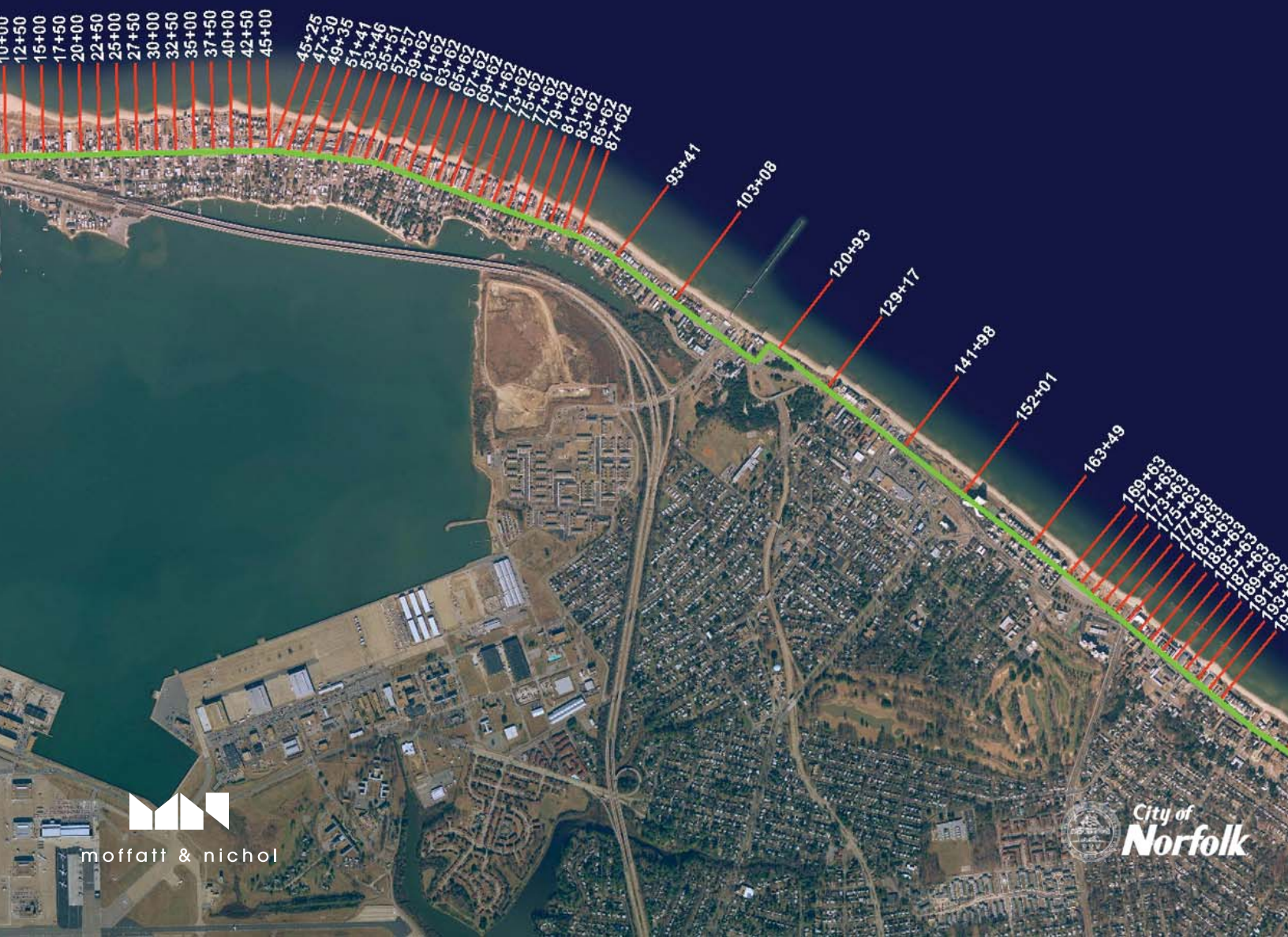
PERIODIC SURVEY EVALUATION:
OCEAN VIEW BEACH

City of Norfolk, Virginia | Spring 2020 | PN: 10390-12



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City of Norfolk

Periodic Survey Evaluation: Ocean View Beach Spring 2020

Presented to:

City of Norfolk

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1. Executive Summary

The thirtieth consecutive twice-yearly survey of the Ocean View shoreline was conducted on June 2-4, 2020. The study area extends from the western end of Willoughby Spit to the western edge of Little Creek Inlet in East Ocean View. The periodic surveys are typically collected bi-annually in March/April and September/October to monitor the condition of the shoreline and the state of existing shore protection projects. The Federal coastal storm damage reduction project was constructed by Norfolk District U.S. Army Corps of Engineers (USACE) in mid-May 2017. This report documents the thirtieth monitoring survey following the initial adjustment period of the Federal Project, illustrating changes in the Federal Project beach and nearshore conditions approximately two years post-construction.

A baseline and transect locations were established with the first survey in September 2005 and have been used for each subsequent survey. Shoreline changes at Mean High Water (MHW) and volumetric changes above 0 feet NAVD88 and -15 feet NAVD88 are calculated at each transect. Differences in the region above 0 feet NAVD88 are indicative of changes to the dune and subaerial beach berm, while the differences above -15 feet NAVD88 indicate changes in the nearshore zone. Comparison of yearly surveys (i.e. April 2019 to June 2020) eliminates seasonal variation of profiles in volumetric change analyses. Consecutive survey comparisons (spring to spring, and spring to fall) are useful to assess the direct impact of extreme events which have occurred during the six months between surveys. This report documents the data sources, methods, and results of a periodic surveying evaluation performed to compare the June 2020 survey data with previous surveys taken in April 2019 (spring to spring comparison) and November 2019 (most recent periodic survey comparison) in the Ocean View Beach area between Willoughby Spit and Little Creek Inlet.

Comparison	Parameter	Quantity
April 2019 vs. June 2020	Average Shoreline Change Rate at MHW (+0.98 ft NAVD88)	-7.01 ft/yr
	Cumulative Volume Change Rate Above 0 ft NAVD88	26,820 cy/yr
	Cumulative Volume Change Rate Above -15 ft NAVD88	-45,507 cy/yr
November 2019 vs. June 2020	Average Shoreline Change at MHW (+0.98 ft NAVD88)	1.32 ft
	Cumulative Volume Change Above 0 ft NAVD88	666 cy
	Cumulative Volume Change Above -15 ft NAVD88	-40,094 cy

The behavior in each of the shoreline reaches for the April 2019 to June 2020 and November 2019 to June 2020 periods are summarized in Table 1-1 and Table 1-2 respectively.

As illustrated in Table 1-1, the Ocean View shoreline has experienced overall retreat at MHW from April 2019 to June 2020 with a length-weighted average change rate of -7.01 ft/yr. The beach and dune above 0 feet NAVD88 gained sediment at a rate of 26,820 cy/yr from April 2019 to November 2020. The beach and dune above -15 feet NAVD88 lost sediment at a rate of -45,507 cy/yr from April 2019 to June 2020.

From November 2019 to June 2020, the MHW shoreline gained on average by 1.32 feet, as shown in Table 1-2. The volumetric change over the same period showed gain above both 0- and loss above 15-feet NAVD88 of 666 cy and -40,094 cy, respectively.

Table 1-1: Regional Shoreline and Volume Change Statistics (Apr. 2019 to Jun. 2020)

Region	Average Shoreline Change	Average Volume Change Rate Above 0 ft NAVD88	Cumulative Volume Change Rate Above 0 ft NAVD88	Average Volume Change Rate Above -15 ft NAVD88	Cumulative Volume Change Rate Above -15 ft NAVD88
	(ft/yr)	(cy/ft/yr)	(cy/yr)	(cy/ft/yr)	(cy/yr)
Willoughby Spit (0+00 to 45+00)	-9.75	0.52	2,354	-8.11	-36,613
800 Block Breakwaters (45+25 to 87+62)	-10.23	-0.80	-3,651	-4.33	-19,671
West Ocean View (93+41 to 163+49)	-10.59	0.09	808	-0.31	-2,770
Central Ocean View Breakwaters (169+63 to 195+63)	-9.89	0.98	3,412	0.25	882
Central Ocean View (206+86 to 323+09)	3.32	2.40	29,966	3.17	39,673
East Ocean View (329+63 to 383+58)	-18.41	-1.06	-6,068	-4.72	-27,007
OVERALL	Weighted Avg (ft/yr)	Weighted Avg (cy/ft/yr)	Total (cy/yr)	Weighted Avg (cy/ft/yr)	Total (cy/yr)
	-7.01	0.70	26,820	-1.18	-45,507

Table 1-2: Regional Shoreline and Volume Change Statistics (Nov. 2019 to Jun. 2020)

Region	Average Shoreline Change	Average Volume Change Above 0 ft NAVD88	Cumulative Volume Change Above 0 ft NAVD88	Average Volume Change Above -15 ft NAVD88	Cumulative Volume Change Above -15 ft NAVD88
	(ft)	(cy/ft)	(cy)	(cy/ft)	(cy)
Willoughby Spit (0+00 to 45+00)	-5.60	-0.64	-2,870	-7.76	-35,029
800 Block Breakwaters (45+25 to 87+62)	-5.57	-0.72	-3,255	-2.97	-13,492
West Ocean View (93+41 to 163+49)	-0.66	0.77	5,885	2.05	15,609
Central Ocean View Breakwaters (169+63 to 195+63)	5.02	1.56	5,399	1.15	3,986
Central Ocean View (206+86 to 323+09)	9.45	0.23	2,868	0.34	4,287
East Ocean View (329+63 to 383+58)	-5.13	-1.29	-7,362	-2.70	-15,455
OVERALL	Weighted Avg (ft)	Weighted Avg (cy/ft)	Total (cy)	Weighted Avg (cy/ft)	Total (cy)
	1.32	0.02	666	-1.05	-40,094

The Federal Willoughby and Vicinity Coastal Storm Damage Reduction Project (Federal Project) was constructed in March, April and May 2017. The Federal Project placed approximately 1.2 million cubic yards material on the Ocean View Beach. Chapter 7 of this Spring 2020 monitoring survey report evaluates the performance of the Federal Project and is intended to help the City and USACE to track project conditions and effectively plan for future renourishment needs. Four reaches within the Federal project length have been identified as potentially needing renourishment to maintain the USACE Design Template level of protection:

- In the Toler Place vicinity of Willoughby Spit, from about halfway along Toler Place east to 10th View Street.

- In West Ocean View from station 93+41 (6th View Street) to station 171+63 (between Ship Watch Rd and Chesapeake Blvd).
- The shoreline within the Central Ocean View breakwaters field.
- In East Ocean View within segments of the Bay Oaks and East Ocean View breakwaters area.

2. Objective

The City of Norfolk, Virginia has maintained a program of periodic surveying of the Ocean View shoreline since 2005. The periodic surveying data collection dates are shown in Table 2-1. This report documents the data sources, methods, and results of a periodic surveying evaluation performed to compare the June 2020 survey data with previous surveys taken in April 2019 (spring to spring comparison) and November 2019 (most recent periodic survey comparison) in the Ocean View Beach area between Willoughby Spit and Little Creek Inlet.

Table 2-1: Surveyors and Collection Dates

Data Collection Date	Surveyor
September 2005	McKim & Creed
March 2006	McKim & Creed
October 2006	McKim & Creed
March 2007	McKim & Creed
October 2007	McKim & Creed
March 2008	McKim & Creed
October 2008	McKim & Creed
April 2009	McKim & Creed
October 2009	Geodynamics, LLC
March 2010	Geodynamics, LLC
October 2010	Geodynamics, LLC
April 2011	Geodynamics, LLC
October 2011	Geodynamics, LLC
March 2012	Geodynamics, LLC
September 2012	Geodynamics, LLC
April 2013	Geodynamics, LLC
October 2013	Geodynamics, LLC
March 2014	Geodynamics, LLC
October 2014	Geodynamics, LLC
April 2015	Geodynamics, LLC
October 2015	Geodynamics, LLC
May 2016	Geodynamics, LLC
October 2016	Geodynamics, LLC
February 2017	USACE (Great Lakes Dredge & Dock)
May 2017	USACE (Great Lakes Dredge & Dock)
May 2017	Geodynamics, LLC
October 2017	Geodynamics, LLC
April 2018	Geodynamics, LLC
November 2018	Geodynamics, LLC
April 2019	Geodynamics, LLC
November 2019	Geodynamics, LLC
June 2020	Geodynamics, LLC

3. Data Sources

Geodynamics, LLC, conducted the most recent survey of Ocean View Beach from June 2 to June 4, 2020. The baseline and transects established for the September 2005 survey were used for the most recent survey. Figure 3-1 shows the location of the baseline, transects and the stationing applied by Geodynamics for the surveying. As shown in Figure 3-1, transects were stationed from west to east along the Ocean View shoreline. The survey data were provided in xyz and shapefile formats allowing for compatibility with multiple programs.

Geodynamics noted that typical vertical survey accuracy along the hydrographic portions of the profiles is approximately ±1 cm. This 'margin of error', if applied over the entire length of the hydrographic profiles can potentially result in significant volumetric differences, in particular on the shallow-sloped and long profiles near Willoughby Spit. Therefore, volumetric changes discussed herein are analyzed with regard to potential volumetric margins of error.

On July 3, 2020, Chesapeake Bay Helicopters (CBH) captured LiDAR data and aerial photography of the Ocean View shoreline. CBH supplied raw LiDAR files (.LAS format) and a bare-earth Digital Elevation Model (DEM) along with georeferenced aerial images of the dry beach and dune along the entire Ocean View shoreline. Geodynamics incorporated the LiDAR-derived DEM with their own surveyed data to generate two DEMs – one of the area above Mean High Water (MHW) and another of the area below MHW. Geodynamics also produced digital contours at the MHW elevation and at the apparent dune toe elevation. The July 2020 aerial photos with the shoreline positions from June 2020, November 2019 and April 2019 are shown in Appendix A.

Since the July 2020 photos cover a limited portion of area landward and seaward of the shoreline, a previous image (2018) is underlain in all Appendices' map products for presentation purposes.

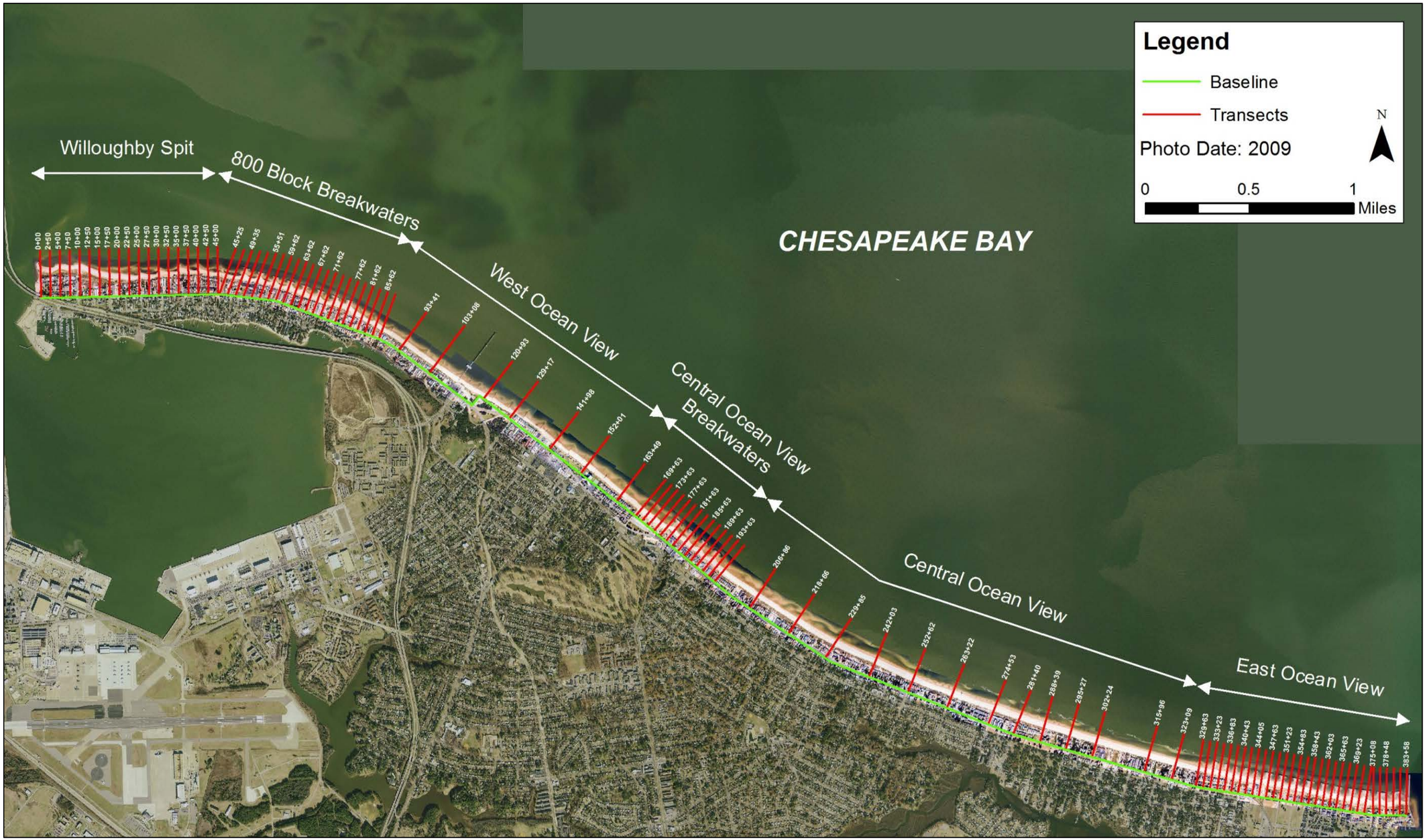


Figure 3-1: Survey Baseline and Transects

4. Methods

Survey comparisons and respective analysis were performed using a combination of Microsoft Excel, Golden Software Surfer, ESRI ArcGIS, custom-coded MATLAB routines and the USACE's Beach Morphology Analysis Package (BMAP). Surfer is a contouring and 3D surface mapping program utilized to create 3D surfaces for analysis. BMAP is a program developed by the USACE to analyze morphologic and dynamic properties of beach profiles.

The horizontal coordinate system used was Virginia South State Plane NAD 1983 (HARN), US Survey feet with a vertical datum of NAVD88. Individual profile plots showing the survey profile at each transect for each date are presented in Appendix B. From the profiles, shoreline changes and volumetric changes were then calculated at each transect for the following time periods:

1. April 2019 to June 2020 (Entire Shoreline)
2. November 2019 to June 2020 (Entire Shoreline)

First, the change in shoreline based on the survey profiles at mean high water (MHW) was calculated at each transect for each time period mentioned. MHW along Ocean View beaches is defined as +0.98 feet NAVD88 based on NOAA tidal benchmark at Sewells Point. The resulting value represents the shoreline change (feet) over the time period between surveys. The shoreline change rate (ft/yr) was then calculated by dividing by the amount of time between survey dates.

Representative volume changes were also calculated at each transect for all time periods. Volume changes were calculated for two different extents in order to better understand the processes occurring onshore and offshore of the Ocean View beach area. Calculations included volume changes above -15 feet NAVD88 and volume changes above 0 feet NAVD88. The results represent volume change per linear foot of shoreline (cy/ft) over the period of time between surveys. The volume change rate (cy/ft/yr) was then calculated by dividing by the amount of time between survey dates. In addition, the volume changes were converted to cumulative changes over the entire shoreline. This was done by applying the average end area method to the unit volume changes (cy/ft) and unit volume change rates (cy/ft/yr) computed at each transect and summing the total volume changes over the entire shoreline. The resulting value indicated the total loss or gain of material (cy) between surveys based on the applicable profile extents.

Volume changes calculated for portions of the profiles above 0 feet NAVD88 are representative of changes in the amount of material in the dune system and on the subaerial beach. These areas are highly influenced by the performance of coastal structures and the impact of storm activity. Volume changes calculated for portions of the profiles above -15 feet NAVD88 allow for the tracking of sand movement in the submerged active profile; removing profile data deeper than the -15 feet NAVD88 contour from the analysis reduces uncertainty that would be associated with hydrographic data beyond this depth.

5. Discussion of Periodic Surveying Evaluation

This section discusses differences observed between the noted surveys, overall shoreline trends, regional shoreline trends and comparison with the pre- and post-construction surveys of the Federal Project. The computed shoreline changes and volume changes at each individual transect for the time periods covered are tabulated in Appendix C.

5.1. Differences in Survey Coverage

Variation in profile positions between surveys taken as part of the ongoing program of periodic surveying of the Ocean View shoreline (April 2019, November 2019 and June 2020) were minimal in the topographic portion of the survey due to use of the same baseline and transects put in place for the initial survey in September 2005. Profile extents and alignment were virtually the same when comparing the survey data.

5.2. Key Events during the Reporting Period

Beach processes are greatly influenced by natural and engineering processes. This section describes key events that happened during the present reporting period which likely had an impact on shoreline position changes and profile volume gains and/or losses.

5.2.1. Storm Wave Events

Understanding of the wave climate immediately offshore of the Norfolk shoreline is vital for the design, monitoring, and understanding of projects along the shoreline and the behavior of the beach. The data used were collected from the City's AWAC (Acoustic Wave and Current) gage, which was deployed in 2006 directly offshore of the Norfolk Shoreline in approximately 23 feet of water. Wave data were collected throughout this survey period.

A summary of the observed conditions from the available wave data during this monitoring period (from November 14, 2019 to the latest download in March 10, 2020) yields the following general observations:

- The average significant wave height and peak period during this monitoring period (wave data available through March 10, 2020) was approximately 1.2 feet and 4.6 seconds.
- The largest significant wave height observed during this monitoring period was approximately 5.3 feet with a corresponding peak period of approximately 8.0 seconds and mean direction of 24 degrees (November 16, 2019).
- Waves approach from the northwest to southeast, with more than 78% approaching from 0 to 120 degrees North.

Twenty-eight storm events occurred during April 2019 and March 2020 for which the significant wave height at the wave gauge exceeded 3.0 feet. These events are shown in Figure 5-1 through Figure 5-28.

The overall trends remained consistent with prior measurement periods with waves during calm periods being predominantly swell traveling into the bay from the ocean and having longer wave periods and lower wave heights. Typically, the larger wave height events are driven by northerly and northeasterly storm winds within the bay and tend to have shorter wave periods. A summary of wave statistics by month from March 2019 through February 2020 is given in Table 5-1.

Table 5-1: Monthly Wave Statistics Summary

Wave Statistic	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19
Average Significant Wave Height, H_s (ft)	1.4	1.1	1.0	1.0	0.8	1.0	1.4
Average Wave Period, T_m (s)	2.5	2.5	2.4	2.3	2.3	2.4	2.7
Average Peak Wave Period, T_p (s)	4.1	5.0	5.2	4.3	4.7	5.3	6.0
Maximum Observed Significant Wave Height, H_s (ft)	4.5	4.2	3.6	3.3	2.6	3.8	7.3
Maximum Observed Wave Height, H_{max} (ft)	7.2	8.0	5.9	7.0	4.7	6.9	12.4

Wave Statistic	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20
Average Significant Wave Height, H_s (ft)	1.5	1.5	1.2	1.2	1.1
Average Wave Period, T_m (s)	2.8	2.7	2.7	2.5	2.4
Average Peak Wave Period, T_p (s)	5.5	4.9	4.7	4.4	4.4
Maximum Observed Significant Wave Height, H_s (ft)	4.6	5.3	4.2	3.7	4.7
Maximum Observed Wave Height, H_{max} (ft)	7.9	8.6	6.9	6.4	8.0

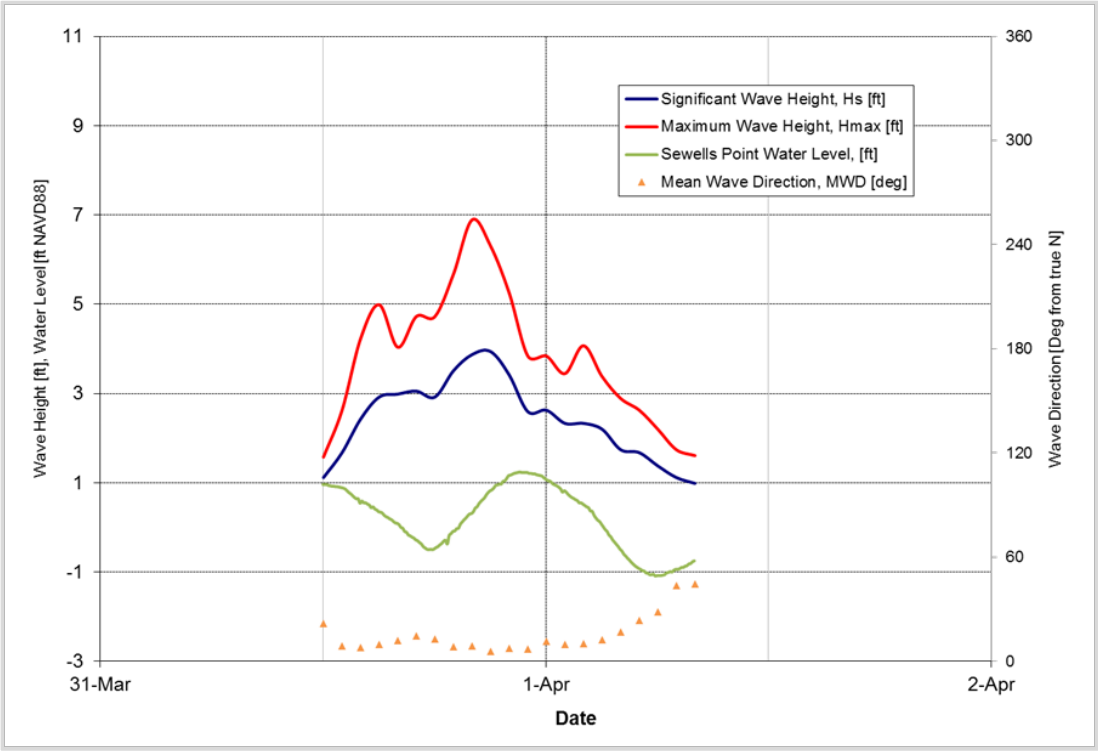


Figure 5-1: April 1, 2019 Storm

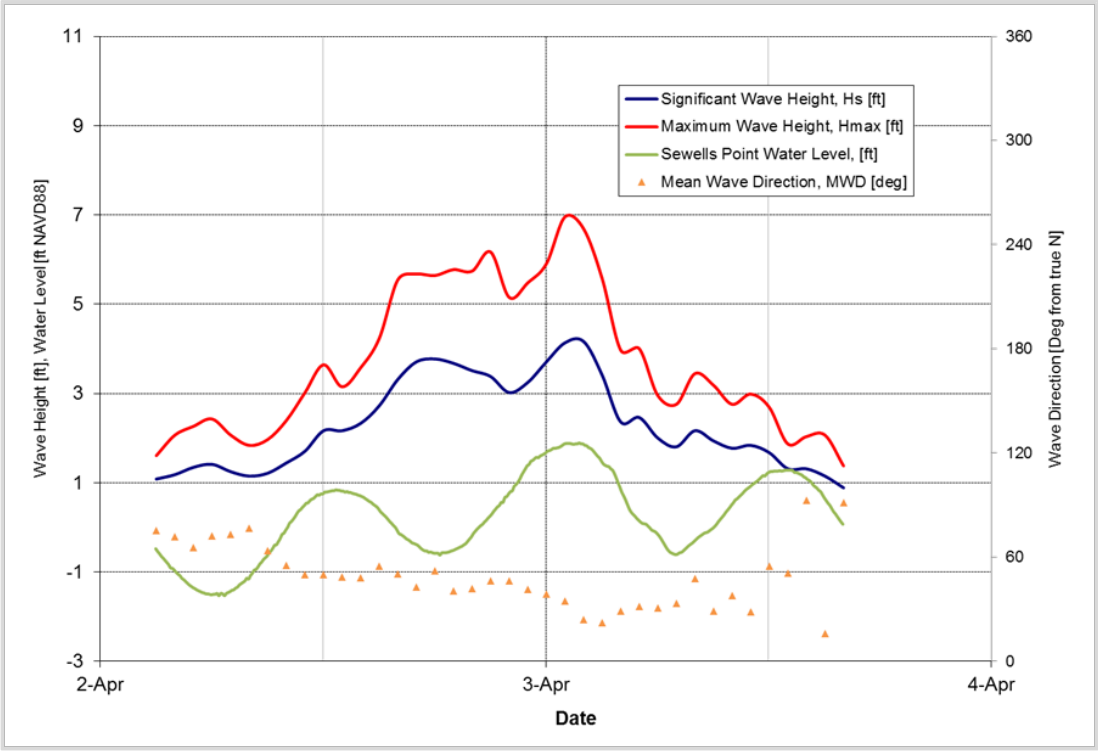


Figure 5-2: April 3, 2019 Storm

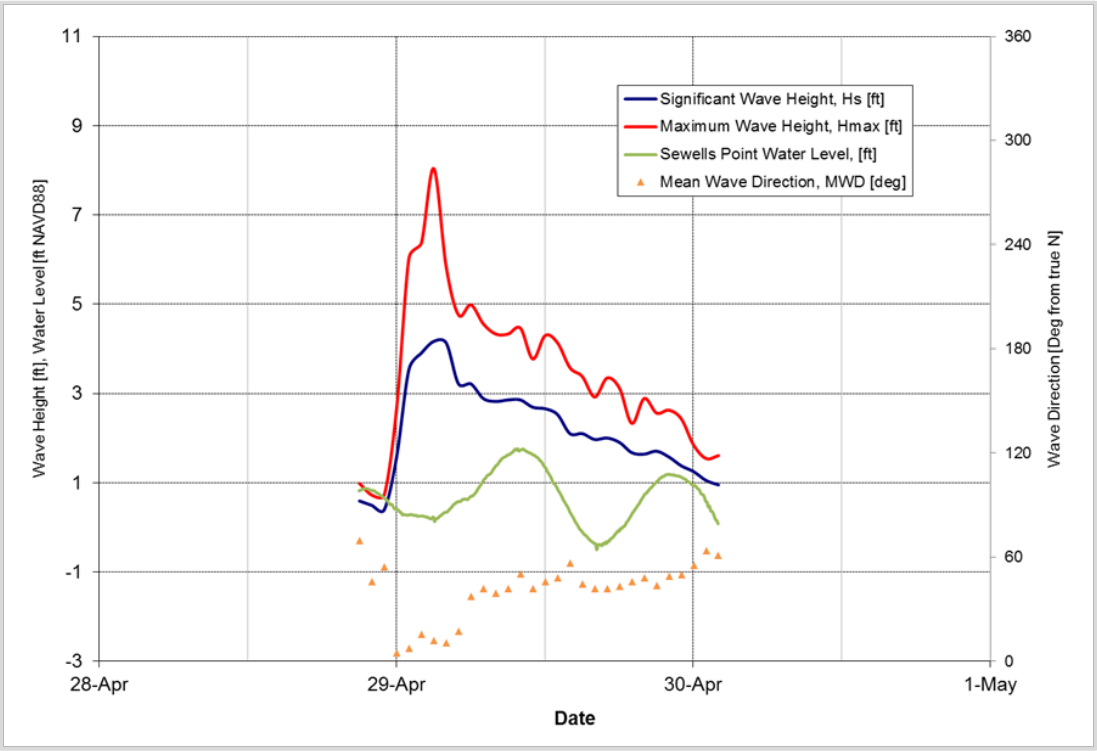


Figure 5-3: April 29, 2019 Storm

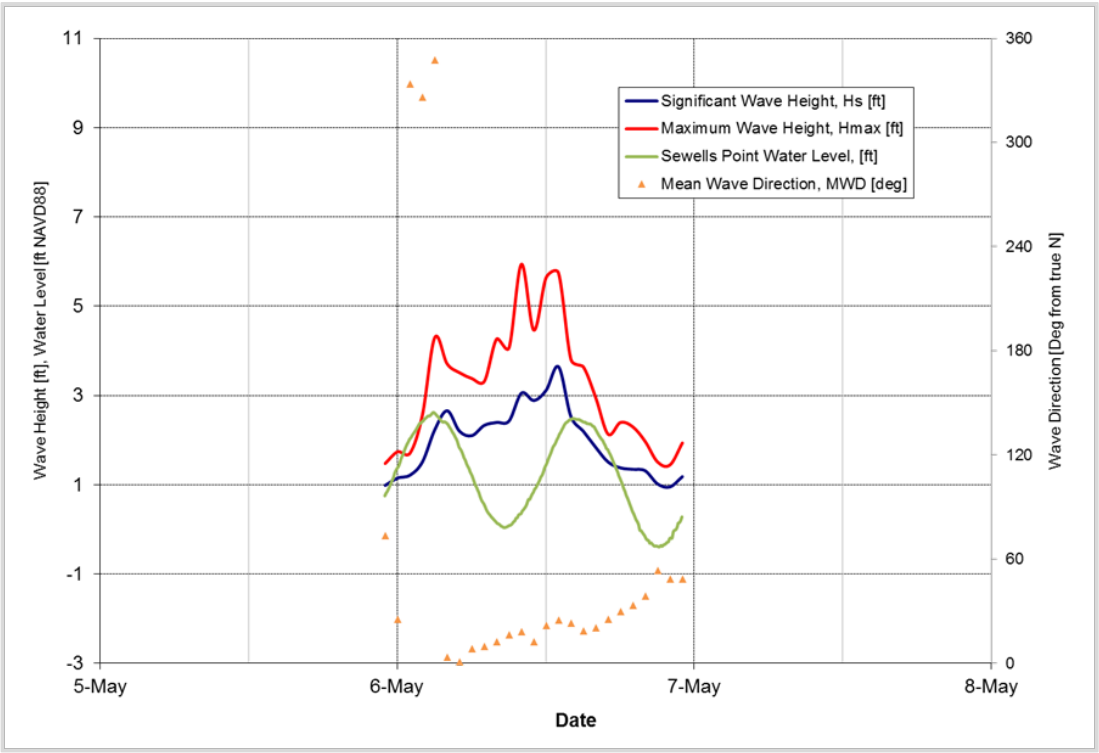


Figure 5-4: May 6, 2019 Storm

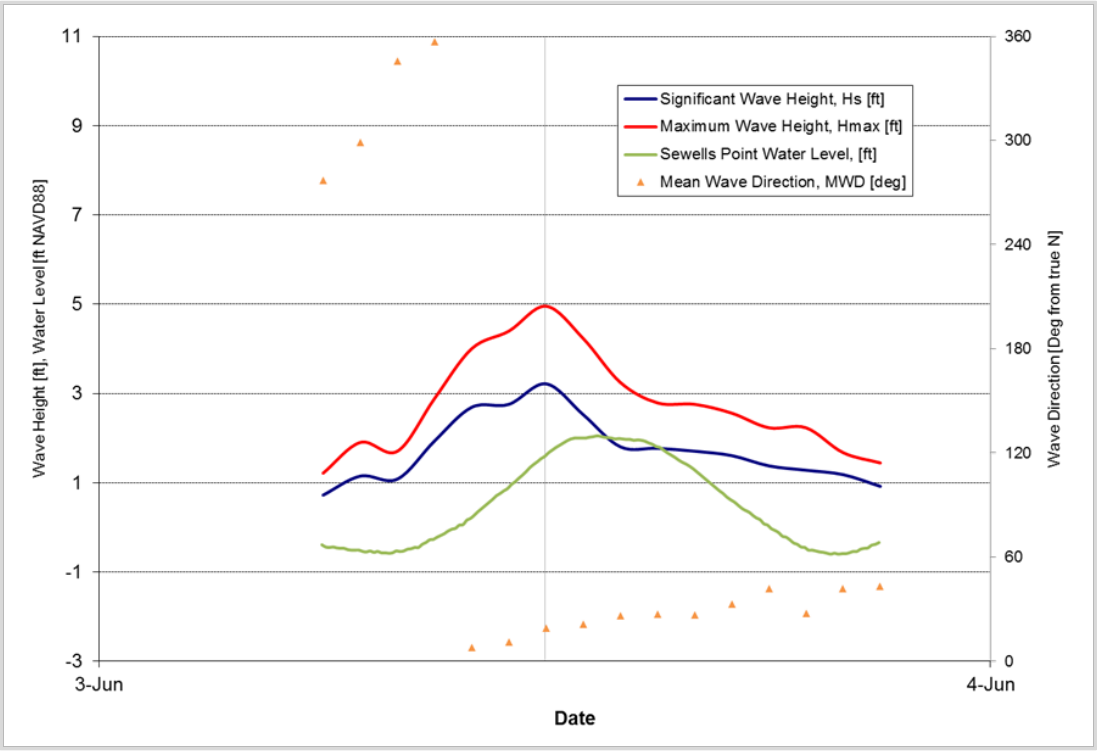


Figure 5-5: June 3, 2019 Storm

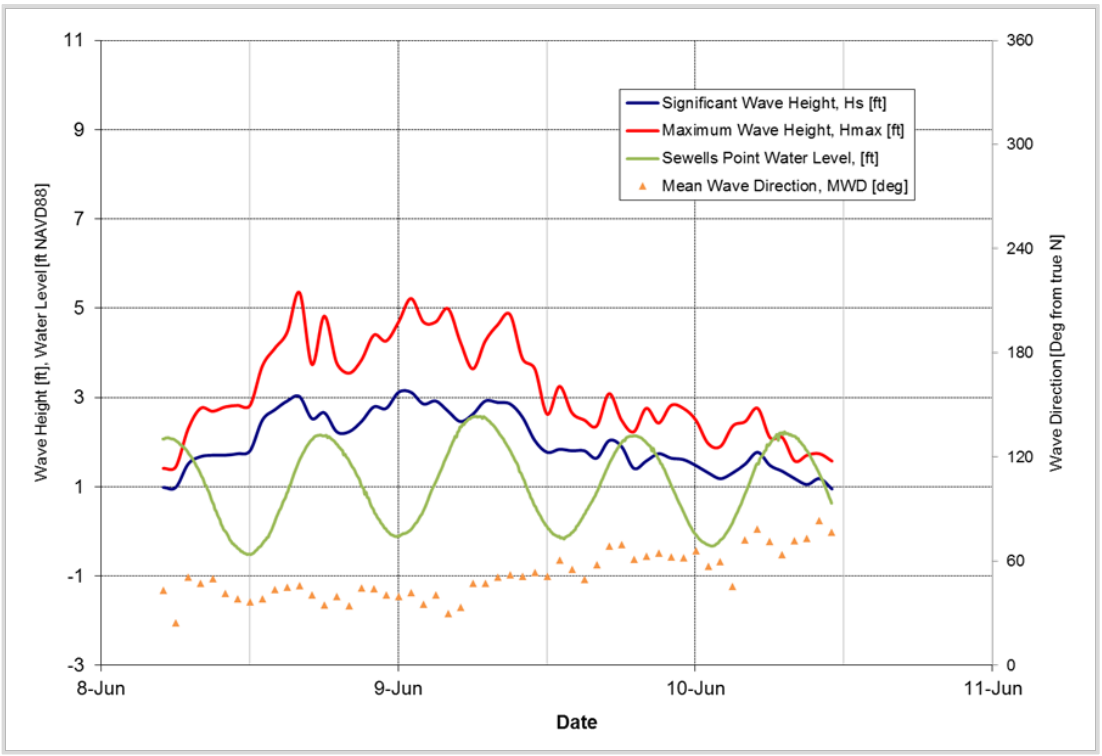


Figure 5-6: June 9, 2019 Storm

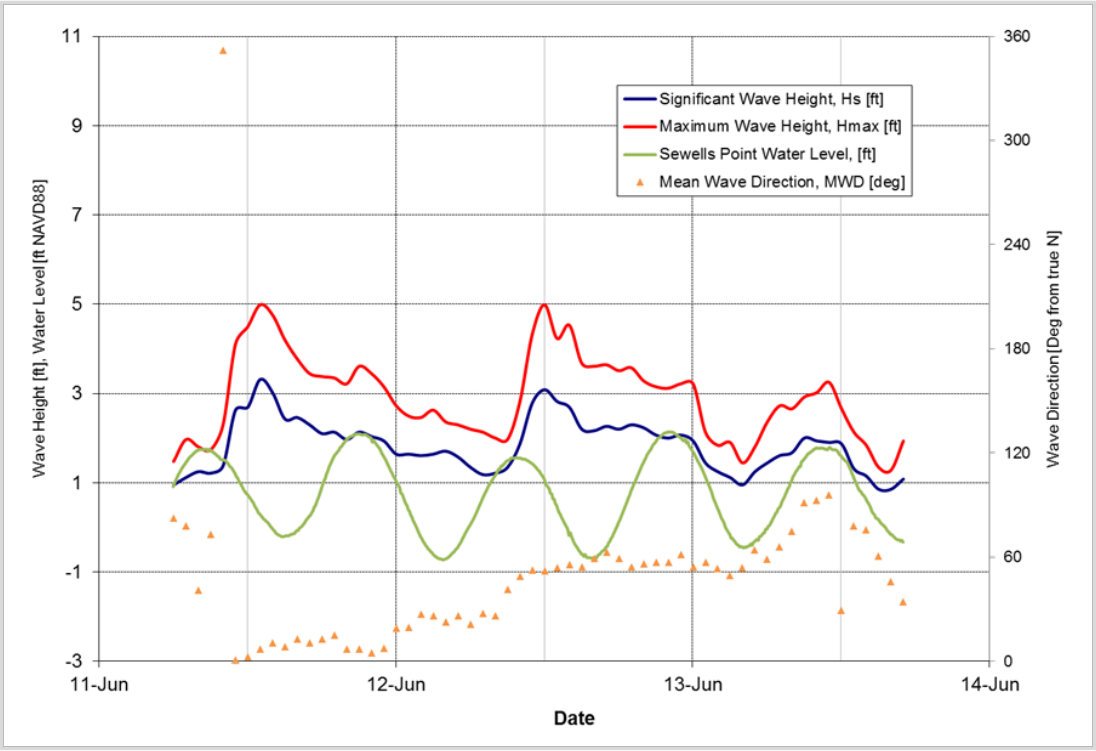


Figure 5-7: June 11, 2019 Storm

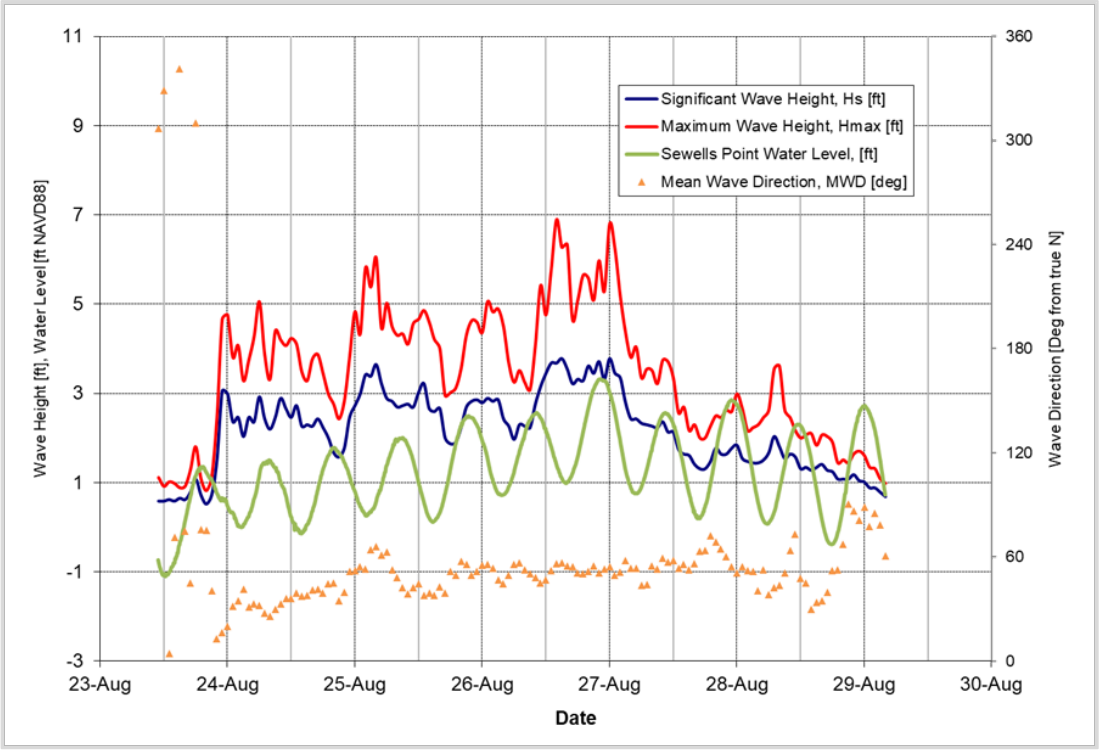


Figure 5-8: August 26, 2019 Storm

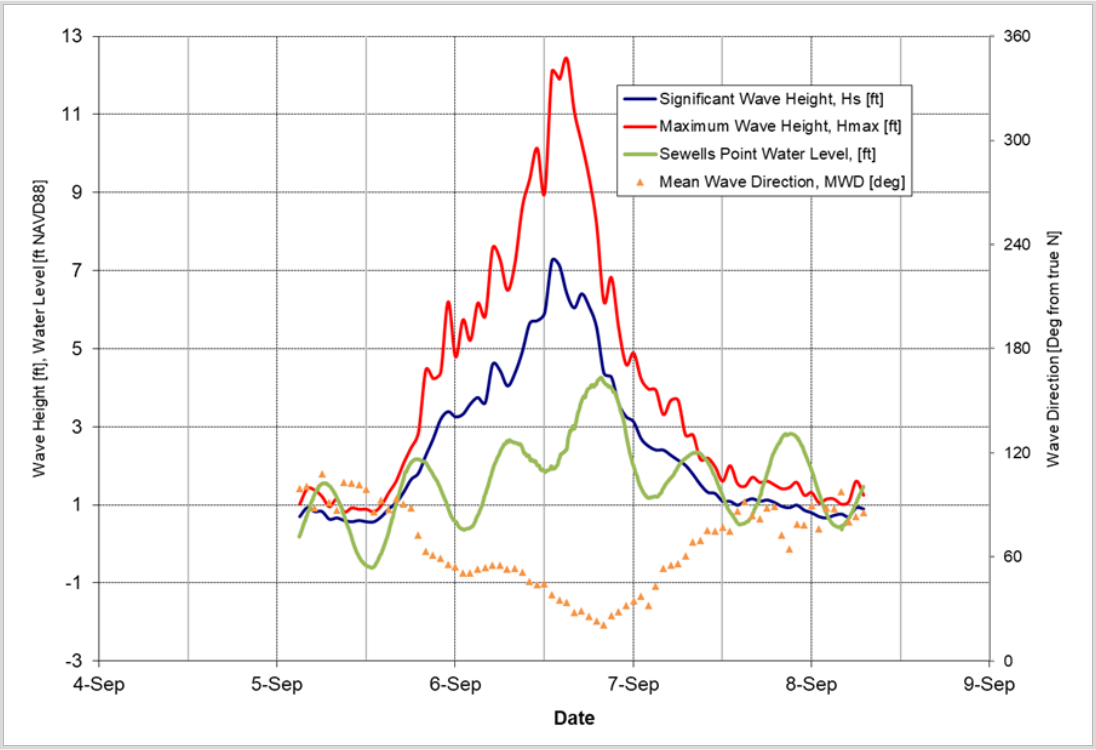


Figure 5-9: September 6, 2019 Storm

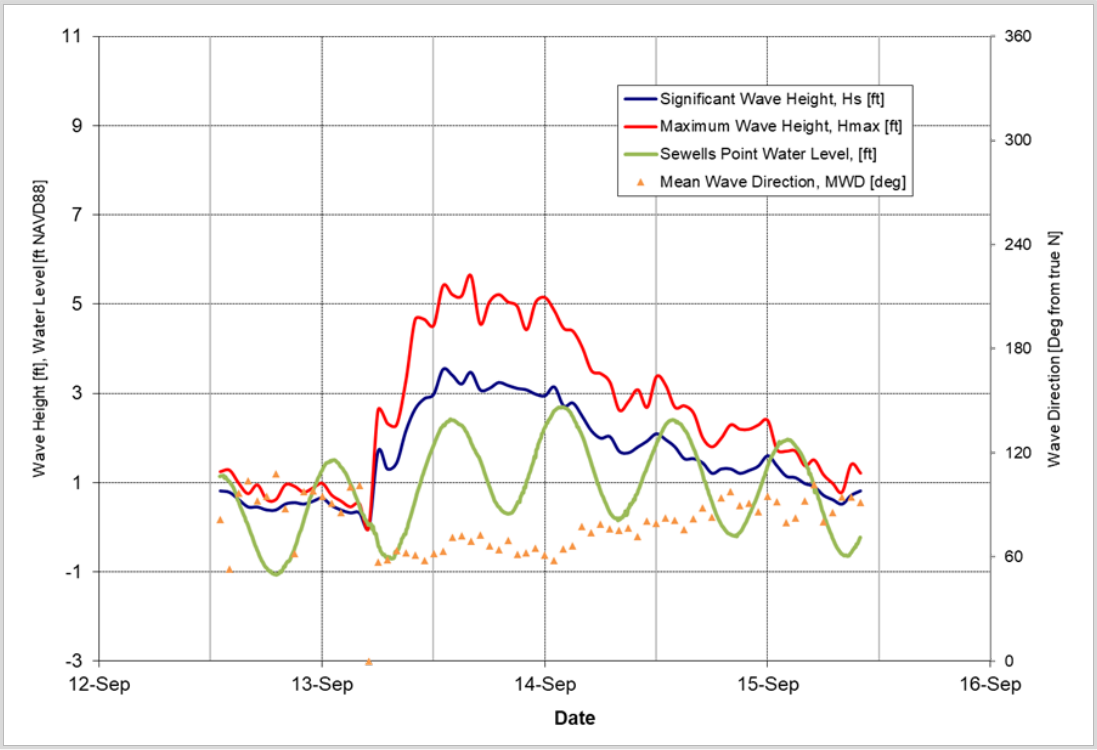


Figure 5-10: September 13, 2019 Storm

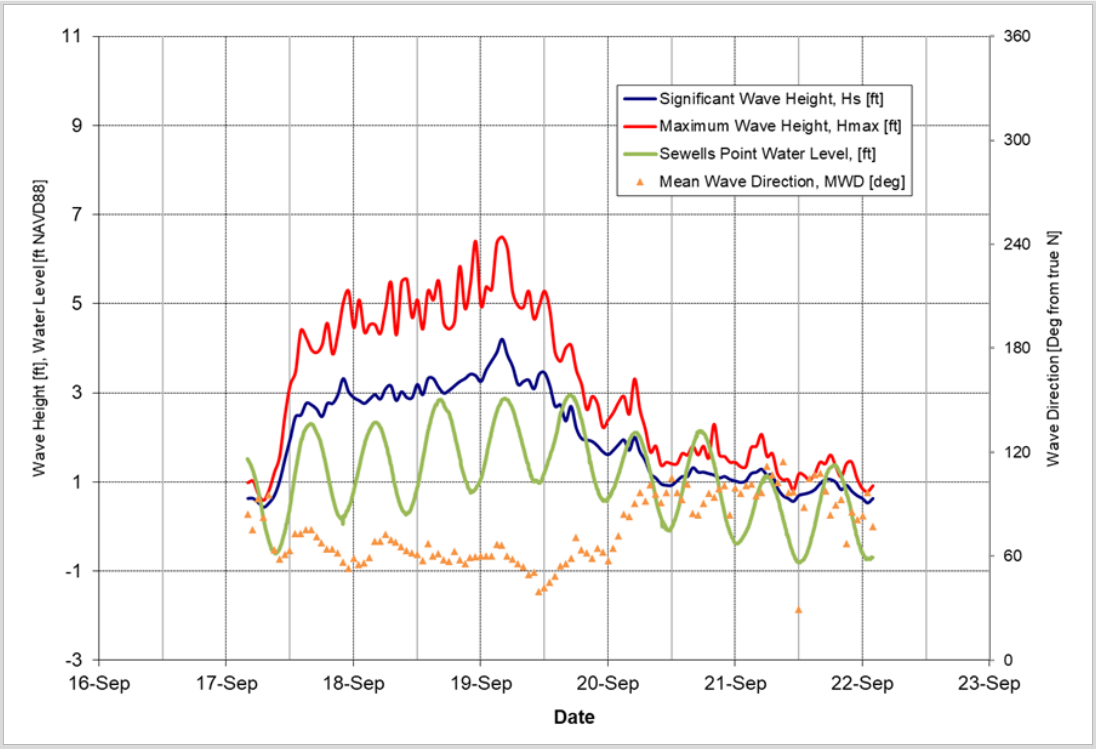


Figure 5-11: September 19, 2019 Storm

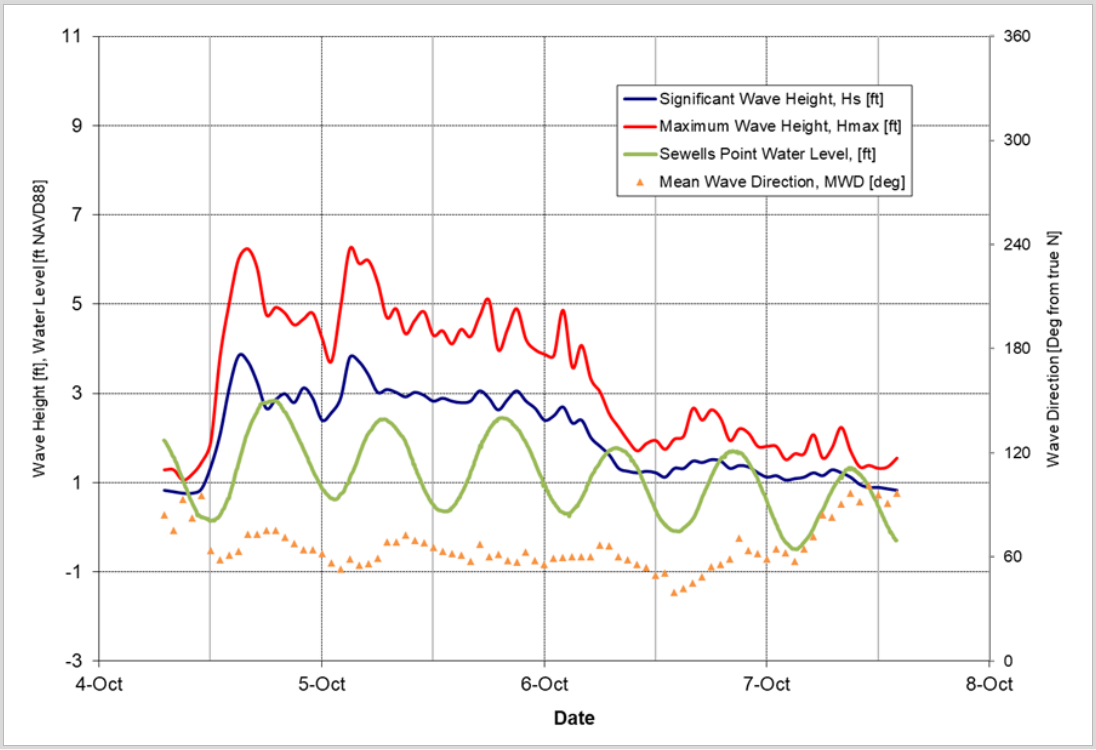


Figure 5-12: October 5, 2019 Storm

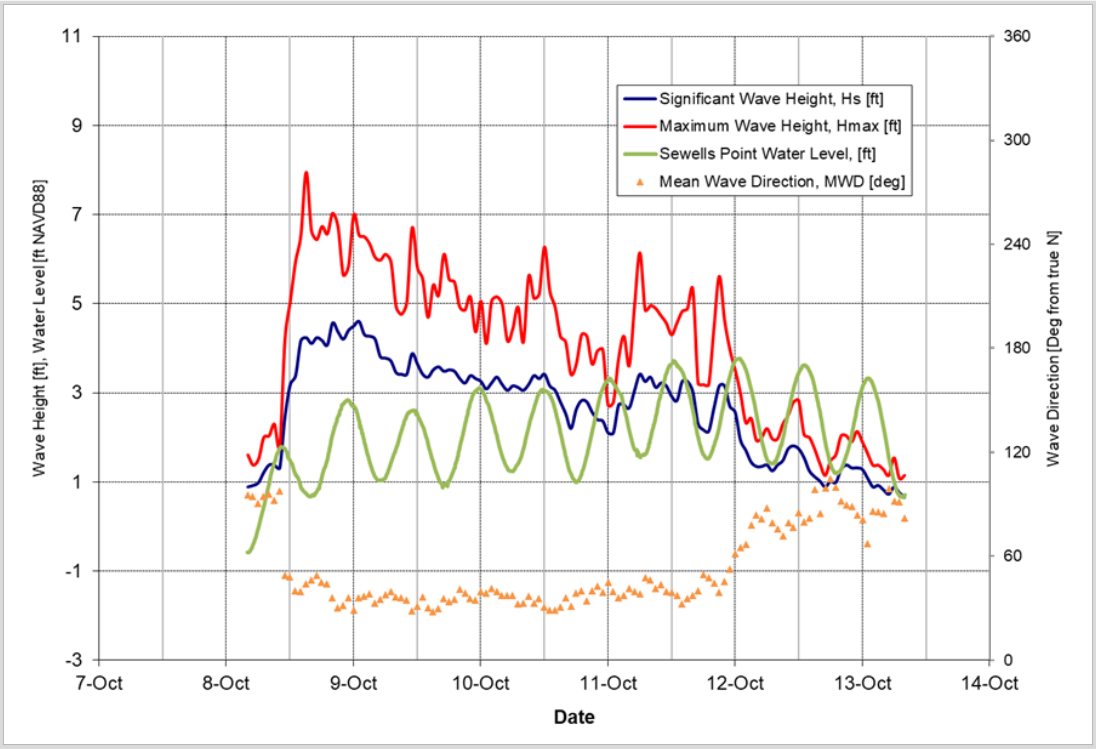


Figure 5-13: October 8, 2019 Storm

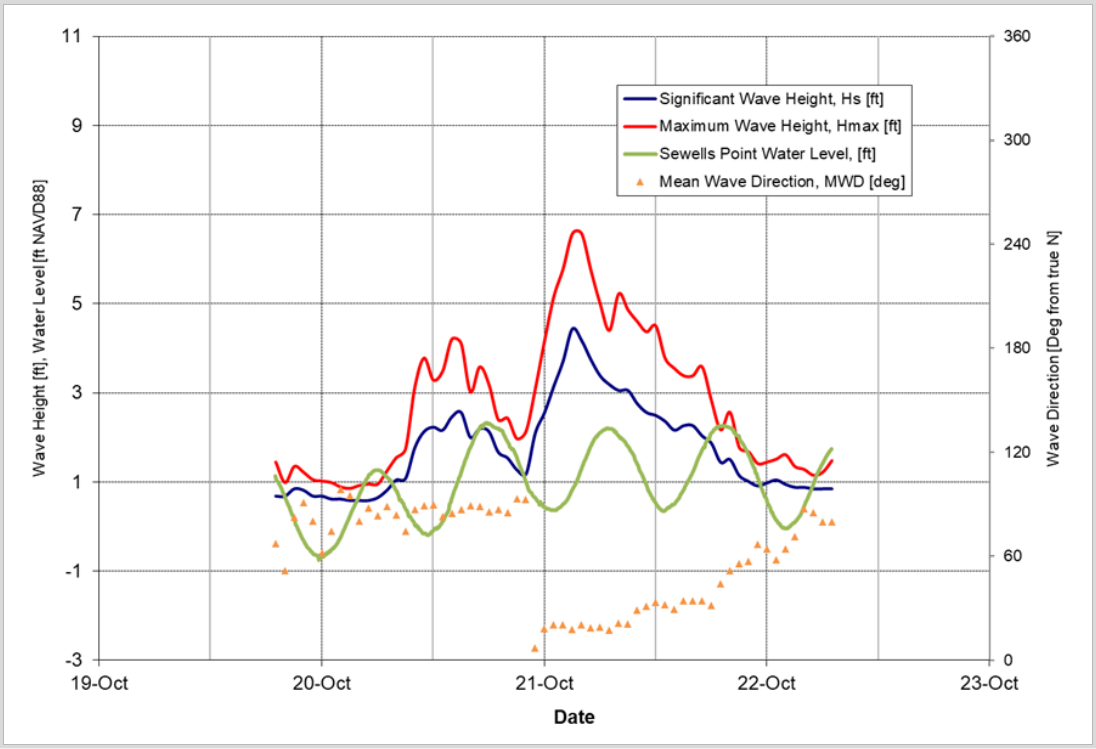


Figure 5-14: October 21, 2019 Storm

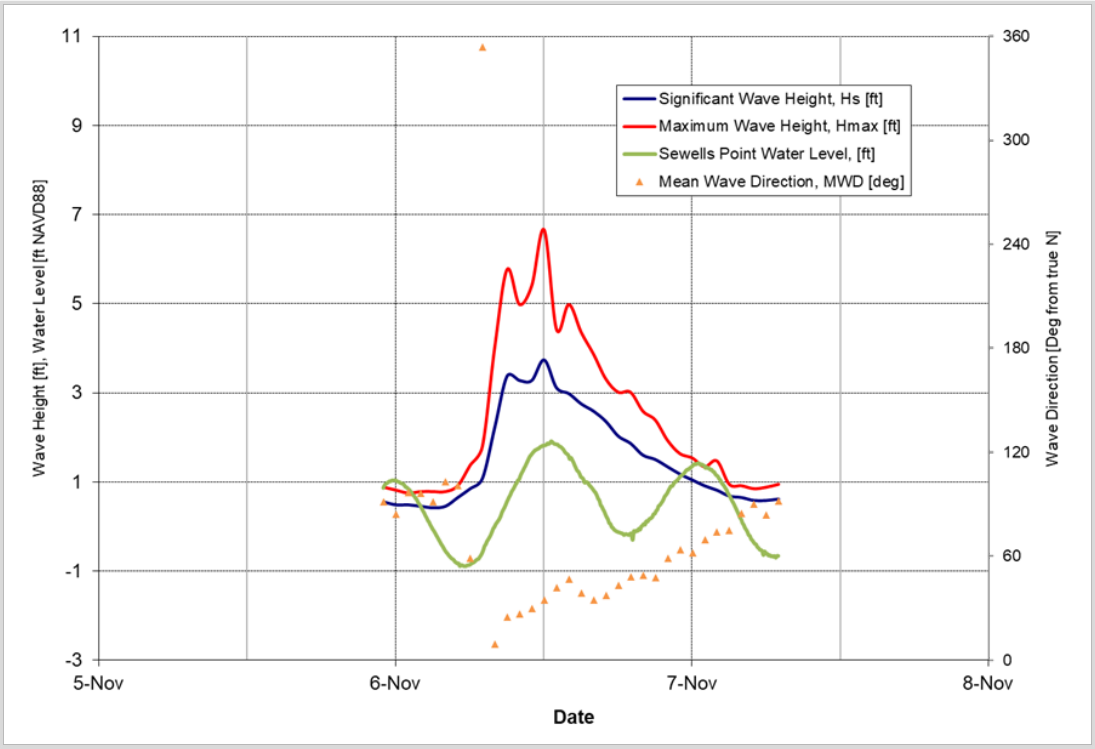


Figure 5-15: November 6, 2019 Storm

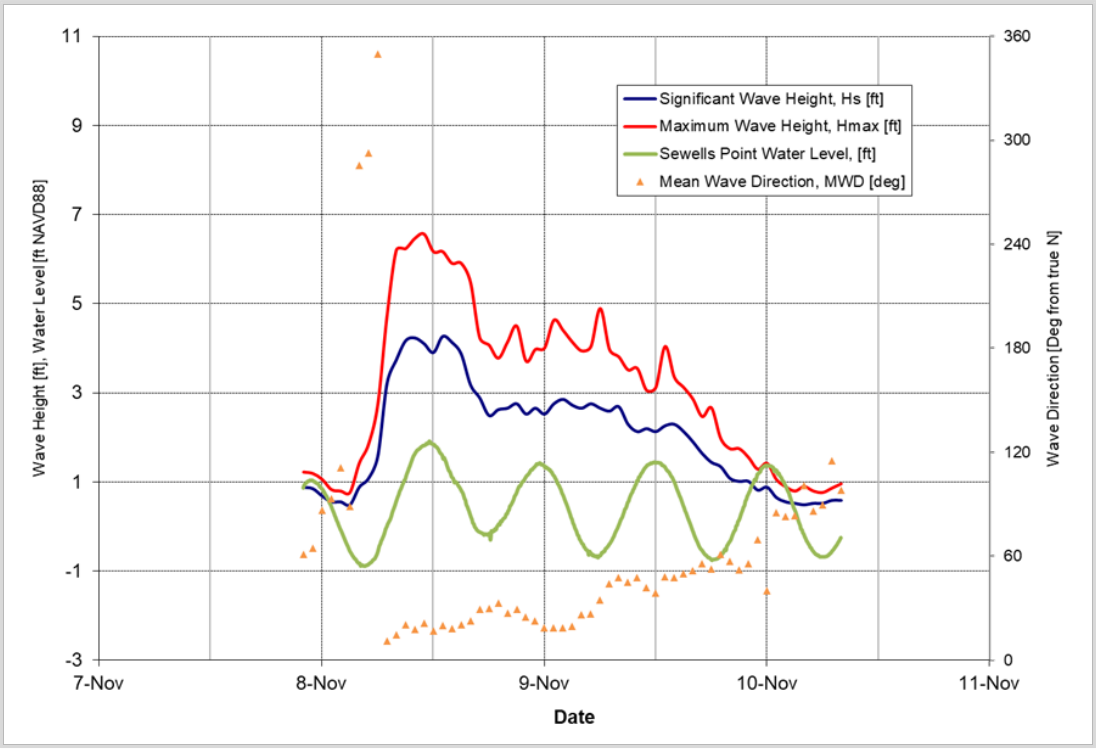


Figure 5-16: November 8, 2019 Storm

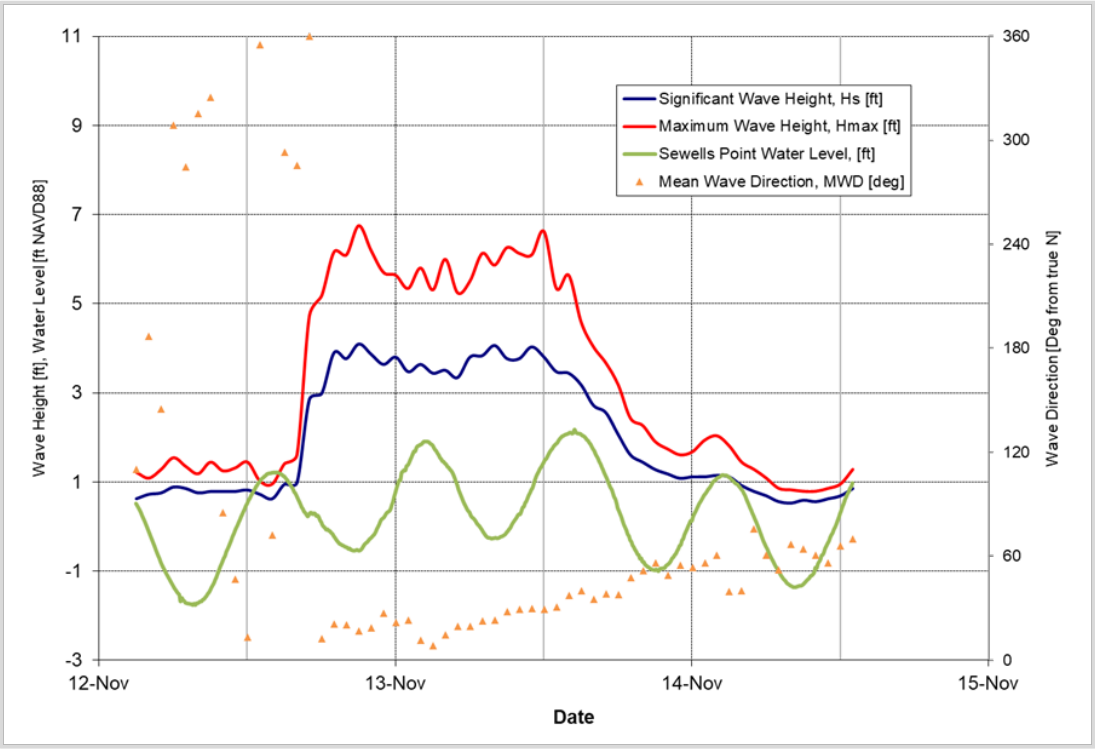


Figure 5-17: November 12, 2019 Storm

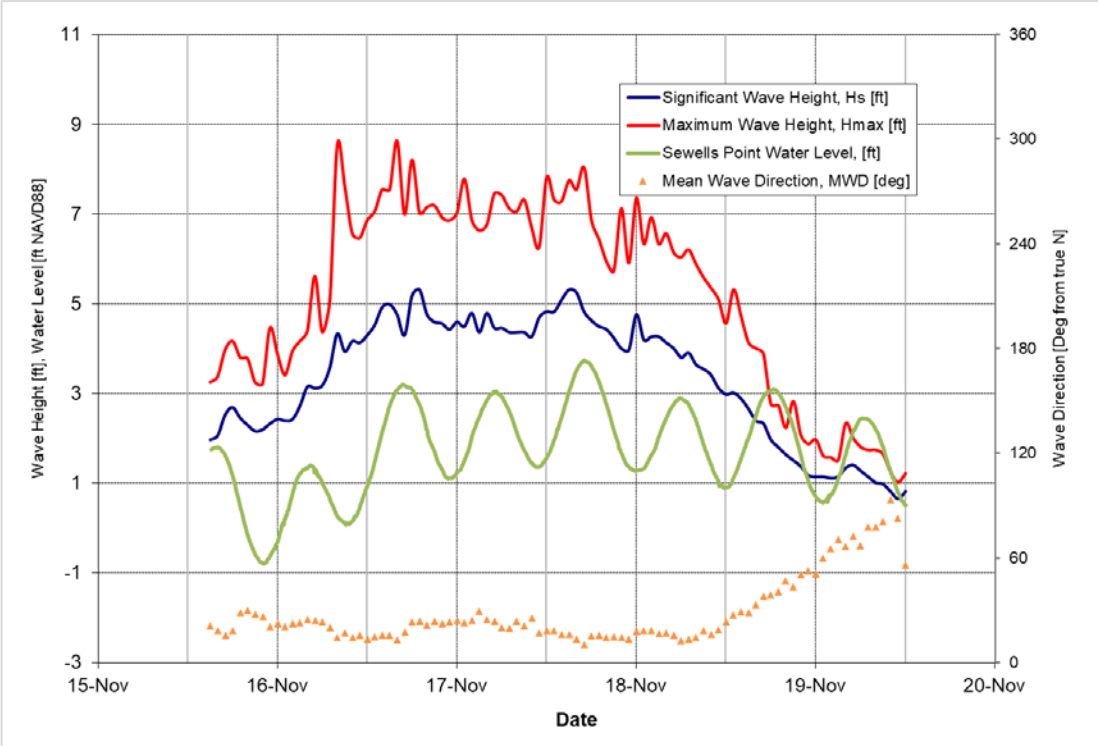


Figure 5-18: November 16, 2019 Storm

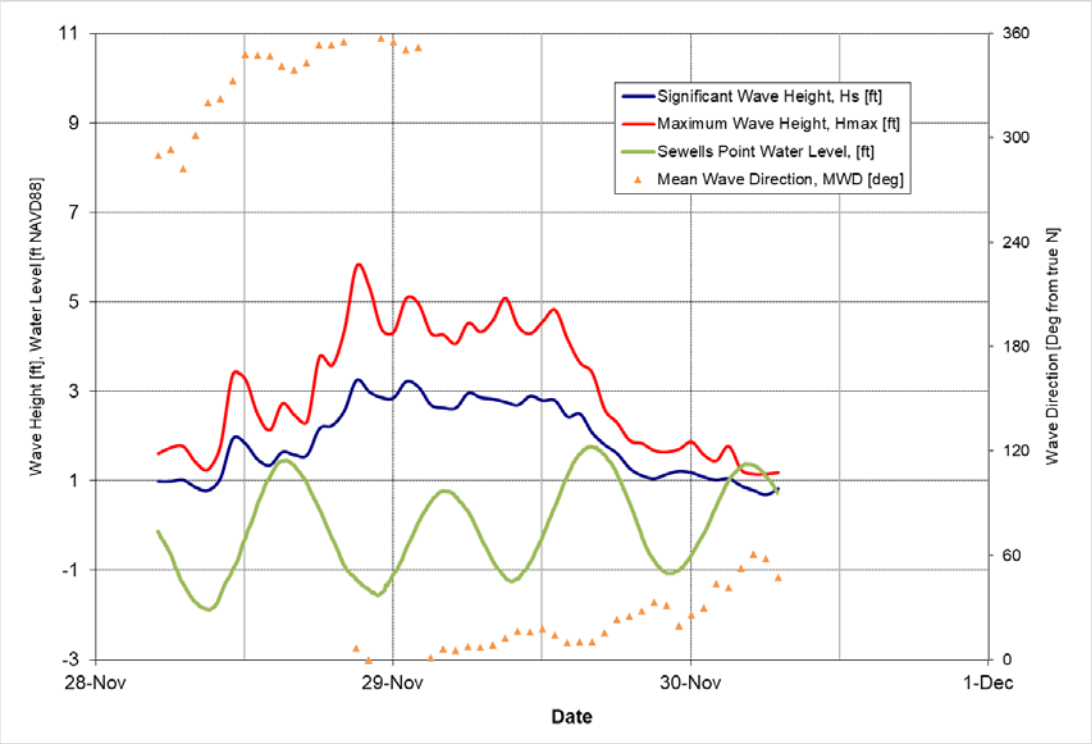


Figure 5-19: November 28, 2019 Storm

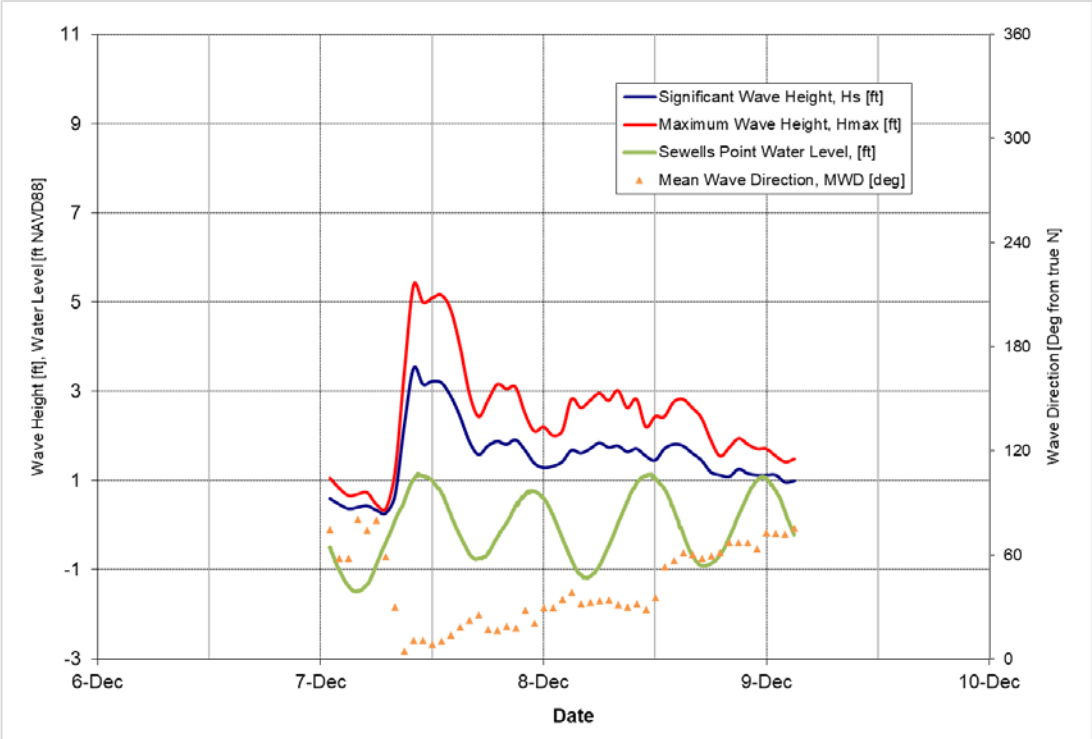


Figure 5-20: December 7, 2019 Storm

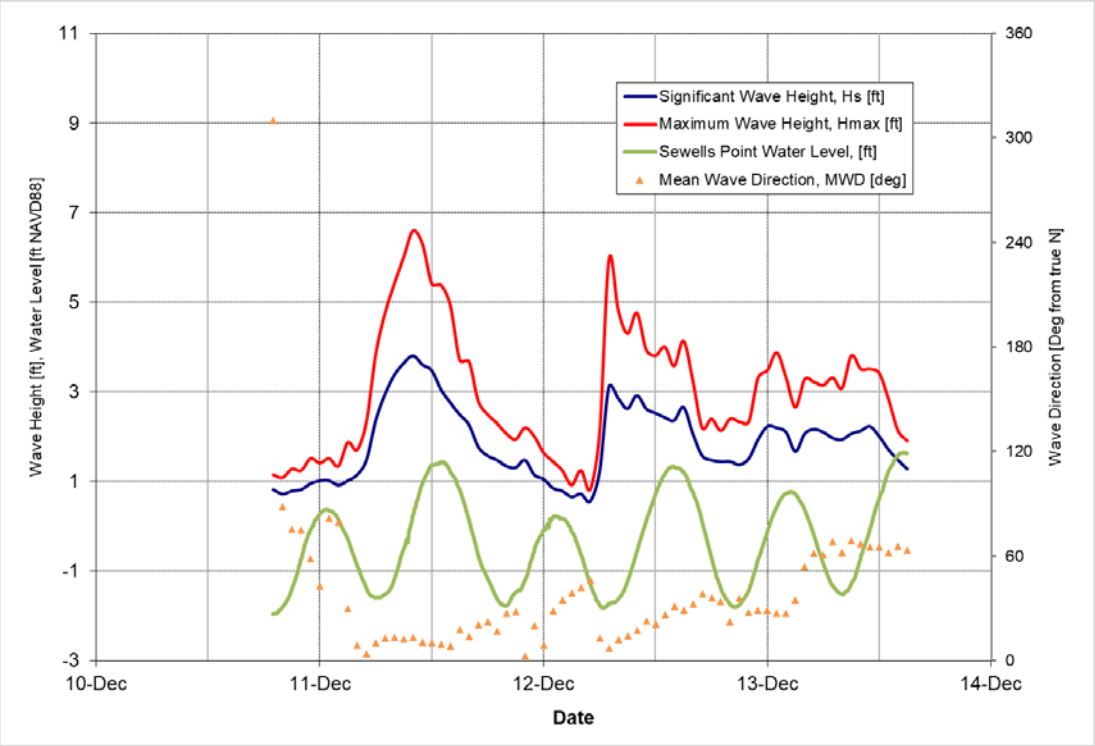


Figure 5-21: December 11, 2019 Storm

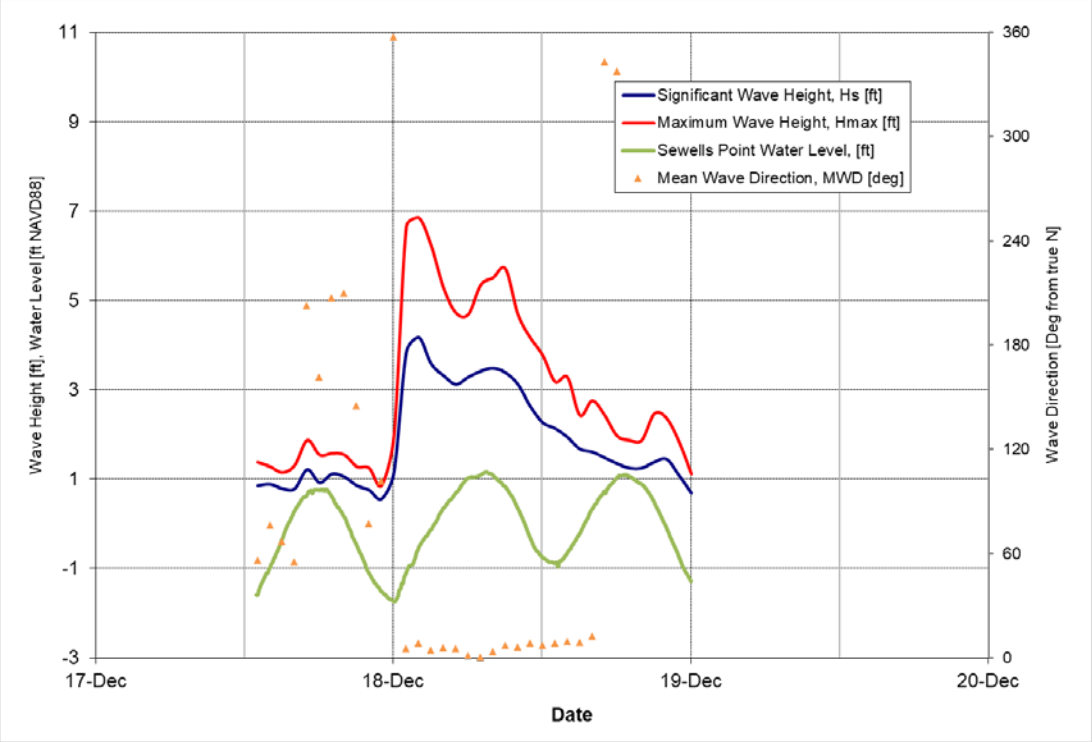


Figure 5-22: December 18, 2019 Storm

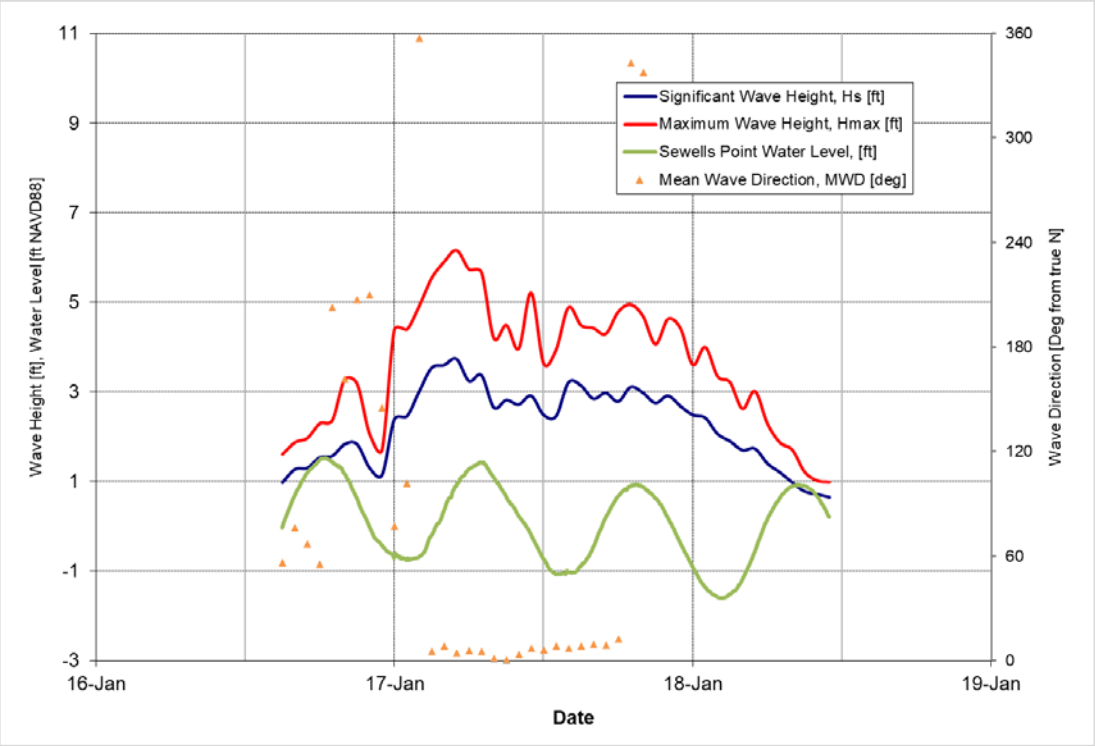


Figure 5-23: January 17, 2020 Storm

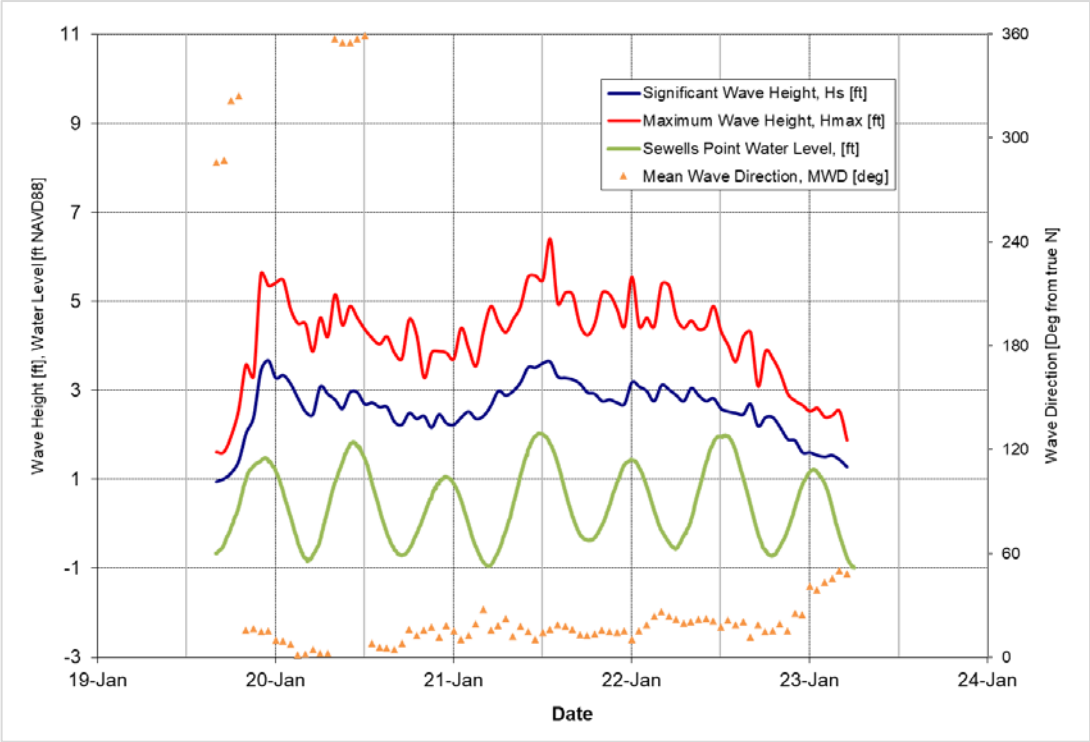


Figure 5-24: January 21, 2020 Storm

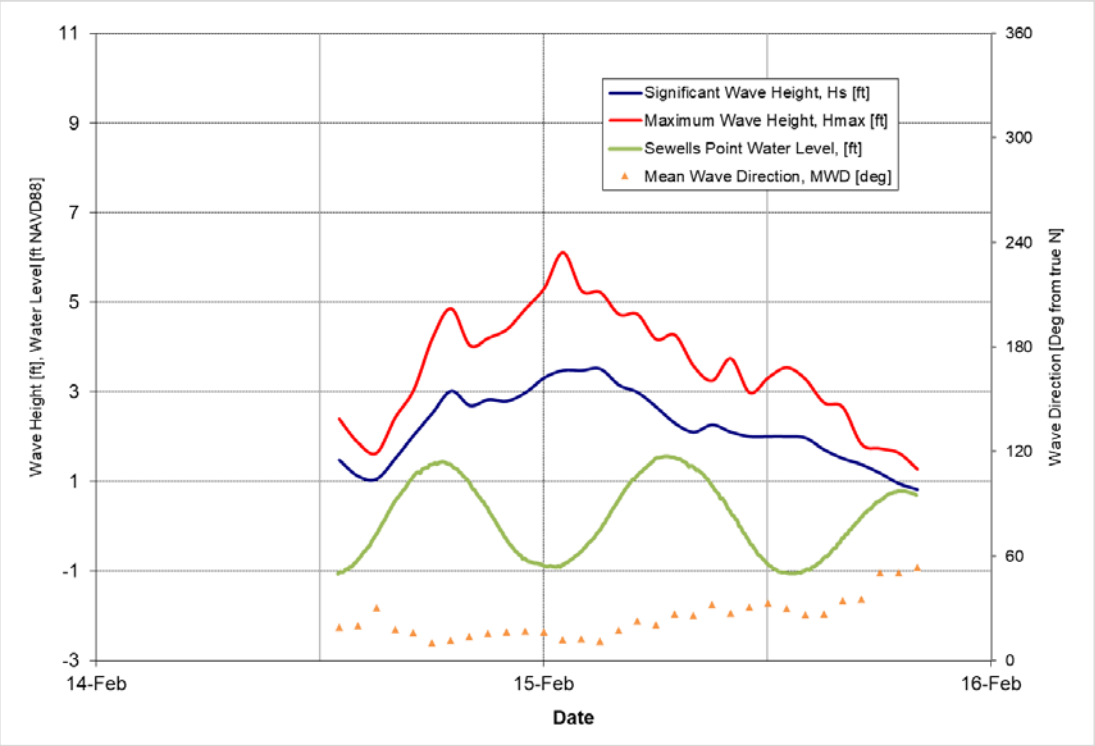


Figure 5-25: February 15, 2020 Storm

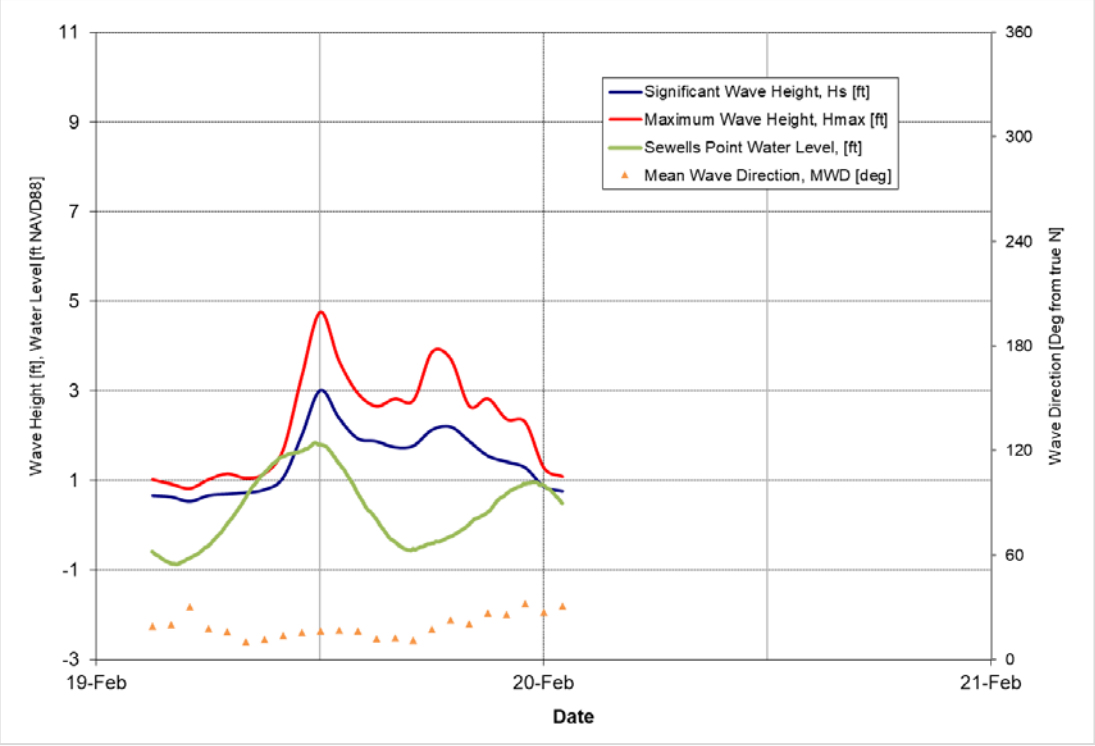


Figure 5-26: February 19, 2020 Storm

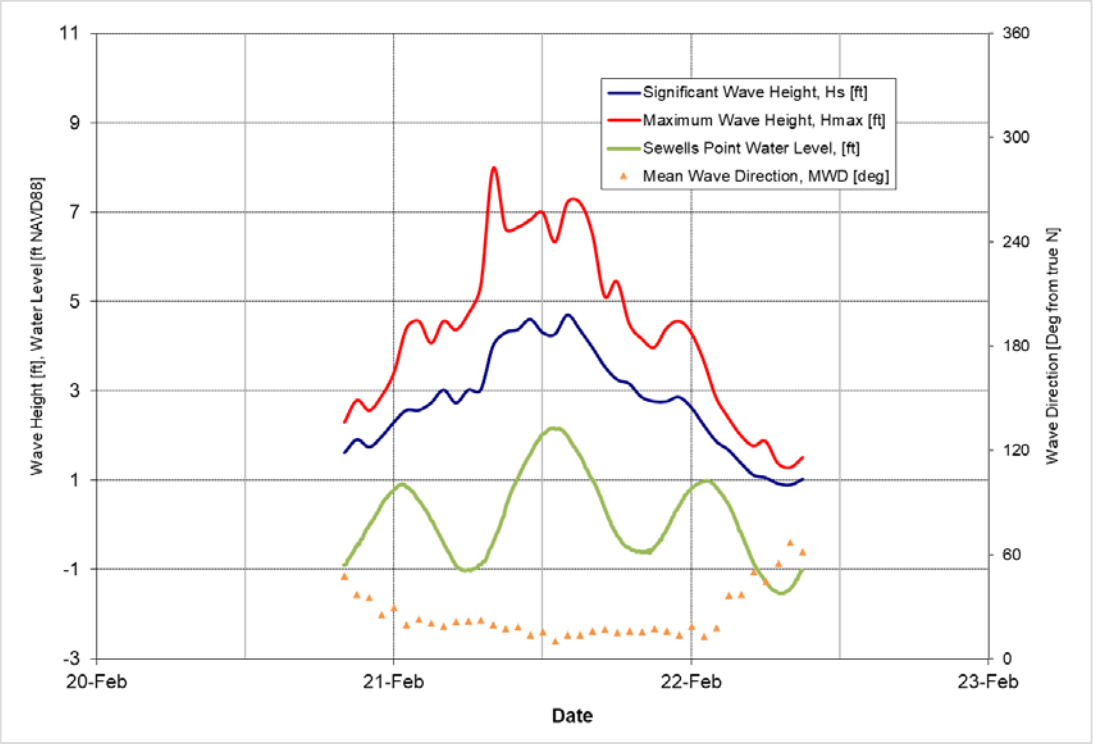


Figure 5-27: February 21, 2020 Storm

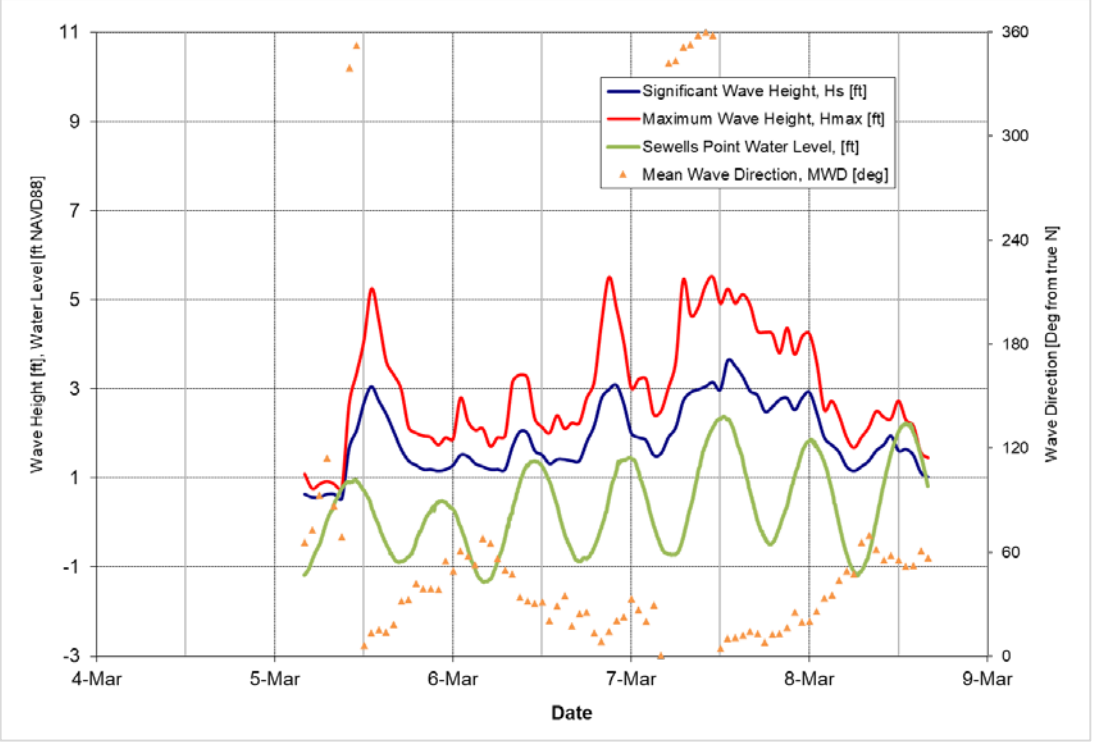


Figure 5-28: March 7, 2020 Storm

5.2.2. Engineering Activities

During this six months' monitoring period, the Toler Place breakwater modification project near 11th View street was constructed between March 2020 and July 2020.

5.3. General Shoreline Trends

Key statistics were calculated to describe the shoreline and volume change trends over the entire shoreline as well as for each region of the shoreline as defined in Figure 3-1. The computed statistics include average shoreline change, average volume change, and cumulative volume change (e.g. total volume of material lost or gained along a section of shoreline). A summary of the resulting statistics for the April 2019 to June 2020 comparison are presented in Table 5-2. A summary of the resulting statistics for the November 2019 to June 2020 comparison are presented in Table 5-3.

As illustrated in Table 5-2, the Ocean View shoreline has experienced overall retreat at MHW during April 2019 and June 2020 with a length-weighted average change rate of -7.01 ft/yr. The beach and dune above 0 feet NAVD88 gained sediment at a rate of 26,820 cy/yr from April 2019 and June 2020. The beach and dune above -15 feet NAVD88 lost sediment at a rate of -45,507 cy/yr from April 2019 and June 2020.

From November 2019 to June 2020, the MHW shoreline gained an average shoreline change of 1.32 feet, as shown in Table 5-3. The volumetric change over the same period showed gaining of 666 cy above 0 feet NAVD88, and loss of -40,094 cy above -15 feet NAVD88, respectively.

The Ocean View shoreline overall lost -40,094 cy above -15 feet NAVD88 between November 2019 and June 2020, and it had a net -45,507 cy/yr loss of sand volume above -15 feet NAVD88 over the year between April 2019 and June 2020. These overall trends and the behavior of the system are better understood by looking at patterns of change on a reach-by-reach basis, as discussed in more detail in the following section.

Table 5-2: Regional Shoreline and Volume Change Statistics (Apr. 2019 to Jun. 2020)

Region	Average Shoreline Change	Average Volume Change Rate Above 0 ft NAVD88	Cumulative Volume Change Rate Above 0 ft NAVD88	Average Volume Change Rate Above -15 ft NAVD88	Cumulative Volume Change Rate Above -15 ft NAVD88
	(ft/yr)	(cy/ft/yr)	(cy/yr)	(cy/ft/yr)	(cy/yr)
Willoughby Spit (0+00 to 45+00)	-9.75	0.52	2,354	-8.11	-36,613
800 Block Breakwaters (45+25 to 87+62)	-10.23	-0.80	-3,651	-4.33	-19,671
West Ocean View (93+41 to 163+49)	-10.59	0.09	808	-0.31	-2,770
Central Ocean View Breakwaters (169+63 to 195+63)	-9.89	0.98	3,412	0.25	882
Central Ocean View (206+86 to 323+09)	3.32	2.40	29,966	3.17	39,673
East Ocean View (329+63 to 383+58)	-18.41	-1.06	-6,068	-4.72	-27,007
OVERALL	Weighted Avg (ft/yr)	Weighted Avg (cy/ft/yr)	Total (cy/yr)	Weighted Avg (cy/ft/yr)	Total (cy/yr)
	-7.01	0.70	26,820	-1.18	-45,507

Table 5-3: Regional Shoreline and Volume Change Statistics (Nov. 2019 to Jun. 2020)

Region	Average Shoreline Change	Average Volume Change Above 0 ft NAVD88	Cumulative Volume Change Above 0 ft NAVD88	Average Volume Change Above -15 ft NAVD88	Cumulative Volume Change Above -15 ft NAVD88
	(ft)	(cy/ft)	(cy)	(cy/ft)	(cy)
Willoughby Spit (0+00 to 45+00)	-5.60	-0.64	-2,870	-7.76	-35,029
800 Block Breakwaters (45+25 to 87+62)	-5.57	-0.72	-3,255	-2.97	-13,492
West Ocean View (93+41 to 163+49)	-0.66	0.77	5,885	2.05	15,609
Central Ocean View Breakwaters (169+63 to 195+63)	5.02	1.56	5,399	1.15	3,986
Central Ocean View (206+86 to 323+09)	9.45	0.23	2,868	0.34	4,287
East Ocean View (329+63 to 383+58)	-5.13	-1.29	-7,362	-2.70	-15,455
OVERALL	Weighted Avg (ft)	Weighted Avg (cy/ft)	Total (cy)	Weighted Avg (cy/ft)	Total (cy)
	1.32	0.02	666	-1.05	-40,094

5.4. Regional Shoreline Trends

Regional shoreline trends are discussed below for the defined regions between Willoughby Spit and Little Creek Inlet (see Figure 3-1). A summary of the information in Table 5-2 and Table 5-3 has been created for each region of study.

Figure 5-29 through Figure 5-32, following the discussion of regional shoreline trends, present the shoreline and volume change at each transect within the defined regions.

5.4.1. Willoughby Spit

The western end of the Willoughby Spit region has, since regular monitoring started in 2005, been a relatively stable and accreting region. However, over both the past year and past six months between monitoring surveys, the western end of the spit between stations 0+00 and 20+00 generally lost sand volume above the -15 feet NAVD88 contour.

The eastern end of this region contained an erosional hot spot that was studied in 2010, and that study recommended improvements to manage erosion rates. Prior to December 2012, coastal structures in this region included two offshore breakwaters, a rock terminal groin, and several timber groins. Construction of the Willoughby Spit Shoreline Improvement Project was completed by December 2013, and it included sand nourishment, the removal of the existing timber groin field, relocation of a prior existing breakwater in the 800 Block breakwater field, and addition of seven new detached breakwaters connecting the 800 Block breakwaters with the two prior existing Willoughby Spit breakwaters. A summary of average shoreline and volume change rates for the Willoughby Spit region between April 2019 and June 2020 and between November 2019 and June 2020 are presented in Table 5-4.

Table 5-4: Average Shoreline and Volume Change Rates for Willoughby Spit

Region	Average Shoreline Change	Average Volume Change Above 0 ft NAVD88	Cumulative Volume Change Above 0 ft NAVD88	Average Volume Change Above -15 ft NAVD88	Cumulative Volume Change Above -15 ft NAVD88
April 2019 vs. June 2020 Comparison					
	(ft/yr)	(cy/ft/yr)	(cy/yr)	(cy/ft/yr)	(cy/yr)
Willoughby Spit (0+00 to 45+00)	-9.75	0.52	2,354	-8.11	-36,613
November 2019 vs. June 2020 Comparison					
	(ft)	(cy/ft)	(cy)	(cy/ft)	(cy)
Willoughby Spit (0+00 to 45+00)	-5.60	-0.64	-2,870	-7.76	-35,029

On average, this region lost volume in the beach and dune above 0 feet NAVD88 over the seasonal comparison (November 2019 - June 2020) and gained volume yearly comparison (April 2019 - June 2020). This region lost volume in the subaerial beach and in the submerged profile over the seasonal comparison (November 2019 - June 2020) and over the yearly comparison (April 2019 - June 2020). For the yearly comparison, the MHW shoreline lost at a rate of -9.75 ft/yr while gaining volume above 0 feet at a rate of 2,354 cy/yr and lost volume above -15 feet NAVD88 at a rate of -36,613 cy/yr, respectively. The seasonal comparison showed loss of the MHW shoreline of -5.60 feet on average and a cumulative sediment loss of -2,870 cy above 0 feet and loss of -35,029 cy above -15 feet NAVD88, respectively. The breakwaters that were part of the 2013 shoreline improvement project that connected to the previously existing 800 Block breakwaters have continued to provide stability to the majority of the Willoughby Spit reach as shown in Figure 5-29 and Figure 5-32. As an exception, at the transition between the two sets of breakwaters, from approximately 11th View Street to 12th View Street along Toler Place, has experienced significantly greater shoreline retreat than adjacent areas in the Willoughby Spit segment. Construction of the Toler Place breakwater modification project near 11th View street began in March 2020 and was completed in July 2020. The survey data captured in June 2020 would not be likely to reflect significant in shoreline and volume changes associated with

the breakwater project. It is expected that the effects of the breakwater project will begin to be apparent in the upcoming fall 2020 monitoring survey.

5.4.2. 800 Block Breakwaters

The 800 Block Breakwaters region (Sta 45+25 to Sta 87+62) is characterized by a field of eight breakwaters. The easternmost breakwater was relocated in February 2006 along with removal of a pre-existing groin spur and toe extension. This relocated breakwater was placed further offshore to mitigate an excessive salient / tombolo formation, caused by the prior structural configuration that had impaired natural sediment transport to the west. In conjunction with the 2013 Willoughby Spit shoreline improvement project, the second easternmost breakwater in the 800 Block set was also relocated further offshore to enhance natural sediment transport in the region. A summary of average shoreline and volume change rates for the 800 Block Breakwaters region between April 2019 and June 2020 and between November 2019 and June 2020 are presented in Table 5-5.

Table 5-5: Average Shoreline and Volume Change Rates for 800 Block Breakwaters

Region	Average Shoreline Change	Average Volume Change Above 0 ft NAVD88	Cumulative Volume Change Above 0 ft NAVD88	Average Volume Change Above -15 ft NAVD88	Cumulative Volume Change Above -15 ft NAVD88
April 2019 vs. June 2020 Comparison					
	(ft/yr)	(cy/ft/yr)	(cy/yr)	(cy/ft/yr)	(cy/yr)
800 Block Breakwaters (45+25 to 87+62)	-10.23	-0.80	-3,651	-4.33	-19,671
November 2019 vs. June 2020 Comparison					
	(ft)	(cy/ft)	(cy)	(cy/ft)	(cy)
800 Block Breakwaters (45+25 to 87+62)	-5.57	-0.72	-3,255	-2.97	-13,492

The 800 Block region lost volume over the seasonal comparison (November 2019 - June 2020) and over the yearly comparison (April 2019 - June 2020). Over the past year, there has been retreat of the MHW shoreline of -10.23 ft/yr as well as an overall volume loss above 0 feet NAVD88 of -3,651 cy/yr and overall volume loss above -15 ft NAVD88 of -19,671 cy/yr, respectively. The seasonal comparison showed there was retreat of the MHW shoreline of -5.57 feet with a loss of sediment volume above 0 feet NAVD88 and a loss of sediment volume above -15 feet NAVD88 of -3,255 cy and -13,492 cy, respectively.

5.4.3. West Ocean View

The West Ocean View area (Sta 93+41 to Sta 163+49), between the 800 Block and Central Ocean View breakwaters, was historically characterized by a series of timber groins. The 2013 West Ocean View Shoreline Improvement Project included the removal of all timber groins located between the Ocean View Fishing Pier and Station 141+98, the reconstruction of a rock groin at station 129+17, and 73,600 cy of sand nourishment placed in front of Sarah Constant Beach Park. A summary of average shoreline and volume change rates for the West Ocean View region between April 2019 and June 2020 and between November 2019 and June 2020 are presented in Table 5-6.

Table 5-6: Average Shoreline and Volume Change Rates for West Ocean View

Region	Average Shoreline Change	Average Volume Change Above 0 ft NAVD88	Cumulative Volume Change Above 0 ft NAVD88	Average Volume Change Above -15 ft NAVD88	Cumulative Volume Change Above -15 ft NAVD88
April 2019 vs. June 2020 Comparison					
	(ft/yr)	(cy/ft/yr)	(cy/yr)	(cy/ft/yr)	(cy/yr)
West Ocean View (93+41 to 163+49)	-10.59	0.09	808	-0.31	-2,770
November 2019 vs. June 2020 Comparison					
	(ft)	(cy/ft)	(cy)	(cy/ft)	(cy)
West Ocean View (93+41 to 163+49)	-0.66	0.77	5,885	2.05	15,609

This region had loss over the yearly comparison (April 2019 - June 2020) with retreat of the MHW shoreline at a rate of -10.59 ft/yr, and a volume gain above 0 feet NAVD88 of 808 cy/yr and a volume loss above -15 feet NAVD88 of -2,770 cy/yr respectively. The seasonal comparison (November 2019 - June 2020) showed a retreat of the MHW shoreline of -0.66 feet, a gain of material above 0 feet NAVD88 of 5,885 cy and a gain of material above -15 feet NAVD88 of 15,609 cy.

5.4.4. Central Ocean View Breakwaters

The Central Ocean View Breakwaters region covers the four offshore breakwaters at Central Ocean View and approximately 800 feet westward (Sta 169+63 to Sta 195+63). A summary of average shoreline and volume change rates for the Central Ocean View Breakwaters region between April 2019 and June 2020 and between November 2019 and June 2020 are presented in Table 5-7.

Table 5-7: Average Shoreline and Volume Change Rates for Central Ocean View Breakwaters

Region	Average Shoreline Change	Average Volume Change Above 0 ft NAVD88	Cumulative Volume Change Above 0 ft NAVD88	Average Volume Change Above -15 ft NAVD88	Cumulative Volume Change Above -15 ft NAVD88
April 2019 vs. June 2020 Comparison					
	(ft/yr)	(cy/ft/yr)	(cy/yr)	(cy/ft/yr)	(cy/yr)
Central Ocean View Breakwaters (169+63 to 195+63)	-9.89	0.98	3,412	0.25	882
November 2019 vs. June 2020 Comparison					
	(ft)	(cy/ft)	(cy)	(cy/ft)	(cy)
Central Ocean View Breakwaters (169+63 to 195+63)	5.02	1.56	5,399	1.15	3,986

This region experienced overall volume gain over the yearly comparison (April 2019 - June 2020) and seasonal comparison (November 2019 - June 2020) above 0 and -15 feet NAVD88. The yearly comparison showed retreat of the MHW shoreline at an average rate of -9.89 ft/yr and an overall volume gain above 0 feet NAVD88 and above -15 feet NAVD88 at a rate of 3,412 cy/yr and 882 cy/yr, respectively. The seasonal comparison indicted gain of the MHW shoreline at an average rate of 5.02 ft and a gain of material above 0 feet NAVD88 and -15 feet NAVD88 of 5,399 cy and 3,986 cy respectively.

5.4.5. Central Ocean View

Central Ocean View (Sta 206+86 to Sta 323+09) is historically a stable region with slight accretion despite the absence of engineering interventions (e.g. beach fill or structures). A summary of average shoreline and volume change rates for the Central Ocean View region between April 2019 and June 2020 and between November 2019 and June 2020 are presented in Table 5-8.

Table 5-8: Average Shoreline and Volume Change Rates for Central Ocean View

Region	Average Shoreline Change	Average Volume Change Above 0 ft NAVD88	Cumulative Volume Change Above 0 ft NAVD88	Average Volume Change Above -15 ft NAVD88	Cumulative Volume Change Above -15 ft NAVD88
April 2019 vs. June 2020 Comparison					
	(ft/yr)	(cy/ft/yr)	(cy/yr)	(cy/ft/yr)	(cy/yr)
Central Ocean View (206+86 to 323+09)	3.32	2.40	29,966	3.17	39,673
November 2019 vs. June 2020 Comparison					
	(ft)	(cy/ft)	(cy)	(cy/ft)	(cy)
Central Ocean View (206+86 to 323+09)	9.45	0.23	2,868	0.34	4,287

As shown in Table 5-8, the yearly comparison (April 2019 - June 2020) for the Central Ocean View region showed volume gain above 0 feet NAVD88 of 29,966 cy/yr and volume gain above -15 feet NAVD88 of 39,673 cy/yr. The seasonal comparison (November 2019 - June 2020) indicated volume gain above 0 feet NAVD88 and above -15 feet NAVD88 of 2,868 cy and 4,287 cy, respectively. The average yearly shoreline gain rate was 3.32 ft/yr with an average of 9.45 ft of gain occurring over the reach during the current survey period.

5.4.6. East Ocean View

The East Ocean View region (Sta 329+63 to Sta 383+58) is characterized by 15 breakwaters of which the 5 westernmost were built in August 2009. In March 2009, prior to the breakwater construction, a beach renourishment project added approximately 196,000 cy of material to the beach. Table 5-9 summarizes average shoreline and volume change rates for the East Ocean View region between April 2019 and June 2020 and between November 2019 and June 2020.

Table 5-9: Average Shoreline and Volume Change Rates for East Ocean View

Region	Average Shoreline Change	Average Volume Change Above 0 ft NAVD88	Cumulative Volume Change Above 0 ft NAVD88	Average Volume Change Above -15 ft NAVD88	Cumulative Volume Change Above -15 ft NAVD88
April 2019 vs. June 2020 Comparison					
	(ft/yr)	(cy/ft/yr)	(cy/yr)	(cy/ft/yr)	(cy/yr)
East Ocean View (329+63 to 383+58)	-18.41	-1.06	-6,068	-4.72	-27,007
November 2019 vs. June 2020 Comparison					
	(ft)	(cy/ft)	(cy)	(cy/ft)	(cy)
East Ocean View (329+63 to 383+58)	-5.13	-1.29	-7,362	-2.70	-15,455

This region is normally characterized by a consistent erosional pattern due to sediment movement along the shoreline from east to west with no external sand source due to the terminal groin at Little Creek Inlet. East Ocean View experienced volume loss over the yearly (April 2019 - June 2020) and seasonal (November 2019 - June 2020) comparison. The yearly comparison showed an overall retreat of the MHW shoreline at a rate of -18.41 ft/yr and an overall volume loss above 0 feet NAVD88 and -15 feet NAVD88 at a rate of -6,068 cy/yr and -27,007 cy/yr respectively. The seasonal comparison showed a MHW shoreline retreat of -5.13 feet, and loss of material above 0 feet NAVD88 of -7,362 cy and loss of sediment above -15 feet NAVD88 of -15,455 cy.

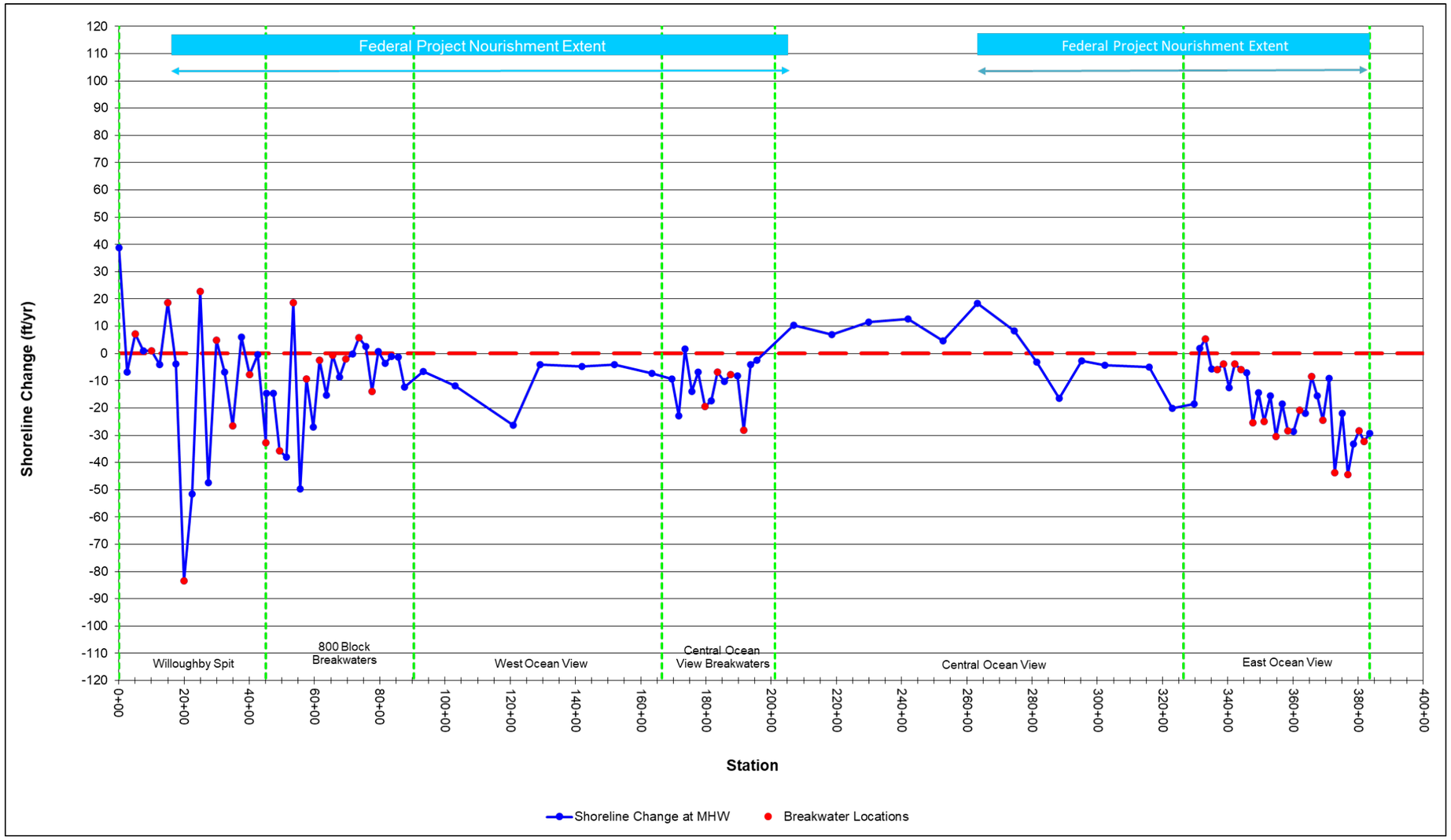


Figure 5-29: Shoreline Change Rate (ft/yr) at Mean High Water (+0.98 ft NAVD88) for April 2019 to June 2020 (Note: Positive = Accretion, Negative = Erosion)

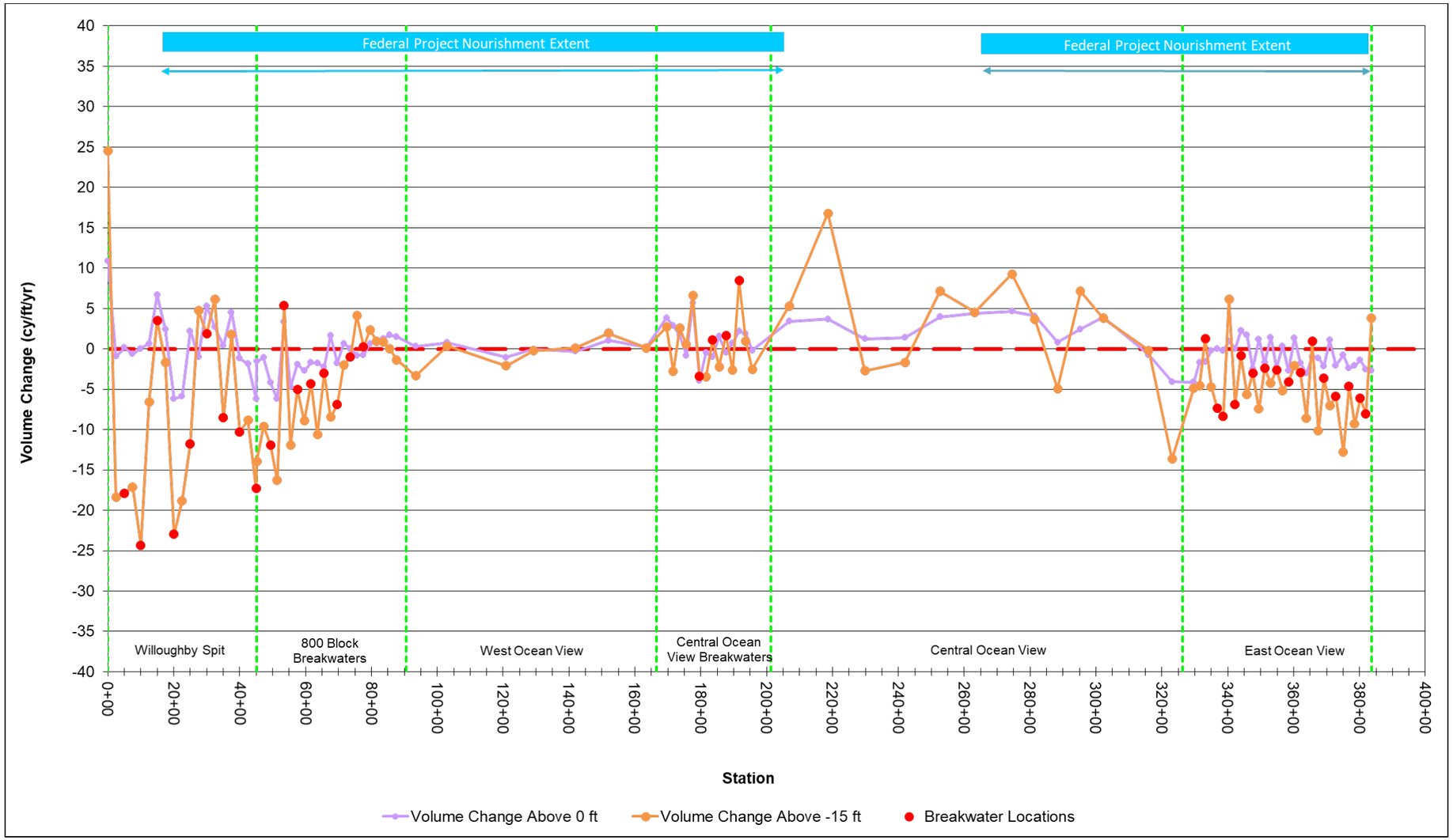


Figure 5-30: Volume Change Rate Above 0 ft NAVD88 and -15 ft NAVD88 (cy/ft/yr) for April 2019 to June 2020 (Note: Positive = Accretion, Negative = Erosion)

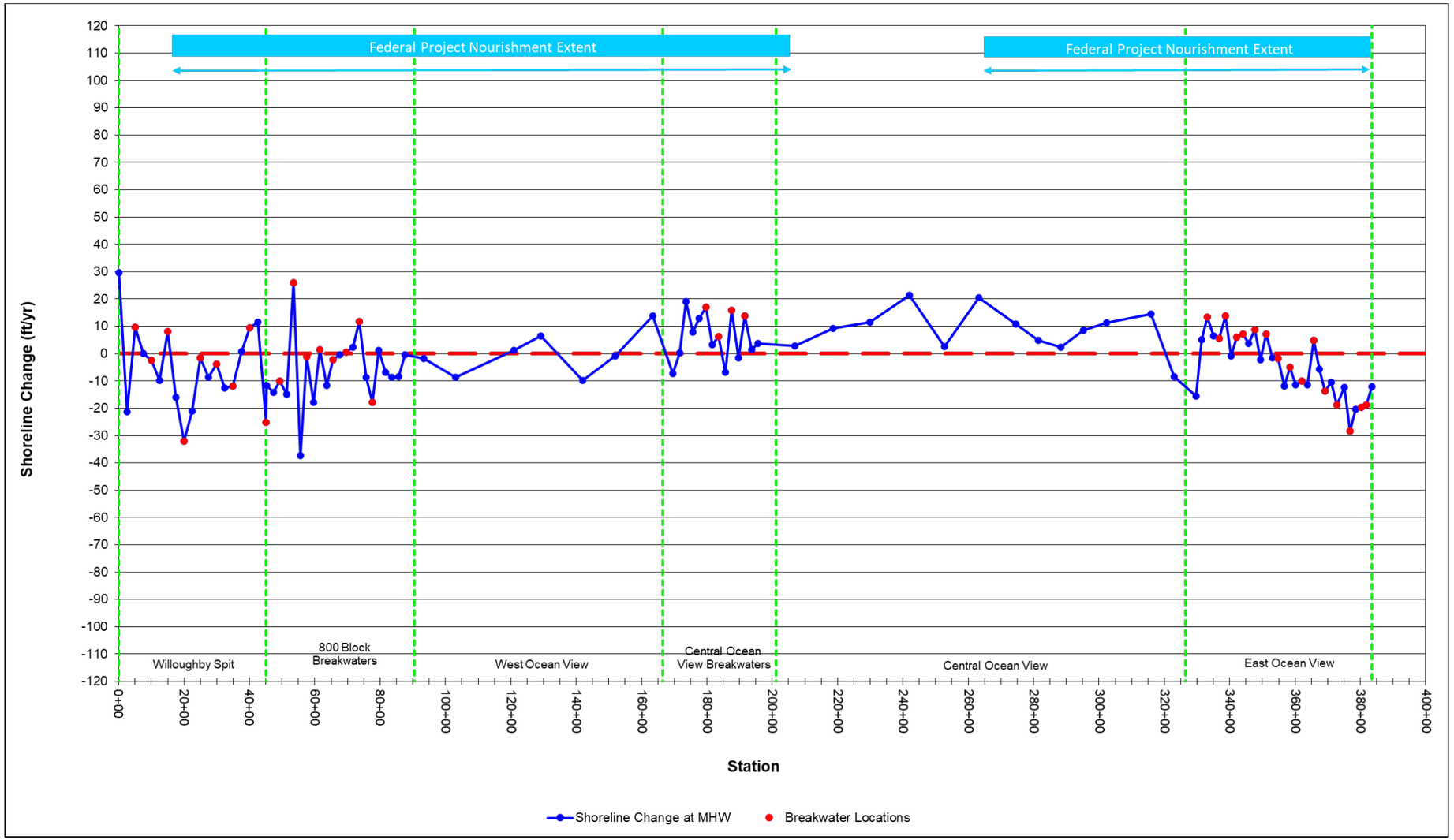


Figure 5-31: Shoreline Change (ft) at Mean High Water (+0.98 ft NAVD88) for November 2019 to June 2020 (Note: Positive = Accretion, Negative = Erosion)

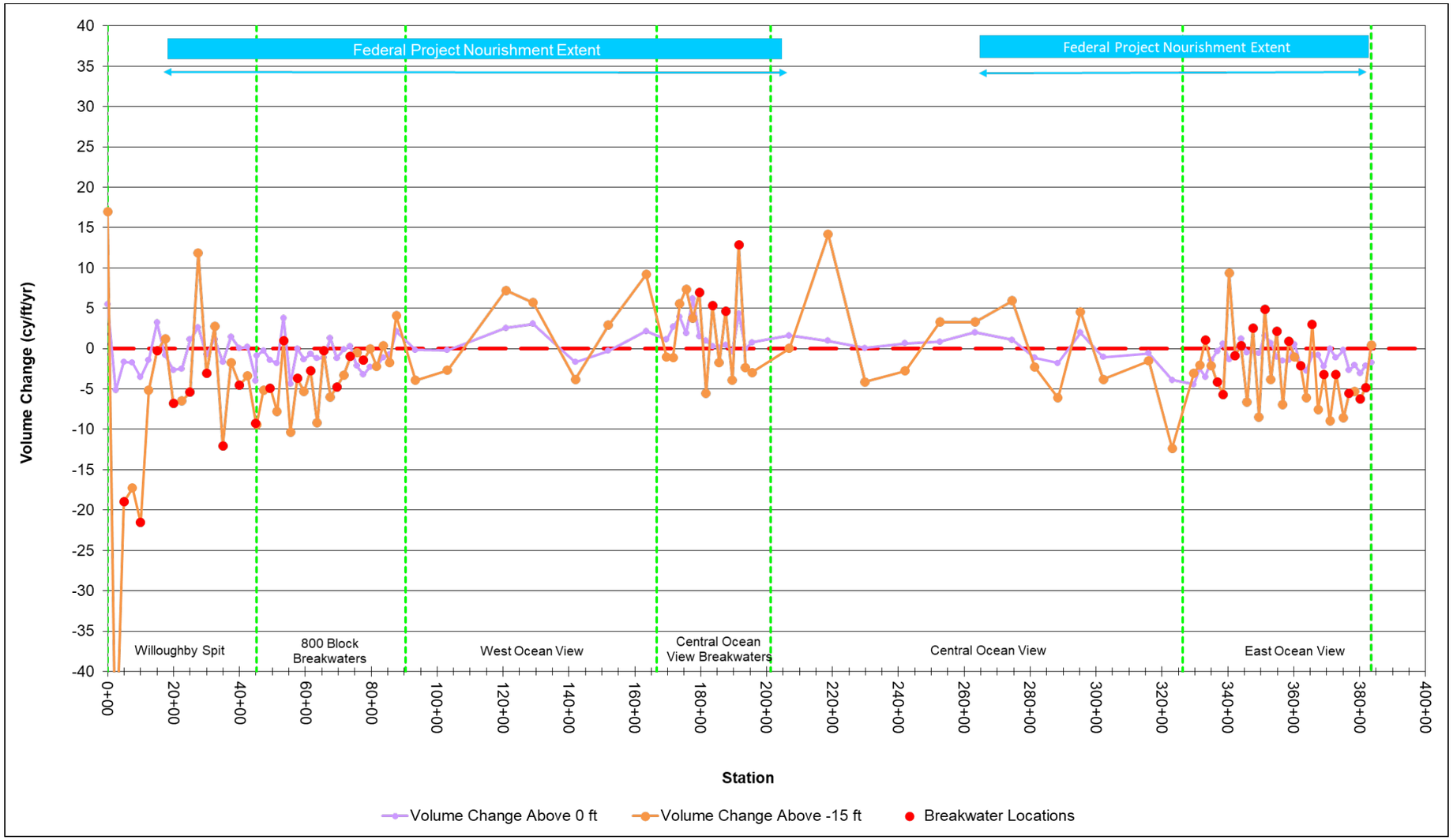


Figure 5-32: Volume Change above 0 ft NAVD88 and -15 ft NAVD88 (cy/ft) for November 2019 to June 2020 (Note: Positive = Accretion, Negative = Erosion)

6. Bed Elevations Immediately West of the Willoughby Spit Terminal Groin

Bed elevations immediately west of Willoughby Spit terminal groin were not captured in the June 2020 survey of the Ocean View shoreline. The text of this chapter of the report is identical to the information presented in the Fall 2018 monitoring report.

The 2012 design and subsequent construction of the Willoughby Spit Shoreline Improvement projects included elevation of the crest of the terminal groin, along with excavation of sand from the area immediately west of the terminal groin. The excavated sand was used as beach fill borrow material in other reaches of the project to pre-fill the newly constructed Willoughby Spit breakwaters field.

Prior to the 2012 project, a resident had expressed concerns to the City about sand accretion at their pier and boat dock adjacent to the terminal groin. The crest of the terminal groin was raised, and the sand between the groin and the pier was excavated, in order to mitigate some of the potential for sand to migrate over the groin and into the vicinity of the pier.

While this area west of the terminal groin has not historically been part of the regular periodic survey coverage, the past two surveys have included vessel tracks, as shown in Figure 6-1, to evaluate the depths near the pier. The left and right panels of Figure 6-1 show the April 2018 and November 2018 survey point depths, respectively, between the terminal groin and the pier and the relatively deeper waters near the Hampton Roads Bridge Tunnel. In both surveys, depths near the pier were deeper than -4.0 feet NAVD88, which is approximately 2.5 feet deeper than local Mean Low Water (MLW). Bed elevations were consistently at or deeper than this elevation from the pier to the deeper water at the end of the spit.

In addition, no significant change in bed elevation was seen between the April 2018 and November 2018 survey data. Thus, the surveys indicate that the depths between the terminal groin and the pier were relatively stable at that time.

Figure 6-1: Spring 2018 and Fall 2018 Survey Depths West of the Willoughby Spit Terminal Groin

7. Federal Coastal Storm Damage Reduction Project

7.1. Initial Construction of the Federal Project

The initial nourishment of the Federal Willoughby and Vicinity Coastal Storm Damage Reduction Project (Federal Project) was constructed in March, April and May 2017. The Federal Project placed approximately 1.2 million cubic yards of sand from the Thimble Shoals Auxiliary Channel along most of the Ocean View shoreline. An exception is that the Federal Project did not place sand between Warwick Avenue (station 206+86) and 1st Bay Street (station 274+53). The Spring 2017 survey (done in late May 2017 after all of the Federal Project beach fill had been placed) captured the project's beach and nearshore condition very soon after construction was completed. The volume gains from October 2016 to May 2017 associated with Federal Project construction, and the initial readjustment of the Federal project post-construction, were discussed in the prior reports for Fall 2017 and Spring 2017 monitoring periods.

7.2. Shoreline and Beach Berm Contour Changes Relative to the May 2017 Post-Construction Condition of the Federal Project

7.2.1. Shoreline Change

The most recent June 2020 periodic survey documents the continued evolution of the Federal Project through background erosion / accretion due to coastal processes from May 2017 through June 2020. Figure 7-1 shows the position of the Mean Higher High Water (MHHW) contour line extracted from the profile surveys from October 2016 (approximately six months pre-construction), May 2017 (post-construction), October 2017 (approximately five months post-construction), April 2018 (11 months post-construction), November 2018 (18 months post-construction), April 2019 (23 months post-construction), November 2019 (29 months post-construction), and June 2020 (36 months post-construction).

The movement of the shoreline is consistent with the shoreline changes tabulated by Ocean View region earlier in this report (Table 1-2). The chart in Figure 7-1 shows shoreline position rather than shoreline change rate as a means of illustrating the beach planform remaining in the project relative to its construction design. The chart illustrates that the MHHW contour changed less in both the six months from November 2019 and June 2020 and over the year from April 2019 to June 2020, compared to the changes observed in the first year post-construction (May 2017 to April 2018). This is consistent with typical expectations of a beach nourishment project's evolution.

The median shoreline change rate from April 2019 to June 2020 among the 106 transects (without any length-weighting) was approximately -9 ft/yr, with 79% of transects having negative change rates with average rate of -18 ft/yr. Over the more recent six months from November 2019 to June 2020, the median shoreline change rate was -1 ft/yr with 53% of transects having negative change rates with average rate of -11 ft/yr. Thus, the survey data indicate that the shoreline changed more slowly during the Fall 2019 to Spring 2020 period than it did over the past year as a whole.

7.2.2. Berm Contour Change

The Federal Project authorized beach template is not defined by the shoreline position, but by the beach width (seaward of the dune toe) at or above a beach berm elevation of +3.5 feet NAVD88. Figure 7-2 shows the position of the most bayward +3.5 ft NAVD88 elevation contour (representing the authorized Federal beach berm elevation) as extracted from the October 2016, May 2017, October 2017, April 2018, November 2018, April 2019, November 2019, and June 2020 survey. The median berm contour change post-construction of the Federal project, through June 2020, is approximately -47 feet, with 70% of the stations exhibiting change between +40 feet and -70 feet.

The berm continued to retreat significantly from stations 40+00 to 51+41, in the vicinity of 11th View street from midway along Toler Place to the 800 Block breakwaters. The breakwater at 11th View Street was modified and a new breakwater added between this one and the 800 Block breakwaters, with construction taking place between March 2020 and July 2020. The beginnings of sand accretion in the lee of these breakwaters was observed during a site visit in June 2020. It is expected that additional sand will accrete in this area and that the shoreline will move bayward as projected by the numerical modeling conducted during project design. The fall 2020 survey evaluation will provide analysis of the breakwater project's initial performance.

The map plots in Appendix E shows areas of elevation change between the dates indicated in the map Legends. Elevation gains (accretion) are shown in green shades, and elevation losses (erosion) are shown in yellow to red shades. The two sets of maps (four pages for each set) were prepared by subtracting elevations in each grid cell within survey Digital Elevation Models (DEMs) between survey dates November 2019 to June 2020.

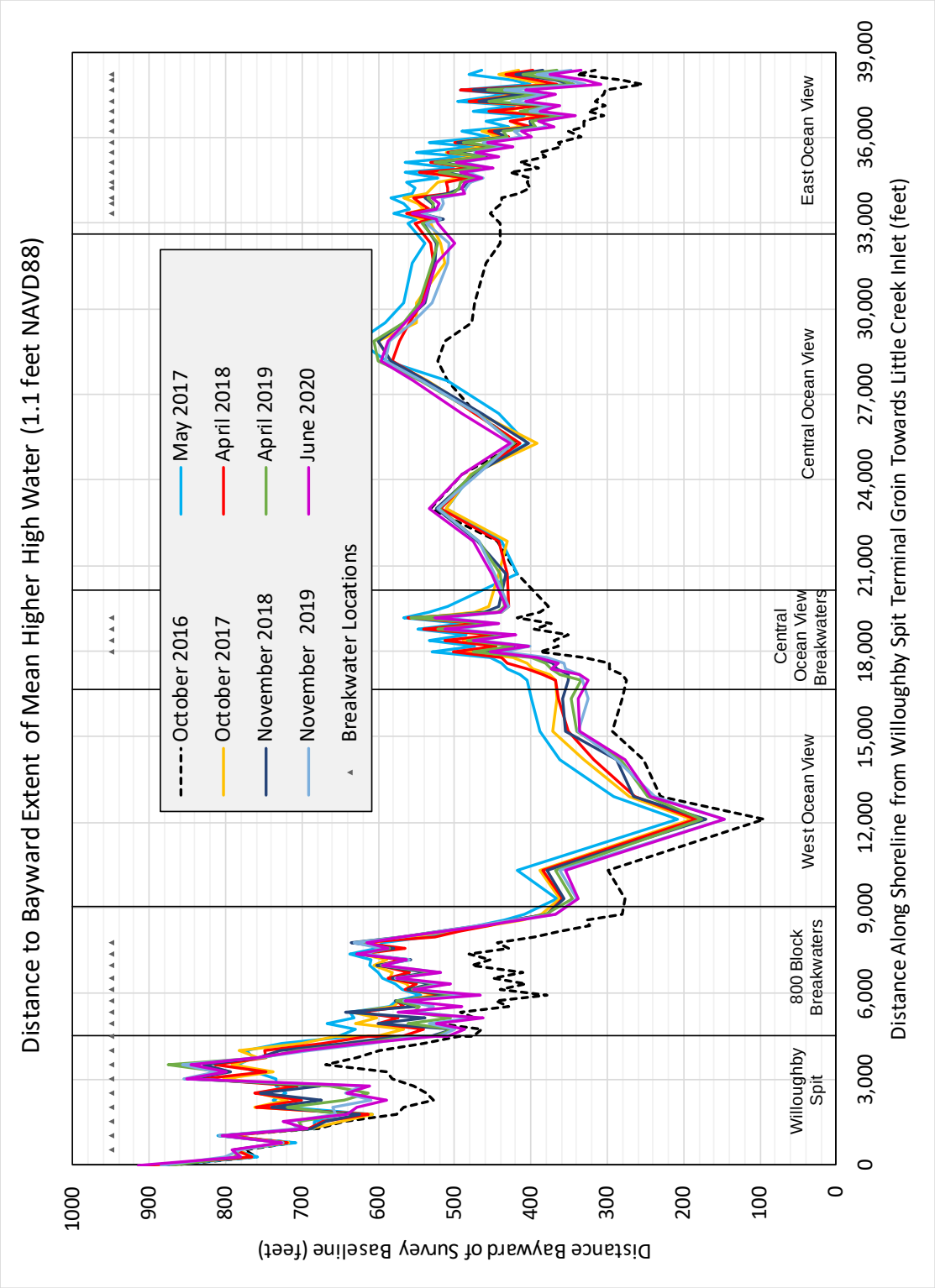


Figure 7-1: Position of the Mean Higher High Water (+1.1 ft NAVD88) Contour Relative to Pre- and Post-Construction of the Federal Project

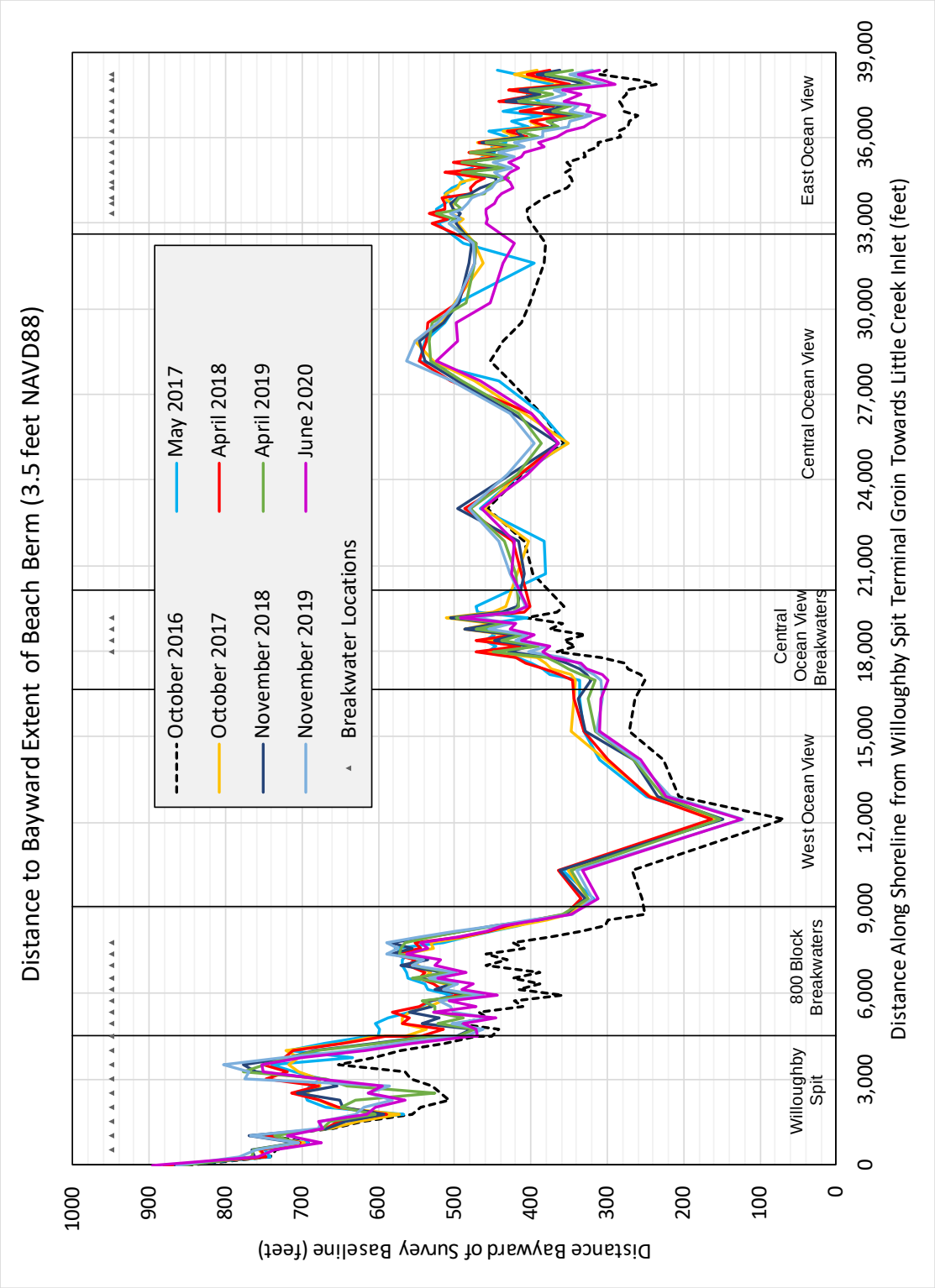


Figure 7-2: Position of the Bayward Extent of the +3.5 ft NAVD88 Beach Berm Contour Relative to Pre- and Post-Construction of the Federal Project

7.3. Federal Project Status Relative to a Renourishment Threshold

The USACE Federal Project design studies established a threshold criteria for renourishment of the Federal Project. The published documents presently available relative to the Federal Project do not define a particular shoreline or beach berm position in physical space that represents such a threshold condition. Instead, the threshold is discussed in the Federal Project's authorizing documents state that [renourishment] would occur when the berm has eroded to a width of 30 feet, which is half of the authorized beach berm width of 60 feet at an elevation of +3.5 feet NAVD88.

For survey stations that are within the limits of the Federal Project's initial construction, the Appendix B survey comparison profiles include a representation of the authorized USACE Design Template (dashed black line), indicating the beach fill outline to achieve a berm width of 60 feet fronting the October 2016 pre-Federal Project monitoring survey data. A USACE Nourishment Threshold is also shown, indicating a berm and slope position 30 feet landward of the authorized 60 ft wide berm. The template outlines provide a way to visually assess the current status of the beach berm with respect to the authorized design and nourishment criteria.

For example, at station 37+50, on page 16 of Appendix B, the survey profiles indicate that the berm edge is approximately 50 feet bayward of the USACE Design Template and that the berm elevation is approximately 1.0 foot higher than the USACE berm template's elevation. Between November 2019 and June 2020, the most bayward 50 feet of the berm was lowered by erosion from waves, and it appears that material was deposited in the nearshore trough at approximately elevation -2.5 feet NAVD88. However, the beach foreshore slope does not appear to have changed in position or steepness during the past six months, and the profile at station 37+50 does not indicate a need for renourishment. Slightly further east at station 45+25, the June 2020 profile shows that the beach has retreated landward of both the USACE Design Template and the Nourishment Threshold, indicating a need for renourishment at this station and some of the adjacent area.

It is difficult to find a single statistic that conveys the status of the beach morphology and berm width at each transect station in a graphical or tabular form. Instead, it is recommended that City and USACE staff review the profiles in Appendix B to track the progression of the Federal Project toward an eventual nourishment need. To assist with this review, the map panels in Appendix F and Table 7-1 below summarize characteristics of the June 2020 survey profiles with respect to the USACE Design Template and the Nourishment Threshold. The map panels in Appendix F also show color shading representing the beach and nearshore elevation change from immediately post-construction of the Federal Project (May 2017) to June 2020.

Table 7-1: Beach Berm Status Relative to the Federal Project Design Template and Nourishment Threshold

Transect Stations	Location Description	Status of the Beach Based on June 2020 Survey Profiles
0+00 to 17+50	Terminal groin to 14th View Street	Outside the limits of initial Federal Project construction.
20+00 to 37+50	14th View Street to east of 12th View Street, midway along Toler Place	Beach berm edge between 20+00 and 27+50 has retreated landward to the USACE Design Template. Other transects remain significantly bayward of the USACE Design Template. At a few transects, in breakwater gaps, the lower berm slope is near the Nourishment Threshold.
40+00 to 55+51	Midway along Toler Place to the 800 Block Breakwaters	The berm edge and lower contours of the beach slope retreated landward of the Design Template. At stations 40+00 through 51+41, the beach is moderately to significantly landward of the Nourishment Threshold, indicating the need for renourishment in this reach. Also note that this reach is the area in which the breakwater modifications were constructed in March through July 2020, and it is expected that some beach recovery will occur through natural processes between the June 2020 survey and the upcoming fall 2020 survey.
57+57 to 87+62	800 Block Breakwaters and eastward adjacent area	Berm edge remains moderately to significantly bayward of the Design Template.
93+41 to 120+93	Vicinity of the Ocean View Fishing Pier	Berm edge reached the Design Template, while the lower contours of the beach slope are landward of the Nourishment Threshold.
129+17 to 152+01	Ocean View Beach Park and adjacent westward area; bulkhead and revetment present at the back of the beach	At all transects the berm edge is landward of the Nourishment Threshold, with the lower beach slope also having retreated landward of the Nourishment Threshold.
163+49 to 181+63	From Ocean View Beach Park to west end of the Central Ocean View Breakwaters	Berm edge retreated landward of the Design Template, while the lower contours of the beach slope have retreated landward of the Nourishment Threshold.
183+63 to 195+63	Central Ocean View Breakwaters and adjacent eastward reach to Atlans Street	The berm edge is at or slightly bayward of the Design Template. Reasonable variations in profile observed between stations at breakwaters vs. stations in gaps between breakwaters where in presence of breakwaters the lower beach slope is bayward of the Nourishment Template.

Transect Stations	Location Description	Status of the Beach Based on June 2020 Survey Profiles
206+86 to 263+22	Central Ocean View between Warwick Avenue and Inlet Road	Outside the limits of initial Federal Project construction. Beach profiles show stable behavior over the past year.
274+53 to 331+43	1st Bay Street to west end of the Bay Oaks Breakwaters	Berm edge remains bayward of the Design Template.
333+23 to 383+58	Bay Oaks Breakwaters and East Ocean View Breakwaters to near Little Creek Inlet	The berm edge is at or slightly bayward of the Design Template. Reasonable variations in profile observed between stations at breakwaters vs. stations in gaps between breakwaters.
381+88 to 383+58	Adjacent to Little Creek Inlet west jetty	Profile has retreat to or landward of the Nourishment Template

From this evaluation, it is summarized that four reaches of the Ocean View shoreline are approaching or have crossed the Nourishment Threshold and would benefit from renourishment. All of the proposed placement areas would be within the template of the Corps of Engineers beach nourishment project. The four potential renourishment reaches are:

- The Toler Place vicinity, from about halfway along Toler Place east to 10th View Street. Nourishment in this reach would prefill the area within the breakwater construction that was completed in July 2020. The reach is approximately 1,500 feet long.
- From station 93+41 (6th View Street) to station 171+63 (between Ship Watch Rd and Chesapeake Blvd), the June 2020 profile has retreated back landward of the USACE Design Template, and is close to or landward of the USACE Nourishment Threshold template. The reach is approximately 7,800 feet long.
- The shoreline in the Central Ocean View breakwaters eroded significantly after the May 2017 USACE project construction, but the profile has been fairly stable over the last year and is still significantly bayward of the Fall 2016 pre-nourishment shoreline. If sand becomes available, refilling this breakwater field may have benefit. The length would be approximately 2,000 feet.
- Some segments of the Bay Oaks and East Ocean View breakwaters area are getting close to the USACE Design Template, with some nearing the Nourishment Threshold. The reach closest to the USACE nourishment threshold starts at about 24th Bay or 25th Bay and goes eastward to the inlet covering approximately 2,400 feet of shoreline length.

8. Summary

Comprehensive periodic surveying of the entire Ocean View shoreline began with an initial survey in September 2005. The most recent survey was completed in June 2020. The beach and bathymetric surveys performed by Geodynamics utilized baseline and transect positions established in September 2005 which are used for all periodic surveys. For this periodic evaluation, the June 2020 survey was compared with both the prior year and prior six months' surveys (June 2020 compared to November 2019 and April 2019, respectively). The surveys were used to compute shoreline change at MHW and volume change above 0 feet NAVD88 and above -15 feet NAVD88.

Key statistics were computed for defined regions along Ocean View and the entire shoreline for the time period between the April 2019 and June 2020 surveys and between the November 2019 and June 2020 surveys.

Comparison	Parameter	Quantity
April 2019 vs. June 2020	Average Shoreline Change Rate at MHW (+0.98 ft NAVD88)	-7.01 ft/yr
	Cumulative Volume Change Rate Above 0 ft NAVD88	26,820 cy/yr
	Cumulative Volume Change Rate Above -15 ft NAVD88	-45,507 cy/yr
November 2019 vs. June 2020	Average Shoreline Change at MHW (+0.98 ft NAVD88)	1.32 ft
	Cumulative Volume Change Above 0 ft NAVD88	666 cy
	Cumulative Volume Change Above -15 ft NAVD88	-40,094 cy

The average shoreline change rate for the entire shoreline at MHW between the April 2019 and June 2020 surveys was -7.01 ft/yr shoreline retreat, and the cumulative volume changes above 0 feet NAVD88 and -15 feet NAVD88 were approximately 26,820 cy/yr and -45,507 cy/yr, respectively.

The average shoreline change for the entire shoreline at MHW between the November 2019 and June 2020 surveys was 1.32 ft, and the cumulative volume changes above 0 feet NAVD88 and -15 feet NAVD88 were approximately 666 cy and -40,094 cy, respectively.

Areas of greater shoreline retreat (compared to average rates along Ocean View as a whole) include: between 11th View Street and the 800 Block Breakwaters; adjacent to the west and east ends of the Central Ocean View Breakwaters; and west of the Bay Oaks Breakwaters in East Ocean View.

Shoreline change rates varied widely on a transect by transect basis. Since construction of the Federal project, the median shoreline change among the 106 transects (without any length-weighting) has been approximately -47 feet, with 90% of transects having change between +40 and -124 feet. Over the past six months 90% of transects having change between +17 and -21 feet,

Four reaches within the Federal project length have been identified as potentially needing renourishment to maintain the USACE Design Template level of protection:

- In the Toler Place vicinity of Willoughby Spit, from about halfway along Toler Place east to 10th View Street.
- In West Ocean View from station 93+41 (6th View Street) to station 171+63 (between Ship Watch Rd and Chesapeake Blvd).
- The shoreline within the Central Ocean View breakwaters field.

- In East Ocean View within segments of the Bay Oaks and East Ocean View breakwaters area.

This is the thirtieth periodic survey report completed to date, and the thirtieth evaluation of a consistent survey period utilizing beach and bathymetric surveys. As noted, there are inevitable margins of error associated with the survey data that may reduce the accuracy of volumetric change analyses. Therefore, it is essential to thoroughly review the beach and bathymetric profiles using various analytical techniques and general engineering judgment to assure that results are not falsely interpreted. Comparison of surveys taken at the same season of the year (i.e. April 2019 to June 2020) mitigates seasonal variation of profiles in volumetric change analyses. Consecutive fall-spring or fall-fall survey comparisons are useful to assess the direct impact of extreme events which may occur during the approximate six month period between surveys.

Future periodic survey evaluations will continue to track changes in and the condition of the Federal Project, to assist the City to manage these beaches and coordinate with USACE regarding Federal Project maintenance.

Appendix A:
Aerial Photography and Digitized Shorelines

CHESAPEAKE BAY

LEA VIEW
CHELA
15TH VIEW
OCEAN VIEW
TOLER
12TH VIEW
HANSFORD
WORTH
SALEM
10TH VIEW
11TH VIEW
LECLAIR
13TH VIEW
RICHVIEW
14TH VIEW
RALLSTON
I-64W
I-64HOV
BAYVILLE
LITTLE BAY

0+00
2+50
5+00
7+50
10+00
12+50
15+00
17+50
20+00
22+50
25+00
27+50
30+00
32+50
35+00
37+50
40+00
42+50
45+00
45+25
47+30
49+35
51+41
53+46
55+51
57+57
59+62

Legend

- Spring 2020 Shoreline (June 2020)
- Fall 2019 Shoreline (November 2019)
- Spring 2019 Shoreline (May 2019)
- Survey Transects
- Survey Baseline

Shoreline Aerial Photo Date: July 2020
Background Aerial Photo Date: 2018

N

0 300 600 1,200
Feet

Legend

- Spring 2020 Shoreline (June 2020)
- Fall 2019 Shoreline (November 2019)
- Spring 2019 Shoreline (May 2019)
- Survey Transects
- Survey Baseline

Shoreline Aerial Photo Date: July 2020
Background Aerial Photo Date: 2018

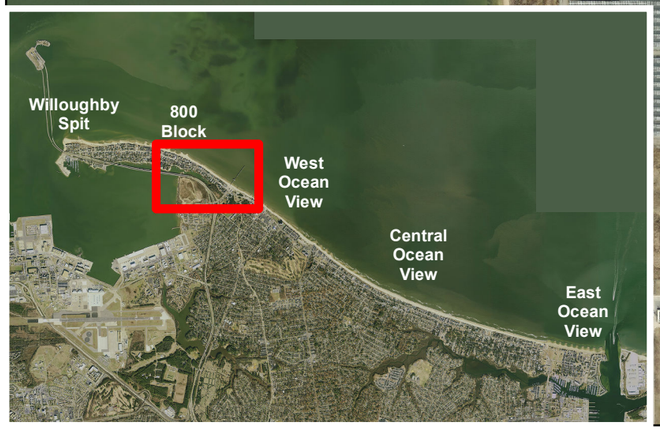
N

0 300 600 1,200
Feet

CHESAPEAKE BAY

59+62
61+62
63+62
65+62
67+62
69+62
71+62
73+62
75+62
77+62
79+62
81+62
83+62
85+62
87+62
93+41
103+08
120+93
129+17

9TH VIEW
LITTLE BAY
OCEAN VIEW
7TH VIEW
6TH VIEW
5TH VIEW
4TH VIEW
STATEN
4TH VIEW
3RD VIEW
TIDEWATER
TIDEWATER
OCEAN VIEW
MASON CREEK
I-64E
I-64W
OCONNER



CHESAPEAKE BAY

MASON CREEK
OCEAN VIEW
PORTVIEW
TIDEWATER
TIDEWATER
LAKESIDE
CAPITOL
STATLER
A VIEW
BALVIEW
D VIEW
1ST VIEW
SEAVIEW
DUFFYS
GOVERNMENT
SEAVIEW
SELBY
WELLS
WELLS
HAMMETT
SHERWOOD
WELLS
GOVERNMENT
HAMMETT
SHERWOOD
NORFOLK
SEABREEZE
WELLS
BAY LYNES
PINEWELL
SHERWOOD
SHIP WATCH
CHESAPEAKE
CHESAPEAKE
ELNORA

129+17
141+98
152+01
163+49
169+63
171+63
173+63
175+63
177+63
179+63
181+63
183+63
185+63
187+63
189+63
191+63
193+63
195+63

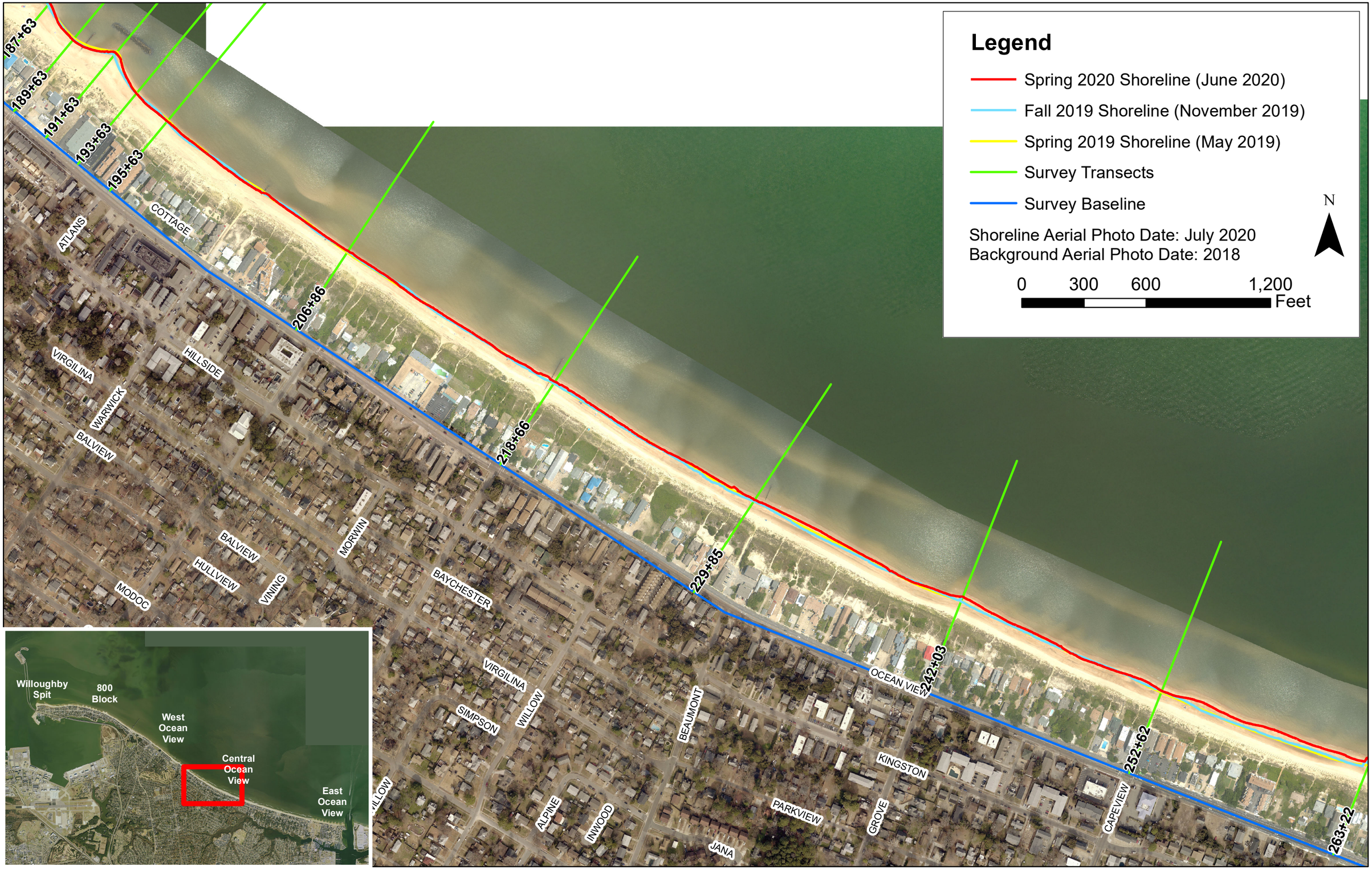
Legend

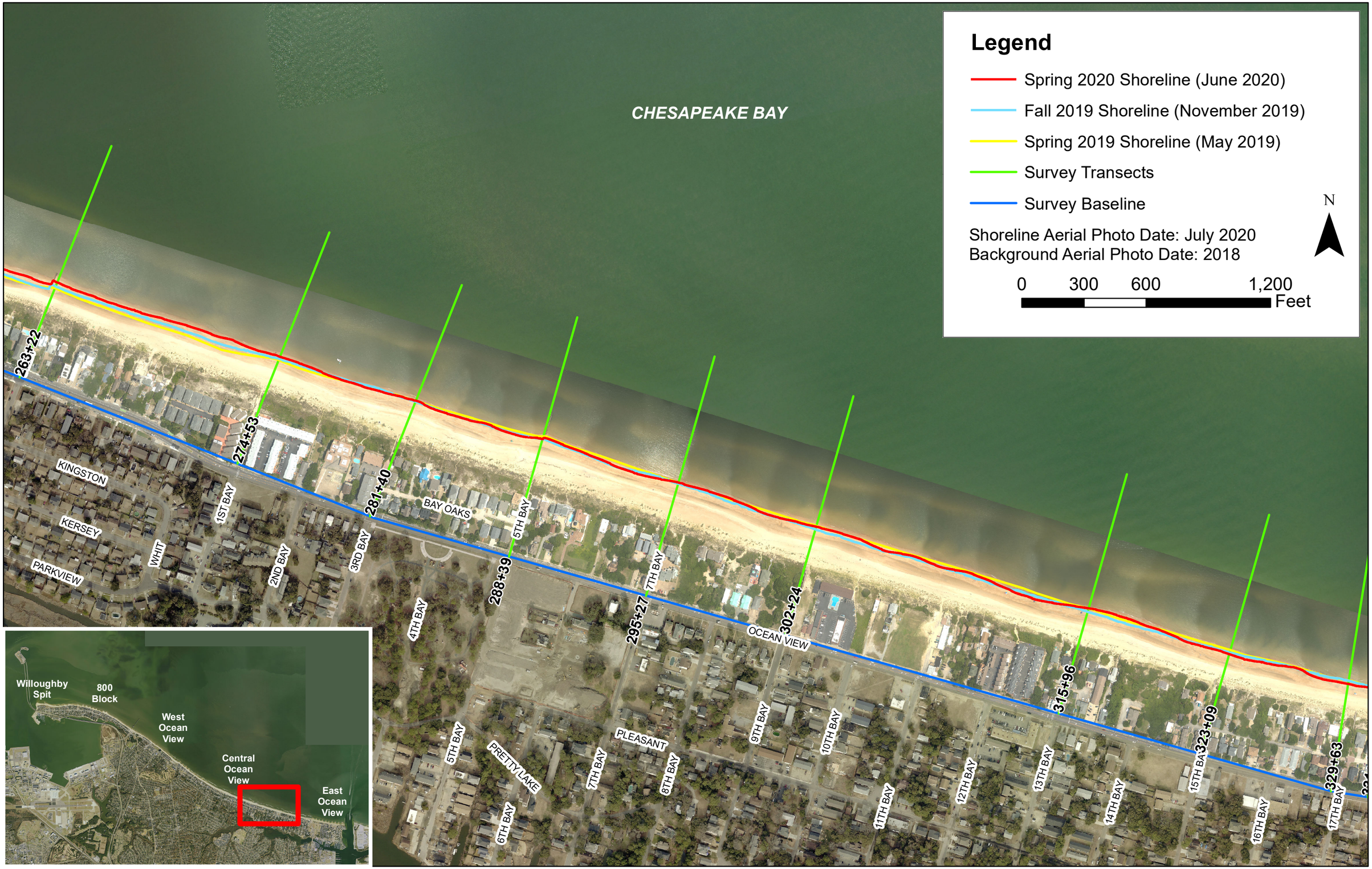
- Spring 2020 Shoreline (June 2020)
- Fall 2019 Shoreline (November 2019)
- Spring 2019 Shoreline (May 2019)
- Survey Transects
- Survey Baseline

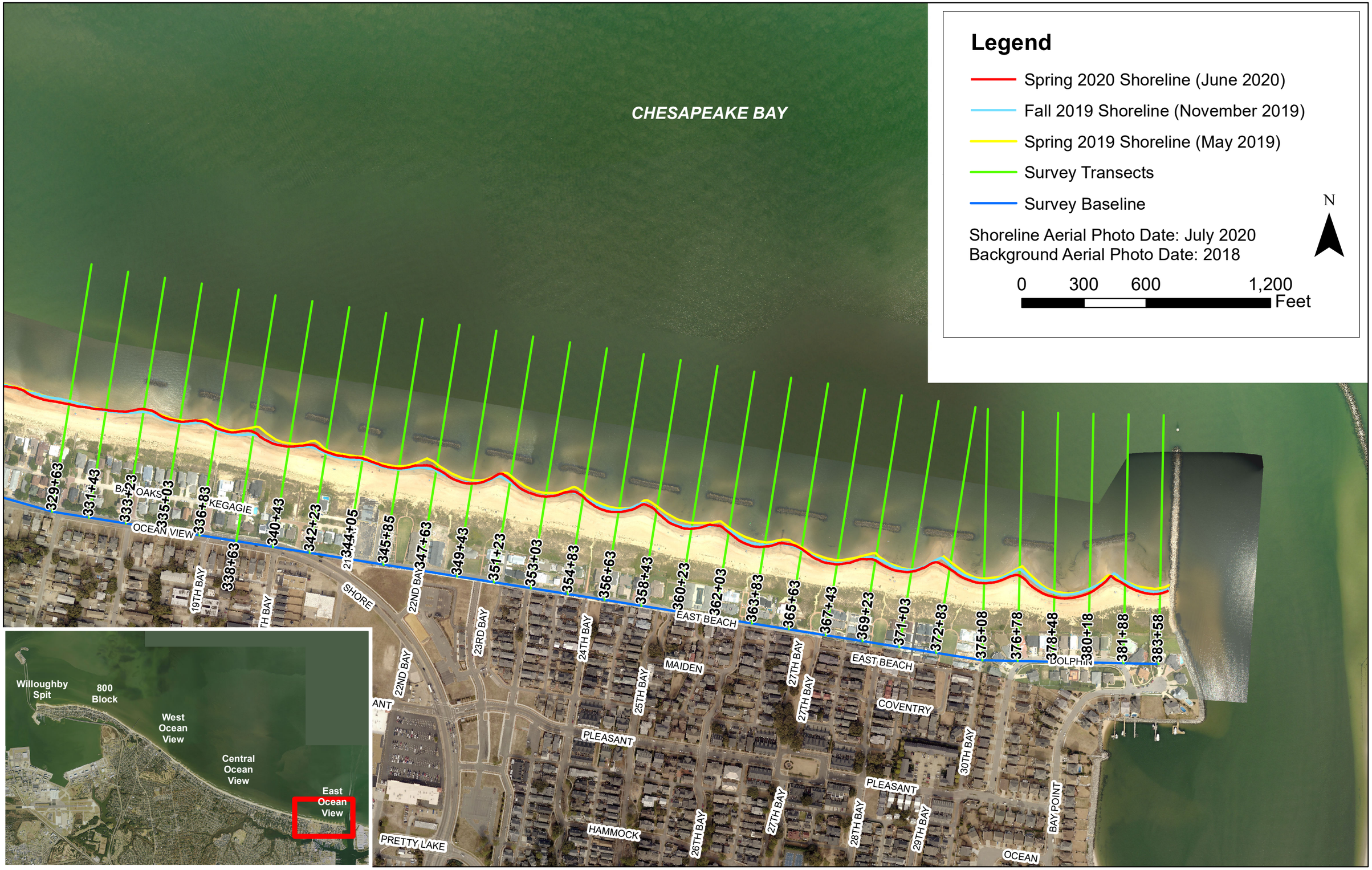
Shoreline Aerial Photo Date: July 2020
Background Aerial Photo Date: 2018

N

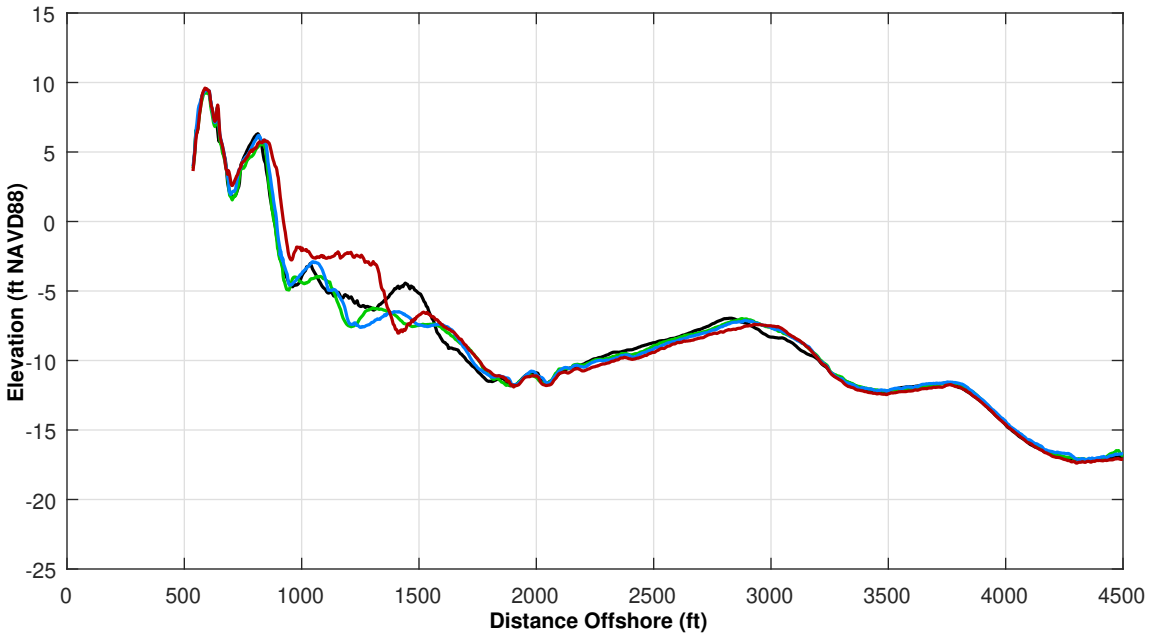
0 300 600 1,200
Feet

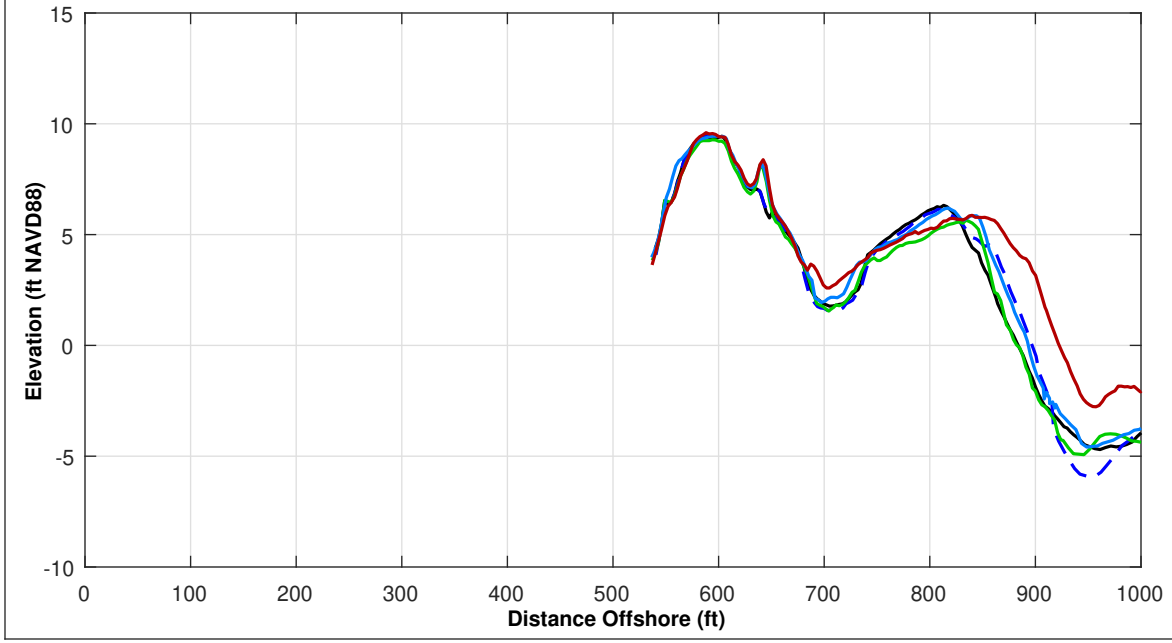

Legend
Spring 2020 Shoreline (June 2020)
Fall 2019 Shoreline (November 2019)
Spring 2019 Shoreline (May 2019)
Survey Transects
Survey Baseline
Shoreline Aerial Photo Date: July 2020
Background Aerial Photo Date: 2018
0 300 600 1,200
Feet
N
187+63
189+63
191+63
193+63
195+63
206+86
218+66
229+85
242+03
252+62
263+22
ATLANS
COTTAGE
VIRGILINA
HILLSIDE
WARWICK
BALVIEW
MORWIN
HULLVIEW
VINING
MODOC
BAYCHESTER
SIMPSON
WILLOW
BEAUMONT
OCEAN VIEW
KINGSTON
ALPINE
INWOOD
PARKVIEW
GROVE
JANA
CAPEVIEW
Willoughby Spit
800 Block
West Ocean View
Central Ocean View
East Ocean View


CHESAPEAKE BAY
Legend
Spring 2020 Shoreline (June 2020)
Fall 2019 Shoreline (November 2019)
Spring 2019 Shoreline (May 2019)
Survey Transects
Survey Baseline
Shoreline Aerial Photo Date: July 2020
Background Aerial Photo Date: 2018
N
0 300 600 1,200
Feet
263+22
274+53
281+40
288+39
295+27
302+24
315+96
323+09
329+63
OCEAN VIEW
KINGSTON
KERSEY
PARKVIEW
WHIT
1ST BAY
2ND BAY
3RD BAY
4TH BAY
BAY OAKS
5TH BAY
7TH BAY
PLEASANT
PRETTY LAKE
5TH BAY
6TH BAY
7TH BAY
8TH BAY
9TH BAY
10TH BAY
11TH BAY
12TH BAY
13TH BAY
14TH BAY
15TH BAY
16TH BAY
17TH BAY
Willoughby Spit
800 Block
West Ocean View
Central Ocean View
East Ocean View


CHESAPEAKE BAY
Legend
Spring 2020 Shoreline (June 2020)
Fall 2019 Shoreline (November 2019)
Spring 2019 Shoreline (May 2019)
Survey Transects
Survey Baseline
Shoreline Aerial Photo Date: July 2020
Background Aerial Photo Date: 2018
N
0 300 600 1,200
Feet
329+63
331+43
333+23
335+03
336+83
338+63
340+43
342+23
344+05
345+85
347+63
349+43
351+23
353+03
354+83
356+63
358+43
360+23
362+03
363+83
365+63
367+43
369+23
371+03
372+83
375+08
376+78
378+48
380+18
381+88
383+58
OCEAN VIEW
KEGAGIE
SHORE
EAST BEACH
MAIDEN
COVENTRY
PLEASANT
HAMMOCK
PRETTY LAKE
OCEAN
BAY POINT
19TH BAY
22ND BAY
23RD BAY
24TH BAY
25TH BAY
26TH BAY
27TH BAY
28TH BAY
29TH BAY
30TH BAY
Willoughby Spit
800 Block
West Ocean View
Central Ocean View
East Ocean View

Appendix B:
Survey Comparison Plots





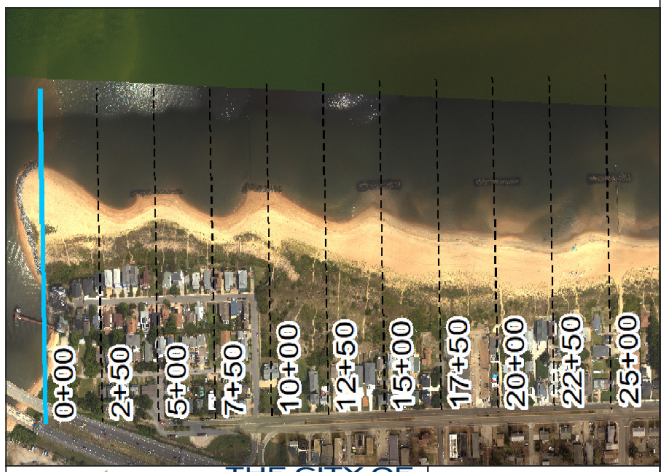
Survey Transect 0+00	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	42.44 ft	29.52 ft
Volume Change Above -15 ft NAVD88	26.77 cy/ft	16.96 cy/ft
Volume Change Above 0 ft NAVD88	11.85 cy/ft	5.52 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	N/A	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016

Notes:

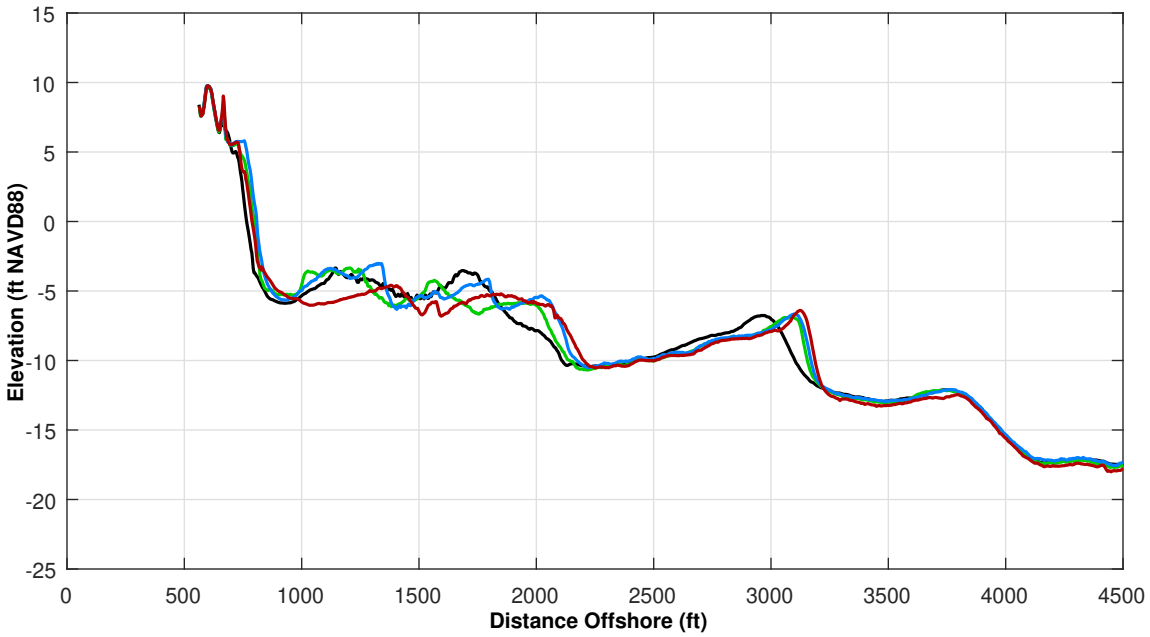
1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.

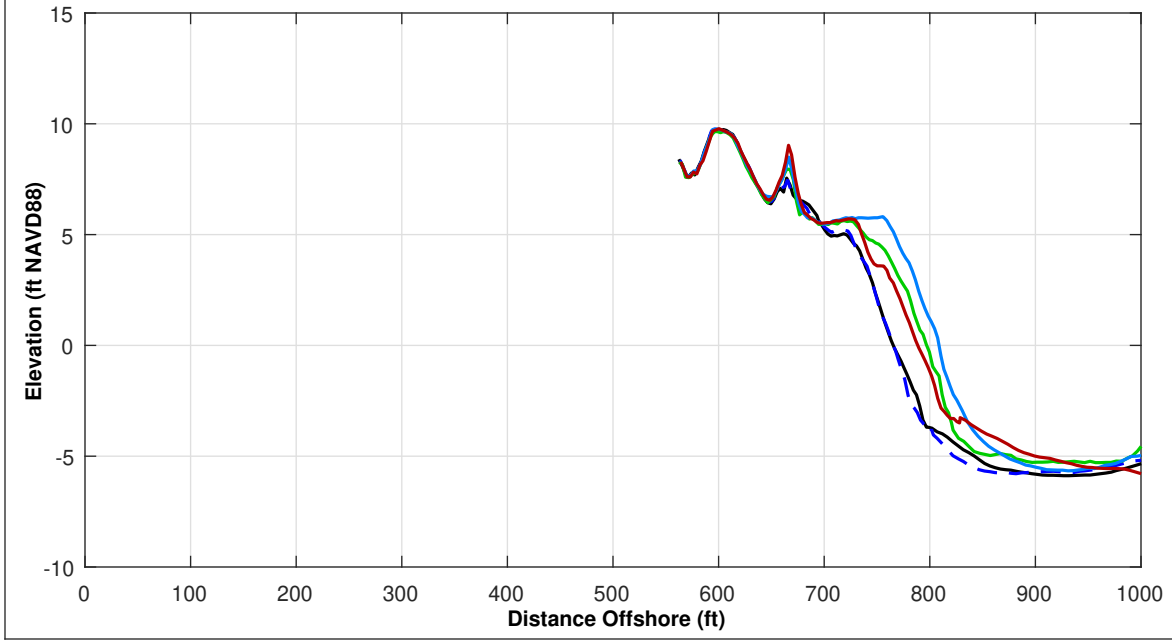


THE CITY OF NORFOLK
PUBLIC WORKS

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

ST 0+00	Pg 1 of 106	Spring 2020





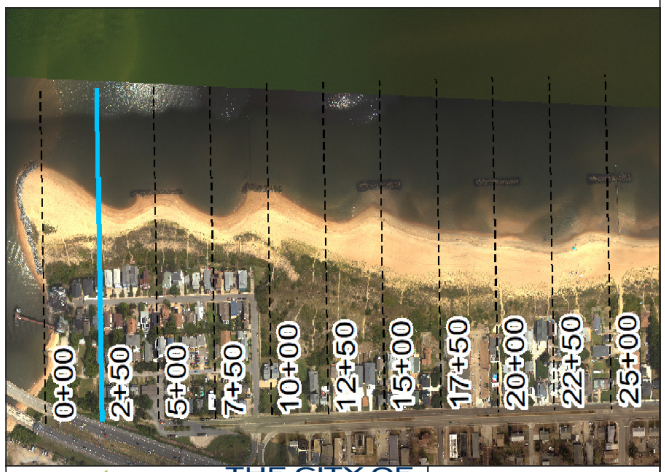
Survey Transect 2+50	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-7.50 ft	-21.34 ft
Volume Change Above -15 ft NAVD88	-20.11 cy/ft	-52.81 cy/ft
Volume Change Above 0 ft NAVD88	-1.02 cy/ft	-5.15 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	N/A	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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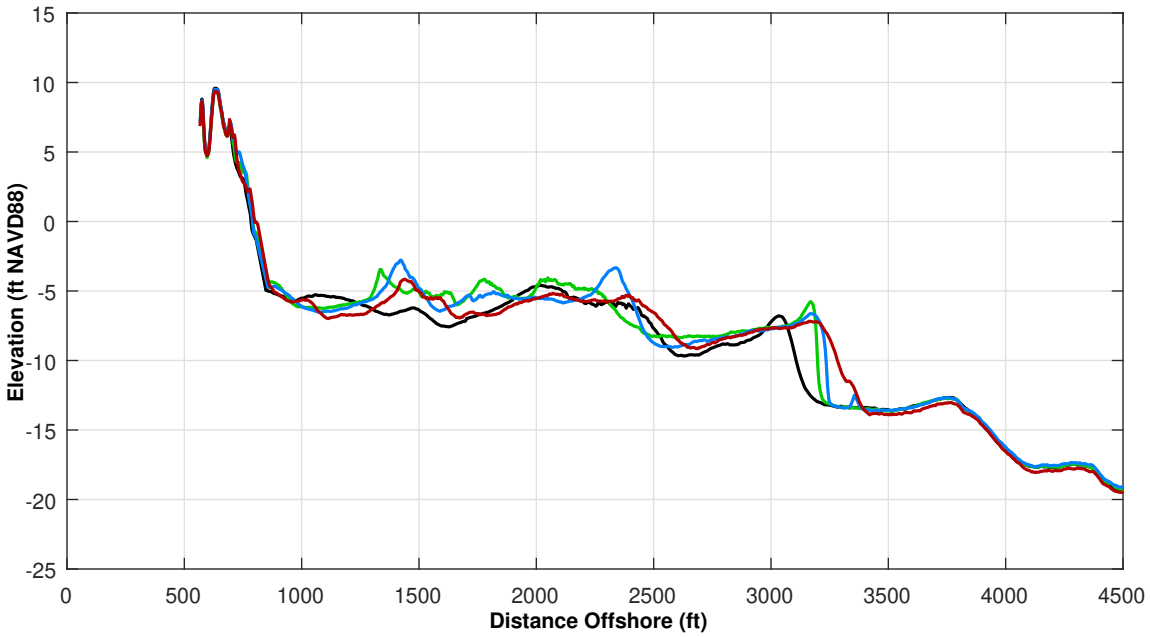
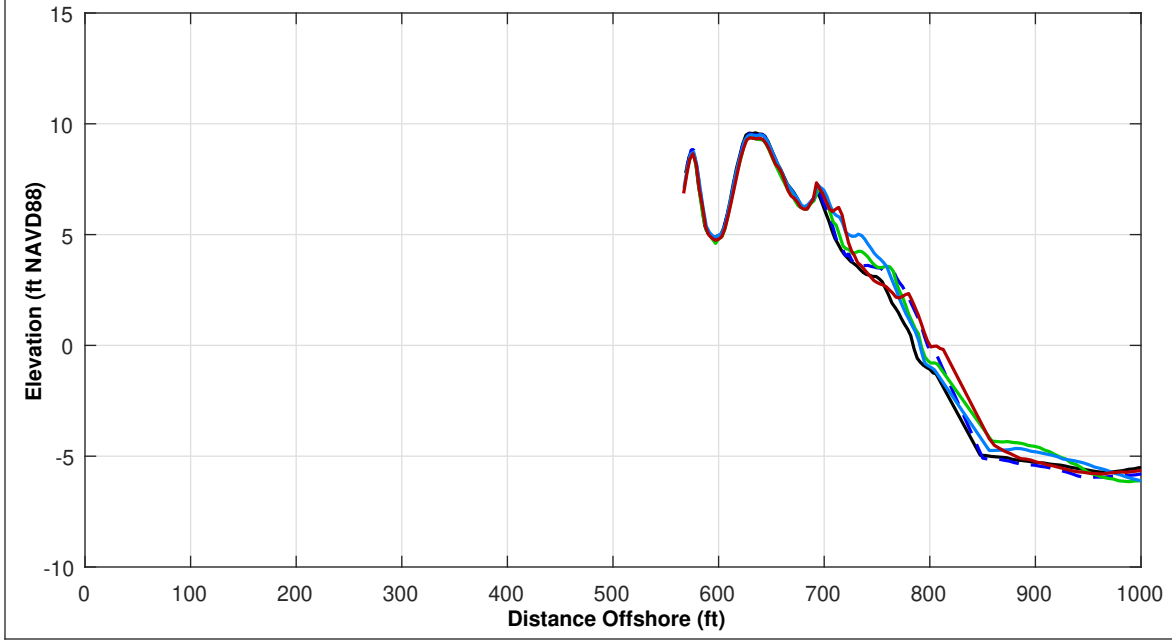
PUBLIC WORKS

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

ST 2+50	Pg 2 of 106	Spring 2020





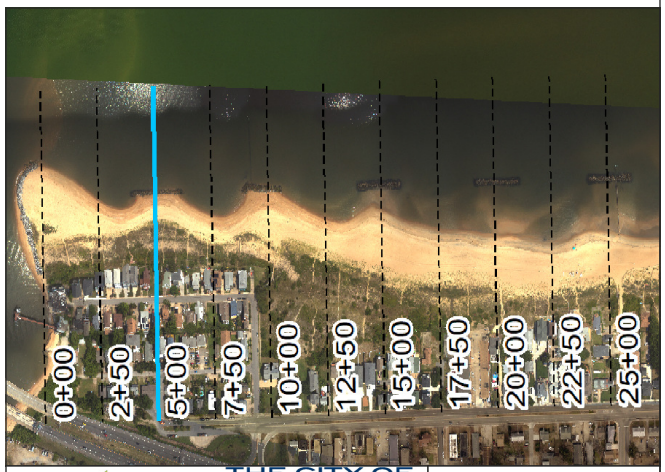
Survey Transect 5+00	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	7.83 ft	9.59 ft
Volume Change Above -15 ft NAVD88	-19.57 cy/ft	-19.00 cy/ft
Volume Change Above 0 ft NAVD88	0.16 cy/ft	-1.63 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	N/A	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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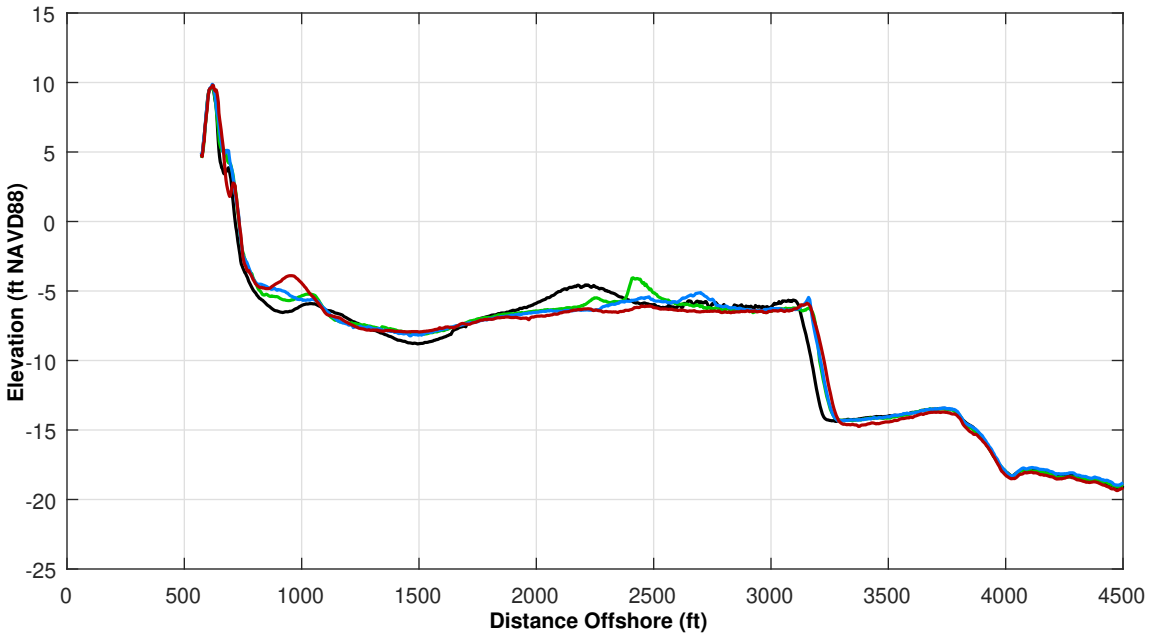
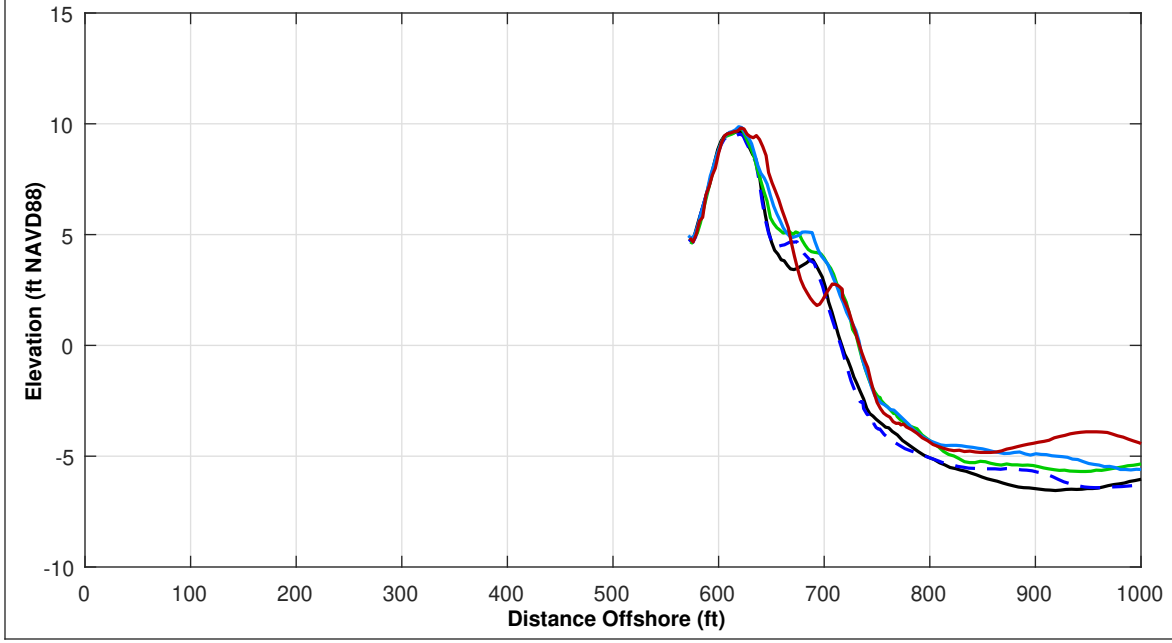
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

ST 5+00	Pg 3 of 106	Spring 2020





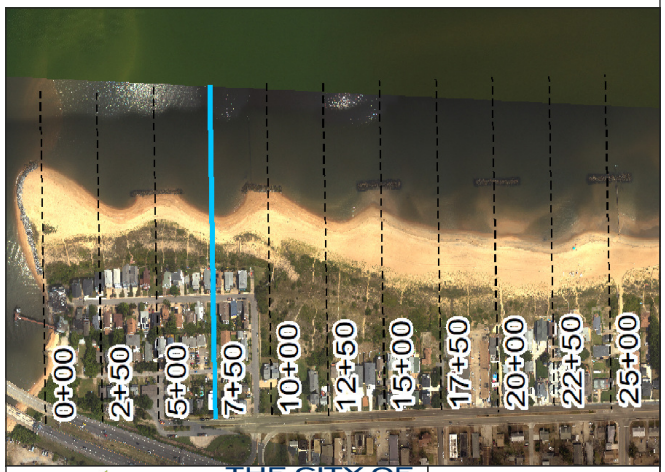
Survey Transect 7+50	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	1.16 ft	0.13 ft
Volume Change Above -15 ft NAVD88	-18.70 cy/ft	-17.26 cy/ft
Volume Change Above 0 ft NAVD88	-0.69 cy/ft	-1.77 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	N/A	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016

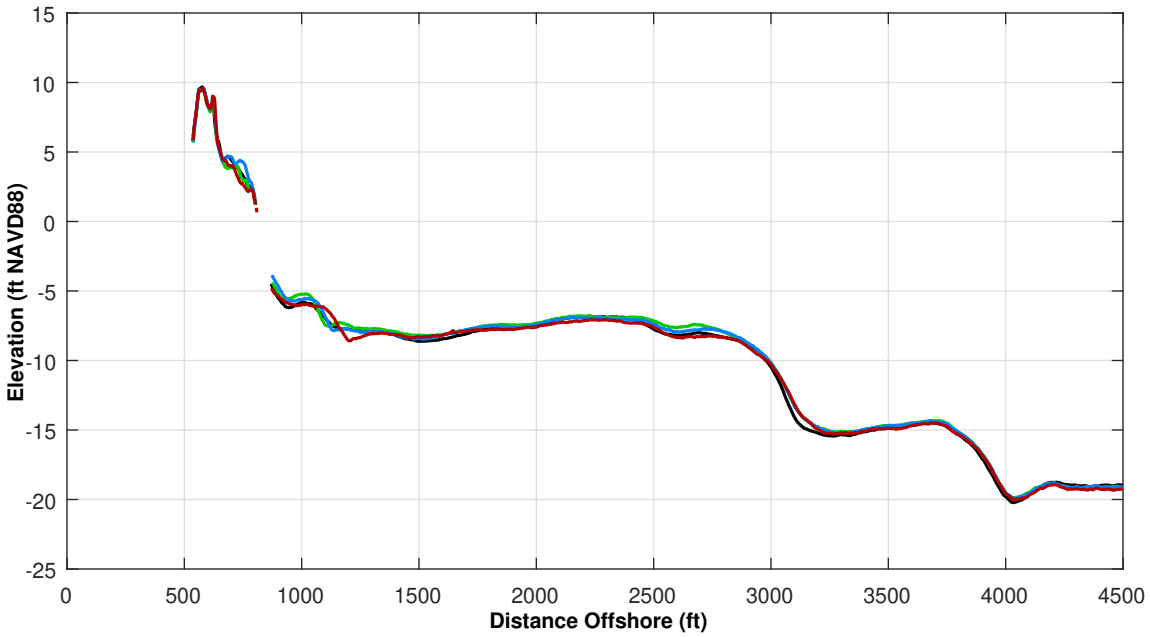
Notes:

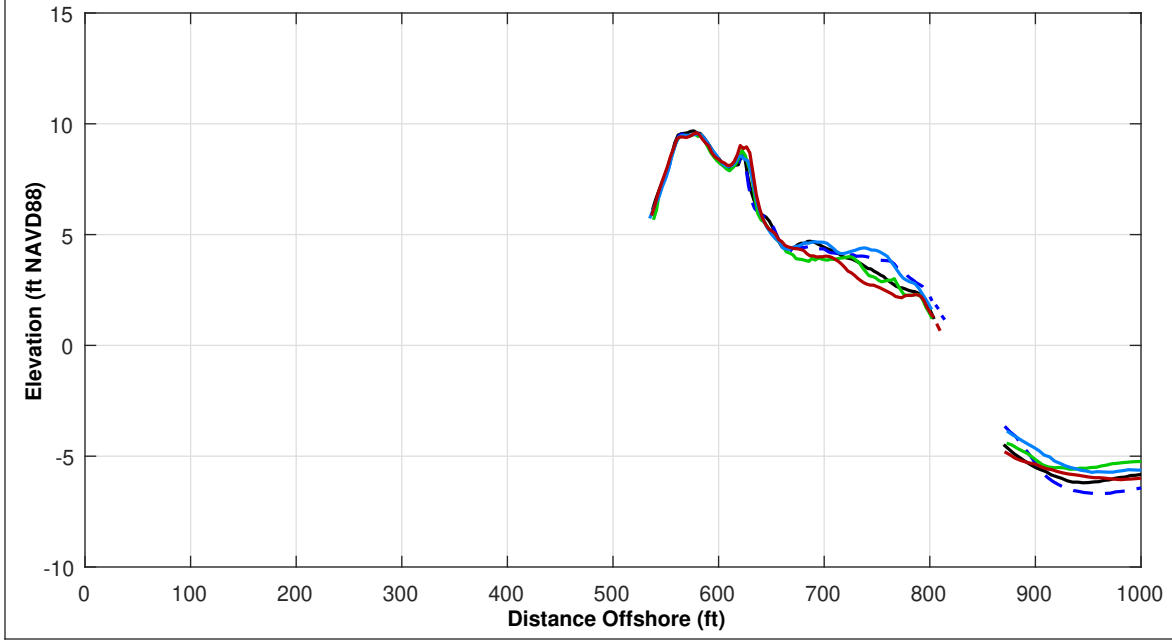
1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



THE CITY OF NORFOLK
PUBLIC WORKS

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





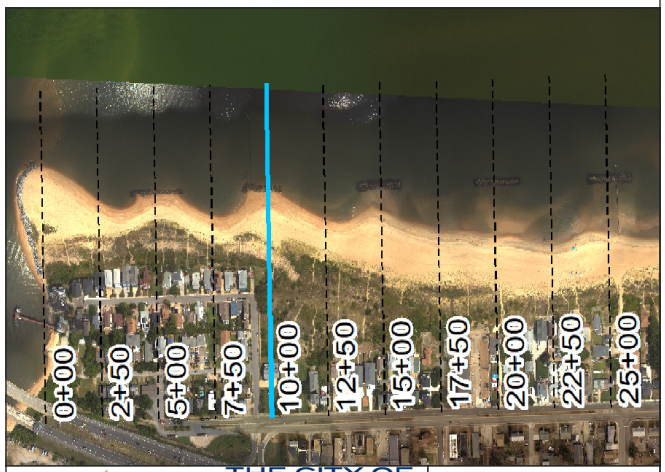
Survey Transect 10+00	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	1.00 ft	-2.55 ft
Volume Change Above -15 ft NAVD88	-26.58 cy/ft	-21.56 cy/ft
Volume Change Above 0 ft NAVD88	0.04 cy/ft	-3.52 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	N/A	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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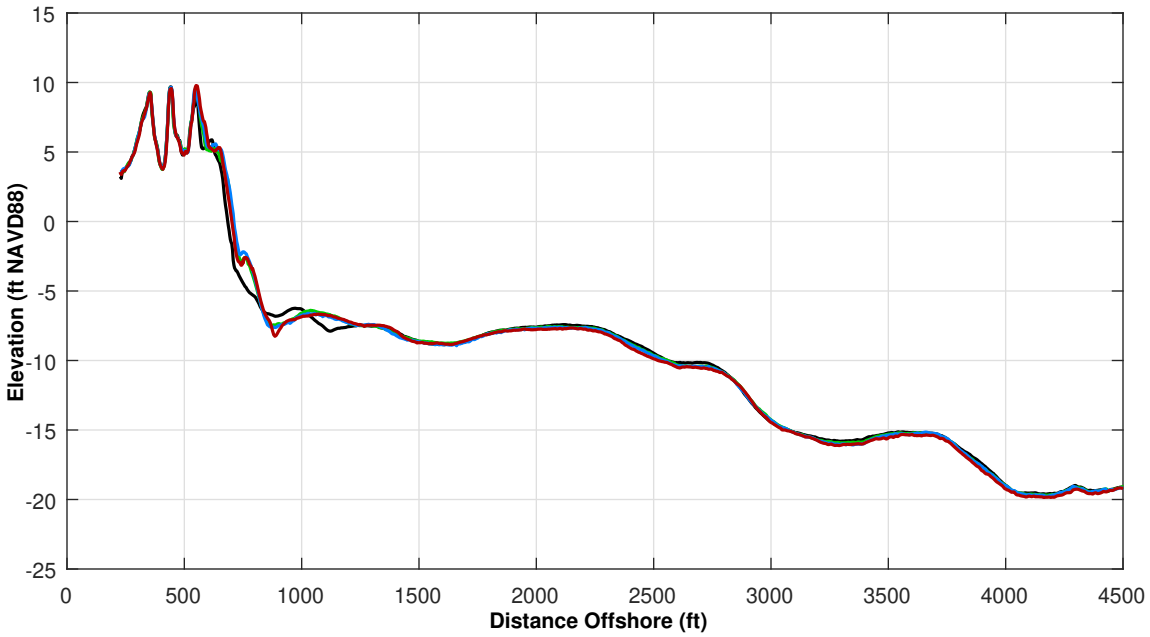
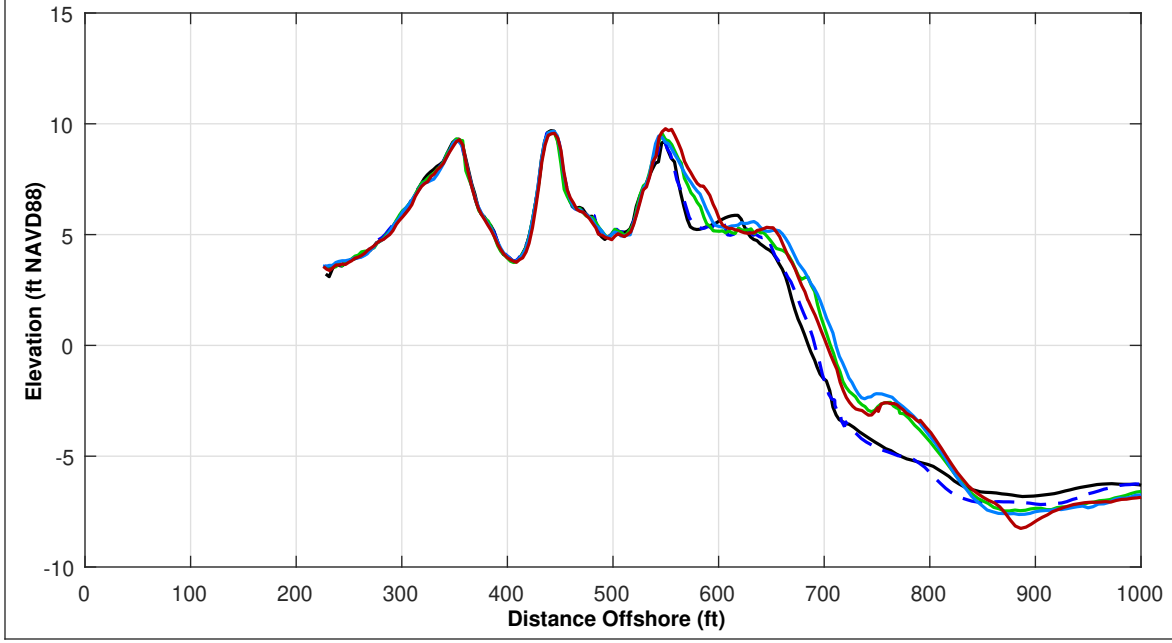
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

ST 10+00	Pg 5 of 106	Spring 2020





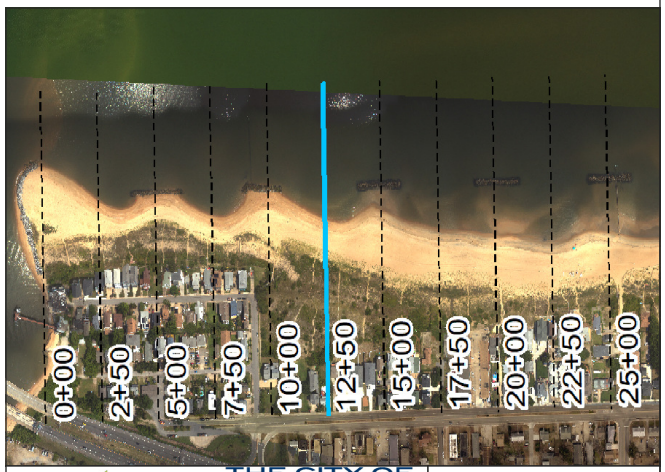
Survey Transect 12+50	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-4.48 ft	-9.90 ft
Volume Change Above -15 ft NAVD88	-7.20 cy/ft	-5.13 cy/ft
Volume Change Above 0 ft NAVD88	0.71 cy/ft	-1.42 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	N/A	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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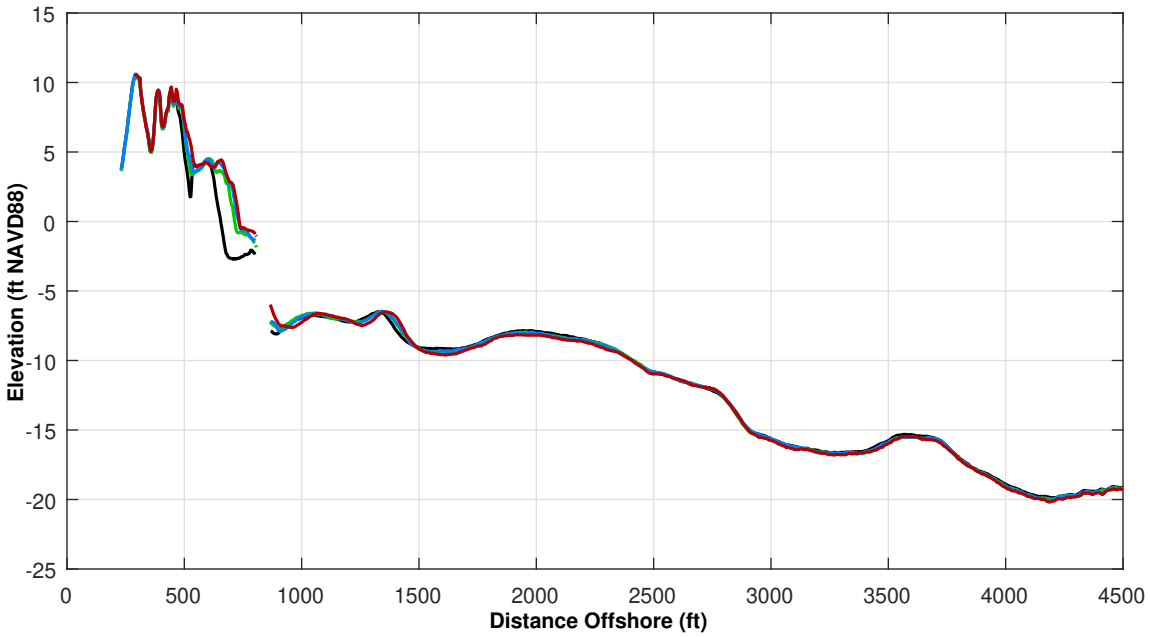
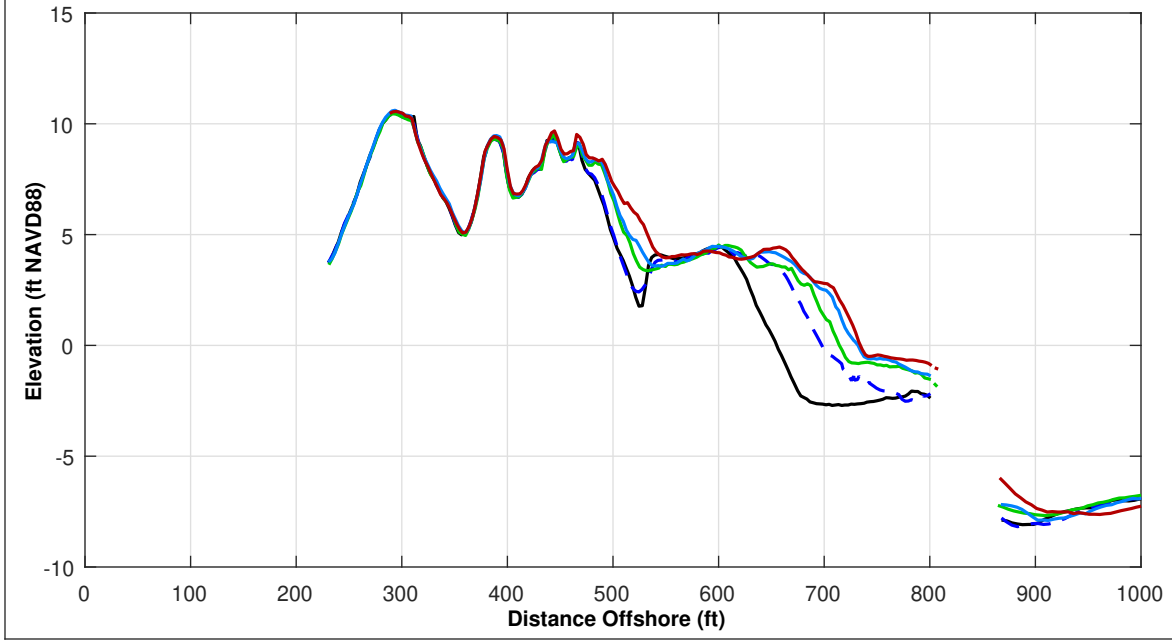
ST 12+50	Pg 6 of 106	Spring 2020





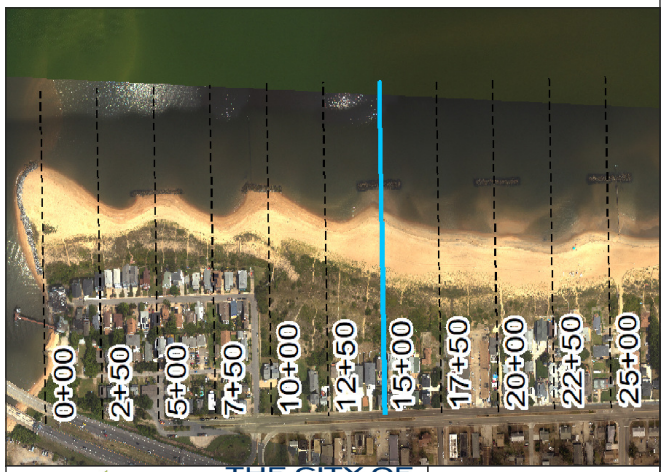
Survey Transect 15+00	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	20.40 ft	8.12 ft
Volume Change Above -15 ft NAVD88	3.86 cy/ft	-0.28 cy/ft
Volume Change Above 0 ft NAVD88	7.29 cy/ft	3.22 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	N/A	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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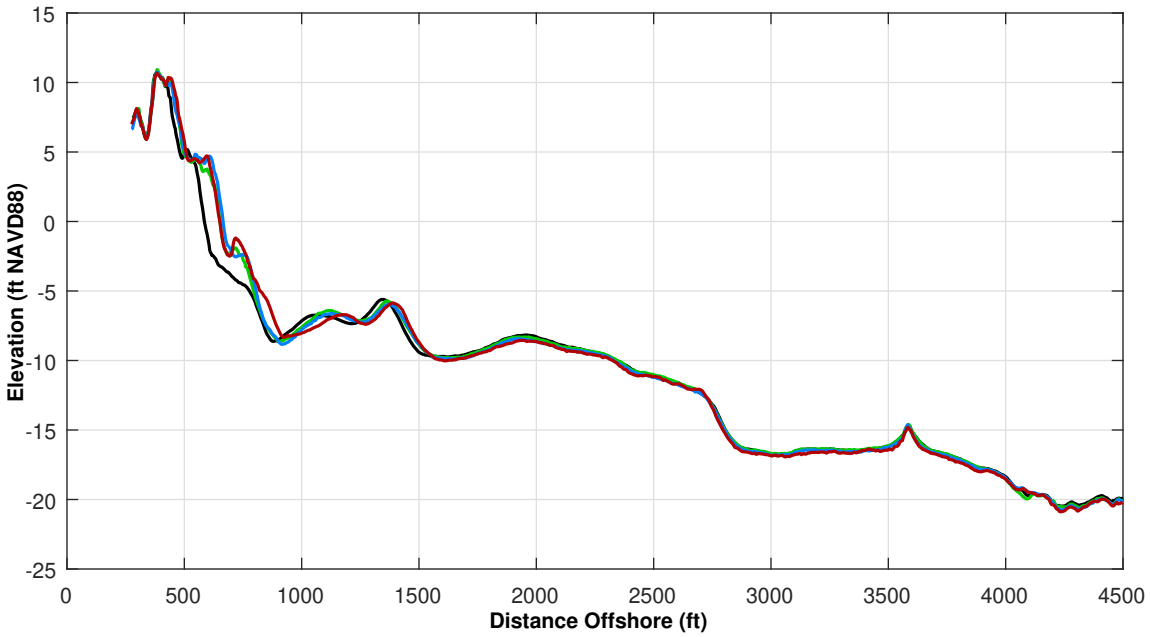
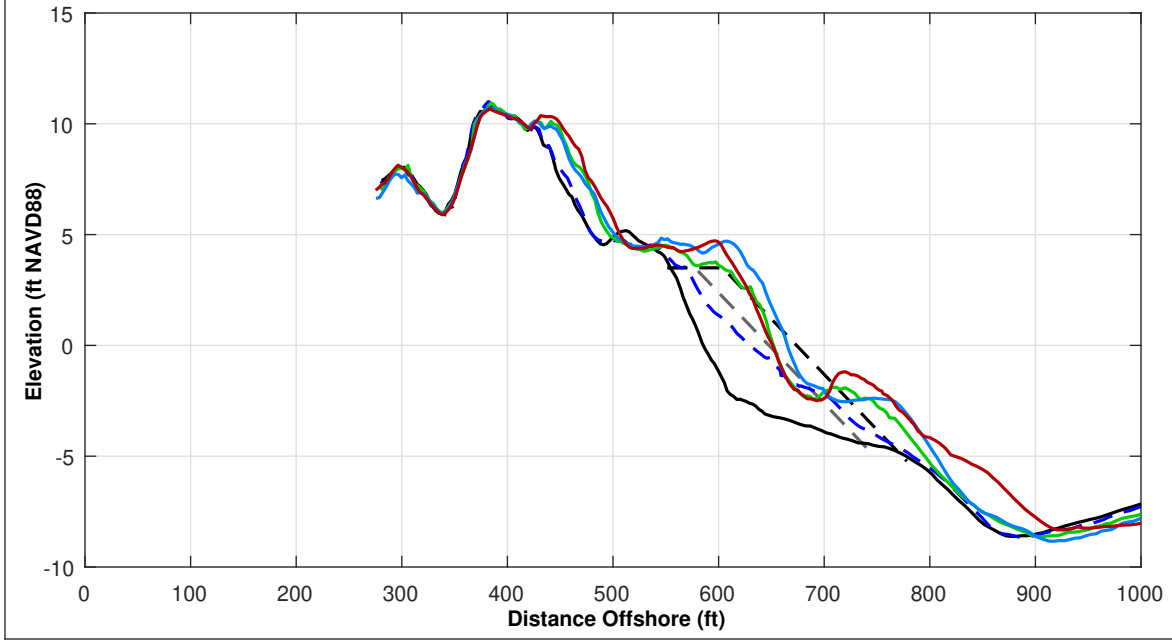




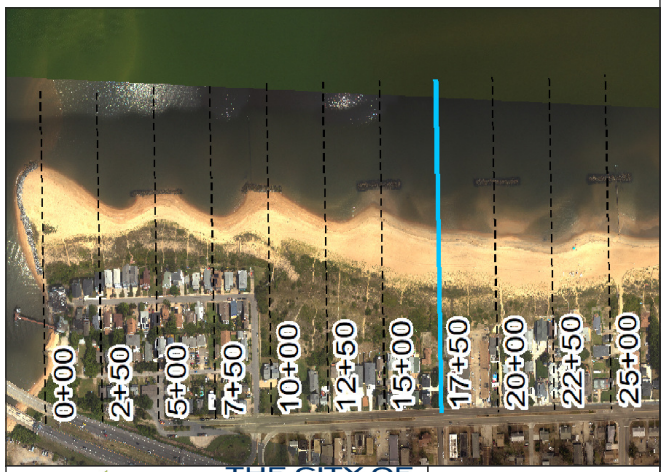
Survey Transect 17+50	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-4.18 ft	-15.94 ft
Volume Change Above -15 ft NAVD88	-1.85 cy/ft	1.23 cy/ft
Volume Change Above 0 ft NAVD88	2.61 cy/ft	-0.81 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 10.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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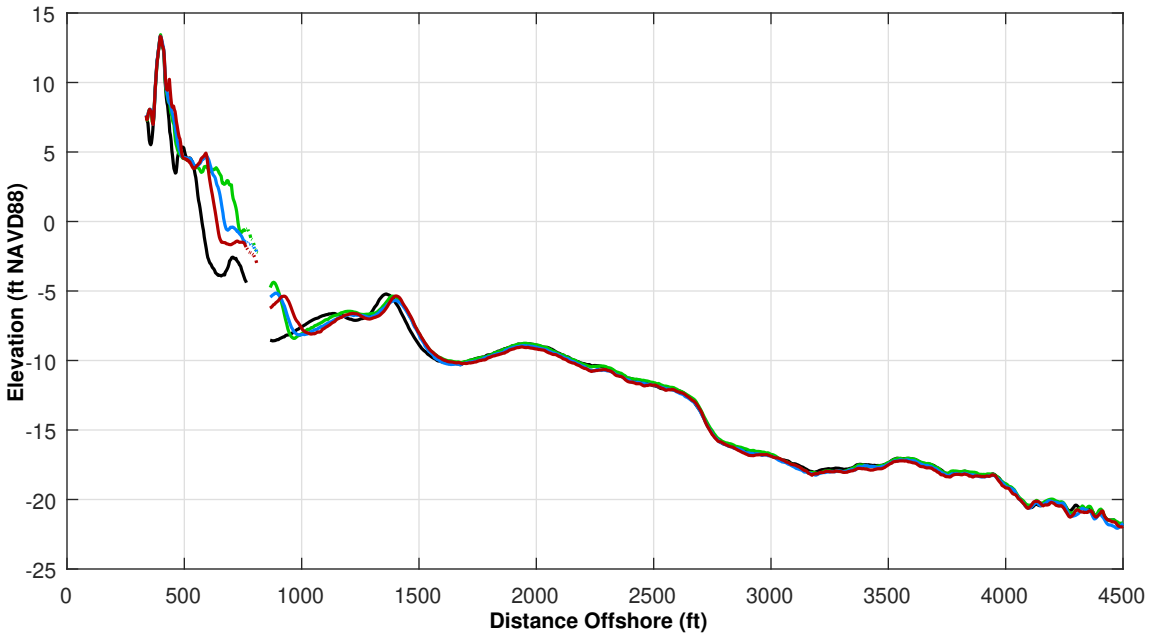
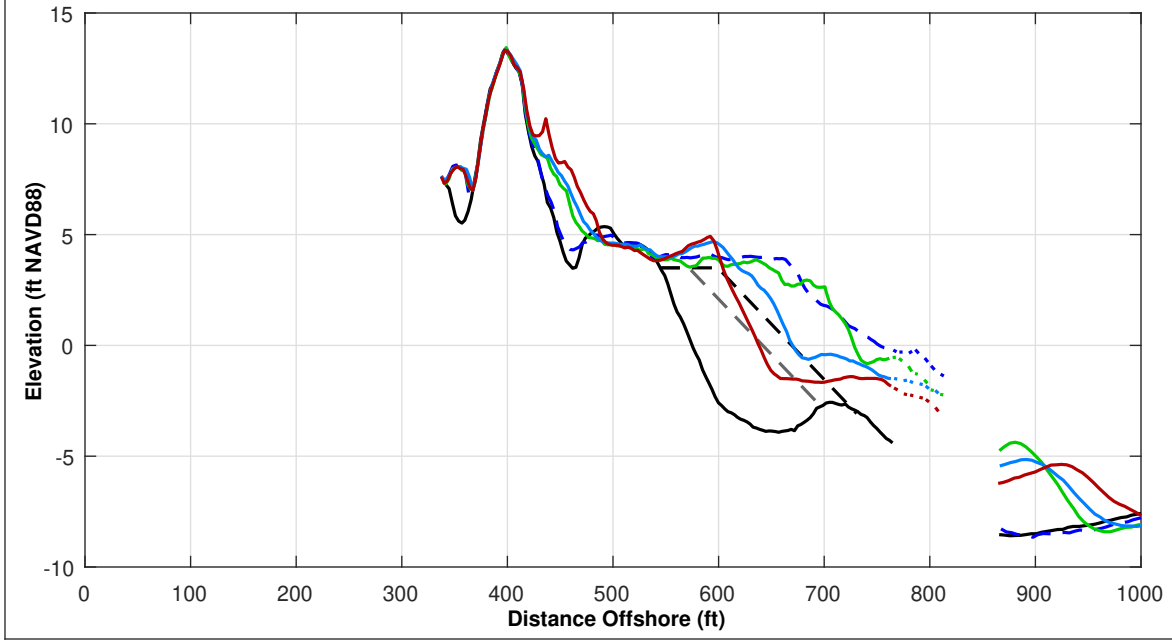
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





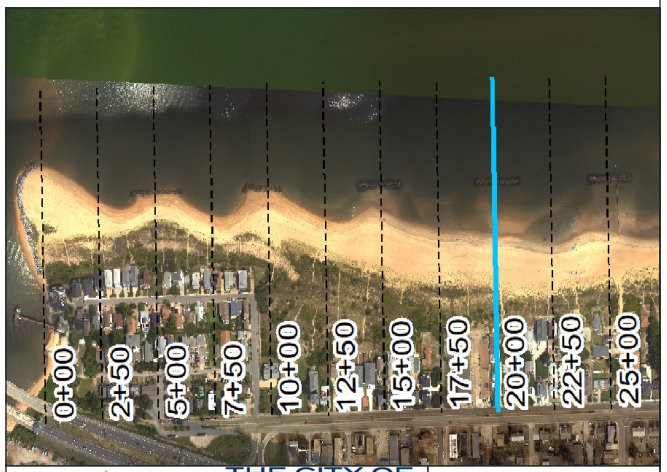
Survey Transect 20+00	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-91.25 ft	-32.05 ft
Volume Change Above -15 ft NAVD88	-25.09 cy/ft	-6.77 cy/ft
Volume Change Above 0 ft NAVD88	-6.76 cy/ft	-2.66 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	+ 2.0 ft	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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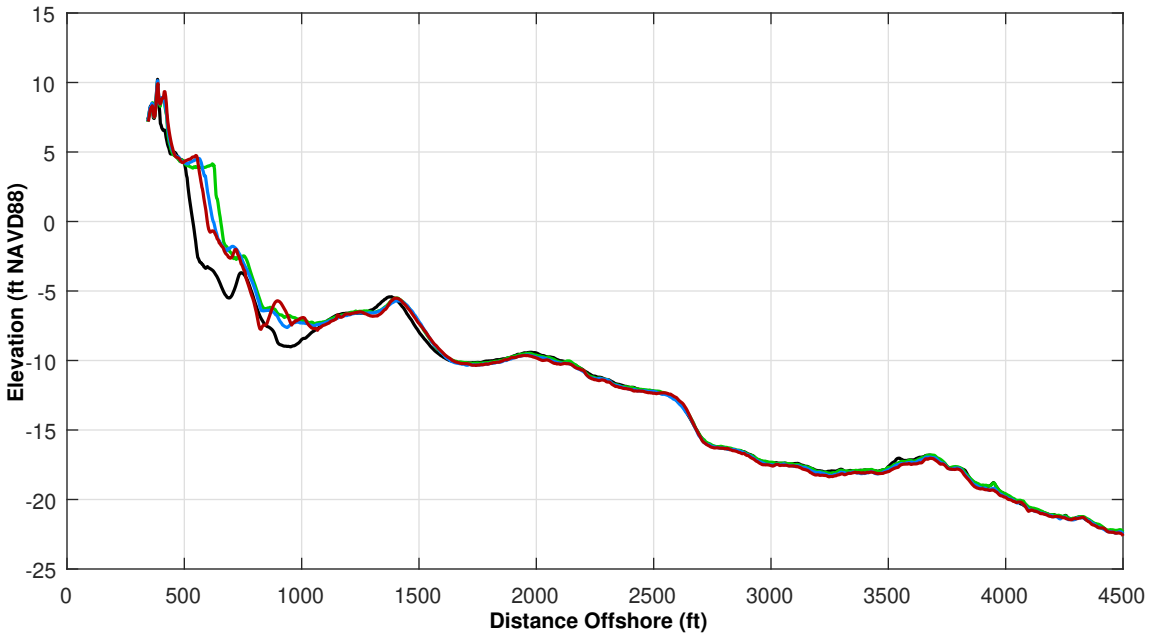
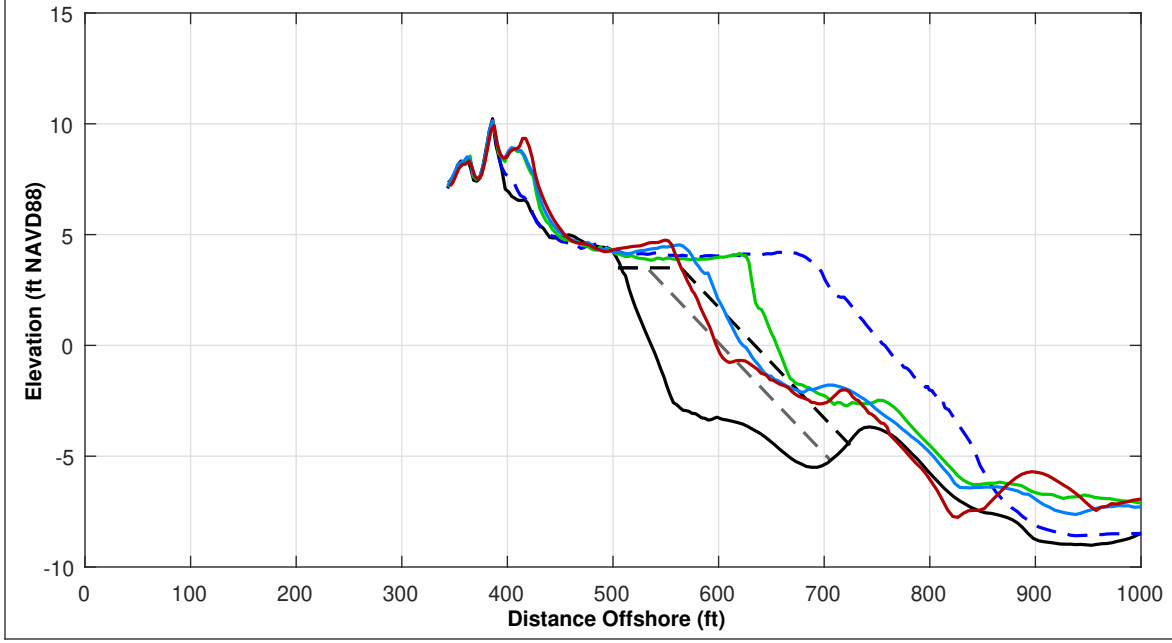
ST 20+00	Pg 9 of 106	Spring 2020





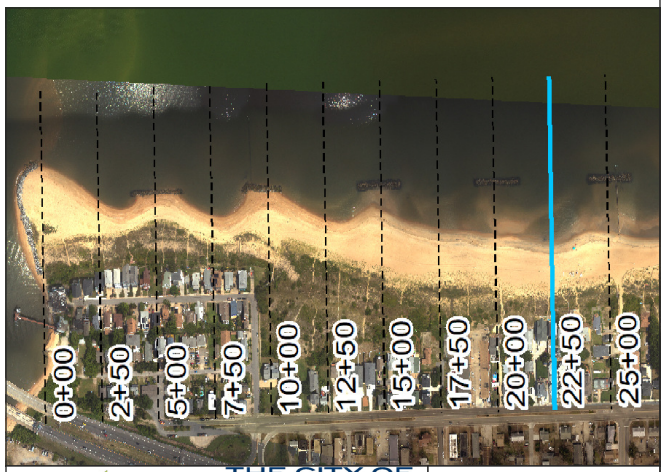
Survey Transect 22+50	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-56.31 ft	-21.12 ft
Volume Change Above -15 ft NAVD88	-20.56 cy/ft	-6.50 cy/ft
Volume Change Above 0 ft NAVD88	-6.43 cy/ft	-2.48 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	+ 0.0 ft	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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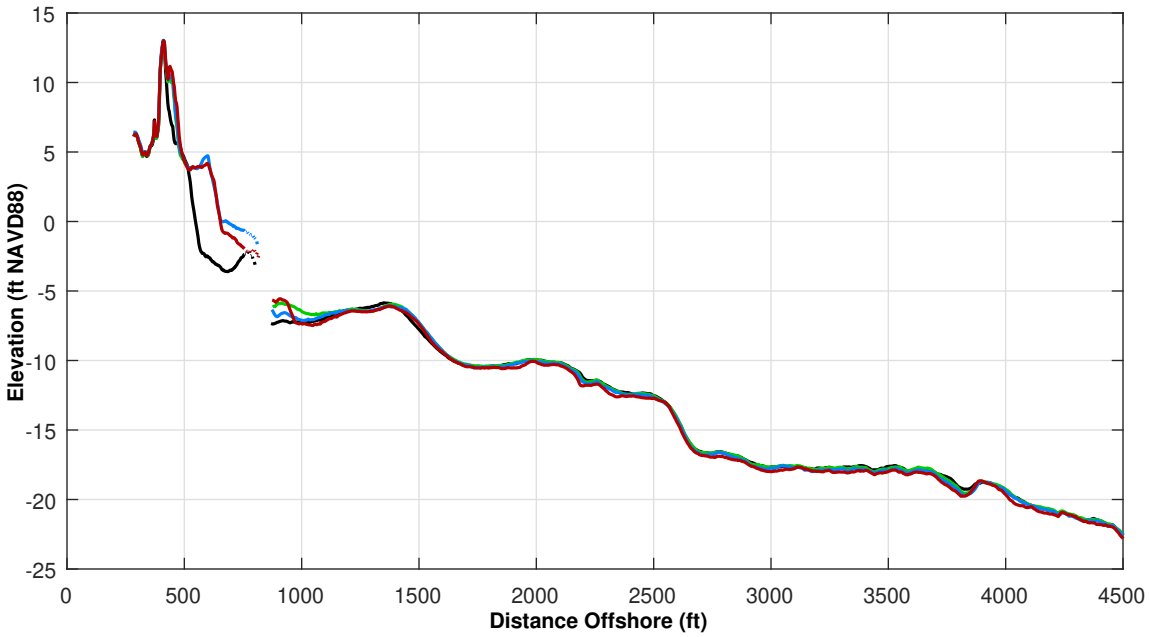
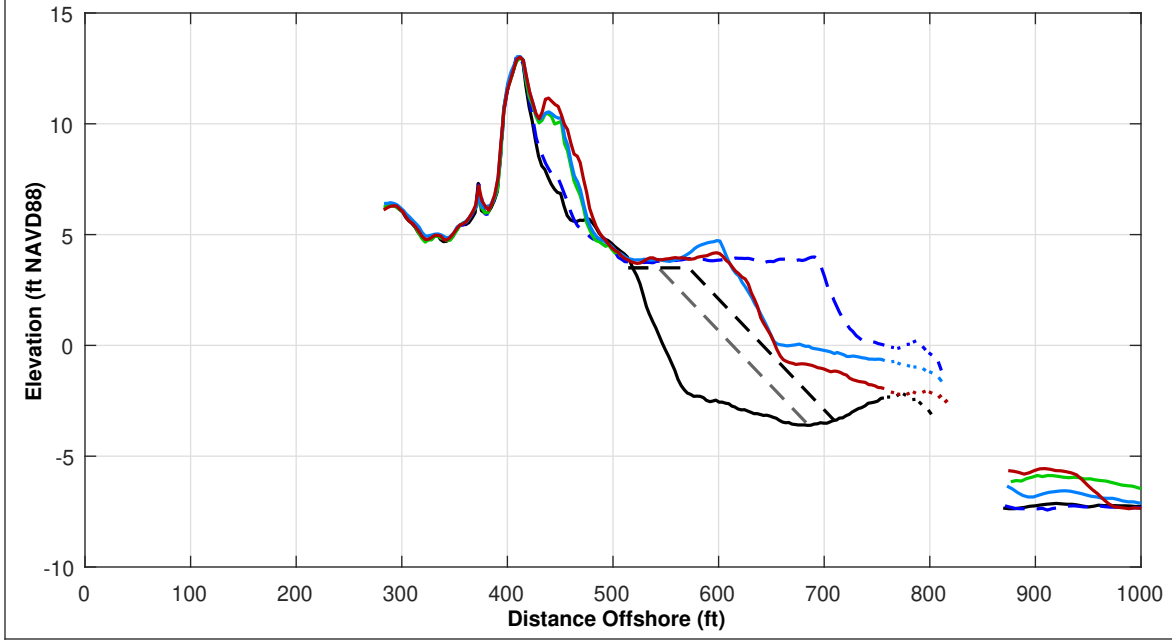




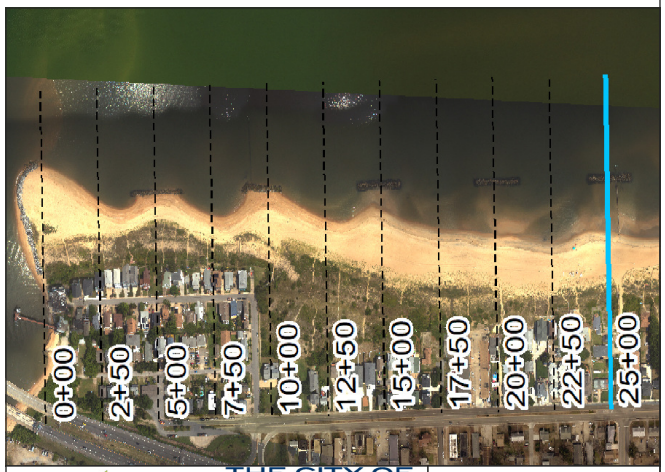
Survey Transect 25+00	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	24.84 ft	-1.62 ft
Volume Change Above -15 ft NAVD88	-12.86 cy/ft	-5.38 cy/ft
Volume Change Above 0 ft NAVD88	2.42 cy/ft	1.13 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 41.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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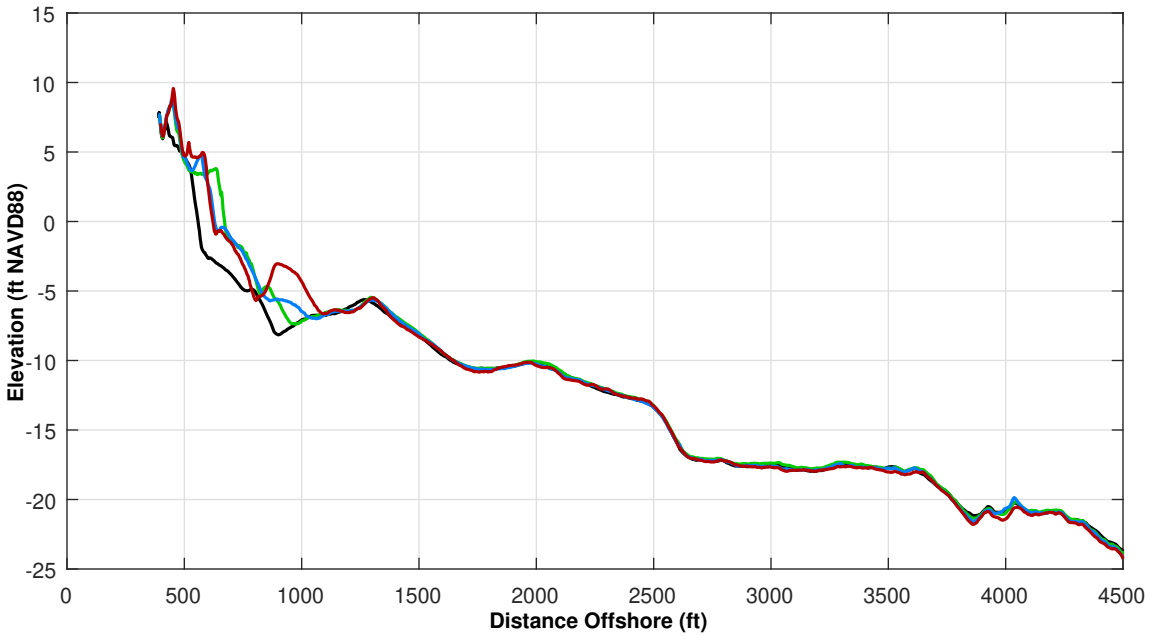
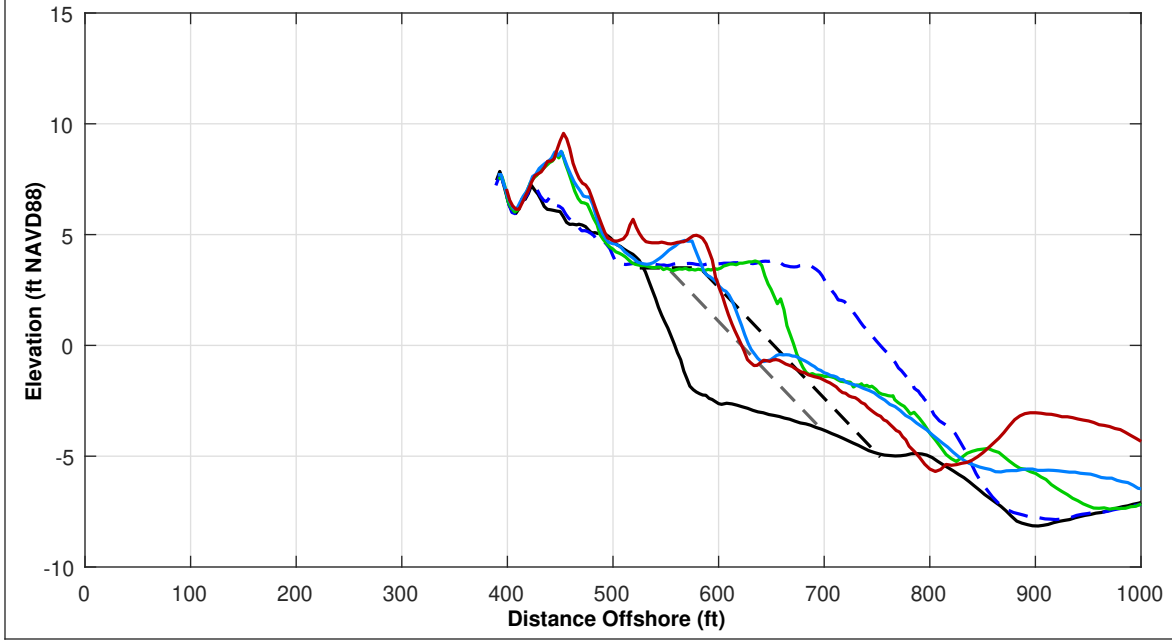
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





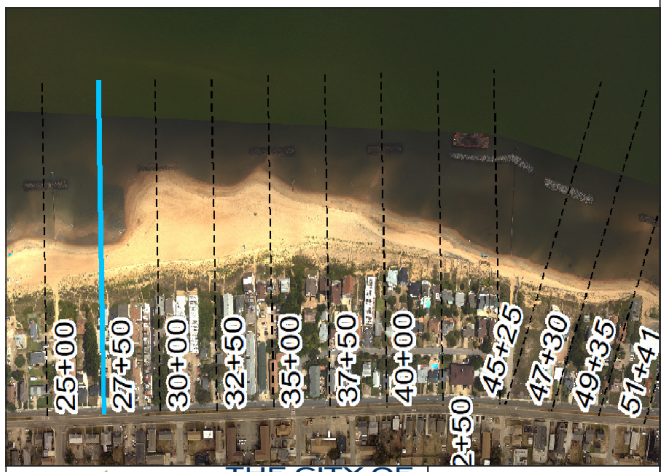
Survey Transect 27+50	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-51.80 ft	-8.58 ft
Volume Change Above -15 ft NAVD88	5.15 cy/ft	11.88 cy/ft
Volume Change Above 0 ft NAVD88	-1.07 cy/ft	2.62 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 12.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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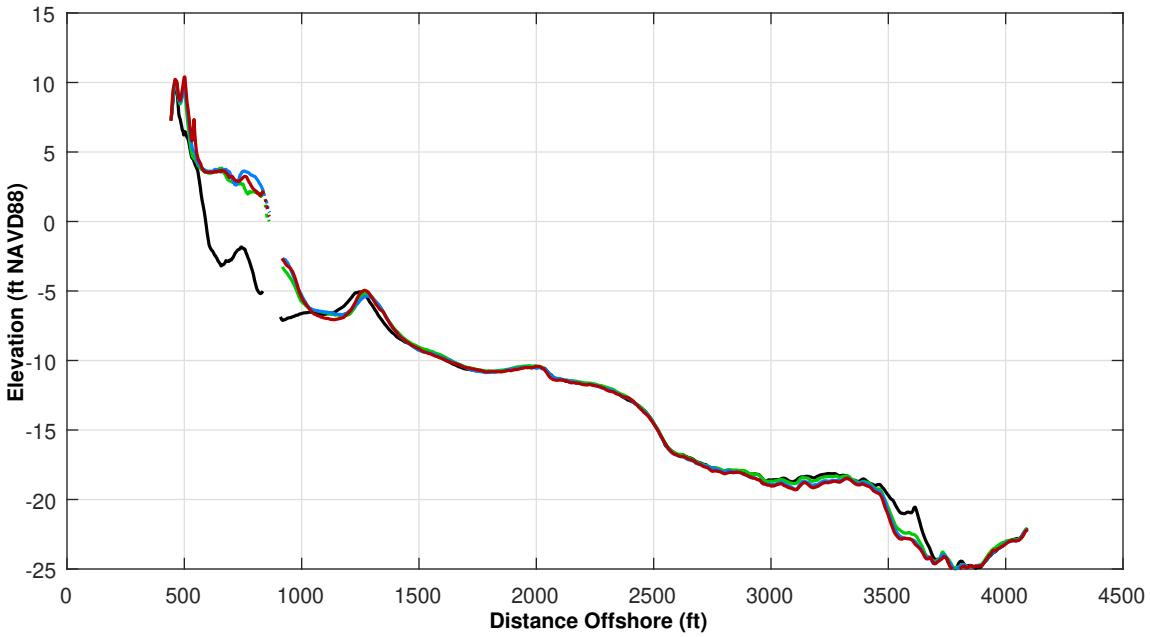
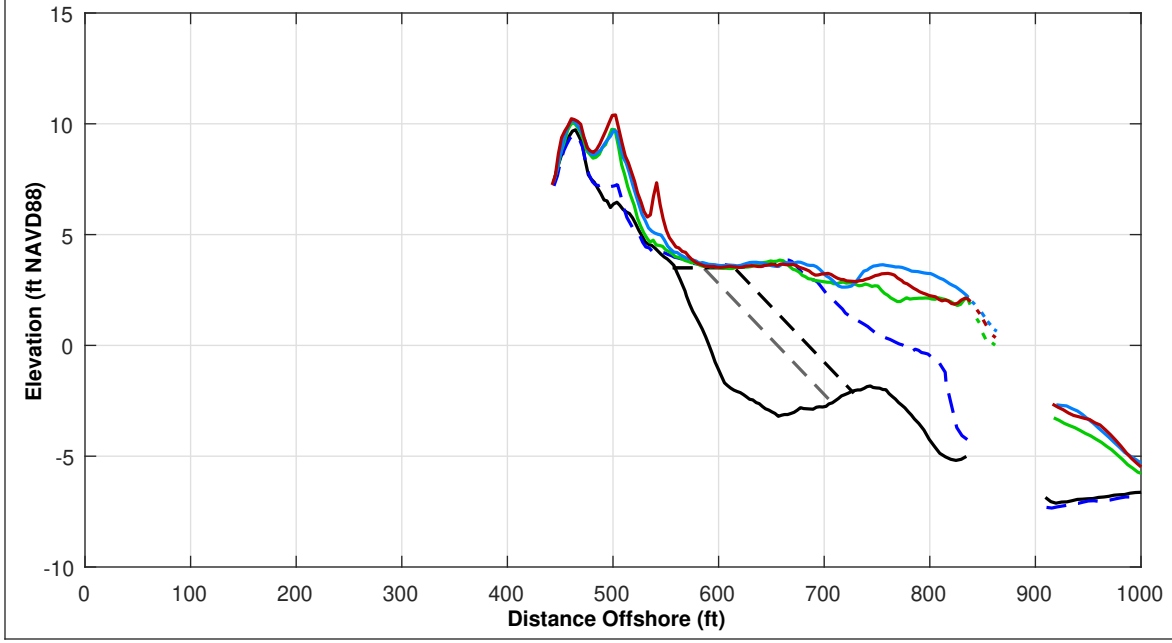
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





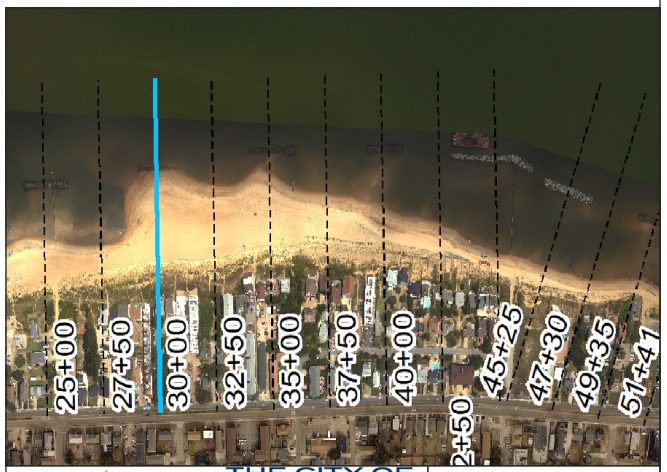
Survey Transect 30+00	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	5.42 ft	-3.95 ft
Volume Change Above -15 ft NAVD88	2.01 cy/ft	-3.08 cy/ft
Volume Change Above 0 ft NAVD88	5.81 cy/ft	-0.76 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 62.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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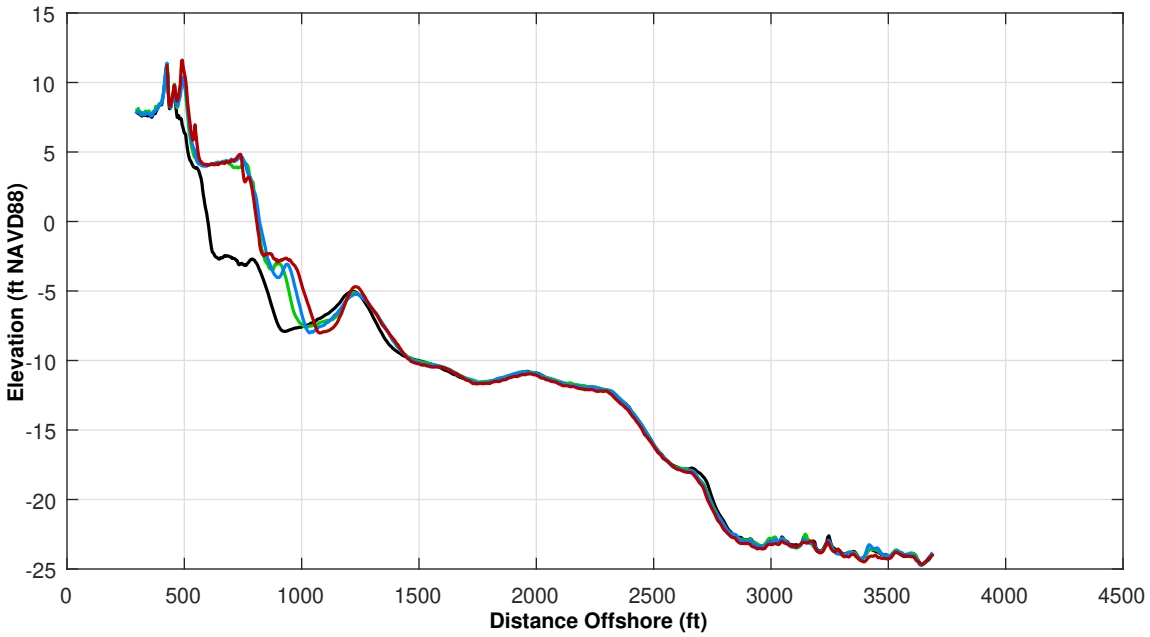
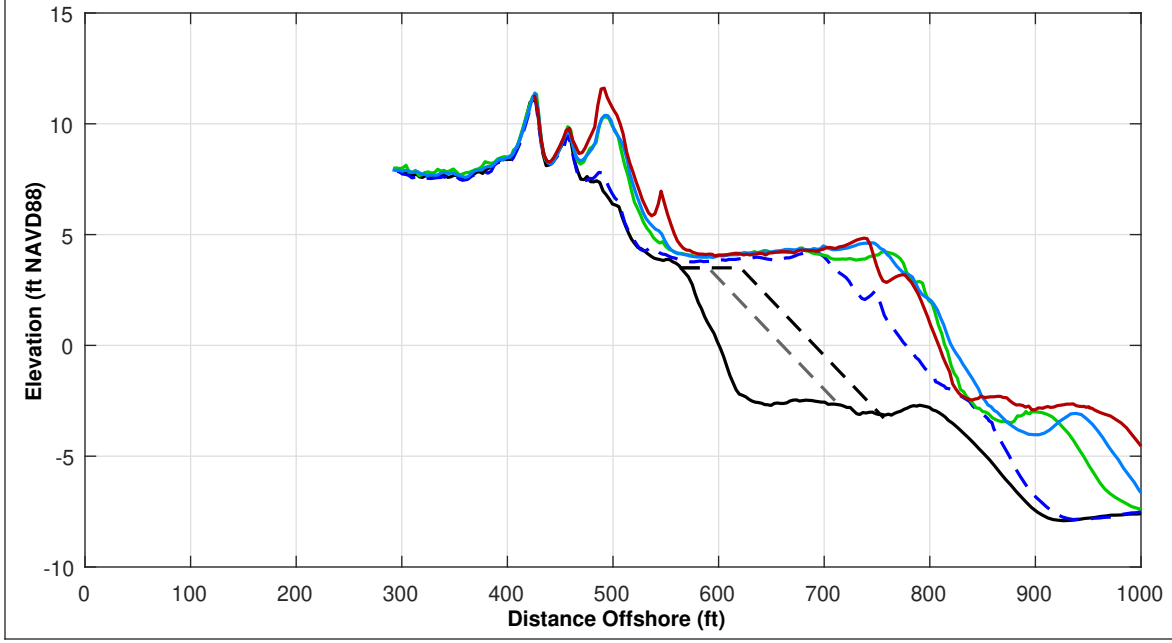




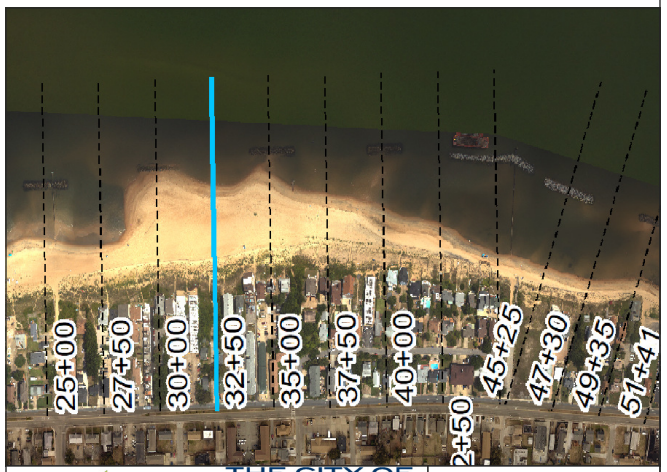
Survey Transect 32+50	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-7.59 ft	-12.46 ft
Volume Change Above -15 ft NAVD88	6.68 cy/ft	2.79 cy/ft
Volume Change Above 0 ft NAVD88	2.96 cy/ft	1.17 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 129.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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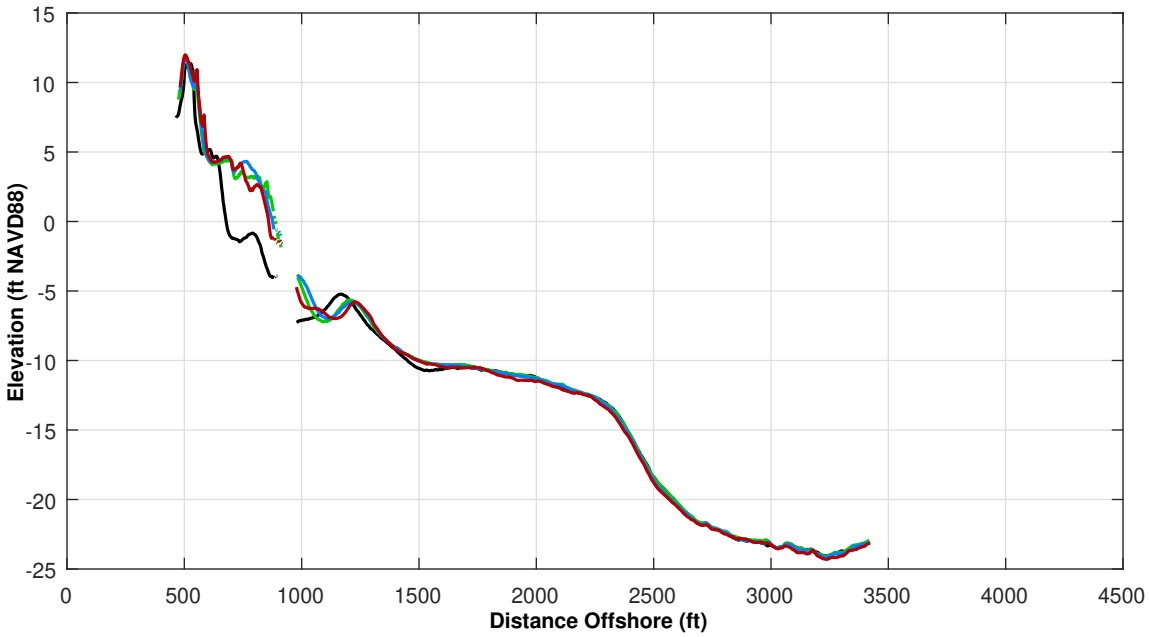
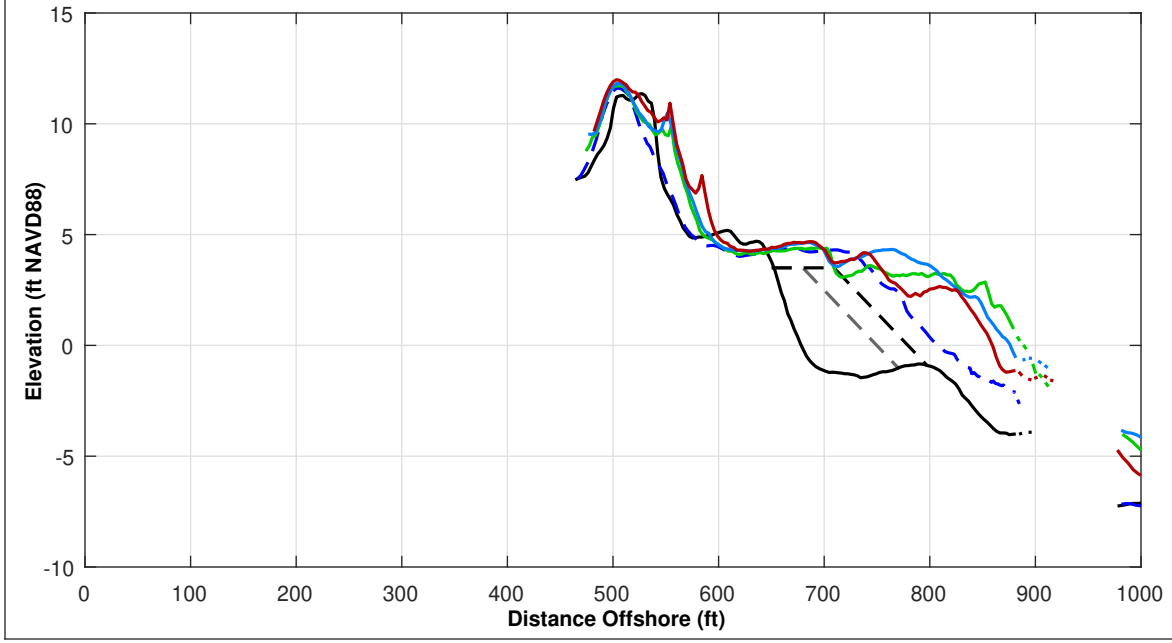
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





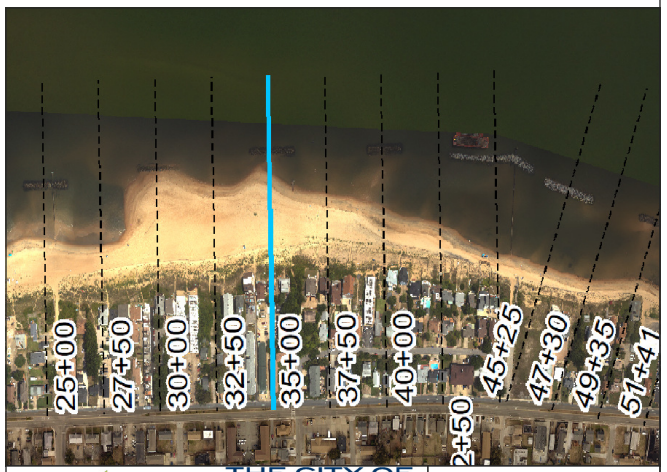
Survey Transect 35+00	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-29.15 ft	-11.80 ft
Volume Change Above -15 ft NAVD88	-9.32 cy/ft	-12.03 cy/ft
Volume Change Above 0 ft NAVD88	0.41 cy/ft	-1.66 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 43.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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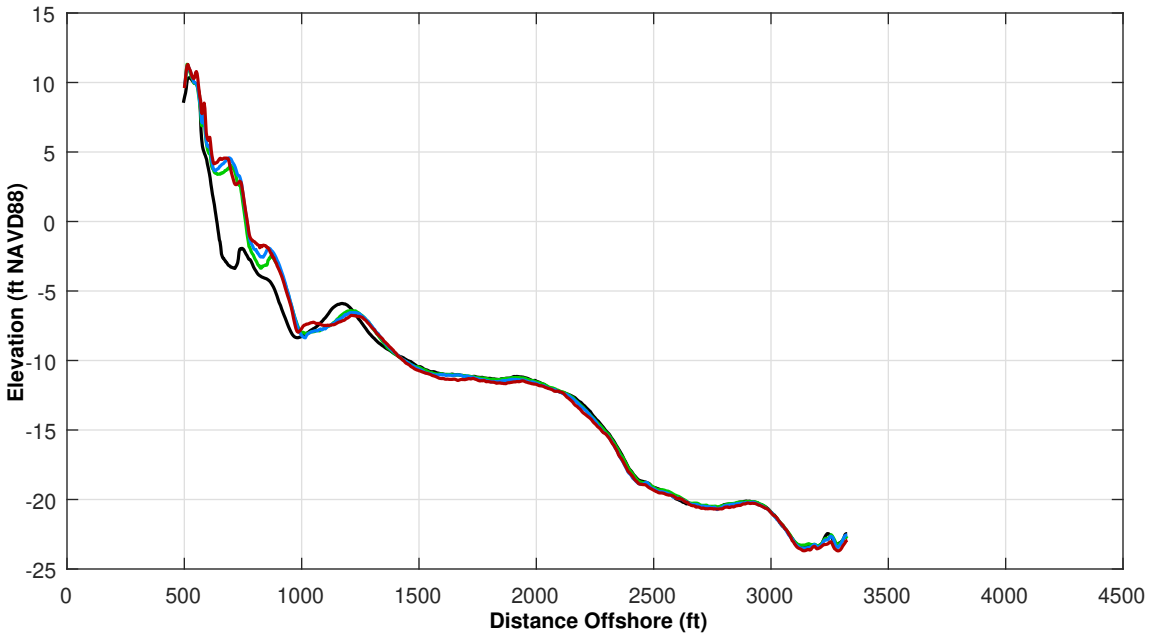
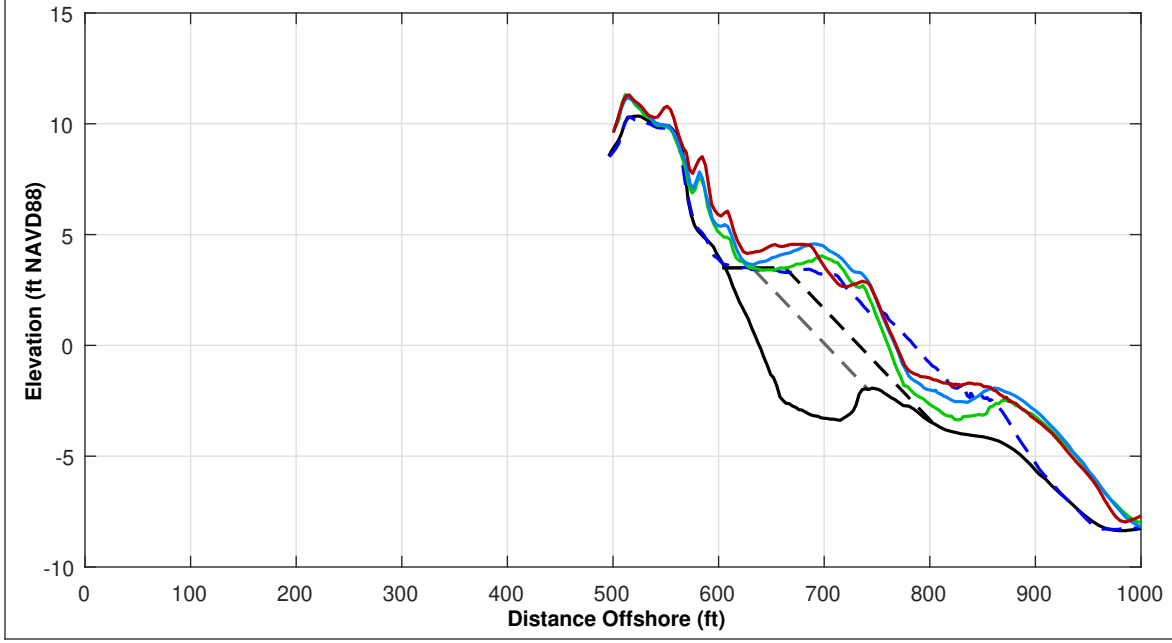
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





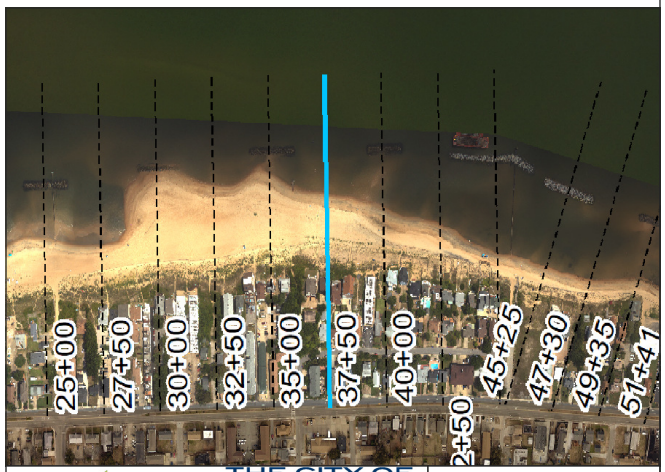
Survey Transect 37+50	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	6.57 ft	0.77 ft
Volume Change Above -15 ft NAVD88	1.99 cy/ft	-1.71 cy/ft
Volume Change Above 0 ft NAVD88	4.96 cy/ft	1.45 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 36.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

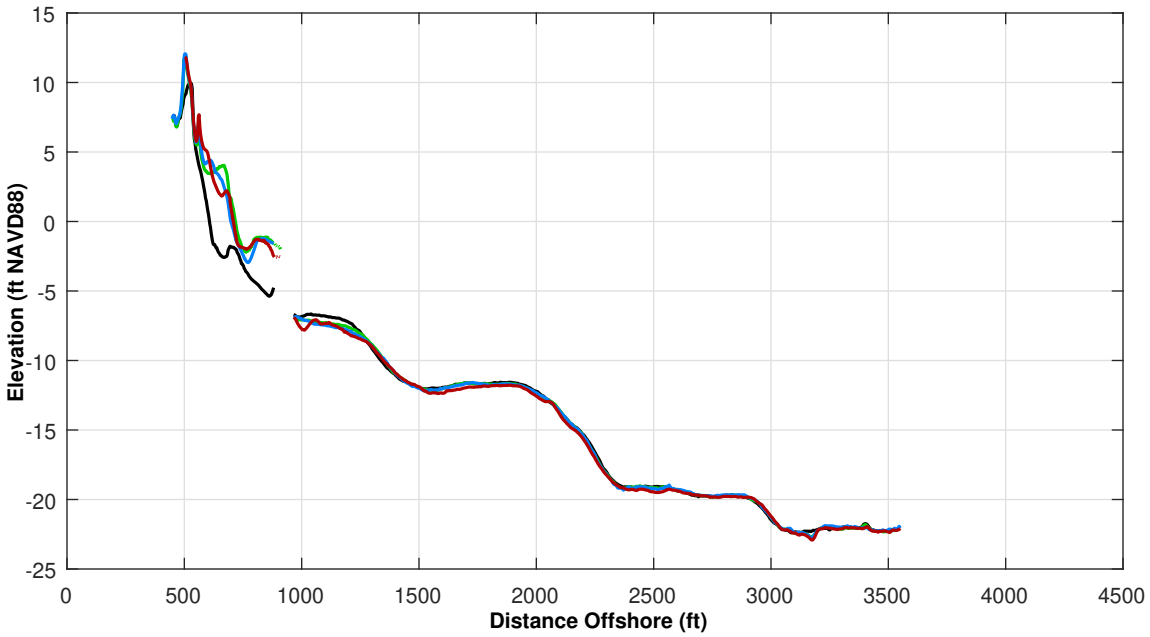
Notes:

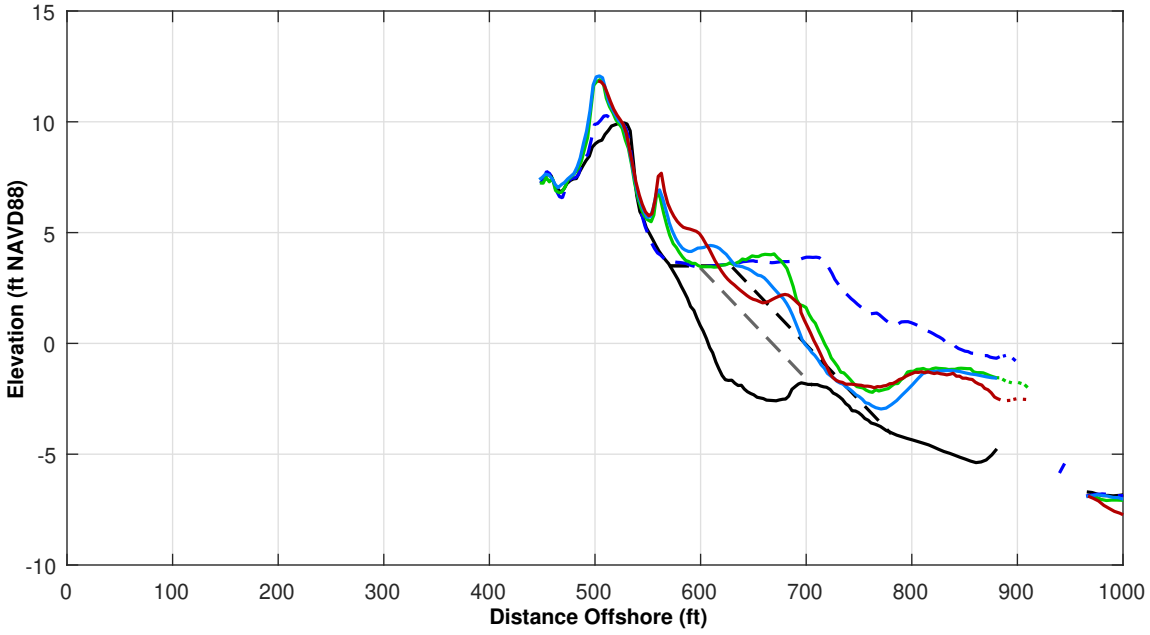
1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



THE CITY OF NORFOLK
PUBLIC WORKS

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





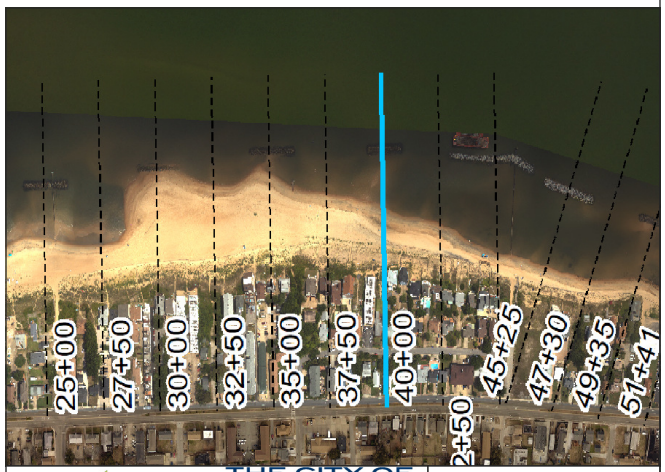
Survey Transect 40+00	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-8.44 ft	9.36 ft
Volume Change Above -15 ft NAVD88	-11.25 cy/ft	-4.51 cy/ft
Volume Change Above 0 ft NAVD88	-1.27 cy/ft	0.03 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		-15.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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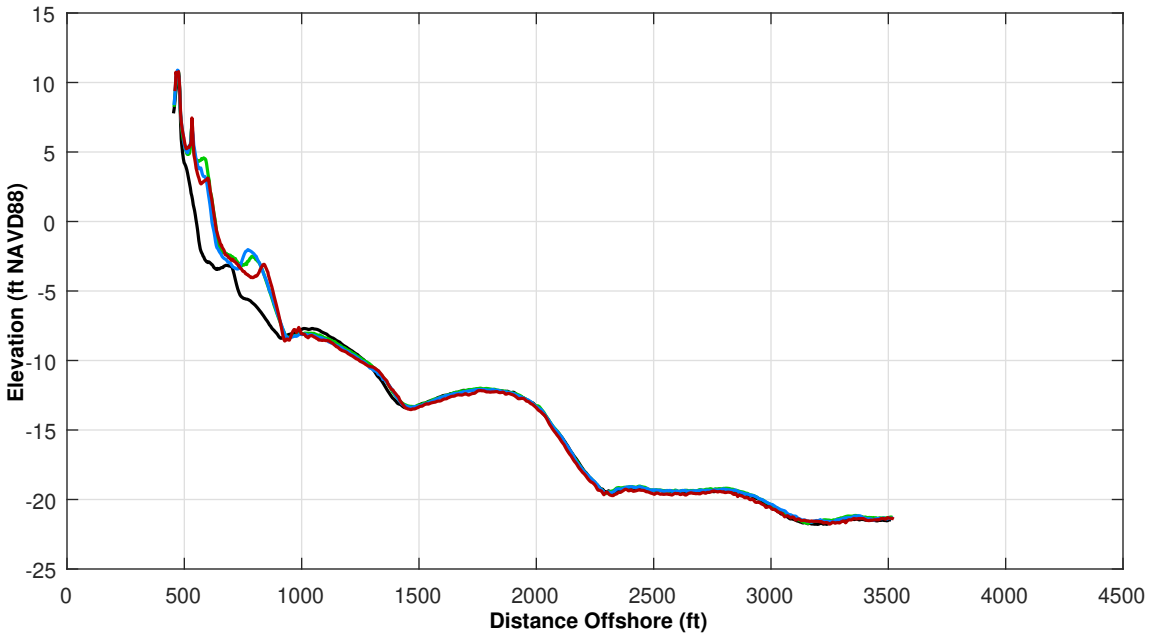
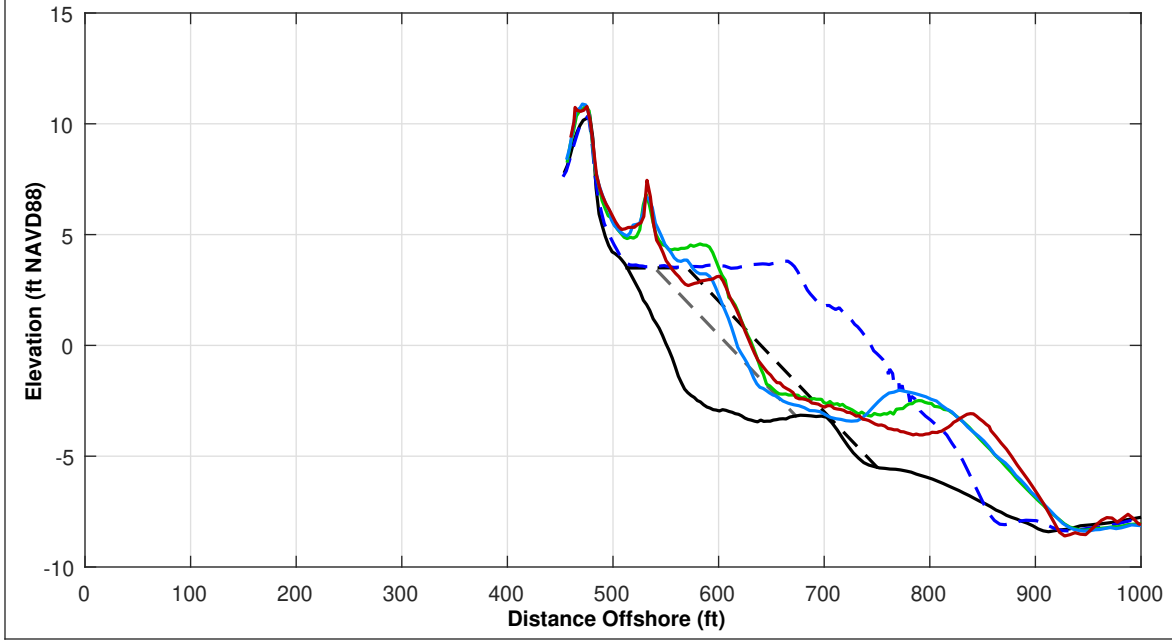
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

ST 40+00	Pg 17 of 106	Spring 2020





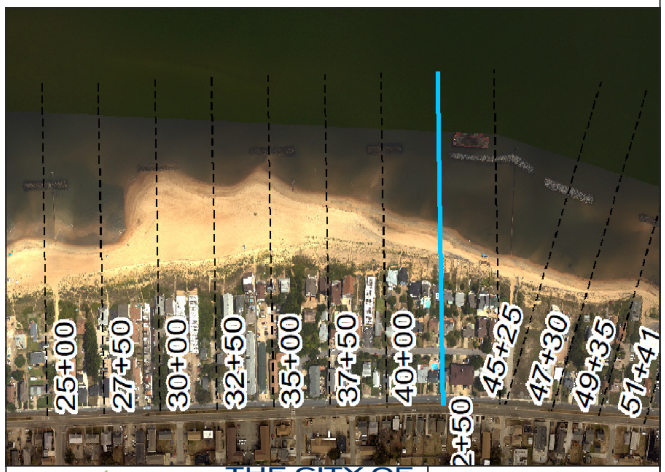
Survey Transect 42+50	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-0.34 ft	11.41 ft
Volume Change Above -15 ft NAVD88	-9.68 cy/ft	-3.39 cy/ft
Volume Change Above 0 ft NAVD88	-2.05 cy/ft	0.19 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		-17.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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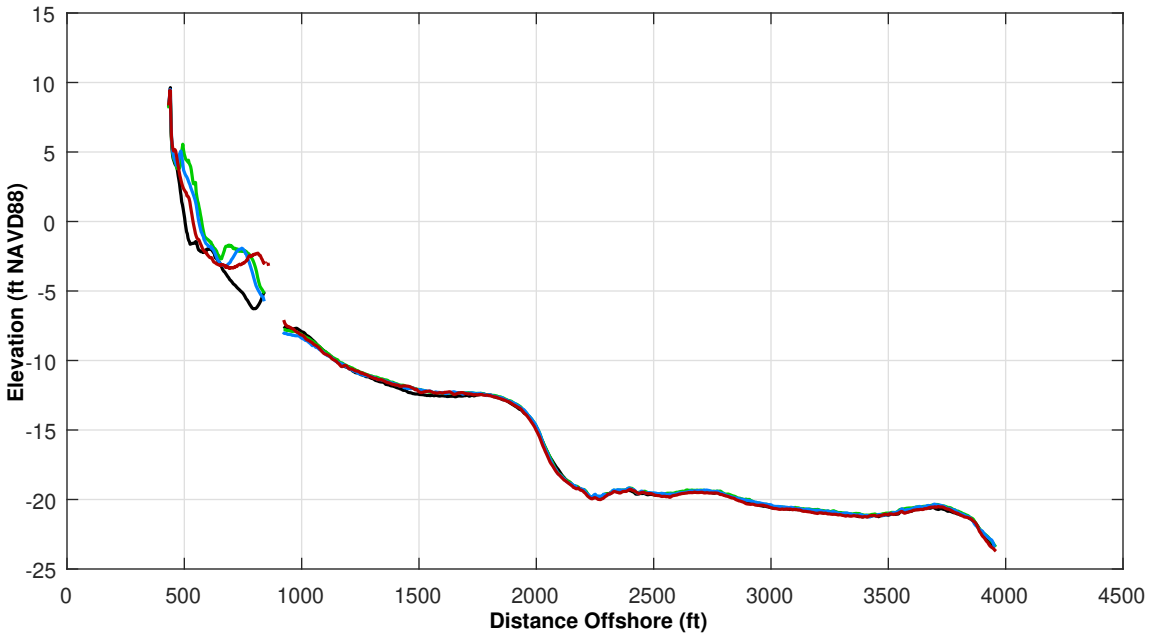
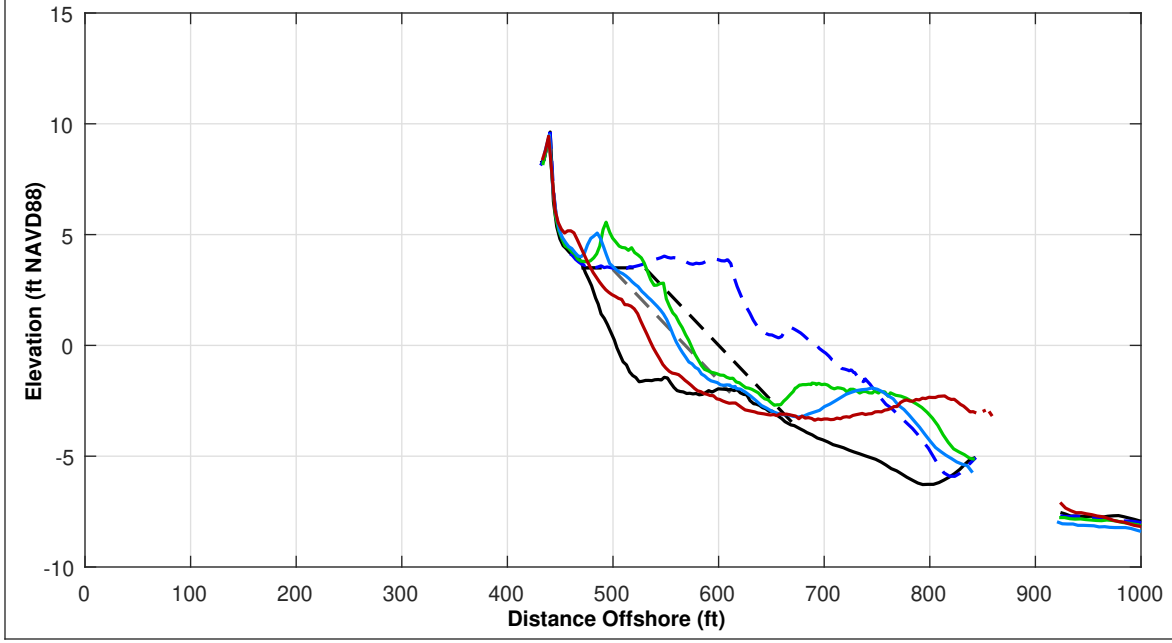
PUBLIC WORKS

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





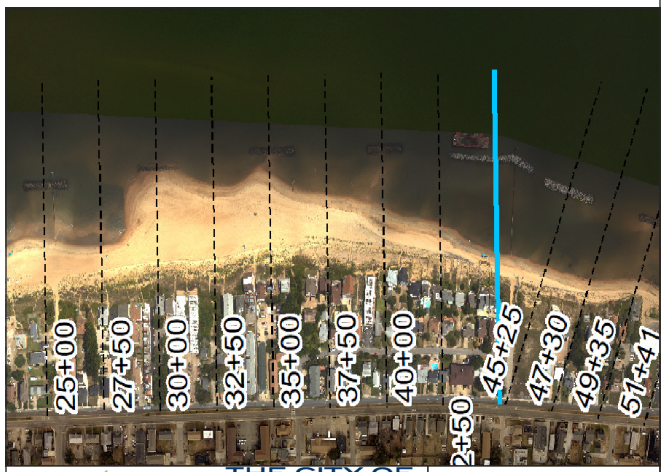
Survey Transect 45+00	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-35.80 ft	-25.15 ft
Volume Change Above -15 ft NAVD88	-18.91 cy/ft	-9.25 cy/ft
Volume Change Above 0 ft NAVD88	-6.75 cy/ft	-3.98 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		-52.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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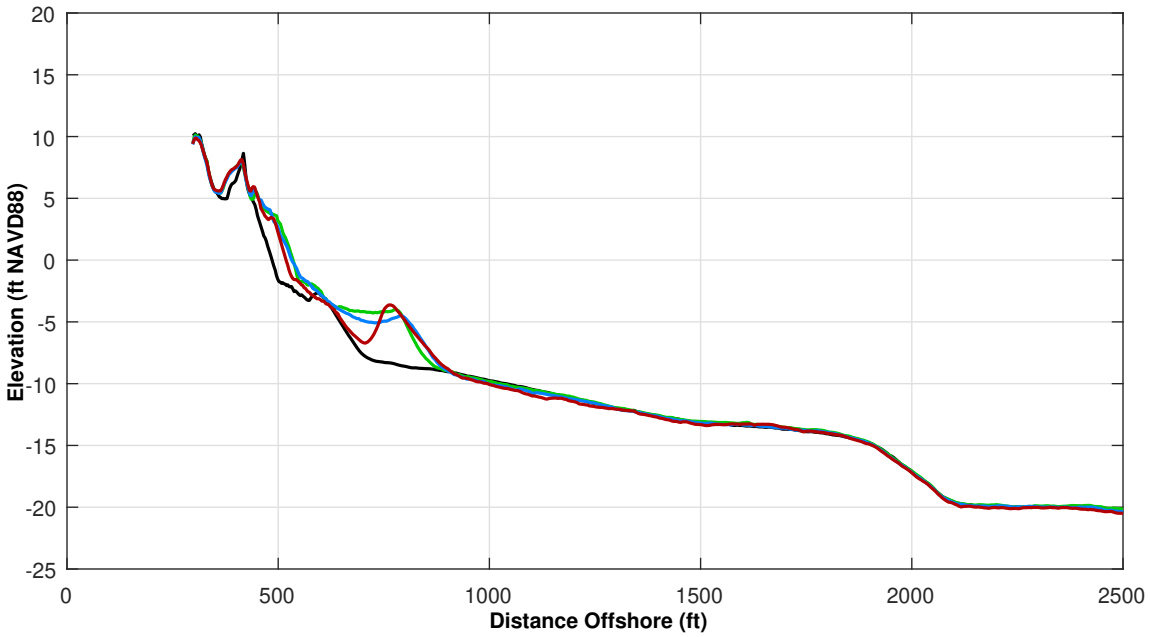
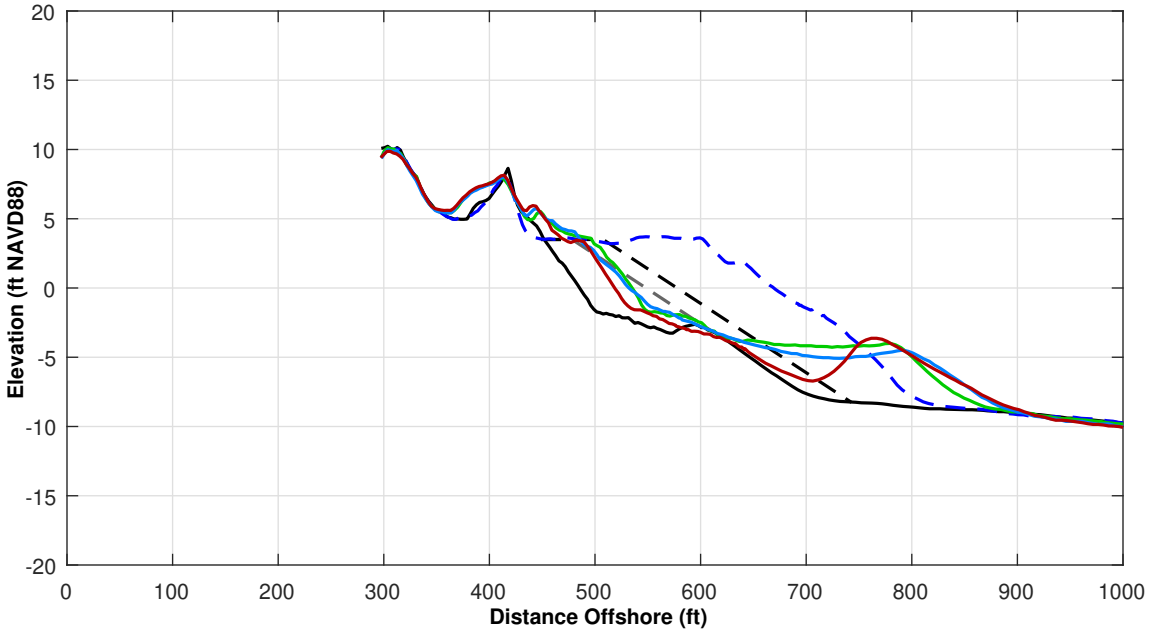
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

ST 45+00	Pg 19 of 106	Spring 2020





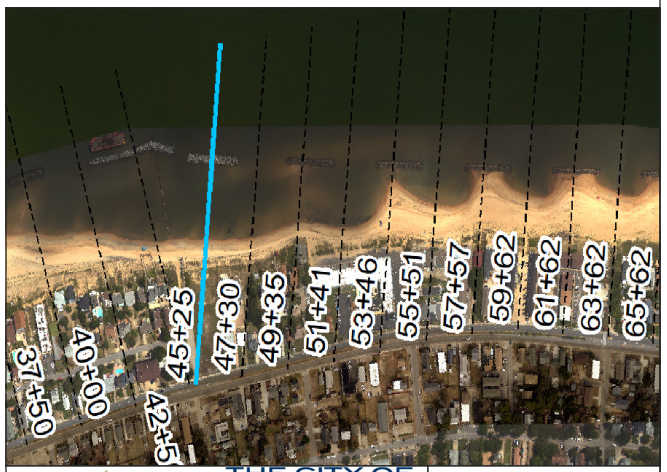
Survey Transect 45+25	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-16.02 ft	-11.54 ft
Volume Change Above -15 ft NAVD88	-15.22 cy/ft	-9.45 cy/ft
Volume Change Above 0 ft NAVD88	-1.72 cy/ft	-0.90 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		-39.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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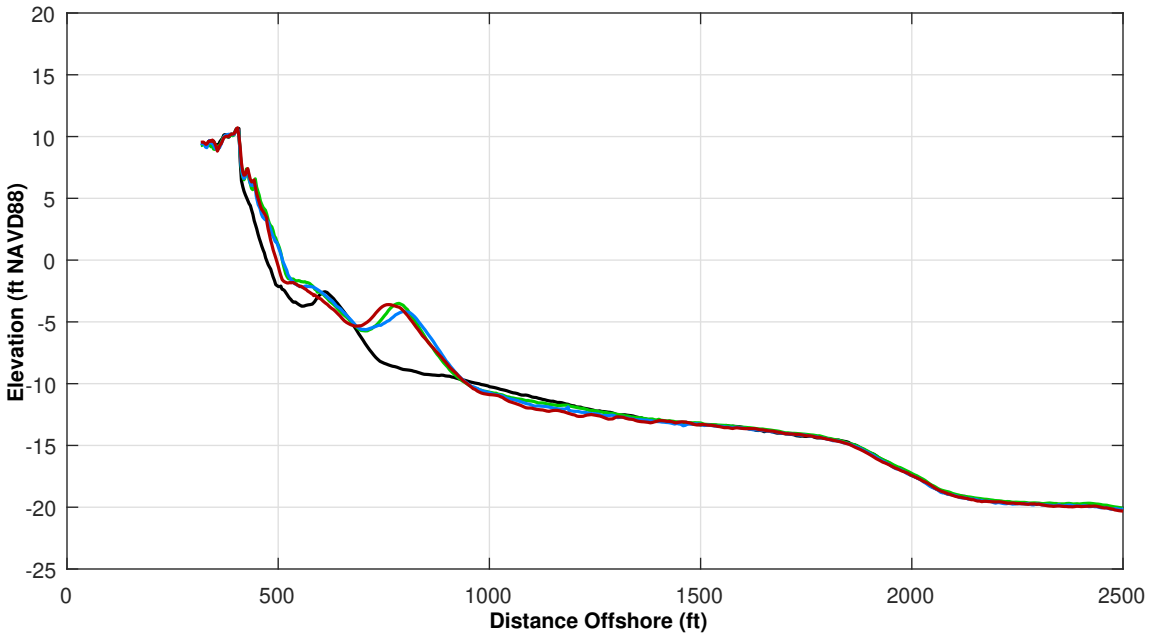
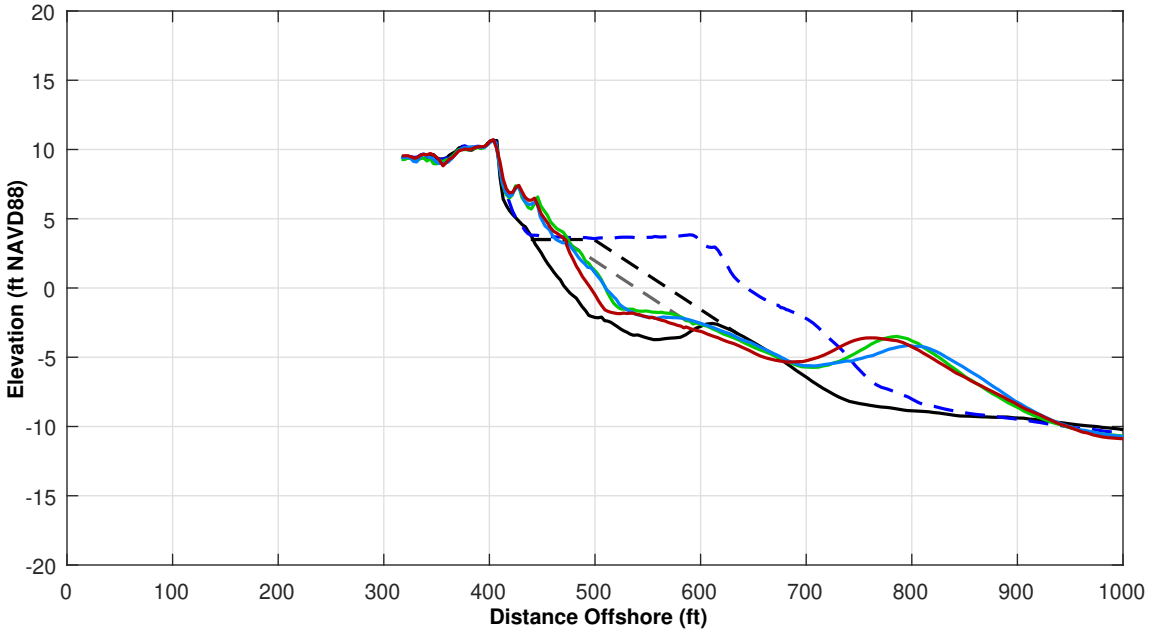




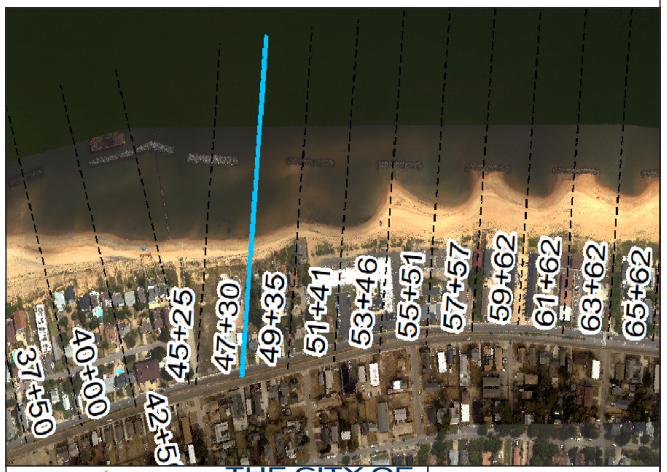
Survey Transect 47+30	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-15.99 ft	-14.20 ft
Volume Change Above -15 ft NAVD88	-10.46 cy/ft	-5.14 cy/ft
Volume Change Above 0 ft NAVD88	-1.20 cy/ft	-0.23 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		-29.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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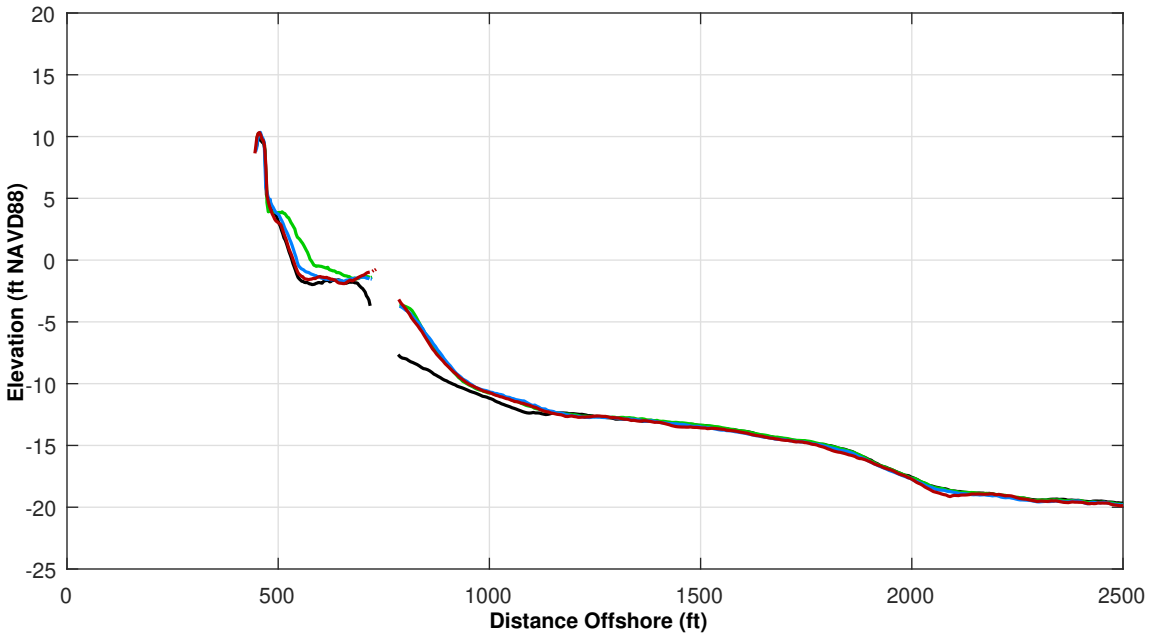
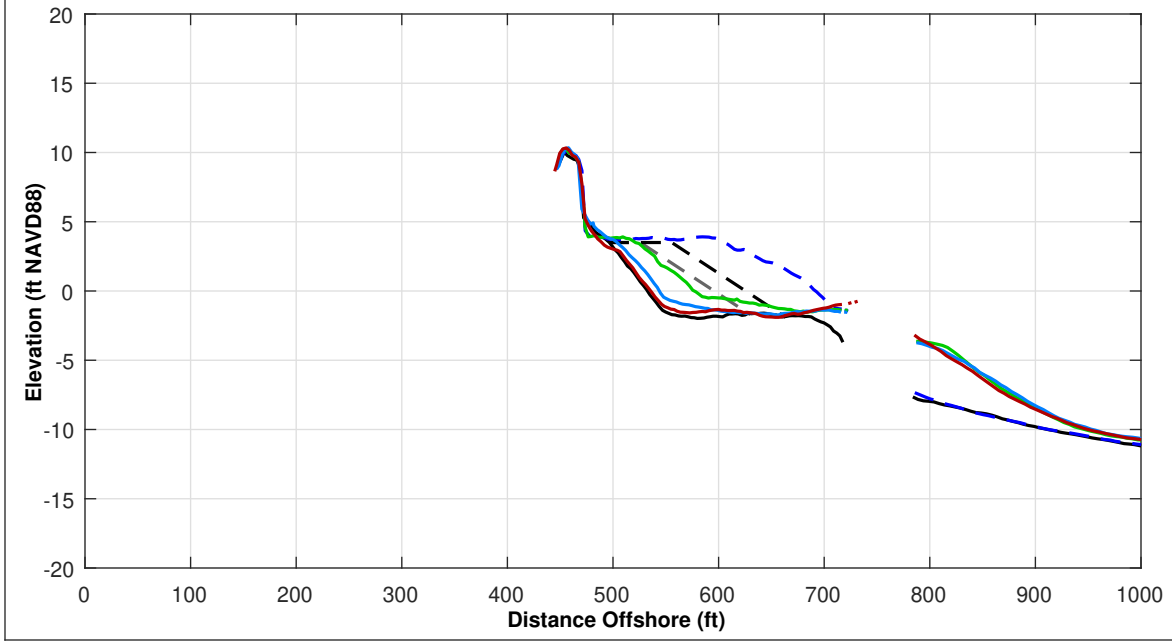
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





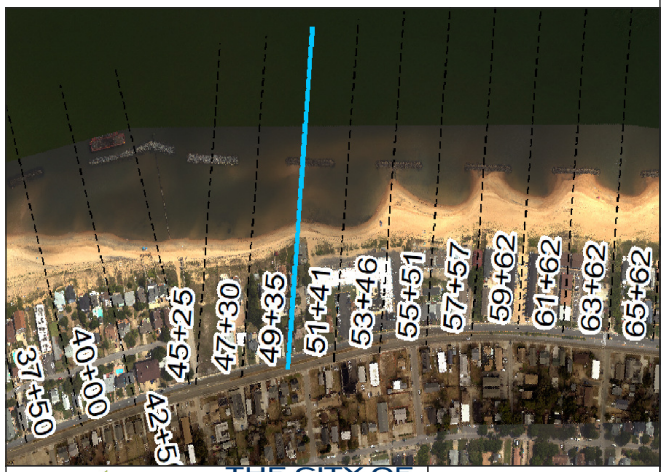
Survey Transect 49+35	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-39.02 ft	-10.14 ft
Volume Change Above -15 ft NAVD88	-13.00 cy/ft	-4.90 cy/ft
Volume Change Above 0 ft NAVD88	-4.57 cy/ft	-1.46 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		-67.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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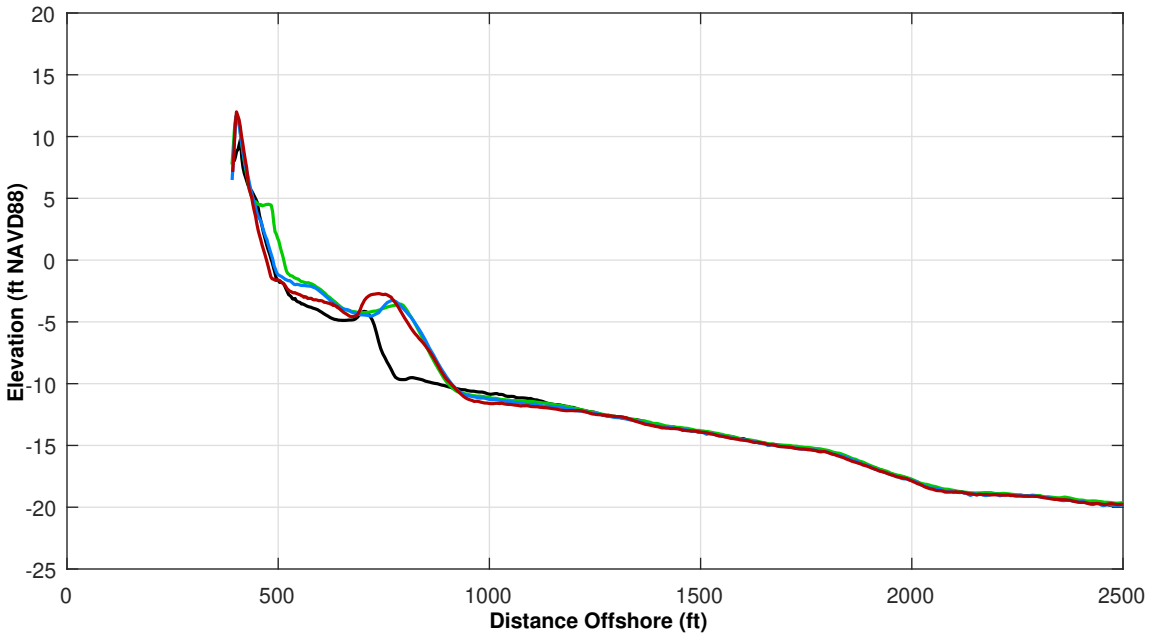
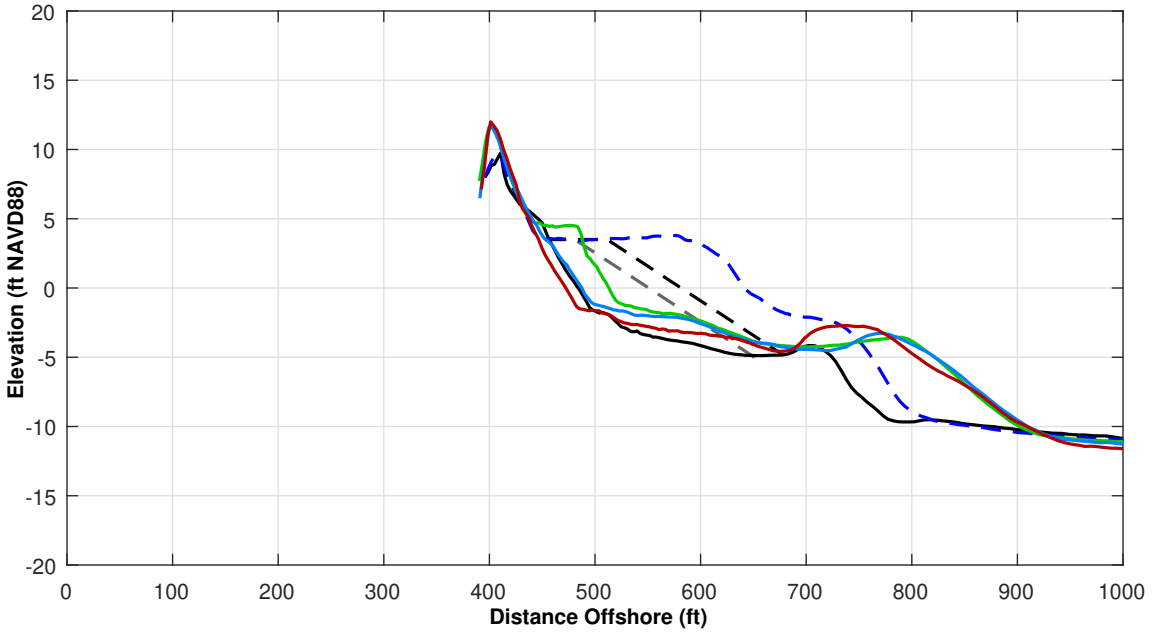
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





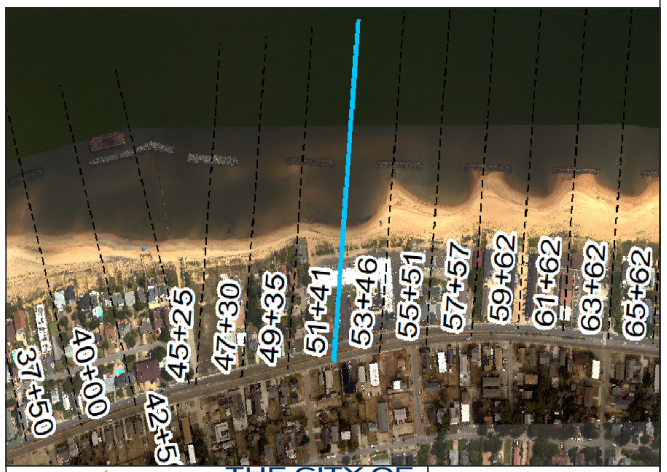
Survey Transect 51+41	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-41.46 ft	-14.86 ft
Volume Change Above -15 ft NAVD88	-17.82 cy/ft	-7.80 cy/ft
Volume Change Above 0 ft NAVD88	-6.77 cy/ft	-1.79 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		-65.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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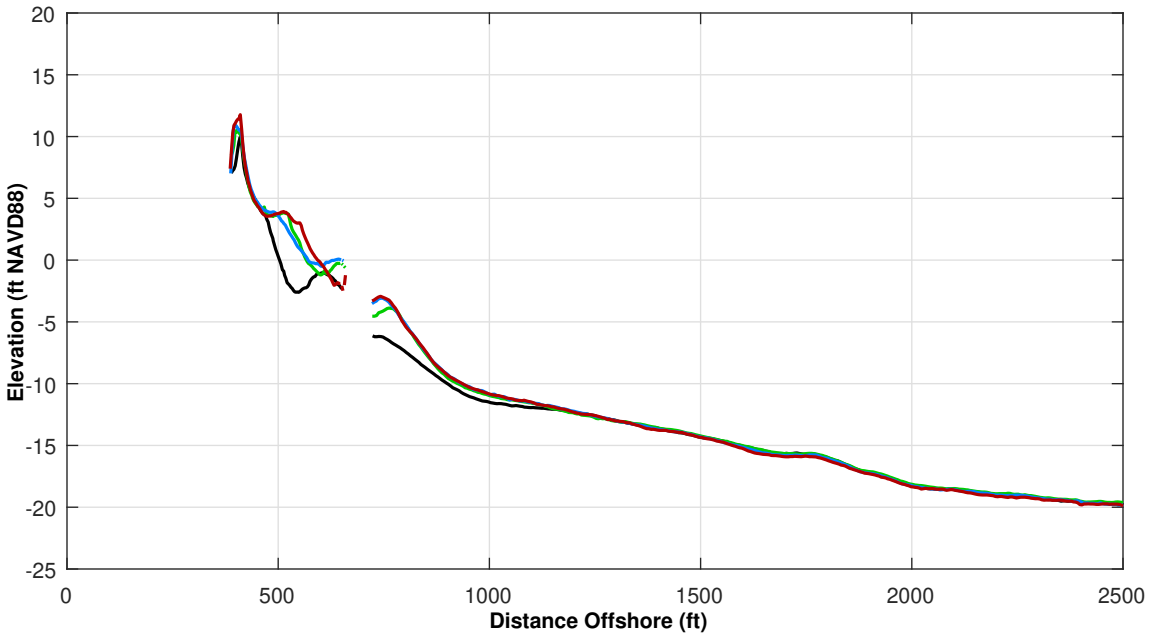
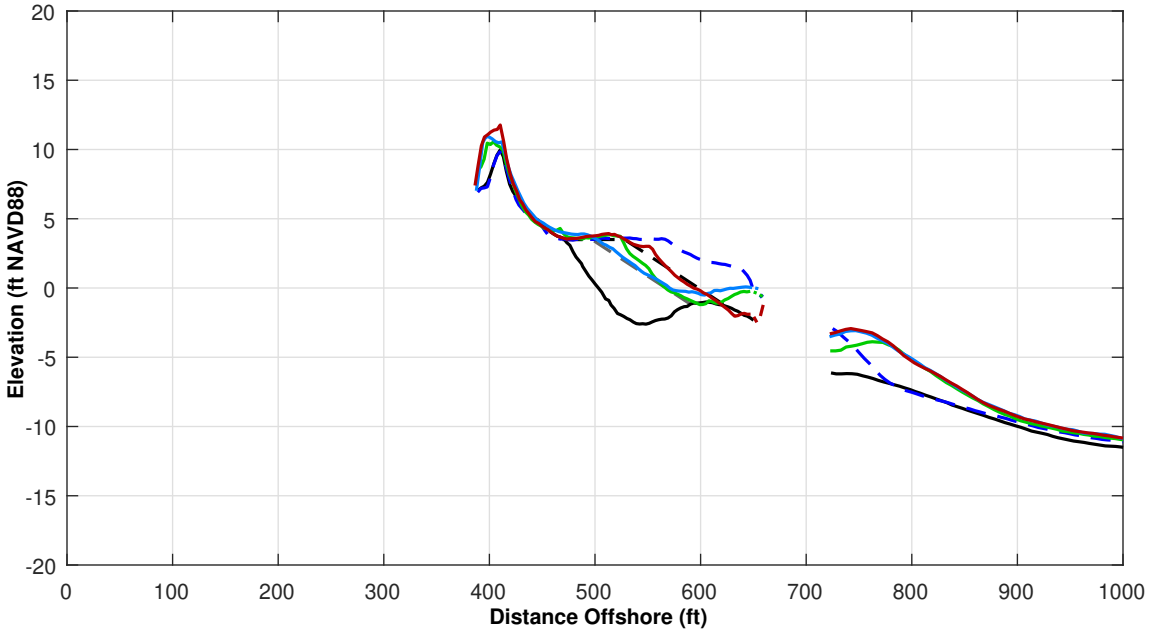
PUBLIC WORKS

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





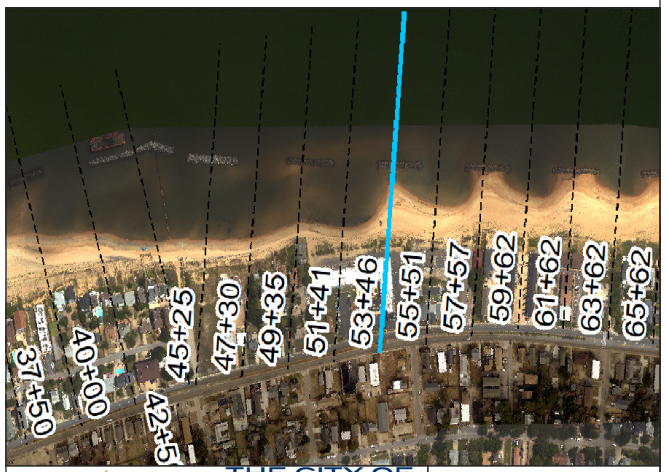
Survey Transect 53+46	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	20.47 ft	25.90 ft
Volume Change Above -15 ft NAVD88	5.83 cy/ft	0.97 cy/ft
Volume Change Above 0 ft NAVD88	3.65 cy/ft	3.80 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	-0.0 ft	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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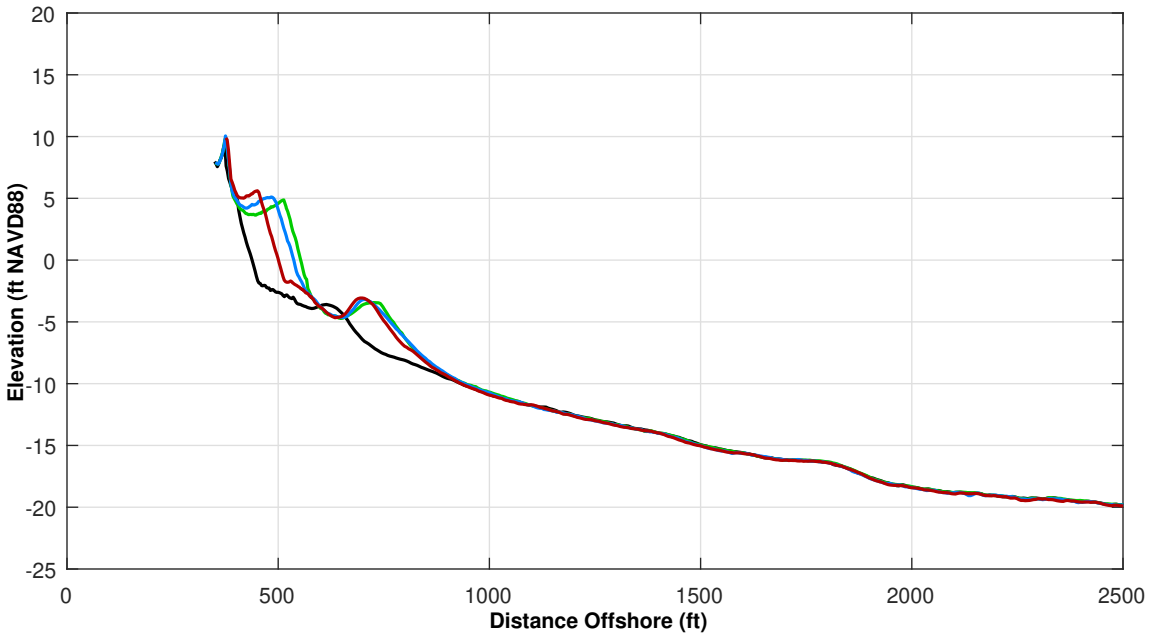
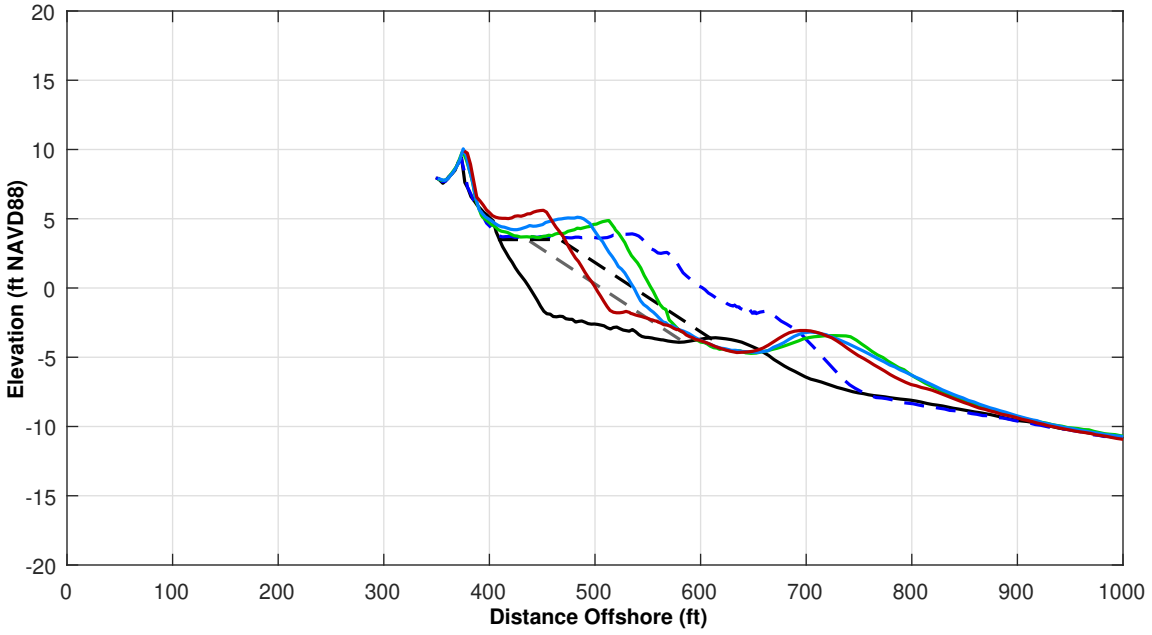
PUBLIC WORKS

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





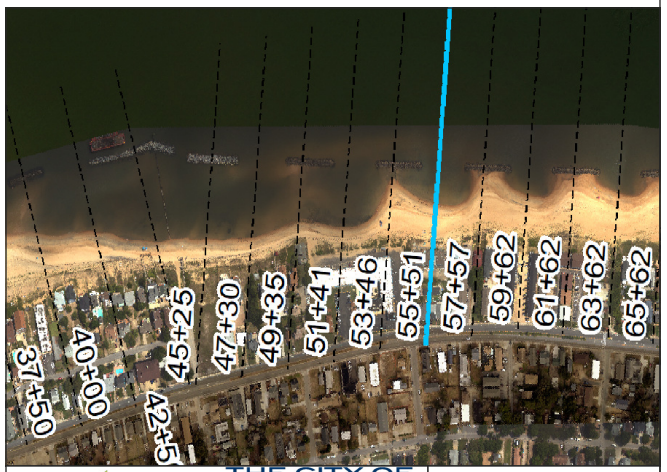
Survey Transect 55+51	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-54.34 ft	-37.28 ft
Volume Change Above -15 ft NAVD88	-13.08 cy/ft	-10.32 cy/ft
Volume Change Above 0 ft NAVD88	-5.17 cy/ft	-4.36 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	+ 3.0 ft	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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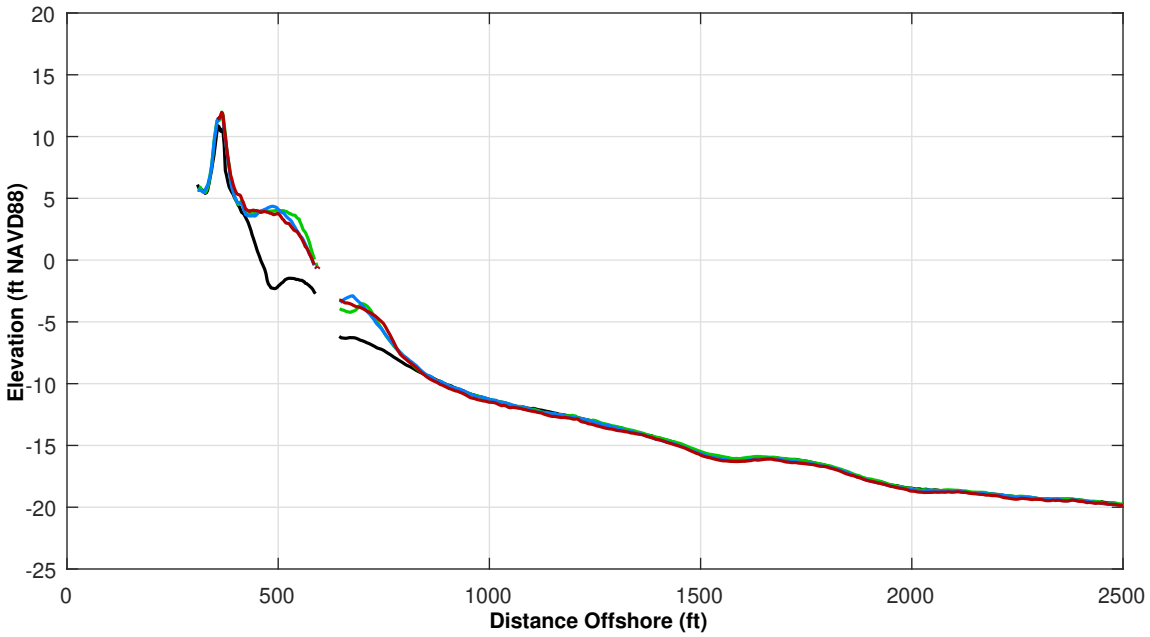
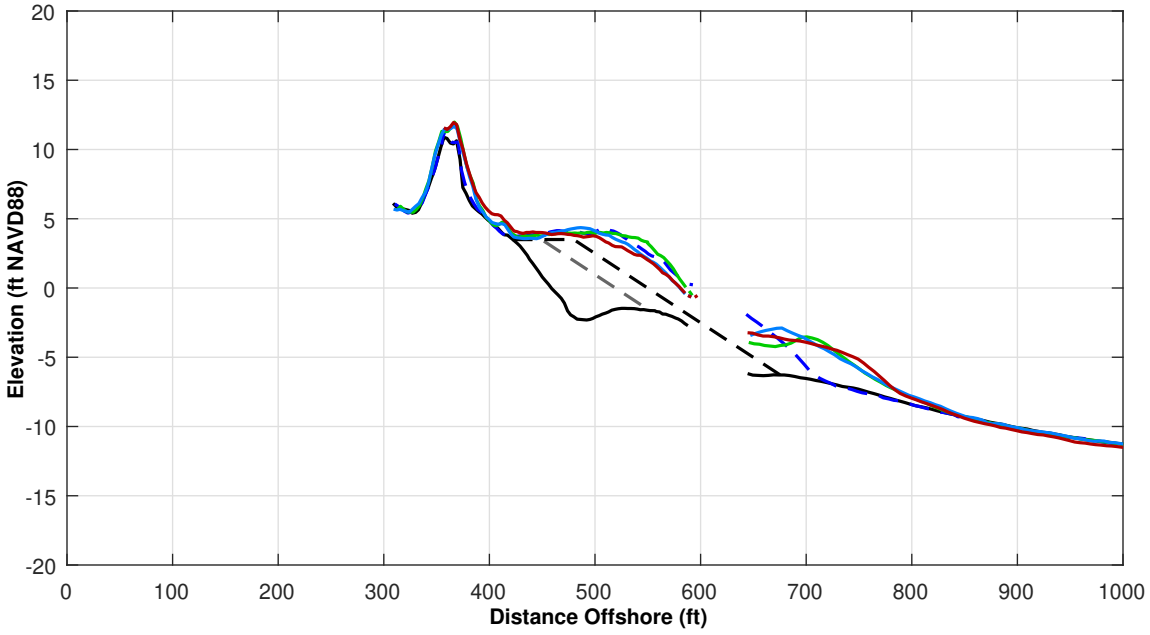
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





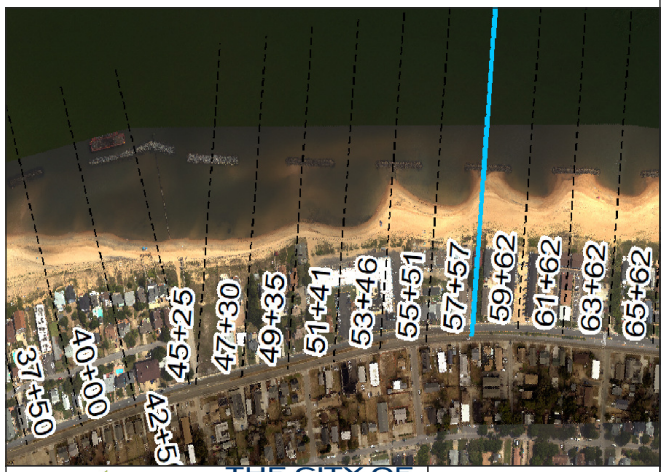
Survey Transect 57+57	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-10.23 ft	-1.12 ft
Volume Change Above -15 ft NAVD88	-5.52 cy/ft	-3.68 cy/ft
Volume Change Above 0 ft NAVD88	-2.07 cy/ft	-0.01 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 24.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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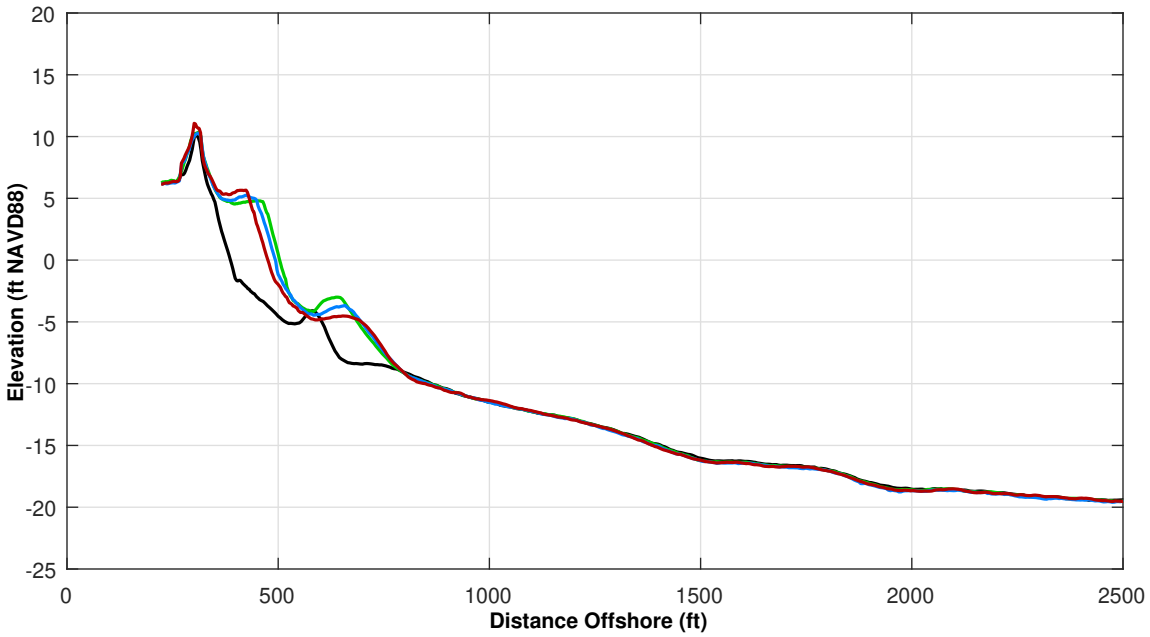
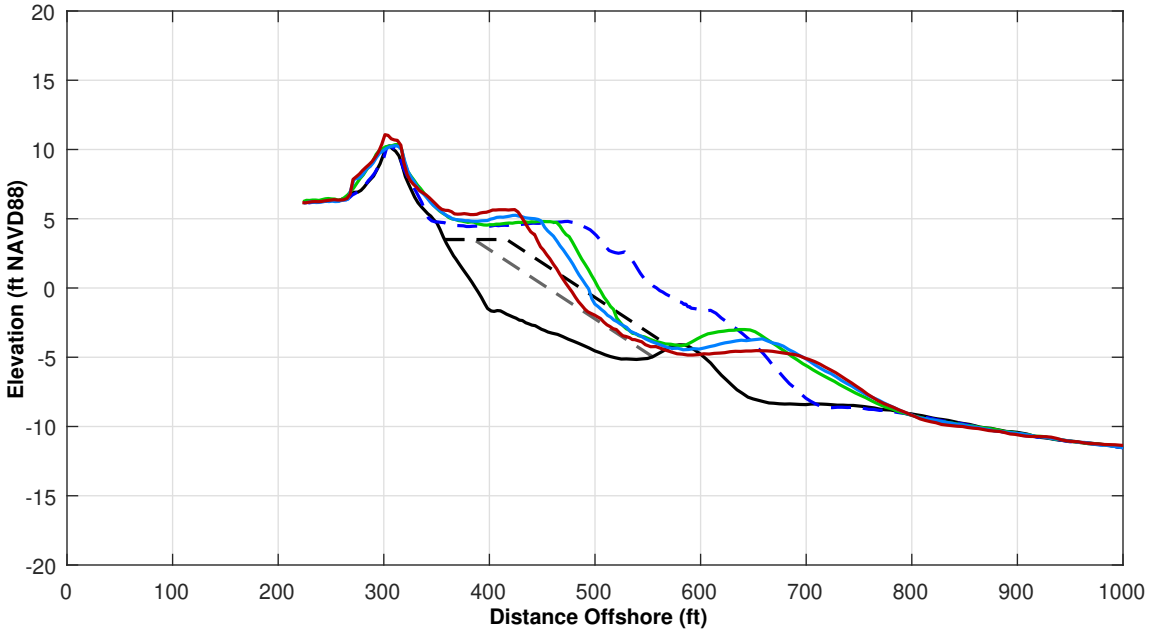
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





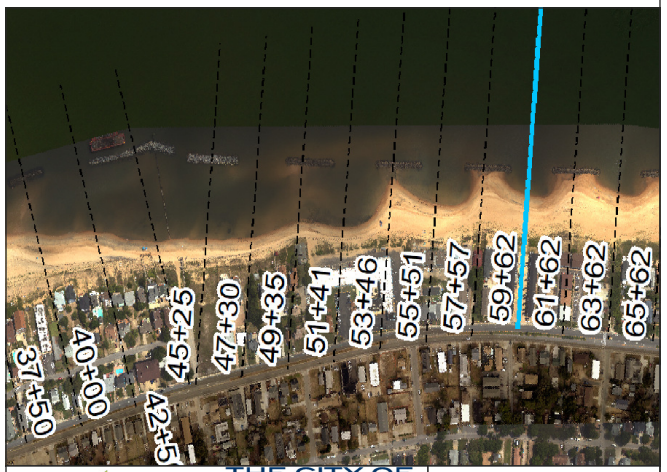
Survey Transect 59+62	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-29.42 ft	-17.79 ft
Volume Change Above -15 ft NAVD88	-9.76 cy/ft	-5.31 cy/ft
Volume Change Above 0 ft NAVD88	-2.99 cy/ft	-1.31 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 26.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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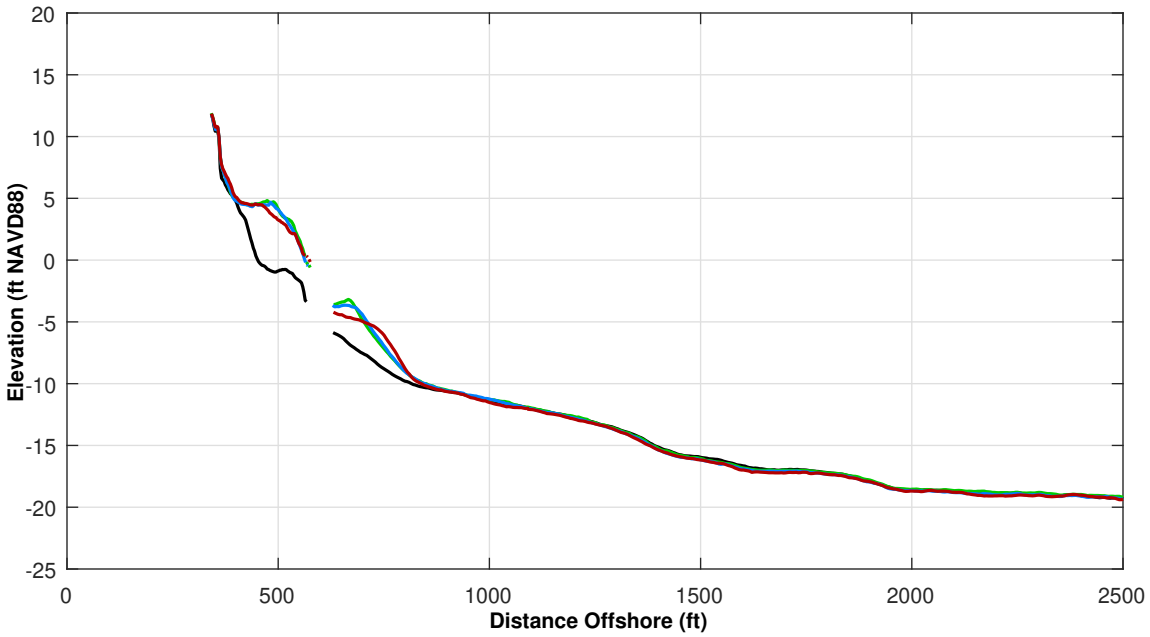
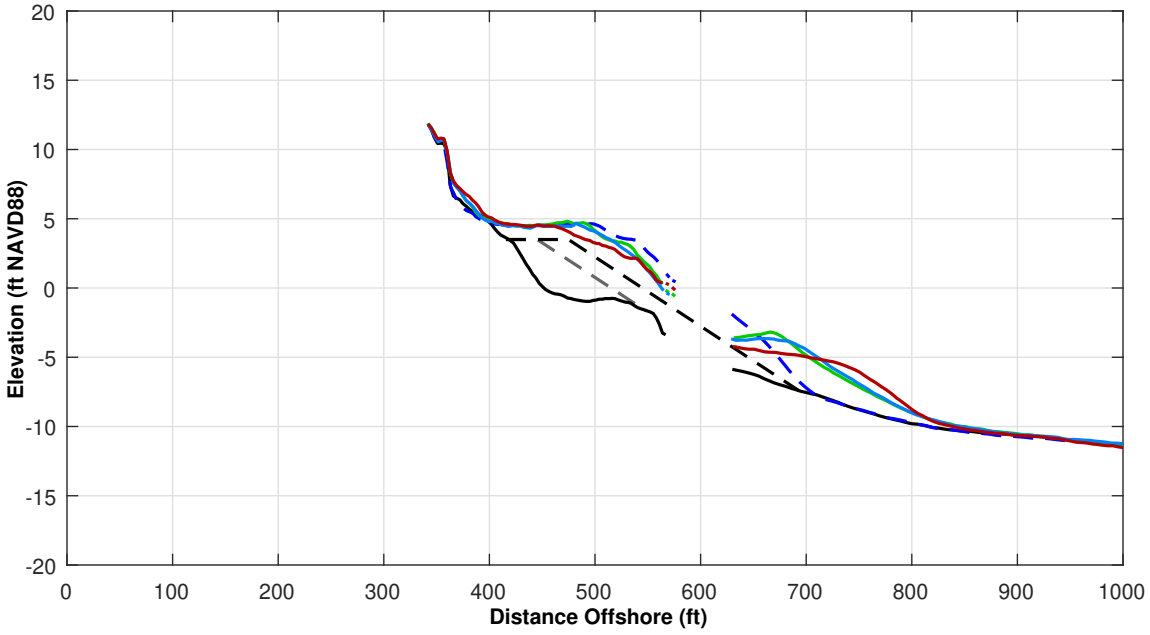
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





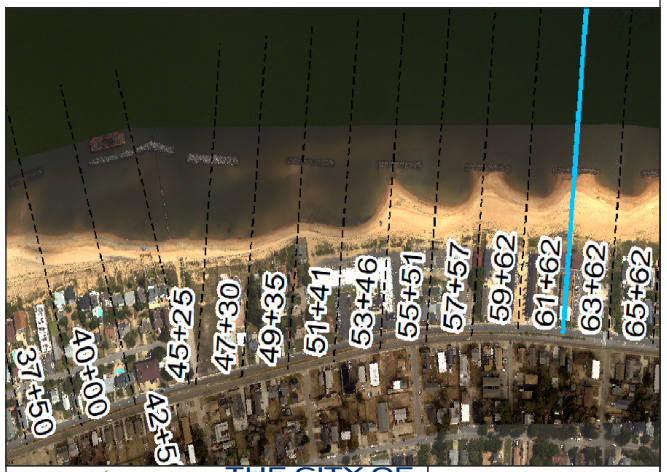
Survey Transect 61+62	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-2.70 ft	1.41 ft
Volume Change Above -15 ft NAVD88	-4.72 cy/ft	-2.73 cy/ft
Volume Change Above 0 ft NAVD88	-1.86 cy/ft	-0.68 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 14.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

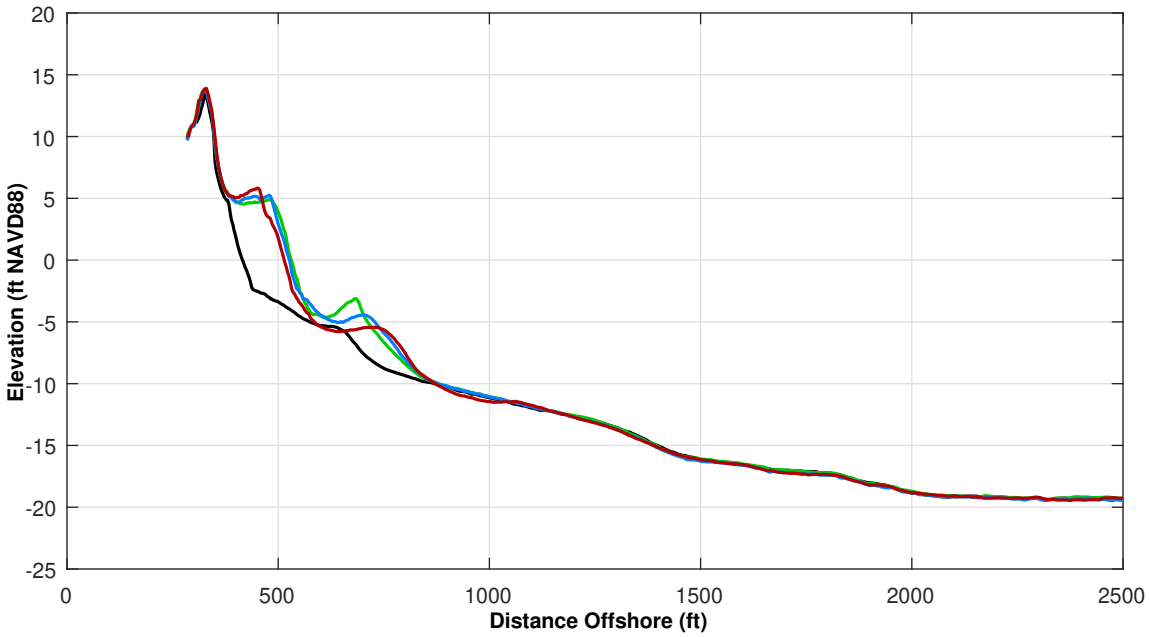
Notes:

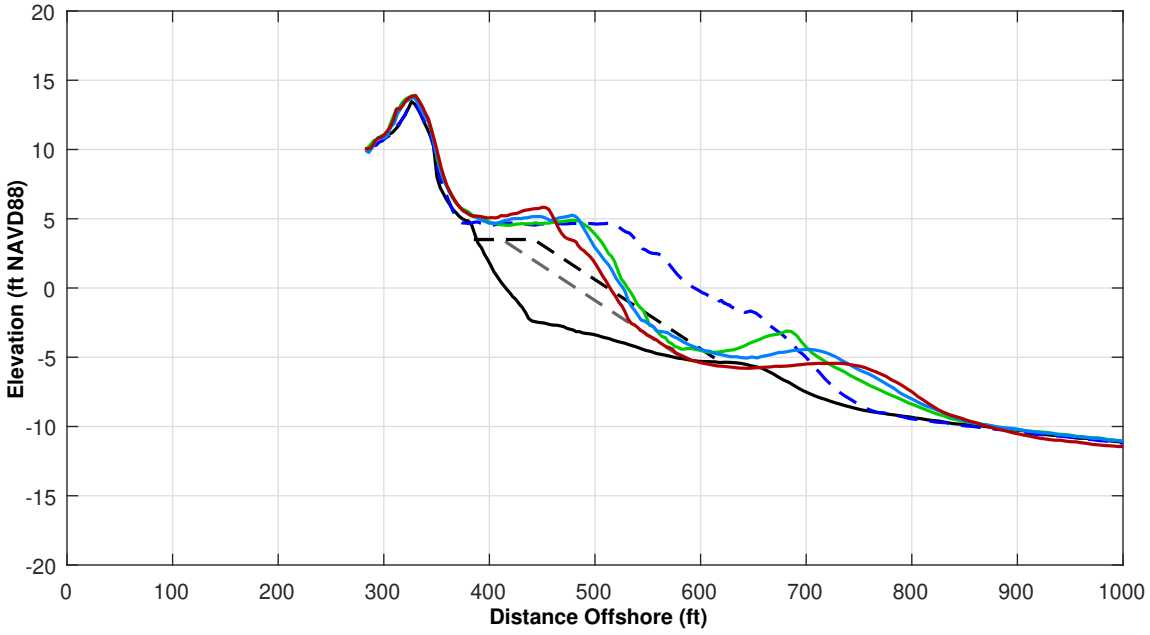
1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



THE CITY OF NORFOLK
PUBLIC WORKS

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





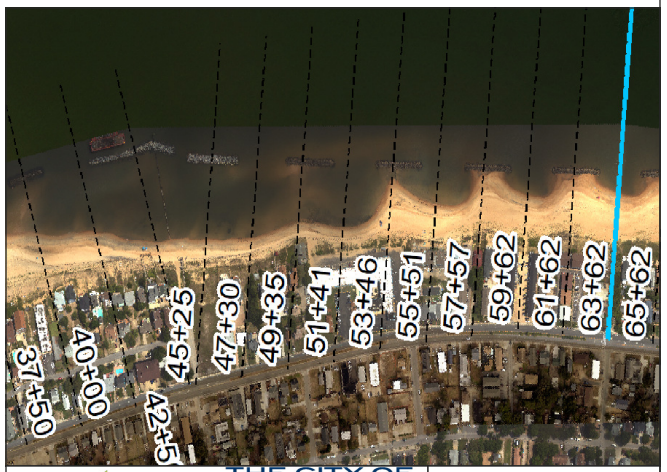
Survey Transect 63+62	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-16.76 ft	-11.69 ft
Volume Change Above -15 ft NAVD88	-11.59 cy/ft	-9.19 cy/ft
Volume Change Above 0 ft NAVD88	-1.91 cy/ft	-1.20 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 32.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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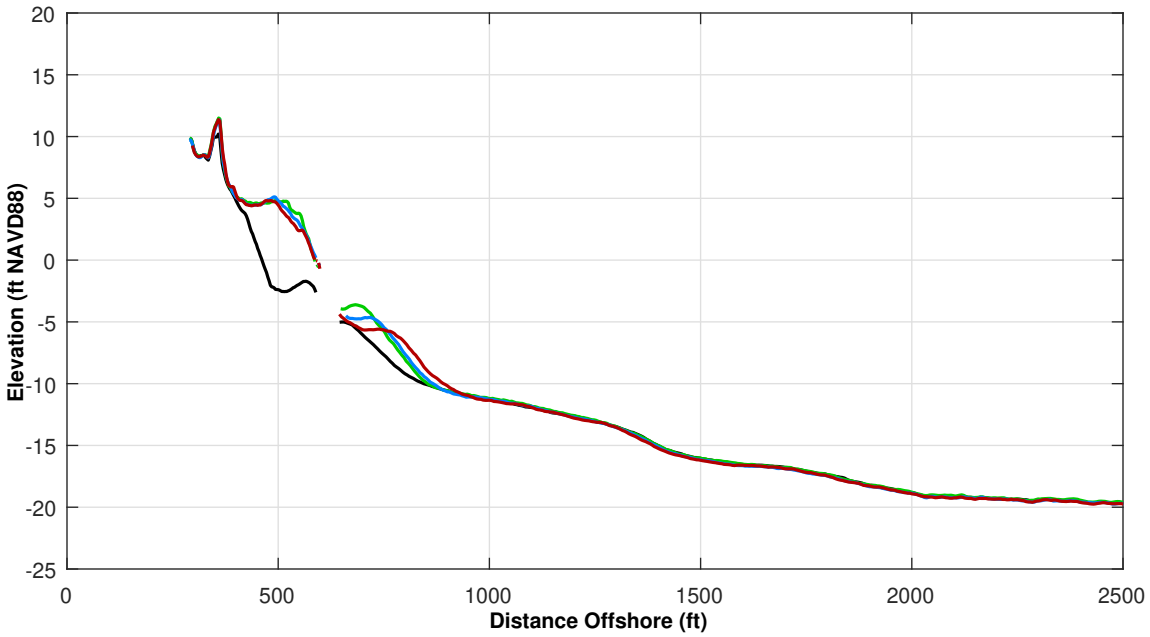
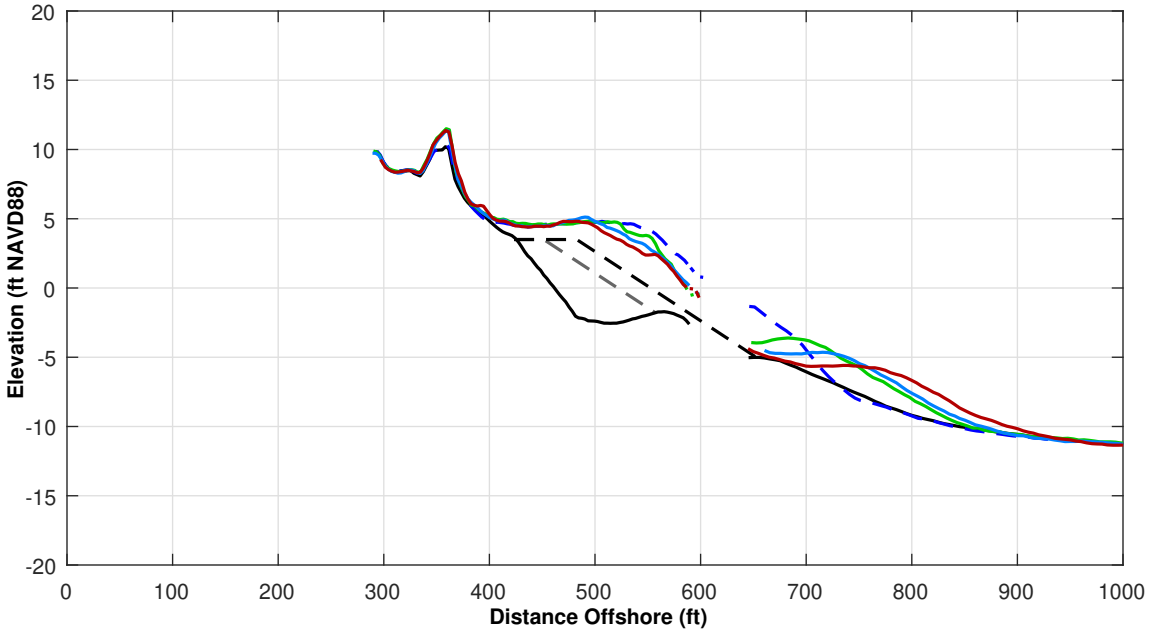
PUBLIC WORKS

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





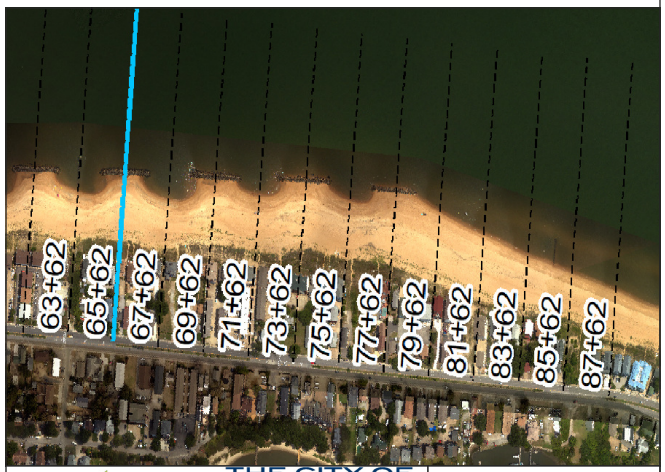
Survey Transect 65+62	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-0.74 ft	-2.26 ft
Volume Change Above -15 ft NAVD88	-3.27 cy/ft	-0.26 cy/ft
Volume Change Above 0 ft NAVD88	-2.48 cy/ft	-1.14 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 38.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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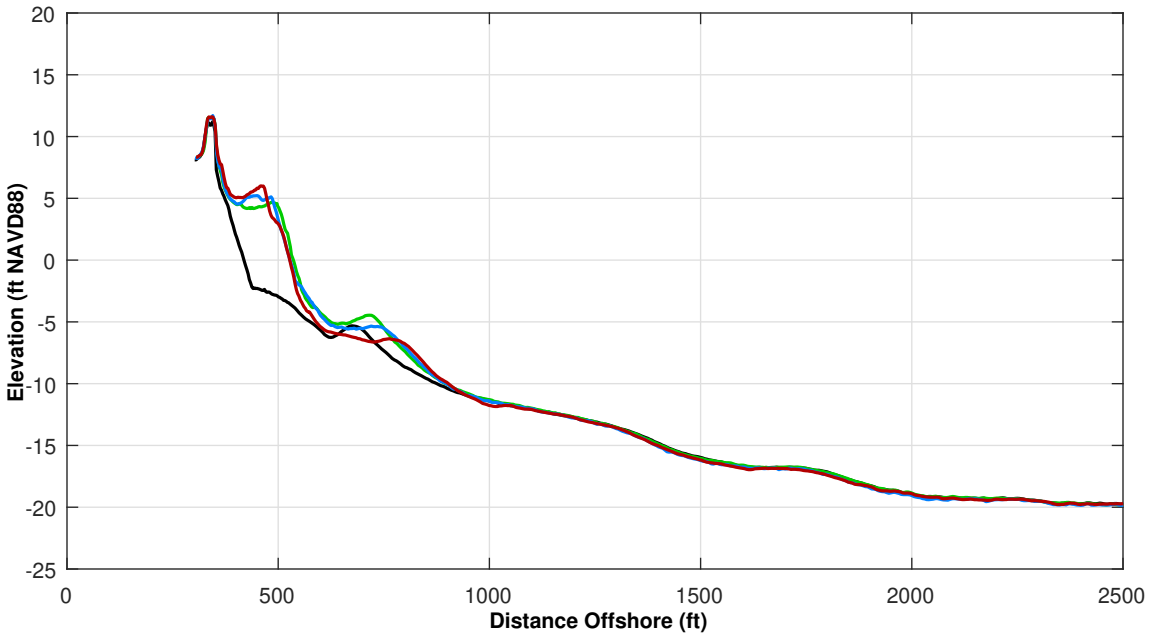
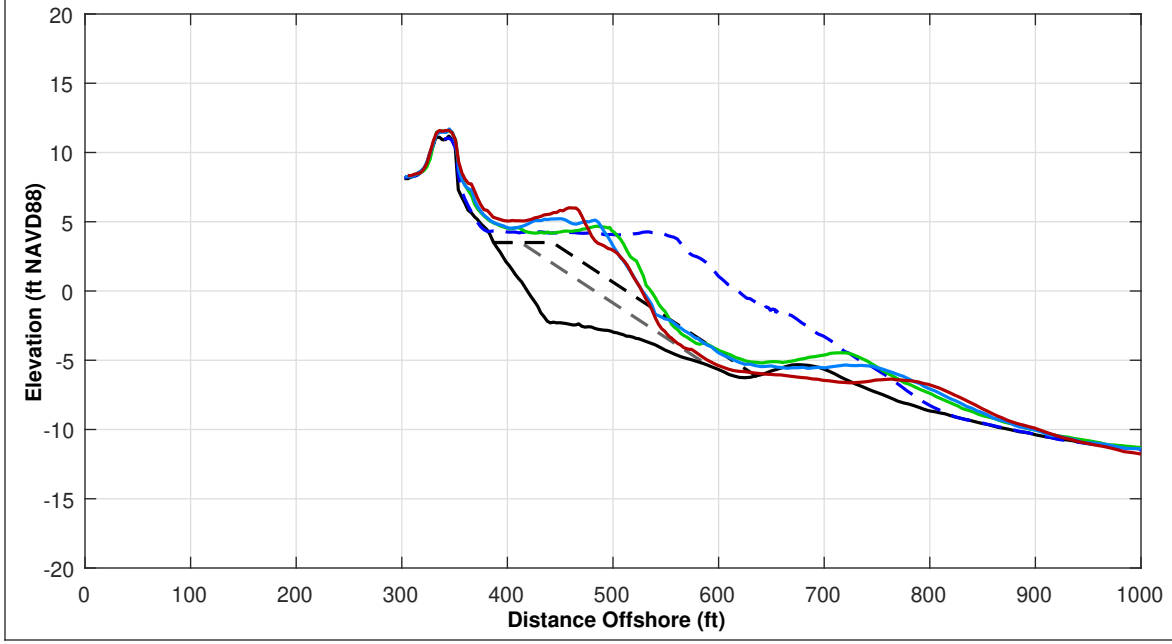
PUBLIC WORKS

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





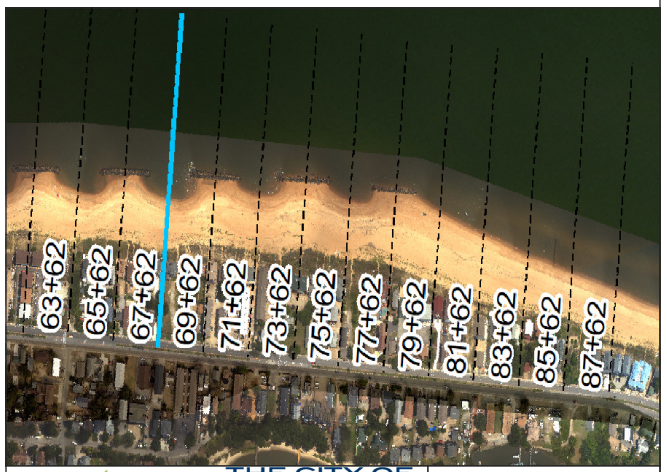
Survey Transect 67+62	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-9.49 ft	-0.43 ft
Volume Change Above -15 ft NAVD88	-9.26 cy/ft	-5.99 cy/ft
Volume Change Above 0 ft NAVD88	1.76 cy/ft	1.29 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 40.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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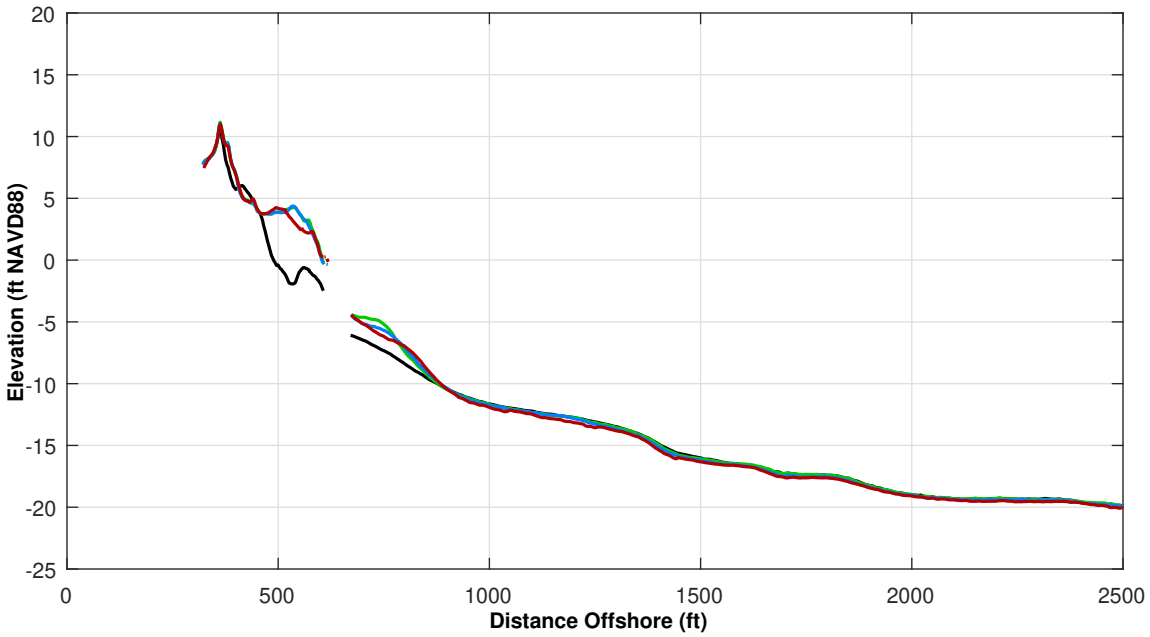
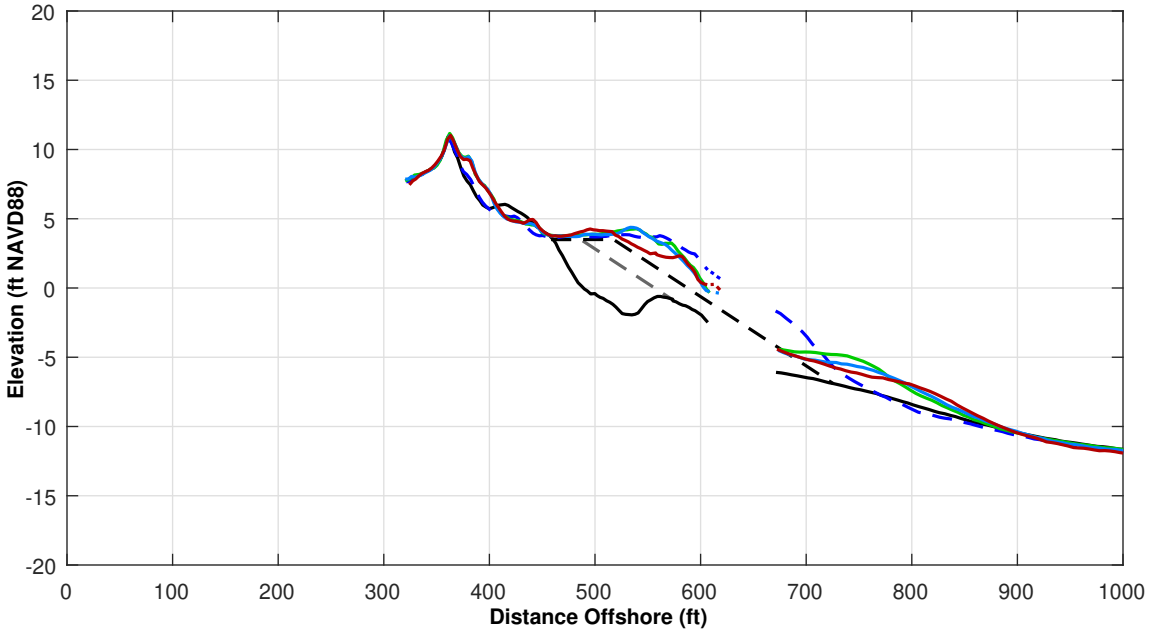
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





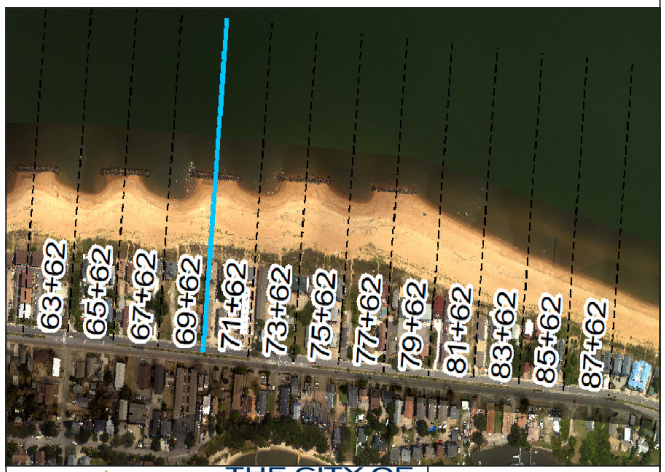
Survey Transect 69+62	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-2.21 ft	0.41 ft
Volume Change Above -15 ft NAVD88	-7.57 cy/ft	-4.76 cy/ft
Volume Change Above 0 ft NAVD88	-1.91 cy/ft	-1.17 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	+ 8.0 ft	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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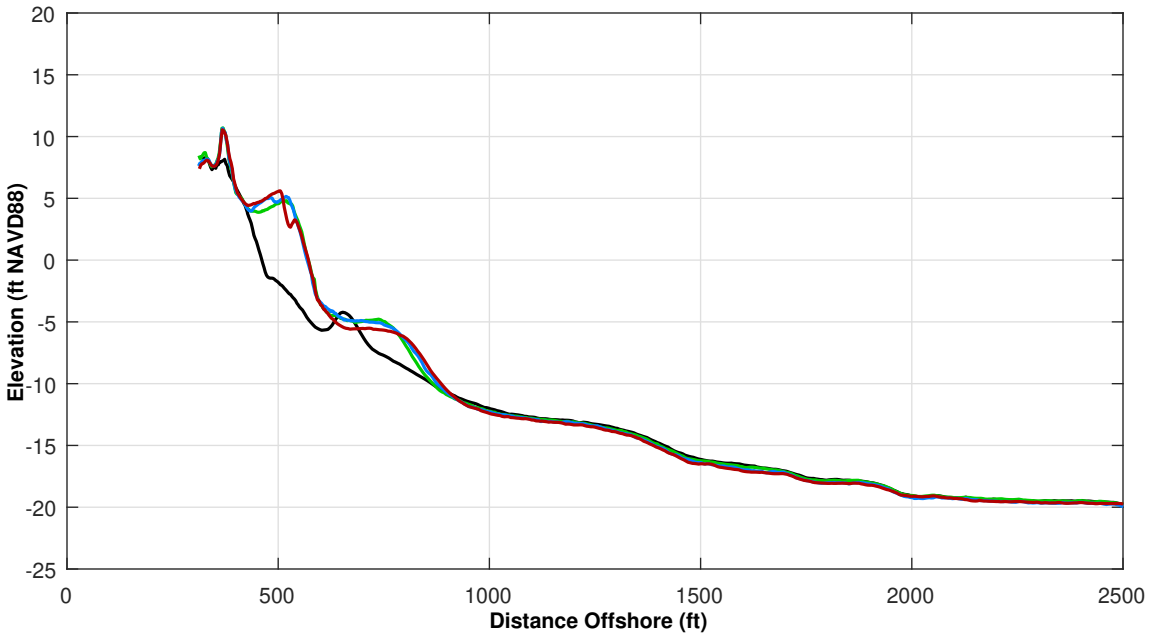
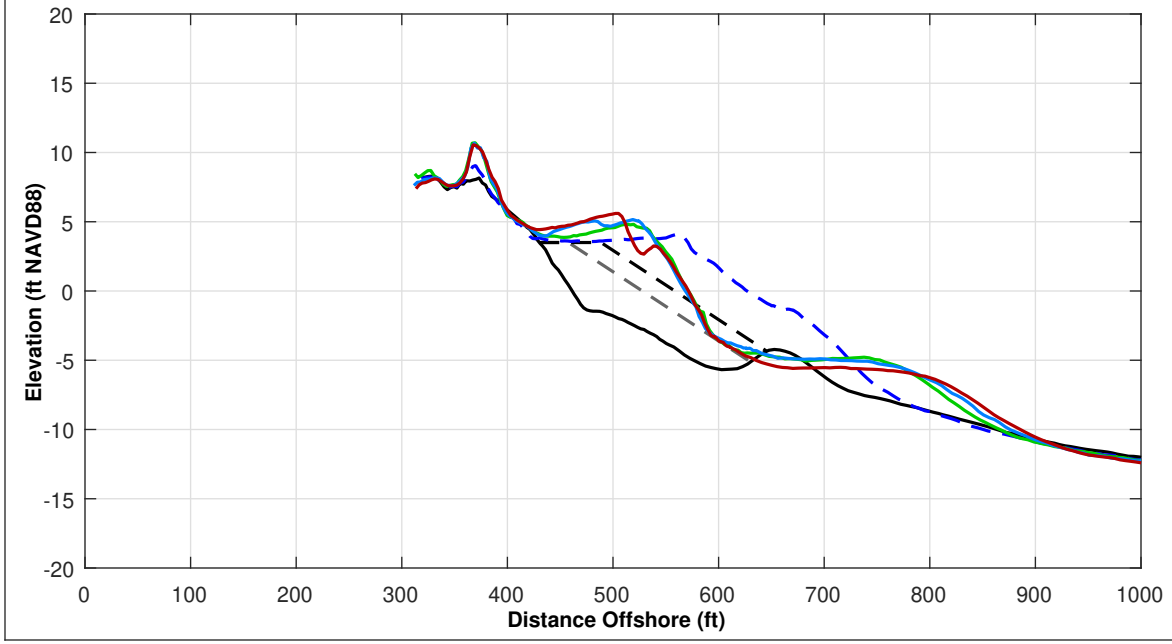




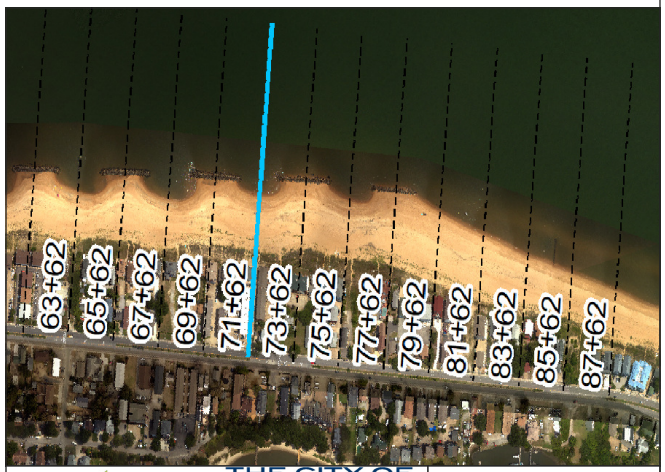
Survey Transect 71+62	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-0.32 ft	2.45 ft
Volume Change Above -15 ft NAVD88	-2.19 cy/ft	-3.29 cy/ft
Volume Change Above 0 ft NAVD88	0.71 cy/ft	-0.11 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 29.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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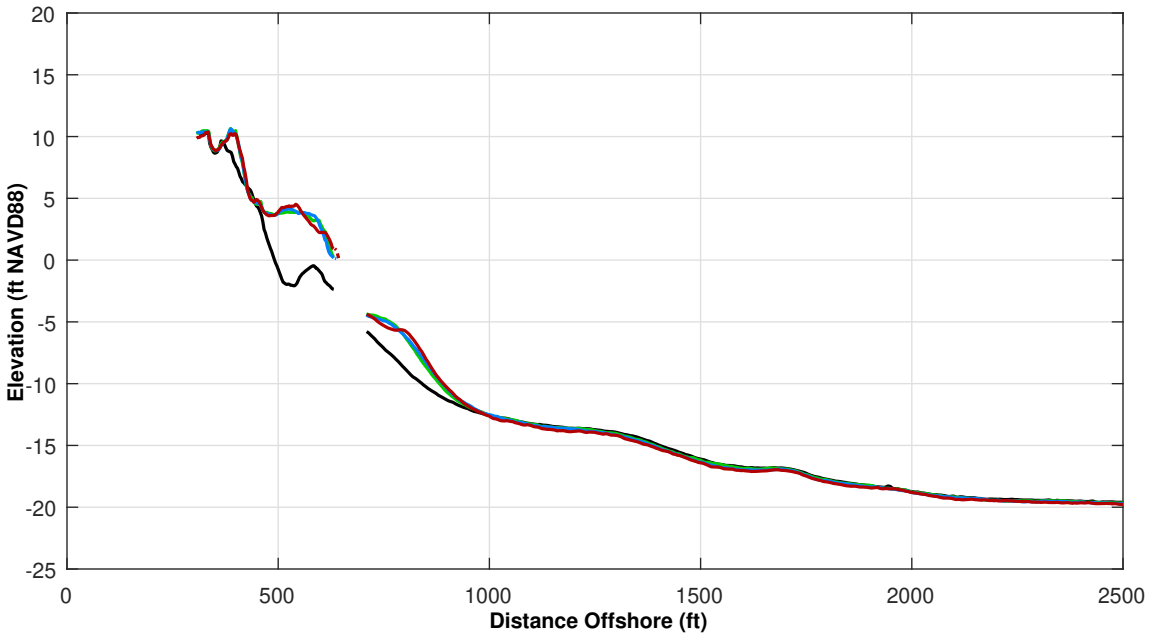
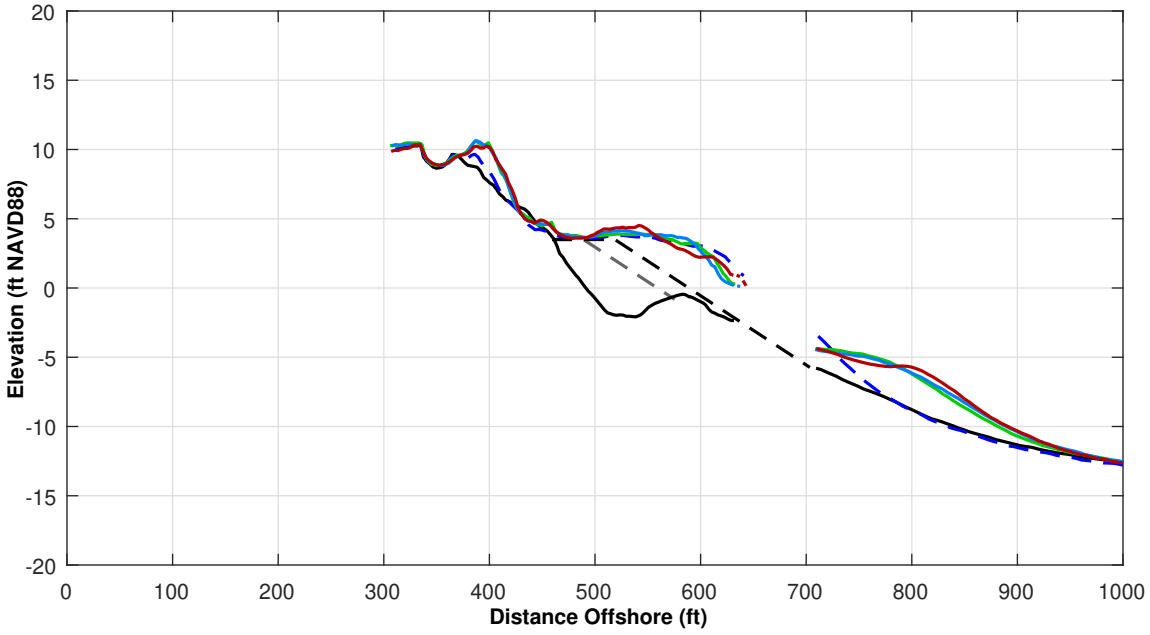
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





Survey Transect 73+62	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	6.42 ft	11.63 ft
Volume Change Above -15 ft NAVD88	-1.11 cy/ft	-0.97 cy/ft
Volume Change Above 0 ft NAVD88	0.05 cy/ft	0.27 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 43.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
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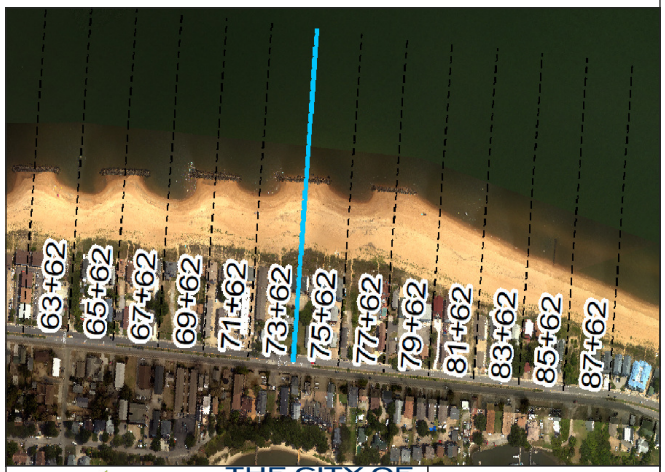
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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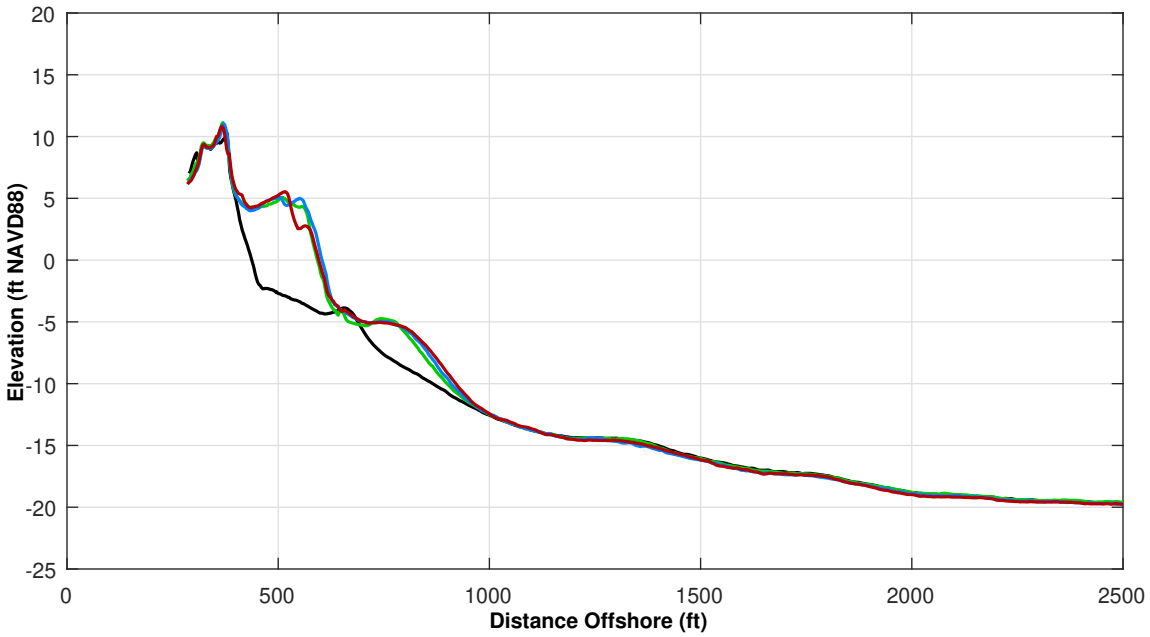
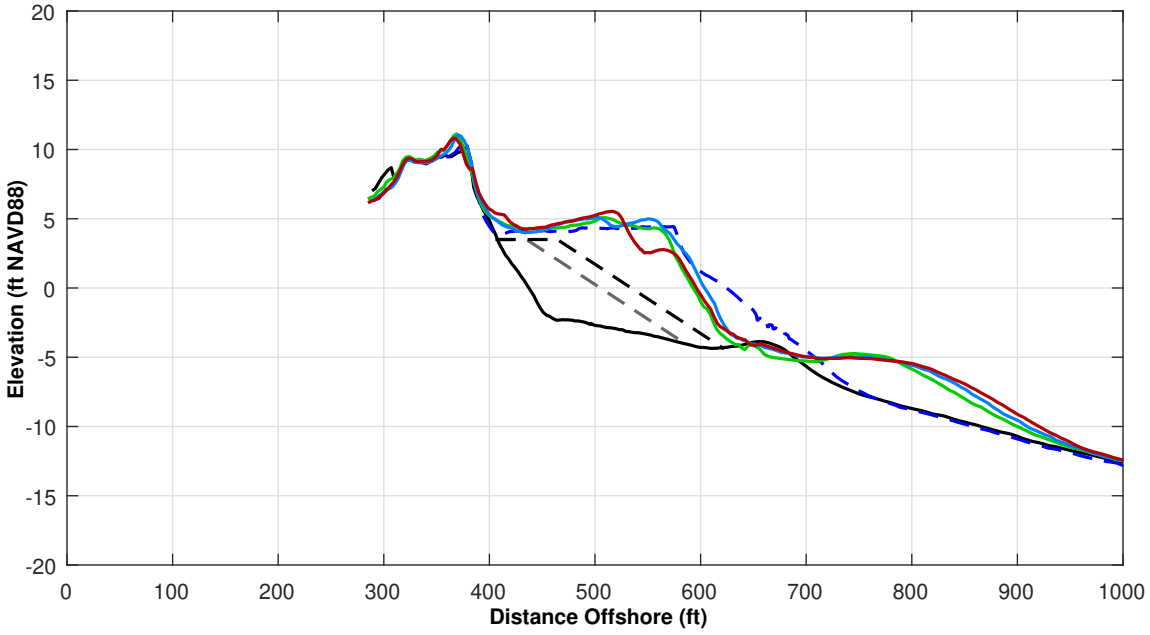
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





Survey Transect 75+62	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	2.81 ft	-8.78 ft
Volume Change Above -15 ft NAVD88	4.48 cy/ft	-0.52 cy/ft
Volume Change Above 0 ft NAVD88	-0.88 cy/ft	-2.16 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 70.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

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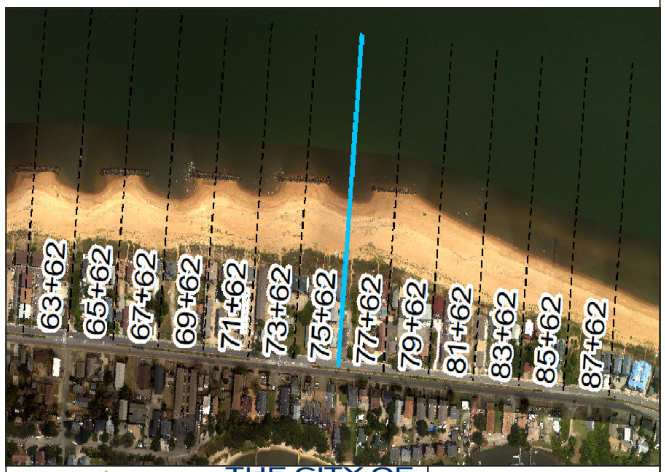
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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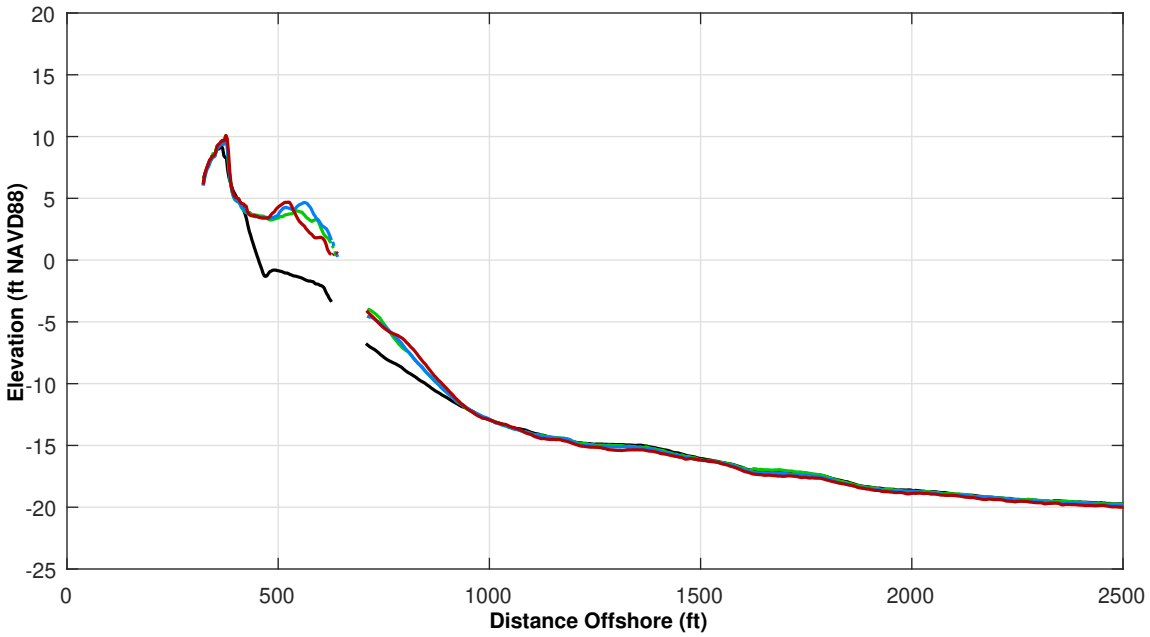
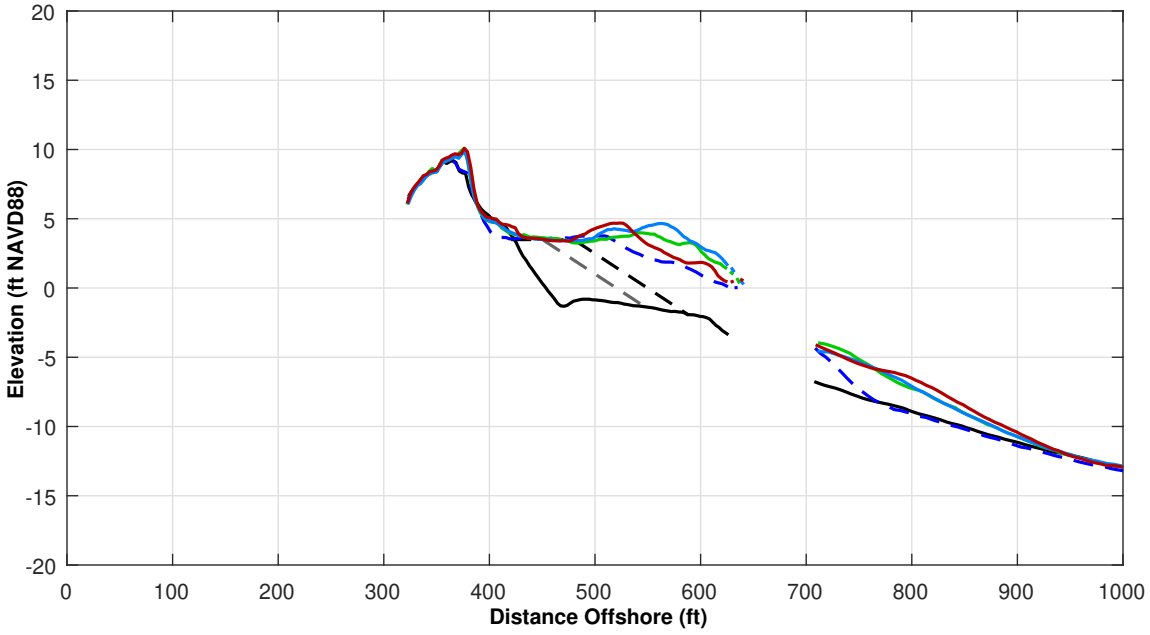
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





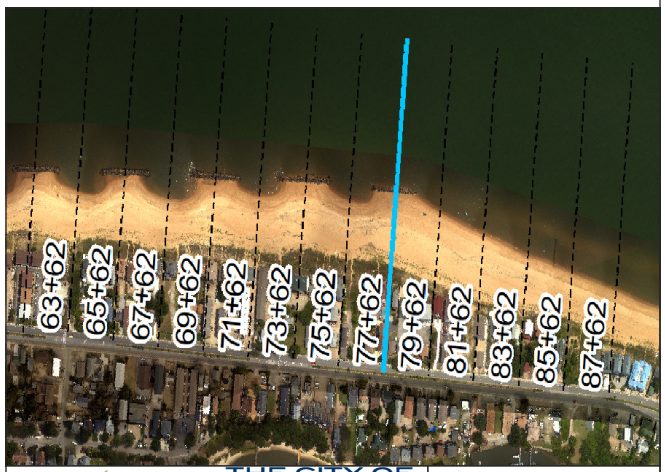
Survey Transect 77+62	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-15.27 ft	-17.78 ft
Volume Change Above -15 ft NAVD88	0.31 cy/ft	-1.46 cy/ft
Volume Change Above 0 ft NAVD88	-0.85 cy/ft	-3.23 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 62.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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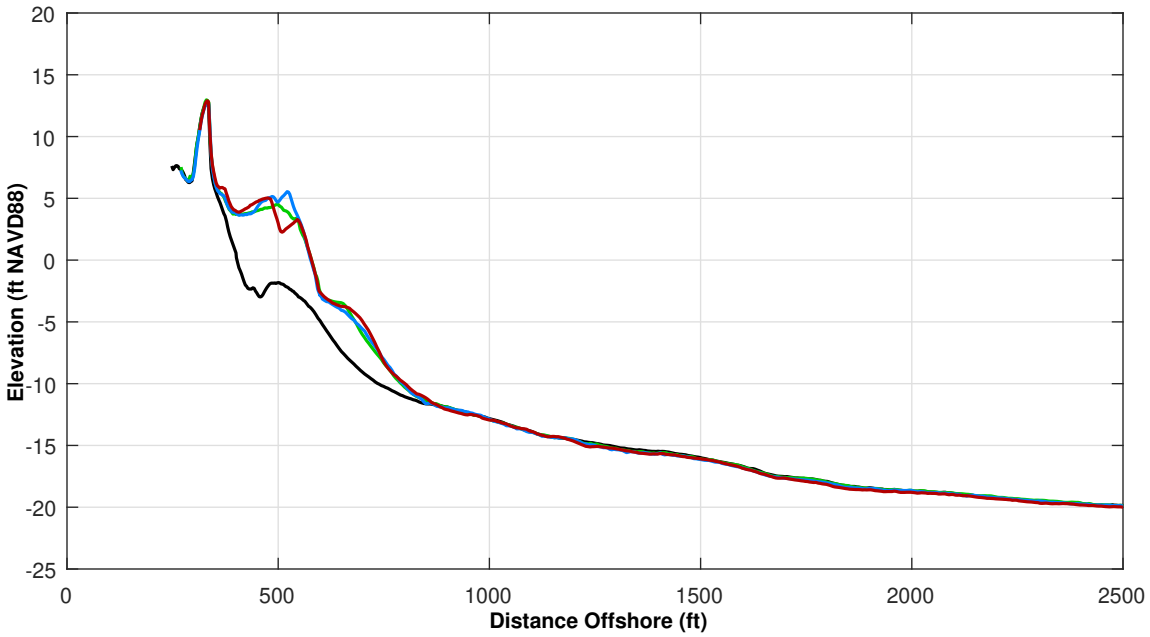
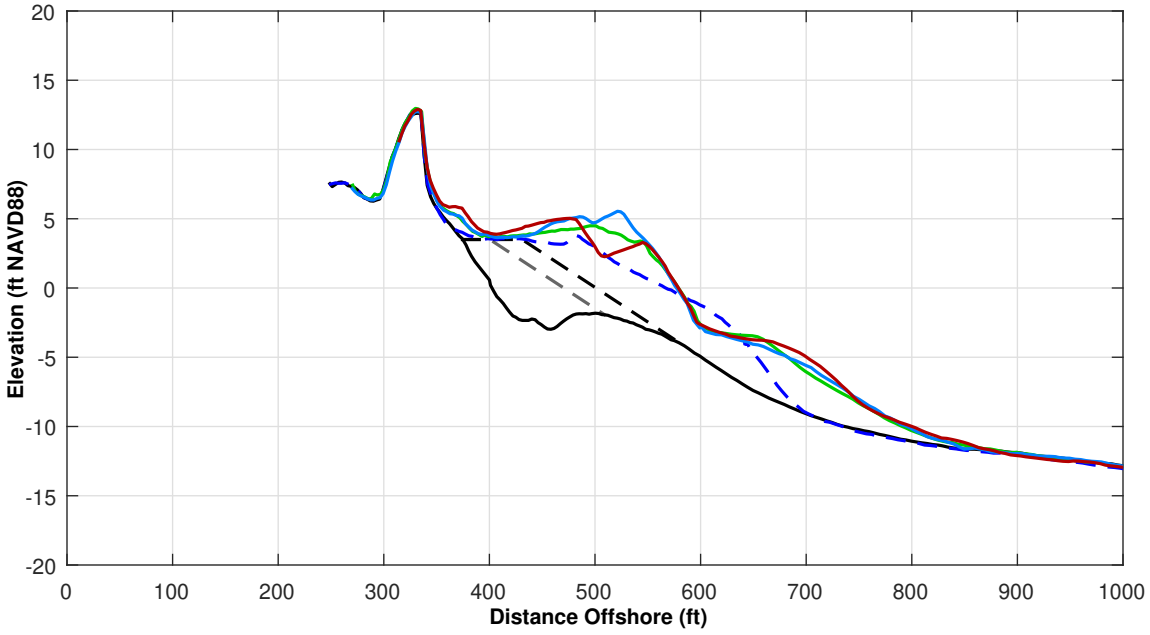
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





Survey Transect 79+62	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	0.73 ft	1.14 ft
Volume Change Above -15 ft NAVD88	2.52 cy/ft	-0.04 cy/ft
Volume Change Above 0 ft NAVD88	0.65 cy/ft	-2.25 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 63.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
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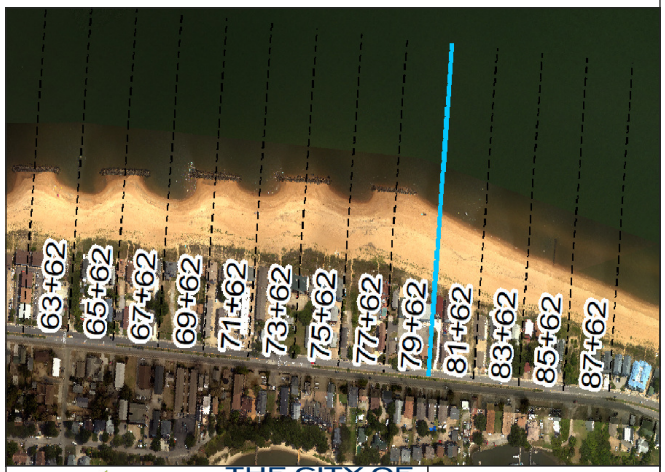
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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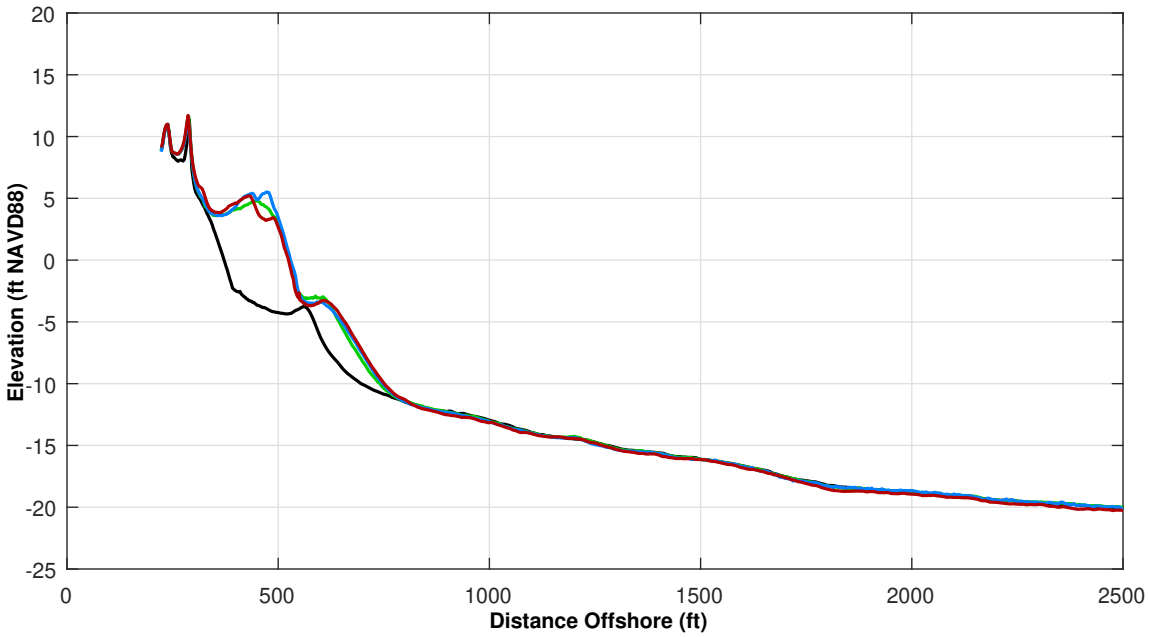
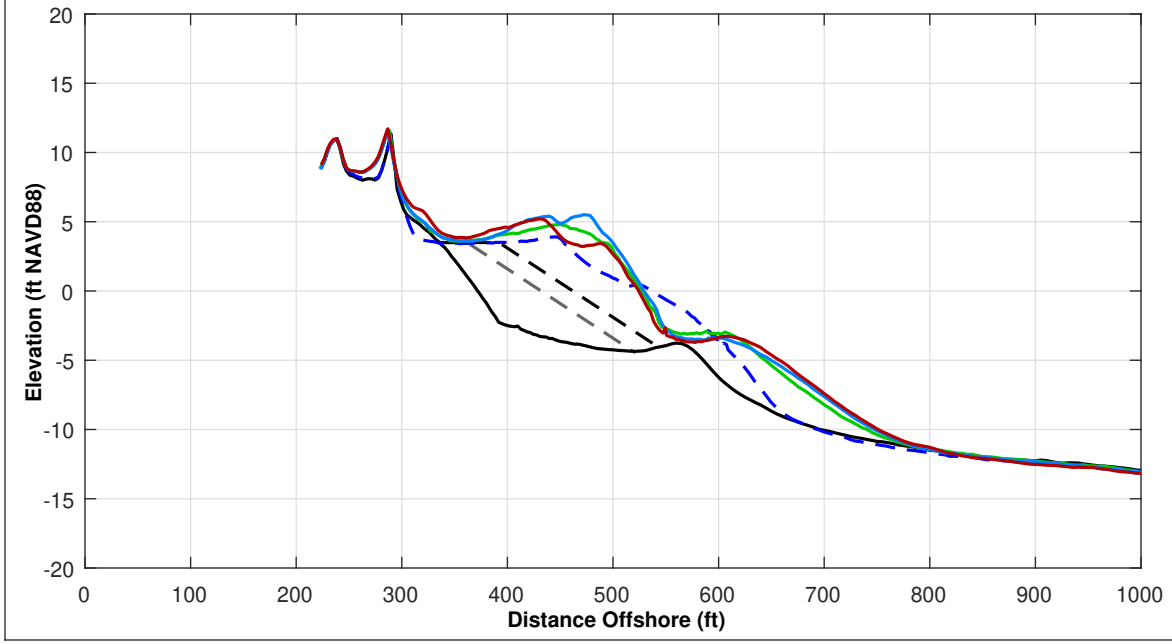
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





Survey Transect 81+62	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-3.90 ft	-6.92 ft
Volume Change Above -15 ft NAVD88	1.06 cy/ft	-2.23 cy/ft
Volume Change Above 0 ft NAVD88	0.88 cy/ft	-2.19 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 66.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
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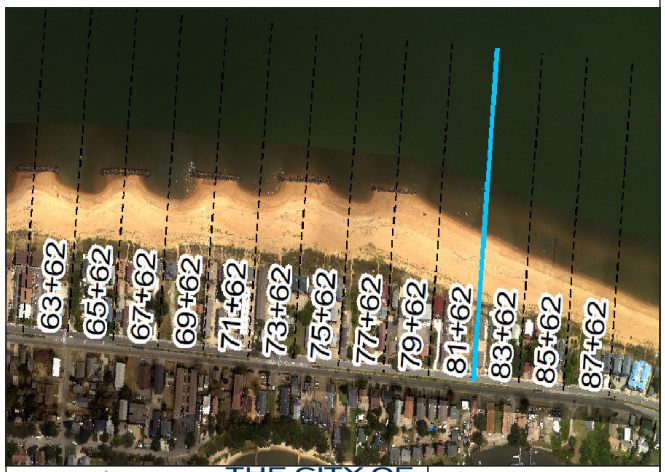
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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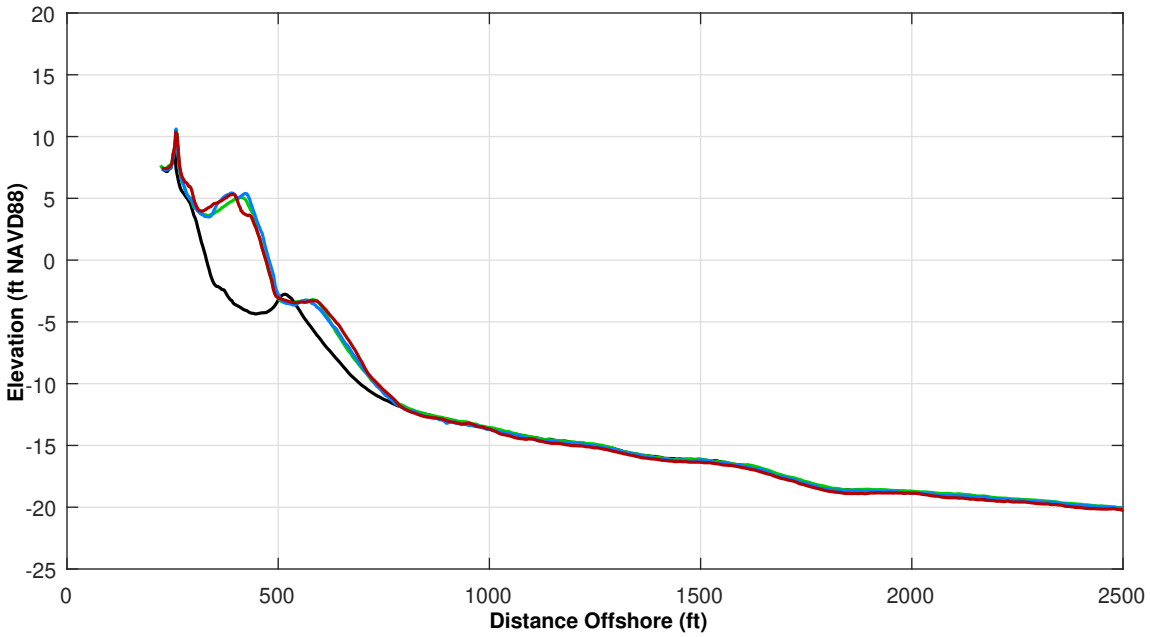
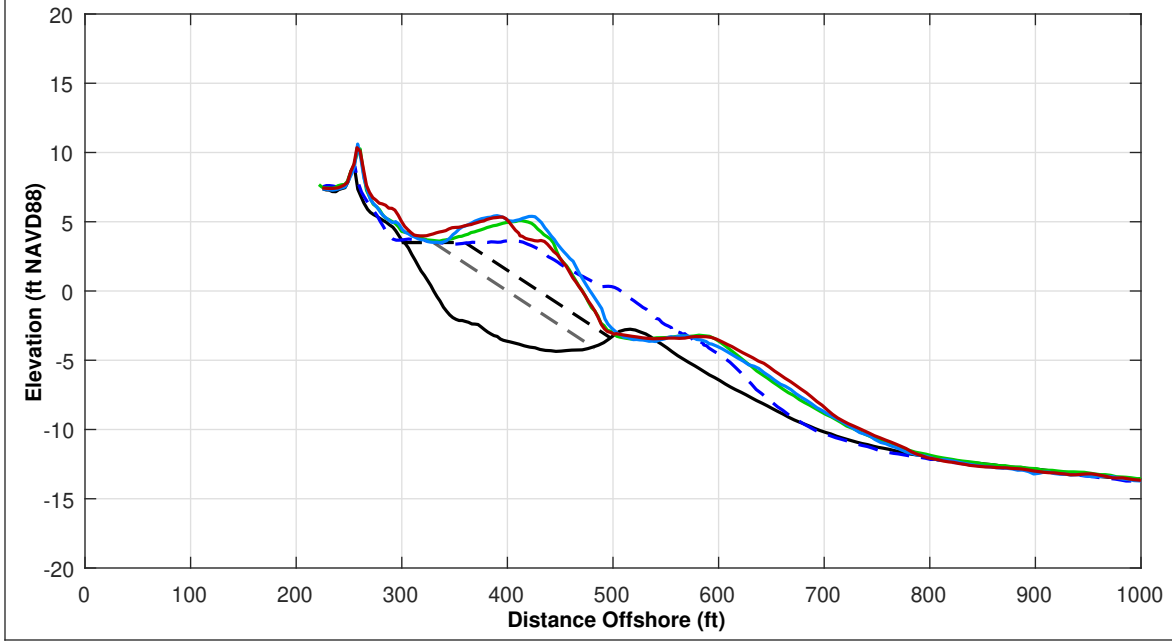




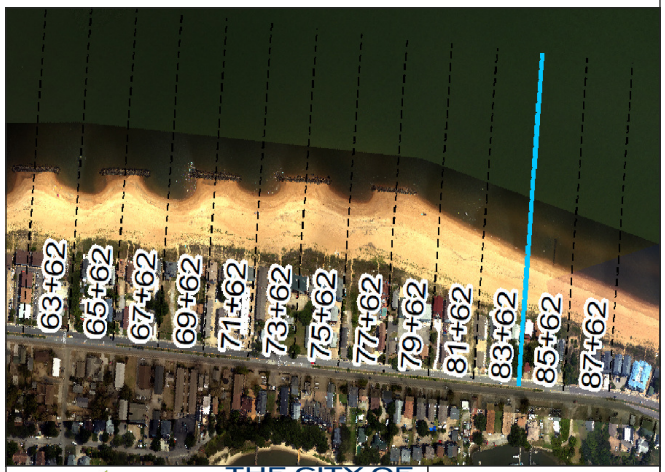
Survey Transect 83+62	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-1.16 ft	-8.63 ft
Volume Change Above -15 ft NAVD88	0.91 cy/ft	0.36 cy/ft
Volume Change Above 0 ft NAVD88	1.38 cy/ft	-1.09 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 75.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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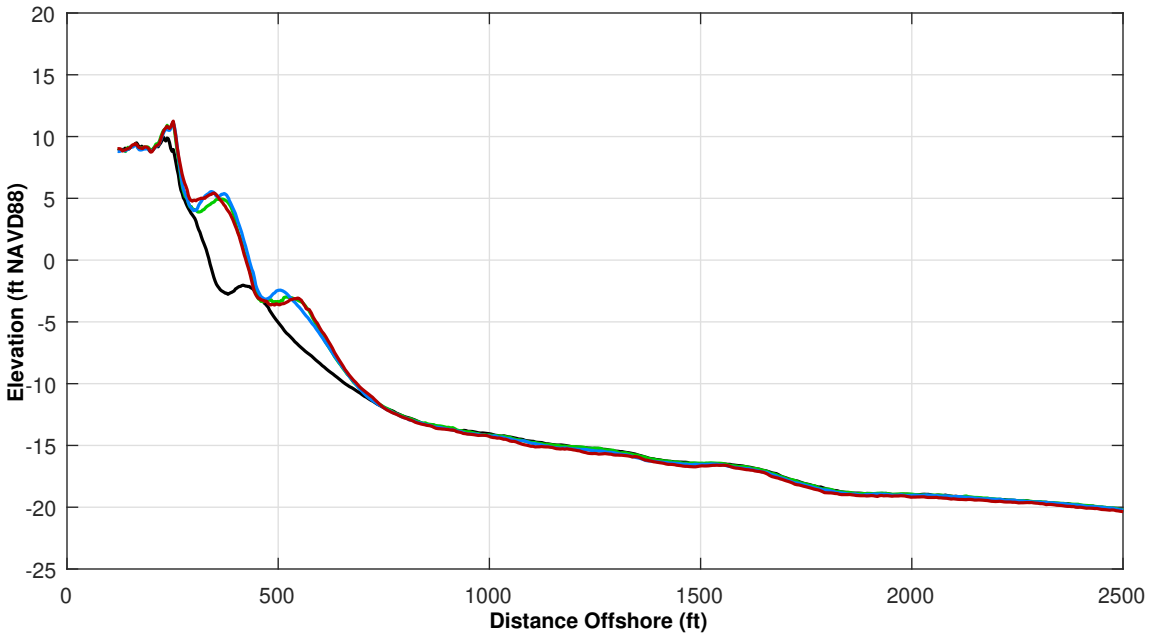
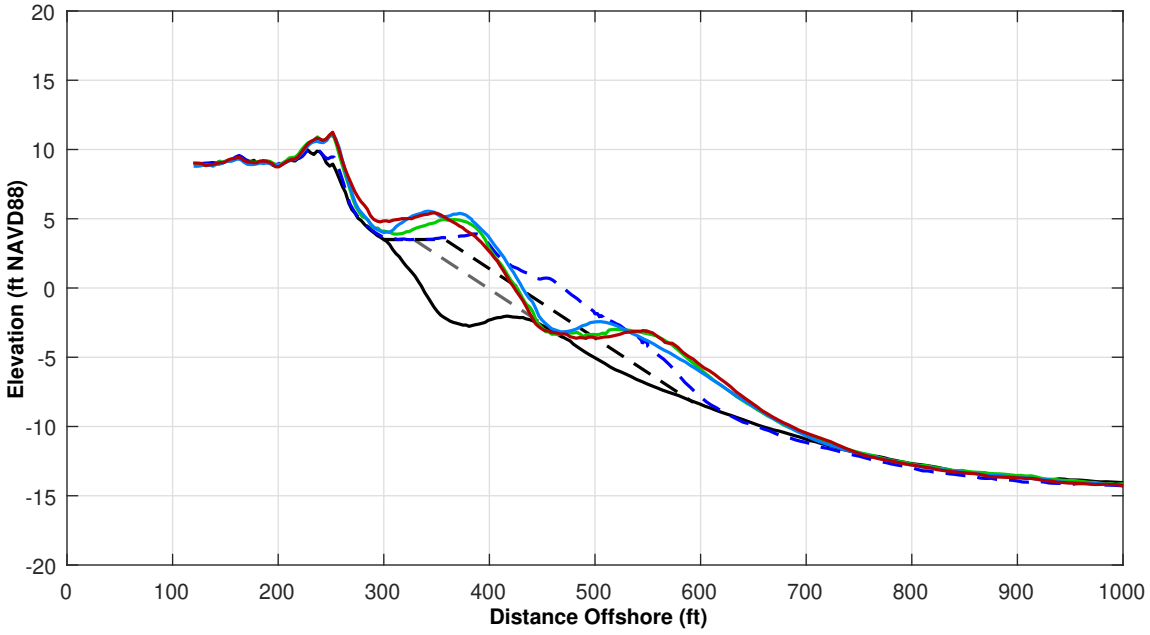
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





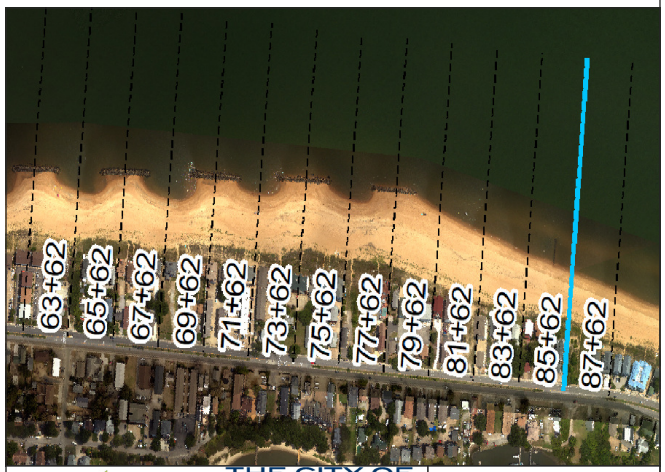
Survey Transect 85+62	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-1.58 ft	-8.54 ft
Volume Change Above -15 ft NAVD88	0.01 cy/ft	-1.77 cy/ft
Volume Change Above 0 ft NAVD88	1.87 cy/ft	-0.73 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 29.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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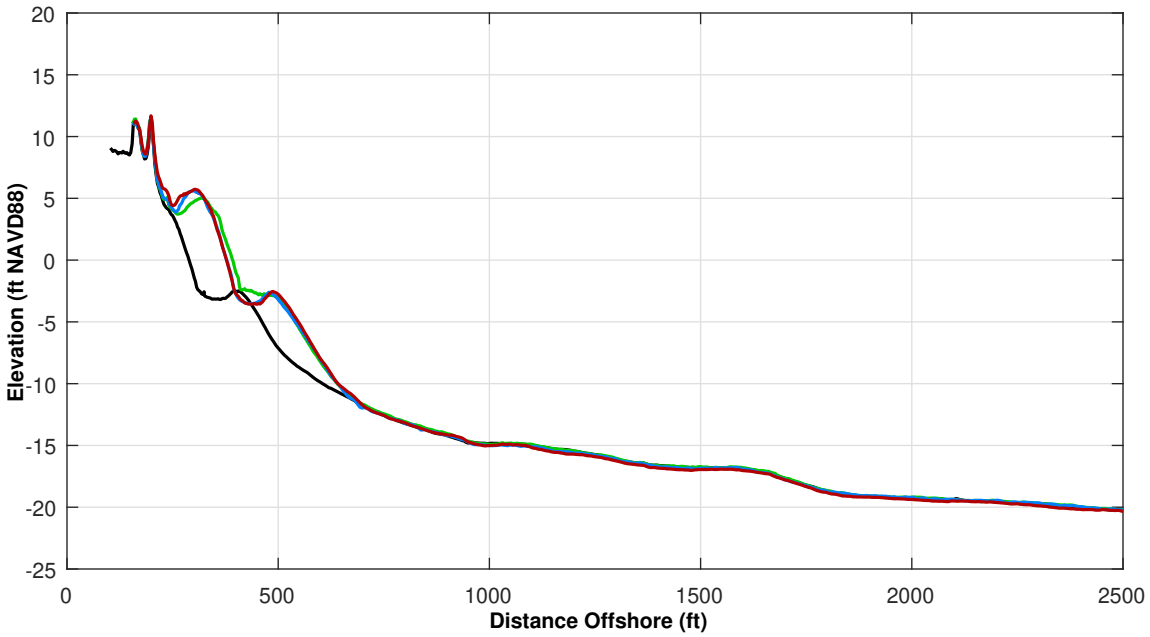
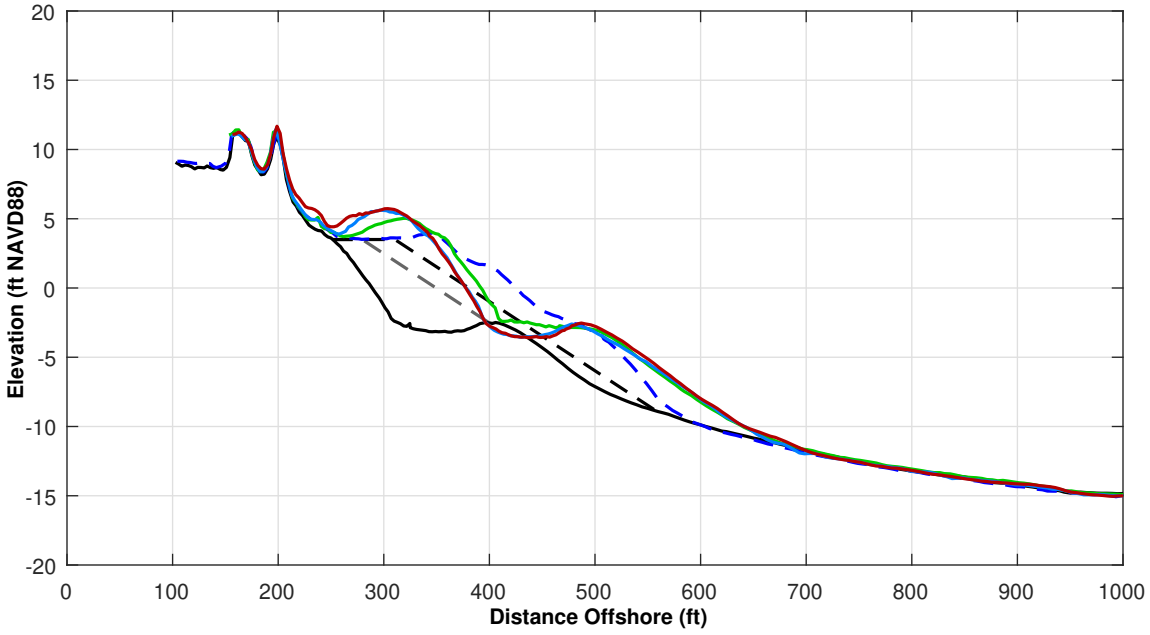
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





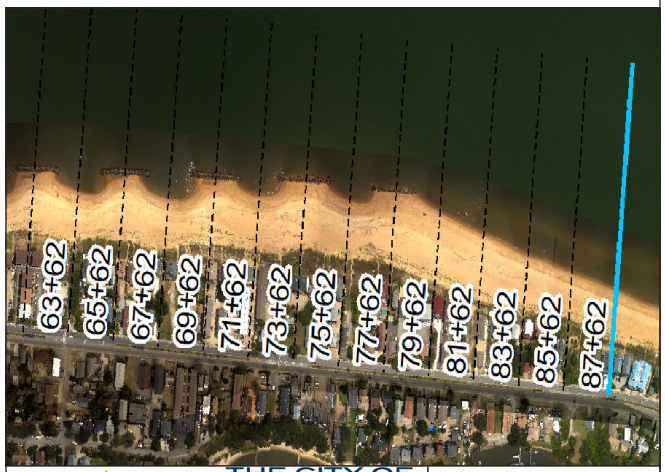
Survey Transect 87+62	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-13.50 ft	-0.32 ft
Volume Change Above -15 ft NAVD88	-1.51 cy/ft	4.06 cy/ft
Volume Change Above 0 ft NAVD88	1.66 cy/ft	2.12 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 36.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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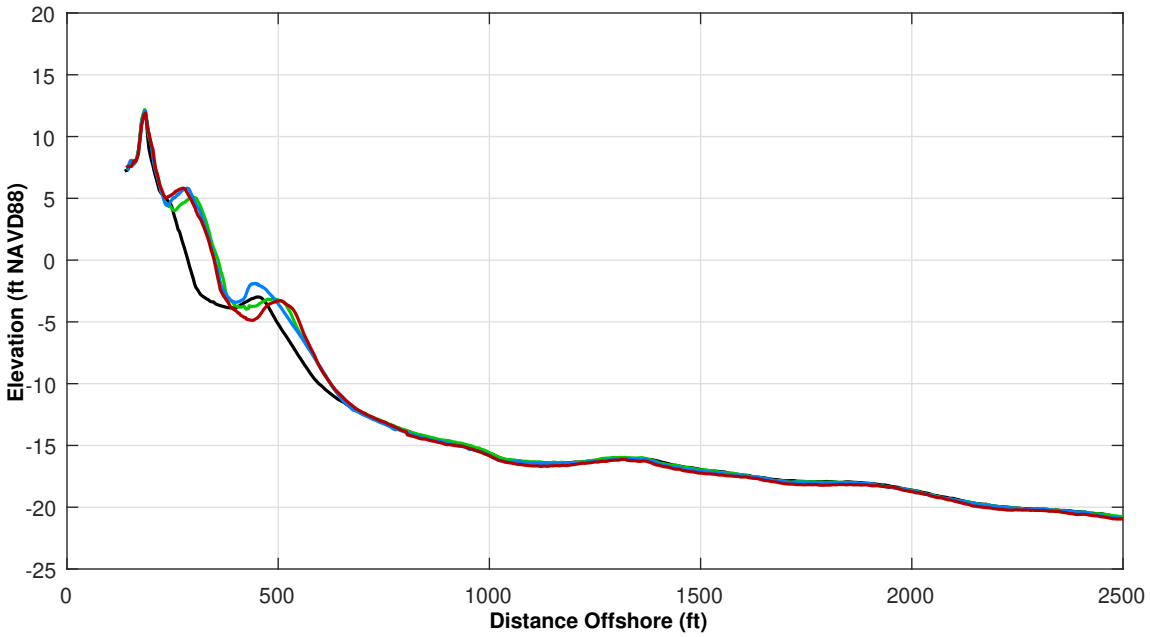
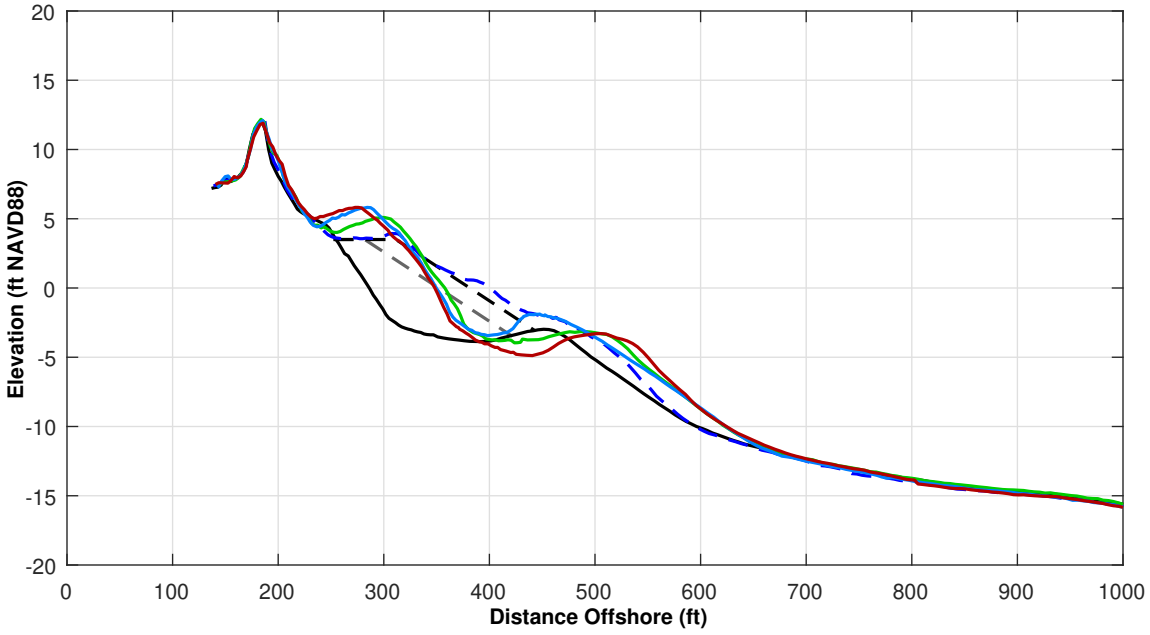
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





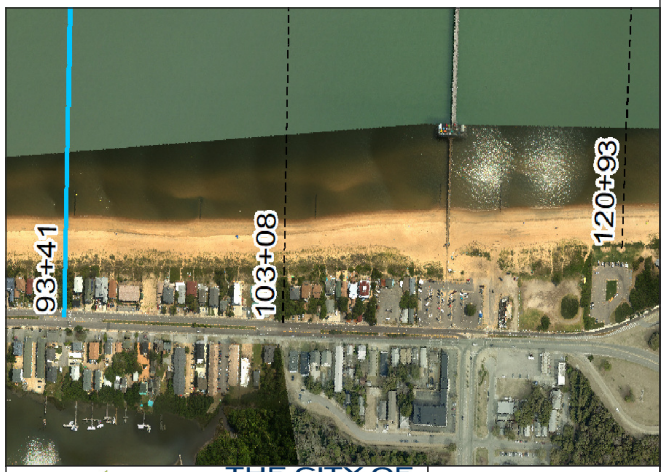
Survey Transect 93+41	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-7.16 ft	-1.76 ft
Volume Change Above -15 ft NAVD88	-3.64 cy/ft	-3.91 cy/ft
Volume Change Above 0 ft NAVD88	0.35 cy/ft	-0.15 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 0.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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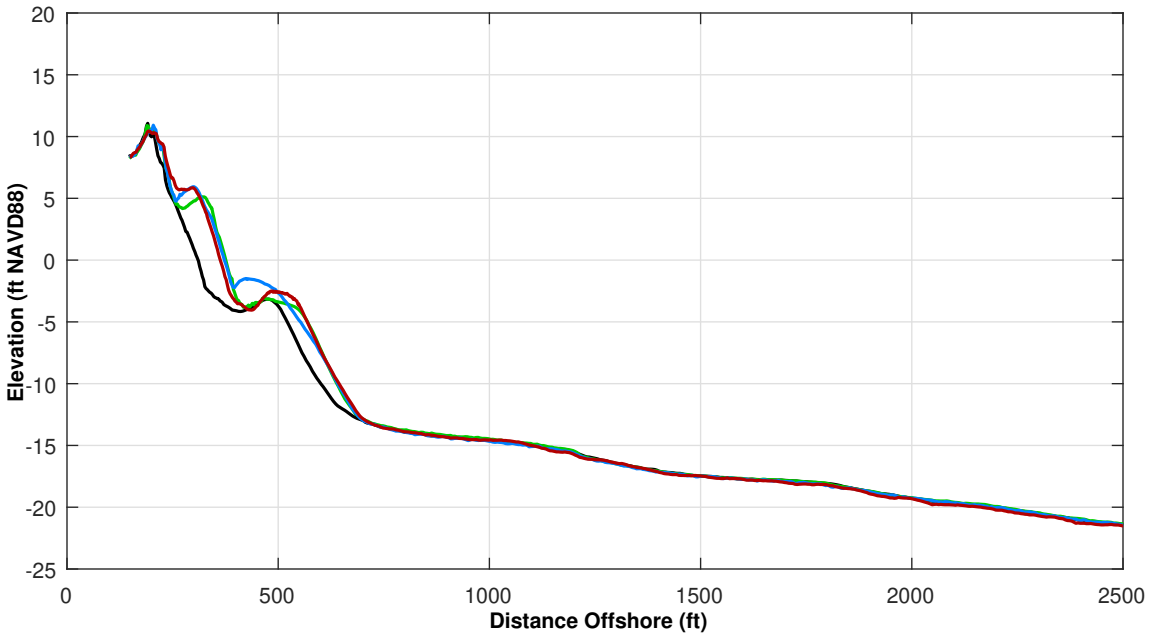
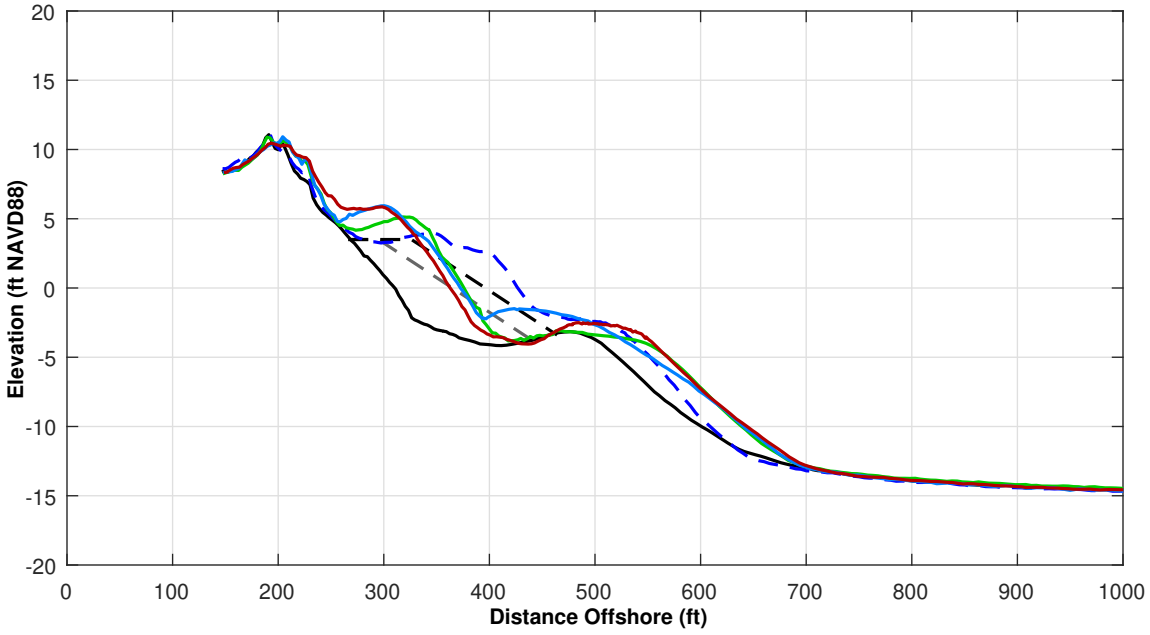
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





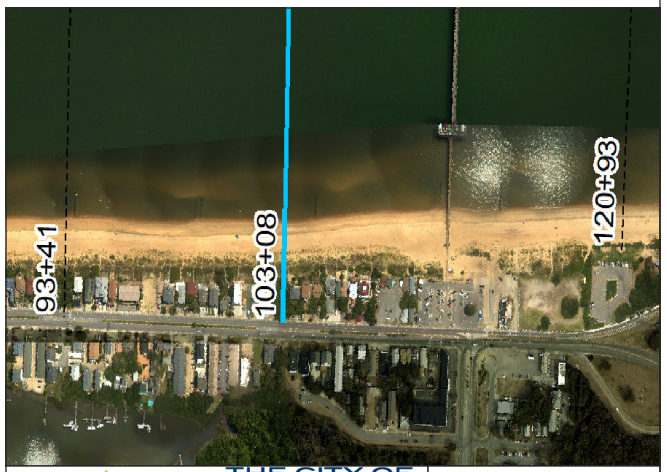
Survey Transect 103+08	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-13.01 ft	-8.70 ft
Volume Change Above -15 ft NAVD88	0.38 cy/ft	-2.67 cy/ft
Volume Change Above 0 ft NAVD88	0.82 cy/ft	-0.20 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 6.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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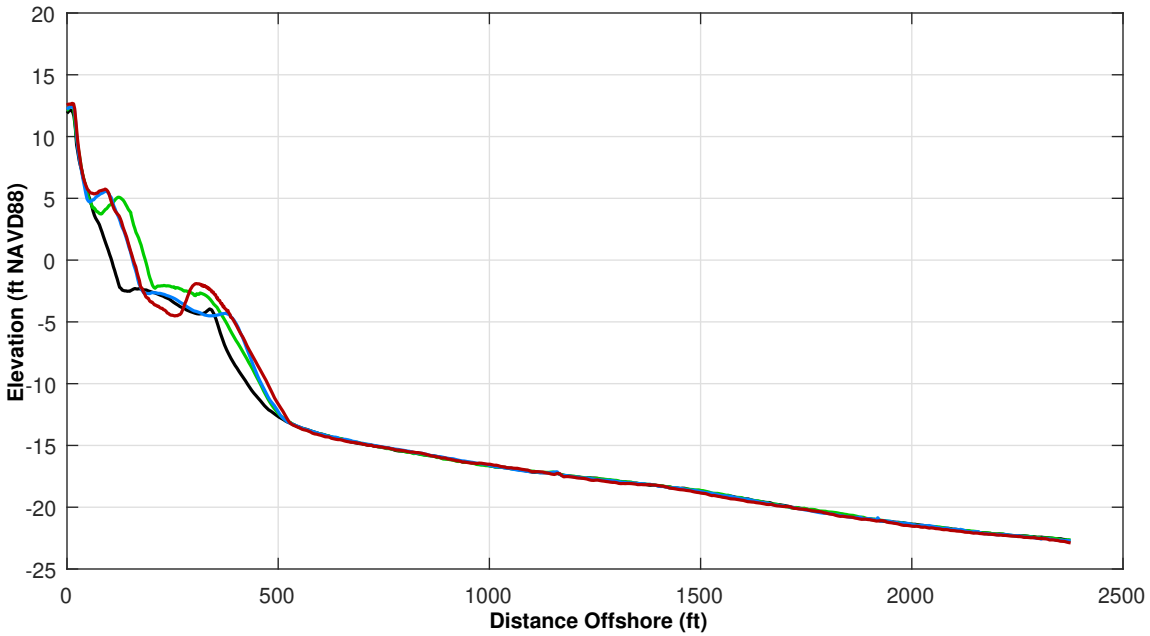
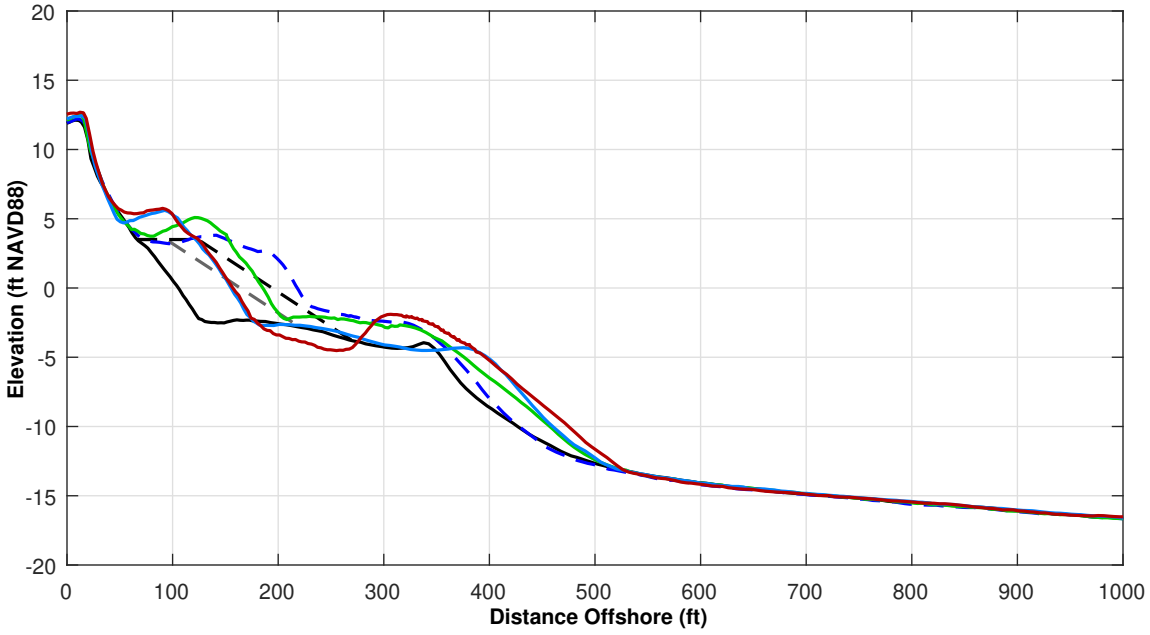
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





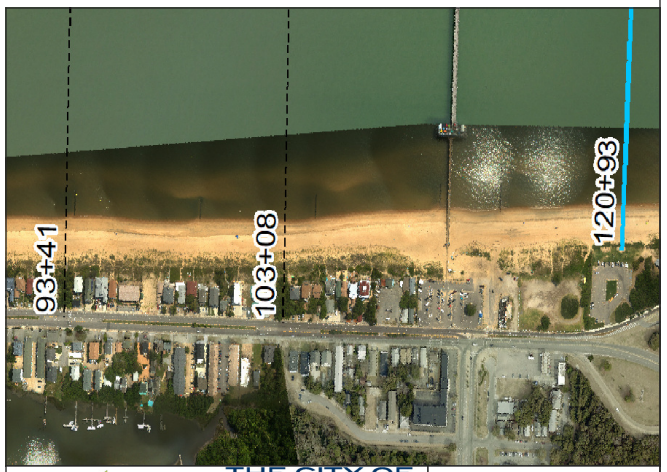
Survey Transect 120+93	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-28.75 ft	1.25 ft
Volume Change Above -15 ft NAVD88	-2.29 cy/ft	7.20 cy/ft
Volume Change Above 0 ft NAVD88	-1.14 cy/ft	2.55 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	-1.0 ft	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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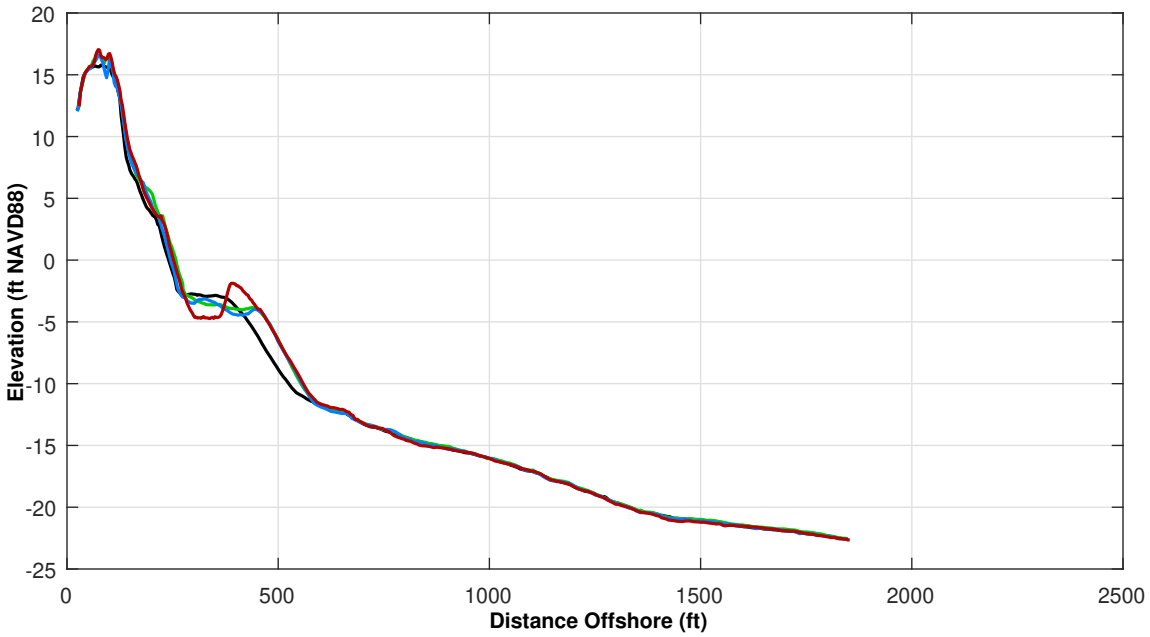
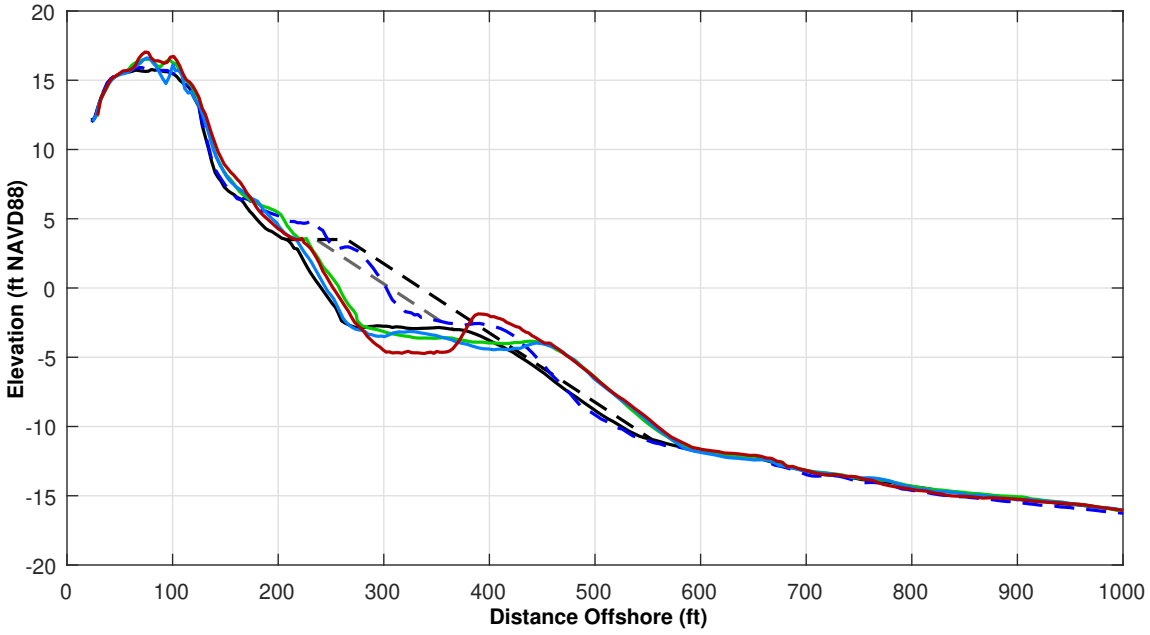
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





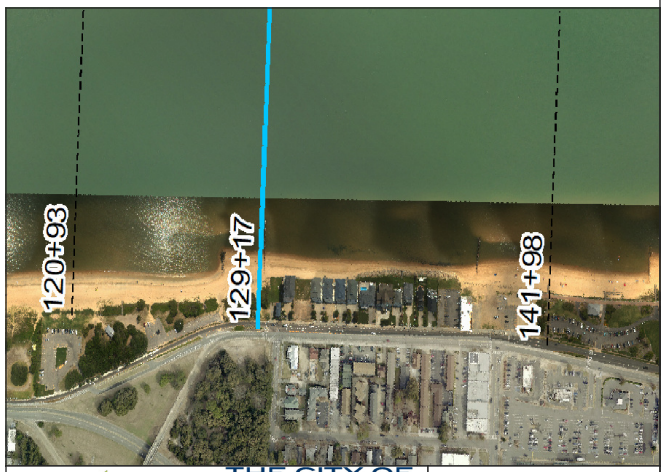
Survey Transect 129+17	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-4.42 ft	6.47 ft
Volume Change Above -15 ft NAVD88	-0.27 cy/ft	5.71 cy/ft
Volume Change Above 0 ft NAVD88	-0.03 cy/ft	3.07 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		-43.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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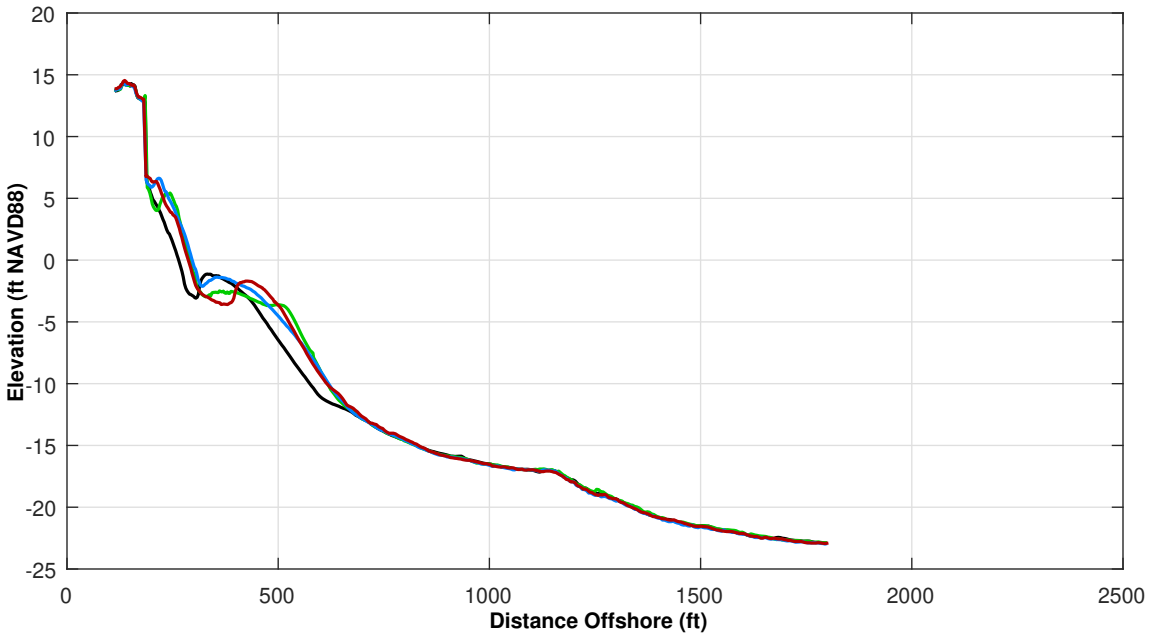
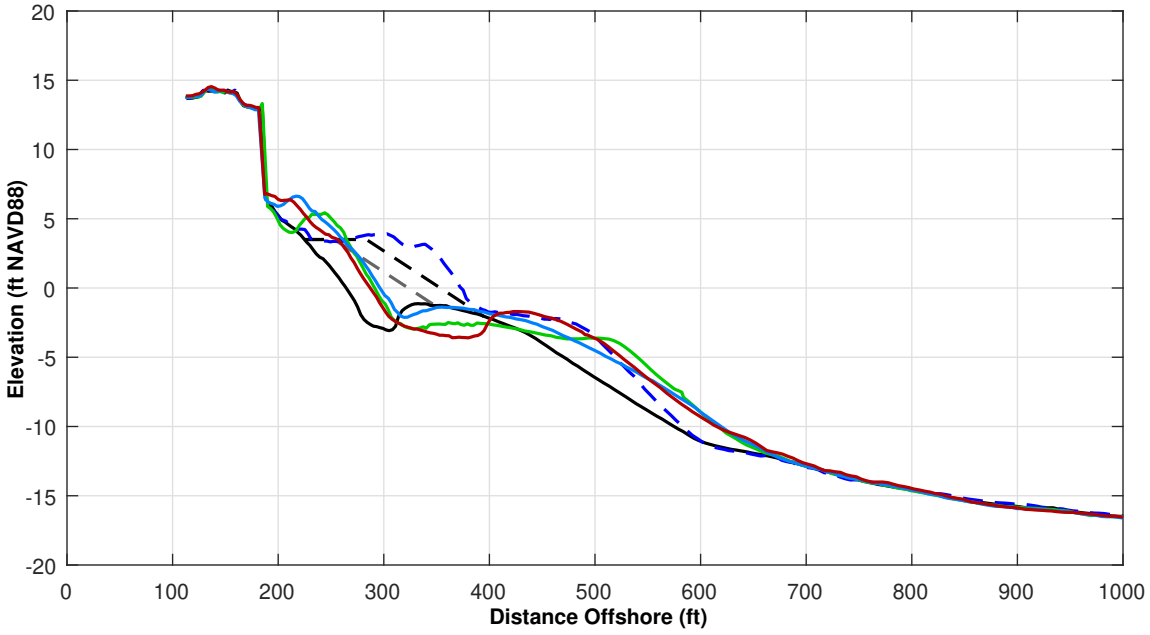
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





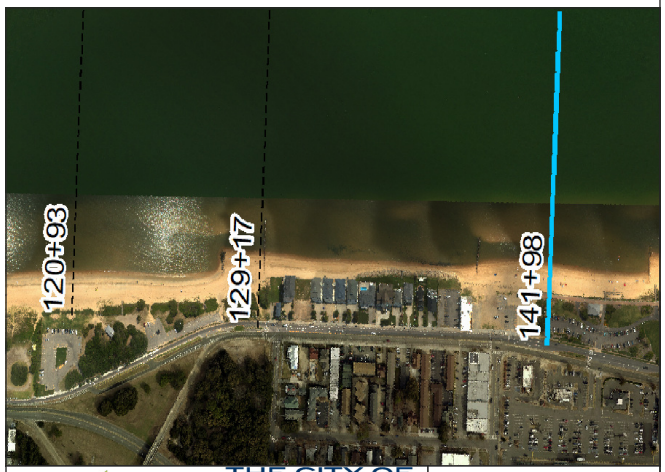
Survey Transect 141+98	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-5.15 ft	-9.85 ft
Volume Change Above -15 ft NAVD88	0.13 cy/ft	-3.81 cy/ft
Volume Change Above 0 ft NAVD88	-0.35 cy/ft	-1.66 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		-30.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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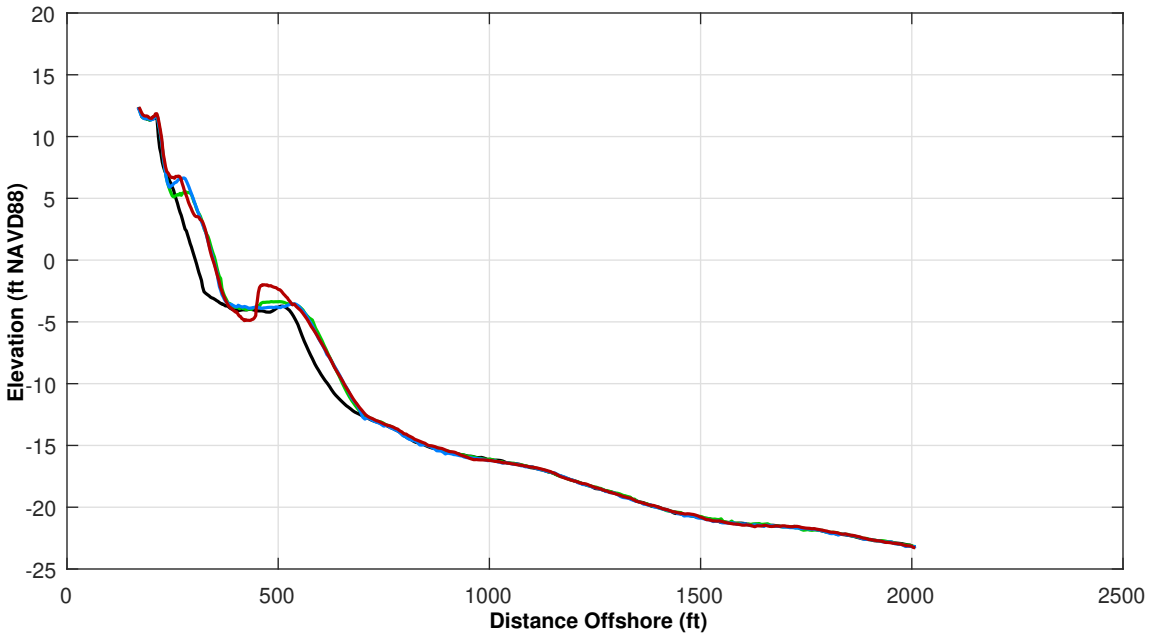
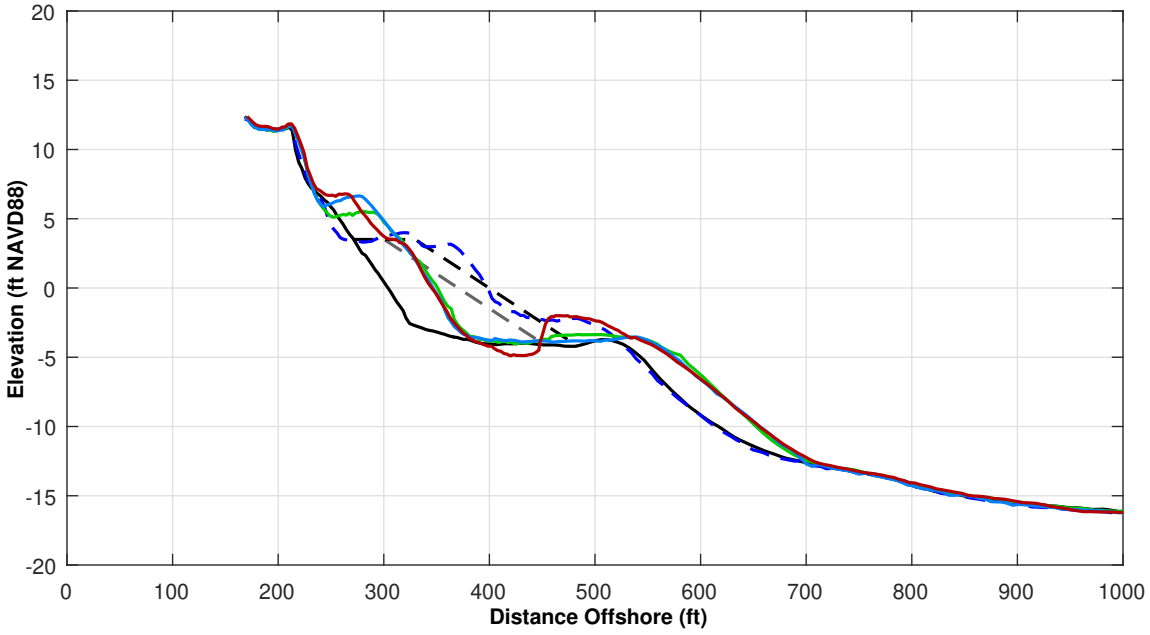
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





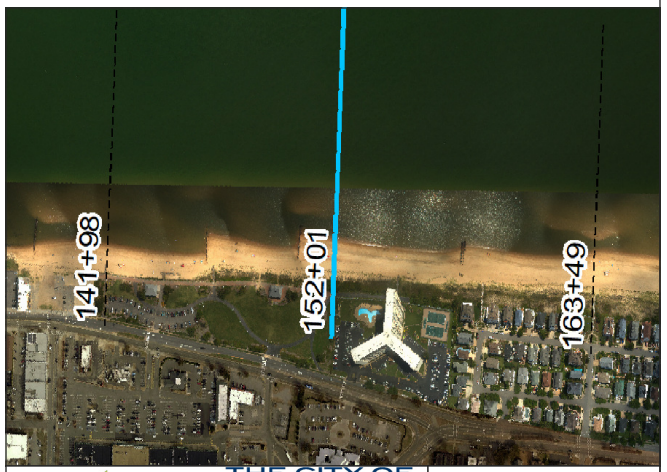
Survey Transect 152+01	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-4.46 ft	-0.94 ft
Volume Change Above -15 ft NAVD88	2.12 cy/ft	2.92 cy/ft
Volume Change Above 0 ft NAVD88	1.14 cy/ft	-0.26 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	-21.0 ft	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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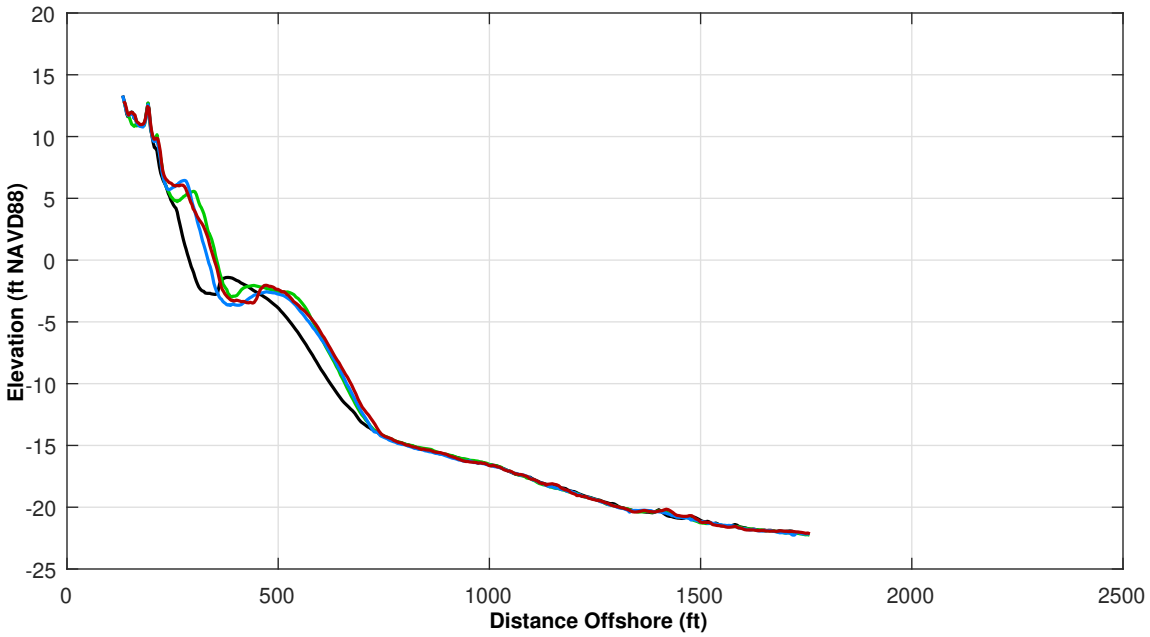
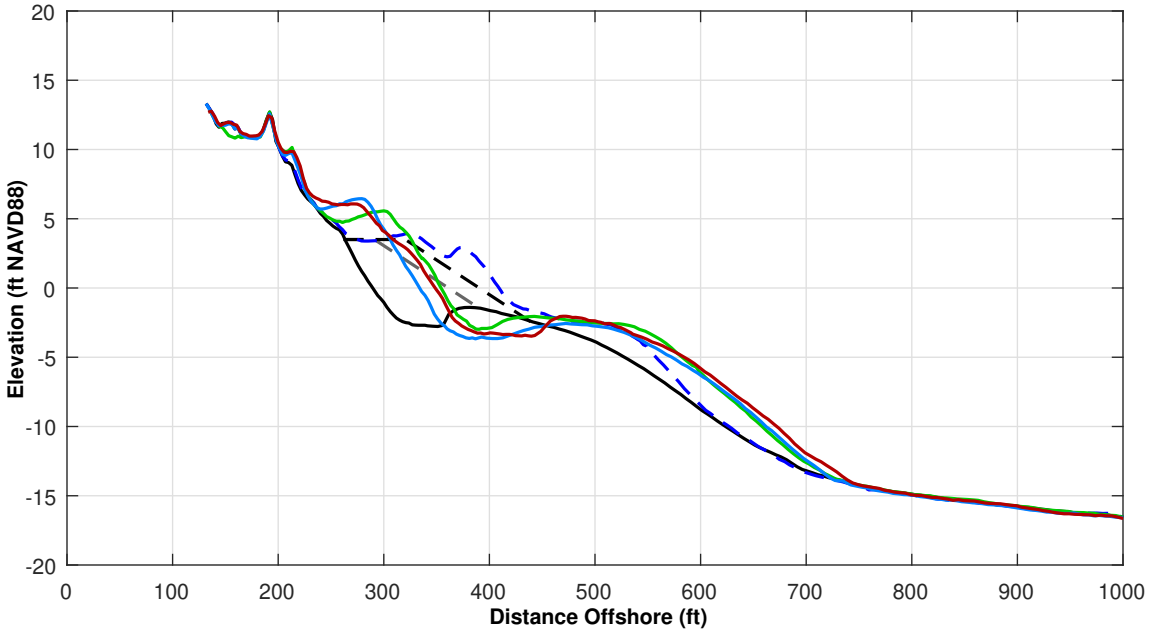
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





Survey Transect 163+49	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-7.99 ft	13.81 ft
Volume Change Above -15 ft NAVD88	0.12 cy/ft	9.21 cy/ft
Volume Change Above 0 ft NAVD88	0.20 cy/ft	2.15 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		-13.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.

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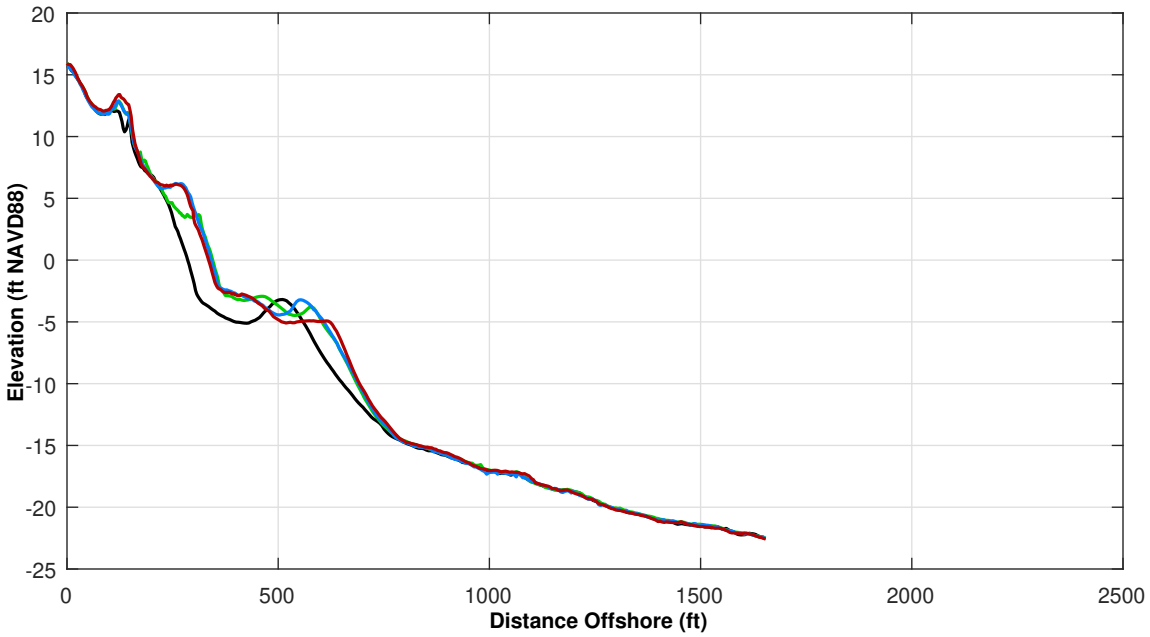
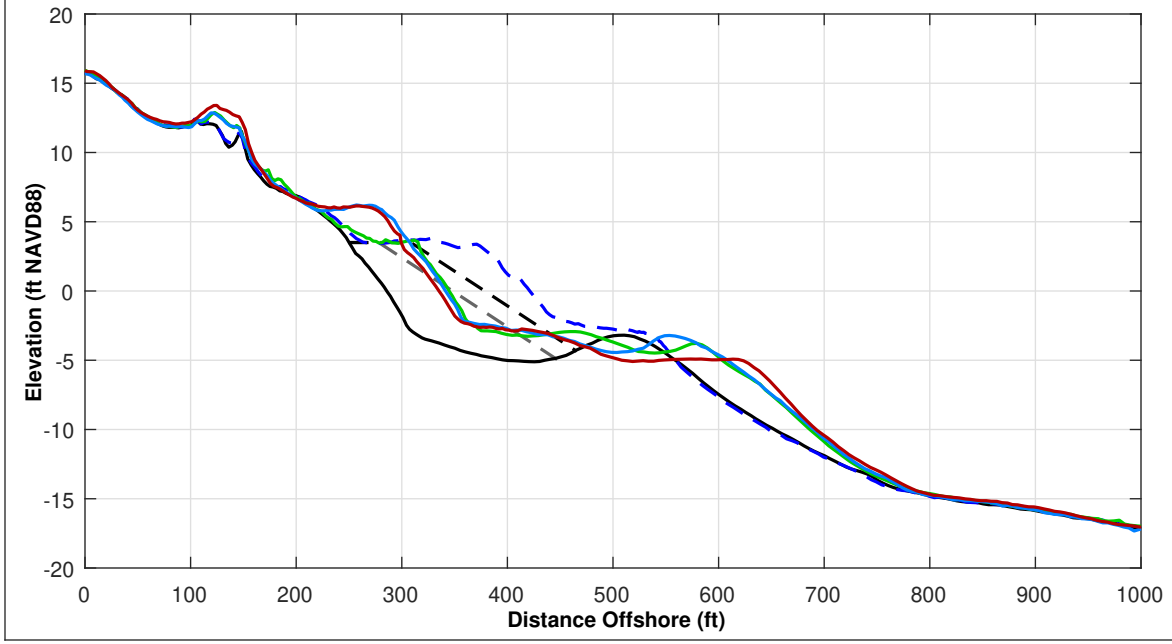
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





Survey Transect 169+63	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-10.28 ft	-7.26 ft
Volume Change Above -15 ft NAVD88	2.97 cy/ft	-1.07 cy/ft
Volume Change Above 0 ft NAVD88	4.18 cy/ft	1.12 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	-10.0 ft	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.

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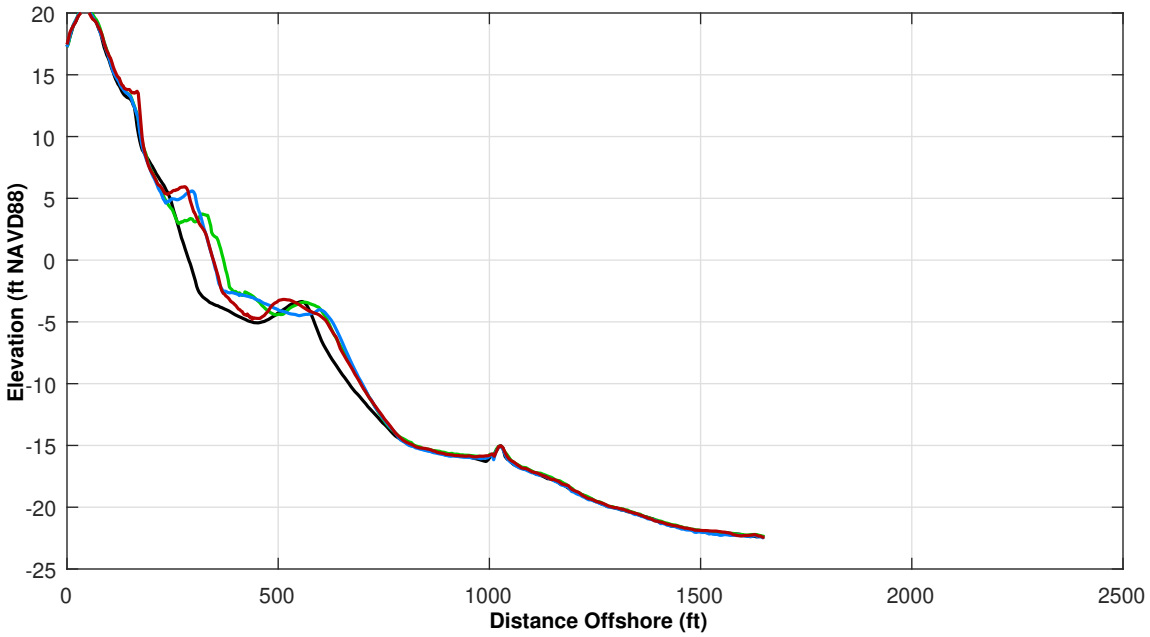
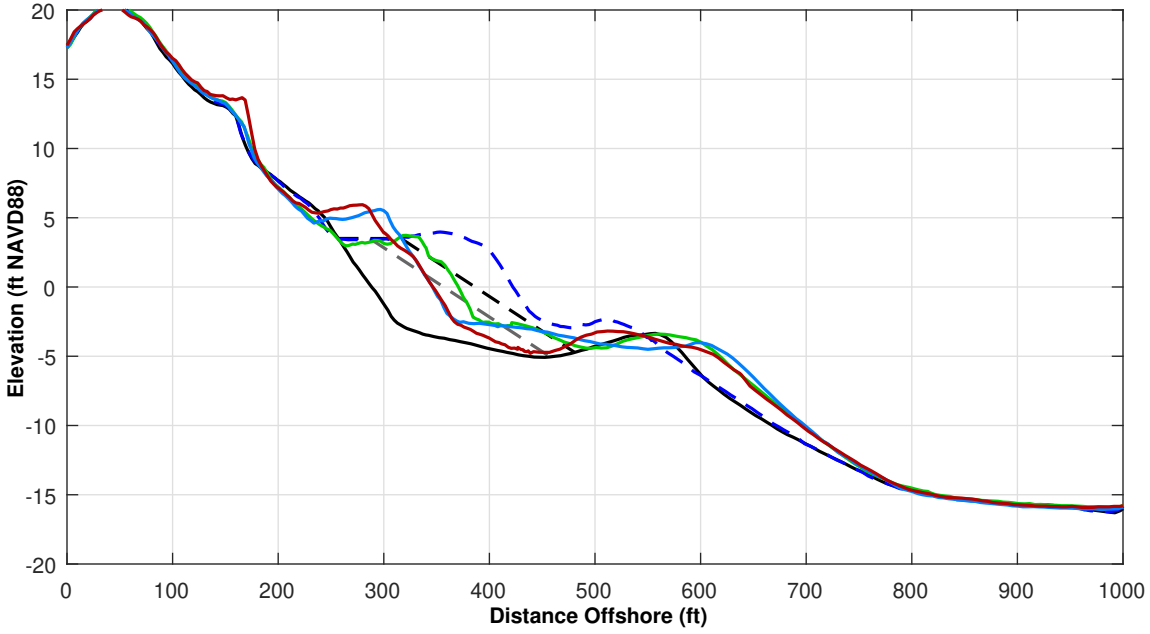
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





Survey Transect 171+63	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-24.91 ft	0.36 ft
Volume Change Above -15 ft NAVD88	-3.08 cy/ft	-1.10 cy/ft
Volume Change Above 0 ft NAVD88	3.13 cy/ft	2.69 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	-12.0 ft	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
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4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.

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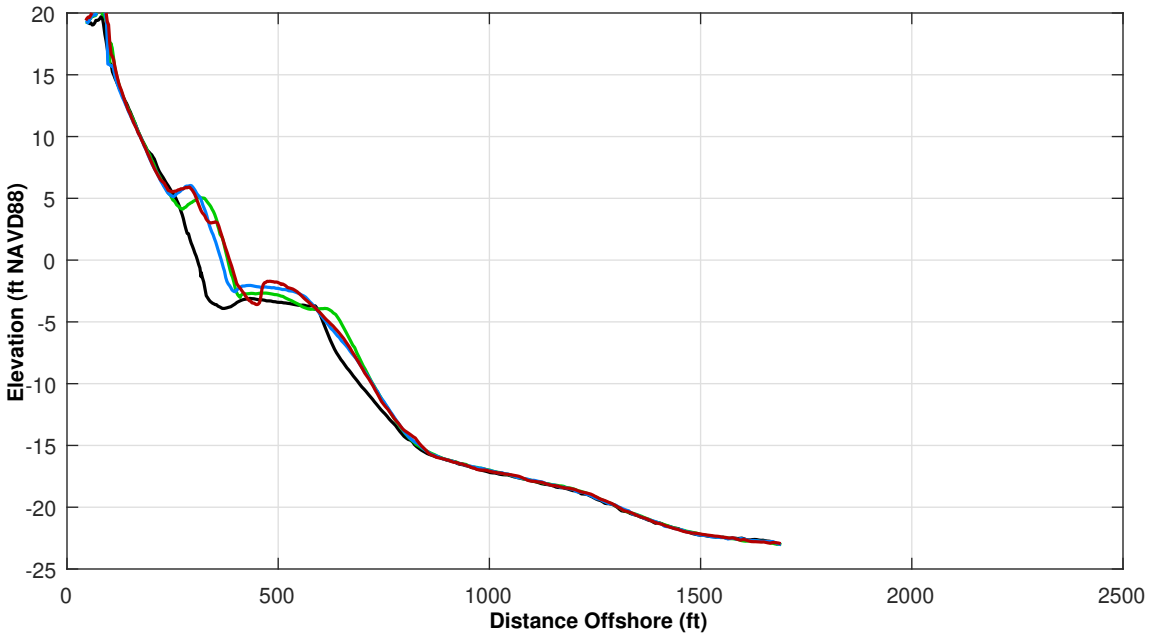

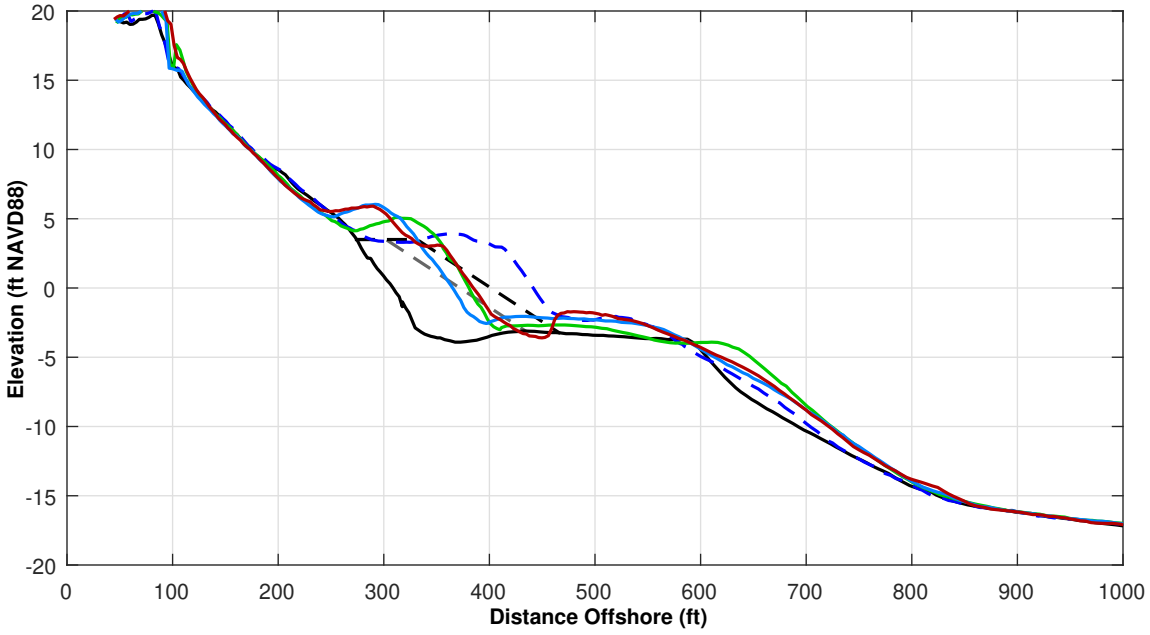

Survey Transect 173+63	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	1.68 ft	19.08 ft
Volume Change Above -15 ft NAVD88	2.80 cy/ft	5.59 cy/ft
Volume Change Above 0 ft NAVD88	1.87 cy/ft	3.92 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		-5.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
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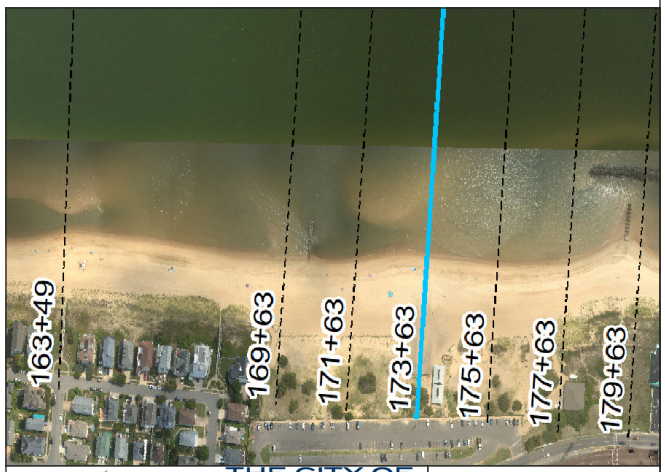
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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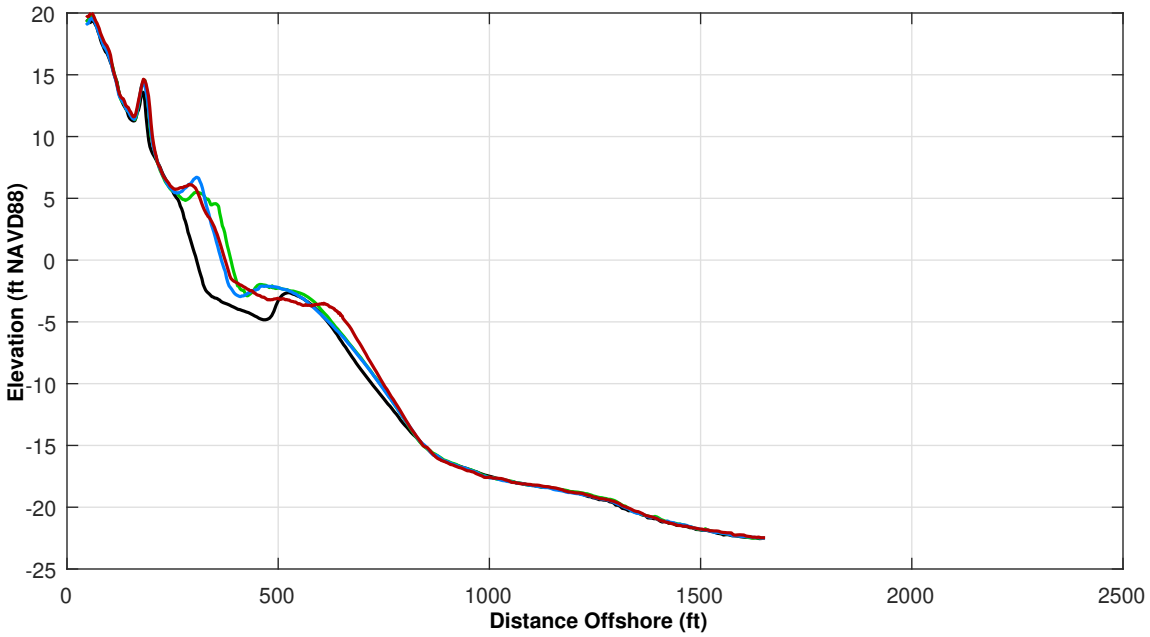

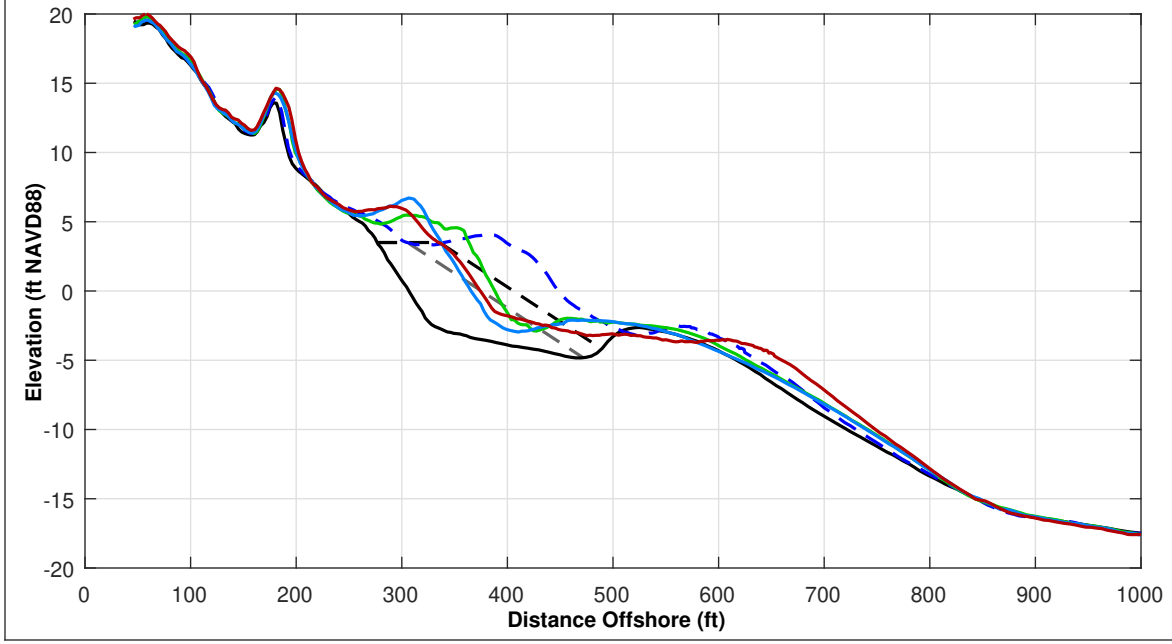

Survey Transect 175+63	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-15.24 ft	7.91 ft
Volume Change Above -15 ft NAVD88	0.59 cy/ft	7.37 cy/ft
Volume Change Above 0 ft NAVD88	-0.90 cy/ft	1.93 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		-2.0 ft

LEGEND:

JUN 2020
NOV 2019
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MAY 2017
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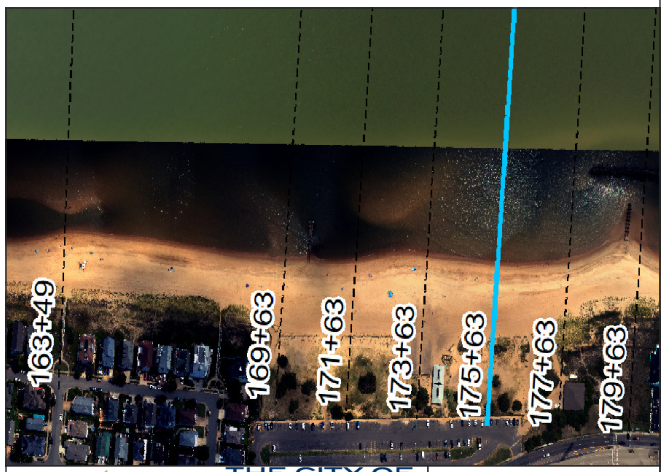
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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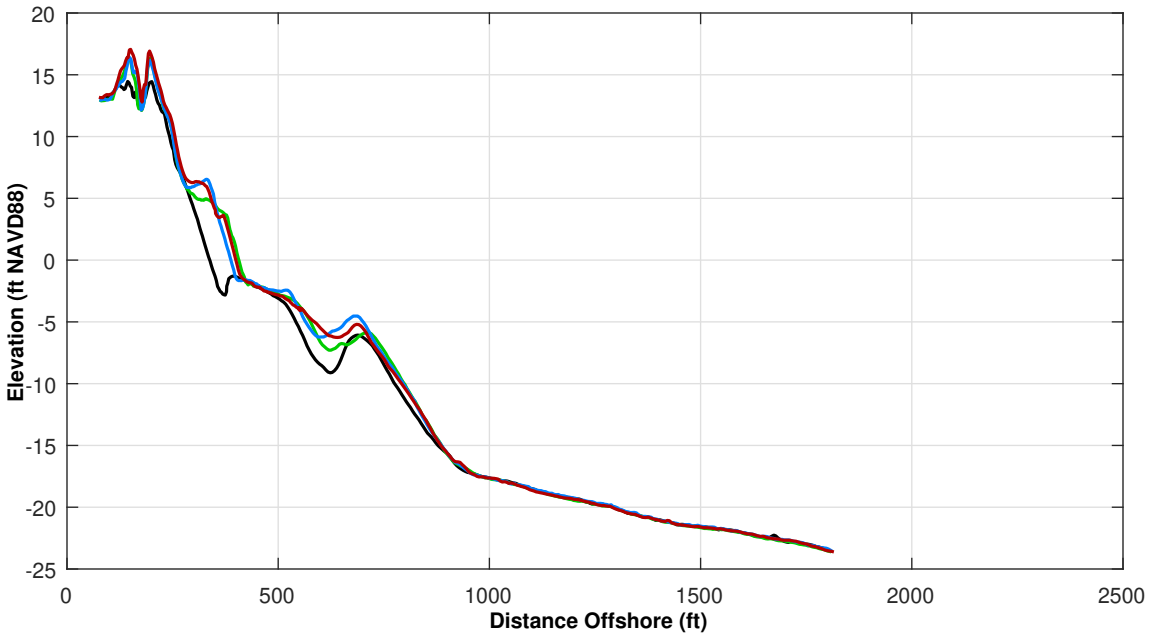
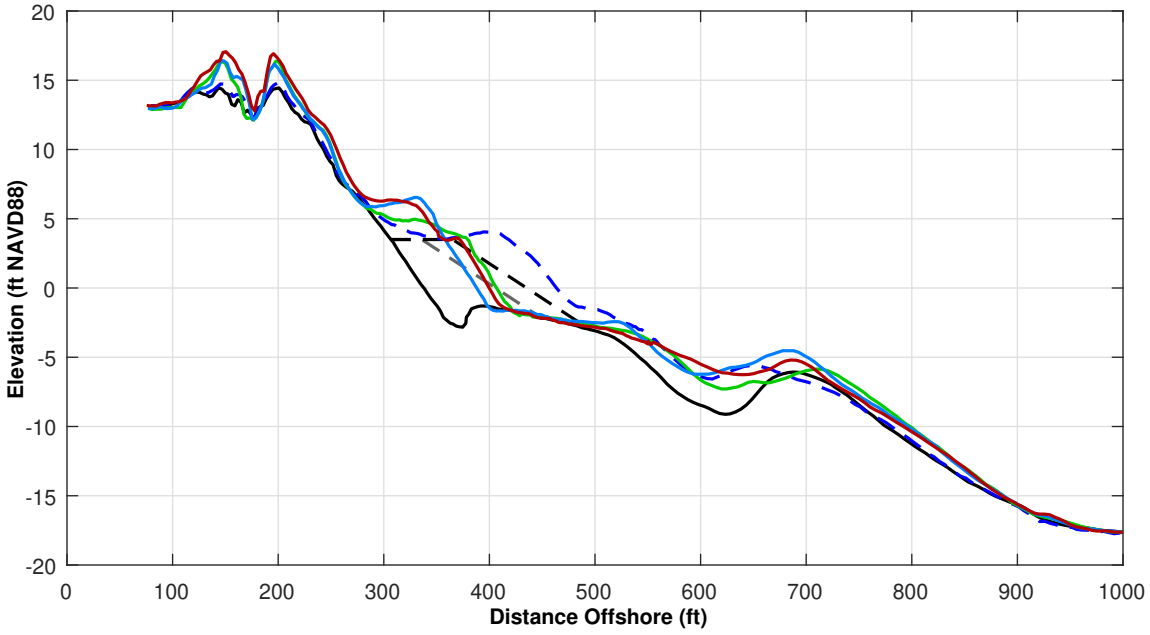
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





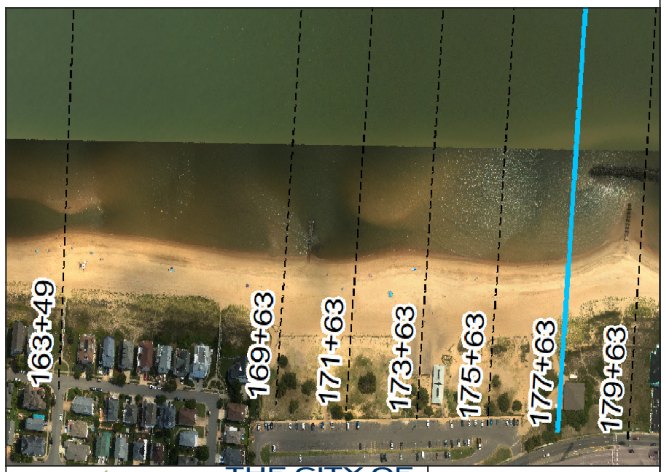
Survey Transect 177+63	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-7.35 ft	12.89 ft
Volume Change Above -15 ft NAVD88	7.21 cy/ft	3.80 cy/ft
Volume Change Above 0 ft NAVD88	6.19 cy/ft	6.15 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 5.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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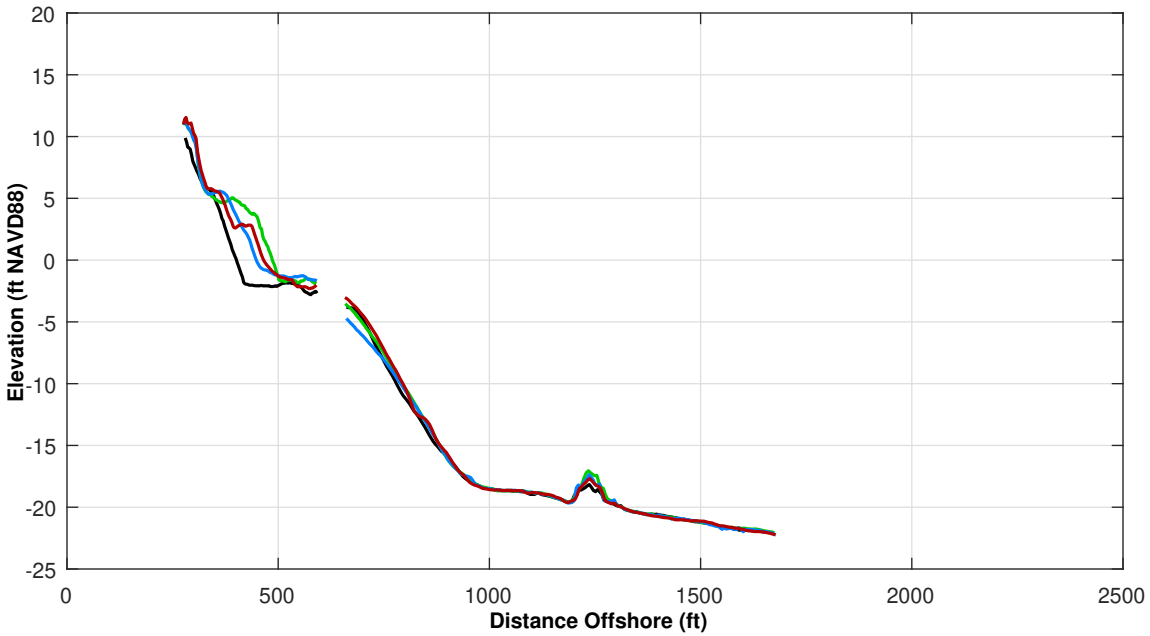
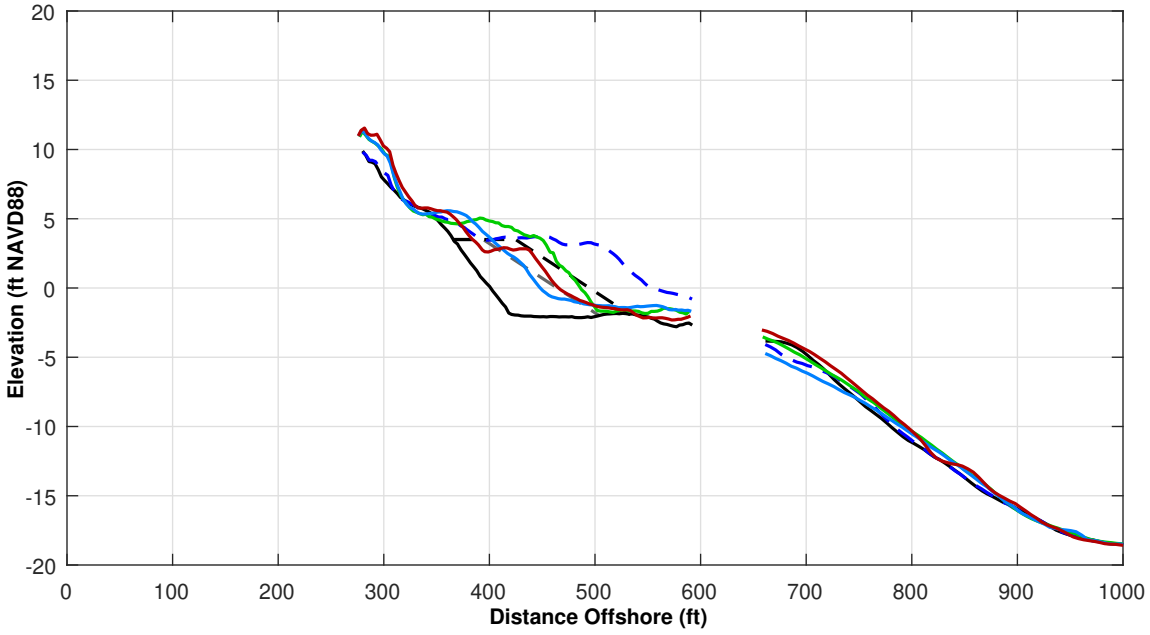
PUBLIC WORKS

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





Survey Transect 179+63	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-21.32 ft	17.04 ft
Volume Change Above -15 ft NAVD88	-3.73 cy/ft	6.93 cy/ft
Volume Change Above 0 ft NAVD88	-4.30 cy/ft	1.56 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	-41.0 ft	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.

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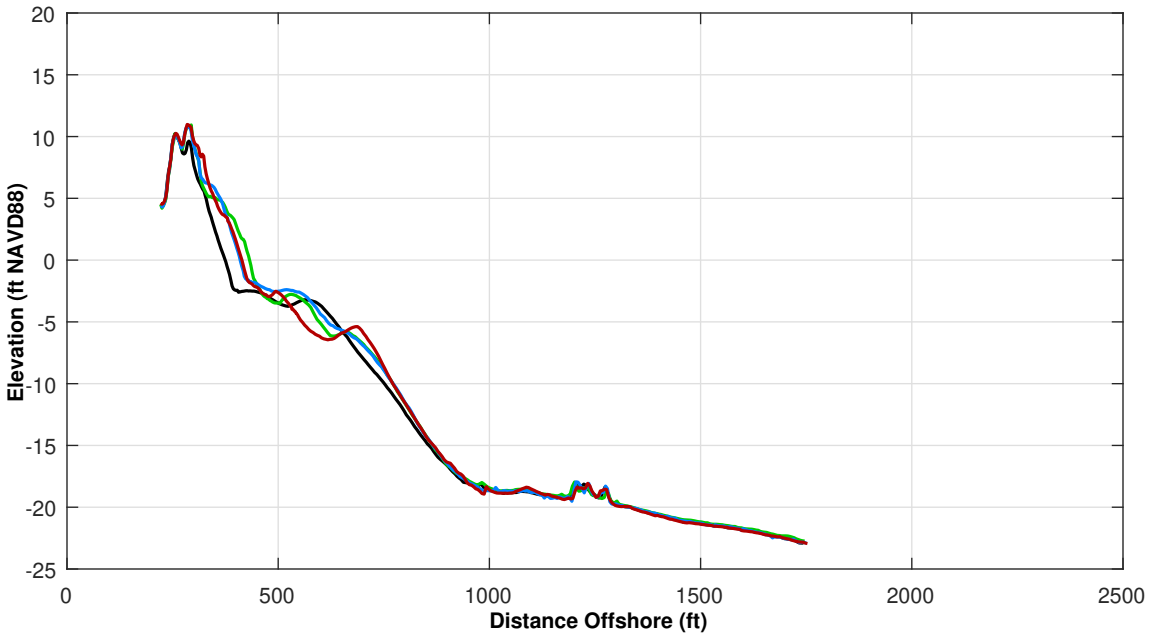
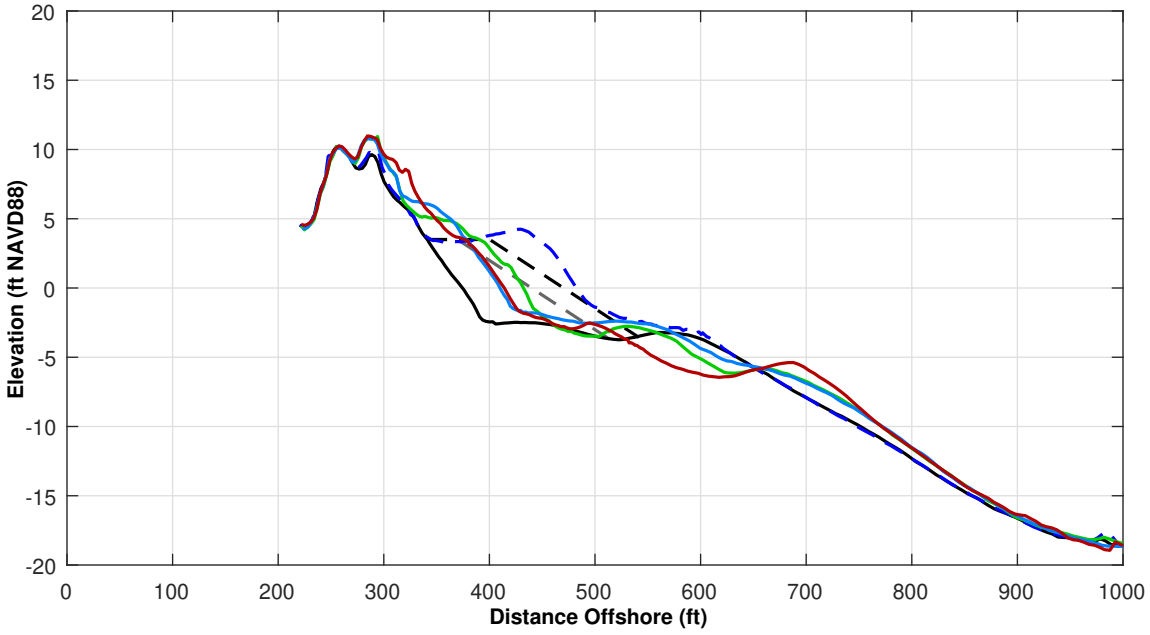
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





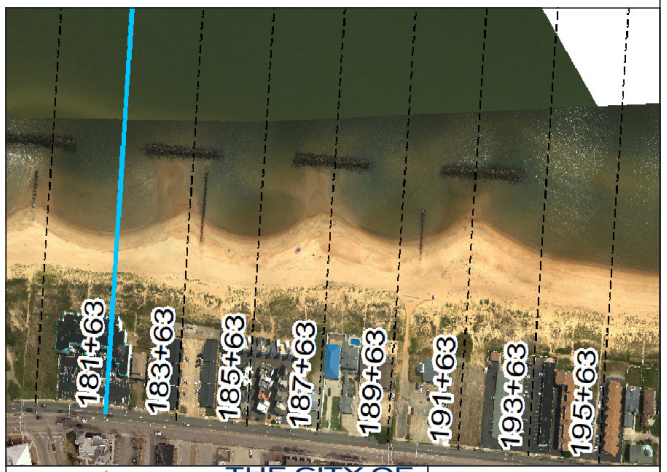
Survey Transect 181+63	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-19.01 ft	3.25 ft
Volume Change Above -15 ft NAVD88	-3.81 cy/ft	-5.51 cy/ft
Volume Change Above 0 ft NAVD88	-0.51 cy/ft	0.96 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		-26.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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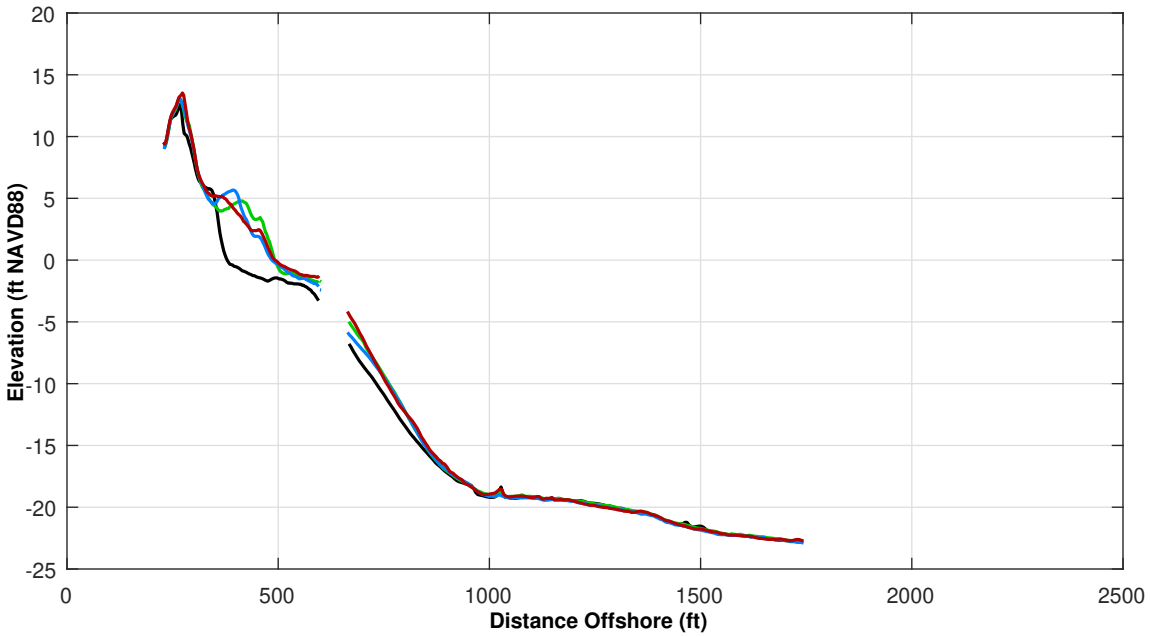
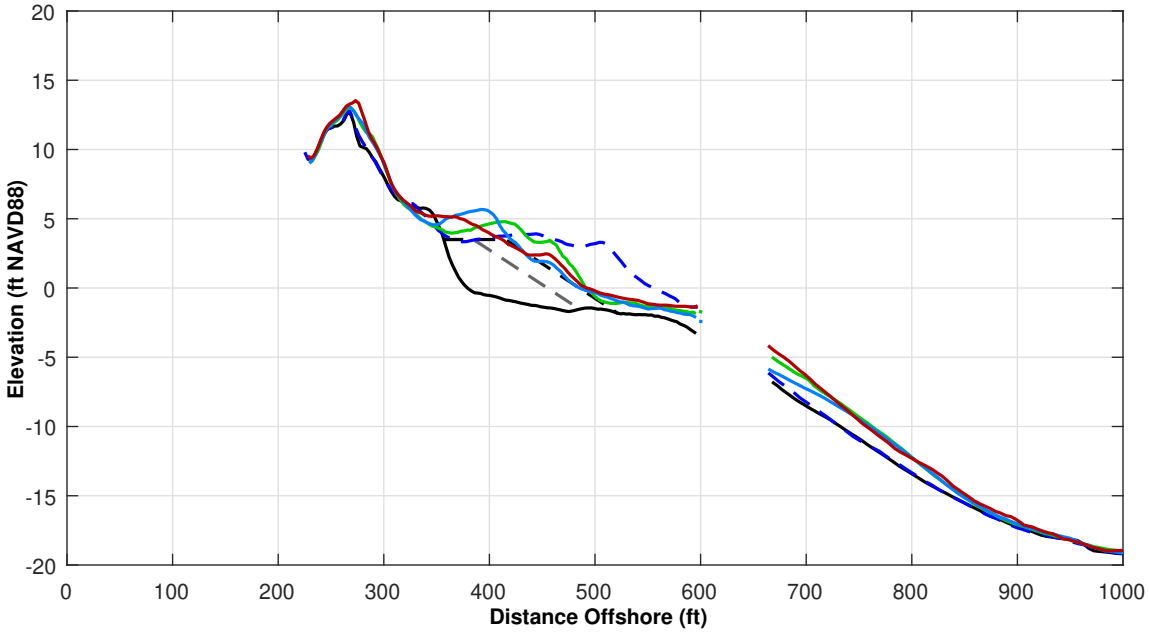
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





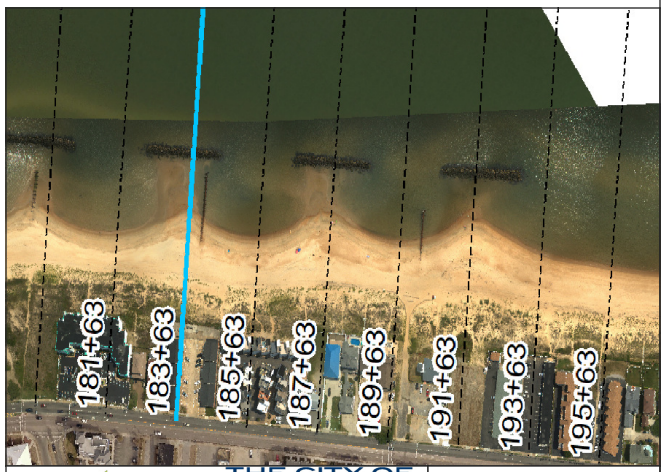
Survey Transect 183+63	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-7.48 ft	6.32 ft
Volume Change Above -15 ft NAVD88	1.23 cy/ft	5.31 cy/ft
Volume Change Above 0 ft NAVD88	-1.06 cy/ft	0.29 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		-4.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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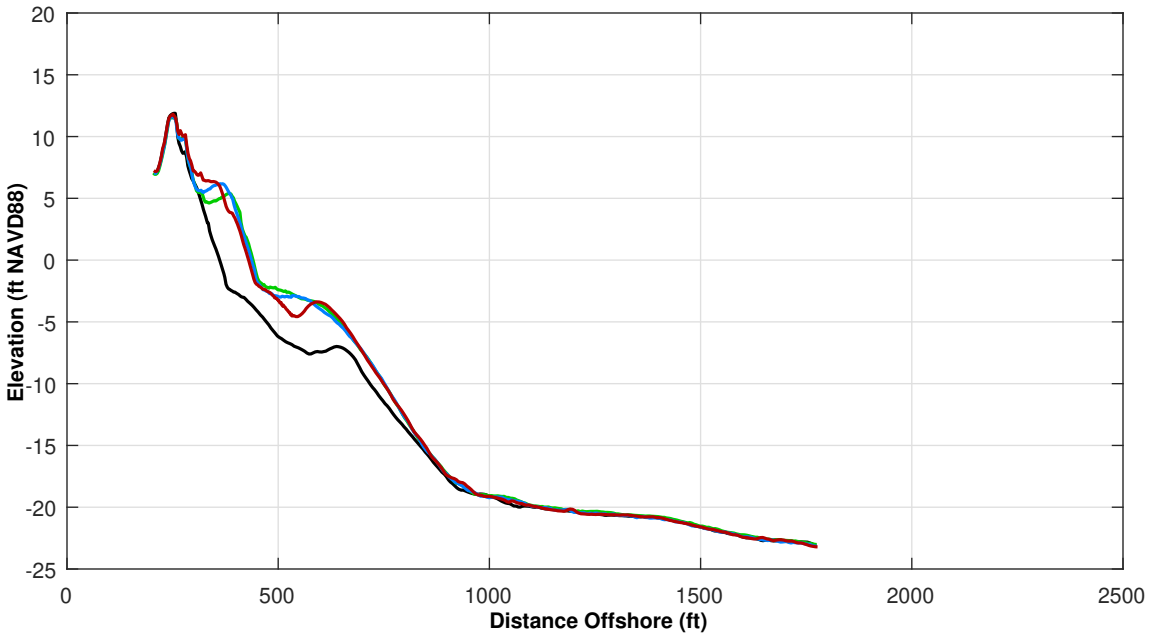
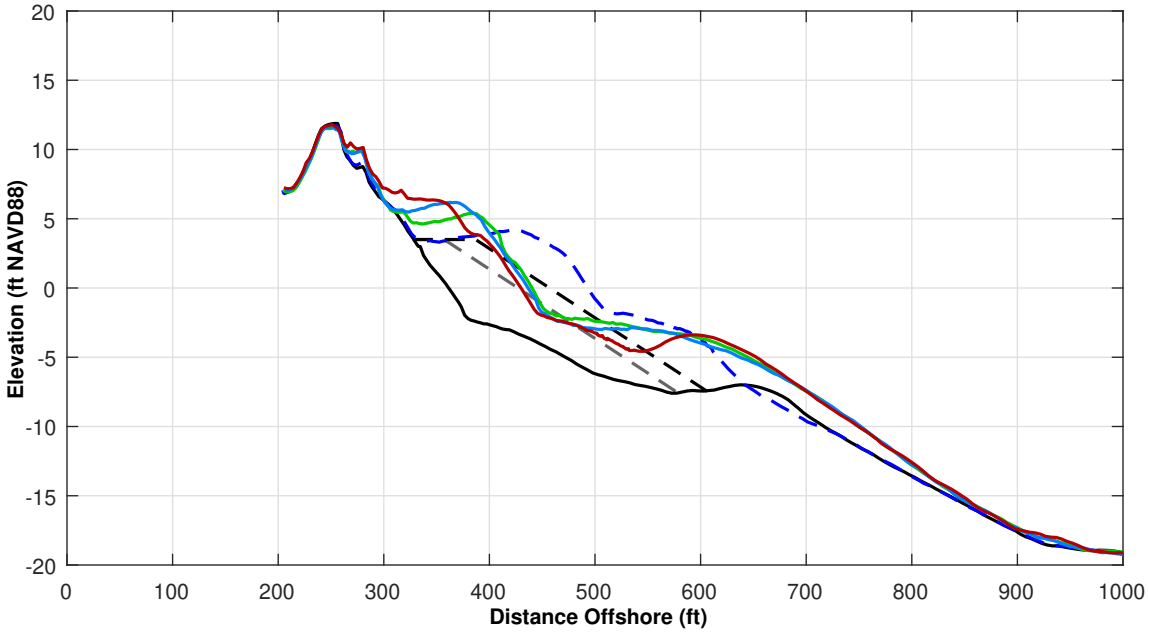
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





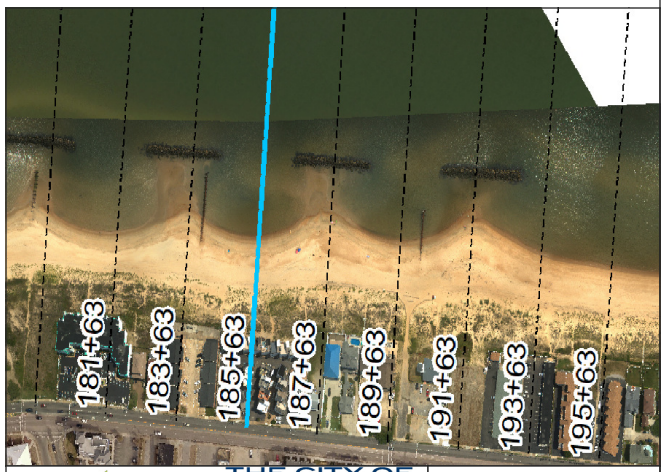
Survey Transect 185+63	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-11.31 ft	-6.88 ft
Volume Change Above -15 ft NAVD88	-2.41 cy/ft	-1.76 cy/ft
Volume Change Above 0 ft NAVD88	1.69 cy/ft	0.16 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 8.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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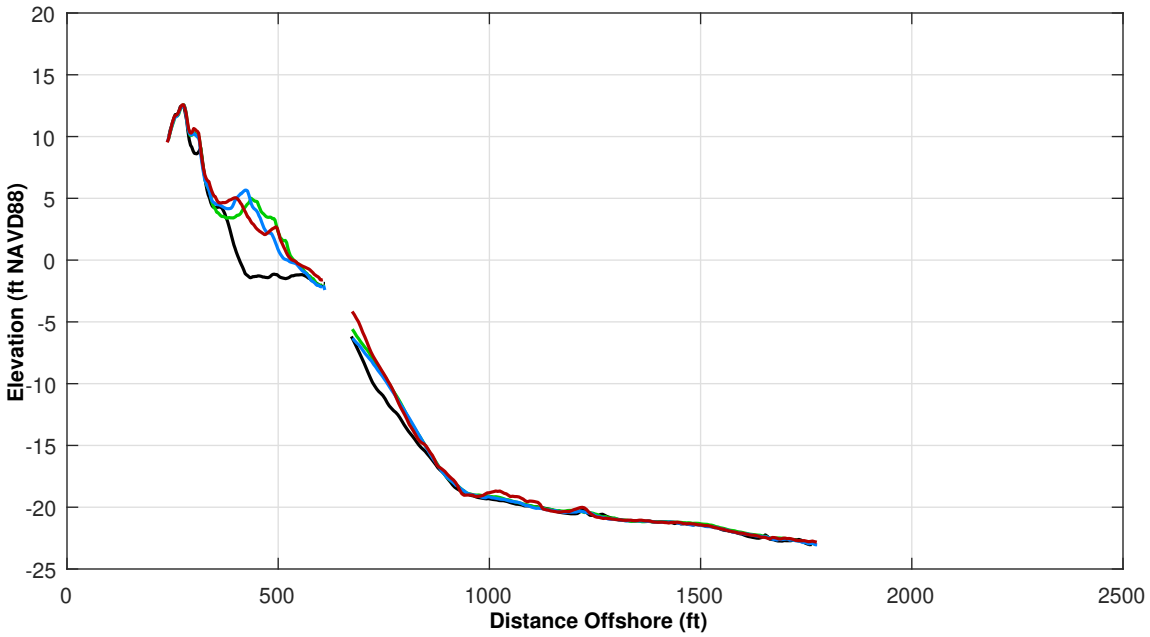
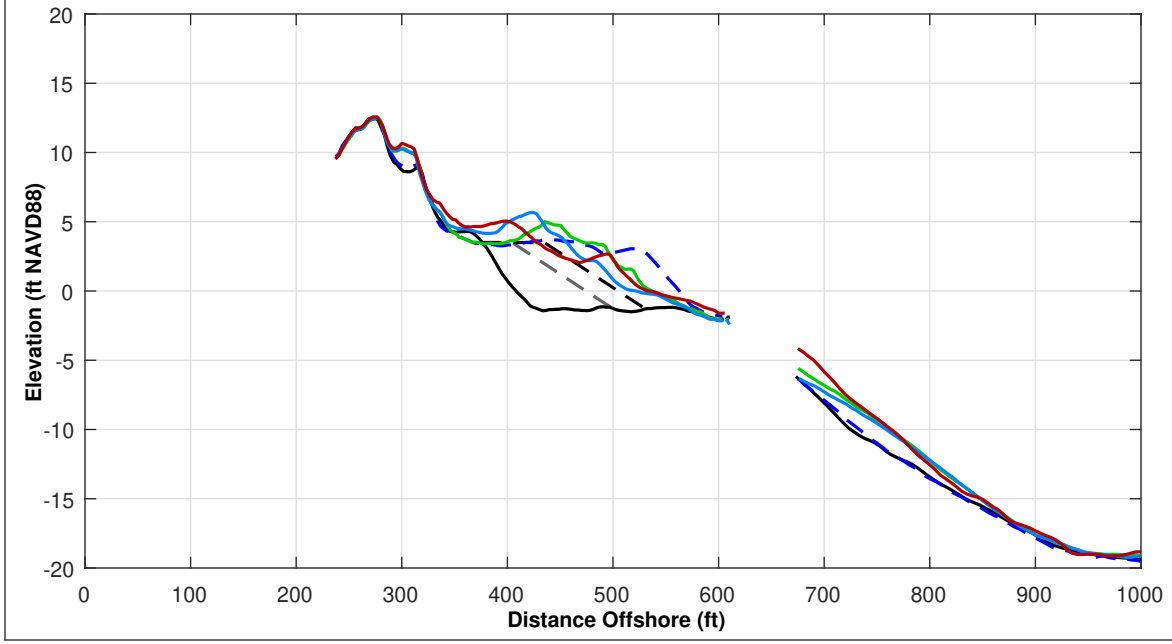
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





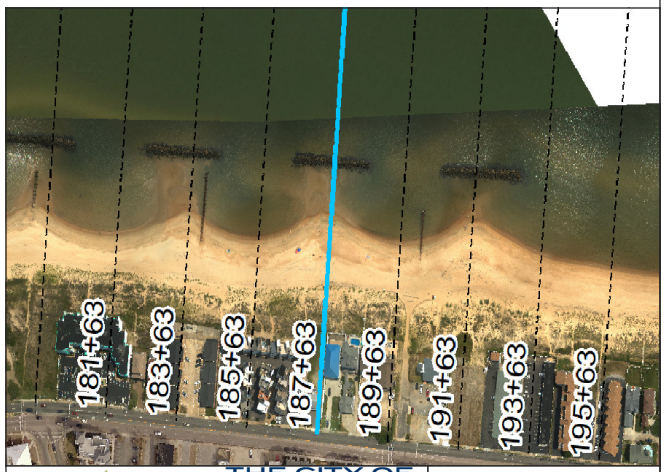
Survey Transect 187+63	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-8.53 ft	15.95 ft
Volume Change Above -15 ft NAVD88	1.83 cy/ft	4.65 cy/ft
Volume Change Above 0 ft NAVD88	-0.46 cy/ft	0.46 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		-12.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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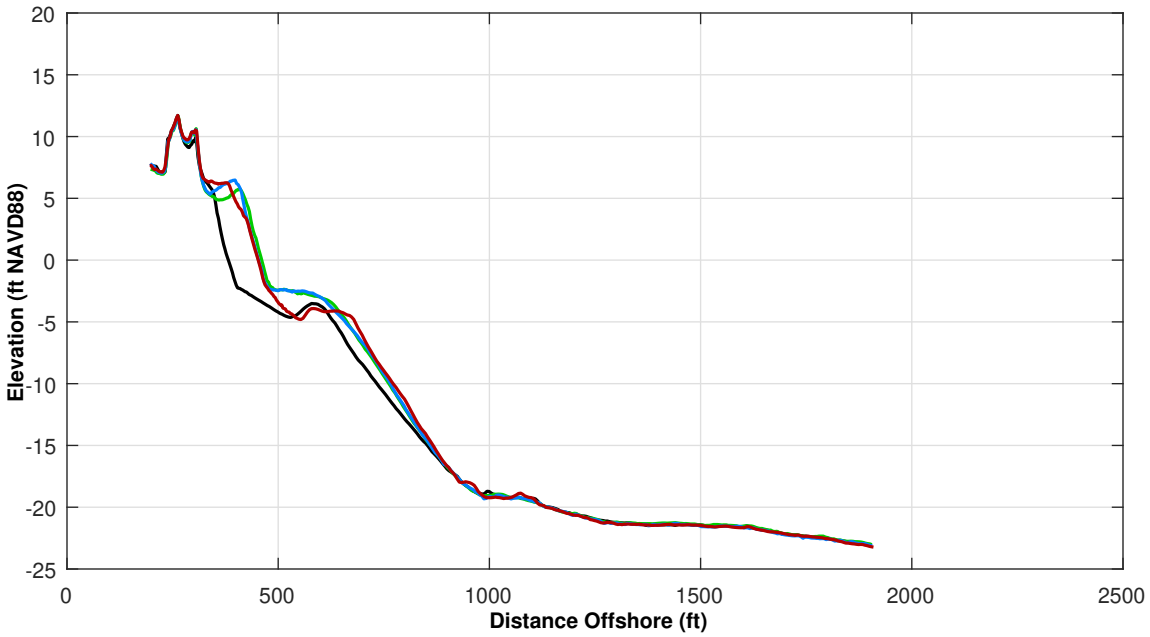
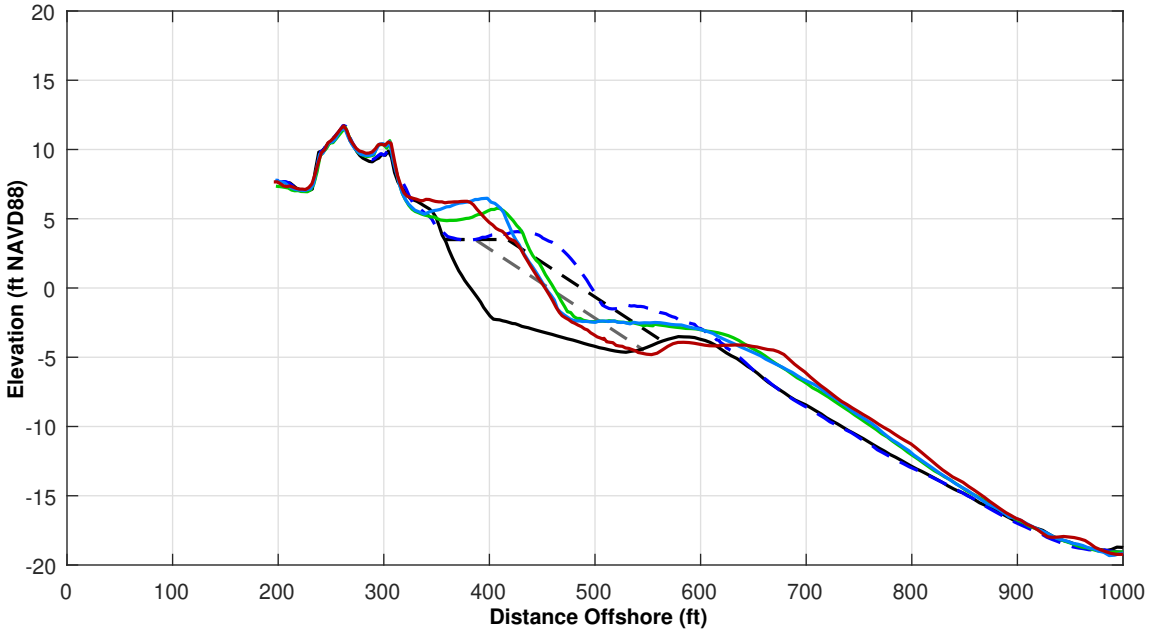
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





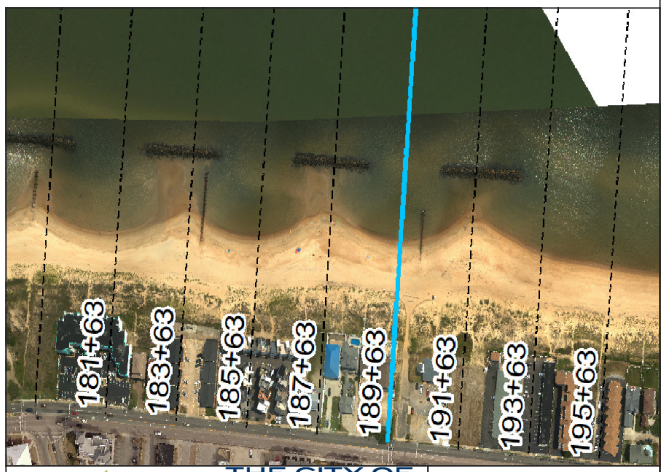
Survey Transect 189+63	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-8.96 ft	-1.55 ft
Volume Change Above -15 ft NAVD88	-2.91 cy/ft	-3.94 cy/ft
Volume Change Above 0 ft NAVD88	0.81 cy/ft	-0.31 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 1.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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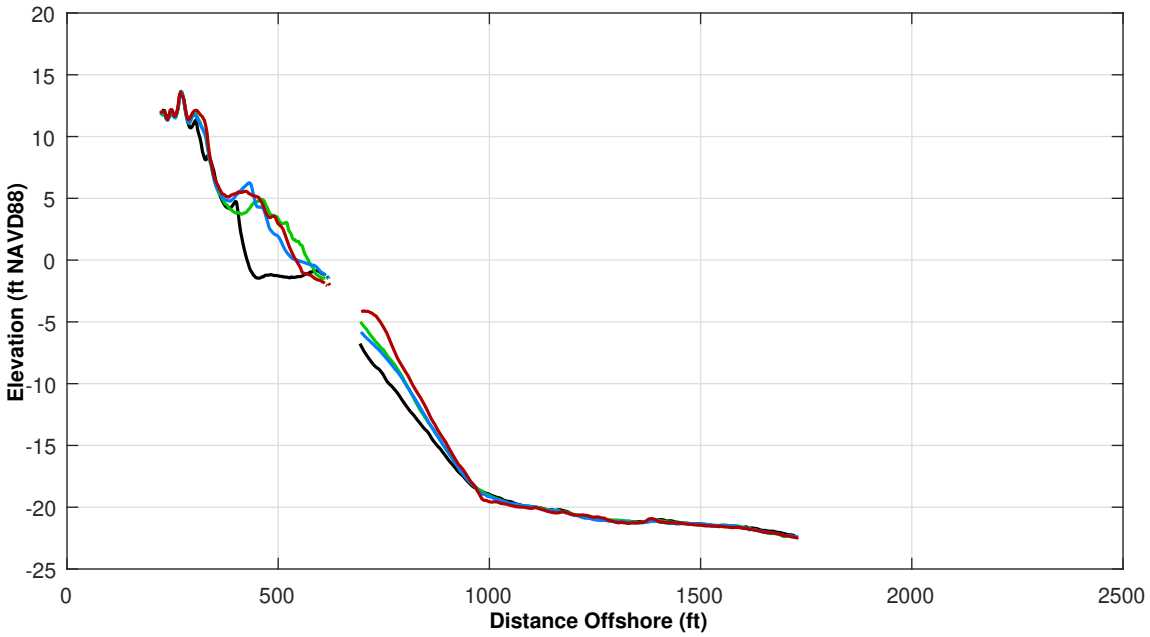
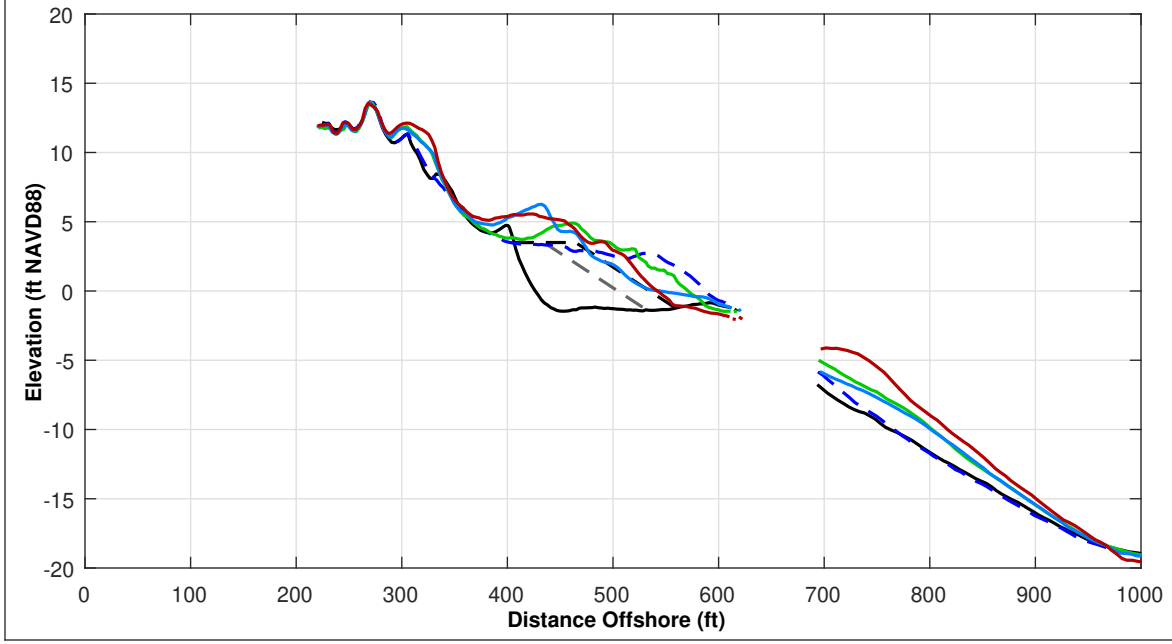
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





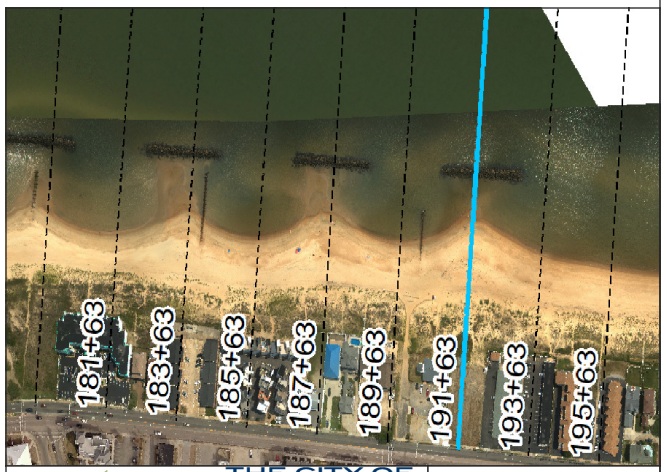
Survey Transect 191+63	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-30.83 ft	13.73 ft
Volume Change Above -15 ft NAVD88	9.22 cy/ft	12.85 cy/ft
Volume Change Above 0 ft NAVD88	2.35 cy/ft	4.35 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 26.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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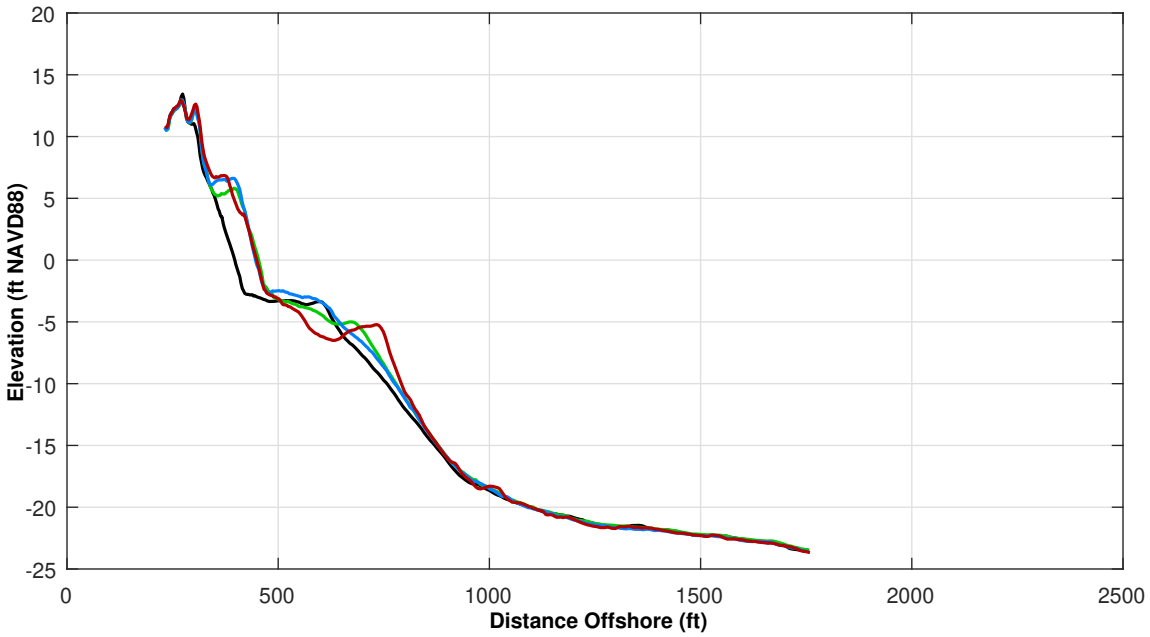
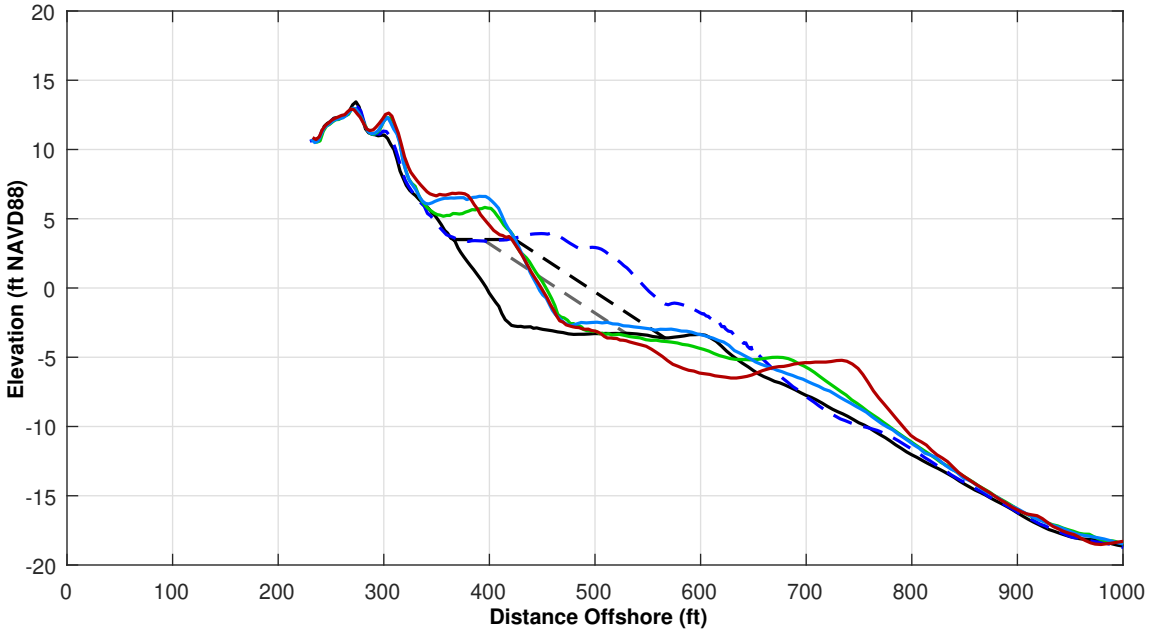
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





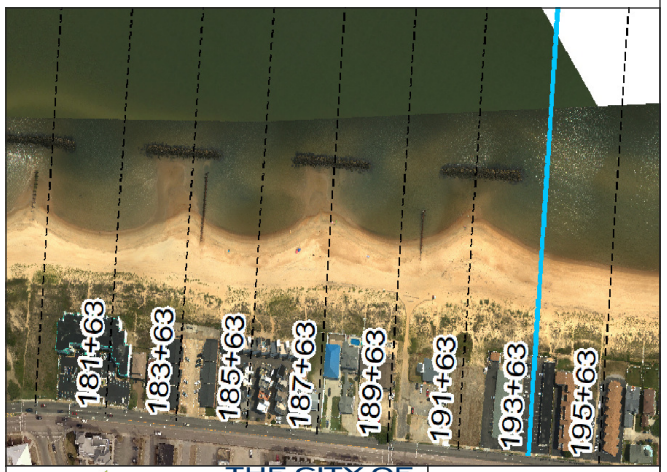
Survey Transect 193+63	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-4.38 ft	1.42 ft
Volume Change Above -15 ft NAVD88	1.03 cy/ft	-2.36 cy/ft
Volume Change Above 0 ft NAVD88	2.06 cy/ft	0.01 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	-6.0 ft	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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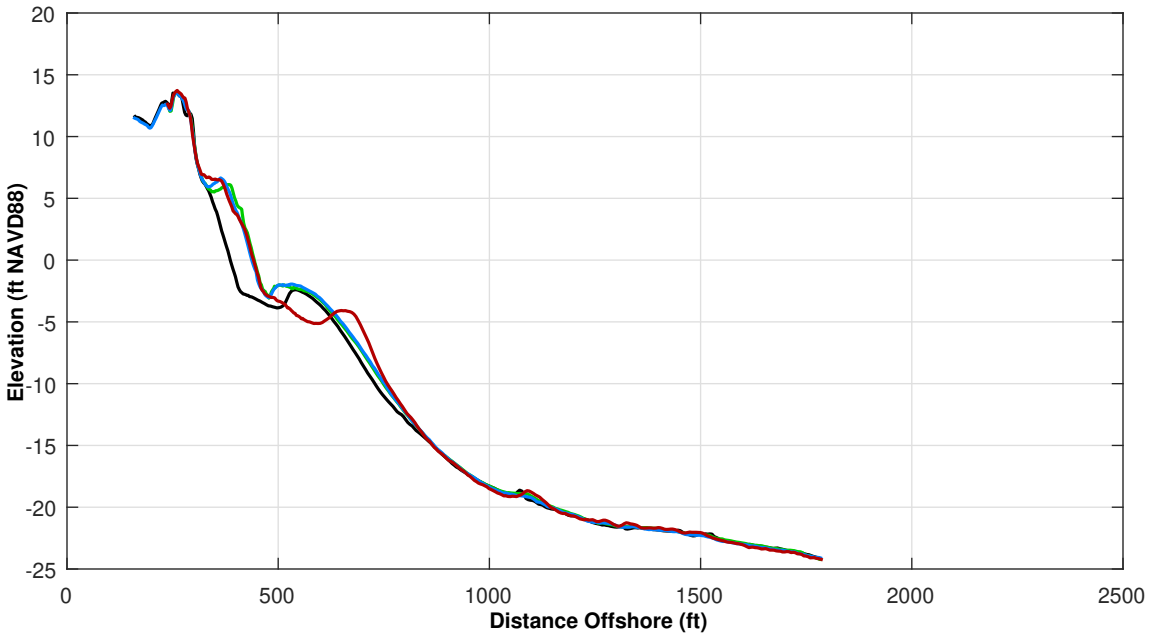
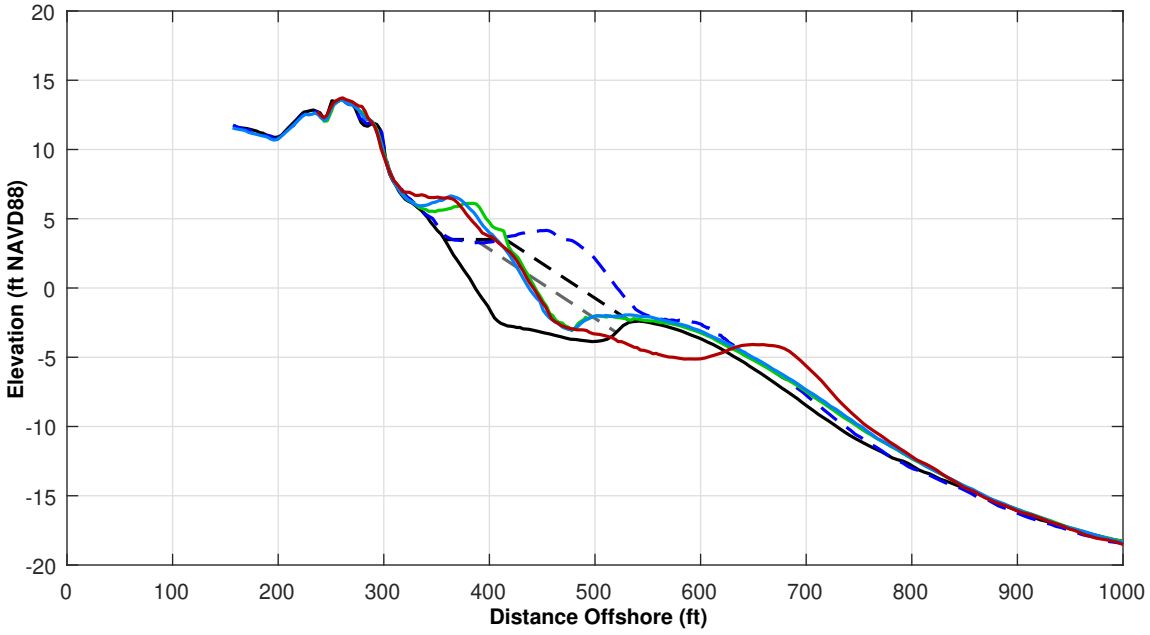
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





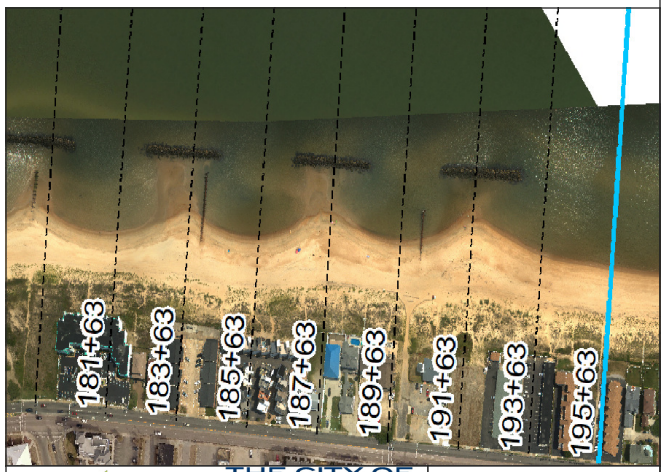
Survey Transect 195+63	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-2.69 ft	3.72 ft
Volume Change Above -15 ft NAVD88	-2.78 cy/ft	-2.94 cy/ft
Volume Change Above 0 ft NAVD88	-0.22 cy/ft	0.77 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		-10.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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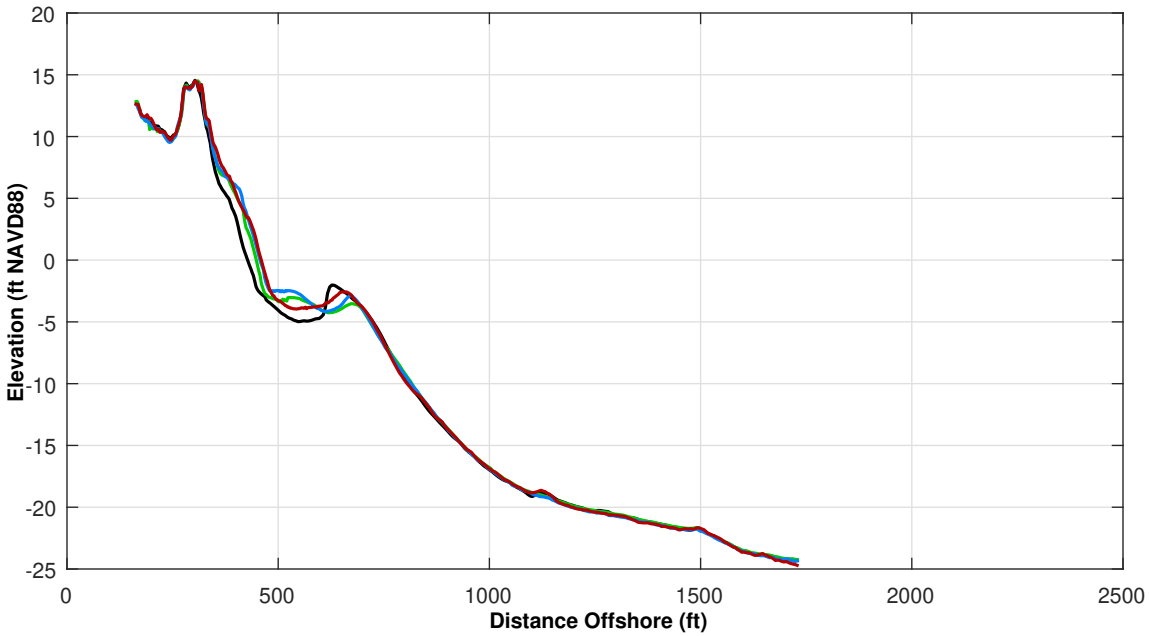
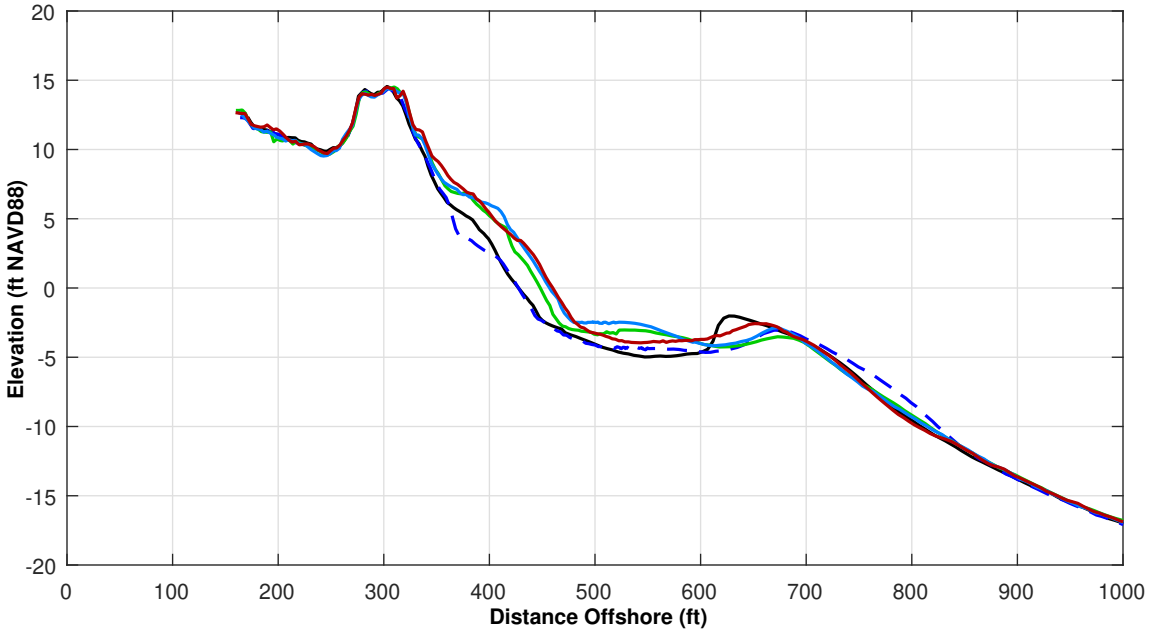




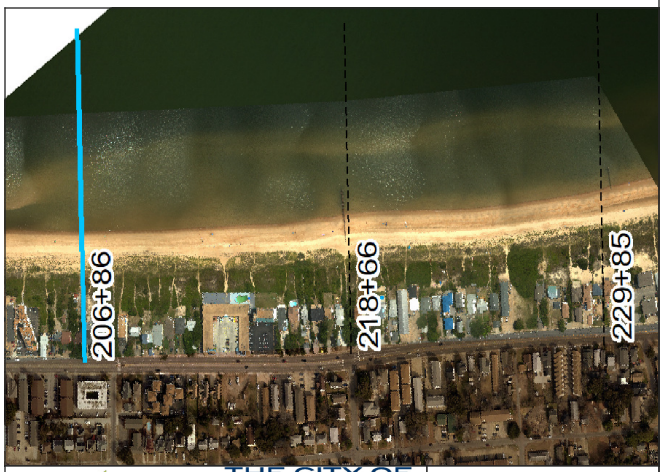
Survey Transect 206+86	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	11.28 ft	2.76 ft
Volume Change Above -15 ft NAVD88	5.79 cy/ft	0.04 cy/ft
Volume Change Above 0 ft NAVD88	3.72 cy/ft	1.61 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	N/A	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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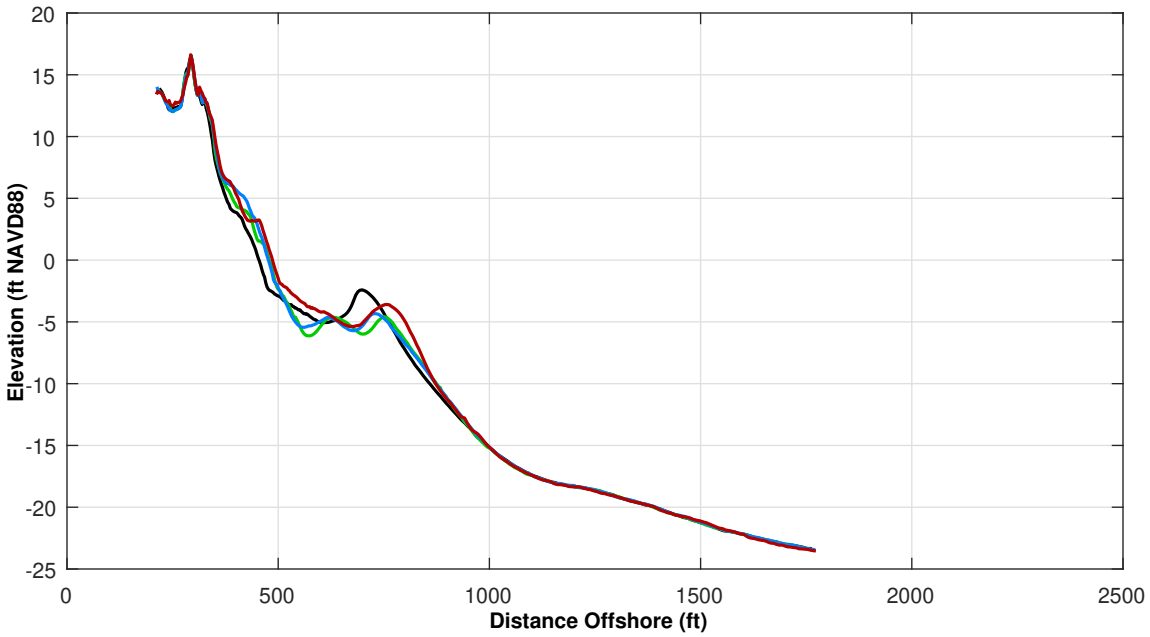
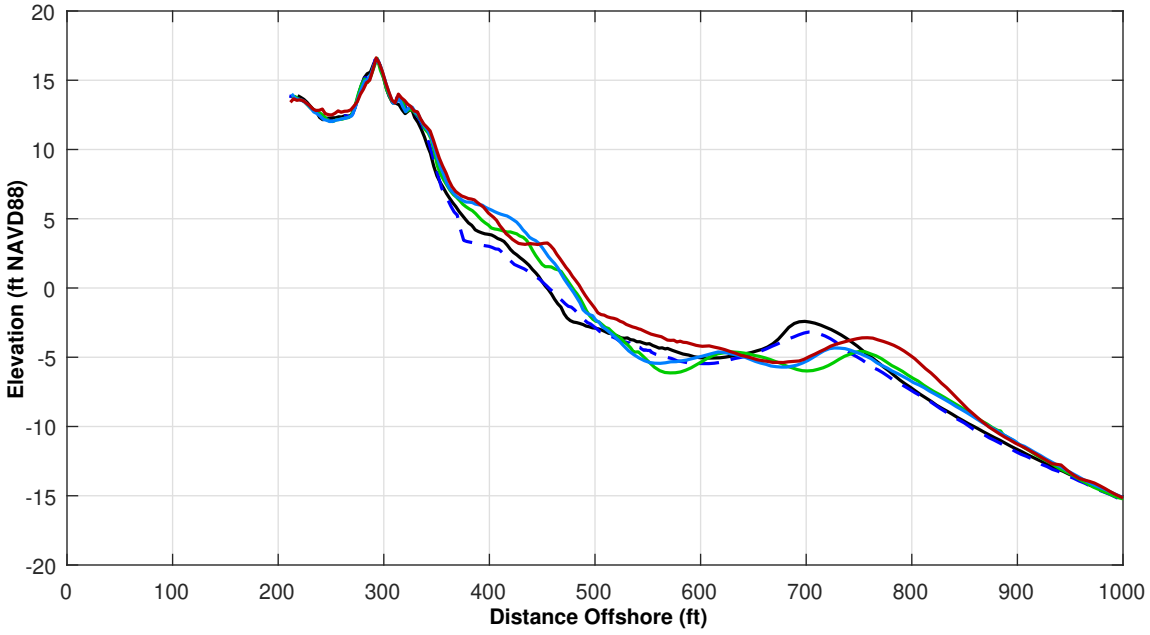




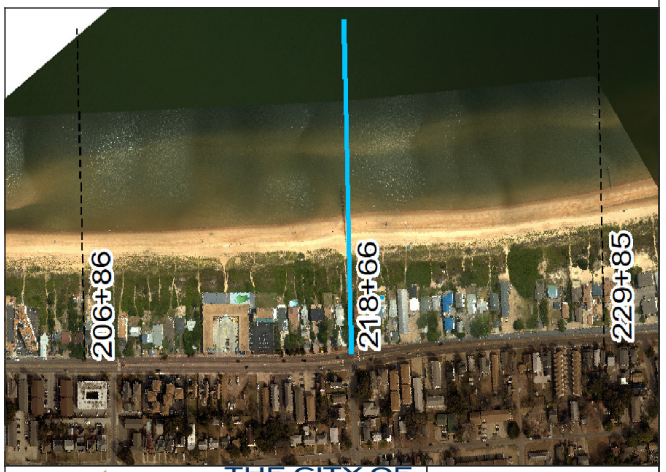
Survey Transect 218+66	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	7.60 ft	9.17 ft
Volume Change Above -15 ft NAVD88	18.34 cy/ft	14.17 cy/ft
Volume Change Above 0 ft NAVD88	4.00 cy/ft	0.95 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	N/A	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016

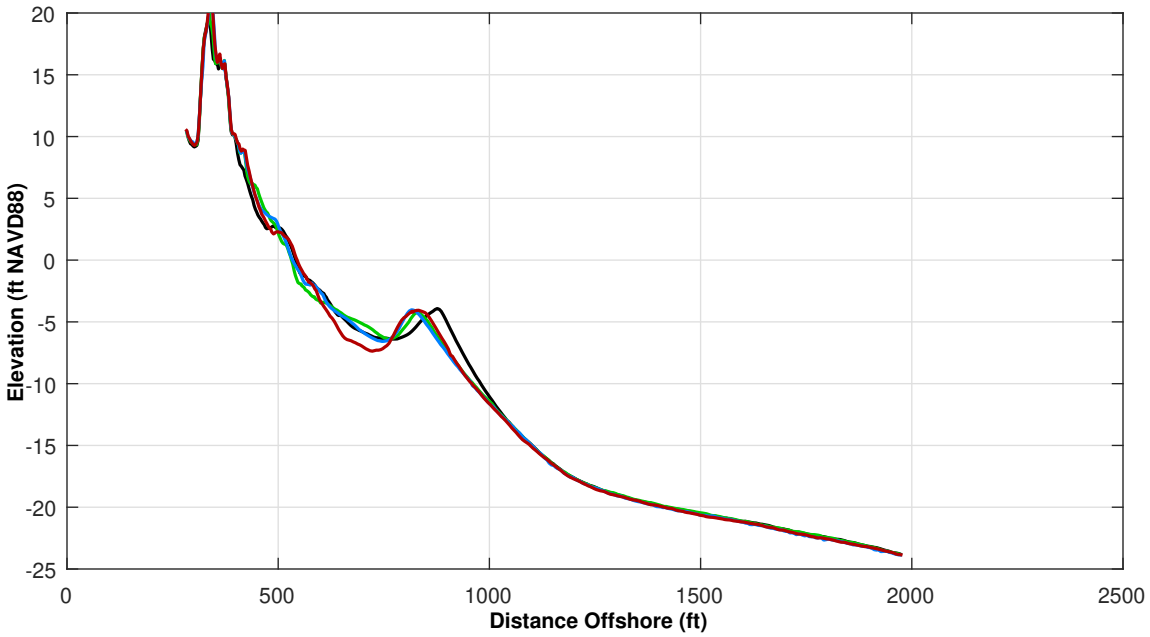
Notes:

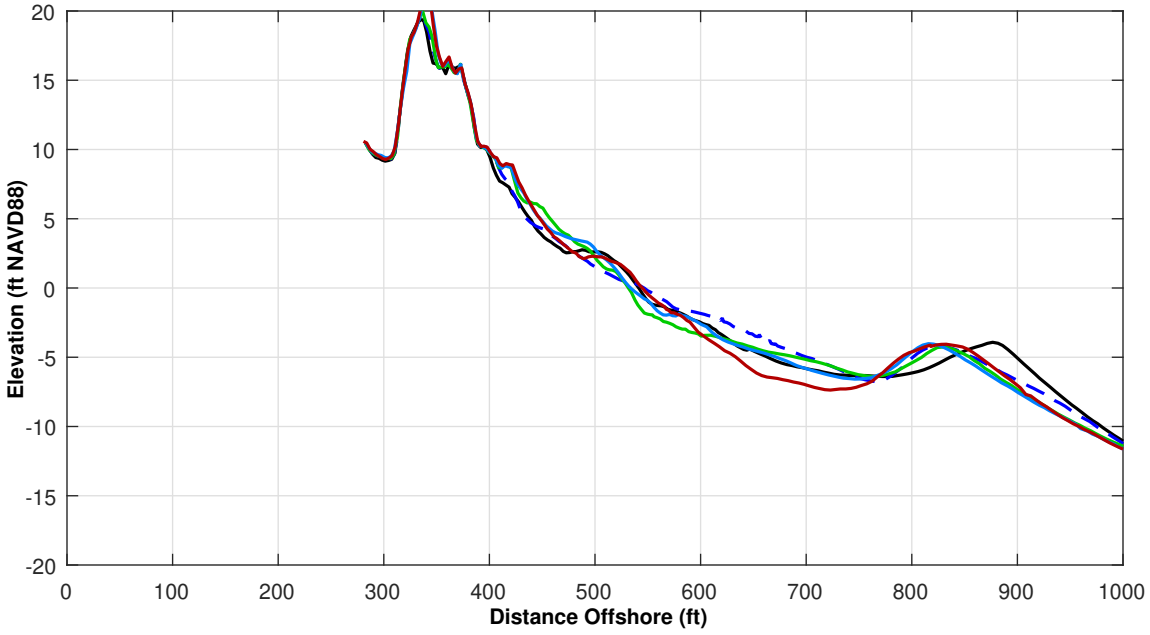
1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



THE CITY OF NORFOLK
PUBLIC WORKS

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





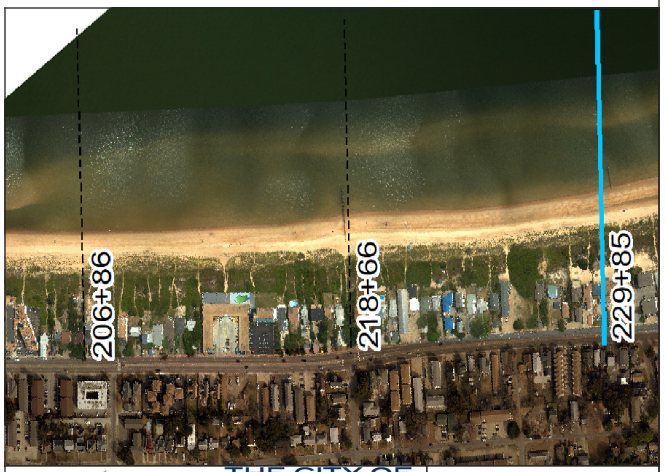
Survey Transect 229+85	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	12.57 ft	11.43 ft
Volume Change Above -15 ft NAVD88	-2.99 cy/ft	-4.12 cy/ft
Volume Change Above 0 ft NAVD88	1.35 cy/ft	0.06 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	N/A	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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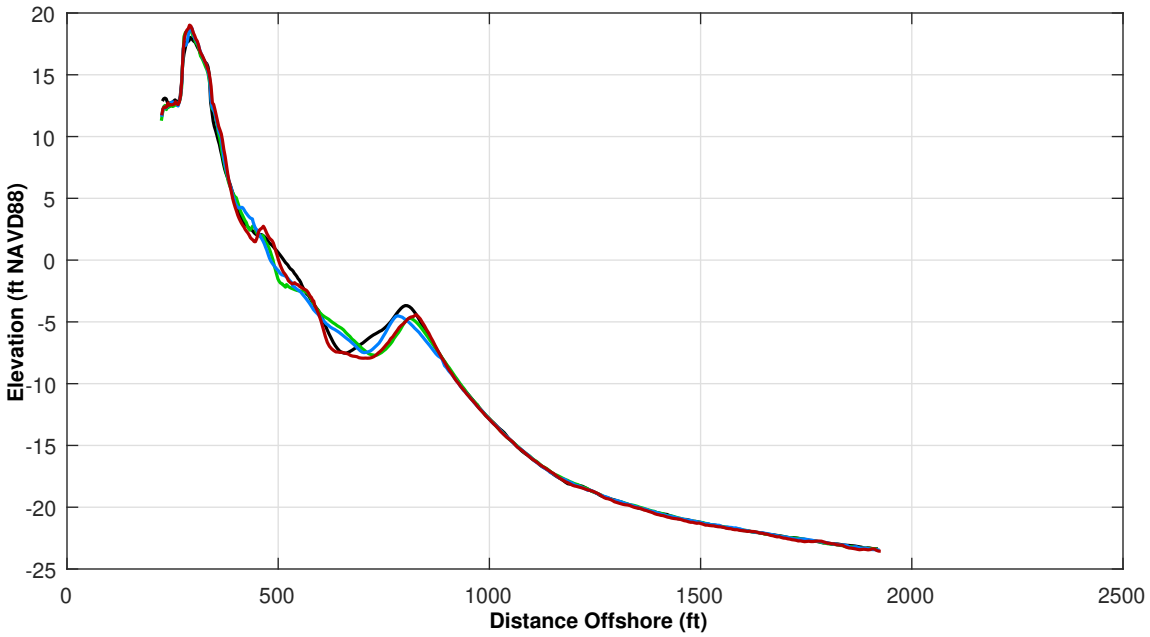
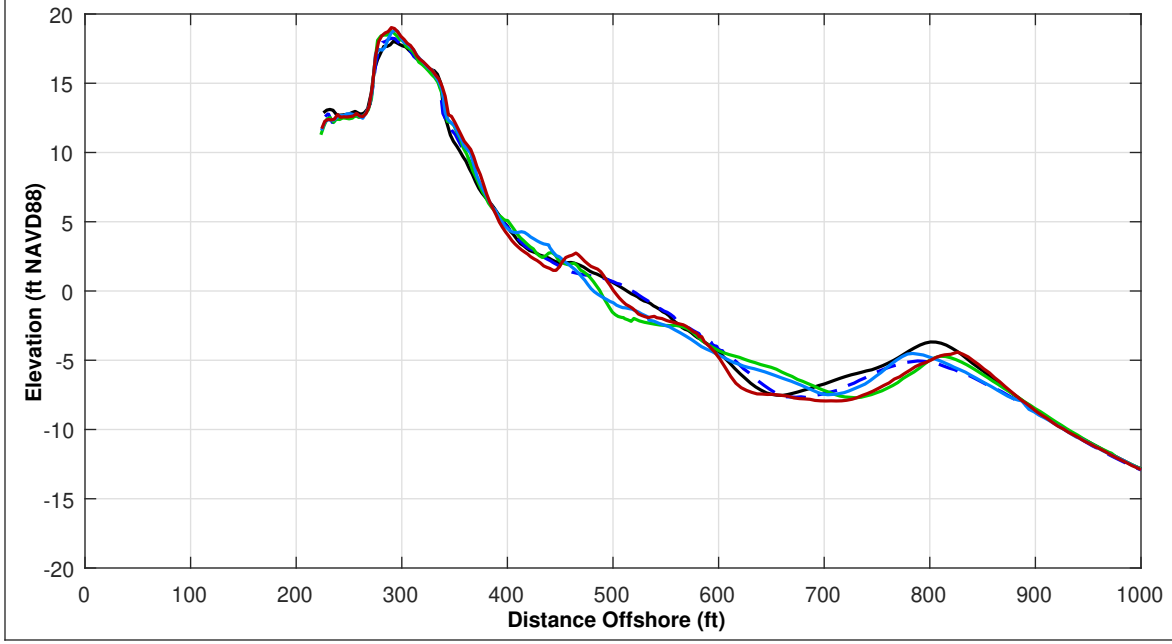
PUBLIC WORKS

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





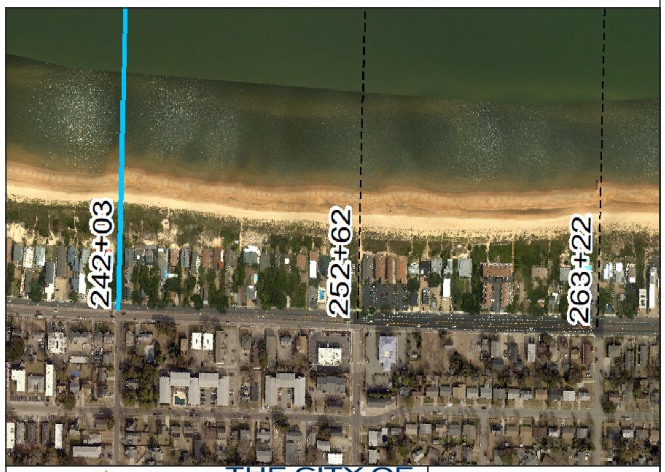
Survey Transect 242+03	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	13.94 ft	21.27 ft
Volume Change Above -15 ft NAVD88	-1.82 cy/ft	-2.75 cy/ft
Volume Change Above 0 ft NAVD88	1.53 cy/ft	0.65 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	N/A	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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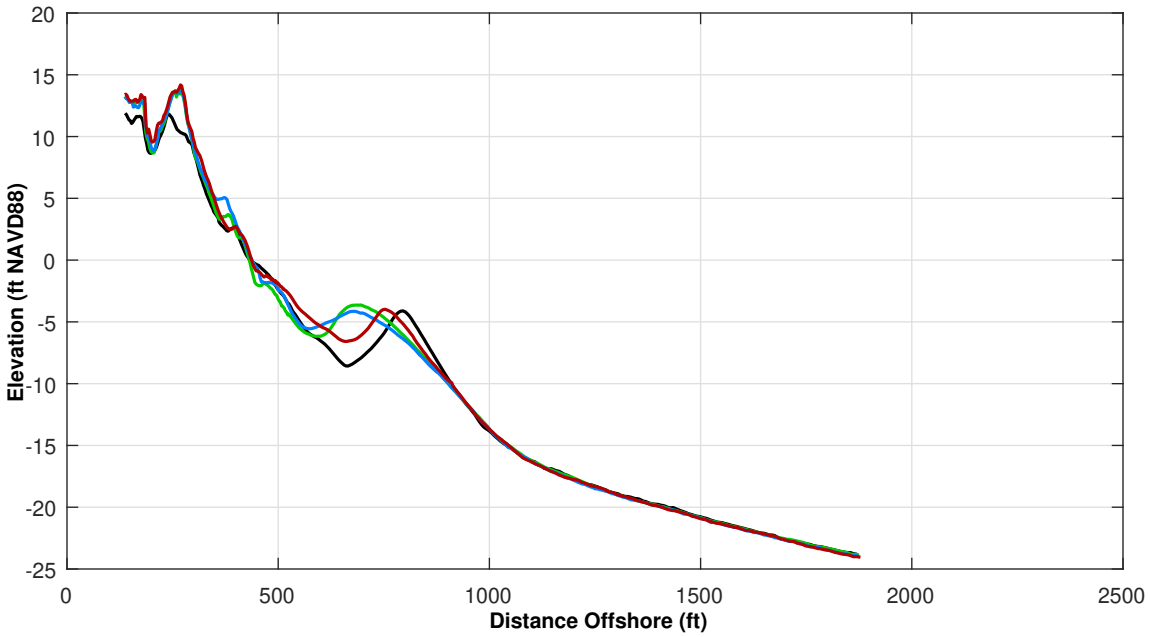
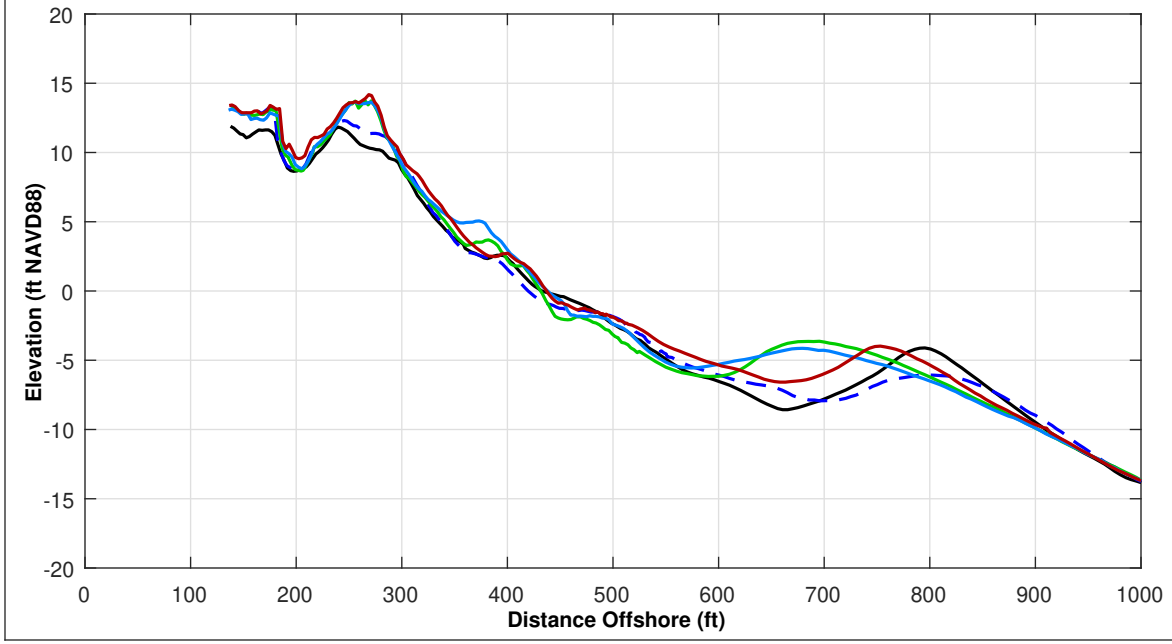
PUBLIC WORKS

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





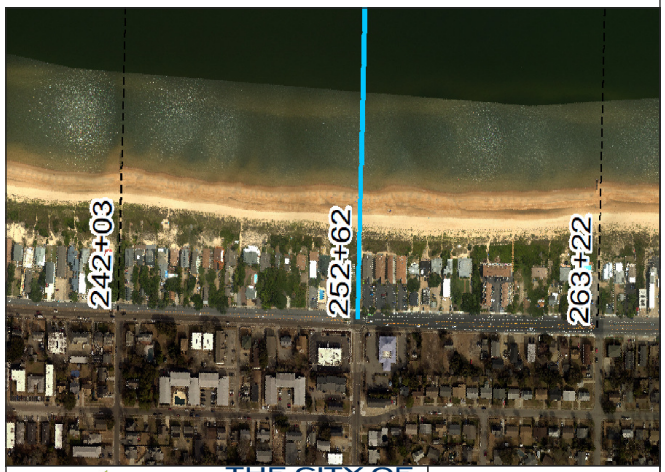
Survey Transect 252+62	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	5.16 ft	2.67 ft
Volume Change Above -15 ft NAVD88	7.78 cy/ft	3.30 cy/ft
Volume Change Above 0 ft NAVD88	4.32 cy/ft	0.86 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	N/A	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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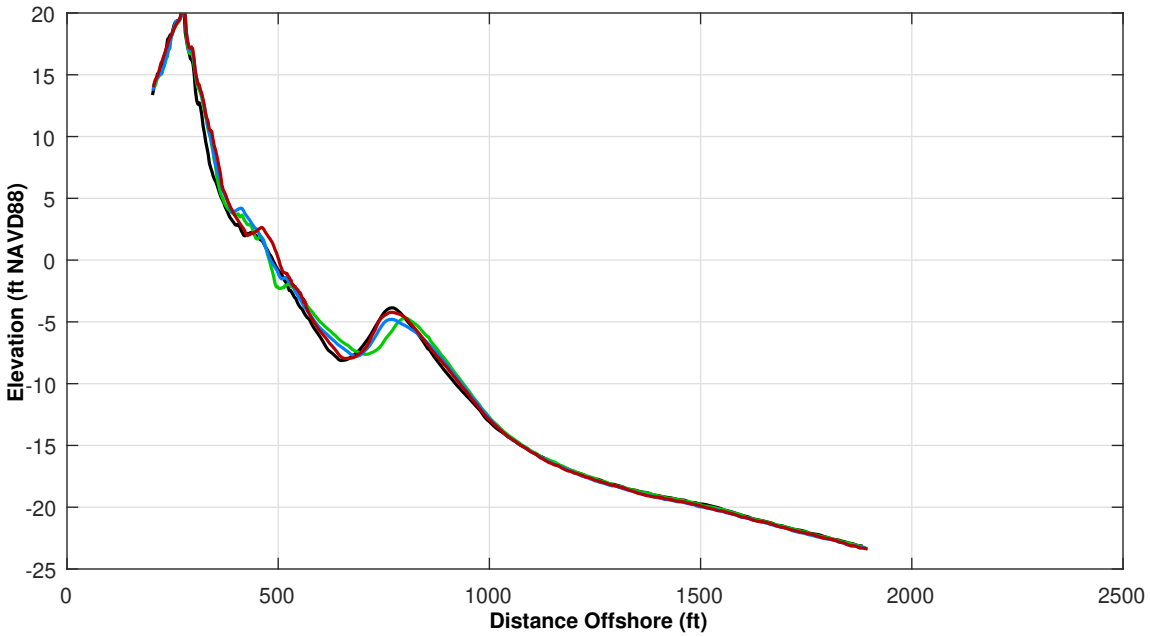
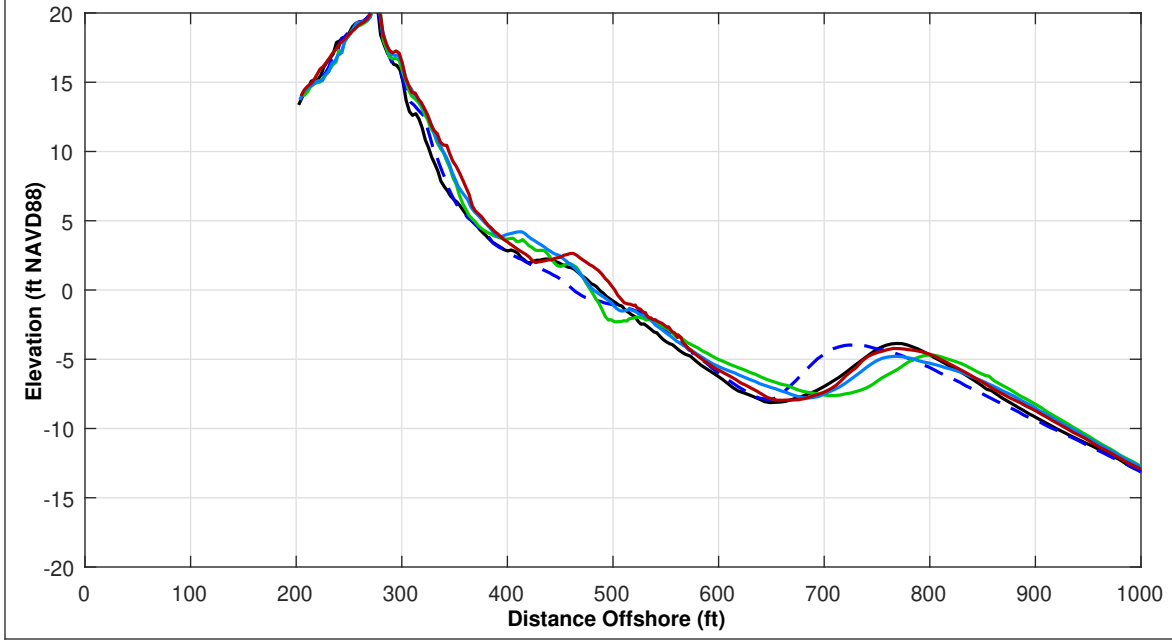
PUBLIC WORKS

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





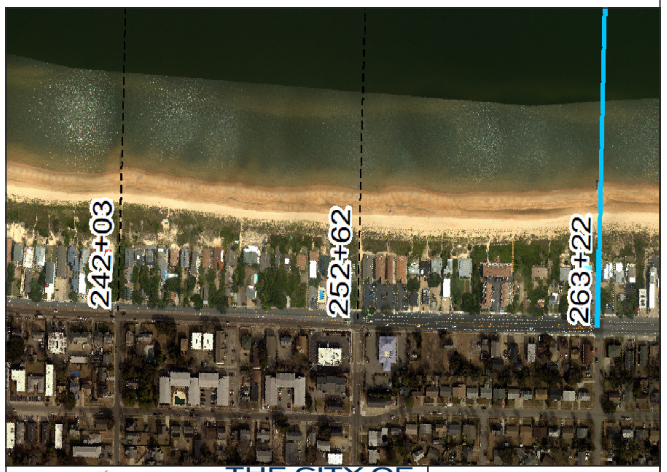
Survey Transect 263+22	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	20.11 ft	20.39 ft
Volume Change Above -15 ft NAVD88	4.95 cy/ft	3.31 cy/ft
Volume Change Above 0 ft NAVD88	4.83 cy/ft	2.03 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	N/A	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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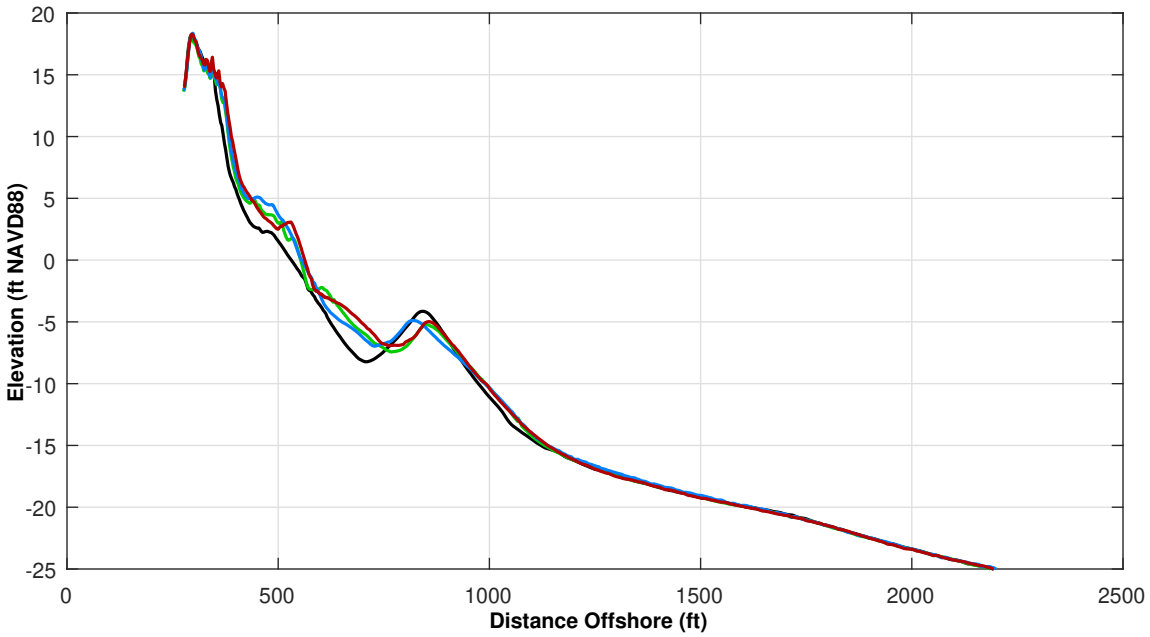
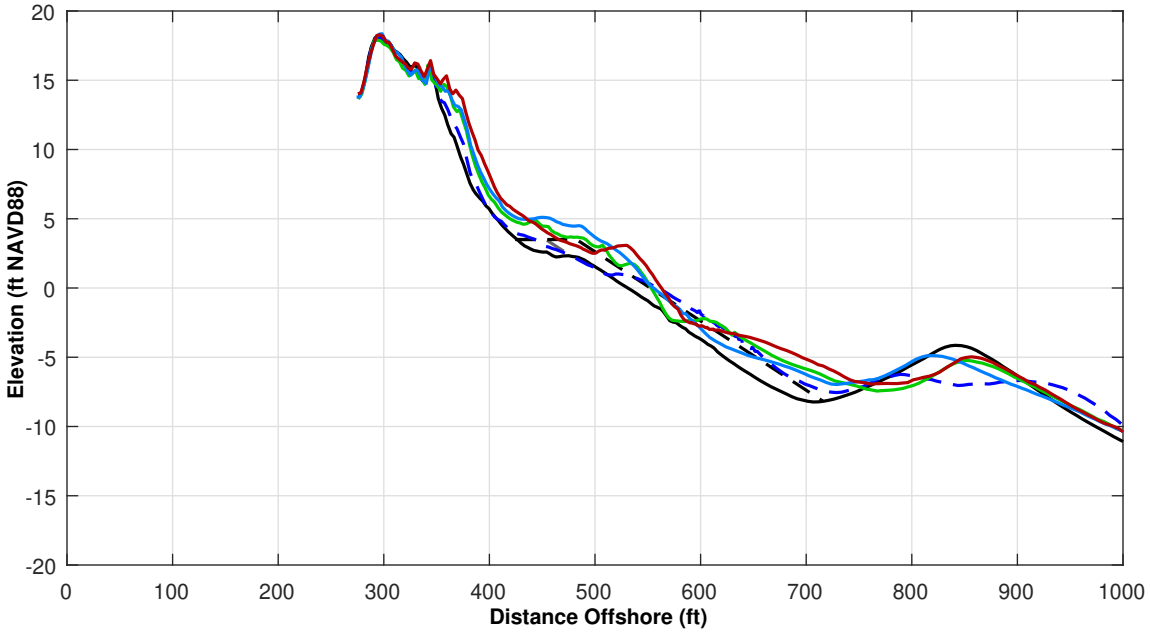
PUBLIC WORKS

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





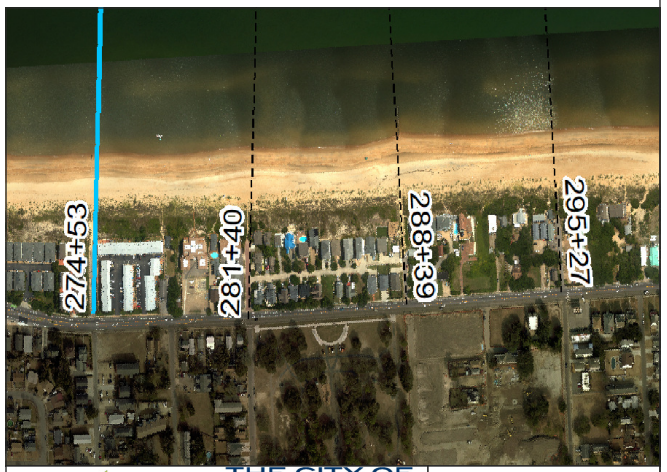
Survey Transect 274+53	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	9.07 ft	10.73 ft
Volume Change Above -15 ft NAVD88	10.13 cy/ft	5.92 cy/ft
Volume Change Above 0 ft NAVD88	5.06 cy/ft	1.09 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	-18.0 ft	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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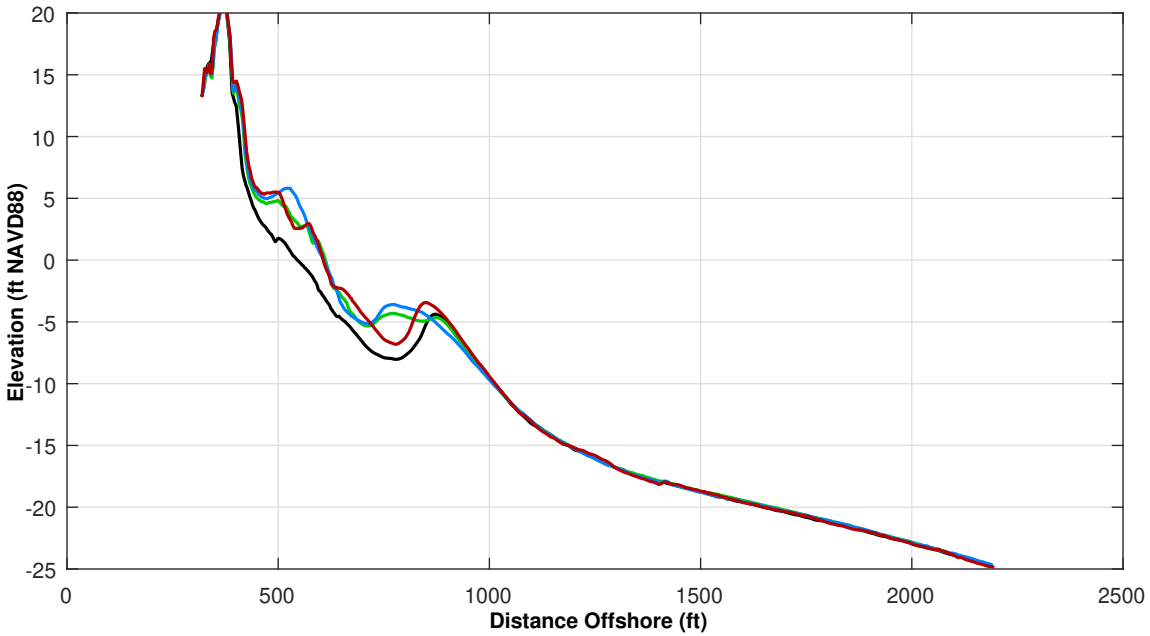
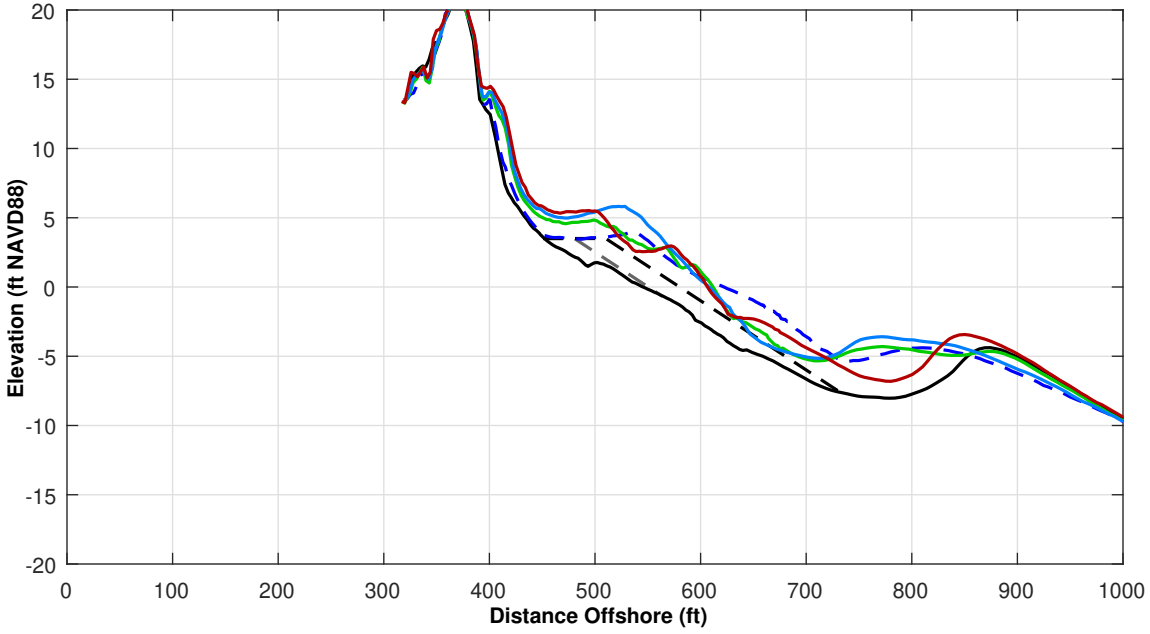
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





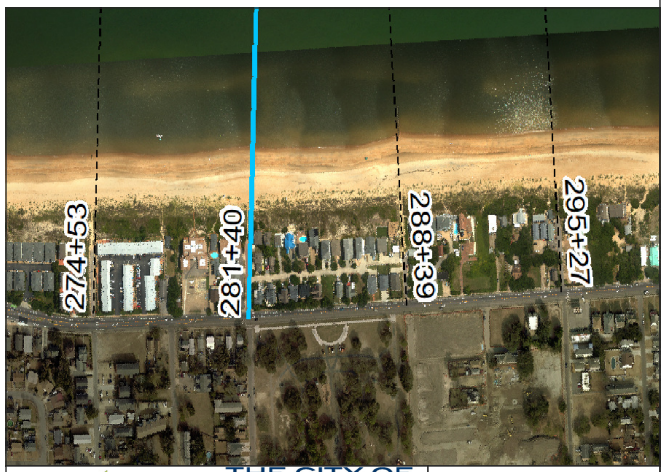
Survey Transect 281+40	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-3.39 ft	4.85 ft
Volume Change Above -15 ft NAVD88	3.99 cy/ft	-2.30 cy/ft
Volume Change Above 0 ft NAVD88	4.45 cy/ft	-1.15 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 14.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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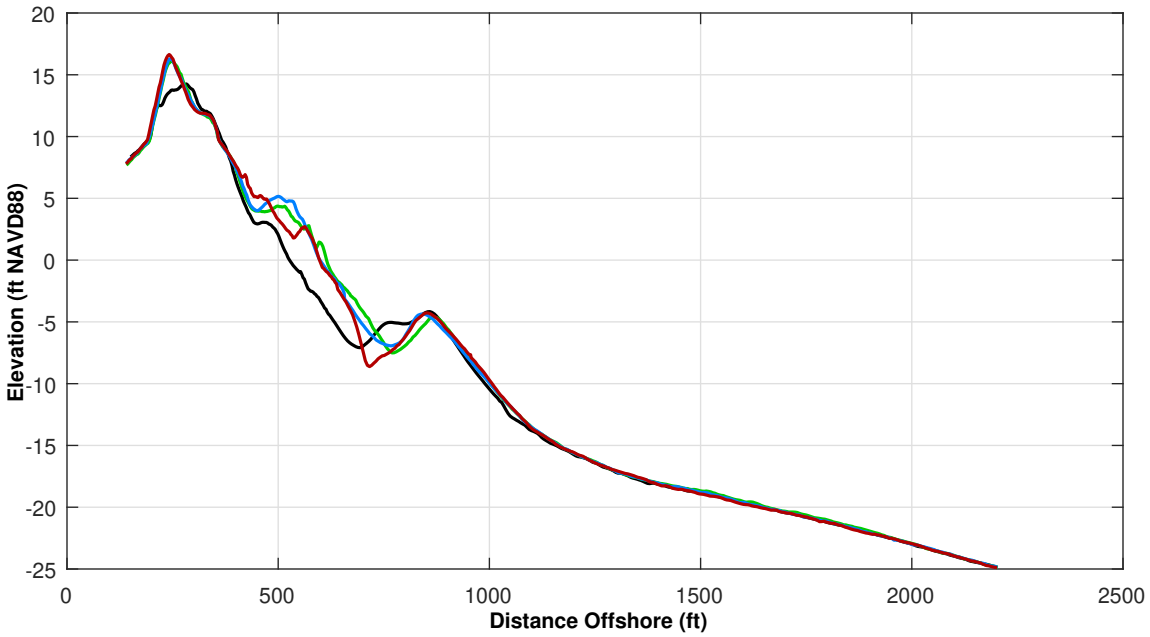
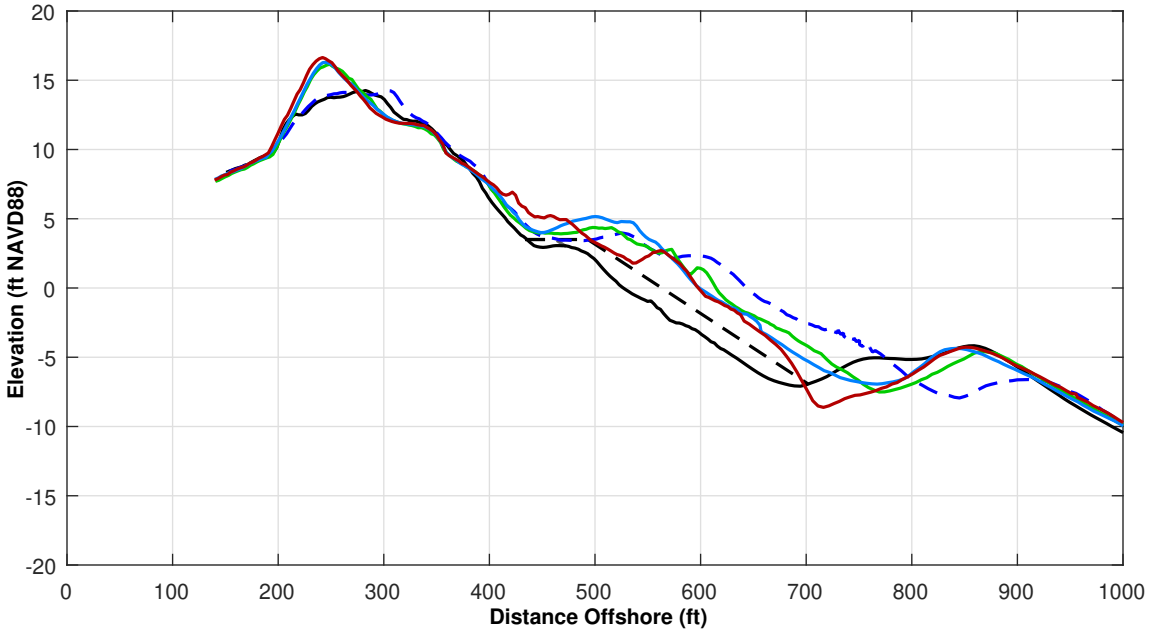
PUBLIC WORKS

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





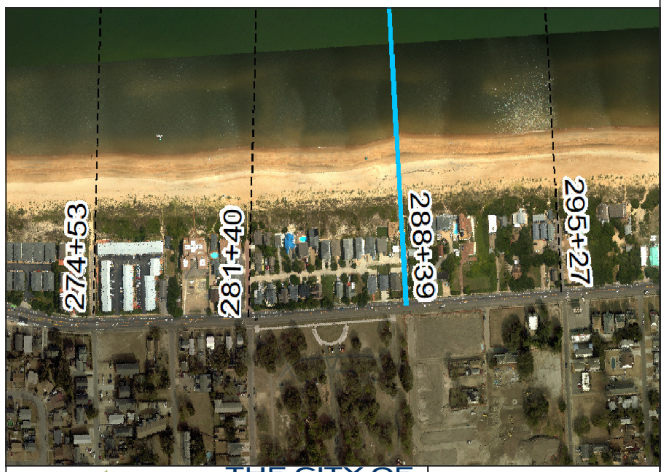
Survey Transect 288+39	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-17.94 ft	2.34 ft
Volume Change Above -15 ft NAVD88	-5.37 cy/ft	-6.11 cy/ft
Volume Change Above 0 ft NAVD88	0.87 cy/ft	-1.79 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 1.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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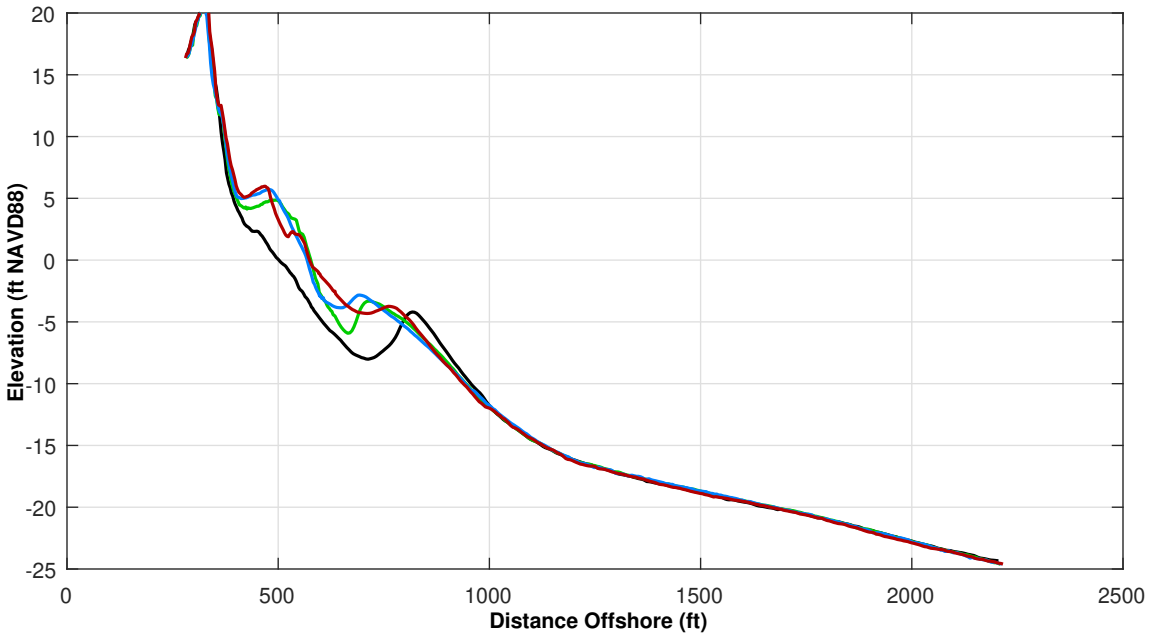
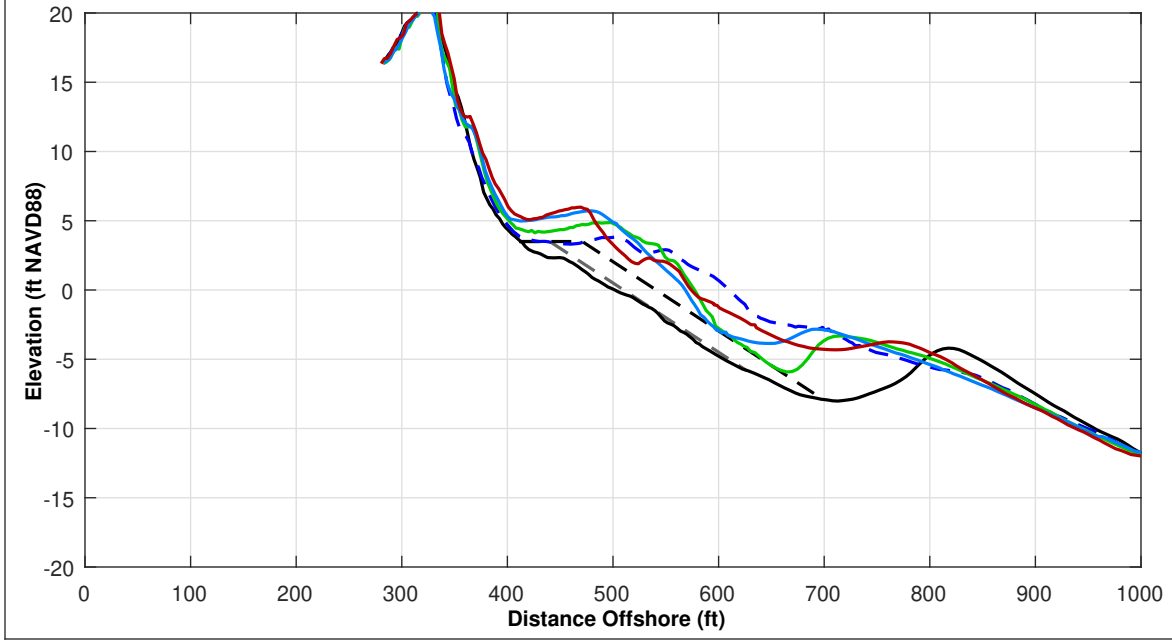
PUBLIC WORKS

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

ST 288+39	Pg 71 of 106	Spring 2020





Survey Transect 295+27	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-2.96 ft	8.61 ft
Volume Change Above -15 ft NAVD88	7.79 cy/ft	4.59 cy/ft
Volume Change Above 0 ft NAVD88	2.66 cy/ft	1.99 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 26.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.

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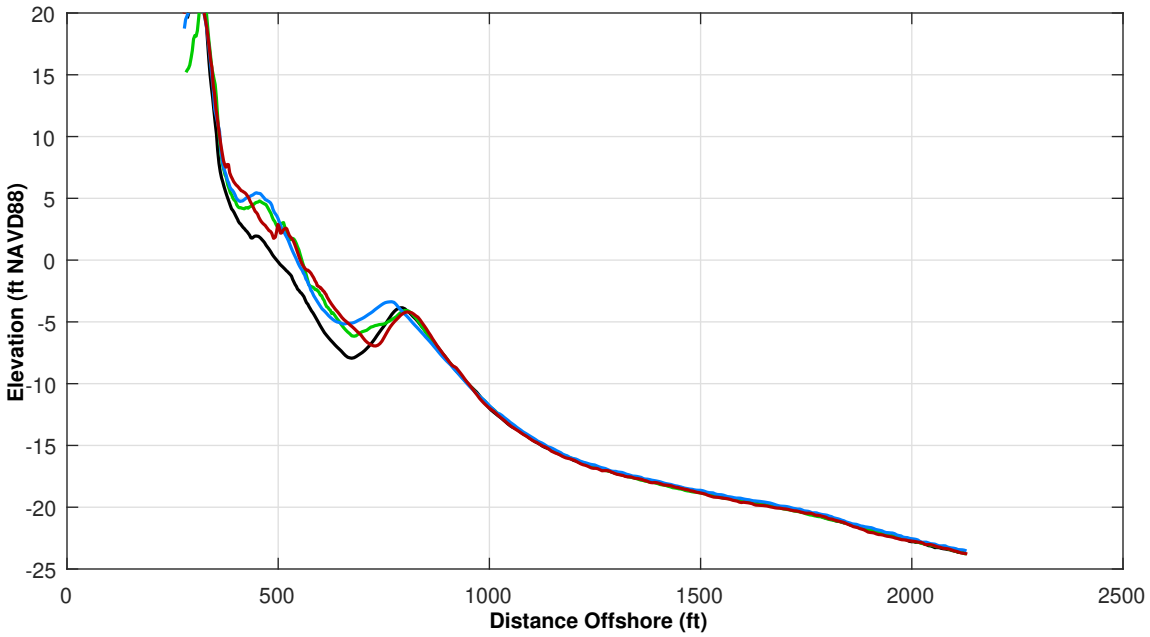
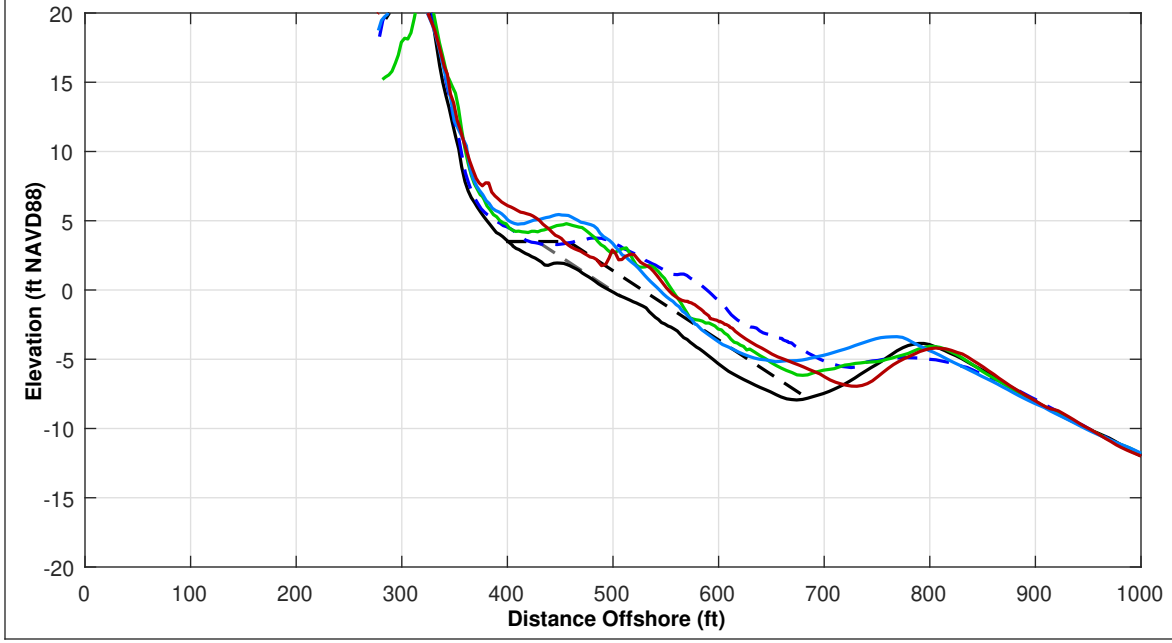
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





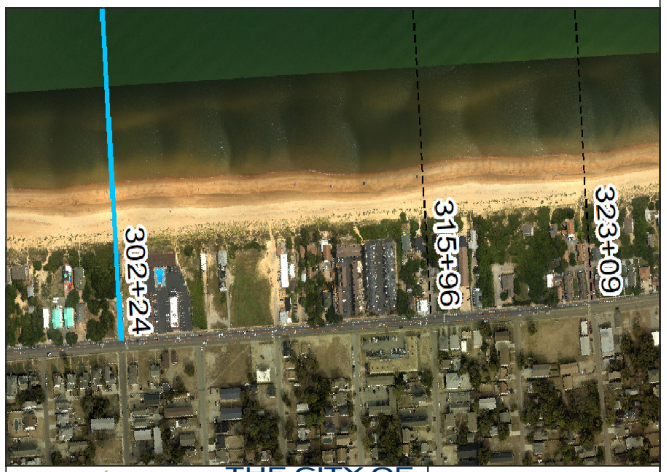
Survey Transect 302+24	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-4.69 ft	11.32 ft
Volume Change Above -15 ft NAVD88	4.14 cy/ft	-3.82 cy/ft
Volume Change Above 0 ft NAVD88	4.30 cy/ft	-1.05 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		-7.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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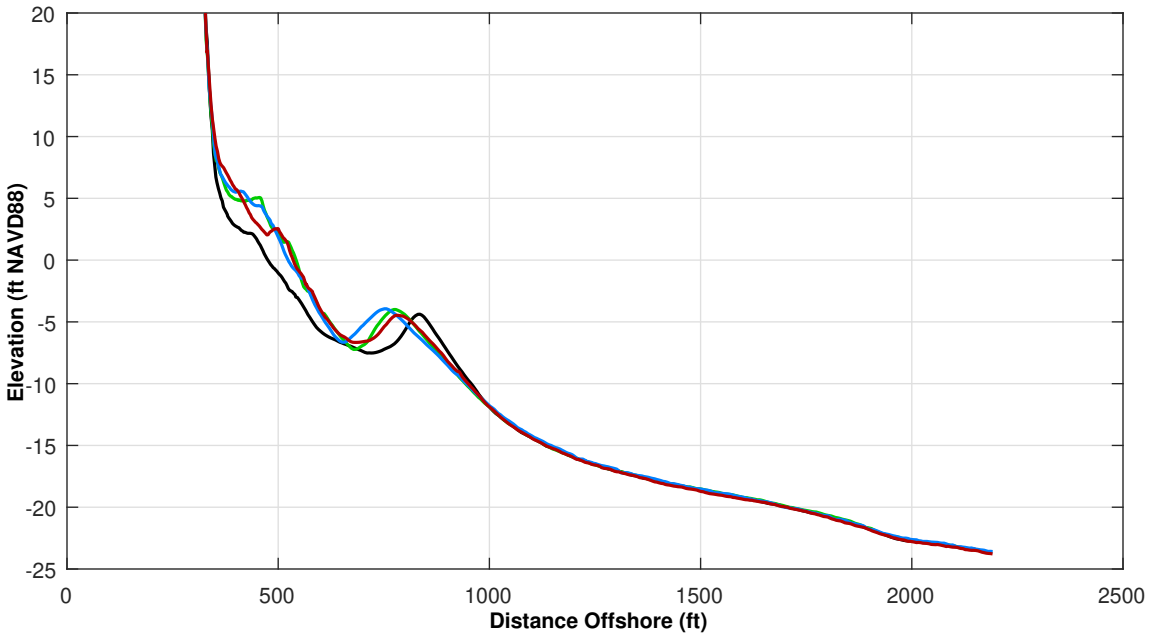
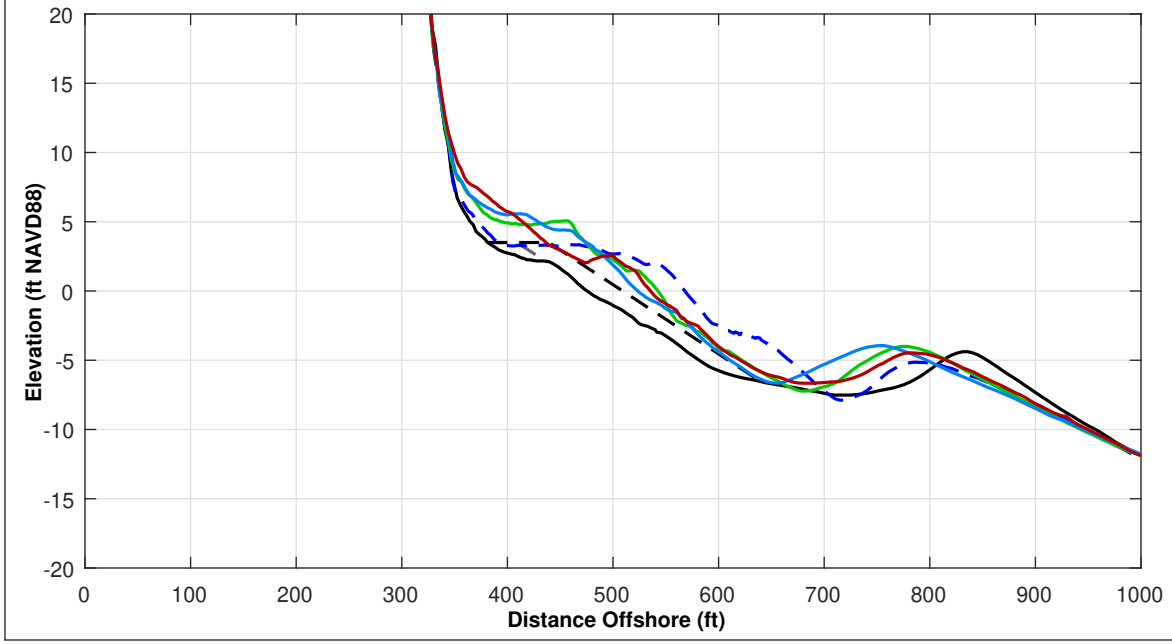
PUBLIC WORKS

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





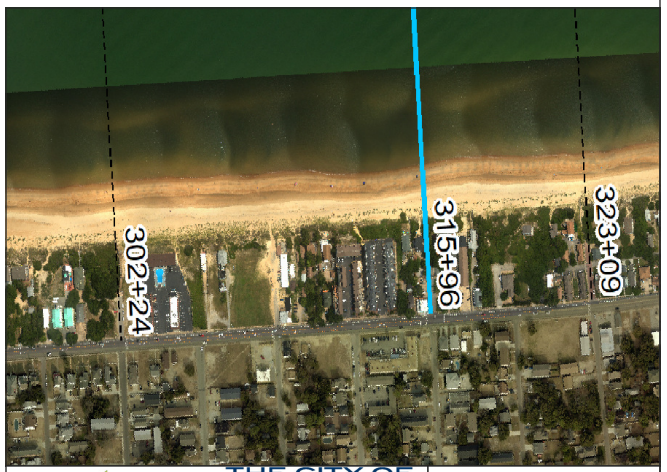
Survey Transect 315+96	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-5.55 ft	14.53 ft
Volume Change Above -15 ft NAVD88	-0.20 cy/ft	-1.51 cy/ft
Volume Change Above 0 ft NAVD88	-0.80 cy/ft	-0.59 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		-5.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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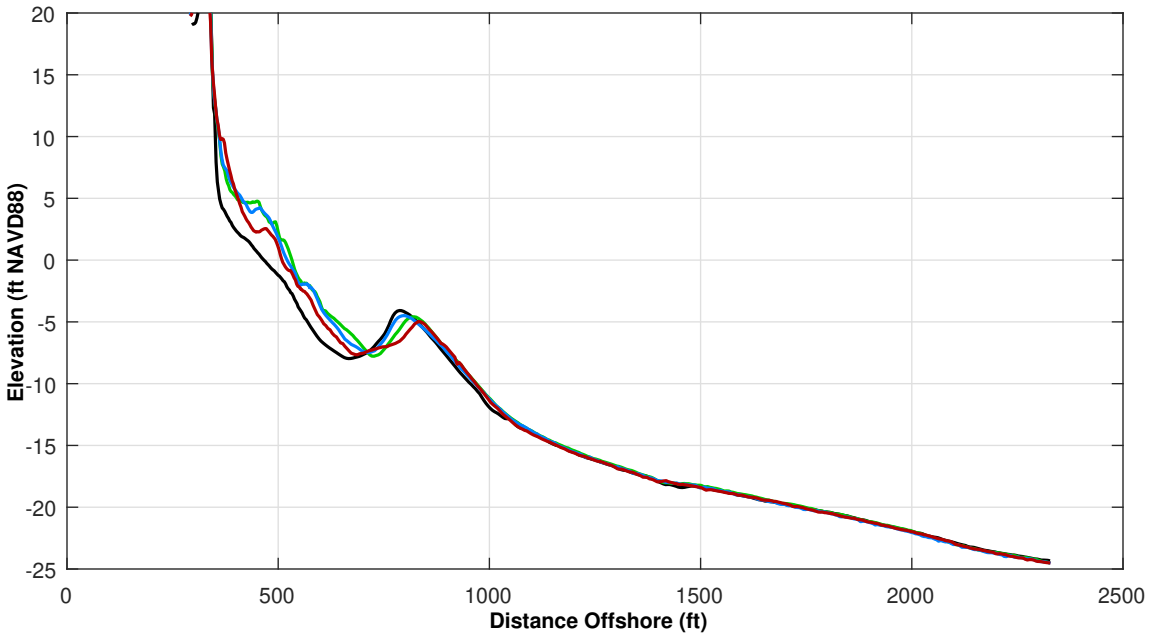
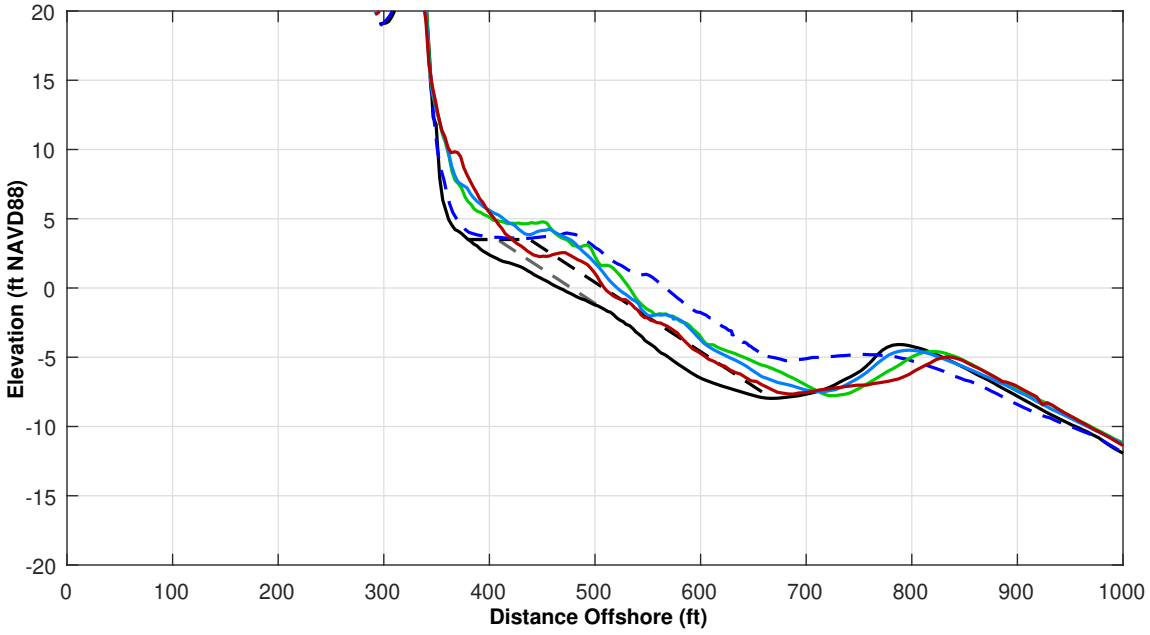
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





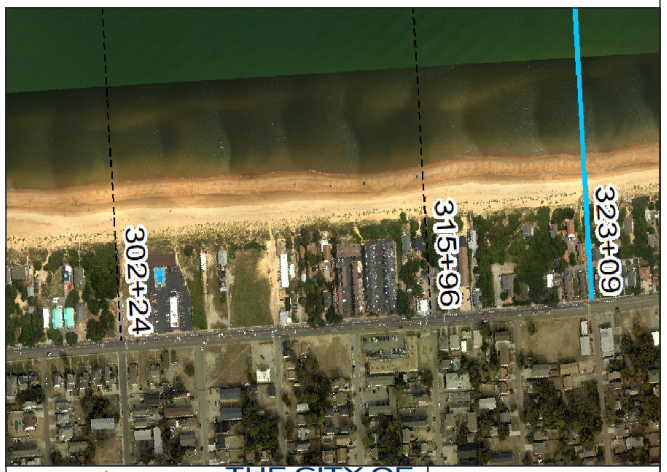
Survey Transect 323+09	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	ft	ft
Volume Change Above -15 ft NAVD88	cy/ft	cy/ft
Volume Change Above 0 ft NAVD88	cy/ft	cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	-17.0 ft	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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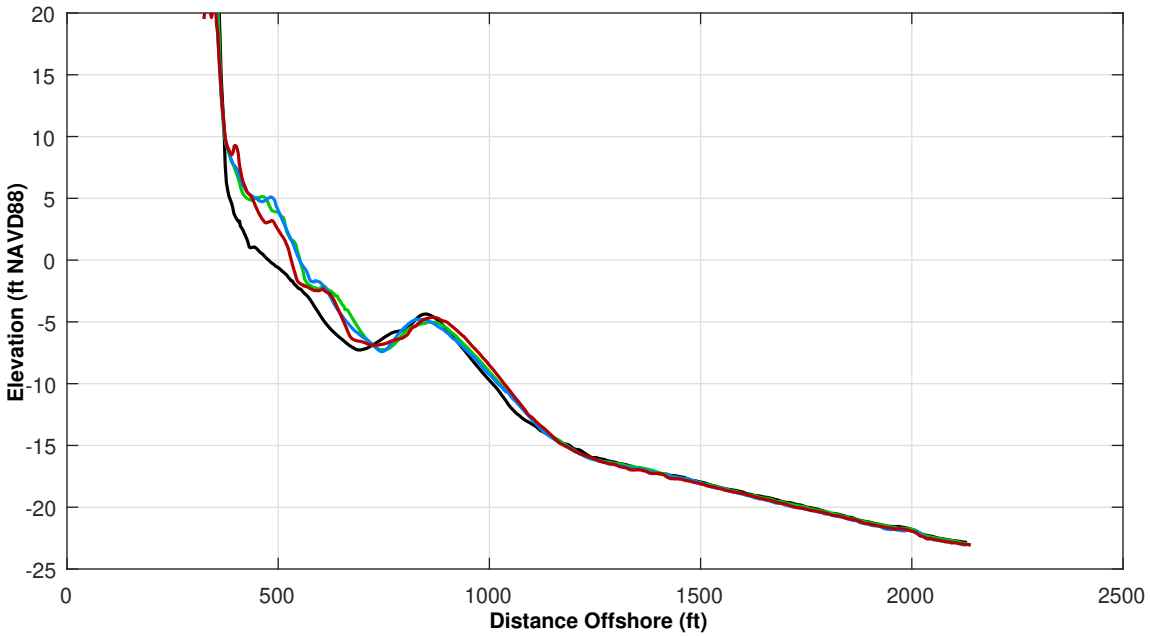
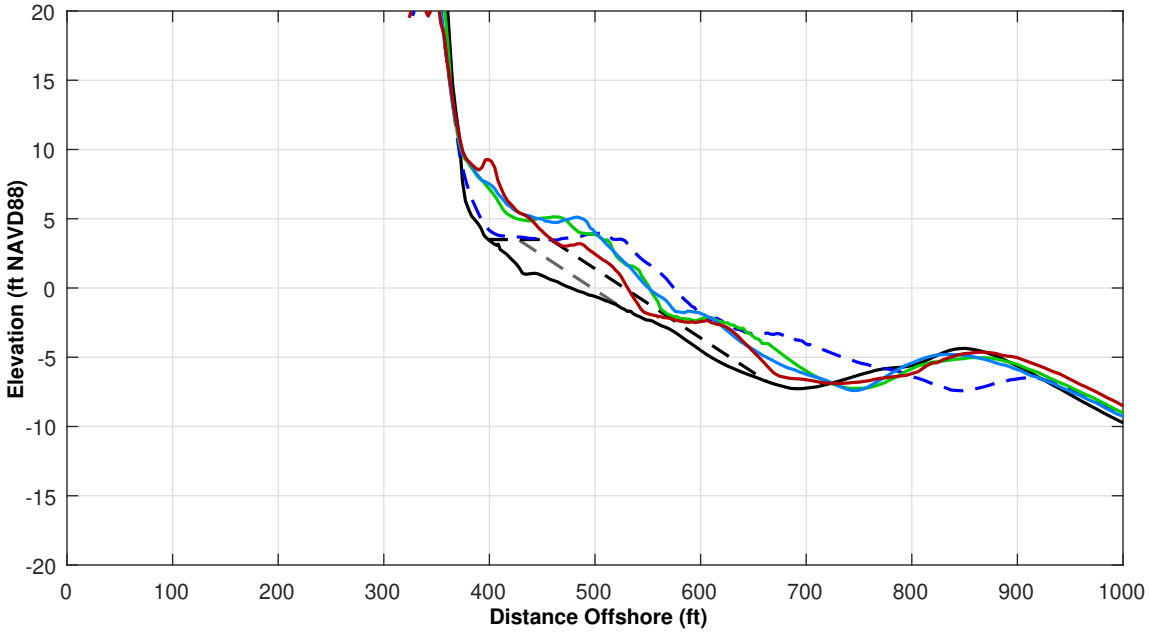
PUBLIC WORKS

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





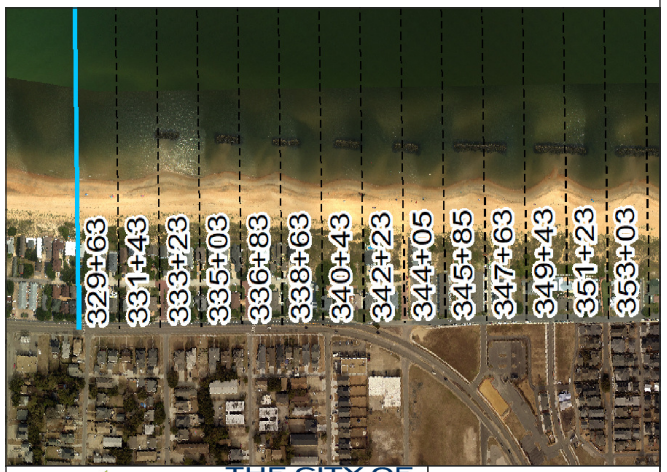
Survey Transect 329+63	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-20.26 ft	-15.63 ft
Volume Change Above -15 ft NAVD88	-5.31 cy/ft	-3.03 cy/ft
Volume Change Above 0 ft NAVD88	-4.50 cy/ft	-4.43 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	+ 1.0 ft	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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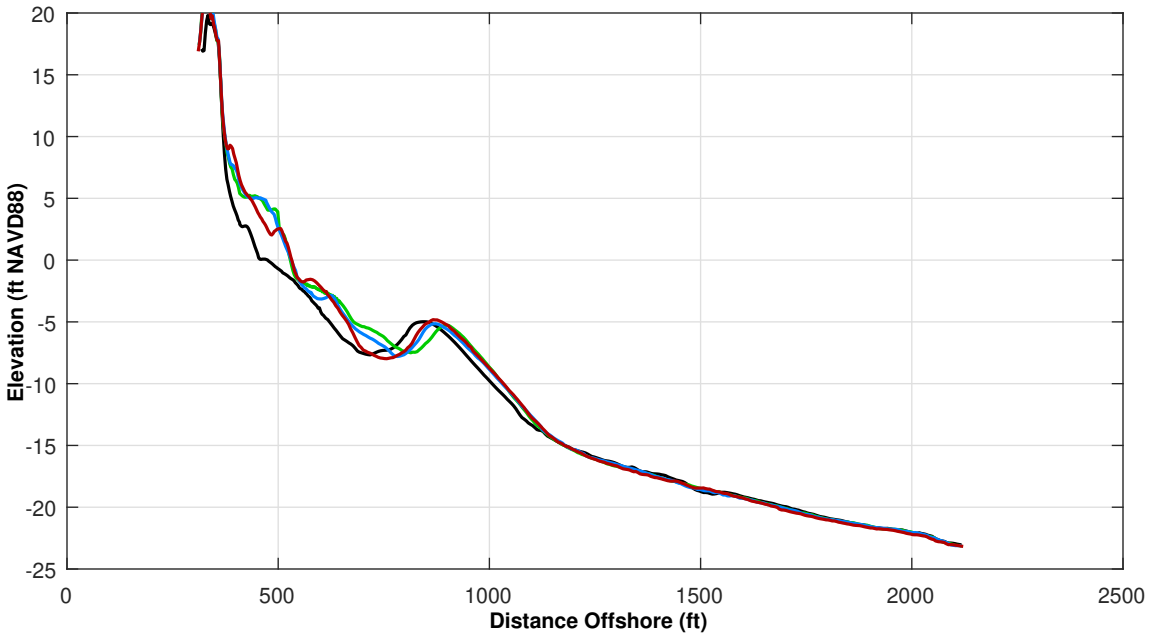
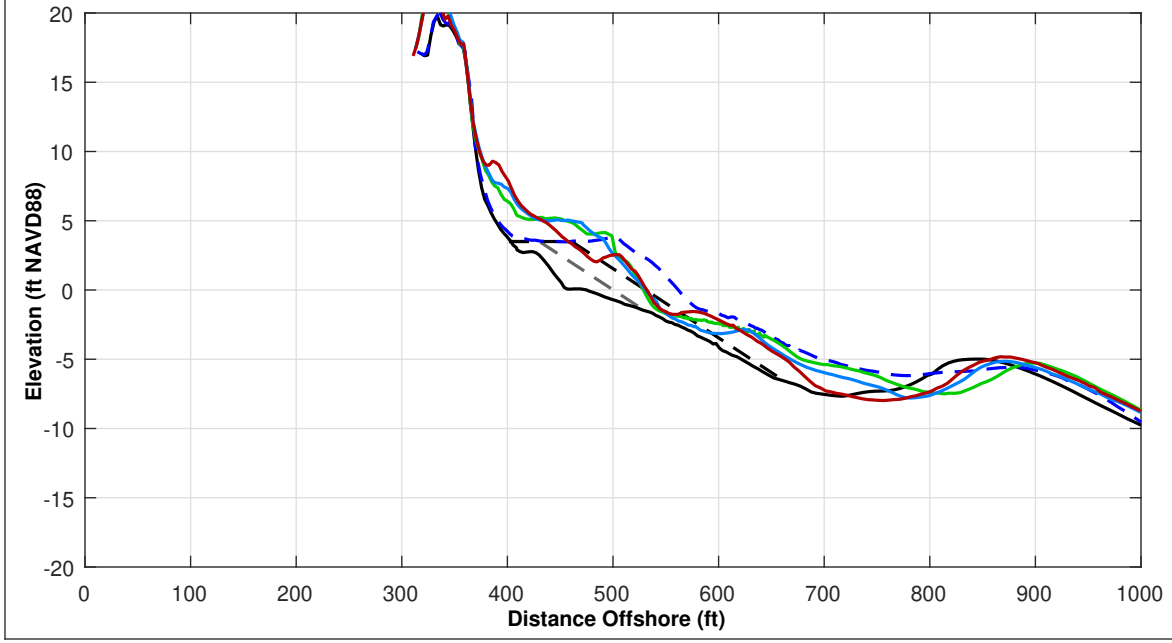
ST 329+63	Pg 76 of 106	Spring 2020





Survey Transect 331+43	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	2.14 ft	4.99 ft
Volume Change Above -15 ft NAVD88	-5.01 cy/ft	-2.07 cy/ft
Volume Change Above 0 ft NAVD88	-1.81 cy/ft	-2.45 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	-6.0 ft	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.

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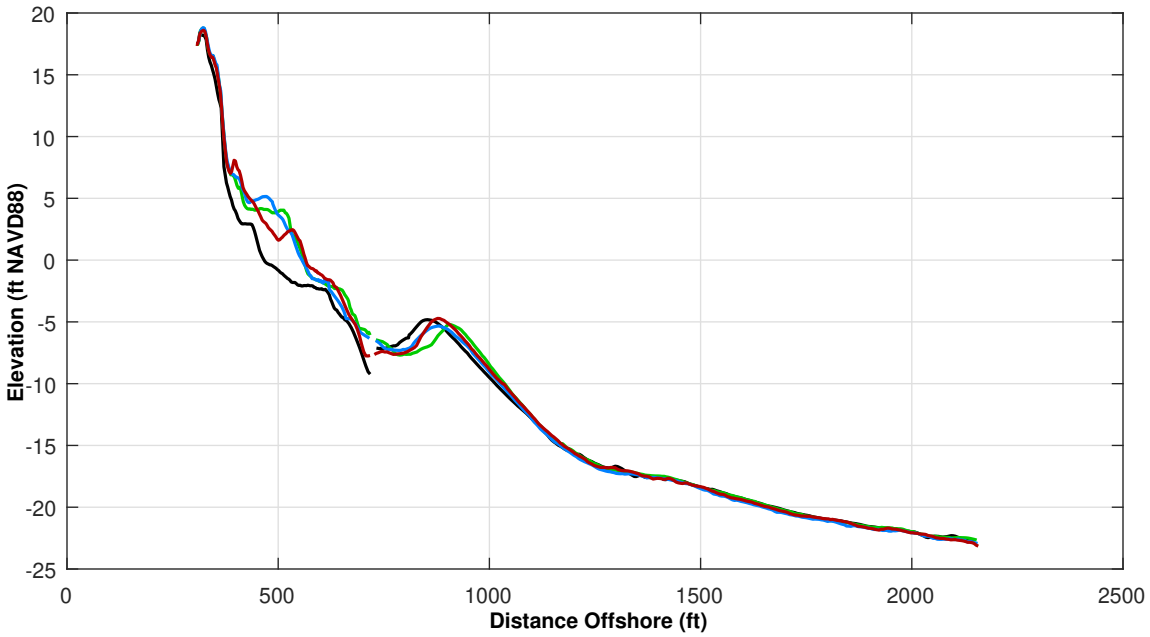
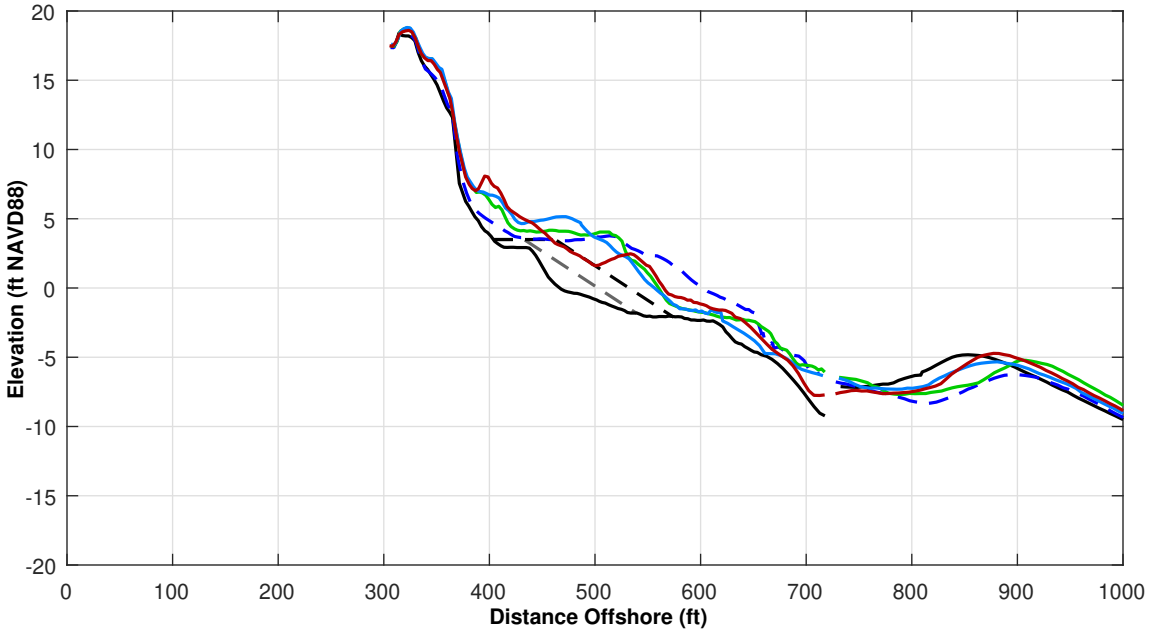
PUBLIC WORKS

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





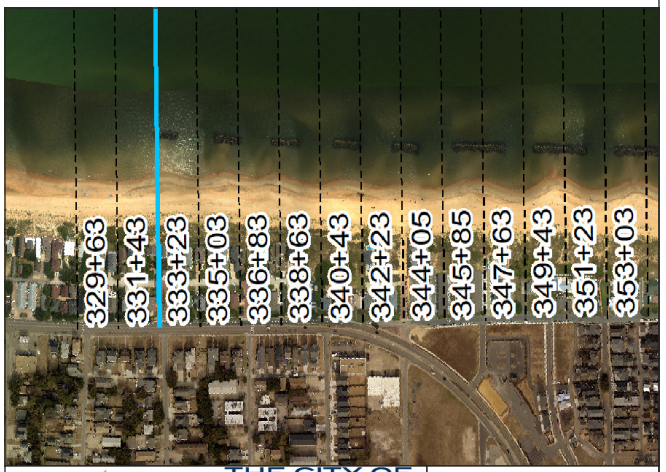
Survey Transect 333+23	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	5.72 ft	13.41 ft
Volume Change Above -15 ft NAVD88	1.40 cy/ft	1.03 cy/ft
Volume Change Above 0 ft NAVD88	-1.79 cy/ft	-3.51 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	-4.0 ft	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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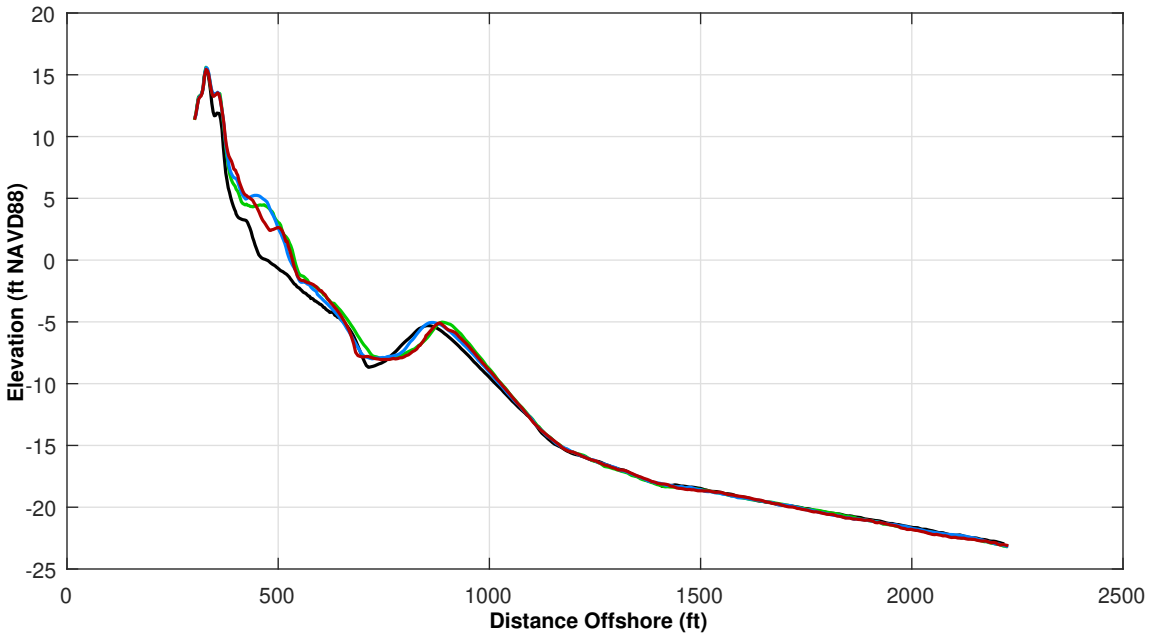
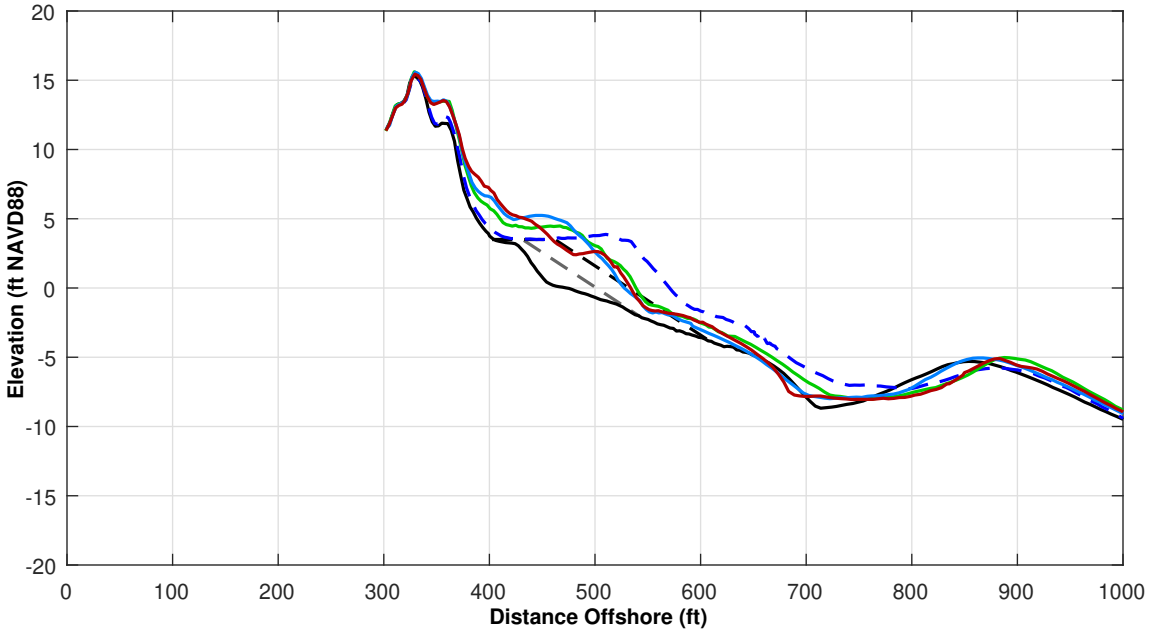
PUBLIC WORKS

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

ST 333+23	Pg 78 of 106	Spring 2020





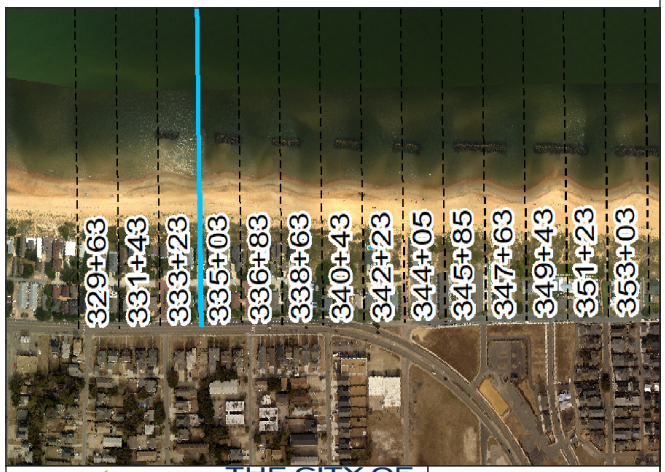
Survey Transect 335+03	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-6.20 ft	6.55 ft
Volume Change Above -15 ft NAVD88	-5.13 cy/ft	-2.12 cy/ft
Volume Change Above 0 ft NAVD88	-0.27 cy/ft	-1.40 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		-4.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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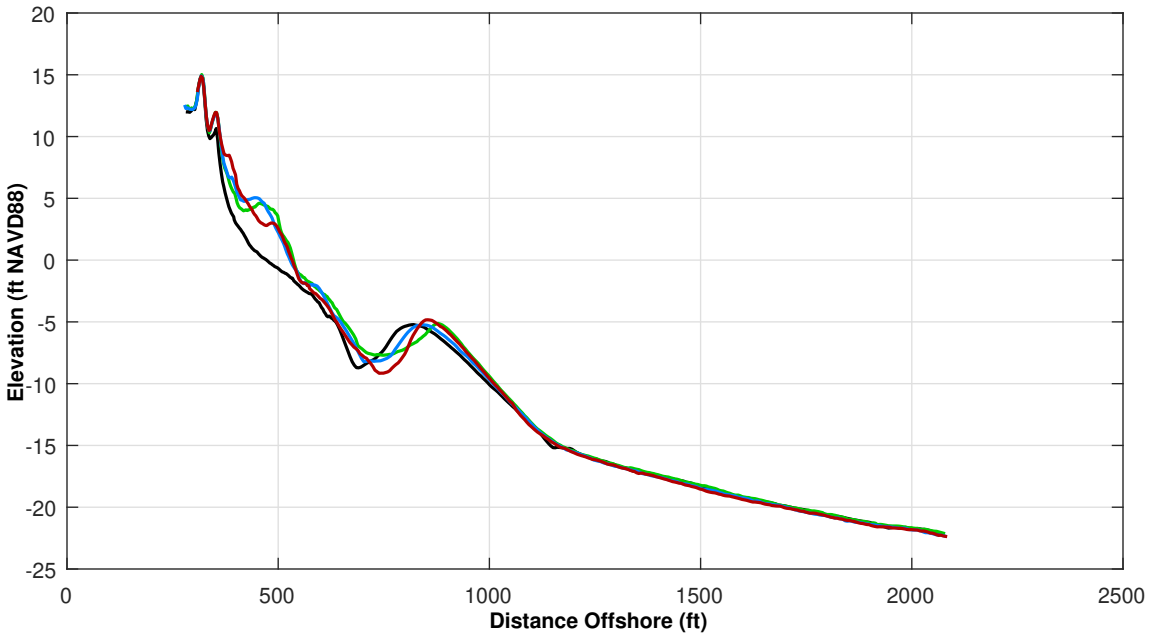
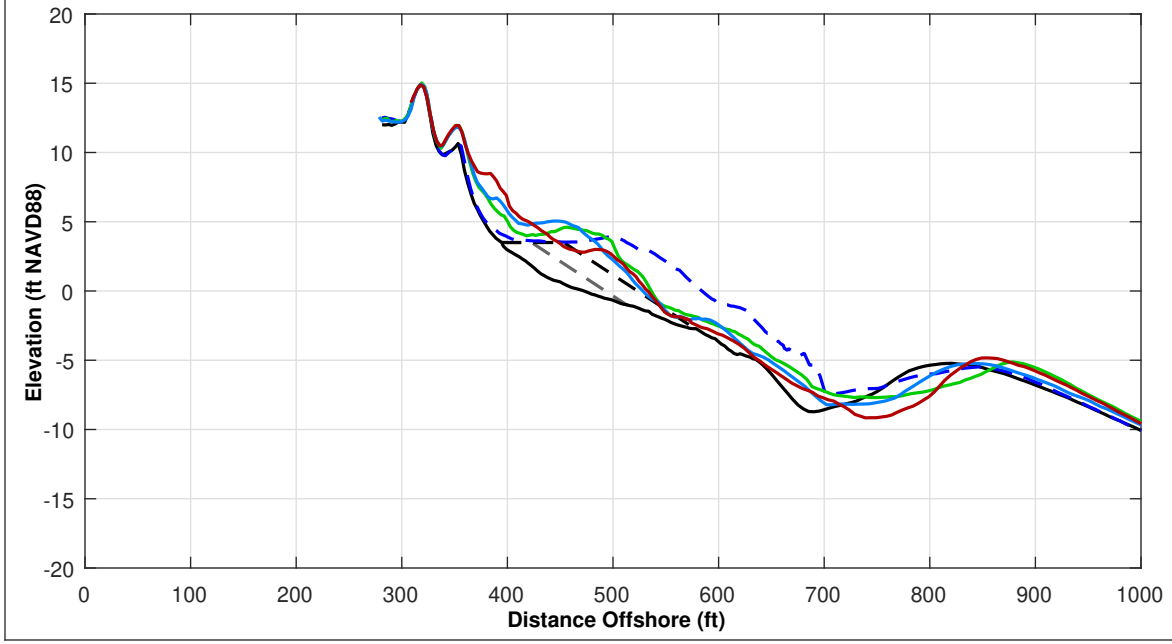
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





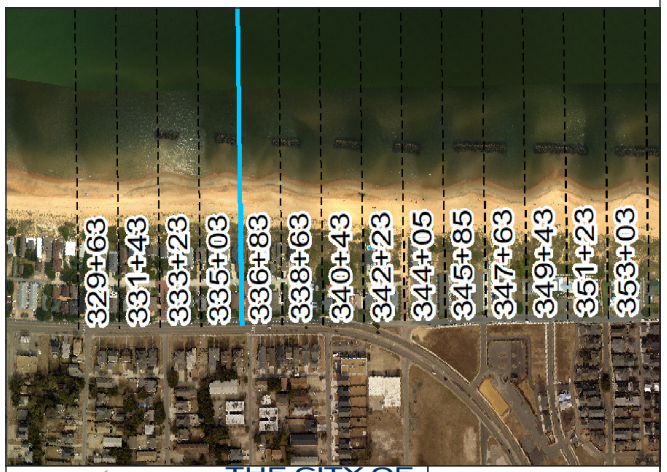
Survey Transect 336+83	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-6.40 ft	5.56 ft
Volume Change Above -15 ft NAVD88	-8.04 cy/ft	-4.15 cy/ft
Volume Change Above 0 ft NAVD88	0.05 cy/ft	-0.32 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		-7.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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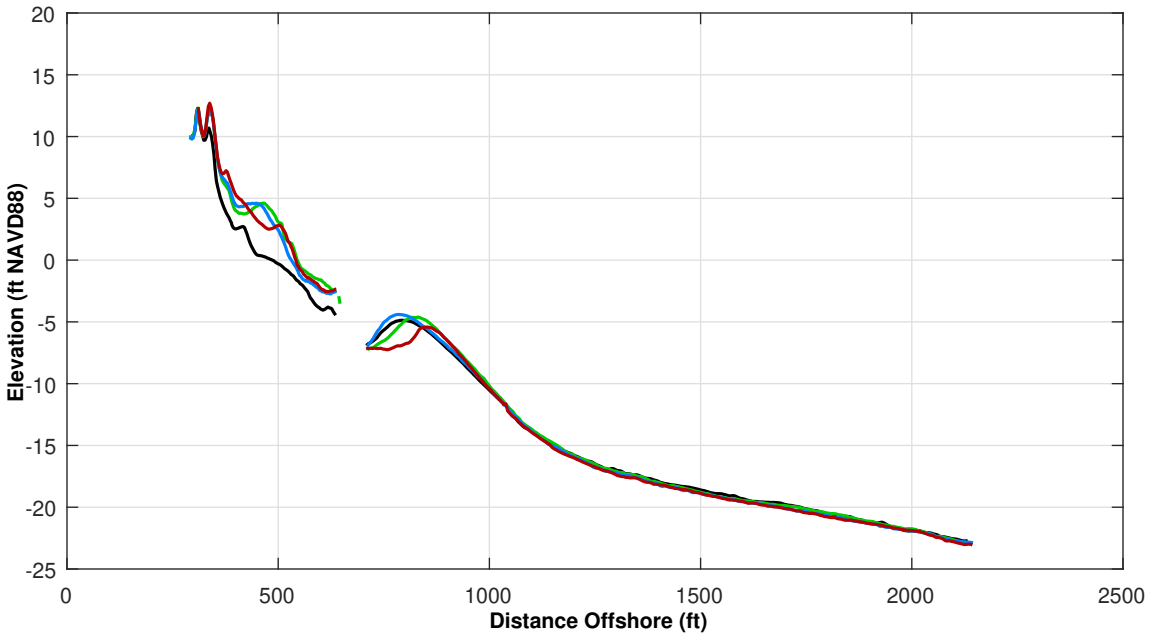
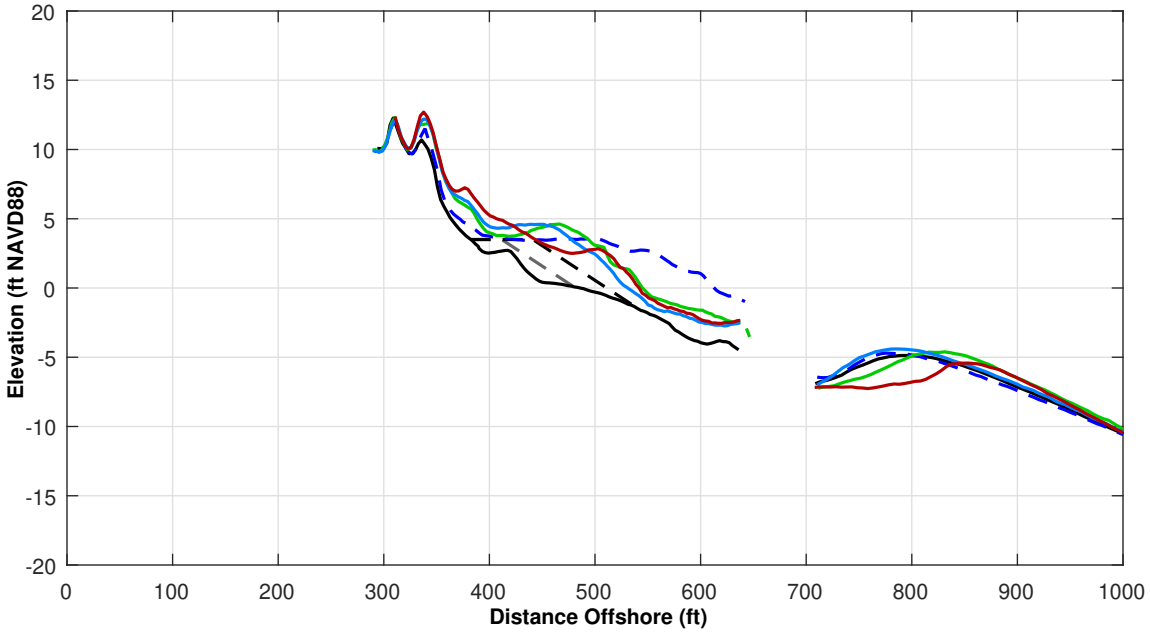




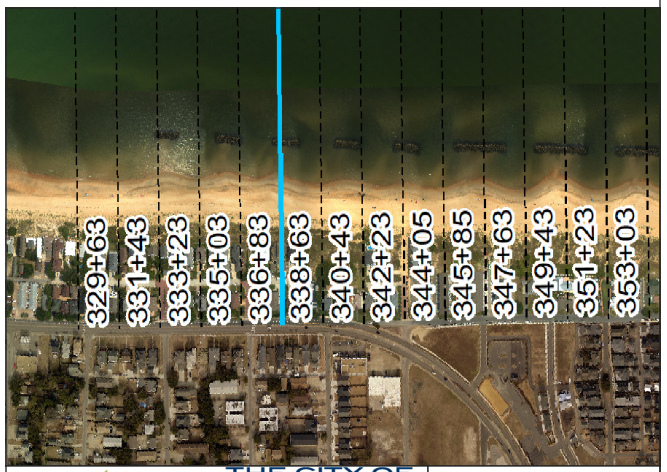
Survey Transect 338+63	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-4.14 ft	13.72 ft
Volume Change Above -15 ft NAVD88	-9.16 cy/ft	-5.66 cy/ft
Volume Change Above 0 ft NAVD88	-0.27 cy/ft	0.56 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 2.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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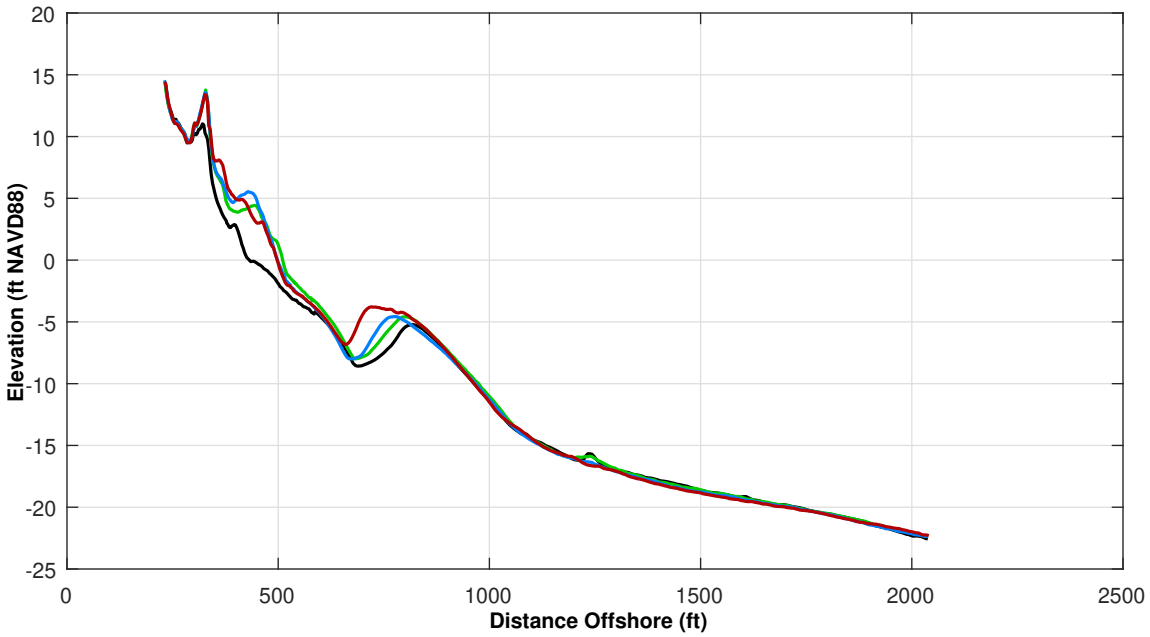

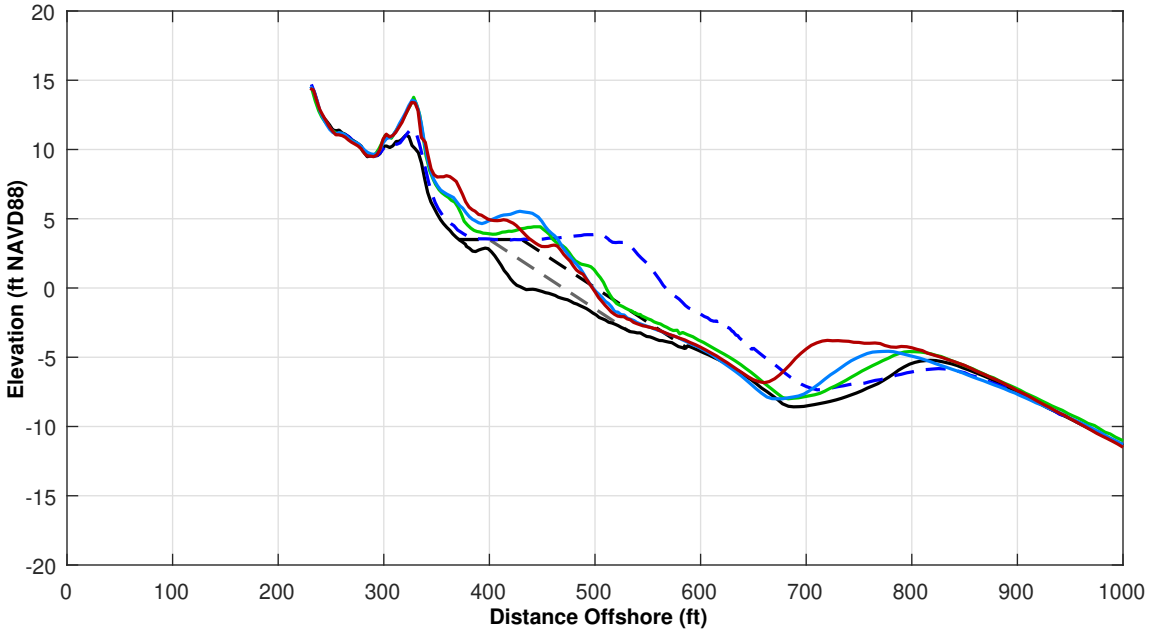

Survey Transect 340+43	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-13.73 ft	-0.77 ft
Volume Change Above -15 ft NAVD88	6.69 cy/ft	9.35 cy/ft
Volume Change Above 0 ft NAVD88	1.05 cy/ft	-1.38 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	+ 7.0 ft	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.

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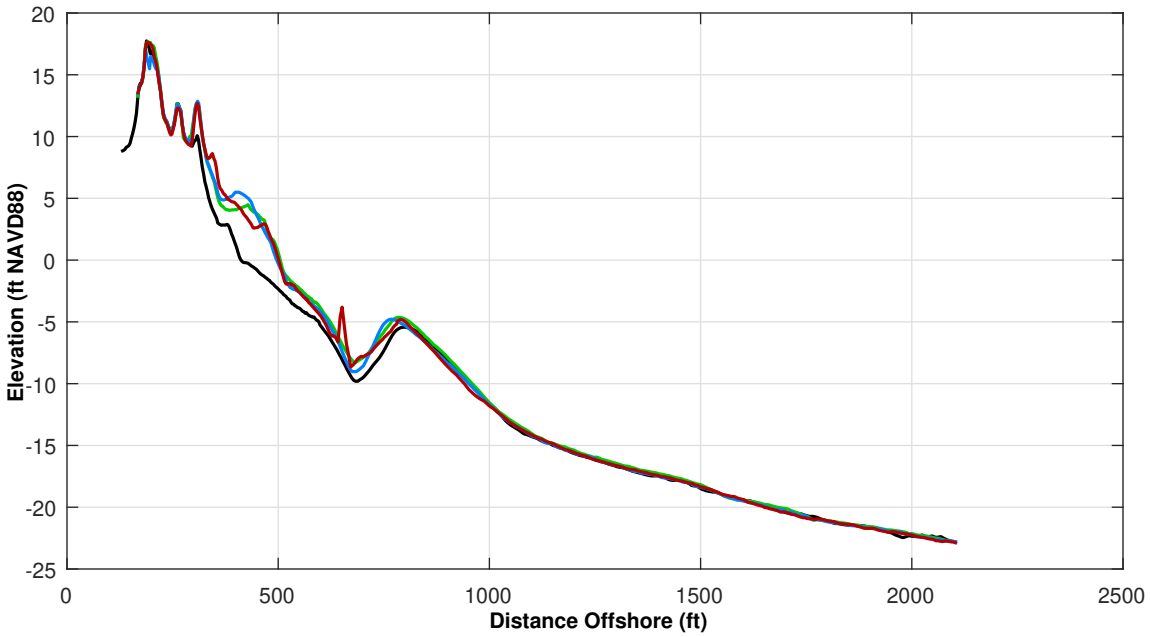
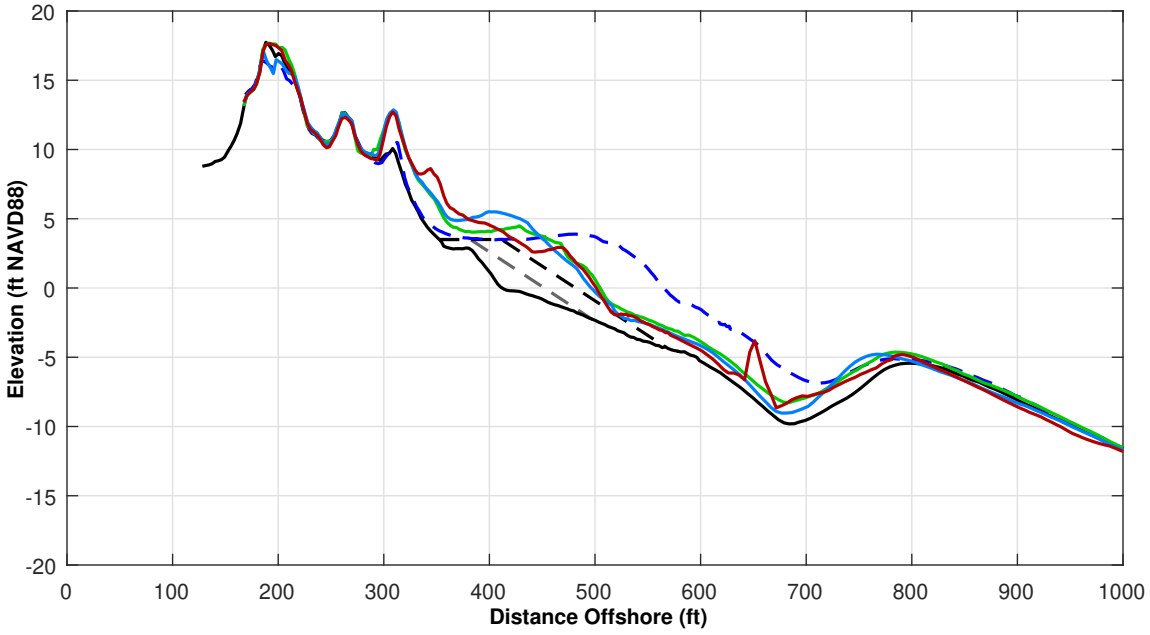




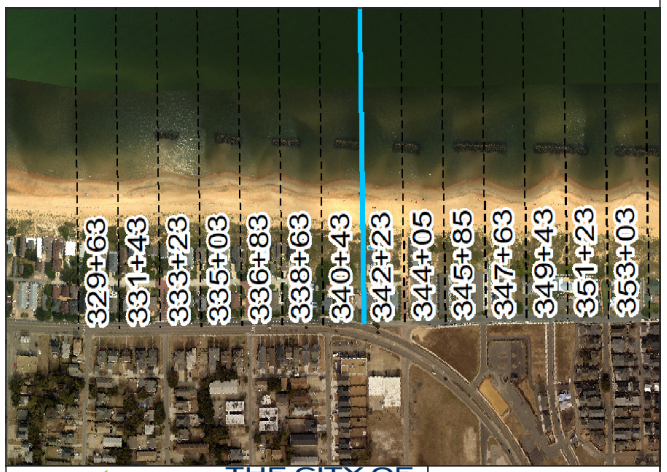
Survey Transect 342+23	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-4.22 ft	5.93 ft
Volume Change Above -15 ft NAVD88	-7.53 cy/ft	-0.87 cy/ft
Volume Change Above 0 ft NAVD88	0.01 cy/ft	-0.65 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 11.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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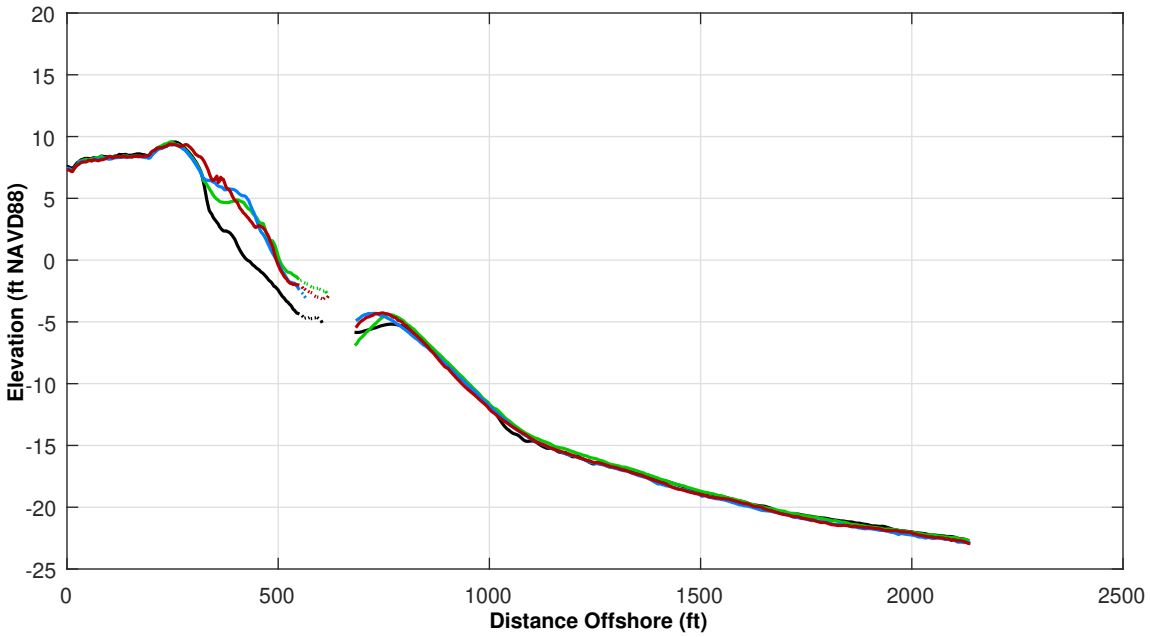
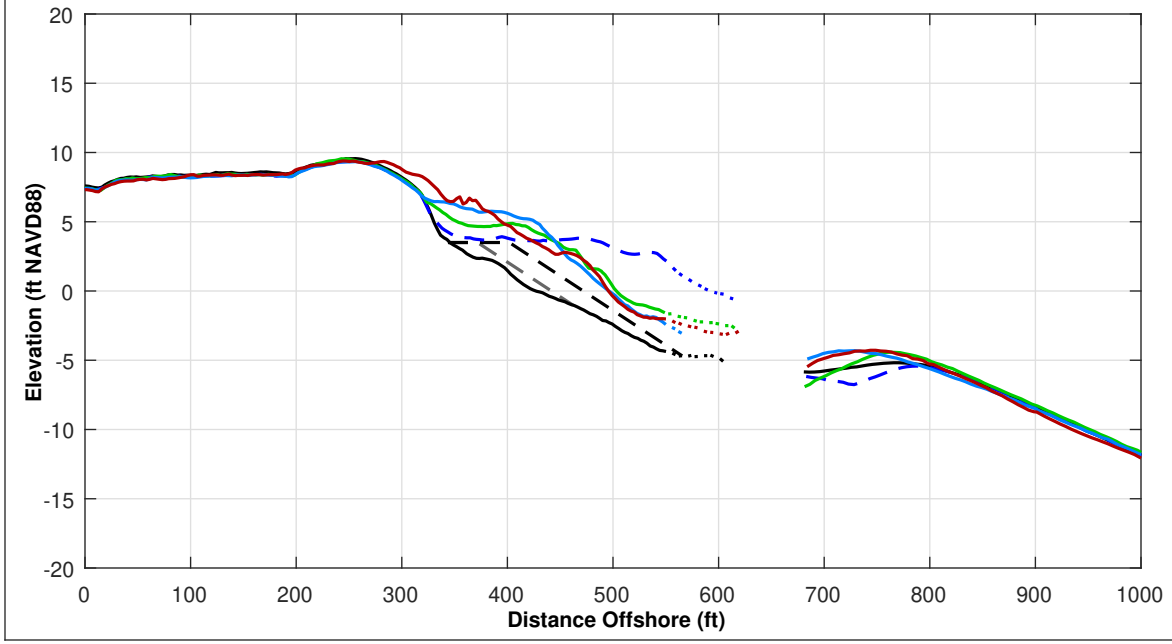
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





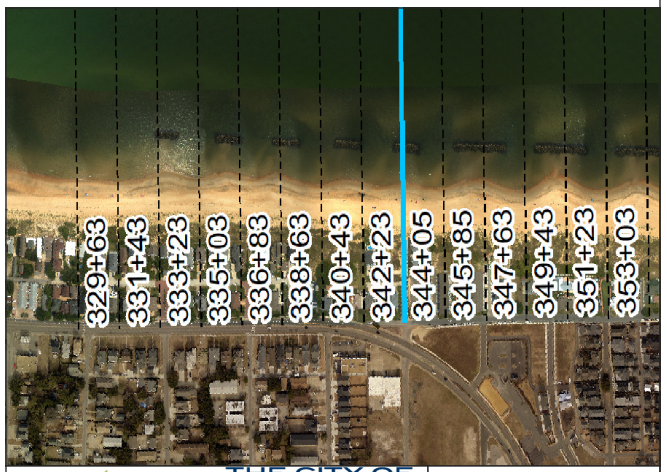
Survey Transect 344+05	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-6.56 ft	7.21 ft
Volume Change Above -15 ft NAVD88	-0.96 cy/ft	0.37 cy/ft
Volume Change Above 0 ft NAVD88	2.44 cy/ft	1.20 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 23.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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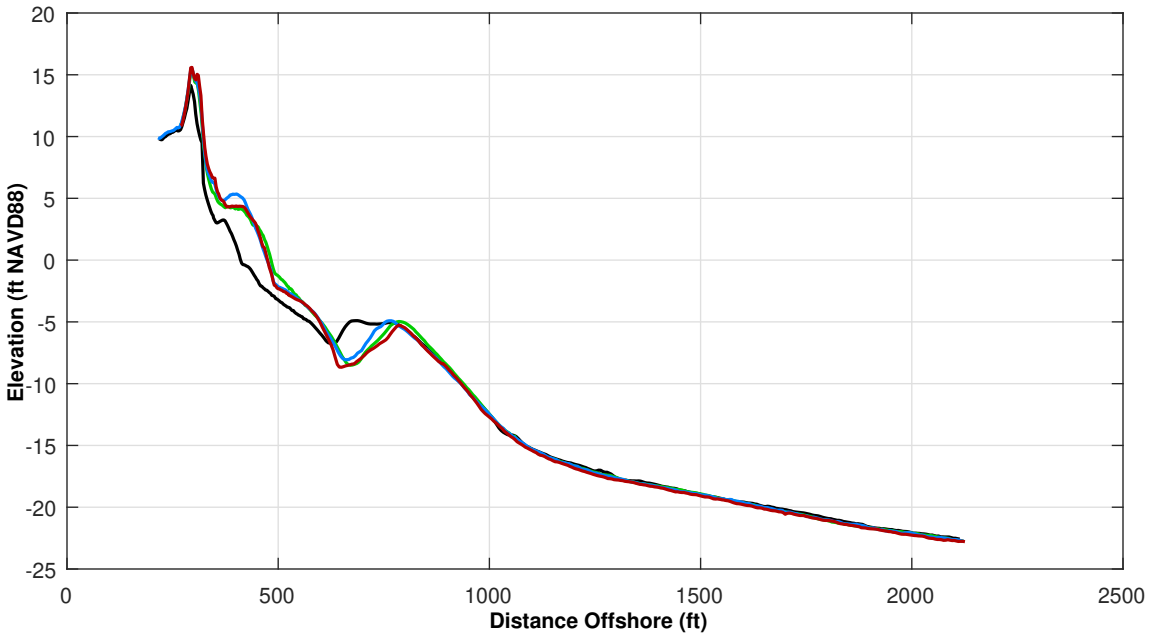
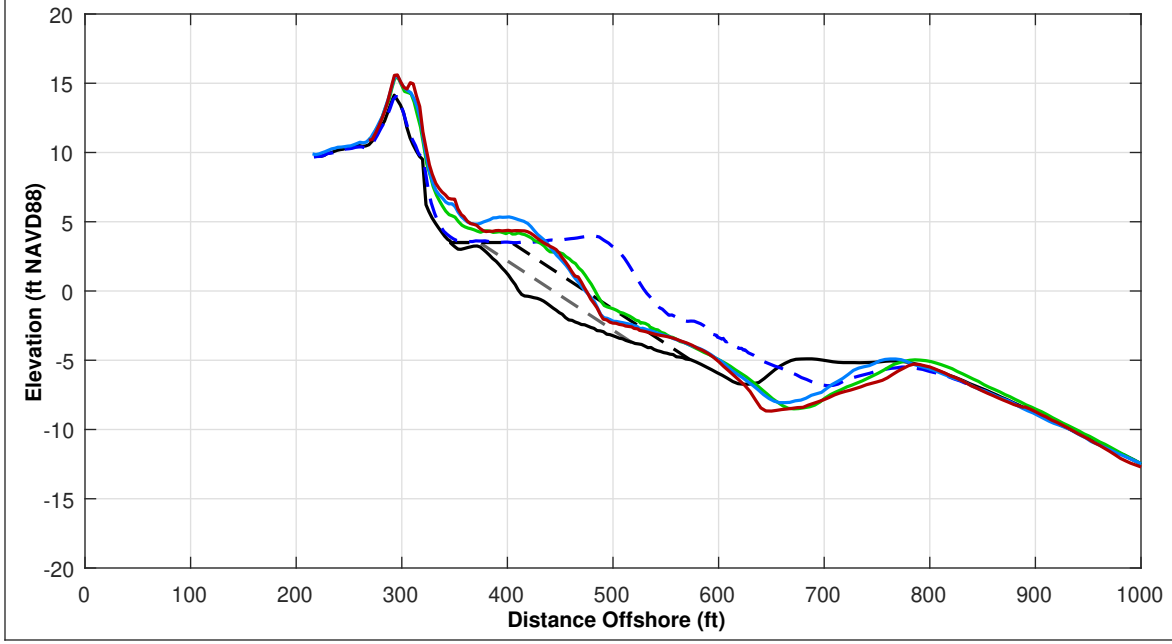
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





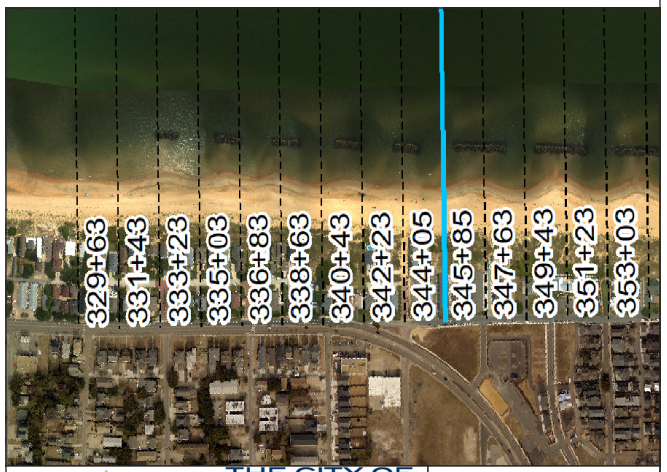
Survey Transect 345+85	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-7.72 ft	3.82 ft
Volume Change Above -15 ft NAVD88	-6.17 cy/ft	-6.66 cy/ft
Volume Change Above 0 ft NAVD88	1.86 cy/ft	-0.50 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 30.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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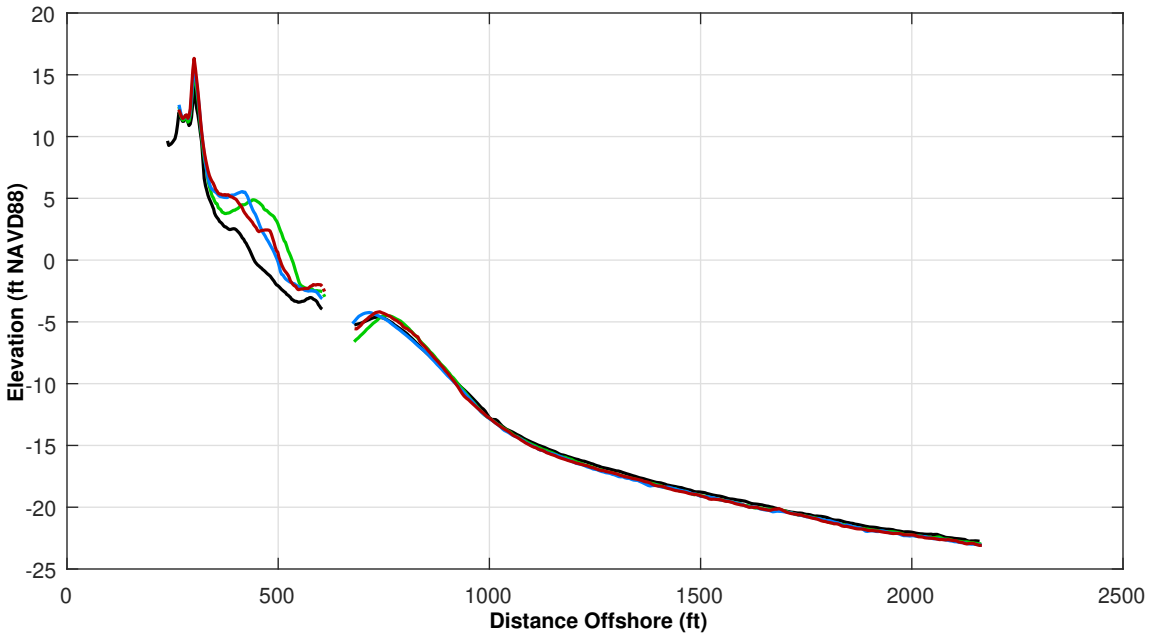
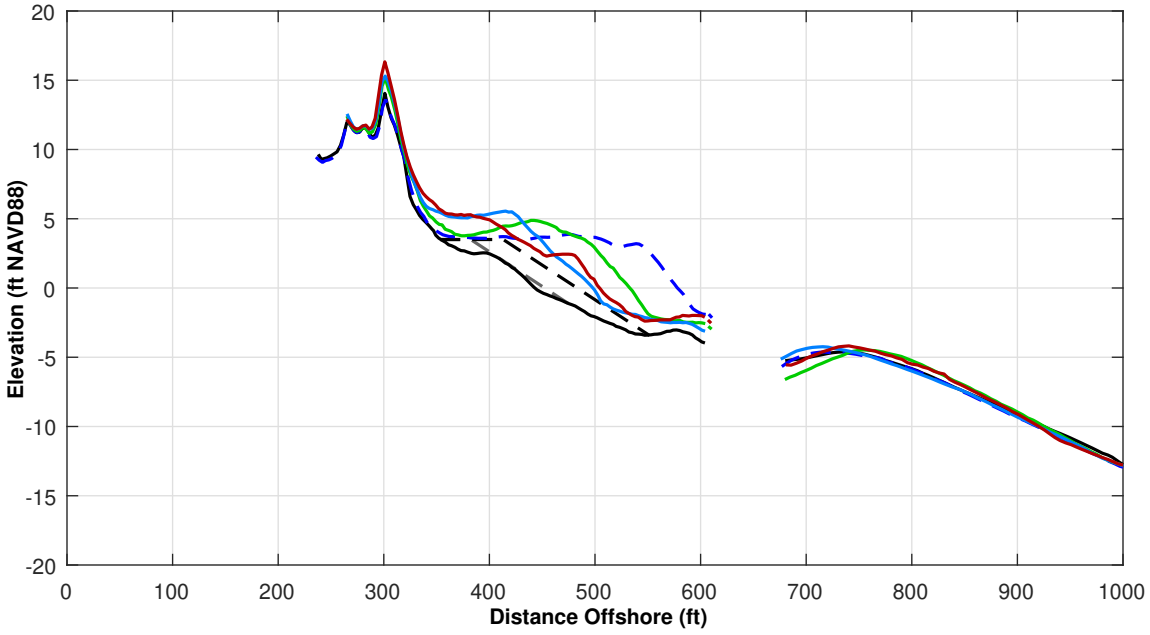
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





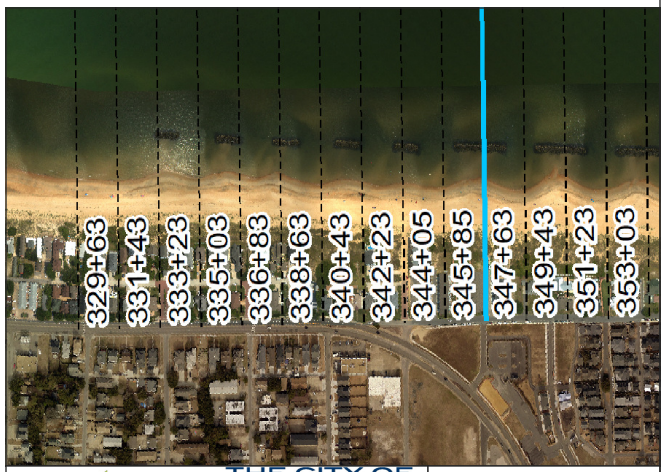
Survey Transect 347+63	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-27.81 ft	8.76 ft
Volume Change Above -15 ft NAVD88	-3.31 cy/ft	2.51 cy/ft
Volume Change Above 0 ft NAVD88	-2.68 cy/ft	-0.28 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	+ 14.0 ft	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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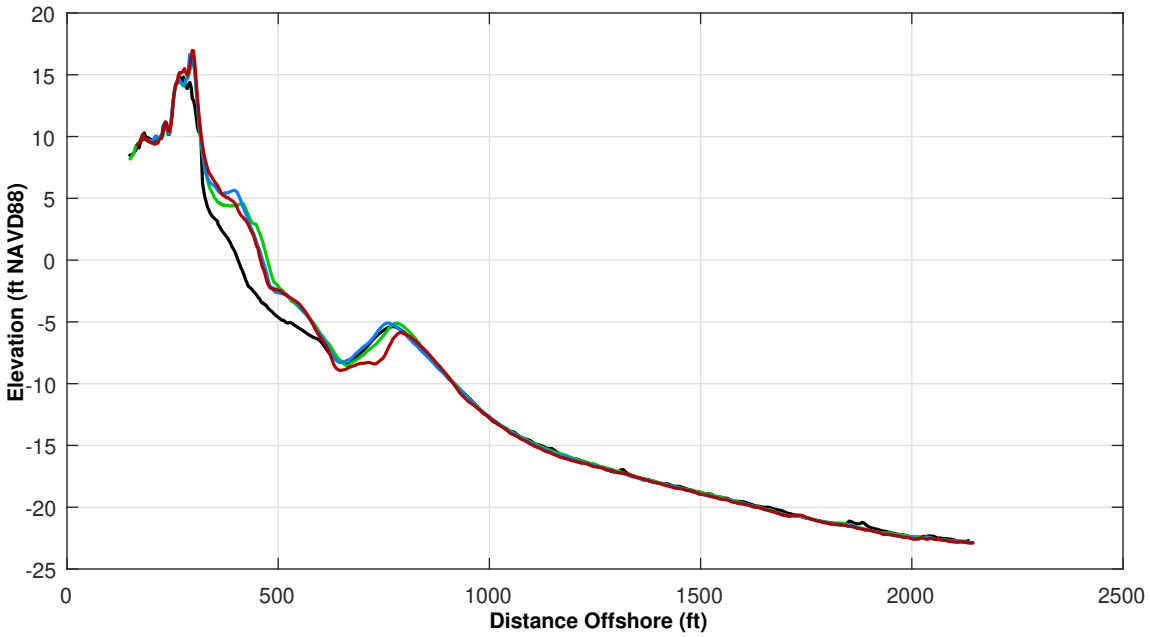
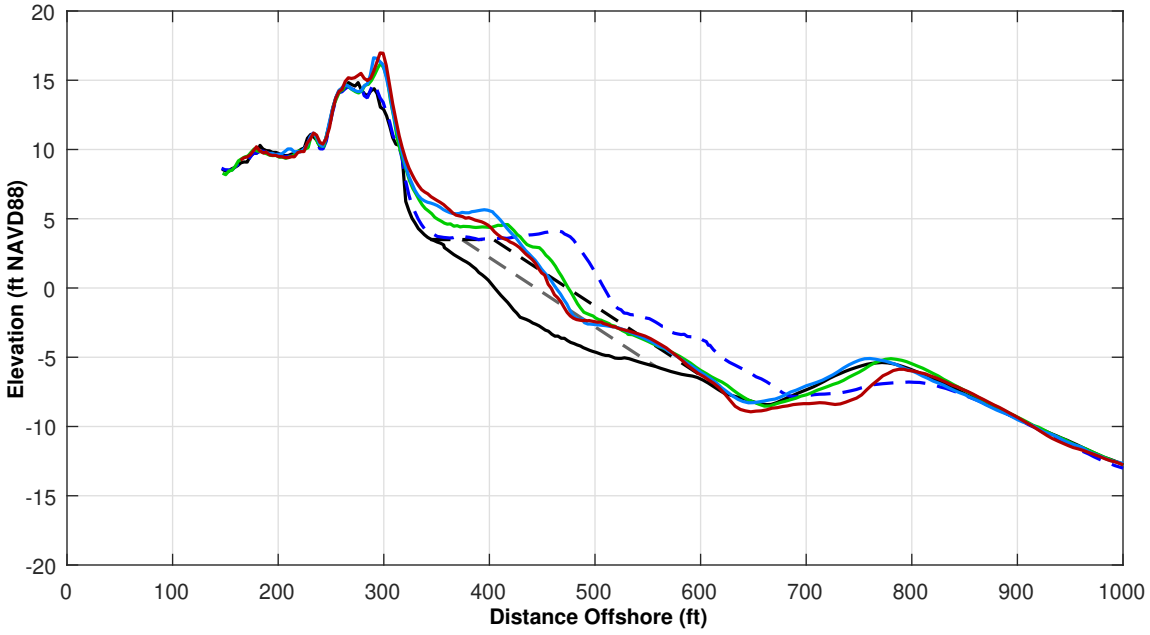
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





Survey Transect 349+43	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-15.78 ft	-2.29 ft
Volume Change Above -15 ft NAVD88	-8.14 cy/ft	-8.47 cy/ft
Volume Change Above 0 ft NAVD88	1.28 cy/ft	-0.58 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 10.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.

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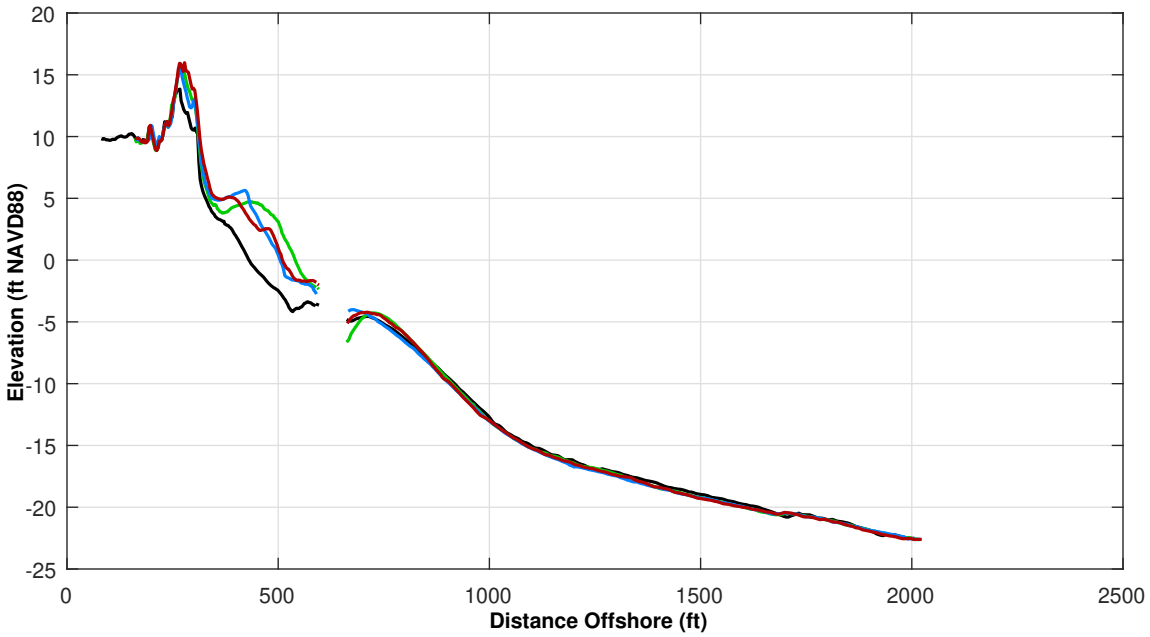

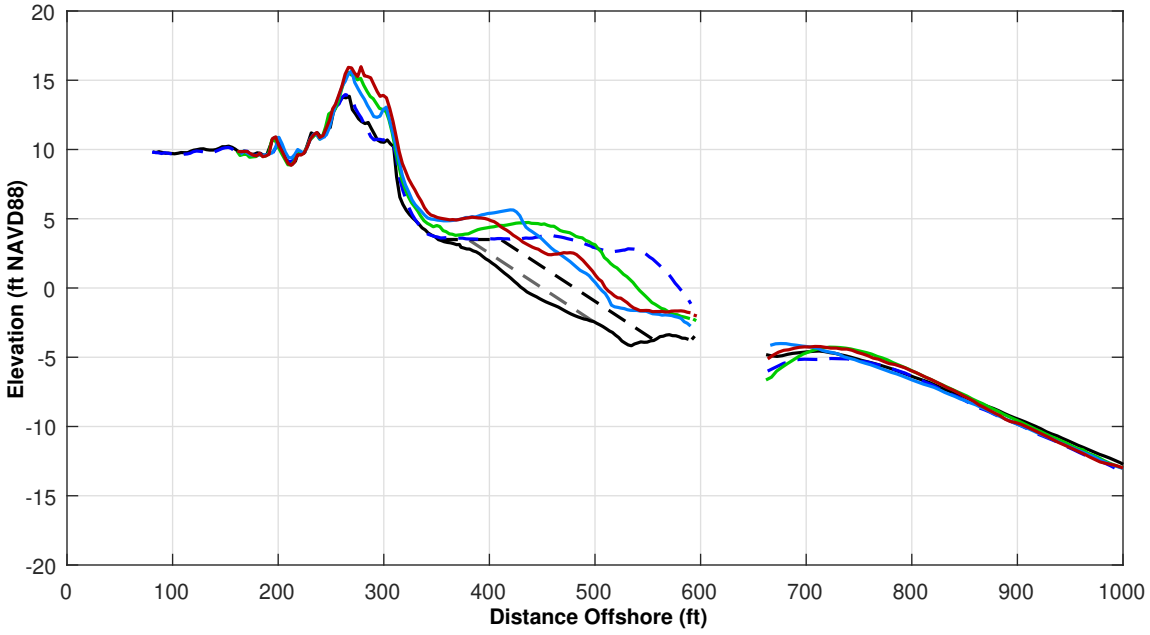

Survey Transect 351+23	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-27.25 ft	7.05 ft
Volume Change Above -15 ft NAVD88	-2.65 cy/ft	4.90 cy/ft
Volume Change Above 0 ft NAVD88	-1.87 cy/ft	1.62 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	+ 18.0 ft	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
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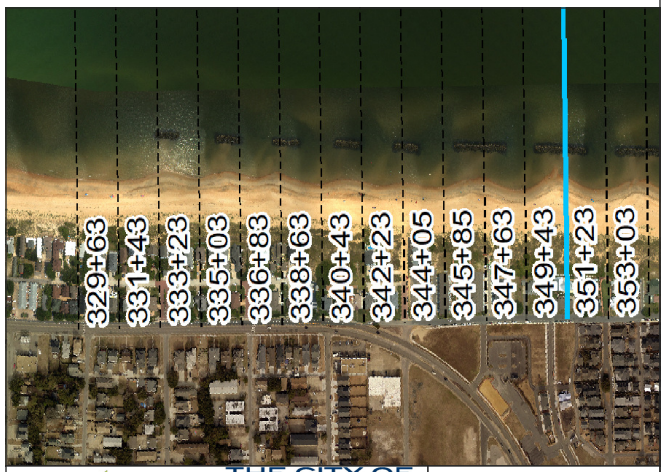
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

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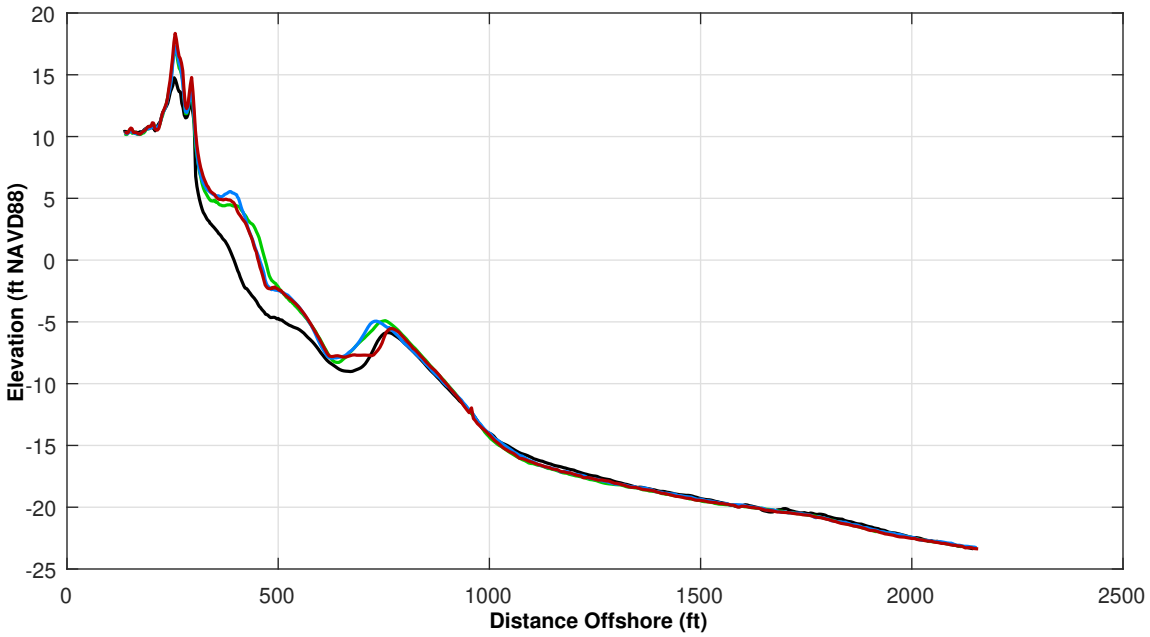
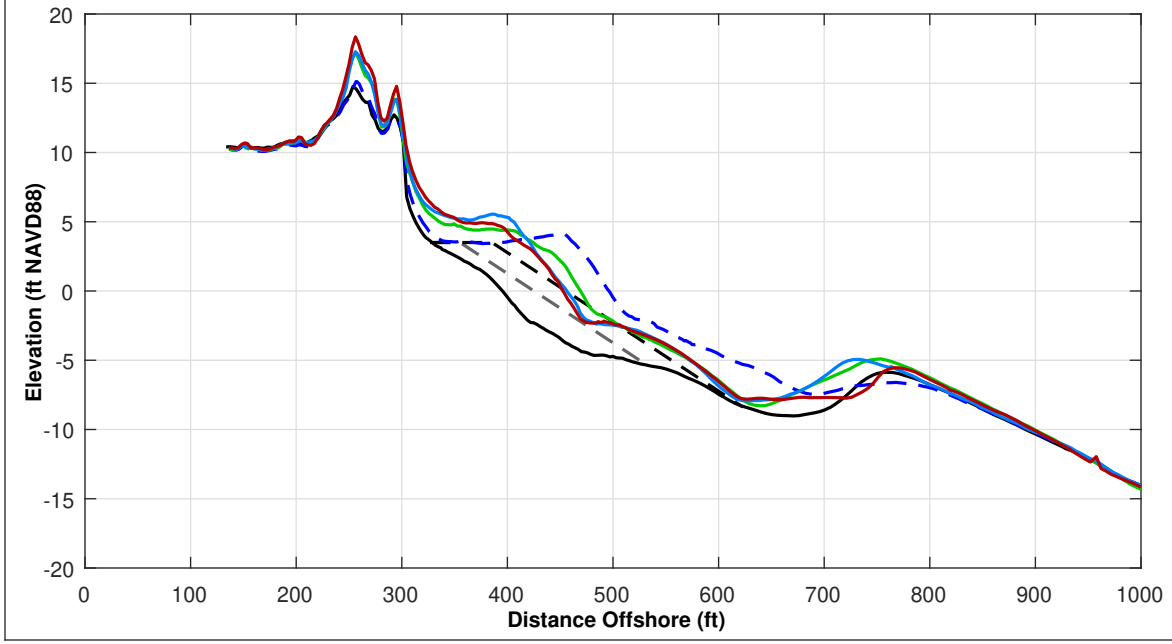




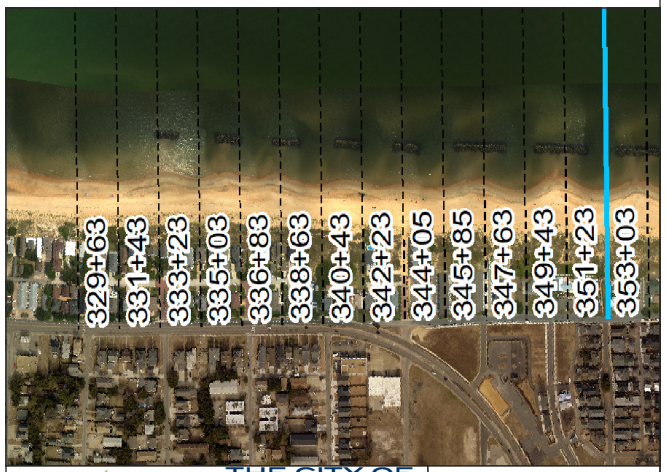
Survey Transect 353+03	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-17.00 ft	-1.49 ft
Volume Change Above -15 ft NAVD88	-4.61 cy/ft	-3.80 cy/ft
Volume Change Above 0 ft NAVD88	1.55 cy/ft	0.69 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 24.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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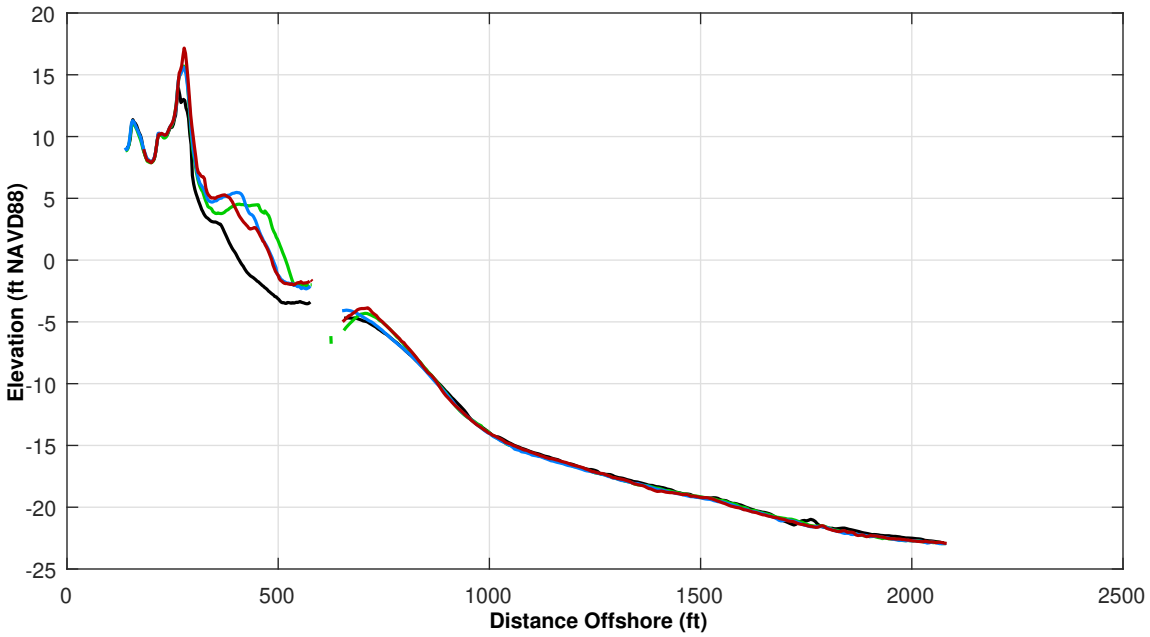
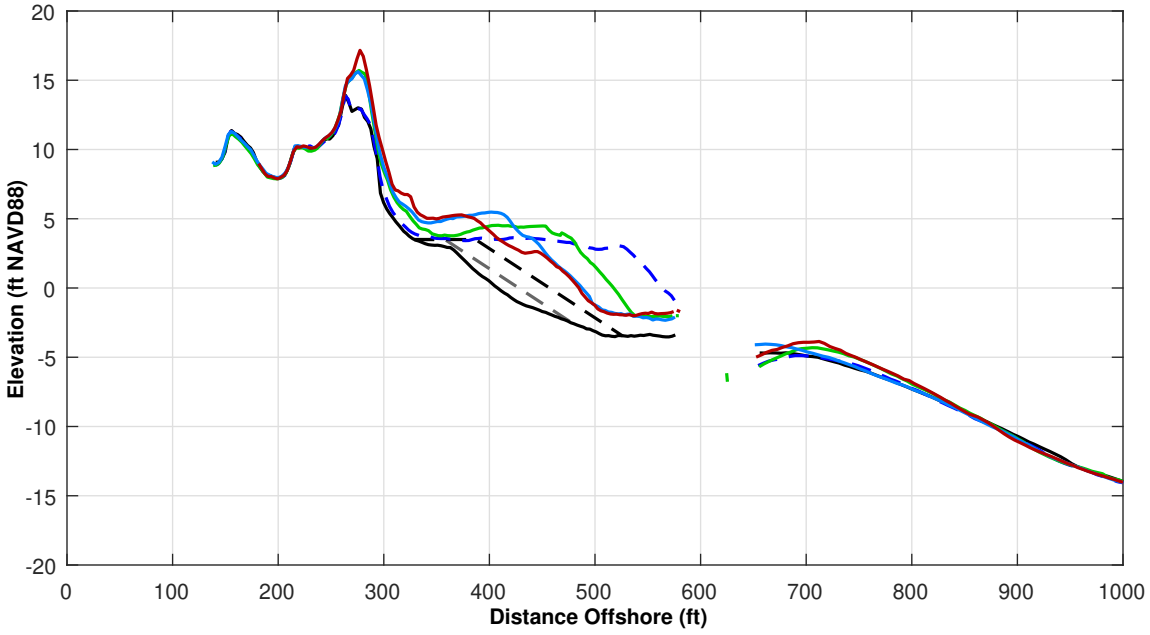
PUBLIC WORKS

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





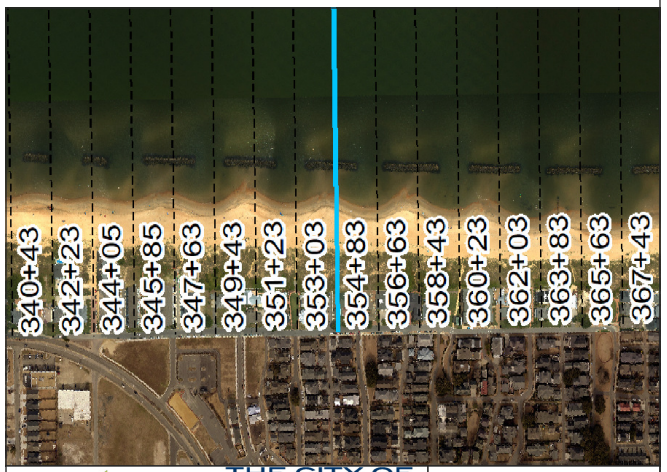
Survey Transect 354+83	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-33.37 ft	-1.83 ft
Volume Change Above -15 ft NAVD88	-2.85 cy/ft	2.15 cy/ft
Volume Change Above 0 ft NAVD88	-2.57 cy/ft	-1.01 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 20.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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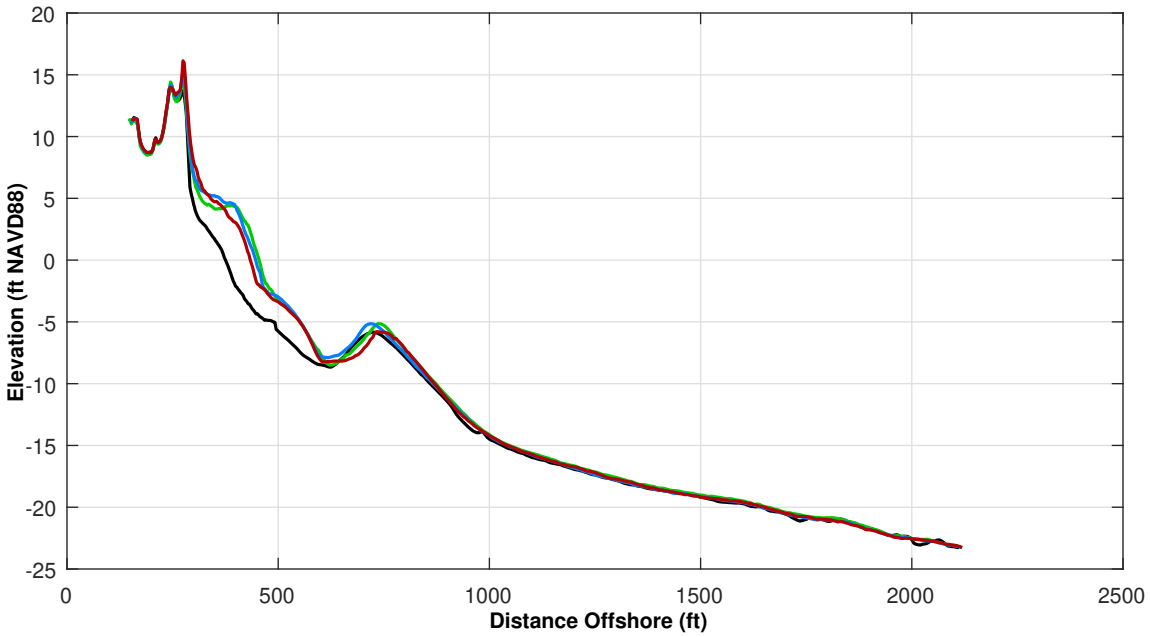
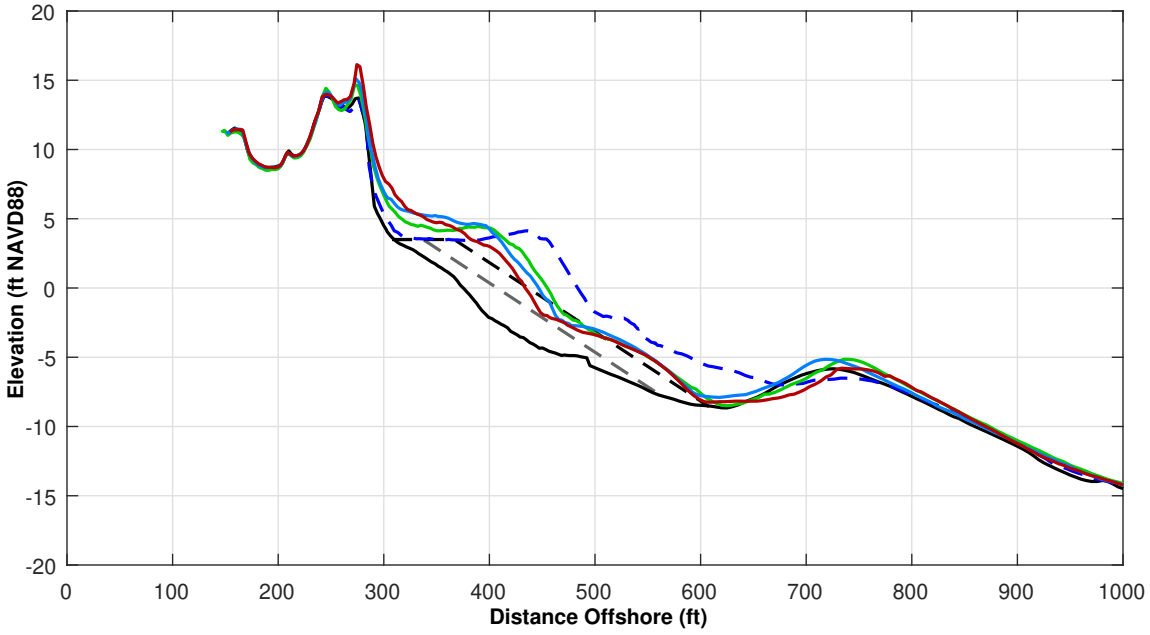
PUBLIC WORKS

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





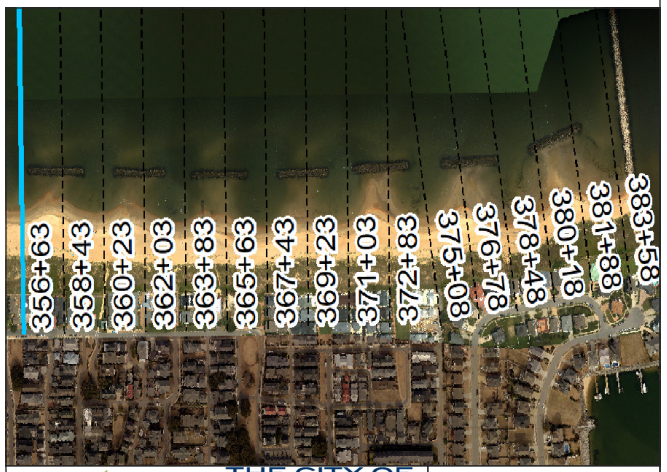
Survey Transect 356+63	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-20.26 ft	-11.77 ft
Volume Change Above -15 ft NAVD88	-5.63 cy/ft	-6.95 cy/ft
Volume Change Above 0 ft NAVD88	0.39 cy/ft	-1.53 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 16.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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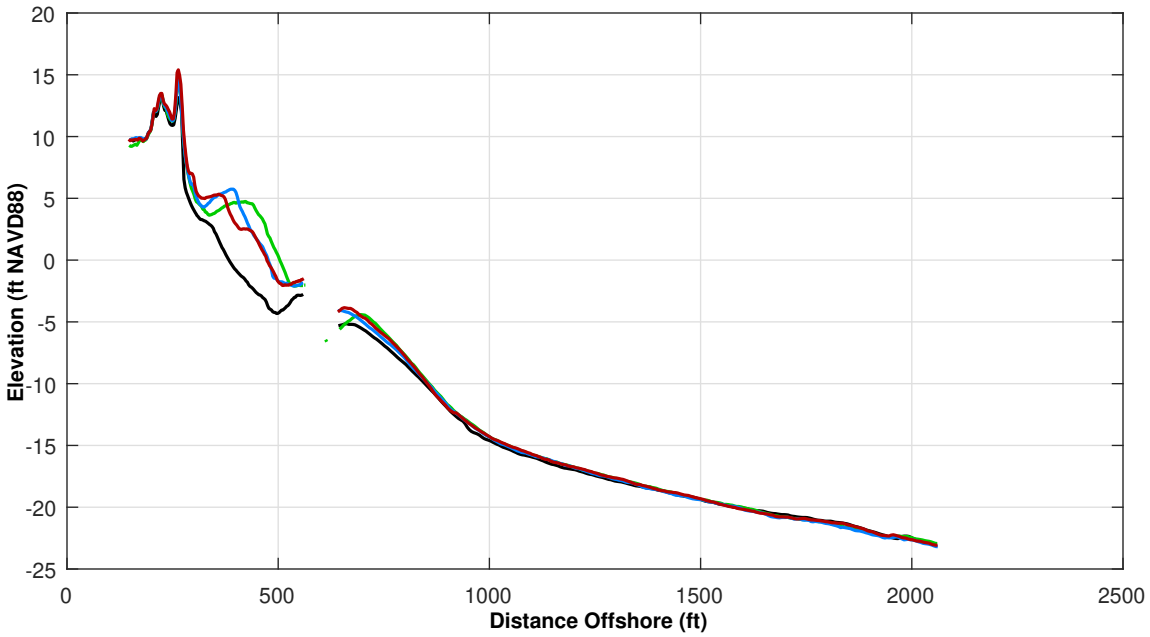
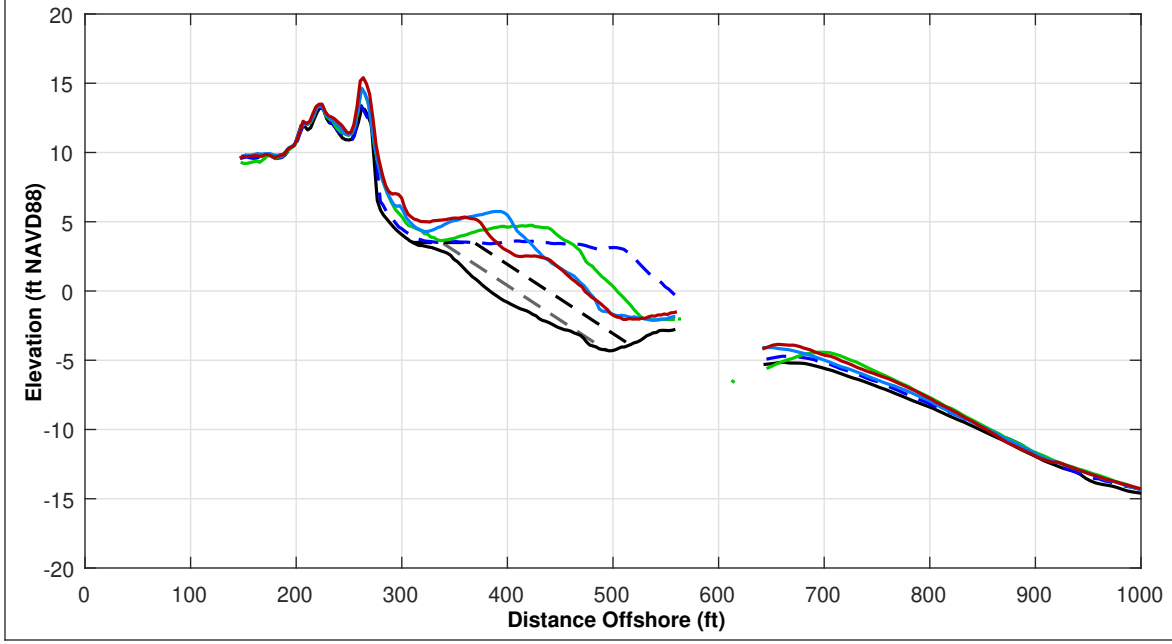
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





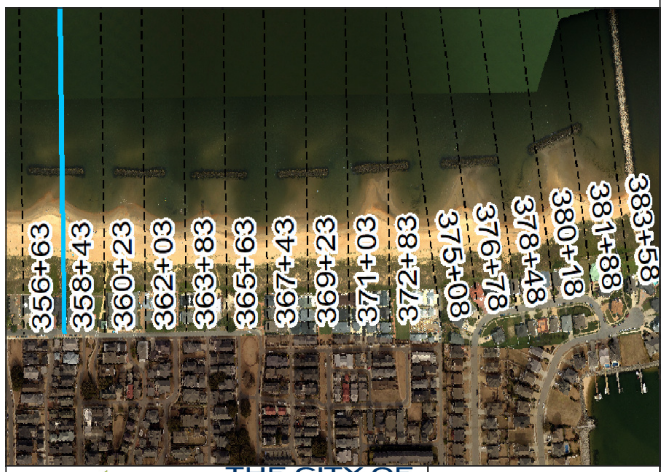
Survey Transect 358+43	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-31.04 ft	-5.01 ft
Volume Change Above -15 ft NAVD88	-4.45 cy/ft	0.87 cy/ft
Volume Change Above 0 ft NAVD88	-2.94 cy/ft	-1.40 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 21.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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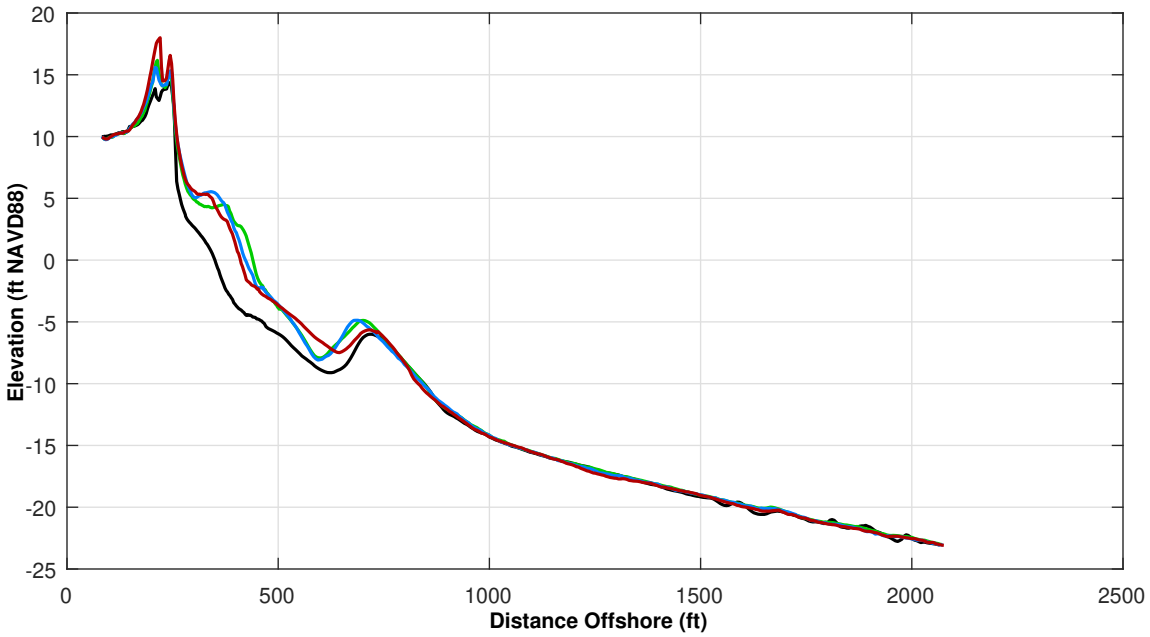
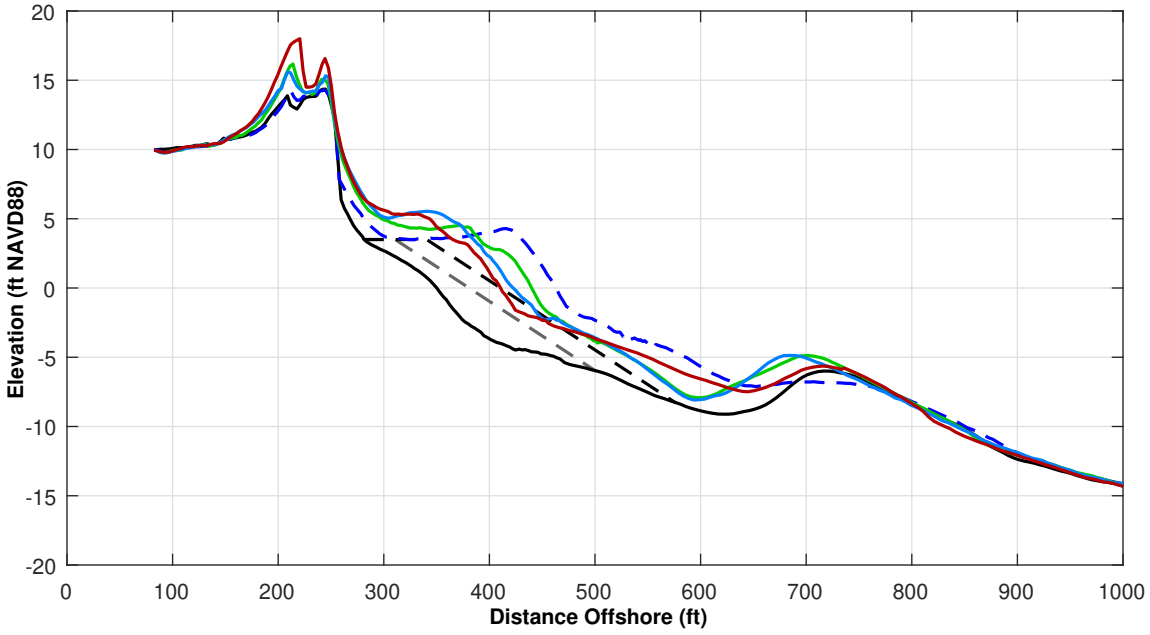




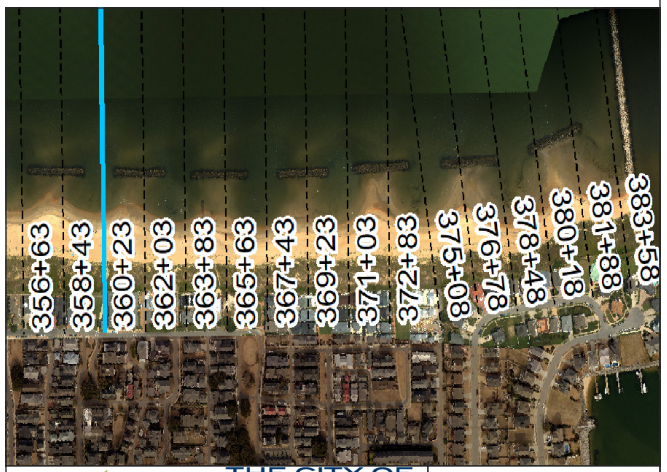
Survey Transect 360+23	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-31.36 ft	-11.47 ft
Volume Change Above -15 ft NAVD88	-2.26 cy/ft	-1.03 cy/ft
Volume Change Above 0 ft NAVD88	1.46 cy/ft	0.52 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 24.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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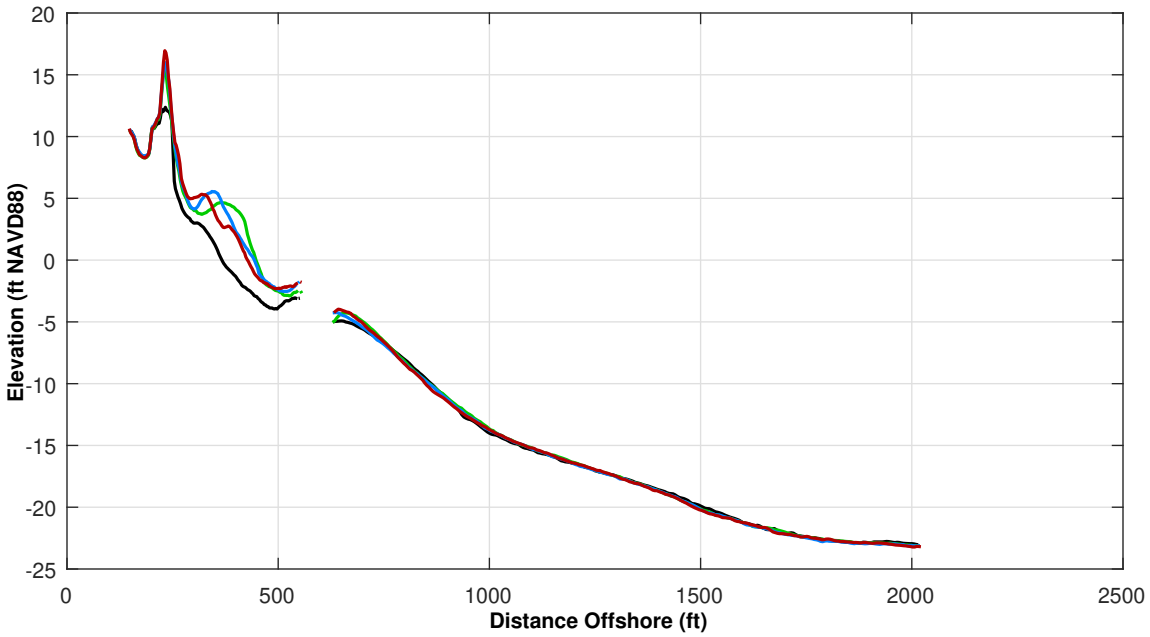
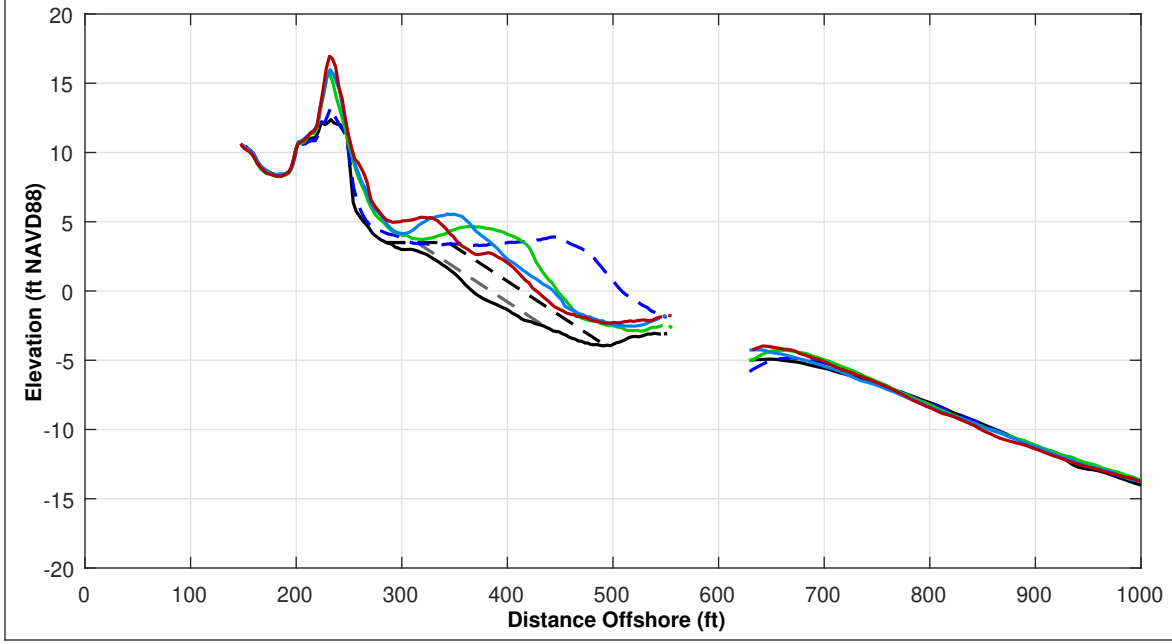




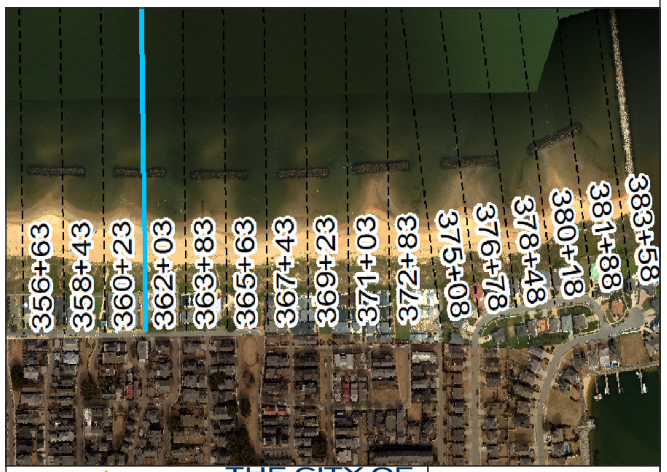
Survey Transect 362+03	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-22.82 ft	-9.96 ft
Volume Change Above -15 ft NAVD88	-3.17 cy/ft	-2.12 cy/ft
Volume Change Above 0 ft NAVD88	-1.91 cy/ft	-2.05 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	+ 7.0 ft	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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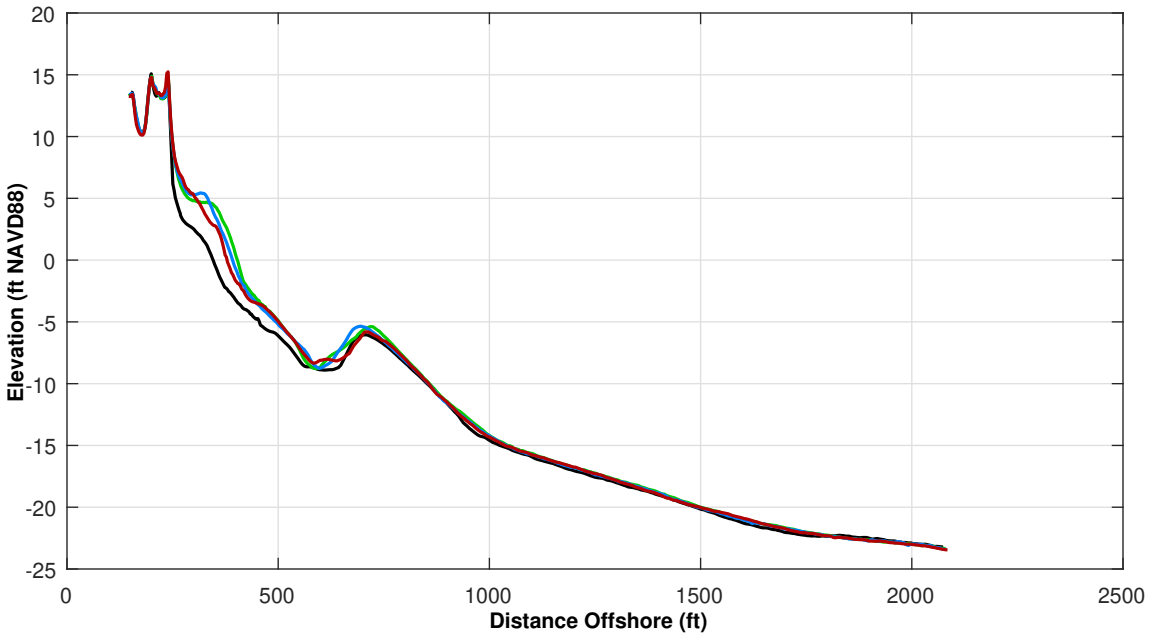
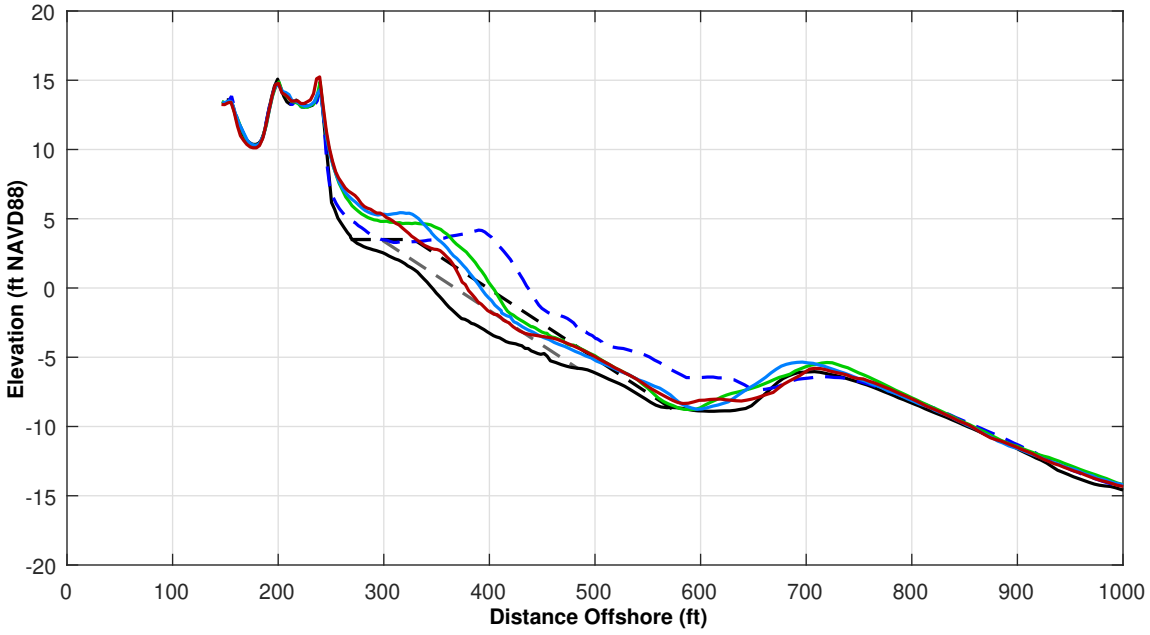




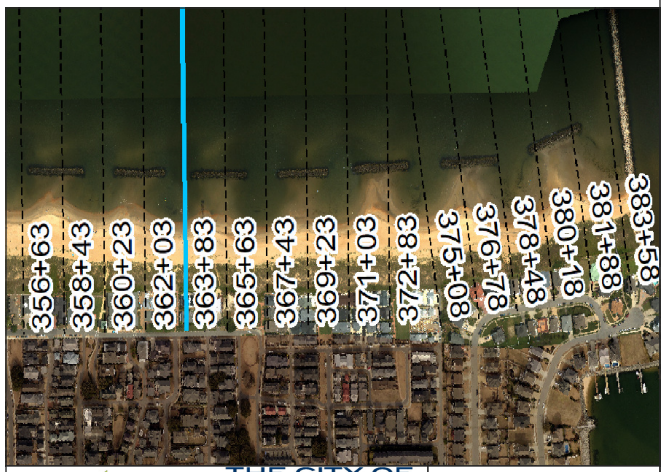
Survey Transect 363+83	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-23.99 ft	-11.41 ft
Volume Change Above -15 ft NAVD88	-9.39 cy/ft	-6.09 cy/ft
Volume Change Above 0 ft NAVD88	-3.31 cy/ft	-2.71 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 1.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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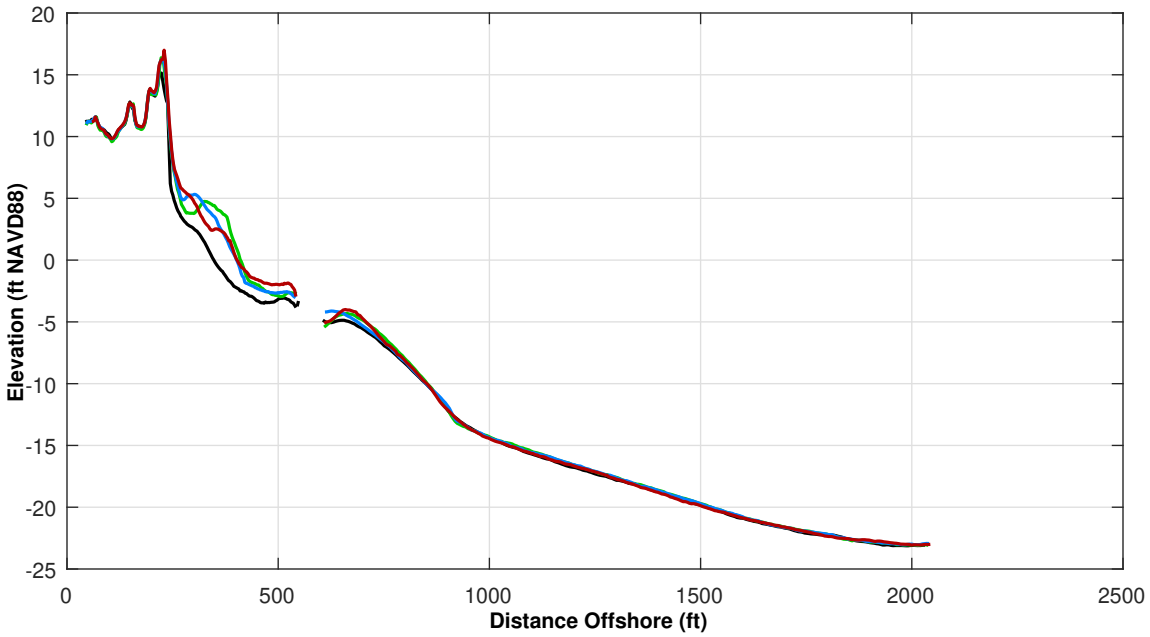
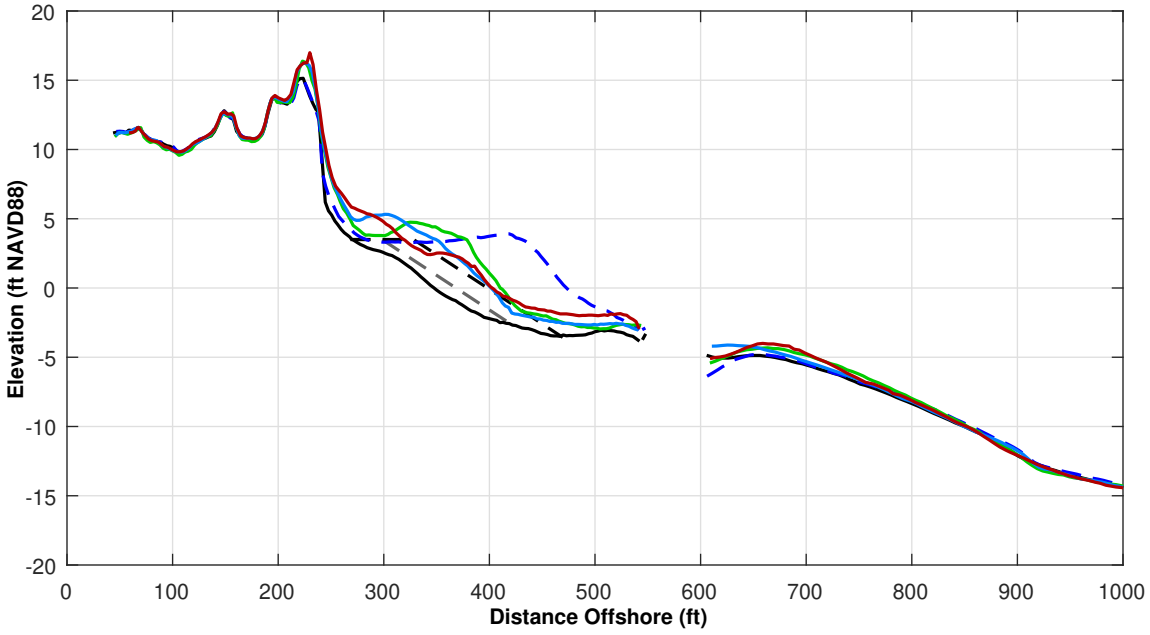
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





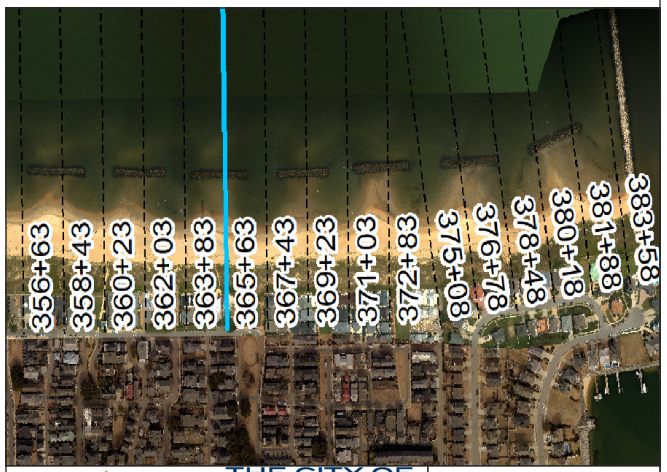
Survey Transect 365+63	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-9.30 ft	4.93 ft
Volume Change Above -15 ft NAVD88	1.03 cy/ft	3.03 cy/ft
Volume Change Above 0 ft NAVD88	-1.13 cy/ft	-0.83 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		-11.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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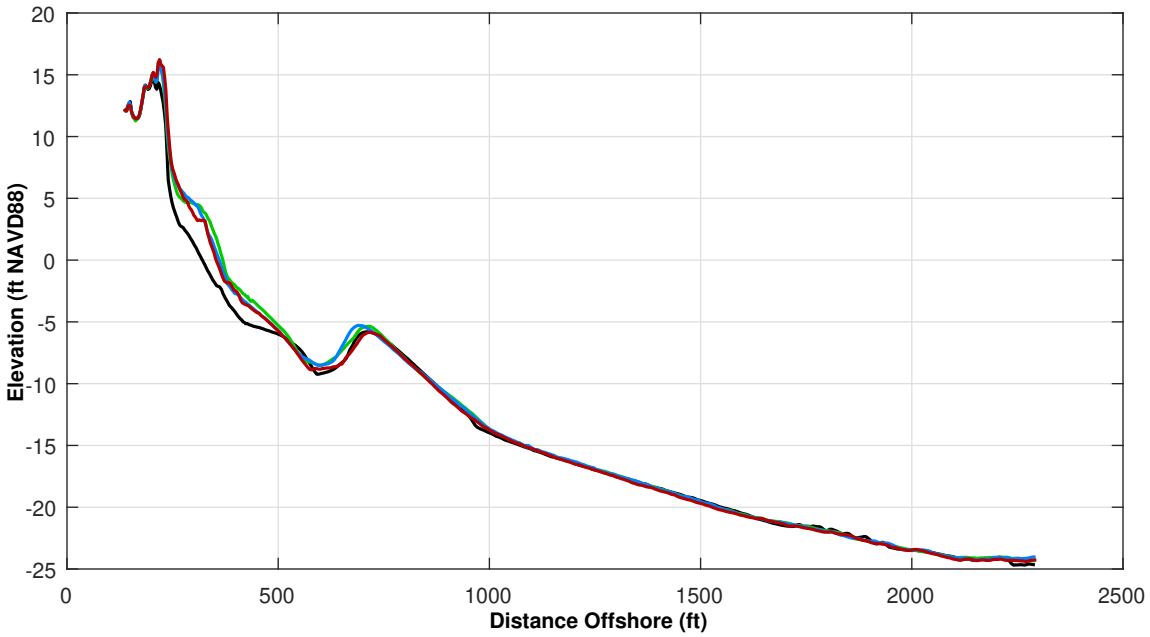
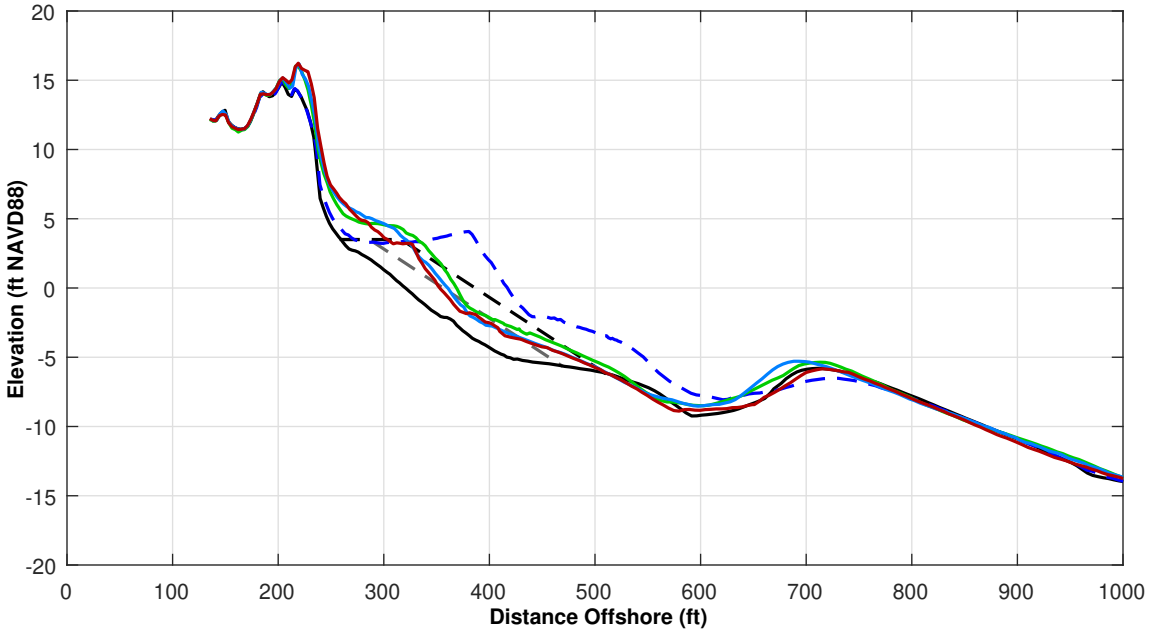




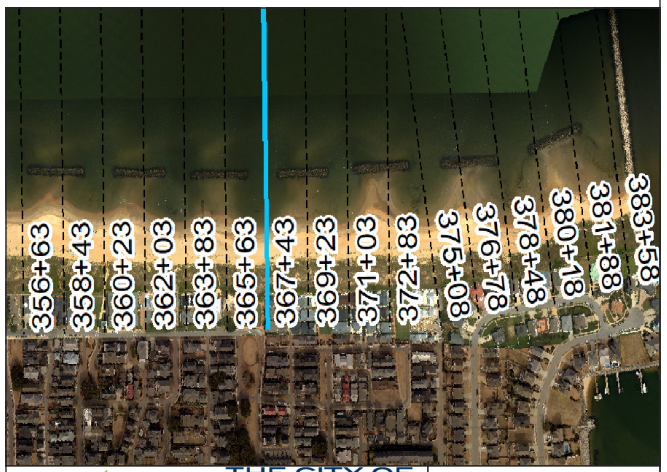
Survey Transect 367+43	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-16.98 ft	-5.76 ft
Volume Change Above -15 ft NAVD88	-11.10 cy/ft	-7.56 cy/ft
Volume Change Above 0 ft NAVD88	-1.22 cy/ft	-0.83 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	-13.0 ft	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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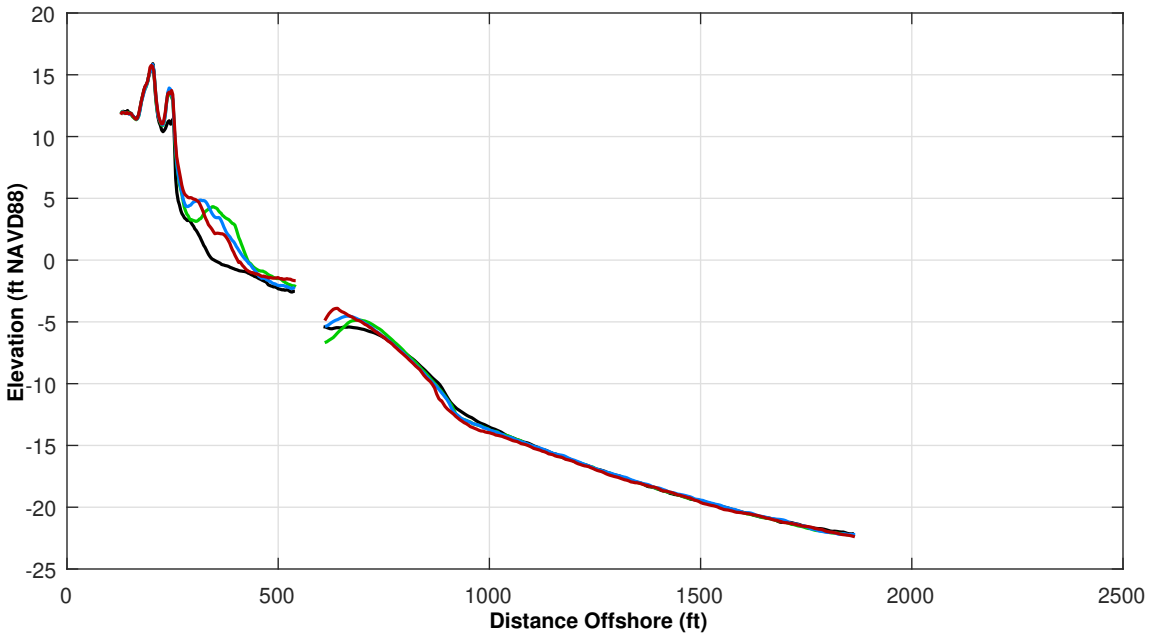
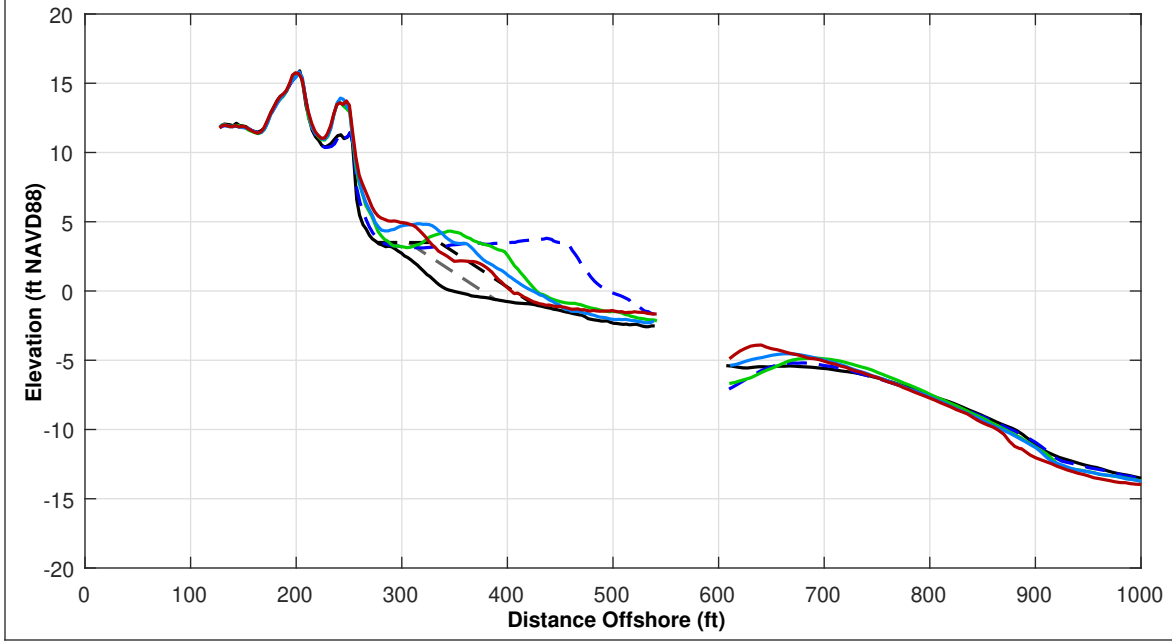




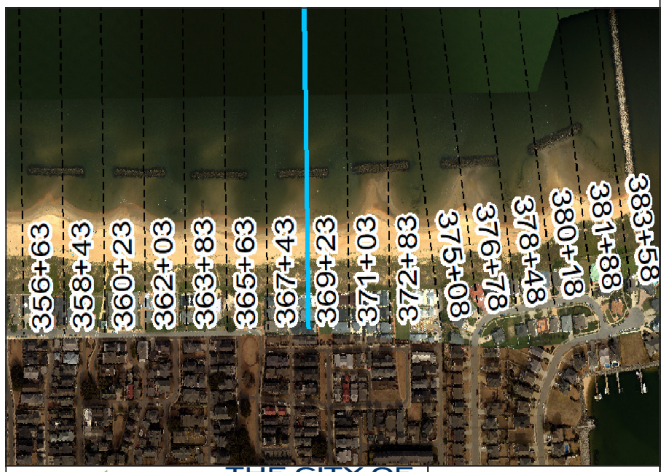
Survey Transect 369+23	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-26.82 ft	-13.77 ft
Volume Change Above -15 ft NAVD88	-3.98 cy/ft	-3.19 cy/ft
Volume Change Above 0 ft NAVD88	-2.33 cy/ft	-2.20 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		-10.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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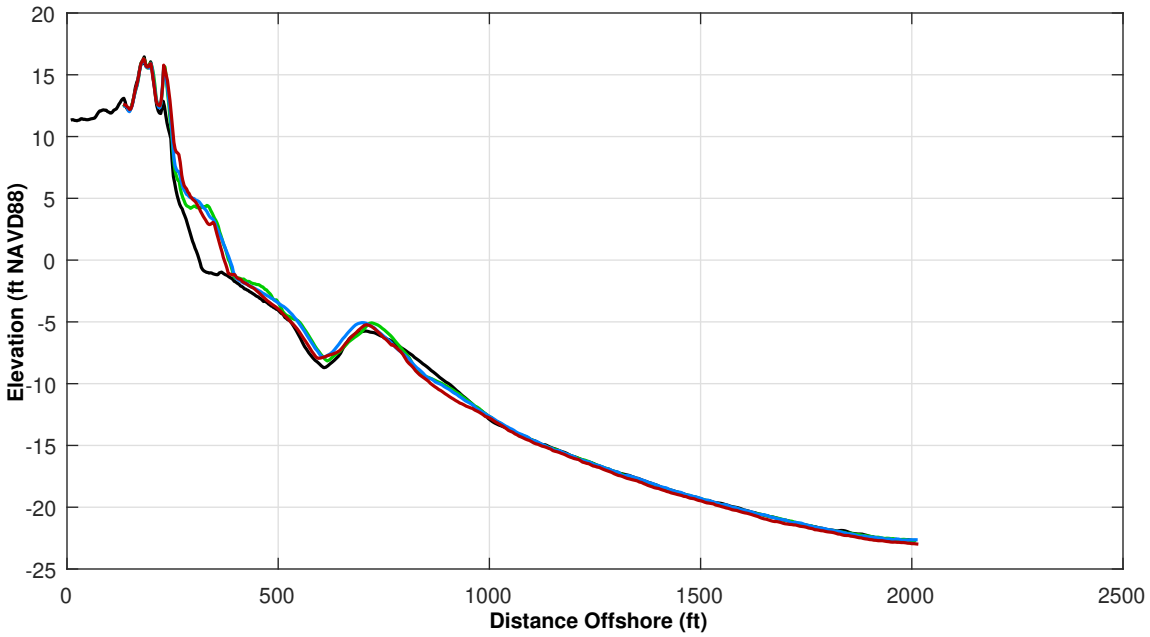
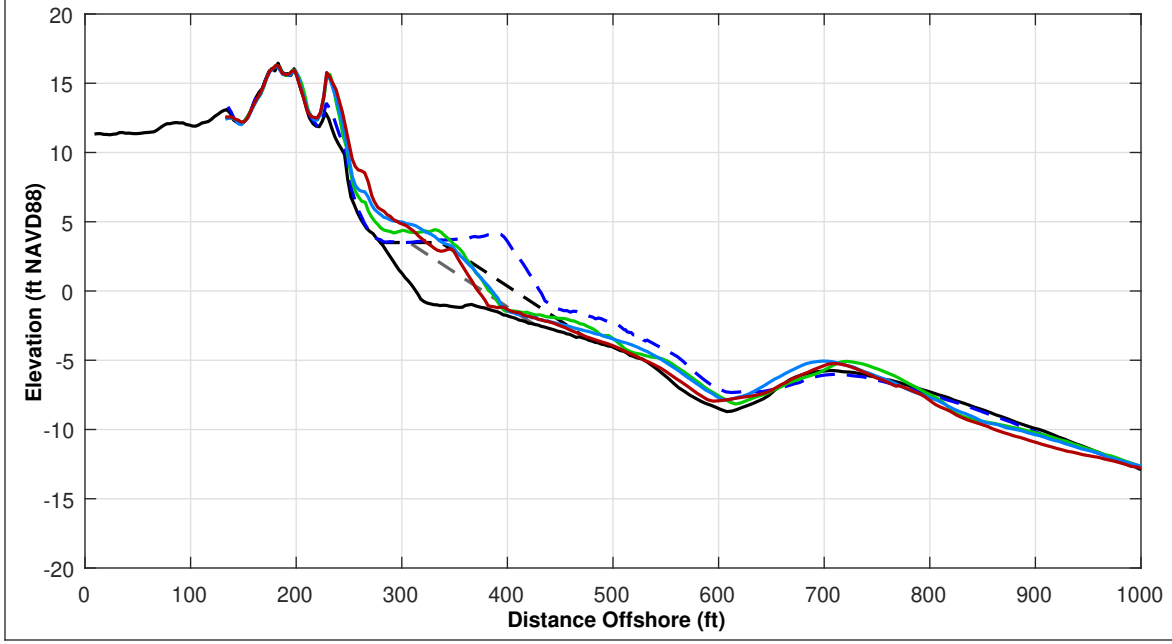




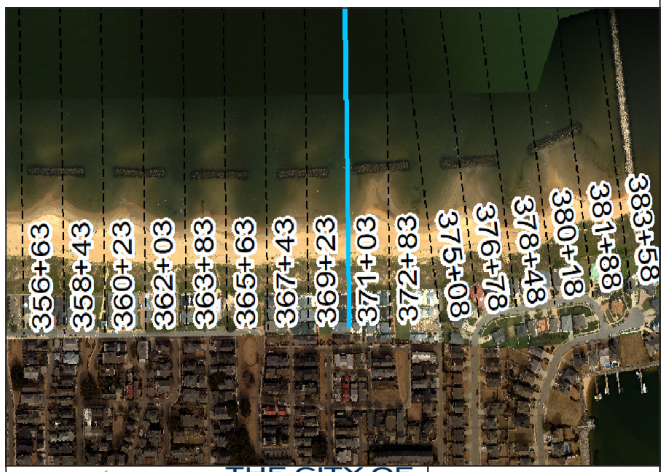
Survey Transect 371+03	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	ft	ft
Volume Change Above -15 ft NAVD88	cy/ft	cy/ft
Volume Change Above 0 ft NAVD88	cy/ft	cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	-15.0 ft	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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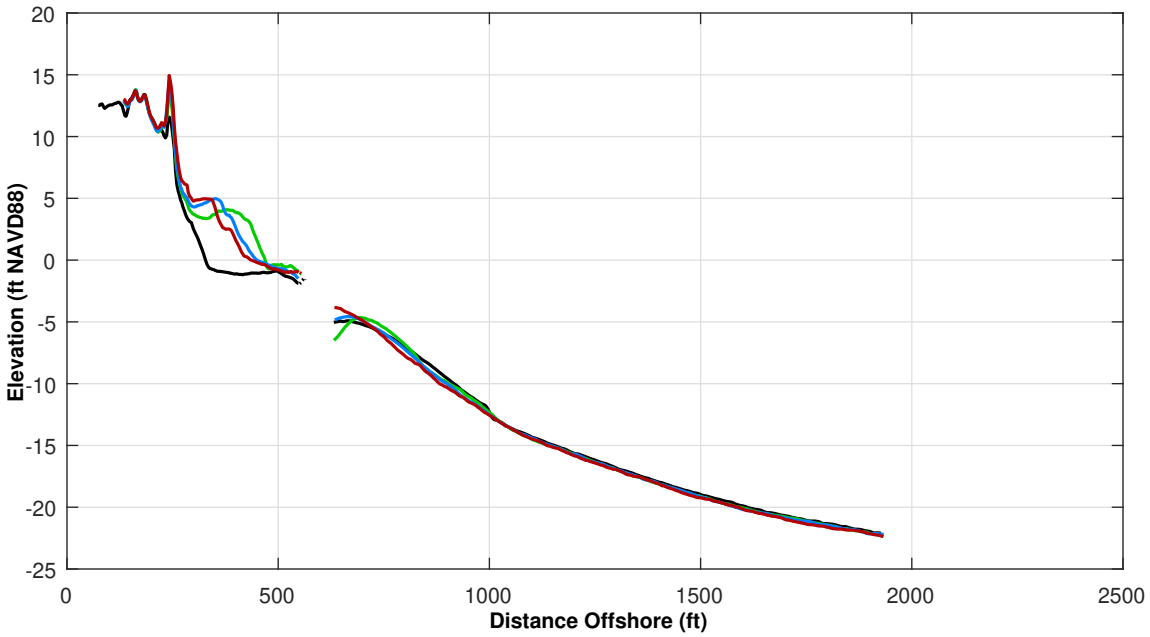
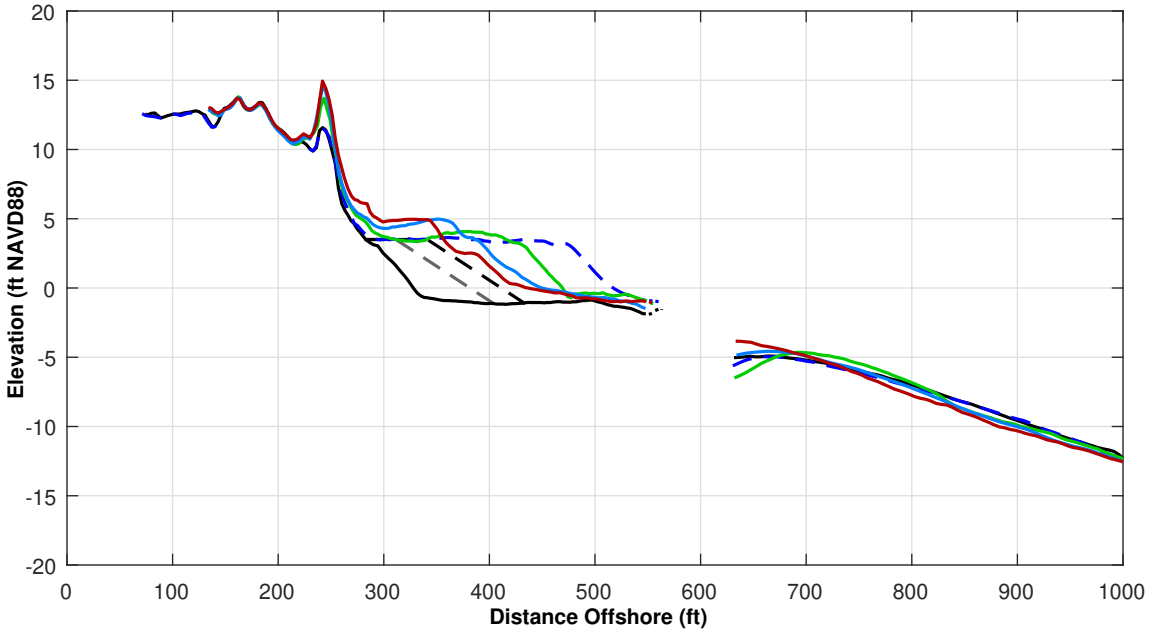




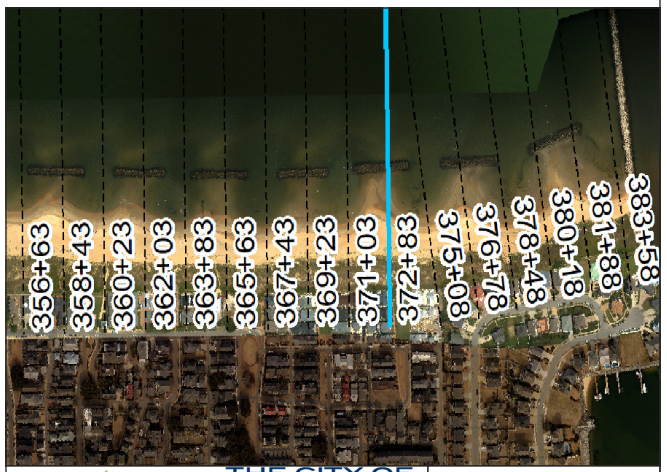
Survey Transect 372+83	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-47.77 ft	-18.76 ft
Volume Change Above -15 ft NAVD88	-6.44 cy/ft	-3.20 cy/ft
Volume Change Above 0 ft NAVD88	-2.26 cy/ft	-1.13 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 15.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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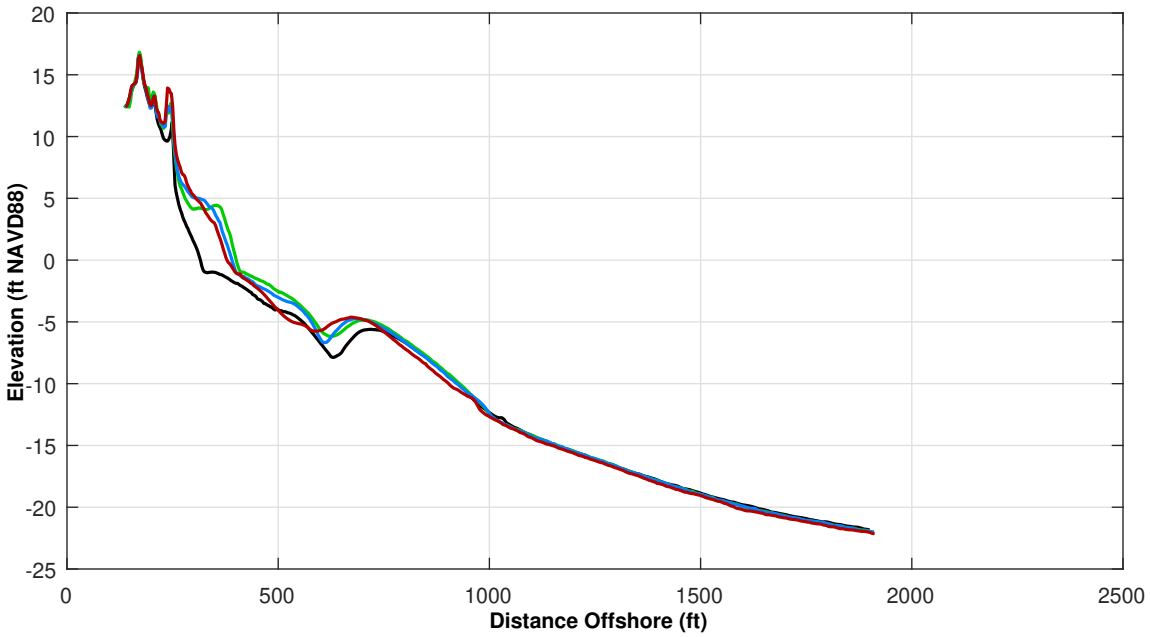
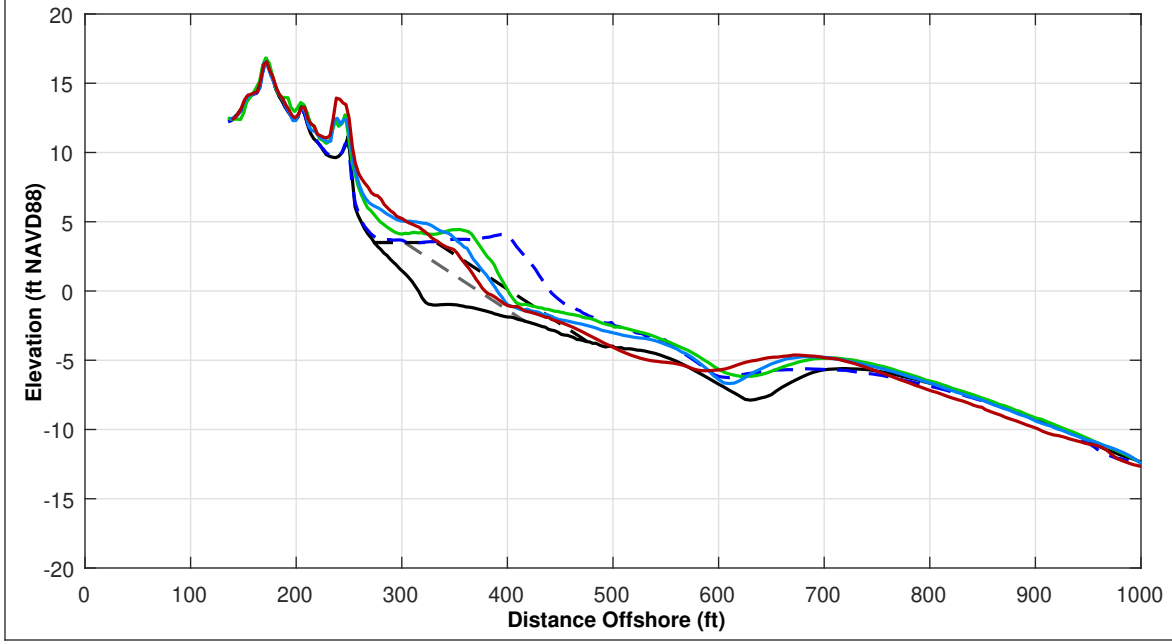
PUBLIC WORKS

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





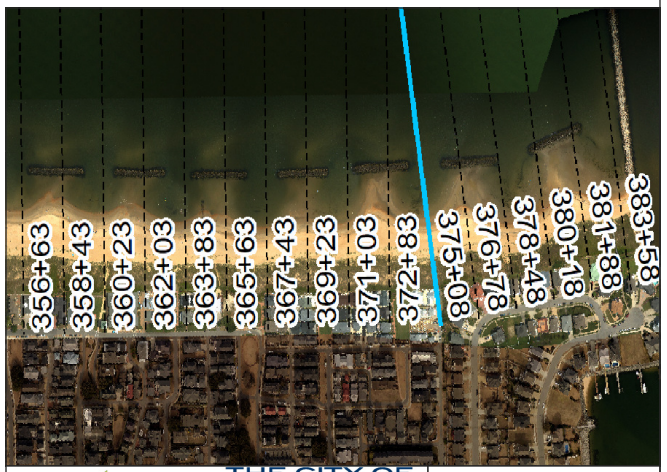
Survey Transect 375+08	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-24.08 ft	-12.38 ft
Volume Change Above -15 ft NAVD88	-13.95 cy/ft	-8.53 cy/ft
Volume Change Above 0 ft NAVD88	-0.86 cy/ft	-0.19 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 2.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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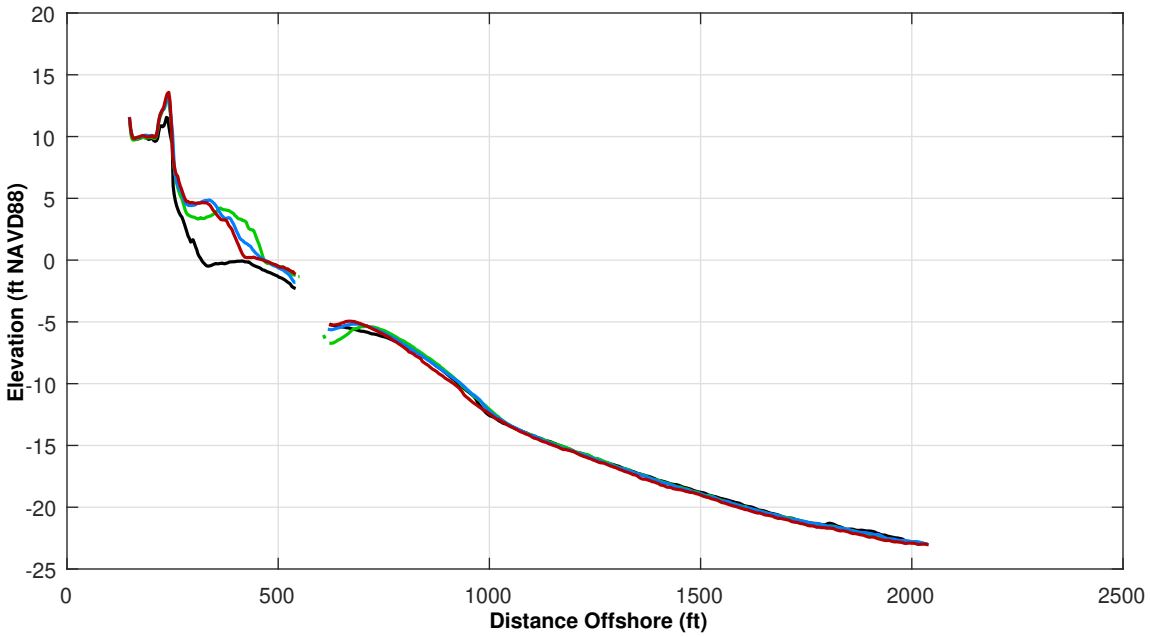
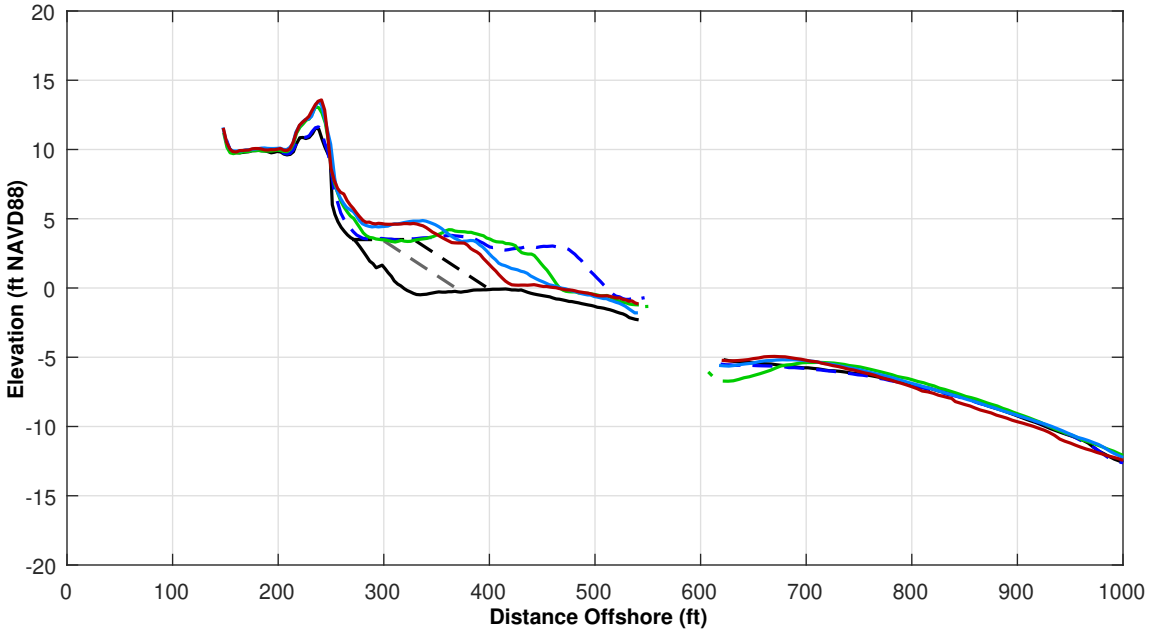
PUBLIC WORKS

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





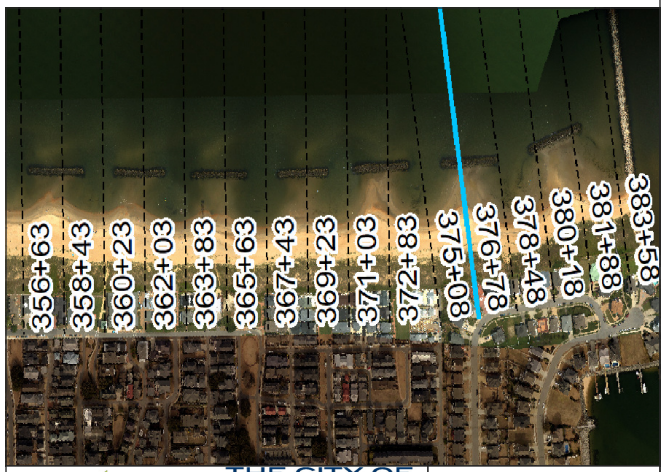
Survey Transect 376+78	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-48.58 ft	-28.38 ft
Volume Change Above -15 ft NAVD88	-5.11 cy/ft	-5.52 cy/ft
Volume Change Above 0 ft NAVD88	-2.63 cy/ft	-2.64 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		+ 30.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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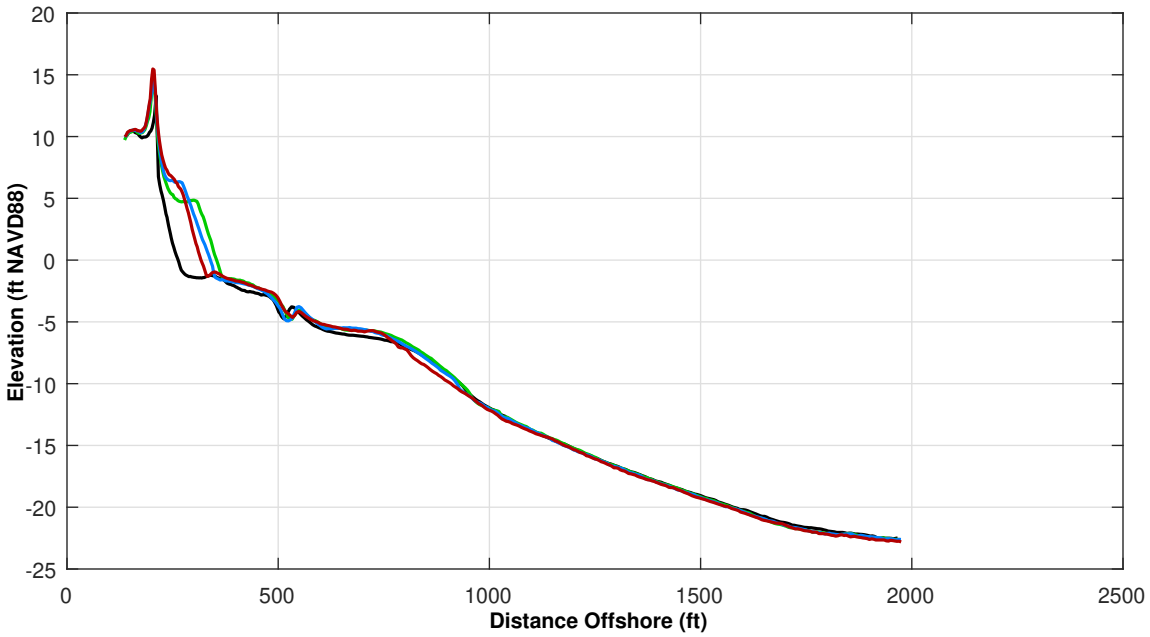
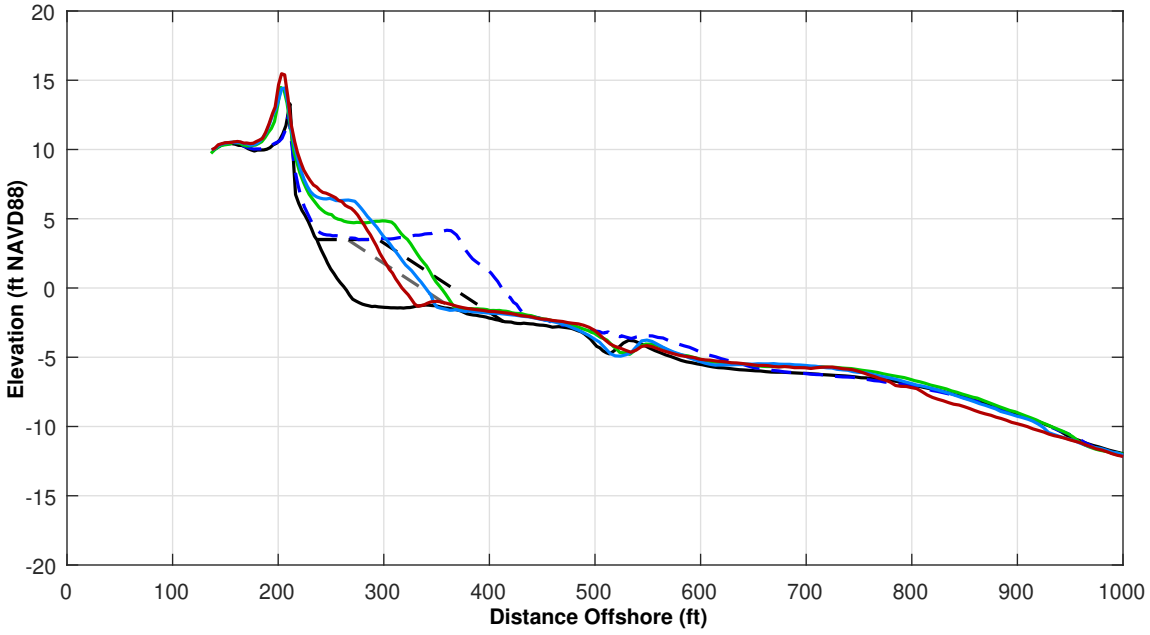
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





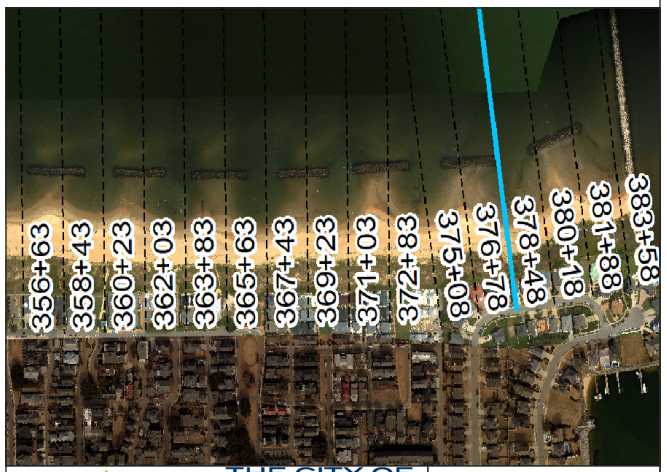
Survey Transect 378+48	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-36.18 ft	-20.30 ft
Volume Change Above -15 ft NAVD88	-10.17 cy/ft	-5.27 cy/ft
Volume Change Above 0 ft NAVD88	-2.31 cy/ft	-2.08 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	-8.0 ft	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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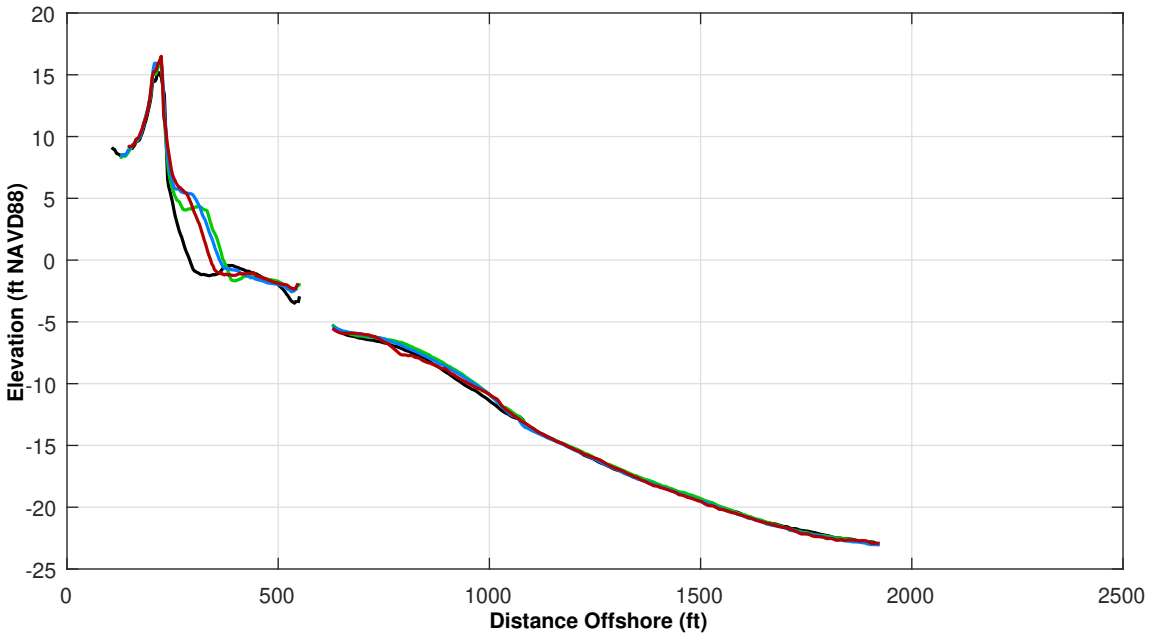
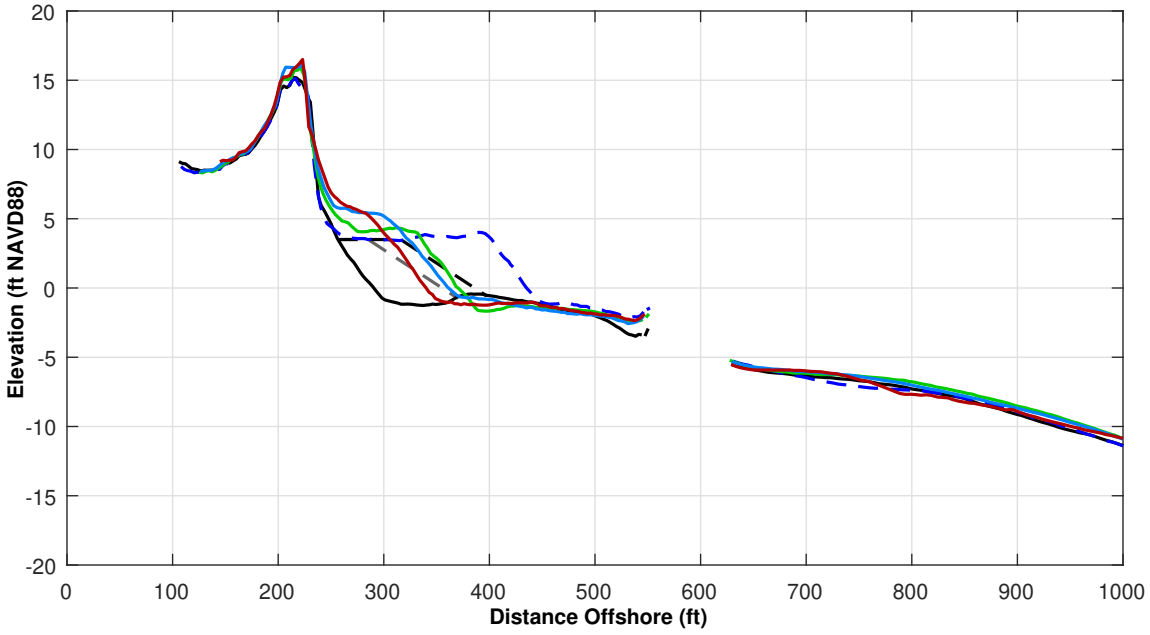
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





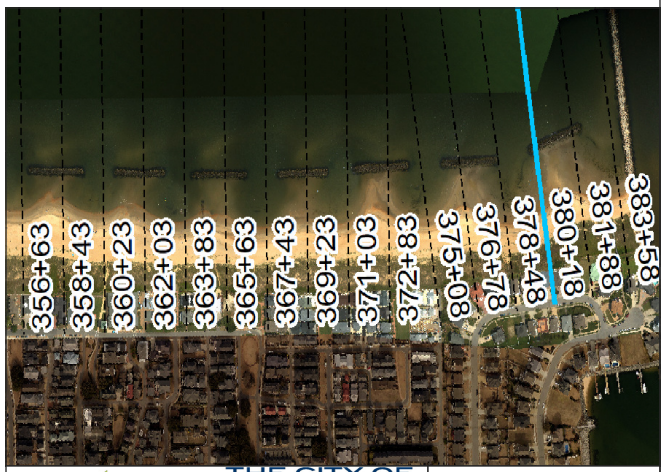
Survey Transect 380+18	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-31.08 ft	-19.79 ft
Volume Change Above -15 ft NAVD88	-6.69 cy/ft	-6.22 cy/ft
Volume Change Above 0 ft NAVD88	-1.55 cy/ft	-3.04 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	-12.0 ft	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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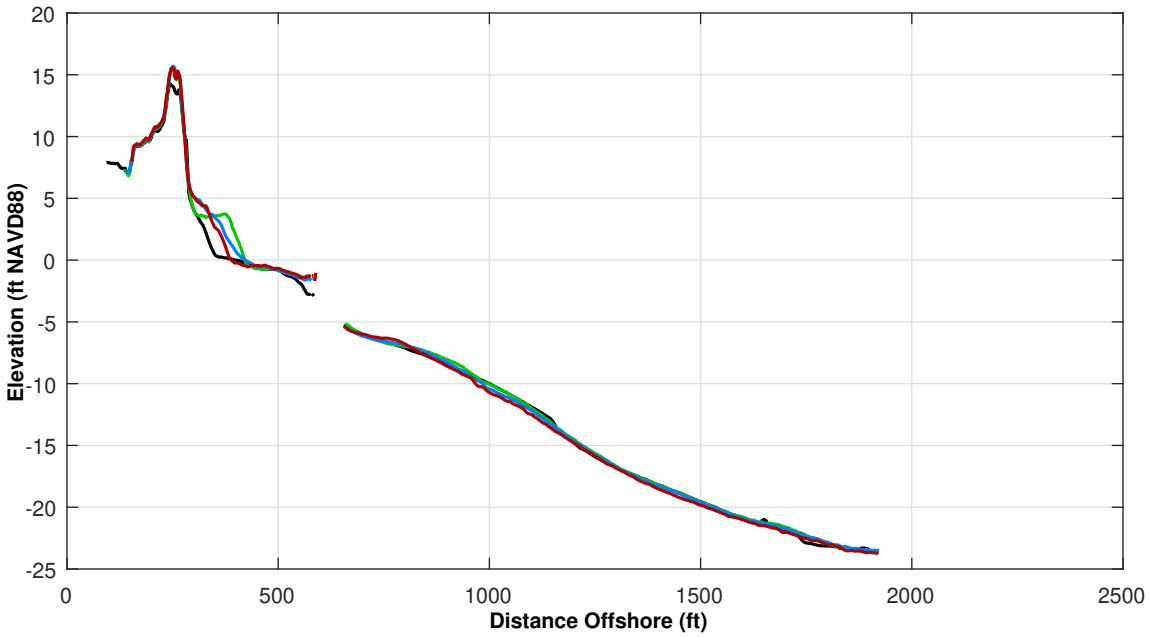
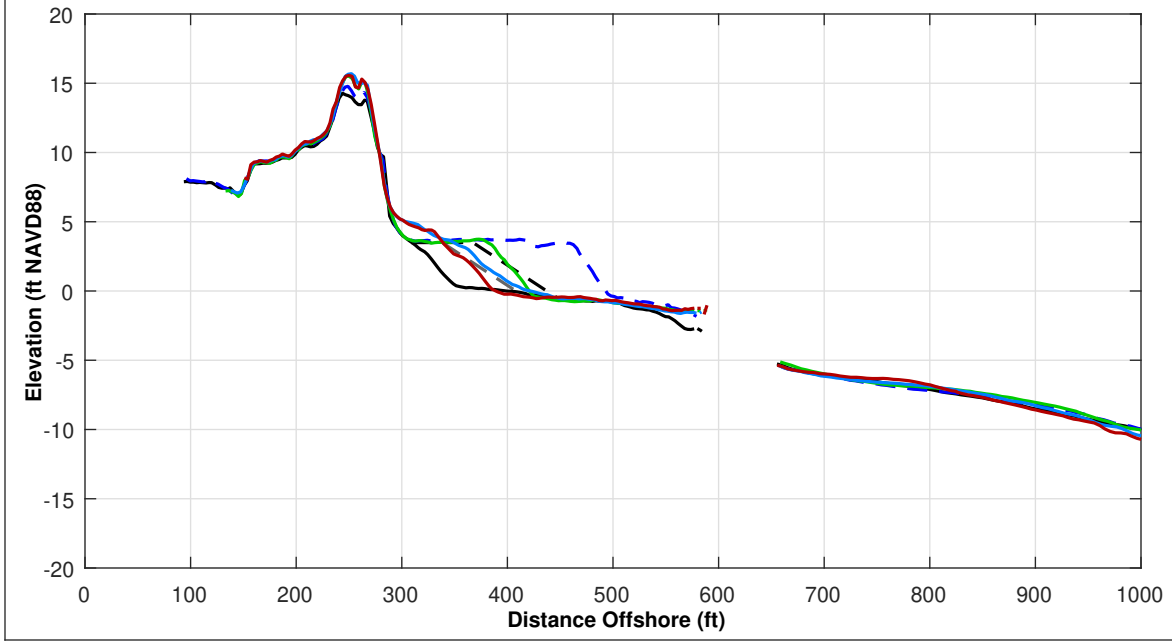
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS





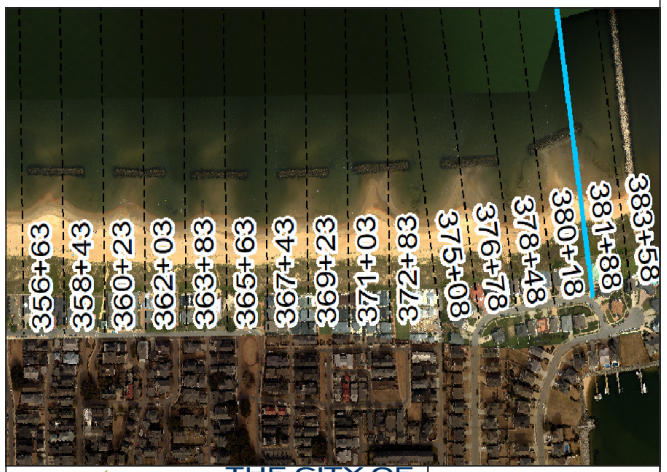
Survey Transect 381+88	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-35.38 ft	-18.72 ft
Volume Change Above -15 ft NAVD88	-8.77 cy/ft	-4.81 cy/ft
Volume Change Above 0 ft NAVD88	-2.75 cy/ft	-2.10 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:	-30.0 ft	

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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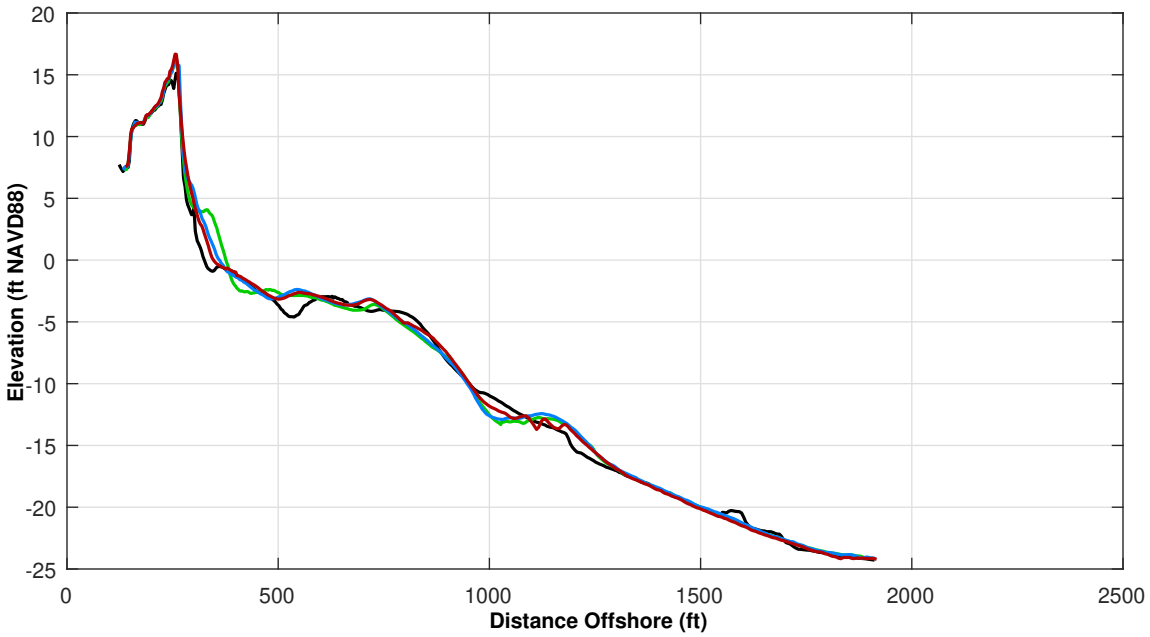
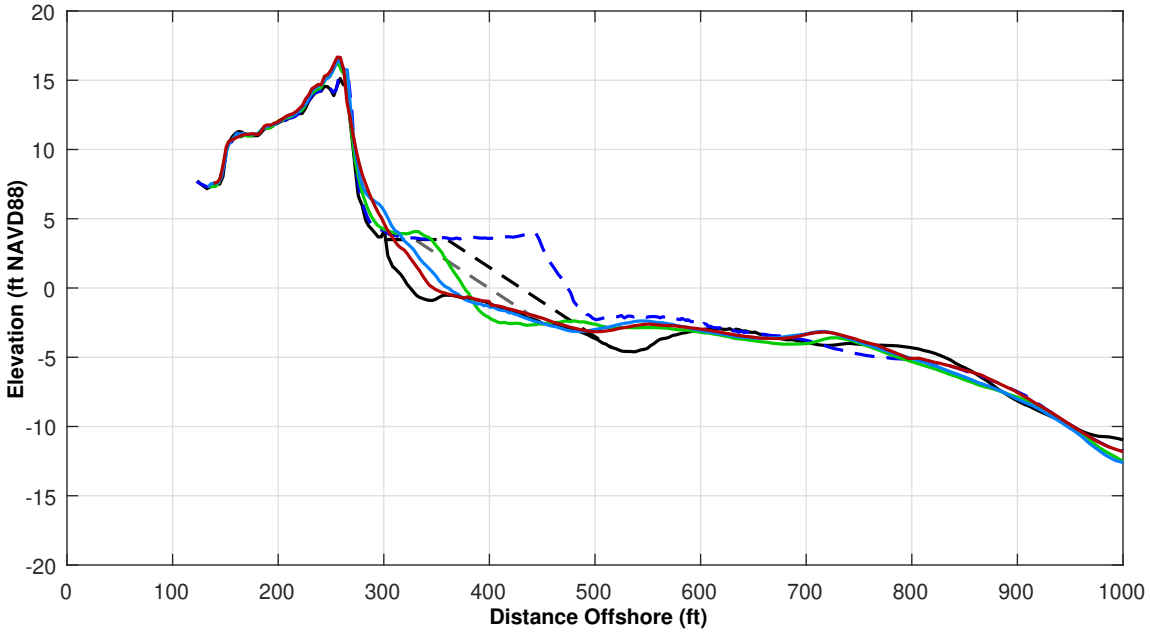
OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

ST 381+88	Pg 105 of 106	Spring 2020





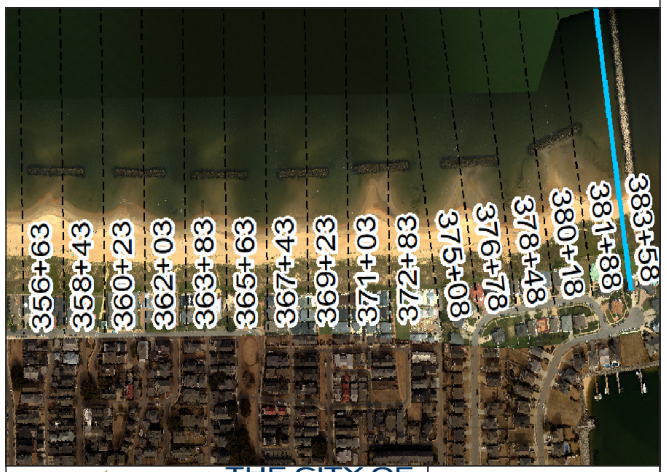
Survey Transect 383+58	JUN 2020 - APR 2019	JUN 2020 - NOV 2019
Shoreline Change at MHW (0.98 ft NAVD88)	-31.98 ft	-12.06 ft
Volume Change Above -15 ft NAVD88	4.14 cy/ft	0.44 cy/ft
Volume Change Above 0 ft NAVD88	-2.93 cy/ft	-1.70 cy/ft
Distance from USACE Design Template @ 3.5 feet NAVD88:		-53.0 ft

LEGEND:

JUN 2020
NOV 2019
APR 2019
MAY 2017
OCT 2016
USACE Design Template
USACE Nourishment Threshold

Notes:

1. Station From West To East At Varying Intervals.
2. Sections Are Viewed Toward Decreasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward and Seaward Of The Breakwater.



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PUBLIC WORKS

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

ST 383+58	Pg 106 of 106	Spring 2020

Appendix C:
Summary of Shoreline Change and Volume Change Tables

Table C-1. Summary of Shoreline Change and Volume Change (April 2019 to June 2020)

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. MHW assumed at +0.98 ft-NAVD88.

3. Shoreline Change and Volume Change is calculated for the period between surveys from April 30, 2019 to June 2, 2020.

Transect Number (Station)	Old Survey Date	New Survey Date	Shoreline Change Rate at MHW (ft/yr)	Volume Change Rate Above 0 ft NAVD88 (cy/ft/yr)	Volume Change Rate Above -15 ft NAVD88 (cy/ft/yr)
0+00	4/30/2019	6/2/2020	38.82	10.84	24.49
2+50	4/30/2019	6/2/2020	-6.86	-0.93	-18.40
5+00	4/30/2019	6/2/2020	7.16	0.15	-17.90
7+50	4/30/2019	6/2/2020	1.06	-0.63	-17.11
10+00	4/30/2019	6/2/2020	0.91	0.04	-24.32
12+50	4/30/2019	6/2/2020	-4.10	0.65	-6.59
15+00	4/30/2019	6/2/2020	18.66	6.67	3.53
17+50	4/30/2019	6/2/2020	-3.82	2.39	-1.69
20+00	4/30/2019	6/2/2020	-83.47	-6.18	-22.95
22+50	4/30/2019	6/2/2020	-51.51	-5.88	-18.81
25+00	4/30/2019	6/2/2020	22.72	2.21	-11.76
27+50	4/30/2019	6/2/2020	-47.39	-0.98	4.71
30+00	4/30/2019	6/2/2020	4.96	5.31	1.84
32+50	4/30/2019	6/2/2020	-6.94	2.71	6.11
35+00	4/30/2019	6/2/2020	-26.67	0.38	-8.53
37+50	4/30/2019	6/2/2020	6.01	4.54	1.82
40+00	4/30/2019	6/2/2020	-7.72	-1.16	-10.29
42+50	4/30/2019	6/2/2020	-0.31	-1.88	-8.86
45+00	4/30/2019	6/2/2020	-32.75	-6.17	-17.30
45+25	4/30/2019	6/2/2020	-14.65	-1.57	-13.92
47+30	4/30/2019	6/2/2020	-14.63	-1.10	-9.57
49+35	4/30/2019	6/2/2020	-35.69	-4.18	-11.89
51+41	4/30/2019	6/2/2020	-37.93	-6.19	-16.30
53+46	4/30/2019	6/2/2020	18.73	3.34	5.33
55+51	4/30/2019	6/2/2020	-49.71	-4.73	-11.97
57+57	4/30/2019	6/2/2020	-9.36	-1.89	-5.05
59+62	4/30/2019	6/2/2020	-26.91	-2.74	-8.93
61+62	4/30/2019	6/2/2020	-2.47	-1.70	-4.32
63+62	4/30/2019	6/2/2020	-15.33	-1.75	-10.60
65+62	4/30/2019	6/2/2020	-0.68	-2.27	-2.99
67+62	4/30/2019	6/2/2020	-8.68	1.61	-8.47
69+62	4/30/2019	6/2/2020	-2.02	-1.75	-6.92
71+62	4/30/2019	6/2/2020	-0.29	0.65	-2.00
73+62	4/30/2019	6/2/2020	5.87	0.05	-1.02
75+62	4/30/2019	6/2/2020	2.57	-0.81	4.10
77+62	4/30/2019	6/2/2020	-13.97	-0.78	0.28
79+62	4/30/2019	6/2/2020	0.67	0.59	2.31
81+62	4/30/2019	6/2/2020	-3.57	0.81	0.97
83+62	4/30/2019	6/2/2020	-1.06	1.26	0.83
85+62	4/30/2019	6/2/2020	-1.45	1.71	0.01
87+62	4/30/2019	6/2/2020	-12.35	1.52	-1.38

Table C-1. Summary of Shoreline Change and Volume Change (April 2019 to June 2020) Cont.

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. MHW assumed at +0.98 ft-NAVD88.

3. Shoreline Change and Volume Change is calculated for the period between surveys from April 4, 2019 to June 2, 2020.

Transect Number (Station)	Old Survey Date	New Survey Date	Shoreline Change Rate at MHW (ft/yr)	Volume Change Rate Above 0 ft NAVD88 (cy/ft/yr)	Volume Change Rate Above -15 ft NAVD88 (cy/ft/yr)
93+41	4/30/2019	6/2/2020	-6.55	0.32	-3.33
103+08	4/30/2019	6/2/2020	-11.90	0.75	0.35
120+93	4/30/2019	6/2/2020	-26.30	-1.04	-2.09
129+17	4/30/2019	6/2/2020	-4.04	-0.03	-0.25
141+98	4/30/2019	6/2/2020	-4.71	-0.32	0.12
152+01	4/30/2019	6/2/2020	-4.08	1.04	1.94
163+49	4/30/2019	6/2/2020	-7.31	0.18	0.11
169+63	4/30/2019	6/2/2020	-9.40	3.82	2.72
171+63	4/30/2019	6/2/2020	-22.79	2.86	-2.82
173+63	4/30/2019	6/2/2020	1.54	1.71	2.56
175+63	4/30/2019	6/2/2020	-13.94	-0.82	0.54
177+63	4/30/2019	6/2/2020	-6.72	5.66	6.60
179+63	4/30/2019	6/2/2020	-19.50	-3.93	-3.41
181+63	4/30/2019	6/2/2020	-17.39	-0.47	-3.49
183+63	4/30/2019	6/2/2020	-6.84	-0.97	1.13
185+63	4/30/2019	6/2/2020	-10.35	1.55	-2.20
187+63	4/30/2019	6/2/2020	-7.80	-0.42	1.67
189+63	4/30/2019	6/2/2020	-8.20	0.74	-2.66
191+63	4/30/2019	6/2/2020	-28.20	2.15	8.43
193+63	4/30/2019	6/2/2020	-4.01	1.88	0.94
195+63	4/30/2019	6/2/2020	-2.46	-0.20	-2.54
206+86	4/30/2019	6/2/2020	10.32	3.40	5.30
218+66	4/30/2019	6/2/2020	6.95	3.66	16.78
229+85	4/30/2019	6/2/2020	11.50	1.23	-2.74
242+03	4/30/2019	6/2/2020	12.75	1.40	-1.66
252+62	4/30/2019	6/2/2020	4.72	3.95	7.12
263+22	4/30/2019	6/2/2020	18.40	4.42	4.53
274+53	4/30/2019	6/2/2020	8.30	4.63	9.27
281+40	4/30/2019	6/2/2020	-3.10	4.07	3.65
288+39	4/30/2019	6/2/2020	-16.41	0.80	-4.91
295+27	4/30/2019	6/2/2020	-2.71	2.43	7.13
302+24	4/30/2019	6/2/2020	-4.29	3.93	3.79
315+96	4/30/2019	6/2/2020	-5.08	-0.73	-0.18
323+09	4/30/2019	6/2/2020	-20.24	-4.09	-13.65
329+63	4/30/2019	6/2/2020	-18.53	-4.12	-4.86
331+43	4/30/2019	6/2/2020	1.96	-1.66	-4.58
333+23	4/30/2019	6/2/2020	5.23	-1.64	1.28
335+03	4/30/2019	6/2/2020	-5.67	-0.25	-4.69
336+83	4/30/2019	6/2/2020	-5.85	0.05	-7.35
338+63	4/30/2019	6/2/2020	-3.79	-0.25	-8.38
340+43	4/30/2019	6/2/2020	-12.56	0.96	6.12
342+23	4/30/2019	6/2/2020	-3.86	0.01	-6.89

Table C-1. Summary of Shoreline Change and Volume Change (April 2019 to June 2020) Cont.

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. MHW assumed at +0.98 ft-NAVD88.

3. Shoreline Change and Volume Change is calculated for the period between surveys from Aril 30, 2019 to June 2, 2020.

Transect Number (Station)	Old Survey Date	New Survey Date	Shoreline Change Rate at MHW (ft/yr)	Volume Change Rate Above 0 ft NAVD88 (cy/ft/yr)	Volume Change Rate Above -15 ft NAVD88 (cy/ft/yr)
344+05	4/30/2019	6/2/2020	-6.00	2.23	-0.88
345+85	4/30/2019	6/2/2020	-7.06	1.70	-5.64
347+63	4/30/2019	6/2/2020	-25.44	-2.45	-3.03
349+43	4/30/2019	6/2/2020	-14.44	1.17	-7.45
351+23	4/30/2019	6/2/2020	-24.93	-1.71	-2.42
353+03	4/30/2019	6/2/2020	-15.55	1.42	-4.22
354+83	4/30/2019	6/2/2020	-30.53	-2.35	-2.61
356+63	4/30/2019	6/2/2020	-18.53	0.36	-5.15
358+43	4/30/2019	6/2/2020	-28.39	-2.69	-4.07
360+23	4/30/2019	6/2/2020	-28.69	1.34	-2.07
362+03	4/30/2019	6/2/2020	-20.88	-1.75	-2.90
363+83	4/30/2019	6/2/2020	-21.95	-3.03	-8.59
365+63	4/30/2019	6/2/2020	-8.51	-1.03	0.94
367+43	4/30/2019	6/2/2020	-15.53	-1.12	-10.15
369+23	4/30/2019	6/2/2020	-24.53	-2.13	-3.64
371+03	4/30/2019	6/2/2020	-9.02	1.06	-7.02
372+83	4/30/2019	6/2/2020	-43.70	-2.07	-5.89
375+08	4/30/2019	6/2/2020	-22.03	-0.79	-12.76
376+78	4/30/2019	6/2/2020	-44.44	-2.41	-4.67
378+48	4/30/2019	6/2/2020	-33.10	-2.11	-9.30
380+18	4/30/2019	6/2/2020	-28.43	-1.42	-6.12
381+88	4/30/2019	6/2/2020	-32.37	-2.52	-8.02
383+58	4/30/2019	6/2/2020	-29.25	-2.68	3.79

Table C-2. Summary of Shoreline Change and Volume Change (November 2019 to June 2020)

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. MHW assumed at +0.98 ft-NAVD88.

3. Shoreline Change and Volume Change is calculated for the period between surveys from November 4, 2019 to June 2, 2020.

Transect Number (Station)	Old Survey Date	New Survey Date	Shoreline Change at MHW (ft)	Volume Change Above 0 ft NAVD88 (cy/ft)	Volume Change Above -15 ft NAVD88 (cy/ft)
0+00	11/4/2019	6/2/2020	29.52	5.52	16.96
2+50	11/4/2019	6/2/2020	-21.34	-5.15	-52.81
5+00	11/4/2019	6/2/2020	9.59	-1.63	-19.00
7+50	11/4/2019	6/2/2020	0.13	-1.77	-17.26
10+00	11/4/2019	6/2/2020	-2.55	-3.52	-21.56
12+50	11/4/2019	6/2/2020	-9.90	-1.42	-5.13
15+00	11/4/2019	6/2/2020	8.12	3.22	-0.28
17+50	11/4/2019	6/2/2020	-15.94	-0.81	1.23
20+00	11/4/2019	6/2/2020	-32.05	-2.66	-6.77
22+50	11/4/2019	6/2/2020	-21.12	-2.48	-6.50
25+00	11/4/2019	6/2/2020	-1.62	1.13	-5.38
27+50	11/4/2019	6/2/2020	-8.58	2.62	11.88
30+00	11/4/2019	6/2/2020	-3.95	-0.76	-3.08
32+50	11/4/2019	6/2/2020	-12.46	1.17	2.79
35+00	11/4/2019	6/2/2020	-11.80	-1.66	-12.03
37+50	11/4/2019	6/2/2020	0.77	1.45	-1.71
40+00	11/4/2019	6/2/2020	9.36	0.03	-4.51
42+50	11/4/2019	6/2/2020	11.41	0.19	-3.39
45+00	11/4/2019	6/2/2020	-25.15	-3.98	-9.25
45+25	11/4/2019	6/2/2020	-11.54	-0.90	-9.45
47+30	11/4/2019	6/2/2020	-14.20	-0.23	-5.14
49+35	11/4/2019	6/2/2020	-10.14	-1.46	-4.90
51+41	11/4/2019	6/2/2020	-14.86	-1.79	-7.80
53+46	11/4/2019	6/2/2020	25.90	3.80	0.97
55+51	11/4/2019	6/2/2020	-37.28	-4.36	-10.32
57+57	11/4/2019	6/2/2020	-1.12	-0.01	-3.68
59+62	11/4/2019	6/2/2020	-17.79	-1.31	-5.31
61+62	11/4/2019	6/2/2020	1.41	-0.68	-2.73
63+62	11/4/2019	6/2/2020	-11.69	-1.20	-9.19
65+62	11/4/2019	6/2/2020	-2.26	-1.14	-0.26
67+62	11/4/2019	6/2/2020	-0.43	1.29	-5.99
69+62	11/4/2019	6/2/2020	0.41	-1.17	-4.76
71+62	11/4/2019	6/2/2020	2.45	-0.11	-3.29
73+62	11/4/2019	6/2/2020	11.63	0.27	-0.97
75+62	11/4/2019	6/2/2020	-8.78	-2.16	-0.52
77+62	11/4/2019	6/2/2020	-17.78	-3.23	-1.46
79+62	11/4/2019	6/2/2020	1.14	-2.25	-0.04
81+62	11/4/2019	6/2/2020	-6.92	-2.19	-2.23
83+62	11/4/2019	6/2/2020	-8.63	-1.09	0.36
85+62	11/4/2019	6/2/2020	-8.54	-0.73	-1.77
87+62	11/4/2019	6/2/2020	-0.32	2.12	4.06

Table C-2. Summary of Shoreline Change and Volume Change (November 2019 to June 2020) Cont.

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. MHW assumed at +0.98 ft-NAVD88.

3. Shoreline Change and Volume Change is calculated for the period between surveys from November 4, 2019 to June 2, 2020.

Transect Number (Station)	Old Survey Date	New Survey Date	Shoreline Change at MHW (ft)	Volume Change Above 0 ft NAVD88 (cy/ft)	Volume Change Above -15 ft NAVD88 (cy/ft)
93+41	11/4/2019	6/2/2020	-1.76	-0.15	-3.91
103+08	11/4/2019	6/2/2020	-8.70	-0.20	-2.67
120+93	11/4/2019	6/2/2020	1.25	2.55	7.20
129+17	11/4/2019	6/2/2020	6.47	3.07	5.71
141+98	11/4/2019	6/2/2020	-9.85	-1.66	-3.81
152+01	11/4/2019	6/2/2020	-0.94	-0.26	2.92
163+49	11/4/2019	6/2/2020	13.81	2.15	9.21
169+63	11/4/2019	6/2/2020	-7.26	1.12	-1.07
171+63	11/4/2019	6/2/2020	0.36	2.69	-1.10
173+63	11/4/2019	6/2/2020	19.08	3.92	5.59
175+63	11/4/2019	6/2/2020	7.91	1.93	7.37
177+63	11/4/2019	6/2/2020	12.89	6.15	3.80
179+63	11/4/2019	6/2/2020	17.04	1.56	6.93
181+63	11/4/2019	6/2/2020	3.25	0.96	-5.51
183+63	11/4/2019	6/2/2020	6.32	0.29	5.31
185+63	11/4/2019	6/2/2020	-6.88	0.16	-1.76
187+63	11/4/2019	6/2/2020	15.95	0.46	4.65
189+63	11/4/2019	6/2/2020	-1.55	-0.31	-3.94
191+63	11/4/2019	6/2/2020	13.73	4.35	12.85
193+63	11/4/2019	6/2/2020	1.42	0.01	-2.36
195+63	11/4/2019	6/2/2020	3.72	0.77	-2.94
206+86	11/4/2019	6/2/2020	2.76	1.61	0.04
218+66	11/4/2019	6/2/2020	9.17	0.95	14.17
229+85	11/4/2019	6/2/2020	11.43	0.06	-4.12
242+03	11/4/2019	6/2/2020	21.27	0.65	-2.75
252+62	11/4/2019	6/2/2020	2.67	0.86	3.30
263+22	11/4/2019	6/2/2020	20.39	2.03	3.31
274+53	11/4/2019	6/2/2020	10.73	1.09	5.92
281+40	11/4/2019	6/2/2020	4.85	-1.15	-2.30
288+39	11/4/2019	6/2/2020	2.34	-1.79	-6.11
295+27	11/4/2019	6/2/2020	8.61	1.99	4.59
302+24	11/4/2019	6/2/2020	11.32	-1.05	-3.82
315+96	11/4/2019	6/2/2020	14.53	-0.59	-1.51
323+09	11/4/2019	6/2/2020	-8.52	-3.88	-12.33
329+63	11/4/2019	6/2/2020	-15.63	-4.43	-3.03
331+43	11/4/2019	6/2/2020	4.99	-2.45	-2.07
333+23	11/4/2019	6/2/2020	13.41	-3.51	1.03
335+03	11/4/2019	6/2/2020	6.55	-1.40	-2.12
336+83	11/4/2019	6/2/2020	5.56	-0.32	-4.15
338+63	11/4/2019	6/2/2020	13.72	0.56	-5.66
340+43	11/4/2019	6/2/2020	-0.77	-1.38	9.35

Table C-2. Summary of Shoreline Change and Volume Change (November 2019 to June 2020) Cont.

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. MHW assumed at +0.98 ft-NAVD88.

3. Shoreline Change and Volume Change is calculated for the period between surveys from November 4, 2019 to June 2, 2020.

Transect Number (Station)	Old Survey Date	New Survey Date	Shoreline Change at MHW (ft)	Volume Change Above 0 ft NAVD88 (cy/ft)	Volume Change Above -15 ft NAVD88 (cy/ft)
342+23	11/4/2019	6/2/2020	5.93	-0.65	-0.87
344+05	11/4/2019	6/2/2020	7.21	1.20	0.37
345+85	11/4/2019	6/2/2020	3.82	-0.50	-6.66
347+63	11/4/2019	6/2/2020	8.76	-0.28	2.51
349+43	11/4/2019	6/2/2020	-2.29	-0.58	-8.47
351+23	11/4/2019	6/2/2020	7.05	1.62	4.90
353+03	11/4/2019	6/2/2020	-1.49	0.69	-3.80
354+83	11/4/2019	6/2/2020	-1.83	-1.01	2.15
356+63	11/4/2019	6/2/2020	-11.77	-1.53	-6.95
358+43	11/4/2019	6/2/2020	-5.01	-1.40	0.87
360+23	11/4/2019	6/2/2020	-11.47	0.52	-1.03
362+03	11/4/2019	6/2/2020	-9.96	-2.05	-2.12
363+83	11/4/2019	6/2/2020	-11.41	-2.71	-6.09
365+63	11/4/2019	6/2/2020	4.93	-0.83	3.03
367+43	11/4/2019	6/2/2020	-5.76	-0.83	-7.56
369+23	11/4/2019	6/2/2020	-13.77	-2.20	-3.19
371+03	11/4/2019	6/2/2020	-10.45	-0.01	-8.97
372+83	11/4/2019	6/2/2020	-18.76	-1.13	-3.20
375+08	11/4/2019	6/2/2020	-12.38	-0.19	-8.53
376+78	11/4/2019	6/2/2020	-28.38	-2.64	-5.52
378+48	11/4/2019	6/2/2020	-20.30	-2.08	-5.27
380+18	11/4/2019	6/2/2020	-19.79	-3.04	-6.22
381+88	11/4/2019	6/2/2020	-18.72	-2.10	-4.81
383+58	11/4/2019	6/2/2020	-12.06	-1.70	0.44

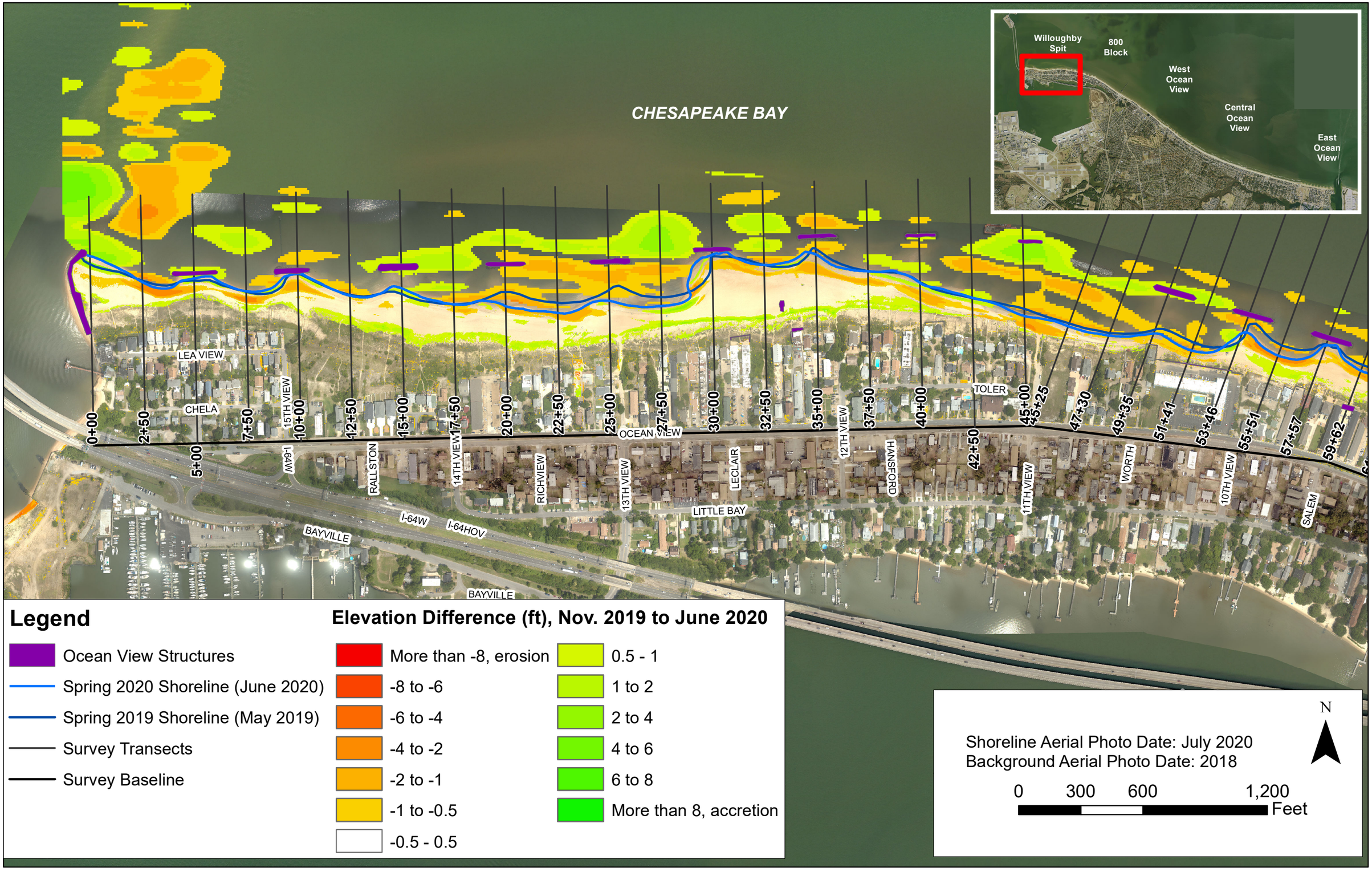
Appendix D:
Engineering Activities Log

ENGINEERING ACTIVITIES LOG AND LOG OF SURVEYS FOR ENTIRE OCEAN VIEW SHORELINE

No	Date	Project Type	Location	Description	Vol (cy)	Extent (ft)	Unit Vol (cy/ft)	Sand Source
1	1920-1937	Groin Construction	Willoughby Spit Shoreline	62 groins built by private property owners				
2	Dec 1926-Jan 1928	Jetty Construction	Little Creek Inlet	East Jetty Construction				
3	Dec 1926-Nov 1928	Jetty Construction	Little Creek Inlet	West Jetty Construction				
4	1938	Groin Construction	Between Willoughby Spit and Chesapeake Blvd.	37 timber groins built by City of Norfolk				
5	1953	Beach Nourishment	18th Bay St to 27th Bay St (East Ocean View)	Beach Nourishment	1,260,000	3,000	420	
6	1953	Beach Nourishment	27th Bay St to West Jetty (East Ocean View)	Beach Nourishment	500,000	1,800	278	
7	1960	Beach Nourishment	East End Parking Lot to West Jetty (East Ocean View)	Beach Nourishment	159,000	900	177	
8	1962	Beach Nourishment	Terminal Groin to 9th View St (Willoughby Spit)	Beach Nourishment	176,000	6,900	25	
9	1981	Groin reconstruction	Willoughby Spit area	5 timber groins were reconstructed				
10	1982	Beach Nourishment	East Ocean View	Beach Nourishment	400,000			Pretty Lake
11	1983	Groin Removal	Ocean View Park area	3 groins removed				
12	1983	Groin Construction	Western end of Willoughby Spit	5 groins built by the City of Norfolk				
13	Jan-Apr 1984	Beach Nourishment	Terminal Groin to 5th View St (Willoughby Spit)	Beach Nourishment	537,500	11,000	49	Navy Piers
14	Aug-Nov 1984	Beach Nourishment	21st Bay St to East End Parking Lot (East Ocean View)	Beach Nourishment	400,000	3,000	133	Pretty Lake
15	1985	Beach Nourishment	6th View St to Sarah Constant Shrine Park	Beach Nourishment	50,000			Navy's Willoughby project site
16	1987	Beach Nourishment	5th View St to Mason Creek	Beach Nourishment	50,000	2,000	25	Truck Haul
17	1988	Beach Access Construction	Willoughby and Ocean View	19 pedestrian beach access ways constructed				
18	Spring 1988	Dune Repair	Willoughby Beach	used 10,000 cy of accretion from terminal groin				
19	June, 1989	Dune Repair	Willoughby Beach	used 25,000 cy of accretion from terminal groin				
20	1989	Beach Nourishment	21st Bay St to East End Parking Lot (East Ocean View)	Beach Nourishment	133,000	3,000	44	Cape Henry Channel
21	1990	Breakwater Construction	Western end of Willoughby Spit-Lea View Ave.	2 near shore breakwaters				
22	1990	Terminal Groin Reconstruction	Western end of Willoughby Spit-Lea View Ave.	Original wooden groin raised and extended using rock				
23	1990	Beach Nourishment	Willoughby Spit-Near Terminal Groin	Beach Nourishment	100,000			West of Terminal Groin
24	1990-1991	Dune Stabilization/repair	Various Locations	dune vegetation planting,sand fence construction, elevated public access way, cross-over structures, and timber roads for vehicles				
25	1995	Beach Nourishment	Willoughby Spit	Beach Nourishment	240,000			15th View
26	December, 1995	Beach Nourishment	13th View St to 12 View St (in 4 groin pockets)	Beach Nourishment	4,000			15th View
27	December, 1995	Beach Nourishment	Critical Area 1: 8th View St to 7th View St	Beach Nourishment	30,000	1,000	30	15th View
28	March, 1997	Terminal Groin (trunk) Elevated	Willoughby Spit	terminal groin (trunk) elevated +4 ft				
29	Jan 1997- April 1997	Breakwater Construction	Critical Area 1: Worth St to 8th View	nearshore breakwaters 1-4 constructed				
30	December 1997 - March 1998	Breakwater Construction	Critical Area 1: Worth St to 8th View	nearshore breakwaters 5-7 constructed				
31	***October 1998 City Survey***		***Entire Ocean View Shoreline***					
32	December, 1998	Beach Nourishment	Critical Area 1: East of 8th View St-near site of future groin spur	Beach Nourishment	500	175	3	
33	***October 1999 City Survey***		***Entire Ocean View Shoreline***					
34	1999	Breakwater Construction	Critical Area 2: Just east of Community Beach	4 nearshore breakwaters constructed				
35	November-December 1999	Groin Spur Construction	Critical Area 1: Worth St to 8th View	groin spur construction				
36	December, 1999	Beach Nourishment	Center of COV breakwaters	Beach Nourishment	4,000			
37	December, 1999	Beach Nourishment	Critical Area 1: East of 8th View St-leeward of newly constructed groin spur	Beach Nourishment	1,000	200	5	15th View
38	***July 2000 City Survey***		***From Approx. 9th View St to Little Creek Inlet***					
39	August, 2000	Breakwater Construction	Critical Area 3: 21st Bay to Little Creek Inlet	nearshore breakwaters 2,3,4 constructed				
40	***October 2000 City Survey***		***From Approx. 12th View St to Little Creek Inlet***					
41	July, 2001	Beach Nourishment	Critical Area 1: Worth St to 8th View	Beach Nourishment	500			Truck Haul
42	September, 2001	Beach Nourishment	Critical Area 1: East of 8th View St-between breakwater 7 and groin spur	Beach Nourishment	2,000	300	7	15th View
43	***October 2001 City Survey***		***Entire Ocean View Shoreline***					
44	November, 2001	Breakwater Construction	Critical Area 3: 21st Bay to Little Creek Inlet	nearshore breakwaters 1,5,6,7 constructed				
45	March - April, 2002	Breakwater Work	Critical Area 1: breakwater 7	work on toe extensions				
46	May, 2002	Beach Nourishment	Critical Area 1: East of 8th View St-between breakwater 7 and groin spur	Beach Nourishment	3,438	300	11	15th View
47	June, 2002	Groin Removal	Critical Area 1: Worth St to 8th View	Removal of timber groin channalward of rock spur				
48	***July 2002 City Survey***		***Entire Ocean View Shoreline - excluding approx. Sherwood Pl. to Warwick Ave.***					
49	***October 2002 City Survey***		***Entire Ocean View Shoreline - minimal survey data (no beach or bathymetric survey points)***					
50	***March 2003 City Survey***		***East Ocean View Shoreline (19th Bay to Little Creek Inlet)***					
51	***April 2003 City Survey***		***East Ocean View Shoreline (17th Bay to Little Creek Inlet)***					
52	***June 2003 Waterway Survey***		***East Ocean View Shoreline (17th Bay to Little Creek Inlet)***					
53	September, 2003	Beach Nourishment	Critical Area 1: West of 8th View St beach access	Beach Nourishment	1,100	350	3	15th View

No	Date	Project Type	Location	Description	Vol (cy)	Extent (ft)	Unit Vol (cy/ft)	Sand Source
54	***October 2003 Waterway Survey***		***Post-Isabel Survey - East Ocean View Shoreline (17th Bay to Little Creek Inlet)***					
55	October, 2003	Beach Nourishment	Critical Area 3: 19th Bay St	Beach Nourishment	6,000	545	11	upland sand trucked in
56	October, 2003	Beach Nourishment	Critical Area 3: East of 30th Bay St	Beach Nourishment	1,000	150	7	upland sand trucked in
57	December, 2003	Beach Nourishment	Critical Area 3: 17th Bay St to Little Creek Inlet	Beach Nourishment	359,000	5,280	68	Thimble Shoal Channel
58	December, 2003	Beach Nourishment	Critical Area 1: 9th View St to 7th View St (+400 ft)	Beach Nourishment	39,800	1,260	32	
59	***Nov-Dec 2003 Post-Fill Survey***		***East OceanView Shoreline (17th Bay to Little Inlet Creek)***					
60	***Feb-April, 2004 Waterway Survey***		***From Approx. Willoughby Spit to 17th Bay St***					
61	August, 2004	Beach Nourishment	13th View to 11th View, Behind Western 4 Breakwaters at 800 Block, 1200' East of dogleg	Beach Nourishment	37,000	4,950	7	Truck Haul
62	January-March, 2005	Dune Restoration	Willoughby Spit to Central Ocean View (14th View St to Warwick Ave)	Willoughby Spit to Central Ocean View Dune Restoration Project	504,329	18,300	28	Thimble Shoal Channel
63	***January-March 2005 Post-Fill Survey***		***Willoughby Spit to Warwick Ave.***					
64	***September 2005 McKim & Creed Periodic Survey***		***Entire Ocean View Shoreline***					
65	January-February, 2006	Groin Spur & Toe Extension Removal	Critical Area 1: East of 8th View	groin spur removal				
66	January-February, 2006	Breakwater Construction	Critical Area 1: East of 8th View	nearshore breakwater 8 constructed				
67	January-February, 2006	Breakwater Construction	Critical Area 3: 29th Bay to Little Creek Inlet	nearshore breakwaters 8, 9, & 10 constructed				
68	***March 2006 McKim & Creed Periodic Survey***		***Entire Ocean View Shoreline***					
69	***October 2006 McKim & Creed Periodic Survey***		***Entire Ocean View Shoreline***					
70	***March 2007 McKim & Creed Periodic Survey***		***Entire Ocean View Shoreline***					
71	***October 2007 McKim & Creed Periodic Survey***		***Entire Ocean View Shoreline***					
72	***March 2008 McKim & Creed Periodic Survey***		***Entire Ocean View Shoreline***					
73	***October 2008 McKim & Creed Periodic Survey***		***Entire Ocean View Shoreline***					
74	March, 2009	Beach Nourishment	East Ocean View and Bay Oaks	Beach Nourishment	196,000			
75	***April 2009 McKim & Creed Periodic Survey***		***Entire Ocean View Shoreline***					
76	August-October, 2009	Breakwater Construction	Bay Oaks	5 Nearshore Breakwaters Constructed				
77	***October 2009 Geodynamics Periodic Survey***		***Entire Ocean View Shoreline***					
78	***November-December 2009 Post-Storm Survey***		***Entire Ocean View Shoreline***					
79	***March 2010 Geodynamics Periodic Survey***		***Entire Ocean View Shoreline***					
80	April, 2010	Dune Restoration	Willoughby Spit and 800 Block	Dune restoration using sediment from terminal groin and 800 block breakwaters				
81	***October 2010 Geodynamics Periodic Survey***		***Entire Ocean View Shoreline***					
82	***April 2011 Geodynamics Periodic Survey***		***Entire Ocean View Shoreline***					
83	***October 2011 Geodynamics Periodic Survey***		***Entire Ocean View Shoreline***					
84	***March 2012 Geodynamics Periodic Survey***		***Entire Ocean View Shoreline***					
85	***October 2012 Geodynamics Periodic Survey***		***Entire Ocean View Shoreline***					
86	January-May, 2013	Breakwater Construction	Willoughby Spit	7 Nearshore Breakwaters Constructed				
87	January-May, 2013	Dune Restoration/Beach Nourishment	Willoughby Spit	Dune Restoration at Lea View Ave and Beach Nourishment from 11th View to 13th View	35,000			Willoughby Spit / Truck Hual
87	January-May, 2013	Breakwater Relocation	800 Block	Breakwater 7 moved further offshore				
88	***April 2013 Geodynamics Periodic Survey***		***Entire Ocean View Shoreline***					
89	May-October, 2013	Timber Groin Removal	West Ocean View	7 Timber Groins removed east of the Pier				
90	October, 2013	Rock Groin Construction	West Ocean View	Rock Groin Constructed between Sarah Constant Shrine Park and the 200 Block				
91	***October 2013 Geodynamics Periodic Survey***		***Entire Ocean View Shoreline***					
92	November 2013	Beach Nourishment	West Ocean View	Beach Nourishment	73,600			Truck Haul
93	***March 2014 Geodynamics Periodic Survey***		***Entire Ocean View Shoreline***					
94	***October 2014 Geodynamics Periodic Survey***		***Entire Ocean View Shoreline***					
95	***April 2015 Geodynamics Periodic Survey***		***Entire Ocean View Shoreline***					
96	***October 2015 Geodynamics Periodic Survey***		***Entire Ocean View Shoreline***					
97	January-February 2016	Beach Nourishment	Toler Place (between 11th View and 12th View Streets)	Emergency nourishemnt placed above MHW	16,400			Willoughby Spit
98	February 2016	Beach Nourishment	Adjacent to Terminal Groin	Emergency nourishemnt placed above MHW	1,500			Truck Hual Upland Source
99	***May 2016 Geodynamics Periodic Survey***		***Entire Ocean View Shoreline***					
100	***October 2016 Geodynamics Periodic Survey***		***Entire Ocean View Shoreline***					
101	***February 2017 Federal Project Ore-Construction Survey (by GLDD)***		***Entire Ocean View Shoreline***					
102	March-May 2017	Beach Nourishment	14th View Street to Warwick Avenue, and 1st Bay Street to Little Creek Inlet	Initial Construction of the Federal Project by USACE	1,200,358		variable	Thimble Shoal Aux. Channel
103	***May 2017 Federal Project Post-Construction Survey (by GLDD)***		***Entire Ocean View Shoreline***					
104	***May 2017 Geodynamics Periodic Survey***		***Entire Ocean View Shoreline***					
105	***October 2017 Geodynamics Periodic Survey***		***Entire Ocean View Shoreline***					
106	***April 2018 Geodynamics Periodic Survey***		***Entire Ocean View Shoreline***					
107	***November 2018 Geodynamics Periodic Survey***		***Entire Ocean View Shoreline***					
108	***April 2019 Geodynamics Periodic Survey***		***Entire Ocean View Shoreline***					
109	***November 2019 Geodynamics Periodic Survey***		***Entire Ocean View Shoreline***					
110	March 2020 - July 2020	Breakwater Modification	Toler Place Area in the 11th View Street vicinity	Extension of existing breakwater, addition of one new breakwater, and outfall extension				
111	***June 2020 Geodynamics Periodic Survey***		***Entire Ocean View Shoreline***					

Appendix E:
Maps of Elevation Change: November 2019 to June 2020



Legend

- Ocean View Structures
- Spring 2020 Shoreline (June 2020)
- Spring 2019 Shoreline (May 2019)
- Survey Transects
- Survey Baseline

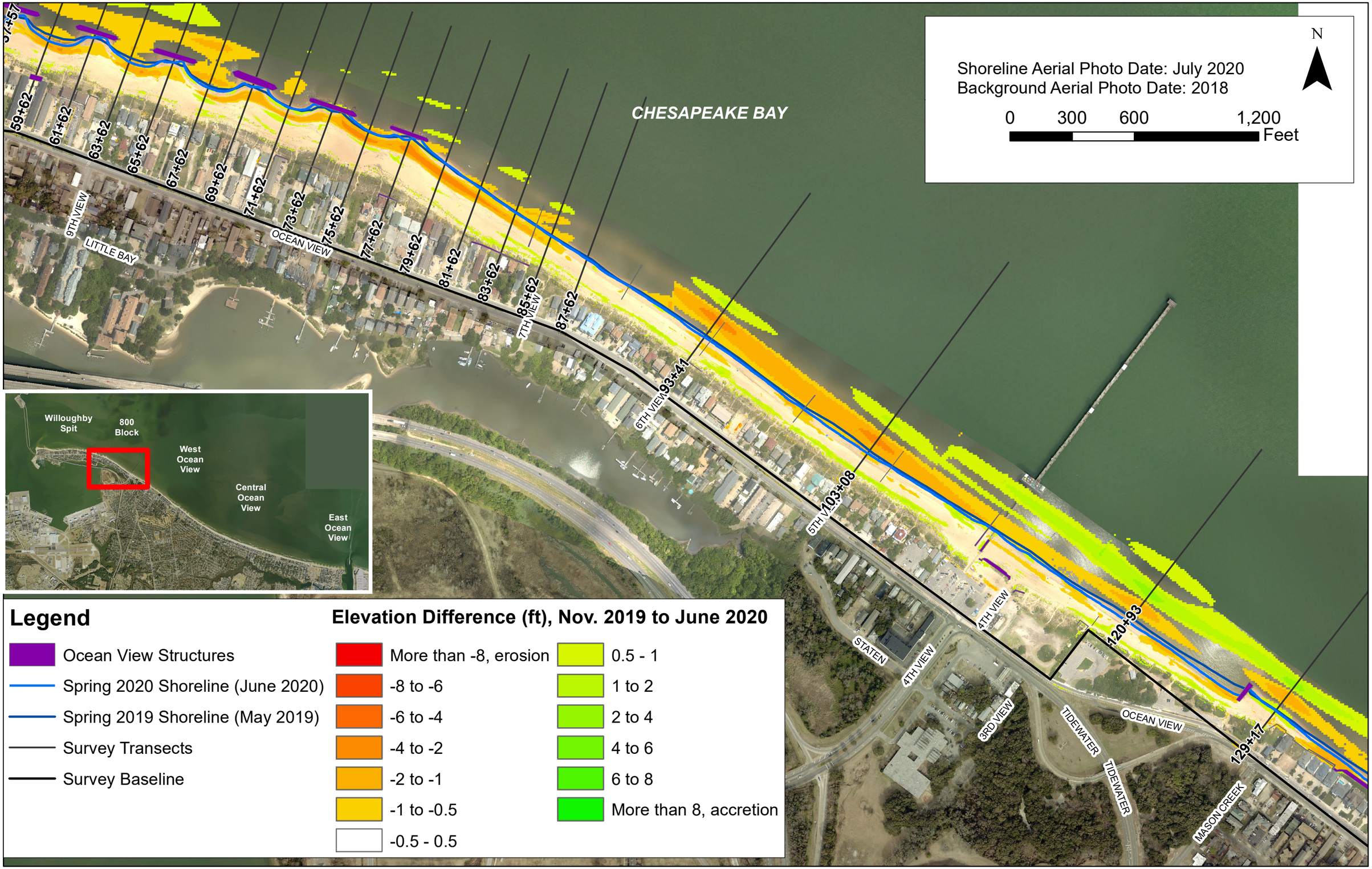
Elevation Difference (ft), Nov. 2019 to June 2020

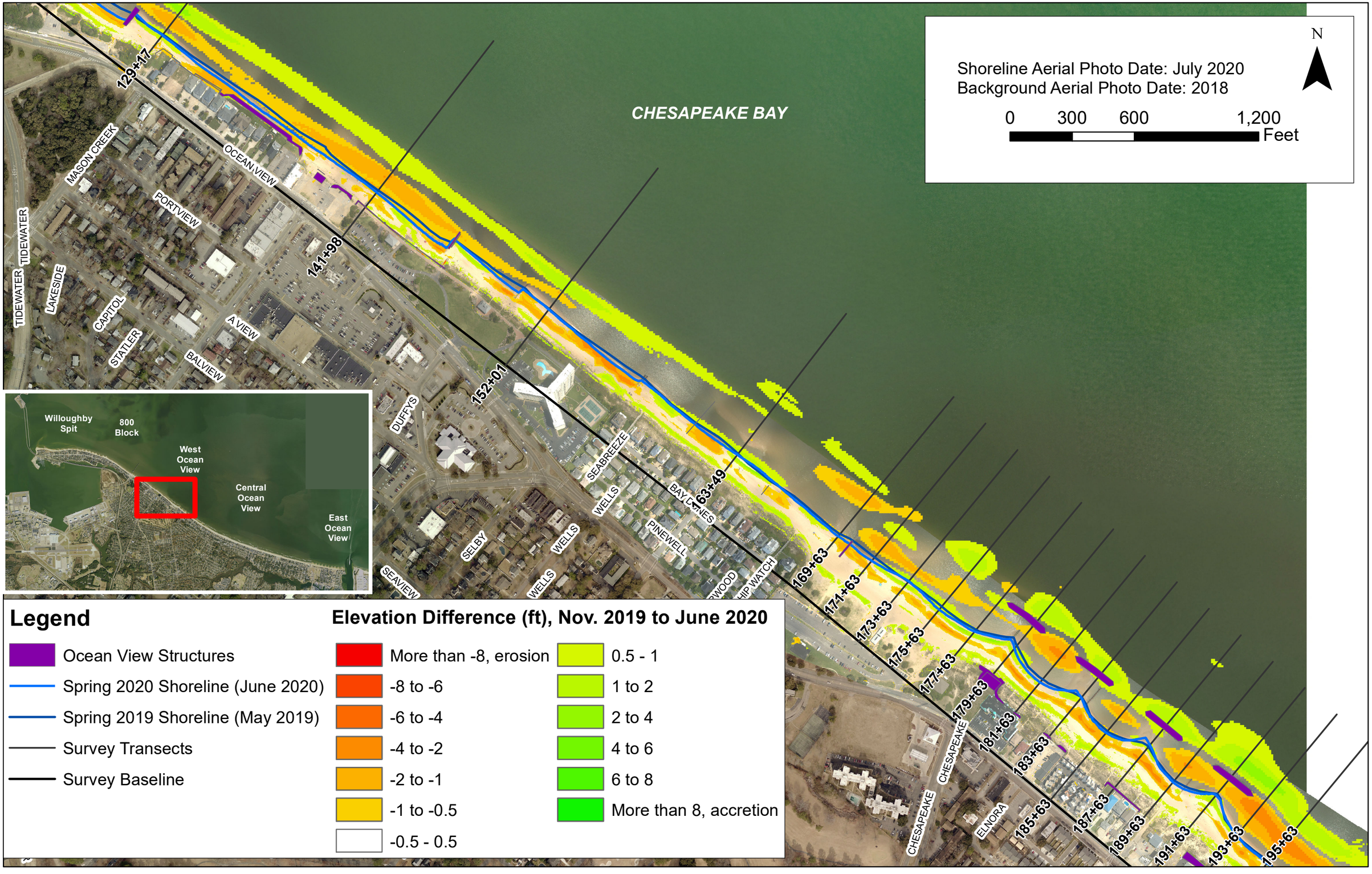
- More than -8, erosion
- -8 to -6
- -6 to -4
- -4 to -2
- -2 to -1
- -1 to -0.5
- -0.5 - 0.5
- 0.5 - 1
- 1 to 2
- 2 to 4
- 4 to 6
- 6 to 8
- More than 8, accretion

Shoreline Aerial Photo Date: July 2020
Background Aerial Photo Date: 2018

N

0 300 600 1,200 Feet


CHESAPEAKE BAY
OCEAN VIEW
LITTLE BAY
9TH VIEW
7TH VIEW
6TH VIEW
5TH VIEW
4TH VIEW
3RD VIEW
STATEN
TIDEWATER
TIDEWATER
MASON CREEK
59+62
61+62
63+62
65+62
67+62
69+62
71+62
73+62
75+62
77+62
79+62
81+62
83+62
85+62
87+62
93+41
103+08
120+93
129+17
N
Shoreline Aerial Photo Date: July 2020
Background Aerial Photo Date: 2018
0 300 600 1,200
Feet
Willoughby Spit
800 Block
West Ocean View
Central Ocean View
East Ocean View
Legend
Ocean View Structures
Spring 2020 Shoreline (June 2020)
Spring 2019 Shoreline (May 2019)
Survey Transects
Survey Baseline
Elevation Difference (ft), Nov. 2019 to June 2020
More than -8, erosion
-8 to -6
-6 to -4
-4 to -2
-2 to -1
-1 to -0.5
-0.5 - 0.5
0.5 - 1
1 to 2
2 to 4
4 to 6
6 to 8
More than 8, accretion



Legend

- Ocean View Structures
- Spring 2020 Shoreline (June 2020)
- Spring 2019 Shoreline (May 2019)
- Survey Transects
- Survey Baseline

Elevation Difference (ft), Nov. 2019 to June 2020

- More than -8, erosion
- -8 to -6
- -6 to -4
- -4 to -2
- -2 to -1
- -1 to -0.5
- -0.5 - 0.5
- 0.5 - 1
- 1 to 2
- 2 to 4
- 4 to 6
- 6 to 8
- More than 8, accretion

Shoreline Aerial Photo Date: July 2020
Background Aerial Photo Date: 2018

N

0 300 600 1,200
Feet

187+63
189+63
191+63
193+63
195+63
206+86
218+66
229+85
242+03
252+62
263+22

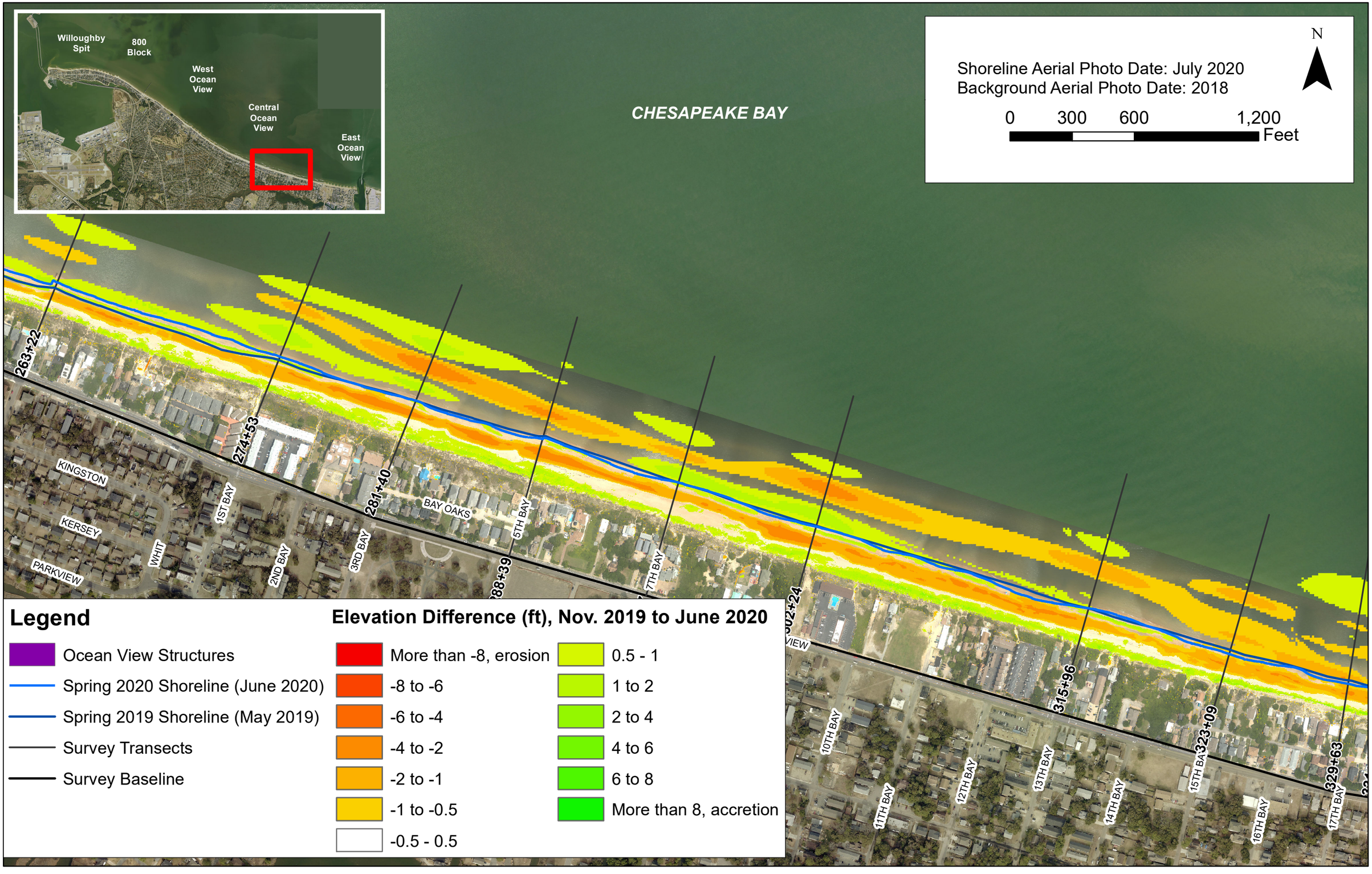
ATLANS
COTTAGE
VIRGILINA
HILLSIDE
BAYCHESTER
OCEAN VIEW
KINGSTON
GROVE
CAPE VIEW

Legend

- Ocean View Structures
- Spring 2020 Shoreline (June 2020)
- Spring 2019 Shoreline (May 2019)
- Survey Transects
- Survey Baseline

Elevation Difference (ft), Nov. 2019 to June 2020

- More than -8, erosion
- -8 to -6
- -6 to -4
- -4 to -2
- -2 to -1
- -1 to -0.5
- -0.5 - 0.5
- 0.5 - 1
- 1 to 2
- 2 to 4
- 4 to 6
- 6 to 8
- More than 8, accretion


Willoughby Spit
800 Block
West Ocean View
Central Ocean View
East Ocean View
CHESAPEAKE BAY
Shoreline Aerial Photo Date: July 2020
Background Aerial Photo Date: 2018
0 300 600 1,200
Feet
N
263+22
274+53
281+40
288+39
302+24
315+96
323+09
329+63
KINGSTON
KERSEY
PARKVIEW
WHIT
1ST BAY
2ND BAY
3RD BAY
BAY OAKS
5TH BAY
7TH BAY
10TH BAY
11TH BAY
12TH BAY
13TH BAY
14TH BAY
15TH BAY
16TH BAY
17TH BAY
Legend
Ocean View Structures
Spring 2020 Shoreline (June 2020)
Spring 2019 Shoreline (May 2019)
Survey Transects
Survey Baseline
Elevation Difference (ft), Nov. 2019 to June 2020
More than -8, erosion
-8 to -6
-6 to -4
-4 to -2
-2 to -1
-1 to -0.5
-0.5 - 0.5
0.5 - 1
1 to 2
2 to 4
4 to 6
6 to 8
More than 8, accretion

CHESAPEAKE BAY

Shoreline Aerial Photo Date: July 2020
Background Aerial Photo Date: 2018

N

0 300 600 1,200 Feet

329+63
331+43
333+23
335+03
336+83
338+63
340+43
342+23
344+05
345+85
347+63
349+43
351+23
353+03
354+83
356+63
358+43
360+23
362+03
363+83
365+63
367+43
369+23
371+03
372+83
375+08
376+78
378+48
380+18
381+88
383+58

OCEAN VIEW
KEGAGIE
EAST BEACH
COVENTRY
PLEASANT
OCEAN
27TH BAY
28TH BAY
29TH BAY
30TH BAY
BAY POINT

Legend

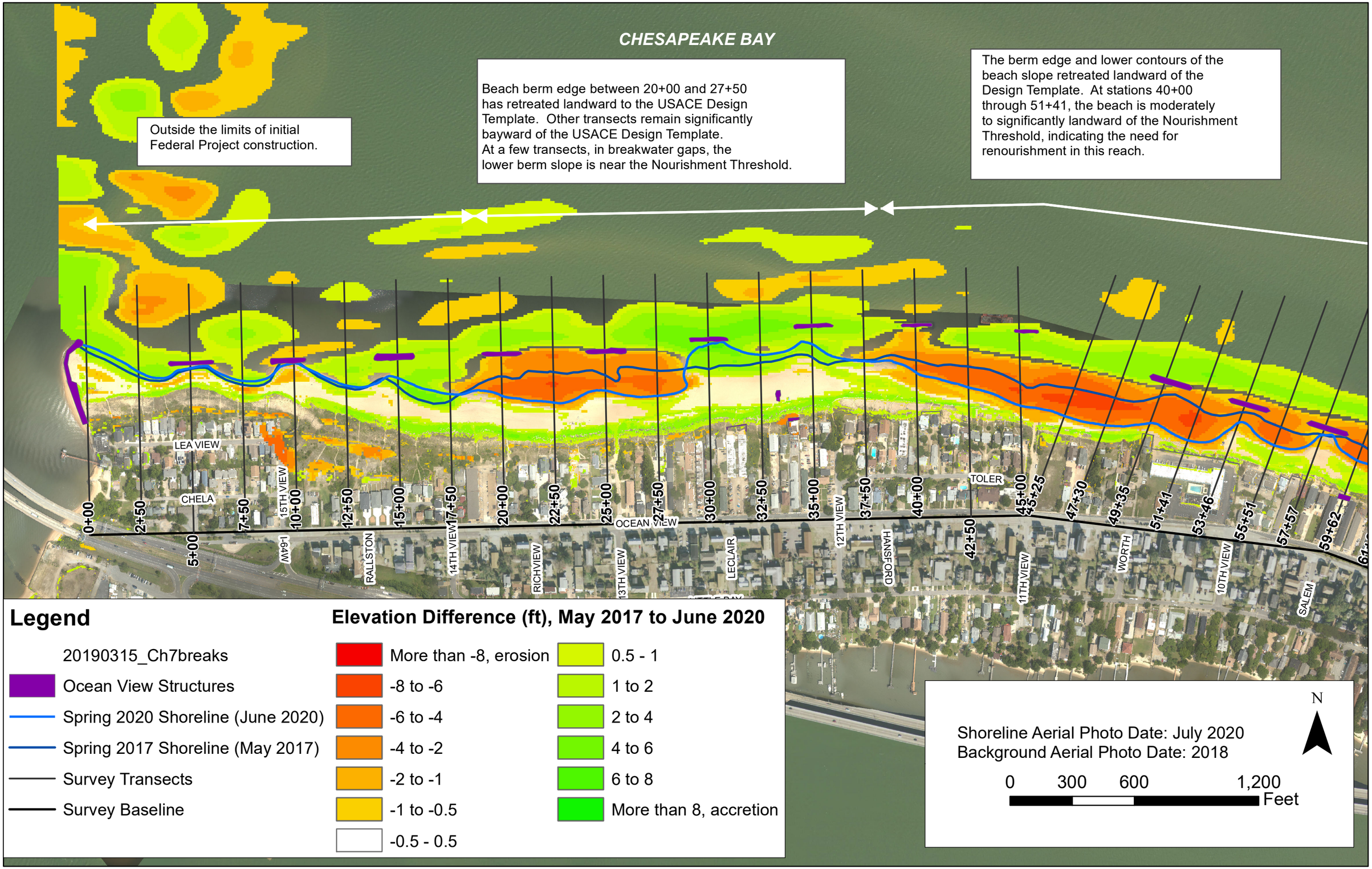
- Ocean View Structures
- Spring 2020 Shoreline (June 2020)
- Spring 2019 Shoreline (May 2019)
- Survey Transects
- Survey Baseline

Elevation Difference (ft), Nov. 2019 to June 2020

- More than -8, erosion
- -8 to -6
- -6 to -4
- -4 to -2
- -2 to -1
- -1 to -0.5
- -0.5 - 0.5
- 0.5 - 1
- 1 to 2
- 2 to 4
- 4 to 6
- 6 to 8
- More than 8, accretion

Appendix F:

Maps of Federal Project Condition Change, May 2017 to June 2020


CHESAPEAKE BAY
Outside the limits of initial Federal Project construction.
Beach berm edge between 20+00 and 27+50 has retreated landward to the USACE Design Template. Other transects remain significantly bayward of the USACE Design Template. At a few transects, in breakwater gaps, the lower berm slope is near the Nourishment Threshold.
The berm edge and lower contours of the beach slope retreated landward of the Design Template. At stations 40+00 through 51+41, the beach is moderately to significantly landward of the Nourishment Threshold, indicating the need for renourishment in this reach.
LEA VIEW
CHELA
15TH VIEW
I-64W
RALLSTON
14TH VIEW
RICHVIEW
13TH VIEW
OCEAN VIEW
LECLAIR
12TH VIEW
HANSFORD
TOLER
11TH VIEW
WORTH
10TH VIEW
SALEM
0+00
2+50
5+00
7+50
10+00
12+50
15+00
17+50
20+00
22+50
25+00
27+50
30+00
32+50
35+00
37+50
40+00
42+50
45+00
45+25
47+30
49+35
51+41
53+46
55+51
57+57
59+62
Legend
20190315_Ch7breaks
Ocean View Structures
Spring 2020 Shoreline (June 2020)
Spring 2017 Shoreline (May 2017)
Survey Transects
Survey Baseline
Elevation Difference (ft), May 2017 to June 2020
More than -8, erosion
-8 to -6
-6 to -4
-4 to -2
-2 to -1
-1 to -0.5
-0.5 - 0.5
0.5 - 1
1 to 2
2 to 4
4 to 6
6 to 8
More than 8, accretion
Shoreline Aerial Photo Date: July 2020
Background Aerial Photo Date: 2018
N
0 300 600 1,200
Feet

CHESAPEAKE BAY

Berm edge remains moderately to significantly bayward of the Design Template.

Shoreline Aerial Photo Date: July 2020
Background Aerial Photo Date: 2018

N

0 300 600 1,200 Feet

Berm edge reached the Design Template, while the lower contours of the beach slope are landward of the Nourishment Threshold.

35+51
37+57
59+62
61+62
63+62
65+62
67+62
69+62
71+62
73+62
75+62
77+62
79+62
81+62
83+62
85+62
87+62
93+41
103+08
120+93
129+17

9TH VIEW
LITTLE BAY
OCEAN VIEW
7TH VIEW
5TH VIEW
4TH VIEW
STATEN
I-64E
I-64W

Legend

- 20190315_Ch7breaks
- Ocean View Structures
- Spring 2020 Shoreline (June 2020)
- Spring 2017 Shoreline (May 2017)
- Survey Transects
- Survey Baseline

Elevation Difference (ft), May 2017 to June 2020

- More than -8, erosion
- -8 to -6
- -6 to -4
- -4 to -2
- -2 to -1
- -1 to -0.5
- -0.5 - 0.5
- 0.5 - 1
- 1 to 2
- 2 to 4
- 4 to 6
- 6 to 8
- More than 8, accretion

CHESAPEAKE BAY

Berm edge retreated landward of the Design Template, while the lower contours of the beach slope have retreated landward of the Nourishment Threshold.

The berm edge is at or slightly bayward of the Design Template. Reasonable variations in profile observed between stations at breakwaters vs. stations in gaps between breakwaters where in presence of breakwaters the lower beach slope is bayward of the Nourishment Template.

129+17
141+98
152+01
163+49
169+63
171+63
173+63
175+63
177+63
179+63
181+63
183+63
185+63
187+63
189+63
191+63
193+63
195+63

MASON CREEK
OCEAN VIEW
PORTVIEW
TIDEWATER
TIDEWATER
LAKESIDE
CAPITOL
STATLER
A VIEW
BALVIEW
D VIEW
SEABREEZE
WELLS
BAY CONIES
PINEWELL
SELBY
WELLS
WELLS
CHESAPEAKE
CHESAPEAKE
CHESAPEAKE
ELNORA

N

Shoreline Aerial Photo Date: July 2020
Background Aerial Photo Date: 2018

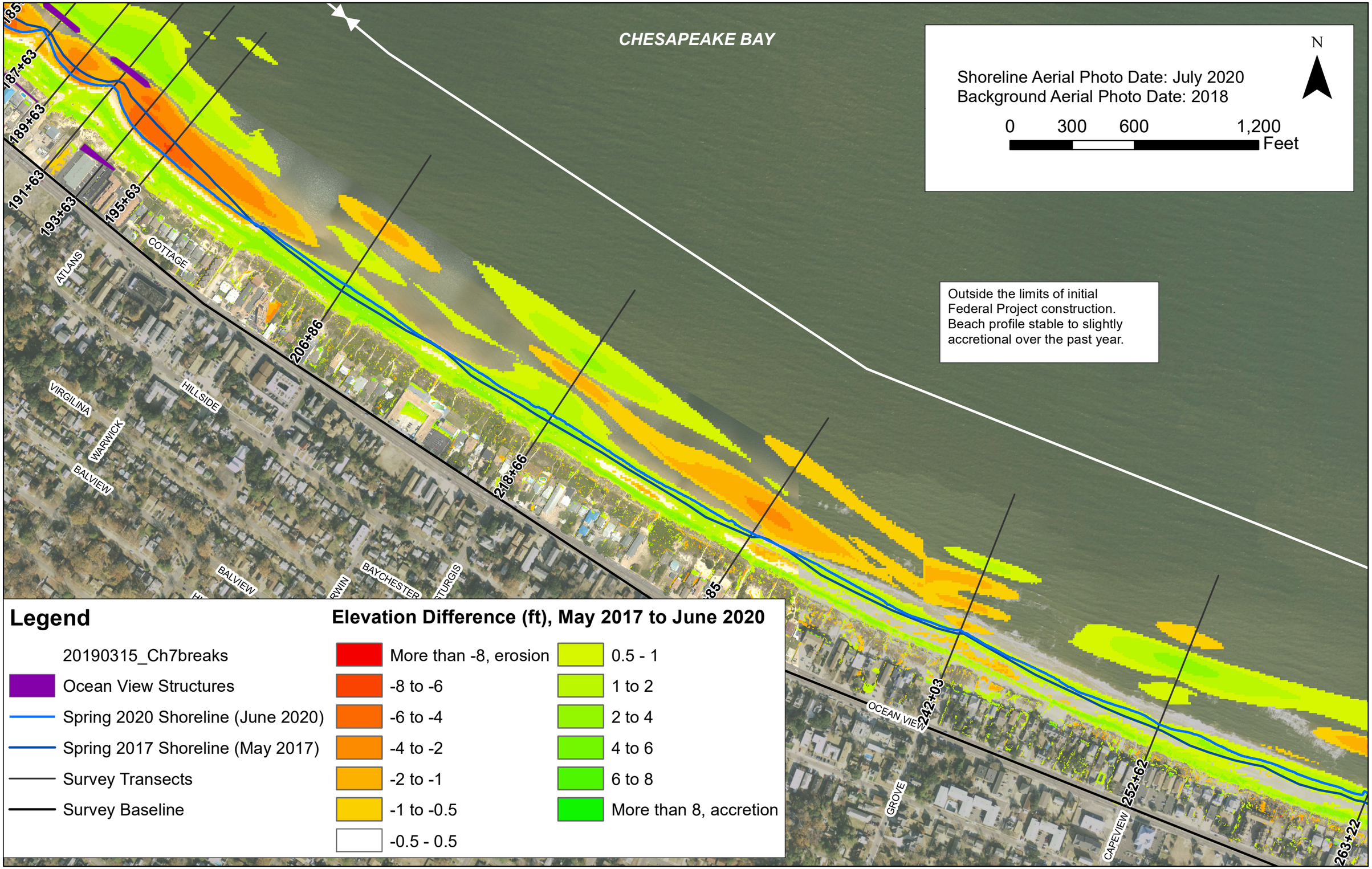
0 300 600 1,200
Feet

Legend

20190315_Ch7breaks
Ocean View Structures
Spring 2020 Shoreline (June 2020)
Spring 2017 Shoreline (May 2017)
Survey Transects
Survey Baseline

Elevation Difference (ft), May 2017 to June 2020

More than -8, erosion
-8 to -6
-6 to -4
-4 to -2
-2 to -1
-1 to -0.5
-0.5 - 0.5
0.5 - 1
1 to 2
2 to 4
4 to 6
6 to 8
More than 8, accretion


CHESAPEAKE BAY
N
Shoreline Aerial Photo Date: July 2020
Background Aerial Photo Date: 2018
0 300 600 1,200
Feet
Outside the limits of initial Federal Project construction. Beach profile stable to slightly accretional over the past year.
185
187+63
189+63
191+63
193+63
195+63
206+86
218+66
242+03
252+62
263+22
COTTAGE
ATLANS
VIRGILINA
HILLSIDE
WARWICK
BALVIEW
BAYCHESTER
OCEAN VIEW
GROVE
CAPEVIEW
Legend
20190315_Ch7breaks
Ocean View Structures
Spring 2020 Shoreline (June 2020)
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More than -8, erosion
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-6 to -4
-4 to -2
-2 to -1
-1 to -0.5
-0.5 - 0.5
0.5 - 1
1 to 2
2 to 4
4 to 6
6 to 8
More than 8, accretion

CHESAPEAKE BAY

Berm edge remains bayward of the Design Template.

Shoreline Aerial Photo Date: July 2020
Background Aerial Photo Date: 2018

N

0 300 600 1,200 Feet

263+22
274+53
281+40
288+39
302+24
315+96
323+09
329+63

KINGSTON
KERSEY
PARKVIEW
WHIT
1ST BAY
2ND BAY
3RD BAY
BAY OAKS
5TH BAY
7TH BAY
10TH BAY
11TH BAY
12TH BAY
13TH BAY
14TH BAY
15TH BAY
16TH BAY
17TH BAY

Legend

20190315_Ch7breaks
Ocean View Structures
Spring 2020 Shoreline (June 2020)
Spring 2017 Shoreline (May 2017)
Survey Transects
Survey Baseline

Elevation Difference (ft), May 2017 to June 2020

- More than -8, erosion
- -8 to -6
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- -4 to -2
- -2 to -1
- -1 to -0.5
- -0.5 - 0.5
- 0.5 - 1
- 1 to 2
- 2 to 4
- 4 to 6
- 6 to 8
- More than 8, accretion

CHESAPEAKE BAY

N

Shoreline Aerial Photo Date: July 2020
Background Aerial Photo Date: 2018

0 300 600 1,200
Feet

The berm edge is at or slightly bayward of the Design Template. Reasonable variations in profile observed between stations at breakwaters vs. stations in gaps between breakwaters.

Profile has retreat to or landward of the Nourishment Template.

329+63
331+43
333+23
335+03
336+83
338+63
340+43
342+23
344+05
345+85
347+63
349+43
351+23
353+03
354+83
356+63
365+63
367+43
369+23
371+03
372+83
375+08
376+78
378+48
380+18
381+88
383+58

OCEAN VIEW
KEGAGIE
EAST BEACH
COVENTRY
PLEASANT
BAY POINT
OCEAN
27TH BAY
28TH BAY
29TH BAY
30TH BAY

Legend

20190315_Ch7breaks
Ocean View Structures
Spring 2020 Shoreline (June 2020)
Spring 2017 Shoreline (May 2017)
Survey Transects
Survey Baseline

Elevation Difference (ft), May 2017 to June 2020

More than -8, erosion
-8 to -6
-6 to -4
-4 to -2
-2 to -1
-1 to -0.5
-0.5 - 0.5
0.5 - 1
1 to 2
2 to 4
4 to 6
6 to 8
More than 8, accretion

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