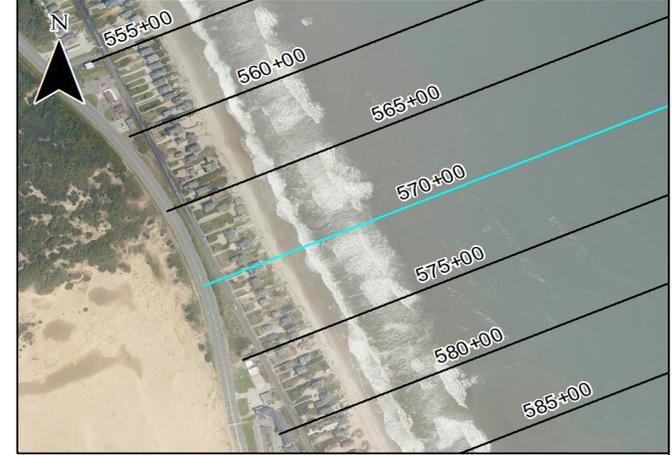


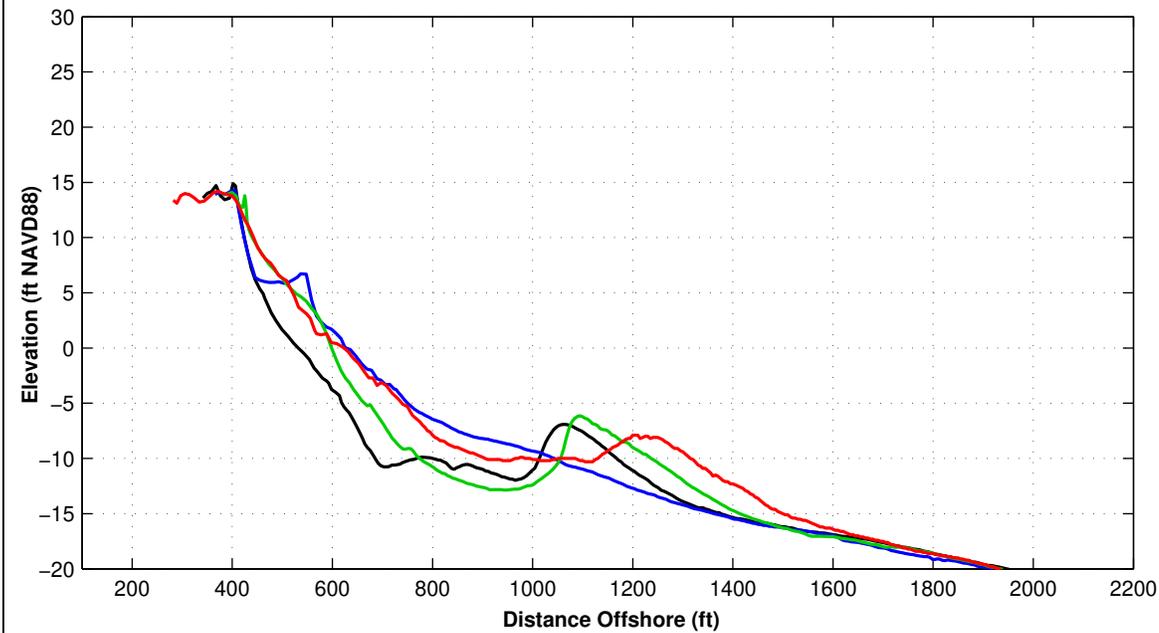
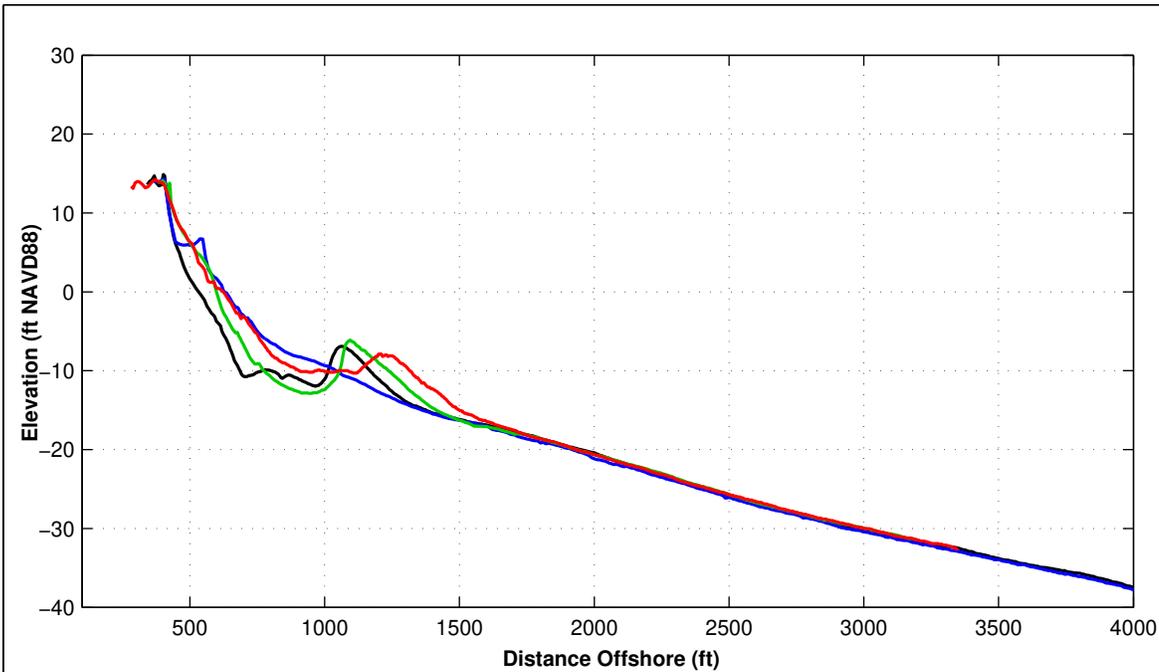
| Survey Transect 570+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | 0.25 ft | 35.02 ft |
| Volume Change Above +6 ft NAVD88 | 4.28 cy/ft | 8.07 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | 0.95 cy/ft | 7.45 cy/ft |
| Volume Change Above -6 ft NAVD88 | -2.09 cy/ft | 17.34 cy/ft |
| Volume Change Above -14 ft NAVD88 | -12.95 cy/ft | 65.52 cy/ft |
| Volume Change Above -19 ft NAVD88 | -5.49 cy/ft | 97.26 cy/ft |
| Volume Change Above -30 ft NAVD88 | 6.43 cy/ft | 104.06 cy/ft |

LEGEND:

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| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
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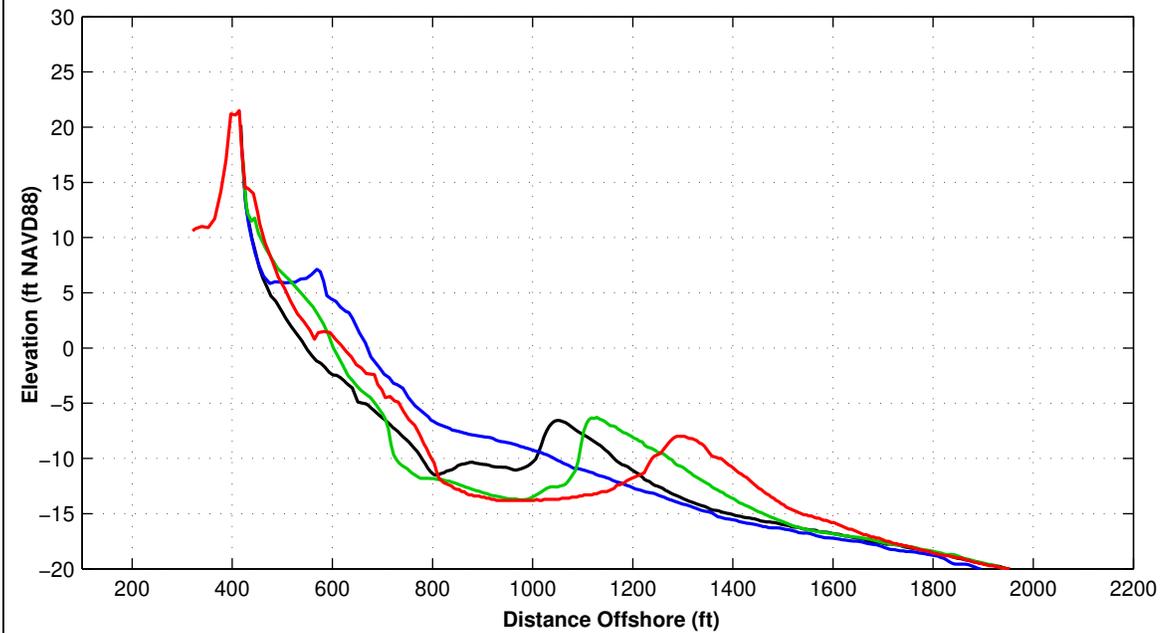
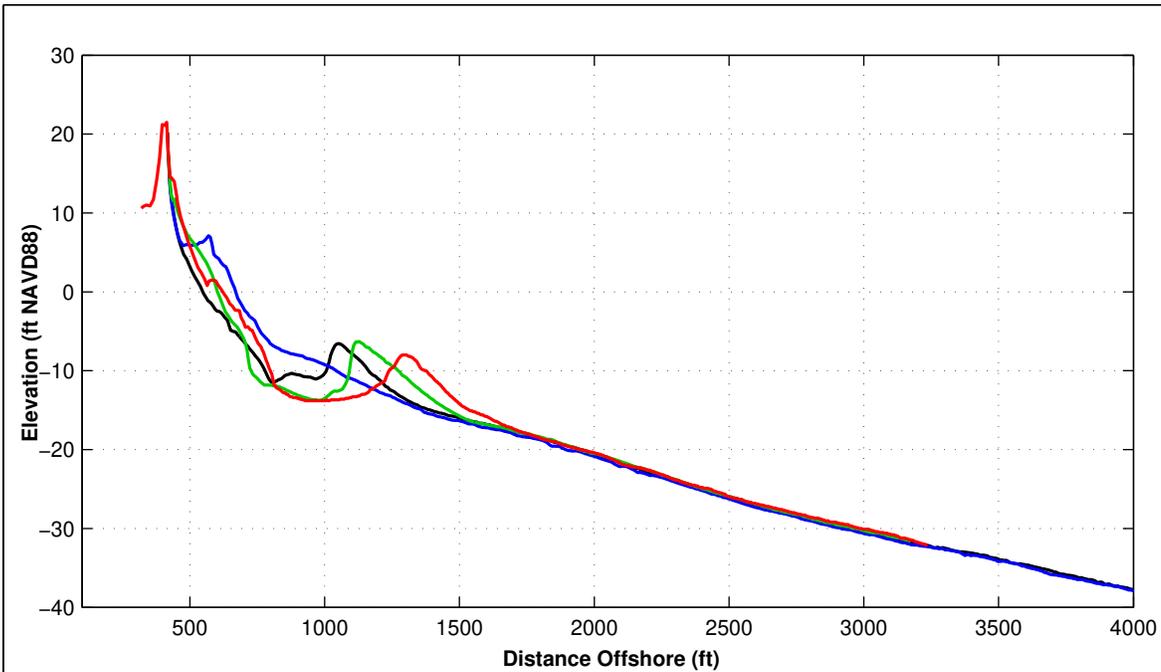
| Survey Transect 575+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -21.22 ft | -20.70 ft |
| Volume Change Above +6 ft NAVD88 | 5.87 cy/ft | 5.39 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | 3.31 cy/ft | 0.24 cy/ft |
| Volume Change Above -6 ft NAVD88 | -12.60 cy/ft | -2.98 cy/ft |
| Volume Change Above -14 ft NAVD88 | -23.95 cy/ft | 26.04 cy/ft |
| Volume Change Above -19 ft NAVD88 | -18.36 cy/ft | 43.03 cy/ft |
| Volume Change Above -30 ft NAVD88 | -2.08 cy/ft | 58.94 cy/ft |

LEGEND:

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| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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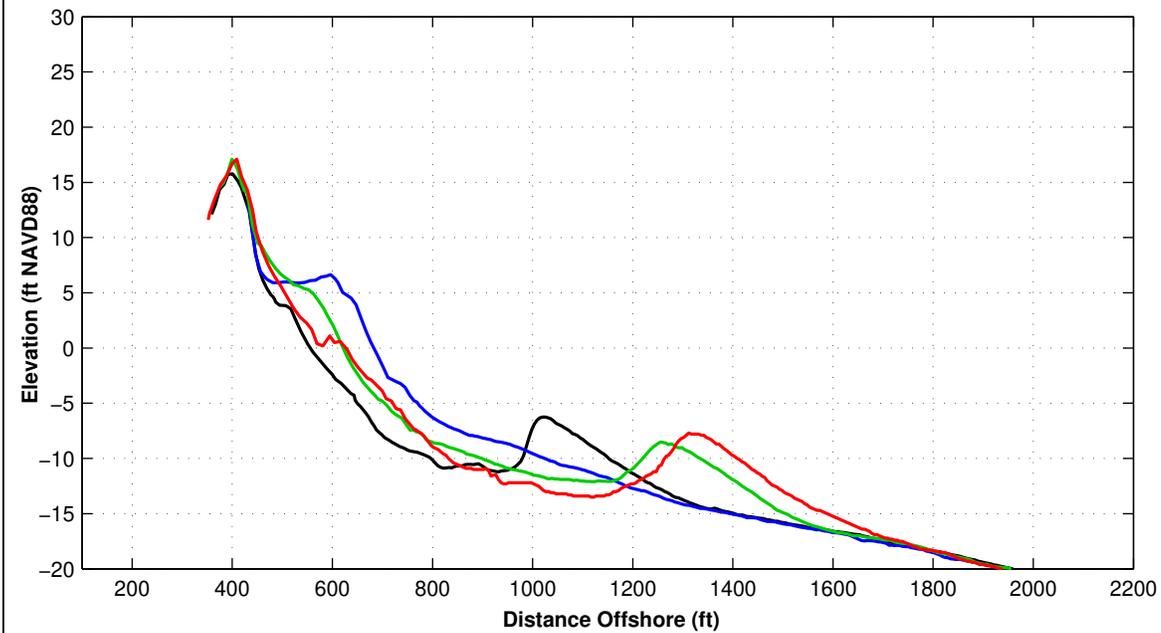
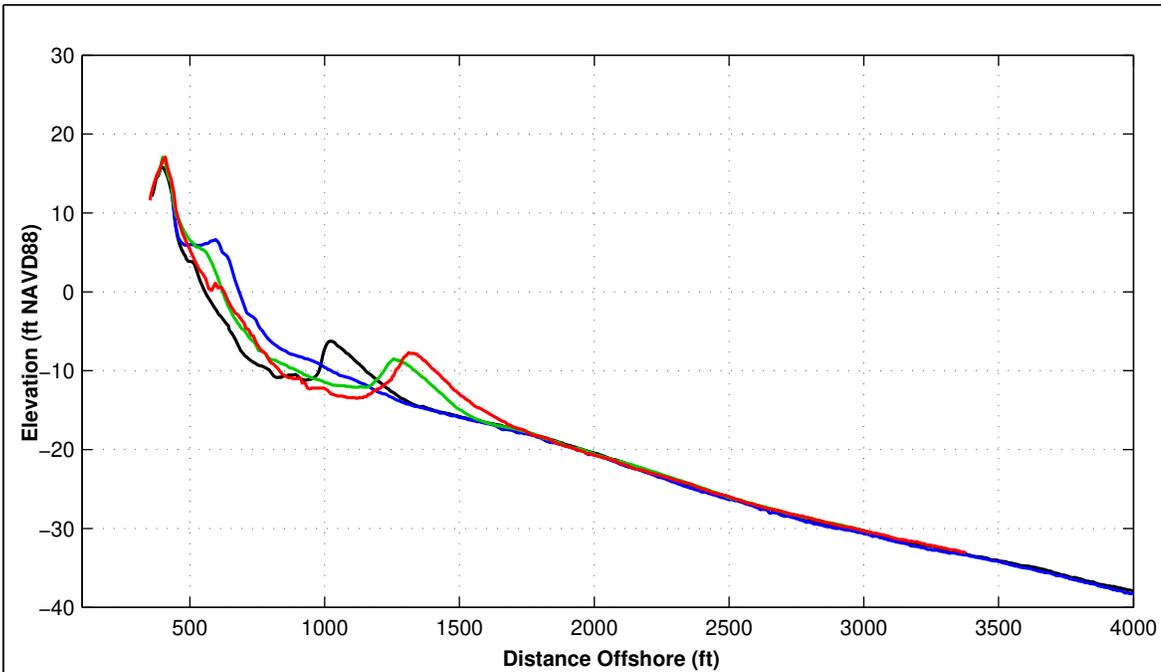
| Survey Transect 580+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -64.04 ft | -56.91 ft |
| Volume Change Above +6 ft NAVD88 | 4.67 cy/ft | 6.45 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -5.72 cy/ft | -9.58 cy/ft |
| Volume Change Above -6 ft NAVD88 | -25.37 cy/ft | -20.21 cy/ft |
| Volume Change Above -14 ft NAVD88 | -46.55 cy/ft | -42.19 cy/ft |
| Volume Change Above -19 ft NAVD88 | -33.49 cy/ft | -19.72 cy/ft |
| Volume Change Above -30 ft NAVD88 | -17.51 cy/ft | -1.49 cy/ft |

LEGEND:

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| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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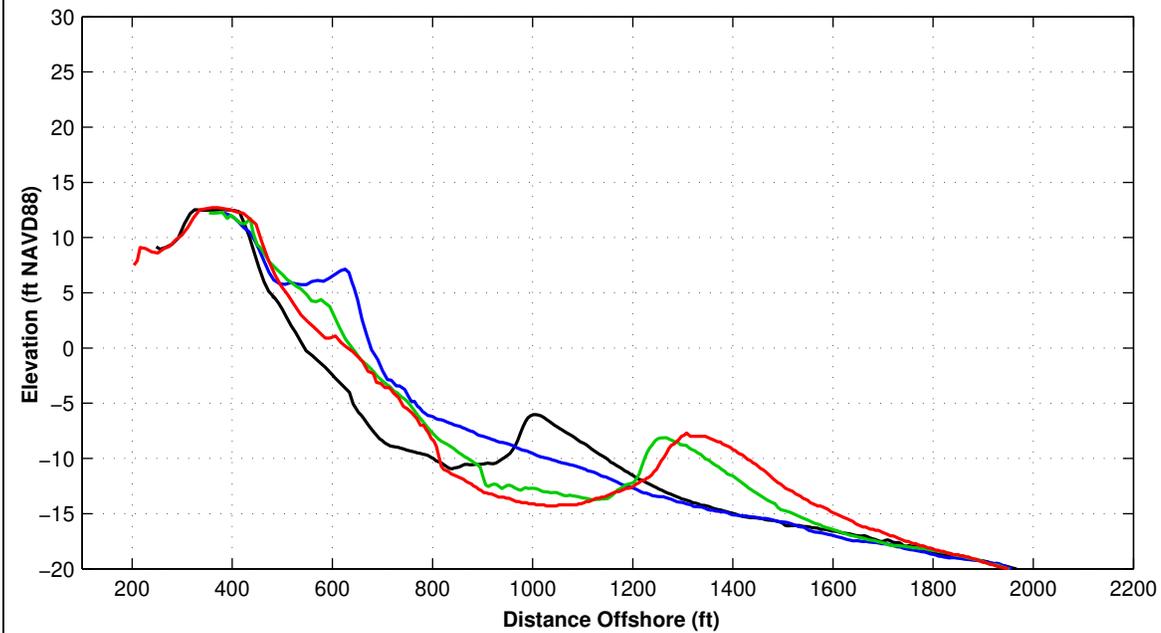
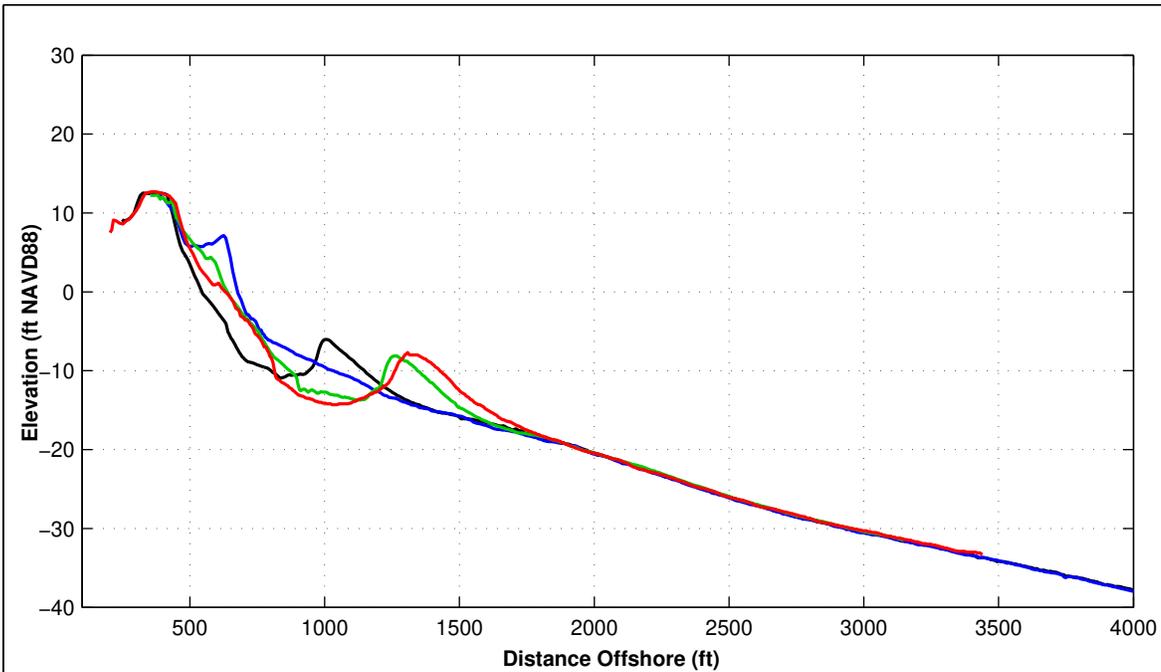
| Survey Transect 585+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -60.74 ft | -107.53 ft |
| Volume Change Above +6 ft NAVD88 | 5.49 cy/ft | 2.74 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -6.41 cy/ft | -18.31 cy/ft |
| Volume Change Above -6 ft NAVD88 | -23.45 cy/ft | -33.12 cy/ft |
| Volume Change Above -14 ft NAVD88 | -16.05 cy/ft | -31.81 cy/ft |
| Volume Change Above -19 ft NAVD88 | -5.05 cy/ft | -11.72 cy/ft |
| Volume Change Above -30 ft NAVD88 | 9.18 cy/ft | -1.34 cy/ft |

LEGEND:

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| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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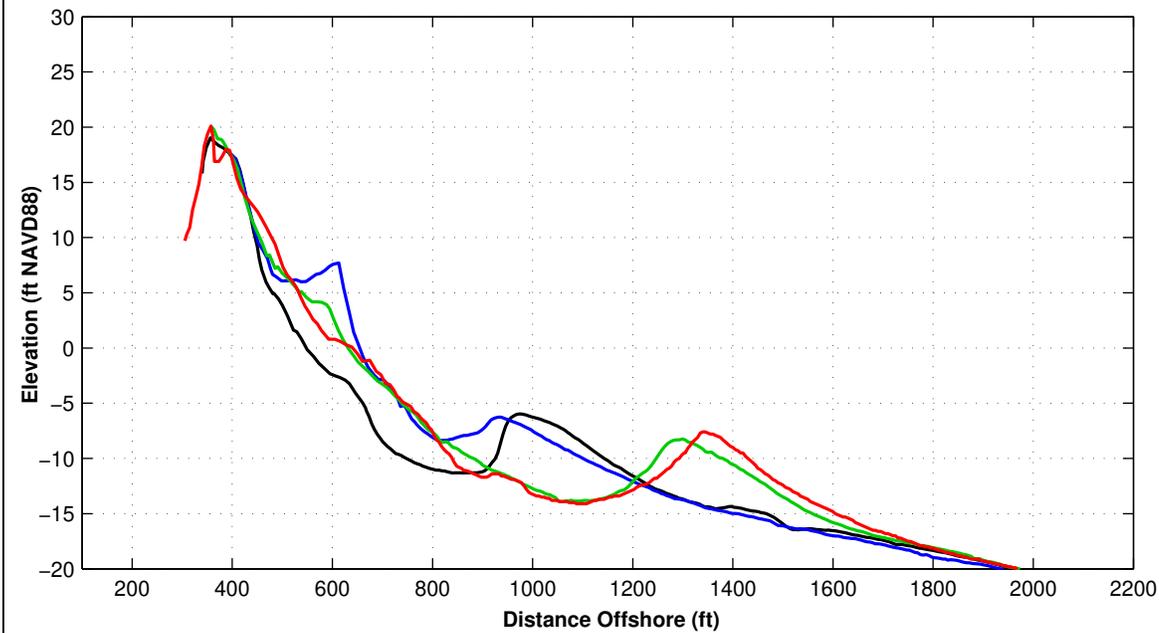
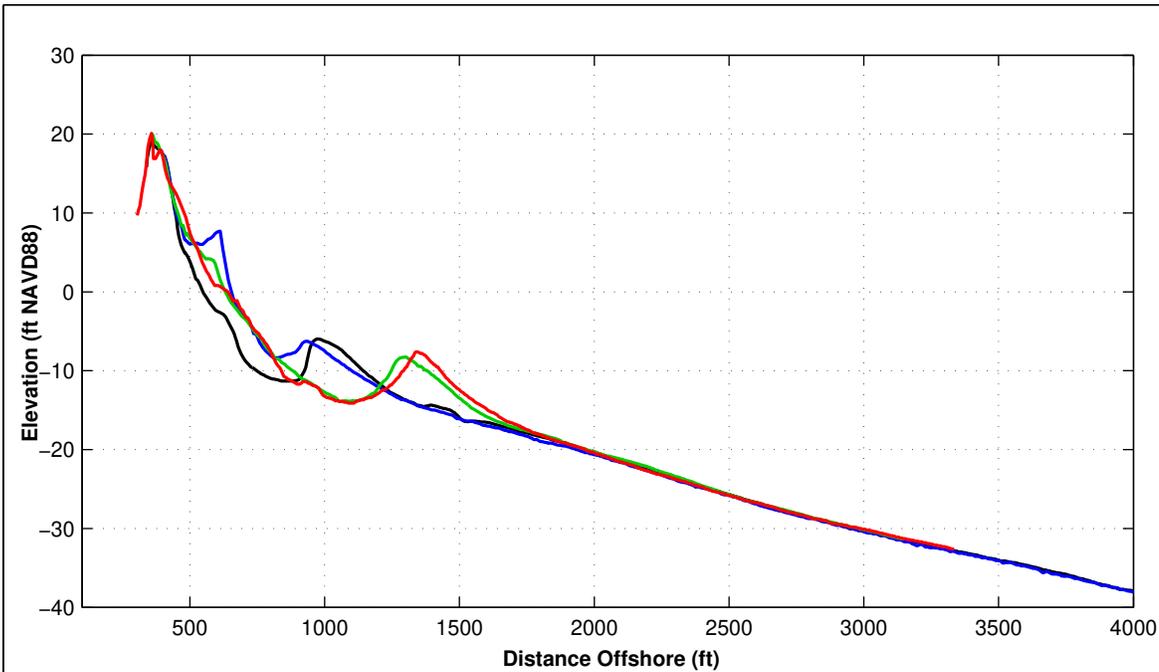


| Survey Transect 590+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -46.67 ft | -89.00 ft |
| Volume Change Above +6 ft NAVD88 | 1.00 cy/ft | 1.94 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -11.53 cy/ft | -19.51 cy/ft |
| Volume Change Above -6 ft NAVD88 | -18.18 cy/ft | -28.62 cy/ft |
| Volume Change Above -14 ft NAVD88 | -24.84 cy/ft | -38.23 cy/ft |
| Volume Change Above -19 ft NAVD88 | -12.17 cy/ft | -14.48 cy/ft |
| Volume Change Above -30 ft NAVD88 | -5.09 cy/ft | -10.01 cy/ft |

LEGEND:
 JUNE 2020 — AUGUST 2019 —
 POST-DORIAN — APRIL 2019 —

- Notes:
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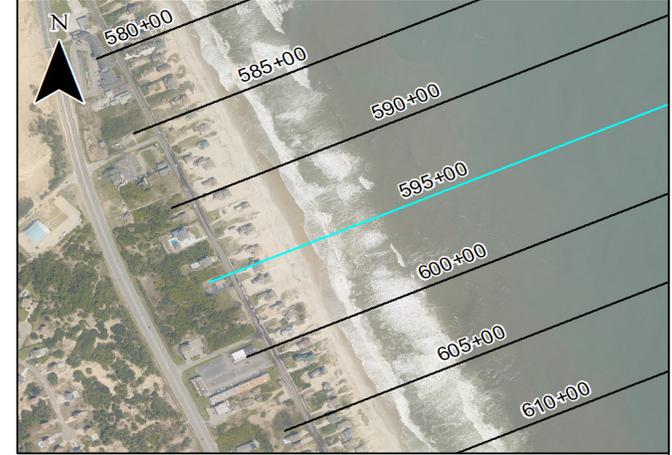


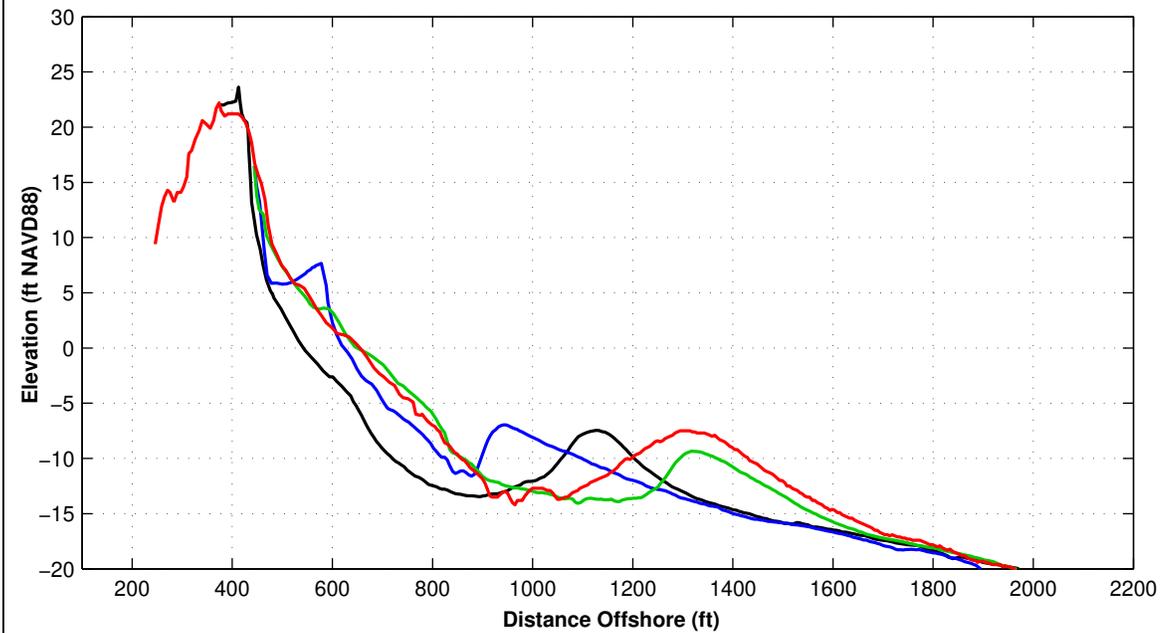
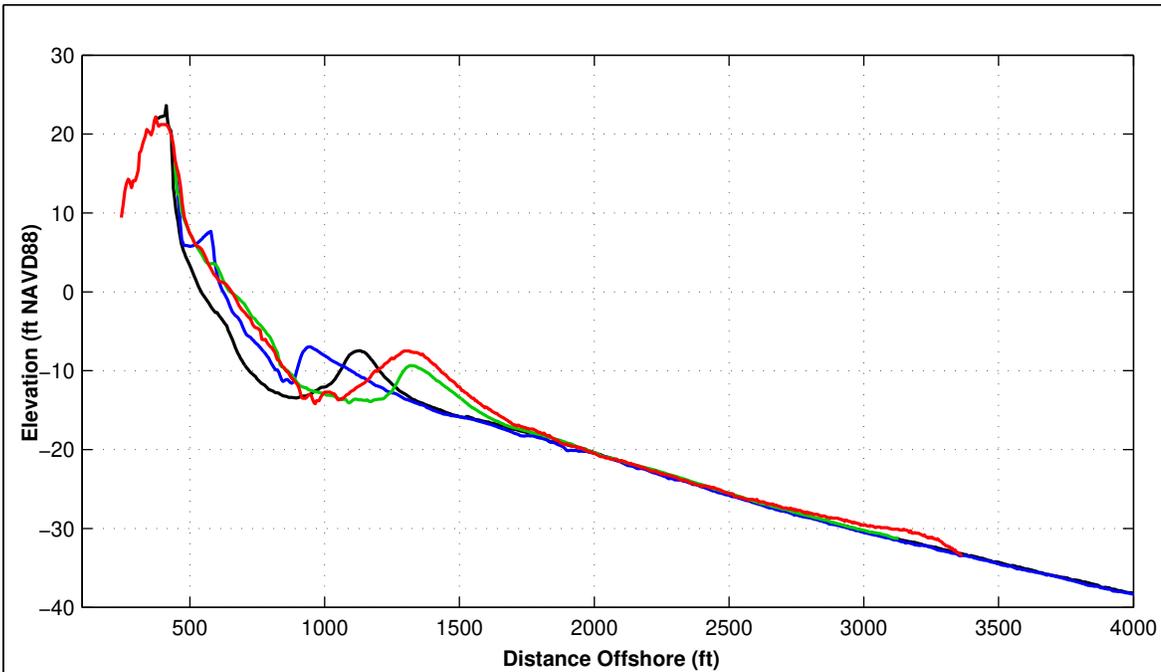
| Survey Transect 595+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -28.26 ft | -58.96 ft |
| Volume Change Above +6 ft NAVD88 | -1.48 cy/ft | 3.06 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -11.27 cy/ft | -11.47 cy/ft |
| Volume Change Above -6 ft NAVD88 | -13.97 cy/ft | -12.08 cy/ft |
| Volume Change Above -14 ft NAVD88 | -25.05 cy/ft | -25.66 cy/ft |
| Volume Change Above -19 ft NAVD88 | -4.18 cy/ft | 0.10 cy/ft |
| Volume Change Above -30 ft NAVD88 | 8.93 cy/ft | 6.20 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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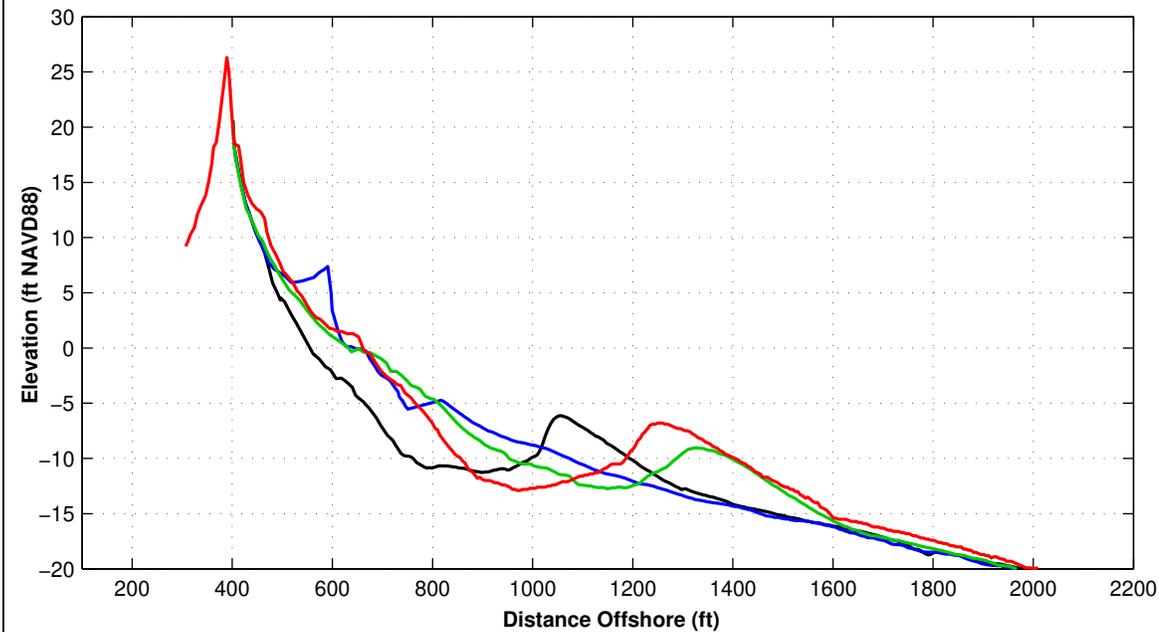
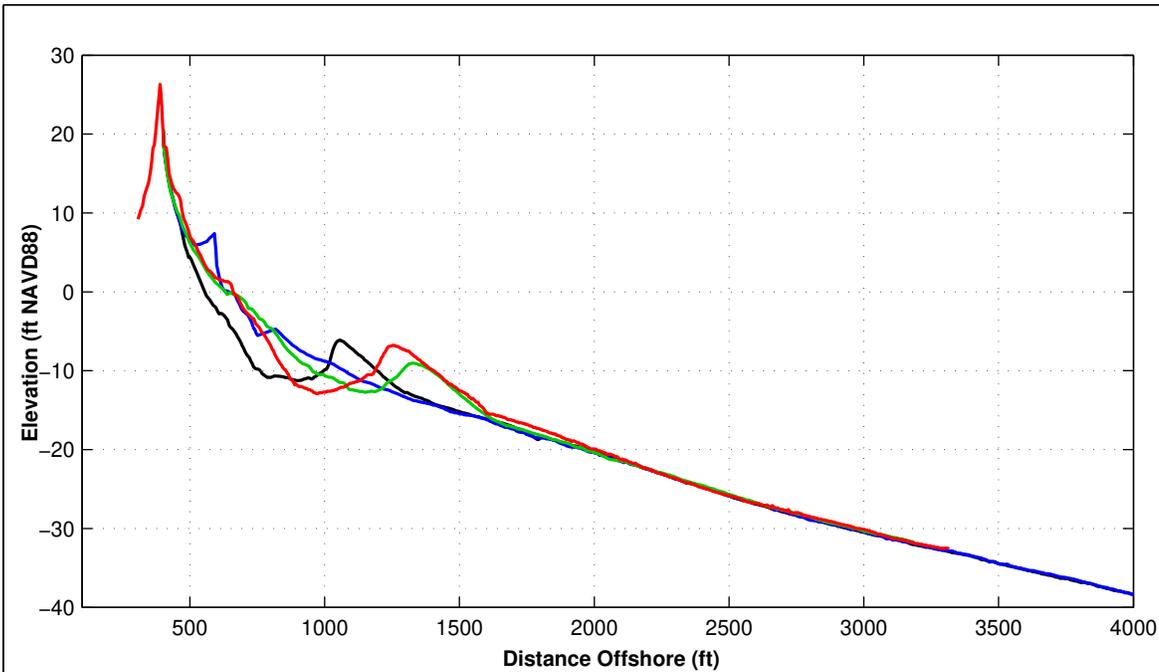
| Survey Transect 600+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | 19.16 ft | 14.80 ft |
| Volume Change Above +6 ft NAVD88 | 2.13 cy/ft | 4.79 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -0.86 cy/ft | 0.50 cy/ft |
| Volume Change Above -6 ft NAVD88 | 13.41 cy/ft | 10.83 cy/ft |
| Volume Change Above -14 ft NAVD88 | 2.88 cy/ft | 33.63 cy/ft |
| Volume Change Above -19 ft NAVD88 | 20.79 cy/ft | 58.41 cy/ft |
| Volume Change Above -30 ft NAVD88 | 32.41 cy/ft | 74.64 cy/ft |

LEGEND:

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| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
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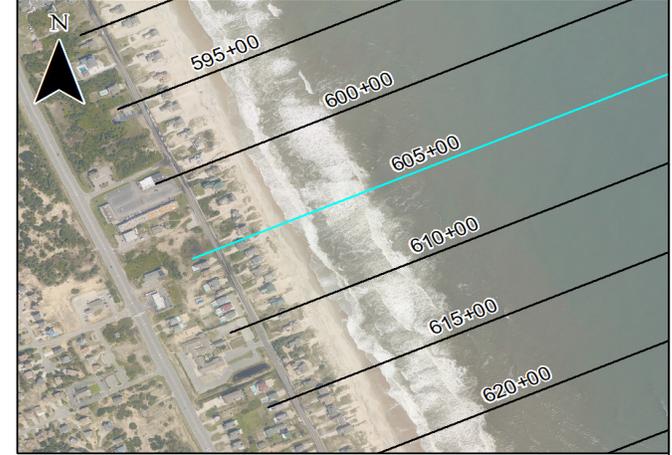


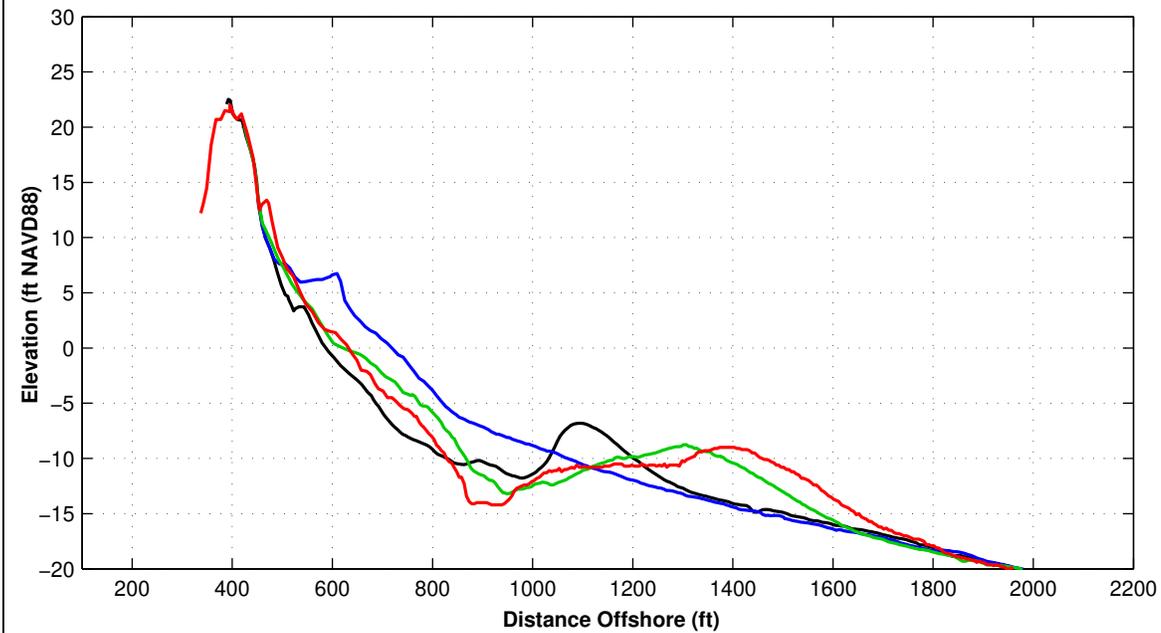
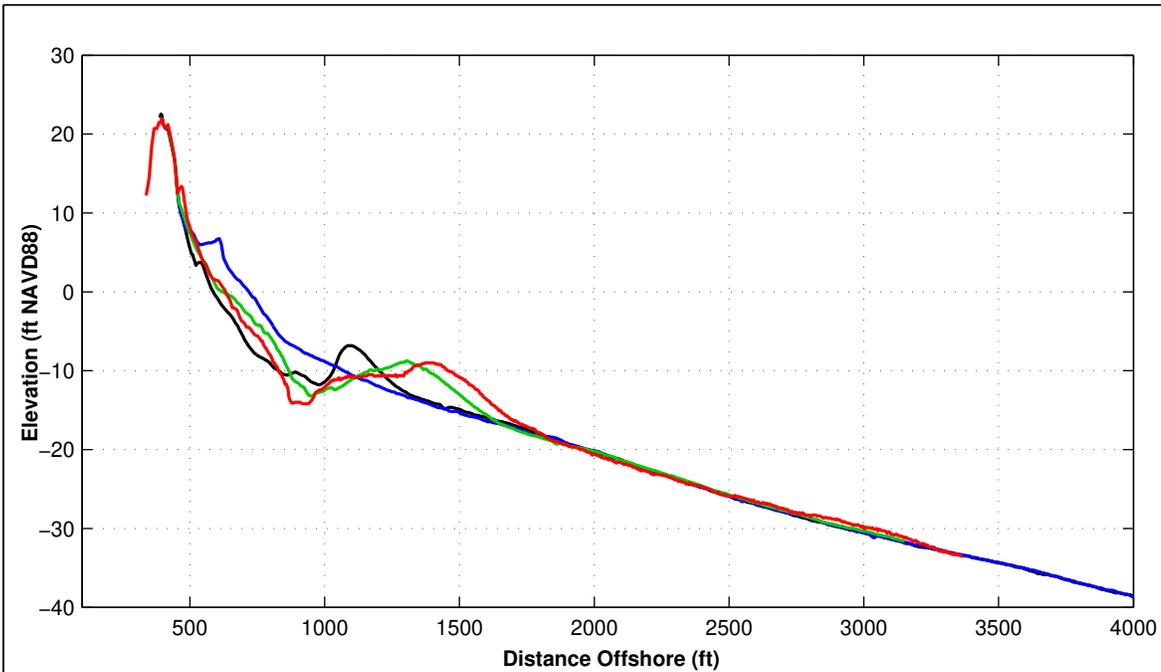
| Survey Transect 605+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -18.91 ft | 31.58 ft |
| Volume Change Above +6 ft NAVD88 | -0.93 cy/ft | 5.36 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -10.72 cy/ft | -2.03 cy/ft |
| Volume Change Above -6 ft NAVD88 | -5.33 cy/ft | -0.86 cy/ft |
| Volume Change Above -14 ft NAVD88 | 7.20 cy/ft | 13.76 cy/ft |
| Volume Change Above -19 ft NAVD88 | 18.39 cy/ft | 34.32 cy/ft |
| Volume Change Above -30 ft NAVD88 | 23.49 cy/ft | 41.72 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
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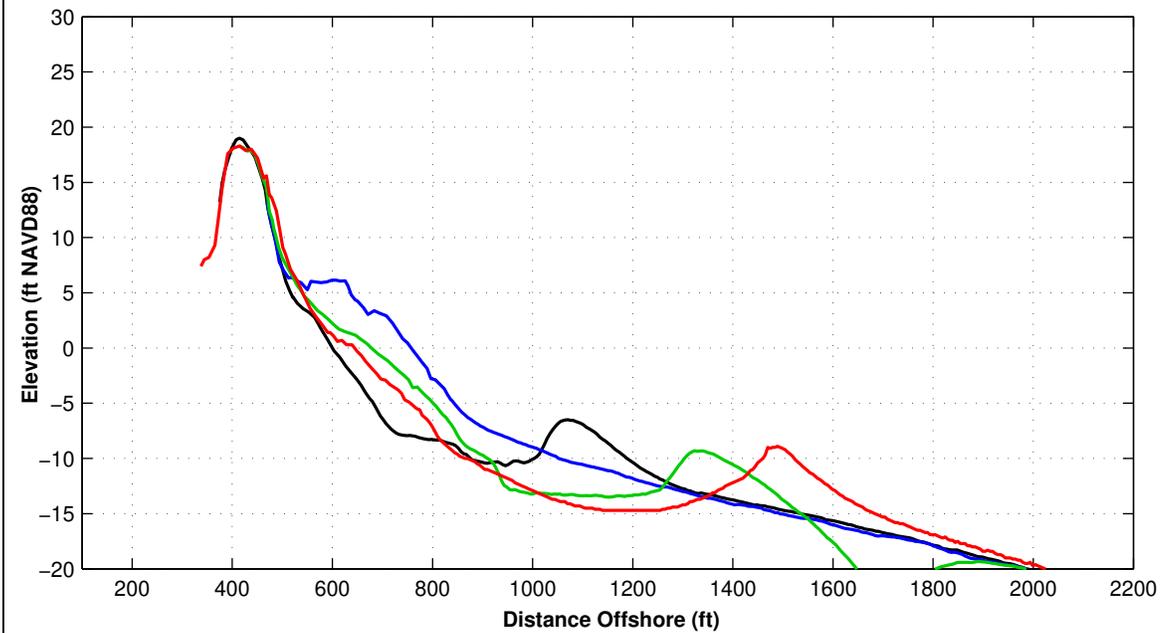
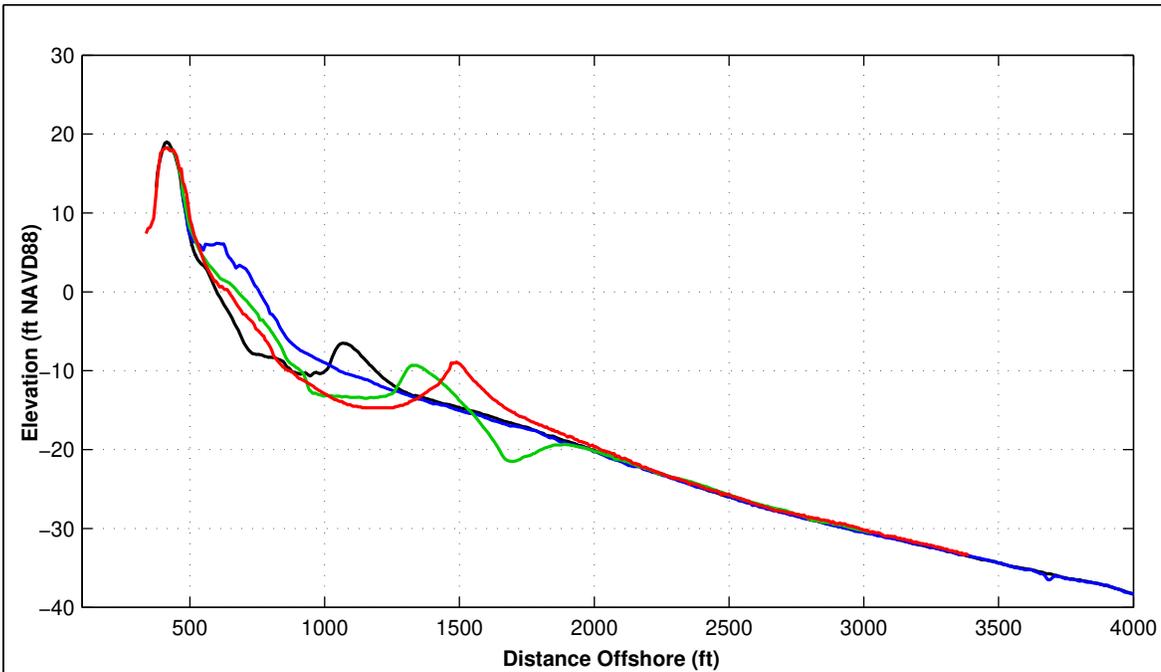
| Survey Transect 610+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -99.84 ft | -80.11 ft |
| Volume Change Above +6 ft NAVD88 | -0.55 cy/ft | 2.75 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -15.81 cy/ft | -12.18 cy/ft |
| Volume Change Above -6 ft NAVD88 | -33.98 cy/ft | -36.92 cy/ft |
| Volume Change Above -14 ft NAVD88 | -28.14 cy/ft | -34.25 cy/ft |
| Volume Change Above -19 ft NAVD88 | -20.88 cy/ft | -15.78 cy/ft |
| Volume Change Above -30 ft NAVD88 | -17.22 cy/ft | -12.04 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
1. Station From North To South At Varying Intervals.
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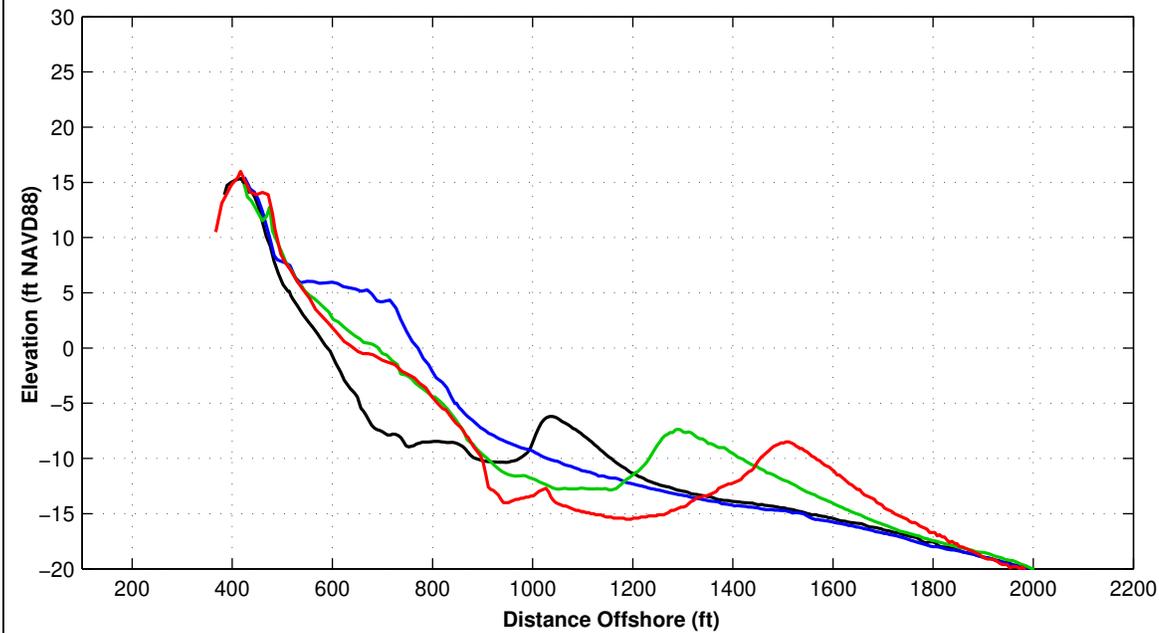
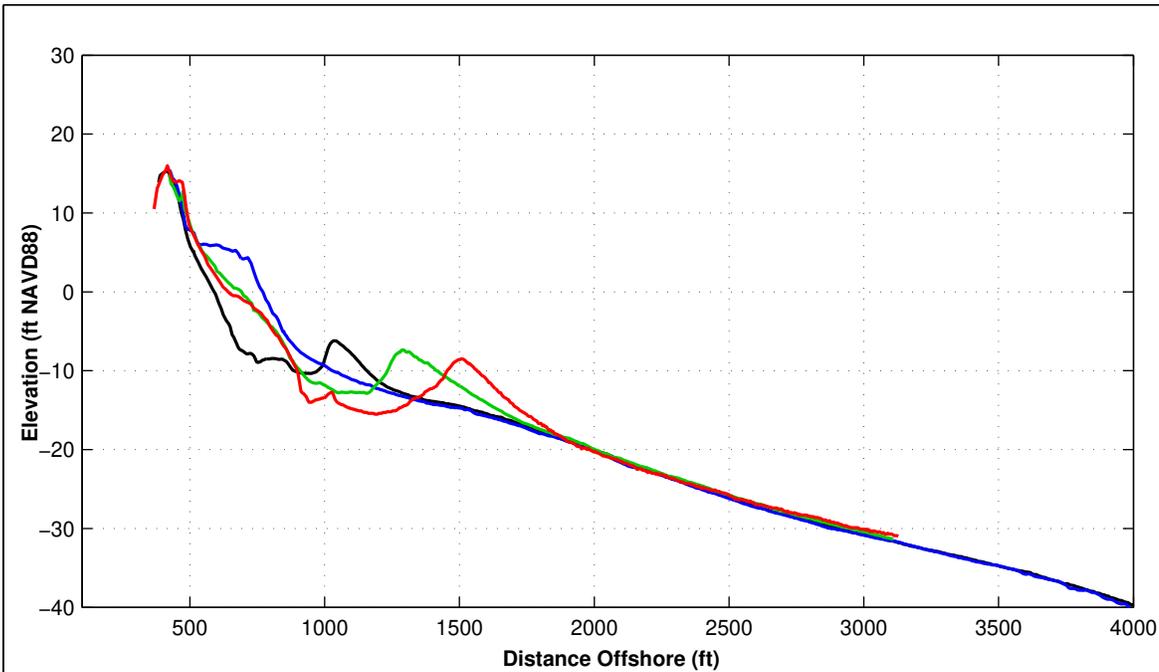
| Survey Transect 615+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -91.39 ft | -135.21 ft |
| Volume Change Above +6 ft NAVD88 | 1.00 cy/ft | 3.94 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -17.44 cy/ft | -16.67 cy/ft |
| Volume Change Above -6 ft NAVD88 | -33.39 cy/ft | -44.33 cy/ft |
| Volume Change Above -14 ft NAVD88 | -52.77 cy/ft | -74.76 cy/ft |
| Volume Change Above -19 ft NAVD88 | -67.06 cy/ft | -55.21 cy/ft |
| Volume Change Above -30 ft NAVD88 | -72.55 cy/ft | -42.96 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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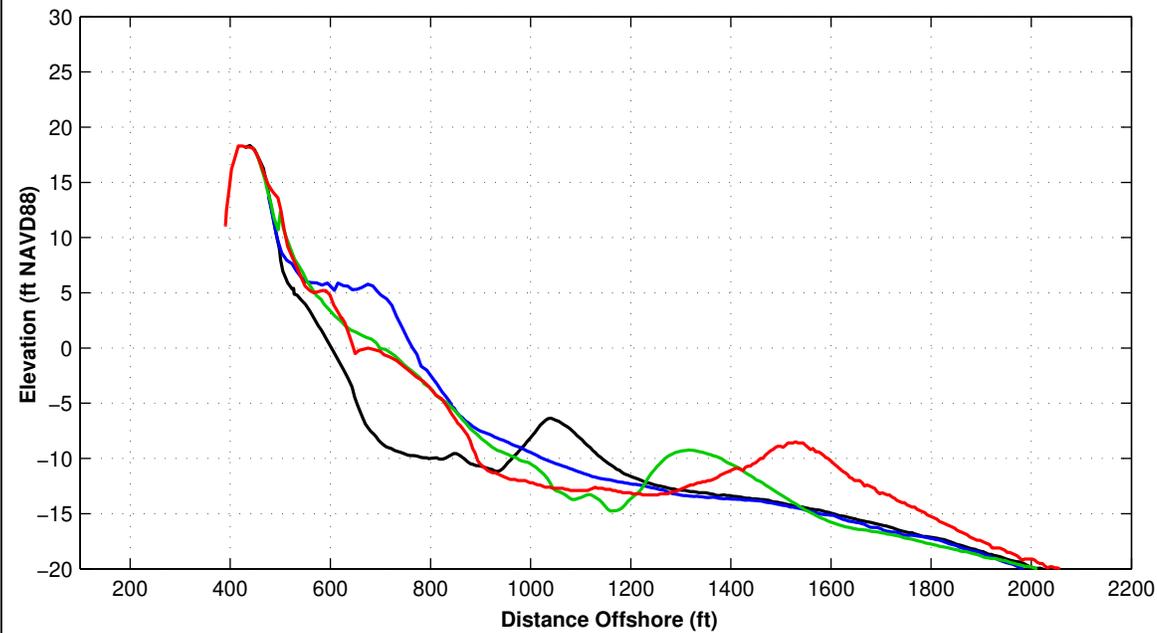
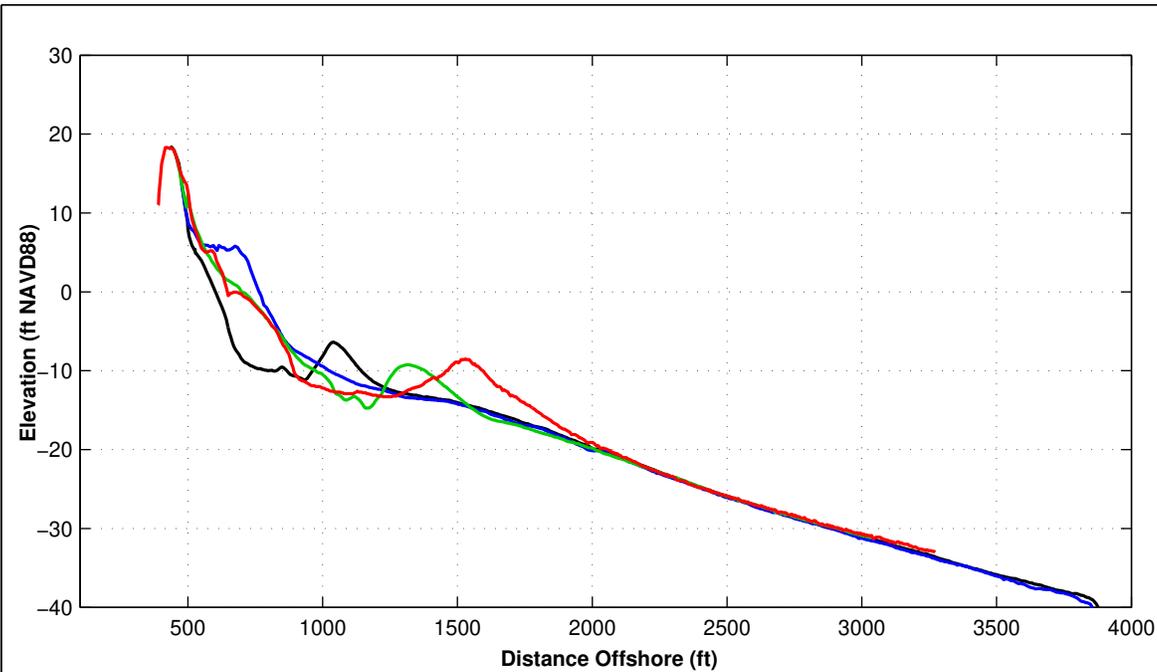
| Survey Transect 620+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -109.51 ft | -139.59 ft |
| Volume Change Above +6 ft NAVD88 | 0.42 cy/ft | 3.55 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -21.32 cy/ft | -20.82 cy/ft |
| Volume Change Above -6 ft NAVD88 | -36.88 cy/ft | -39.54 cy/ft |
| Volume Change Above -14 ft NAVD88 | -12.78 cy/ft | -49.85 cy/ft |
| Volume Change Above -19 ft NAVD88 | 2.16 cy/ft | -35.73 cy/ft |
| Volume Change Above -30 ft NAVD88 | 16.55 cy/ft | -24.80 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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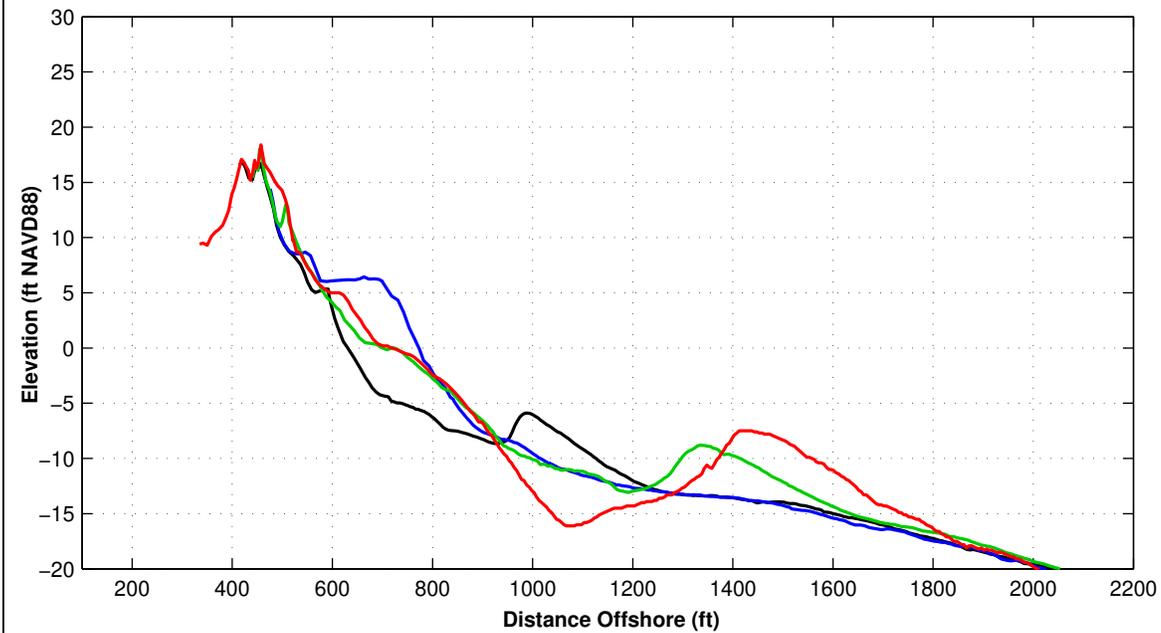
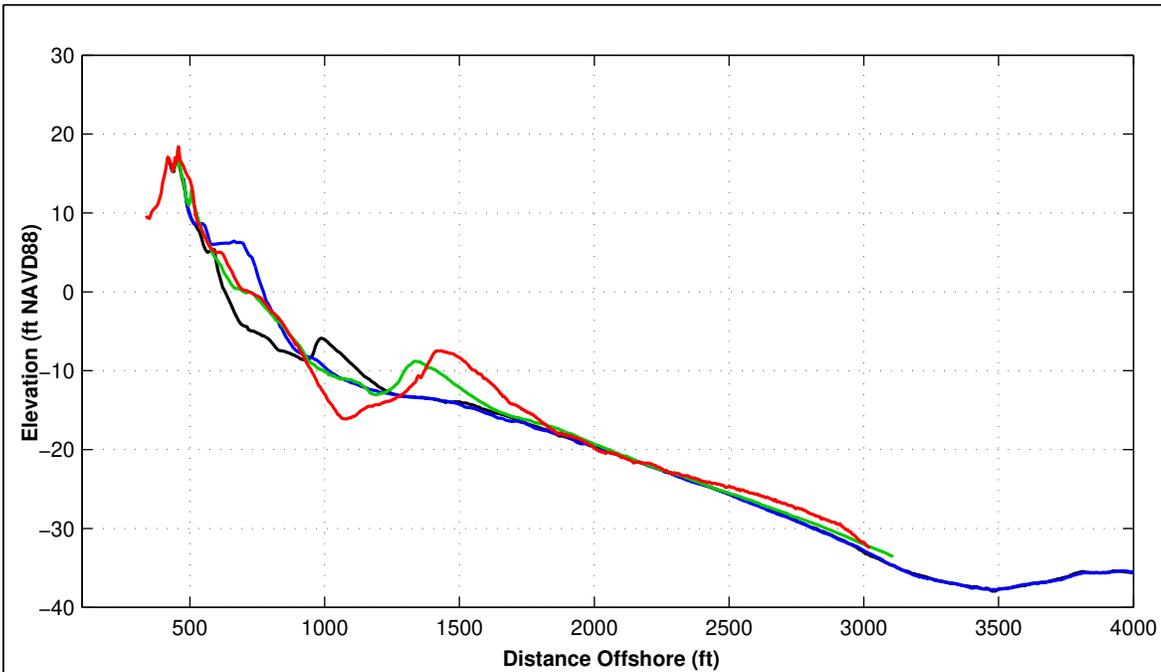
| Survey Transect 625+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -88.46 ft | -113.00 ft |
| Volume Change Above +6 ft NAVD88 | 3.04 cy/ft | 4.27 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -17.03 cy/ft | -14.64 cy/ft |
| Volume Change Above -6 ft NAVD88 | -25.72 cy/ft | -26.67 cy/ft |
| Volume Change Above -14 ft NAVD88 | -16.75 cy/ft | -8.64 cy/ft |
| Volume Change Above -19 ft NAVD88 | -22.47 cy/ft | 17.61 cy/ft |
| Volume Change Above -30 ft NAVD88 | -18.61 cy/ft | 26.21 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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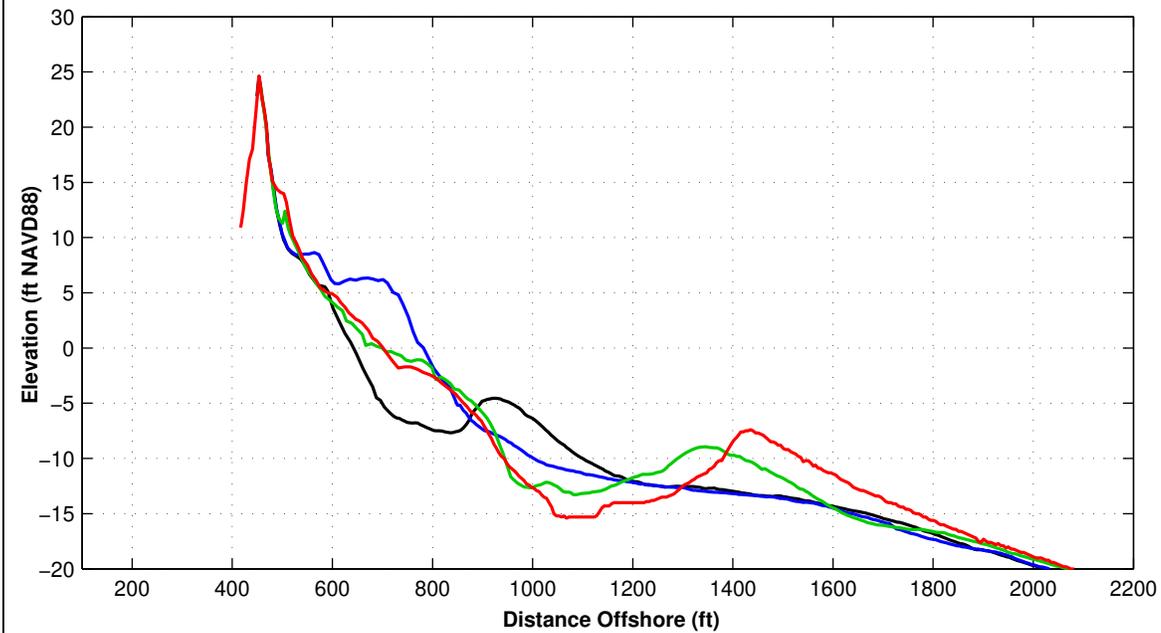
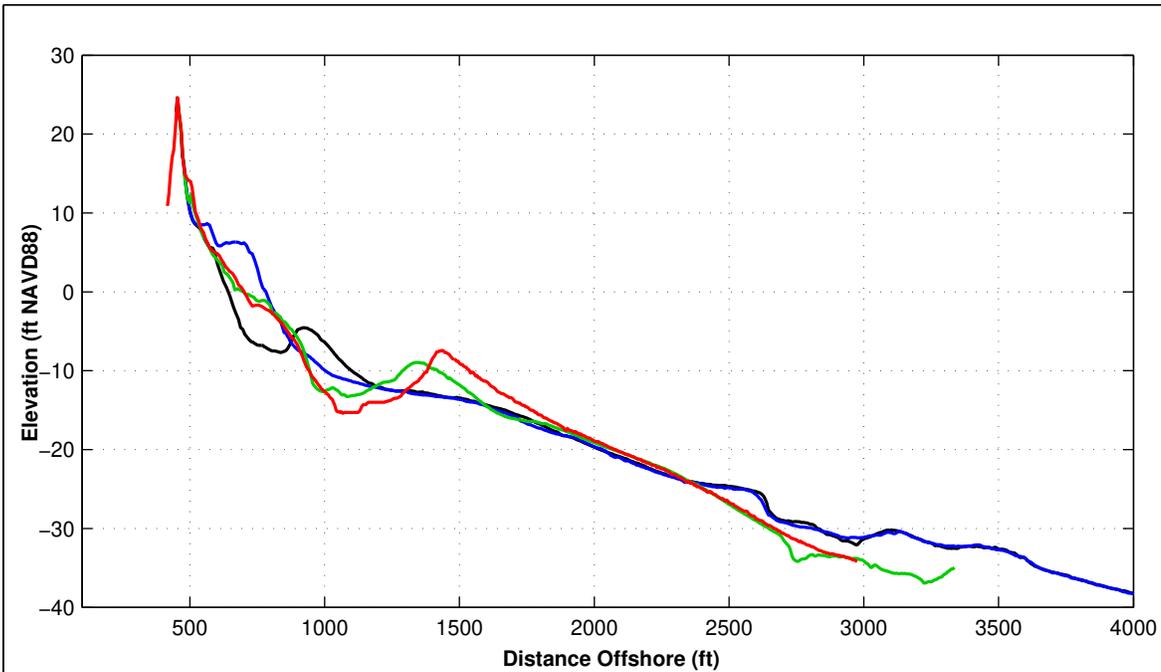
| Survey Transect 630+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -110.54 ft | -84.36 ft |
| Volume Change Above +6 ft NAVD88 | 1.41 cy/ft | 3.65 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -21.05 cy/ft | -14.37 cy/ft |
| Volume Change Above -6 ft NAVD88 | -26.93 cy/ft | -17.53 cy/ft |
| Volume Change Above -14 ft NAVD88 | 5.31 cy/ft | 9.32 cy/ft |
| Volume Change Above -19 ft NAVD88 | 17.23 cy/ft | 19.85 cy/ft |
| Volume Change Above -30 ft NAVD88 | 26.16 cy/ft | 45.96 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
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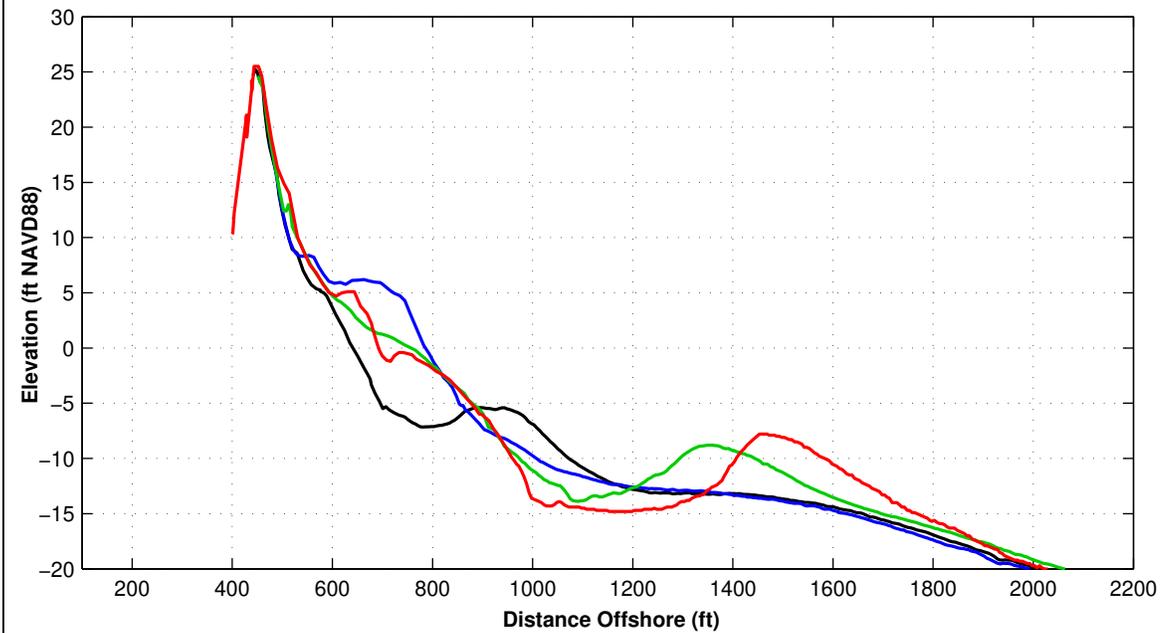
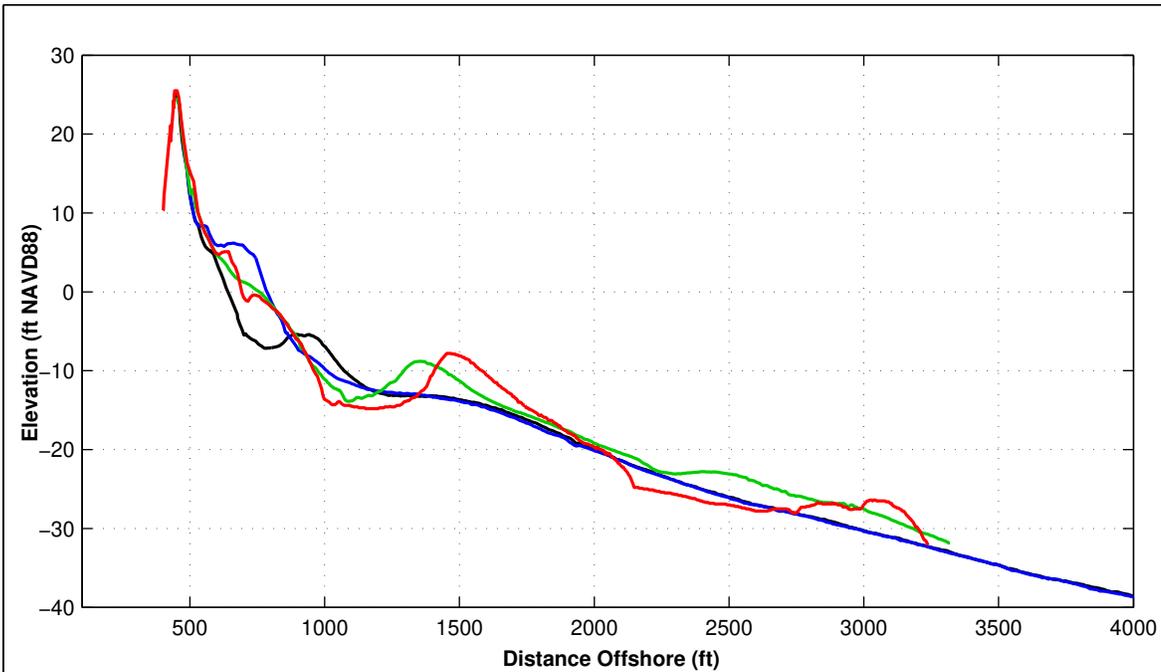
| Survey Transect 635+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -104.18 ft | -87.19 ft |
| Volume Change Above +6 ft NAVD88 | -1.34 cy/ft | 0.61 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -24.49 cy/ft | -19.89 cy/ft |
| Volume Change Above -6 ft NAVD88 | -29.37 cy/ft | -28.75 cy/ft |
| Volume Change Above -14 ft NAVD88 | -11.98 cy/ft | -11.71 cy/ft |
| Volume Change Above -19 ft NAVD88 | -7.88 cy/ft | 2.69 cy/ft |
| Volume Change Above -30 ft NAVD88 | -22.09 cy/ft | -9.85 cy/ft |

LEGEND:

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| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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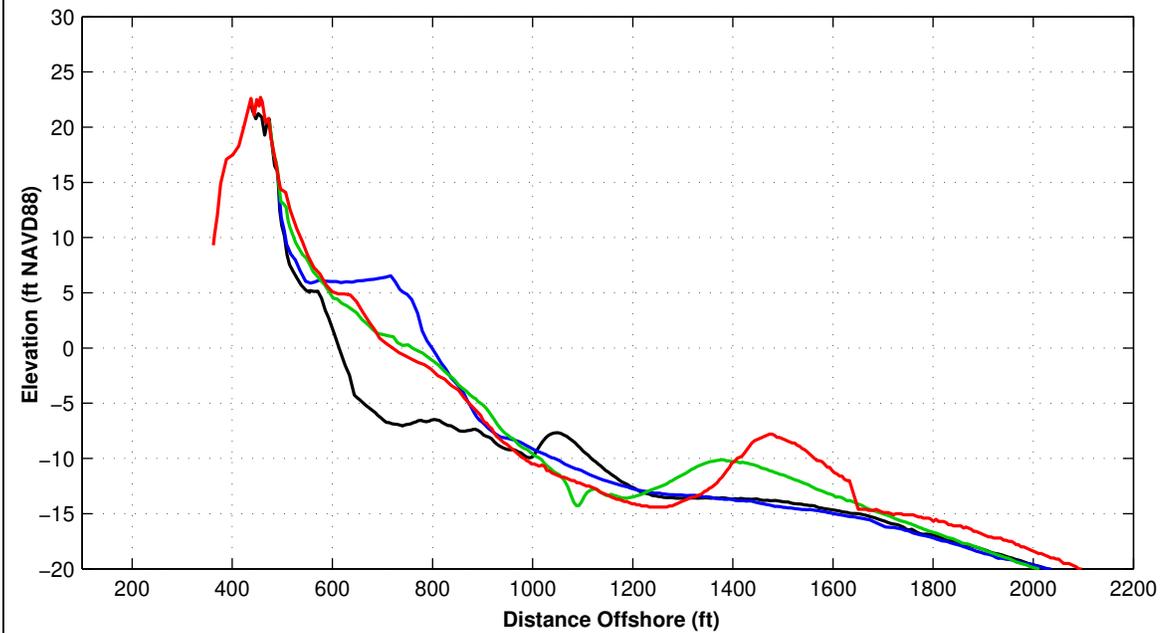
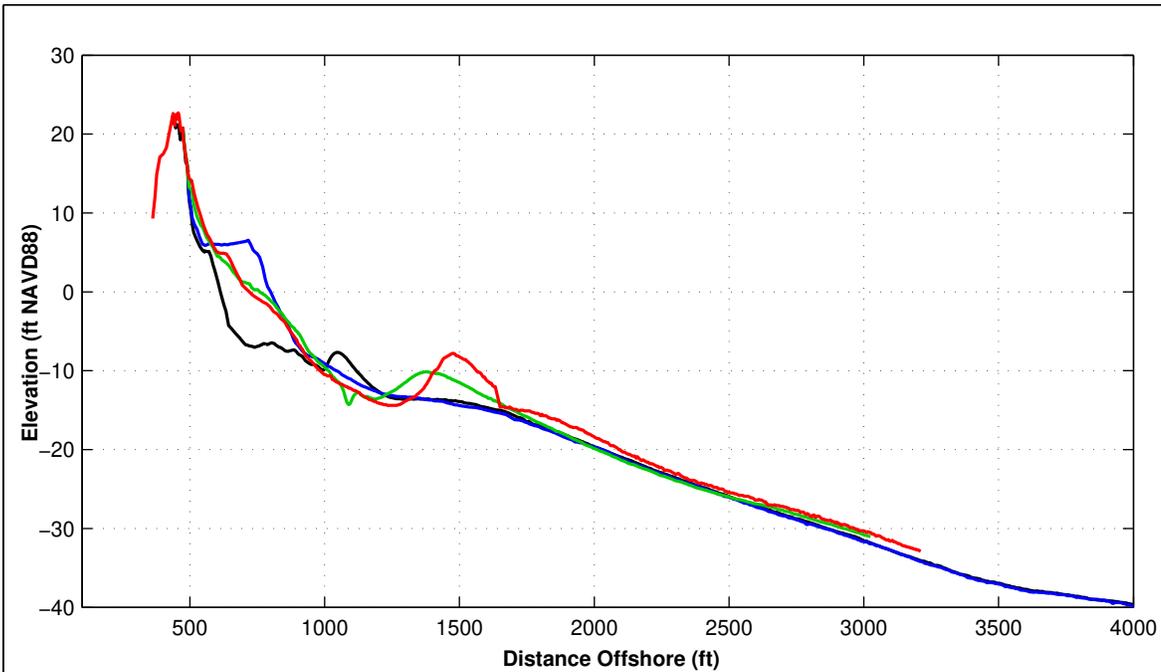
| Survey Transect 640+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -69.62 ft | -89.34 ft |
| Volume Change Above +6 ft NAVD88 | 1.41 cy/ft | 4.13 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -18.91 cy/ft | -12.78 cy/ft |
| Volume Change Above -6 ft NAVD88 | -19.79 cy/ft | -18.38 cy/ft |
| Volume Change Above -14 ft NAVD88 | 6.80 cy/ft | 2.15 cy/ft |
| Volume Change Above -19 ft NAVD88 | 21.42 cy/ft | 16.71 cy/ft |
| Volume Change Above -30 ft NAVD88 | 106.47 cy/ft | 29.56 cy/ft |

LEGEND:

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| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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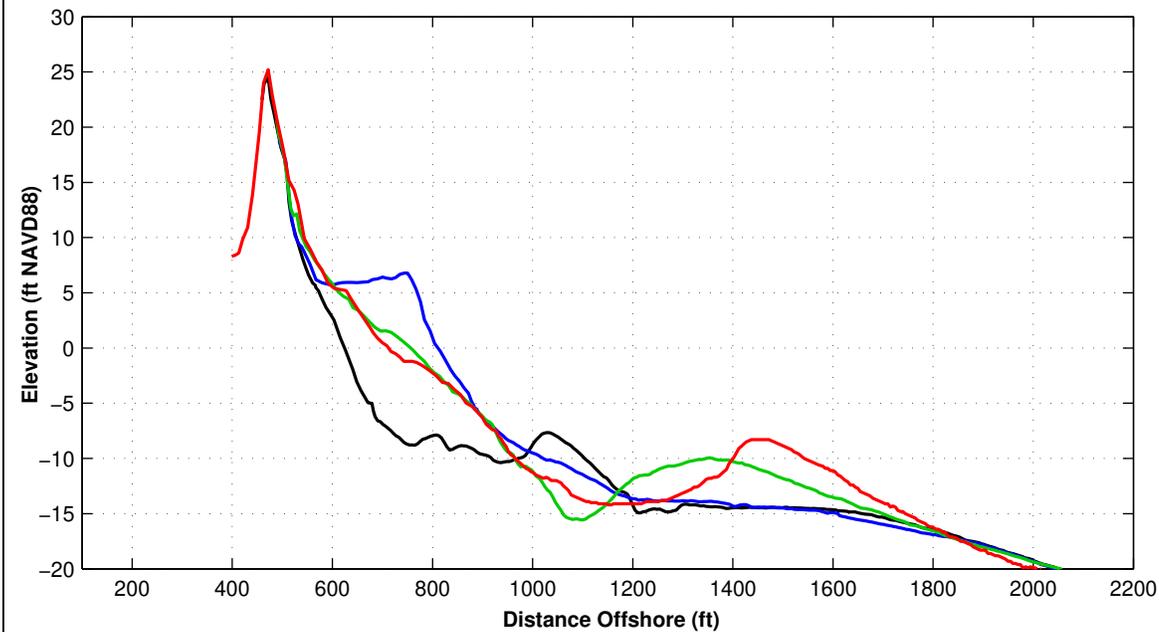
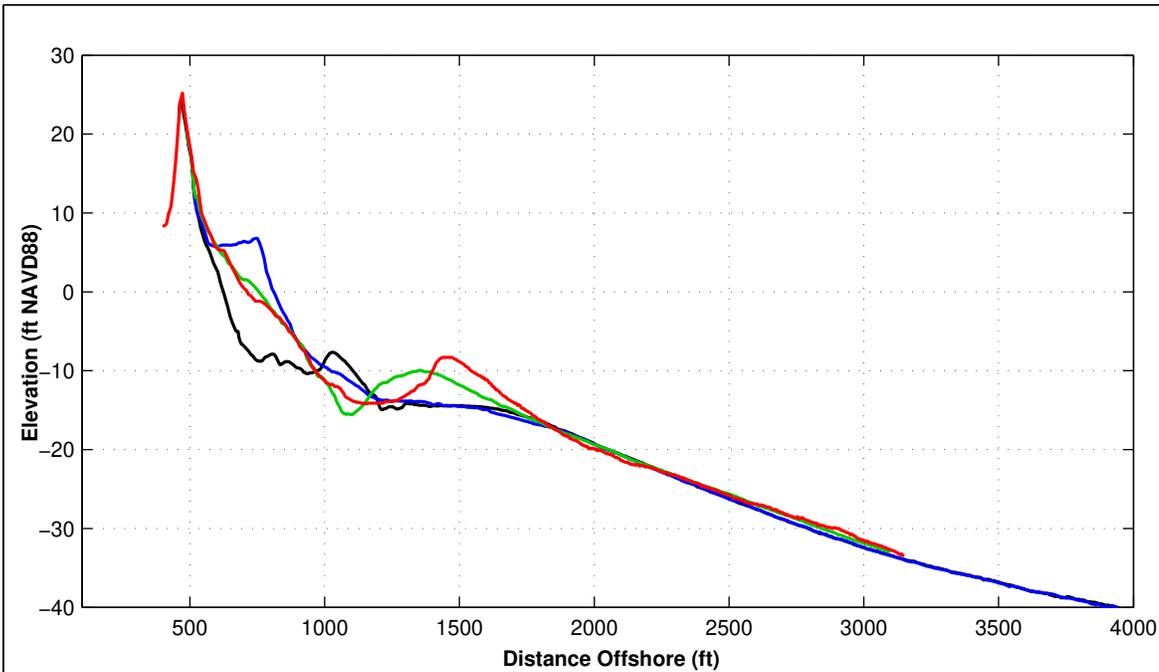
| Survey Transect 645+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -78.88 ft | -92.87 ft |
| Volume Change Above +6 ft NAVD88 | 4.51 cy/ft | 7.50 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -18.15 cy/ft | -12.69 cy/ft |
| Volume Change Above -6 ft NAVD88 | -20.28 cy/ft | -21.63 cy/ft |
| Volume Change Above -14 ft NAVD88 | 2.10 cy/ft | 6.67 cy/ft |
| Volume Change Above -19 ft NAVD88 | 13.63 cy/ft | 29.82 cy/ft |
| Volume Change Above -30 ft NAVD88 | 18.25 cy/ft | 60.92 cy/ft |

LEGEND:

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| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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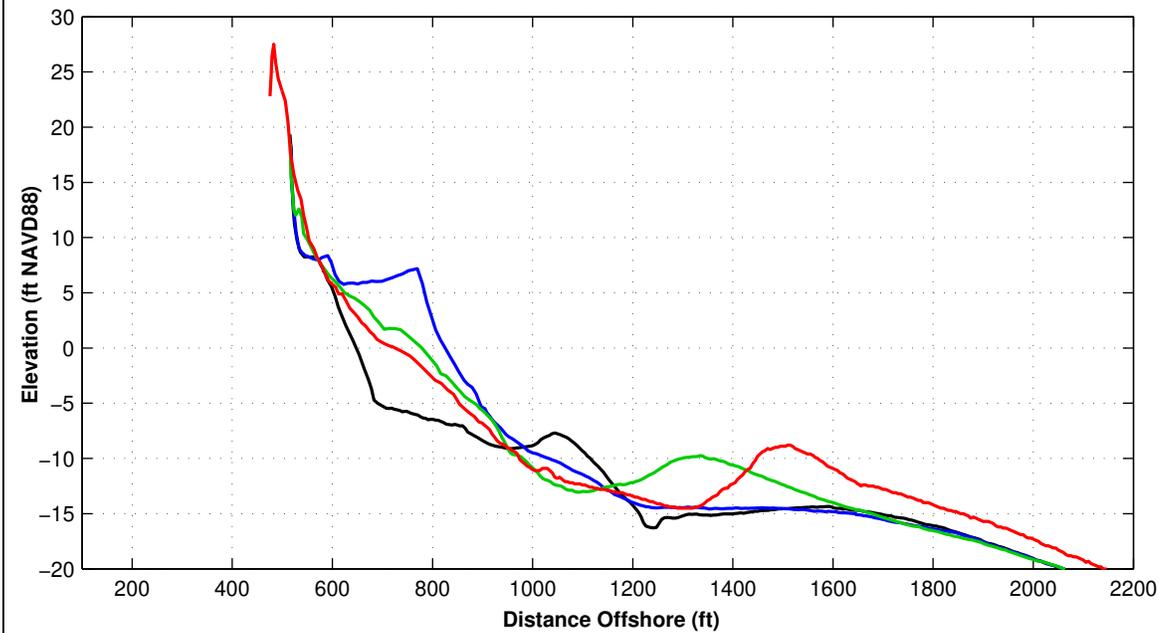
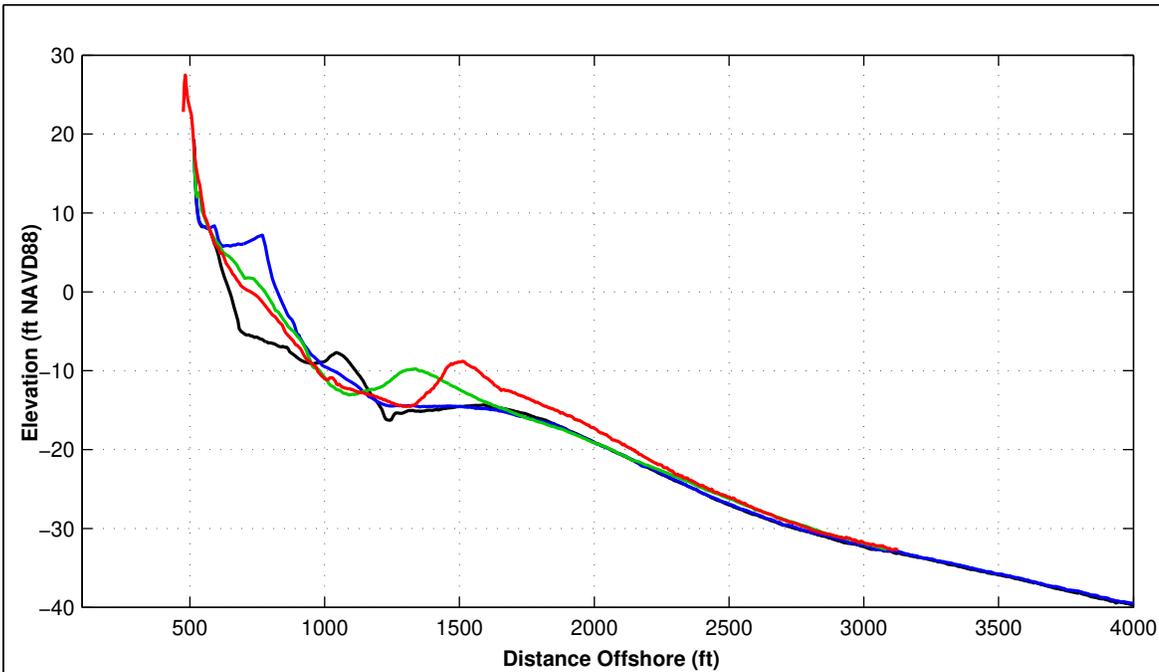
| Survey Transect 650+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -73.59 ft | -112.84 ft |
| Volume Change Above +6 ft NAVD88 | 1.96 cy/ft | 4.28 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -20.88 cy/ft | -18.96 cy/ft |
| Volume Change Above -6 ft NAVD88 | -30.00 cy/ft | -32.31 cy/ft |
| Volume Change Above -14 ft NAVD88 | -6.27 cy/ft | -0.94 cy/ft |
| Volume Change Above -19 ft NAVD88 | -0.24 cy/ft | 11.96 cy/ft |
| Volume Change Above -30 ft NAVD88 | 10.88 cy/ft | 19.39 cy/ft |

LEGEND:

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| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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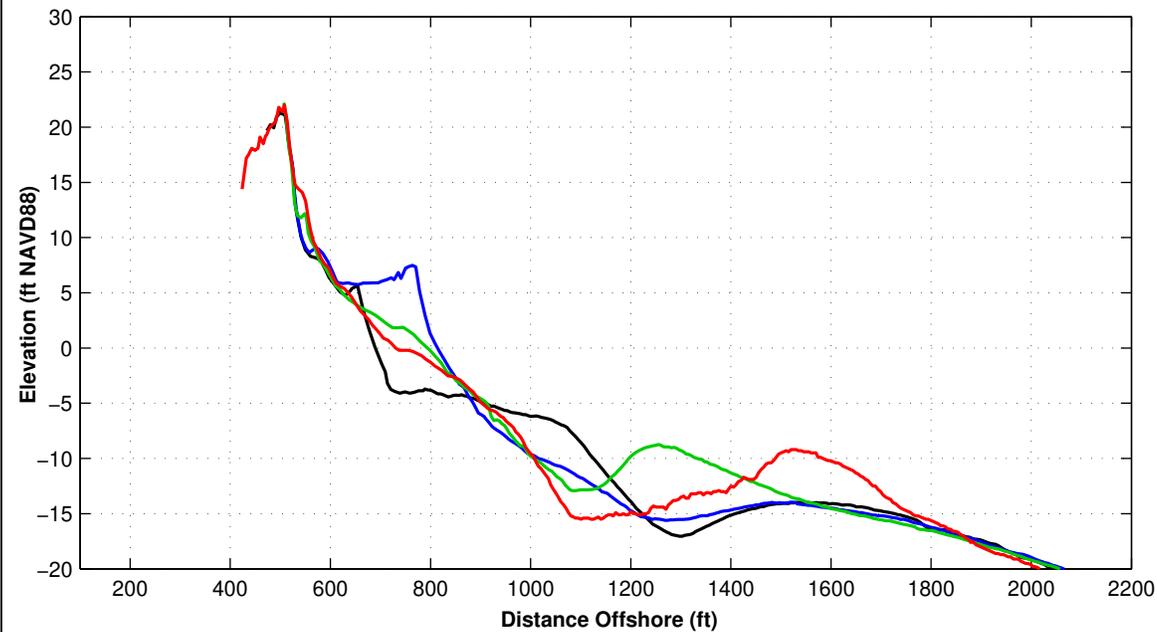
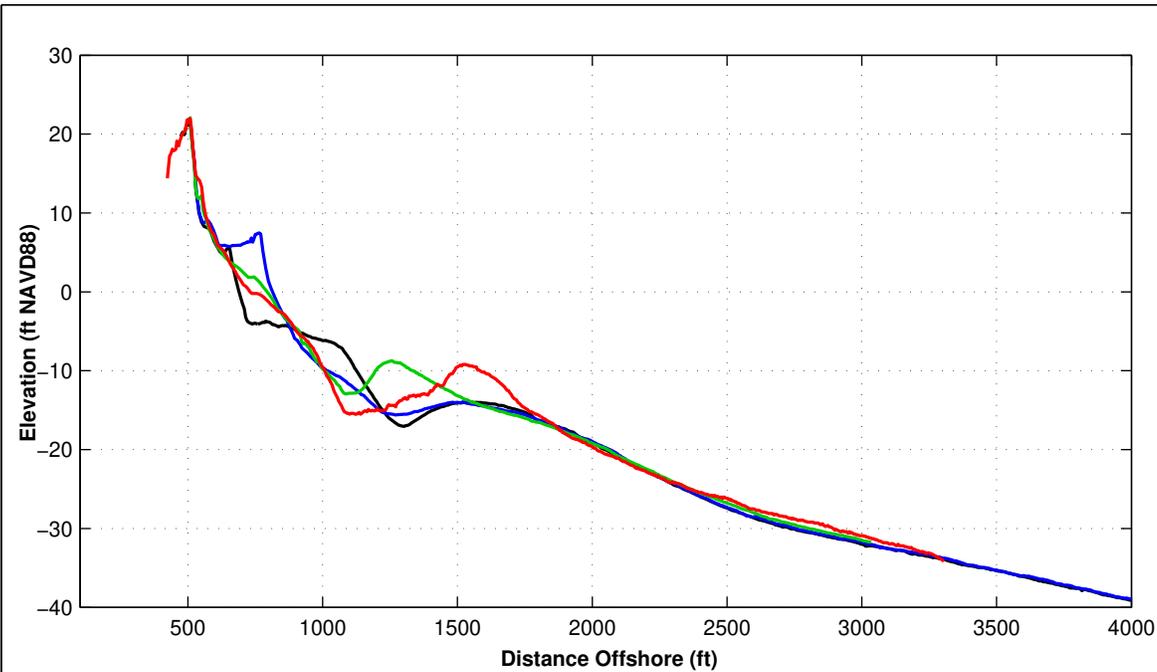
| Survey Transect 655+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -62.43 ft | -128.66 ft |
| Volume Change Above +6 ft NAVD88 | -0.64 cy/ft | 1.67 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -22.88 cy/ft | -25.82 cy/ft |
| Volume Change Above -6 ft NAVD88 | -31.62 cy/ft | -44.04 cy/ft |
| Volume Change Above -14 ft NAVD88 | -3.28 cy/ft | -12.44 cy/ft |
| Volume Change Above -19 ft NAVD88 | 4.88 cy/ft | 22.03 cy/ft |
| Volume Change Above -30 ft NAVD88 | 17.41 cy/ft | 46.33 cy/ft |

LEGEND:

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| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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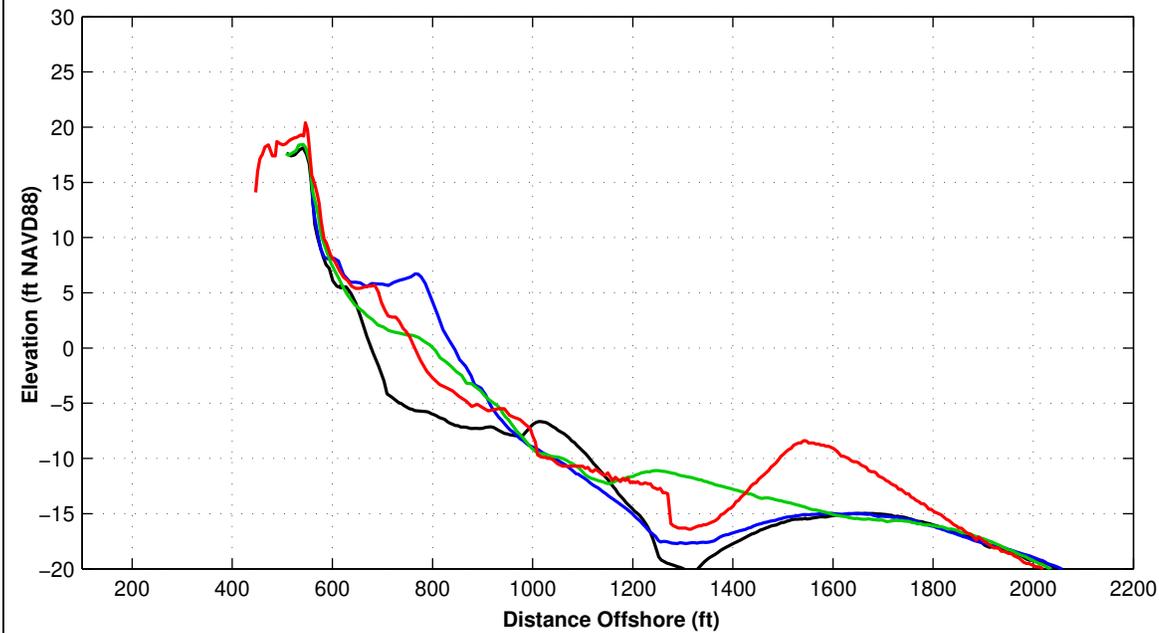
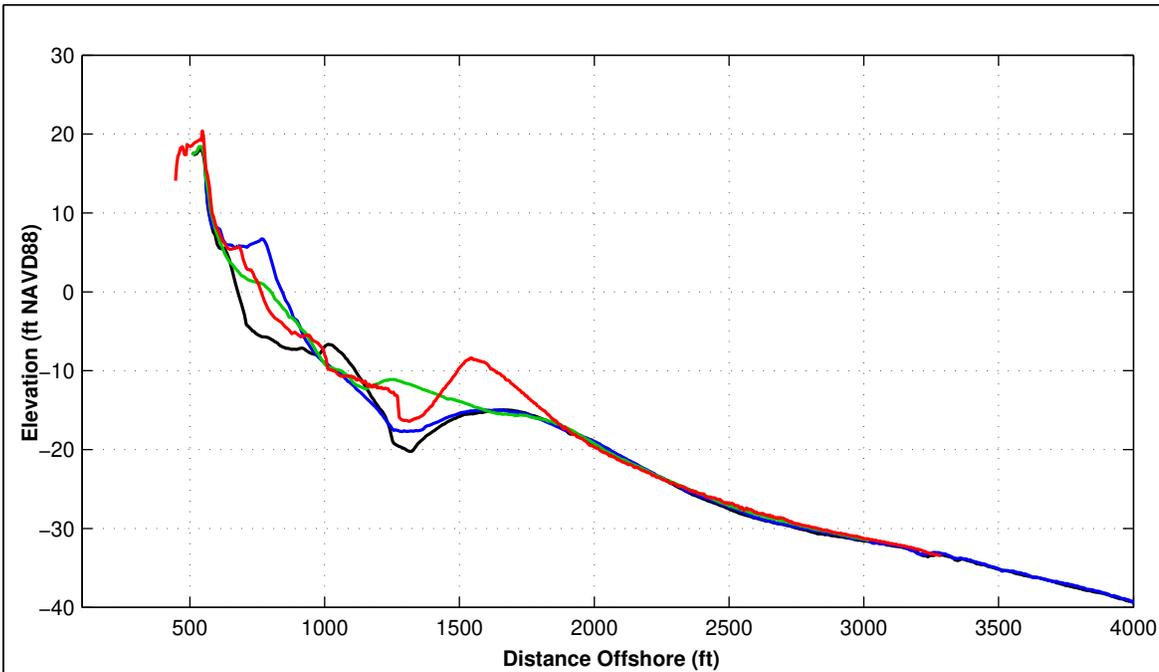
| Survey Transect 660+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -33.24 ft | -99.68 ft |
| Volume Change Above +6 ft NAVD88 | -1.24 cy/ft | 1.86 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -21.33 cy/ft | -20.70 cy/ft |
| Volume Change Above -6 ft NAVD88 | -21.96 cy/ft | -26.00 cy/ft |
| Volume Change Above -14 ft NAVD88 | 20.21 cy/ft | 6.86 cy/ft |
| Volume Change Above -19 ft NAVD88 | 27.45 cy/ft | 15.70 cy/ft |
| Volume Change Above -30 ft NAVD88 | 35.35 cy/ft | 28.68 cy/ft |

LEGEND:

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| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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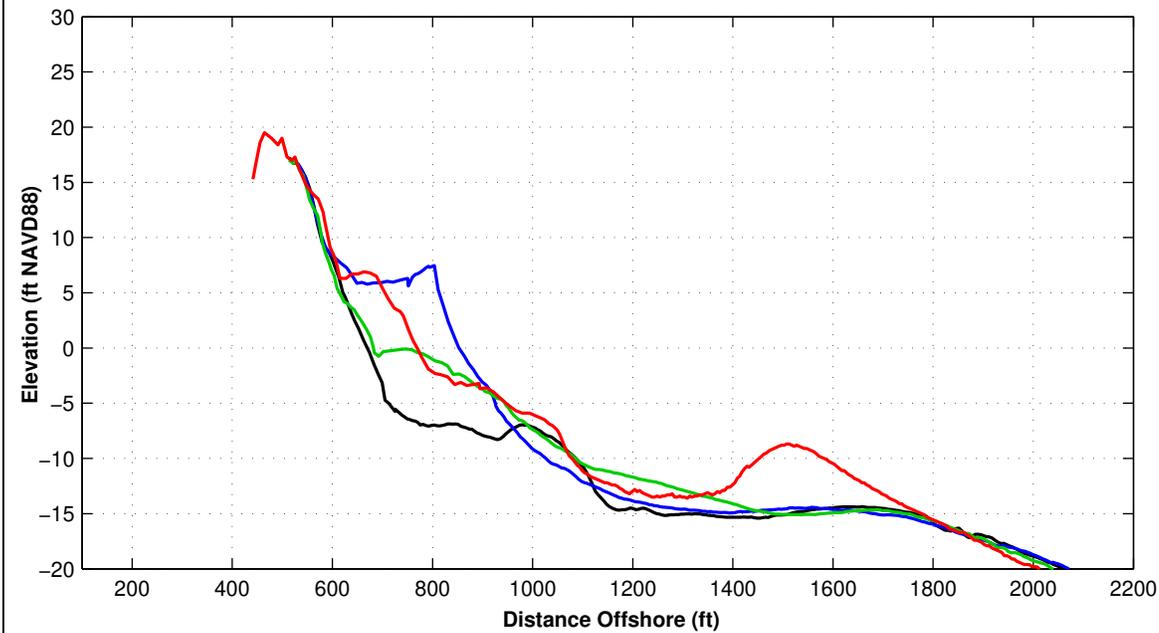
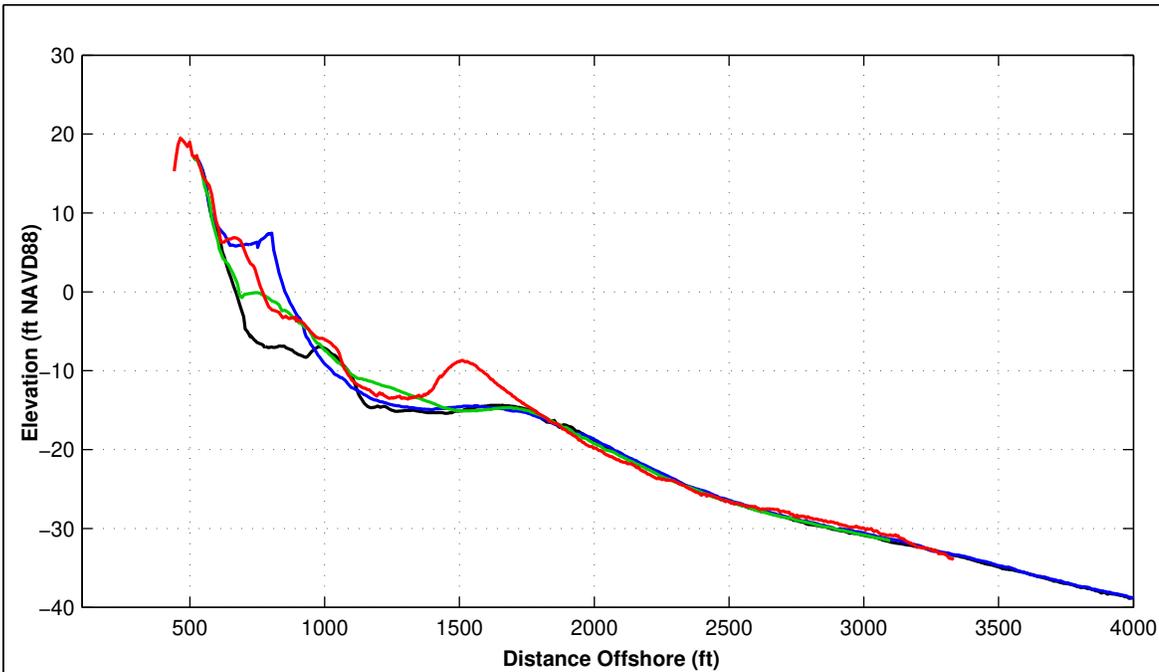
| Survey Transect 665+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -76.65 ft | -74.98 ft |
| Volume Change Above +6 ft NAVD88 | 0.15 cy/ft | 1.94 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -25.06 cy/ft | -15.06 cy/ft |
| Volume Change Above -6 ft NAVD88 | -30.38 cy/ft | -31.89 cy/ft |
| Volume Change Above -14 ft NAVD88 | -4.63 cy/ft | 24.45 cy/ft |
| Volume Change Above -19 ft NAVD88 | 28.33 cy/ft | 63.01 cy/ft |
| Volume Change Above -30 ft NAVD88 | 31.75 cy/ft | 66.56 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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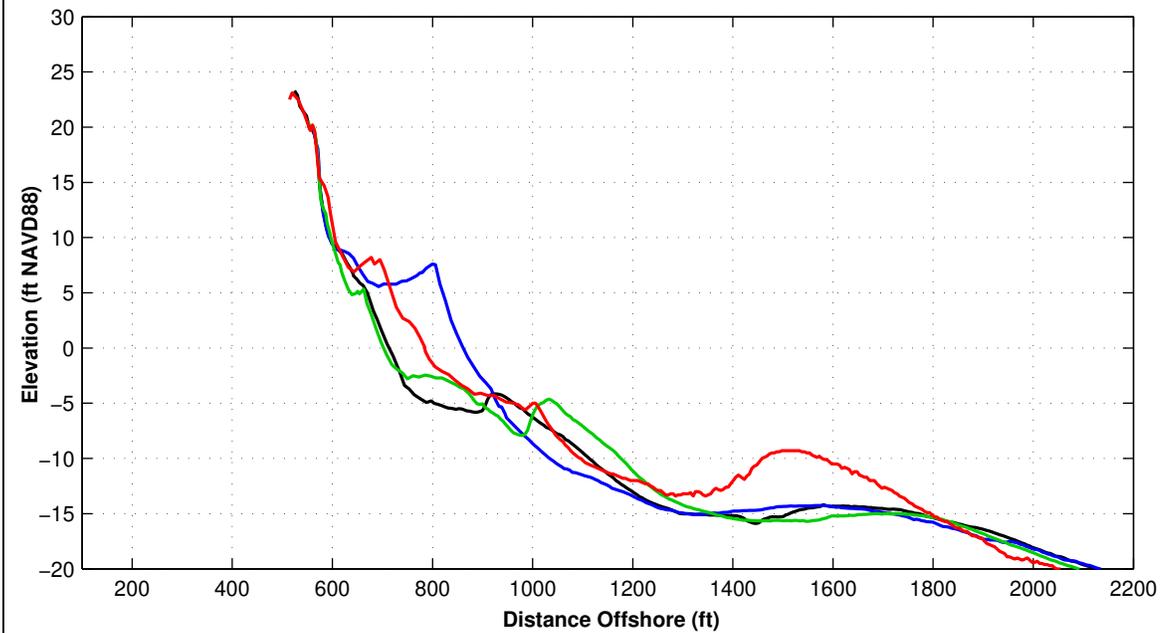
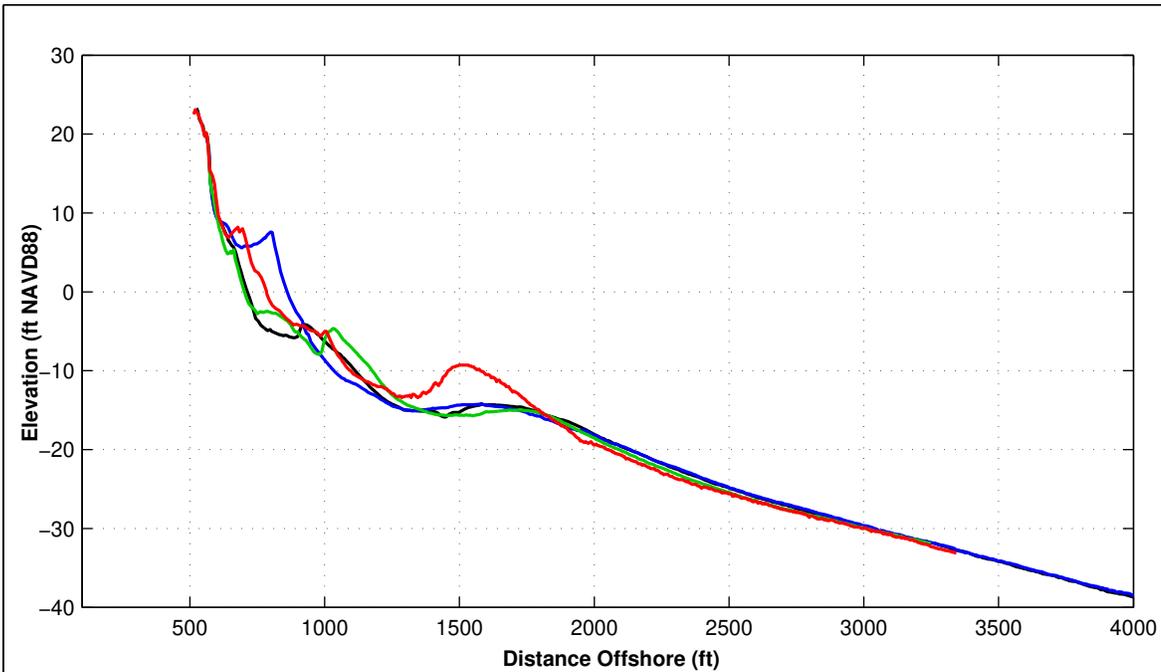
| Survey Transect 670+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -168.01 ft | -85.61 ft |
| Volume Change Above +6 ft NAVD88 | -5.10 cy/ft | 0.57 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -37.87 cy/ft | -16.48 cy/ft |
| Volume Change Above -6 ft NAVD88 | -51.84 cy/ft | -28.26 cy/ft |
| Volume Change Above -14 ft NAVD88 | -27.49 cy/ft | 32.79 cy/ft |
| Volume Change Above -19 ft NAVD88 | -24.19 cy/ft | 45.75 cy/ft |
| Volume Change Above -30 ft NAVD88 | -32.41 cy/ft | 39.88 cy/ft |

LEGEND:

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| JUNE 2020 | — | AUGUST 2019 | — |
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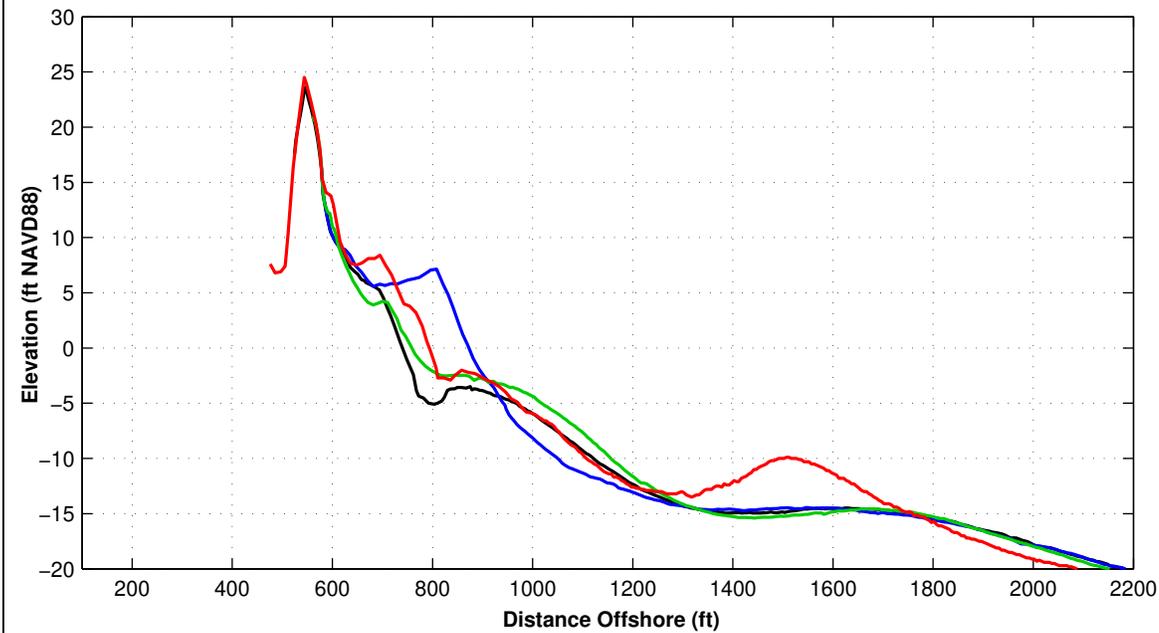
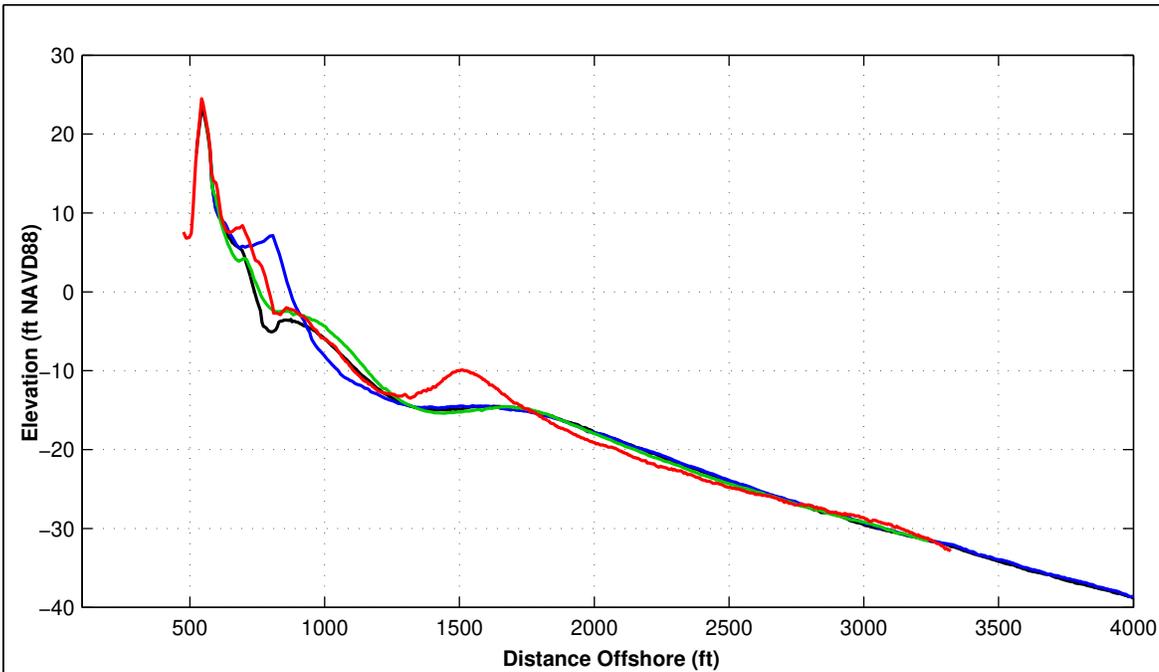
| Survey Transect 675+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -157.29 ft | -76.67 ft |
| Volume Change Above +6 ft NAVD88 | -5.47 cy/ft | -0.11 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -34.06 cy/ft | -16.54 cy/ft |
| Volume Change Above -6 ft NAVD88 | -60.18 cy/ft | -27.38 cy/ft |
| Volume Change Above -14 ft NAVD88 | -28.40 cy/ft | 37.08 cy/ft |
| Volume Change Above -19 ft NAVD88 | -35.10 cy/ft | 48.24 cy/ft |
| Volume Change Above -30 ft NAVD88 | -56.30 cy/ft | 15.23 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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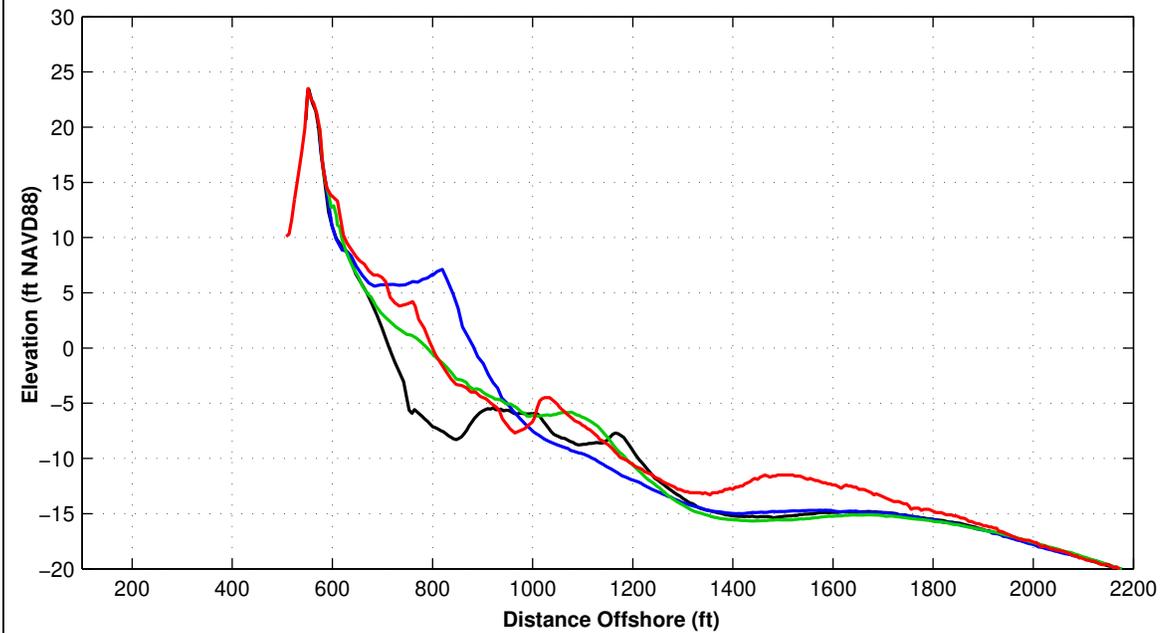
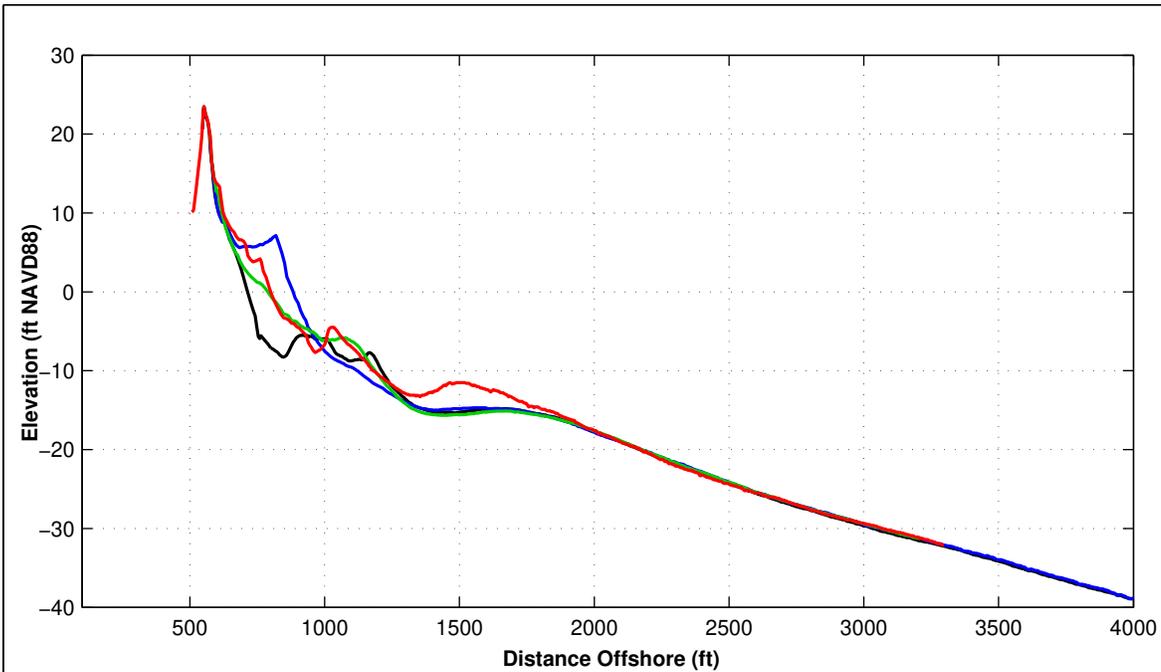
| Survey Transect 680+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -116.56 ft | -76.02 ft |
| Volume Change Above +6 ft NAVD88 | -2.99 cy/ft | 4.93 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -27.74 cy/ft | -9.72 cy/ft |
| Volume Change Above -6 ft NAVD88 | -35.88 cy/ft | -18.13 cy/ft |
| Volume Change Above -14 ft NAVD88 | -8.51 cy/ft | 32.58 cy/ft |
| Volume Change Above -19 ft NAVD88 | -13.06 cy/ft | 33.49 cy/ft |
| Volume Change Above -30 ft NAVD88 | -25.01 cy/ft | 12.50 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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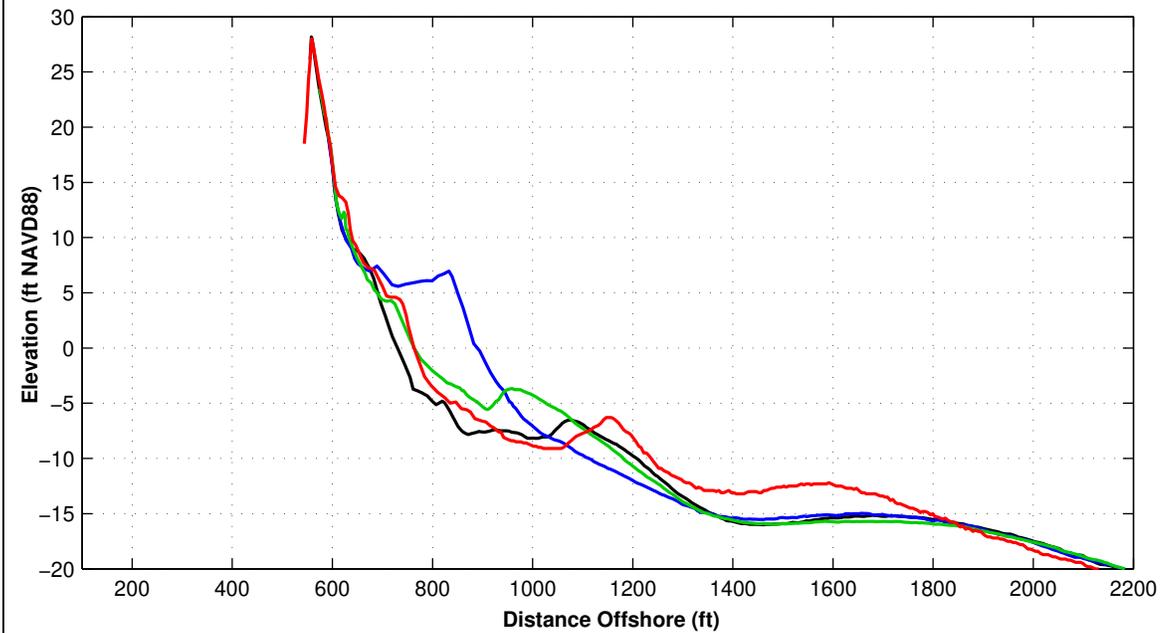
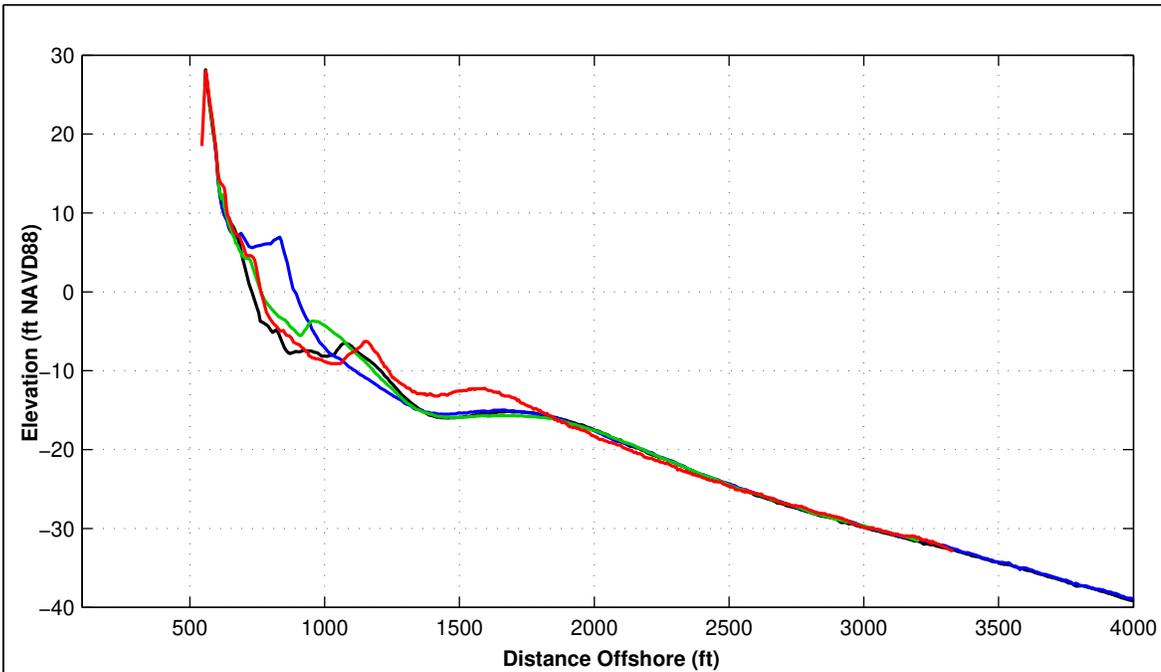
| Survey Transect 685+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -114.53 ft | -79.89 ft |
| Volume Change Above +6 ft NAVD88 | -0.01 cy/ft | 4.49 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -26.83 cy/ft | -12.62 cy/ft |
| Volume Change Above -6 ft NAVD88 | -41.84 cy/ft | -28.04 cy/ft |
| Volume Change Above -14 ft NAVD88 | -20.02 cy/ft | 15.21 cy/ft |
| Volume Change Above -19 ft NAVD88 | -27.67 cy/ft | 33.97 cy/ft |
| Volume Change Above -30 ft NAVD88 | -28.00 cy/ft | 28.79 cy/ft |

LEGEND:

| | | | |
|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
1. Station From North To South At Varying Intervals.
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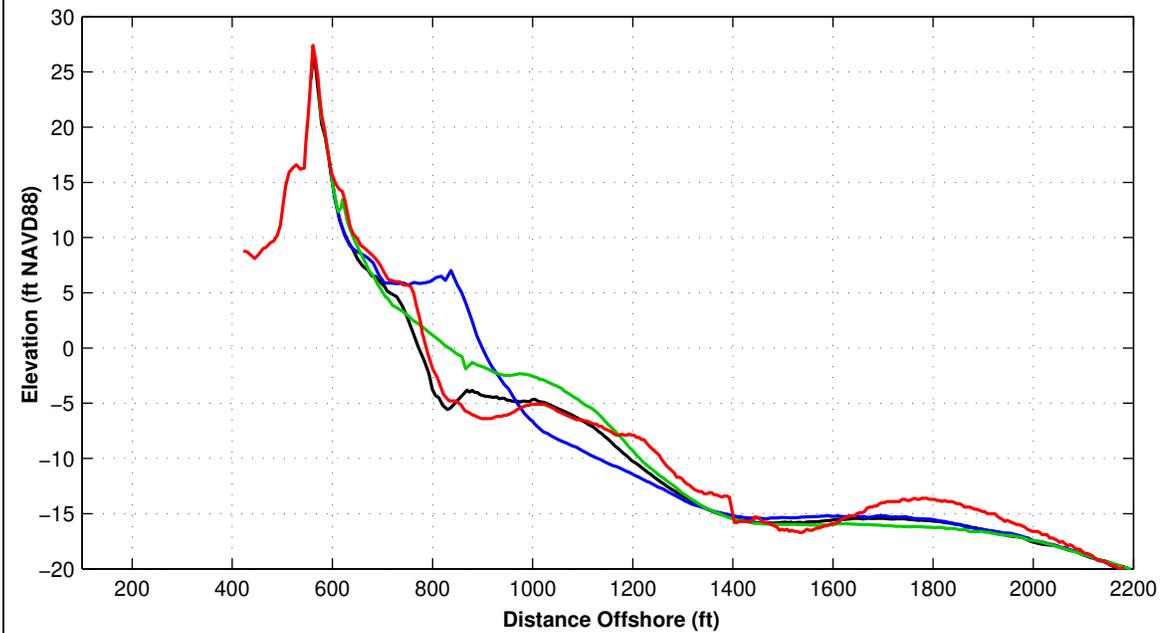
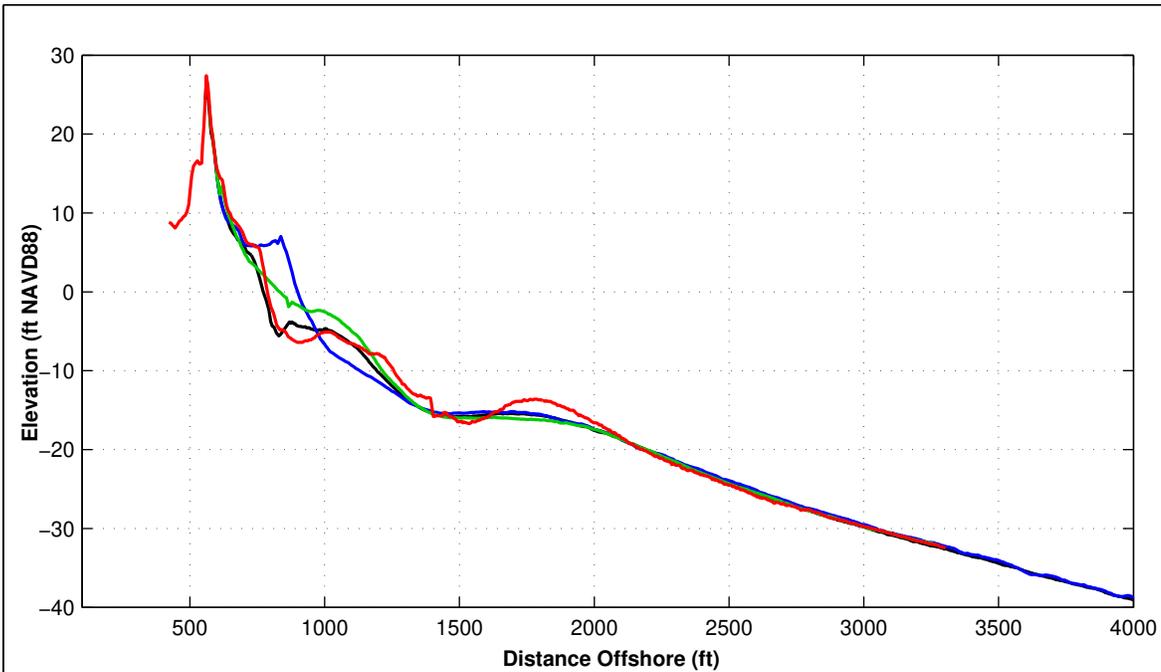
| Survey Transect 690+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -125.61 ft | -120.70 ft |
| Volume Change Above +6 ft NAVD88 | -0.97 cy/ft | 2.34 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -25.83 cy/ft | -19.86 cy/ft |
| Volume Change Above -6 ft NAVD88 | -44.73 cy/ft | -53.43 cy/ft |
| Volume Change Above -14 ft NAVD88 | -26.04 cy/ft | -18.90 cy/ft |
| Volume Change Above -19 ft NAVD88 | -34.07 cy/ft | -1.87 cy/ft |
| Volume Change Above -30 ft NAVD88 | -36.03 cy/ft | -10.09 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
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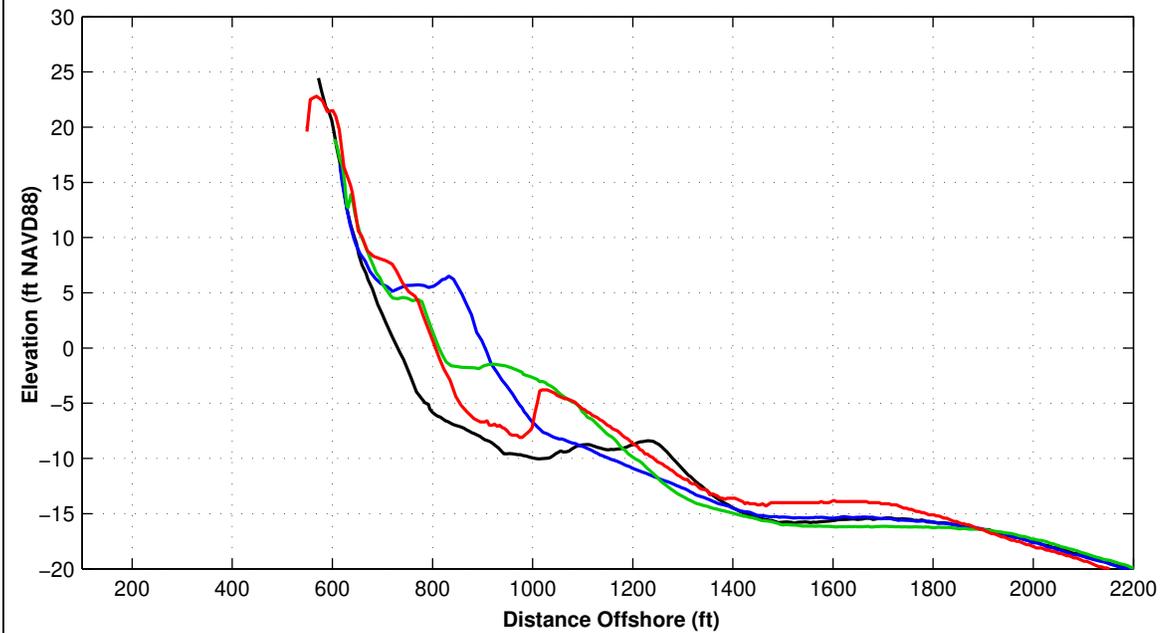
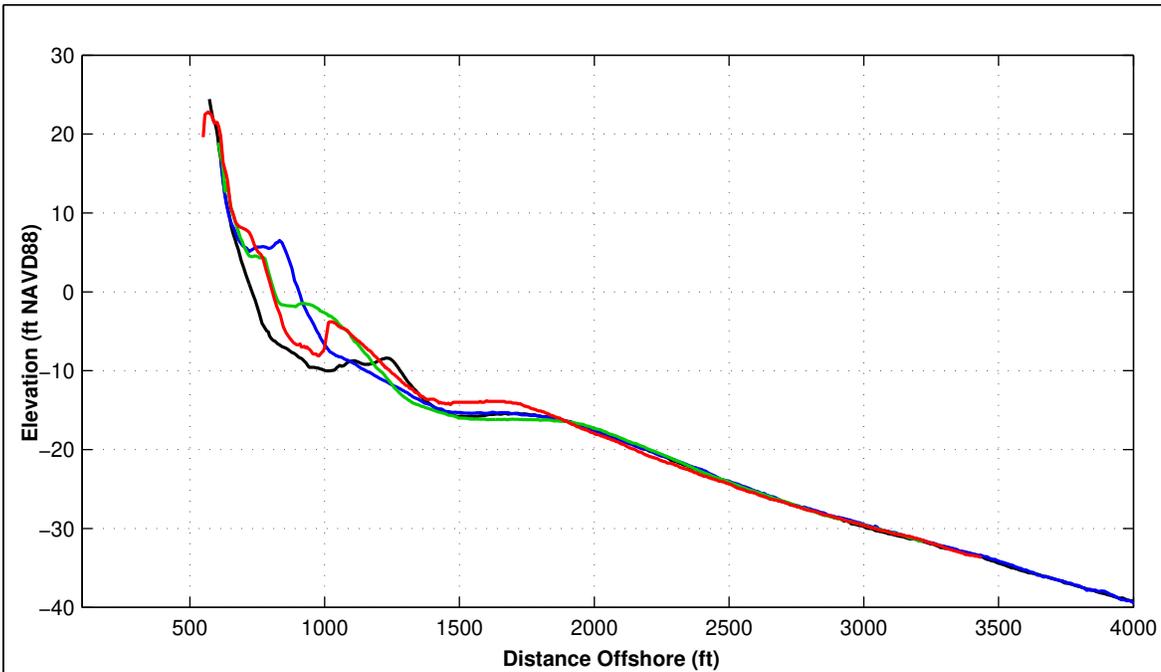
| Survey Transect 695+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -88.28 ft | -107.13 ft |
| Volume Change Above +6 ft NAVD88 | 0.51 cy/ft | 5.01 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -22.91 cy/ft | -12.69 cy/ft |
| Volume Change Above -6 ft NAVD88 | -14.64 cy/ft | -42.25 cy/ft |
| Volume Change Above -14 ft NAVD88 | 10.66 cy/ft | -9.06 cy/ft |
| Volume Change Above -19 ft NAVD88 | -1.75 cy/ft | 6.37 cy/ft |
| Volume Change Above -30 ft NAVD88 | -10.45 cy/ft | -7.95 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
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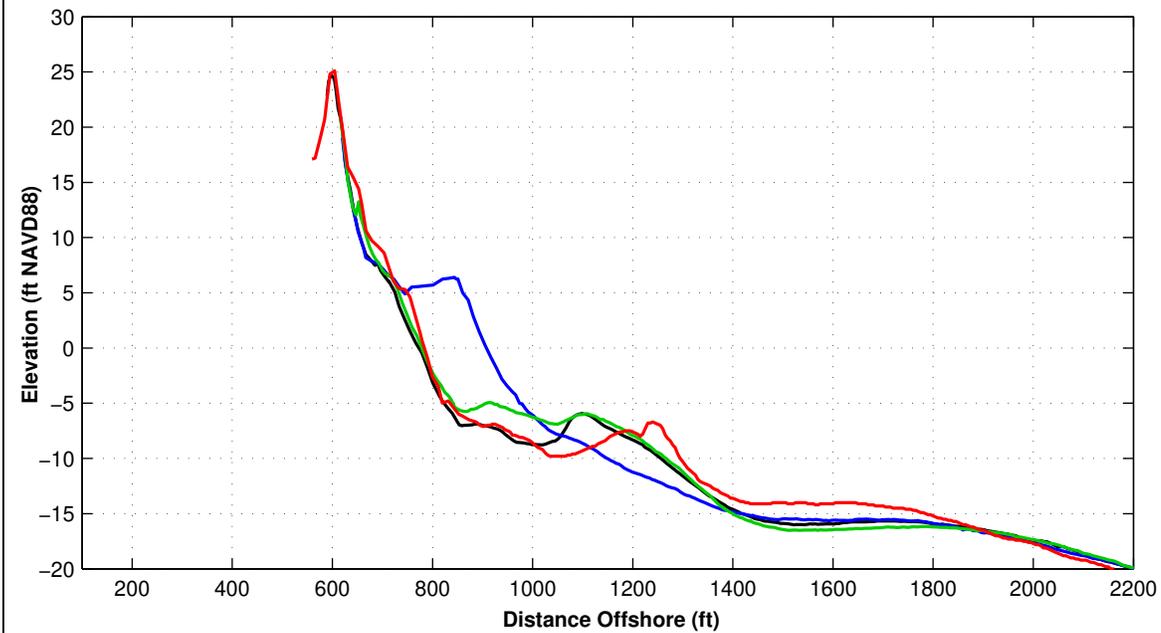
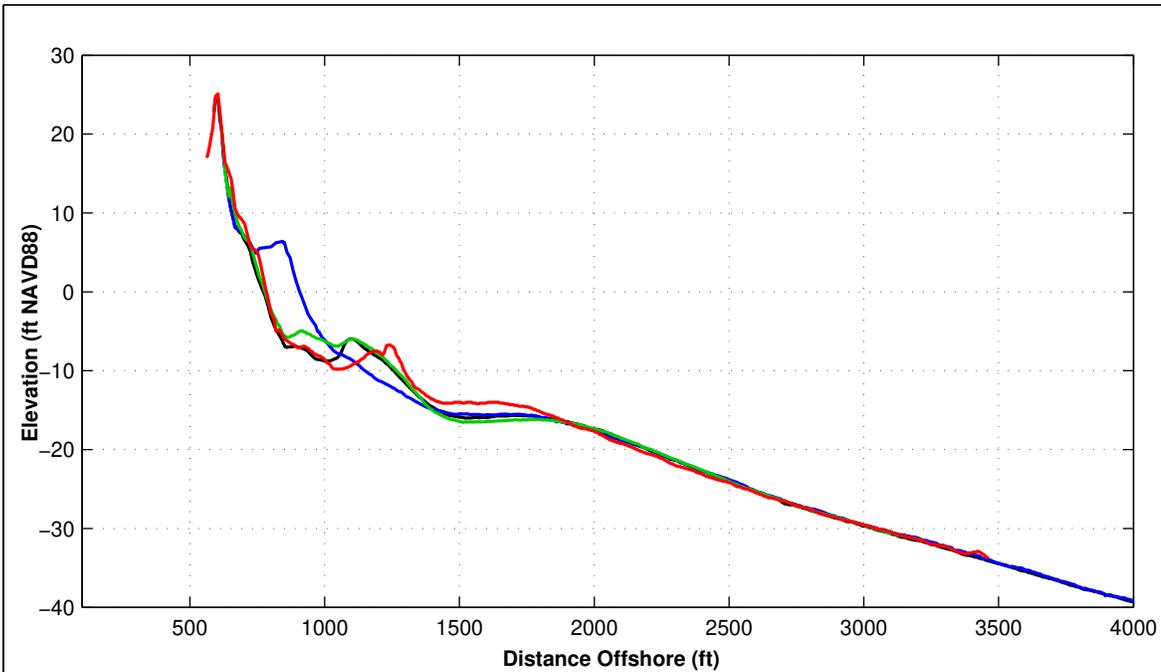
| Survey Transect 700+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -88.87 ft | -95.12 ft |
| Volume Change Above +6 ft NAVD88 | 4.07 cy/ft | 8.82 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -13.20 cy/ft | -6.77 cy/ft |
| Volume Change Above -6 ft NAVD88 | -8.74 cy/ft | -29.33 cy/ft |
| Volume Change Above -14 ft NAVD88 | 5.77 cy/ft | -7.98 cy/ft |
| Volume Change Above -19 ft NAVD88 | -3.88 cy/ft | 8.67 cy/ft |
| Volume Change Above -30 ft NAVD88 | -5.69 cy/ft | -3.91 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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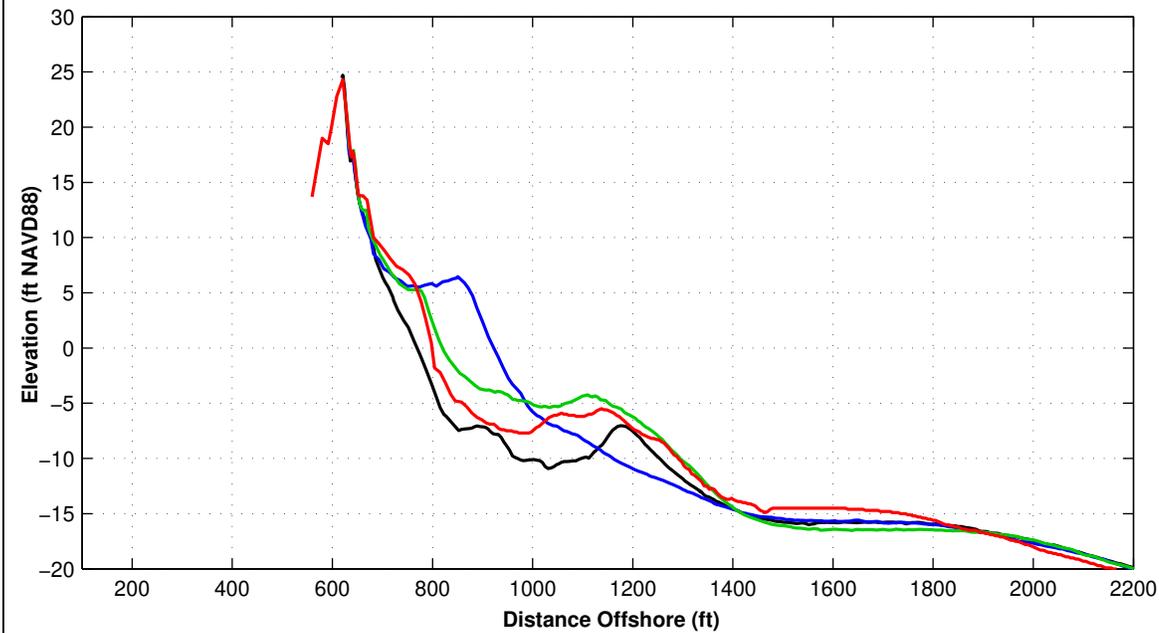
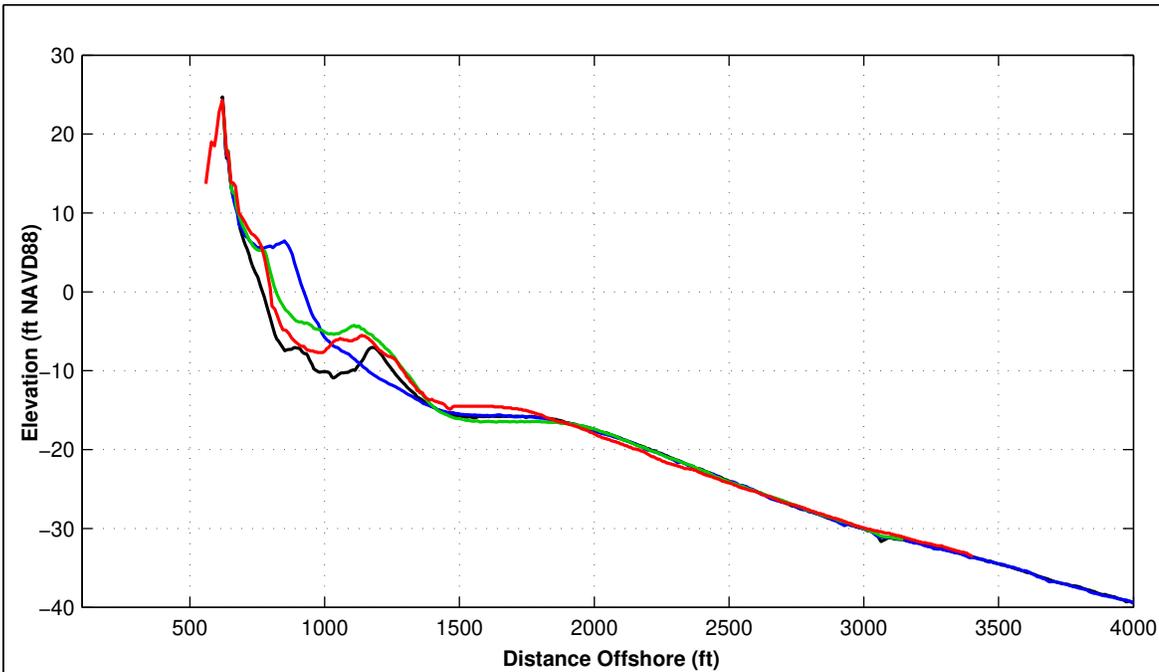
| Survey Transect 705+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -128.22 ft | -119.94 ft |
| Volume Change Above +6 ft NAVD88 | 2.09 cy/ft | 7.00 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -19.76 cy/ft | -12.39 cy/ft |
| Volume Change Above -6 ft NAVD88 | -52.31 cy/ft | -48.24 cy/ft |
| Volume Change Above -14 ft NAVD88 | -23.73 cy/ft | -34.12 cy/ft |
| Volume Change Above -19 ft NAVD88 | -32.27 cy/ft | -14.01 cy/ft |
| Volume Change Above -30 ft NAVD88 | -33.70 cy/ft | -24.77 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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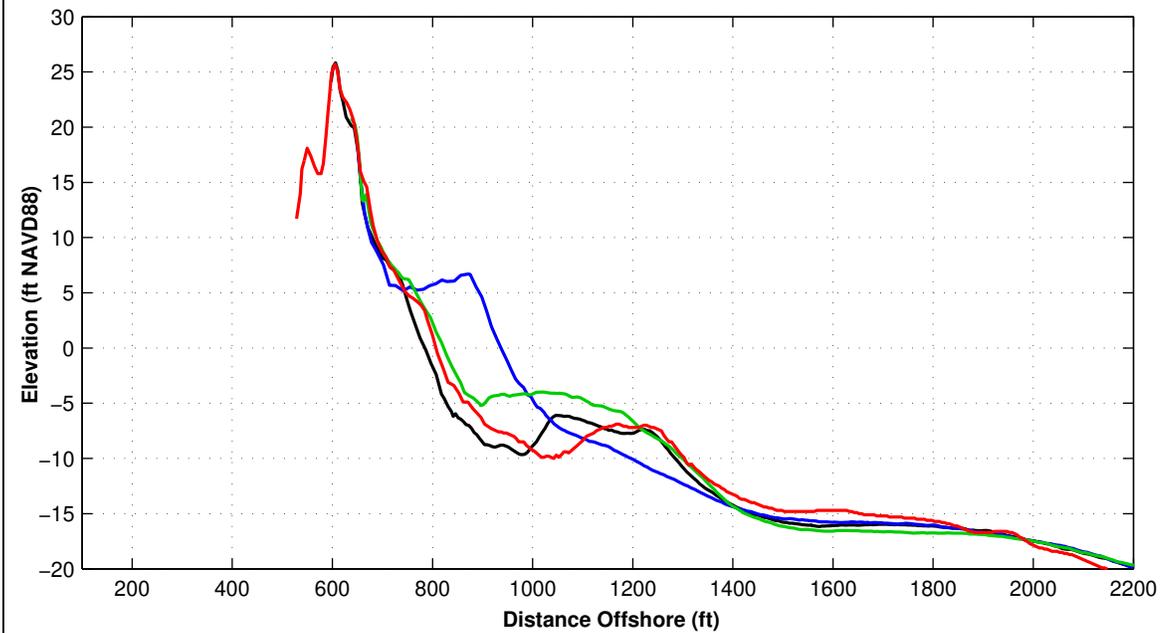
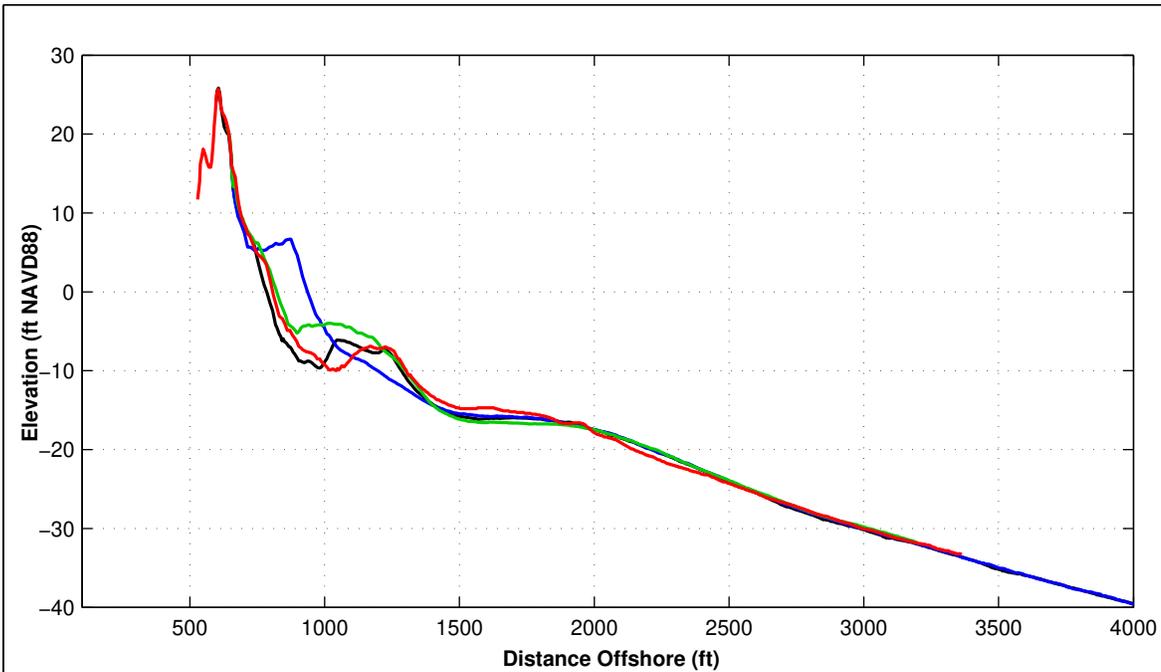
| Survey Transect 710+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -101.28 ft | -116.20 ft |
| Volume Change Above +6 ft NAVD88 | 1.72 cy/ft | 5.60 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -15.84 cy/ft | -12.88 cy/ft |
| Volume Change Above -6 ft NAVD88 | -27.05 cy/ft | -46.84 cy/ft |
| Volume Change Above -14 ft NAVD88 | 9.27 cy/ft | -20.02 cy/ft |
| Volume Change Above -19 ft NAVD88 | 1.09 cy/ft | -7.83 cy/ft |
| Volume Change Above -30 ft NAVD88 | 3.04 cy/ft | -14.04 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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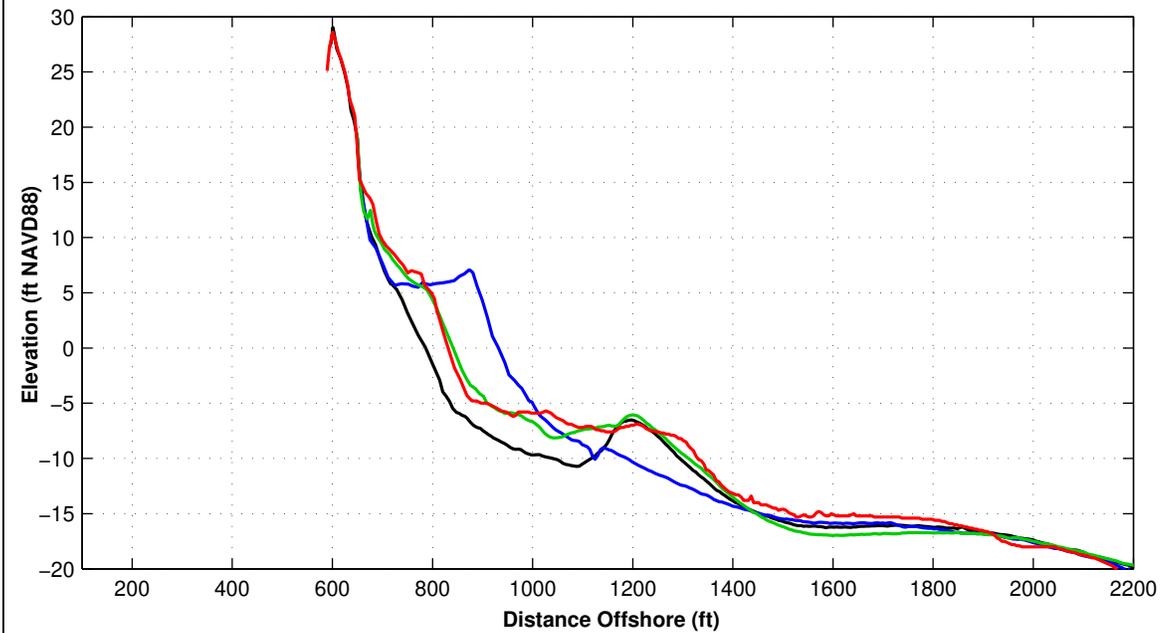
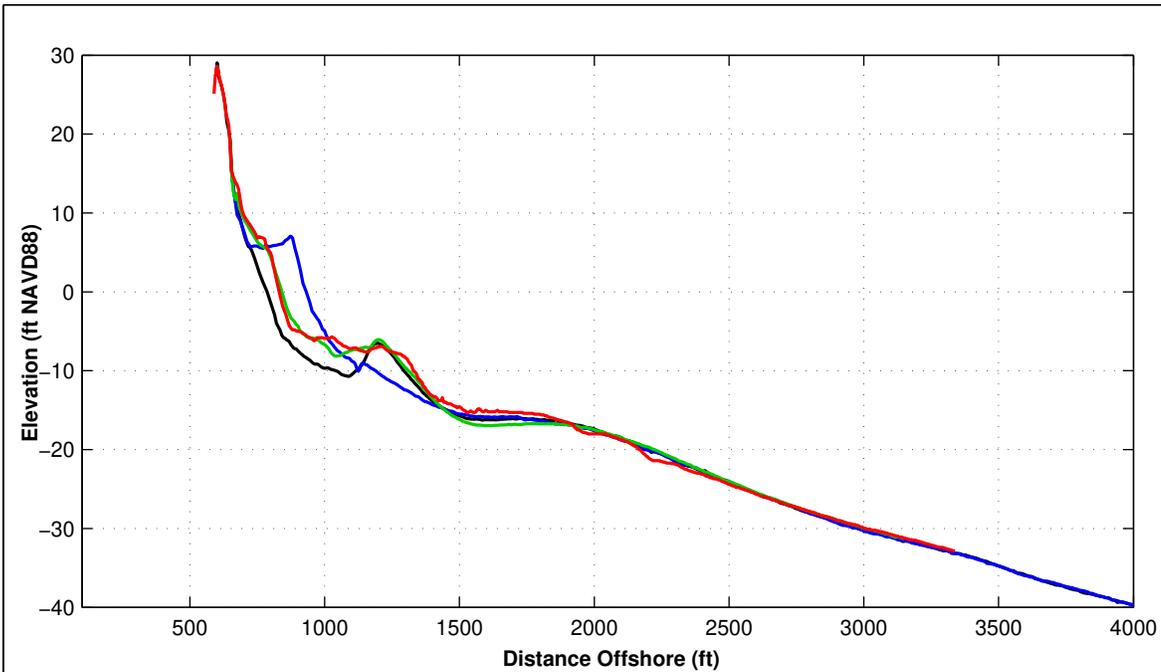
| Survey Transect 715+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -114.78 ft | -125.11 ft |
| Volume Change Above +6 ft NAVD88 | 3.66 cy/ft | 3.70 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -16.13 cy/ft | -18.00 cy/ft |
| Volume Change Above -6 ft NAVD88 | -32.12 cy/ft | -53.57 cy/ft |
| Volume Change Above -14 ft NAVD88 | -2.38 cy/ft | -44.84 cy/ft |
| Volume Change Above -19 ft NAVD88 | -14.85 cy/ft | -35.12 cy/ft |
| Volume Change Above -30 ft NAVD88 | -11.91 cy/ft | -44.91 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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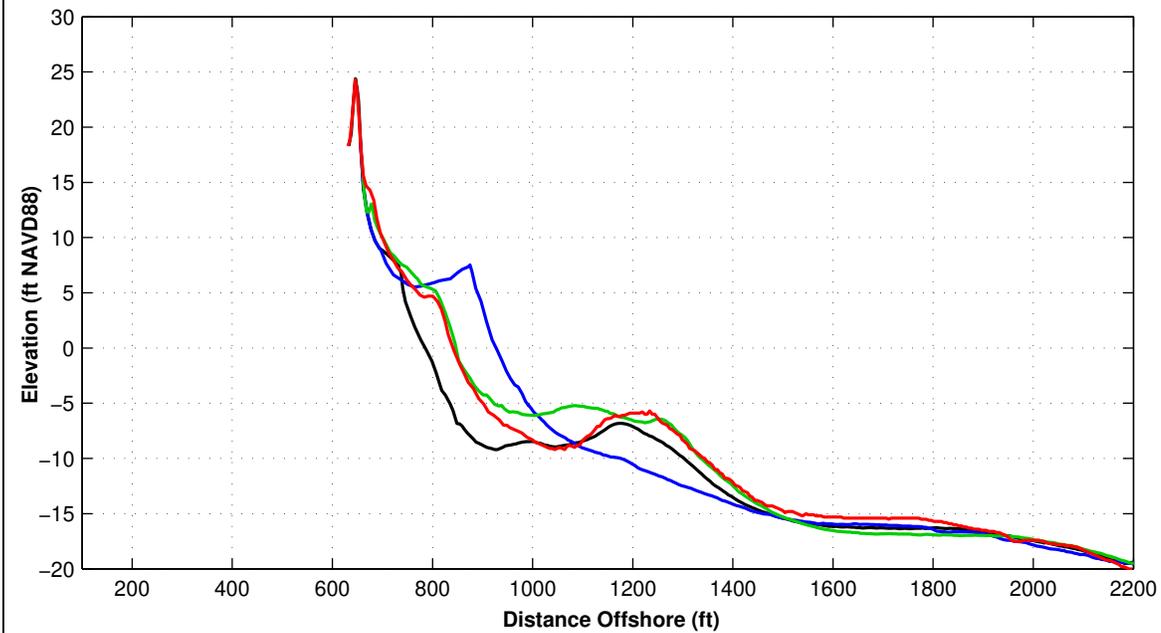
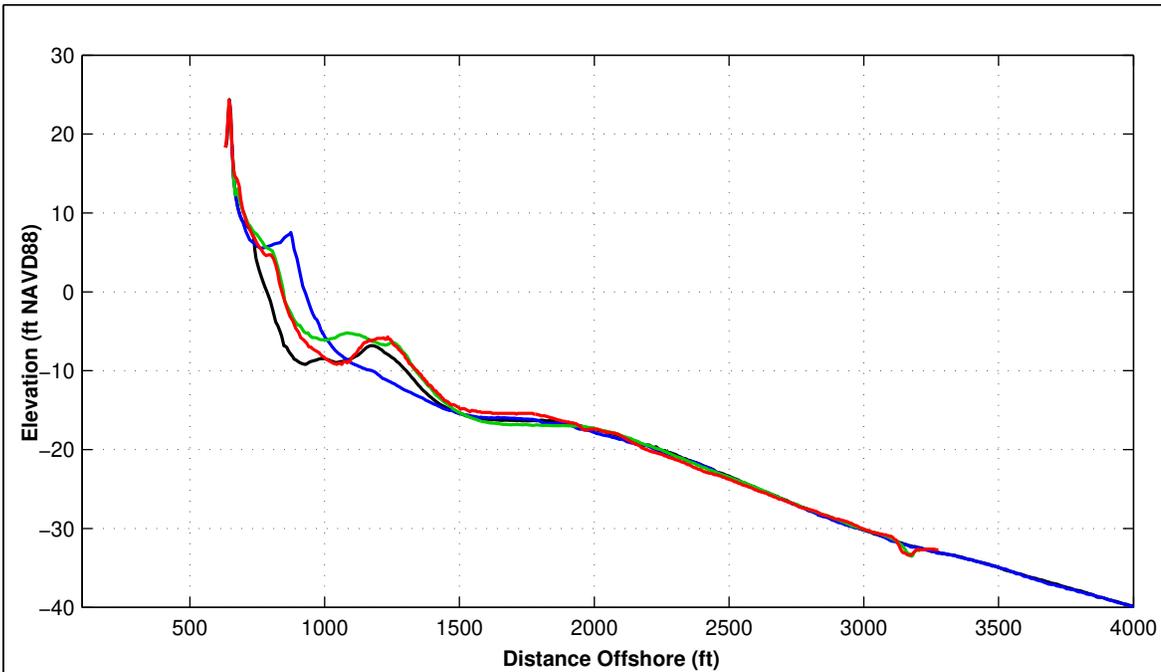
| Survey Transect 720+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -88.69 ft | -95.87 ft |
| Volume Change Above +6 ft NAVD88 | 3.68 cy/ft | 7.65 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -12.88 cy/ft | -8.76 cy/ft |
| Volume Change Above -6 ft NAVD88 | -36.48 cy/ft | -35.31 cy/ft |
| Volume Change Above -14 ft NAVD88 | -7.58 cy/ft | 0.16 cy/ft |
| Volume Change Above -19 ft NAVD88 | -17.16 cy/ft | 11.39 cy/ft |
| Volume Change Above -30 ft NAVD88 | -10.40 cy/ft | 6.91 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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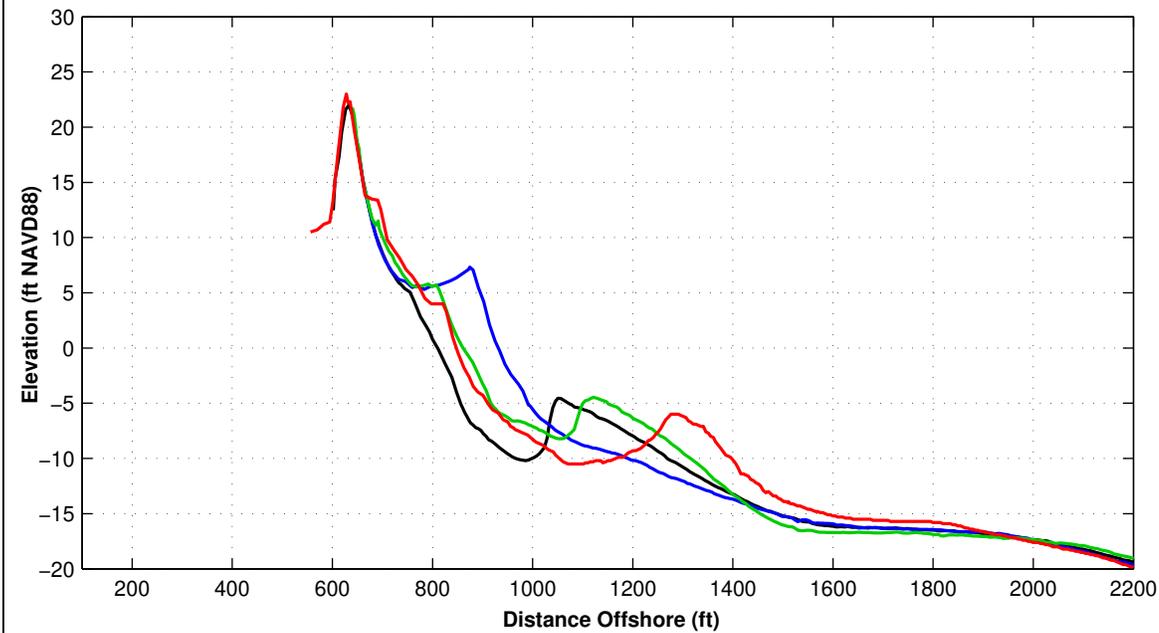
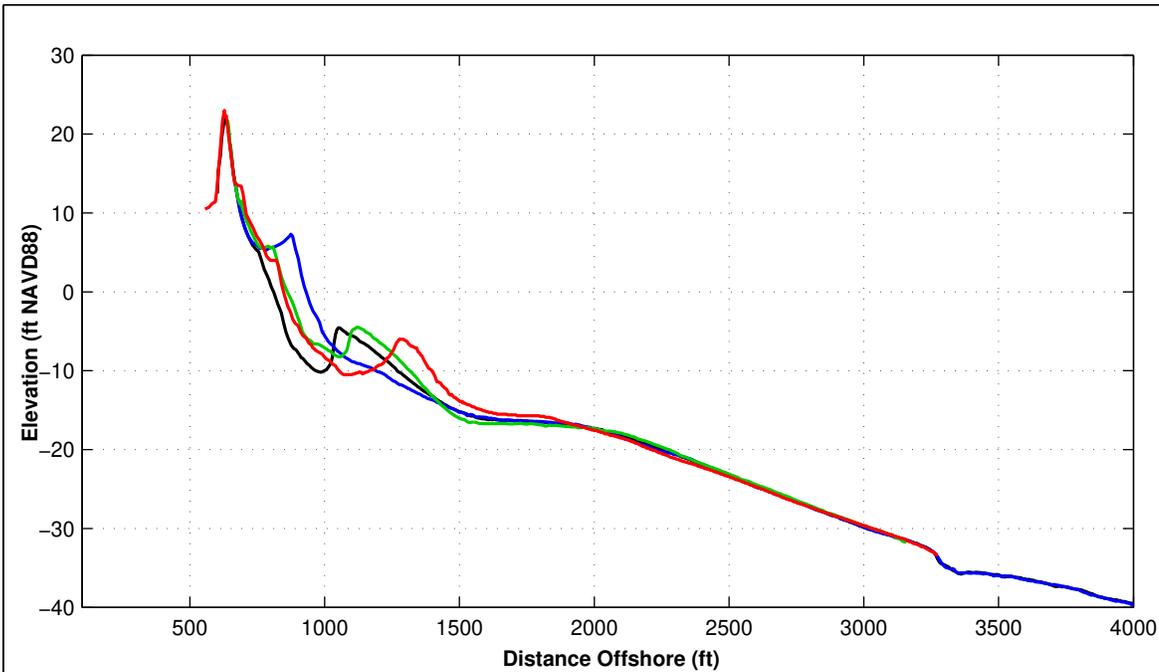


| Survey Transect 725+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -75.70 ft | -84.22 ft |
| Volume Change Above +6 ft NAVD88 | 3.27 cy/ft | 3.56 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -10.62 cy/ft | -12.73 cy/ft |
| Volume Change Above -6 ft NAVD88 | -28.39 cy/ft | -35.92 cy/ft |
| Volume Change Above -14 ft NAVD88 | 20.10 cy/ft | -2.58 cy/ft |
| Volume Change Above -19 ft NAVD88 | 18.14 cy/ft | 12.69 cy/ft |
| Volume Change Above -30 ft NAVD88 | 21.25 cy/ft | 8.15 cy/ft |

LEGEND:
 JUNE 2020 — AUGUST 2019 —
 POST-DORIAN — APRIL 2019 —

- Notes:
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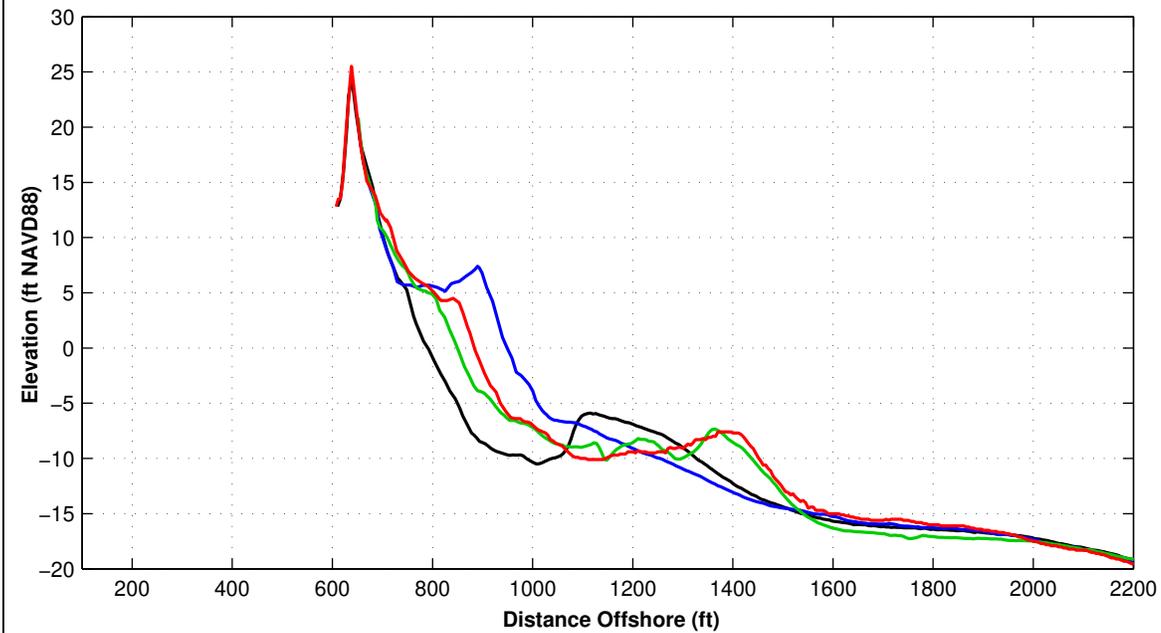
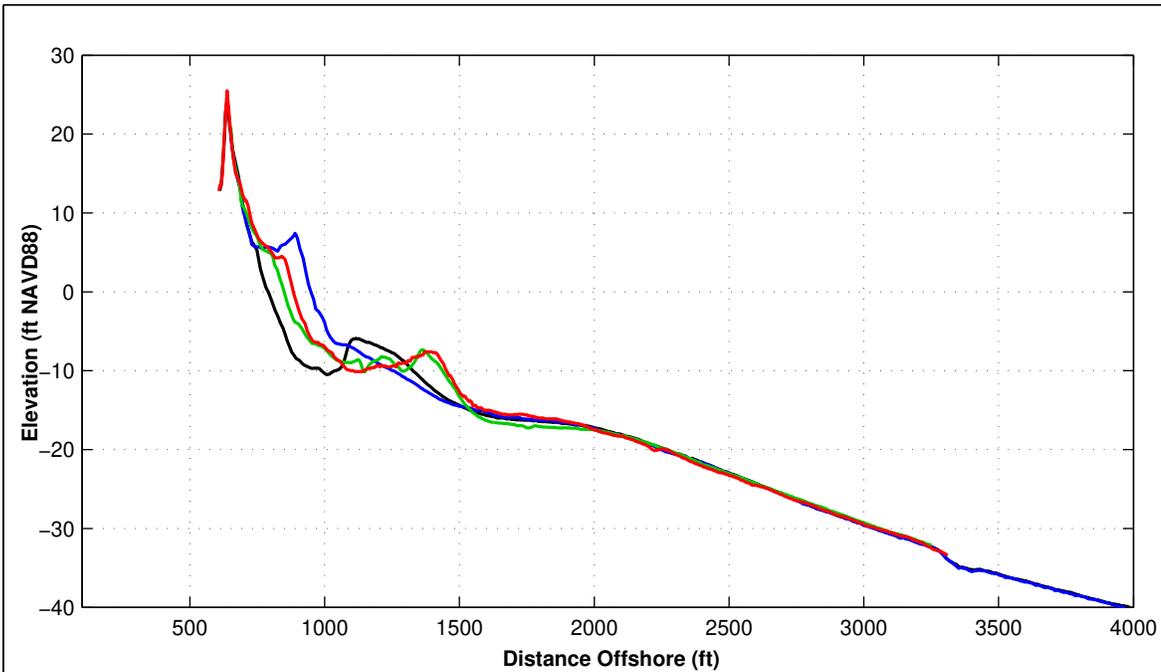
| Survey Transect 730+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -73.28 ft | -81.43 ft |
| Volume Change Above +6 ft NAVD88 | 2.05 cy/ft | 5.52 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -11.49 cy/ft | -10.29 cy/ft |
| Volume Change Above -6 ft NAVD88 | -26.70 cy/ft | -32.81 cy/ft |
| Volume Change Above -14 ft NAVD88 | 2.69 cy/ft | -8.71 cy/ft |
| Volume Change Above -19 ft NAVD88 | -4.81 cy/ft | 3.09 cy/ft |
| Volume Change Above -30 ft NAVD88 | 2.46 cy/ft | -1.20 cy/ft |

LEGEND:

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| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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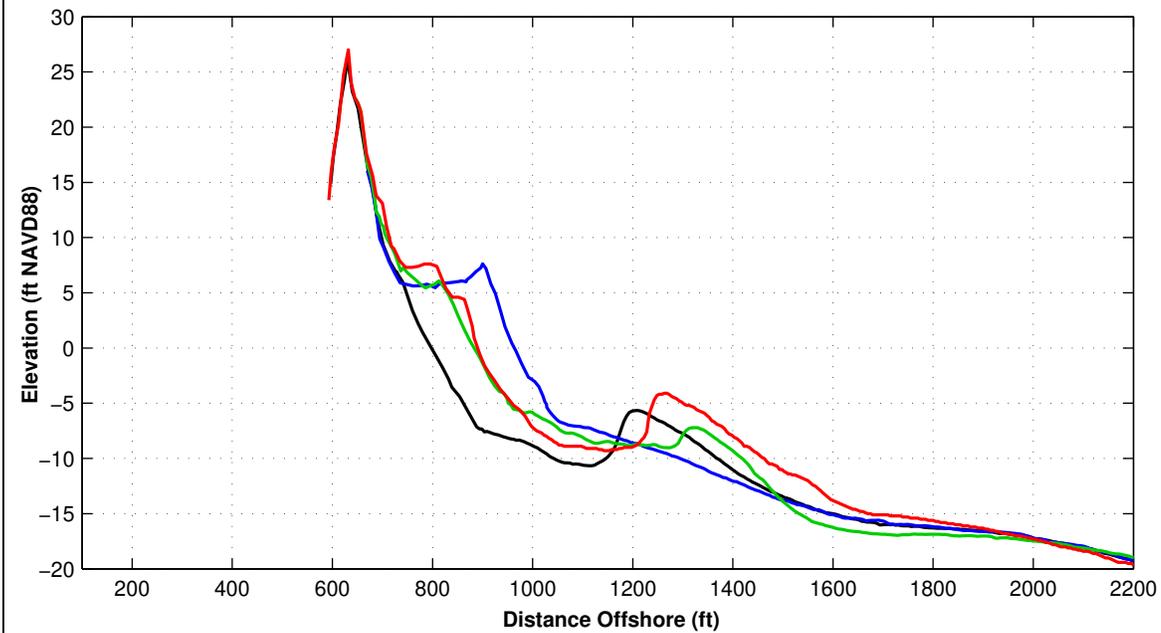
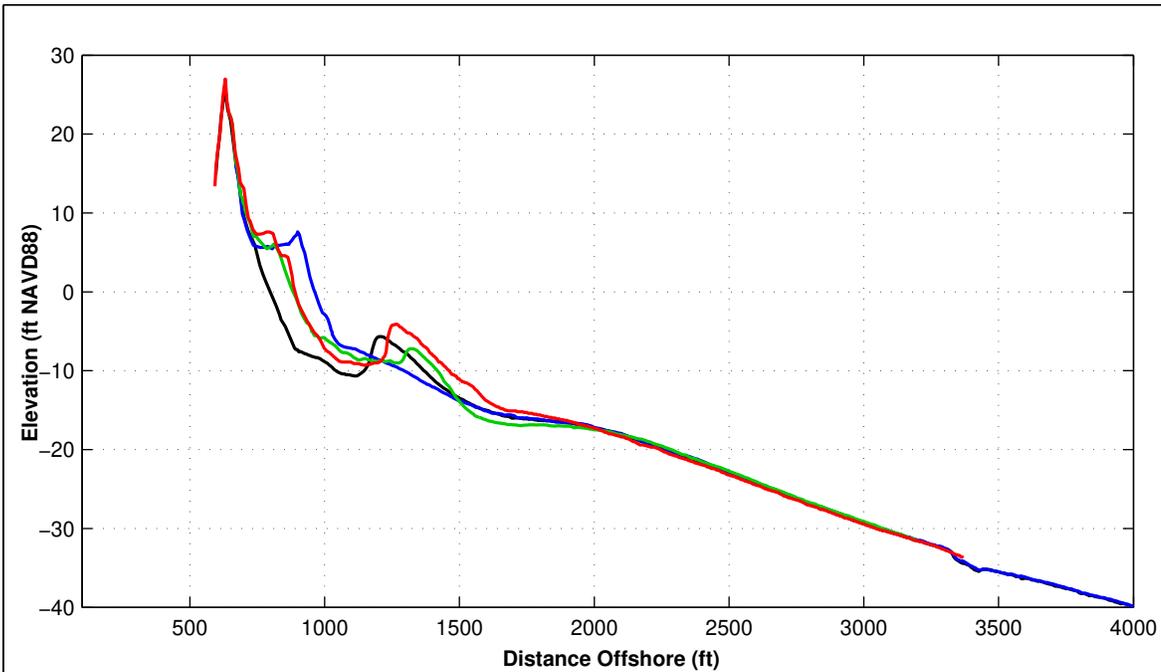
| Survey Transect 735+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -99.95 ft | -62.80 ft |
| Volume Change Above +6 ft NAVD88 | 1.78 cy/ft | 4.10 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -16.80 cy/ft | -8.80 cy/ft |
| Volume Change Above -6 ft NAVD88 | -43.11 cy/ft | -27.38 cy/ft |
| Volume Change Above -14 ft NAVD88 | -27.47 cy/ft | -10.64 cy/ft |
| Volume Change Above -19 ft NAVD88 | -39.23 cy/ft | -4.99 cy/ft |
| Volume Change Above -30 ft NAVD88 | -34.60 cy/ft | -7.91 cy/ft |

LEGEND:

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| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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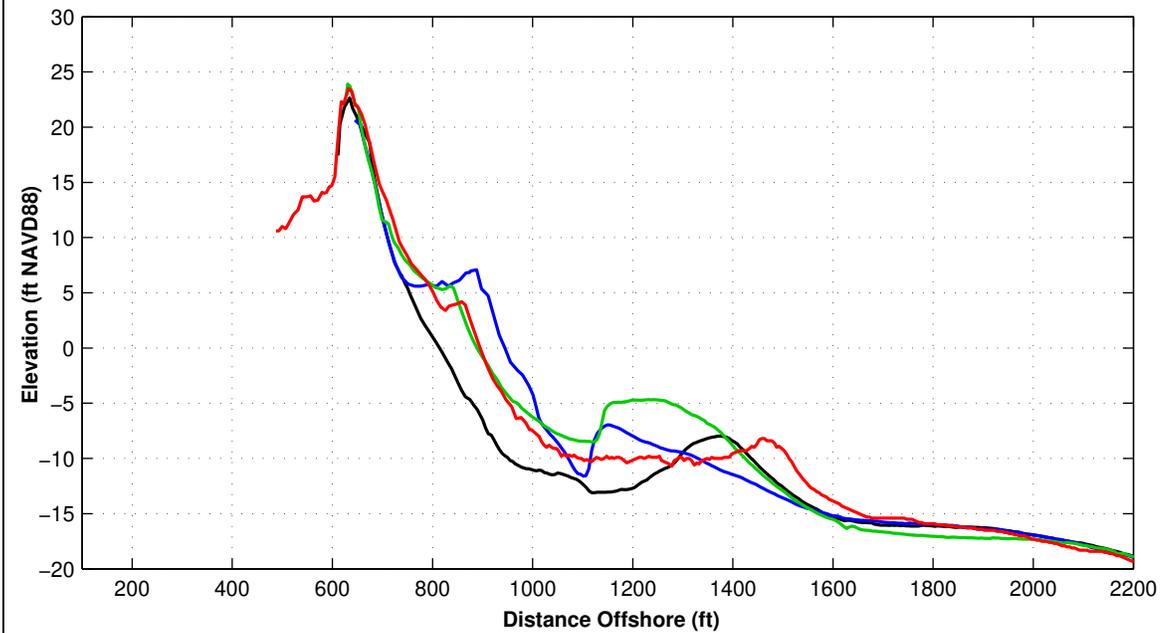
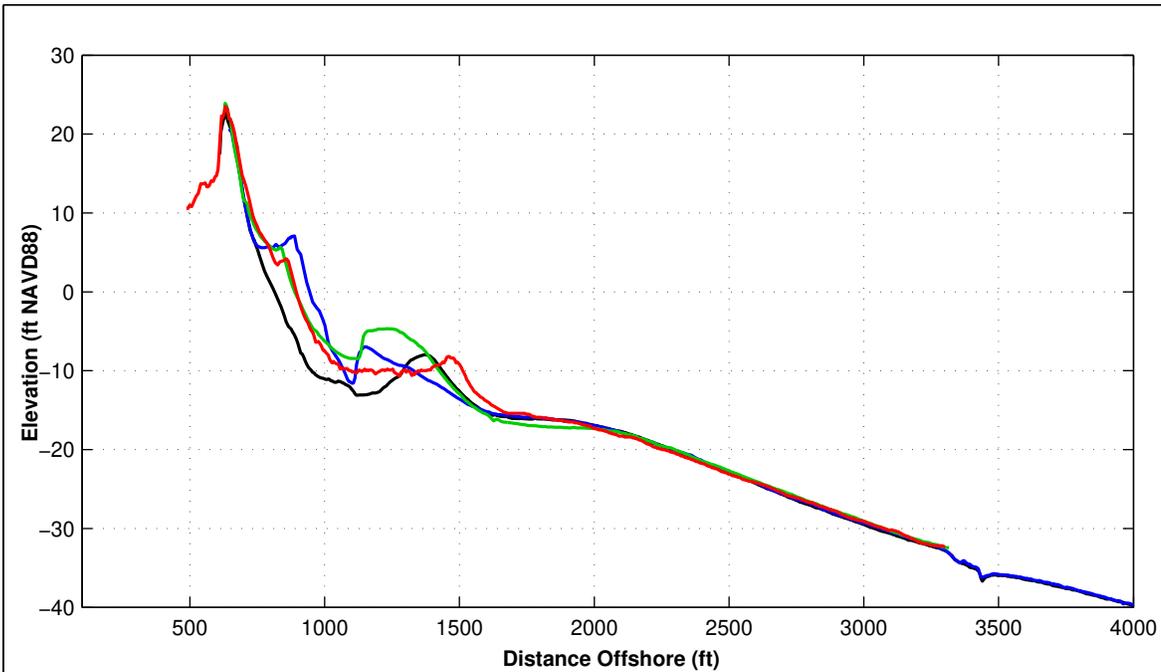
| Survey Transect 740+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -82.56 ft | -69.44 ft |
| Volume Change Above +6 ft NAVD88 | 3.12 cy/ft | 8.17 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -12.37 cy/ft | -3.96 cy/ft |
| Volume Change Above -6 ft NAVD88 | -32.86 cy/ft | -18.73 cy/ft |
| Volume Change Above -14 ft NAVD88 | -19.22 cy/ft | 14.14 cy/ft |
| Volume Change Above -19 ft NAVD88 | -34.04 cy/ft | 20.83 cy/ft |
| Volume Change Above -30 ft NAVD88 | -29.82 cy/ft | 11.31 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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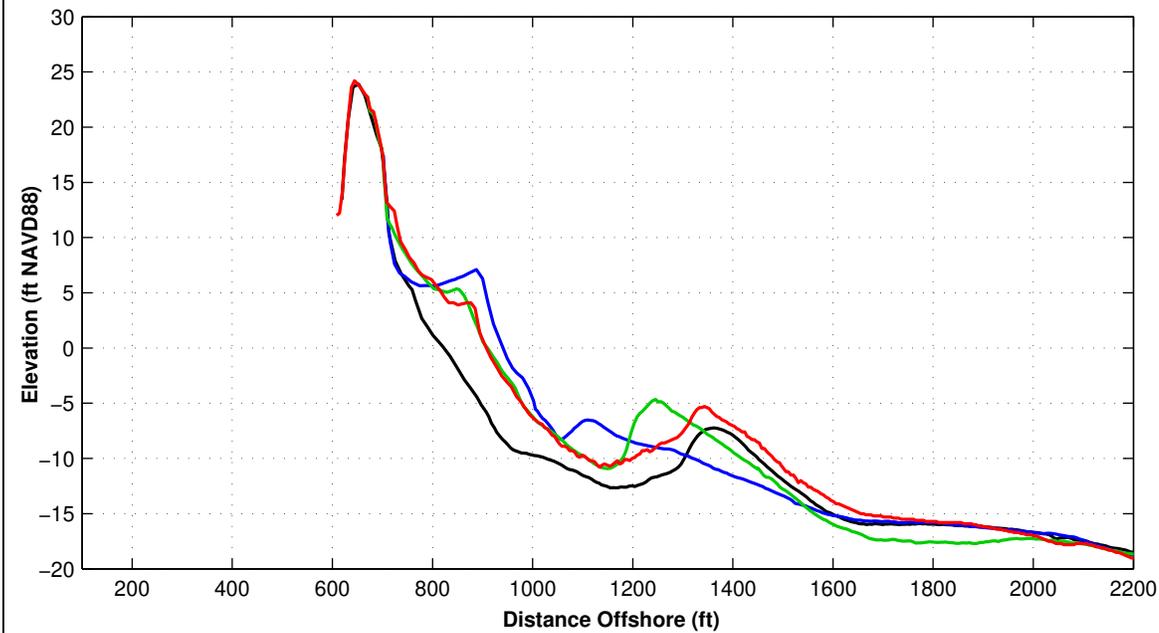
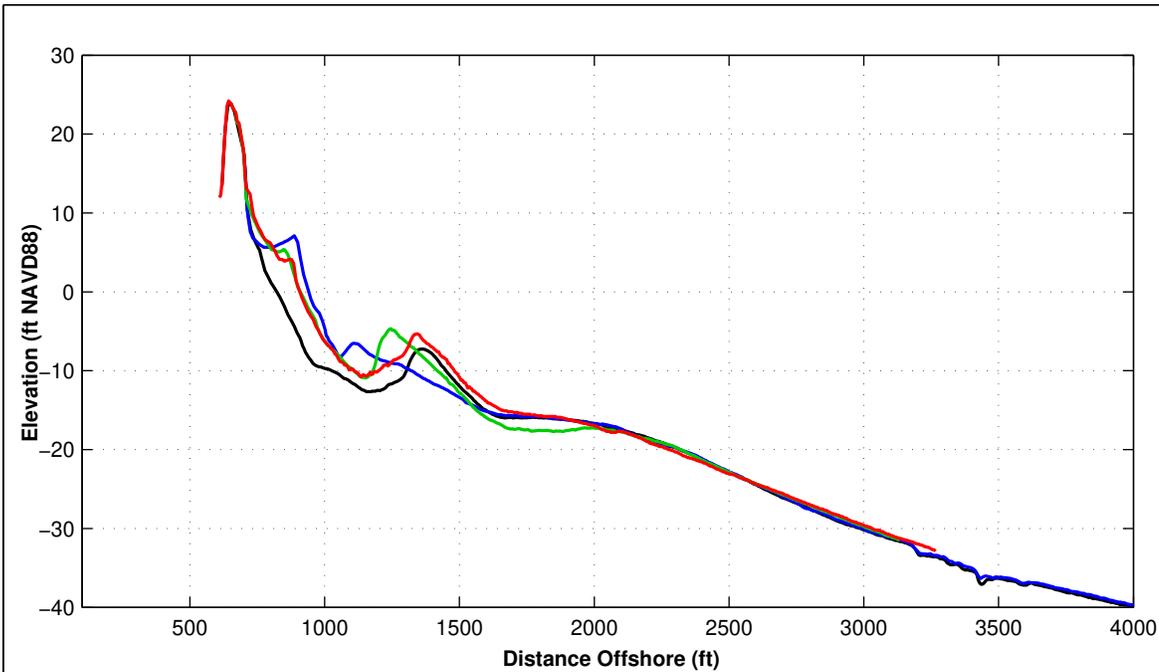
| Survey Transect 745+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -56.94 ft | -47.44 ft |
| Volume Change Above +6 ft NAVD88 | 3.78 cy/ft | 9.34 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -6.81 cy/ft | -2.80 cy/ft |
| Volume Change Above -6 ft NAVD88 | -13.54 cy/ft | -17.25 cy/ft |
| Volume Change Above -14 ft NAVD88 | 24.39 cy/ft | -9.54 cy/ft |
| Volume Change Above -19 ft NAVD88 | 11.02 cy/ft | -7.35 cy/ft |
| Volume Change Above -30 ft NAVD88 | 17.23 cy/ft | -8.76 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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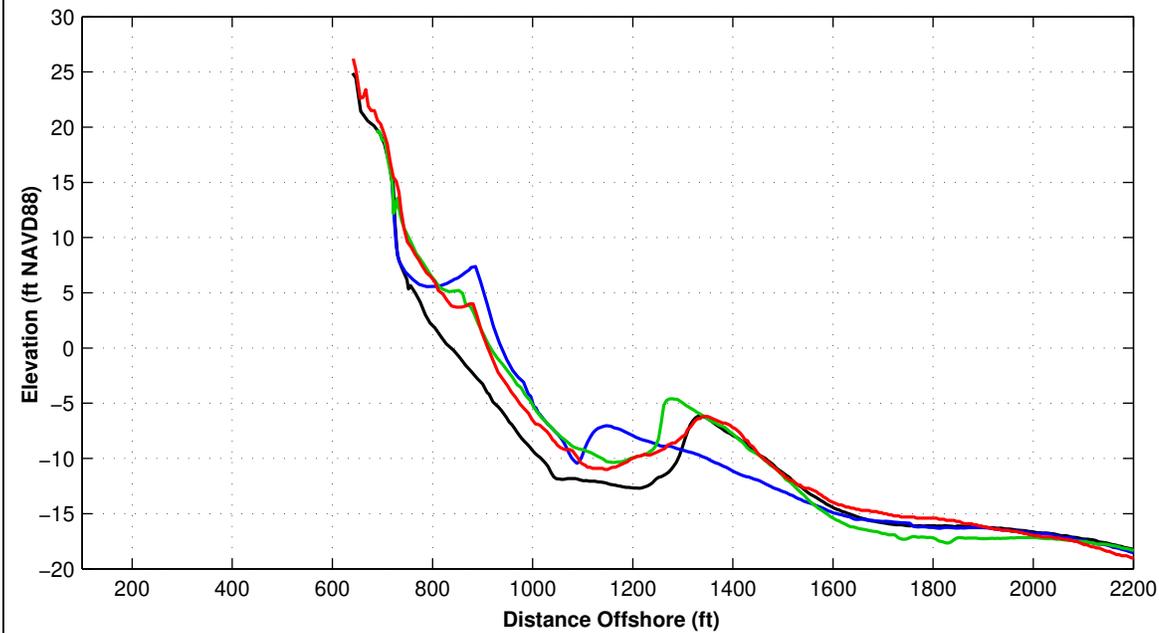
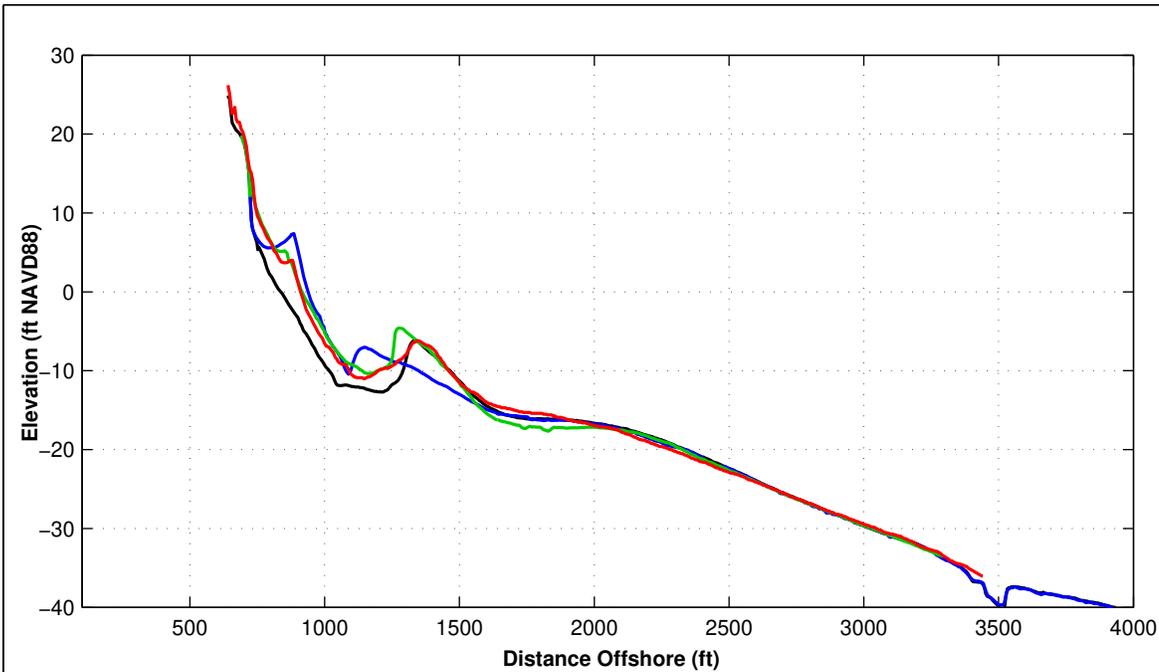
| Survey Transect 750+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -35.03 ft | -34.33 ft |
| Volume Change Above +6 ft NAVD88 | 3.56 cy/ft | 5.24 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -4.67 cy/ft | -3.80 cy/ft |
| Volume Change Above -6 ft NAVD88 | -9.82 cy/ft | -11.38 cy/ft |
| Volume Change Above -14 ft NAVD88 | 3.61 cy/ft | 8.90 cy/ft |
| Volume Change Above -19 ft NAVD88 | -19.82 cy/ft | 11.81 cy/ft |
| Volume Change Above -30 ft NAVD88 | -15.61 cy/ft | 13.19 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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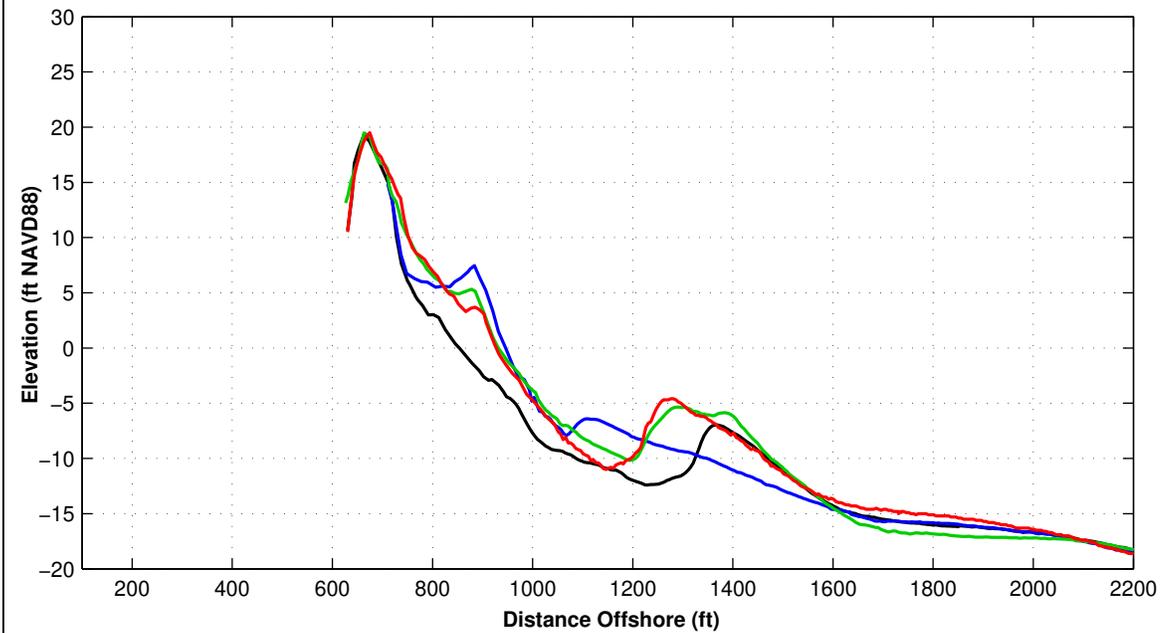
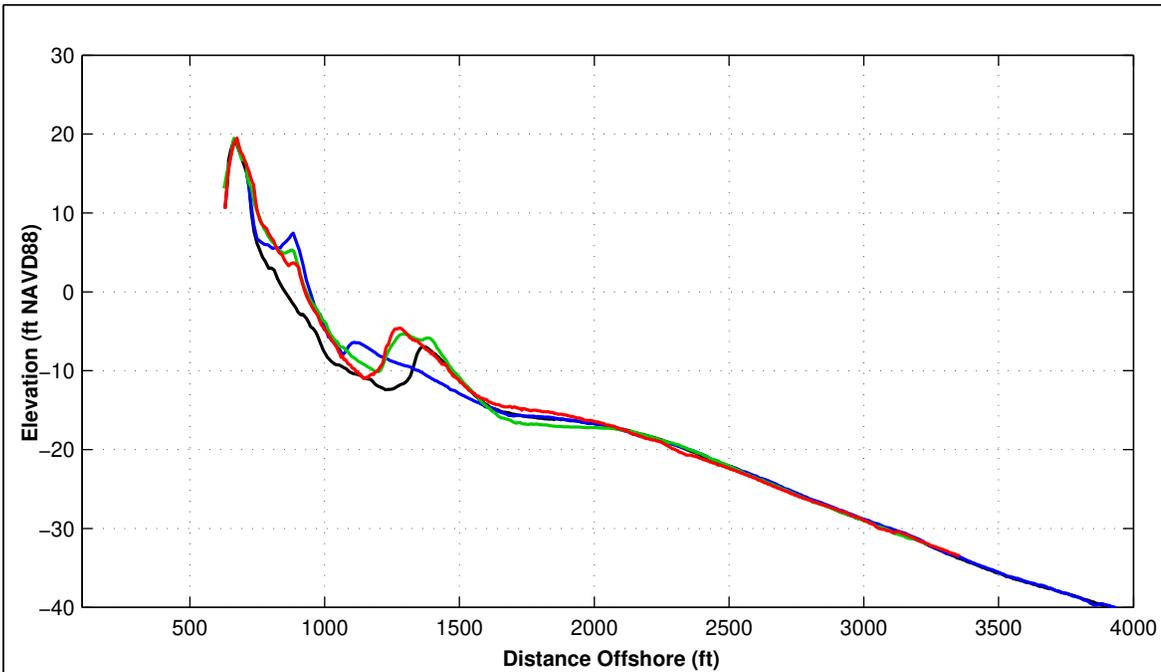
| Survey Transect 755+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -25.28 ft | -27.39 ft |
| Volume Change Above +6 ft NAVD88 | 6.04 cy/ft | 6.67 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -0.86 cy/ft | -1.98 cy/ft |
| Volume Change Above -6 ft NAVD88 | -1.84 cy/ft | -9.73 cy/ft |
| Volume Change Above -14 ft NAVD88 | 17.20 cy/ft | 0.87 cy/ft |
| Volume Change Above -19 ft NAVD88 | 2.62 cy/ft | 6.42 cy/ft |
| Volume Change Above -30 ft NAVD88 | 2.01 cy/ft | 1.93 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
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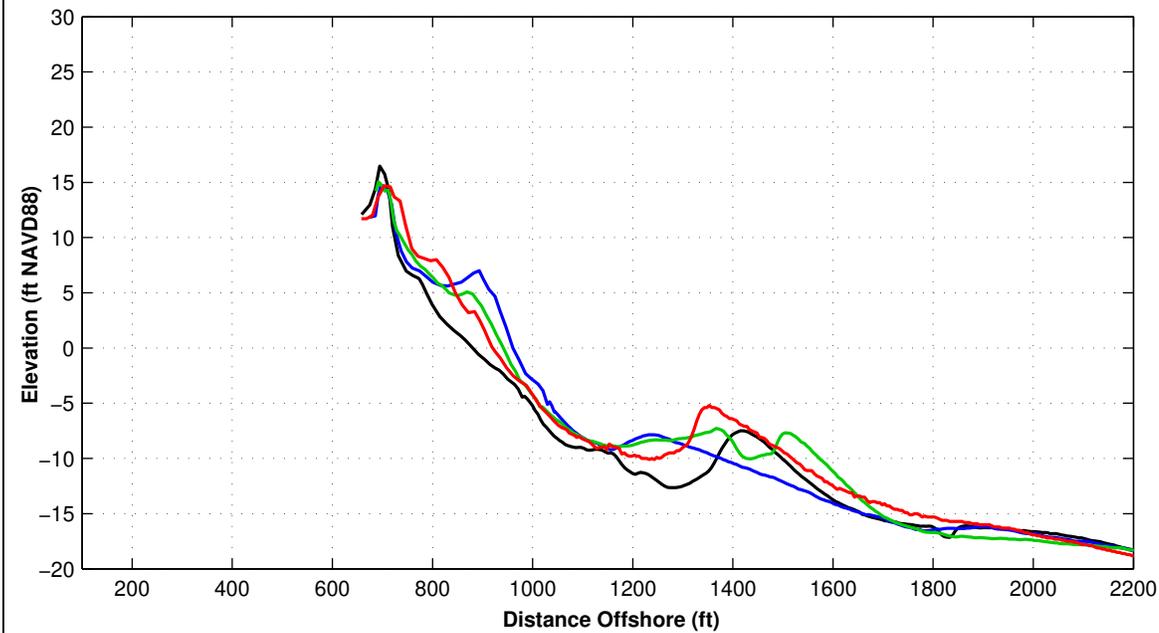
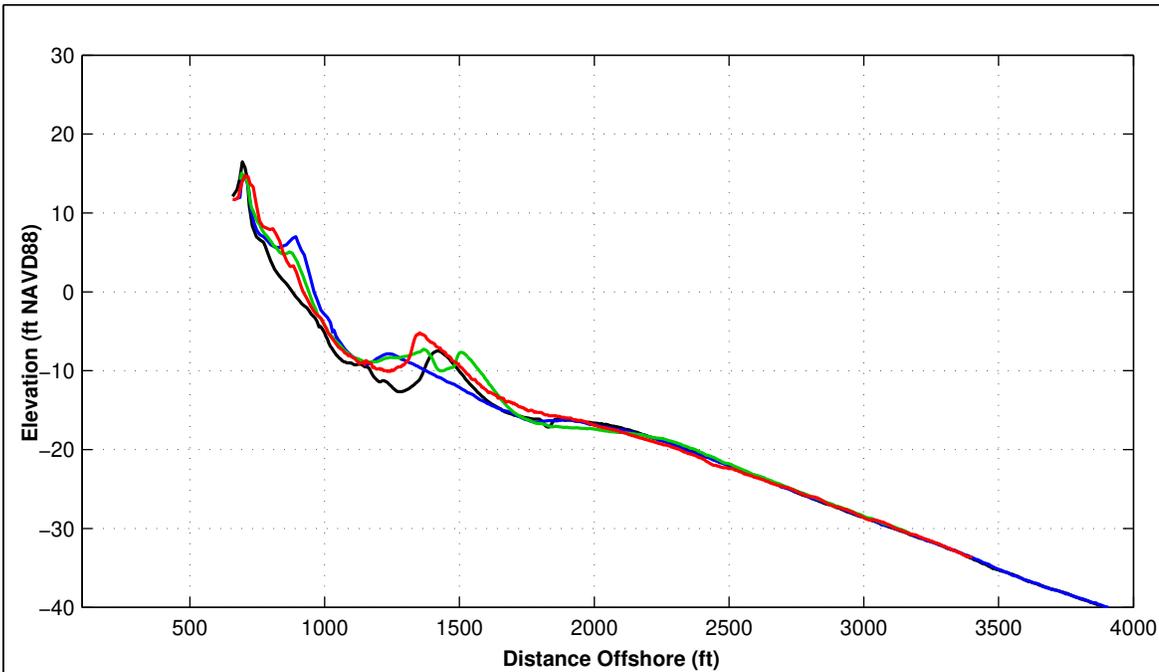
| Survey Transect 760+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -15.87 ft | -18.11 ft |
| Volume Change Above +6 ft NAVD88 | 5.86 cy/ft | 7.94 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | 1.20 cy/ft | 0.42 cy/ft |
| Volume Change Above -6 ft NAVD88 | 2.22 cy/ft | 0.29 cy/ft |
| Volume Change Above -14 ft NAVD88 | 30.51 cy/ft | 17.56 cy/ft |
| Volume Change Above -19 ft NAVD88 | 18.93 cy/ft | 28.06 cy/ft |
| Volume Change Above -30 ft NAVD88 | 14.24 cy/ft | 17.76 cy/ft |

LEGEND:

| | | | |
|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
1. Station From North To South At Varying Intervals.
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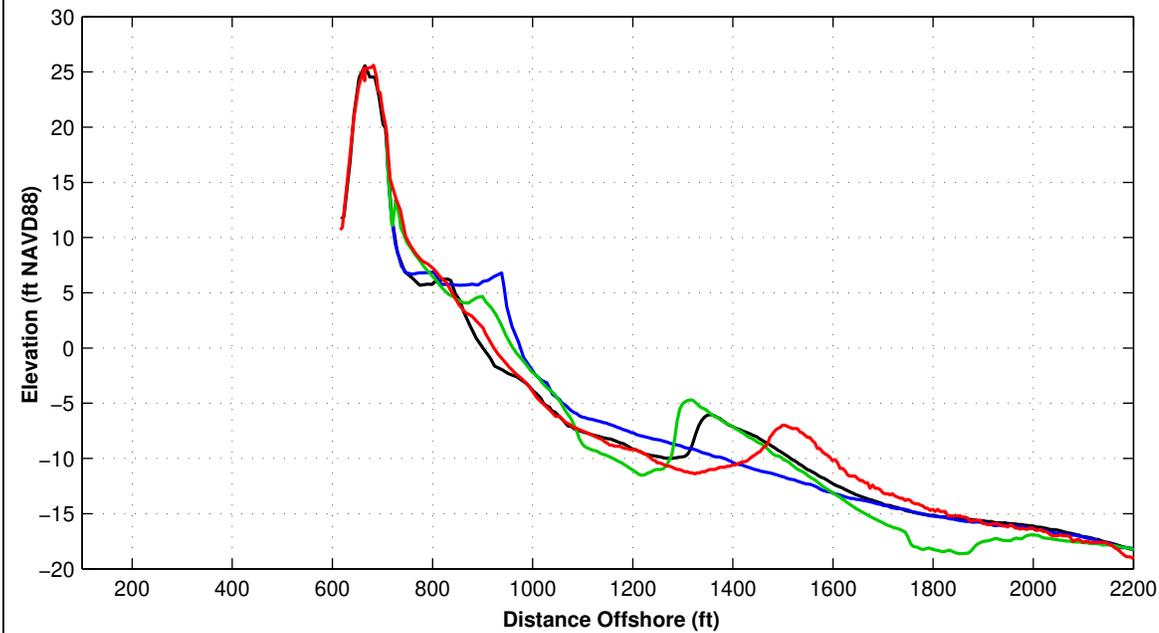
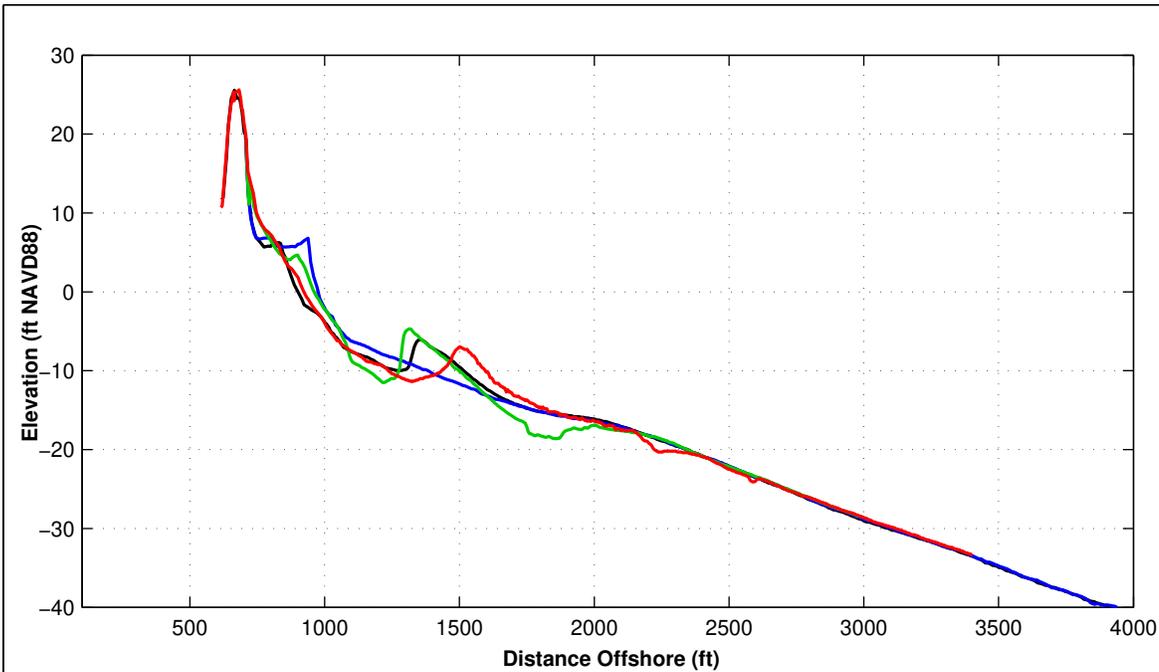
| Survey Transect 765+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -24.12 ft | -44.04 ft |
| Volume Change Above +6 ft NAVD88 | 1.46 cy/ft | 7.93 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -5.95 cy/ft | -2.34 cy/ft |
| Volume Change Above -6 ft NAVD88 | -11.66 cy/ft | -9.69 cy/ft |
| Volume Change Above -14 ft NAVD88 | 18.36 cy/ft | 15.35 cy/ft |
| Volume Change Above -19 ft NAVD88 | 13.43 cy/ft | 23.19 cy/ft |
| Volume Change Above -30 ft NAVD88 | 20.29 cy/ft | 19.71 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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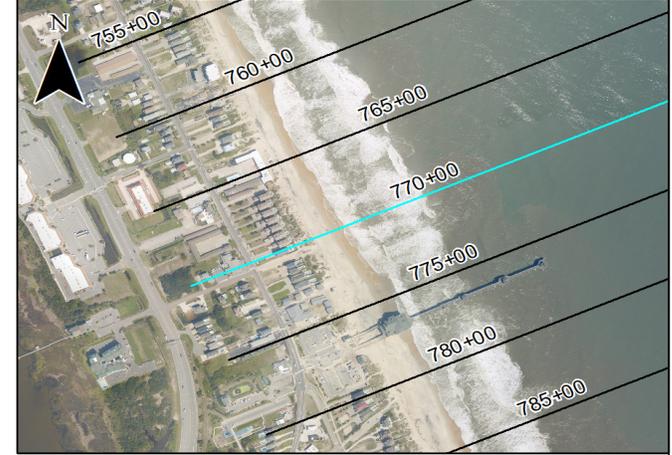


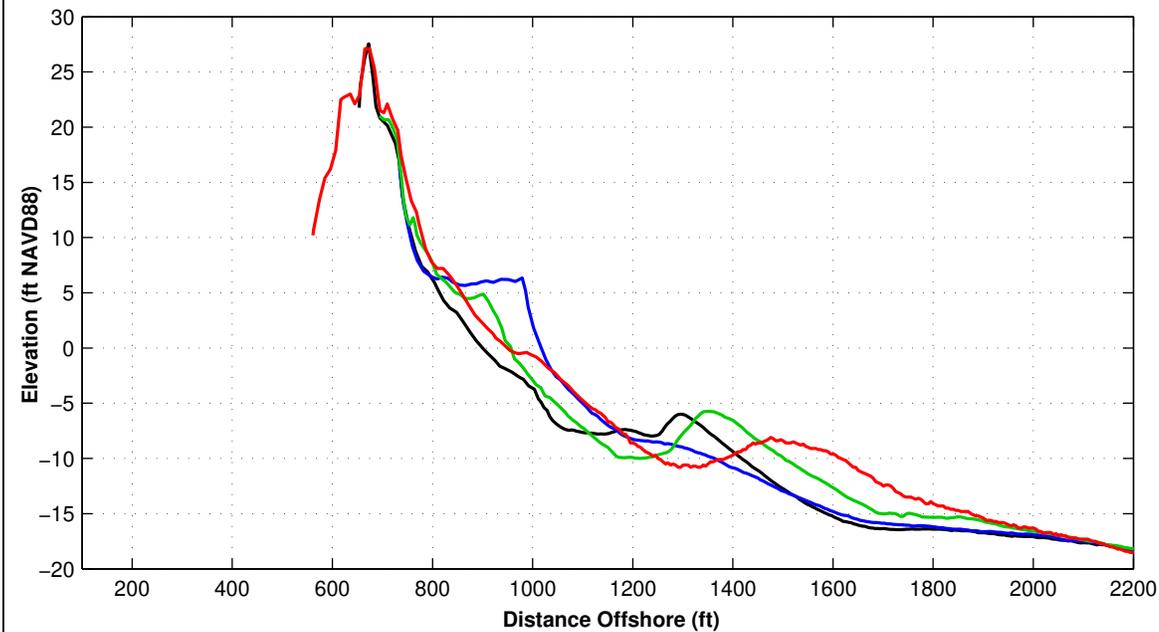
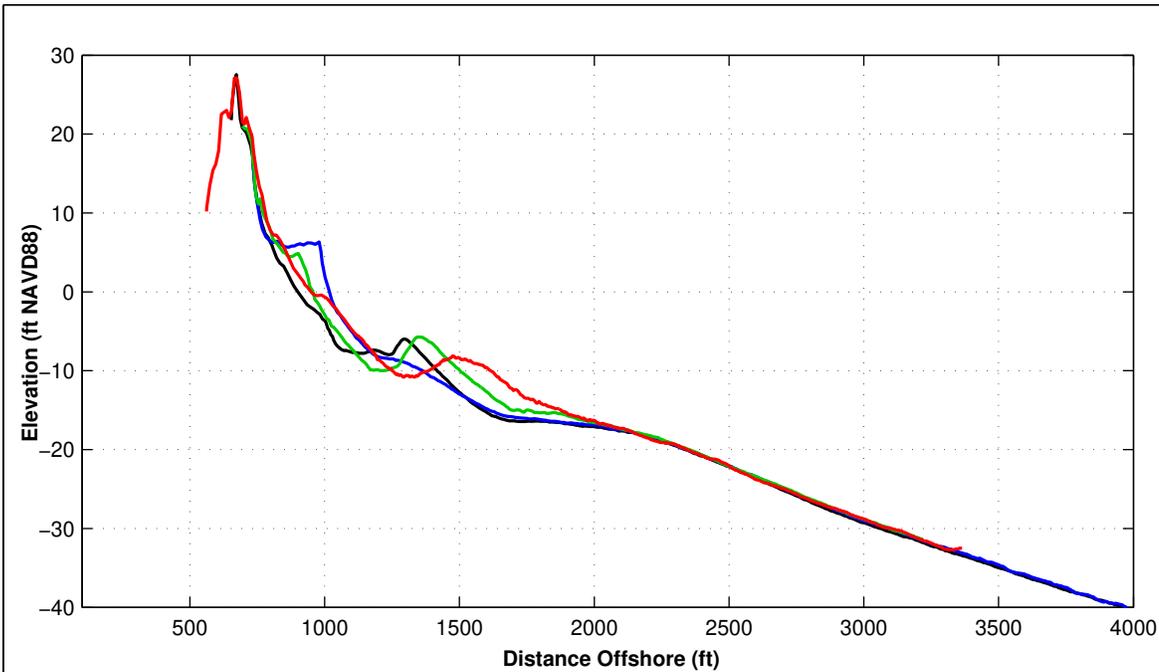
| Survey Transect 770+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -19.42 ft | -57.95 ft |
| Volume Change Above +6 ft NAVD88 | 4.75 cy/ft | 7.83 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -4.73 cy/ft | -6.82 cy/ft |
| Volume Change Above -6 ft NAVD88 | -4.77 cy/ft | -18.50 cy/ft |
| Volume Change Above -14 ft NAVD88 | -0.12 cy/ft | -8.26 cy/ft |
| Volume Change Above -19 ft NAVD88 | -29.06 cy/ft | -8.02 cy/ft |
| Volume Change Above -30 ft NAVD88 | -28.68 cy/ft | -13.78 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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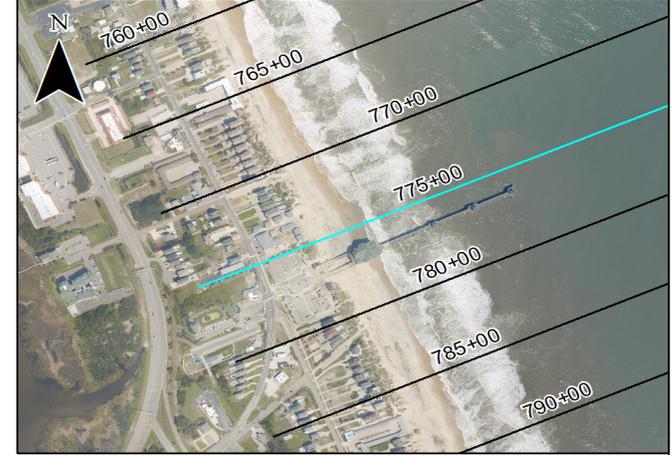


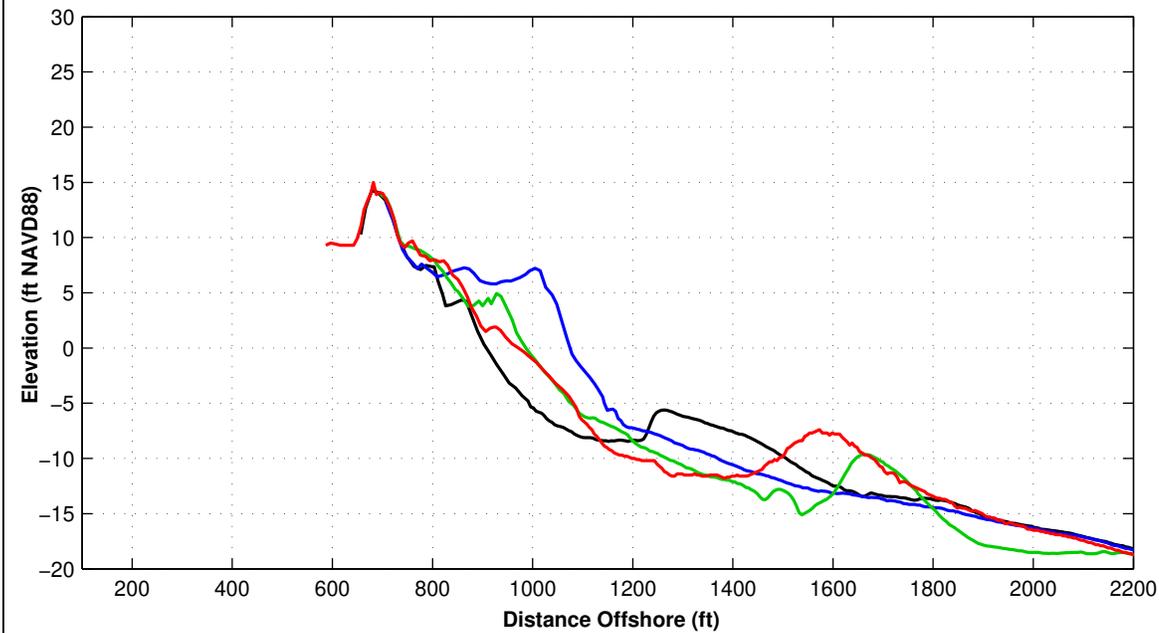
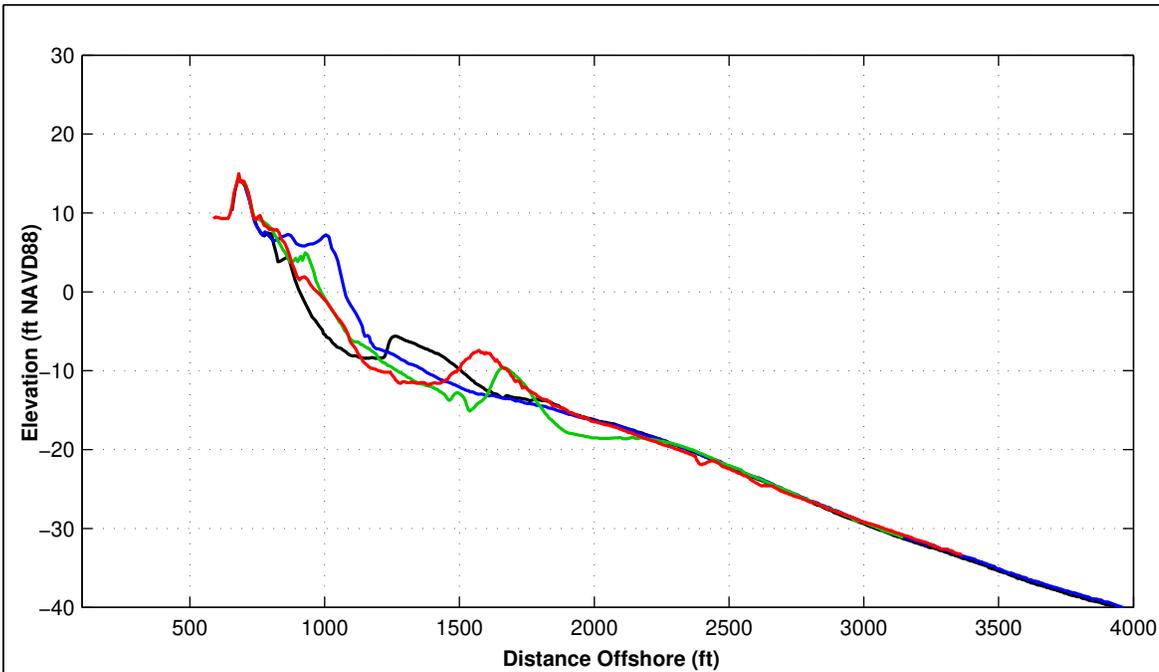
| Survey Transect 775+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -65.16 ft | -84.60 ft |
| Volume Change Above +6 ft NAVD88 | 4.40 cy/ft | 8.20 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -11.33 cy/ft | -11.64 cy/ft |
| Volume Change Above -6 ft NAVD88 | -26.26 cy/ft | -15.84 cy/ft |
| Volume Change Above -14 ft NAVD88 | -1.69 cy/ft | 20.53 cy/ft |
| Volume Change Above -19 ft NAVD88 | 14.39 cy/ft | 43.96 cy/ft |
| Volume Change Above -30 ft NAVD88 | 17.31 cy/ft | 43.89 cy/ft |

LEGEND:

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| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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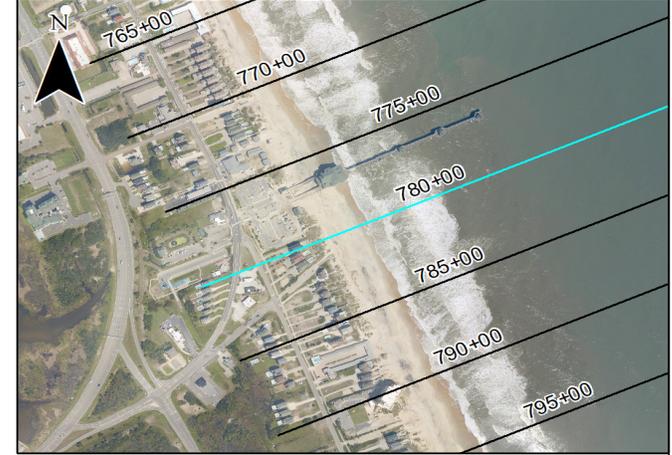


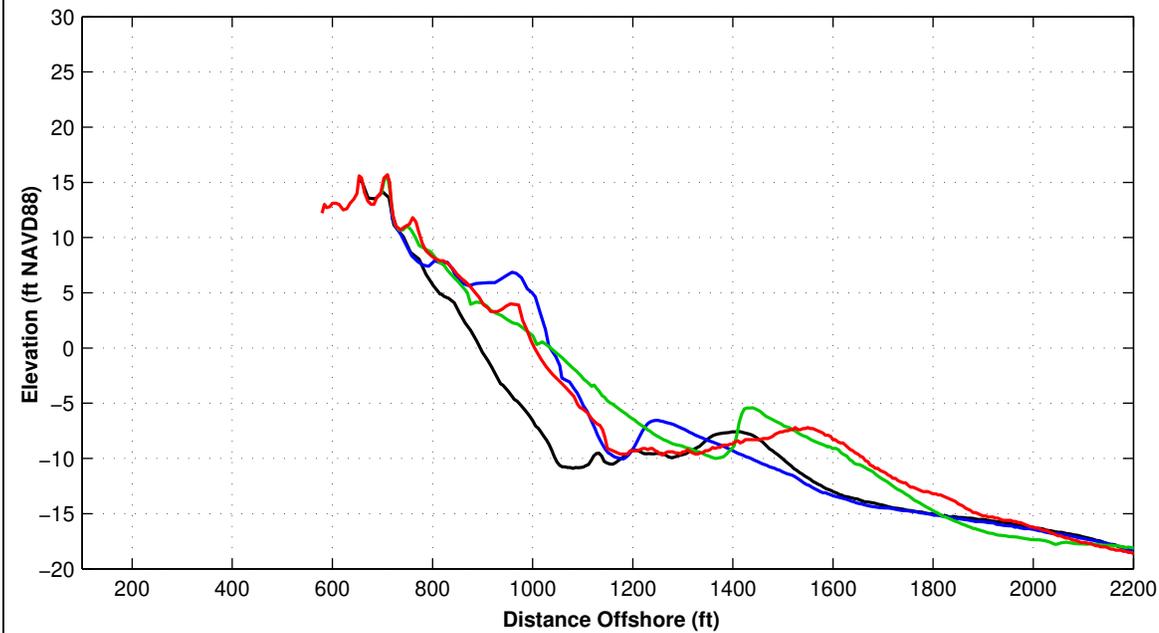
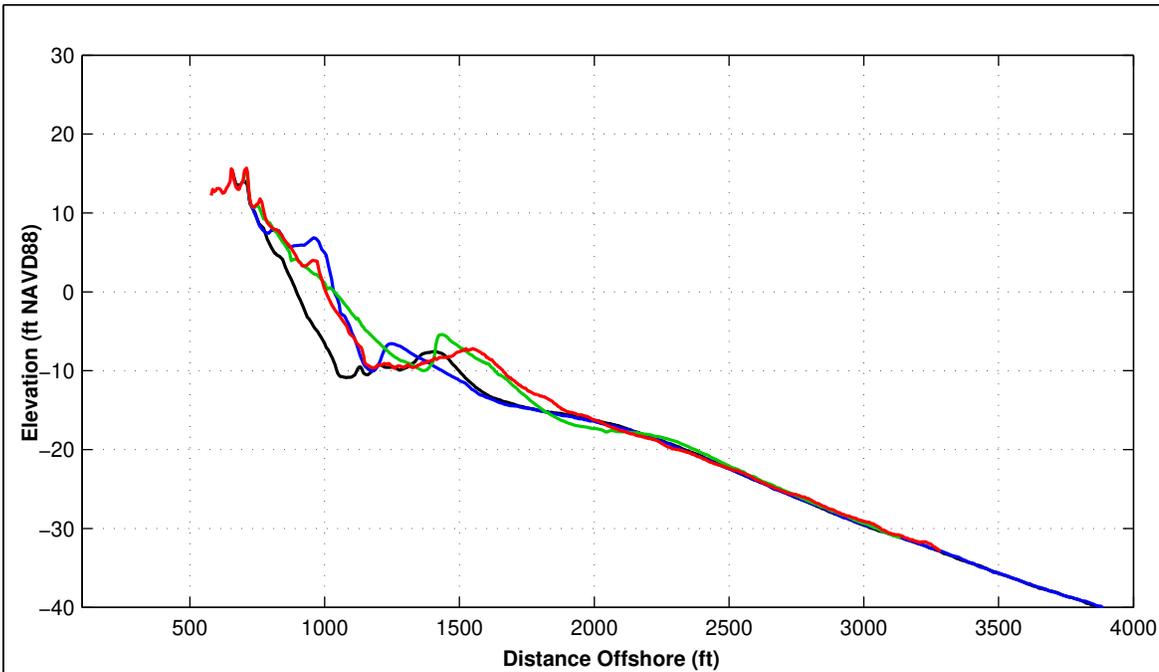
| Survey Transect 780+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -96.25 ft | -123.68 ft |
| Volume Change Above +6 ft NAVD88 | 0.11 cy/ft | 1.03 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -23.03 cy/ft | -28.03 cy/ft |
| Volume Change Above -6 ft NAVD88 | -44.20 cy/ft | -50.12 cy/ft |
| Volume Change Above -14 ft NAVD88 | -53.03 cy/ft | -36.16 cy/ft |
| Volume Change Above -19 ft NAVD88 | -78.56 cy/ft | -36.35 cy/ft |
| Volume Change Above -30 ft NAVD88 | -78.74 cy/ft | -45.78 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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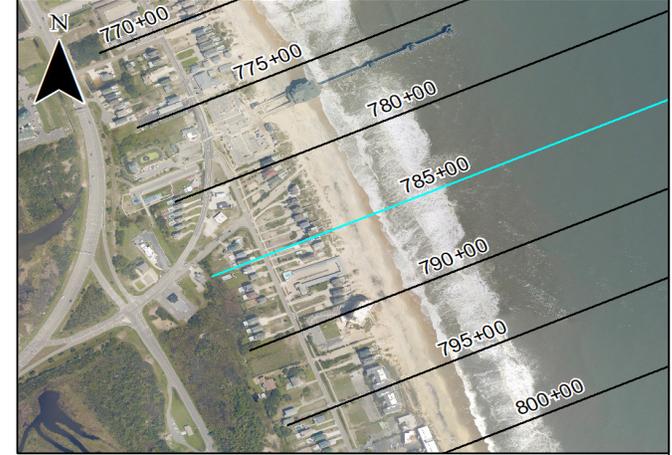


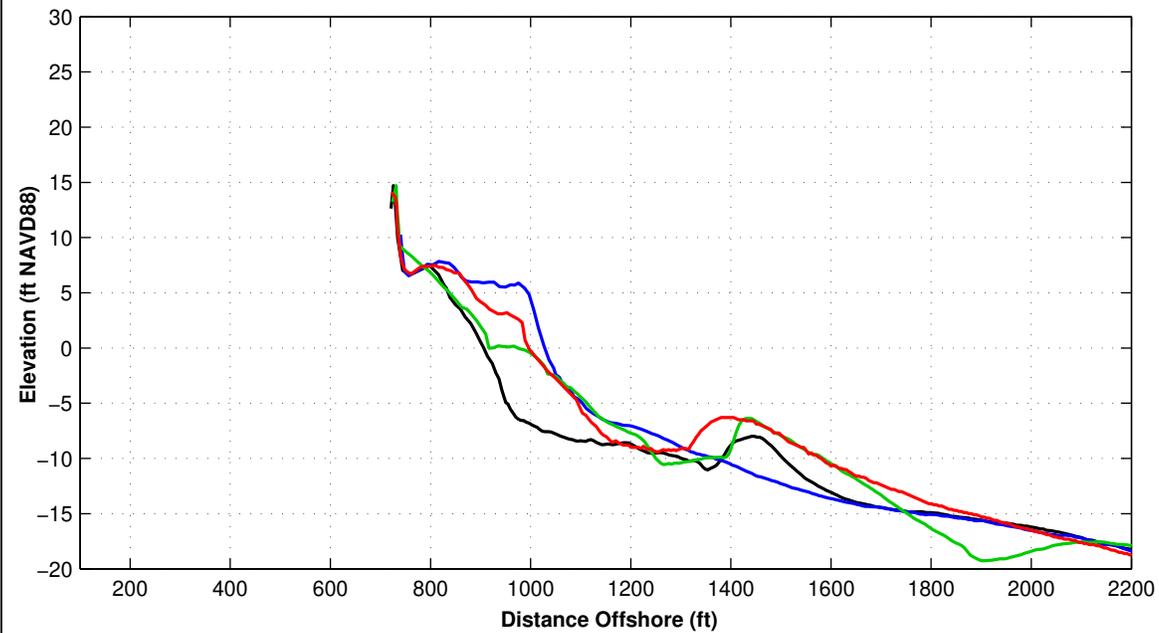
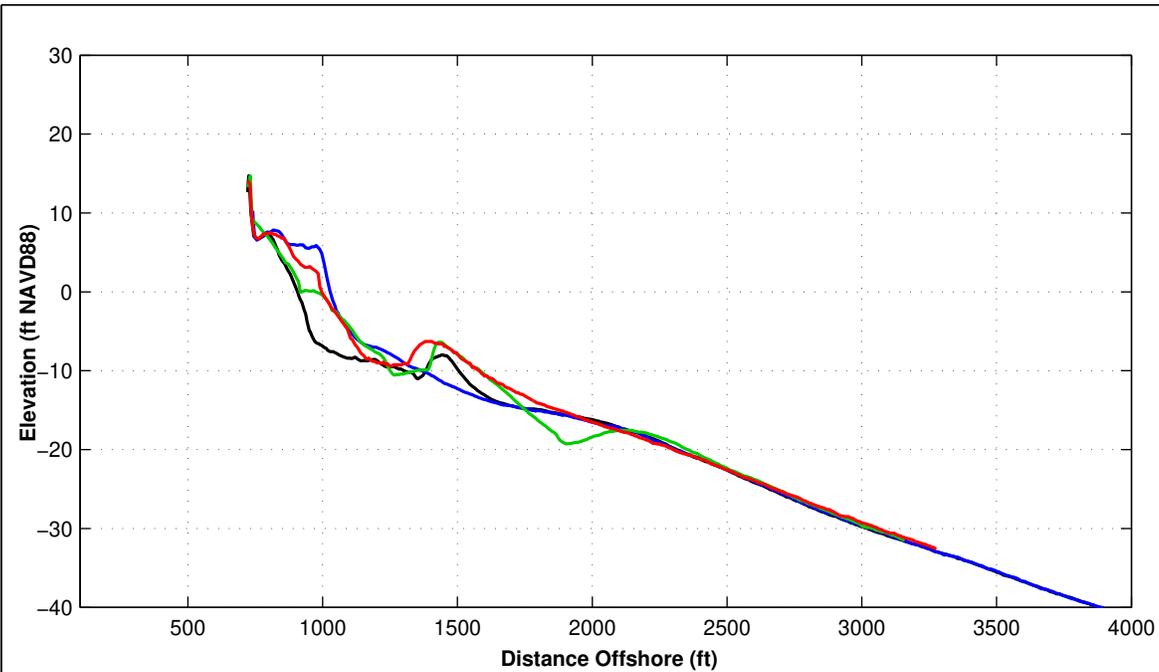
| Survey Transect 785+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -29.24 ft | -35.29 ft |
| Volume Change Above +6 ft NAVD88 | 3.19 cy/ft | 4.42 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -13.16 cy/ft | -8.36 cy/ft |
| Volume Change Above -6 ft NAVD88 | -5.03 cy/ft | -13.84 cy/ft |
| Volume Change Above -14 ft NAVD88 | 42.50 cy/ft | 24.55 cy/ft |
| Volume Change Above -19 ft NAVD88 | 38.91 cy/ft | 31.75 cy/ft |
| Volume Change Above -30 ft NAVD88 | 48.68 cy/ft | 36.17 cy/ft |

LEGEND:

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| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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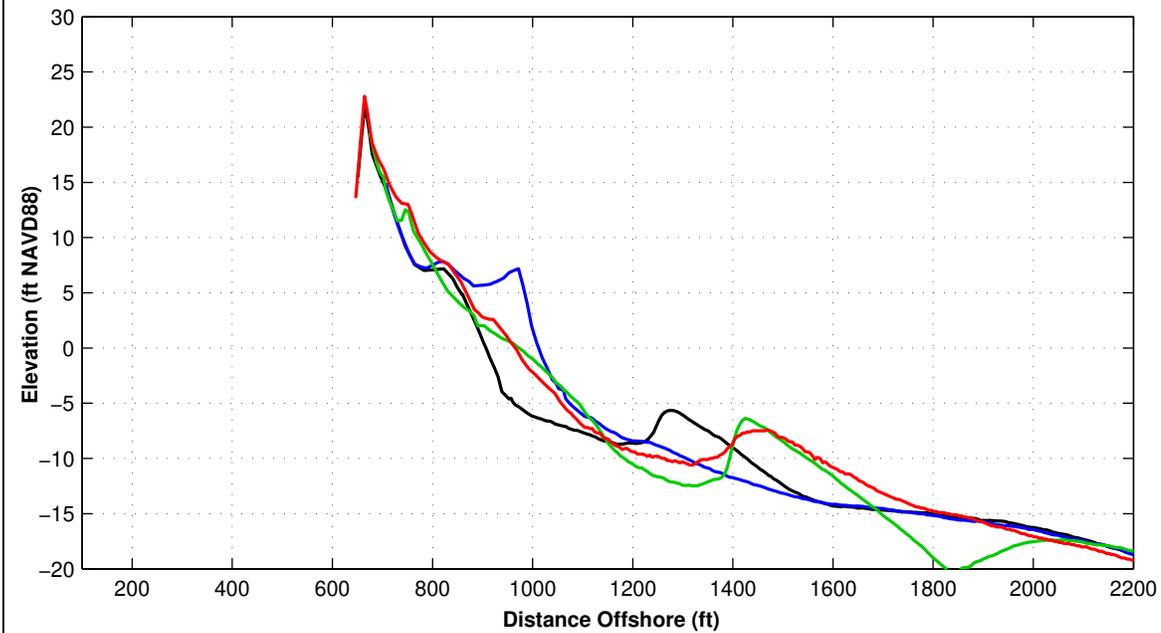
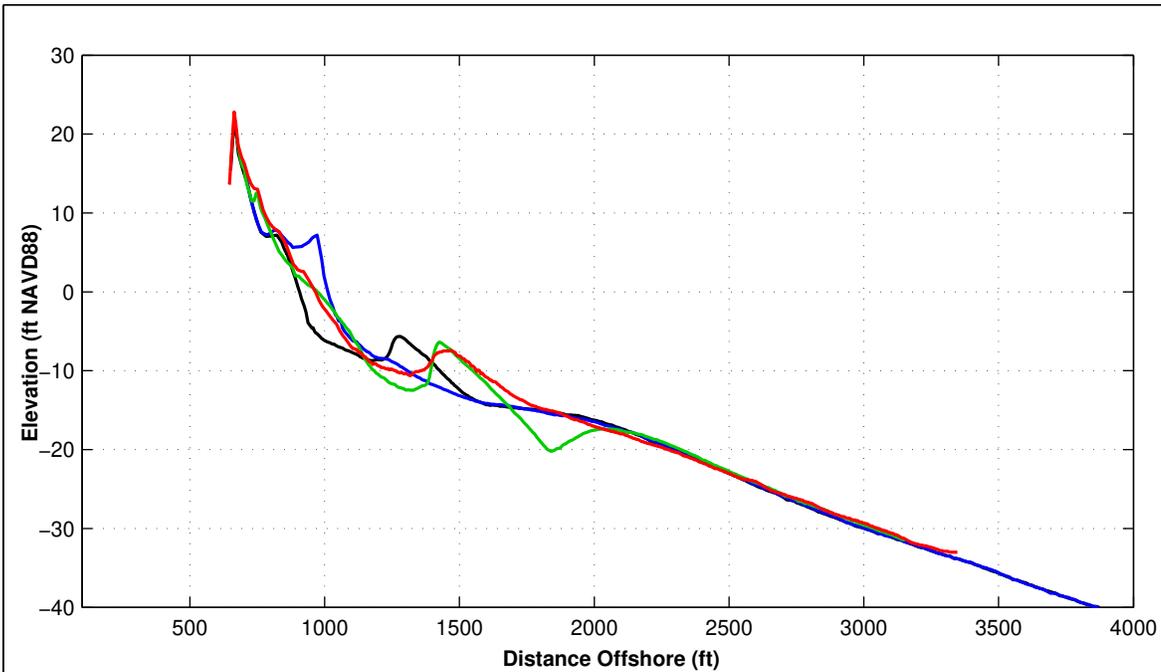
| Survey Transect 790+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -109.10 ft | -32.54 ft |
| Volume Change Above +6 ft NAVD88 | 9.77 cy/ft | -1.17 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -13.91 cy/ft | -13.71 cy/ft |
| Volume Change Above -6 ft NAVD88 | -19.88 cy/ft | -18.11 cy/ft |
| Volume Change Above -14 ft NAVD88 | 10.76 cy/ft | 23.75 cy/ft |
| Volume Change Above -19 ft NAVD88 | -10.07 cy/ft | 28.16 cy/ft |
| Volume Change Above -30 ft NAVD88 | 91.06 cy/ft | 32.82 cy/ft |

LEGEND:

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| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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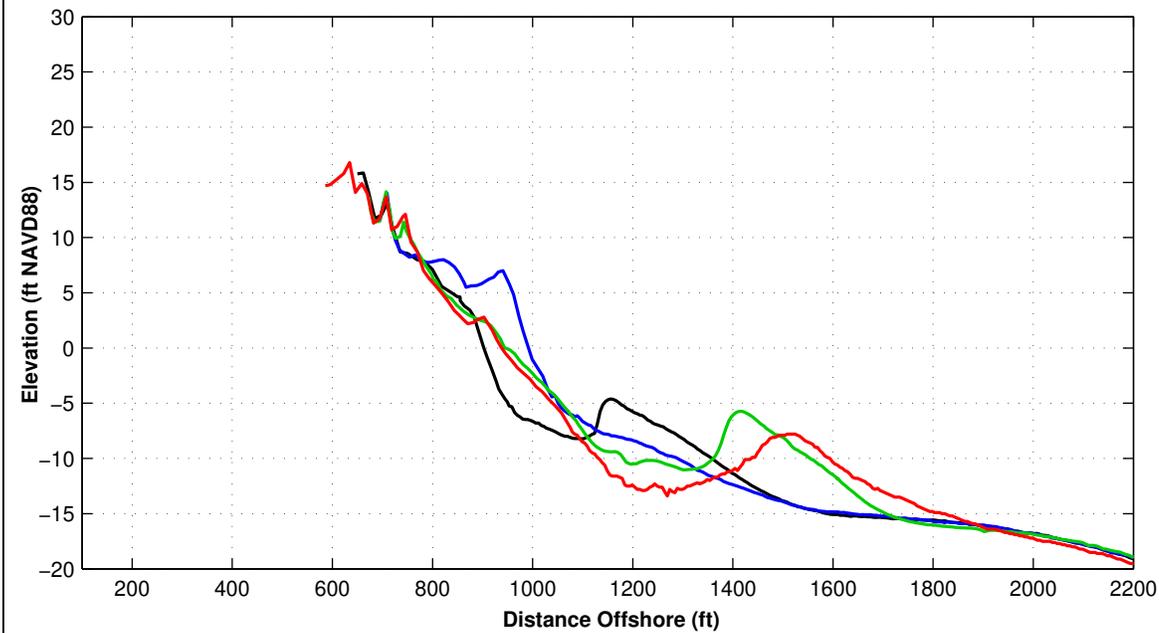
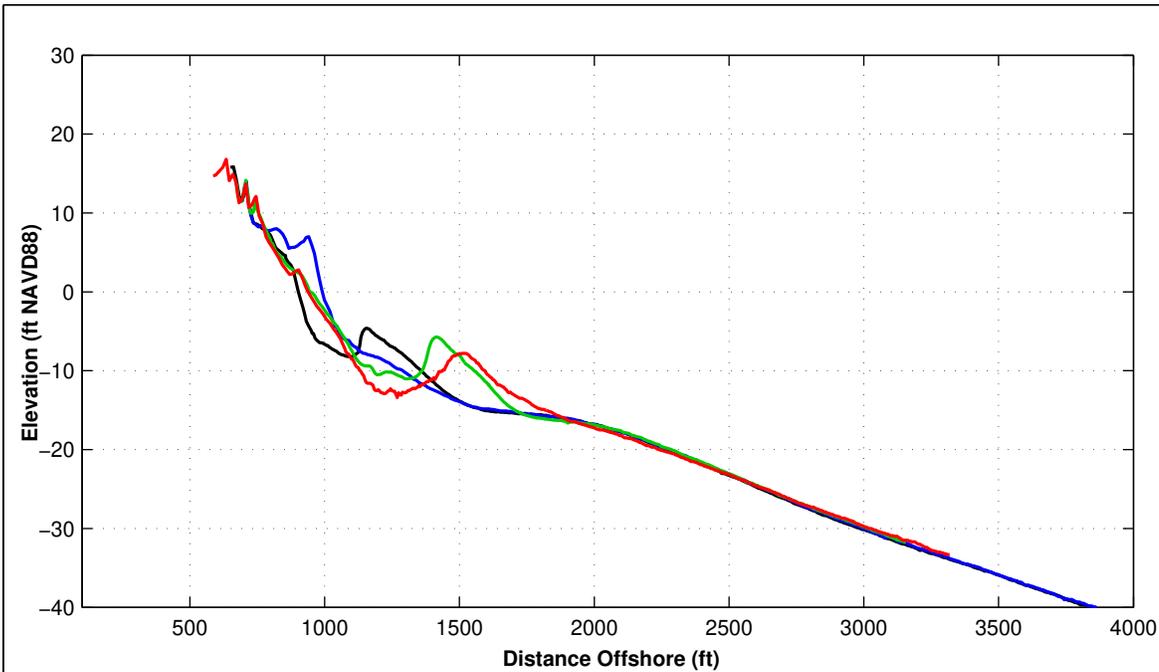
| Survey Transect 795+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -74.61 ft | -56.84 ft |
| Volume Change Above +6 ft NAVD88 | 1.78 cy/ft | 7.66 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -19.93 cy/ft | -9.18 cy/ft |
| Volume Change Above -6 ft NAVD88 | -22.83 cy/ft | -17.76 cy/ft |
| Volume Change Above -14 ft NAVD88 | -4.48 cy/ft | 19.42 cy/ft |
| Volume Change Above -19 ft NAVD88 | -33.46 cy/ft | 18.75 cy/ft |
| Volume Change Above -30 ft NAVD88 | -26.98 cy/ft | 23.18 cy/ft |

LEGEND:

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| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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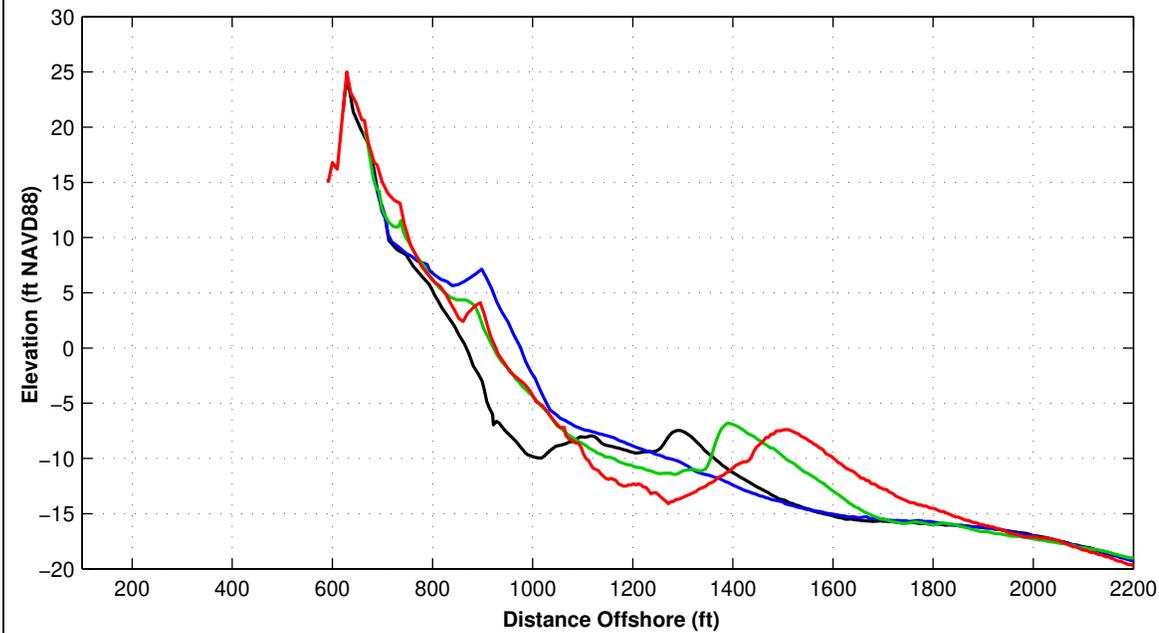
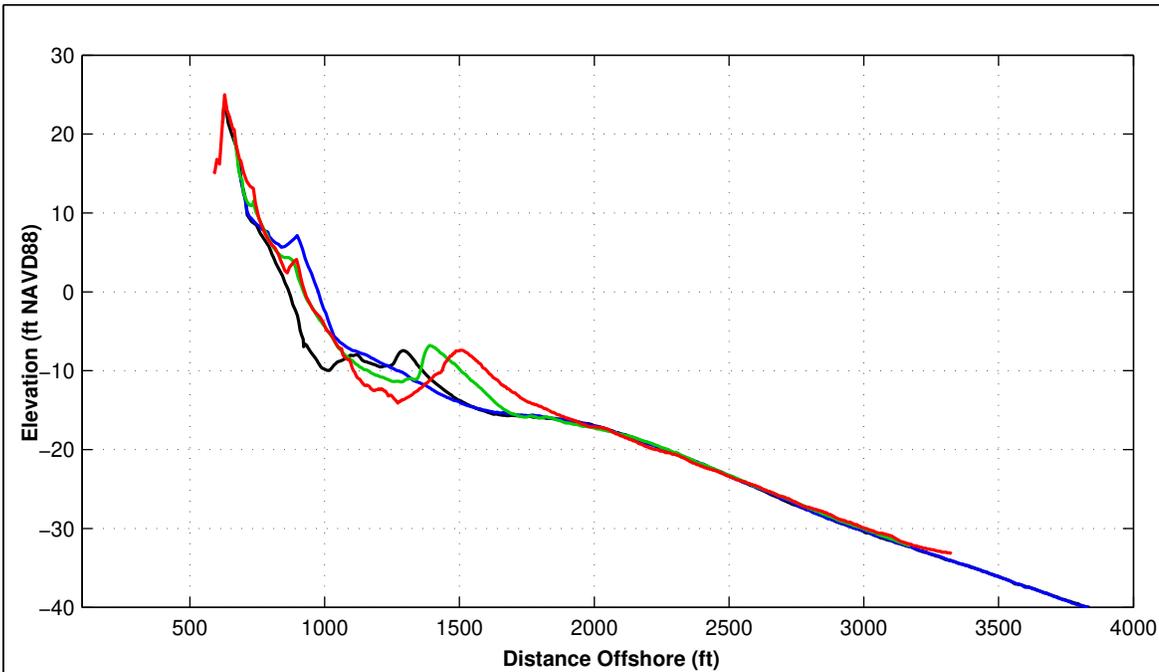
| Survey Transect 800+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -52.75 ft | -59.45 ft |
| Volume Change Above +6 ft NAVD88 | -2.47 cy/ft | -2.11 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -20.78 cy/ft | -22.15 cy/ft |
| Volume Change Above -6 ft NAVD88 | -25.15 cy/ft | -30.80 cy/ft |
| Volume Change Above -14 ft NAVD88 | 12.79 cy/ft | -15.94 cy/ft |
| Volume Change Above -19 ft NAVD88 | 15.71 cy/ft | -8.24 cy/ft |
| Volume Change Above -30 ft NAVD88 | 19.41 cy/ft | -8.90 cy/ft |

LEGEND:

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| JUNE 2020 | | AUGUST 2019 | |
| POST-DORIAN | | APRIL 2019 | |

- Notes:
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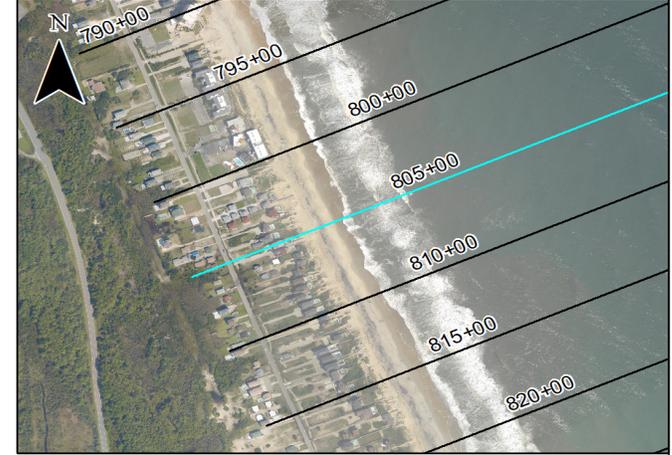


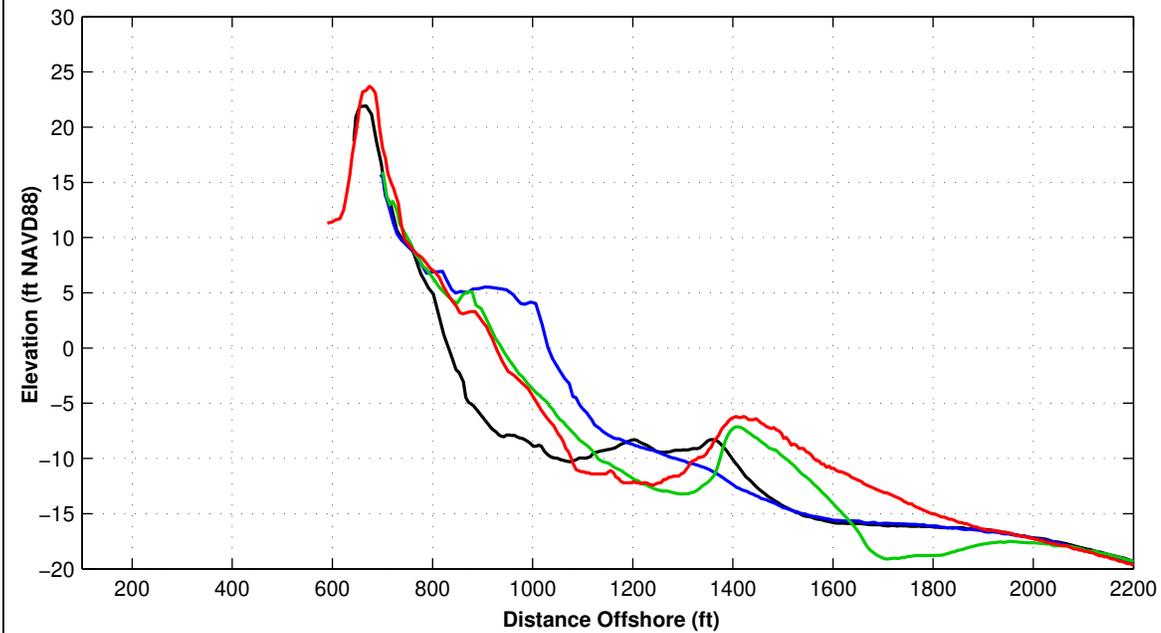
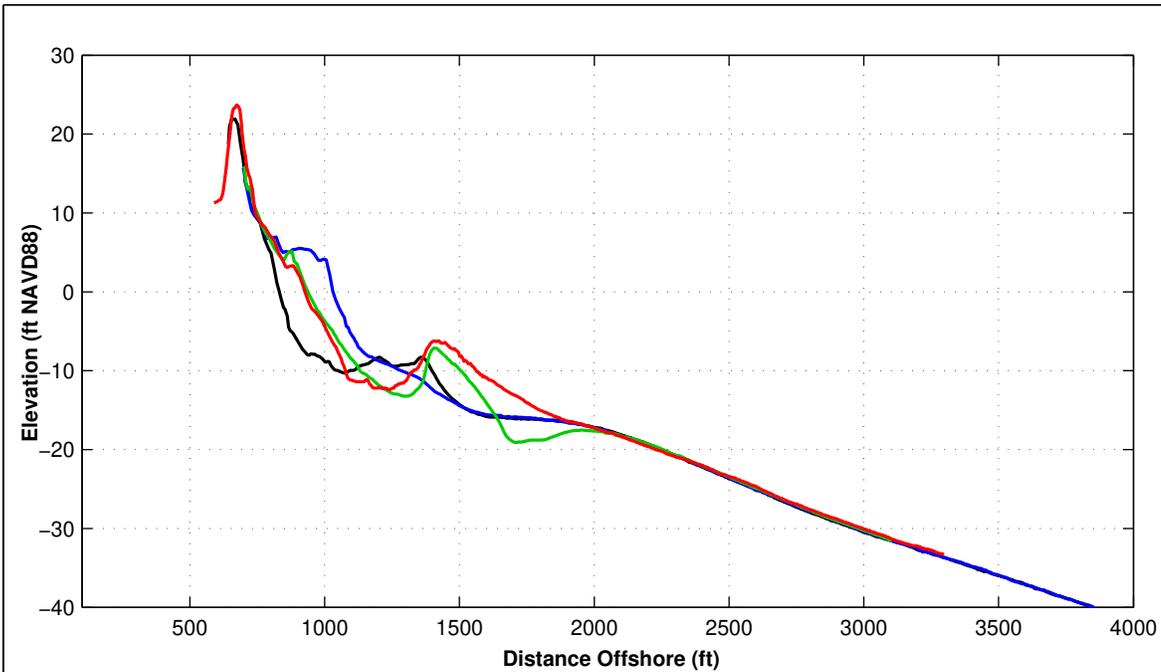
| Survey Transect 805+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -53.87 ft | -46.94 ft |
| Volume Change Above +6 ft NAVD88 | 1.60 cy/ft | 6.78 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -10.18 cy/ft | -6.02 cy/ft |
| Volume Change Above -6 ft NAVD88 | -19.99 cy/ft | -14.99 cy/ft |
| Volume Change Above -14 ft NAVD88 | 1.53 cy/ft | -0.08 cy/ft |
| Volume Change Above -19 ft NAVD88 | 3.94 cy/ft | 14.42 cy/ft |
| Volume Change Above -30 ft NAVD88 | 8.41 cy/ft | 16.44 cy/ft |

LEGEND:

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| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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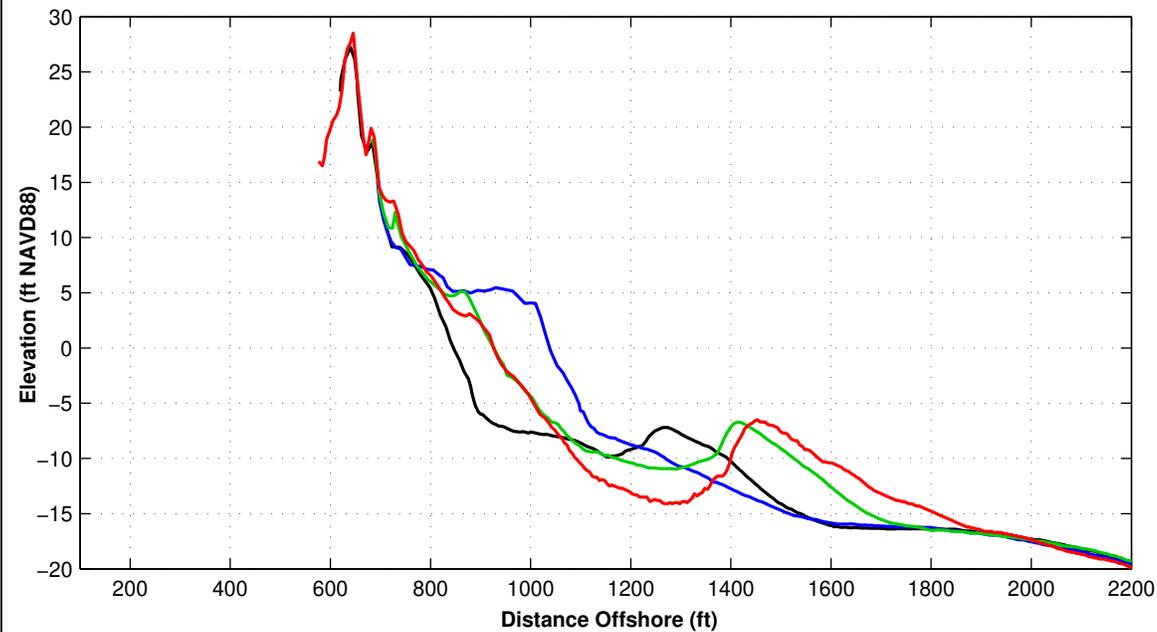
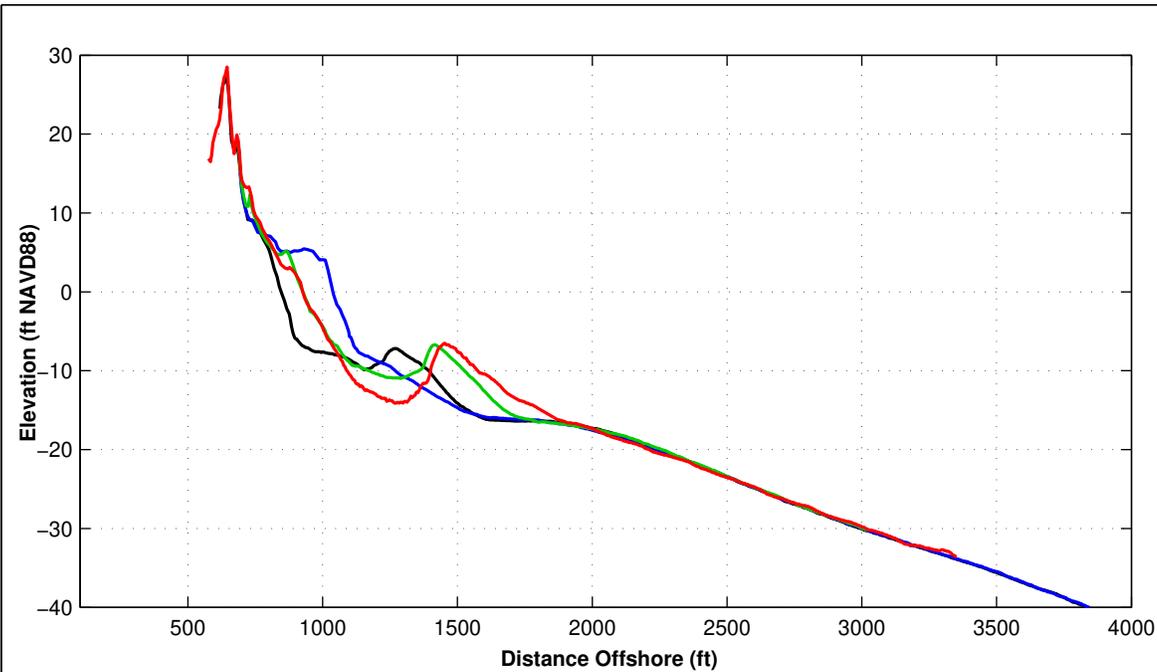
| Survey Transect 810+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -101.36 ft | -108.58 ft |
| Volume Change Above +6 ft NAVD88 | 1.54 cy/ft | 5.25 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -15.71 cy/ft | -14.71 cy/ft |
| Volume Change Above -6 ft NAVD88 | -37.29 cy/ft | -40.10 cy/ft |
| Volume Change Above -14 ft NAVD88 | -36.16 cy/ft | -14.77 cy/ft |
| Volume Change Above -19 ft NAVD88 | -57.08 cy/ft | 3.93 cy/ft |
| Volume Change Above -30 ft NAVD88 | -53.40 cy/ft | 8.29 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
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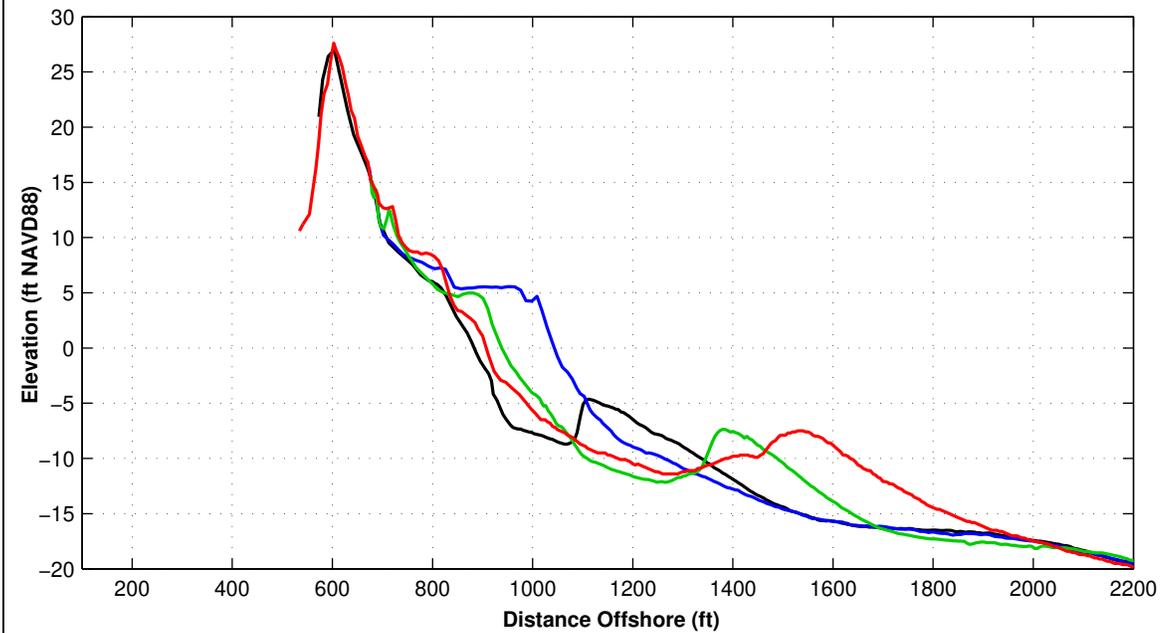
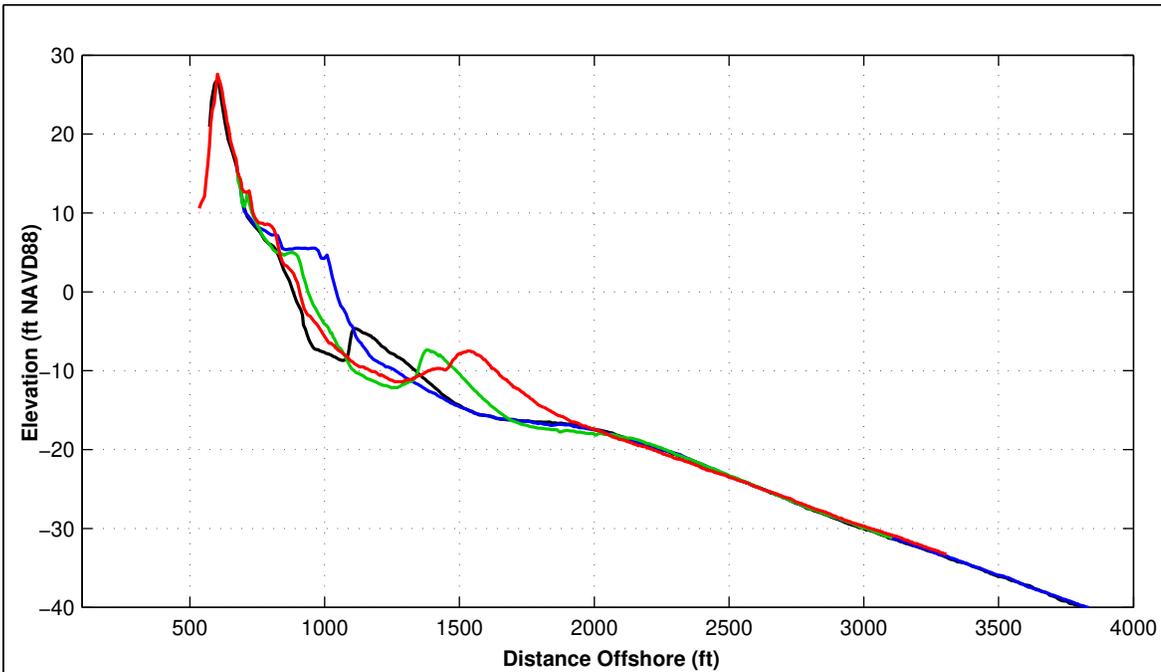
| Survey Transect 815+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -117.74 ft | -112.04 ft |
| Volume Change Above +6 ft NAVD88 | 9.20 cy/ft | 5.81 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -9.43 cy/ft | -15.86 cy/ft |
| Volume Change Above -6 ft NAVD88 | -36.63 cy/ft | -43.08 cy/ft |
| Volume Change Above -14 ft NAVD88 | -10.35 cy/ft | -33.72 cy/ft |
| Volume Change Above -19 ft NAVD88 | 2.97 cy/ft | -9.94 cy/ft |
| Volume Change Above -30 ft NAVD88 | 6.06 cy/ft | -11.08 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
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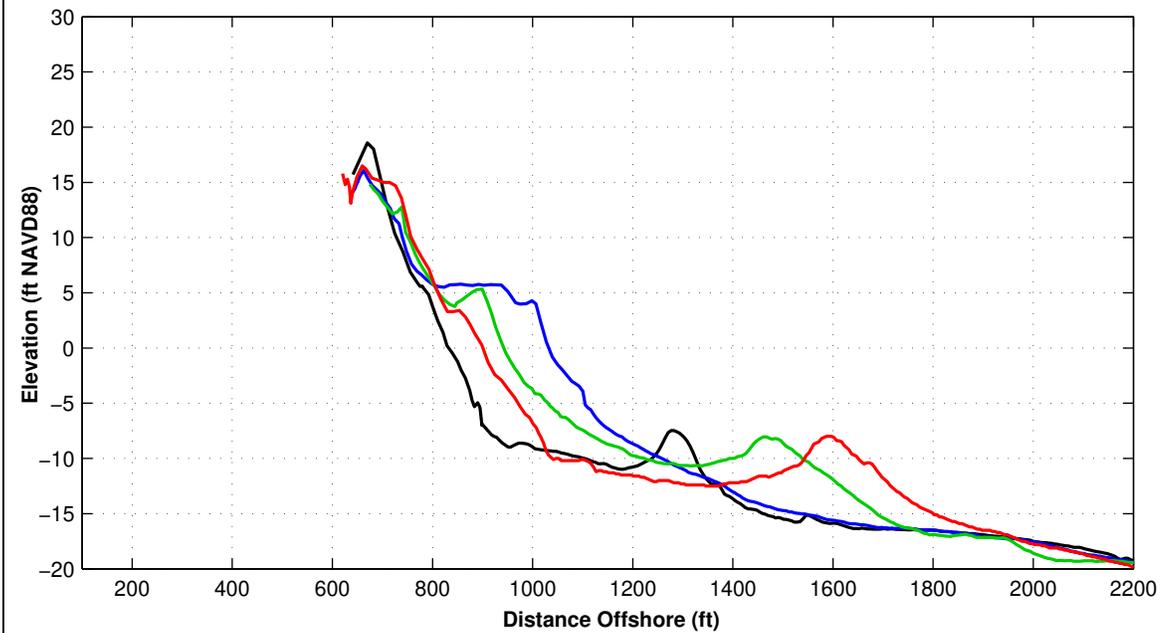
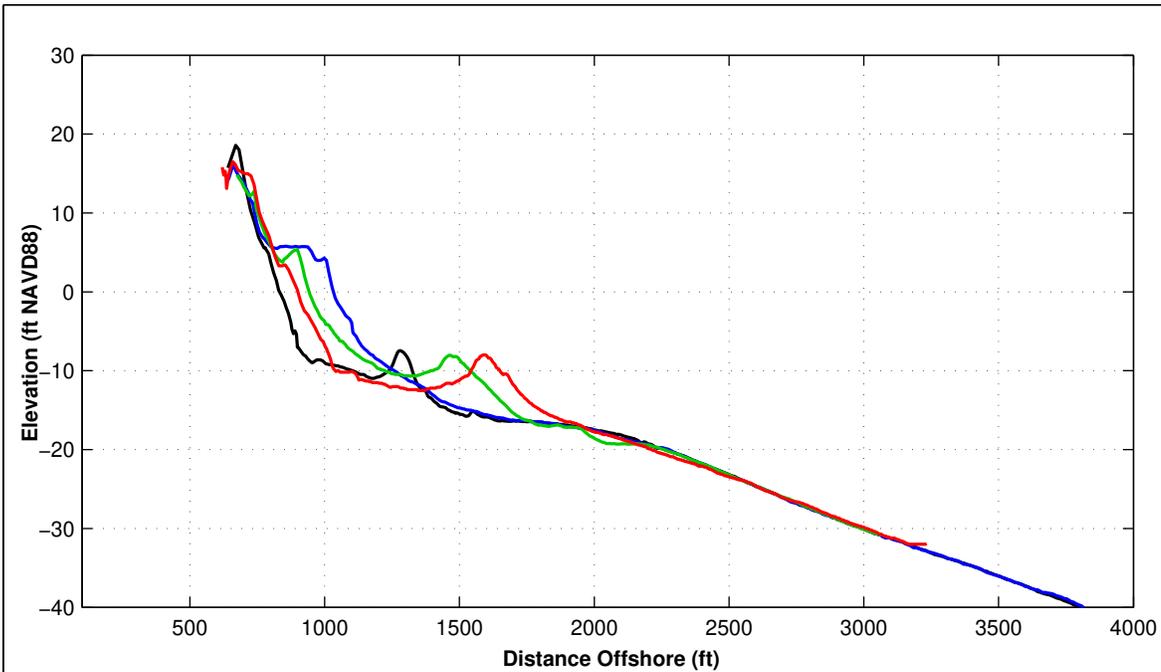
| Survey Transect 820+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 – AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -106.19 ft | -135.29 ft |
| Volume Change Above +6 ft NAVD88 | -0.56 cy/ft | 6.29 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -19.24 cy/ft | -18.02 cy/ft |
| Volume Change Above -6 ft NAVD88 | -45.46 cy/ft | -53.33 cy/ft |
| Volume Change Above -14 ft NAVD88 | -37.42 cy/ft | -12.34 cy/ft |
| Volume Change Above -19 ft NAVD88 | -36.39 cy/ft | 14.90 cy/ft |
| Volume Change Above -30 ft NAVD88 | -35.42 cy/ft | 11.43 cy/ft |

LEGEND:

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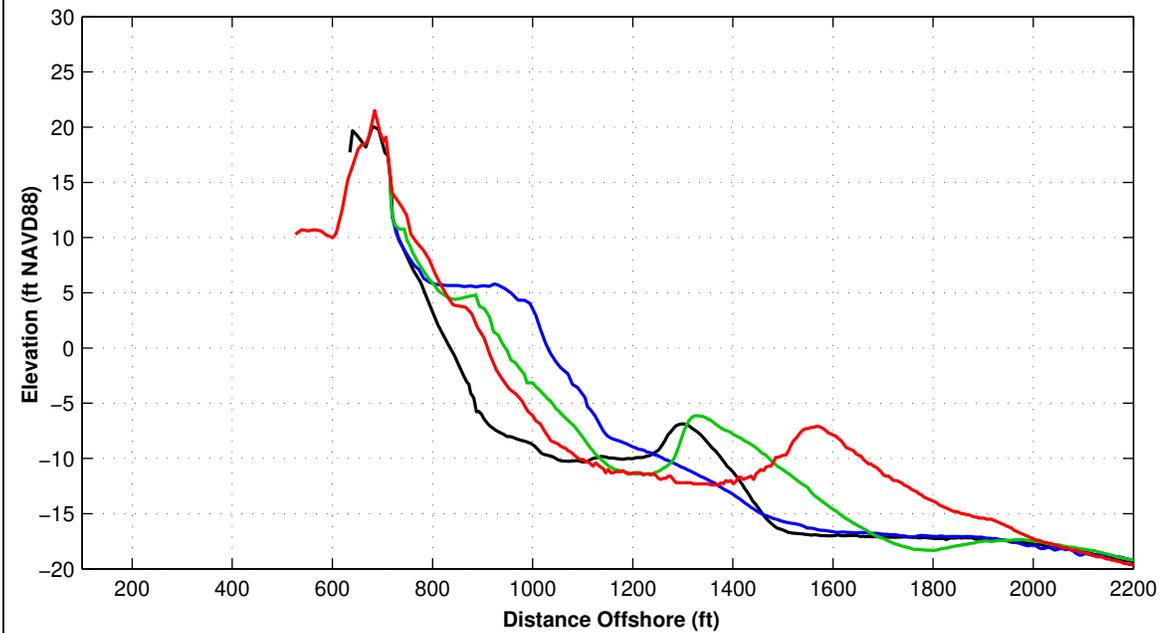
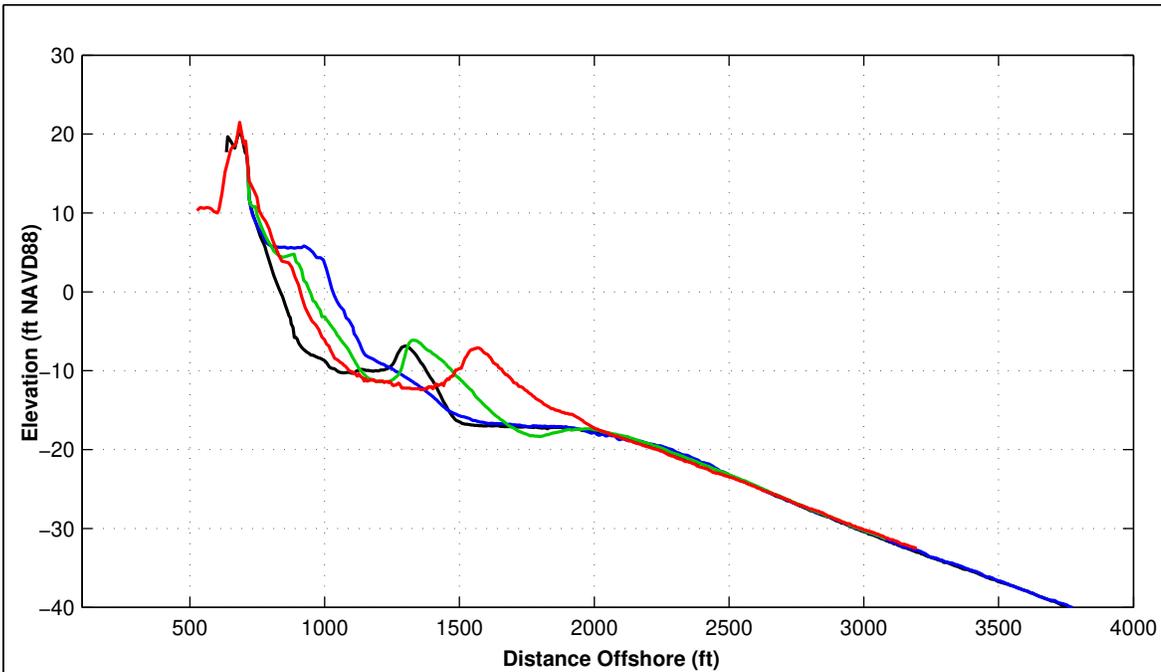
| Survey Transect 825+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 – AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -91.40 ft | -137.17 ft |
| Volume Change Above +6 ft NAVD88 | 2.83 cy/ft | 9.19 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -13.87 cy/ft | -15.74 cy/ft |
| Volume Change Above -6 ft NAVD88 | -37.41 cy/ft | -52.24 cy/ft |
| Volume Change Above -14 ft NAVD88 | -5.64 cy/ft | -47.68 cy/ft |
| Volume Change Above -19 ft NAVD88 | 0.24 cy/ft | -23.62 cy/ft |
| Volume Change Above -30 ft NAVD88 | -0.74 cy/ft | -27.88 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
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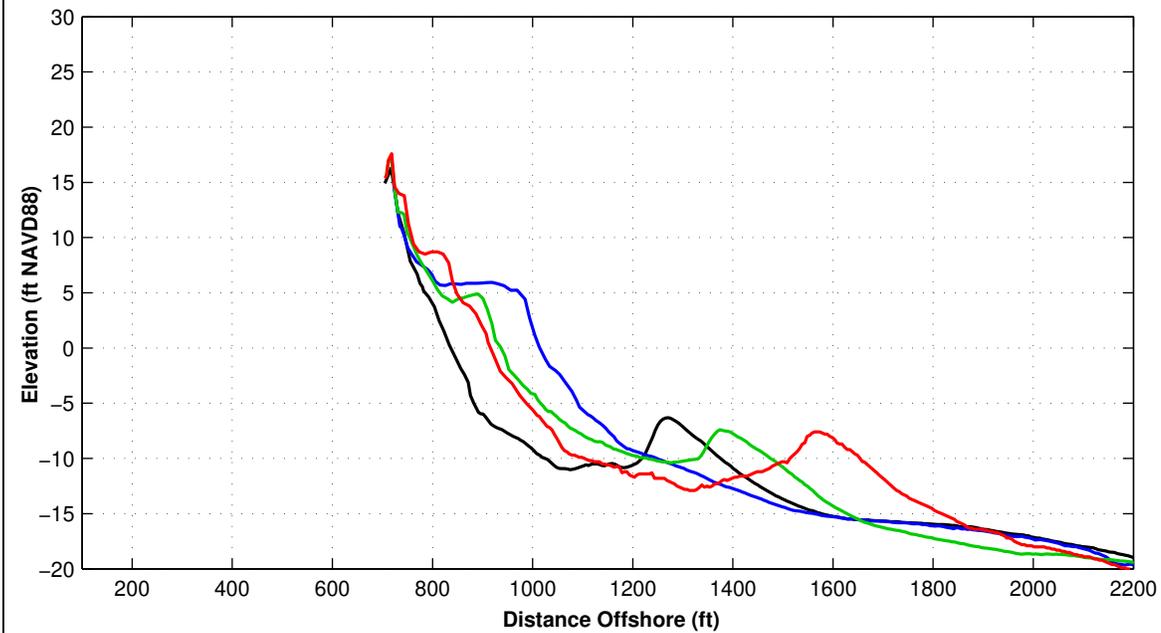
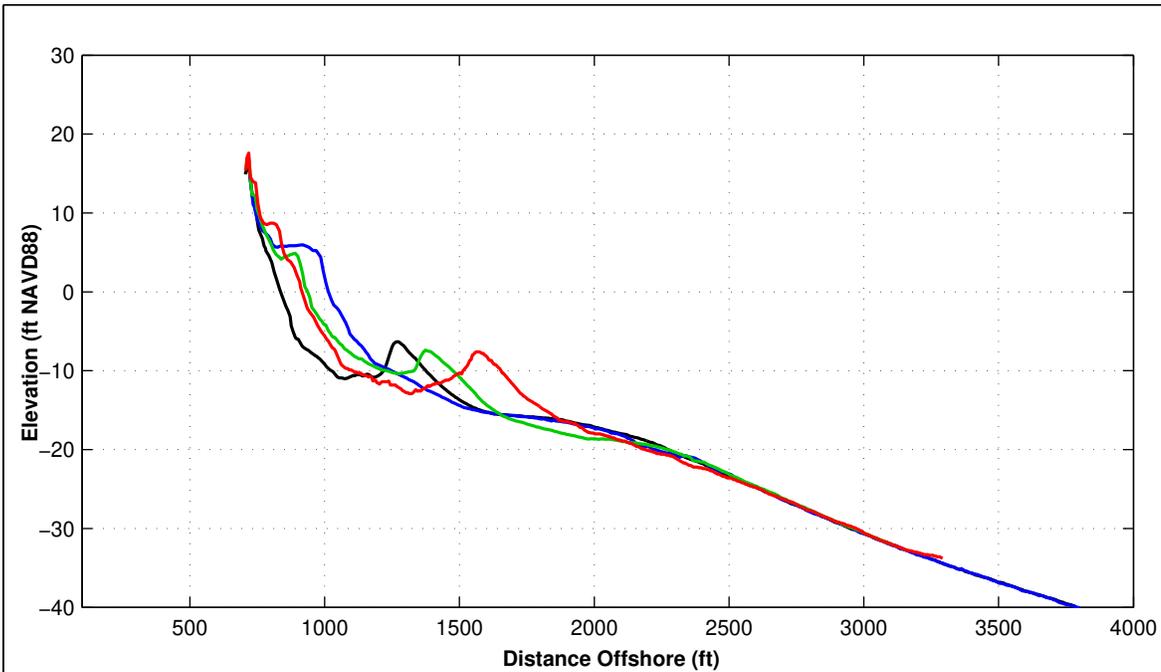
| Survey Transect 830+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -89.21 ft | -120.49 ft |
| Volume Change Above +6 ft NAVD88 | 2.35 cy/ft | 8.36 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -15.02 cy/ft | -12.97 cy/ft |
| Volume Change Above -6 ft NAVD88 | -36.52 cy/ft | -47.05 cy/ft |
| Volume Change Above -14 ft NAVD88 | -10.61 cy/ft | -22.60 cy/ft |
| Volume Change Above -19 ft NAVD88 | -1.61 cy/ft | 23.71 cy/ft |
| Volume Change Above -30 ft NAVD88 | -2.71 cy/ft | 16.63 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
1. Station From North To South At Varying Intervals.
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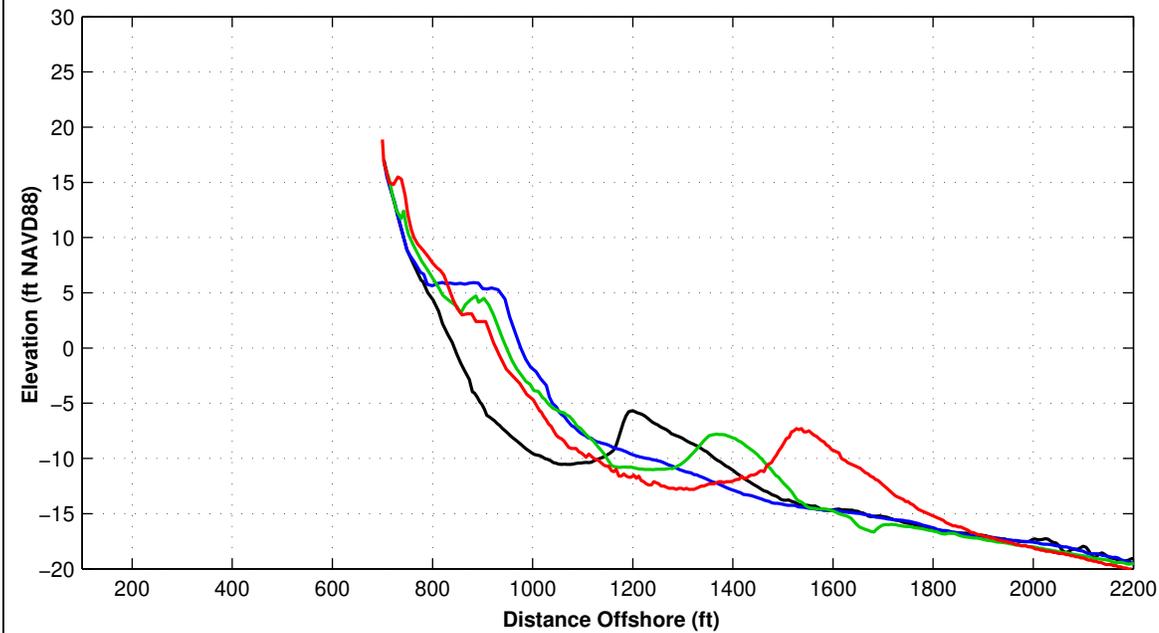
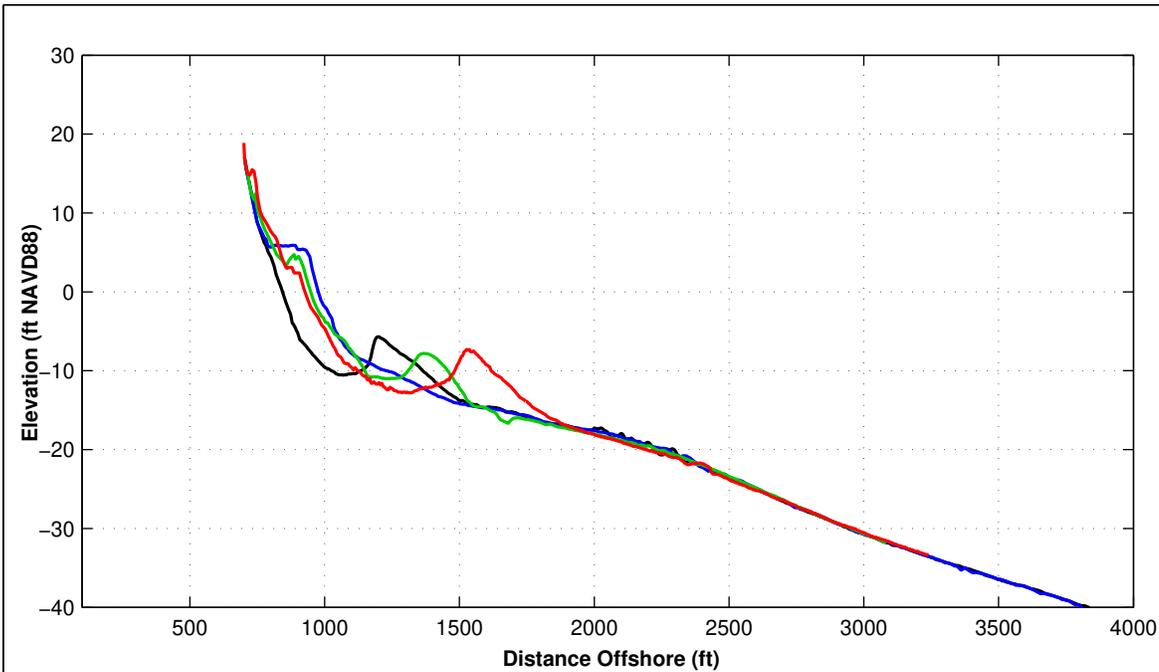
| Survey Transect 835+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -80.82 ft | -96.57 ft |
| Volume Change Above +6 ft NAVD88 | 5.83 cy/ft | 8.37 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -11.25 cy/ft | -10.30 cy/ft |
| Volume Change Above -6 ft NAVD88 | -32.86 cy/ft | -37.89 cy/ft |
| Volume Change Above -14 ft NAVD88 | -7.76 cy/ft | -19.92 cy/ft |
| Volume Change Above -19 ft NAVD88 | -22.20 cy/ft | -5.86 cy/ft |
| Volume Change Above -30 ft NAVD88 | -17.51 cy/ft | -12.61 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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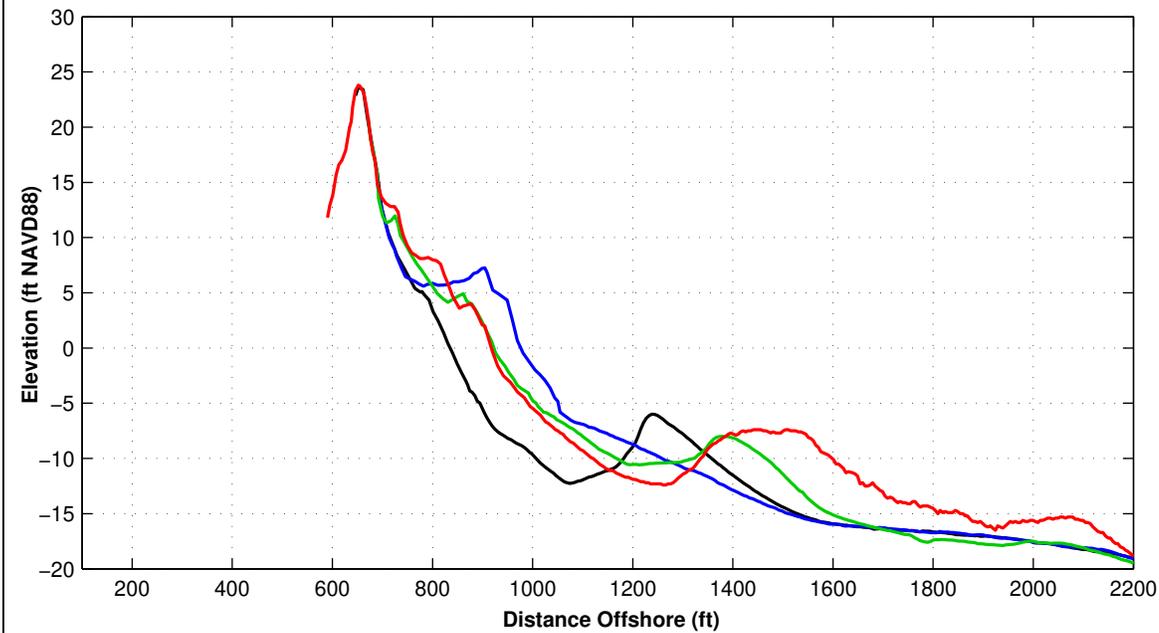
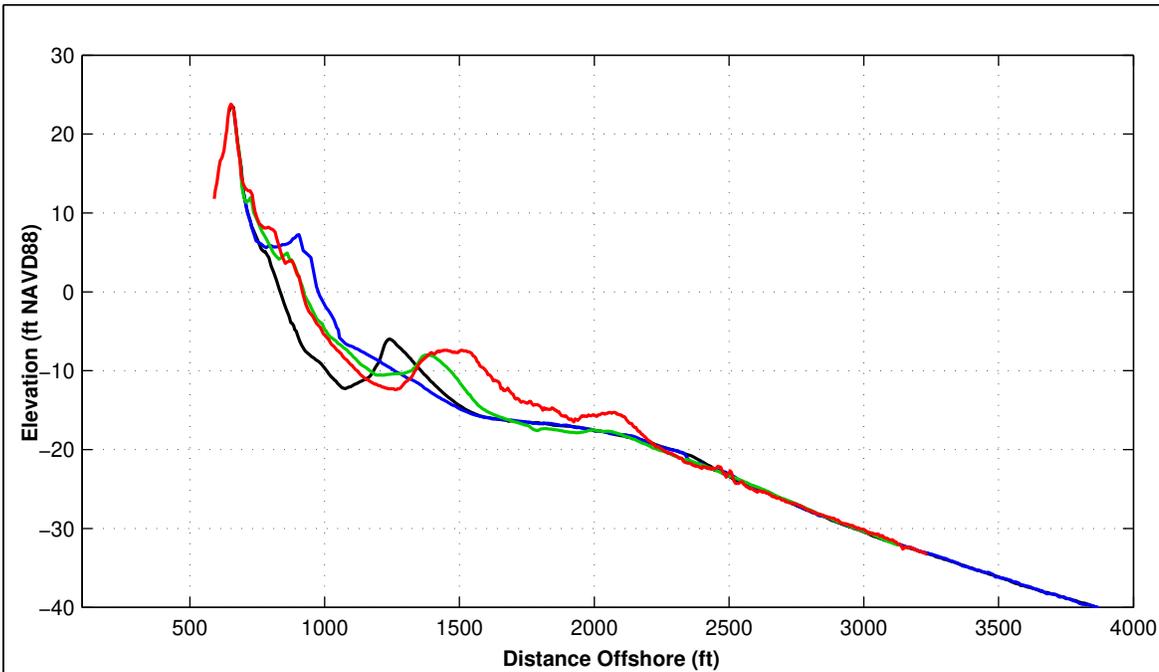
| Survey Transect 840+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -29.74 ft | -50.59 ft |
| Volume Change Above +6 ft NAVD88 | 3.39 cy/ft | 9.33 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -6.88 cy/ft | -4.17 cy/ft |
| Volume Change Above -6 ft NAVD88 | -13.27 cy/ft | -16.60 cy/ft |
| Volume Change Above -14 ft NAVD88 | 8.98 cy/ft | 6.59 cy/ft |
| Volume Change Above -19 ft NAVD88 | 0.67 cy/ft | 15.84 cy/ft |
| Volume Change Above -30 ft NAVD88 | 0.42 cy/ft | 9.01 cy/ft |

LEGEND:

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| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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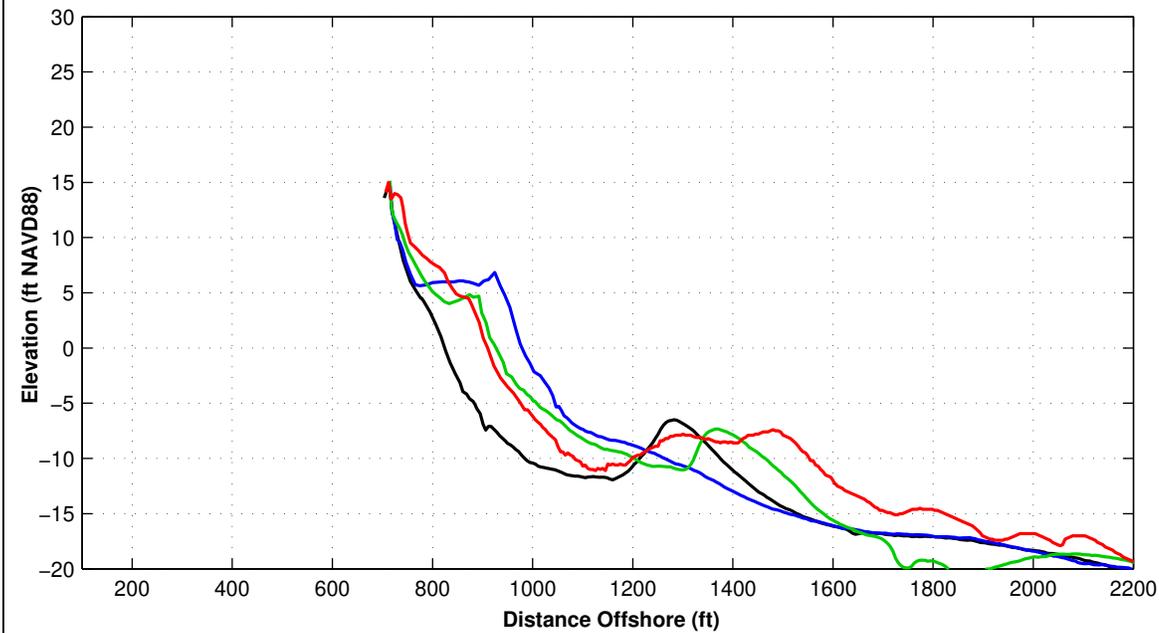
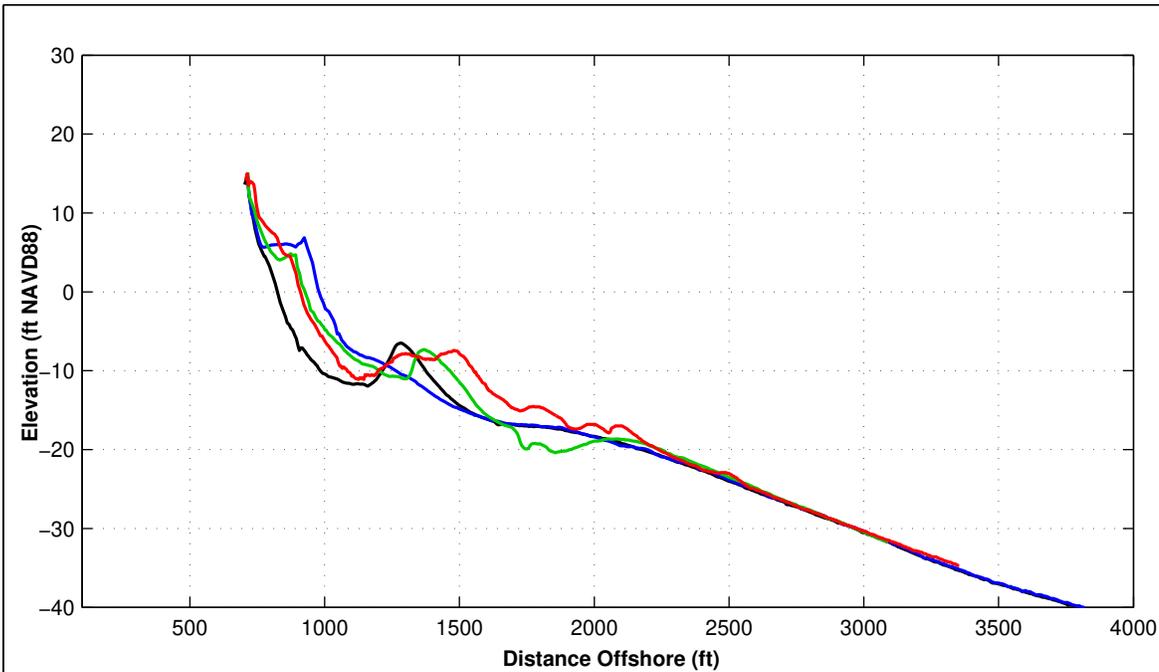
| Survey Transect 845+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -55.06 ft | -57.06 ft |
| Volume Change Above +6 ft NAVD88 | 4.67 cy/ft | 10.24 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -9.33 cy/ft | -2.86 cy/ft |
| Volume Change Above -6 ft NAVD88 | -23.23 cy/ft | -19.75 cy/ft |
| Volume Change Above -14 ft NAVD88 | -5.22 cy/ft | 16.68 cy/ft |
| Volume Change Above -19 ft NAVD88 | -5.44 cy/ft | 64.25 cy/ft |
| Volume Change Above -30 ft NAVD88 | -7.12 cy/ft | 60.98 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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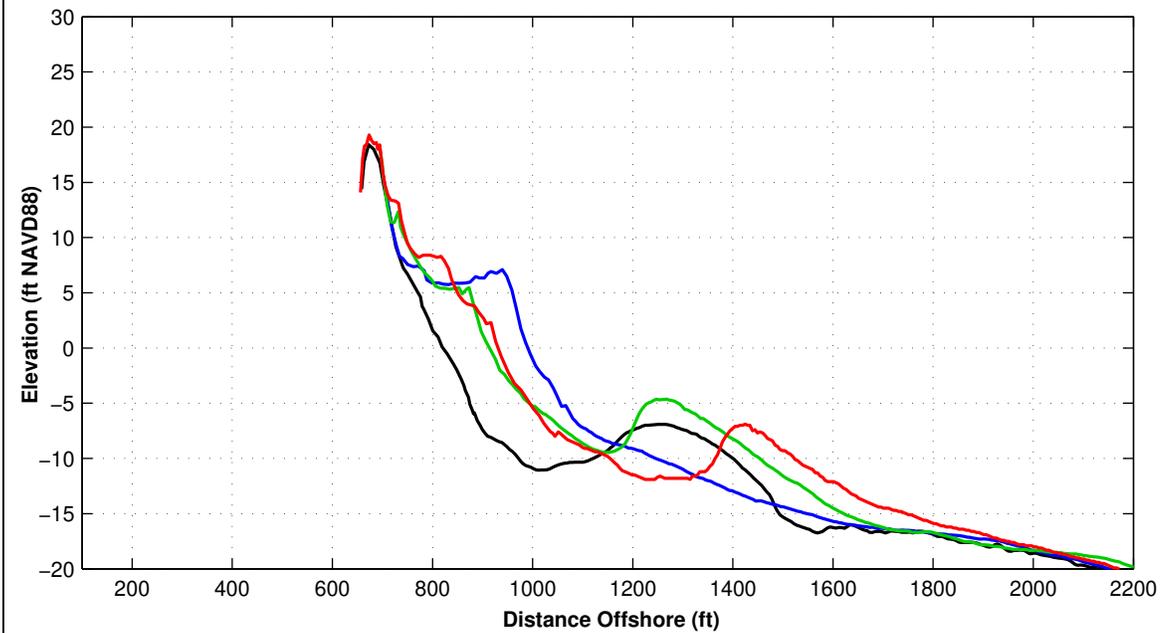
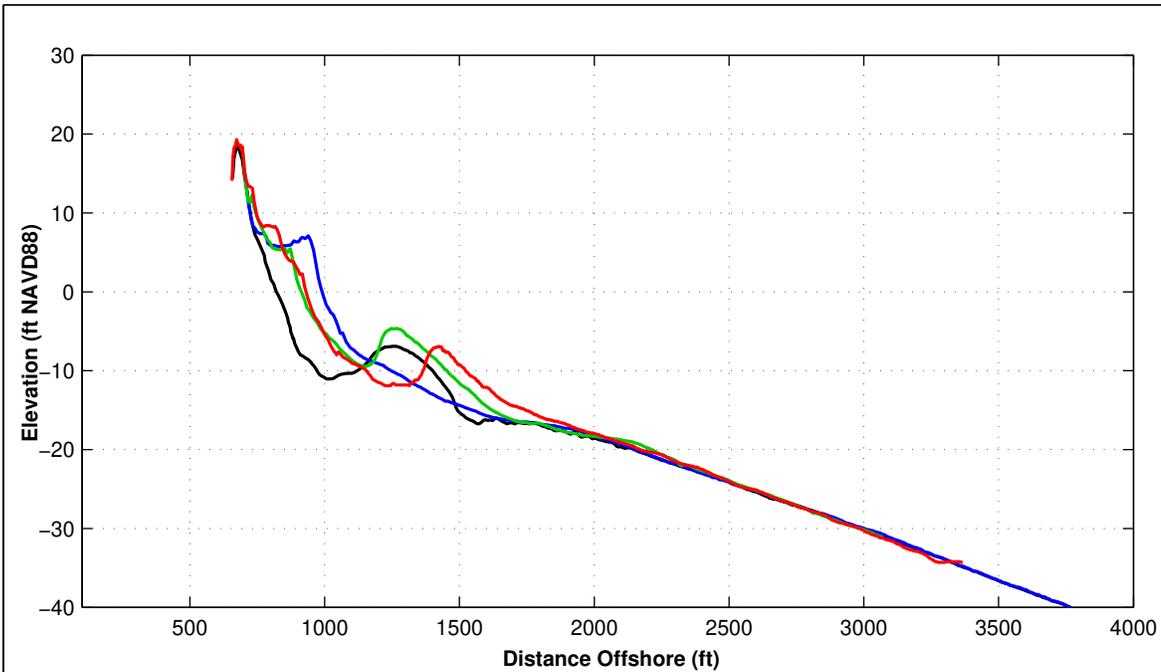
| Survey Transect 850+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -56.79 ft | -69.91 ft |
| Volume Change Above +6 ft NAVD88 | 2.77 cy/ft | 9.46 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -11.69 cy/ft | -4.08 cy/ft |
| Volume Change Above -6 ft NAVD88 | -25.16 cy/ft | -23.56 cy/ft |
| Volume Change Above -14 ft NAVD88 | -3.46 cy/ft | 14.79 cy/ft |
| Volume Change Above -19 ft NAVD88 | -15.78 cy/ft | 55.85 cy/ft |
| Volume Change Above -30 ft NAVD88 | -12.12 cy/ft | 64.33 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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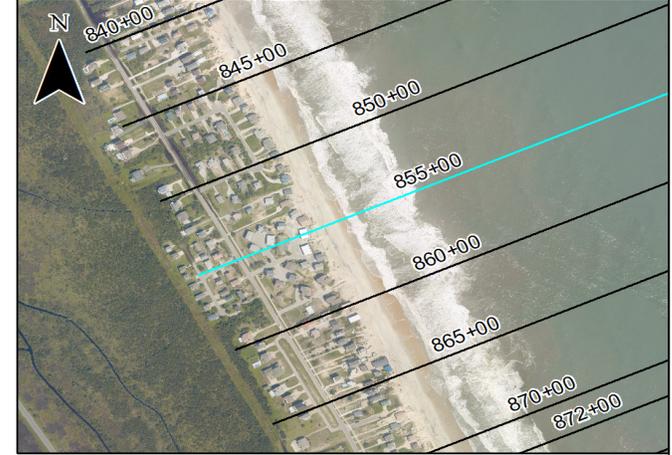


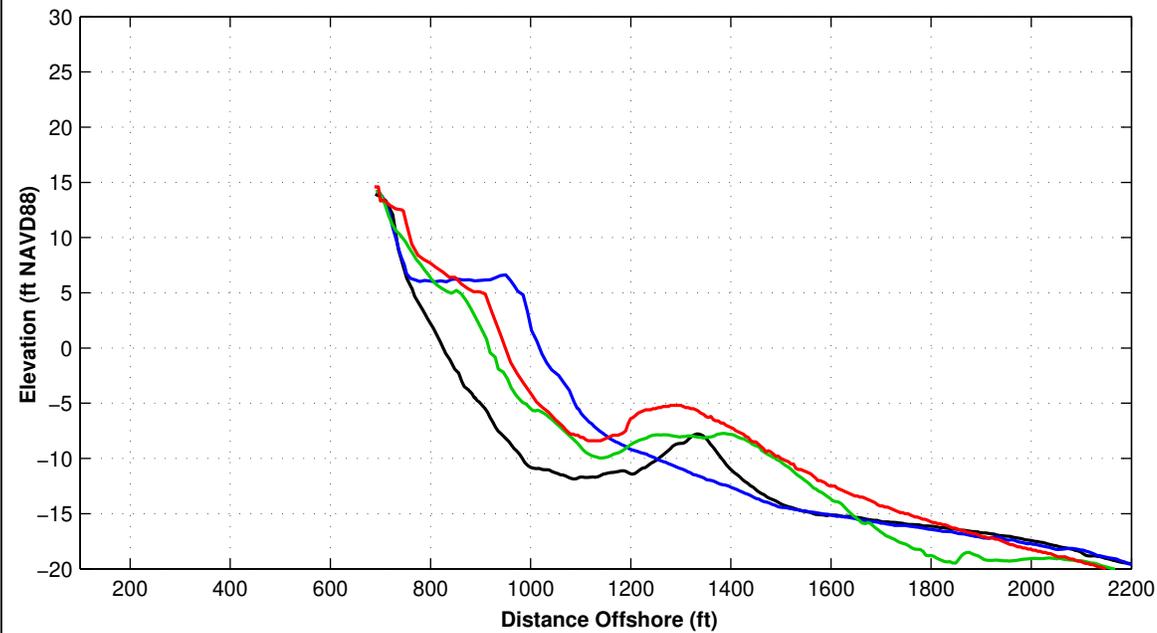
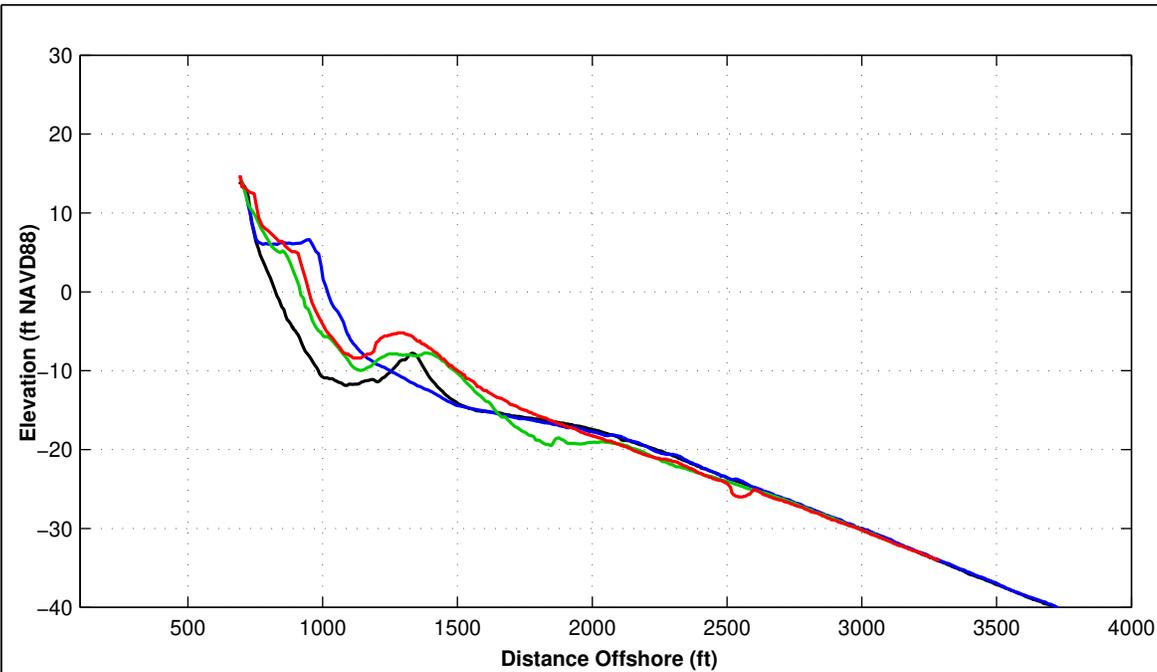
| Survey Transect 855+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -80.23 ft | -57.84 ft |
| Volume Change Above +6 ft NAVD88 | 2.45 cy/ft | 8.11 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -13.50 cy/ft | -6.64 cy/ft |
| Volume Change Above -6 ft NAVD88 | -29.16 cy/ft | -23.50 cy/ft |
| Volume Change Above -14 ft NAVD88 | 17.11 cy/ft | 0.76 cy/ft |
| Volume Change Above -19 ft NAVD88 | 21.66 cy/ft | 21.85 cy/ft |
| Volume Change Above -30 ft NAVD88 | 28.50 cy/ft | 26.34 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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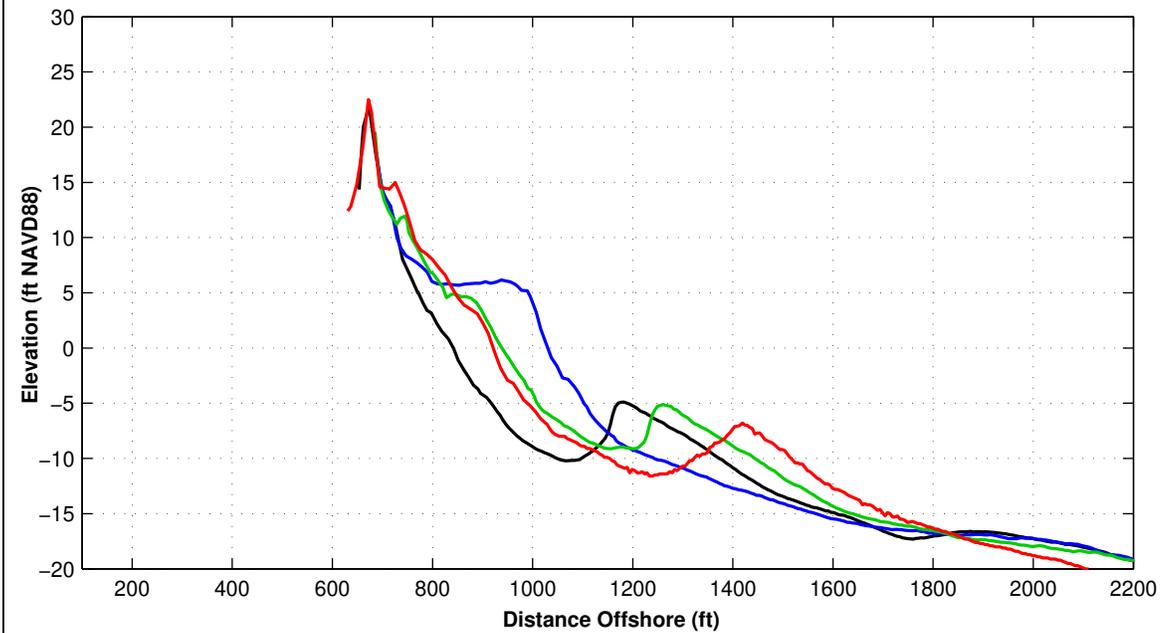
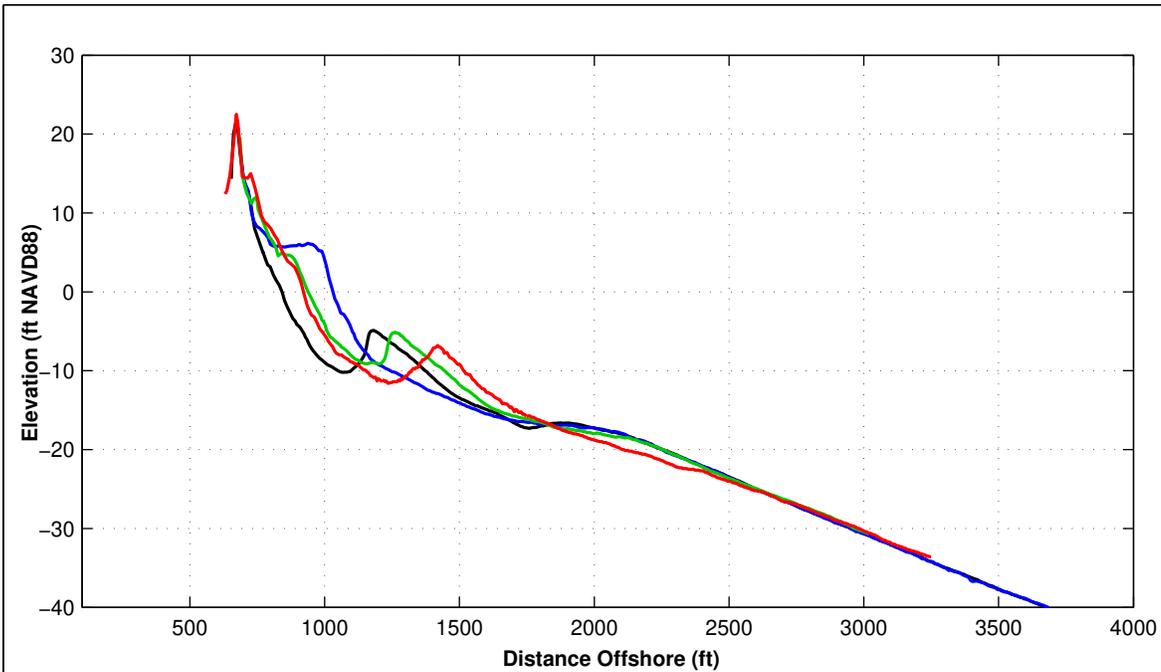
| Survey Transect 860+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -98.78 ft | -66.14 ft |
| Volume Change Above +6 ft NAVD88 | 3.23 cy/ft | 9.11 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -17.64 cy/ft | -4.42 cy/ft |
| Volume Change Above -6 ft NAVD88 | -44.79 cy/ft | -21.35 cy/ft |
| Volume Change Above -14 ft NAVD88 | -9.43 cy/ft | 40.80 cy/ft |
| Volume Change Above -19 ft NAVD88 | -29.56 cy/ft | 50.85 cy/ft |
| Volume Change Above -30 ft NAVD88 | -48.92 cy/ft | 28.11 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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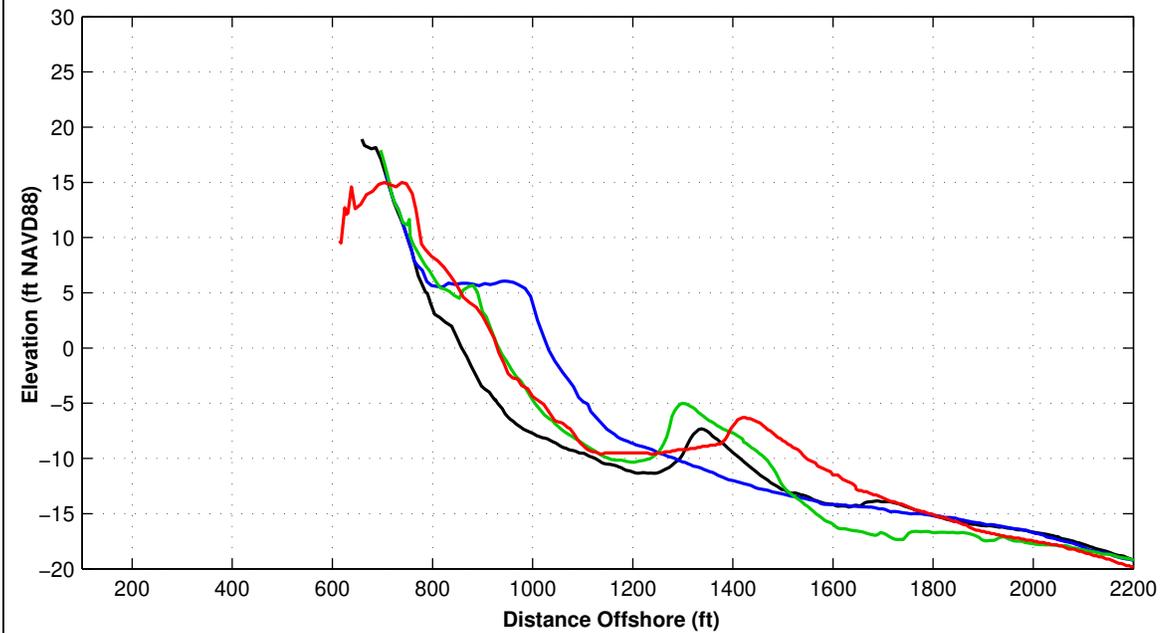
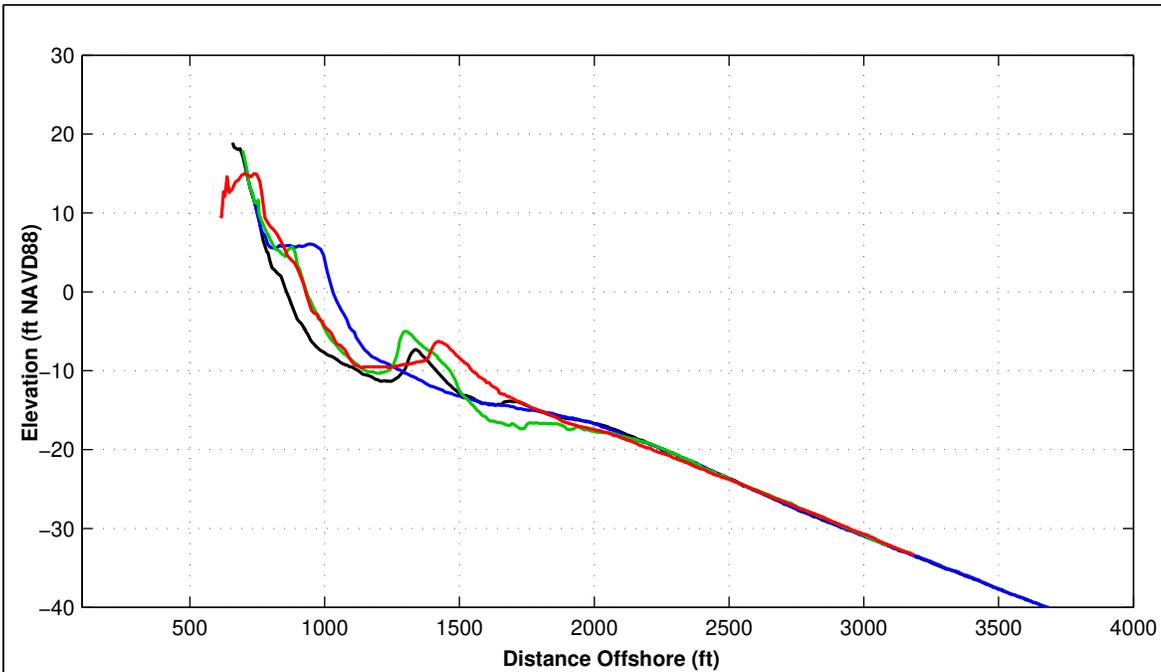
| Survey Transect 865+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -96.52 ft | -108.16 ft |
| Volume Change Above +6 ft NAVD88 | 5.27 cy/ft | 10.28 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -15.22 cy/ft | -11.50 cy/ft |
| Volume Change Above -6 ft NAVD88 | -37.97 cy/ft | -41.48 cy/ft |
| Volume Change Above -14 ft NAVD88 | -2.51 cy/ft | -18.49 cy/ft |
| Volume Change Above -19 ft NAVD88 | -0.75 cy/ft | -17.26 cy/ft |
| Volume Change Above -30 ft NAVD88 | 1.73 cy/ft | -34.06 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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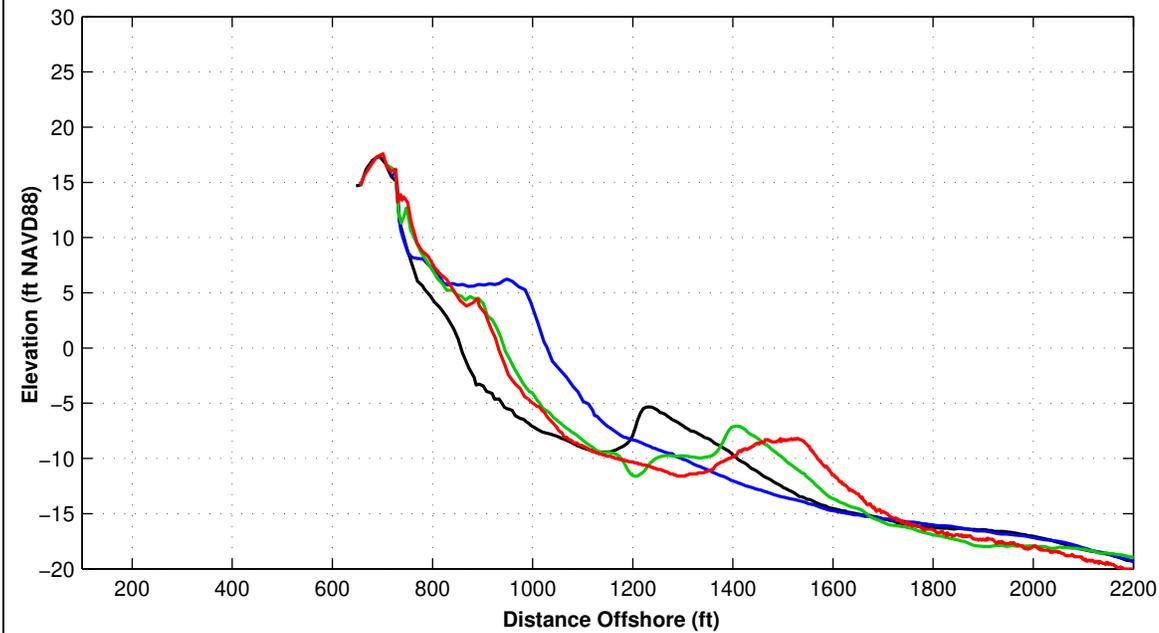
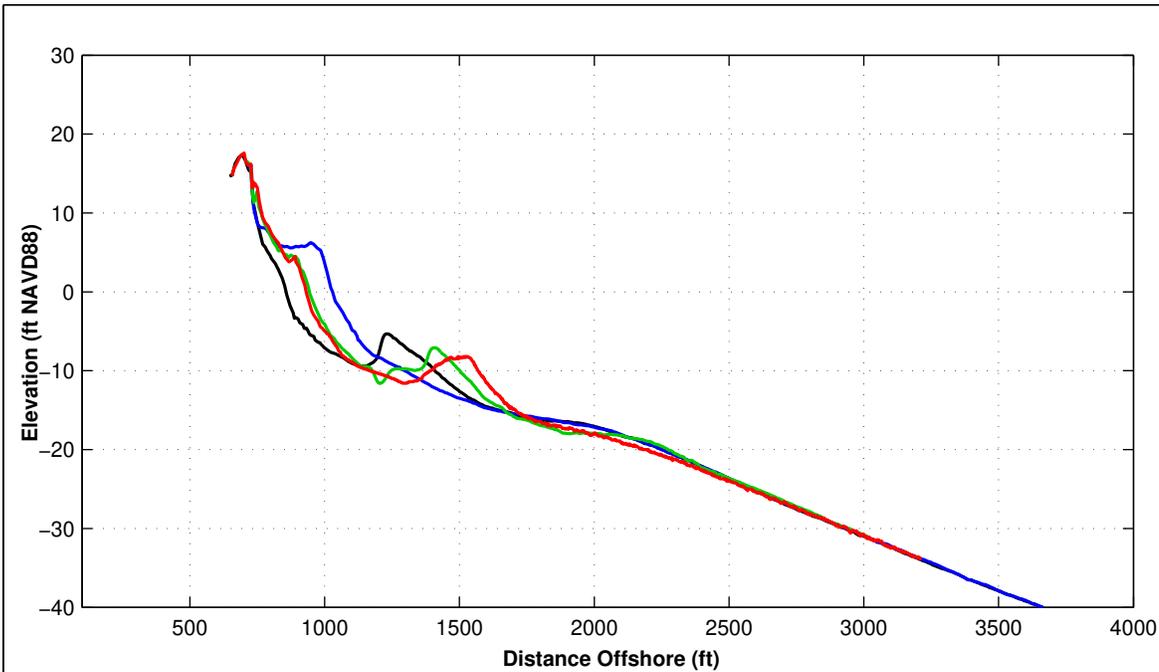


| Survey Transect 870+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -99.24 ft | -100.70 ft |
| Volume Change Above +6 ft NAVD88 | 2.90 cy/ft | 11.92 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -15.85 cy/ft | -7.58 cy/ft |
| Volume Change Above -6 ft NAVD88 | -40.68 cy/ft | -33.77 cy/ft |
| Volume Change Above -14 ft NAVD88 | -23.17 cy/ft | 4.26 cy/ft |
| Volume Change Above -19 ft NAVD88 | -52.45 cy/ft | 0.38 cy/ft |
| Volume Change Above -30 ft NAVD88 | -49.46 cy/ft | -2.55 cy/ft |

LEGEND:
 JUNE 2020 — AUGUST 2019 —
 POST-DORIAN — APRIL 2019 —

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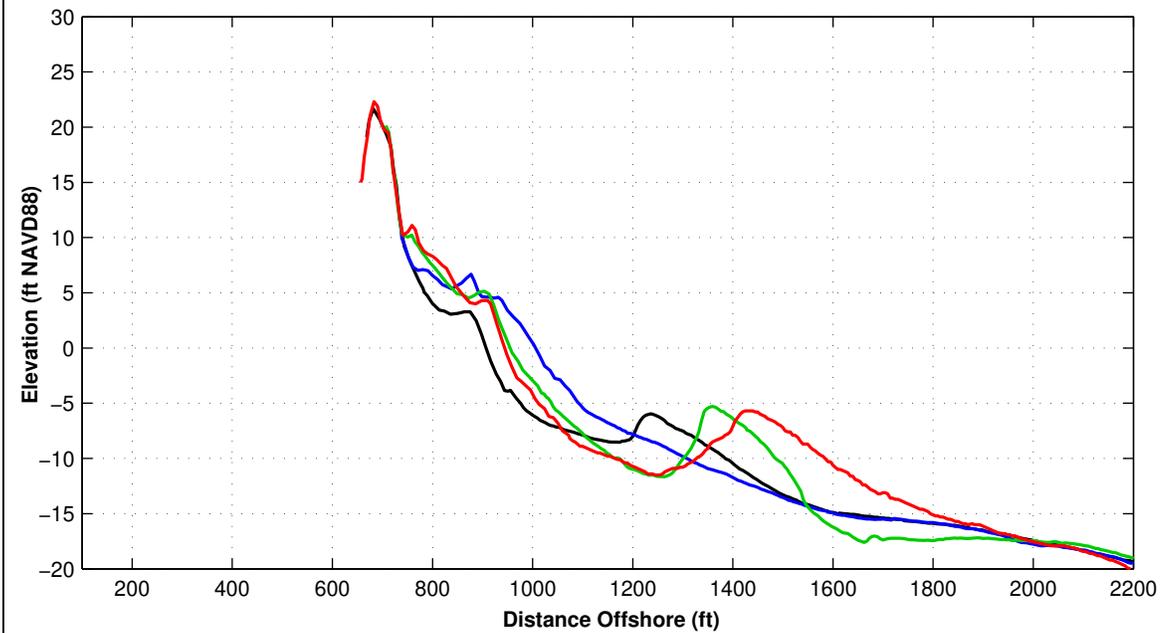
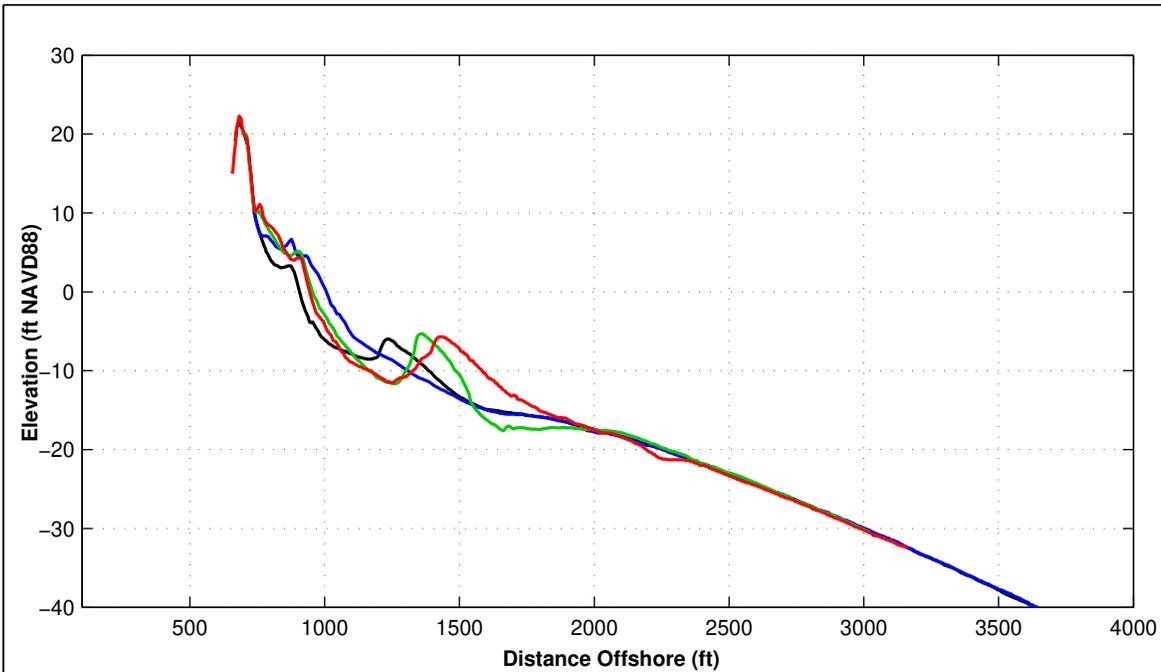
| Survey Transect 872+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -83.67 ft | -95.34 ft |
| Volume Change Above +6 ft NAVD88 | 2.99 cy/ft | 5.57 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -15.14 cy/ft | -13.82 cy/ft |
| Volume Change Above -6 ft NAVD88 | -39.00 cy/ft | -41.44 cy/ft |
| Volume Change Above -14 ft NAVD88 | -24.84 cy/ft | -27.59 cy/ft |
| Volume Change Above -19 ft NAVD88 | -34.50 cy/ft | -34.09 cy/ft |
| Volume Change Above -30 ft NAVD88 | -30.07 cy/ft | -43.69 cy/ft |

LEGEND:

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| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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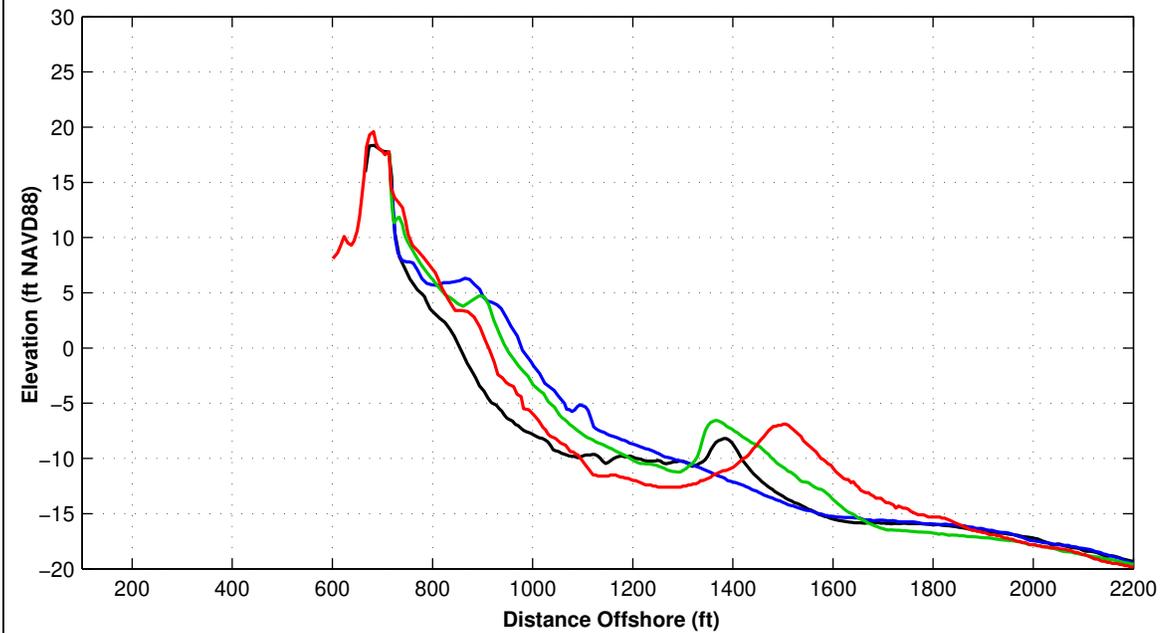
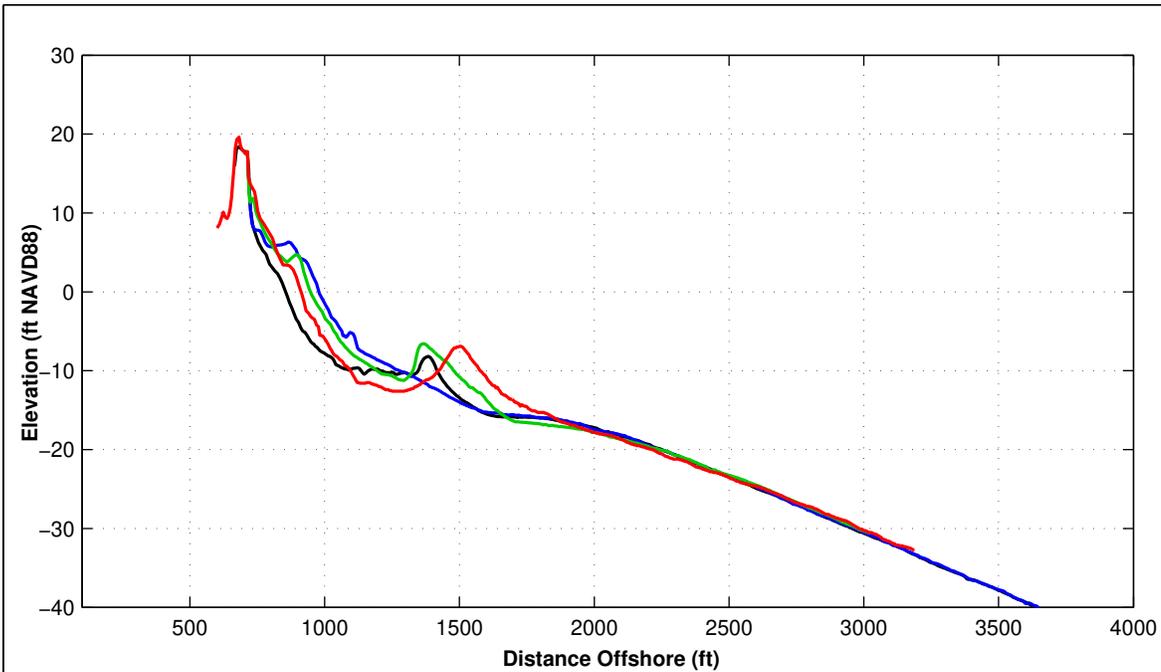
| Survey Transect 880+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -45.24 ft | -53.90 ft |
| Volume Change Above +6 ft NAVD88 | 4.06 cy/ft | 6.59 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -1.27 cy/ft | -0.25 cy/ft |
| Volume Change Above -6 ft NAVD88 | -14.53 cy/ft | -18.93 cy/ft |
| Volume Change Above -14 ft NAVD88 | -2.33 cy/ft | 13.64 cy/ft |
| Volume Change Above -19 ft NAVD88 | -18.27 cy/ft | 27.70 cy/ft |
| Volume Change Above -30 ft NAVD88 | -15.98 cy/ft | 16.96 cy/ft |

LEGEND:

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| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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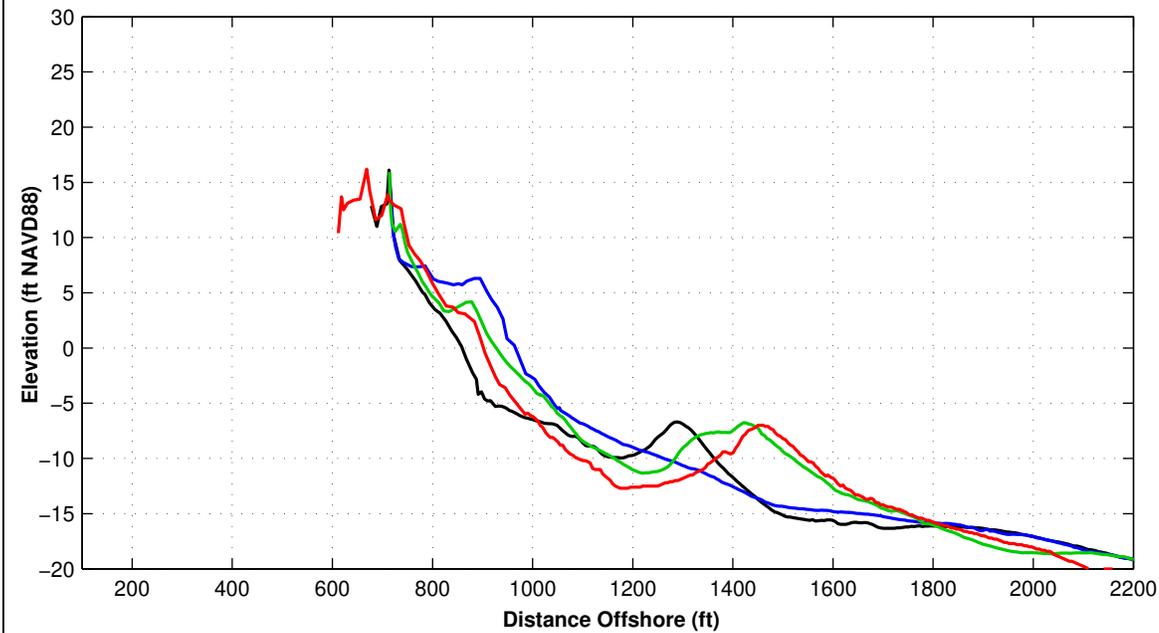
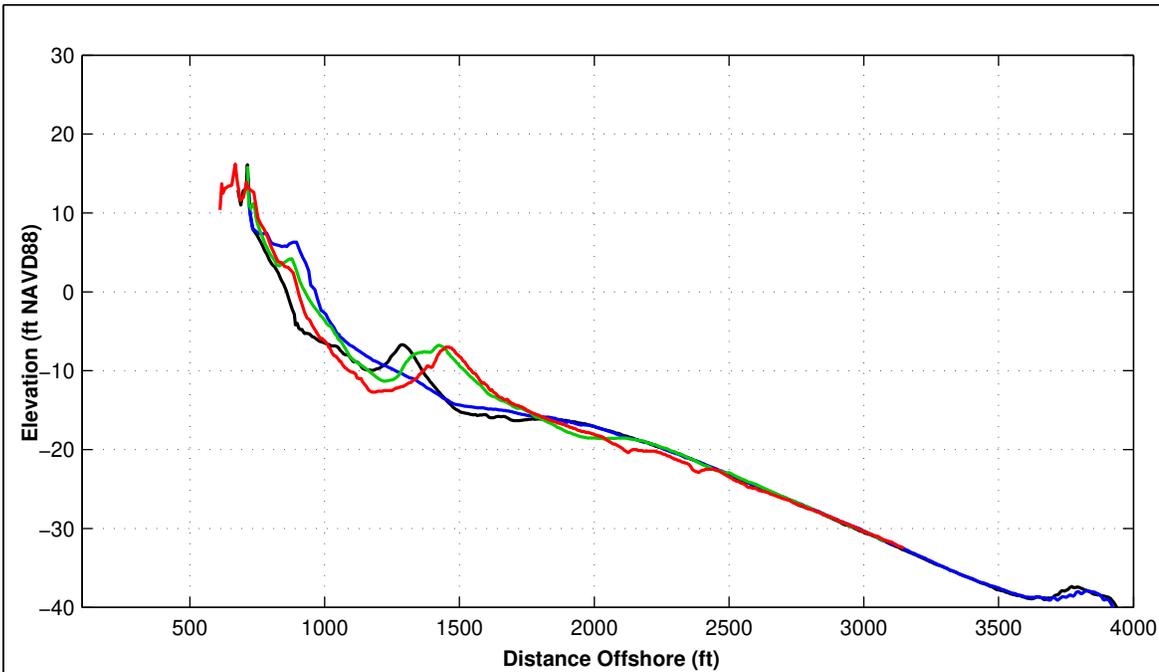
| Survey Transect 885+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -33.22 ft | -67.08 ft |
| Volume Change Above +6 ft NAVD88 | 4.08 cy/ft | 7.74 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -3.15 cy/ft | -4.76 cy/ft |
| Volume Change Above -6 ft NAVD88 | -11.59 cy/ft | -25.52 cy/ft |
| Volume Change Above -14 ft NAVD88 | 9.43 cy/ft | -20.19 cy/ft |
| Volume Change Above -19 ft NAVD88 | 1.52 cy/ft | -11.61 cy/ft |
| Volume Change Above -30 ft NAVD88 | 6.19 cy/ft | -12.34 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
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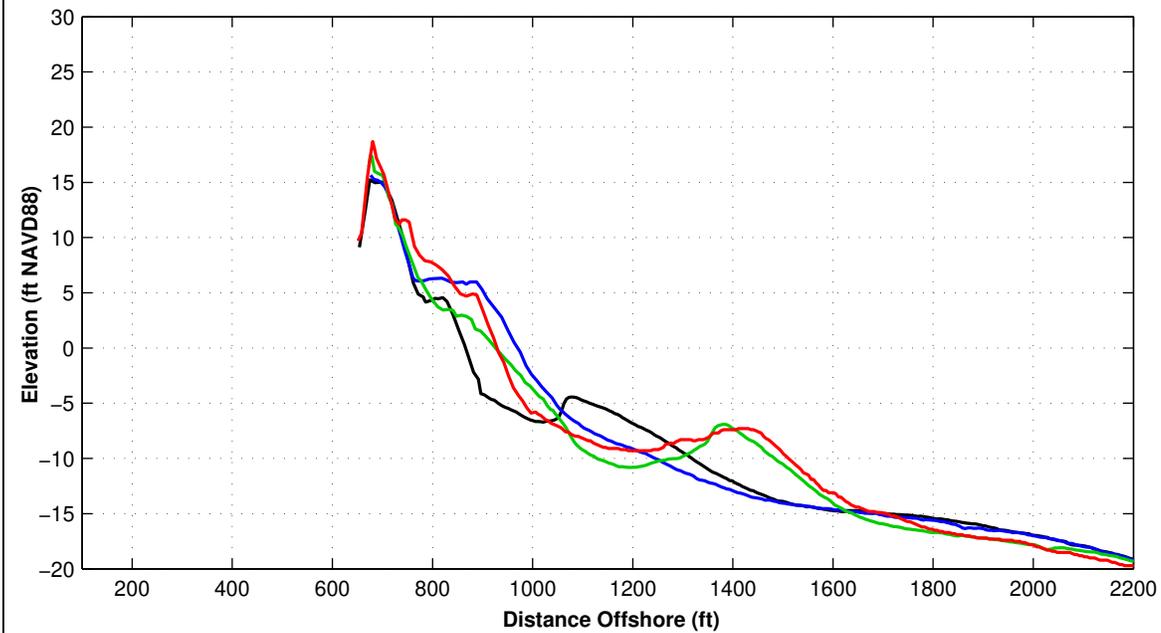
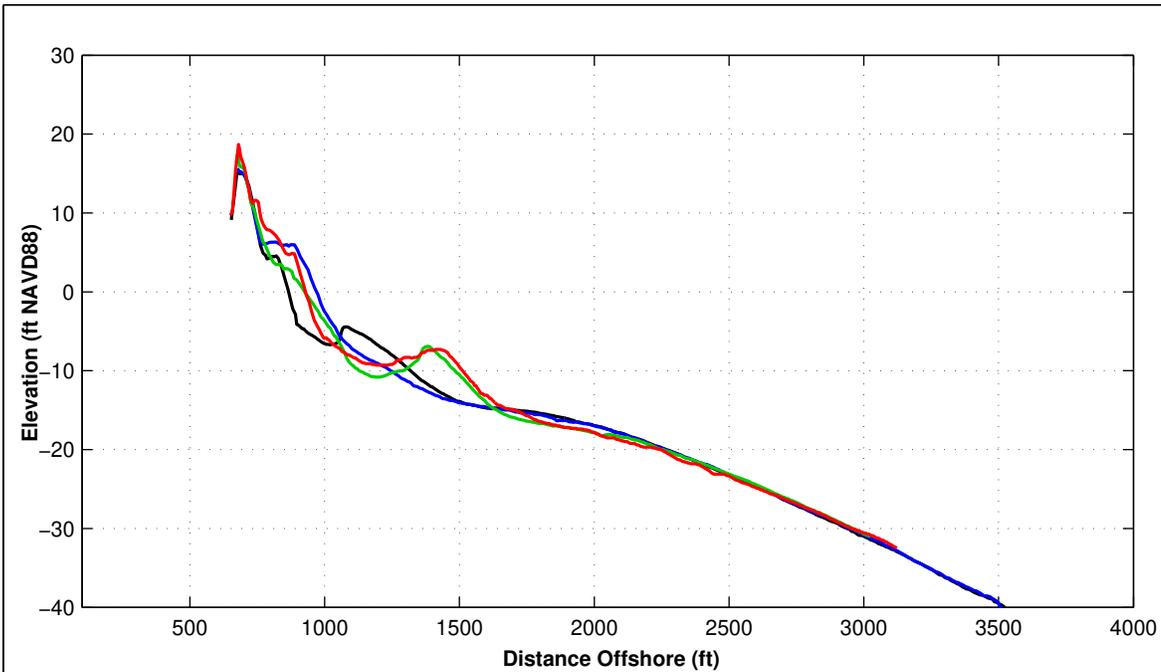
| Survey Transect 890+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -37.06 ft | -53.78 ft |
| Volume Change Above +6 ft NAVD88 | 1.15 cy/ft | 4.88 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -12.19 cy/ft | -9.35 cy/ft |
| Volume Change Above -6 ft NAVD88 | -18.30 cy/ft | -27.51 cy/ft |
| Volume Change Above -14 ft NAVD88 | 17.64 cy/ft | -16.72 cy/ft |
| Volume Change Above -19 ft NAVD88 | 12.83 cy/ft | -17.44 cy/ft |
| Volume Change Above -30 ft NAVD88 | 13.23 cy/ft | -33.28 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
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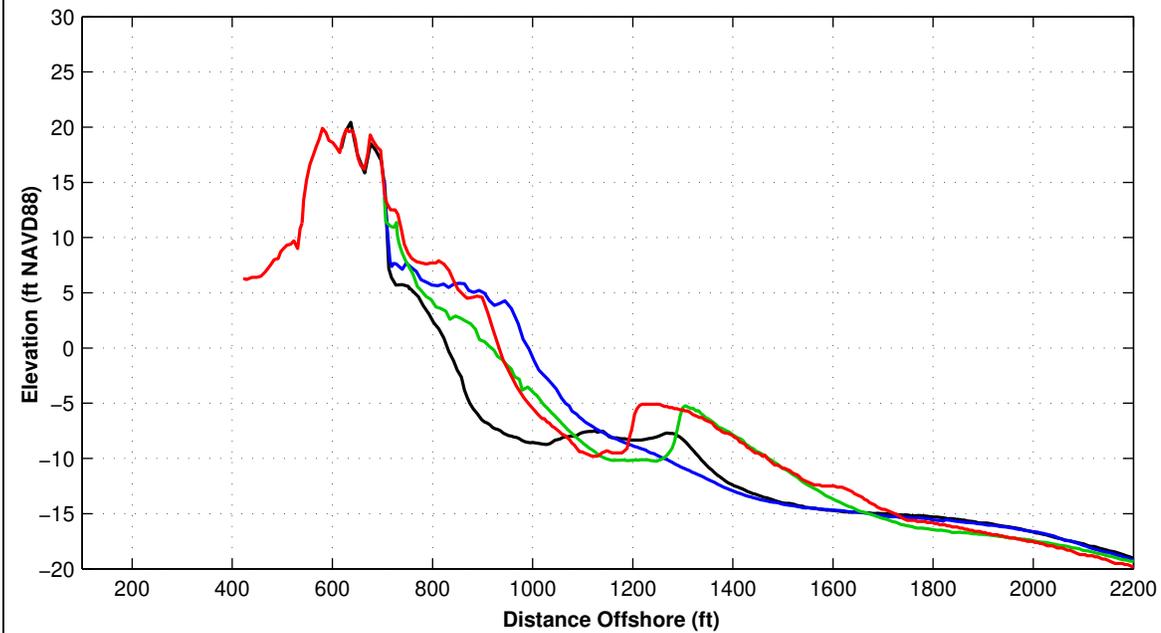
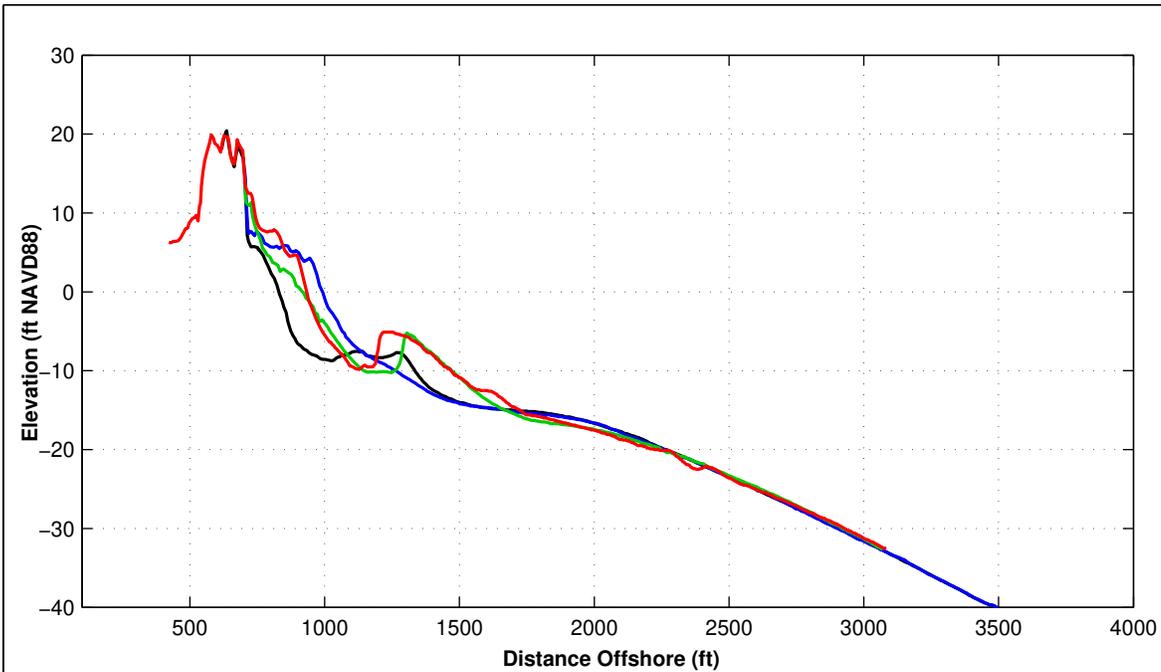
| Survey Transect 895+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 – AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -51.72 ft | -35.48 ft |
| Volume Change Above +6 ft NAVD88 | 2.32 cy/ft | 9.26 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -13.73 cy/ft | 3.38 cy/ft |
| Volume Change Above -6 ft NAVD88 | -21.63 cy/ft | -9.96 cy/ft |
| Volume Change Above -14 ft NAVD88 | 5.52 cy/ft | 34.49 cy/ft |
| Volume Change Above -19 ft NAVD88 | -7.87 cy/ft | 25.05 cy/ft |
| Volume Change Above -30 ft NAVD88 | -5.49 cy/ft | 18.41 cy/ft |

LEGEND:

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| JUNE 2020 | — | AUGUST 2019 | — |
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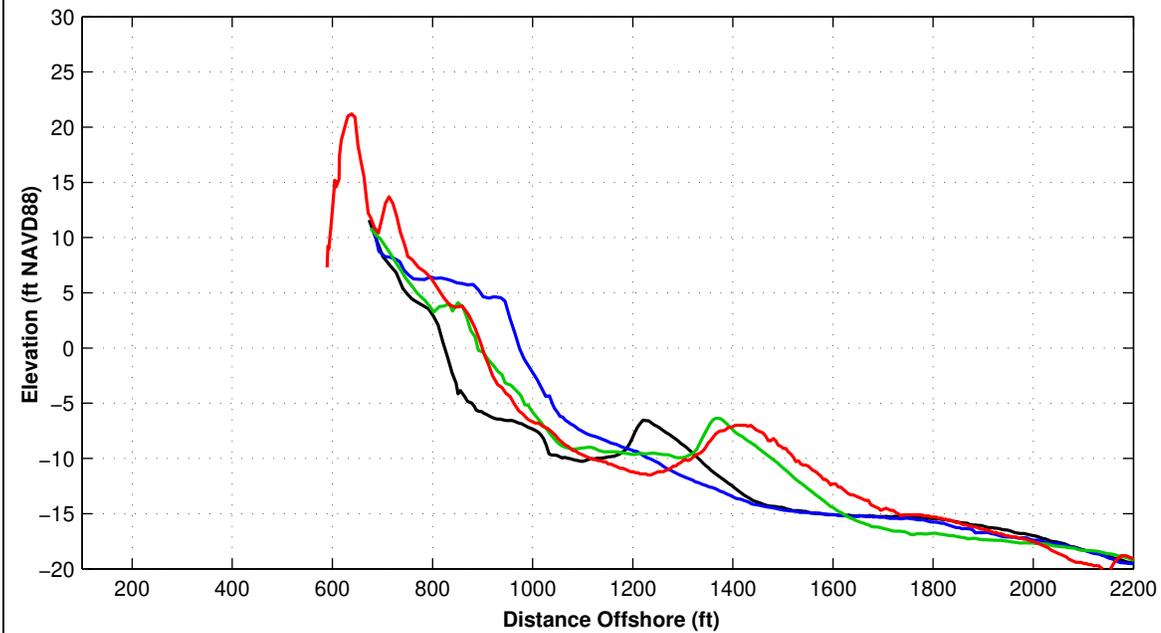
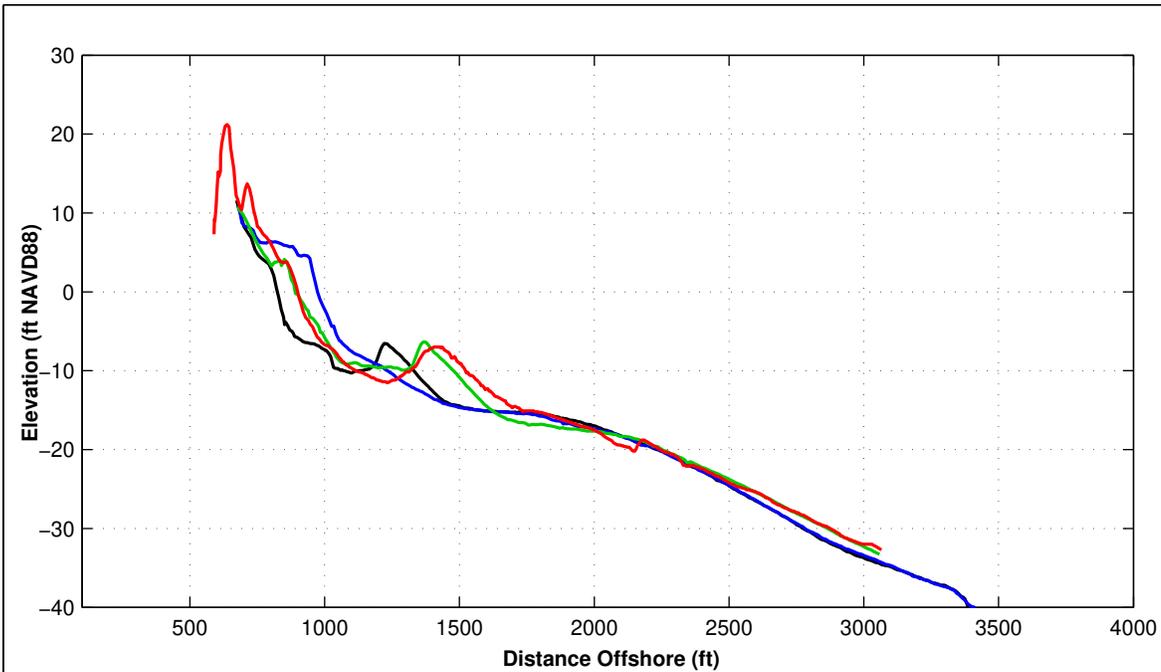
| Survey Transect 900+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -87.93 ft | -53.72 ft |
| Volume Change Above +6 ft NAVD88 | 2.43 cy/ft | 10.20 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -16.85 cy/ft | 3.69 cy/ft |
| Volume Change Above -6 ft NAVD88 | -32.26 cy/ft | -11.28 cy/ft |
| Volume Change Above -14 ft NAVD88 | 0.40 cy/ft | 35.68 cy/ft |
| Volume Change Above -19 ft NAVD88 | -9.60 cy/ft | 30.22 cy/ft |
| Volume Change Above -30 ft NAVD88 | -4.94 cy/ft | 28.49 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
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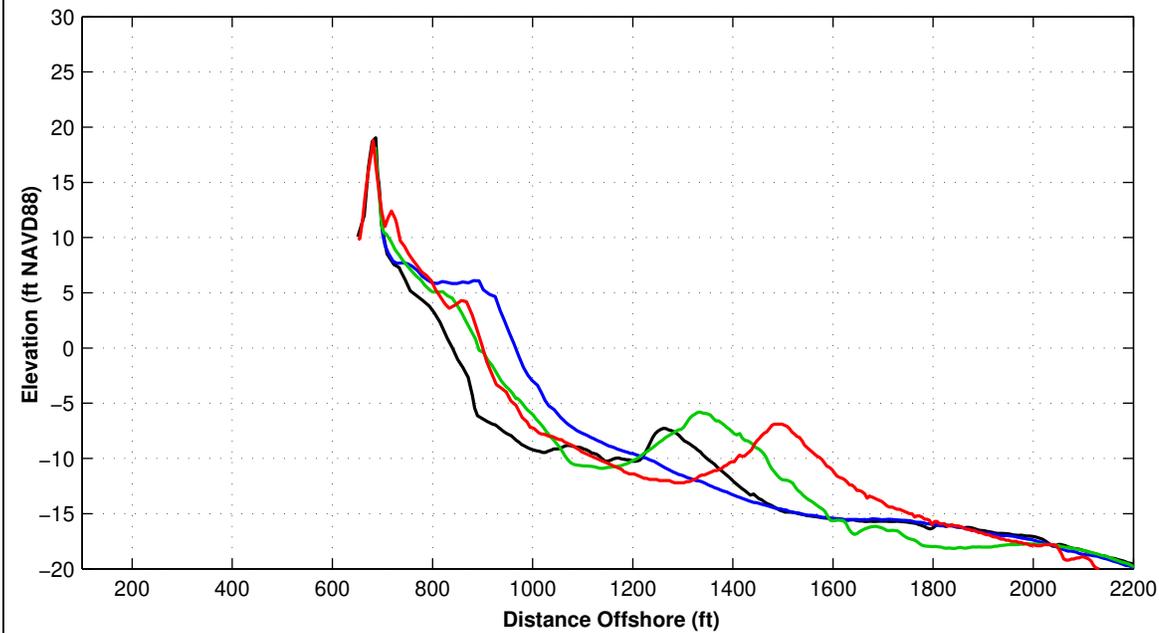
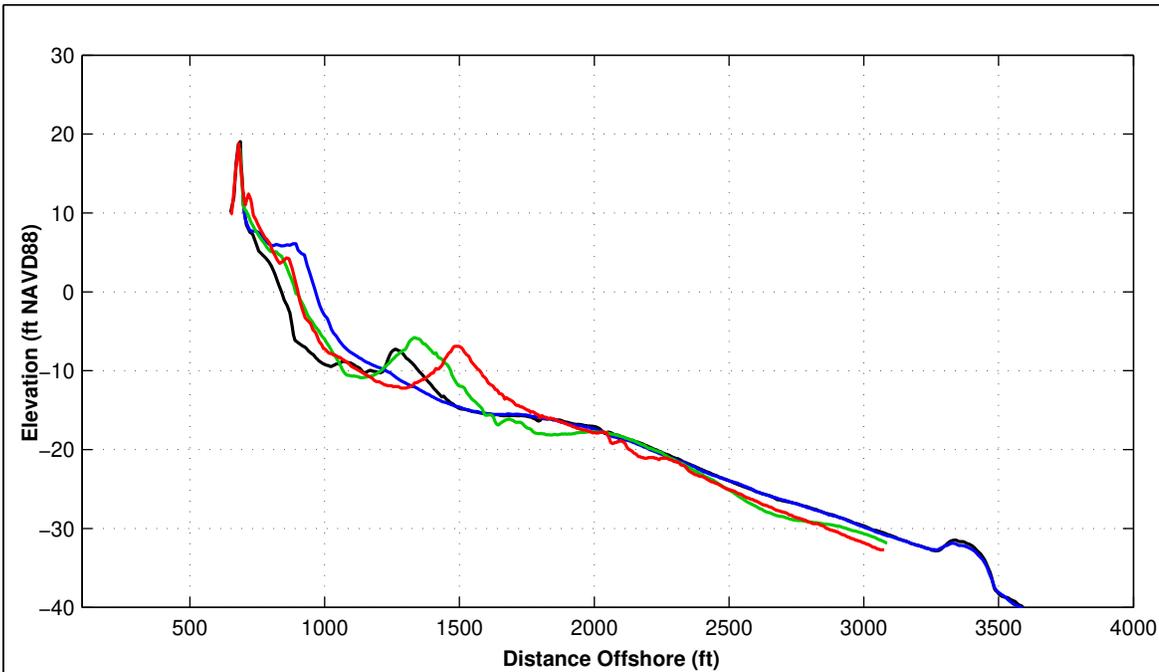
| Survey Transect 905+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -82.88 ft | -75.12 ft |
| Volume Change Above +6 ft NAVD88 | -0.95 cy/ft | 8.53 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -20.41 cy/ft | -6.41 cy/ft |
| Volume Change Above -6 ft NAVD88 | -37.93 cy/ft | -27.03 cy/ft |
| Volume Change Above -14 ft NAVD88 | -4.59 cy/ft | 7.71 cy/ft |
| Volume Change Above -19 ft NAVD88 | -11.03 cy/ft | 16.59 cy/ft |
| Volume Change Above -30 ft NAVD88 | 8.16 cy/ft | 30.30 cy/ft |

LEGEND:

| | | | |
|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
1. Station From North To South At Varying Intervals.
 2. Post-Dorian Survey Extends Between Station 495+00 to 1025+00
 3. All Survey Elevations In Feet Referenced to NAVD88.



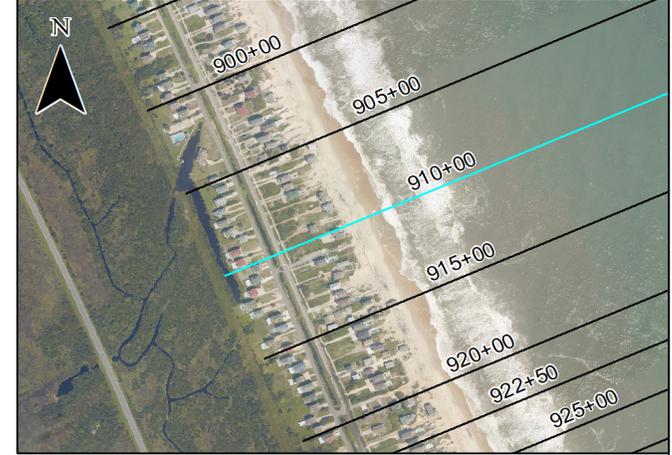


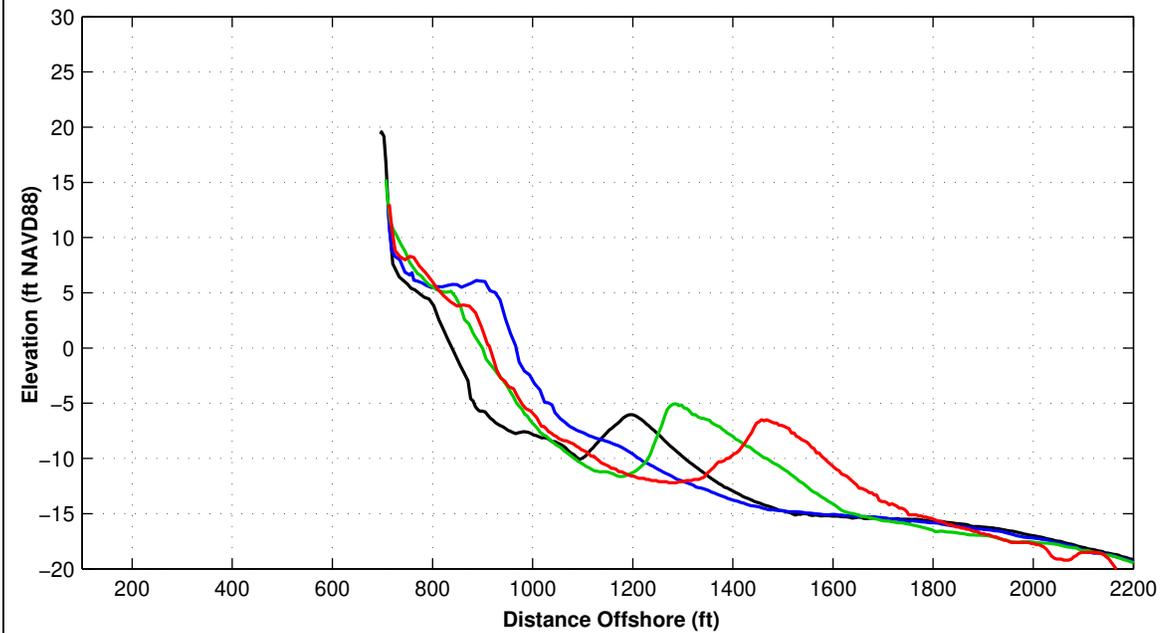
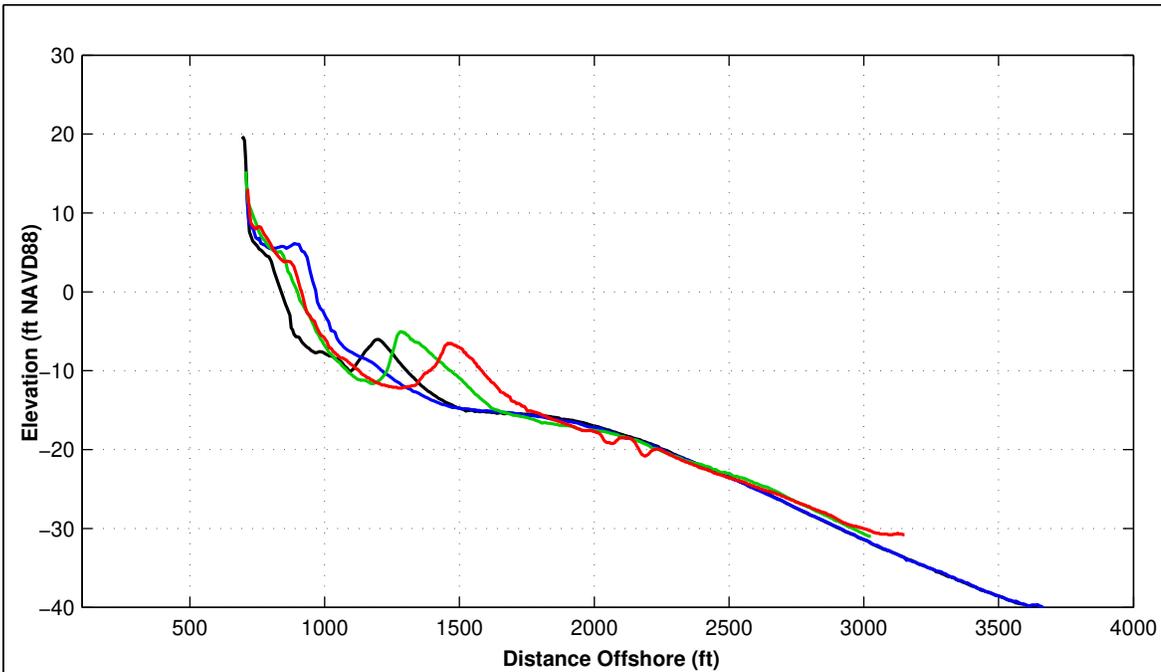
| Survey Transect 910+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|--|-------------------------|-------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -73.59 ft | -62.75 ft |
| Volume Change Above +6 ft NAVD88 | 0.45 cy/ft | 5.80 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -14.64 cy/ft | -7.79 cy/ft |
| Volume Change Above -6 ft NAVD88 | -31.12 cy/ft | -26.23 cy/ft |
| Volume Change Above -14 ft NAVD88 | 0.83 cy/ft | 2.19 cy/ft |
| Volume Change Above -19 ft NAVD88 | -12.65 cy/ft | 12.74 cy/ft |
| Volume Change Above -30 ft NAVD88 | -45.67 cy/ft | -24.61 cy/ft |

LEGEND:

| | | | |
|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
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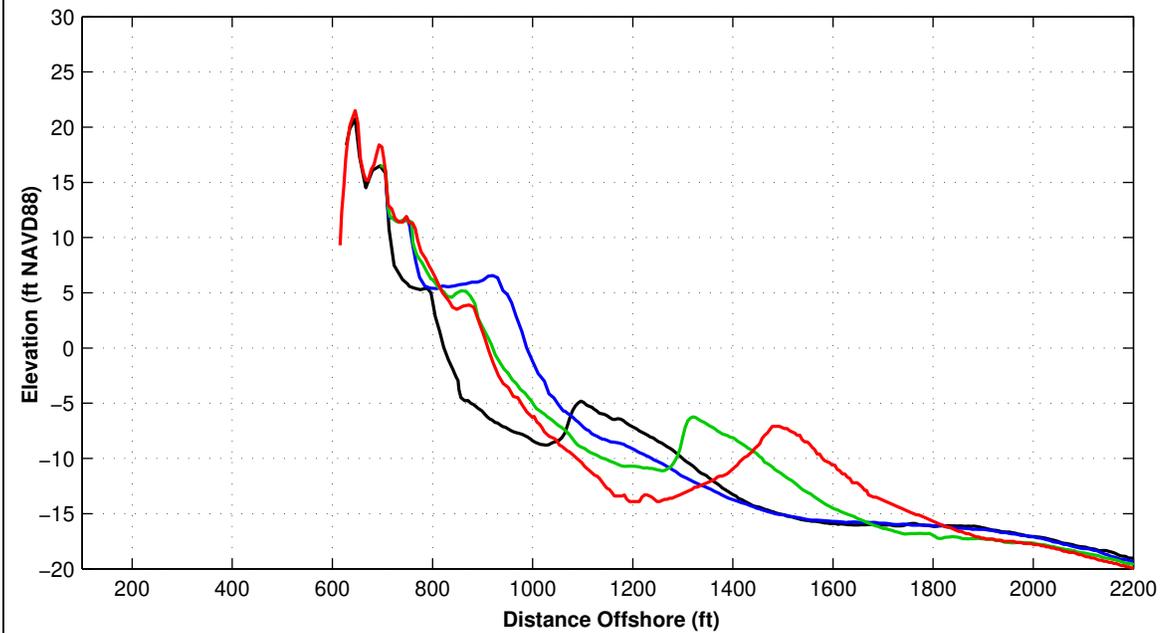
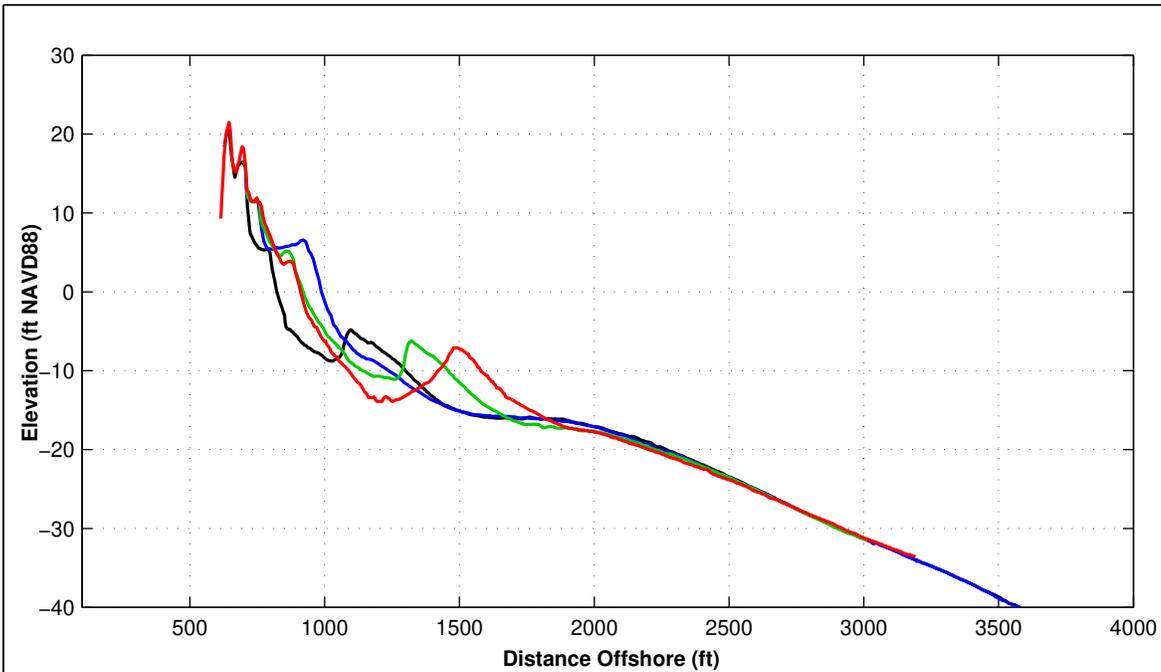
| Survey Transect 915+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -73.78 ft | -53.81 ft |
| Volume Change Above +6 ft NAVD88 | 3.49 cy/ft | 3.59 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -10.66 cy/ft | -8.84 cy/ft |
| Volume Change Above -6 ft NAVD88 | -26.23 cy/ft | -22.98 cy/ft |
| Volume Change Above -14 ft NAVD88 | 10.08 cy/ft | 16.24 cy/ft |
| Volume Change Above -19 ft NAVD88 | 9.05 cy/ft | 22.88 cy/ft |
| Volume Change Above -30 ft NAVD88 | 21.20 cy/ft | 28.26 cy/ft |

LEGEND:

| | | | |
|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
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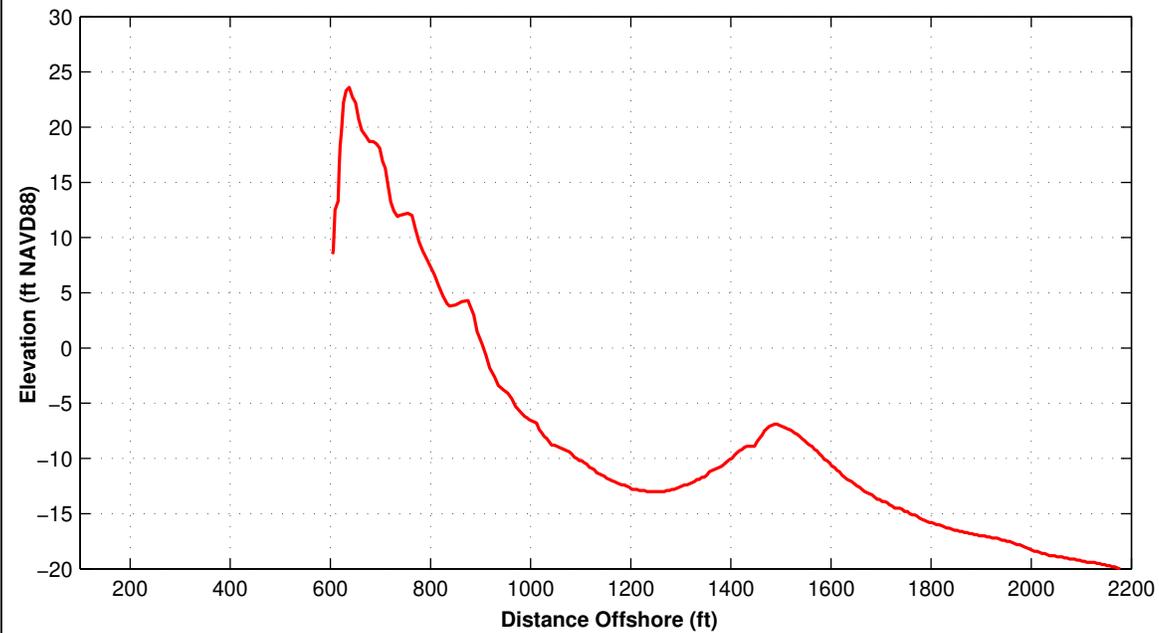
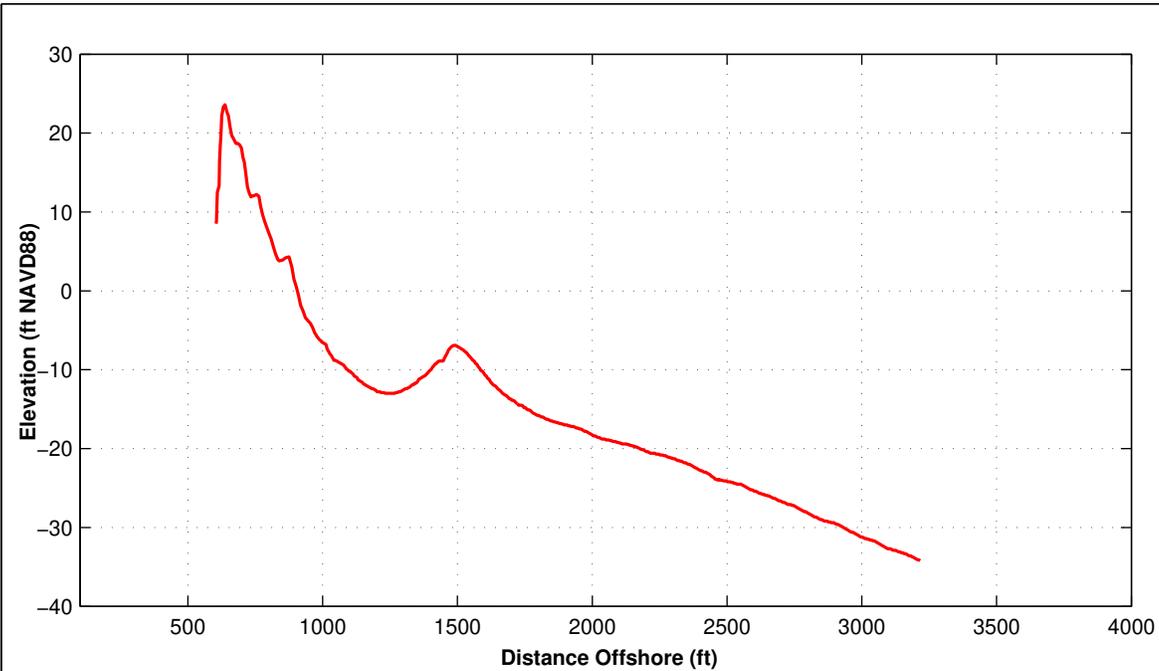
| Survey Transect 920+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -72.38 ft | -78.07 ft |
| Volume Change Above +6 ft NAVD88 | 1.39 cy/ft | 3.51 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -12.68 cy/ft | -12.91 cy/ft |
| Volume Change Above -6 ft NAVD88 | -28.62 cy/ft | -33.66 cy/ft |
| Volume Change Above -14 ft NAVD88 | -0.19 cy/ft | -23.24 cy/ft |
| Volume Change Above -19 ft NAVD88 | -3.17 cy/ft | -11.69 cy/ft |
| Volume Change Above -30 ft NAVD88 | -5.54 cy/ft | -18.78 cy/ft |

LEGEND:

| | | | |
|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
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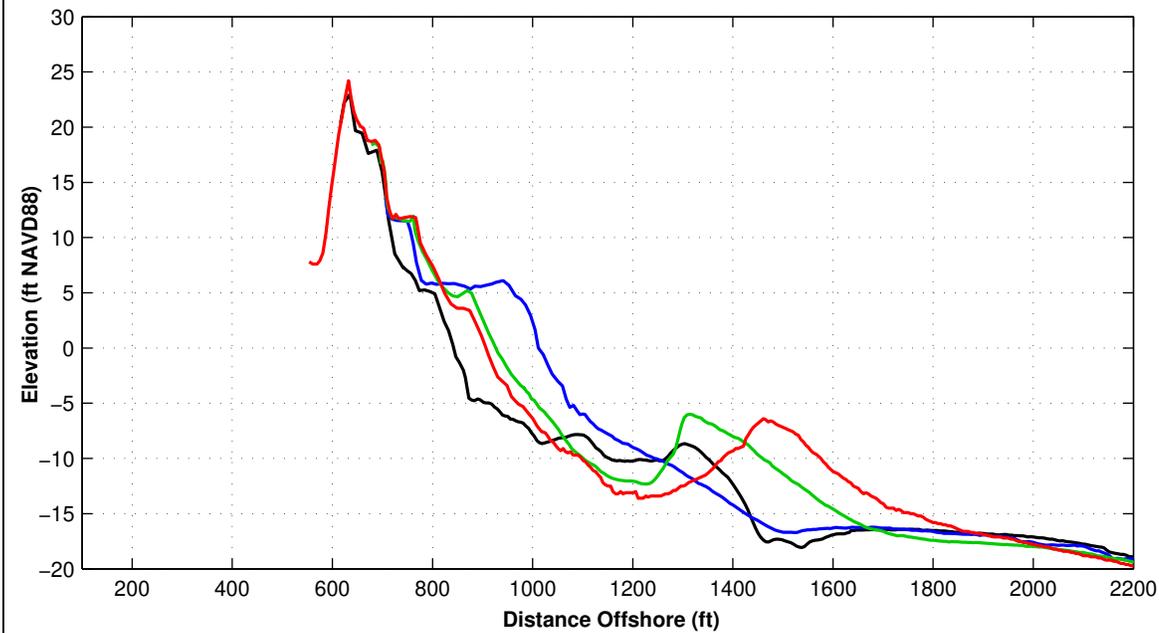
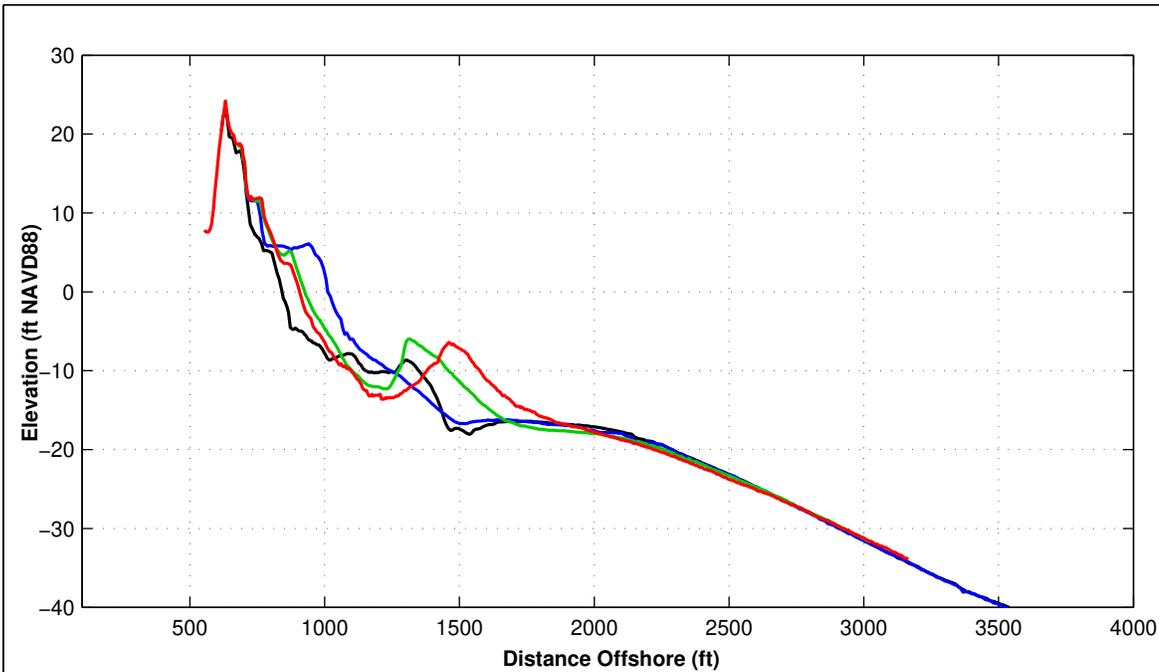
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|--|----------------------------|----------------------------|
| Survey Transect 922+50 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
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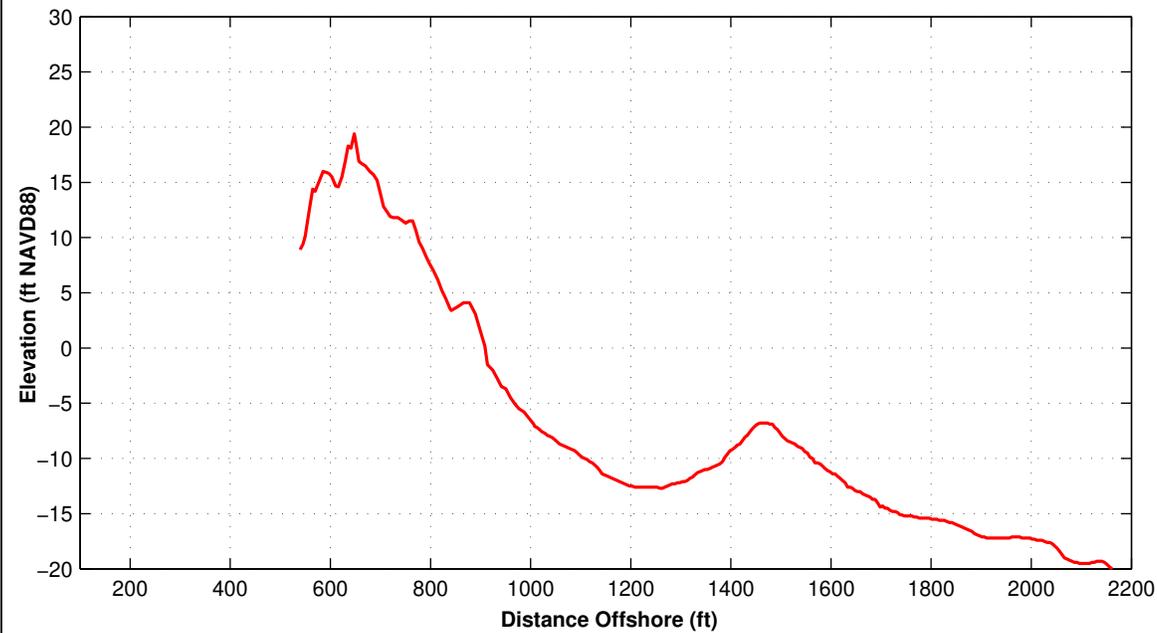
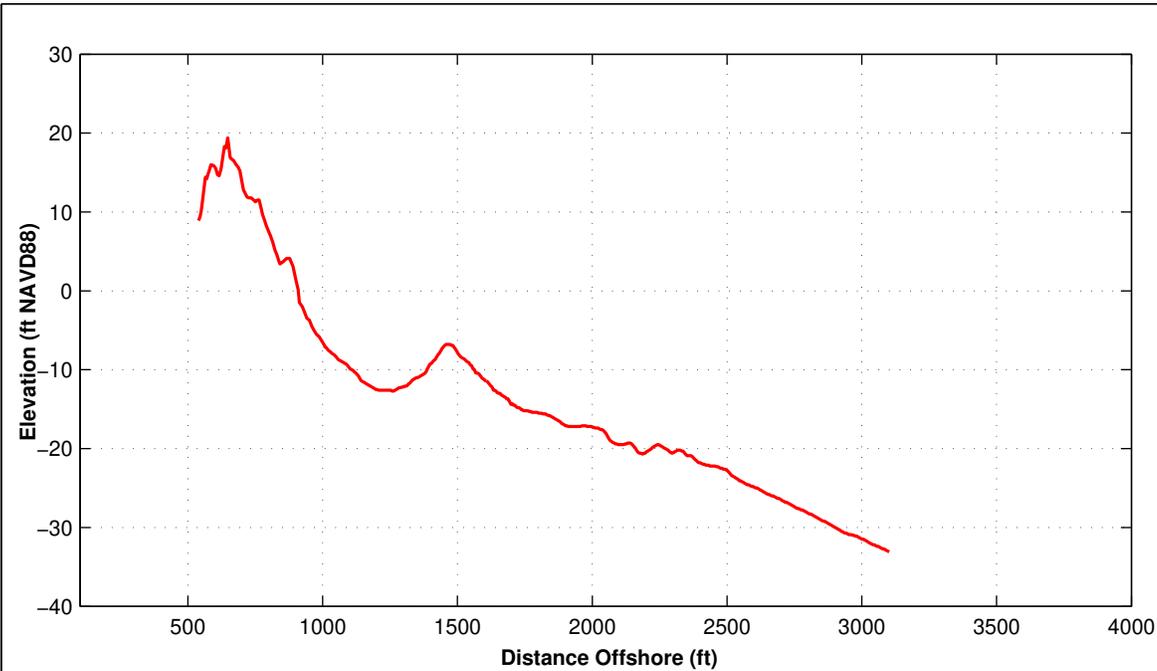
| Survey Transect 925+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -92.48 ft | -109.42 ft |
| Volume Change Above +6 ft NAVD88 | 5.22 cy/ft | 5.57 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -11.91 cy/ft | -15.64 cy/ft |
| Volume Change Above -6 ft NAVD88 | -33.15 cy/ft | -44.29 cy/ft |
| Volume Change Above -14 ft NAVD88 | -13.41 cy/ft | -28.45 cy/ft |
| Volume Change Above -19 ft NAVD88 | -6.13 cy/ft | -0.47 cy/ft |
| Volume Change Above -30 ft NAVD88 | -8.16 cy/ft | -10.33 cy/ft |

LEGEND:

| | | | |
|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
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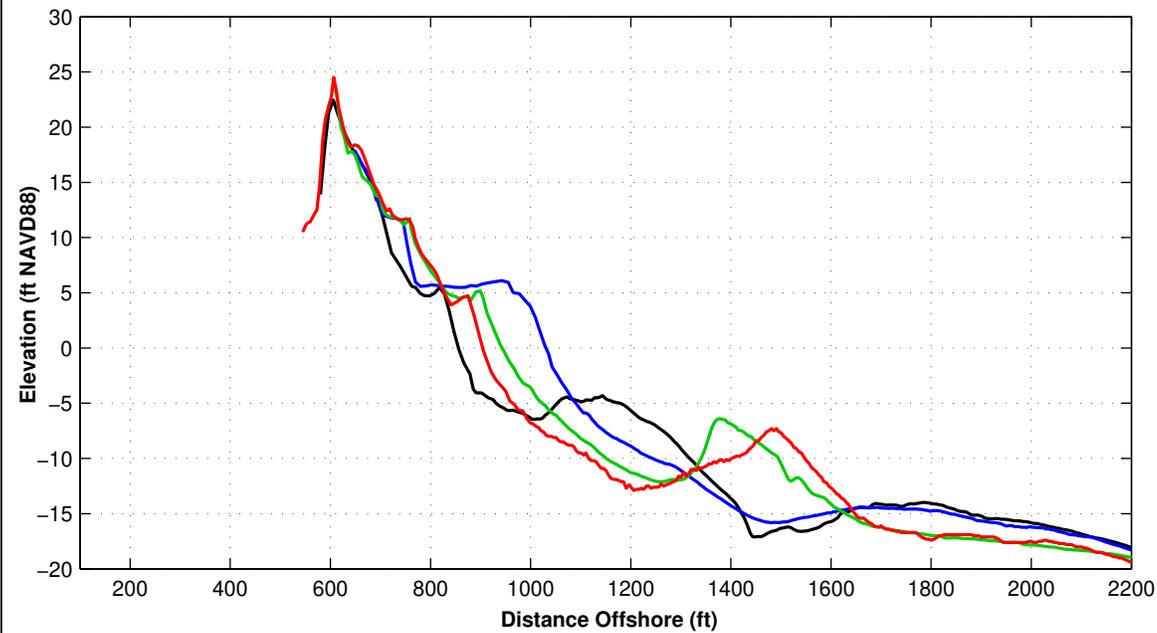
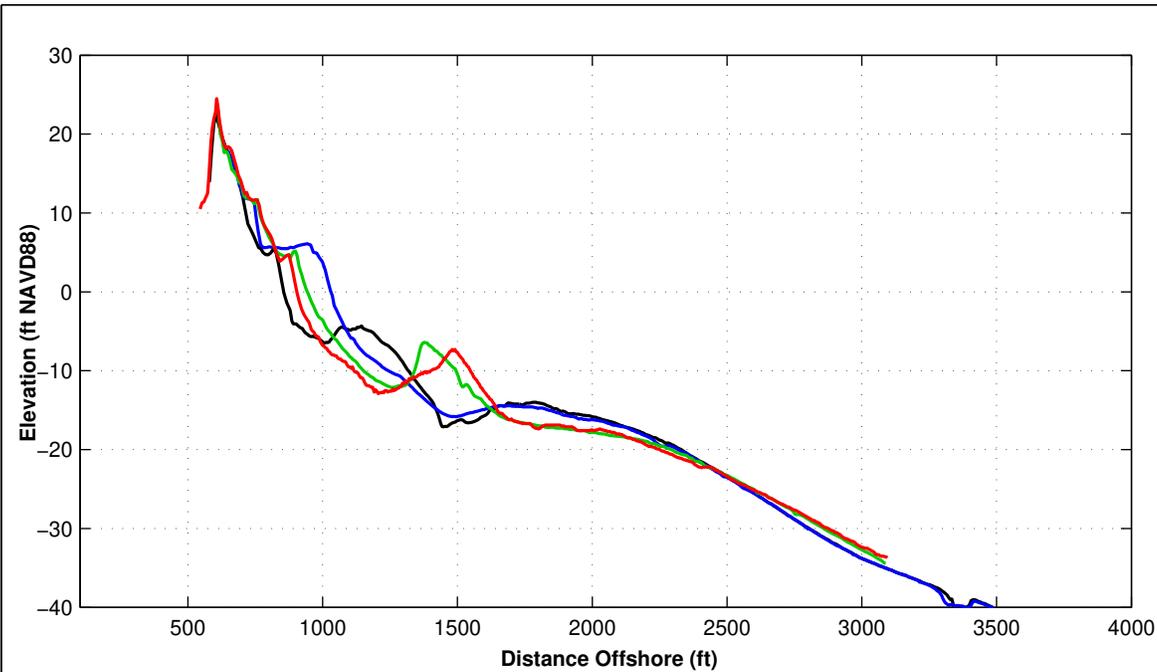
| | | |
|--|----------------------------|----------------------------|
| Survey Transect 927+50 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
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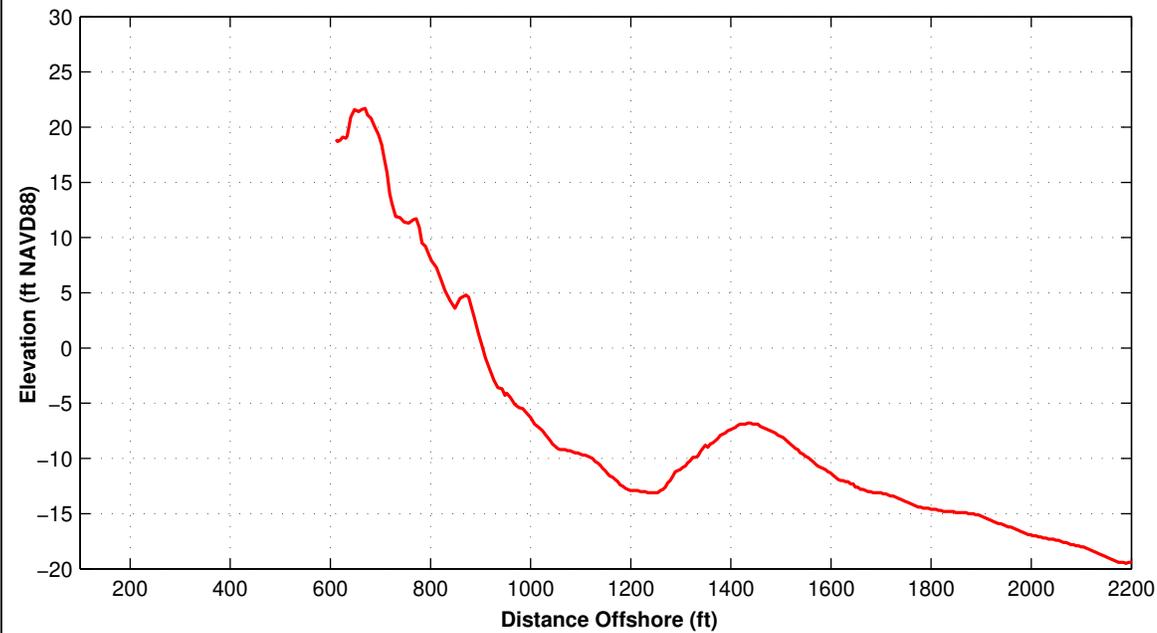
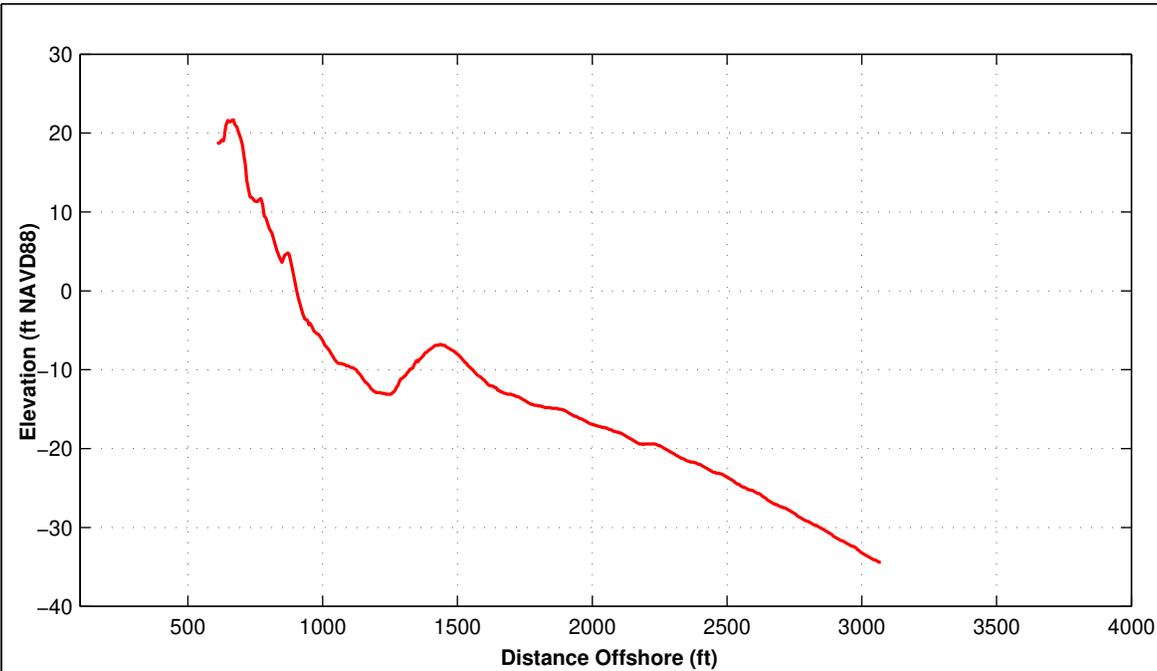
| Survey Transect 930+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -90.25 ft | -124.06 ft |
| Volume Change Above +6 ft NAVD88 | 4.22 cy/ft | 8.14 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -11.97 cy/ft | -12.70 cy/ft |
| Volume Change Above -6 ft NAVD88 | -32.55 cy/ft | -46.18 cy/ft |
| Volume Change Above -14 ft NAVD88 | -10.22 cy/ft | -34.56 cy/ft |
| Volume Change Above -19 ft NAVD88 | -34.43 cy/ft | -54.65 cy/ft |
| Volume Change Above -30 ft NAVD88 | -27.30 cy/ft | -50.93 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
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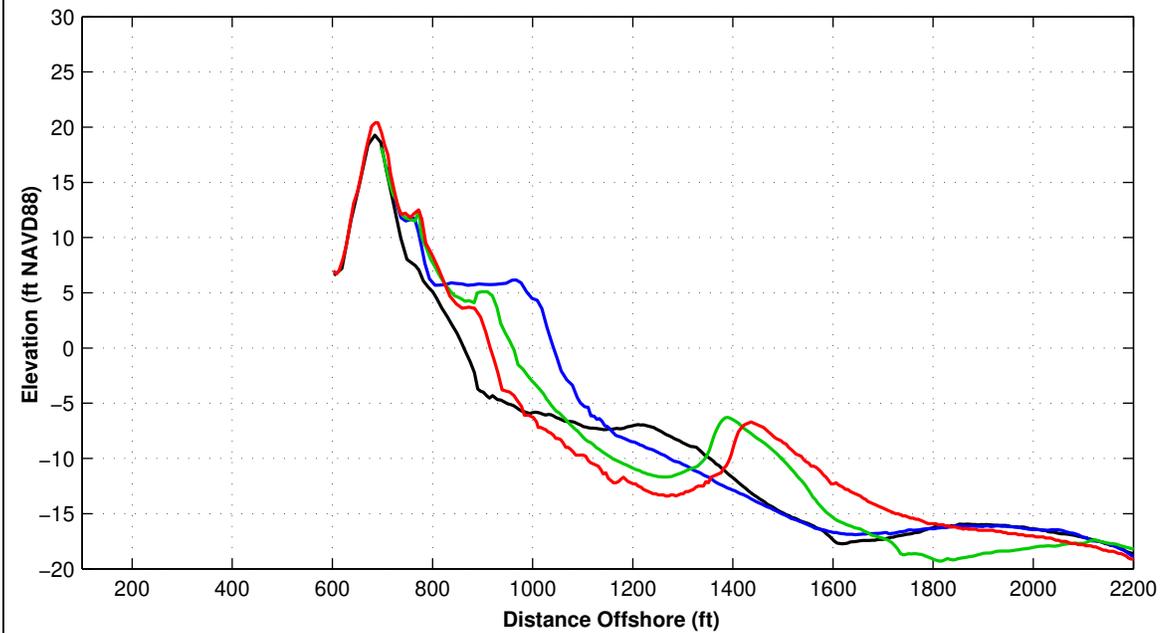
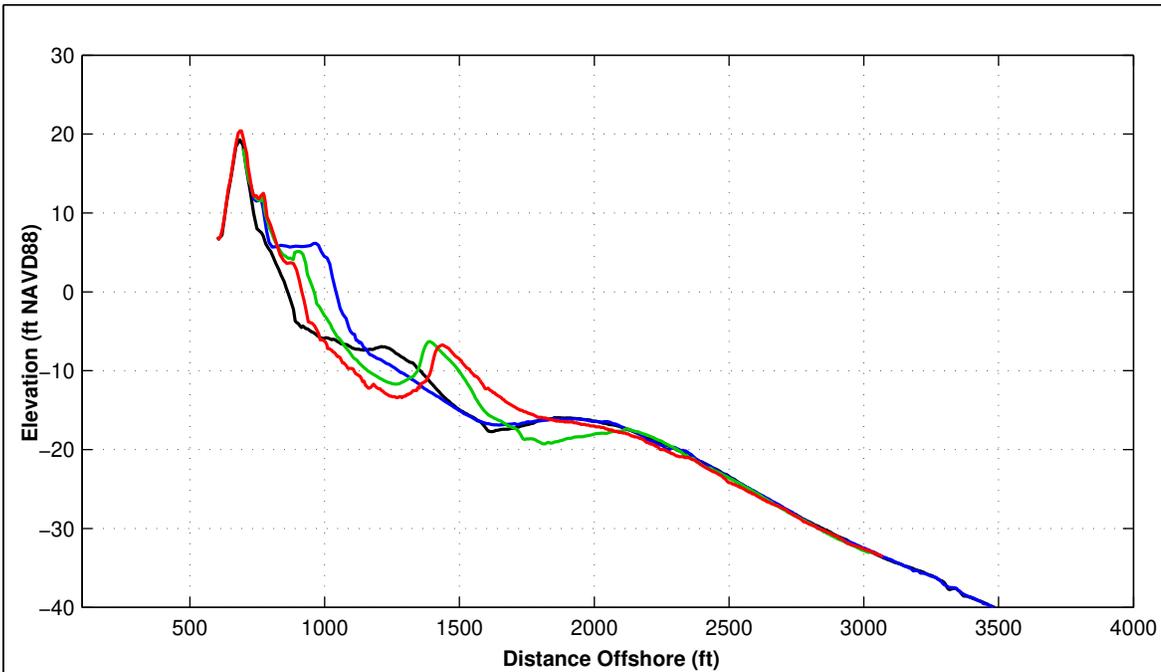
| | | |
|--|----------------------------|----------------------------|
| Survey Transect 932+50 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
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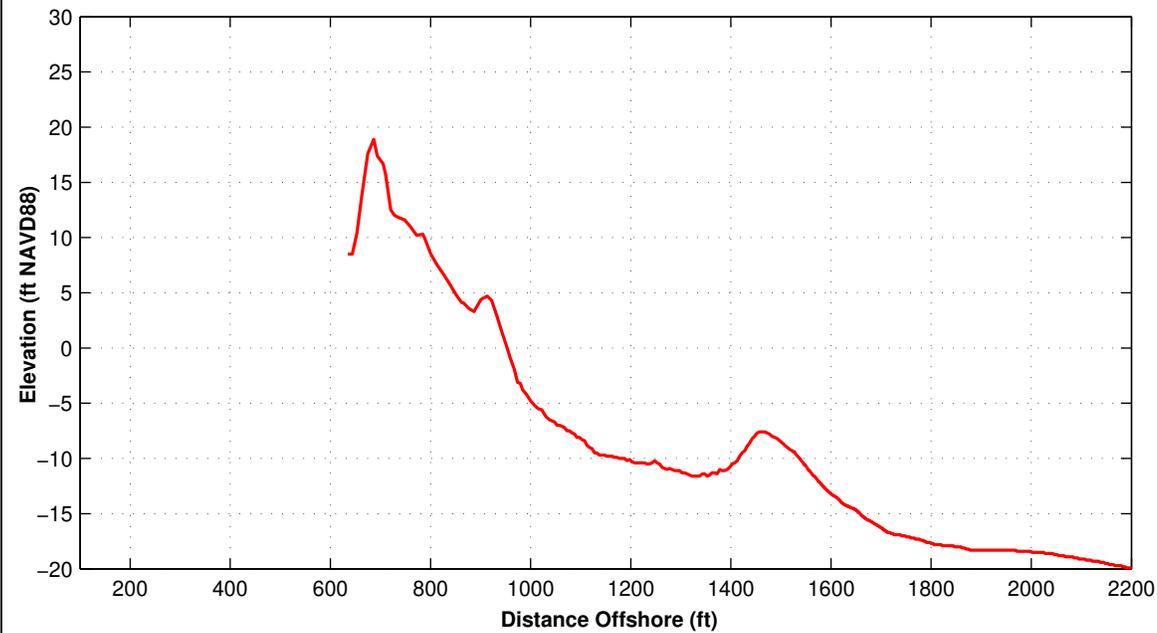
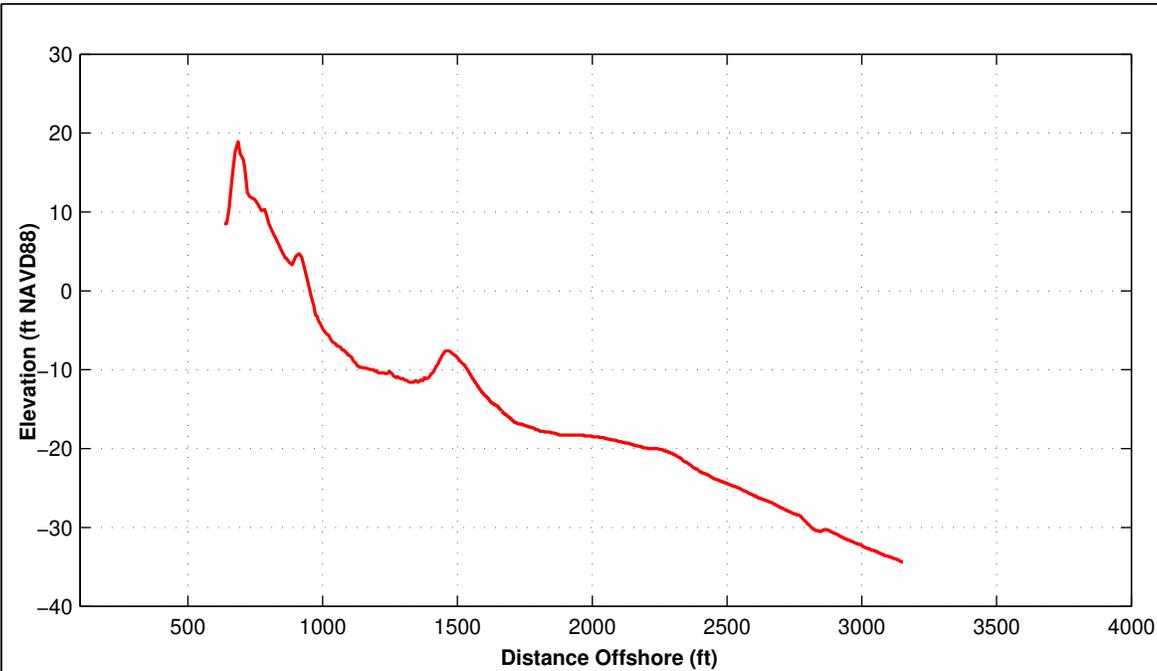
| Survey Transect 935+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -85.79 ft | -125.70 ft |
| Volume Change Above +6 ft NAVD88 | 2.57 cy/ft | 4.88 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -15.03 cy/ft | -19.41 cy/ft |
| Volume Change Above -6 ft NAVD88 | -34.67 cy/ft | -53.82 cy/ft |
| Volume Change Above -14 ft NAVD88 | -16.81 cy/ft | -52.40 cy/ft |
| Volume Change Above -19 ft NAVD88 | -35.97 cy/ft | -36.40 cy/ft |
| Volume Change Above -30 ft NAVD88 | -38.94 cy/ft | -45.65 cy/ft |

LEGEND:

| | | | |
|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
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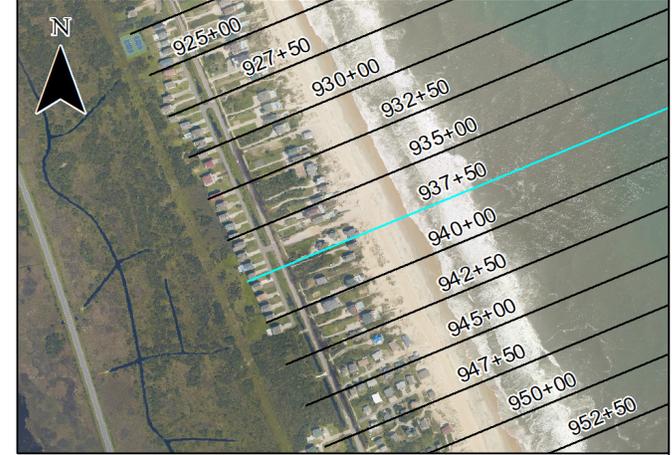


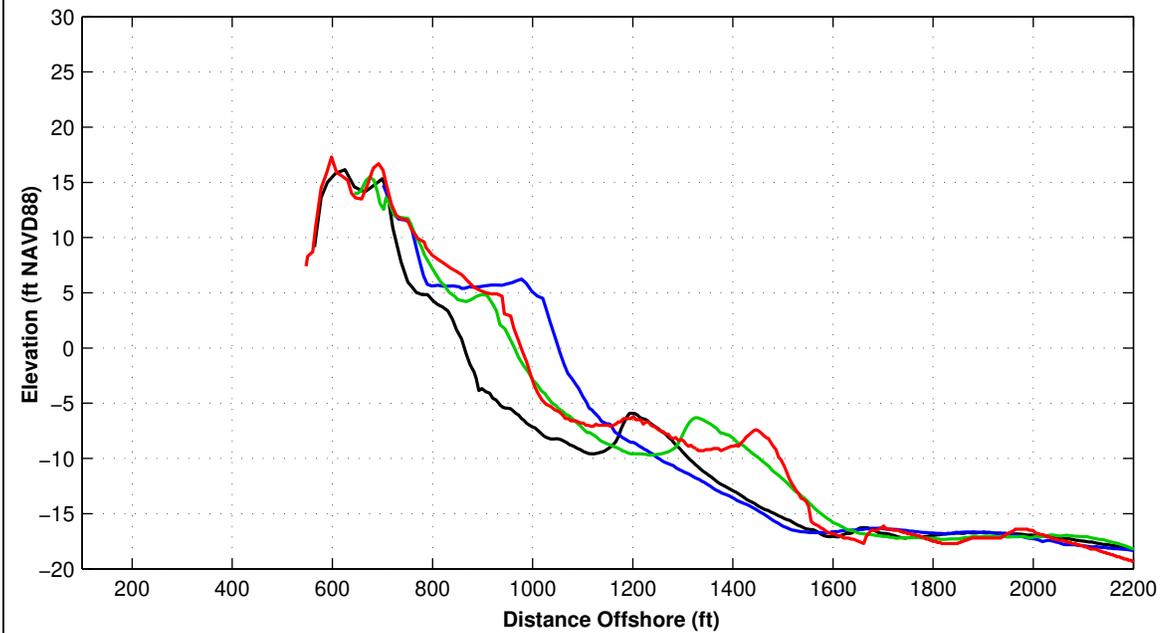
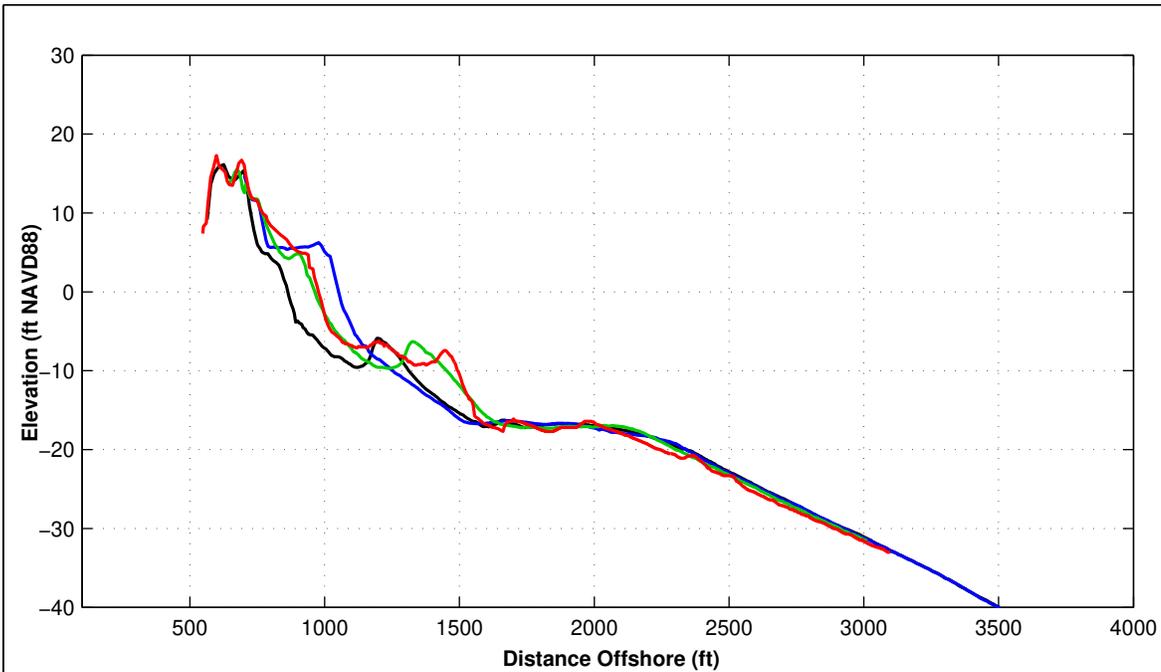
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|--|----------------------------|----------------------------|
| Survey Transect 937+50 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
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 2. Station From North To South At Varying Intervals.
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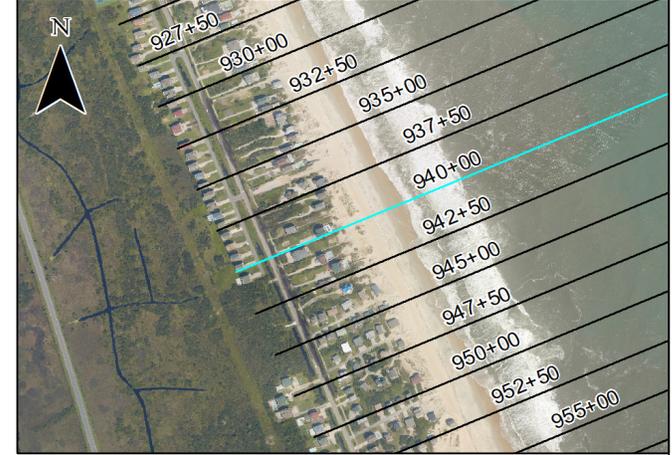


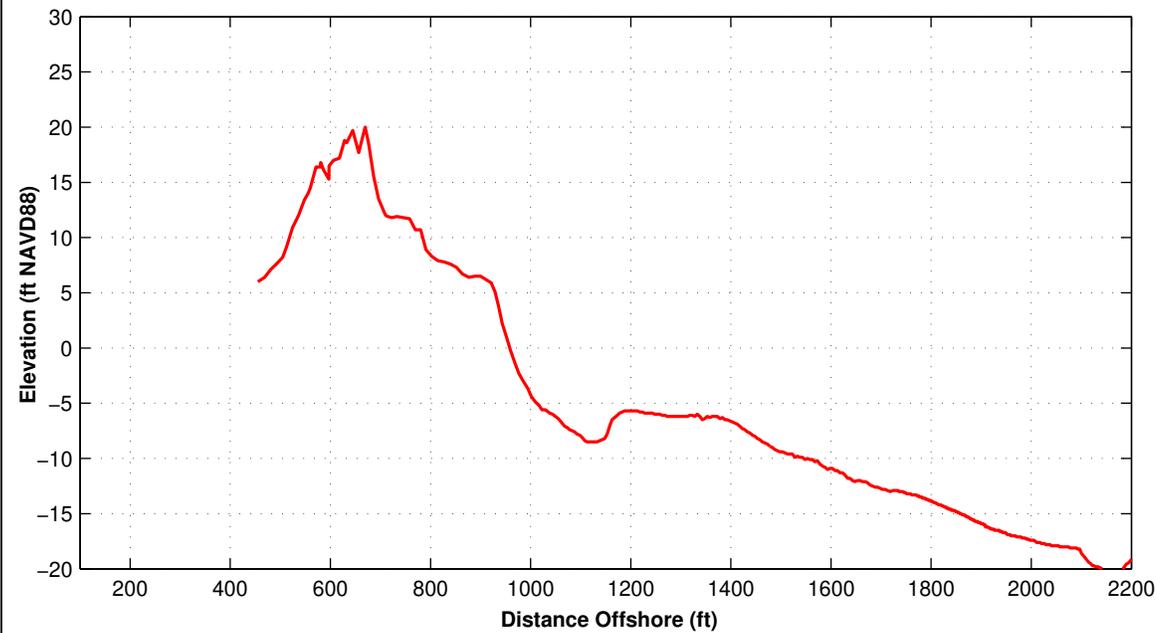
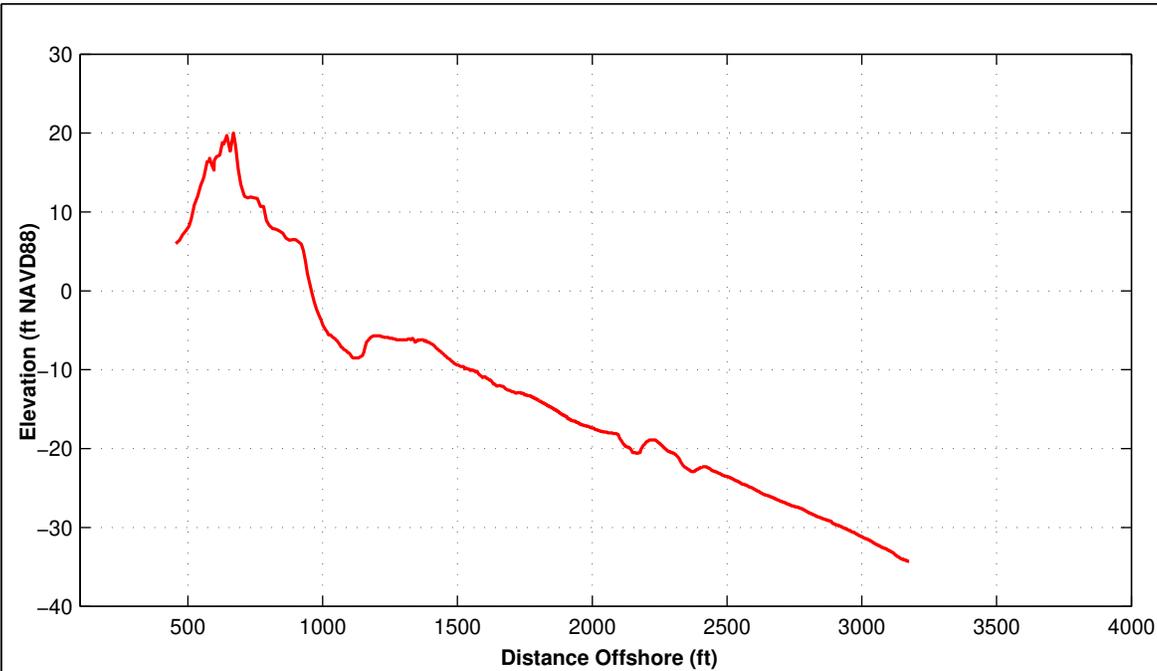
| Survey Transect 940+00 | POST-DORIAN - AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|--|---------------------------|-------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -92.27 ft | -75.61 ft |
| Volume Change Above +6 ft NAVD88 | 1.73 cy/ft | 6.93 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -17.47 cy/ft | -5.84 cy/ft |
| Volume Change Above -6 ft NAVD88 | -38.43 cy/ft | -26.52 cy/ft |
| Volume Change Above -14 ft NAVD88 | -6.54 cy/ft | 18.15 cy/ft |
| Volume Change Above -19 ft NAVD88 | 3.05 cy/ft | 19.70 cy/ft |
| Volume Change Above -30 ft NAVD88 | -5.51 cy/ft | -0.69 cy/ft |

LEGEND:

| | | | |
|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
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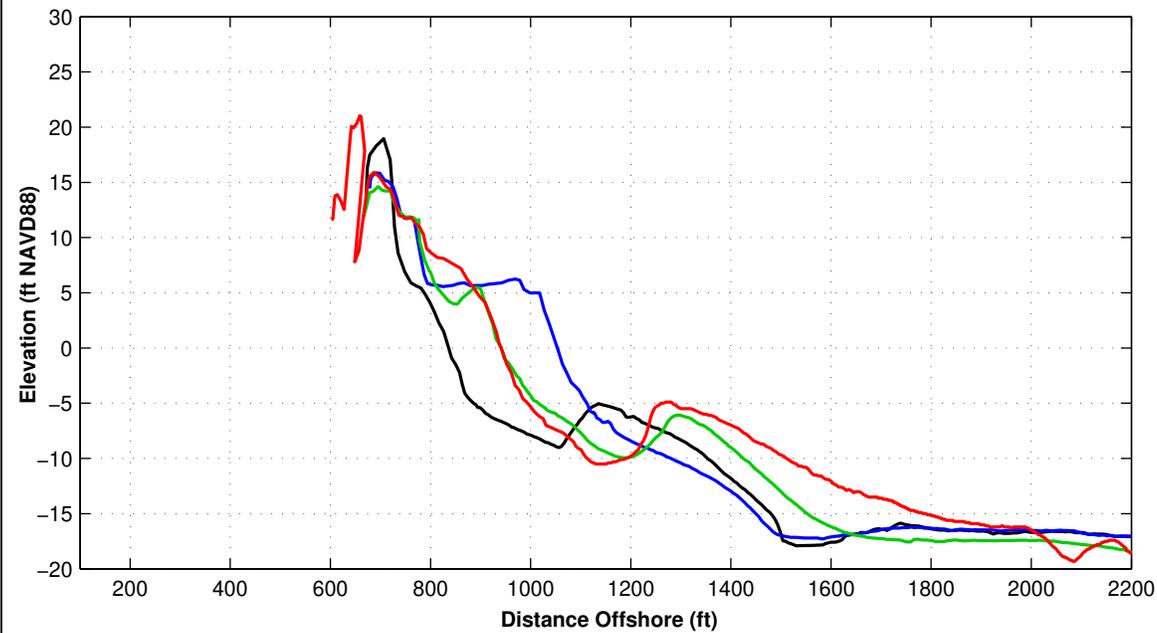
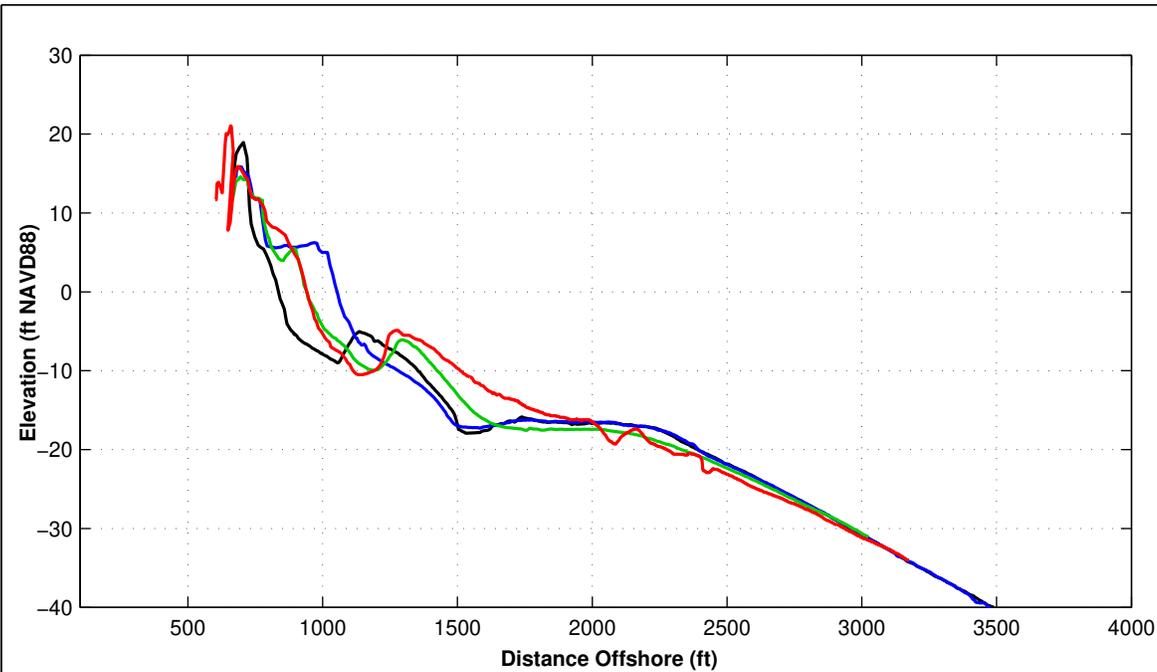
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|--|----------------------------|----------------------------|
| Survey Transect 942+50 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

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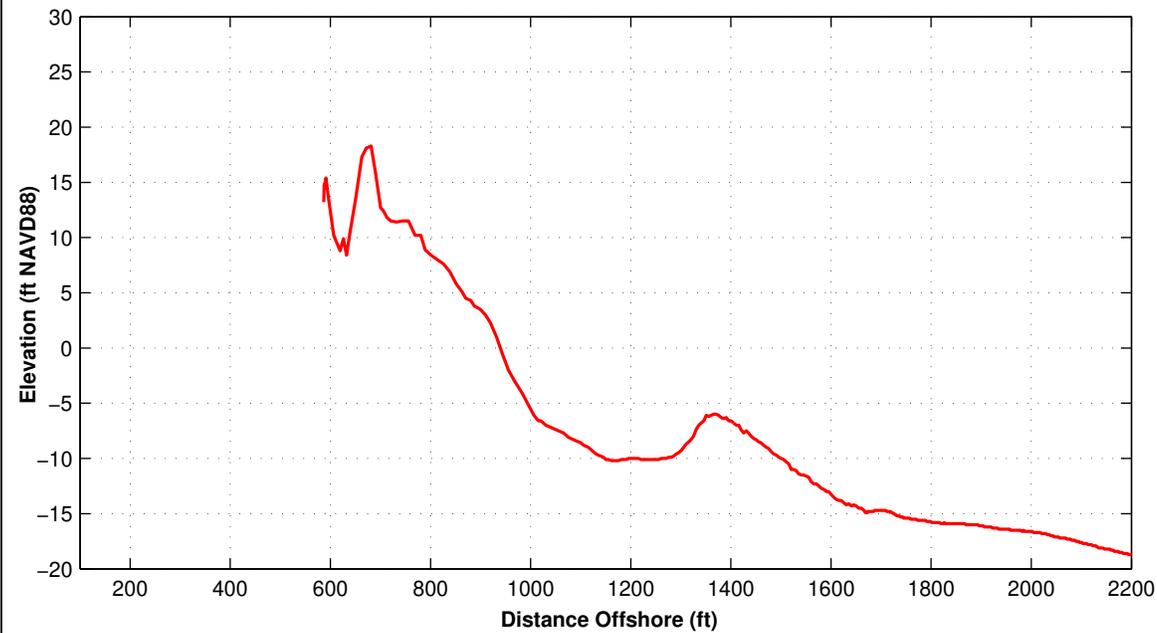
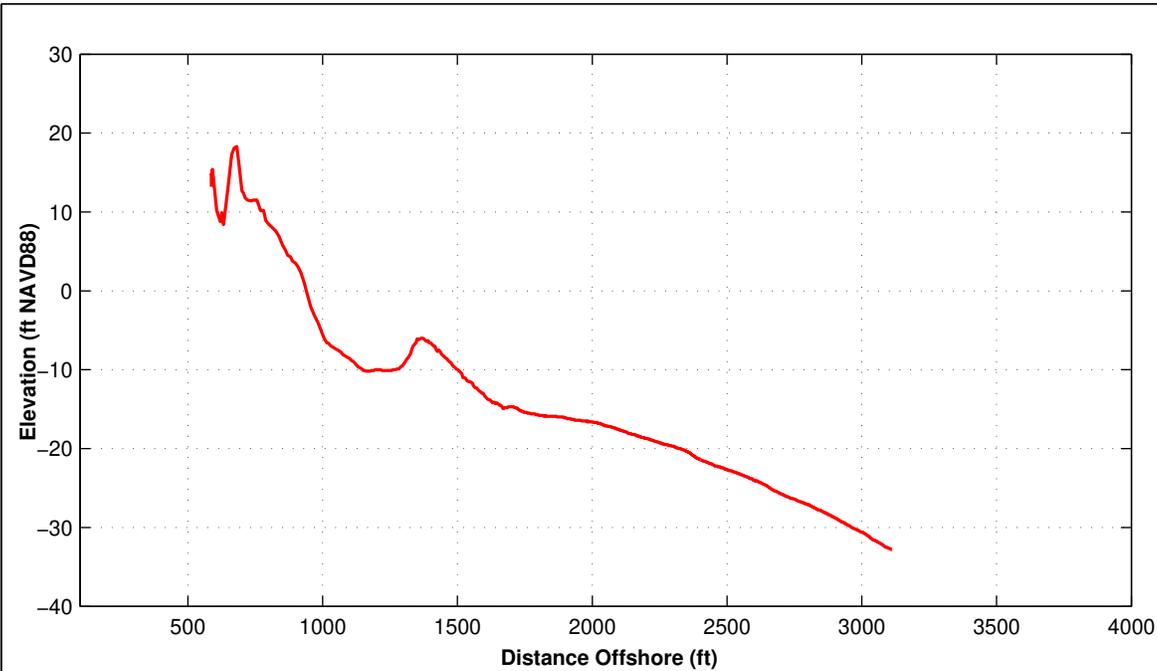
| Survey Transect 945+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -115.27 ft | -111.31 ft |
| Volume Change Above +6 ft NAVD88 | -8.01 cy/ft | 6.40 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -29.89 cy/ft | -11.90 cy/ft |
| Volume Change Above -6 ft NAVD88 | -57.62 cy/ft | -39.91 cy/ft |
| Volume Change Above -14 ft NAVD88 | -35.53 cy/ft | 7.04 cy/ft |
| Volume Change Above -19 ft NAVD88 | -47.79 cy/ft | 29.19 cy/ft |
| Volume Change Above -30 ft NAVD88 | -47.05 cy/ft | 0.45 cy/ft |

LEGEND:

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|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

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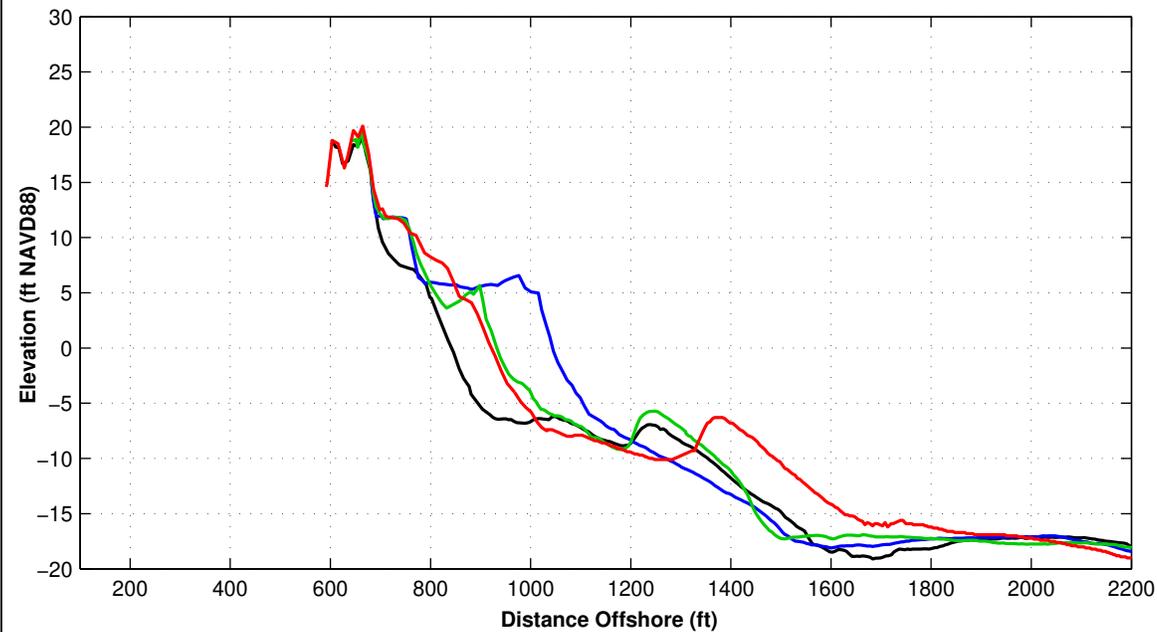
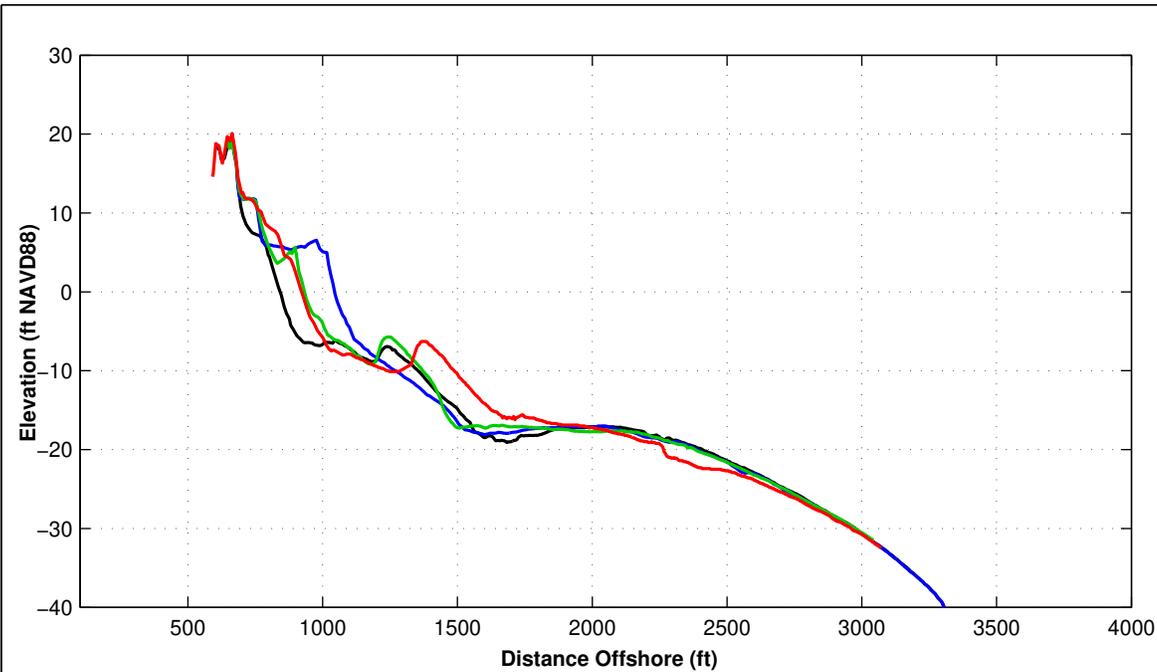
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|--|----------------------------|----------------------------|
| Survey Transect 947+50 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 ——

- Notes:
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 2. Station From North To South At Varying Intervals.
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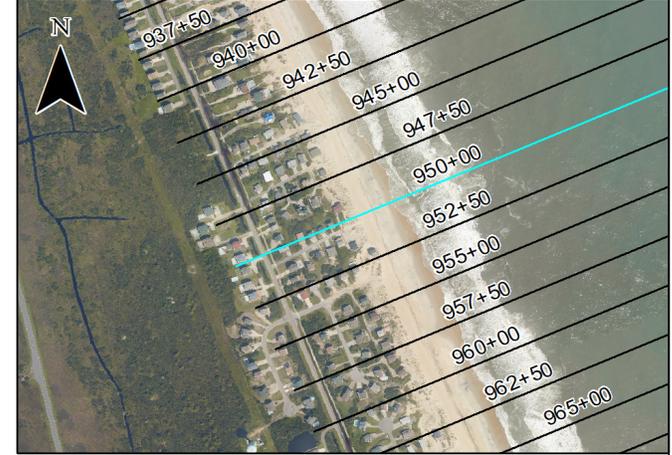


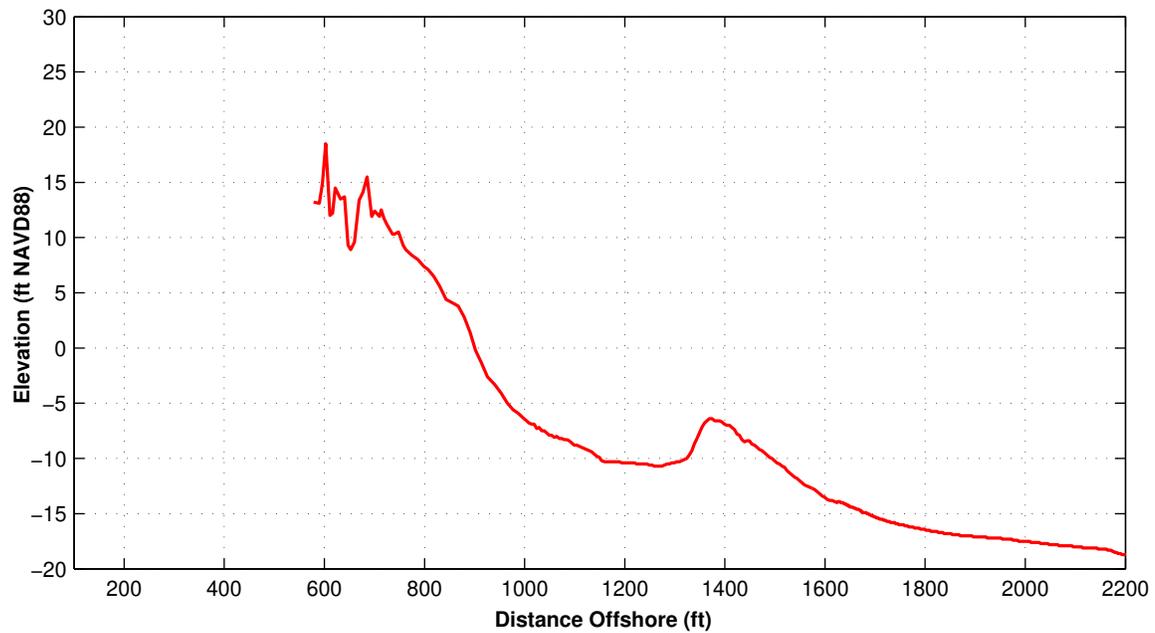
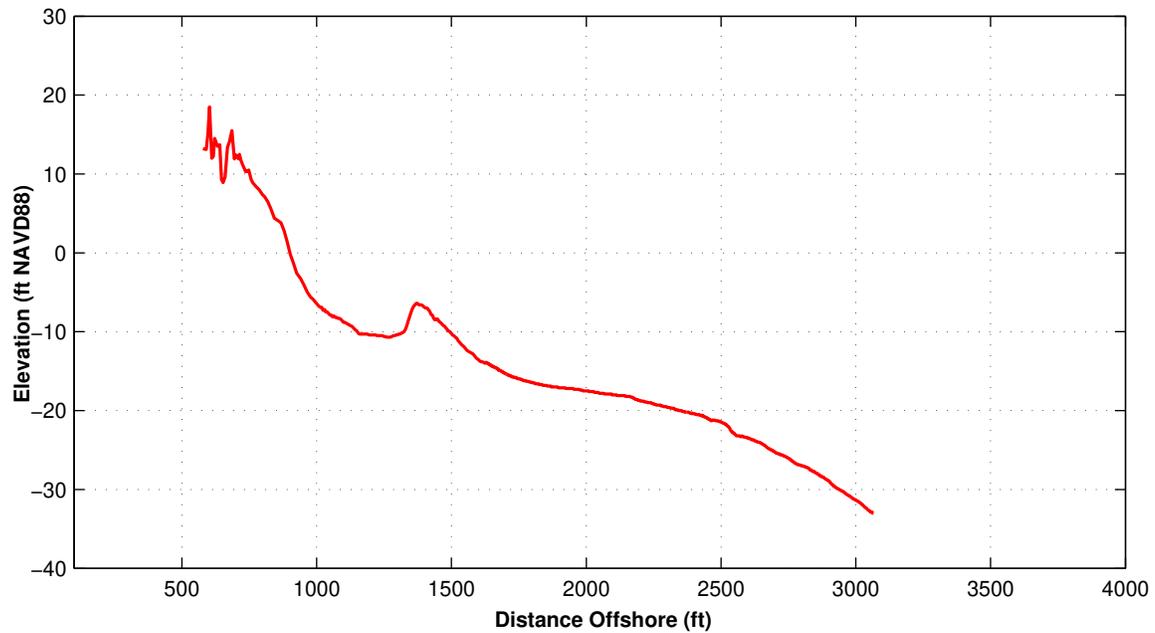
| Survey Transect 950+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -112.94 ft | -126.15 ft |
| Volume Change Above +6 ft NAVD88 | 1.84 cy/ft | 6.48 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -21.22 cy/ft | -16.06 cy/ft |
| Volume Change Above -6 ft NAVD88 | -48.25 cy/ft | -48.49 cy/ft |
| Volume Change Above -14 ft NAVD88 | -31.12 cy/ft | -19.67 cy/ft |
| Volume Change Above -19 ft NAVD88 | -30.06 cy/ft | 9.59 cy/ft |
| Volume Change Above -30 ft NAVD88 | -29.85 cy/ft | -15.98 cy/ft |

LEGEND:

| | | | |
|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
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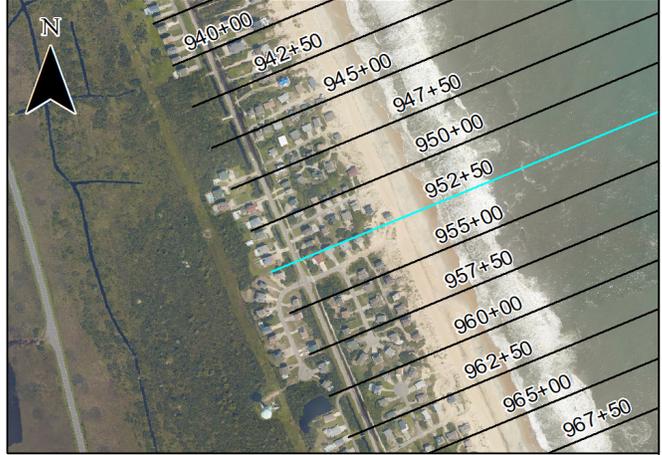
| | | |
|--|----------------------------|----------------------------|
| Survey Transect 952+50 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

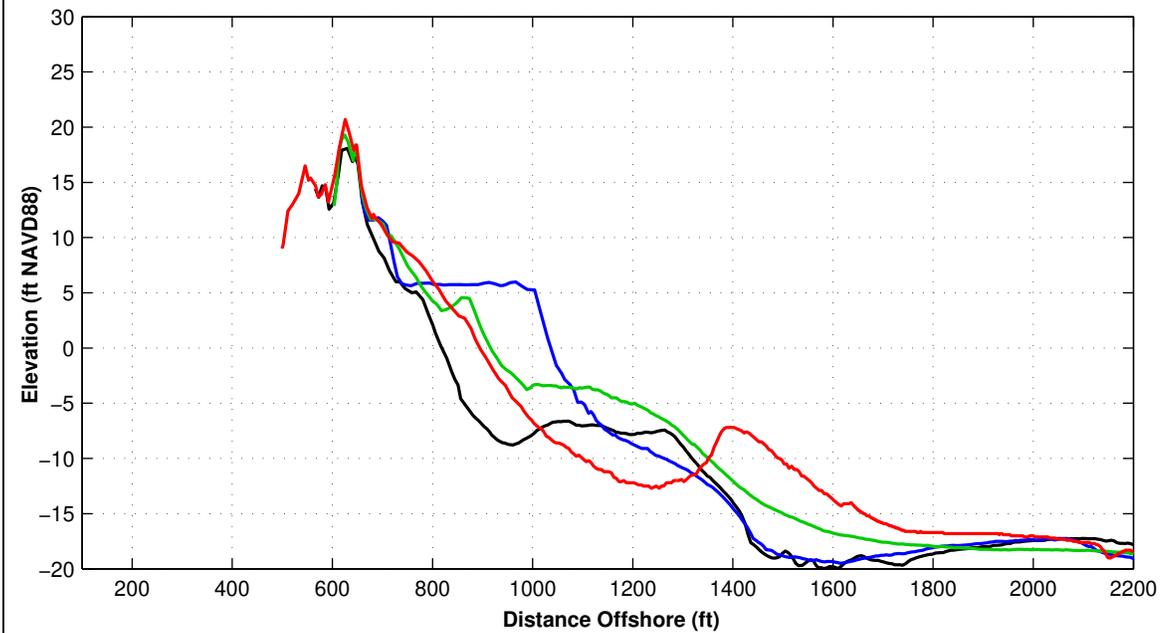
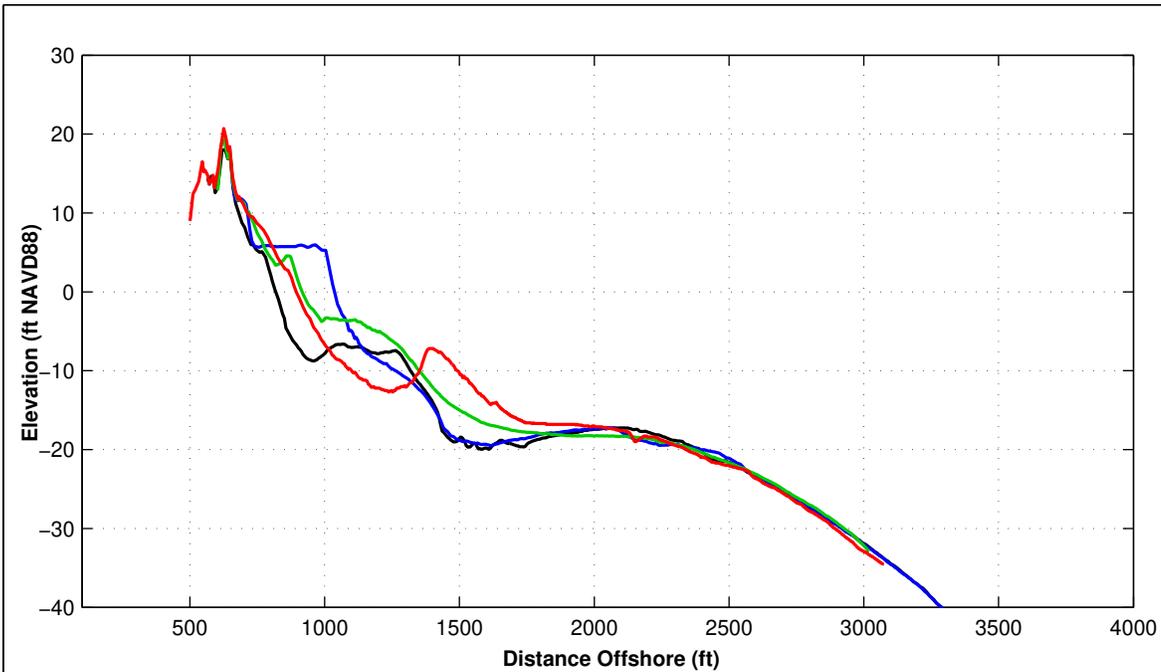
LEGEND:

JUNE 2020 —

Notes:

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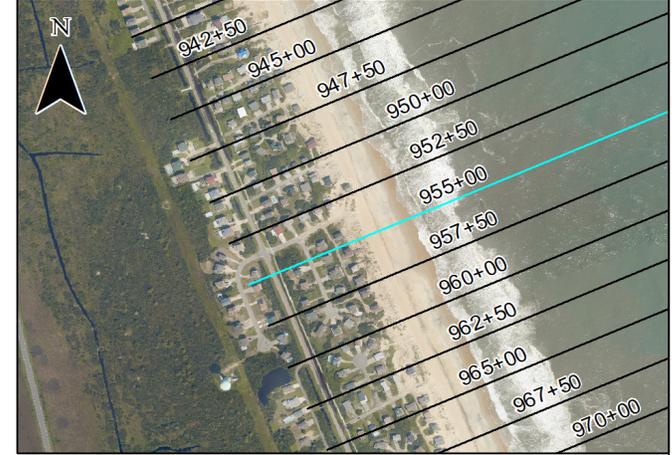


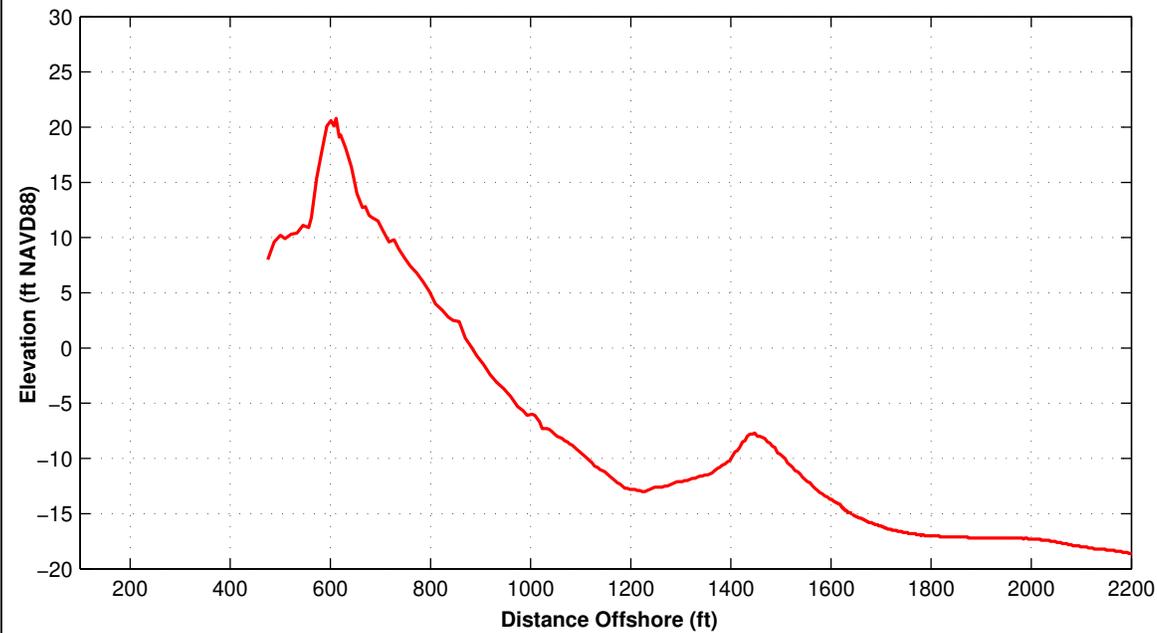
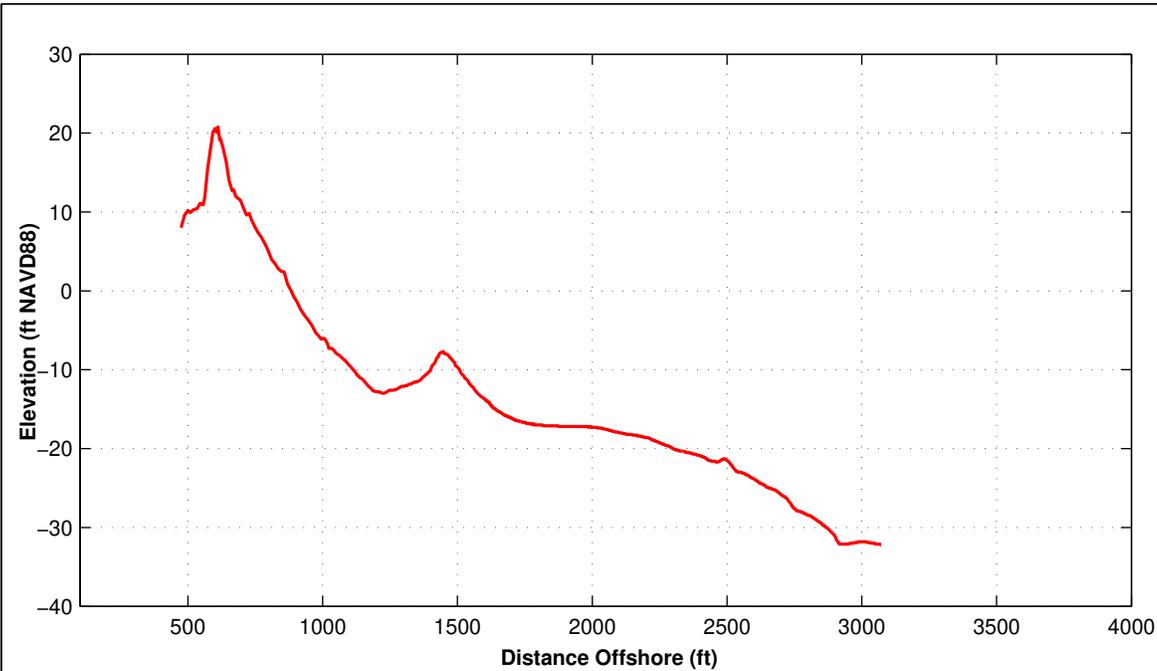
| Survey Transect 955+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -125.27 ft | -146.21 ft |
| Volume Change Above +6 ft NAVD88 | 4.76 cy/ft | 6.47 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -22.45 cy/ft | -21.66 cy/ft |
| Volume Change Above -6 ft NAVD88 | -33.86 cy/ft | -57.23 cy/ft |
| Volume Change Above -14 ft NAVD88 | -5.77 cy/ft | -53.00 cy/ft |
| Volume Change Above -19 ft NAVD88 | 19.43 cy/ft | 8.79 cy/ft |
| Volume Change Above -30 ft NAVD88 | 22.25 cy/ft | -0.29 cy/ft |

LEGEND:

| | | | |
|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
1. Station From North To South At Varying Intervals.
 2. Post-Dorian Survey Extends Between Station 495+00 to 1025+00
 3. All Survey Elevations In Feet Referenced to NAVD88.



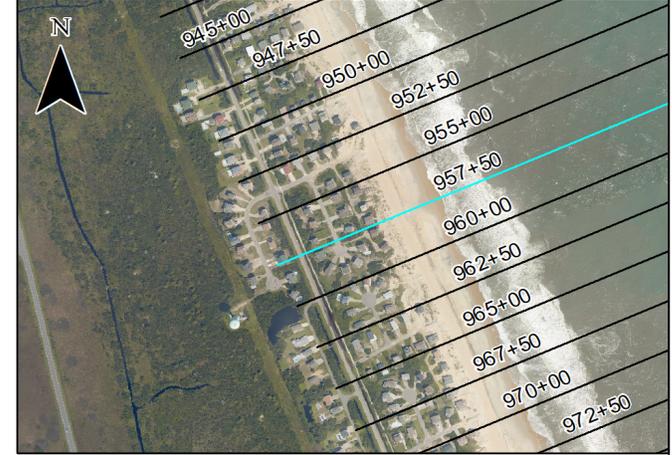


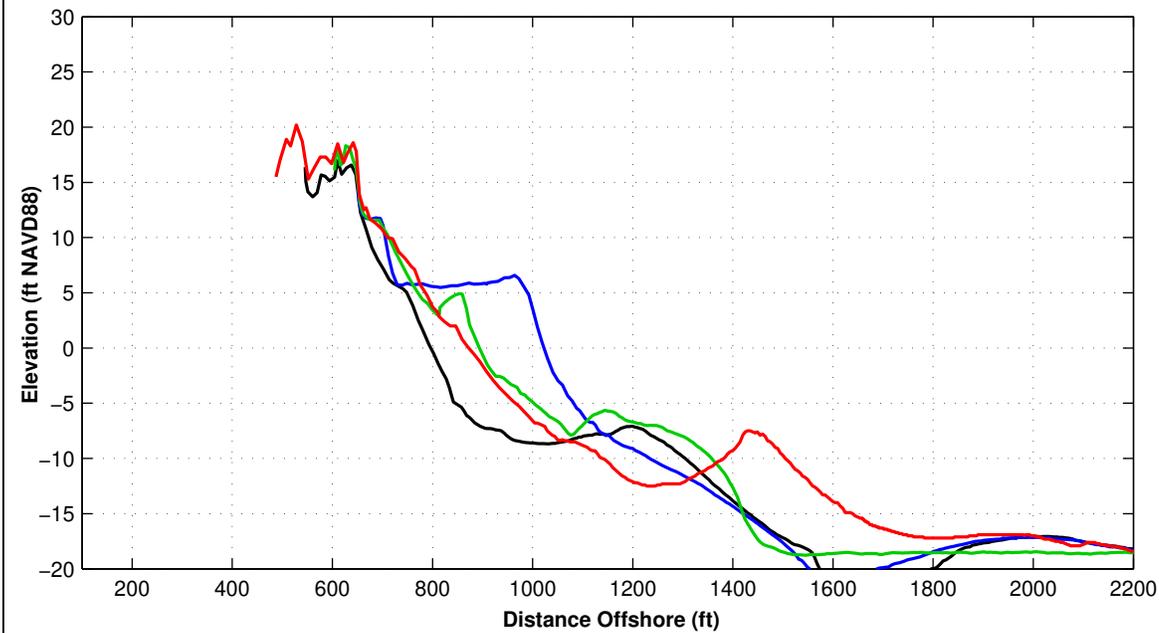
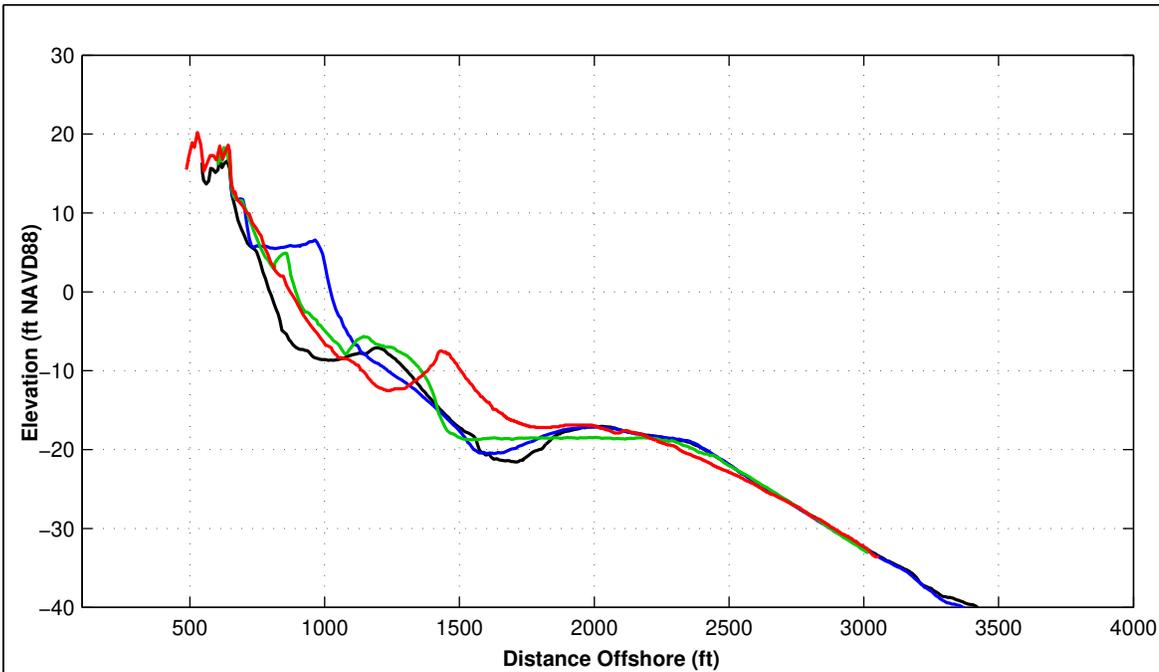
| | | |
|--|----------------------------|----------------------------|
| Survey Transect 957+50 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.





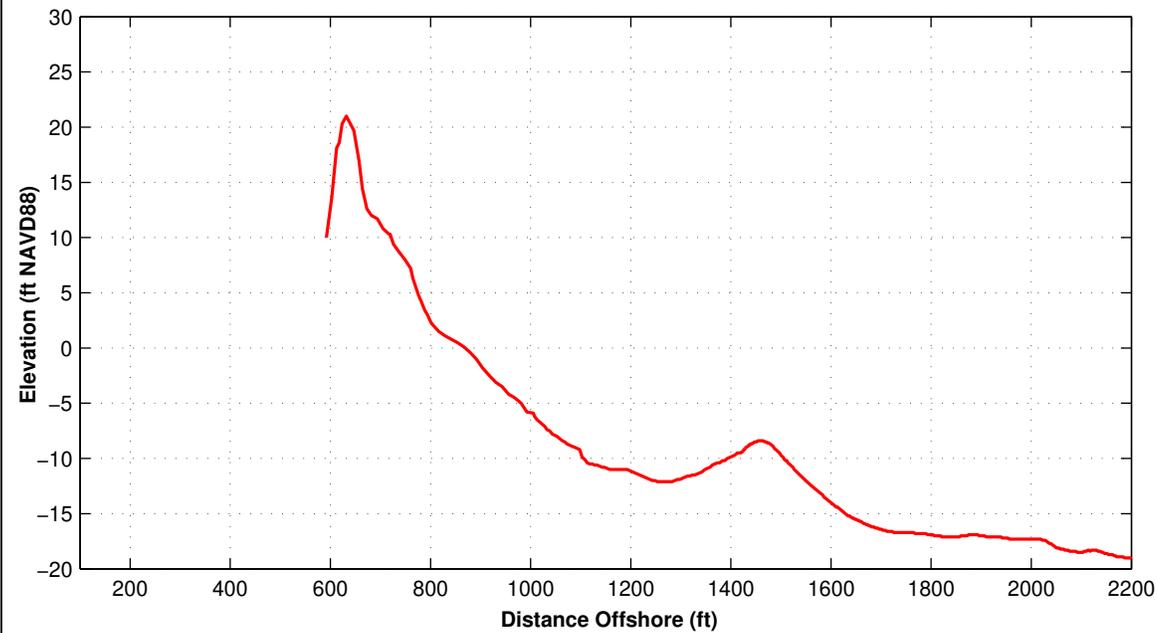
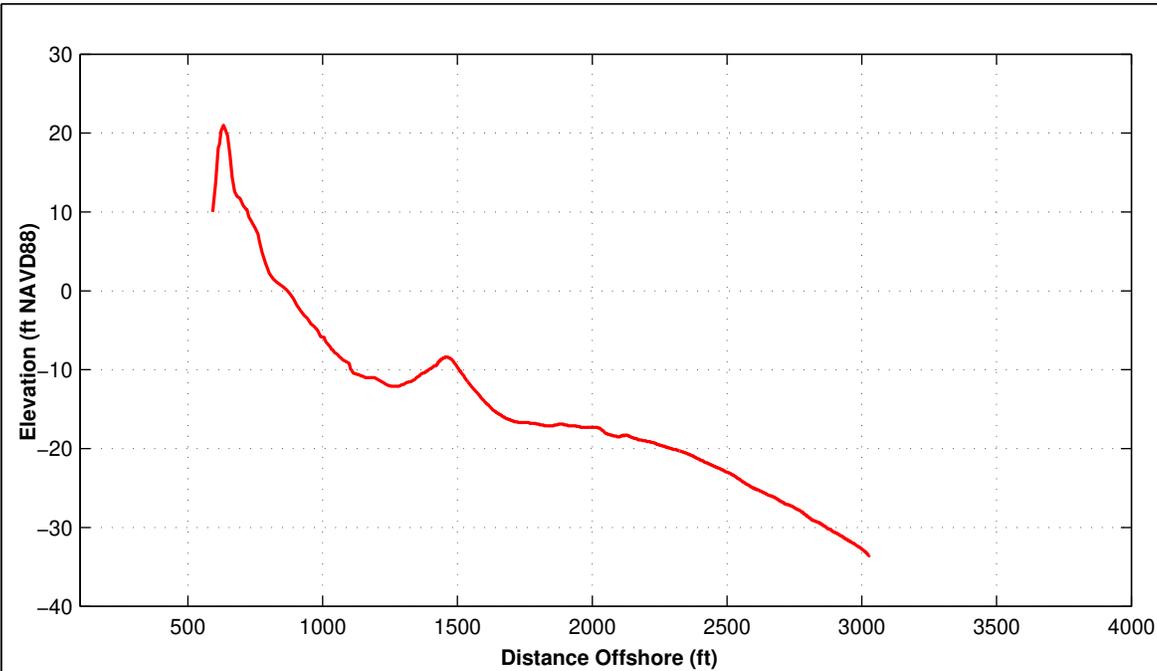
| Survey Transect 960+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -131.85 ft | -159.39 ft |
| Volume Change Above +6 ft NAVD88 | 4.49 cy/ft | 4.39 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -23.14 cy/ft | -27.61 cy/ft |
| Volume Change Above -6 ft NAVD88 | -51.53 cy/ft | -62.99 cy/ft |
| Volume Change Above -14 ft NAVD88 | -25.41 cy/ft | -50.99 cy/ft |
| Volume Change Above -19 ft NAVD88 | -40.71 cy/ft | -3.54 cy/ft |
| Volume Change Above -30 ft NAVD88 | -34.00 cy/ft | -8.20 cy/ft |

LEGEND:

| | | | |
|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
1. Station From North To South At Varying Intervals.
 2. Post-Dorian Survey Extends Between Station 495+00 to 1025+00
 3. All Survey Elevations In Feet Referenced to NAVD88.





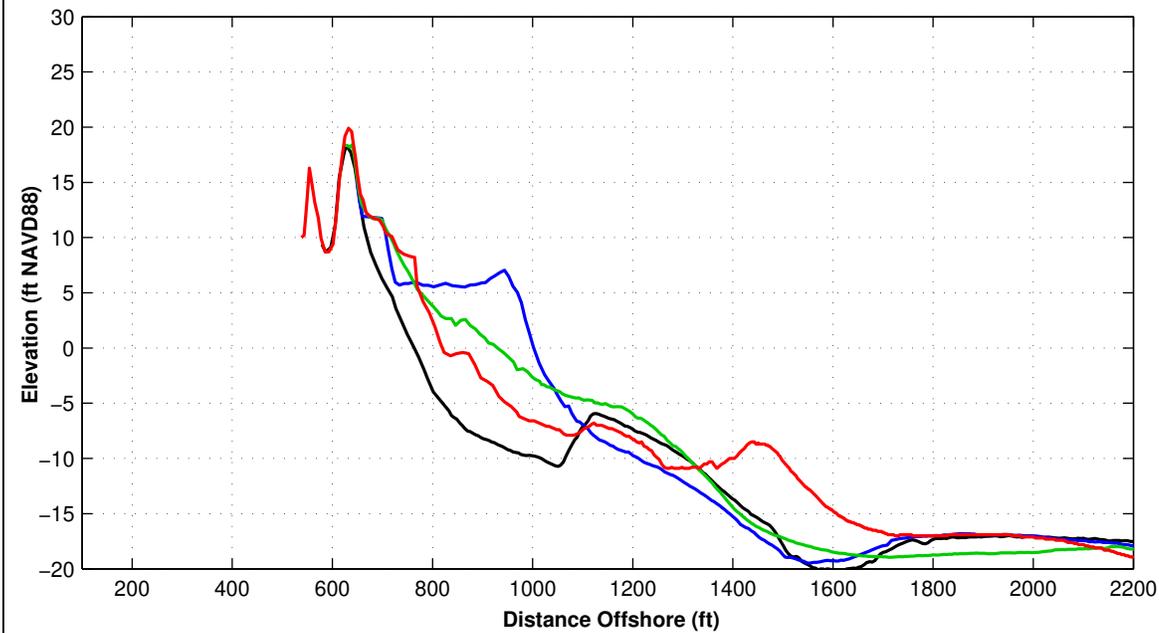
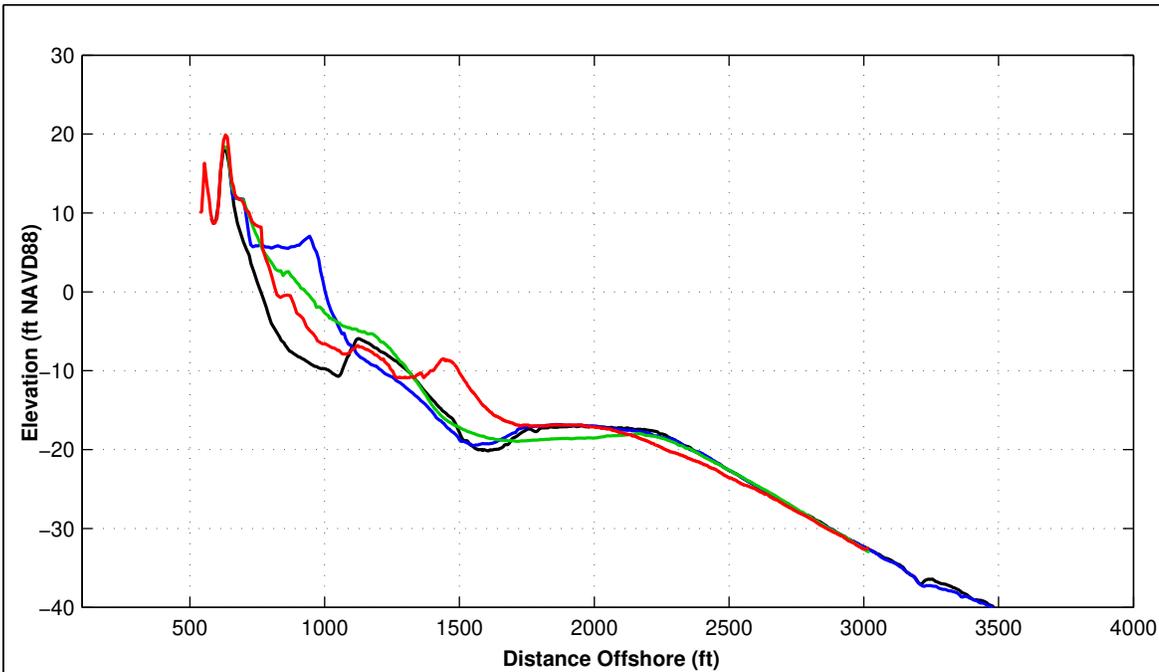
| | | |
|--|----------------------------|----------------------------|
| Survey Transect 962+50 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.



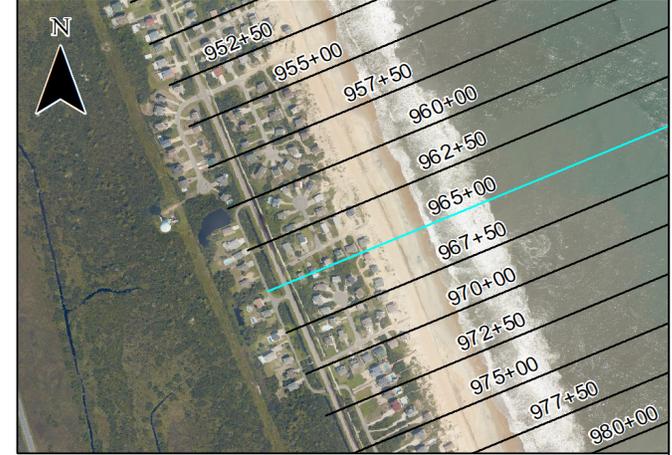


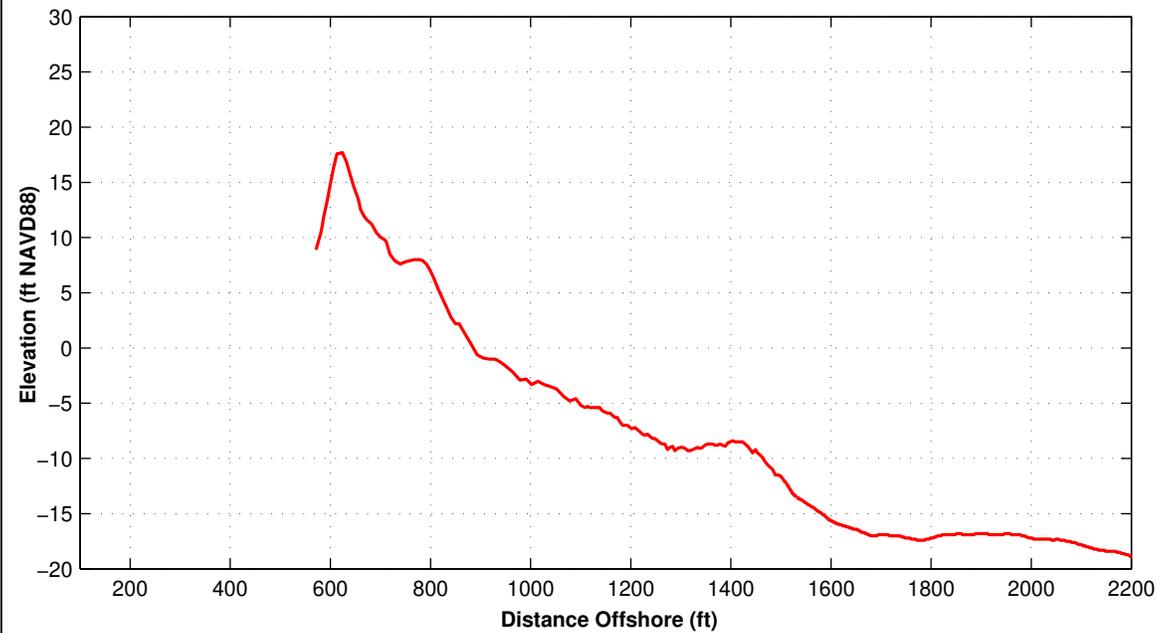
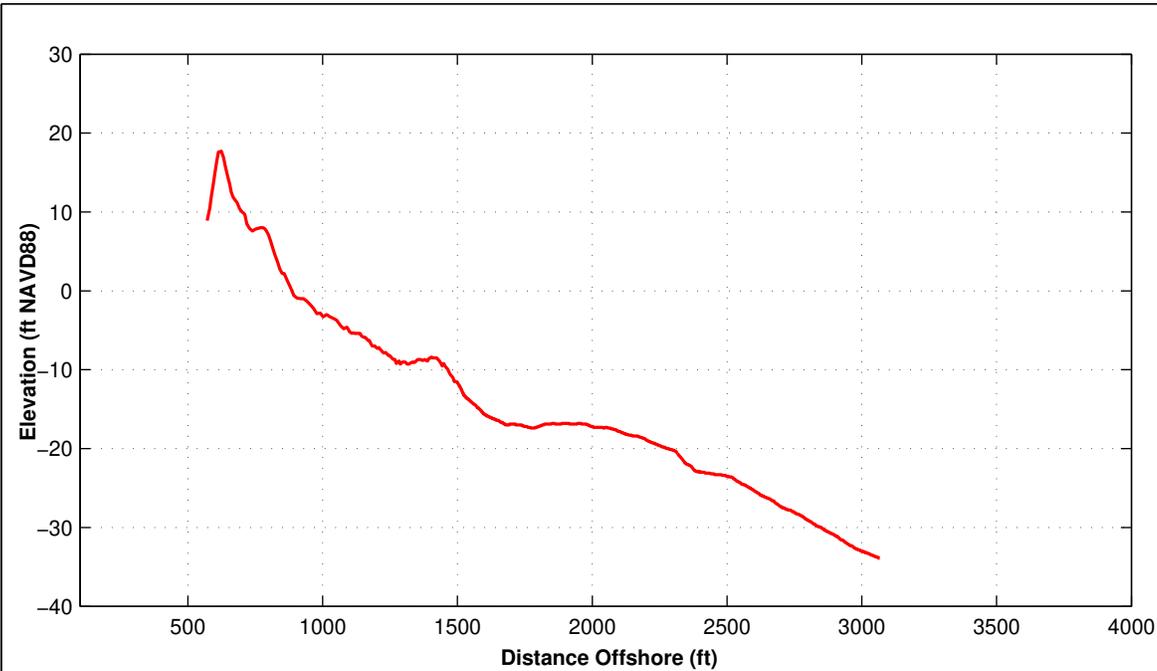
| Survey Transect 965+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -97.79 ft | -184.22 ft |
| Volume Change Above +6 ft NAVD88 | 3.62 cy/ft | 5.00 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -23.62 cy/ft | -27.17 cy/ft |
| Volume Change Above -6 ft NAVD88 | -27.72 cy/ft | -63.53 cy/ft |
| Volume Change Above -14 ft NAVD88 | -0.22 cy/ft | -26.84 cy/ft |
| Volume Change Above -19 ft NAVD88 | -17.20 cy/ft | 8.62 cy/ft |
| Volume Change Above -30 ft NAVD88 | -16.00 cy/ft | -6.83 cy/ft |

LEGEND:

| | | | |
|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
1. Station From North To South At Varying Intervals.
 2. Post-Dorian Survey Extends Between Station 495+00 to 1025+00
 3. All Survey Elevations In Feet Referenced to NAVD88.





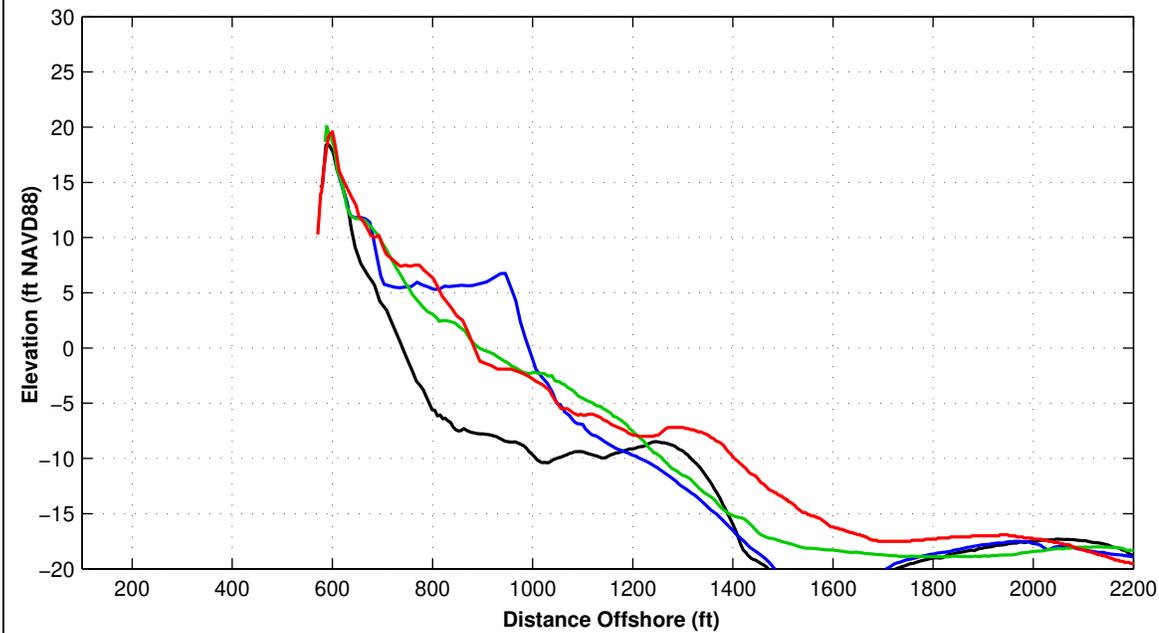
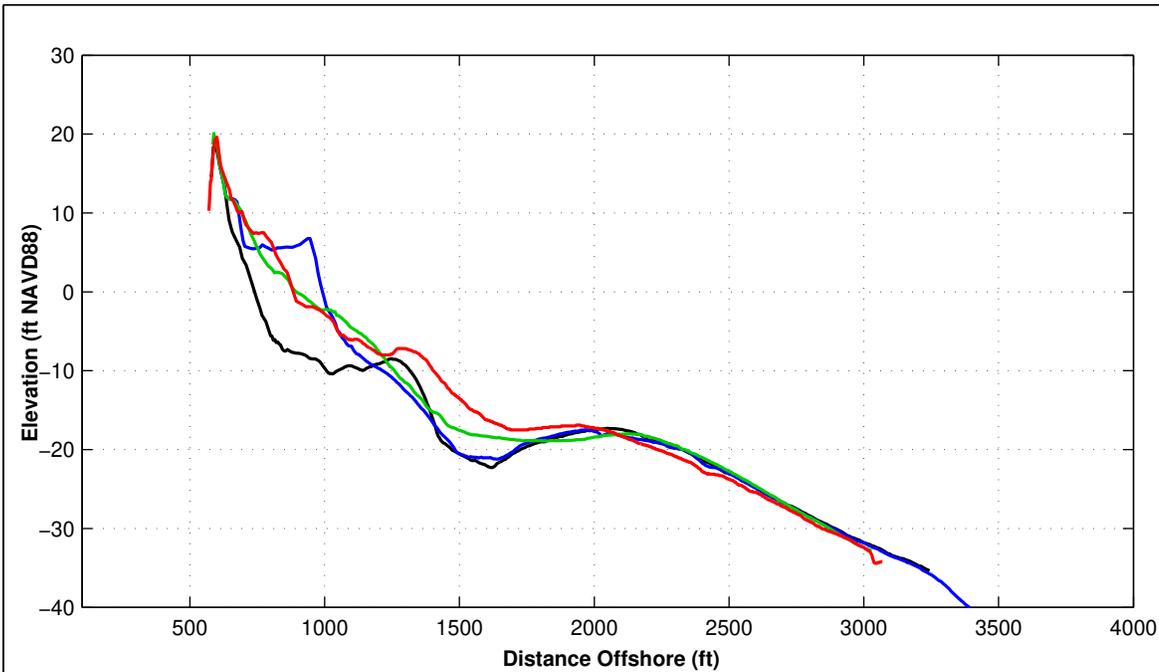
| | | |
|--|----------------------------|----------------------------|
| Survey Transect 967+50 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.





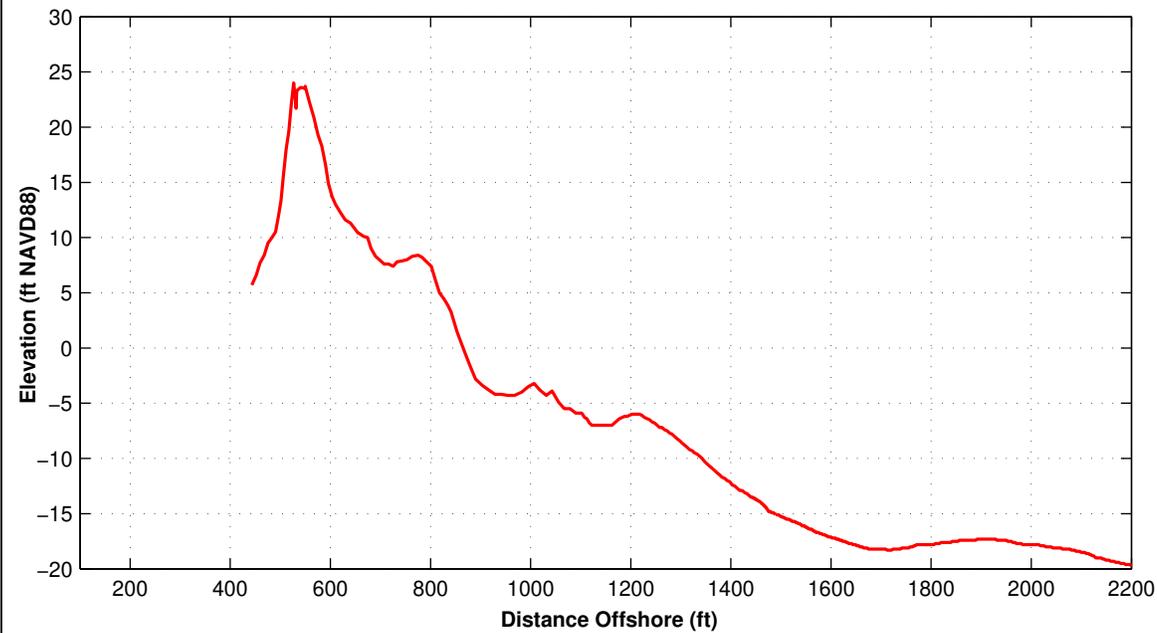
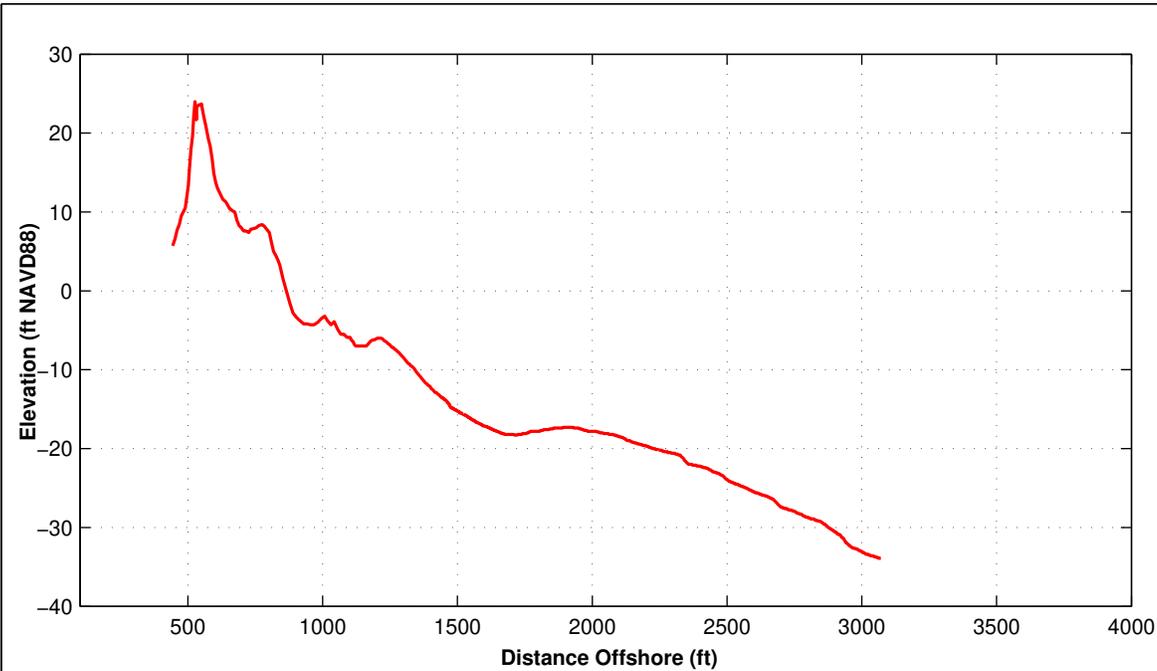
| Survey Transect 970+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -113.71 ft | -110.19 ft |
| Volume Change Above +6 ft NAVD88 | 6.74 cy/ft | 7.45 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -21.24 cy/ft | -12.81 cy/ft |
| Volume Change Above -6 ft NAVD88 | -24.15 cy/ft | -26.17 cy/ft |
| Volume Change Above -14 ft NAVD88 | -8.00 cy/ft | 22.33 cy/ft |
| Volume Change Above -19 ft NAVD88 | 1.93 cy/ft | 75.83 cy/ft |
| Volume Change Above -30 ft NAVD88 | 23.71 cy/ft | 73.86 cy/ft |

LEGEND:

| | | | |
|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
1. Station From North To South At Varying Intervals.
 2. Post-Dorian Survey Extends Between Station 495+00 to 1025+00
 3. All Survey Elevations In Feet Referenced to NAVD88.



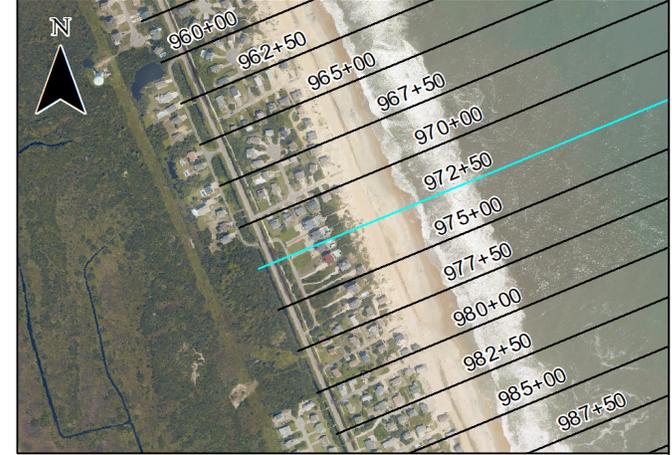


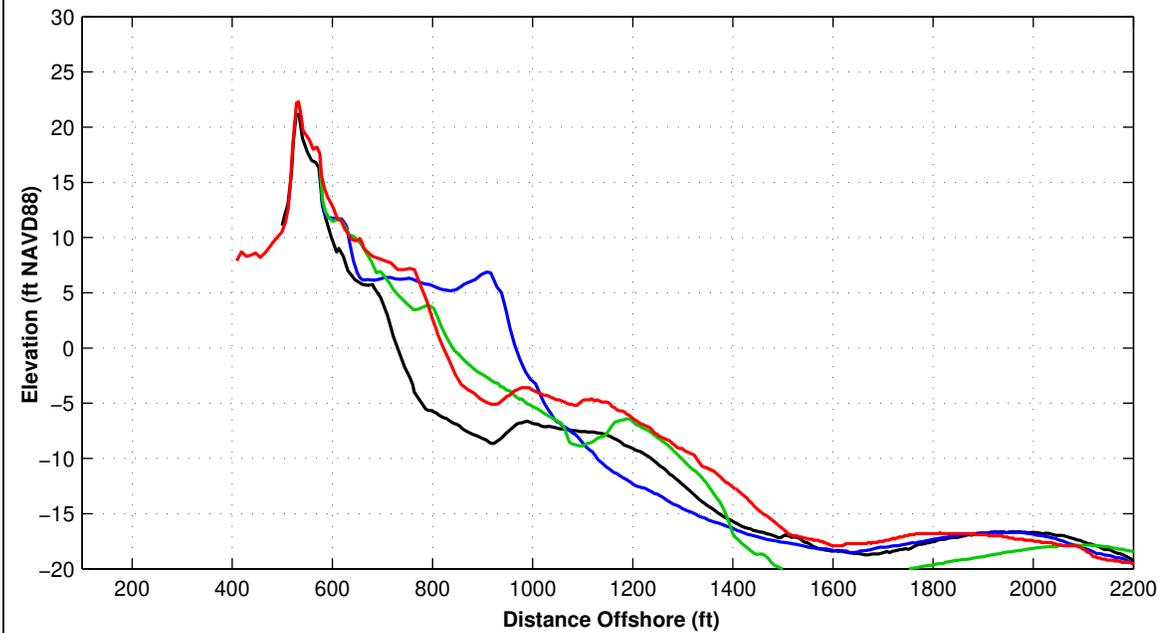
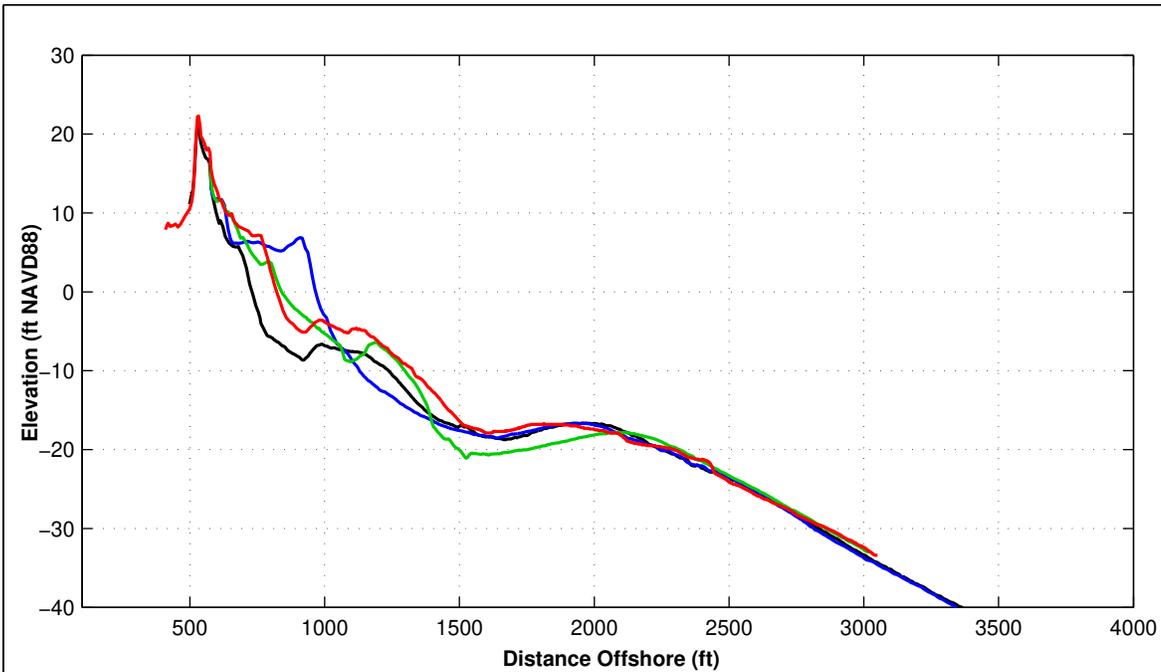
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|--|----------------------------|----------------------------|
| Survey Transect 972+50 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
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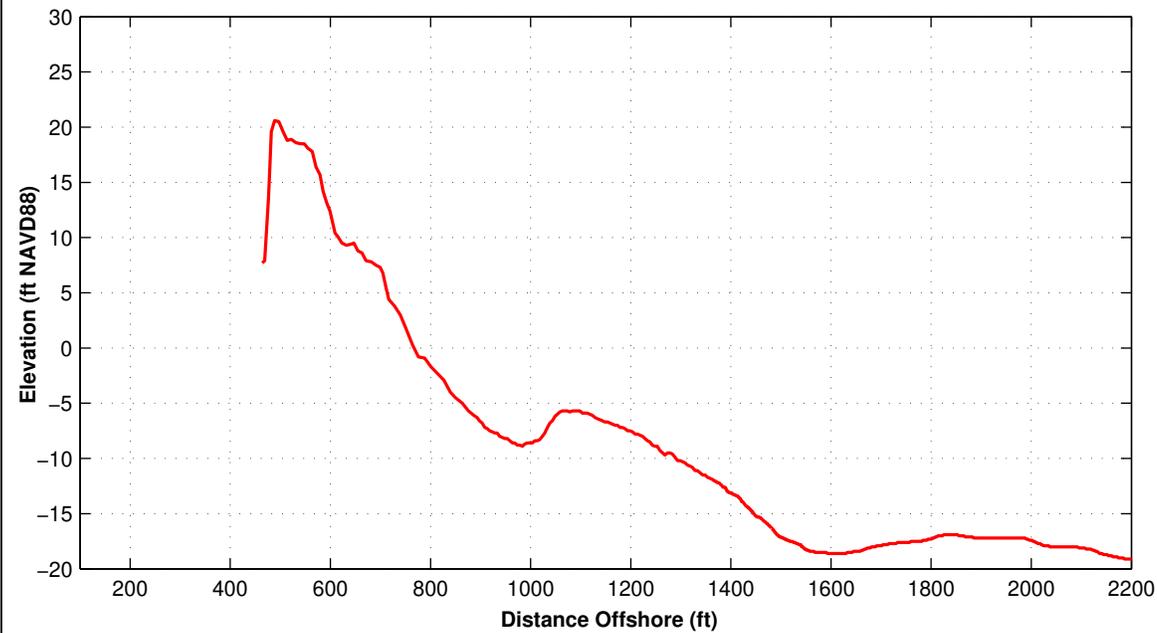
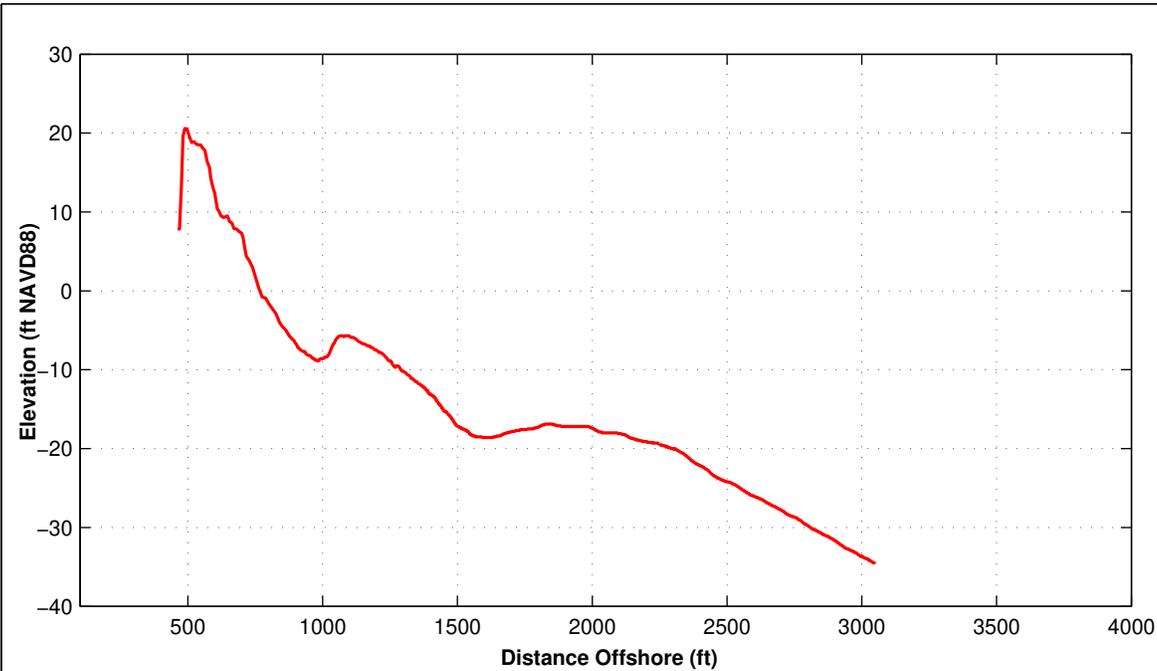
| Survey Transect 975+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -132.78 ft | -147.44 ft |
| Volume Change Above +6 ft NAVD88 | 3.30 cy/ft | 9.05 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -25.41 cy/ft | -16.29 cy/ft |
| Volume Change Above -6 ft NAVD88 | -47.79 cy/ft | -39.17 cy/ft |
| Volume Change Above -14 ft NAVD88 | -12.49 cy/ft | 14.11 cy/ft |
| Volume Change Above -19 ft NAVD88 | -36.91 cy/ft | 33.02 cy/ft |
| Volume Change Above -30 ft NAVD88 | -39.70 cy/ft | 36.94 cy/ft |

LEGEND:

| | | | |
|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
1. Station From North To South At Varying Intervals.
 2. Post-Dorian Survey Extends Between Station 495+00 to 1025+00
 3. All Survey Elevations In Feet Referenced to NAVD88.





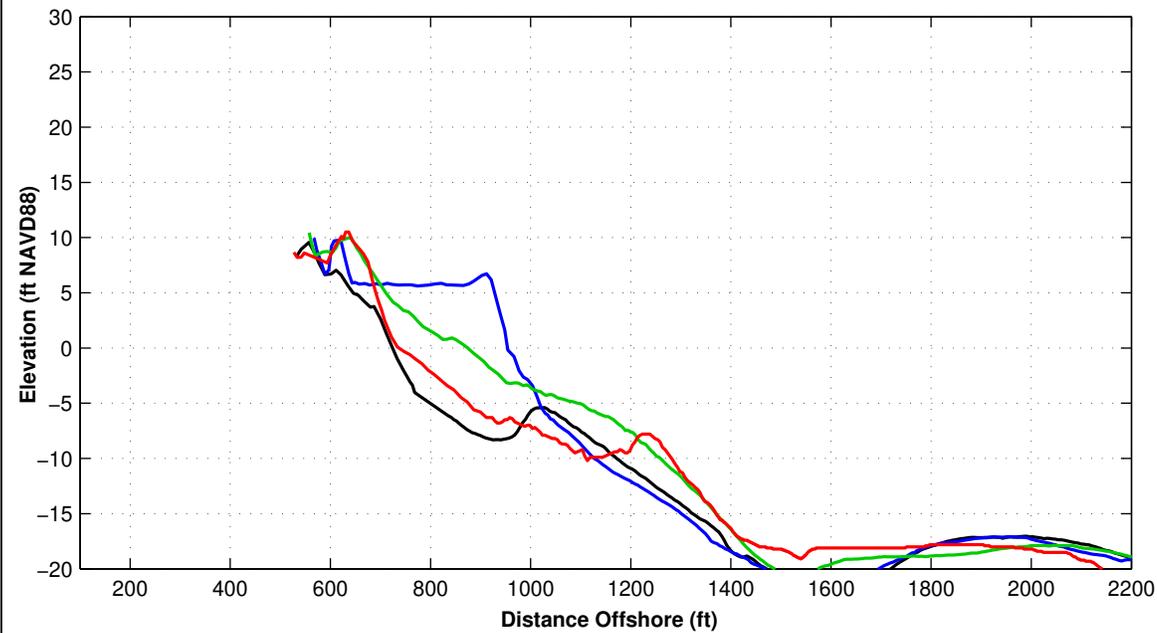
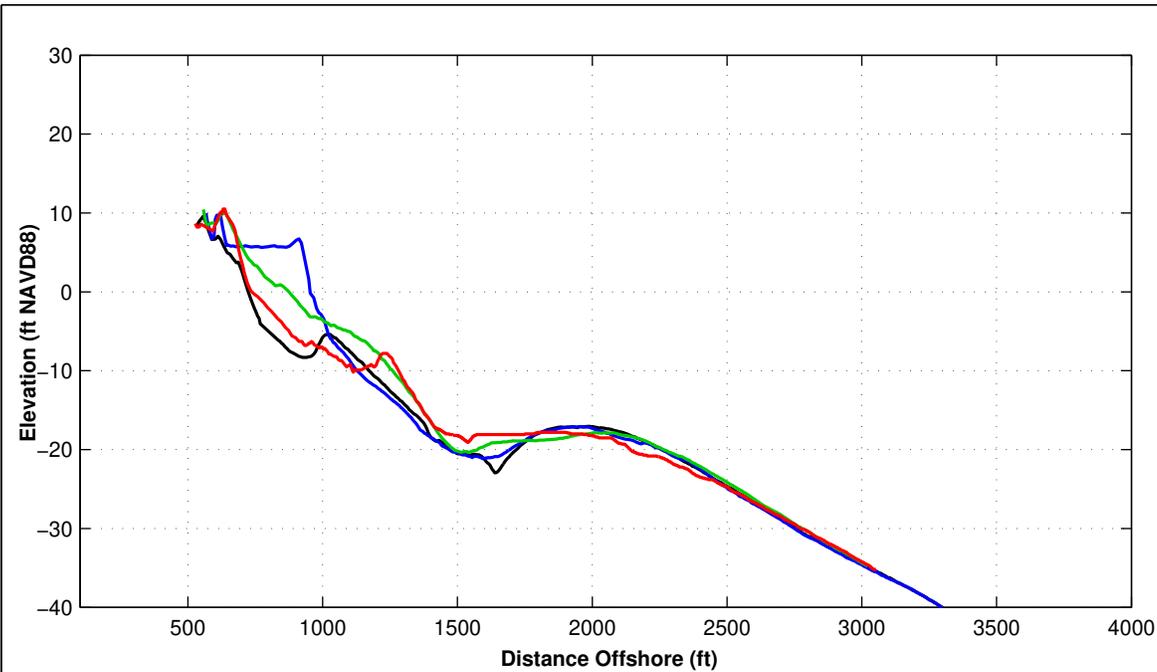
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|--|----------------------------|----------------------------|
| Survey Transect 977+50 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 ———

- Notes:
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 2. Station From North To South At Varying Intervals.
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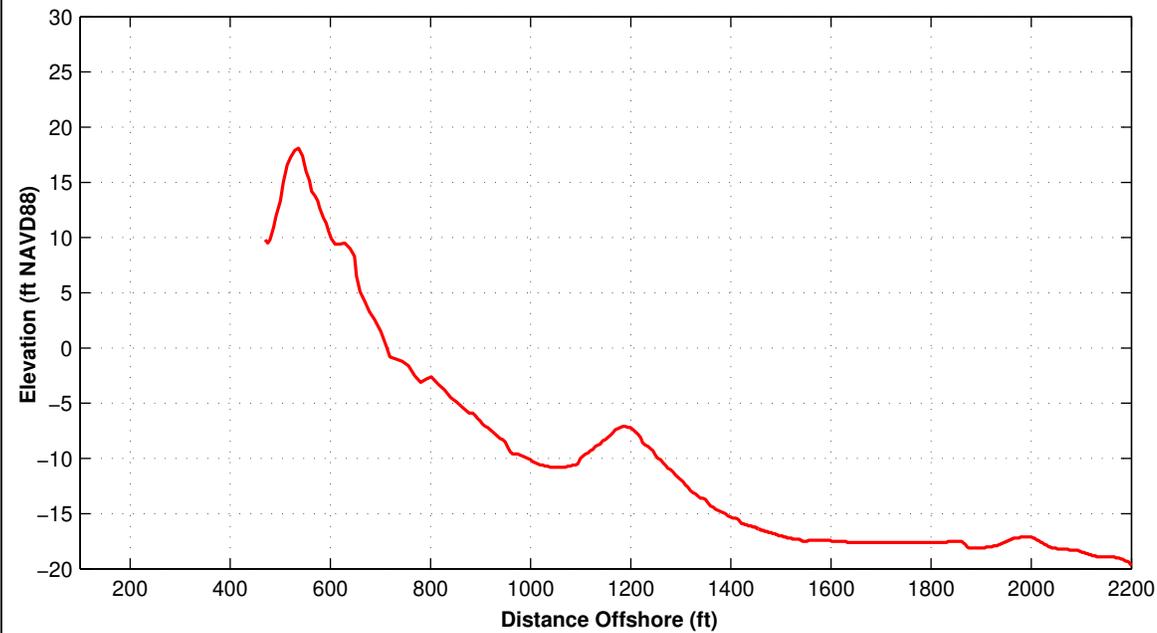
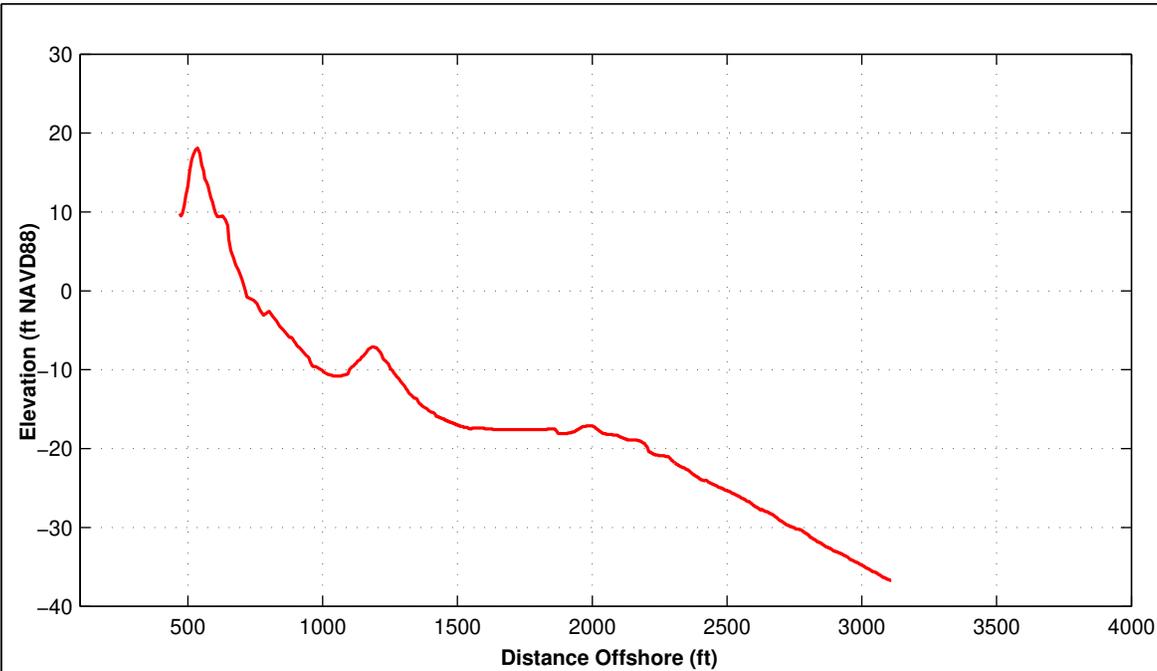
| Survey Transect 980+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -136.88 ft | -229.56 ft |
| Volume Change Above +6 ft NAVD88 | 6.15 cy/ft | 4.51 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -25.63 cy/ft | -35.28 cy/ft |
| Volume Change Above -6 ft NAVD88 | -32.35 cy/ft | -83.02 cy/ft |
| Volume Change Above -14 ft NAVD88 | 2.47 cy/ft | -67.52 cy/ft |
| Volume Change Above -19 ft NAVD88 | 5.75 cy/ft | -53.86 cy/ft |
| Volume Change Above -30 ft NAVD88 | 26.06 cy/ft | -48.30 cy/ft |

LEGEND:

| | | | |
|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
1. Station From North To South At Varying Intervals.
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 3. All Survey Elevations In Feet Referenced to NAVD88.





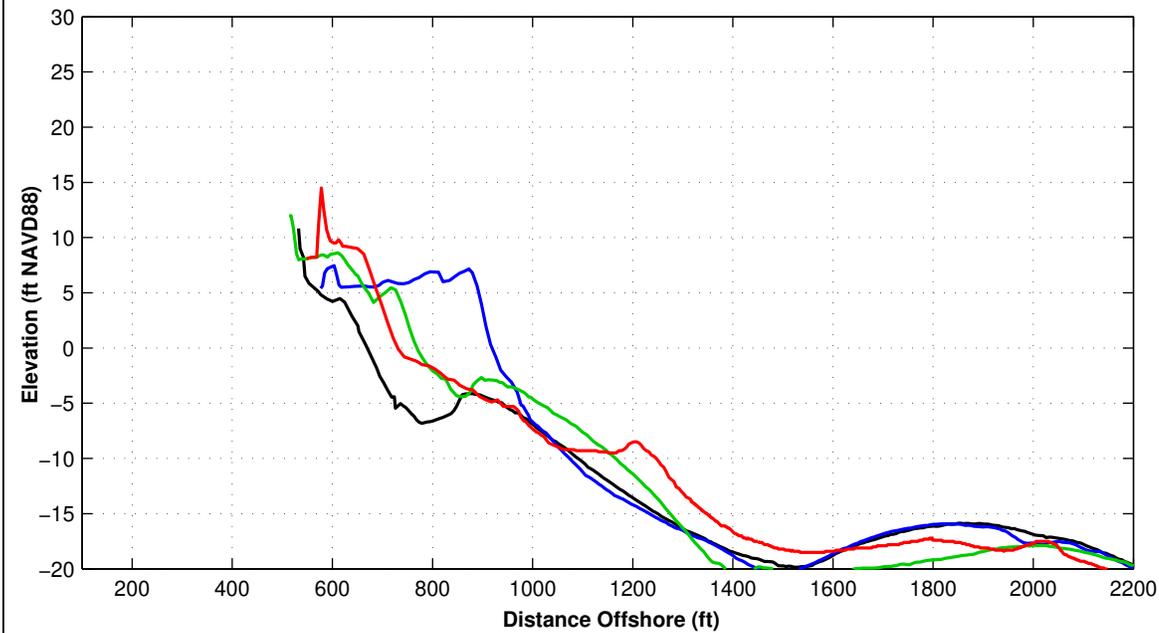
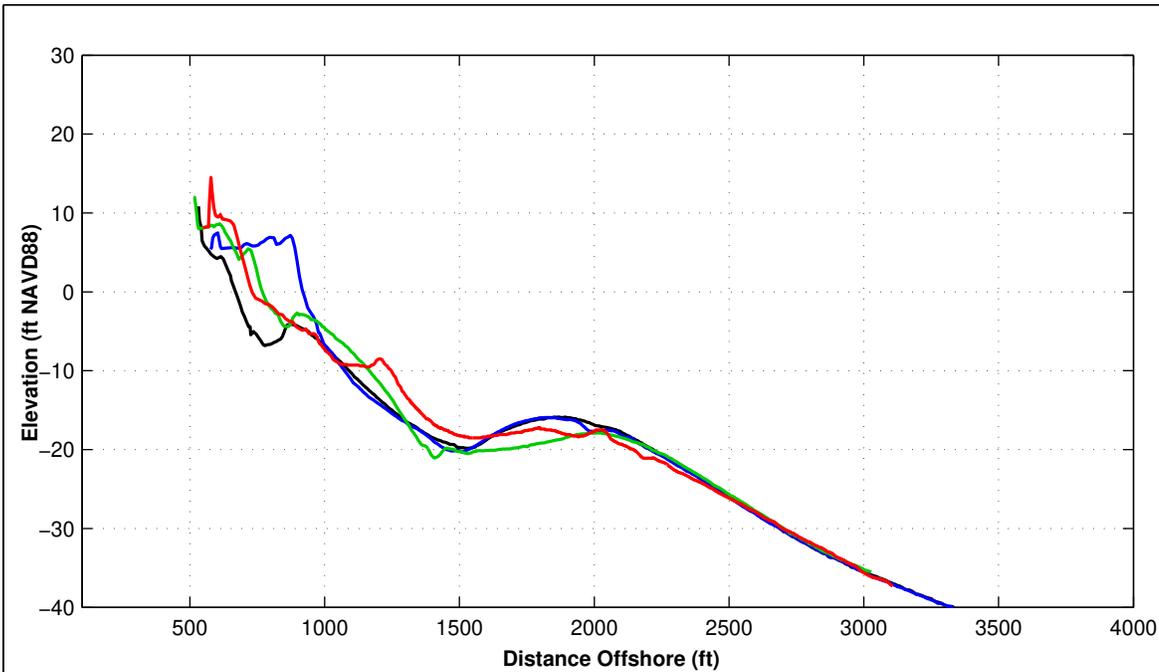
| | | |
|--|----------------------------|----------------------------|
| Survey Transect 982+50 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.





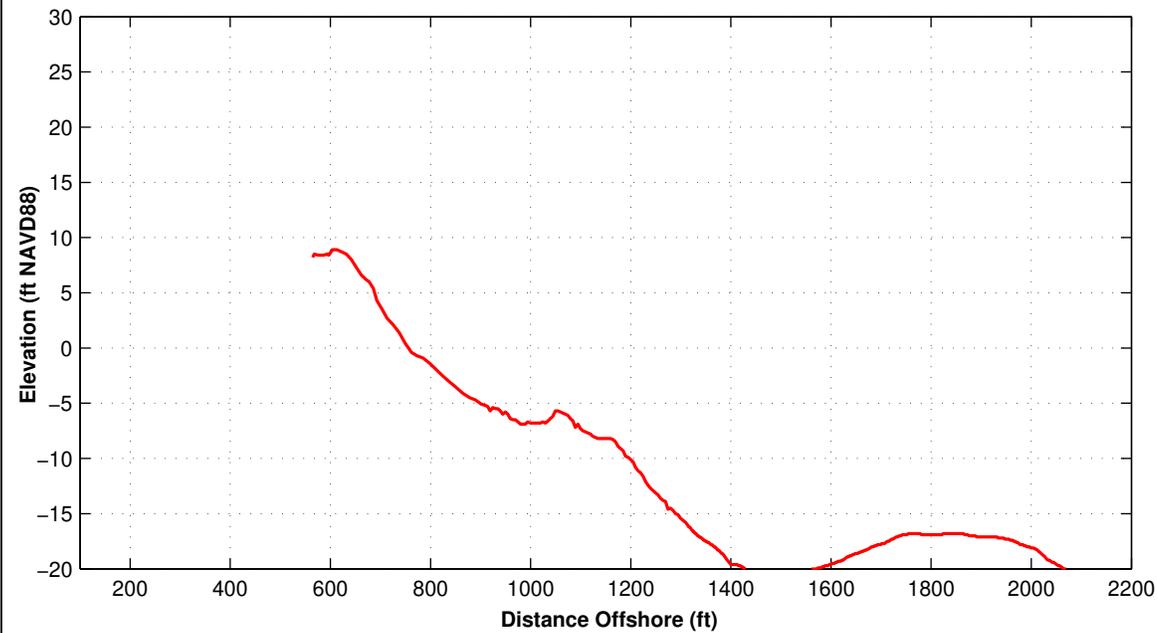
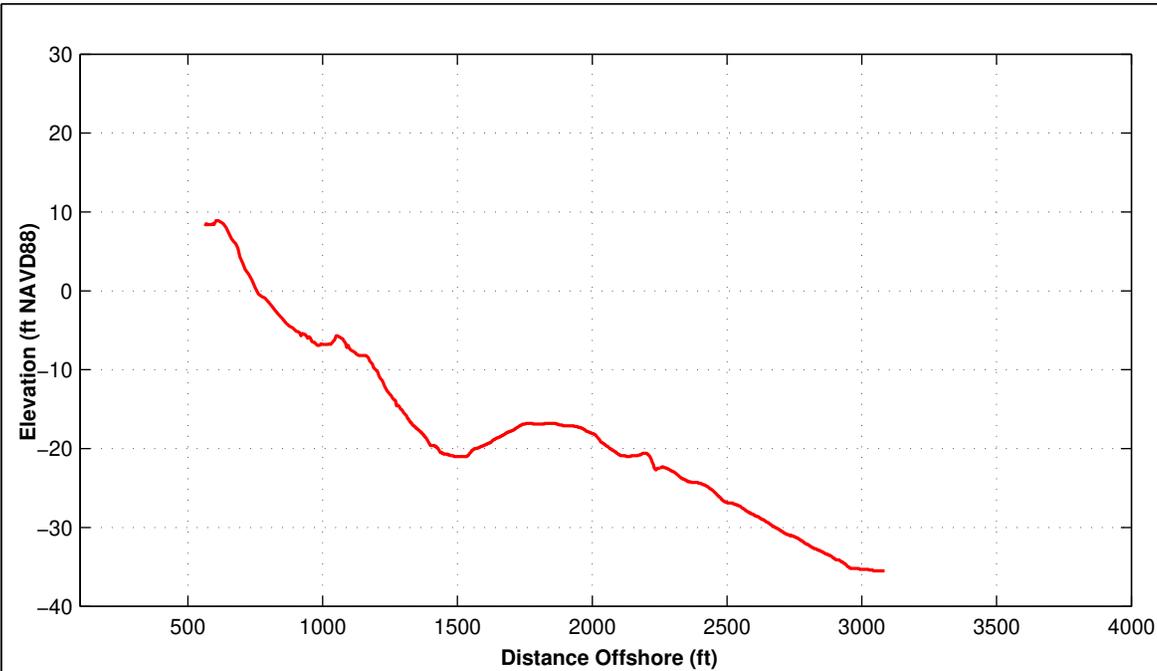
| Survey Transect 985+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -152.49 ft | -191.70 ft |
| Volume Change Above +6 ft NAVD88 | 3.74 cy/ft | 7.41 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -25.58 cy/ft | -26.43 cy/ft |
| Volume Change Above -6 ft NAVD88 | -47.39 cy/ft | -58.68 cy/ft |
| Volume Change Above -14 ft NAVD88 | -22.74 cy/ft | -31.93 cy/ft |
| Volume Change Above -19 ft NAVD88 | -53.36 cy/ft | -30.16 cy/ft |
| Volume Change Above -30 ft NAVD88 | -57.97 cy/ft | -33.58 cy/ft |

LEGEND:

| | | | |
|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
1. Station From North To South At Varying Intervals.
 2. Post-Dorian Survey Extends Between Station 495+00 to 1025+00
 3. All Survey Elevations In Feet Referenced to NAVD88.





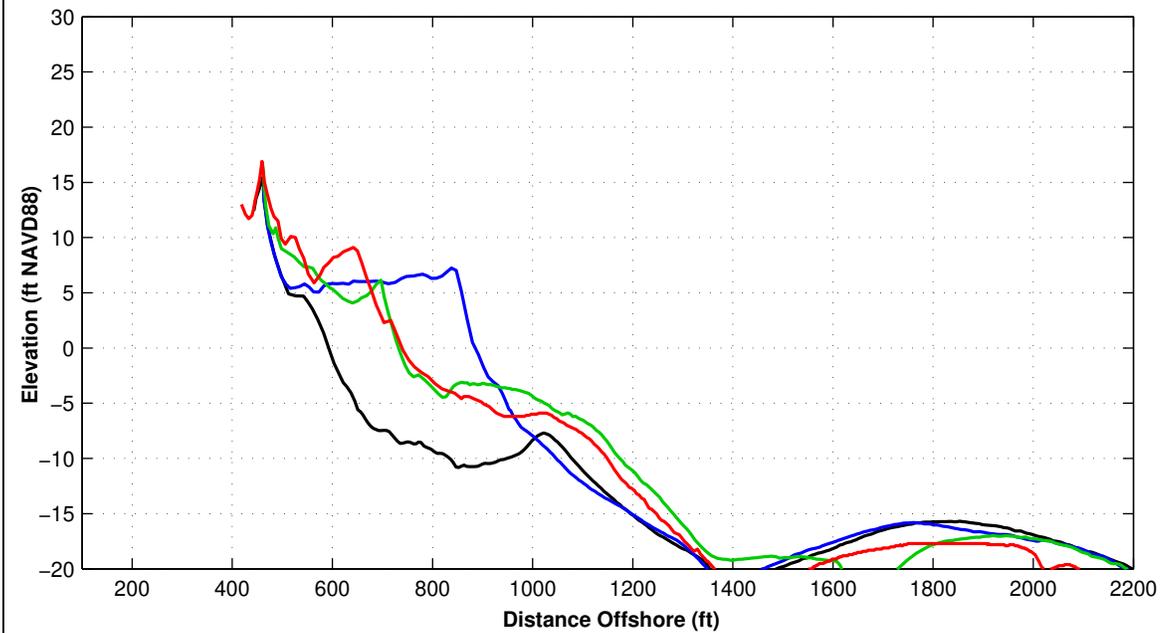
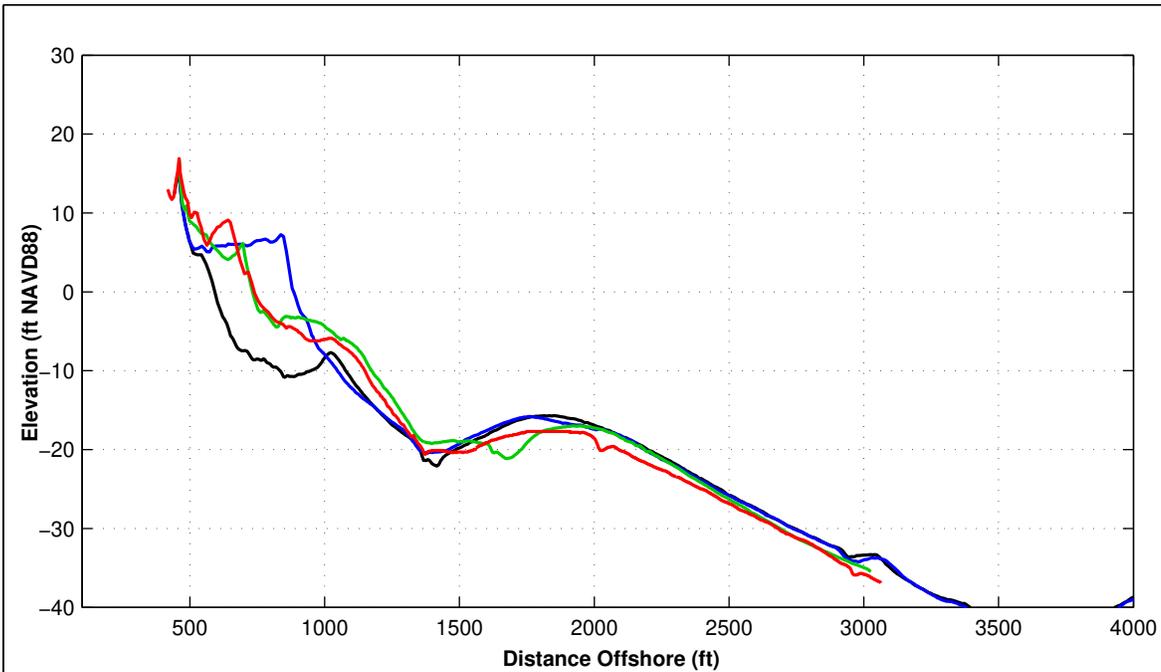
| | | |
|--|----------------------------|----------------------------|
| Survey Transect 987+50 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
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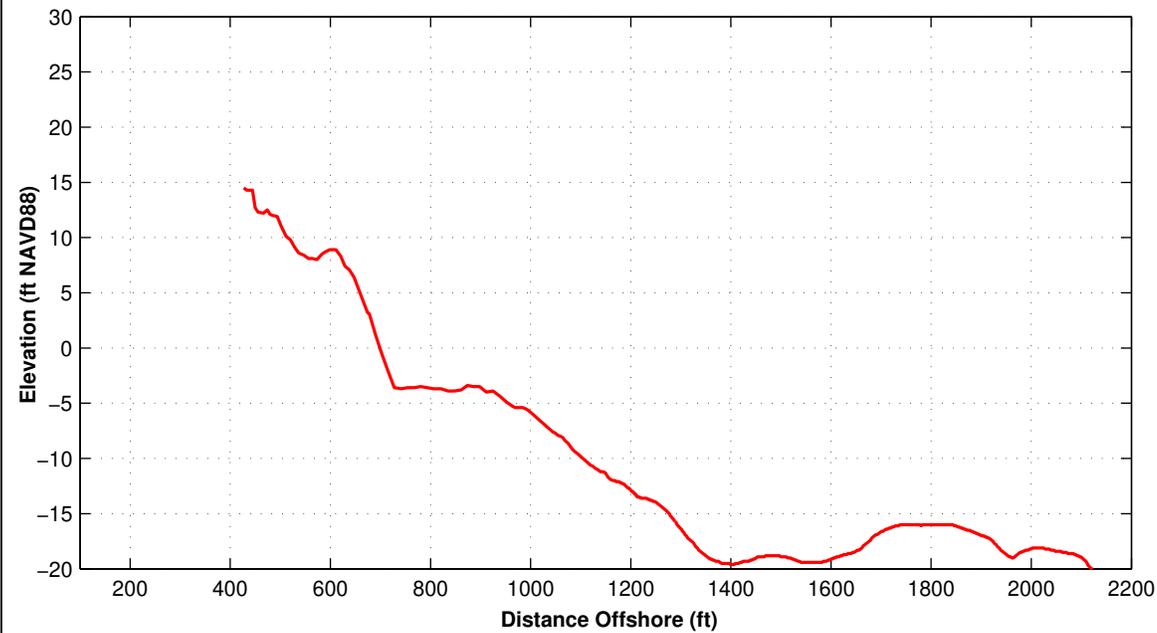
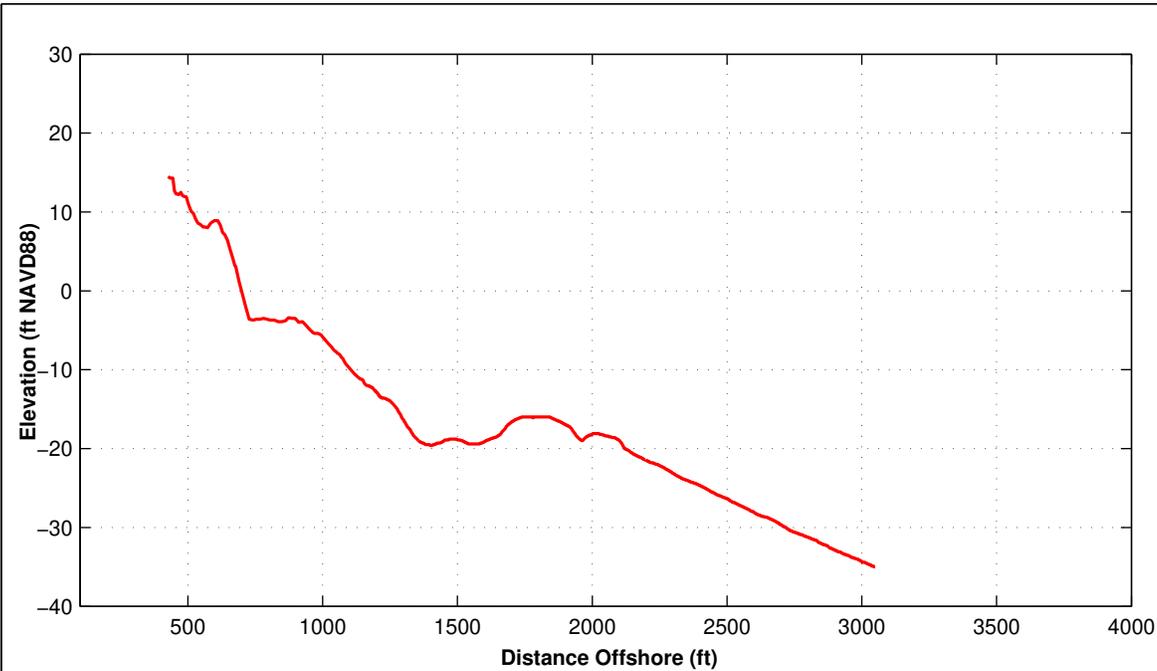
| Survey Transect 990+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -152.35 ft | -147.47 ft |
| Volume Change Above +6 ft NAVD88 | 2.84 cy/ft | 11.91 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -27.29 cy/ft | -16.26 cy/ft |
| Volume Change Above -6 ft NAVD88 | -47.34 cy/ft | -46.04 cy/ft |
| Volume Change Above -14 ft NAVD88 | -9.56 cy/ft | -18.97 cy/ft |
| Volume Change Above -19 ft NAVD88 | -23.45 cy/ft | -42.64 cy/ft |
| Volume Change Above -30 ft NAVD88 | -32.85 cy/ft | -76.08 cy/ft |

LEGEND:

| | | | |
|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
1. Station From North To South At Varying Intervals.
 2. Post-Dorian Survey Extends Between Station 495+00 to 1025+00
 3. All Survey Elevations In Feet Referenced to NAVD88.





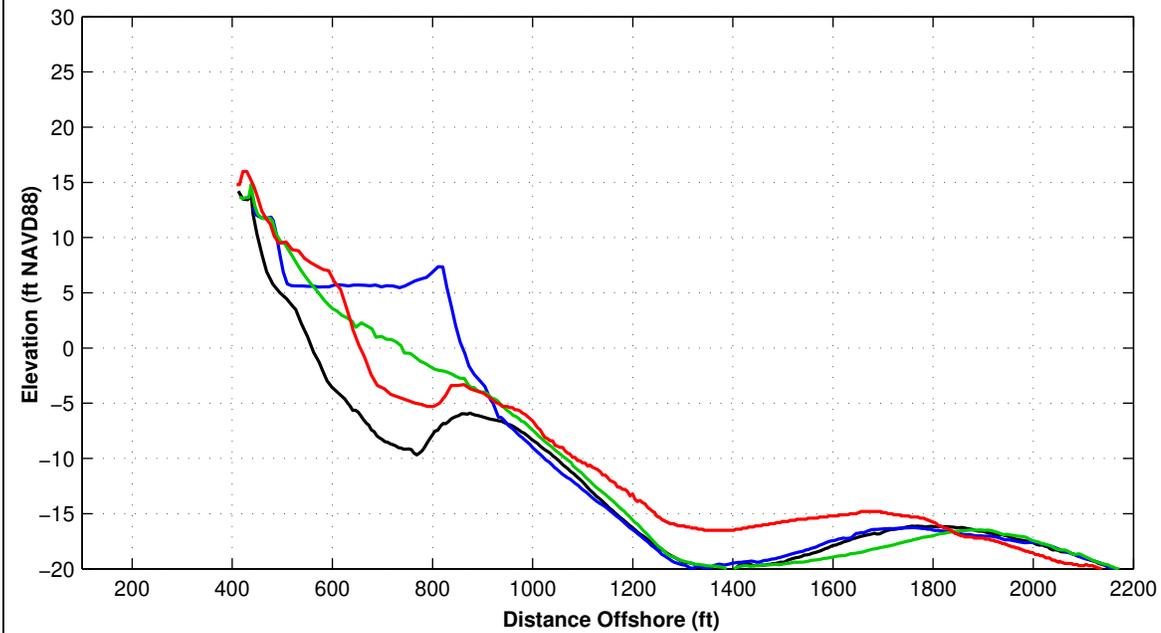
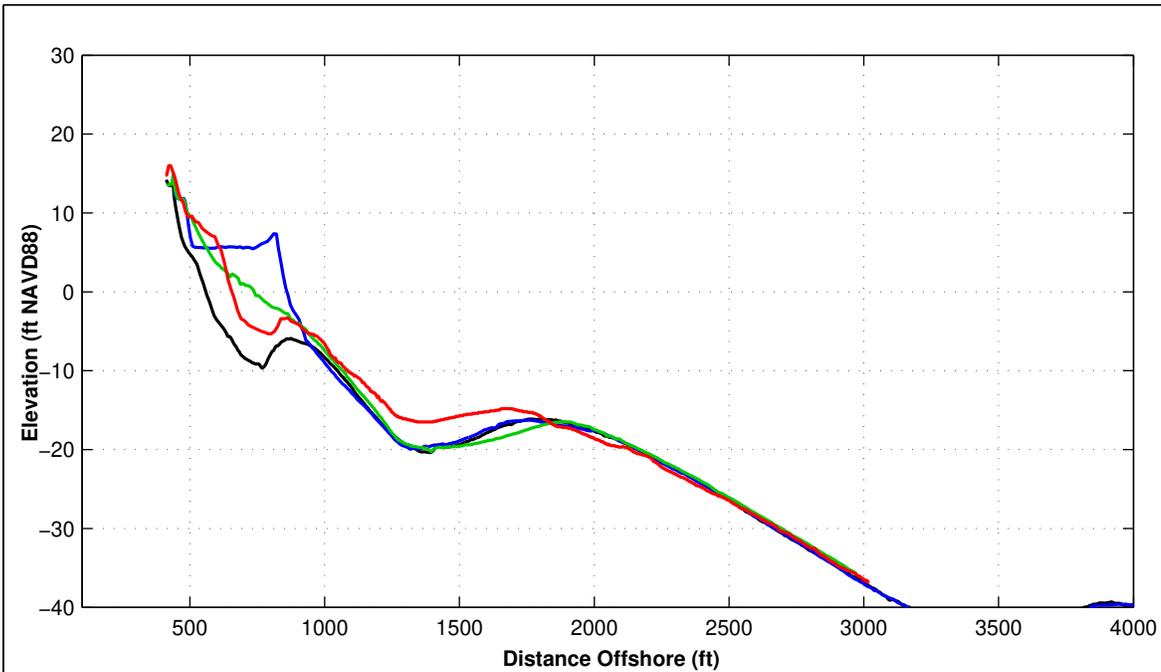
| Survey Transect 992+50 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
|--|----------------------------|----------------------------|
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.





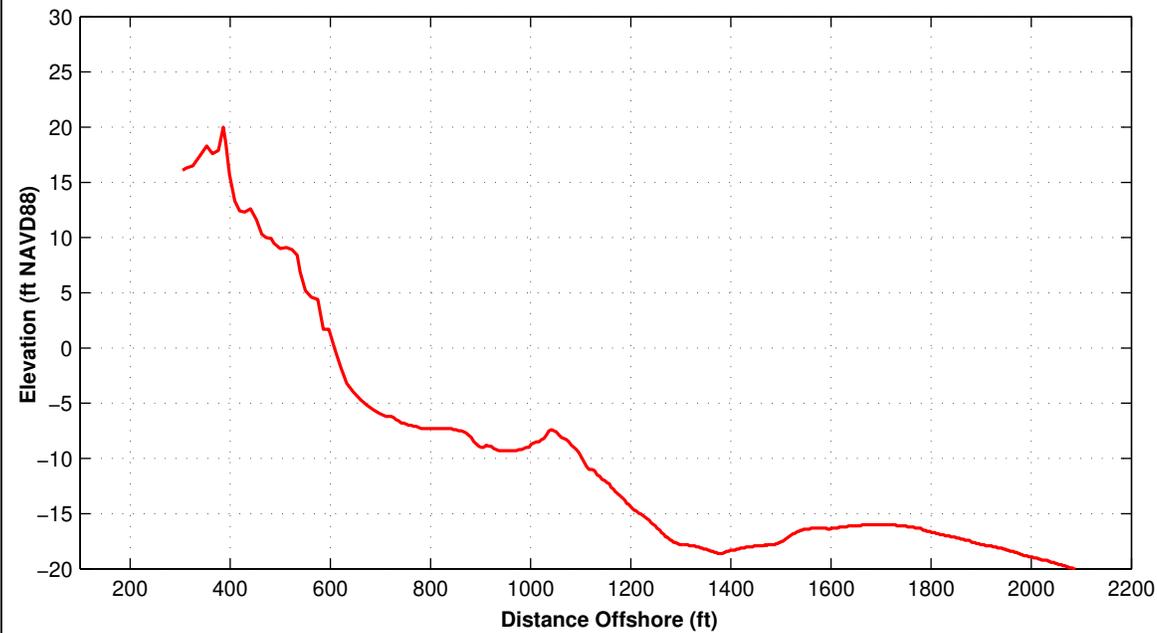
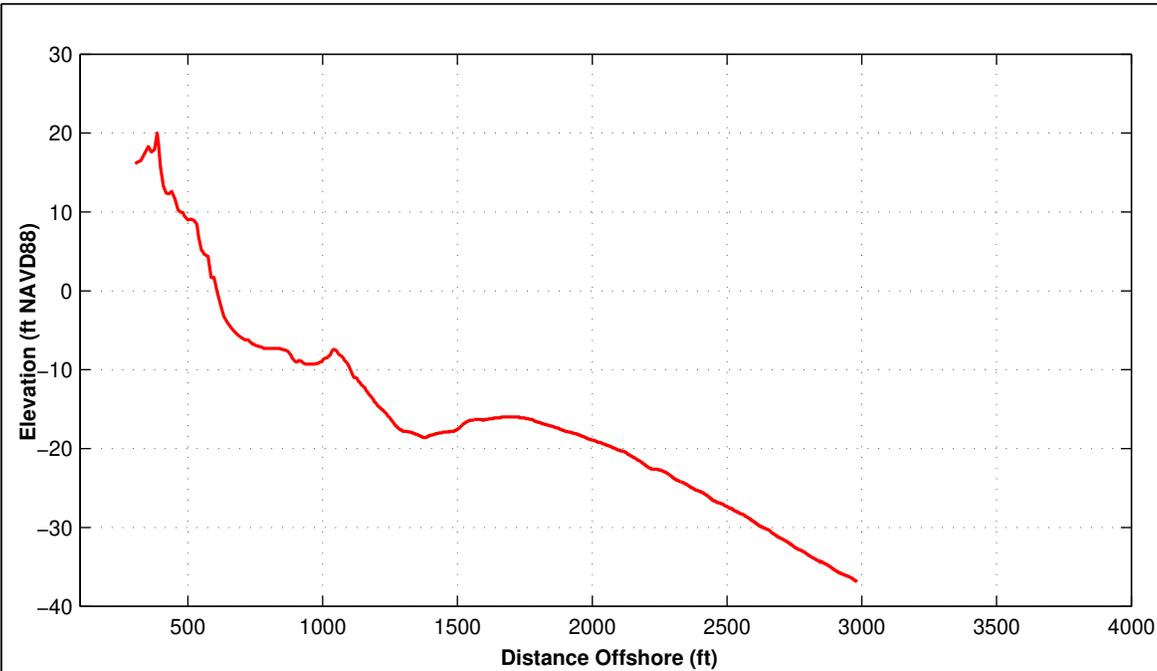
| Survey Transect 995+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -166.30 ft | -206.25 ft |
| Volume Change Above +6 ft NAVD88 | 2.33 cy/ft | 6.08 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -35.04 cy/ft | -28.16 cy/ft |
| Volume Change Above -6 ft NAVD88 | -49.69 cy/ft | -68.83 cy/ft |
| Volume Change Above -14 ft NAVD88 | -38.71 cy/ft | -49.20 cy/ft |
| Volume Change Above -19 ft NAVD88 | -46.07 cy/ft | 2.20 cy/ft |
| Volume Change Above -30 ft NAVD88 | -41.58 cy/ft | -0.19 cy/ft |

LEGEND:

| | | | |
|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
1. Station From North To South At Varying Intervals.
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 3. All Survey Elevations In Feet Referenced to NAVD88.





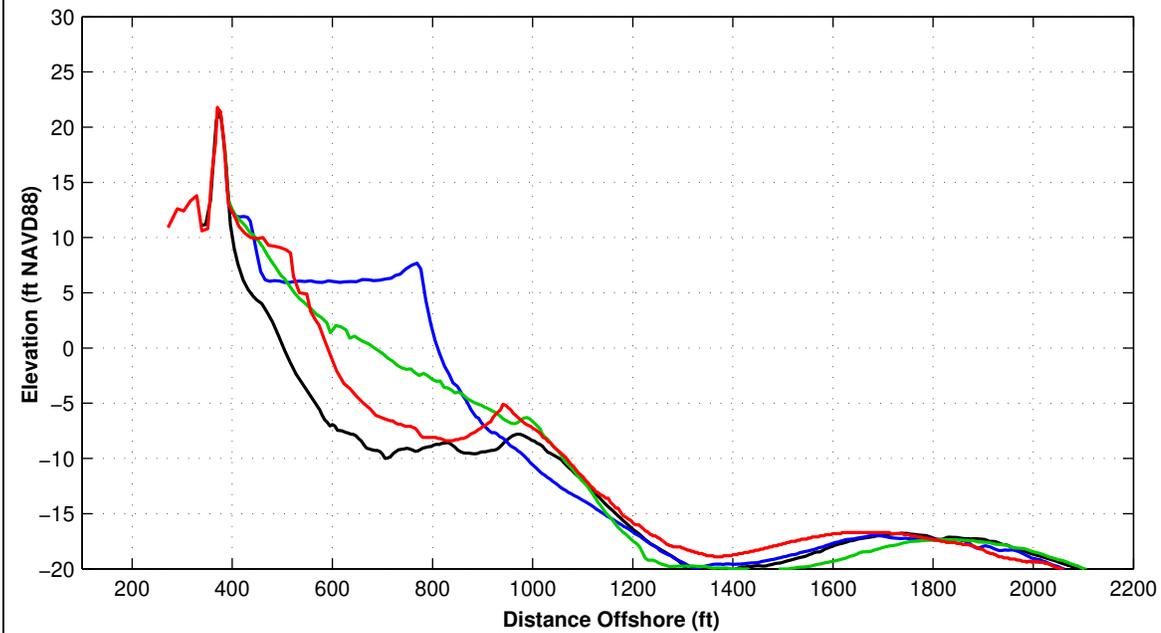
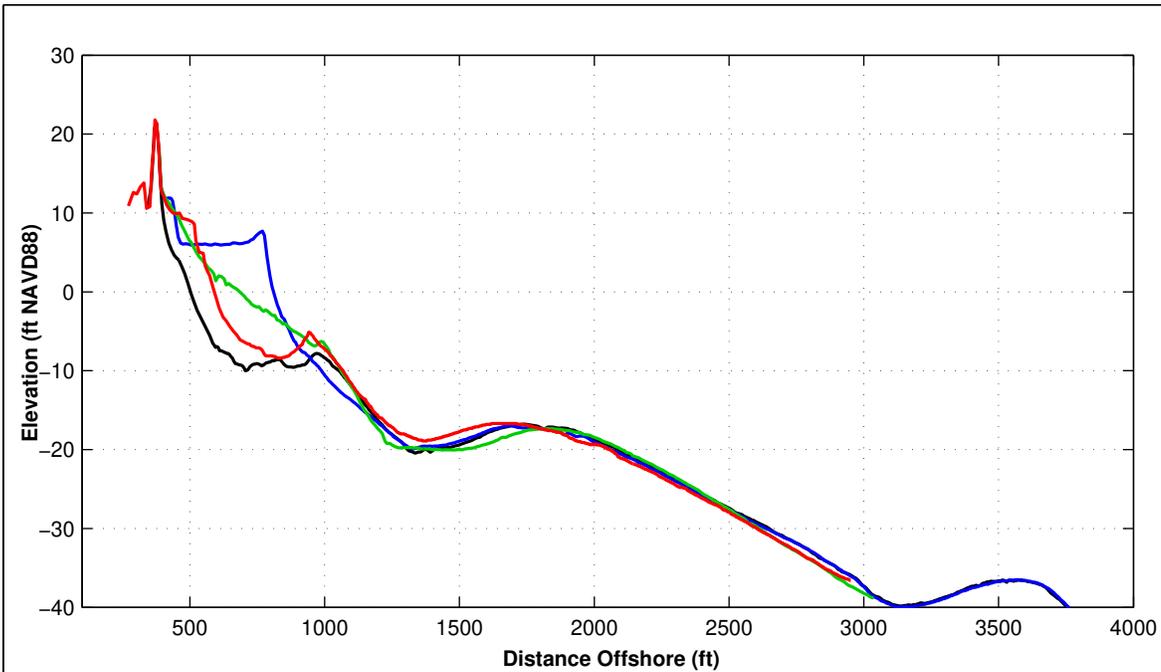
| | | |
|--|----------------------------|----------------------------|
| Survey Transect 997+50 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.





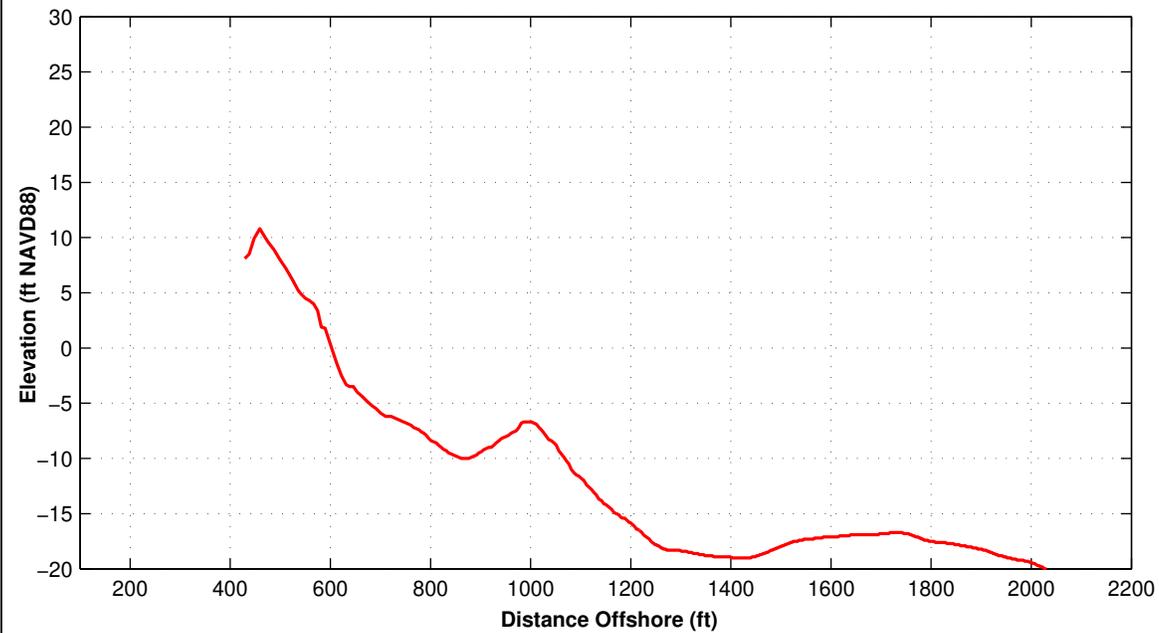
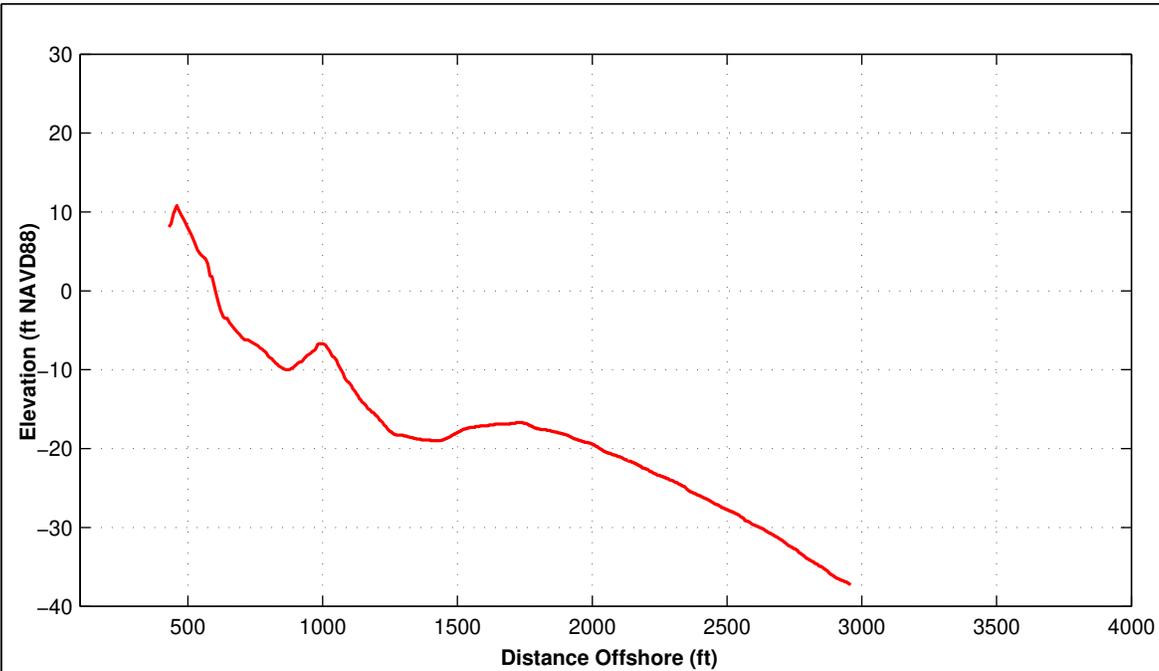
| Survey Transect 1000+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -170.41 ft | -221.49 ft |
| Volume Change Above +6 ft NAVD88 | -0.06 cy/ft | 4.05 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -41.09 cy/ft | -37.85 cy/ft |
| Volume Change Above -6 ft NAVD88 | -56.38 cy/ft | -94.71 cy/ft |
| Volume Change Above -14 ft NAVD88 | -35.56 cy/ft | -85.11 cy/ft |
| Volume Change Above -19 ft NAVD88 | -44.94 cy/ft | -70.03 cy/ft |
| Volume Change Above -30 ft NAVD88 | -45.42 cy/ft | -75.41 cy/ft |

LEGEND:

| | | | |
|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
1. Station From North To South At Varying Intervals.
 2. Post-Dorian Survey Extends Between Station 495+00 to 1025+00
 3. All Survey Elevations In Feet Referenced to NAVD88.





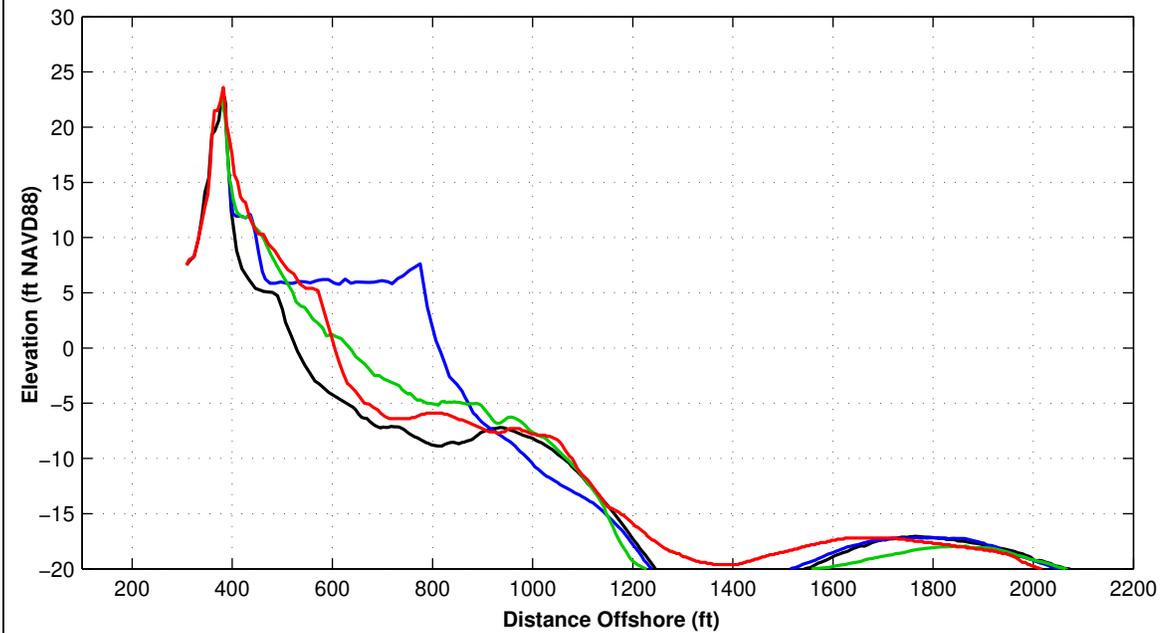
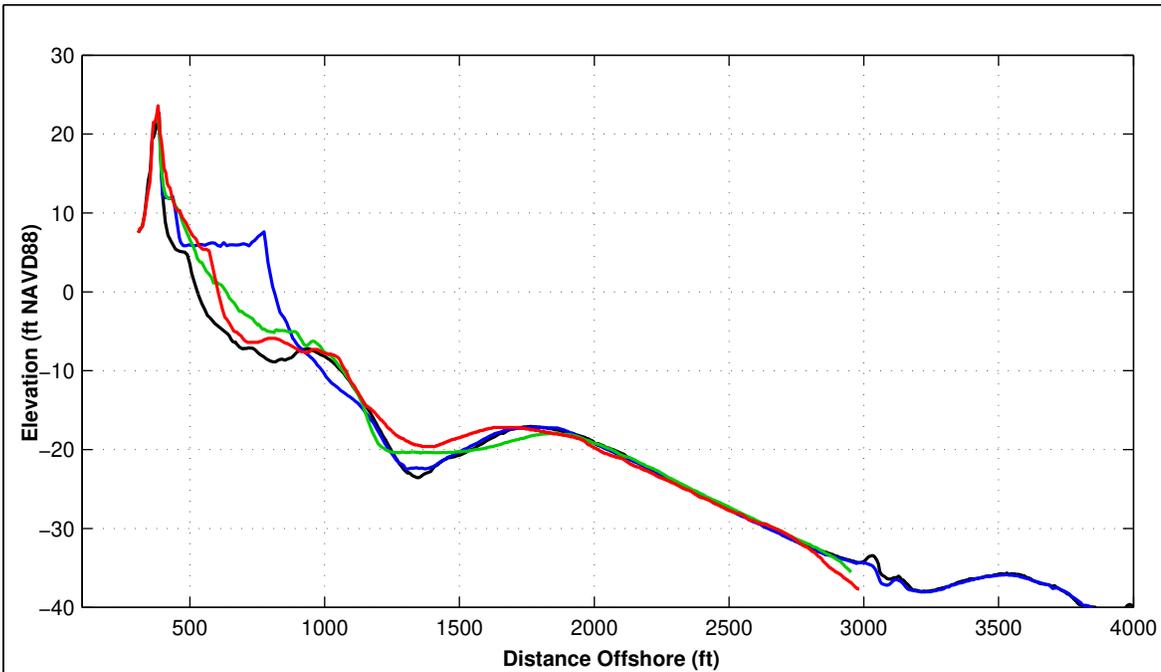
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| Survey Transect 1002+50 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.





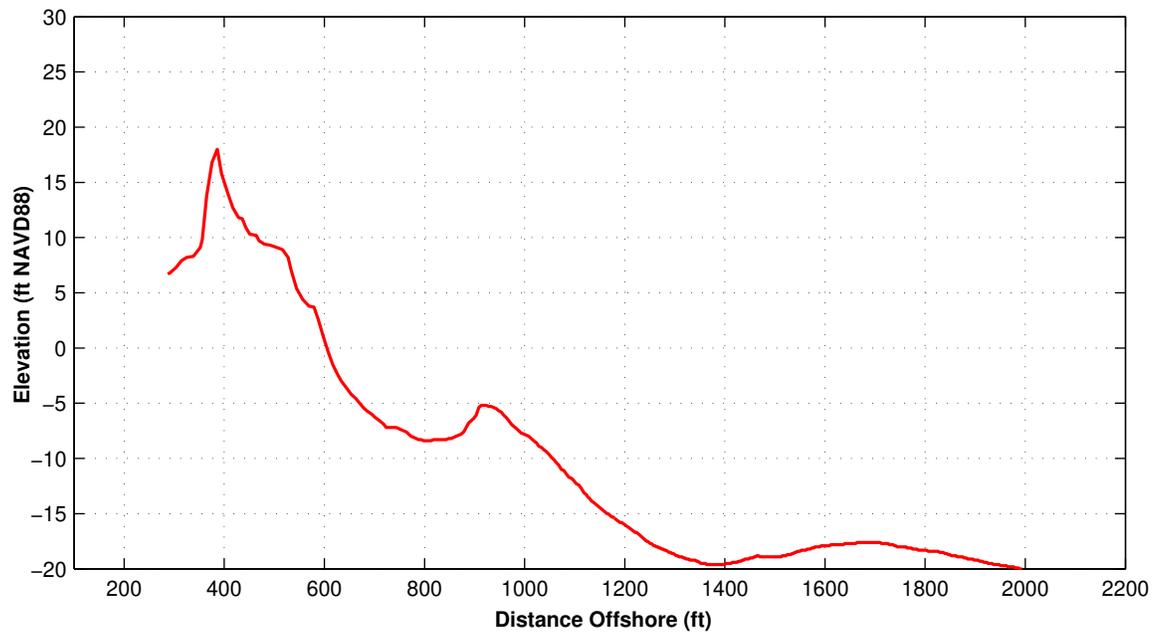
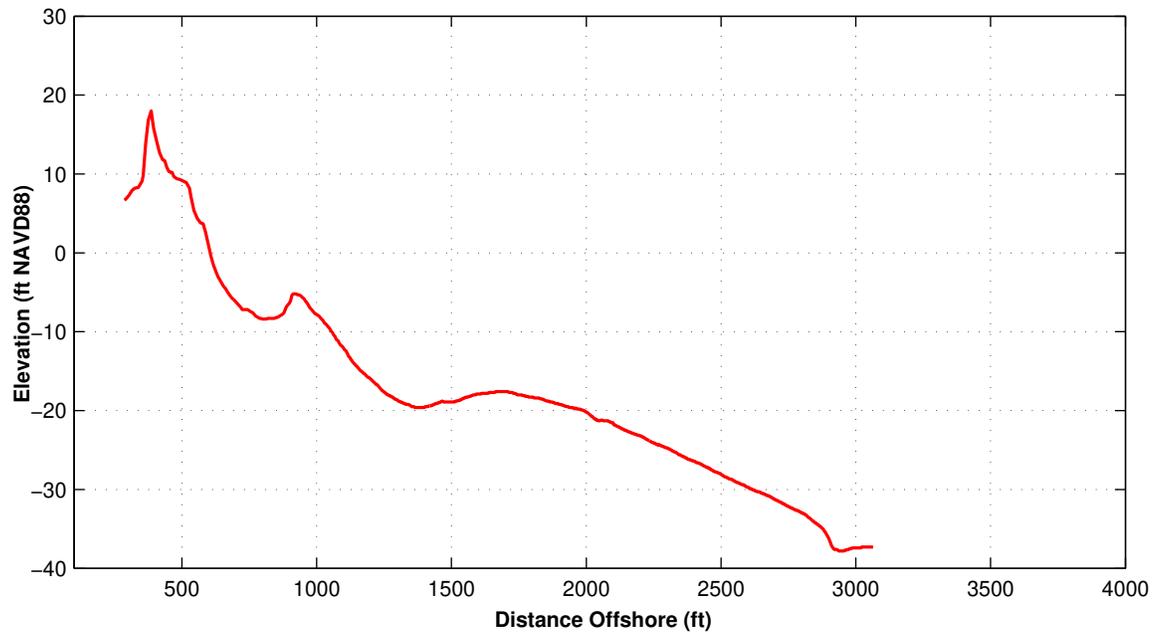
| Survey Transect 1005+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -203.08 ft | -206.89 ft |
| Volume Change Above +6 ft NAVD88 | 2.36 cy/ft | 6.22 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -41.04 cy/ft | -31.41 cy/ft |
| Volume Change Above -6 ft NAVD88 | -74.10 cy/ft | -86.54 cy/ft |
| Volume Change Above -14 ft NAVD88 | -54.95 cy/ft | -71.53 cy/ft |
| Volume Change Above -19 ft NAVD88 | -68.94 cy/ft | -61.00 cy/ft |
| Volume Change Above -30 ft NAVD88 | -53.23 cy/ft | -39.75 cy/ft |

LEGEND:

| | | | |
|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
1. Station From North To South At Varying Intervals.
 2. Post-Dorian Survey Extends Between Station 495+00 to 1025+00
 3. All Survey Elevations In Feet Referenced to NAVD88.





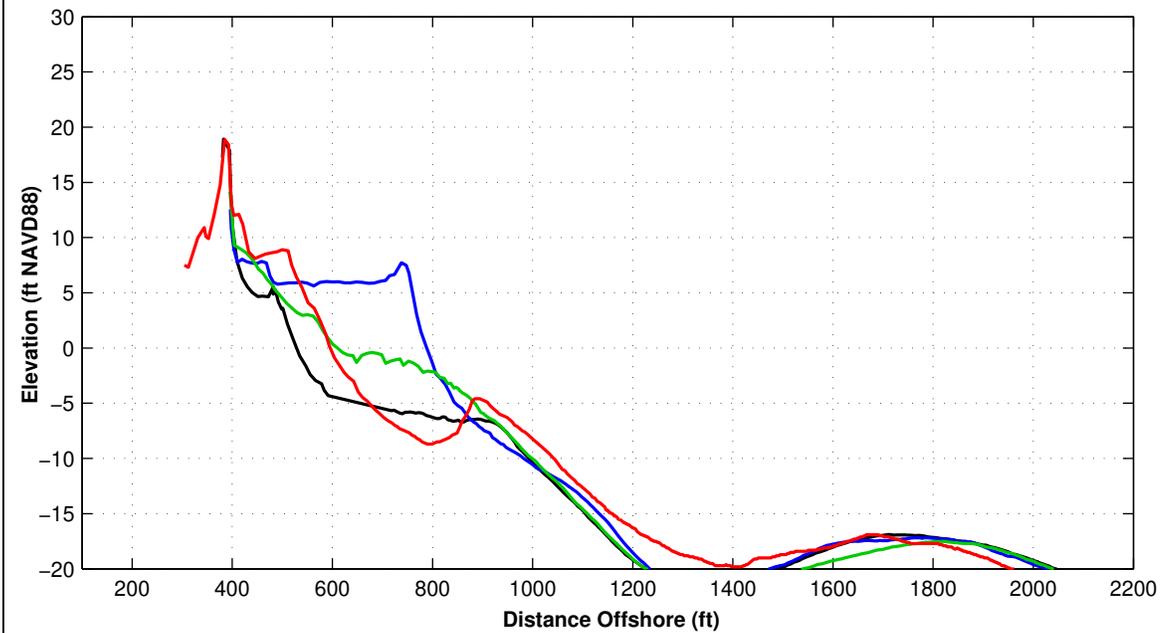
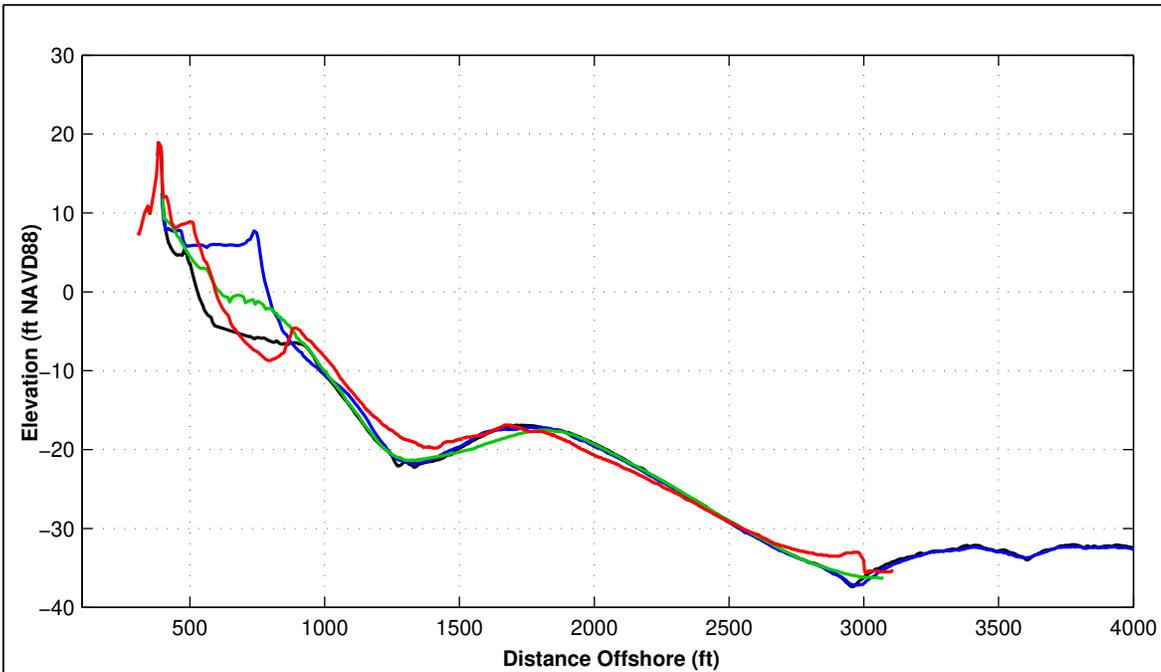
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| Survey Transect 1007+50 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.



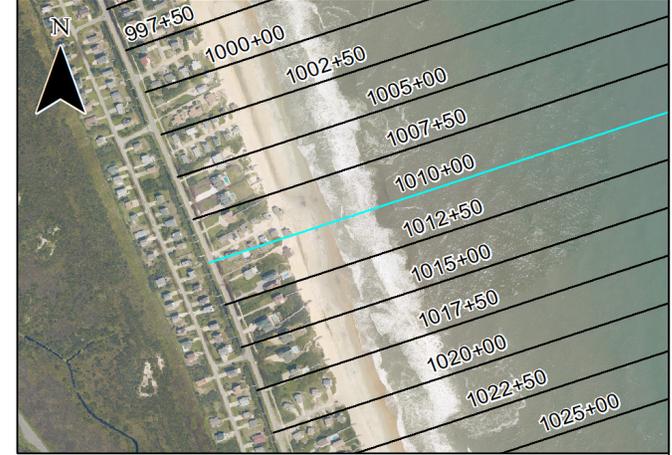


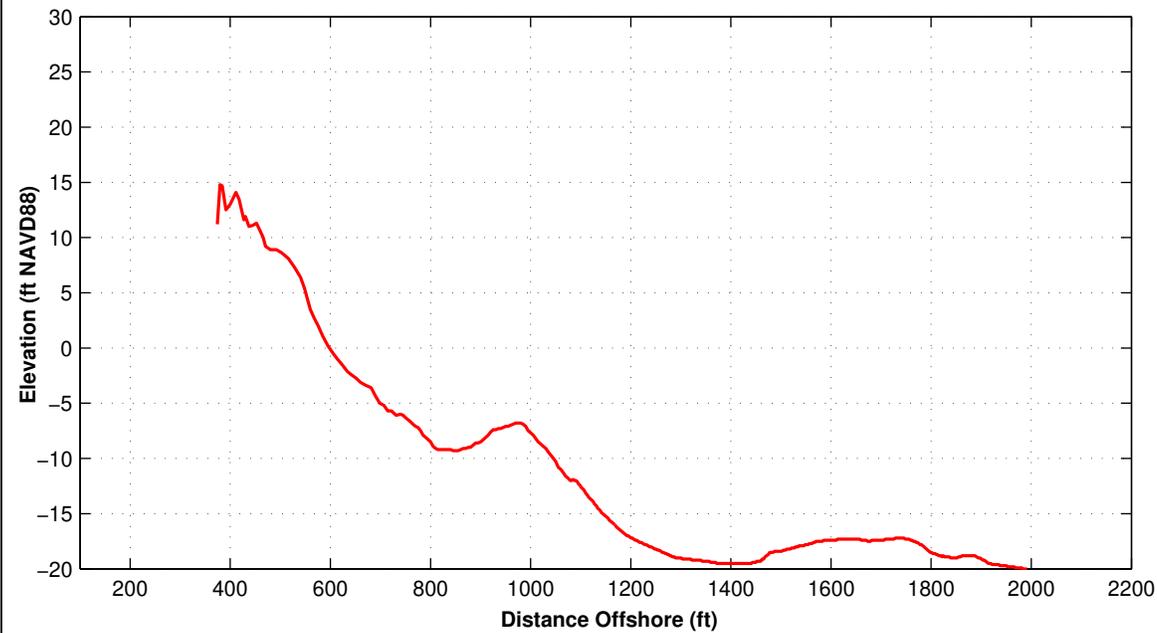
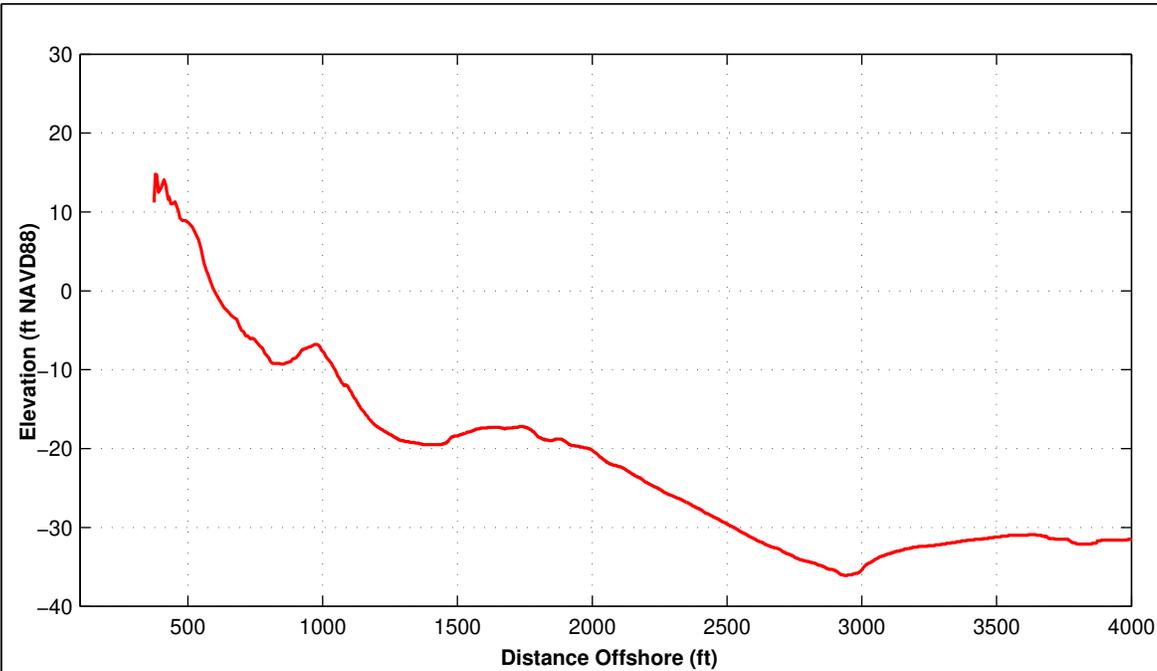
| Survey Transect 1010+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -192.58 ft | -191.89 ft |
| Volume Change Above +6 ft NAVD88 | -2.35 cy/ft | 4.65 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -44.04 cy/ft | -31.32 cy/ft |
| Volume Change Above -6 ft NAVD88 | -56.26 cy/ft | -78.05 cy/ft |
| Volume Change Above -14 ft NAVD88 | -52.26 cy/ft | -72.98 cy/ft |
| Volume Change Above -19 ft NAVD88 | -64.00 cy/ft | -66.59 cy/ft |
| Volume Change Above -30 ft NAVD88 | -62.71 cy/ft | -61.13 cy/ft |

LEGEND:

JUNE 2020 — AUGUST 2019 —
 POST-DORIAN — APRIL 2019 —

- Notes:
1. Station From North To South At Varying Intervals.
 2. Post-Dorian Survey Extends Between Station 495+00 to 1025+00
 3. All Survey Elevations In Feet Referenced to NAVD88.





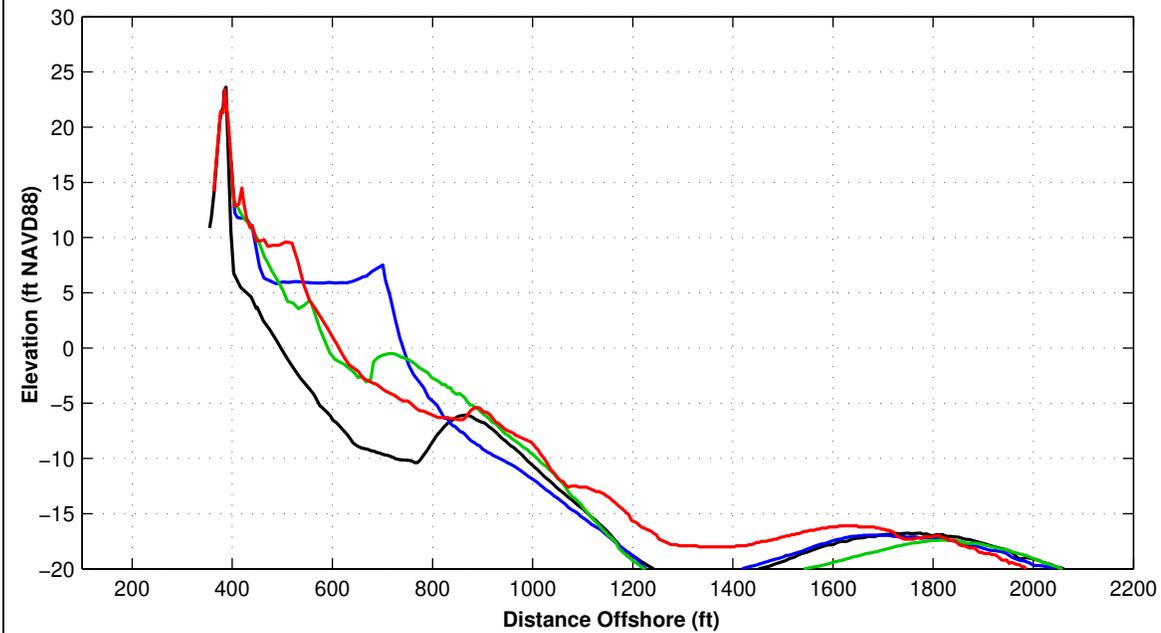
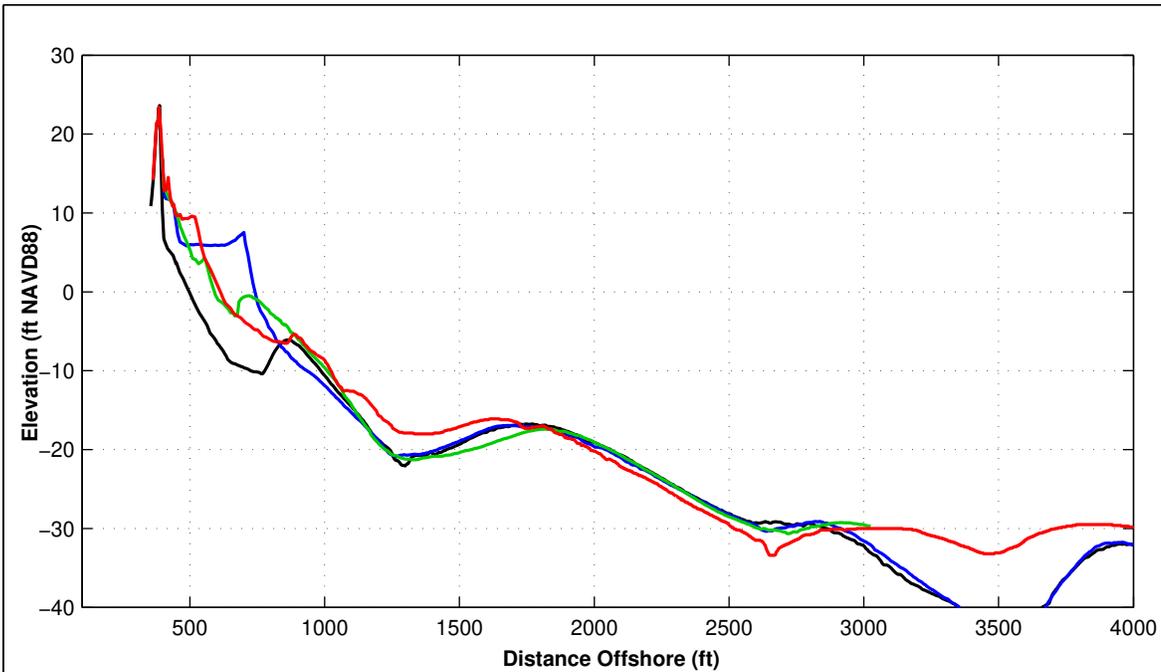
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| Survey Transect 1012+50 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.





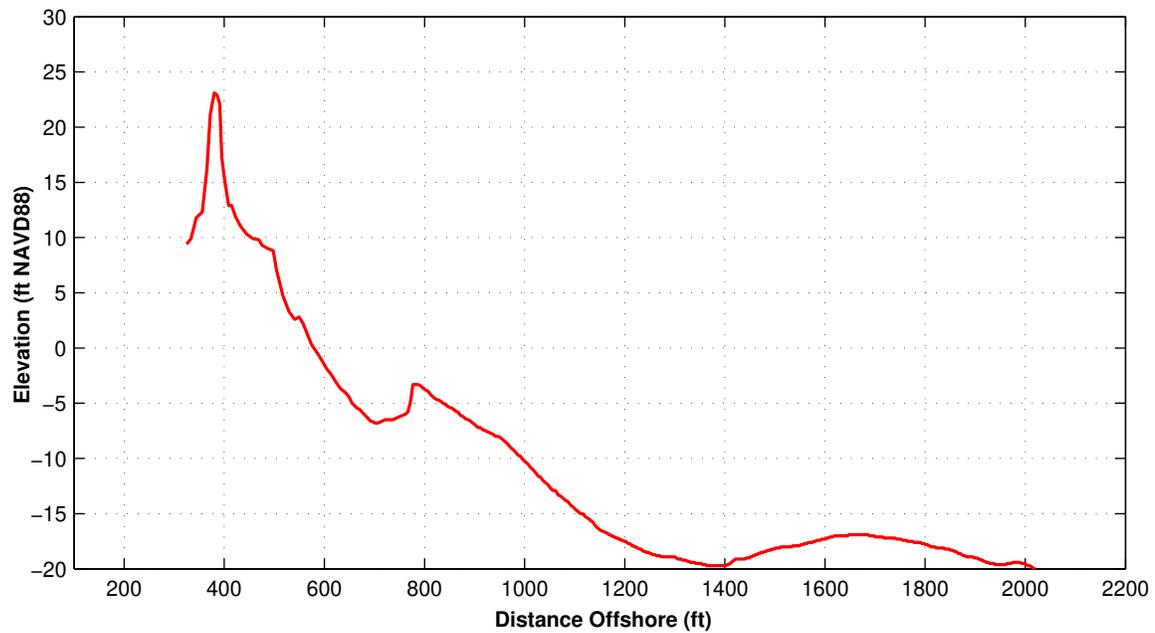
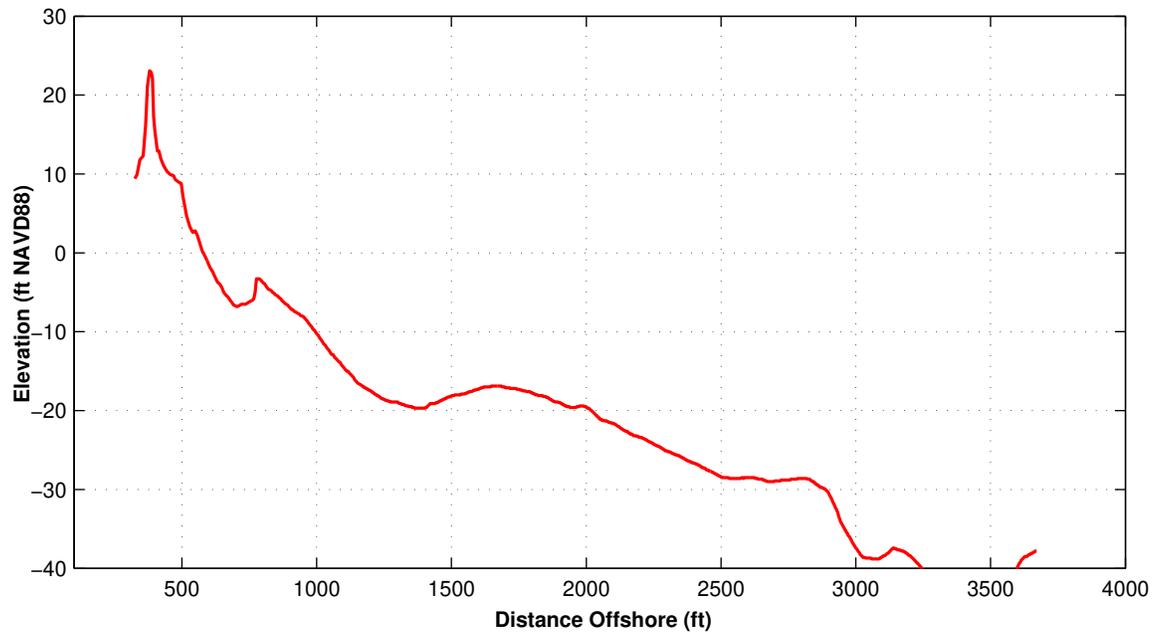
| Survey Transect 1015+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -153.33 ft | -135.29 ft |
| Volume Change Above +6 ft NAVD88 | 0.92 cy/ft | 9.28 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -30.74 cy/ft | -17.80 cy/ft |
| Volume Change Above -6 ft NAVD88 | -36.58 cy/ft | -42.93 cy/ft |
| Volume Change Above -14 ft NAVD88 | -16.49 cy/ft | -17.57 cy/ft |
| Volume Change Above -19 ft NAVD88 | -25.46 cy/ft | 18.38 cy/ft |
| Volume Change Above -30 ft NAVD88 | -34.45 cy/ft | 7.47 cy/ft |

LEGEND:

JUNE 2020 — AUGUST 2019 —
 POST-DORIAN — APRIL 2019 —

- Notes:
1. Station From North To South At Varying Intervals.
 2. Post-Dorian Survey Extends Between Station 495+00 to 1025+00
 3. All Survey Elevations In Feet Referenced to NAVD88.





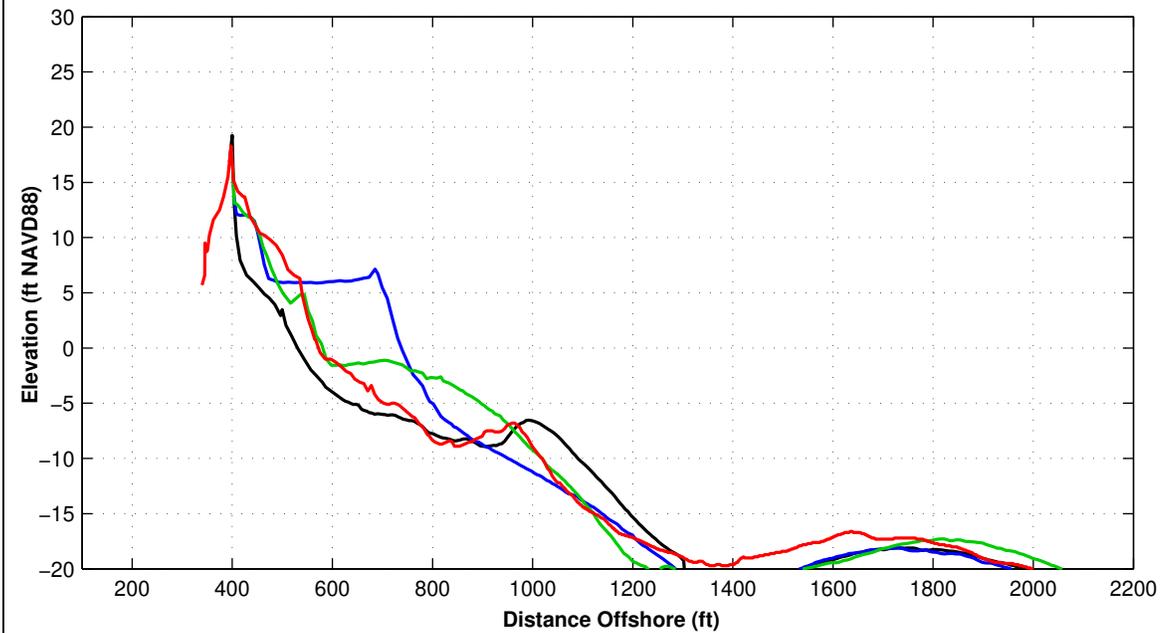
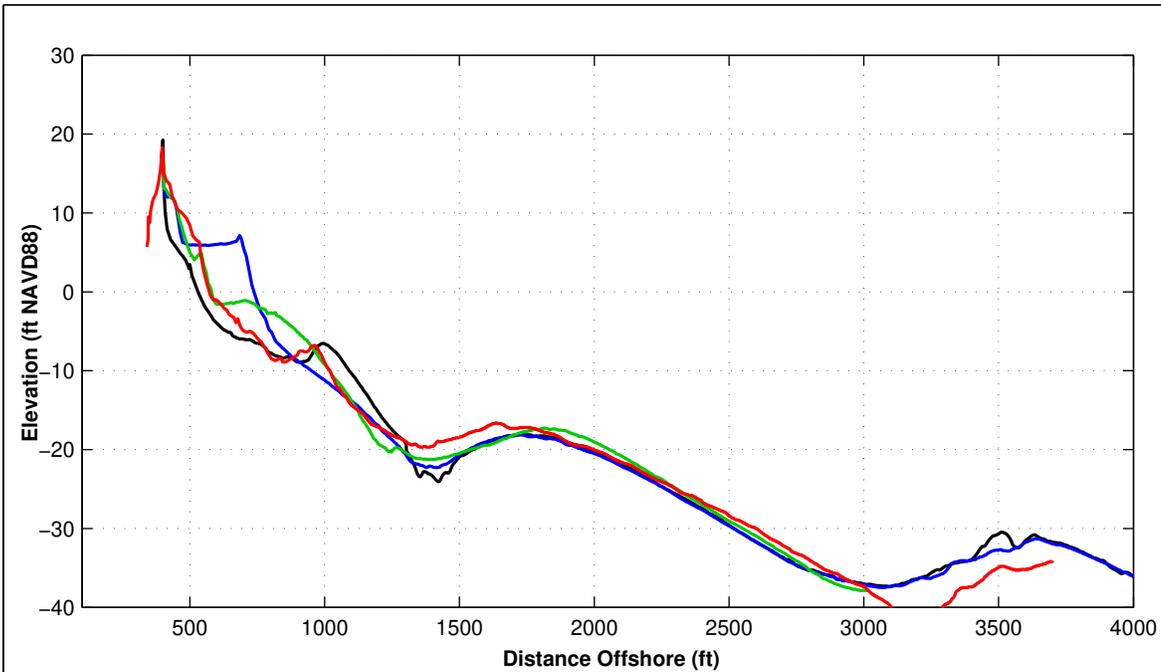
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| Survey Transect 1017+50 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.





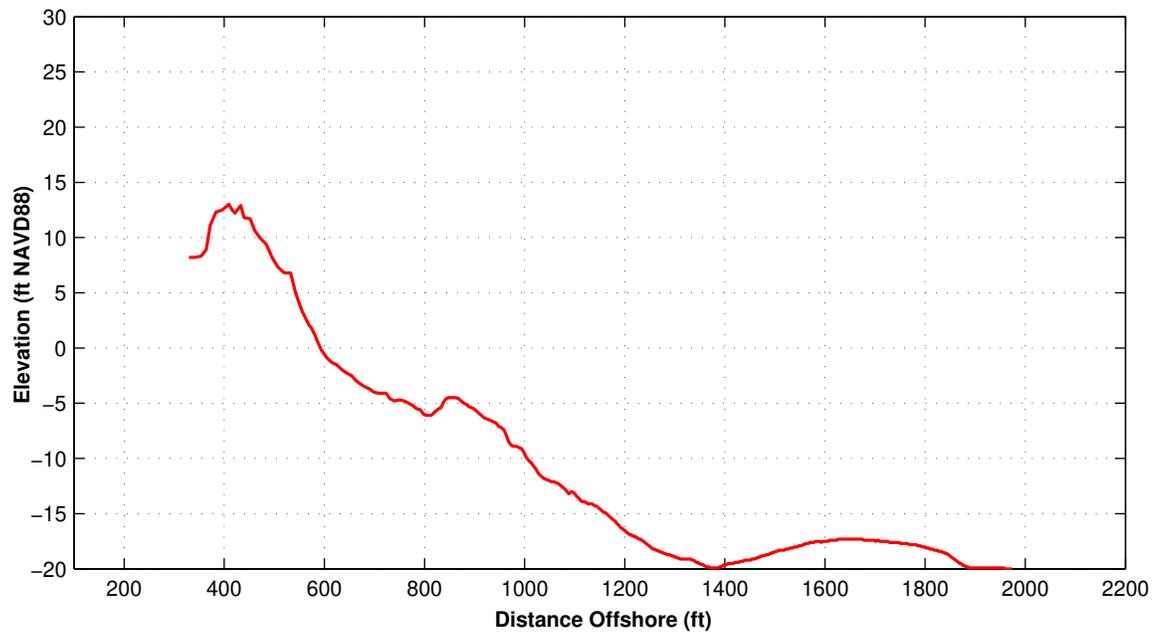
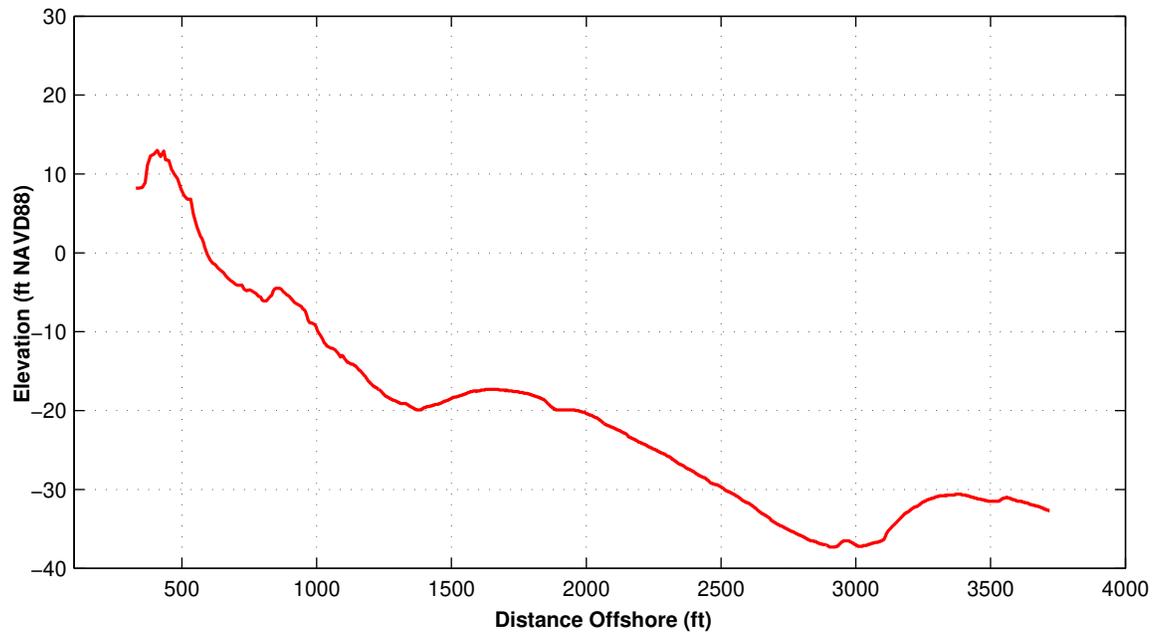
| Survey Transect 1020+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 – AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -161.61 ft | -166.28 ft |
| Volume Change Above +6 ft NAVD88 | 0.29 cy/ft | 5.46 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -30.80 cy/ft | -24.04 cy/ft |
| Volume Change Above -6 ft NAVD88 | -35.43 cy/ft | -57.52 cy/ft |
| Volume Change Above -14 ft NAVD88 | -16.15 cy/ft | -52.37 cy/ft |
| Volume Change Above -19 ft NAVD88 | -14.34 cy/ft | -36.04 cy/ft |
| Volume Change Above -30 ft NAVD88 | 10.43 cy/ft | 5.01 cy/ft |

LEGEND:

| | | | |
|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
1. Station From North To South At Varying Intervals.
 2. Post-Dorian Survey Extends Between Station 495+00 to 1025+00
 3. All Survey Elevations In Feet Referenced to NAVD88.





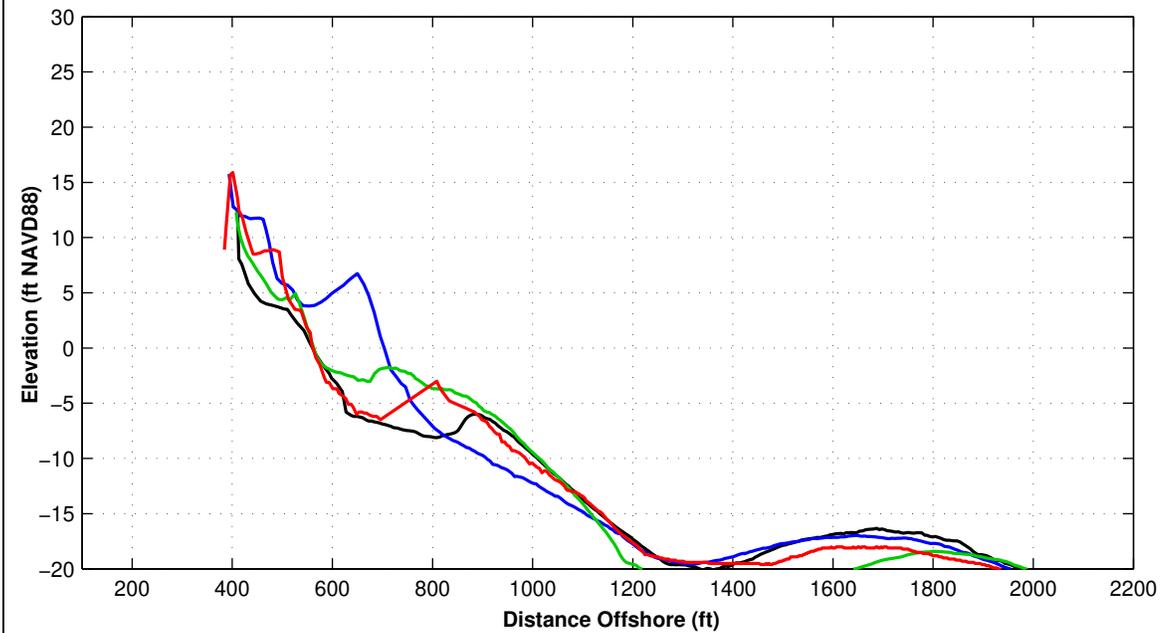
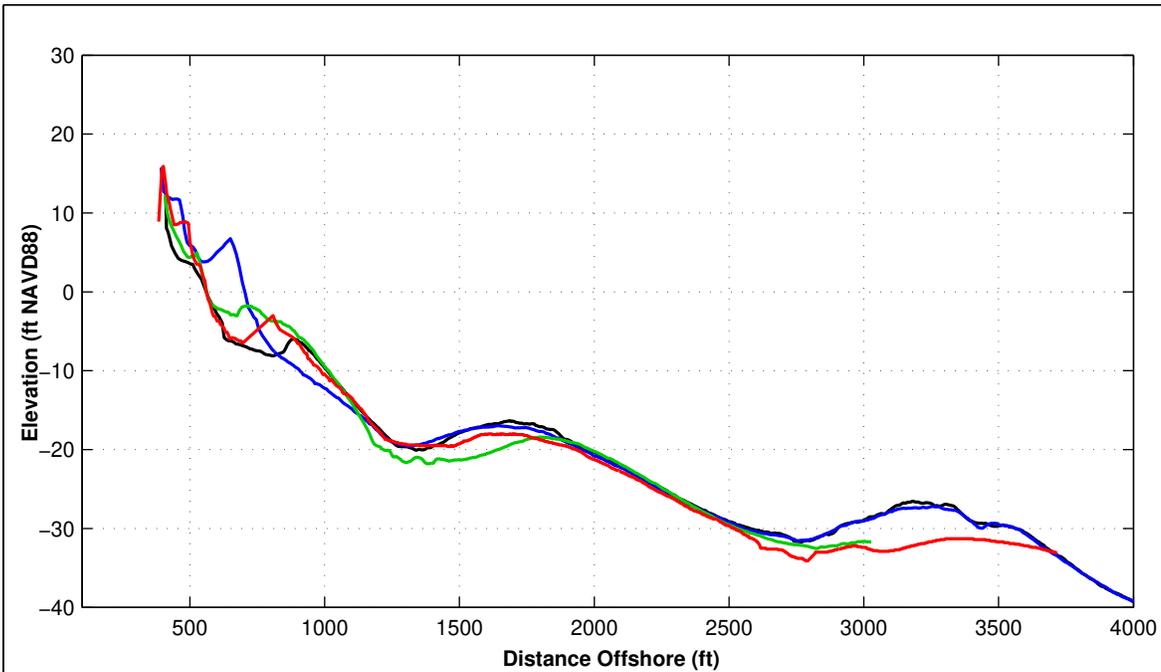
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| Survey Transect 1022+50 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.





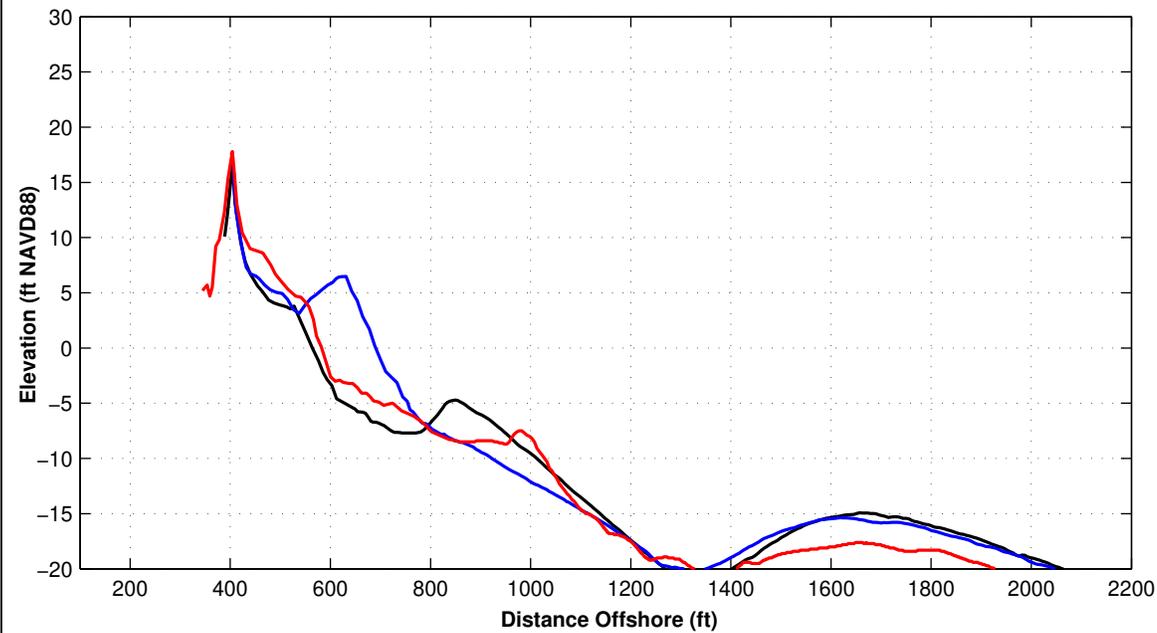
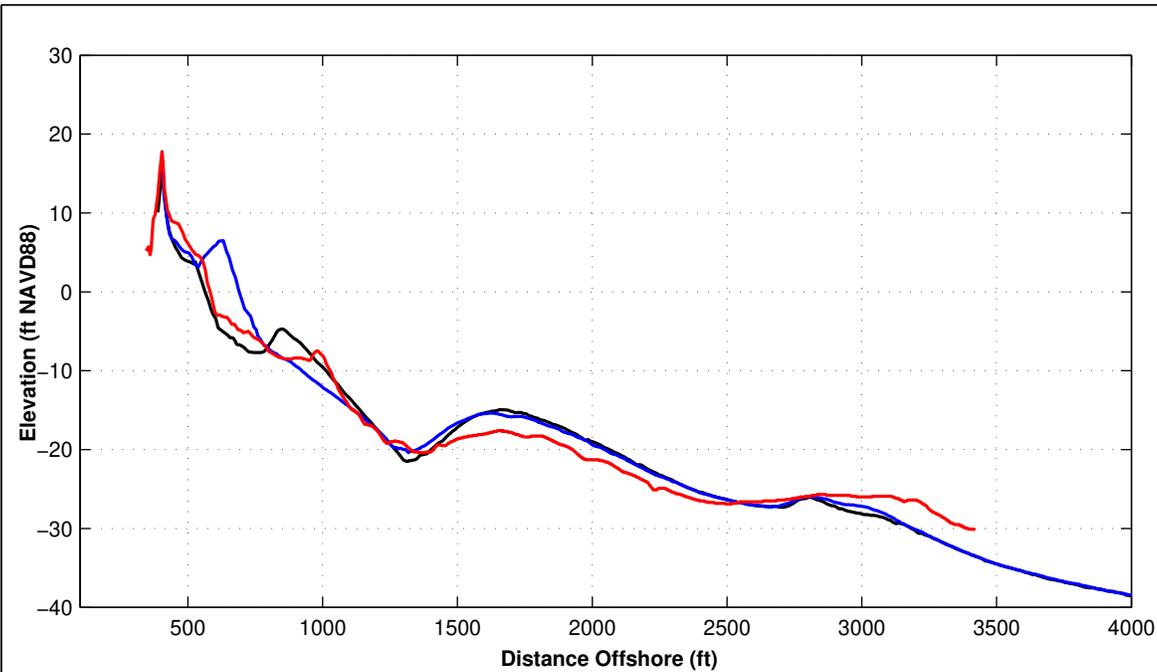
| Survey Transect 1025+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | -140.56 ft | -138.37 ft |
| Volume Change Above +6 ft NAVD88 | -2.18 cy/ft | -2.83 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | -30.07 cy/ft | -23.80 cy/ft |
| Volume Change Above -6 ft NAVD88 | -29.59 cy/ft | -51.89 cy/ft |
| Volume Change Above -14 ft NAVD88 | 0.44 cy/ft | -28.38 cy/ft |
| Volume Change Above -19 ft NAVD88 | -30.55 cy/ft | -42.23 cy/ft |
| Volume Change Above -30 ft NAVD88 | -95.33 cy/ft | -92.16 cy/ft |

LEGEND:

| | | | |
|-------------|--------------------------------------|-------------|--------------------------------------|
| JUNE 2020 | — | AUGUST 2019 | — |
| POST-DORIAN | — | APRIL 2019 | — |

- Notes:
1. Station From North To South At Varying Intervals.
 2. Post-Dorian Survey Extends Between Station 495+00 to 1025+00
 3. All Survey Elevations In Feet Referenced to NAVD88.



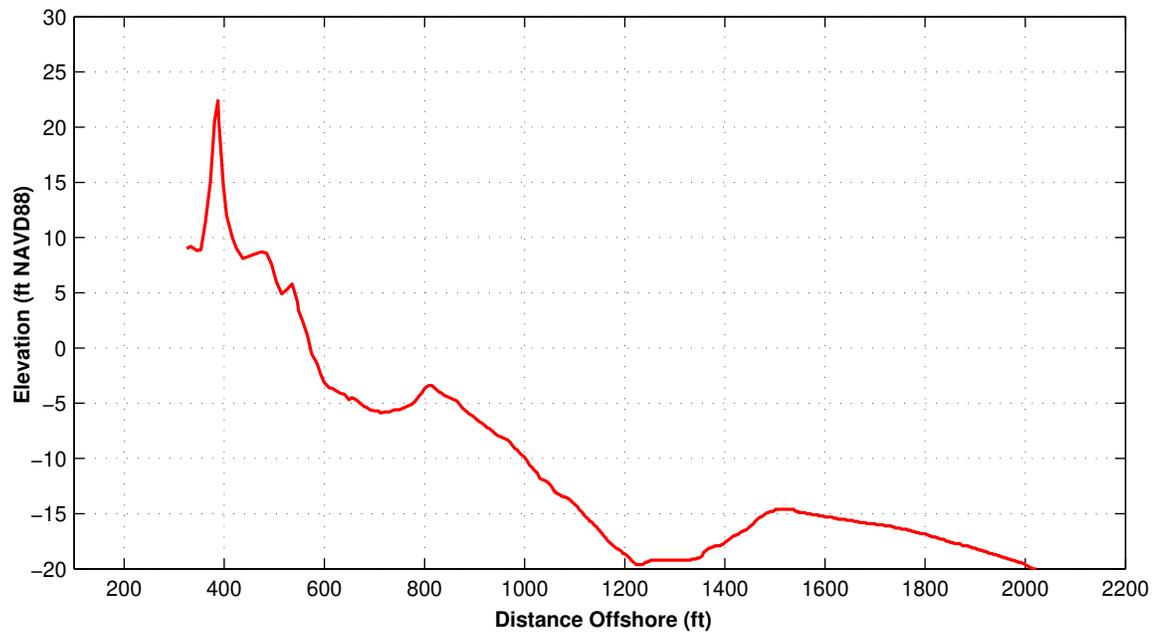
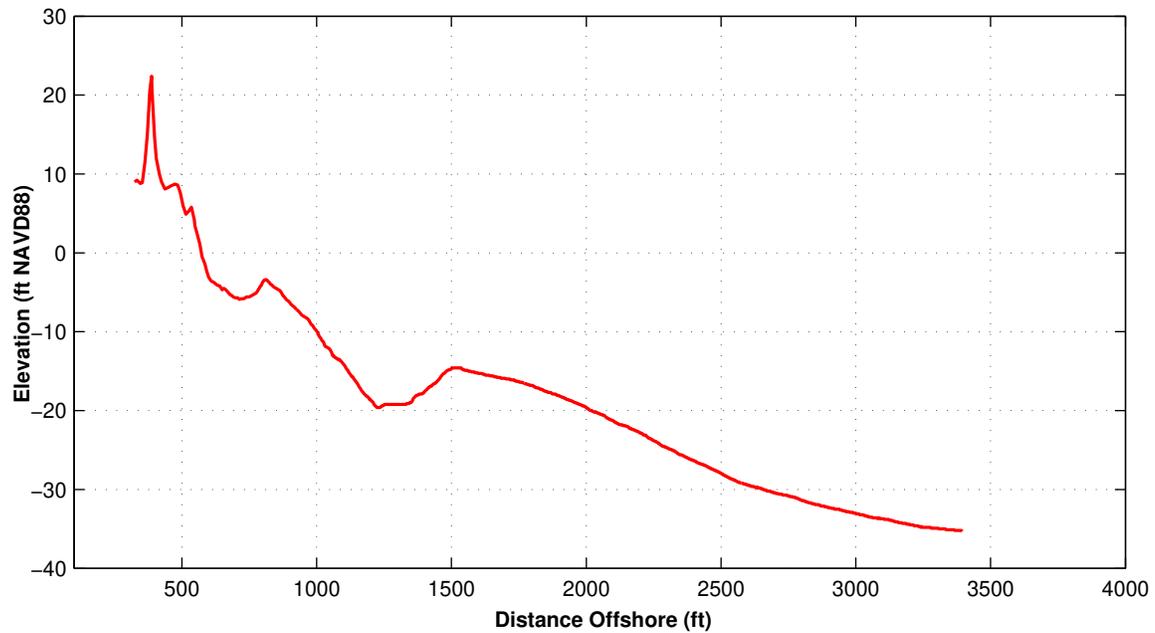


| Survey Transect 1030+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 – AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | – ft | –109.66 ft |
| Volume Change Above +6 ft NAVD88 | – cy/ft | 5.73 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | – cy/ft | –7.22 cy/ft |
| Volume Change Above –6 ft NAVD88 | – cy/ft | –31.10 cy/ft |
| Volume Change Above –14 ft NAVD88 | – cy/ft | –15.18 cy/ft |
| Volume Change Above –19 ft NAVD88 | – cy/ft | –53.90 cy/ft |
| Volume Change Above –30 ft NAVD88 | – cy/ft | –47.63 cy/ft |

LEGEND:
 JUNE 2020 ——— AUGUST 2019 ———
 APRIL 2019 ———

- Notes:
 1. Station From North To South At Varying Intervals.
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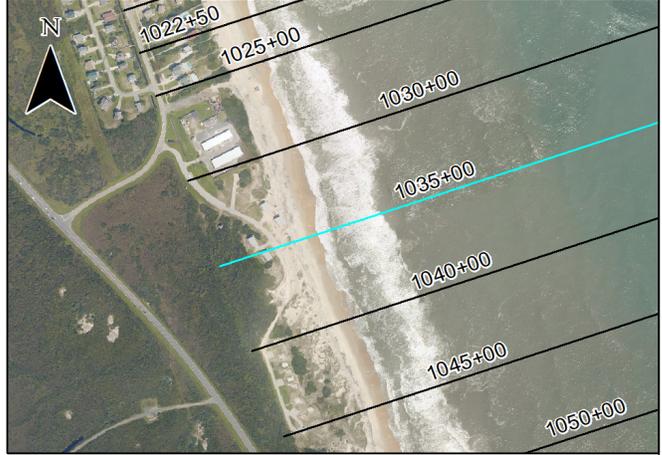


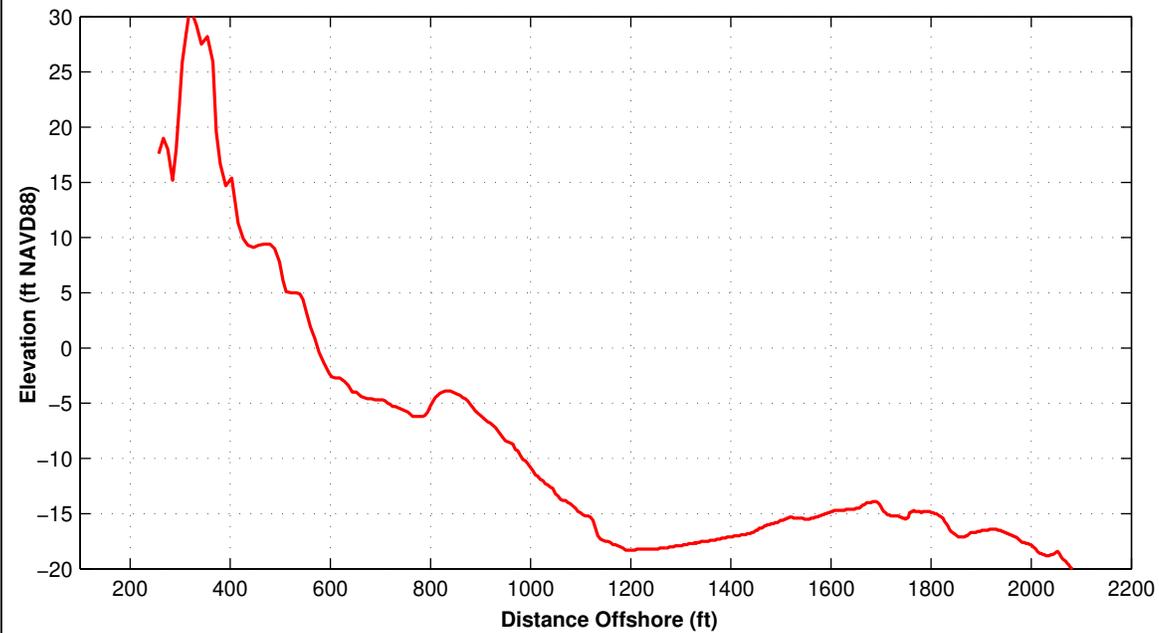
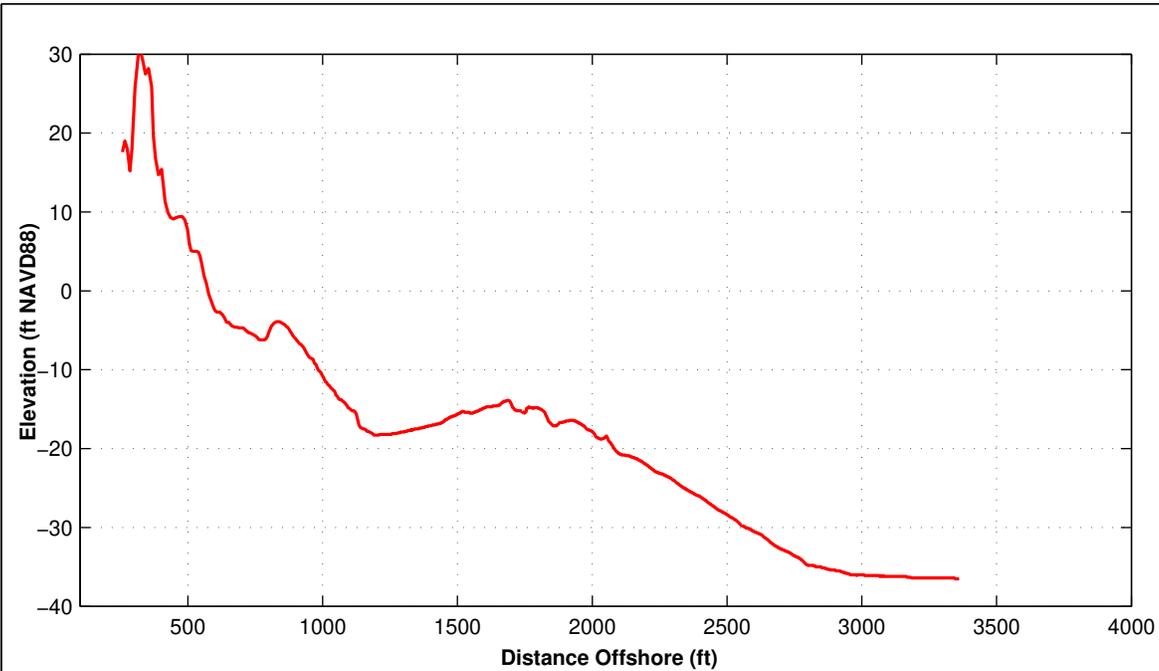
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| Survey Transect 1035+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.



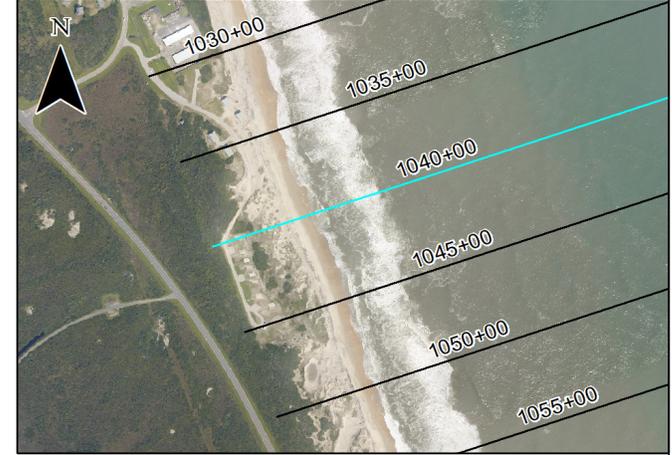


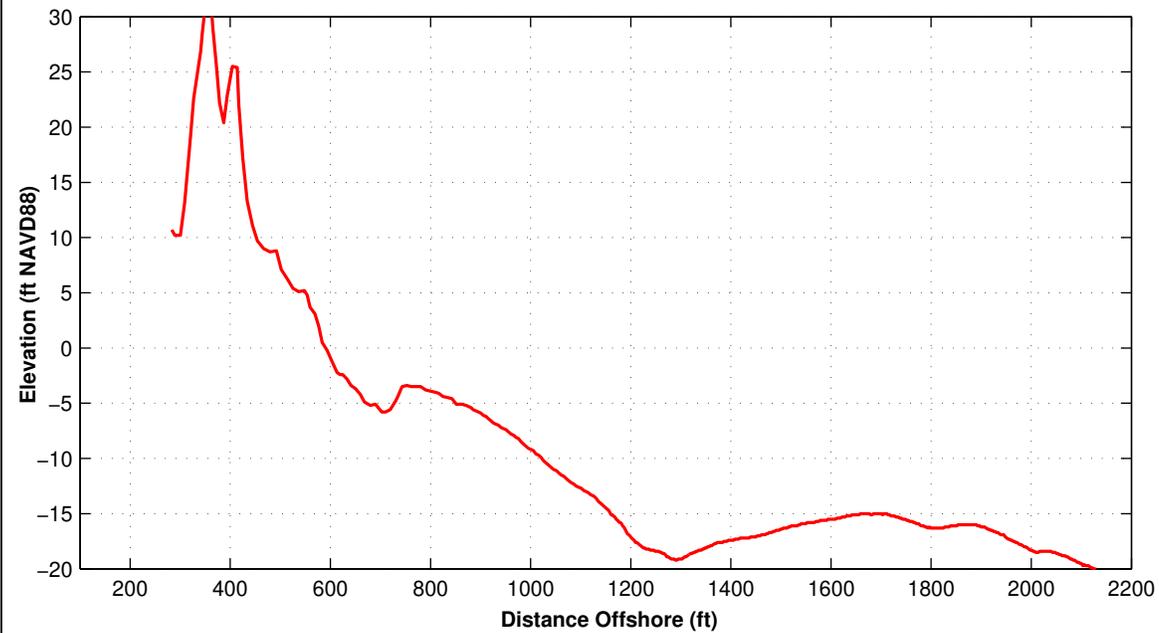
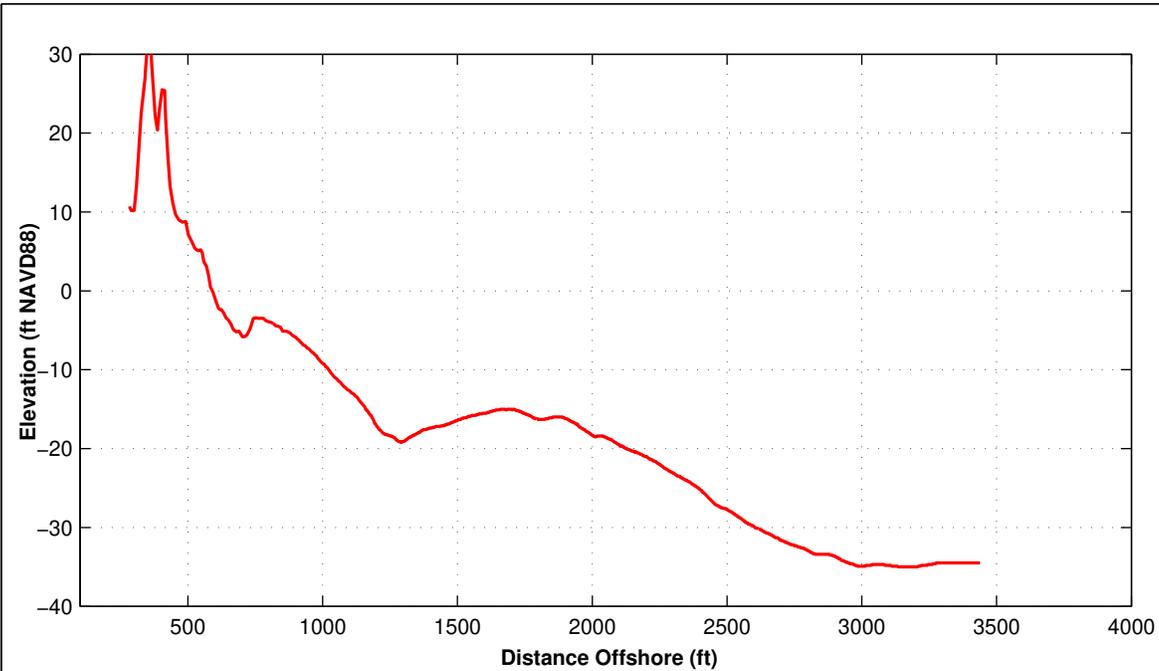
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| Survey Transect 1040+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
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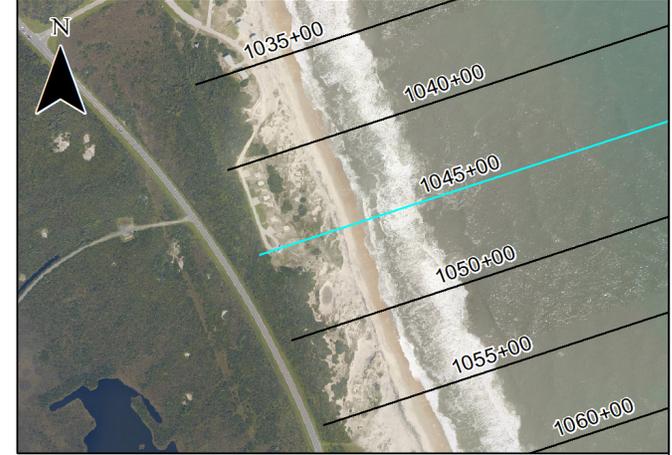


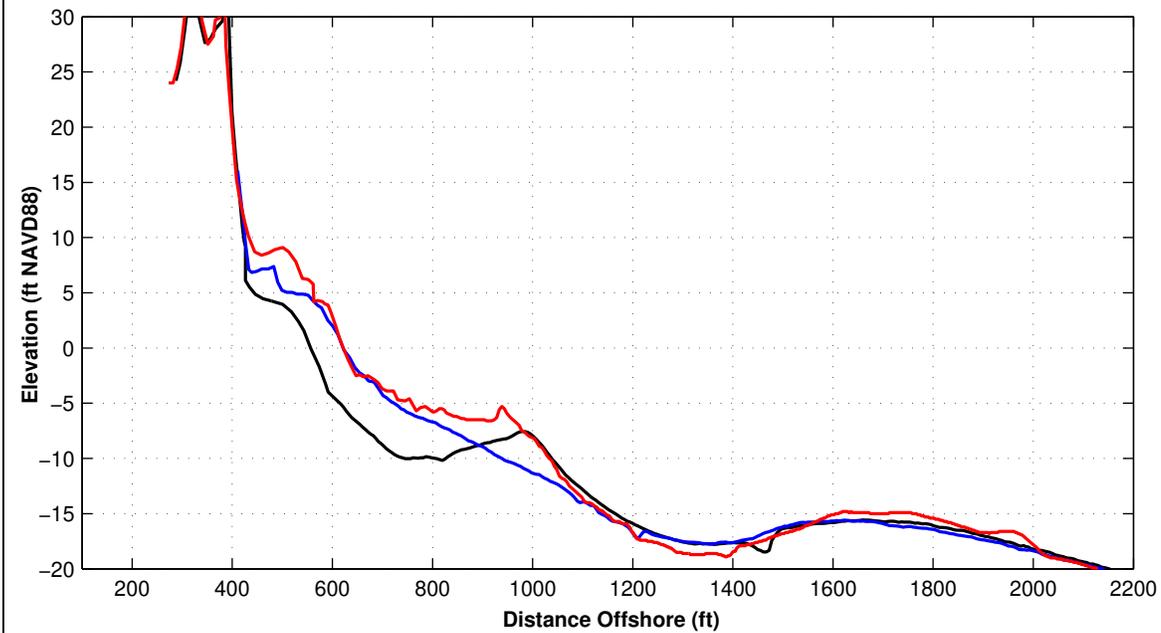
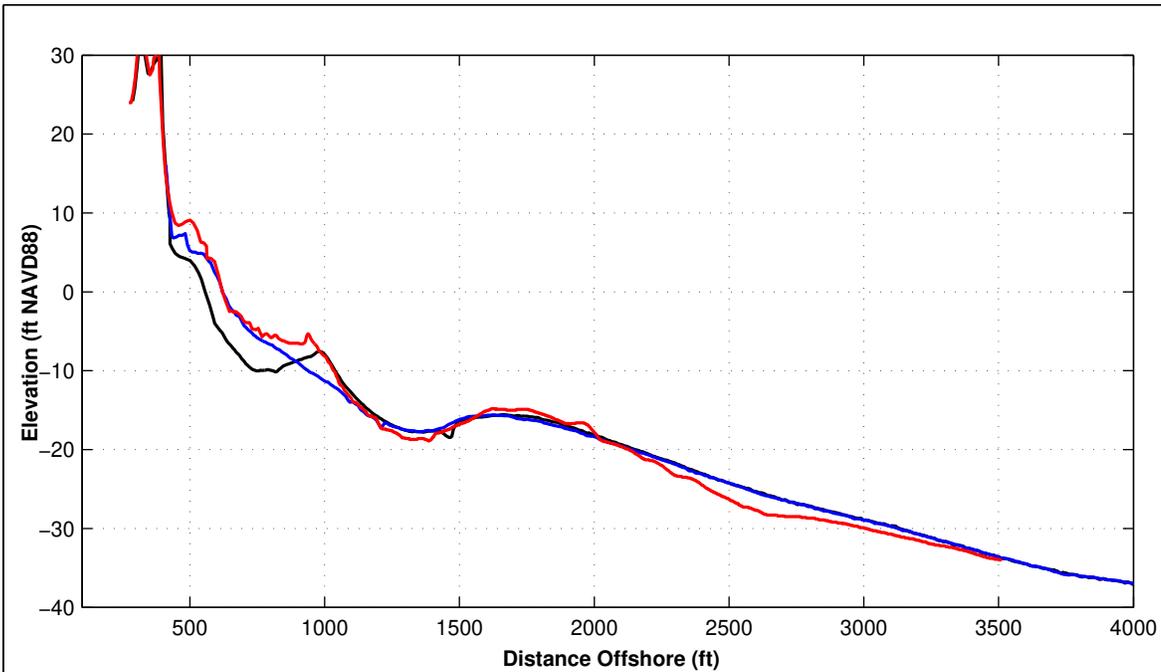
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| Survey Transect 1045+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
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 2. Station From North To South At Varying Intervals.
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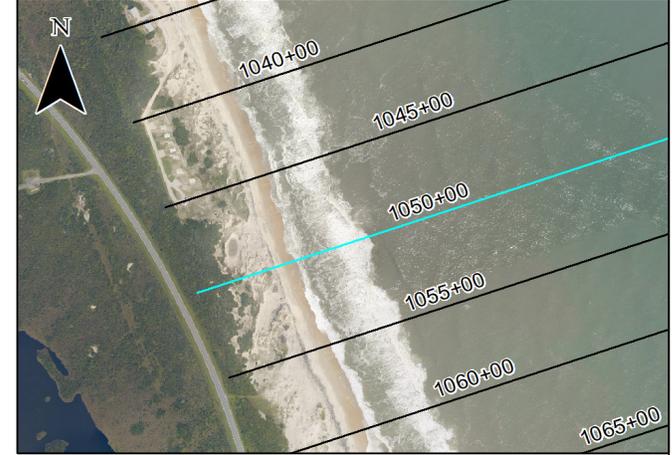


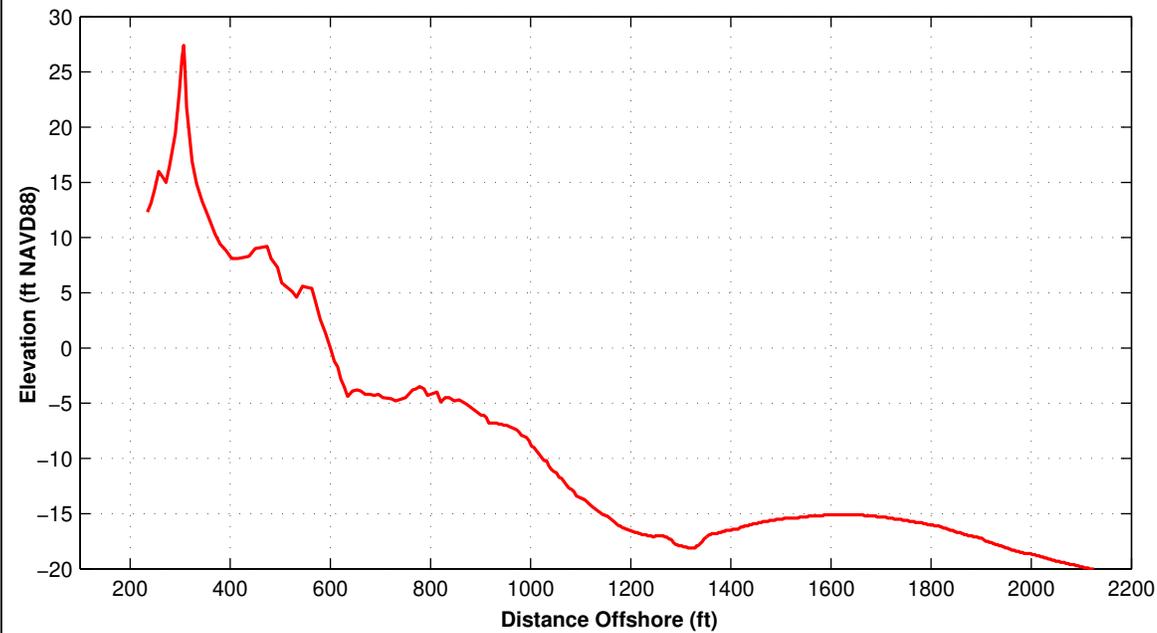
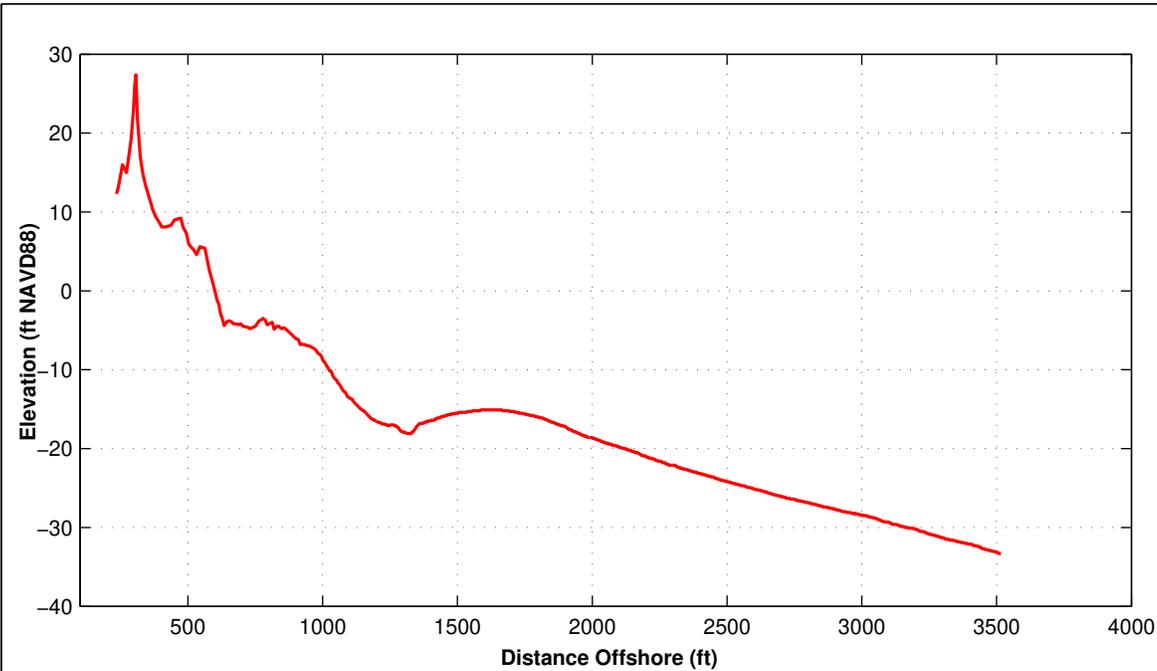


| Survey Transect 1050+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | - ft | 1.04 ft |
| Volume Change Above +6 ft NAVD88 | - cy/ft | 8.71 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | - cy/ft | 12.65 cy/ft |
| Volume Change Above -6 ft NAVD88 | - cy/ft | 16.00 cy/ft |
| Volume Change Above -14 ft NAVD88 | - cy/ft | 40.76 cy/ft |
| Volume Change Above -19 ft NAVD88 | - cy/ft | 46.50 cy/ft |
| Volume Change Above -30 ft NAVD88 | - cy/ft | -3.02 cy/ft |

LEGEND:
 JUNE 2020 ———— AUGUST 2019 ————
 APRIL 2019 ————

- Notes:
 1. Station From North To South At Varying Intervals.
 2. Post-Dorian Survey Extends Between Station 495+00 to 1025+00
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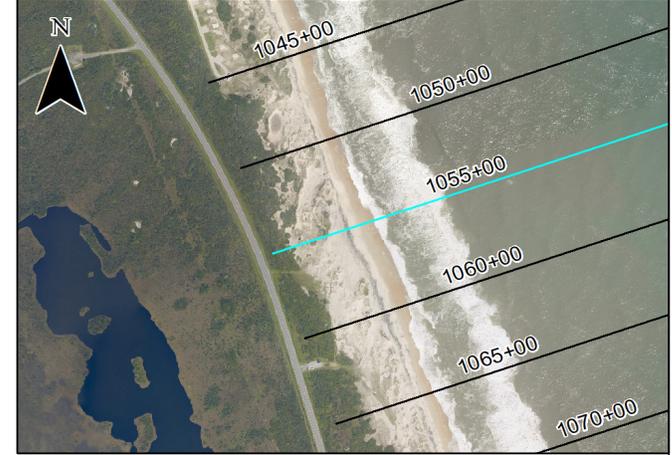


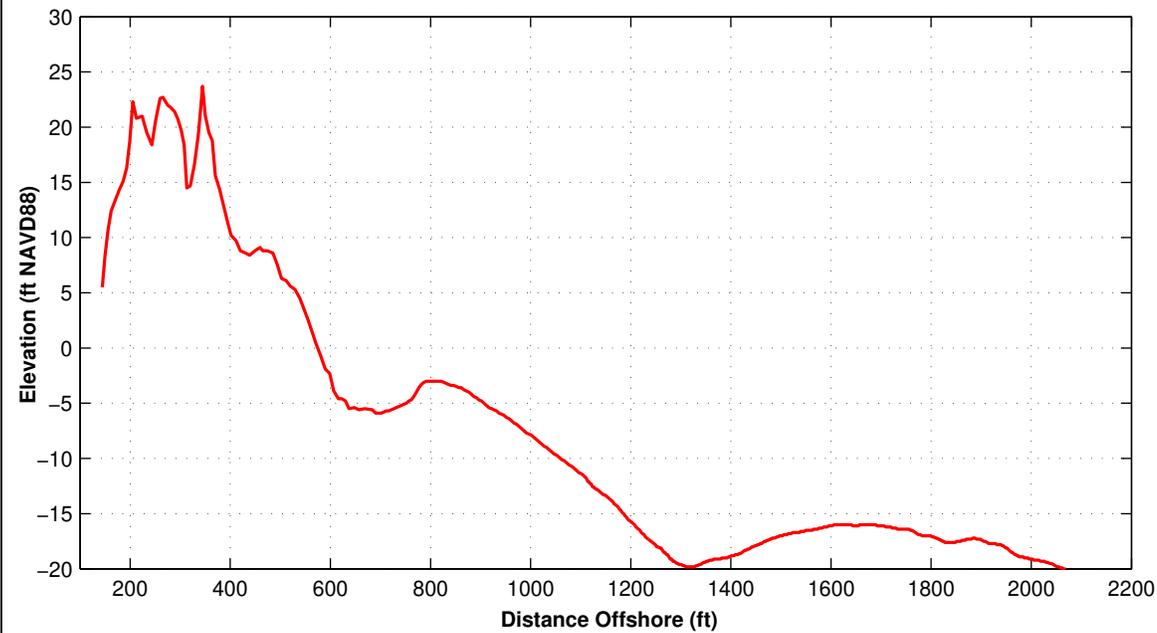
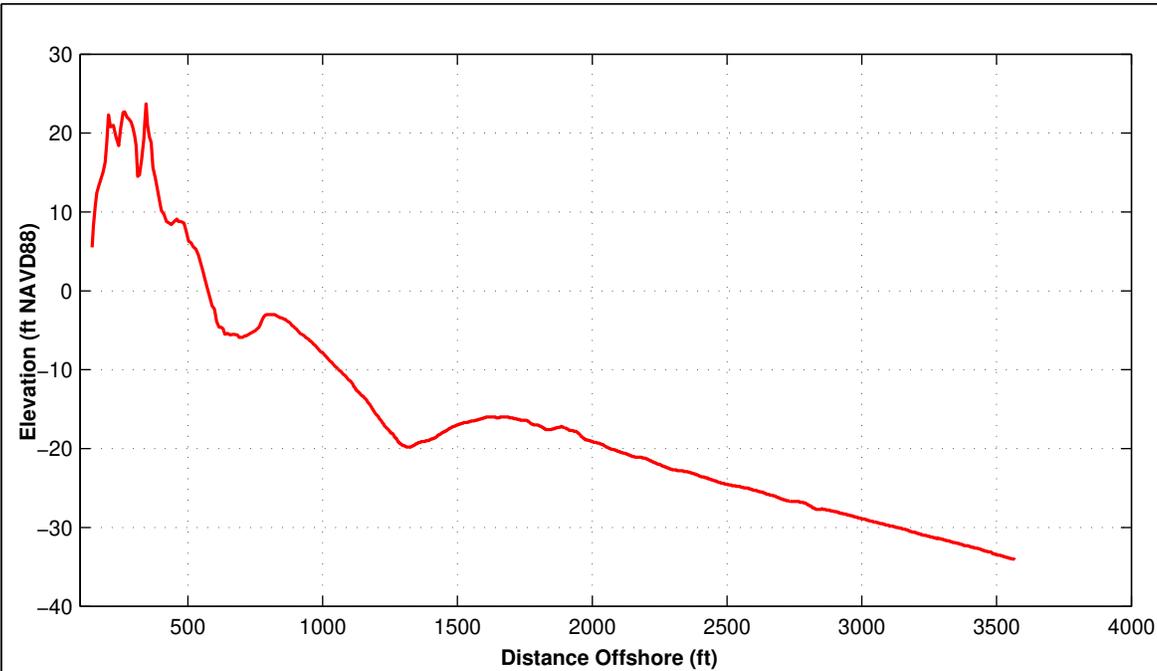
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| Survey Transect 1055+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
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 2. Station From North To South At Varying Intervals.
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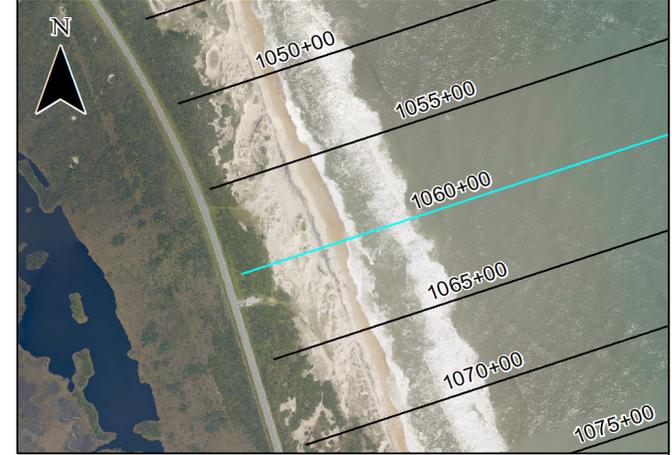


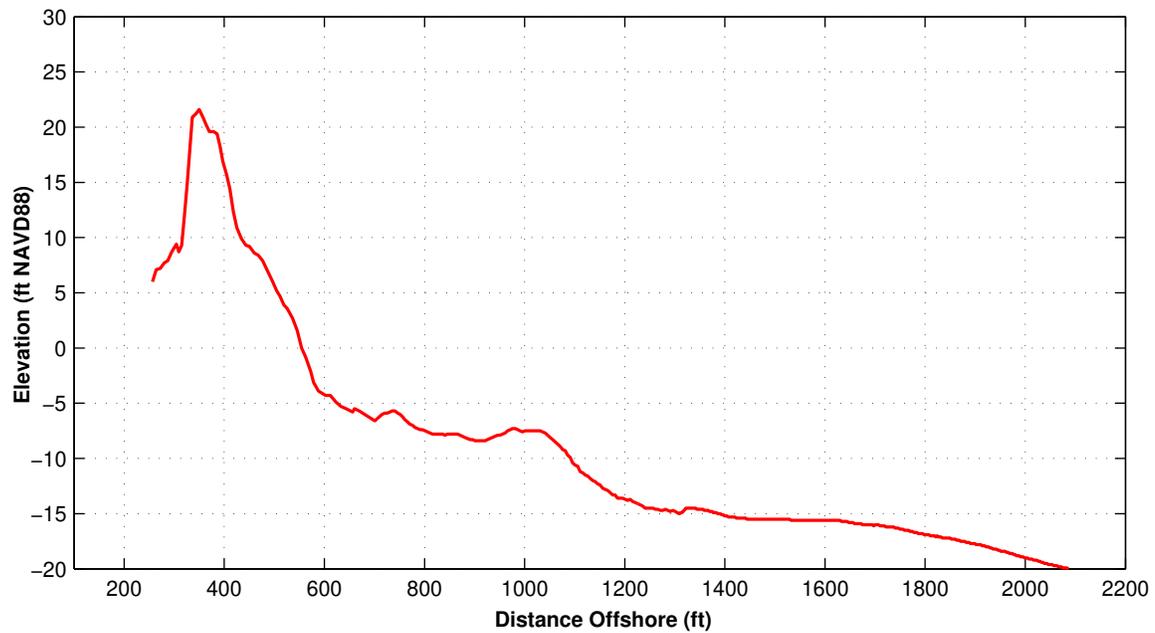
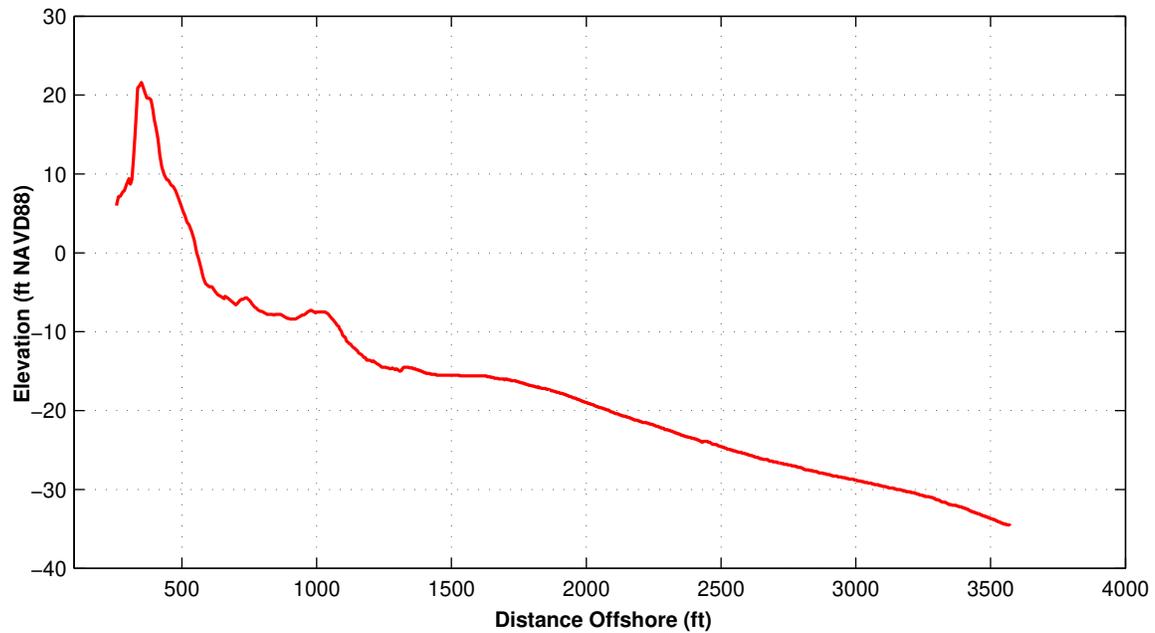
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|--|----------------------------|----------------------------|
| Survey Transect 1060+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
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 2. Station From North To South At Varying Intervals.
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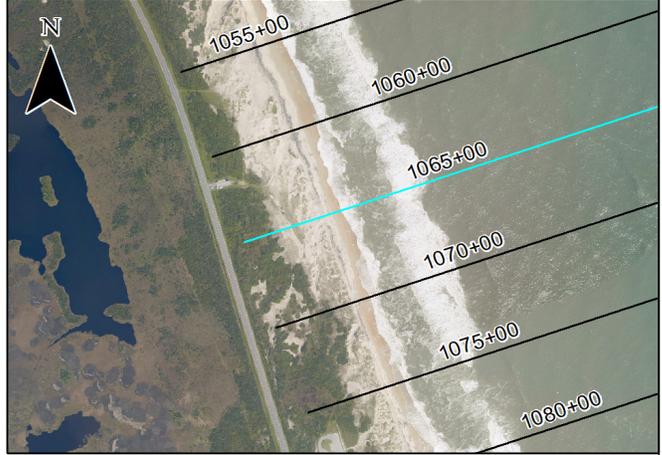


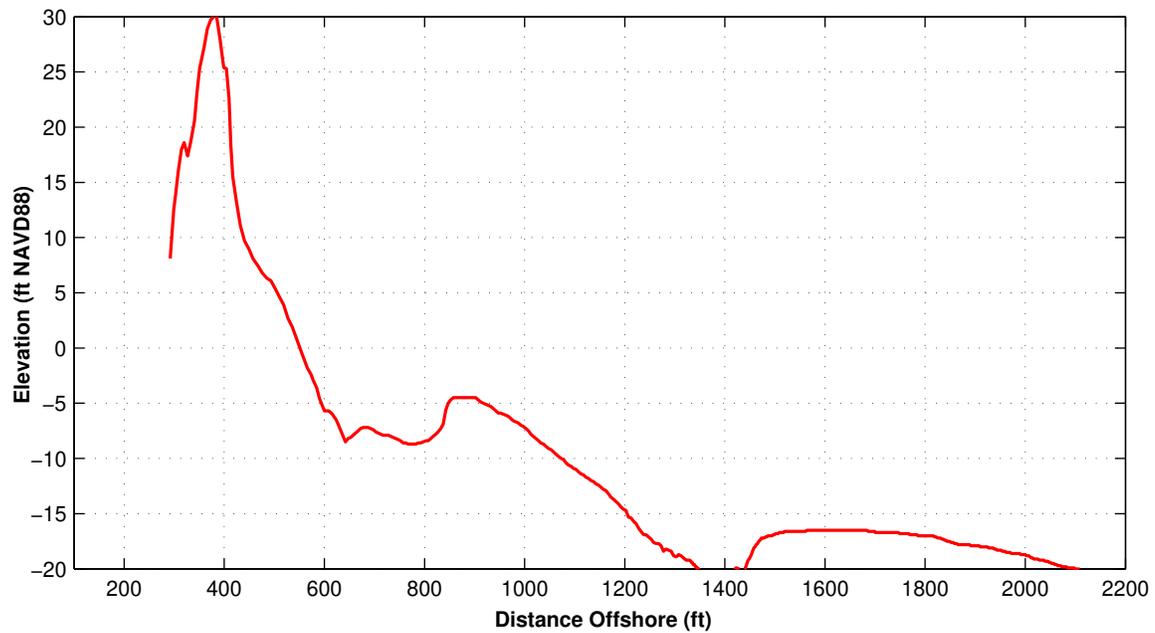
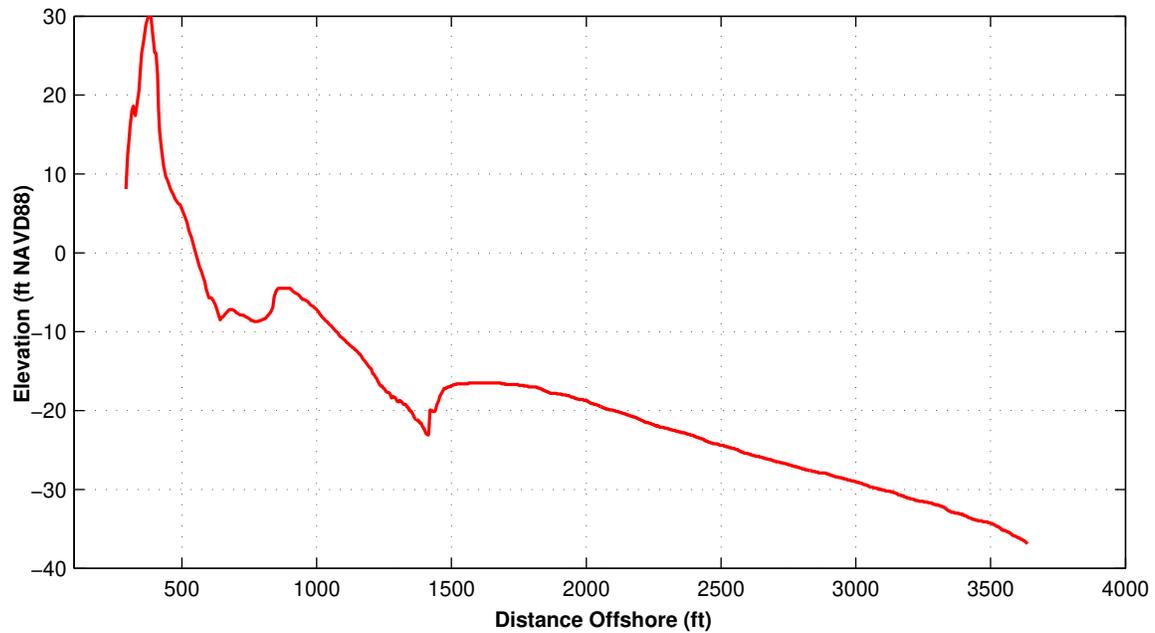
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| Survey Transect 1065+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
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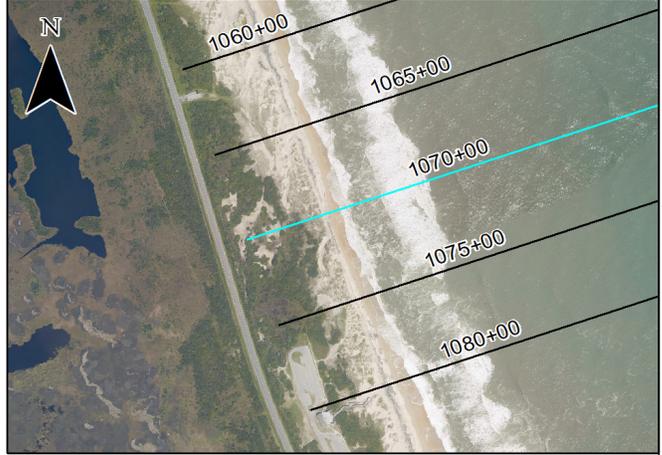


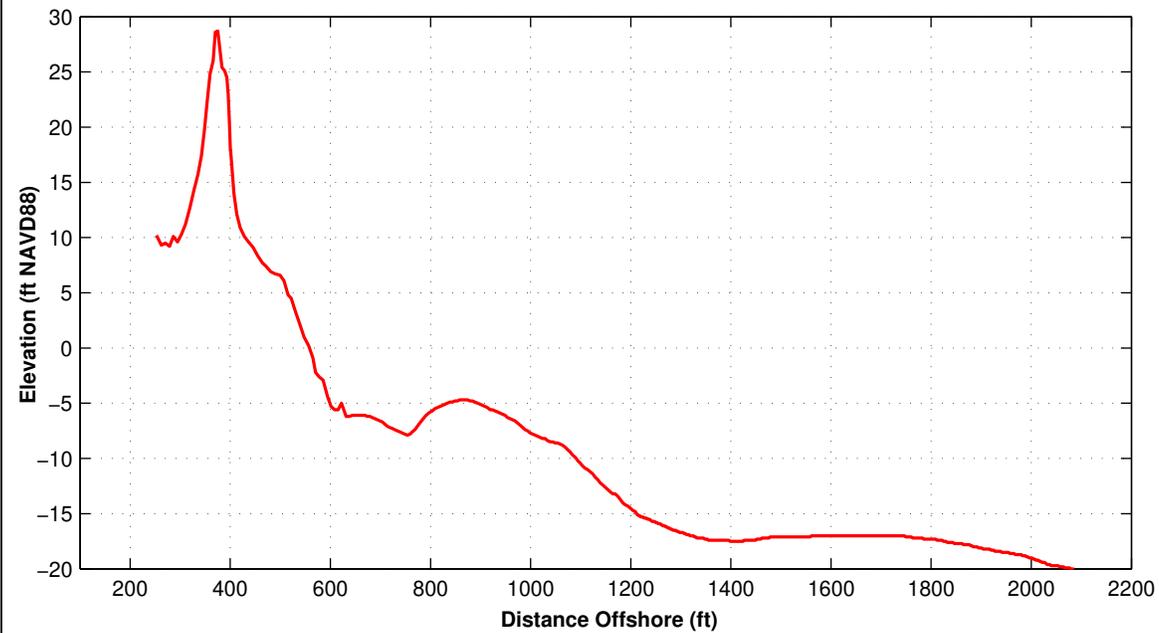
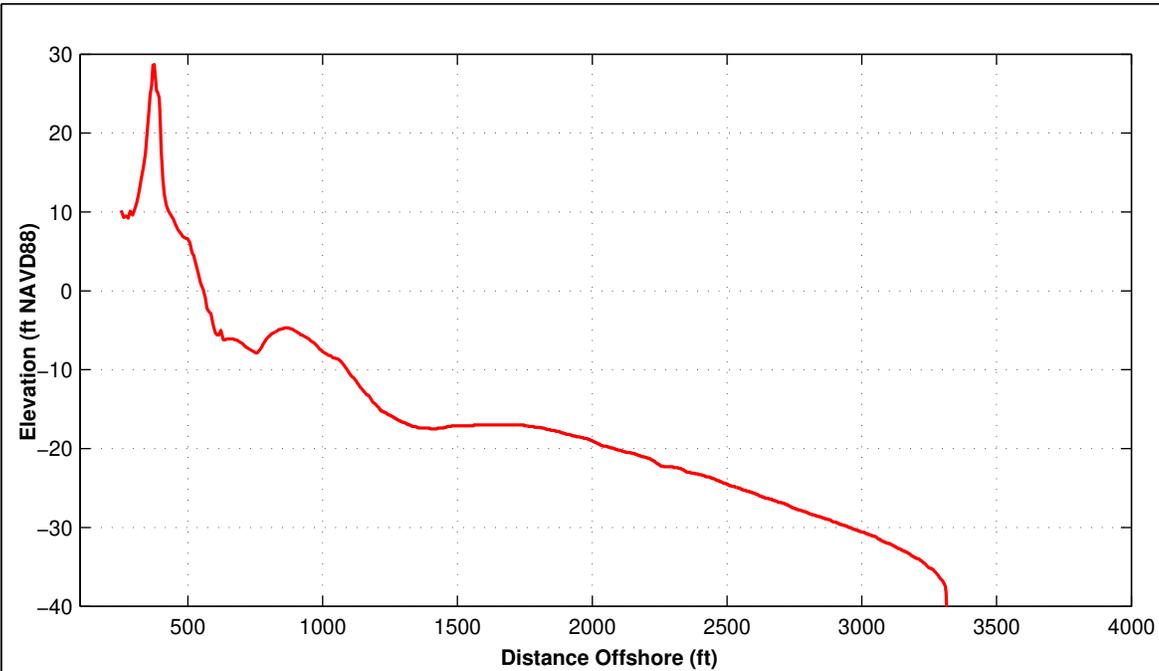
| | | |
|--|----------------------------|----------------------------|
| Survey Transect 1070+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.





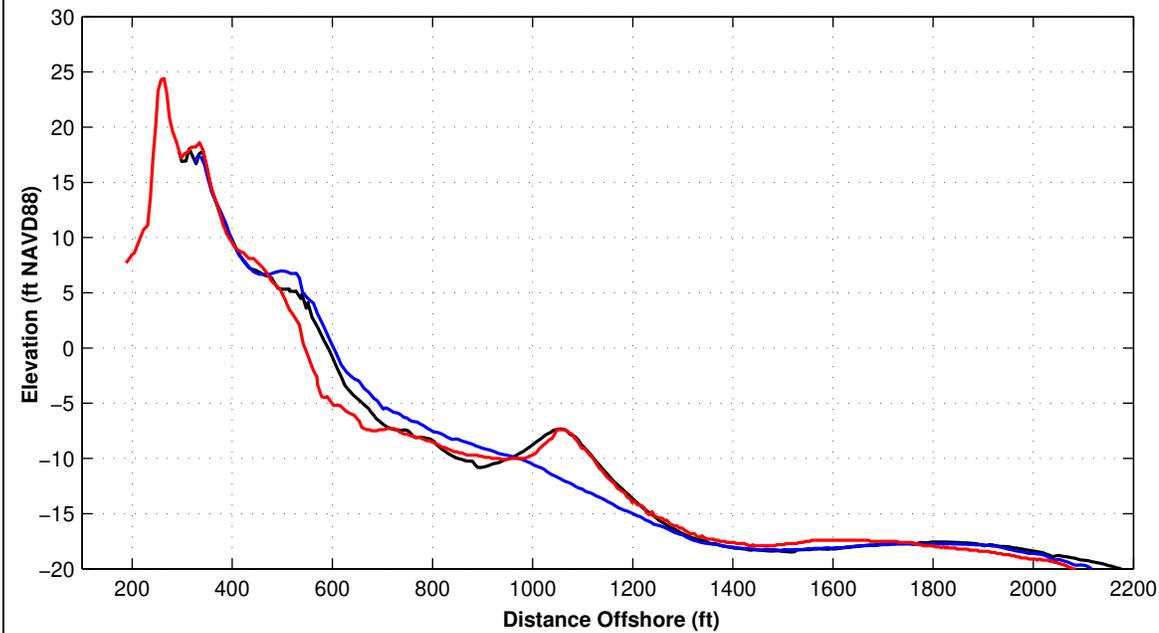
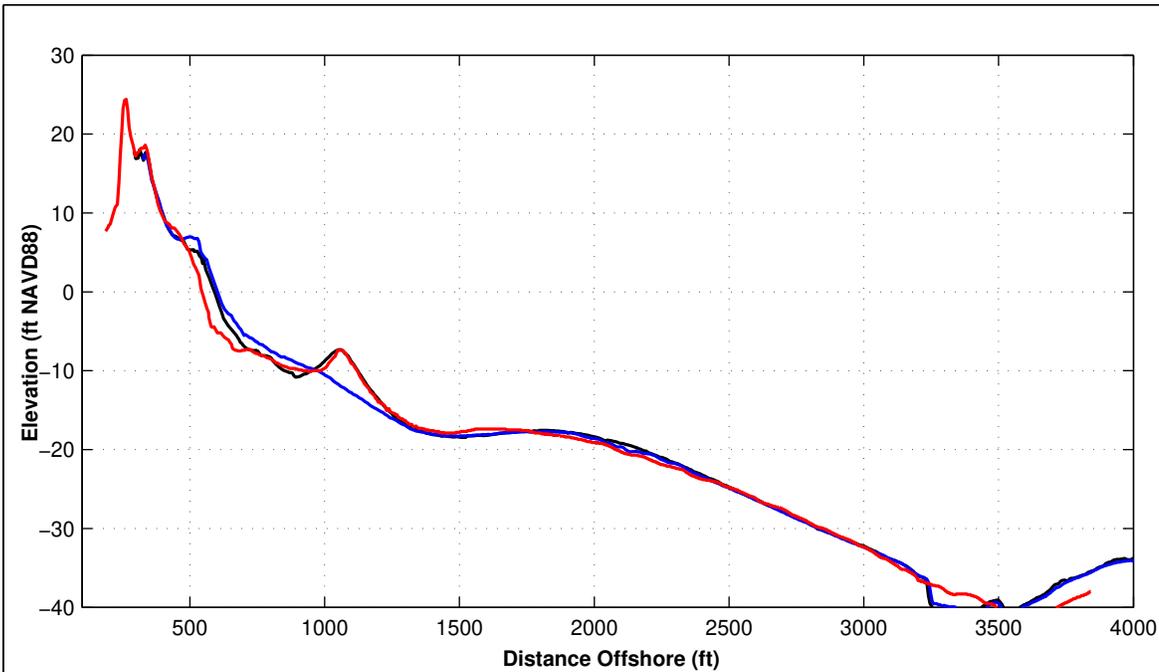
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|--|----------------------------|----------------------------|
| Survey Transect 1075+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.



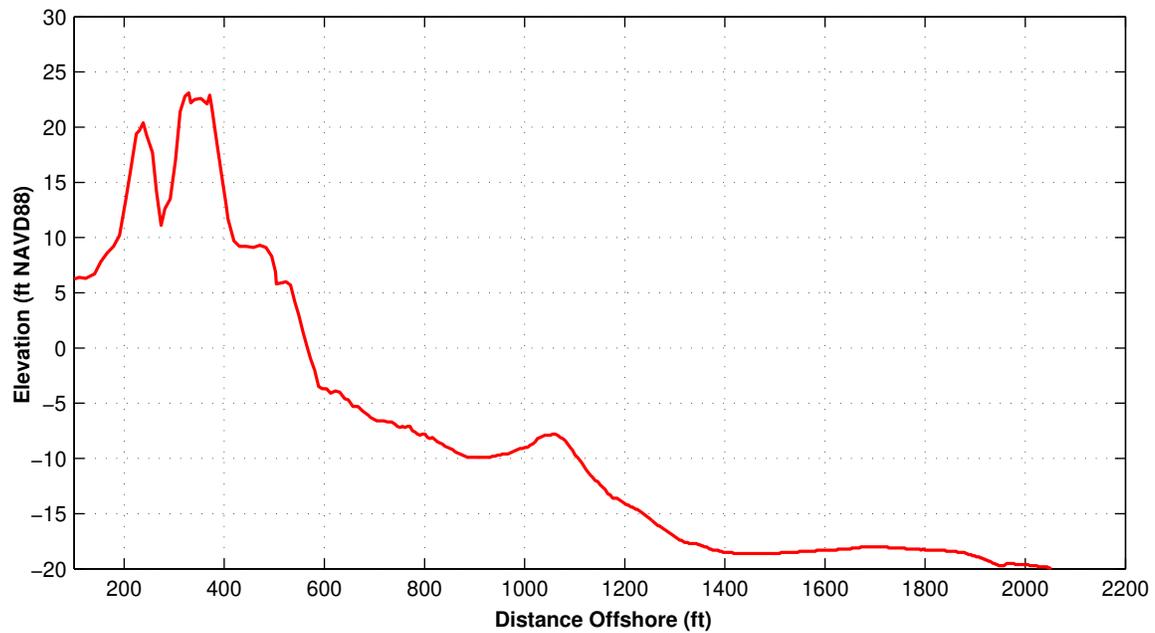
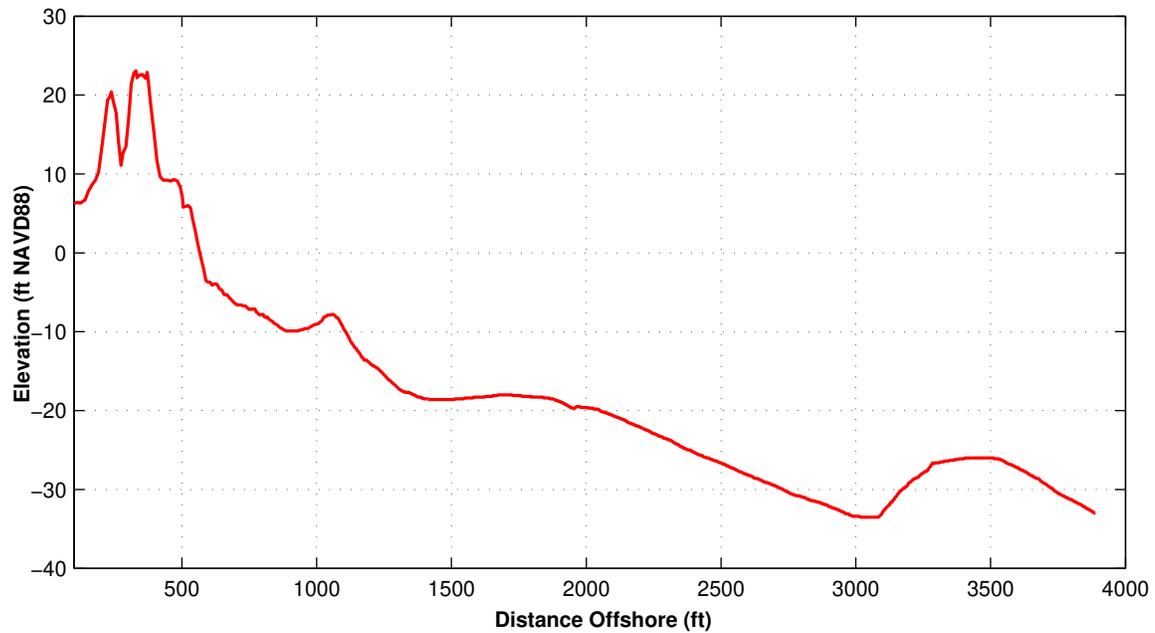


| Survey Transect 1080+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | - ft | -52.22 ft |
| Volume Change Above +6 ft NAVD88 | - cy/ft | 0.54 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | - cy/ft | -8.20 cy/ft |
| Volume Change Above -6 ft NAVD88 | - cy/ft | -27.79 cy/ft |
| Volume Change Above -14 ft NAVD88 | - cy/ft | -19.61 cy/ft |
| Volume Change Above -19 ft NAVD88 | - cy/ft | -11.68 cy/ft |
| Volume Change Above -30 ft NAVD88 | - cy/ft | -16.00 cy/ft |

LEGEND:
 JUNE 2020 ————
 AUGUST 2019 ————
 APRIL 2019 ————

- Notes:
 1. Station From North To South At Varying Intervals.
 2. Post-Dorian Survey Extends Between Station 495+00 to 1025+00
 3. All Survey Elevations In Feet Referenced to NAVD88.





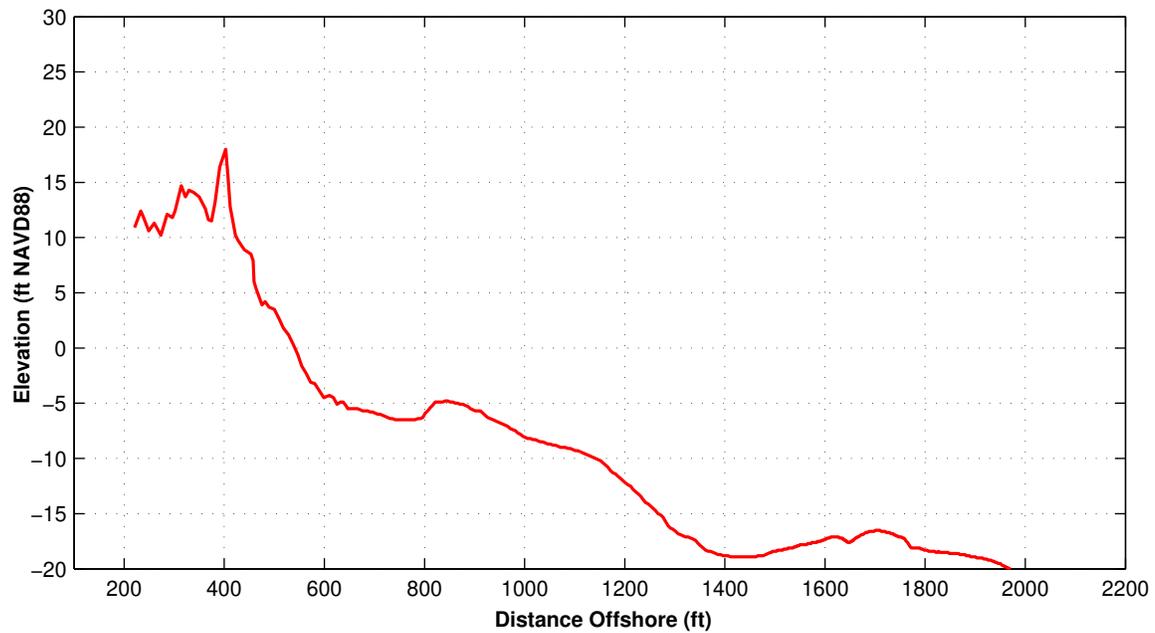
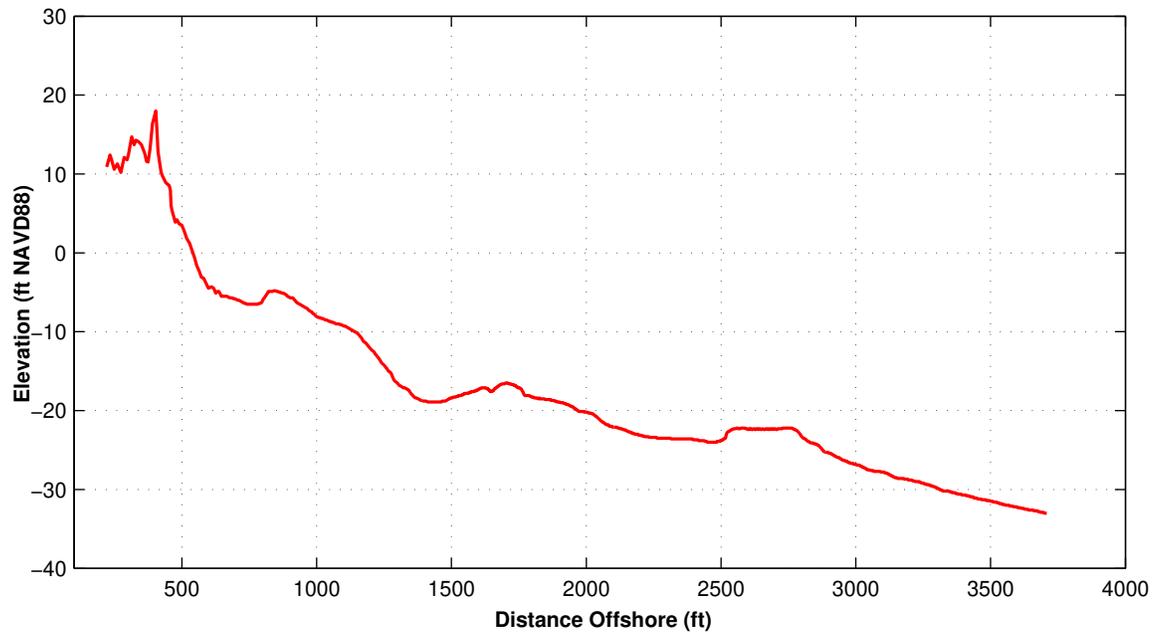
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|--|----------------------------|----------------------------|
| Survey Transect 1090+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.





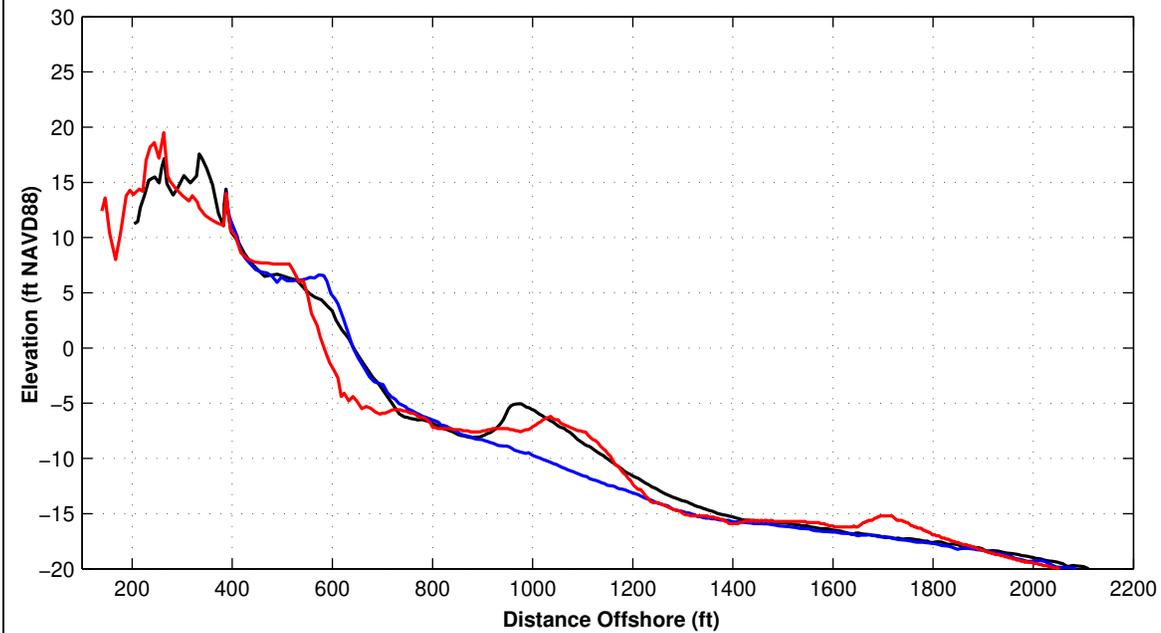
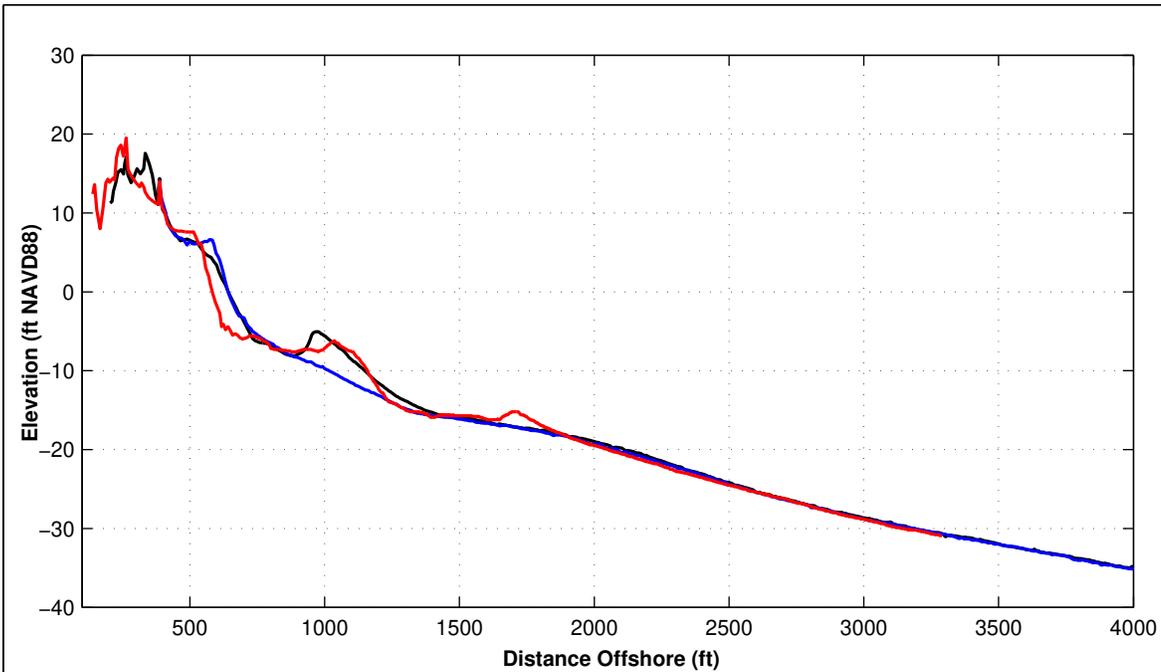
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|--|----------------------------|----------------------------|
| Survey Transect 1100+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.



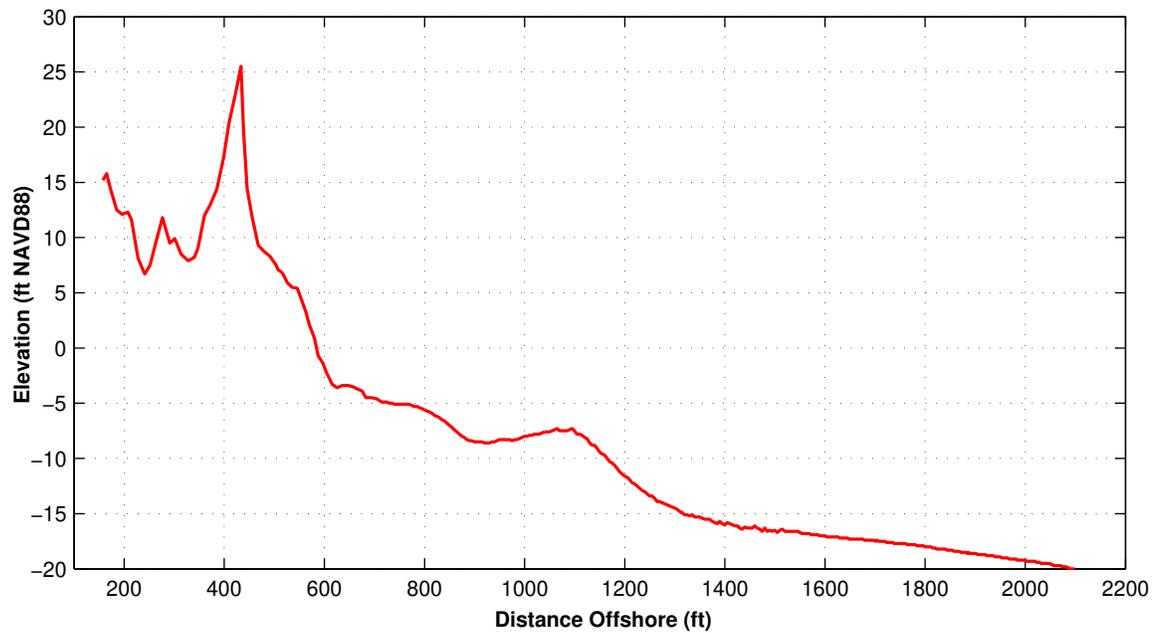
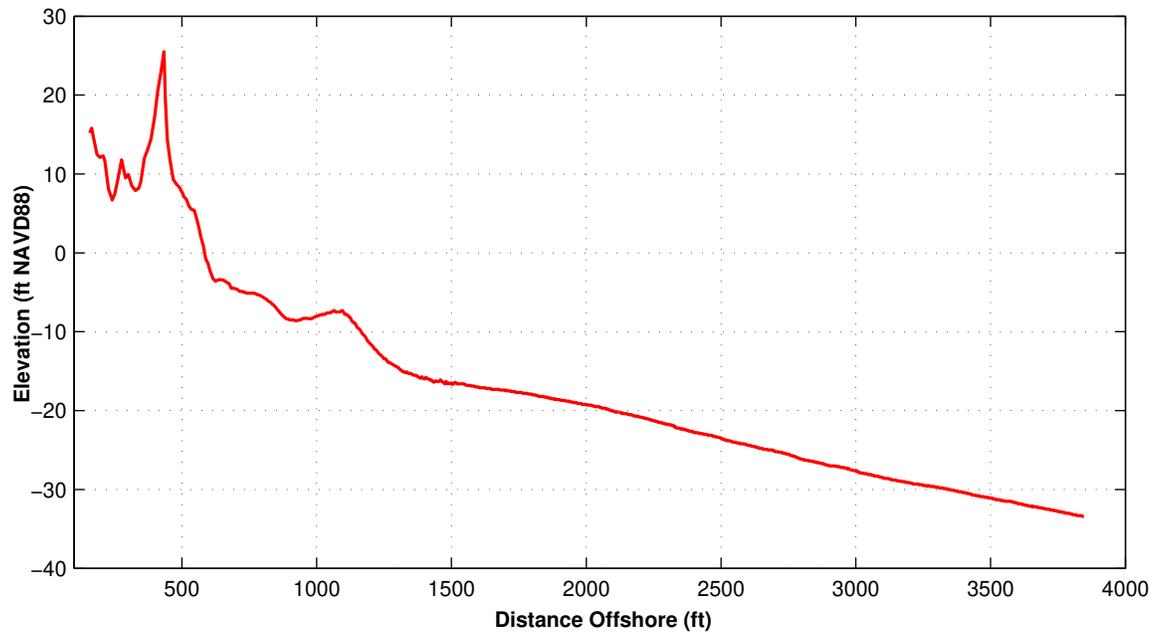


| Survey Transect 1110+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | - ft | -57.85 ft |
| Volume Change Above +6 ft NAVD88 | - cy/ft | 2.27 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | - cy/ft | -7.45 cy/ft |
| Volume Change Above -6 ft NAVD88 | - cy/ft | -25.72 cy/ft |
| Volume Change Above -14 ft NAVD88 | - cy/ft | 4.74 cy/ft |
| Volume Change Above -19 ft NAVD88 | - cy/ft | 18.43 cy/ft |
| Volume Change Above -30 ft NAVD88 | - cy/ft | 10.38 cy/ft |

LEGEND:
 JUNE 2020 — AUGUST 2019 —
 APRIL 2019 —

- Notes:
1. Station From North To South At Varying Intervals.
 2. Post-Dorian Survey Extends Between Station 495+00 to 1025+00
 3. All Survey Elevations In Feet Referenced to NAVD88.





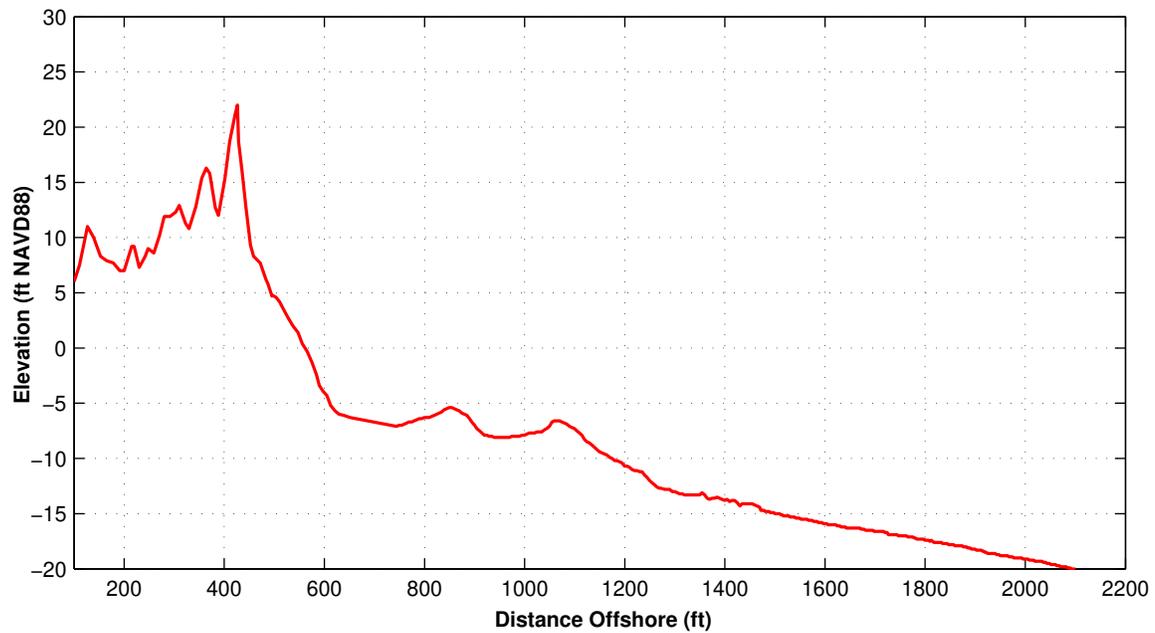
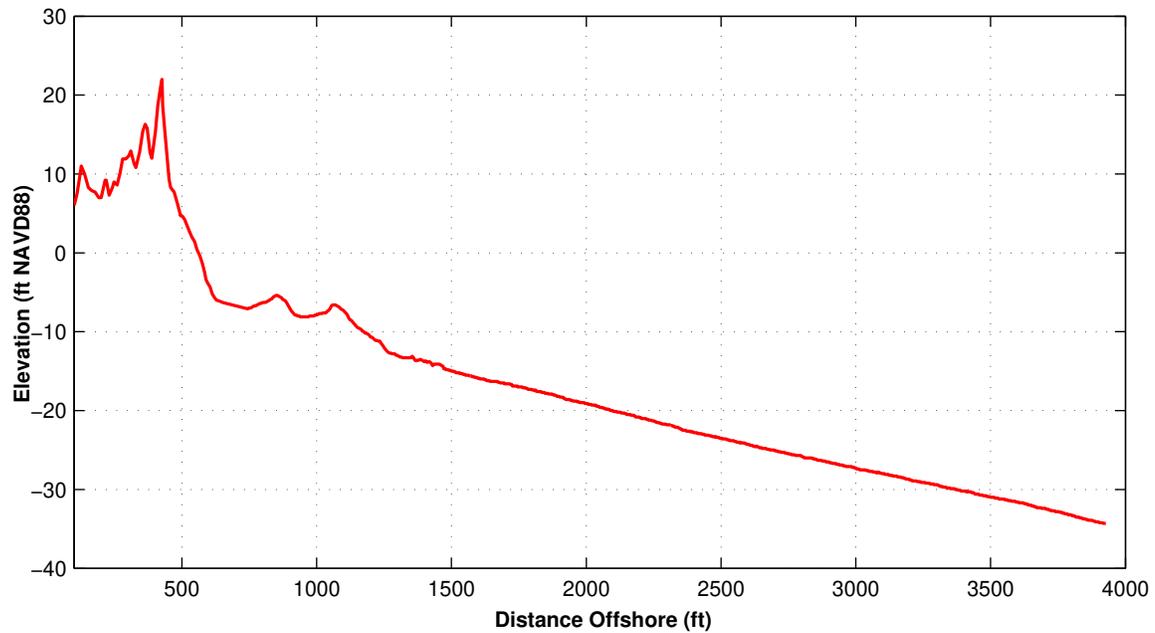
| | | |
|--|----------------------------|----------------------------|
| Survey Transect 1120+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.





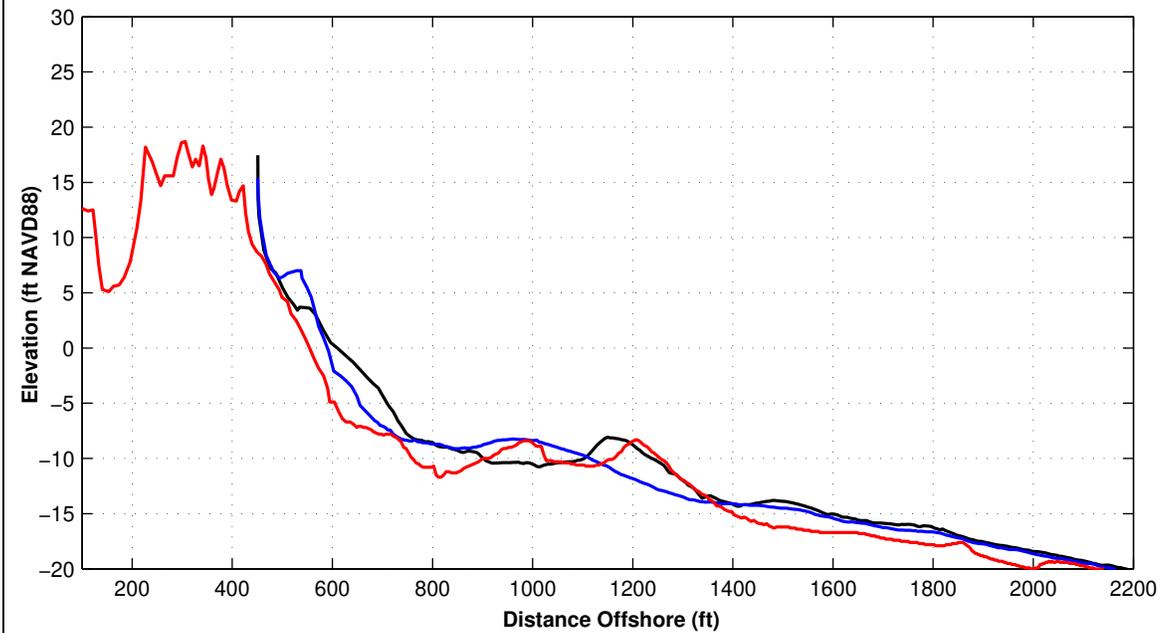
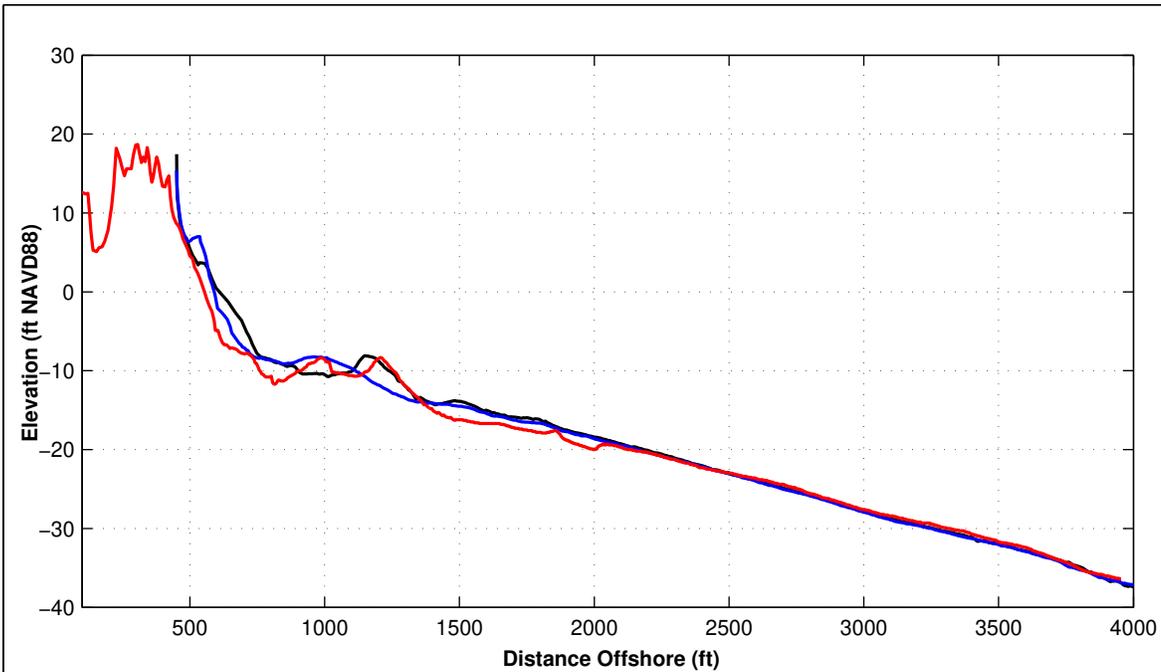
| | | |
|--|----------------------------|----------------------------|
| Survey Transect 1130+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.



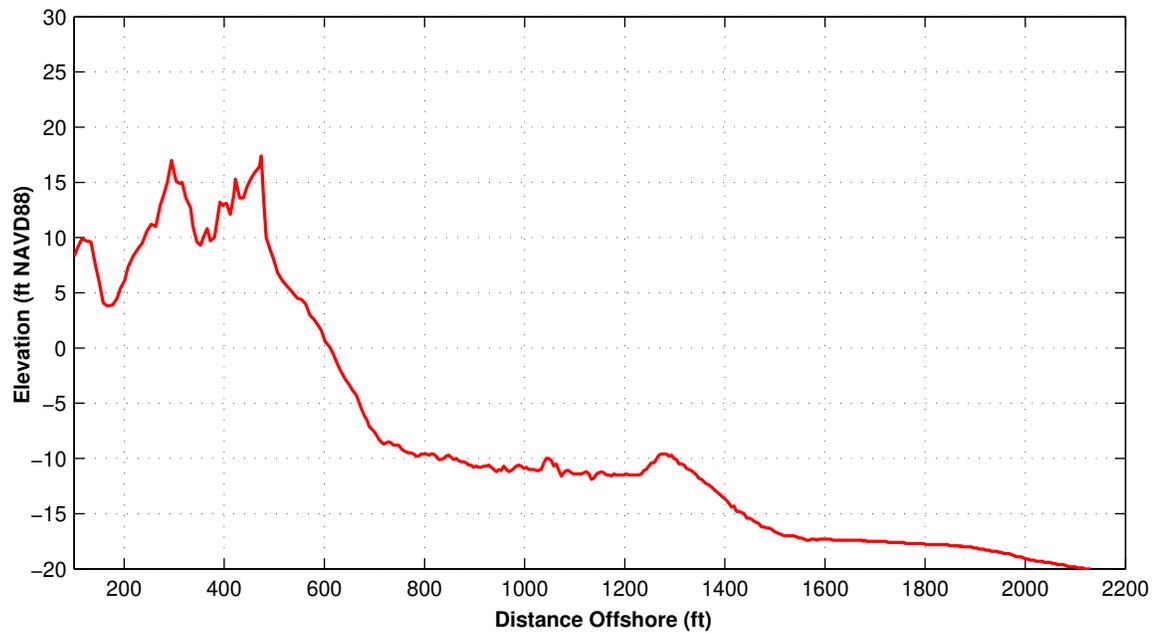
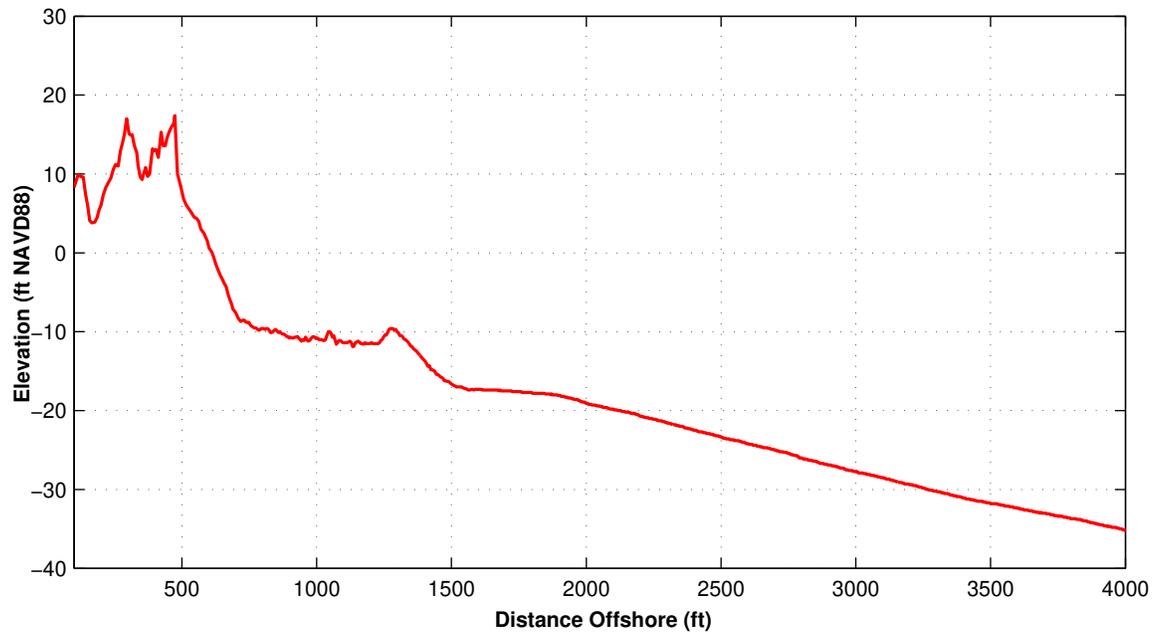


| Survey Transect 1140+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | - ft | -37.57 ft |
| Volume Change Above +6 ft NAVD88 | - cy/ft | 0.00 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | - cy/ft | 0.00 cy/ft |
| Volume Change Above -6 ft NAVD88 | - cy/ft | -7.51 cy/ft |
| Volume Change Above -14 ft NAVD88 | - cy/ft | -13.57 cy/ft |
| Volume Change Above -19 ft NAVD88 | - cy/ft | -39.31 cy/ft |
| Volume Change Above -30 ft NAVD88 | - cy/ft | -32.47 cy/ft |

LEGEND:
 JUNE 2020 ————
 AUGUST 2019 ————
 APRIL 2019 ————

- Notes:
 1. Station From North To South At Varying Intervals.
 2. Post-Dorian Survey Extends Between Station 495+00 to 1025+00
 3. All Survey Elevations In Feet Referenced to NAVD88.





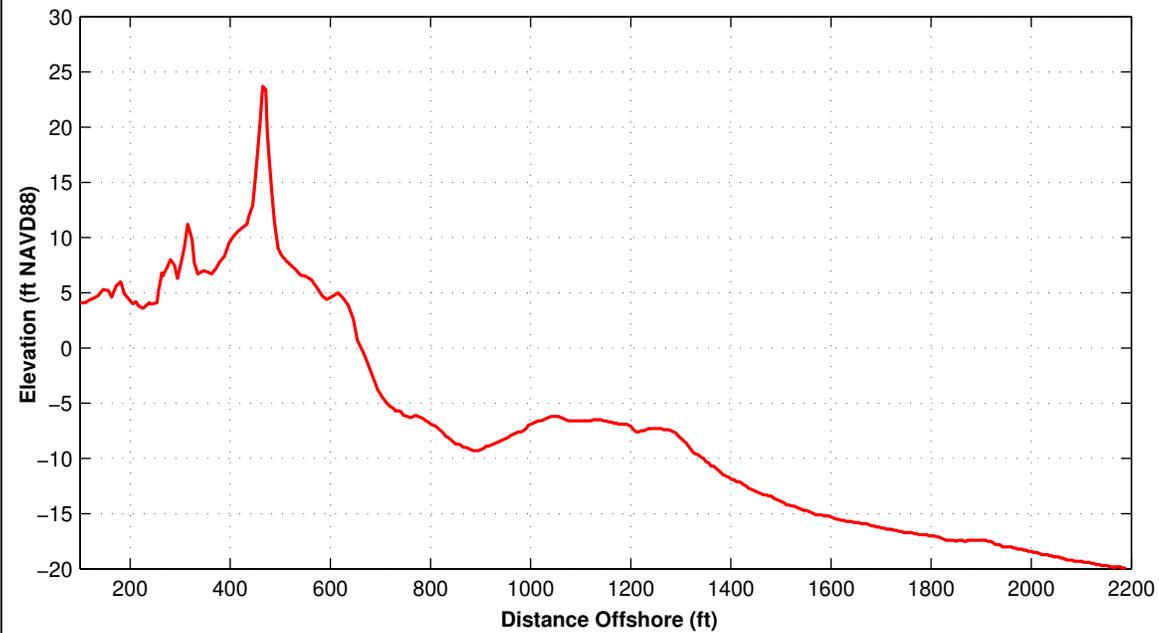
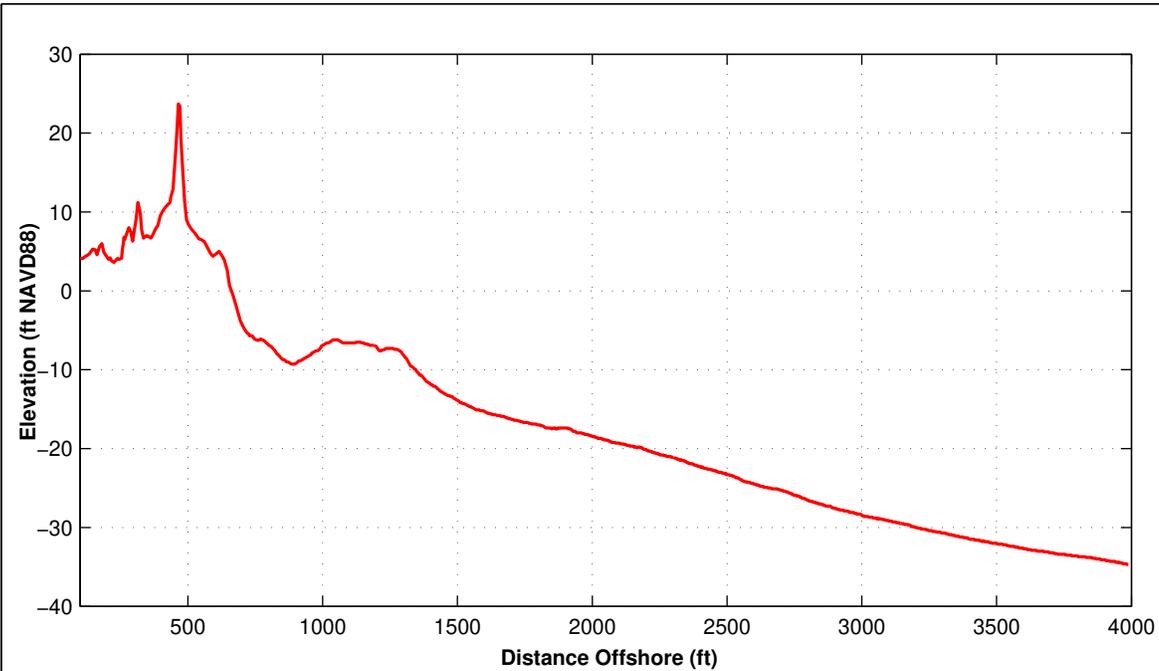
| | | |
|--|----------------------------|----------------------------|
| Survey Transect 1150+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.





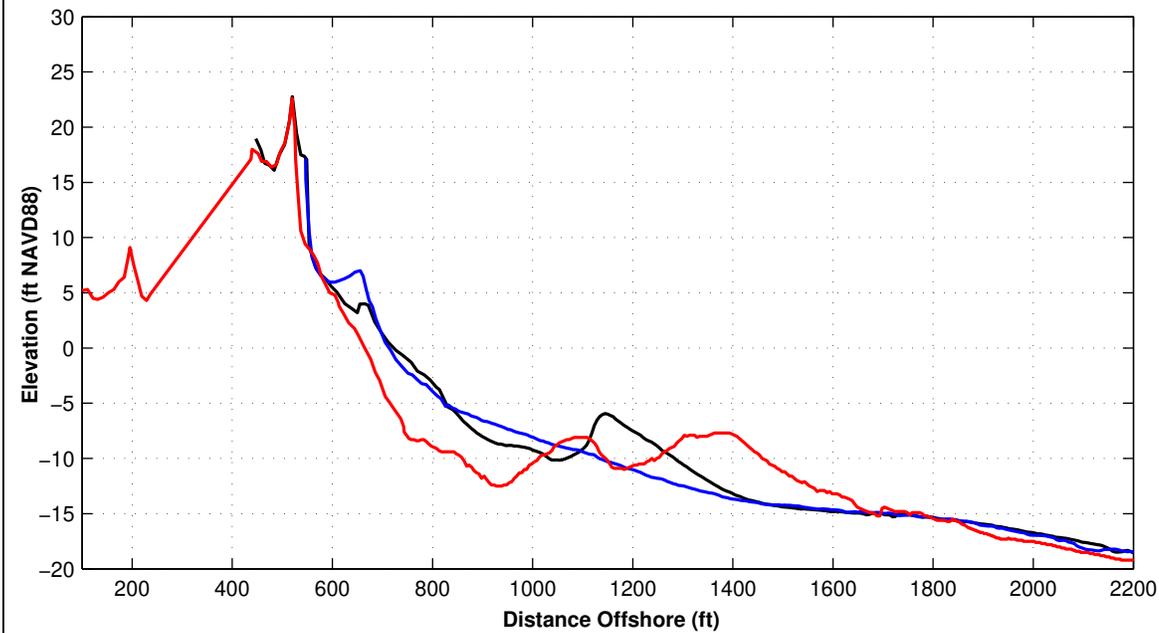
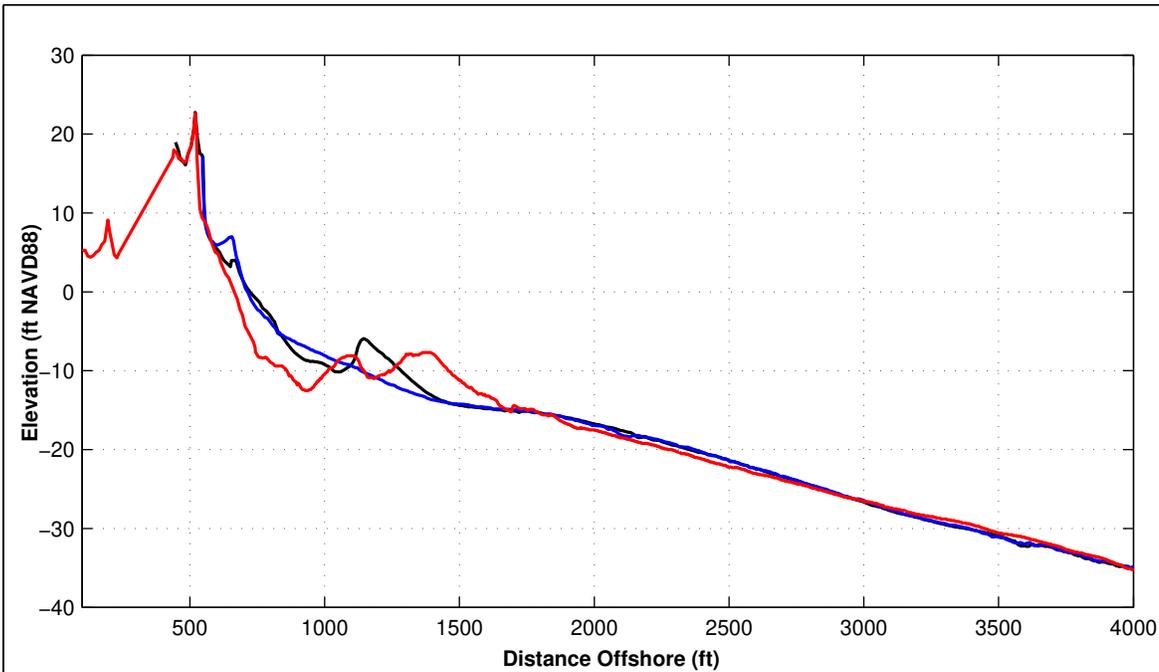
| | | |
|--|----------------------------|----------------------------|
| Survey Transect 1160+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.



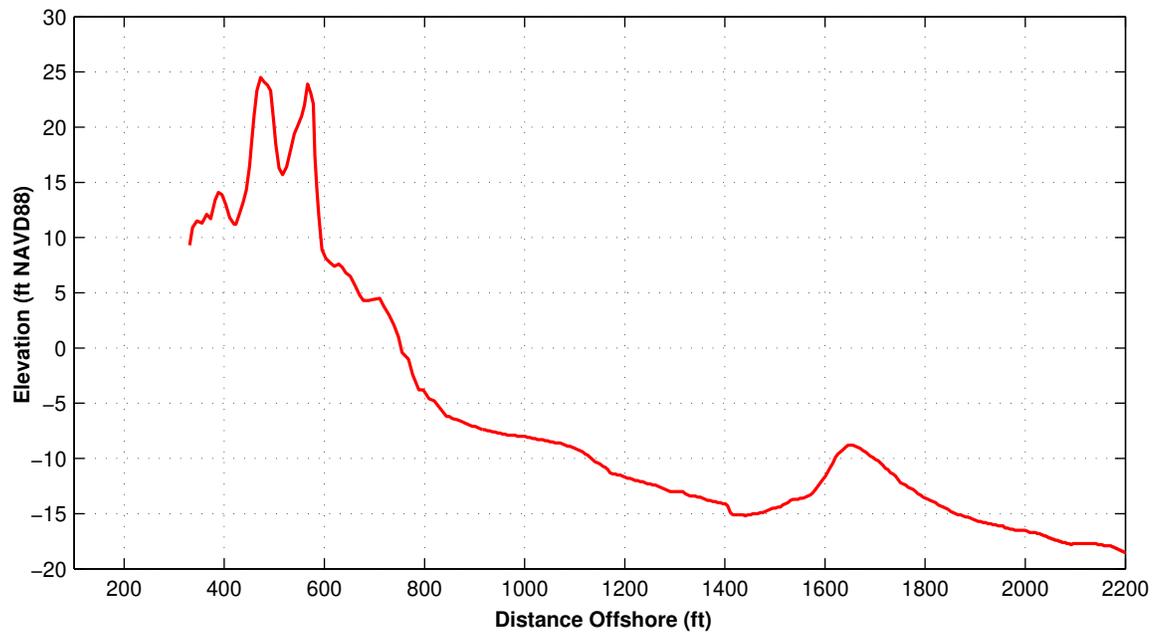
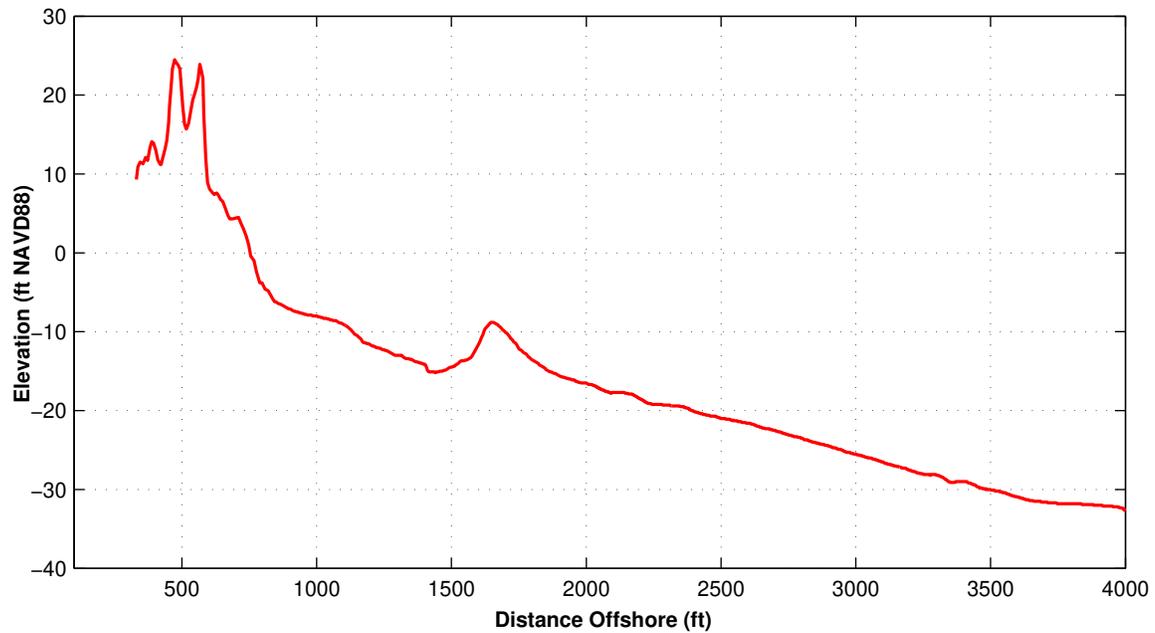


| Survey Transect 1170+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | - ft | -47.85 ft |
| Volume Change Above +6 ft NAVD88 | - cy/ft | 0.00 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | - cy/ft | -2.75 cy/ft |
| Volume Change Above -6 ft NAVD88 | - cy/ft | -22.74 cy/ft |
| Volume Change Above -14 ft NAVD88 | - cy/ft | -8.20 cy/ft |
| Volume Change Above -19 ft NAVD88 | - cy/ft | -12.71 cy/ft |
| Volume Change Above -30 ft NAVD88 | - cy/ft | -22.88 cy/ft |

LEGEND:
 JUNE 2020 ————
 AUGUST 2019 ————
 APRIL 2019 ————

- Notes:
 1. Station From North To South At Varying Intervals.
 2. Post-Dorian Survey Extends Between Station 495+00 to 1025+00
 3. All Survey Elevations In Feet Referenced to NAVD88.





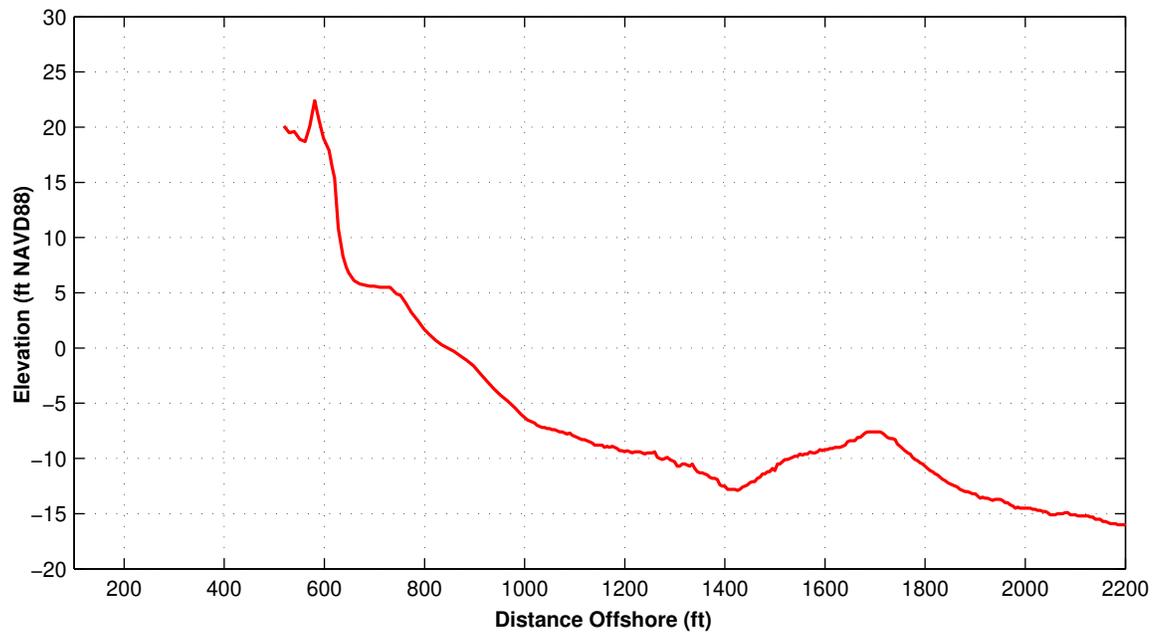
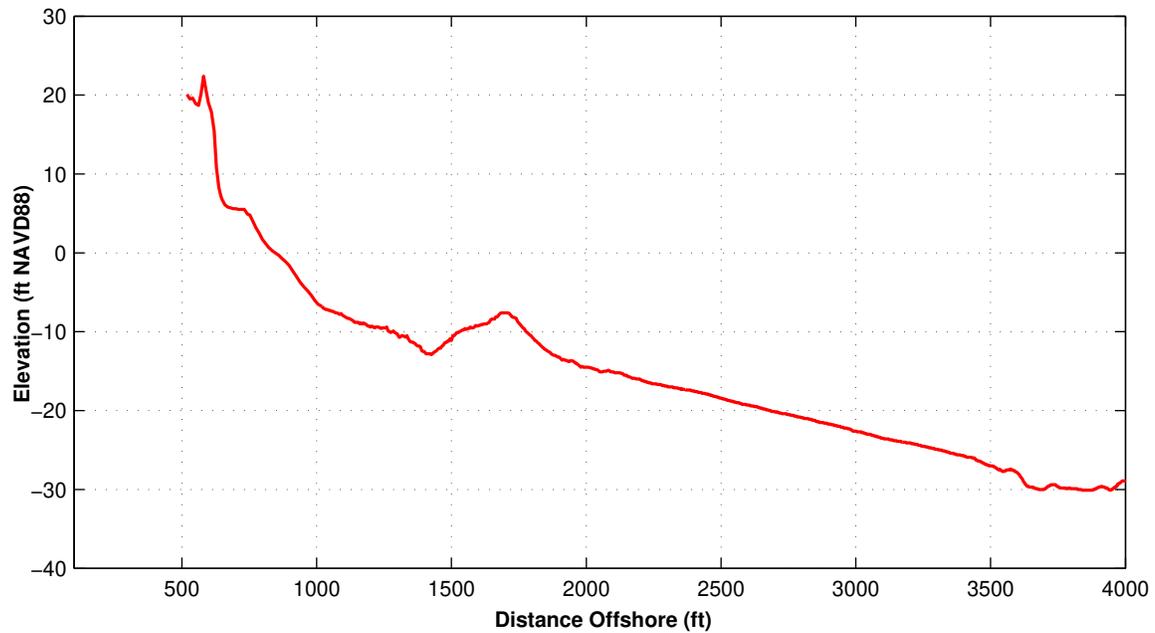
| | | |
|--|----------------------------|----------------------------|
| Survey Transect 1180+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.





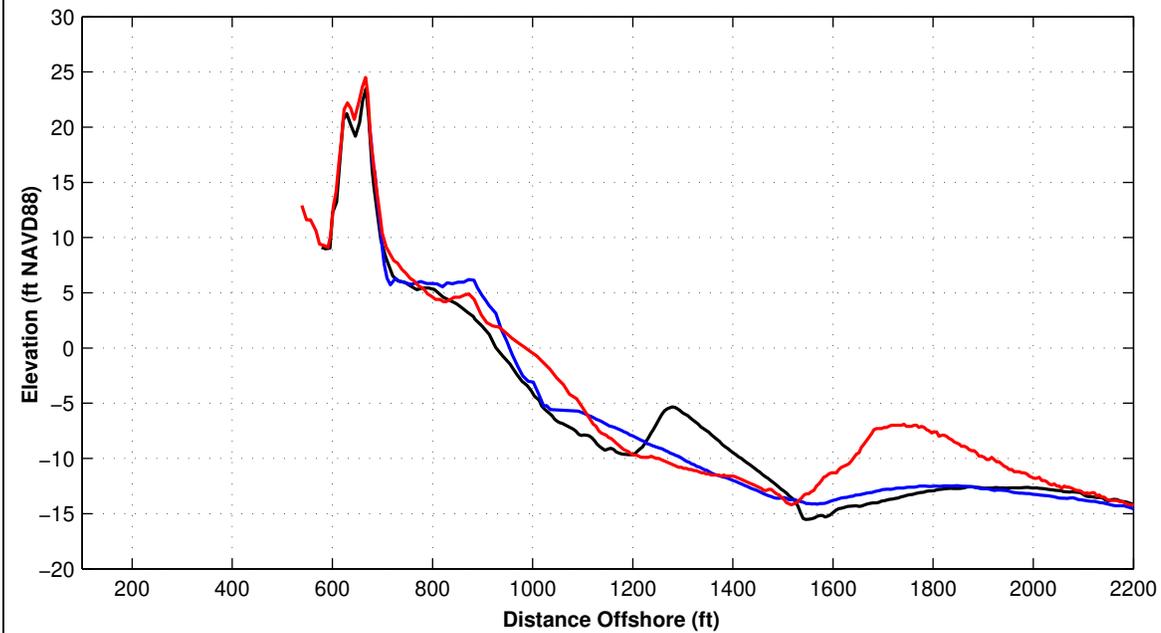
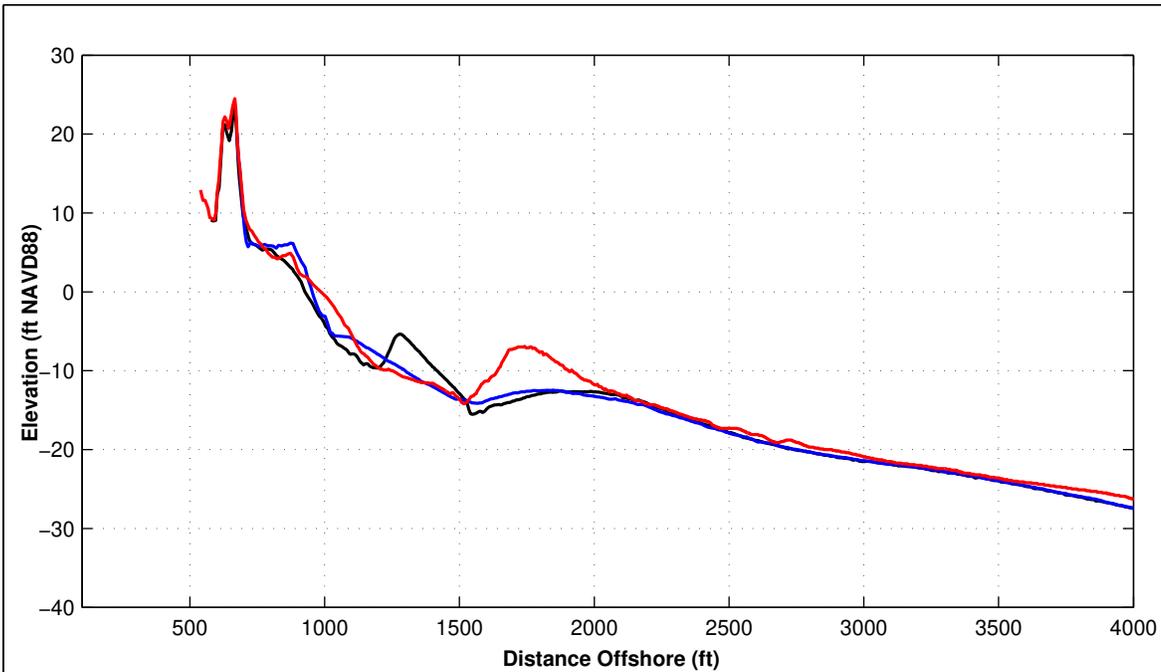
| | | |
|--|----------------------------|----------------------------|
| Survey Transect 1190+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.



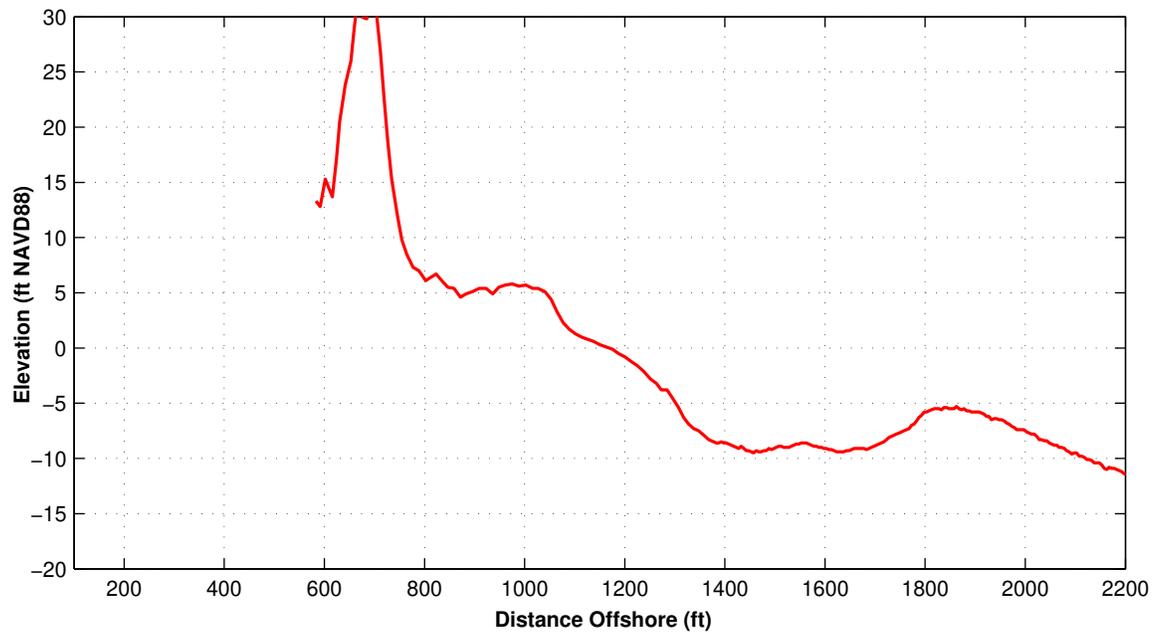
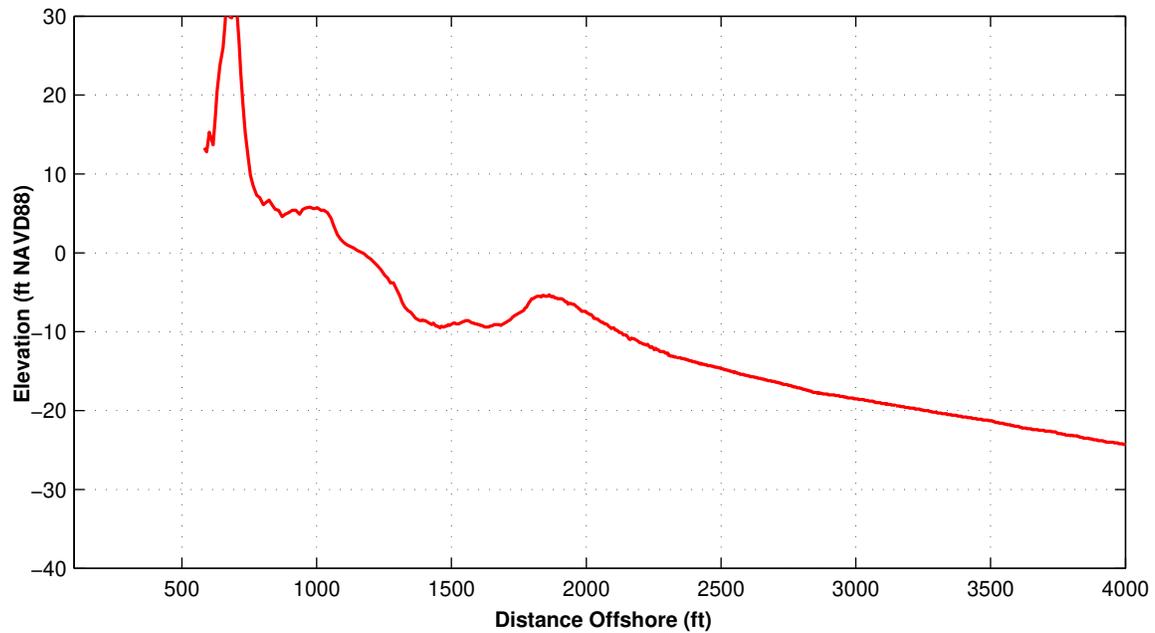


| Survey Transect 1200+00 | POST-DORIAN AUGUST 2019 | JUNE 2020 - AUGUST 2019 |
|---|----------------------------|----------------------------|
| Shoreline Change at MHW (1.18 ft NAVD88) | - ft | 8.77 ft |
| Volume Change Above +6 ft NAVD88 | - cy/ft | 0.37 cy/ft |
| Volume Change Above 1.18 ft NAVD88 | - cy/ft | -7.29 cy/ft |
| Volume Change Above -6 ft NAVD88 | - cy/ft | 6.12 cy/ft |
| Volume Change Above -14 ft NAVD88 | - cy/ft | 65.23 cy/ft |
| Volume Change Above -19 ft NAVD88 | - cy/ft | 75.36 cy/ft |
| Volume Change Above -30 ft NAVD88 | - cy/ft | 120.69 cy/ft |

LEGEND:
 JUNE 2020 ————
 AUGUST 2019 ————
 APRIL 2019 ————

- Notes:
 1. Station From North To South At Varying Intervals.
 2. Post-Dorian Survey Extends Between Station 495+00 to 1025+00
 3. All Survey Elevations In Feet Referenced to NAVD88.





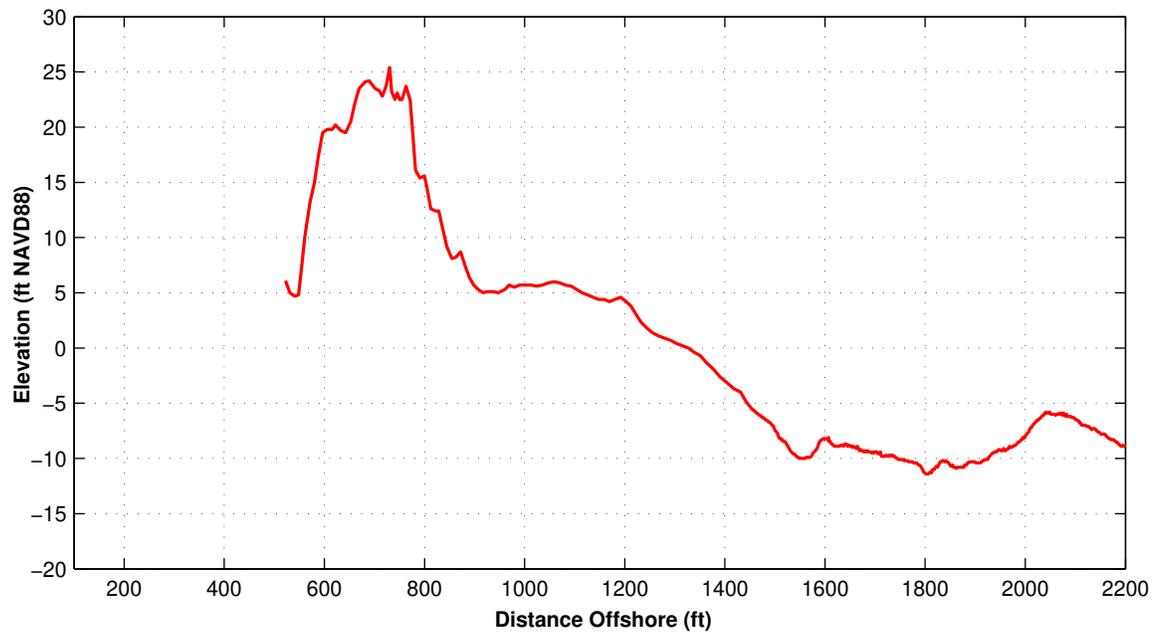
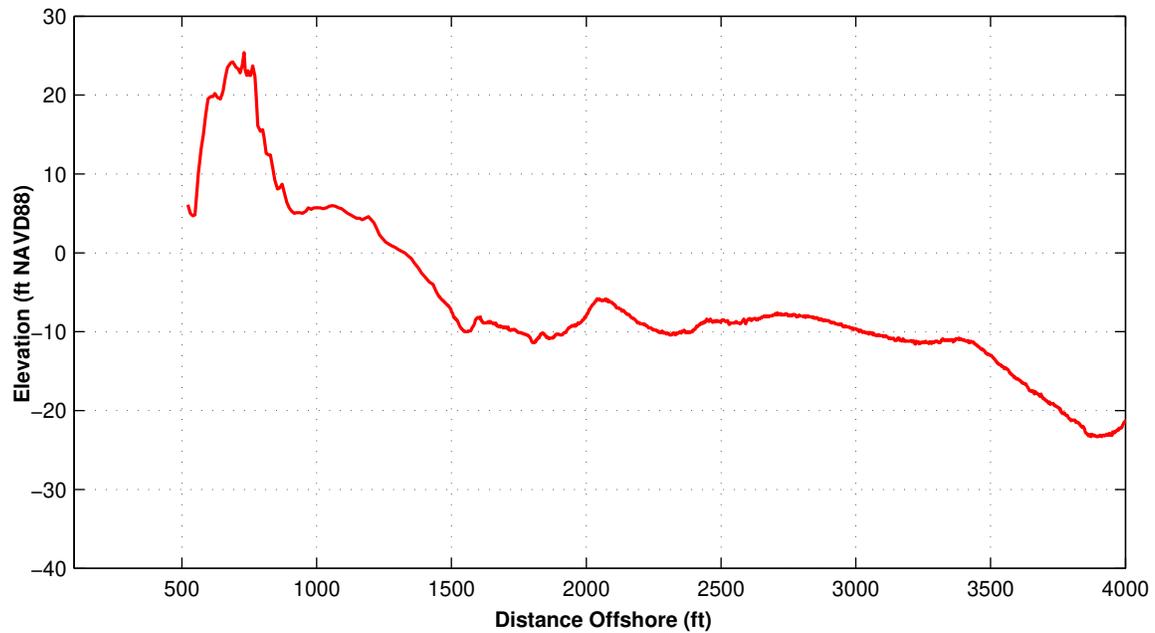
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| Survey Transect 1210+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.





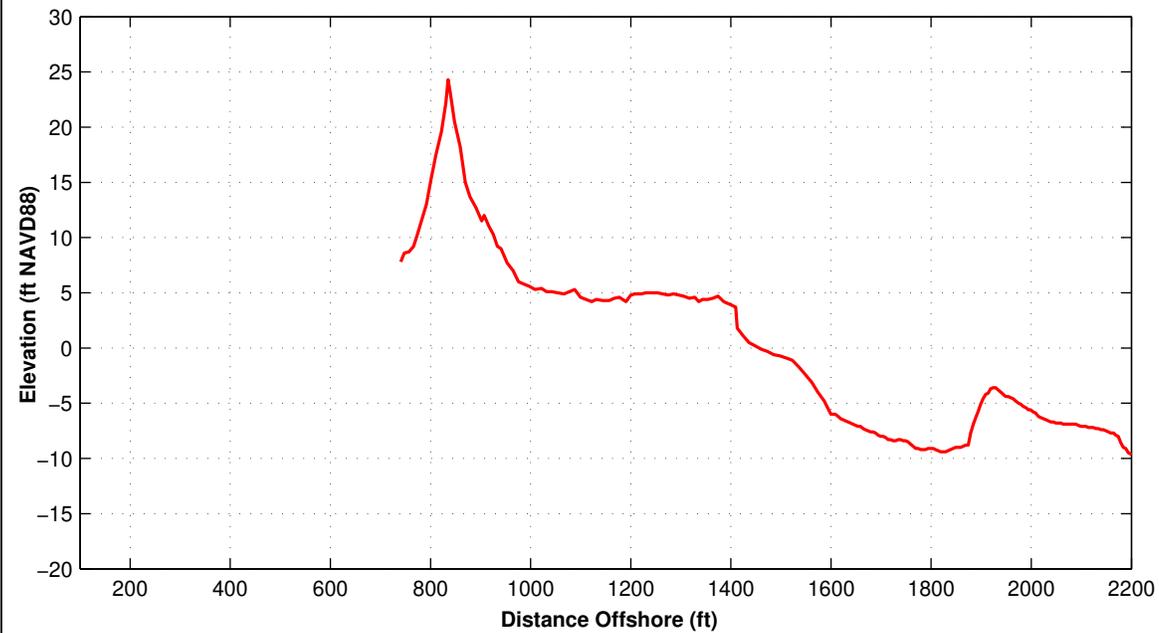
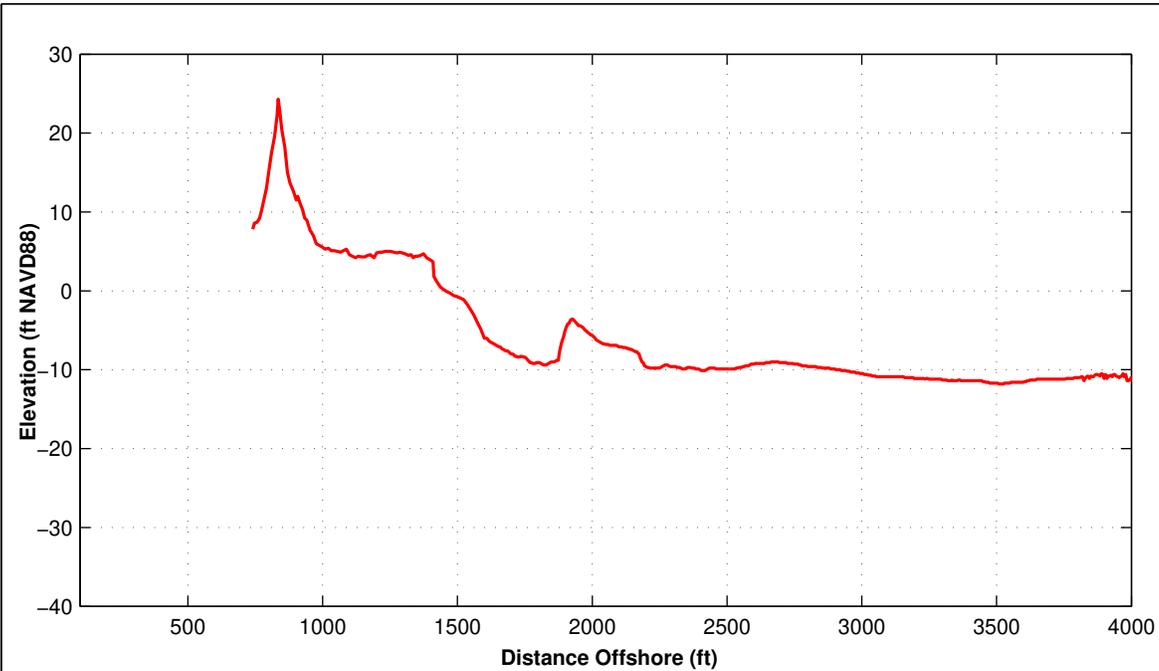
| | | |
|--|----------------------------|----------------------------|
| Survey Transect 1220+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.





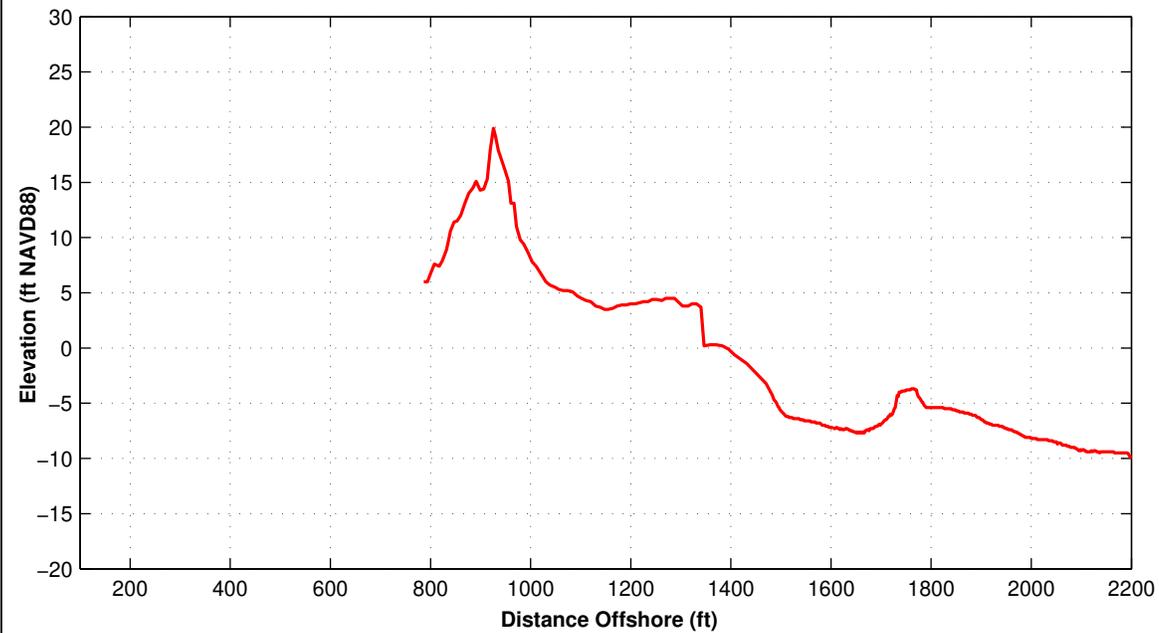
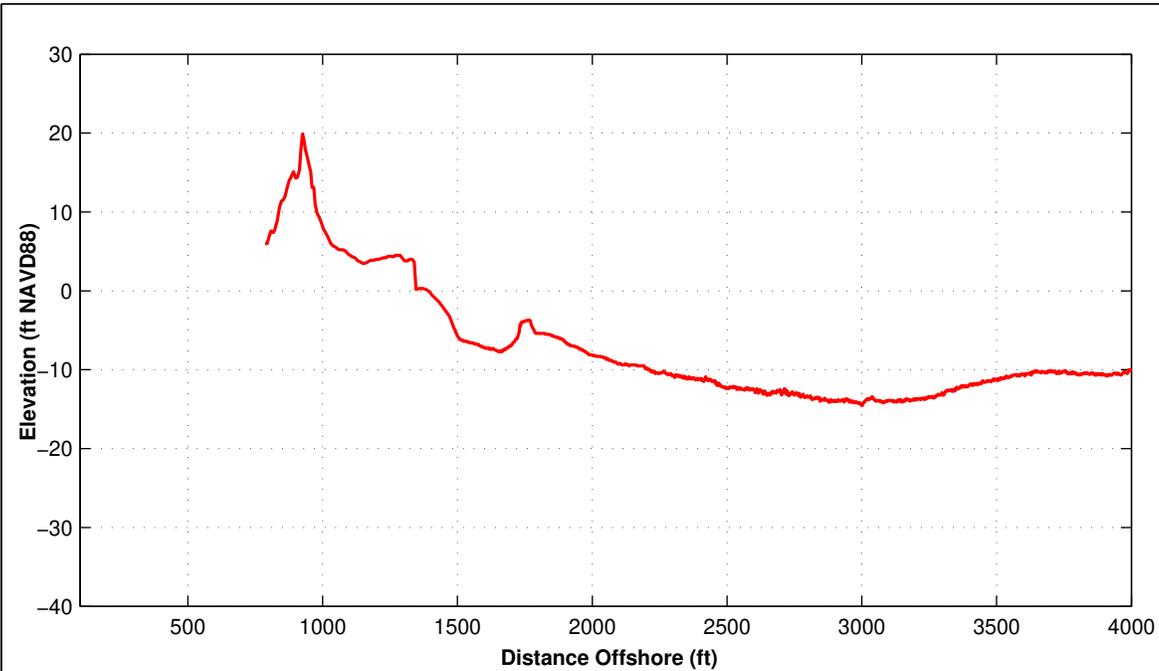
| | | |
|--|----------------------------|----------------------------|
| Survey Transect 1230+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
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 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.





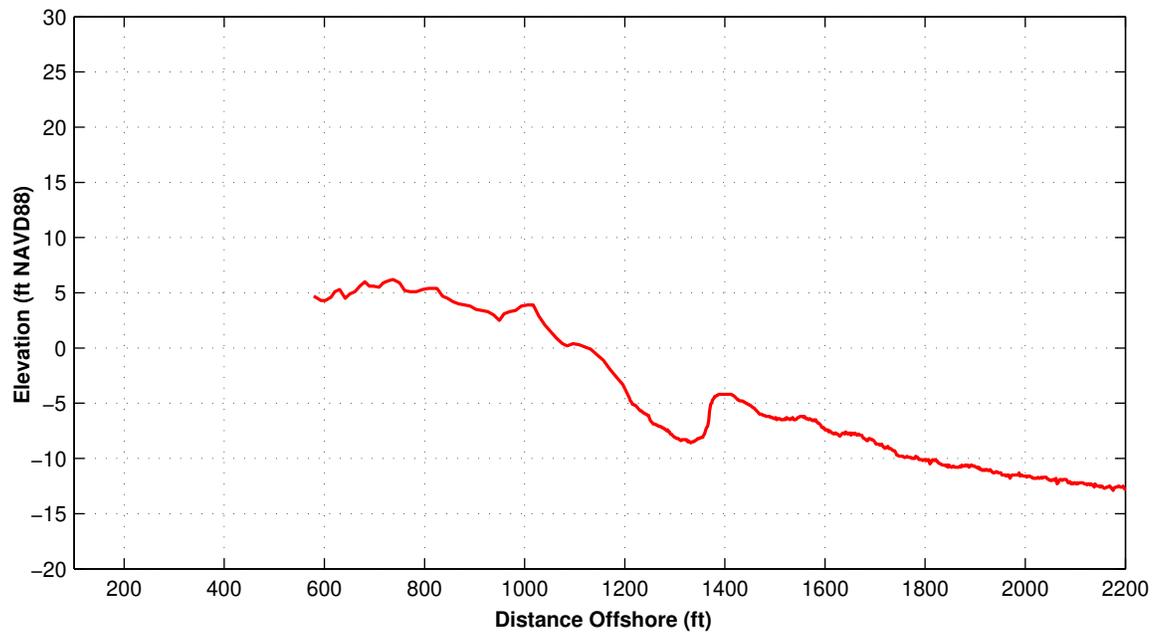
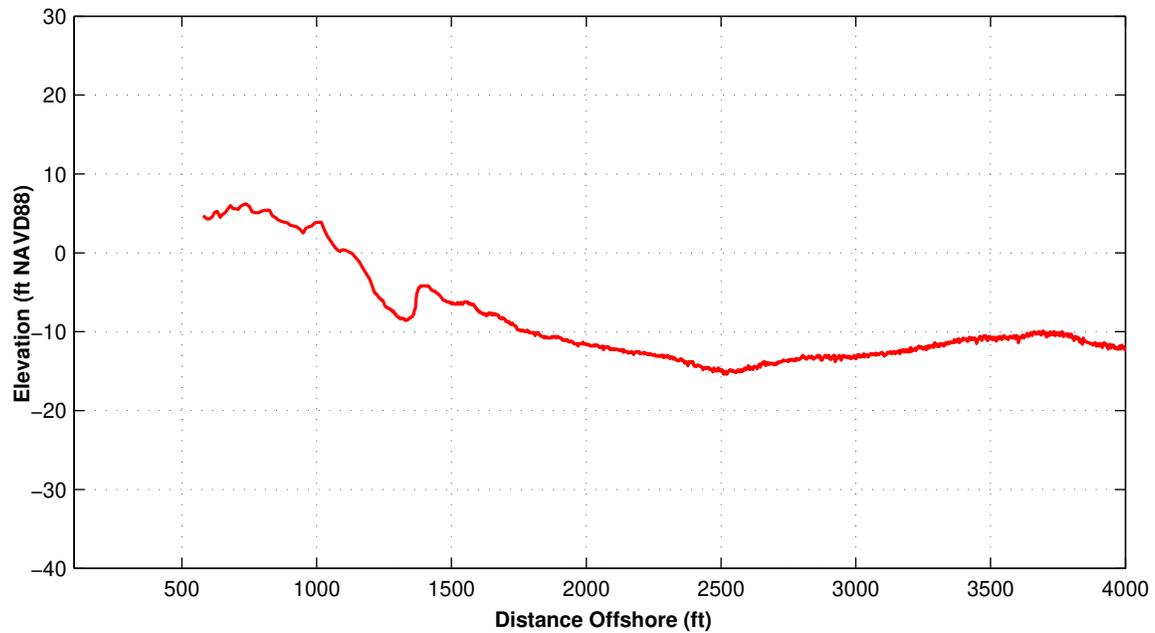
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| Survey Transect 1240+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.





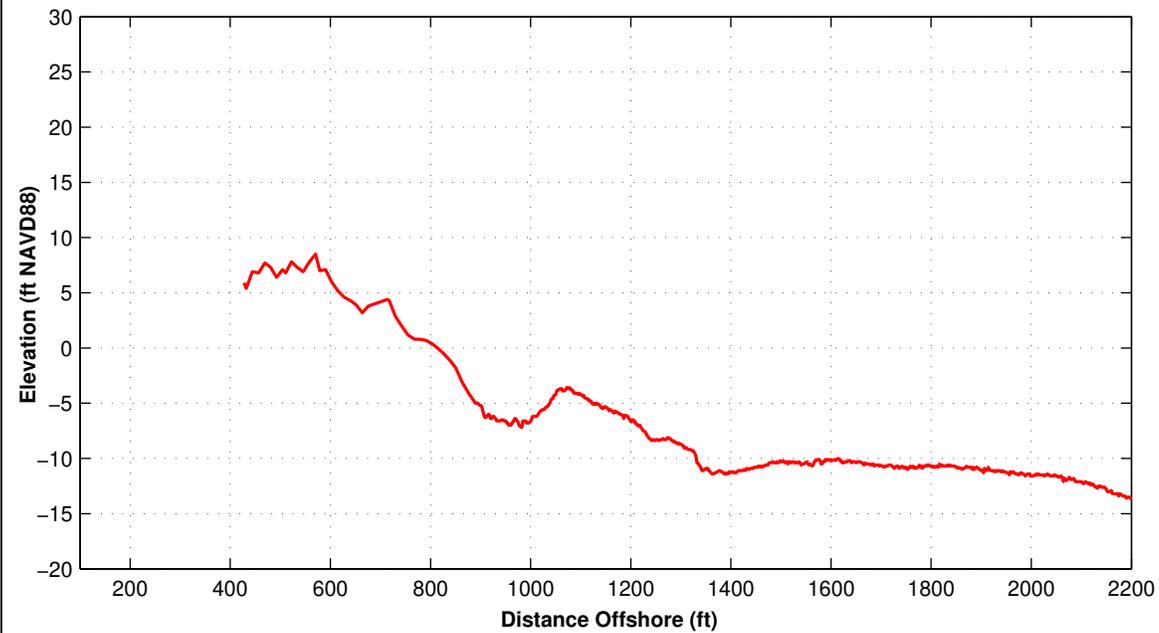
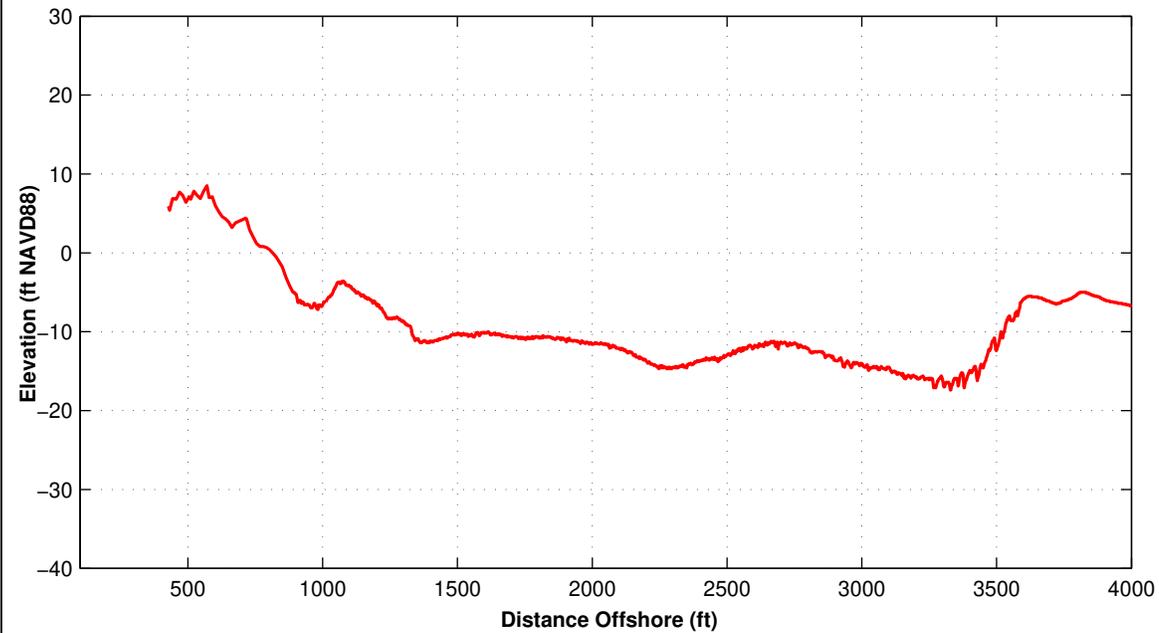
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|--|----------------------------|----------------------------|
| Survey Transect 1250+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.



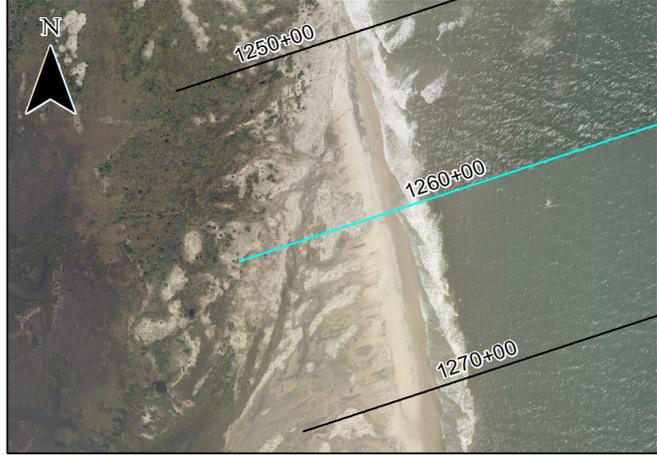


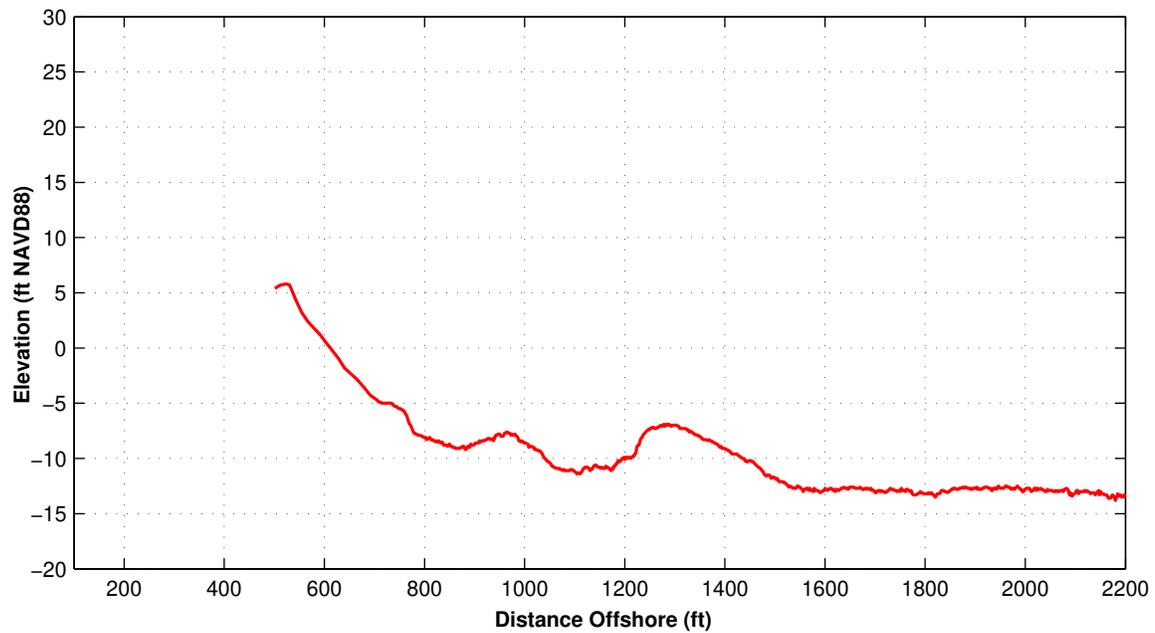
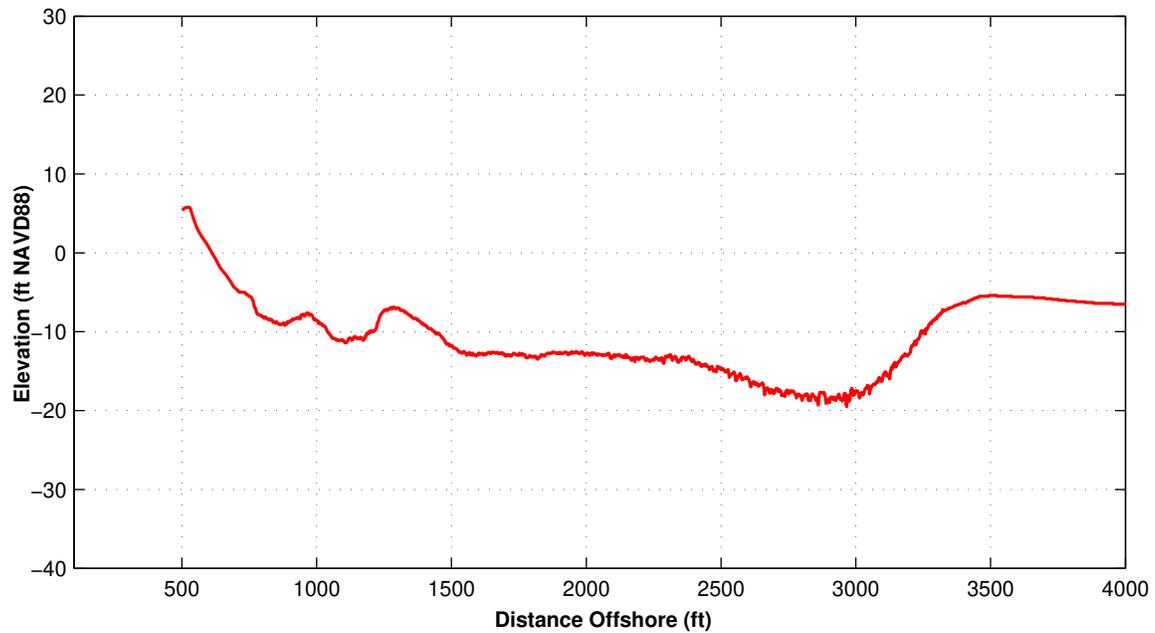
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| Survey Transect 1260+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.





| | | |
|--|----------------------------|----------------------------|
| Survey Transect 1270+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

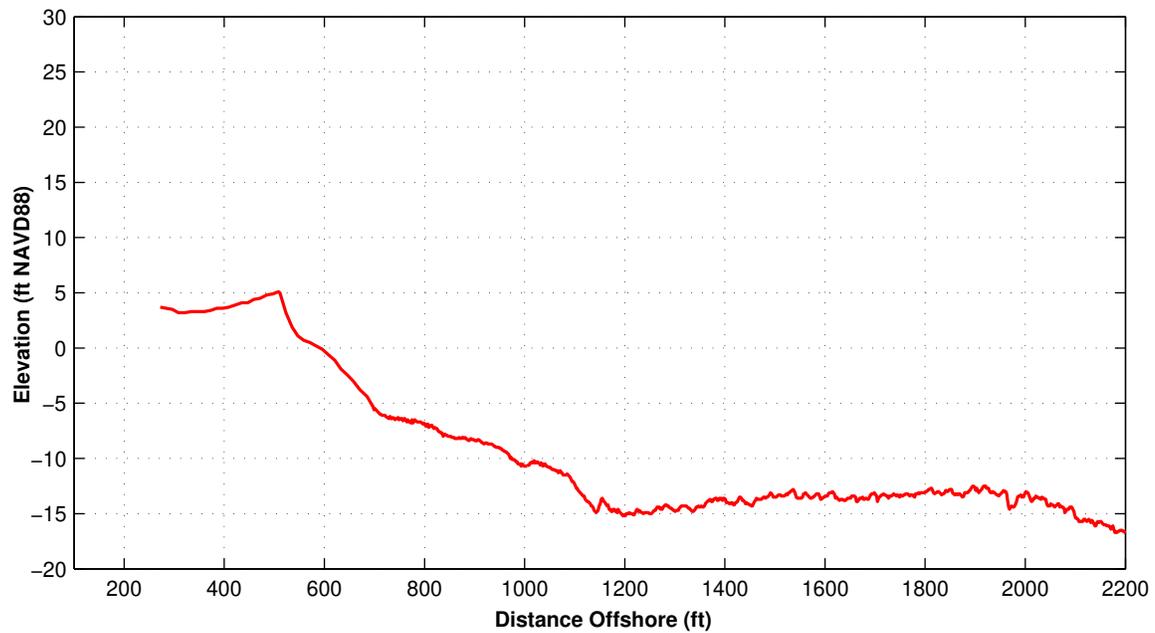
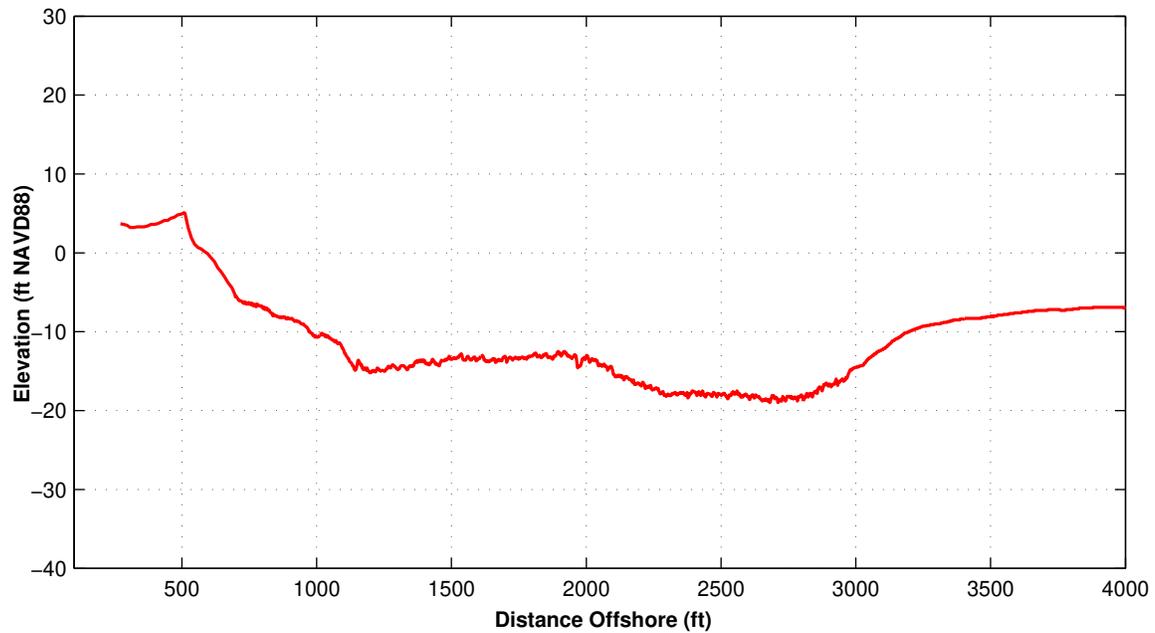
LEGEND:

JUNE 2020 —

Notes:

1. This transect was first surveyed during 2020 survey.
2. Station From North To South At Varying Intervals.
3. All Survey Elevations In Feet Referenced to NAVD88.





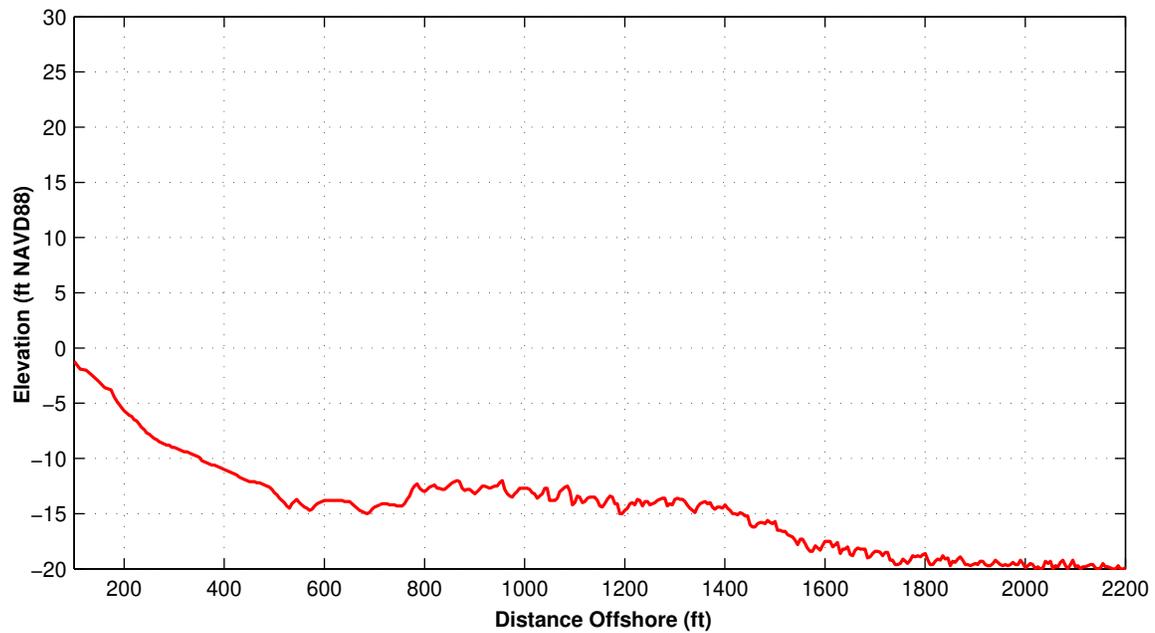
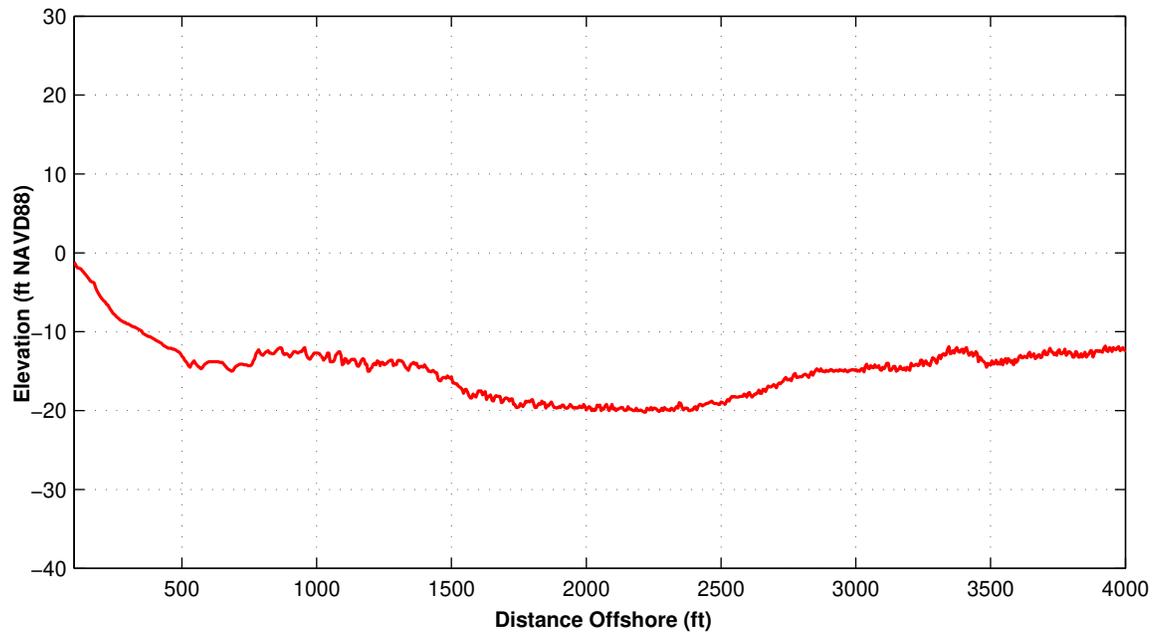
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|--|----------------------------|----------------------------|
| Survey Transect 1280+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.





| | | |
|--|----------------------------|----------------------------|
| Survey Transect 1290+00 | POST DORIAN AUGUST 2019 | JUNE 2019 - AUGUST 2019 |
| NEW STATION NO CALCULATIONS | | |

LEGEND:

JUNE 2020 —

- Notes:
1. This transect was first surveyed during 2020 survey.
 2. Station From North To South At Varying Intervals.
 3. All Survey Elevations In Feet Referenced to NAVD88.



APPENDIX C

TABULATED SHORELINE AND VOLUME CHANGE DATA



NOTES:

1. Positive changes indicate accretion or gain in volume along the profile and negative changes indicate erosion or loss of volume along the profile.
2. Shoreline Change and Volume Change is calculated for the period between surveys from August 21, 2019 to June 24, 2020.

| Reach | Transect Number | Station | Shoreline Change @ MHW (+1.18 ft NAVD) | Above Berm (+6 ft NAVD88) | | Above MHW (+1.18 ft NAVD88) | | Above -6 ft NAVD88 | | Above -14 ft NAVD88 | | Above -19 ft NAVD88 | | Above -30 ft NAVD88 | | | |
|---------------------|-----------------|---------|--|------------------------------|---------------------------------|------------------------------|---------------------------------|------------------------------|---------------------------------|------------------------------|---------------------------------|------------------------------|---------------------------------|------------------------------|---------------------------------|------------------------------|---------------------------------|
| | | | | 2020 Measured Volume (cy/ft) | 2019-2020 Volume Change (cy/ft) | 2020 Measured Volume (cy/ft) | 2019-2020 Volume Change (cy/ft) | 2020 Measured Volume (cy/ft) | 2019-2020 Volume Change (cy/ft) | 2020 Measured Volume (cy/ft) | 2019-2020 Volume Change (cy/ft) | 2020 Measured Volume (cy/ft) | 2019-2020 Volume Change (cy/ft) | 2020 Measured Volume (cy/ft) | 2019-2020 Volume Change (cy/ft) | 2020 Measured Volume (cy/ft) | 2019-2020 Volume Change (cy/ft) |
| | | | | Nags Head - North | 1 | 430+00 | -51.49 | 80.20 | -4.32 | 111.95 | -11.87 | 180.19 | -21.77 | 378.70 | 21.22 | 625.53 | 18.21 |
| | 2 | 440+00 | -32.63 | 32.10 | -2.82 | 57.26 | -6.90 | 117.43 | -12.66 | 275.72 | 5.79 | 486.60 | -15.78 | 1304.92 | -11.62 | | |
| | 3 | 450+00 | -63.15 | 26.80 | -0.08 | 46.80 | -7.08 | 89.35 | -29.60 | 262.34 | 6.75 | 504.19 | 20.18 | 1318.62 | 28.85 | | |
| | 4 | 460+00 | -69.42 | 36.65 | -2.83 | 56.16 | -13.72 | 98.50 | -40.31 | 247.74 | -33.10 | 475.54 | -30.08 | 1292.85 | -21.58 | | |
| | 5 | 470+00 | -44.72 | 42.40 | 1.42 | 72.43 | -2.64 | 138.60 | -12.02 | 308.82 | 7.76 | 536.28 | 3.63 | 1366.61 | 13.69 | | |
| | 6 | 480+00 | -46.73 | 32.30 | -1.87 | 59.66 | -7.53 | 114.04 | -26.59 | 281.50 | -4.74 | 509.84 | 13.54 | 1345.48 | 22.98 | | |
| | 7 | 490+00 | -56.39 | 49.75 | 3.46 | 80.86 | -3.64 | 142.09 | -22.87 | 329.44 | 3.04 | 579.42 | 30.10 | 1428.86 | 43.57 | | |
| Nags Head - Reach 1 | 8 | 495+00 | -80.14 | 43.56 | 2.65 | 71.45 | -8.14 | 125.34 | -34.42 | 301.69 | -17.72 | 534.76 | -0.93 | 1381.44 | 9.36 | | |
| | 9 | 500+00 | -51.16 | 35.82 | 5.23 | 64.01 | -1.47 | 122.22 | -17.04 | 305.91 | 13.28 | 534.44 | 26.32 | 1374.60 | 32.53 | | |
| | 10 | 505+00 | -71.50 | 35.34 | 7.85 | 63.52 | -1.23 | 118.97 | -22.71 | 291.06 | -10.59 | 519.99 | 5.17 | 1365.80 | 17.25 | | |
| | 11 | 510+00 | -71.43 | 29.84 | 5.20 | 65.35 | -6.54 | 148.69 | -12.77 | 342.13 | 7.17 | 535.17 | 28.69 | 1347.59 | 42.30 | | |
| | 12 | 515+00 | -92.35 | 37.96 | 3.91 | 66.40 | -14.43 | 127.37 | -38.31 | 306.85 | -22.48 | 513.77 | -32.82 | 1353.92 | -20.21 | | |
| | 13 | 520+00 | -90.52 | 36.25 | 7.63 | 67.88 | -8.93 | 131.91 | -34.58 | 313.91 | -27.32 | 524.51 | -27.67 | 1356.62 | -14.16 | | |
| | 14 | 525+00 | -75.27 | 19.08 | 5.46 | 53.70 | -8.81 | 122.07 | -28.92 | 323.56 | -8.46 | 544.13 | -2.15 | 1367.72 | 9.48 | | |
| | 15 | 530+00 | -71.58 | 25.85 | 7.84 | 58.31 | -6.14 | 126.19 | -21.72 | 325.44 | 7.20 | 561.88 | 29.60 | 1388.45 | 43.32 | | |
| | 16 | 535+00 | -74.46 | 24.19 | 4.21 | 56.33 | -13.10 | 124.58 | -32.69 | 306.47 | -26.44 | 532.83 | -14.20 | 1366.53 | -1.67 | | |
| | 17 | 540+00 | -75.09 | 35.16 | 4.69 | 70.29 | -12.35 | 147.35 | -26.47 | 349.19 | -2.12 | 582.93 | 14.54 | 1417.83 | 30.68 | | |
| | 18 | 545+00 | -96.75 | 33.59 | 3.54 | 64.88 | -17.60 | 133.68 | -40.90 | 315.68 | -51.40 | 546.55 | -35.91 | 1372.24 | -18.23 | | |
| | 19 | 550+00 | -50.69 | 18.90 | 9.14 | 45.82 | -3.11 | 107.35 | -14.12 | 300.81 | 6.41 | 526.47 | 23.04 | 1332.11 | 45.12 | | |
| | 20 | 555+00 | -46.05 | 22.95 | 7.79 | 48.36 | -6.34 | 114.04 | -14.68 | 308.14 | -7.43 | 536.49 | 2.79 | 1337.18 | 18.53 | | |
| | 21 | 560+00 | -45.13 | 14.71 | 4.21 | 34.54 | -12.59 | 94.99 | -21.26 | 260.00 | -42.54 | 485.96 | -29.80 | 1281.93 | -19.48 | | |
| | 22 | 565+00 | -4.64 | 20.28 | 3.18 | 45.65 | -6.17 | 112.26 | -5.58 | 291.82 | -15.44 | 501.20 | -20.31 | 1302.20 | -28.78 | | |
| | 23 | 570+00 | 35.02 | 26.89 | 8.07 | 58.06 | 7.45 | 134.46 | 17.34 | 372.39 | 65.52 | 614.69 | 97.26 | 1437.70 | 104.06 | | |
| | 24 | 575+00 | -20.70 | 13.63 | 5.39 | 38.55 | 0.24 | 111.97 | -2.98 | 327.69 | 26.04 | 553.46 | 43.03 | 1365.63 | 58.94 | | |
| | 25 | 580+00 | -56.91 | 21.00 | 6.45 | 42.63 | -9.58 | 113.19 | -20.21 | 276.52 | -42.19 | 506.27 | -19.72 | 1312.53 | -1.49 | | |
| | 26 | 585+00 | -107.53 | 15.80 | 2.74 | 37.05 | -18.31 | 105.76 | -33.12 | 291.11 | -31.81 | 526.23 | -11.72 | 1325.69 | -1.34 | | |
| | 27 | 590+00 | -89.00 | 12.11 | 1.94 | 33.78 | -19.51 | 106.11 | -28.82 | 281.38 | -38.24 | 518.43 | -14.48 | 1320.14 | -10.01 | | |
| | 28 | 595+00 | -58.96 | 19.56 | 3.06 | 44.62 | -11.47 | 119.08 | -12.08 | 301.93 | -25.66 | 540.09 | 0.10 | 1346.56 | 6.20 | | |
| | 29 | 600+00 | 14.80 | 64.07 | 4.79 | 103.45 | 0.50 | 197.08 | 10.83 | 420.09 | 33.63 | 671.43 | 58.41 | 1514.29 | 74.64 | | |
| | 30 | 605+00 | 31.58 | 30.36 | 5.36 | 60.39 | -2.03 | 145.38 | -0.86 | 362.87 | 13.76 | 609.23 | 34.32 | 1428.70 | 41.72 | | |
| | 31 | 610+00 | -80.11 | 30.43 | 2.76 | 56.68 | -12.18 | 127.40 | -36.92 | 328.25 | -34.25 | 571.04 | -15.78 | 1380.03 | -12.04 | | |
| | 32 | 615+00 | -135.21 | 35.77 | 3.94 | 63.10 | -16.67 | 139.75 | -44.33 | 310.03 | -74.76 | 559.80 | -55.21 | 1374.97 | -42.96 | | |
| | 33 | 620+00 | -139.59 | 25.14 | 3.55 | 53.18 | -20.82 | 139.43 | -39.54 | 320.74 | -49.85 | 566.89 | -35.73 | 1373.28 | -24.80 | | |
| | 34 | 625+00 | -113.00 | 35.51 | 4.27 | 68.69 | -14.64 | 157.95 | -26.67 | 365.80 | -8.64 | 632.13 | 17.61 | 1440.92 | 26.21 | | |
| | 35 | 630+00 | -84.36 | 39.17 | 3.65 | 77.80 | -14.37 | 178.18 | -17.53 | 393.41 | 9.32 | 643.66 | 19.85 | 1475.35 | 45.96 | | |
| | 36 | 635+00 | -87.20 | 24.30 | 0.61 | 53.91 | -19.89 | 139.20 | -28.75 | 338.16 | -11.71 | 591.43 | 2.69 | 1366.46 | -9.85 | | |
| | 37 | 640+00 | -89.34 | 45.39 | 4.13 | 82.92 | -12.78 | 178.71 | -18.38 | 383.90 | 2.15 | 638.34 | 16.71 | 1442.26 | 29.56 | | |
| | 38 | 645+00 | -92.87 | 42.15 | 7.50 | 79.39 | -12.69 | 175.64 | -21.63 | 388.91 | 6.67 | 650.75 | 29.82 | 1471.85 | 60.92 | | |
| | 39 | 650+00 | -112.84 | 41.02 | 4.28 | 74.32 | -18.96 | 163.30 | -32.31 | 365.98 | -0.94 | 616.32 | 11.96 | 1404.44 | 19.39 | | |
| | 40 | 655+00 | -128.66 | 27.72 | 1.67 | 53.77 | -25.82 | 133.12 | -44.04 | 326.57 | -12.44 | 594.65 | 22.03 | 1376.39 | 46.32 | | |
| | 41 | 660+00 | -99.68 | 37.70 | 1.86 | 69.44 | -20.70 | 161.94 | -26.00 | 357.54 | 6.86 | 600.74 | 15.70 | 1367.95 | 28.68 | | |
| | 42 | 665+00 | -74.98 | 46.61 | 1.94 | 86.99 | -15.06 | 175.61 | -31.89 | 398.43 | 24.45 | 646.56 | 63.01 | 1403.10 | 66.56 | | |
| | 43 | 670+00 | -85.61 | 26.97 | 0.57 | 64.37 | -16.48 | 151.57 | -28.26 | 368.07 | 32.79 | 613.88 | 45.75 | 1368.95 | 39.88 | | |
| | 44 | 675+00 | -76.67 | 4.94 | -0.11 | 25.23 | -16.54 | 86.96 | -27.38 | 280.08 | 37.08 | 508.88 | 48.24 | 1243.11 | 15.23 | | |
| | 45 | 680+00 | -76.02 | 39.90 | 4.93 | 78.58 | -9.72 | 167.30 | -18.13 | 375.22 | 32.58 | 616.07 | 33.49 | 1421.76 | 12.50 | | |
| | 46 | 685+00 | -79.89 | 34.76 | 4.49 | 70.52 | -12.62 | 152.10 | -28.04 | 363.26 | 15.21 | 617.85 | 33.97 | 1427.15 | 28.79 | | |
| | 47 | 690+00 | -120.70 | 41.31 | 2.34 | 72.87 | -19.86 | 136.23 | -53.43 | 337.16 | -18.90 | 583.03 | -1.87 | 1379.17 | -10.09 | | |
| | 48 | 695+00 | -107.13 | 43.18 | 5.01 | 80.98 | -12.69 | 151.49 | -42.25 | 356.36 | -9.06 | 603.60 | 6.37 | 1404.70 | -7.95 | | |
| | 49 | 700+00 | -95.12 | 45.14 | 8.82 | 81.35 | -6.77 | 155.90 | -29.33 | 351.36 | -7.98 | 596.91 | 8.67 | 1392.59 | -3.91 | | |
| | 50 | 705+00 | -119.94 | 39.74 | 7.00 | 69.43 | -12.39 | 125.84 | -48.24 | 306.98 | -34.12 | 547.56 | -14.01 | 1338.48 | -24.77 | | |
| | 51 | 710+00 | -116.20 | 39.32 | 5.60 | 70.94 | -12.88 | 129.86 | -46.84 | 325.25 | -20.02 | 555.20 | -7.83 | 1339.33 | -14.04 | | |
| | 52 | 715+00 | -125.12 | 42.20 | 3.70 | 72.41 | -18.00 | 133.48 | -53.57 | 316.59 | -44.85 | 545.73 | -35.12 | 1326.26 | -44.91 | | |
| | 53 | 720+00 | -95.87 | 51.86 | 7.65 | 88.54 | -8.76 | 157.74 | -35.31 | 364.49 | 0.16 | 591.78 | 11.39 | 1373.43 | 6.91 | | |
| | 54 | 725+00 | -84.22 | 27.93 | 3.56 | 58.30 | -12.74 | 120.41 | -35.92 | 313.09 | -2.58 | 536.89 | 12.69 | 1319.07 | 8.15 | | |
| | 55 | 730+00 | -81.43 | 34.01 | 5.52 | 66.86 | -10.29 | 133.15 | -32.81 | 324.00 | -8.72 | 549.32 | 3.09 | 1345.05 | -1.20 | | |
| | 56 | 735+00 | -62.80 | 27.64 | 4.10 | 62.88 | -8.80 | 133.17 | -27.38 | 328.40 | -10.64 | 552.86 | -4.99 | 1349.88 | -7.91 | | |
| | 57 | 740+00 | -69.44 | 36.40 | 8.17 | 75.90 | -3.96 | 155.36 | -18.73 | 377.93 | 14.14 | 609.63 | 20.83 | 1408.73 | 11.31 | | |
| | 58 | 745+00 | -47.44 | 44.76 | 9.34 | 82.41 | -2.80 | 159.18 | -17.25 | 355.21 | -9.54 | 586.99 | -7.35 | 1397.29 | -8.76 | | |
| | 59 | 750+00 | -34.33 | 56.94 | 5.24 | 99.04 | -3.80 | 183.89 | -11.38 | 402.47 | 8.90 | 640.53 | 11.81 | 1451.34 | 13.19 | | |
| | 60 | 755+00 | -27.39 | 55.30 | 6.67 | 94.01 | -1.98 | 173.09 | -9.73 | 377.92 | 0.87 | 615.42 | 6.42 | 1422.99 | 1.93 | | |
| | 61 | 760+00 | -18.11 | 44.79 | 7.94 | 85.25 | 0.42 | 172.71 | 0.29 | 390.38 | 17.56 | 635.60 | 28.06 | 1454.55 | 17.76 | | |
| | 62 | 765+00 | -44.04 | 17.34 | 7.93 | 46.26 | -2.34 | 115.00 | -9.69 | 324.75 | 15.35 | 554.39 | 23.19 | 1356.05 | 19.71 | | |
| | 63 | 770+00 | -57.95 | 34.02 | 7.83 | 66.95 | -6.82 | 144.03 | -18.50 | 360.45 | -8.26 | 603.14 | -8.02 | 1410.79 | -13.78 | | |
| | 64 | 775+00 | -84.60 | 52.31 | 8.20 | 88.76 | -11.64 | 185.07 | -15.84 | 418.01 | 20.53 | 665.55 | 43.96 | 1478.86 | 43.89 | | |
| | 65 | 780+00 | -123.68 | 23.57 | 1.03 | 60.03 | -28.03 | 152.21 | -50.12 | 374.82 | -36.16 | 622.45 | -36.35 | 1422.72 | -45.78 | | |
| | 66 | 785+00 | -35.29 | 41.41 | 4.42 | 94.79 | -8.36 | 203.23 | -13.84 | 465.63 | 24.55 | 722.07 | 31.75 | 1543.45 | 36.17 | | |

| Reach | Transect Number | Station | Shoreline Change @ MHW (+1.18 ft NAVD) | Above Berm (+6 ft NAVD88) | | Above MHW (+1.18 ft NAVD88) | | Above -6 ft NAVD88 | | Above -14 ft NAVD88 | | Above -19 ft NAVD88 | | Above -30 ft NAVD88 | | | |
|--------------------------|-----------------|---------|--|------------------------------|---------------------------------|------------------------------|---------------------------------|------------------------------|---------------------------------|------------------------------|---------------------------------|------------------------------|---------------------------------|------------------------------|---------------------------------|------------------------------|---------------------------------|
| | | | | 2020 Measured Volume (cy/ft) | 2019-2020 Volume Change (cy/ft) | 2020 Measured Volume (cy/ft) | 2019-2020 Volume Change (cy/ft) | 2020 Measured Volume (cy/ft) | 2019-2020 Volume Change (cy/ft) | 2020 Measured Volume (cy/ft) | 2019-2020 Volume Change (cy/ft) | 2020 Measured Volume (cy/ft) | 2019-2020 Volume Change (cy/ft) | 2020 Measured Volume (cy/ft) | 2019-2020 Volume Change (cy/ft) | 2020 Measured Volume (cy/ft) | 2019-2020 Volume Change (cy/ft) |
| | | | | Nags Head - Reach 2 | 67 | 790+00 | -32.54 | 5.94 | -1.17 | 40.64 | -13.71 | 122.70 | -18.11 | 352.04 | 23.75 | 587.15 | 28.16 |
| 68 | 795+00 | -56.84 | 50.26 | | 7.66 | 93.76 | -9.18 | 189.01 | -17.76 | 421.60 | 19.42 | 664.28 | 18.75 | 1465.90 | 23.18 | | |
| 69 | 800+00 | -59.45 | 19.90 | | -2.11 | 51.78 | -22.15 | 134.64 | -30.80 | 328.60 | -15.94 | 563.33 | -8.24 | 1345.53 | -8.90 | | |
| 70 | 805+00 | -46.94 | 39.61 | | 6.78 | 77.64 | -6.02 | 161.91 | -14.99 | 358.88 | -0.08 | 599.95 | 14.42 | 1387.91 | 16.44 | | |
| 71 | 810+00 | -108.58 | 53.90 | | 5.25 | 93.83 | -14.71 | 180.29 | -40.10 | 395.50 | -14.77 | 634.71 | 3.93 | 1423.30 | 8.29 | | |
| 72 | 815+00 | -112.04 | 41.64 | | 5.81 | 78.91 | -15.86 | 162.60 | -43.08 | 354.98 | -33.72 | 591.09 | -9.94 | 1379.74 | -11.08 | | |
| 73 | 820+00 | -135.29 | 43.34 | | 6.29 | 83.13 | -18.02 | 164.74 | -53.33 | 393.56 | -12.34 | 634.54 | 14.90 | 1427.12 | 11.43 | | |
| 74 | 825+00 | -137.17 | 34.87 | | 9.19 | 67.47 | -15.74 | 140.29 | -52.24 | 324.92 | -47.68 | 557.97 | -23.62 | 1340.61 | -27.88 | | |
| 75 | 830+00 | -120.49 | 38.60 | | 8.36 | 72.32 | -12.97 | 144.47 | -47.05 | 343.94 | -22.60 | 583.56 | 23.71 | 1359.34 | 16.63 | | |
| 76 | 835+00 | -96.57 | 19.24 | | 8.37 | 47.26 | -10.30 | 108.74 | -37.89 | 288.48 | -19.92 | 510.17 | -5.86 | 1259.93 | -12.61 | | |
| 77 | 840+00 | -50.59 | 24.36 | | 9.33 | 53.73 | -4.18 | 123.42 | -16.60 | 305.92 | 6.59 | 525.83 | 15.84 | 1279.67 | 9.01 | | |
| 78 | 845+00 | -57.06 | 44.72 | | 10.24 | 84.94 | -2.86 | 165.89 | -19.75 | 384.41 | 16.68 | 643.39 | 64.25 | 1428.59 | 60.98 | | |
| 79 | 850+00 | -69.91 | 14.41 | | 9.46 | 42.09 | -4.08 | 100.56 | -23.56 | 297.27 | 14.79 | 523.63 | 55.85 | 1275.32 | 64.33 | | |
| 80 | 855+00 | -57.84 | 37.88 | | 8.11 | 77.36 | -6.64 | 156.65 | -23.51 | 354.50 | 0.76 | 578.24 | 21.85 | 1344.57 | 26.34 | | |
| 81 | 860+00 | -66.14 | 22.07 | | 9.11 | 61.60 | -4.42 | 140.55 | -21.35 | 371.37 | 40.80 | 588.67 | 50.85 | 1335.31 | 28.11 | | |
| 82 | 865+00 | -108.16 | 36.98 | | 10.28 | 73.46 | -11.50 | 148.52 | -41.48 | 348.13 | -18.49 | 561.09 | -17.26 | 1317.54 | -34.06 | | |
| 83 | 870+00 | -100.70 | 35.28 | | 11.92 | 72.43 | -7.58 | 149.79 | -33.77 | 371.93 | 4.26 | 601.79 | 0.38 | 1364.46 | -2.55 | | |
| 84 | 872+00 | -95.34 | 22.81 | | 5.57 | 54.77 | -13.82 | 123.17 | -41.44 | 313.86 | -27.59 | 523.56 | -34.09 | 1268.30 | -43.69 | | |
| 85 | 880+00 | -53.90 | 39.88 | | 6.59 | 79.86 | -0.25 | 159.78 | -18.93 | 381.50 | 13.64 | 613.32 | 27.70 | 1387.71 | 16.96 | | |
| 86 | 885+00 | -67.08 | 36.27 | | 7.74 | 69.98 | -4.76 | 143.27 | -25.52 | 331.27 | -20.19 | 559.49 | -11.61 | 1335.68 | -12.34 | | |
| 87 | 890+00 | -53.78 | 27.44 | | 4.88 | 61.12 | -9.35 | 133.84 | -27.51 | 324.16 | -16.72 | 548.15 | -17.44 | 1320.76 | -33.29 | | |
| 88 | 895+00 | -35.48 | 34.11 | | 9.26 | 74.98 | 3.38 | 152.84 | -9.96 | 370.86 | 34.49 | 589.85 | 25.05 | 1366.25 | 18.42 | | |
| 89 | 900+00 | -53.72 | 45.98 | | 10.20 | 92.59 | 3.69 | 181.79 | -11.28 | 414.51 | 35.68 | 645.61 | 30.22 | 1428.77 | 28.49 | | |
| 90 | 905+00 | -75.12 | 12.96 | | 8.53 | 39.72 | -6.41 | 99.97 | -27.03 | 291.34 | 7.71 | 512.24 | 16.59 | 1254.92 | 30.30 | | |
| 91 | 910+00 | -62.75 | 22.27 | 5.80 | 54.79 | -7.80 | 122.92 | -26.23 | 315.74 | 2.19 | 540.22 | 12.74 | 1272.29 | -24.61 | | | |
| 92 | 915+00 | -53.82 | 7.34 | 3.59 | 33.84 | -8.84 | 95.32 | -22.98 | 283.52 | 16.24 | 501.05 | 22.88 | 1258.74 | 28.26 | | | |
| Nags Head - Reach 3N | 93 | 920+00 | -78.07 | 51.19 | 3.51 | 92.76 | -12.91 | 175.64 | -33.66 | 365.43 | -23.24 | 597.51 | -11.69 | 1376.07 | -18.78 | | |
| | 94 | 925+00 | -109.42 | 58.10 | 5.57 | 99.04 | -15.64 | 181.09 | -44.29 | 379.68 | -28.45 | 612.40 | -0.47 | 1396.34 | -10.33 | | |
| | 95 | 930+00 | -124.06 | 42.26 | 8.14 | 82.68 | -12.70 | 160.13 | -46.18 | 351.68 | -34.56 | 572.39 | -54.65 | 1350.60 | -50.93 | | |
| | 96 | 935+00 | -125.70 | 55.34 | 4.88 | 100.46 | -19.41 | 186.37 | -53.82 | 383.08 | -52.40 | 624.33 | -36.40 | 1403.08 | -45.65 | | |
| | 97 | 940+00 | -75.62 | 56.44 | 6.93 | 116.14 | -5.85 | 221.90 | -26.52 | 461.20 | 18.15 | 679.06 | 19.71 | 1471.33 | -0.69 | | |
| | 98 | 945+00 | -111.31 | 48.89 | 6.40 | 103.93 | -11.90 | 202.76 | -39.91 | 449.99 | 7.04 | 700.61 | 29.19 | 1508.54 | 0.45 | | |
| | 99 | 950+00 | -126.15 | 54.81 | 6.48 | 102.01 | -16.06 | 190.41 | -48.49 | 412.65 | -19.67 | 642.85 | 9.59 | 1452.60 | -15.97 | | |
| | 100 | 955+00 | -146.21 | 59.29 | 6.47 | 110.56 | -21.67 | 210.33 | -57.23 | 422.41 | -53.00 | 667.10 | 8.79 | 1509.19 | -0.29 | | |
| | 101 | 960+00 | -159.39 | 60.71 | 4.39 | 107.17 | -27.61 | 205.00 | -62.99 | 421.02 | -50.99 | 662.14 | -3.54 | 1492.96 | -8.20 | | |
| | 102 | 965+00 | -184.22 | 45.60 | 5.00 | 86.23 | -27.17 | 174.35 | -63.53 | 404.39 | -26.84 | 638.85 | 8.62 | 1450.71 | -6.83 | | |
| | 103 | 970+00 | -110.19 | 42.93 | 7.45 | 90.79 | -12.81 | 196.66 | -26.17 | 433.70 | 22.33 | 654.03 | 75.83 | 1450.65 | 73.86 | | |
| Nags Head - Reach 3S | 104 | 975+00 | -147.45 | 47.34 | 9.05 | 94.27 | -16.29 | 194.58 | -39.17 | 428.67 | 14.11 | 643.86 | 33.02 | 1462.71 | 36.94 | | |
| | 105 | 980+00 | -229.56 | 14.76 | 4.52 | 44.07 | -35.28 | 115.84 | -83.02 | 309.67 | -67.52 | 490.96 | -53.86 | 1273.91 | -48.30 | | |
| | 106 | 985+00 | -191.70 | 15.95 | 7.41 | 42.85 | -26.43 | 116.17 | -58.68 | 299.40 | -31.94 | 479.74 | -30.16 | 1235.11 | -33.58 | | |
| | 107 | 990+00 | -147.47 | 14.78 | 11.91 | 50.90 | -16.26 | 133.24 | -46.04 | 325.11 | -18.97 | 485.98 | -42.64 | 1236.07 | -76.08 | | |
| | 108 | 995+00 | -206.25 | 10.36 | 6.08 | 36.55 | -28.16 | 104.10 | -68.83 | 285.43 | -49.20 | 508.35 | 2.20 | 1282.60 | -0.18 | | |
| | 109 | 1000+00 | -221.49 | 12.60 | 4.05 | 36.23 | -37.85 | 89.54 | -94.71 | 266.31 | -85.11 | 447.38 | -70.03 | 1213.16 | -75.41 | | |
| | 110 | 1005+00 | -206.89 | 18.61 | 6.22 | 49.45 | -31.41 | 109.80 | -86.54 | 298.80 | -71.53 | 471.44 | -61.00 | 1243.39 | -39.75 | | |
| Nags Head - Reach 4 | 111 | 1010+00 | -191.89 | 9.76 | 4.65 | 34.38 | -31.32 | 91.98 | -78.05 | 263.77 | -72.98 | 427.27 | -66.59 | 1162.80 | -61.13 | | |
| | 112 | 1015+00 | -135.29 | 19.95 | 9.28 | 48.46 | -17.80 | 119.51 | -42.93 | 301.59 | -17.57 | 495.74 | 18.38 | 1242.98 | 7.47 | | |
| | 113 | 1020+00 | -166.28 | 13.74 | 5.46 | 35.54 | -24.04 | 92.82 | -57.52 | 254.25 | -52.37 | 416.35 | -36.04 | 1166.49 | 5.01 | | |
| | 114 | 1025+00 | -138.37 | 6.40 | -2.83 | 23.01 | -23.80 | 73.23 | -51.89 | 237.80 | -28.38 | 382.27 | -42.23 | 1093.92 | -92.16 | | |
| Nags Head - Oregon Inlet | 115 | 1030+00 | -109.66 | 13.71 | 5.73 | 40.26 | -7.22 | 101.57 | -31.10 | 271.03 | -15.18 | 423.02 | -53.90 | 1274.95 | -47.63 | | |
| | 116 | 1050+00 | 1.04 | 12.04 | 8.71 | 41.19 | 12.65 | 109.65 | 16.00 | 288.07 | 40.76 | 499.53 | 46.50 | 1315.15 | -3.02 | | |
| | 117 | 1080+00 | -52.22 | 43.41 | 0.54 | 83.25 | -8.20 | 157.41 | -27.79 | 361.26 | -19.61 | 574.95 | -11.68 | 1456.24 | -16.00 | | |
| | 118 | 1100+00 | -57.85 | 15.71 | 2.27 | 49.25 | -7.45 | 114.28 | -25.72 | 333.61 | 4.74 | 571.25 | 18.43 | 1446.02 | 10.38 | | |
| | 119 | 1140+00 | -37.57 | 0.00 | 0.00 | 0.00 | 0.00 | 1.20 | -7.51 | 124.71 | -13.57 | 313.00 | -39.31 | 1158.20 | -32.47 | | |
| | 120 | 1170+00 | -47.85 | 0.00 | 0.00 | 0.00 | -2.75 | 6.66 | -22.74 | 160.29 | -8.20 | 387.65 | -12.71 | 1249.75 | -22.88 | | |
| | 121 | 1200+00 | 8.77 | 0.47 | 0.37 | 23.51 | -7.29 | 103.10 | 6.12 | 347.42 | 65.23 | 659.61 | 75.36 | 1843.11 | 120.69 | | |



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