

PERIODIC SURVEY EVALUATION: OCEAN VIEW BEACH



CITY OF NORFOLK, VIRGINIA

FALL 2009

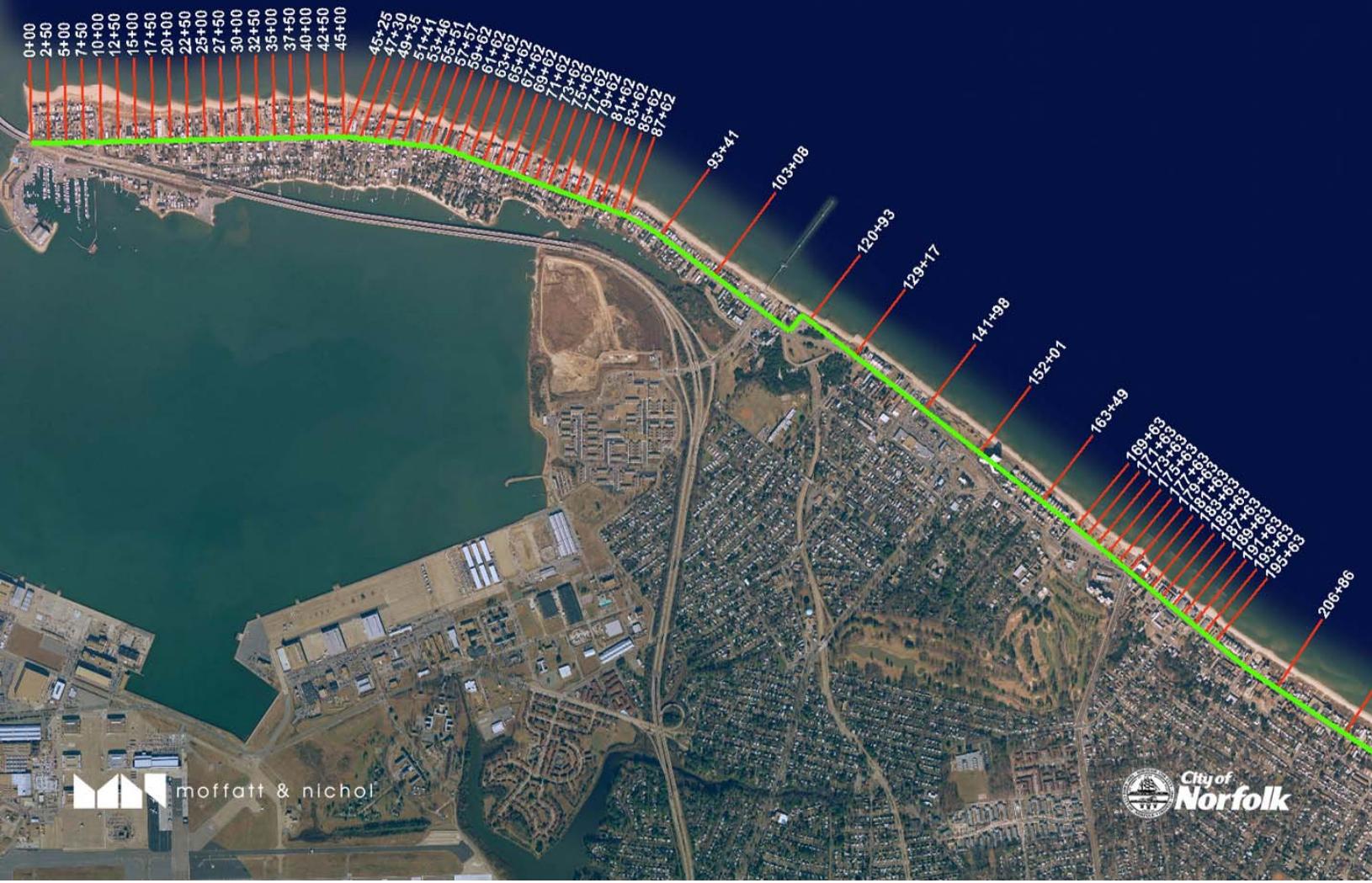


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1.0 Objective

The City of Norfolk, Virginia has a program of periodic surveying of the Ocean View shoreline. The periodic surveying data were collected by McKim & Creed in September 2005, March 2006, October 2006, March 2007, October 2007, March 2008, October 2008, April 2009 and most recently by Geodynamics, LLC in October 2009. This report documents the data sources, methods, and results of a periodic surveying evaluation performed to compare the October 2009 survey data with previous surveys taken in October 2008 (fall to fall comparison) and April 2009 (most recent survey comparison) in the Ocean View Beach area between Willoughby Spit and Little Creek Inlet. In addition, comparison of the most recent survey (October 2009) was made to pre-fill and post-fill surveys from the Central Ocean View beach nourishment project that took place in January-March 2005 and the East Ocean View beach nourishment project that was most recently renourished in March 2009.

2.0 Data Sources

Most recently, Geodynamics conducted a survey of Ocean View Beach in October 2009. The baseline and transects established for the September 2005 survey were used for the most recent survey. Twenty additional transects were added for this survey in the vicinities of Willoughby Spit and the 800 Block region to gather data for specific studies. **Figure 1** shows the location of the baseline, transects and the stationing applied by Geodynamics for the surveying. As shown, transects were stationed from west to east along the Ocean View shoreline. The survey data were obtained in xyz and shapefile formats allowing for compatibility with multiple programs. Previous survey data collected by McKim & Creed in October 2008 and April 2009 were also used for comparisons in this study.

As noted, the Fall 2009 survey utilized a different surveying company than was used on the previous surveys. There is a notable offset in the hydrographic portion of the shoreline data between the Fall 2009 survey and the Spring 2009 survey that may be attributed to several factors that affect hydrographic survey data. Each surveyor may use different types of equipment, and have different methods for handling sound velocity, both of which can affect the survey data elevations. Additionally, the distance of the vessel from the base station, or GPS interference from the nearby military bases, can impact the accuracy of the data. Due to this observed discrepancy, the hydrographic portions of the current and previous survey data were not compared in this report. Comparison of the hydrographic data will resume in the Spring 2010 report as the survey data in the spring will be collected by Geodynamics.

Also, in October 2009, the Virginia Institute of Marine Science (VIMS) flew aerial photography of the Ocean View shoreline, georectified these images, and digitized a shoreline position from the images.

The October 2009 aerial photos with the digitized shoreline position are presented in **Appendix A**. Since these photos cover a limited portion of area landward and seaward of the shoreline, a previous image (2000) is underlain, for presentation purposes.

In addition, pre-fill survey data from the East Ocean View beach nourishment, taken in March 2009, and the Willoughby Spit to Central Ocean View dune restoration, taken in December

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2004-February 2005, were used. Post-fill surveys taken for the East Ocean View beach nourishment and Willoughby Spit to Central Ocean View dune restoration projects in March 2009 and March 2005 respectively were also used. Pre-fill and post-fill data were available in xyz format from previous studies of these projects by Moffatt & Nichol.

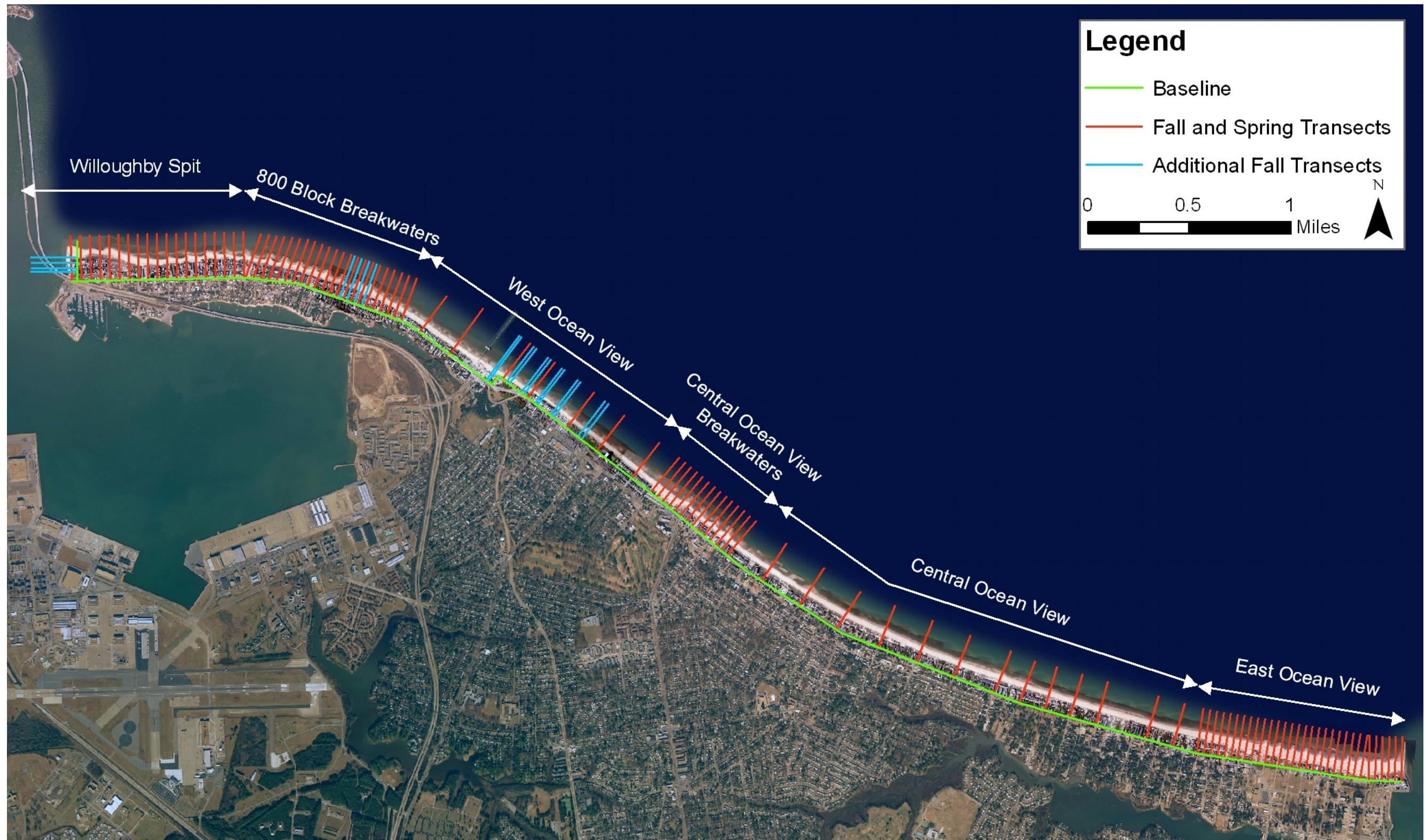


Figure 1. Survey Baseline and Transects

3.0 Methods

Survey comparisons and respective analysis were performed using a combination of Autodesk Civil 3D 2007 (Civil 3D), Autodesk Land Development Desktop 2007 (LLD), Microsoft Excel (Excel), and Surfer. Civil 3D and LLD are AutoCAD based programs which allow the user to create and analyze Digital Terrain Models (DTMs). Surfer is a contouring and 3D surface mapping program utilized to create 3D surfaces for analysis.

All pertinent survey data were imported into Civil 3D in xyz format. The horizontal coordinate system used was State Plane NAD 1983 (HARN), US Survey feet with a vertical datum of NAVD88 (ft). Digital Terrain Models (DTMs) were created for each set of survey data. From these surfaces, a beach profile was extracted at each survey transect in station elevation format. Individual profile plates showing the extracted profile at each transect for each date are presented in **Appendix B**. From the profiles, shoreline change and volumetric change were then calculated at each transect for the following time periods:

1. October 2008 to October 2009 (Entire Shoreline)
2. April 2009 to October 2009 (Entire Shoreline)
3. March 2009 (East Ocean View post-fill) to October 2009 (Sta 329+63-Sta 383+58)
4. March 2009 (East Ocean View pre-fill) to October 2009 (Sta 329+63-Sta 383+58)
5. March 2005 (Central Ocean View post-fill) to October 2009 (Sta 15+00-Sta 195+63)
6. December 2004-February 2005 (Central Ocean View pre-fill) to October 2009 (Sta 15+00-Sta 195+63)

First, change in shoreline position at mean high water (MHW), which was defined as +0.98 ft NAVD88 (based on NOAA tidal benchmark at Sewell's Point), was calculated at each transect for all time periods mentioned. The resulting value represents the shoreline change (ft) 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. In previous reports, 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; however, due to the discrepancies between the survey methods, calculations for this study are only provided for volume change above 0 ft NAVD88. As with the shoreline change, the results represent volume change (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 between surveys based on the applicable profile extents.

Volume changes calculated for portions of the profiles above 0 ft 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.

4.0 Discussion of Periodic Surveying Evaluation

This section will discuss differences observed in the relative surveys, overall shoreline trends, regional shoreline trends and the East Ocean View and Central Ocean View nourishment projects. The computed shoreline changes and volume changes at each individual transect for the time periods being covered are tabulated in **Appendix C**.

4.1. Differences in Relative Surveys

Differences in the surveys taken as part of the ongoing program of periodic surveying of the Ocean View shoreline (October 2008, April 2009 and October 2009) were minimal 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. The only discrepancy which impacted calculations was the vertical margin of error in the hydrographic portion of the survey as mentioned in Section 3.0.

The pre-fill and post-fill surveys taken for the East Ocean View and Central Ocean View nourishment projects did not use the same baseline and transects or cover the same extents as the periodic surveys. Therefore, the profiles extracted from the DTMs in Civil3D at the periodic surveying transects are interpolations between the actual pre- and post-fill data points. In addition, the surveys did not extend as far offshore as the periodic surveys, limiting computations and the ability to track the offshore movement of sand.

4.2. General Shoreline Trends

Key statistics were calculated to describe the average shoreline and volume changes over the entire shoreline as well as for each region of the shoreline as defined in **Figure 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 October 2008 to October 2009 comparison are presented in **Table 1**. A summary of the resulting statistics for the April 2009 to October 2009 comparison are presented in **Table 2**. Evaluation of the computed statistics took into account volume changes computed for portions of the profile above 0 ft NAVD88 in order to better understand onshore and offshore processes.

Table 1. Regional Shoreline and Volume Change Statistics (October 2008 – October 2009 Comparison)

Region	Average Shoreline Change	Average Volume Change Rate Above 0 ft NAVD88	Cumulative Volume Change Rate Above 0 ft NAVD88
	(ft/yr)	(cy/ft/yr)	(cy/yr)
Willoughby Spit (0+00 to 45+00)	-13.35	0.83	4,311
800 Block Breakwaters (45+25 to 87+62)	-16.20	-0.93	-4,244
West Ocean View (93+41 to 163+49)	-5.84	-1.33	-11,476
Central Ocean View Breakwaters (169+63 to 195+63)	-2.12	-0.13	-1,269
Central Ocean View (206+86 to 323+09)	-10.04	2.68	33,845
East Ocean View (329+63 to 383+58)	78.80	13.93	75,586
OVERALL	Weighted Avg (ft/yr)	Weighted Avg (cy/ft/yr)	Total (cy/yr)
	3.64	2.66	96,753

Table 2. Regional Shoreline and Volume Change Statistics (April 2009 – October 2009 Comparison)

Region	Average Shoreline Change	Average Volume Change Above 0 ft NAVD88	Cumulative Volume Change Above 0 ft NAVD88
	(ft)	(cy/ft)	(cy)
Willoughby Spit (0+00 to 45+00)	-13.69	0.16	1,297
800 Block Breakwaters (45+25 to 87+62)	-13.56	-0.76	-3,803
West Ocean View (93+41 to 163+49)	-5.86	-0.69	-6,833
Central Ocean View Breakwaters (169+63 to 195+63)	-9.36	-1.06	-3,644
Central Ocean View (206+86 to 323+09)	-11.41	-1.04	-13,180
East Ocean View (329+63 to 383+58)	-17.20	-3.59	-21,076
OVERALL	Weighted Avg (ft)	Weighted Avg (cy/ft)	Total (cy)
	-11.51	-1.18	-47,238

According to **Table 1**, the Ocean View shoreline has experienced overall accretion at MHW over the past year, due to the East Ocean View nourishment project which took place in March 2009. The recent East Ocean View project placed approximately 196,000 cy of material on the beach in the East Ocean View region, approximately 113,000 cy of which was placed above 0 ft NAVD88. This also affected the overall shoreline trends, and the volume change over the past year above 0 ft NAVD88 was positive. Regions other than East Ocean View experienced

various levels of erosion at MHW over the past year. In addition to the large gains in East Ocean View, due to the nourishment project, Central Ocean View had volumetric increases which can be attributed to spreading losses from the nourishment project into this region. Willoughby Spit also continued to show volumetric accretion above 0 ft NAVD88, while the remaining portions of shoreline had volumetric erosion.

The most recent period of comparison, from the April 2009 survey to the October 2009, survey is shown in **Table 2**. Overall there is erosion at the MHW line and it appears the majority of the erosion in the past year occurred during this six month period. As expected, the largest change in MHW shoreline position was in the East Ocean View area as the March 2009 nourishment project construction template equilibrated.

While the overall trends over the past year are accretional due to the East Ocean View nourishment project, patterns vary within each region of the shoreline as defined in **Figure 1**. The calculated statistics with respect to each region will be discussed in more detail in the following section.

4.3. Regional Shoreline Trends

Regional shoreline trends are discussed below for the defined regions between Willoughby Spit and Little Creek Inlet (see **Figure 1**). A summary of the information in **Table 1** and **Table 2** has been created for each region of study. **Figure 2** through **Figure 5**, following the discussion of regional shoreline trends, present the shoreline and volume change at each transect within the defined regions.

4.3.1. Willoughby Spit

The Willoughby Spit region (Sta 0+00 to Sta 45+00) includes two offshore breakwaters, timber groins and has historically been a stable and accreting region. A summary of average shoreline and volume change rates between October 2008 and October 2009 for the Willoughby Spit region along with average shoreline and volume change quantities between April 2009 and October 2009 are presented in **Table 3**.

Table 3. 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
October 2008 vs. October 2009 Comparison			
	(ft/yr)	(cy/ft/yr)	(cy/yr)
Willoughby Spit (0+00 to 45+00)	-13.35	0.83	4,311
April 2009 vs. October 2009 Comparison			
	(ft)	(cy/ft)	(cy)
Willoughby Spit (0+00 to 45+00)	-13.69	0.16	1,297

Table 3 indicates that during the time between the two fall surveys (October 2008 and October 2009), this region experienced an average shoreline recession rate of -13.35 ft/yr at MHW. Conversely, the region experienced a volumetric gain above 0 ft NAVD88 of 4,300 cy/yr. Examination of the profile plots in **Appendix B** shows that accretion is occurring on the beach berm between the elevations of 3 ft NAVD88 and 5 ft NAVD88 at the transects closest to the terminal groin. Sediment appears to continue to accrete between the existing timber groins in this region, especially in the fillet areas, and landward of the breakwaters that are connected to the shore. **Figure 3** shows the area closest to Willoughby spit (Sta 0+00 to Sta 20+00) continues to accrete at the highest rate. This is due to the natural direction of littoral drift and sediment movement from east to west, causing accretion in the direction of the spit.

4.3.2. 800 Block Breakwaters

The 800 Block Breakwaters region (Sta 45+25 to Sta 87+62) is characterized by a field of 8 breakwaters. The easternmost breakwater was built in February 2006 along with removal of the pre-existing groin spur and toe extension. This new breakwater was built further offshore since the previous structural configuration caused the beach to fill out and impair natural sediment transport to the west. A summary of average shoreline and volume change rates between October 2008 and October 2009 for the 800 Block Breakwater region along with average shoreline and volume change quantities between April 2009 and October 2009 are presented in **Table 4**.

Table 4. 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
October 2008 vs. October 2009 Comparison			
	(ft/yr)	(cy/ft/yr)	(cy/yr)
800 Block Breakwaters (45+25 to 87+62)	-16.20	-0.93	-4,244
April 2009 vs. October 2009 Comparison			
	(ft)	(cy/ft)	(cy)
800 Block Breakwaters (45+25 to 87+62)	-13.56	-0.76	-3,803

The comparison between profiles in the 800 Block Breakwater region indicates erosion at MHW with volumetric decreases above 0 ft NAVD88 over the past year from October 2008 to October 2009 and over the past six months from April 2009 to October 2009. **Figure 3** shows varying accretion and erosion throughout the region. Notable points include erosion at Stations 85+62, 73+62 and 53+46. Upon inspection of aerial photography, Sta 85+62 is immediately west of an outfall and Sta 73+62 is immediately west of the two easternmost breakwaters which had formed tombolos as of the October 2007 periodic survey. Tombolo formation has interrupted sediment transport to the west, causing erosion at this transect and behind the breakwaters to the west of it (Sta 53+46). The system seems to recover westward of these transects. Due to a nor'easter that impacted the shoreline two weeks after the survey was collected, a project is planned to remove approximately 10,000 cy of sediment from this tombolo formation for dune restoration in the 800 Block region.

4.3.3. West Ocean View

The West Ocean View area (Sta 93+41 to Sta 163+49), between the 800 Block and Central Ocean View breakwaters, is characterized by a series of timber groins. A summary of average shoreline and volume change rates between October 2008 and October 2009 for the West Ocean View region along with average shoreline and volume change quantities between April 2009 and October 2009 are presented in **Table 5**.

Table 5. 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
October 2008 vs. October 2009 Comparison			
	(ft/yr)	(cy/ft/yr)	(cy/yr)
West Ocean View (93+41 to 163+49)	-5.84	-1.33	-11,476
April 2009 vs. October 2009 Comparison			
	(ft)	(cy/ft)	(cy)
West Ocean View (93+41 to 163+49)	-5.86	-0.69	-6,833

The October 2008 to October 2009 comparison showed recession of the MHW shoreline as well as overall volumetric erosion above 0 ft NAVD88. **Figure 2** and **Figure 3** shows that the region

is slightly erosional along the shoreline. It is apparent that the erosion is worse at the eastern portion of the region, especially at Sta 152+01, which is downdrift of the Central Ocean View breakwater field and may experience some end effects of the breakwater field. The majority of the erosion in this region occurs at this location. Profile plots in **Appendix B** show that the loss is occurring slightly landward of an offshore bar located approximately 200 feet offshore.

4.3.4. Central Ocean View Breakwaters

The Central Ocean View breakwater region covers the four offshore breakwaters at Central Ocean View and approximately 800 feet westward (Sta 169+93 to Sta 195+63). A summary of average shoreline and volume change rates between October 2008 and October 2009 for the Central Ocean View Breakwaters region along with average shoreline and volume change quantities between April 2009 and October 2009 are presented in **Table 6**.

Table 6. 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
October 2008 vs. October 2009 Comparison			
	(ft/yr)	(cy/ft/yr)	(cy/yr)
Central Ocean View Breakwaters (169+63 to 195+63)	-2.12	-0.13	-1,269
April 2009 vs. October 2009 Comparison			
	(ft)	(cy/ft)	(cy)
Central Ocean View Breakwaters (169+63 to 195+63)	-9.36	-1.06	-3,644

In the Central Ocean View Breakwaters region changes at MHW receded over the previous year and resulted in negative volumetric changes above 0 ft NAVD88. The six month period from April 2009 to October 2009 revealed a higher level of recession at the MHW line than the year long change with a greater overall loss of volume above 0 ft NAVD88. **Figure 2** through **Figure 5** show varying levels of erosion across the region with some slight accretion at some locations. The level of erosion is on the same order as the erosion along the entire Ocean View shoreline.

4.3.5. 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 between October 2008 and October 2009 for the Central Ocean View region along with average shoreline and volume change quantities between April 2009 and October 2009 are presented in **Table 7**.

Table 7. 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
October 2008 vs. October 2009 Comparison			
	(ft/yr)	(cy/ft/yr)	(cy/yr)
Central Ocean View (206+86 to 323+09)	-10.04	2.68	33,845
April 2009 vs. October 2009 Comparison			
	(ft)	(cy/ft)	(cy)
Central Ocean View (206+86 to 323+09)	-11.41	-1.04	-13,180

As seen in **Table 7**, Central Ocean View has experienced shoreline erosion at MHW over the past year; however, the volume change above 0 ft NAVD88 has been positive. The Central Ocean View region is unprotected and therefore more vulnerable to erosion, but has in the past been a very stable region. This trend continues to be seen with only slight volume loss above 0 ft NAVD88 since April but with areas of accretion within this region during that time as well.

4.3.6. East Ocean View

The East Ocean View region (Sta 329+63 to Sta 383+58) is characterized by 15 breakwaters of which the 5 easternmost were built in August of 2009. Prior to the breakwater construction, a beach renourishment project took place in March 2009, adding approximately 196,000 cy of material to the beach. A summary of average shoreline and volume change rates between October 2008 and October 2009 for the East Ocean View region along with average shoreline and volume change quantities between April 2009 and October 2009 are presented in **Table 8**.

Table 8. 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
October 2008 vs. October 2009 Comparison			
	(ft/yr)	(cy/ft/yr)	(cy/yr)
East Ocean View (329+63 to 383+58)	78.80	13.93	75,586
April 2009 vs. October 2009 Comparison			
	(ft)	(cy/ft)	(cy)
East Ocean View (329+63 to 383+58)	-17.20	-3.59	-21,076

As a result of the recent nourishment project, there have been large gains in the MHW shoreline location and material volume above 0 ft NAVD88 in the past year. As expected, the period following the nourishment has resulted in a negative MHW shoreline change and loss of material above the 0 ft NAVD88 as the profile equilibrates and fines are transported offshore. Some of this material was likely captured offshore near the breakwaters and some was likely transported westward due to the direction of the natural littoral drift. End effects of the ten easternmost breakwaters previously caused erosion to the western portion of East Ocean View (Bay Oaks

hotspot). The five recently constructed breakwaters were designed to help alleviate these end effects and create a more uniform shoreline response. As evidenced in **Figure 2** through **Figure 5**, the erosion hotspot, which was apparent at the western end of the breakwater field in previous reports, has been adequately filled with new material and the newly constructed breakwaters have performed as expected, decreasing the end effects of the breakwater field on the shoreline.

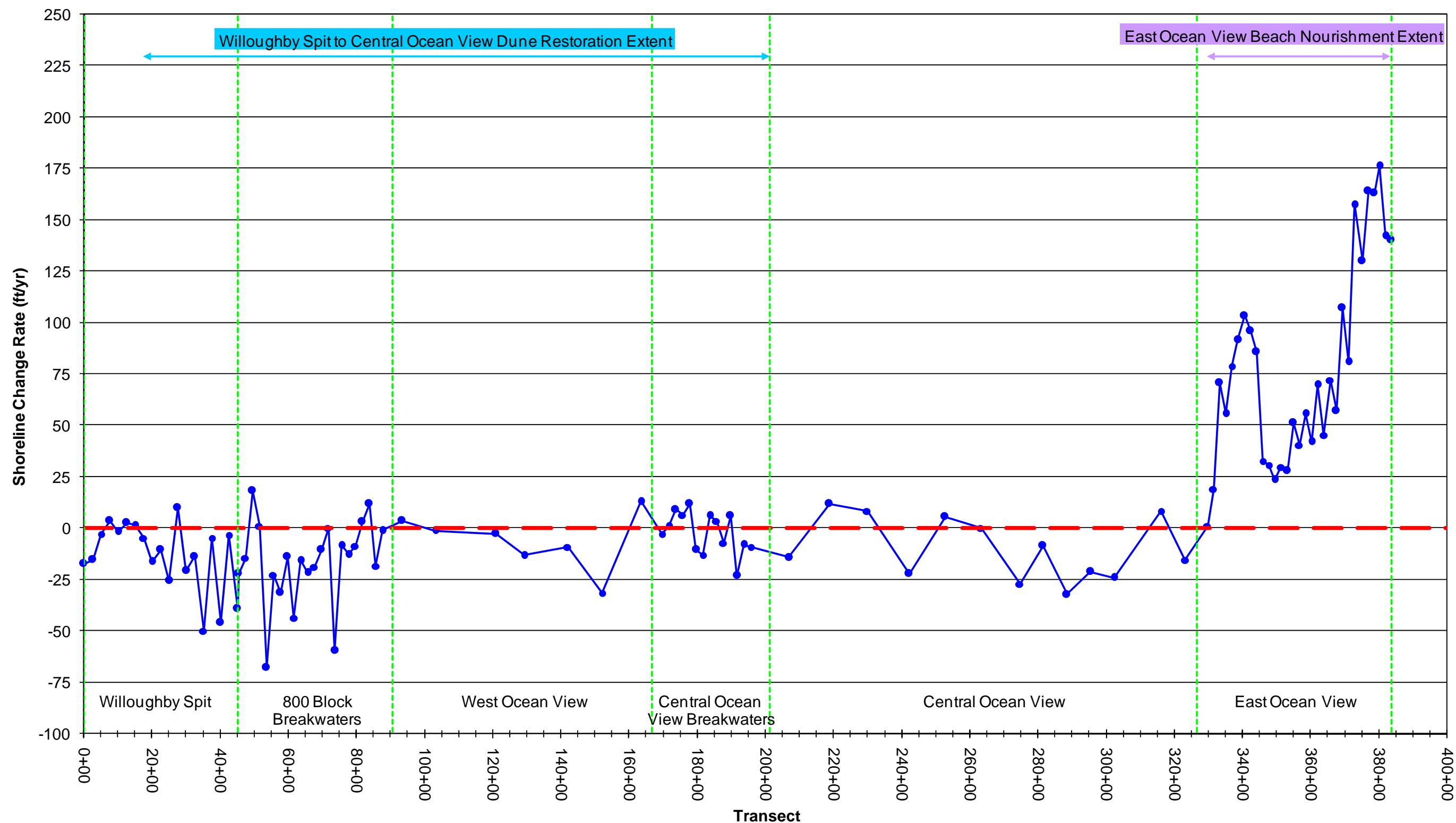


Figure 2. Shoreline Change Rate (ft/yr) At Mean High Water (+0.98 ft NAVD88) For October 2008 to October 2009

(Note: Positive=Accretion, Negative=Erosion)

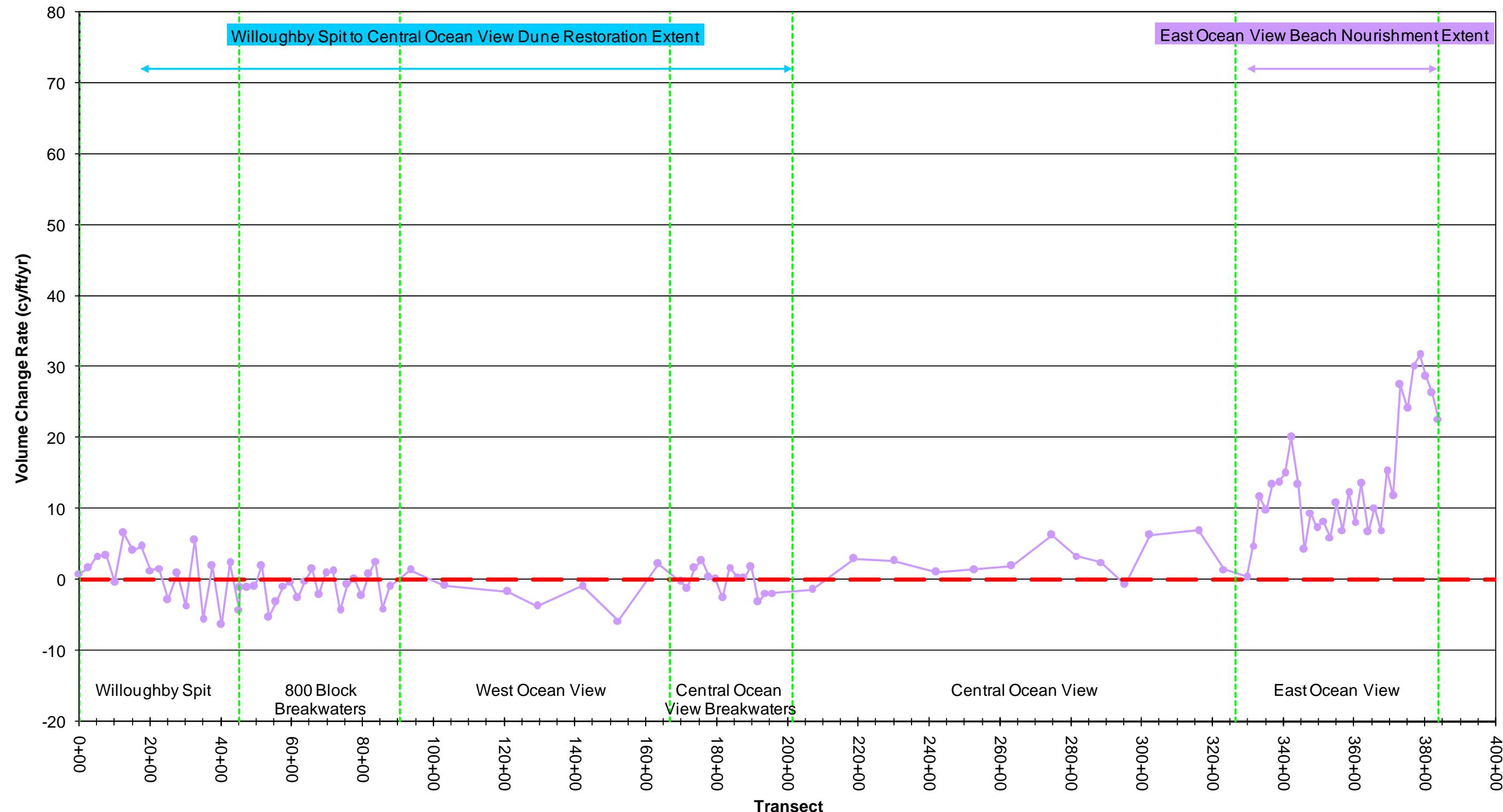


Figure 3. Volume Change Rate Above 0 ft NAVD88 (cy/ft/yr) For October 2008 to October 2009
(Note: Positive=Volume Gain, Negative=Volume Loss)

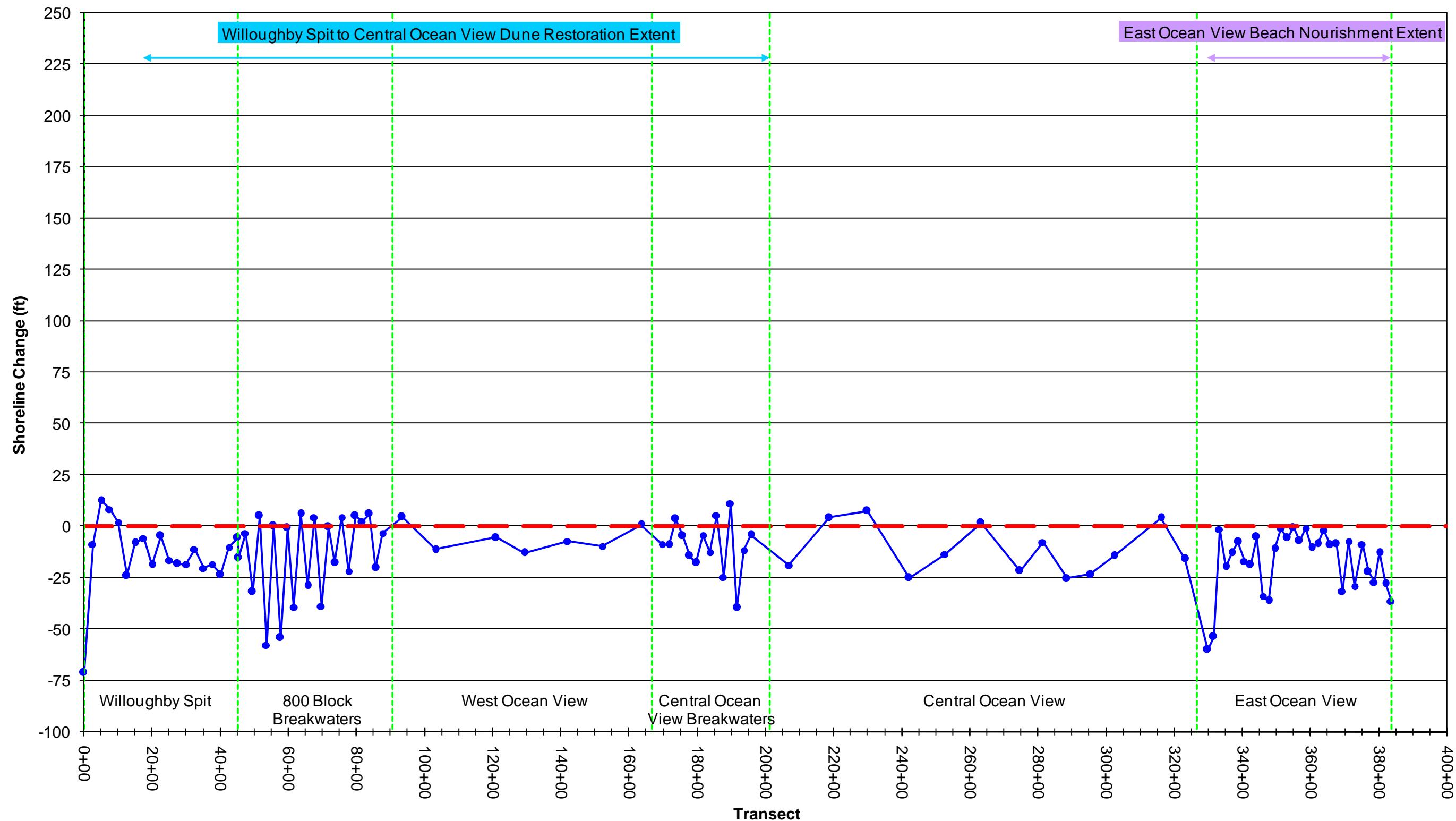


Figure 4. Shoreline Change (ft) At Mean High Water (+0.98 ft NAVD88) For April 2009 to October 2009

(Note: Positive=Accretion, Negative=Erosion)

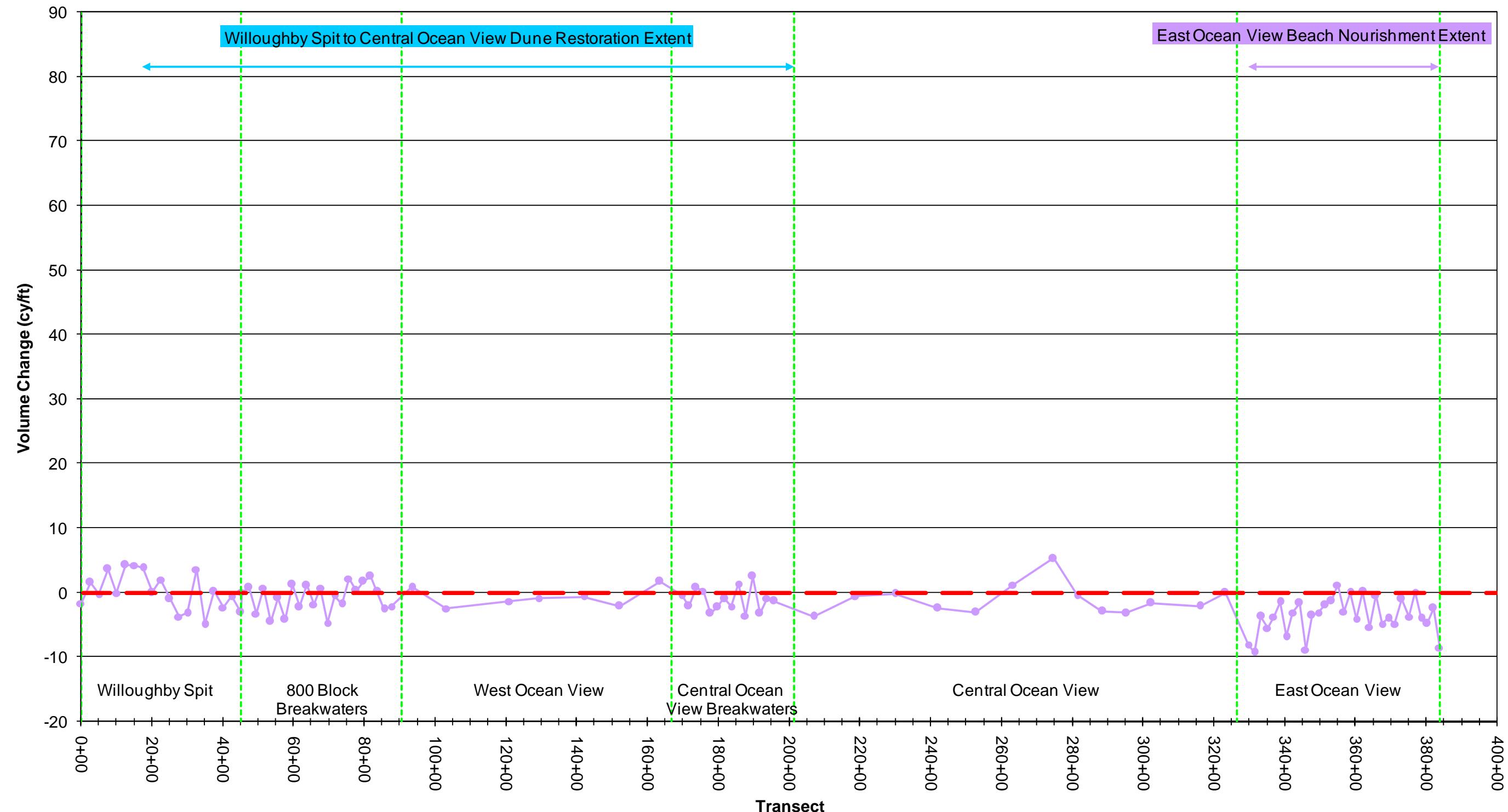


Figure 5. Volume Change Above 0 ft NAVD88 (cy/ft) For April 2009 to October 2009
(Note: Positive=Volume Gain, Negative=Volume Loss)

4.4. East Ocean View Beach Nourishment Project (2009)

Previously, a beach nourishment project took place along the East Ocean View shoreline in November 2003. Approximately 359,000 cy of material was placed on the beach between Sta 329+63 and Sta 383+58. Most recently, the East Ocean View shoreline was renourished with approximately 196,000 cy of material in March 2009. The most recent periodic survey, taken in October 2009, was compared to the post-fill survey taken in March 2009. **Table 9** presents the shoreline and volume change statistics comparing the two surveys.

Table 9. Overall Shoreline and Volume Change Statistics – East Ocean View Nourishment Project (Post-Fill – October 2009 Comparison)

Region		Average Shoreline Change	Average Volume Change Above 0 ft NAVD88	Cumulative Volume Change Above 0 ft NAVD88
East Ocean View (329+63 to 383+58)	Rate per Year	-23.70 ft/yr	-10.68 cy/ft/yr	-55,768 cy/yr
	Total	-15.00 ft	-6.76 cy/ft	-35,295 cy

Results indicate that the East Ocean View shoreline has begun to equilibrate with losses at MHW. Roughly 35,000 cy of material has been lost above 0 ft NAVD88, or approximately 31% of the 113,000 cy originally placed above 0 ft NAVD88. This loss is the result of the expected increased erosion over the short term due to profile equilibration of the recent nourishment project. As shown in **Table 8** more than a third of this volume loss above 0 ft NAVD88 occurred immediately following the March nourishment as the volume change above 0 ft NAVD88 from the April 2009 survey to October 2009 survey was approximately 21,000 cy. Over the course of the next few surveys, these rates should decrease as profile equilibration is achieved. **Figure 6** shows areas of volume gain and volume loss between the post-fill survey and the April 2009 survey. As can be seen in the figure, there has been erosion of the beach face and nearshore, which is to be expected after a nourishment project as profiles equilibrate. It is notable that the eroded material from the beach face and nearshore appears to be caught offshore in the vicinity of the breakwaters.

In addition, the October 2009 MHW shoreline was compared to the MHW shoreline from June 2003, before the first nourishment project in November 2003, as another way to measure the amount of protection being supplied by the March 2009 nourishment project. Areas where the current shoreline is within 20 ft of the June 2003 shoreline may need to be targeted for nourishment. **Figure 7** shows the MHW shoreline position difference between the pre-fill and October 2009 shorelines. As can be seen, the recent nourishment project has provided ample protection along the East Ocean View shoreline. The portion of the shoreline closest to the original pre-fill position occurs at Sta 331+43 and is 14.5 ft away. This portion of shoreline is immediately downdrift of the recently constructed breakwaters and is affected by the end effect erosion. It will be important to monitor this portion of shoreline as stabilization from the nourishment and breakwater construction continues.

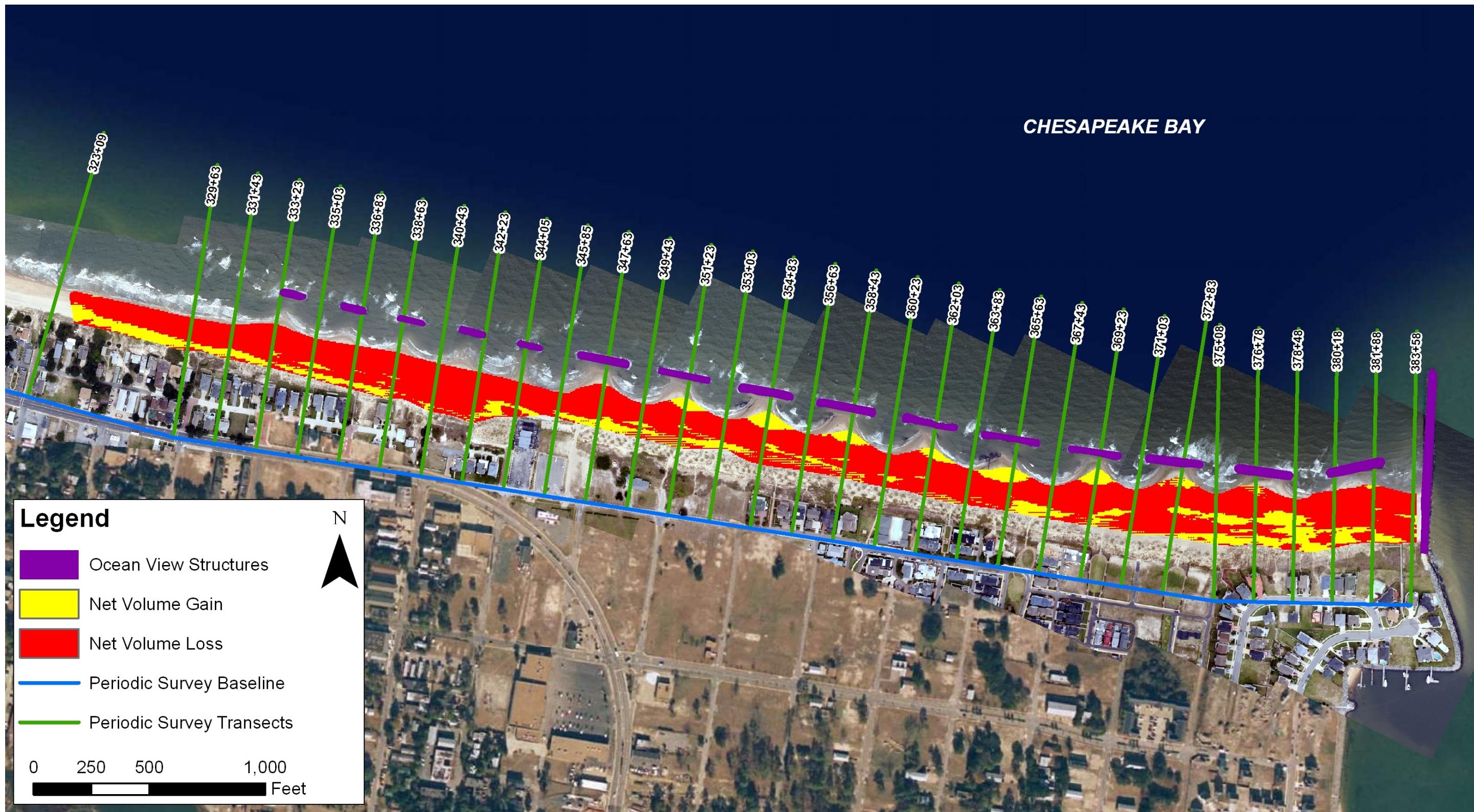


Figure 6. Net Volume Change Since the East Ocean View Nourishment Project (March 2009)

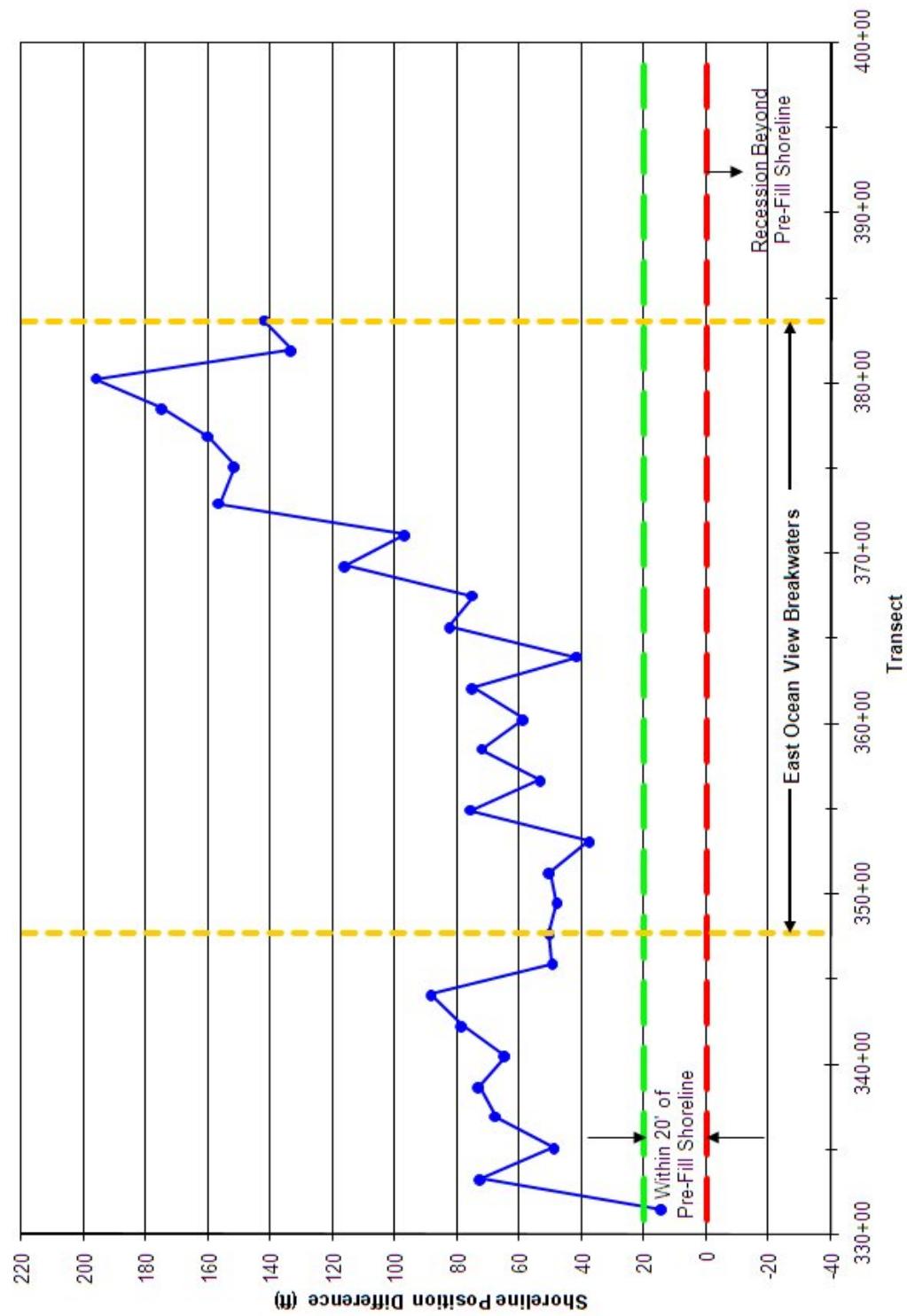


Figure 7. Shoreline Position Difference (ft) at MHW Between Pre-Fill and October 2009 Shorelines for East Ocean View

4.5. Central Ocean View Dune Restoration Project (2005)

The most recent periodic survey, taken in October 2009, was also compared to the post-fill survey taken in March 2005 after completion of the Willoughby Spit to Central Ocean View Dune Restoration project. A total of 504,300 cy of sand was placed from Sta 15+00 to Sta 195+63. **Table 10** presents the shoreline and volume change statistics comparing the two surveys.

Table 10. Regional and Overall Shoreline and Volume Change Statistics for Central Ocean View Nourishment Project (Post-Fill – October 2009 Comparison)

Region		Average Shoreline Change	Average Volume Change Above 0 ft NAVD88	Cumulative Volume Change Above 0 ft NAVD88
Willoughby Spit (0+00 to 45+00)	Rate per Year	-6.90 ft/yr	-2.13 cy/ft/yr	-6,378 cy/yr
	Total	-32.09 ft	-9.89 cy/ft	-29,654 cy
800 Block Breakwaters (45+25 to 87+62)	Rate per Year	-8.00 ft/yr	-1.55 cy/ft/yr	-6,562 cy/yr
	Total	-37.19 ft	-7.19 cy/ft	-30,510 cy
West Ocean View (93+41 to 163+49)	Rate per Year	-6.92 ft/yr	-2.65 cy/ft/yr	-21,298 cy/yr
	Total	-32.18 ft	-12.30 cy/ft	-99,020 cy
Central Ocean View Breakwaters (169+63 to 195+63)	Rate per Year	-3.81 ft/yr	-0.77 cy/ft/yr	-2,514 cy/yr
	Total	-17.69 ft	-3.59 cy/ft	-11,688 cy
OVERALL		Weighted Avg	Weighted Avg	Total
		Rate per Year	-6.60 ft/yr	-1.95 cy/ft/yr
		Total	-30.70 ft	-9.05 cy/ft
				-170,871 cy

It is important to consider changes above the 0 ft contour since the project was primarily a dune restoration, placing the majority of sand above the water. **Table 10** shows that there has been significant loss of material in the dune system and subaerial beach above 0 ft NAVD88 since the project was completed. Roughly 171,000 cy of material has been lost above 0 ft NAVD88, or approximately 53% of the 320,700 cy originally placed above 0 ft NAVD88. **Figure 8** supports the calculated statistics by showing more losses than gains to the dunes and subaerial beach. This dune/subaerial beach material is likely being transported offshore but remaining within the system. Although the material likely remains within the system, storm protection is being lost as material is moved offshore from the dune and subaerial beach system.

In addition, the October 2009 MHW shoreline was compared to the pre-fill MHW shoreline as another way to measure the amount of protection still being supplied by the January-March 2005 nourishment (dune restoration) project. Areas where the current shoreline is within 20 ft of the pre-fill shoreline may need to be targeted for nourishment. **Figure 9** shows the MHW shoreline position difference between the pre-fill and October 2009 shorelines. As can be seen, the October 2009 Willoughby Spit to Central Ocean View MHW shoreline comes within 20 ft of the pre-fill shoreline in various locations and has even receded past the pre-fill shoreline at a few locations. One area of concern is the shoreline to the west of the 800 Block breakwater field as well as portions of the breakwater field itself which exist westward of the tombolo formation at Sta 73+62 and Sta 77+62. The breakwaters are most likely inhibiting the transport of sand to the western portion of the field and shoreline beyond. Portions of the shoreline in the groin field of the Willoughby Spit region also appear to be retreating to the pre-fill shoreline position. The shoreline between the 800 Block breakwater field and the Central Ocean View breakwaters is also of concern as most transects either show recession beyond the pre-fill shoreline or shoreline positions within 20 ft of the pre-fill shoreline. Targeted nourishment projects should be planned for these areas in the near future.



Figure 8. Net Volume Change Since the Willoughby Spit to Central Ocean View Dune Restoration Project (March 2005)

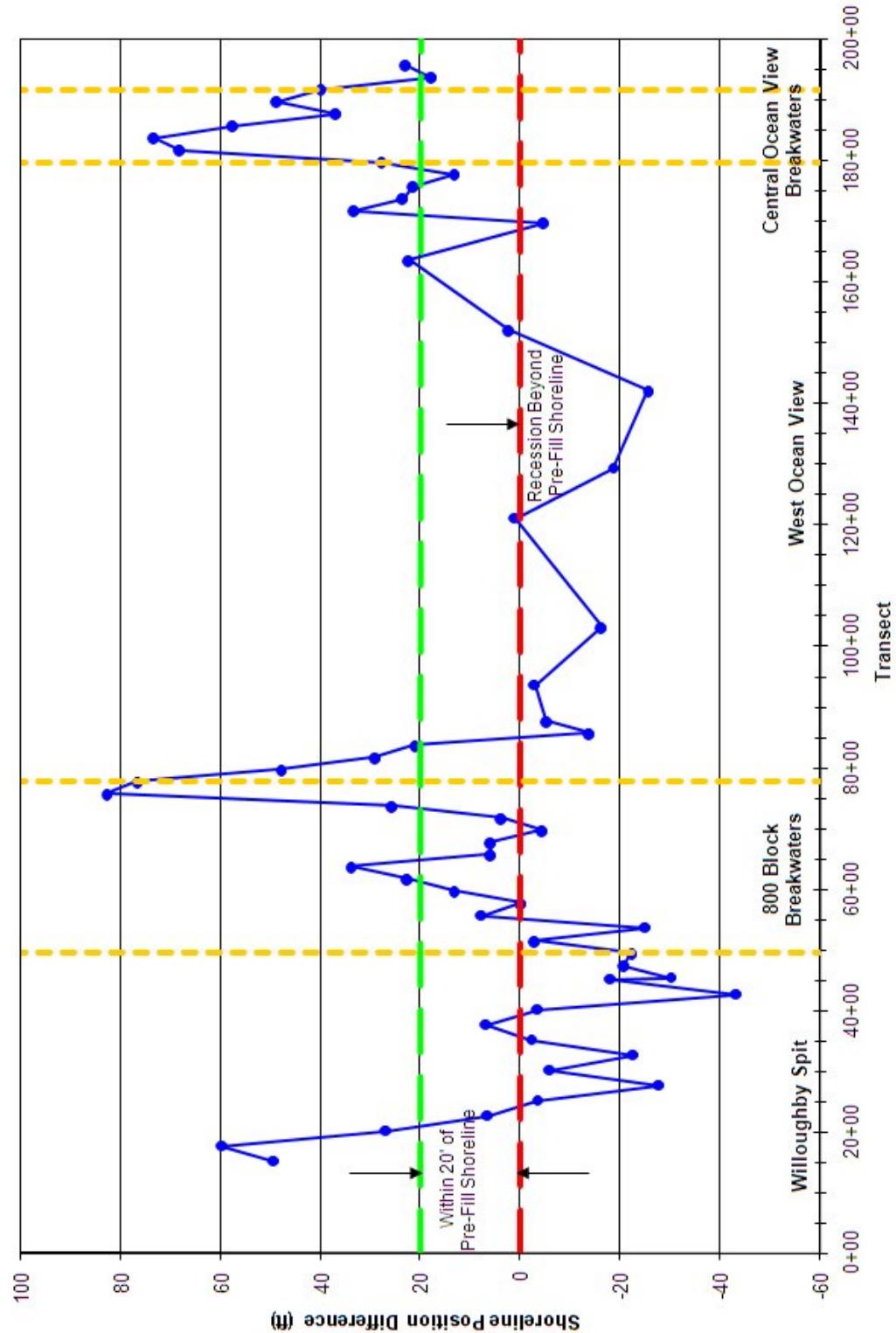


Figure 9. Shoreline Position Difference (ft) at MHW Between Pre-Fill and October 2009 Shorelines for Central Ocean View

5.0 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 October 2009. Subsequent surveys are planned to be conducted and evaluated every six months, in March/April and September/October. The beach and bathymetric surveys, performed by Geodynamics, utilized baseline and transect positions established in September 2005 which will be used for all future periodic surveys. For this periodic evaluation, the October 2009 survey was compared with both the October 2008 and April 2009 surveys. The surveys were used to compute shoreline change at MHW and volume change above 0 ft NAVD88. In addition, the most recent survey in October 2009 was compared to pre- and post-fill surveys taken after the East Ocean View beach nourishment and Willoughby Spit to Central Ocean View dune restoration projects in March 2009 and January-March 2005 respectively. This was done to quantify the amount of material loss since the projects were completed and condition of the shoreline with respect to pre-fill conditions.

Key statistics were computed for defined regions along Ocean View and the entire shoreline for the time period between both the October 2008 and October 2009 surveys and the April 2009 and October 2009 surveys.

Comparison	Parameter	Quantity
March 2008 vs. April 2009 Comparison	Average Shoreline Change Rate at MHW (+0.98 ft NAVD88)	3.64 ft/yr
	Cumulative Volume Change Rate Above 0 ft NAVD88	96,753 cy/yr
October 2008 vs. April 2009 Comparison	Average Shoreline Change at MHW (+0.98 ft NAVD88)	-11.51 ft
	Cumulative Volume Change Above 0 ft NAVD88	-47,238 cy

The average shoreline change rate for the entire shoreline at MHW between the October 2008 and October 2009 surveys was 3.64 ft/yr. The cumulative volume change above 0 ft NAVD88 was approximately 97,000 cy/yr, between the October 2008 and October 2009 surveys, indicating an overall volumetric gain in the dune and subaerial beach over the past year. This gain can mostly be attributed to the East Ocean View nourishment project as the change from the previous survey in April 2009 shows a negative shoreline change at MHW and a loss of volume above 0 ft NAVD88. Due to the discrepancy in hydrographic survey data between the previous and current surveyors the offshore portion of the profiles were not examined to determine if the trend of offshore accretion seen in previous reports has continued. A comparison of the October 2009 survey to the survey next spring will be able to reveal a better understanding of the offshore conditions as the survey methods will be consistent with those utilized in the October 2009 survey.

Overall, regional erosion/accretion patterns as have been seen in previous reports are similar with this monitoring study. The Willoughby Spit region, although showing recession at MHW, is mainly accreting (receiving sand from the 800 Block area) with losses only occurring in the dune/berm area during significant storm events. The 800 block region has shown evidence that the breakwater field is decreasing erosion of the area; however, tombolos have formed behind the two easternmost breakwaters, interrupting littoral drift to the immediately adjacent area to the west. The region seems to recover towards the middle of the breakwater field with worsening erosion at the western end of the breakwater field. This region will benefit from localized nourishment in the future, or some reworking of the existing beach if a storm does not break up

the tombolos that have formed, reinstating the historical littoral drift pattern. The West Ocean View region still remains fairly stable with some slight erosion, especially in the eastern portion of the region. This could be the result of the end effect of the Central Ocean View breakwaters. The Central Ocean View Breakwaters region appears to be fairly stable with some highly localized erosion/accretion patterns based on breakwater location. Like the eastern portion of the West Ocean View region, the western portion of this region is possibly seeing a slight end effect from the breakwater field. Focused nourishments may be required here in the future. The Central Ocean View region continues to be fairly stable. Usually, some slight erosion is seen at the eastern portion of the region, which is most likely attributed to the end effect of the East Ocean View breakwaters. For this monitoring period, the Central Ocean View region has most likely seen some benefit of material placed at East Ocean View due to natural littoral drift, lessening the downdrift impact of the breakwater field. Finally, the East Ocean View area underwent a large gain in material from nourishment, especially in the area behind the three easternmost breakwaters (which do not receive sediment from natural transport due to the jetties) and the area landward of the five recently constructed breakwaters (which was previously designated as an erosion hotspot). The recently constructed breakwaters appear to be alleviating the end effects from the previous breakwater field and creating a more uniform shoreline response.

In addition, comparison of the October survey was made against post-fill surveys from the East Ocean View beach nourishment and Willoughby Spit to Central Ocean View dune restoration which took place in March 2009 and January-March 2005 respectively.

Comparison	Average Shoreline Change	Average Volume Change Above 0 ft NAVD88	Cumulative Volume Change Above 0 ft NAVD88
East Ocean View Nourishment vs. October 2009 Comparison	-15.00 ft	-6.76 cy/ft	-35,295 cy
Central Ocean View Nourishment vs. October 2009 Comparison	-30.70 ft	-9.05 cy/ft	-170,871 cy

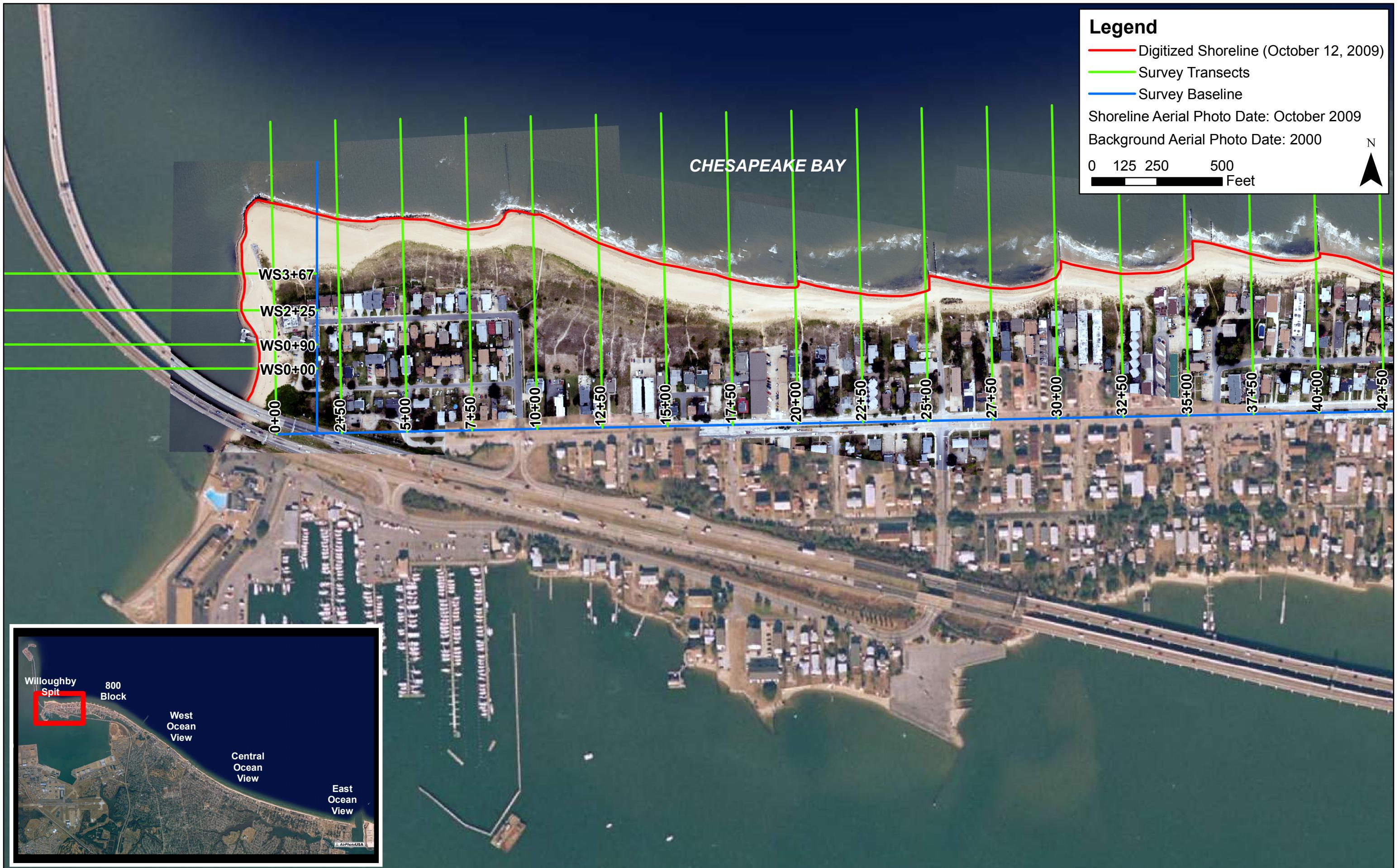
Approximately 35,000 cy of material has been lost in the East Ocean View area above 0 ft NAVD88 since the nourishment project which took place in March 2009. This is approximately 31% of the original amount of fill placed above the 0 ft contour. The Willoughby Spit to Central Ocean View region has lost approximately 171,000 cy of material from the dune system and/or subaerial beach since the project completion in March 2005. This is approximately 53% of the total material placed above 0 ft NAVD88 during the dune restoration and a large loss of storm protection.

As another measure of the protection being supplied by the East Ocean View and Central Ocean View nourishment projects, the pre-fill and October 2009 MHW shoreline positions were compared. Areas where the current shoreline has receded beyond or eroded within 20 ft of the pre-fill shoreline may need to be targeted for immediate nourishment. Results of this analysis indicated that the East Ocean View nourishment project has provided ample shoreline protection for the majority of the shoreline with only slight end effects immediately west of the recently constructed breakwaters. The Willoughby Spit to Central Ocean View shoreline continues to have various problem spots. A portion of the shoreline in the Willoughby Spit groin field, the shoreline to the west of the 800 Block breakwaters, portions of the 800 Block region to the west

of the easternmost breakwaters, and the shoreline between the 800 Block breakwaters and Central Ocean View breakwaters has eroded to within 20 ft of the pre-fill shoreline and even receded beyond the pre-fill shoreline in some locations. Targeted nourishment should be planned for these areas in the near future.

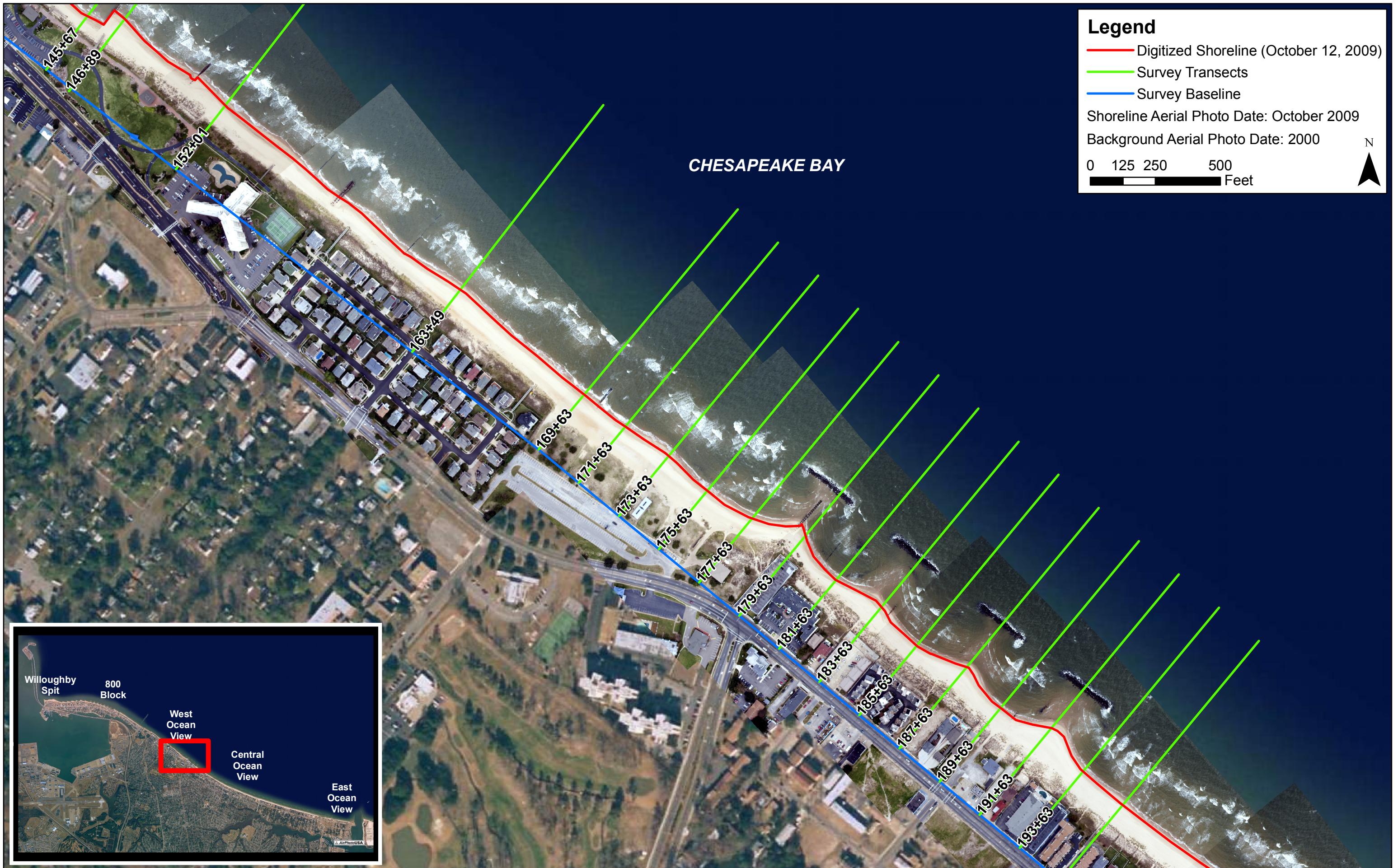
This is the ninth periodic survey report completed to date, and eighth evaluation of a consistent survey period utilizing beach and bathymetric surveys. As noted, there are inevitable margins of error associated with the survey data that may reduce the accuracy of volumetric change analyses. Therefore, 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 seasonal surveys (i.e. October 2008 to October 2009) eliminates seasonal variation of profiles in volumetric change analyses. It is also useful to continue comparing consecutive surveys to assess the direct impact of extreme events which may occur during the six month period between surveys. Future periodic survey evaluations will continue to improve on analysis techniques so that the rich survey data sets are best utilized.

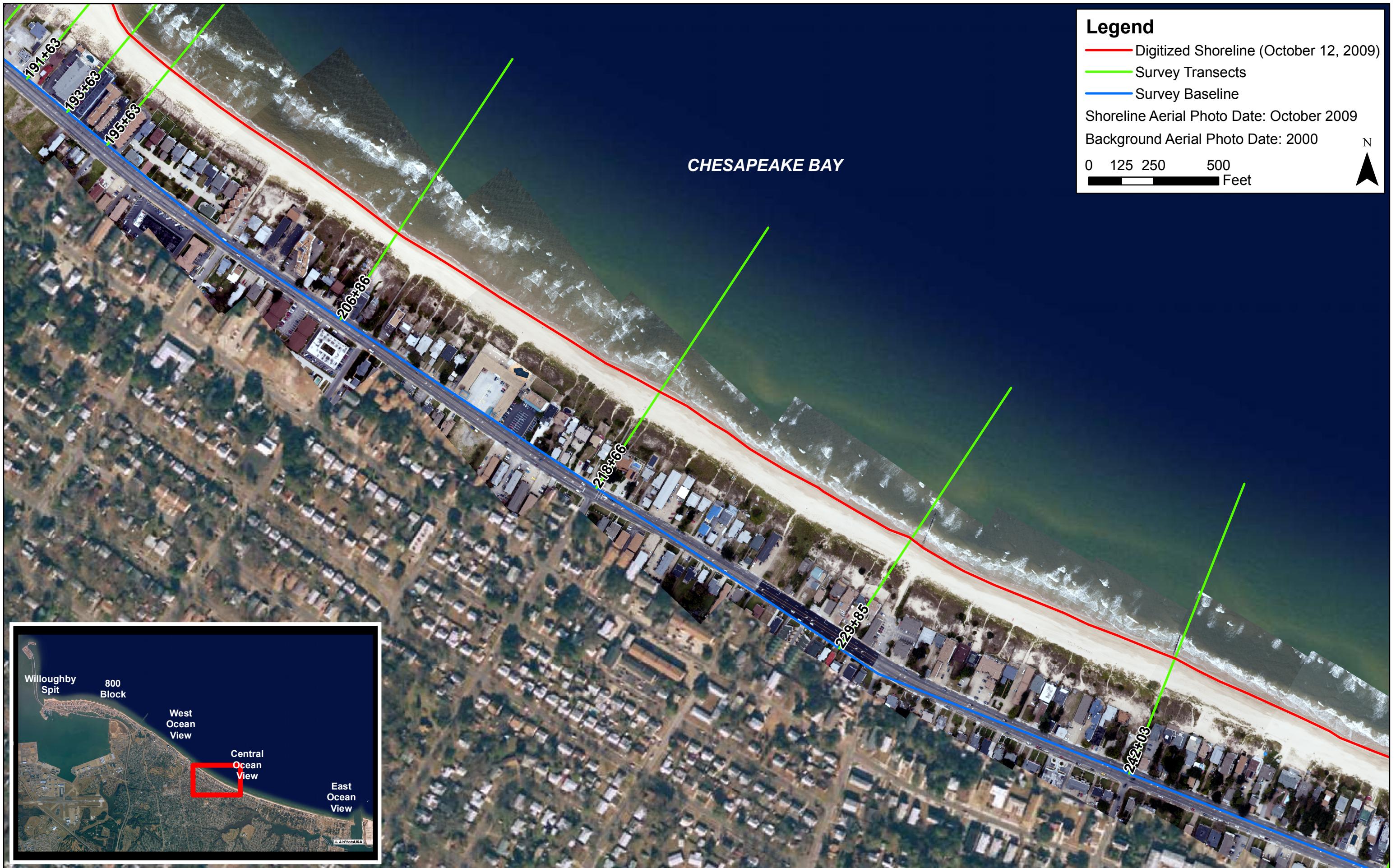
Appendix A: Aerial Photography and Digitized Shorelines



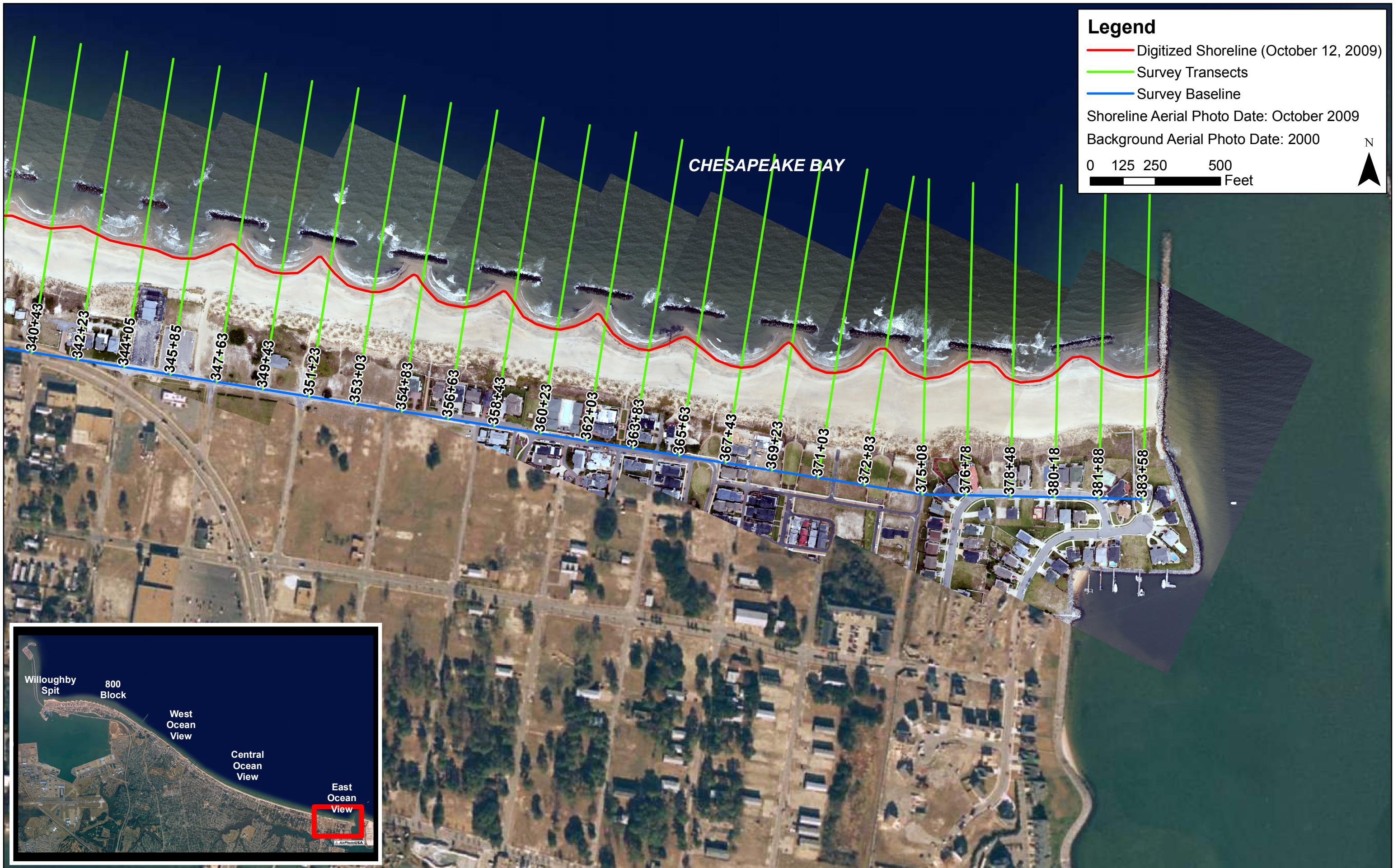




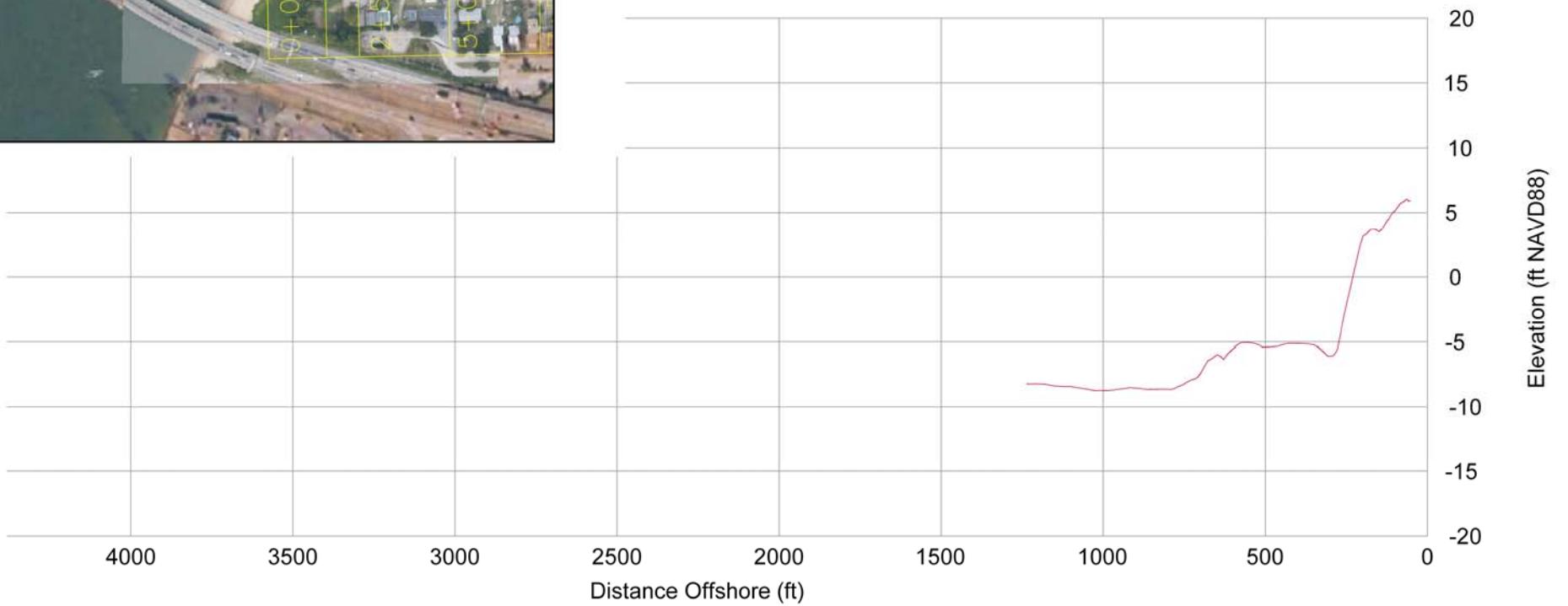








Appendix B: Survey Comparison Plots

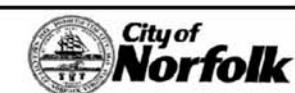


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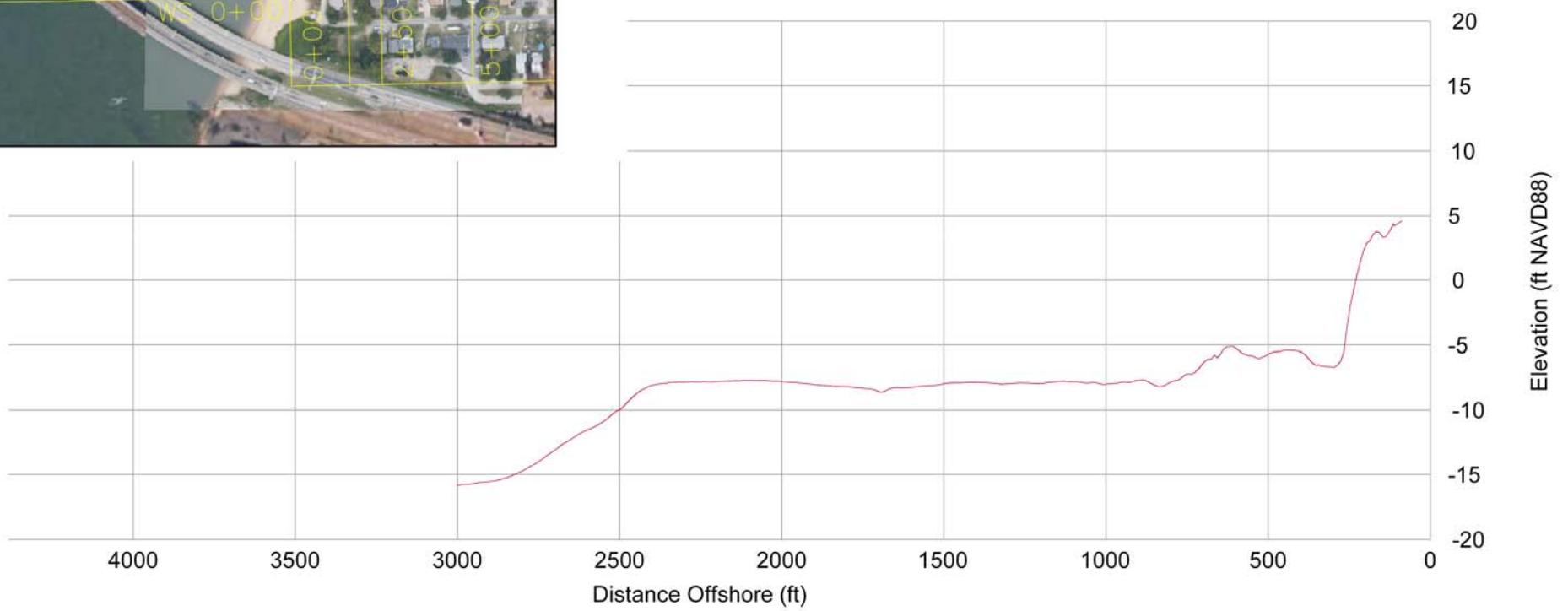
- OCTOBER 2008
- APRIL 2009
- OCTOBER 2009

Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. 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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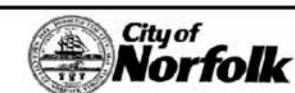


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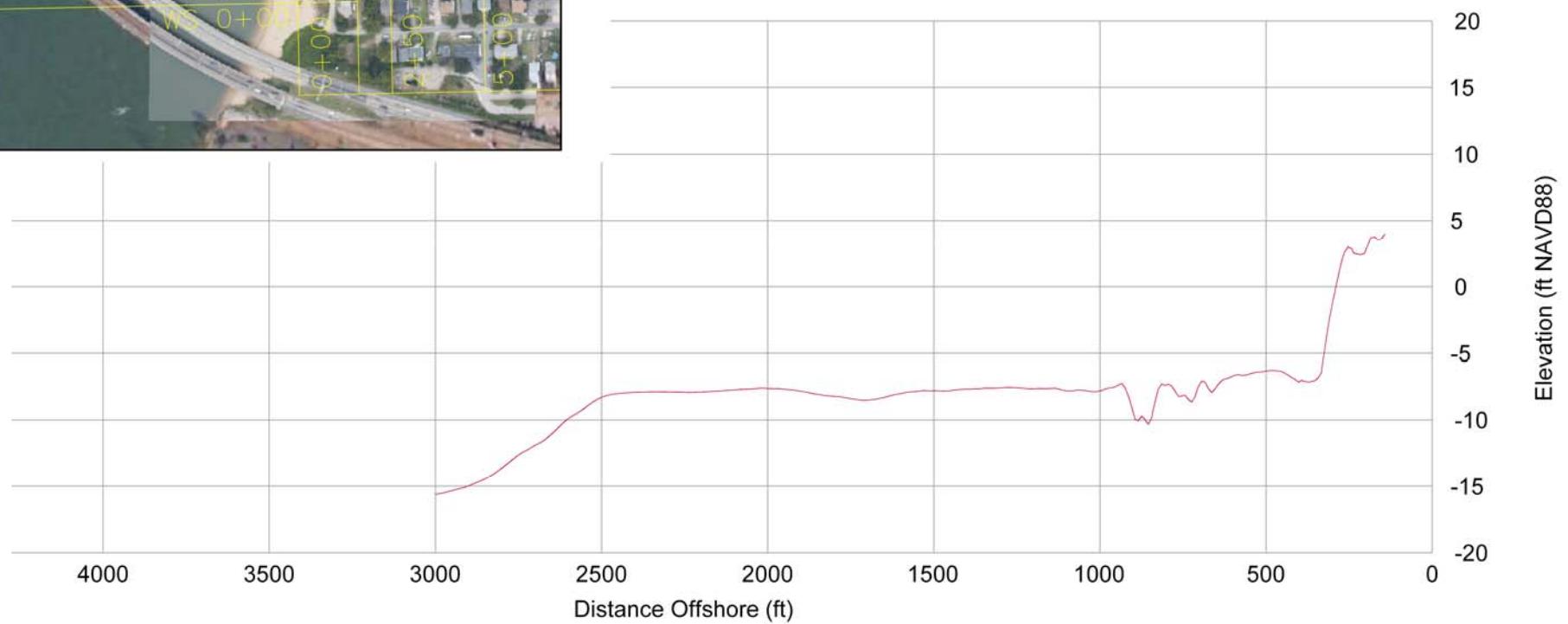
- OCTOBER 2008
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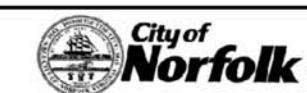


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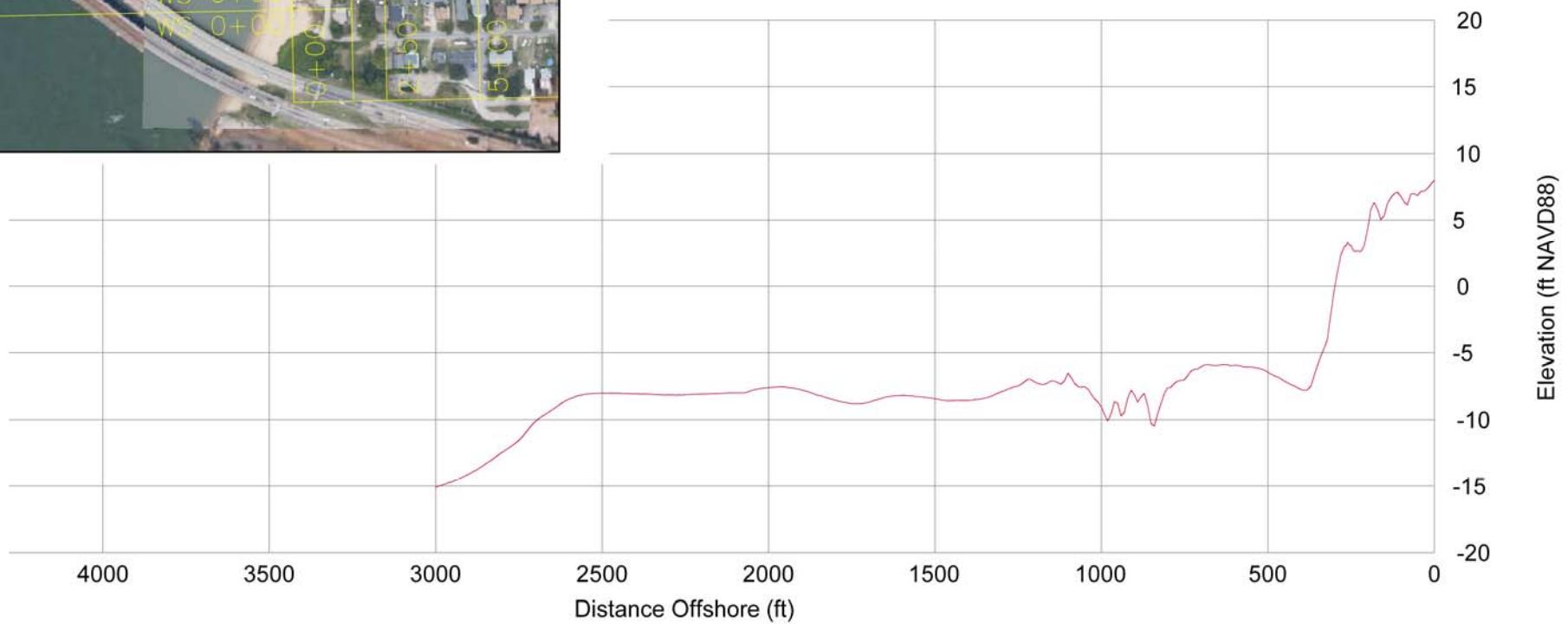
- OCTOBER 2008
- APRIL 2009
- OCTOBER 2009

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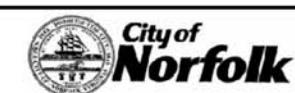


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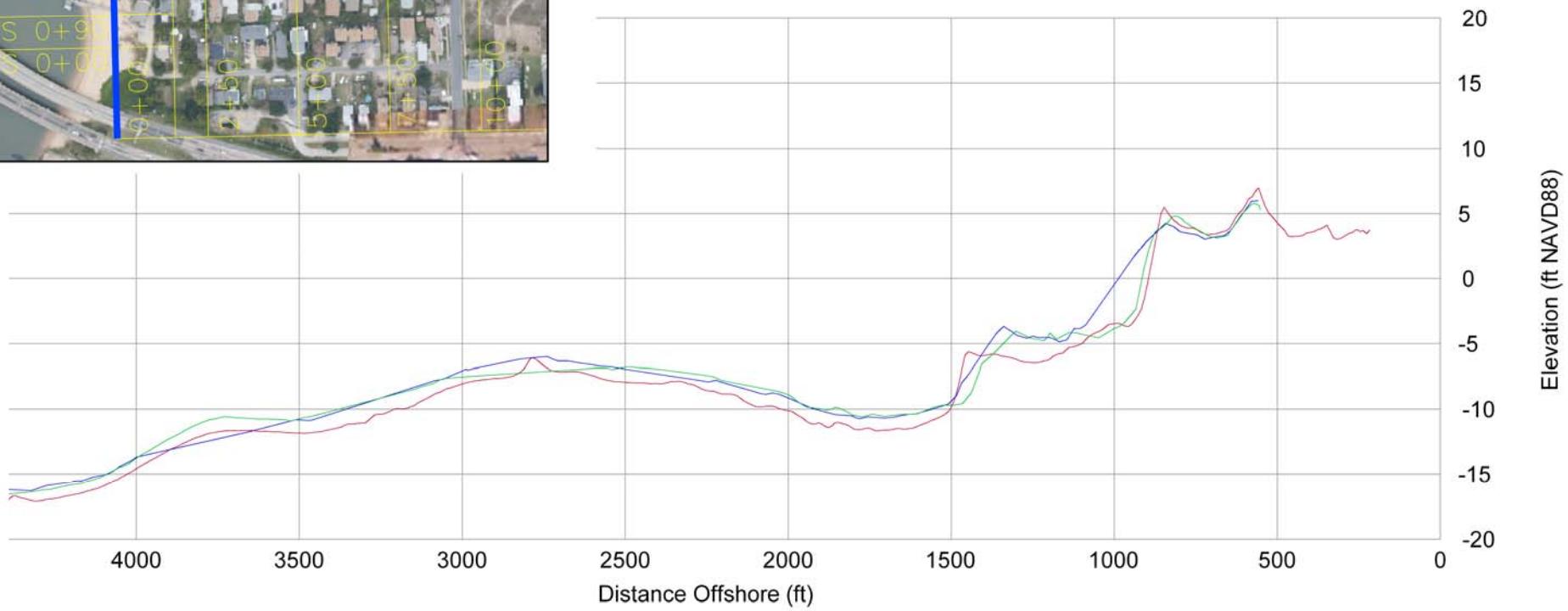
- OCTOBER 2008
- APRIL 2009
- OCTOBER 2009

Notes:

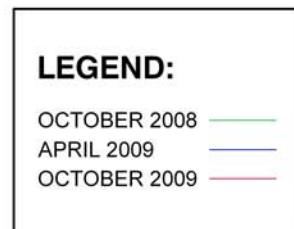
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Survey Transect 0+00	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-18.84 ft/yr	-71.29 ft
Volume Change Above -15 ft NAVD88	-93.00 cy/ft/yr	-106.83 cy/ft
Volume Change Above 0 ft NAVD88	0.94 cy/ft/yr	-1.65 cy/ft

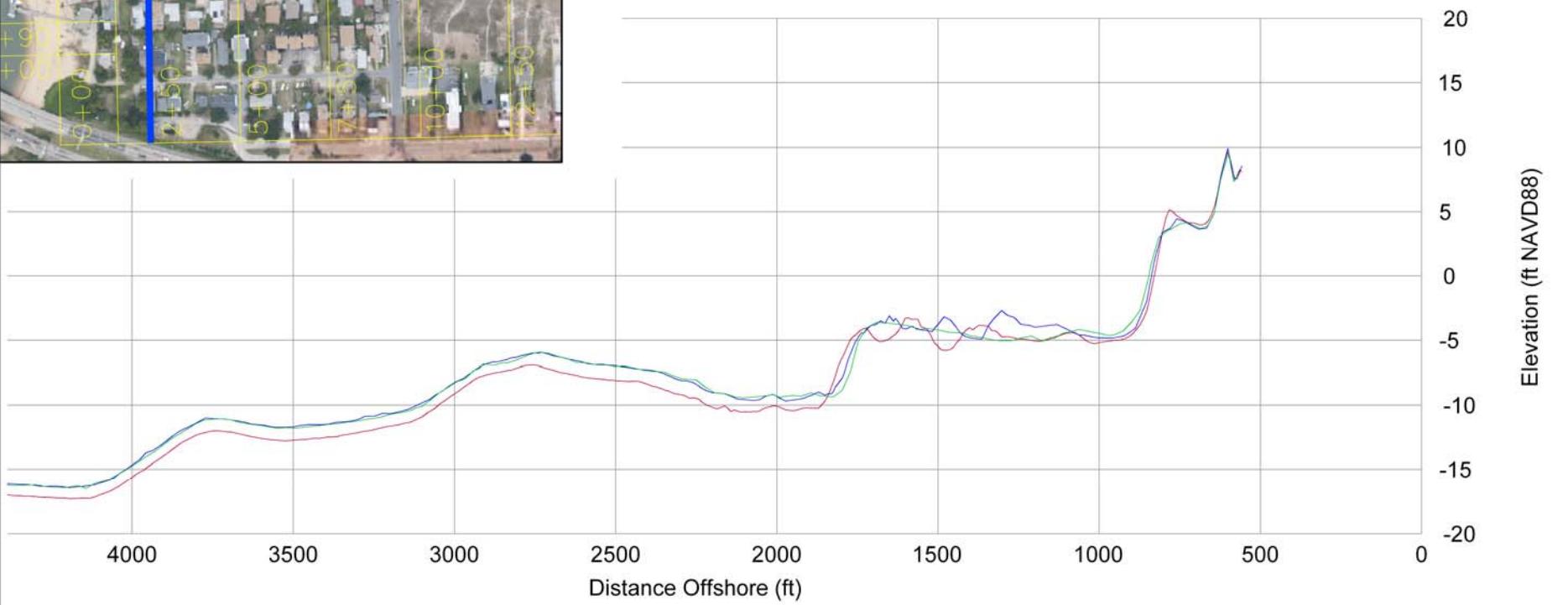


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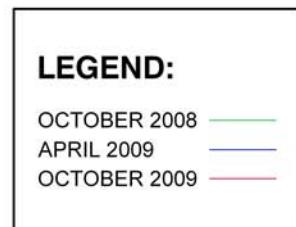
1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.



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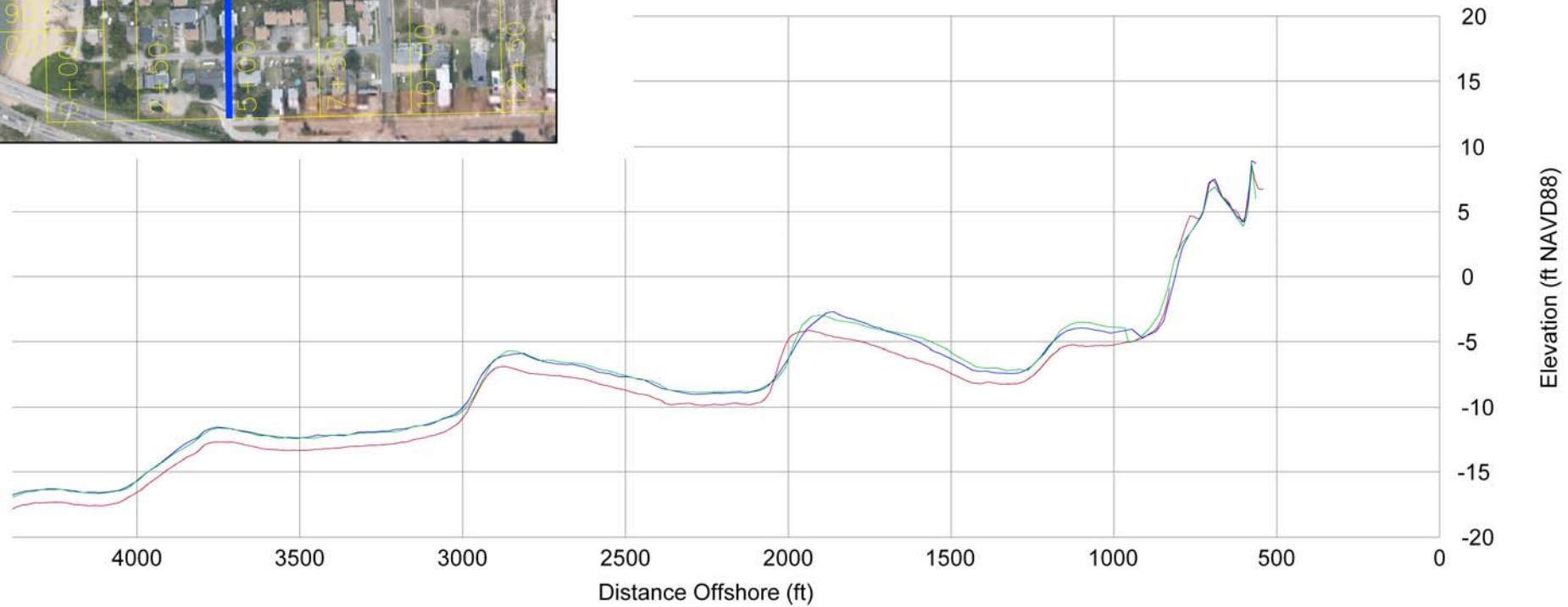


Survey Transect 2+50	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at M HW (0.98 ft NAVD88)	-16.73 ft/yr	-8.75 ft
Volume Change Above -15 ft NAVD88	-80.48 cy/ft/yr	-95.09 cy/ft
Volume Change Above 0 ft NAVD88	1.79 cy/ft/yr	1.56 cy/ft

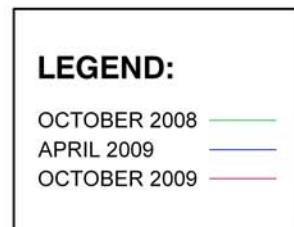


Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
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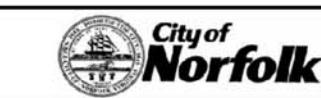


Survey Transect 5+00	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	- ft/yr	- ft
Volume Change Above -15 ft NAVD88	-111.83 cy/ft/yr	-109.19 cy/ft
Volume Change Above 0 ft NAVD88	3.70 cy/ft/yr	-0.22 cy/ft

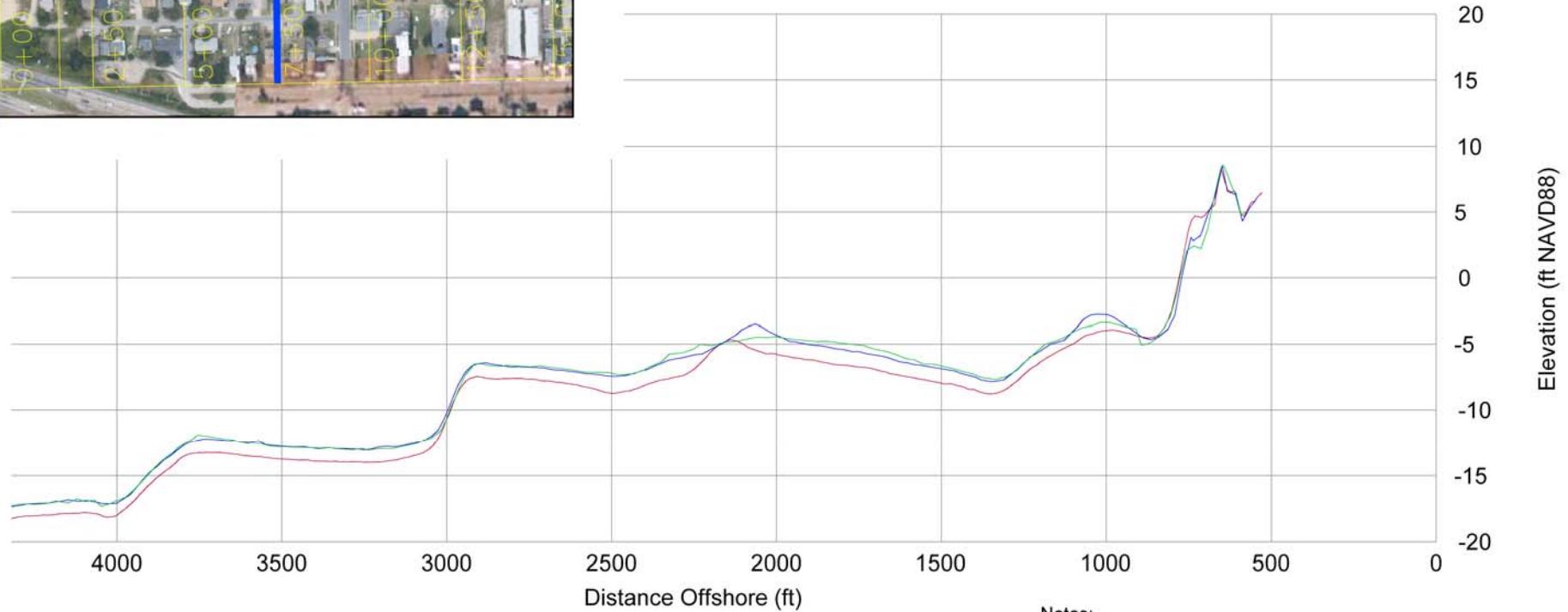


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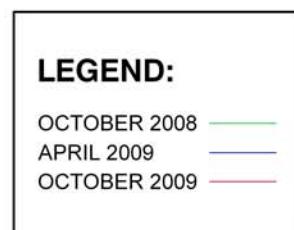
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2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
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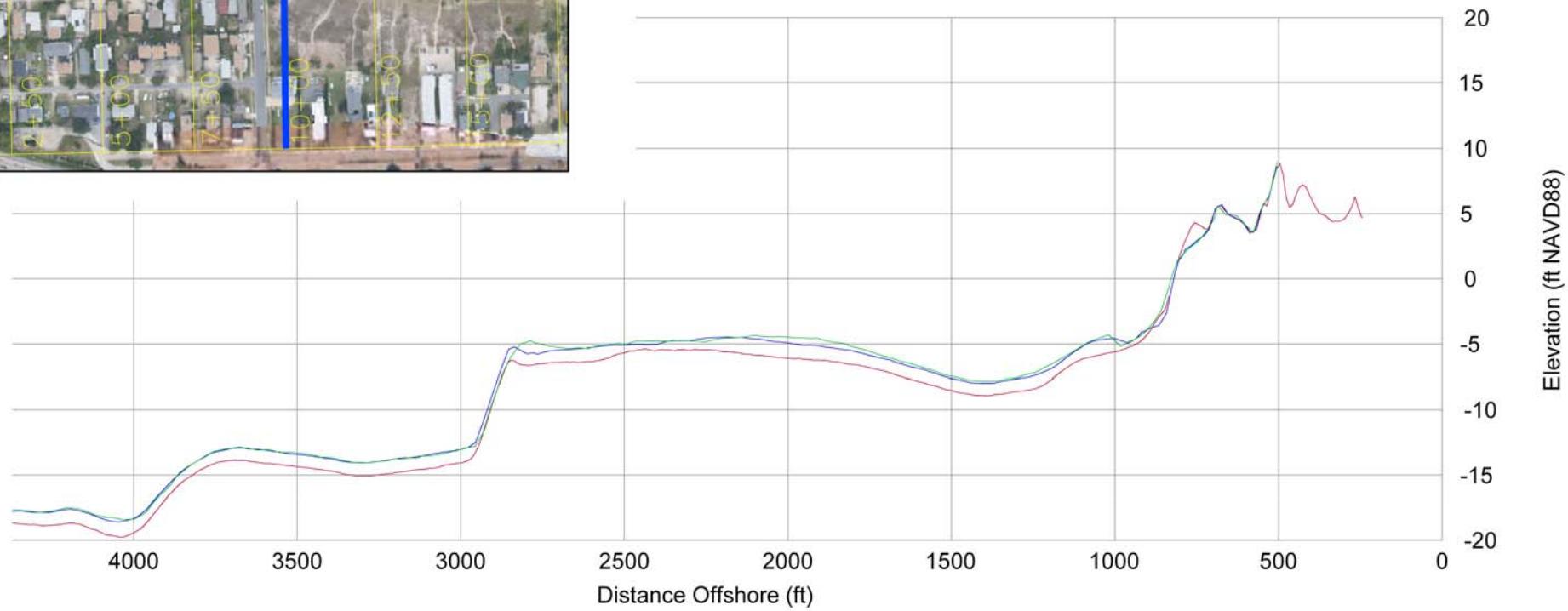


Survey Transect 7+50	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	4.03 ft/yr	8.33 ft
Volume Change Above -15 ft NAVD88	-110.86 cy/ft/yr	-105.24 cy/ft
Volume Change Above 0 ft NAVD88	3.80 cy/ft/yr	3.66 cy/ft

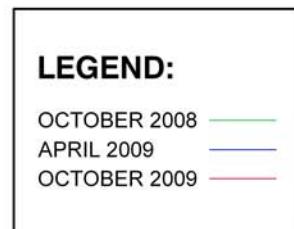


Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
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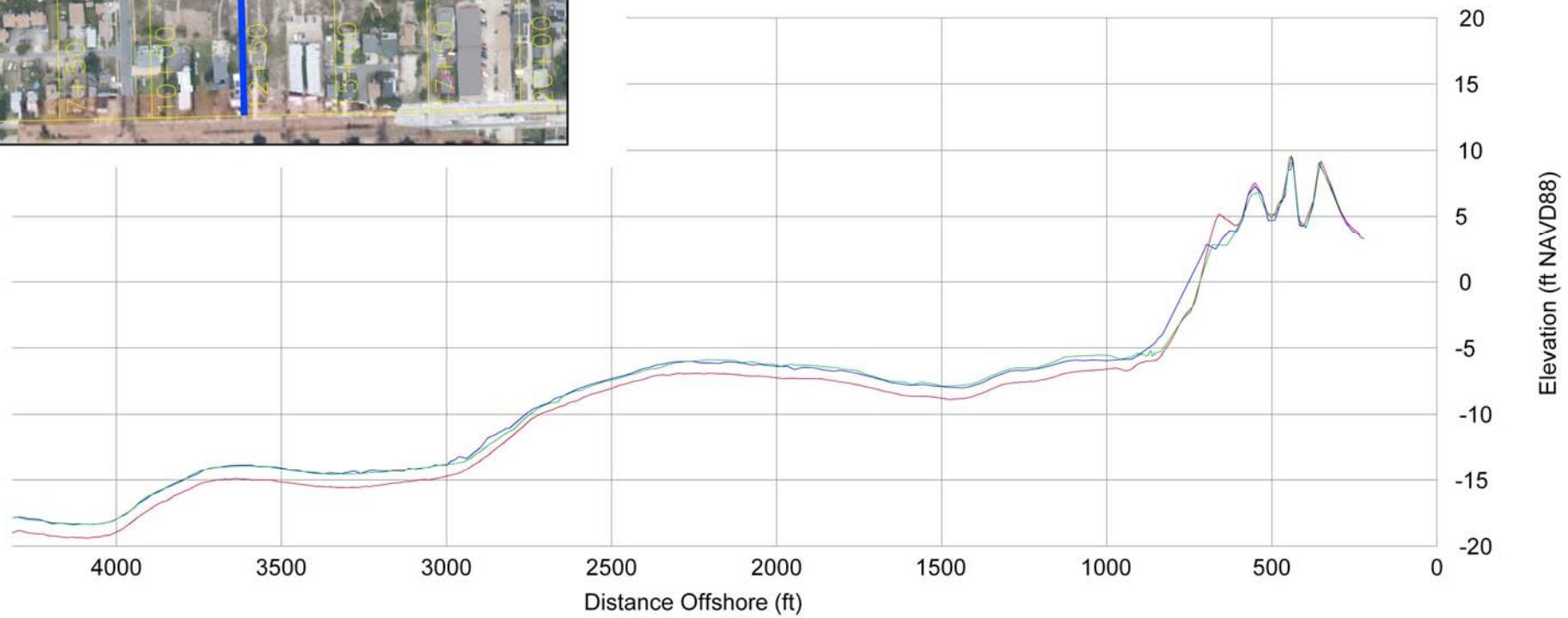


Survey Transect 10+00	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	- ft/yr	- ft
Volume Change Above -15 ft NAVD88	-32.58 cy/ft/yr	-101.71 cy/ft
Volume Change Above 0 ft NAVD88	-0.36 cy/ft/yr	-0.05 cy/ft

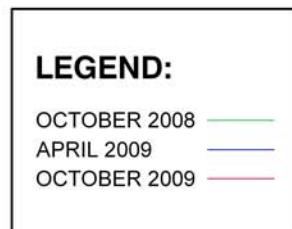


Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
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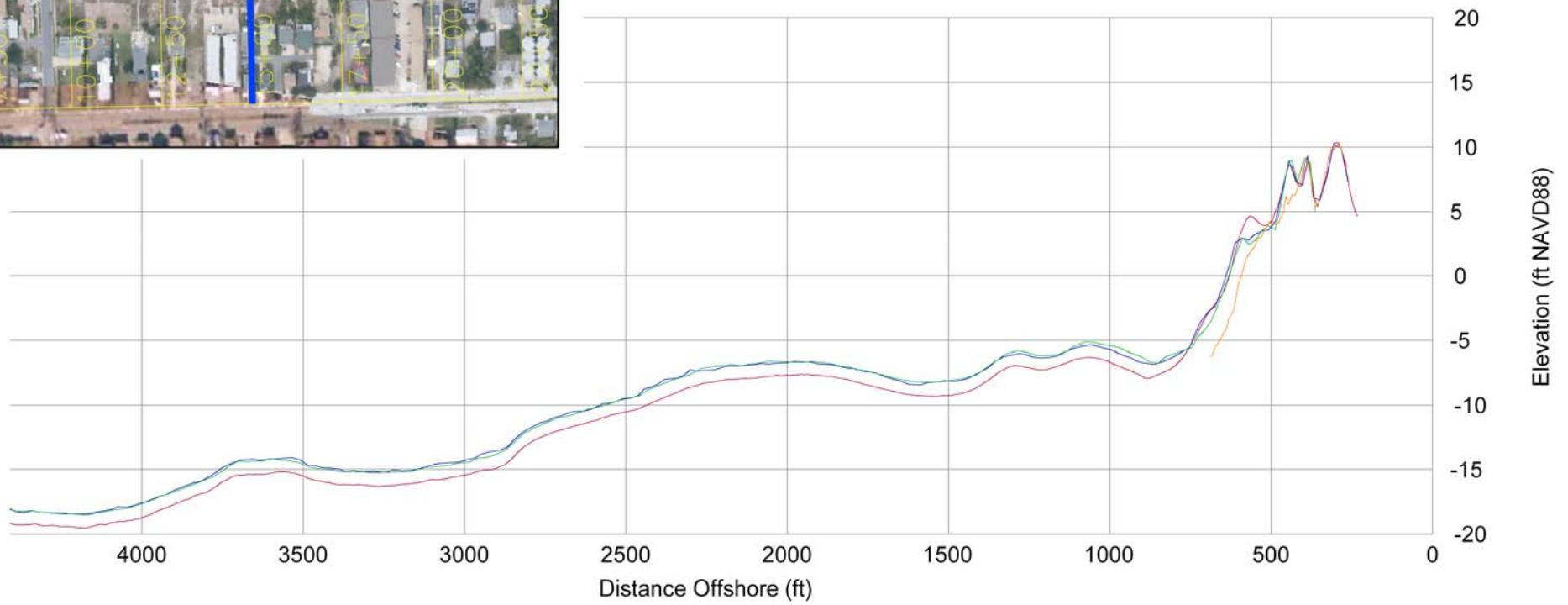


Survey Transect 12+50	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	2.94 ft/yr	-23.90 ft
Volume Change Above -15 ft NAVD88	-84.89 cy/ft/yr	-93.33 cy/ft
Volume Change Above 0 ft NAVD88	7.22 cy/ft/yr	4.32 cy/ft



Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
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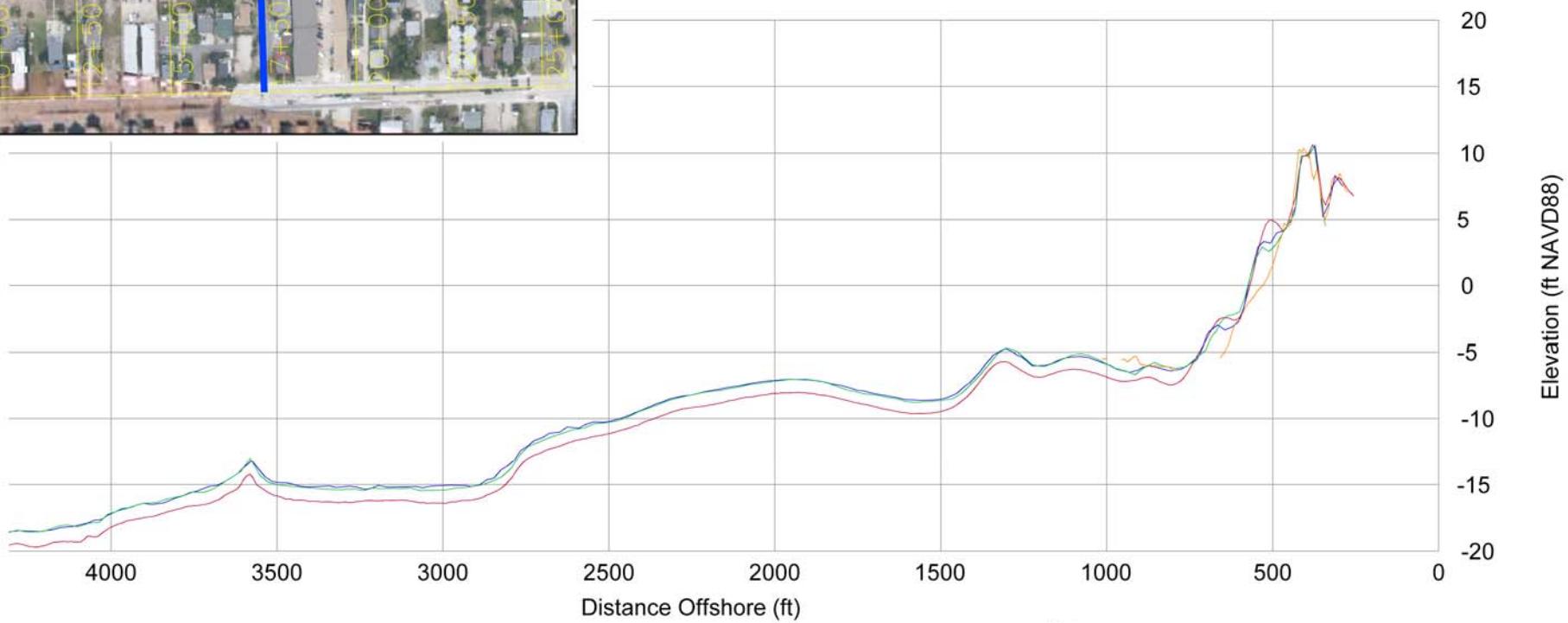
Survey Transect 15+00	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	1.49 ft/yr	-7.99 ft
Volume Change Above -15 ft NAVD88	-88.62 cy/ft/yr	-90.65 cy/ft
Volume Change Above 0 ft NAVD88	4.55 cy/ft/yr	4.21 cy/ft

LEGEND:

OCTOBER 2008	—
APRIL 2009	—
OCTOBER 2009	—
POST-FILL	—

Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.



Survey Transect 17+50	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-5.31 ft/yr	-5.84 ft
Volume Change Above -15 ft NAVD88	-67.92 cy/ft/yr	-75.05 cy/ft
Volume Change Above 0 ft NAVD88	5.20 cy/ft/yr	3.82 cy/ft

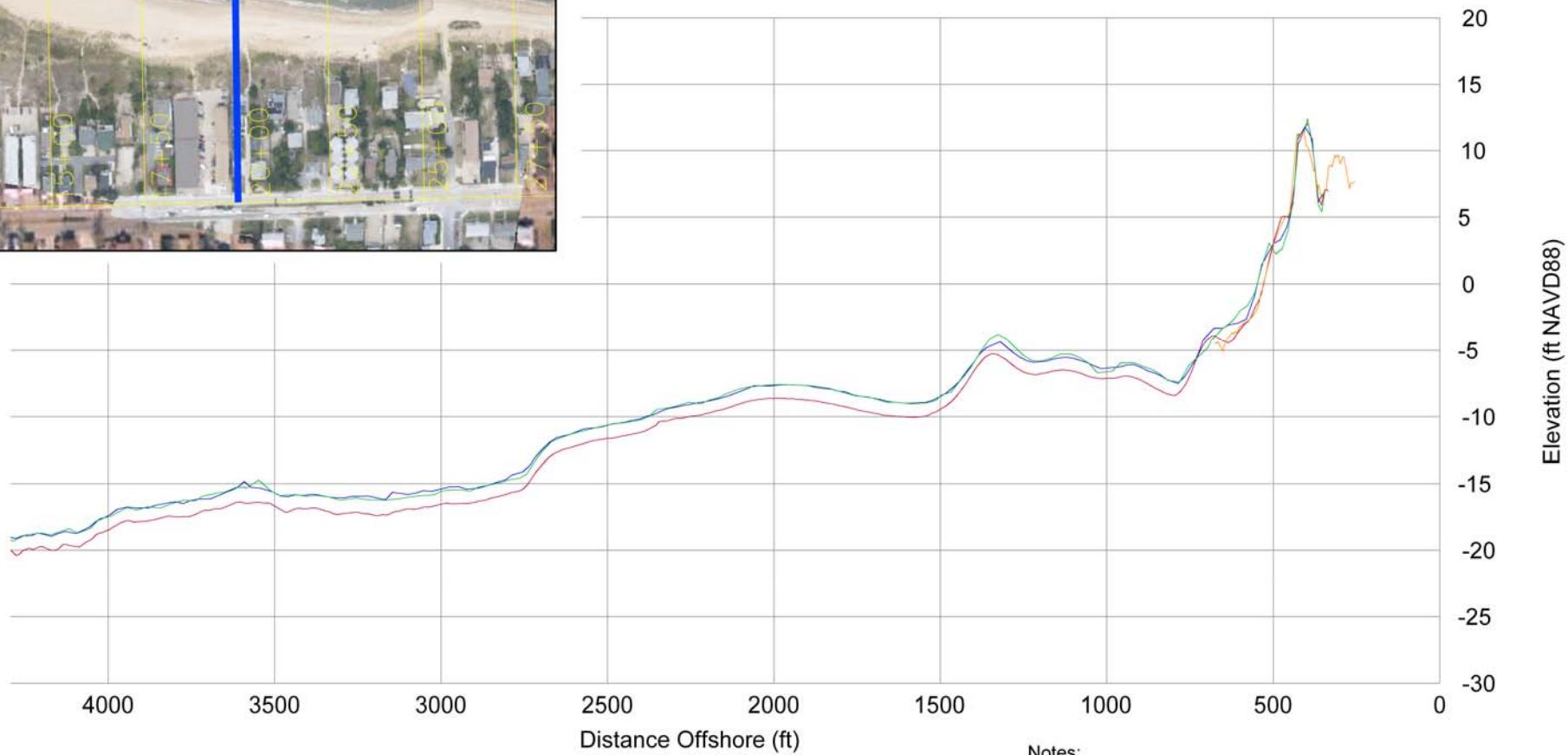


Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
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Survey Transect 20+00	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-17.93 ft/yr	-18.59 ft
Volume Change Above -15 ft NAVD88	-80.52 cy/ft/yr	-78.97 cy/ft
Volume Change Above 0 ft NAVD88	1.45 cy/ft/yr	0.06 cy/ft

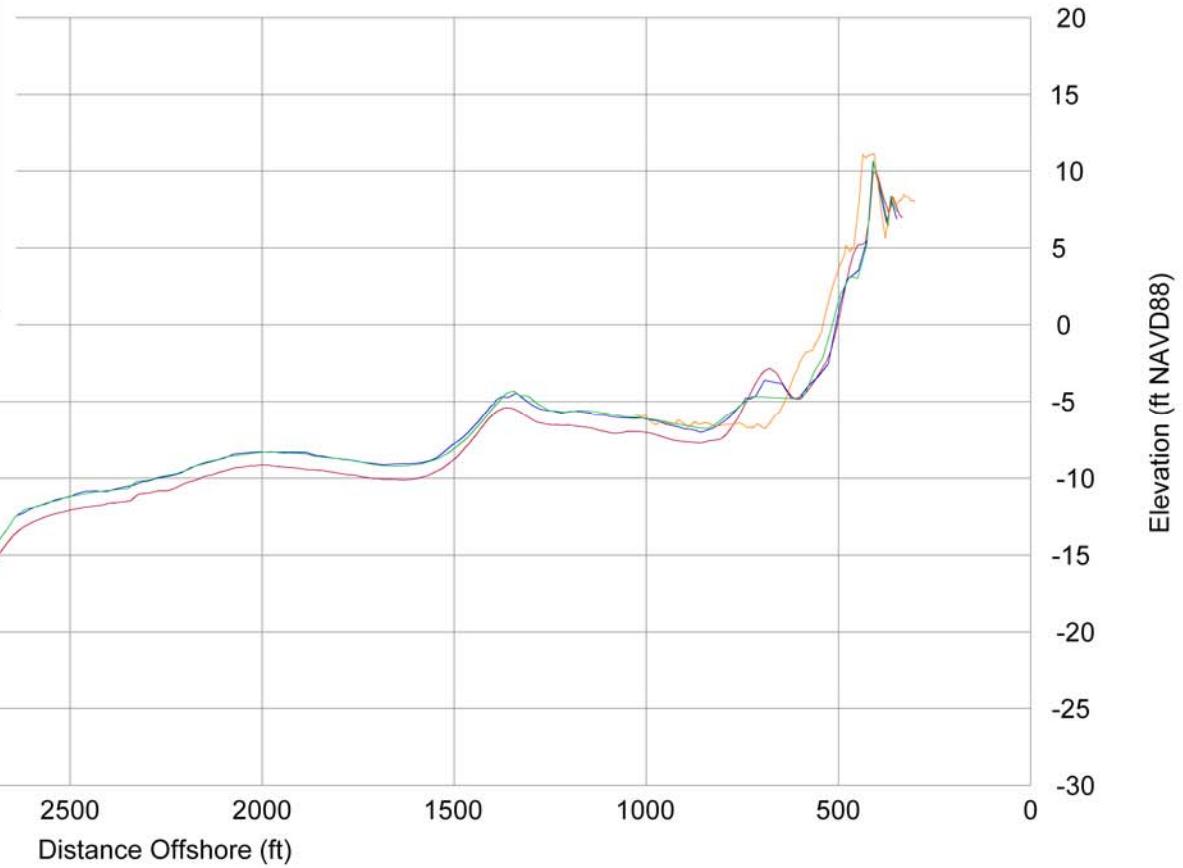


Notes:

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3. All Survey Elevations In Feet Referenced to NAVD88.
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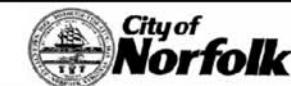
Survey Transect 22+50	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-11.47 ft/yr	-4.51 ft
Volume Change Above -15 ft NAVD88	-61.82 cy/ft/yr	-62.89 cy/ft
Volume Change Above 0 ft NAVD88	1.73 cy/ft/yr	2.01 cy/ft

LEGEND:

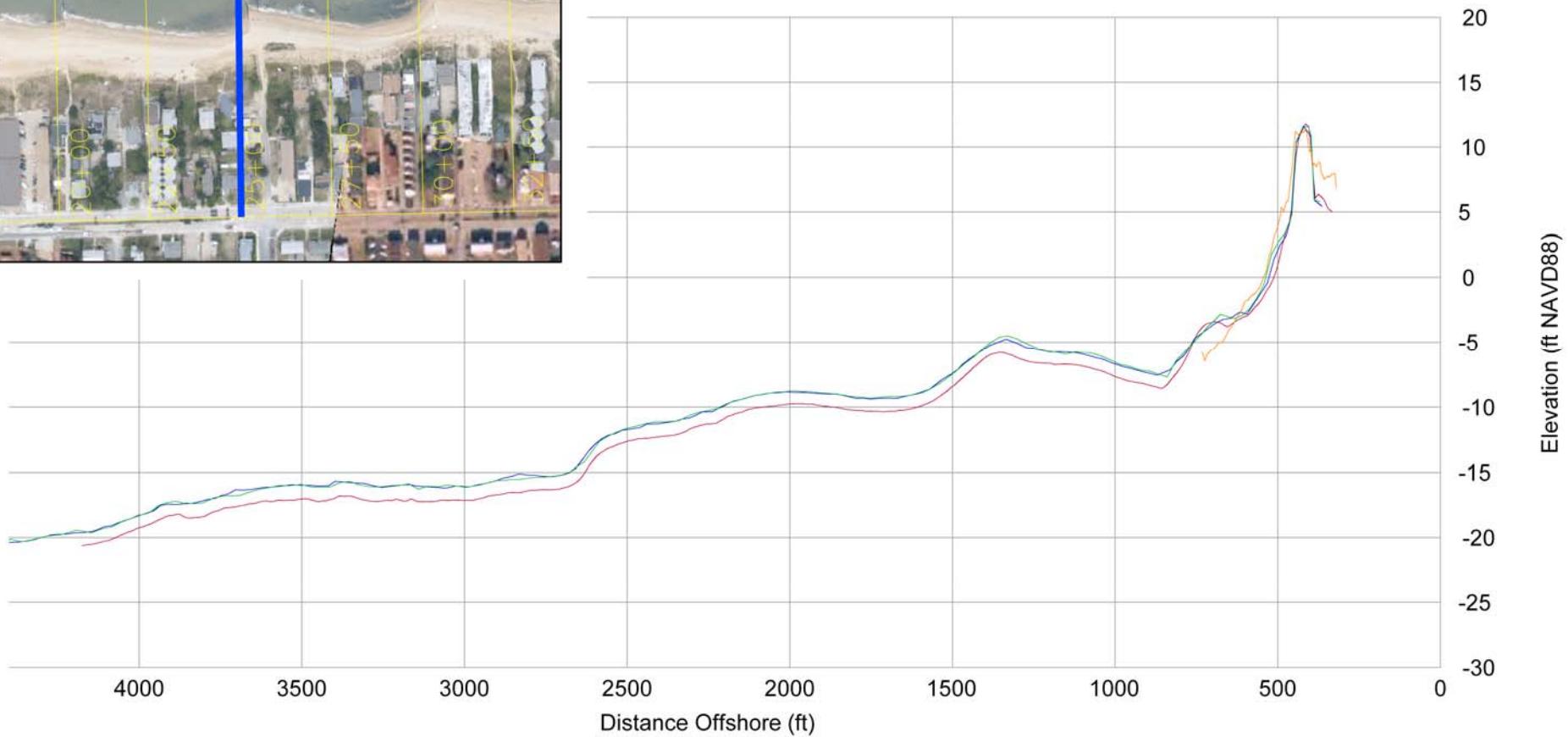
- OCTOBER 2008
- APRIL 2009
- OCTOBER 2009
- POST-FILL

Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.



OCEAN VIEW PERIODIC
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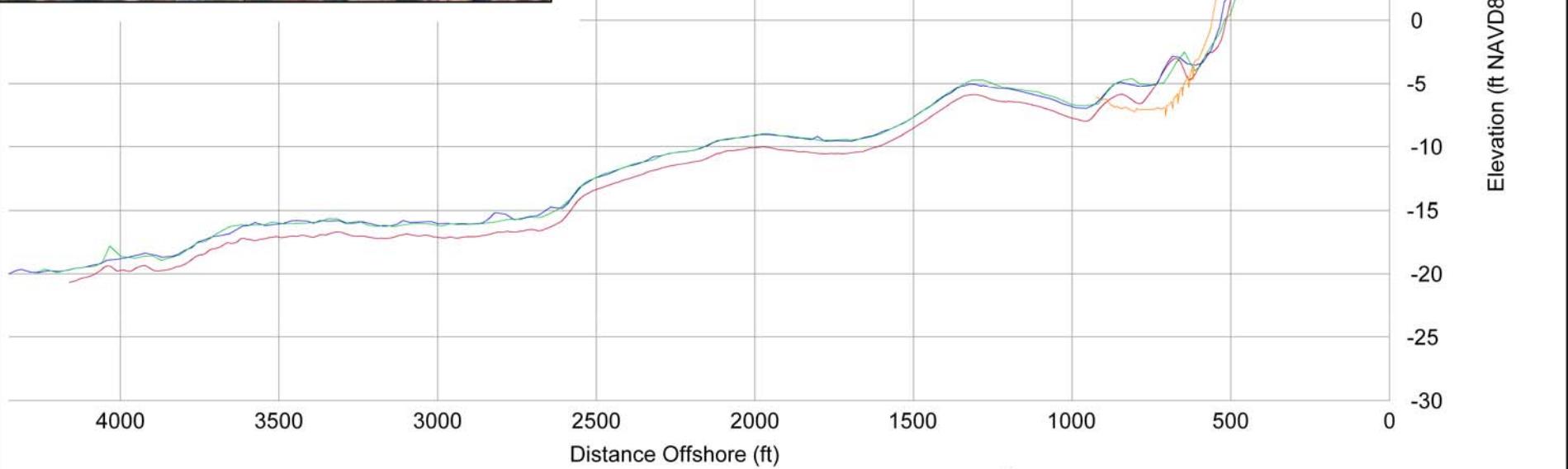


Survey Transect 25+00	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-28.15 ft/yr	-16.51 ft
Volume Change Above -15 ft NAVD88	-77.19 cy/ft/yr	-70.32 cy/ft
Volume Change Above 0 ft NAVD88	-3.06 cy/ft/yr	-0.90 cy/ft

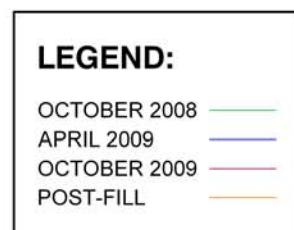


Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.

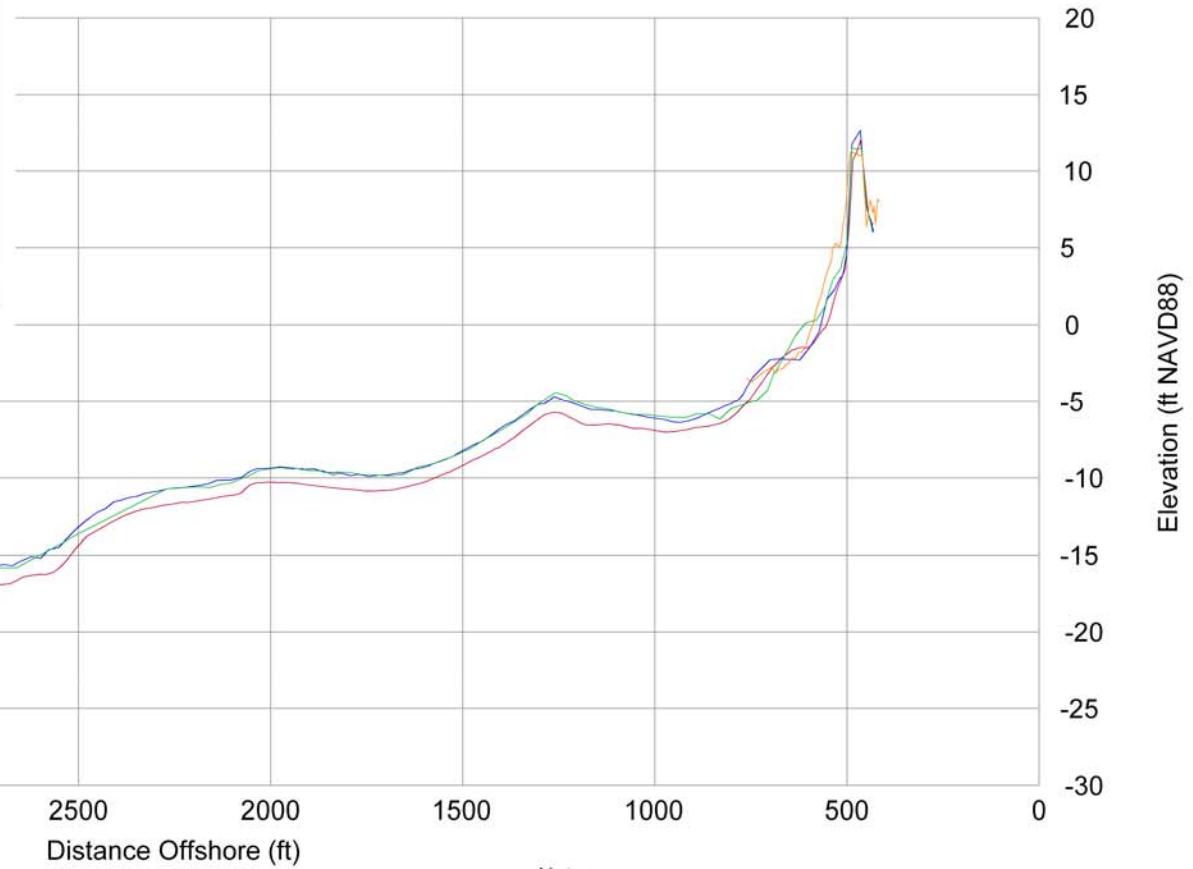


Survey Transect	October 2008 - October 2009	April 2009 - October 2009
27+50		
Shoreline Change at MHW (0.98 ft NAVD88)	11.09 ft/yr	-18.16 ft
Volume Change Above -15 ft NAVD88	-71.27 cy/ft/yr	-73.29 cy/ft
Volume Change Above 0 ft NAVD88	1.05 cy/ft/yr	-3.72 cy/ft

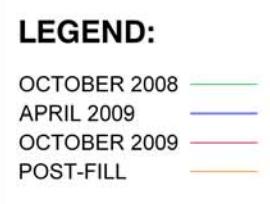


Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.



Survey Transect 30+00	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at M HW (0.98 ft NAVD88)	-22.61 ft/yr	-18.37 ft
Volume Change Above -15 ft NAVD88	-64.11 cy/ft/yr	-69.49 cy/ft
Volume Change Above 0 ft NAVD88	-3.99 cy/ft/yr	-3.13 cy/ft

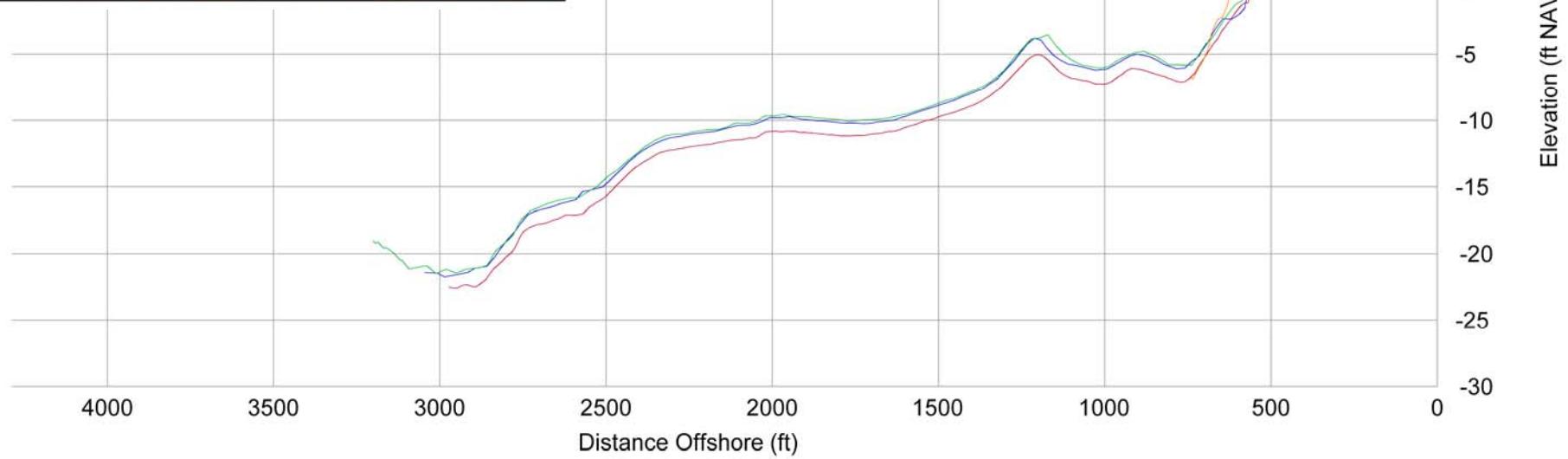


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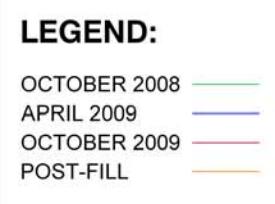
1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.



OCEAN VIEW PERIODIC
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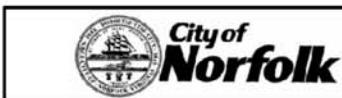


Survey Transect 32+50	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-15.06 ft/yr	-11.15 ft
Volume Change Above -15 ft NAVD88	-74.51 cy/ft/yr	-62.15 cy/ft
Volume Change Above 0 ft NAVD88	6.18 cy/ft/yr	3.61 cy/ft

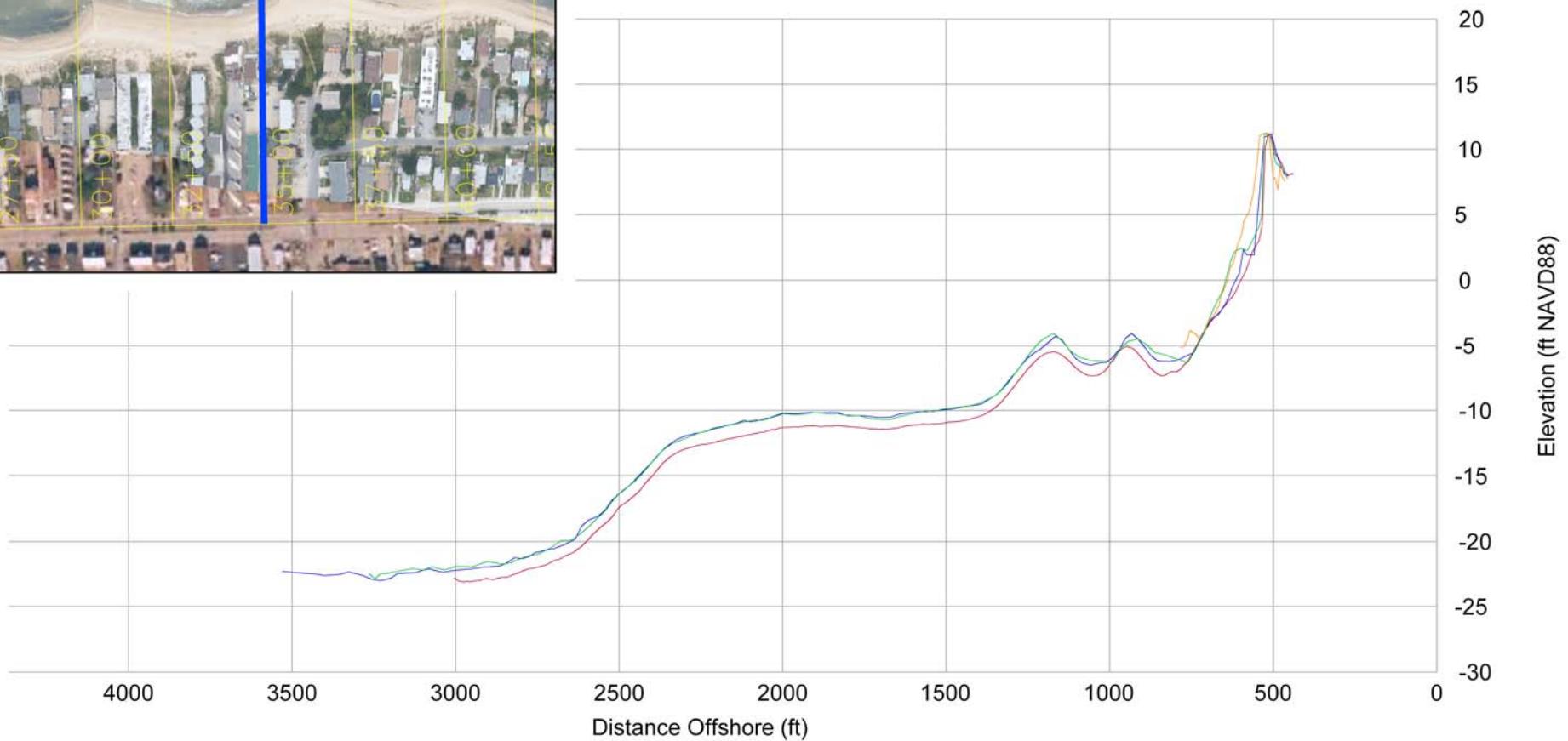


Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. 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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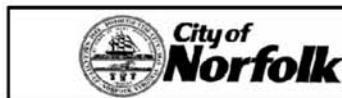
Survey Transect 35+00	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-55.03 ft/yr	-20.34 ft
Volume Change Above -15 ft NAVD88	-68.77 cy/ft/yr	-63.32 cy/ft
Volume Change Above 0 ft NAVD88	-6.09 cy/ft/yr	-4.90 cy/ft

LEGEND:

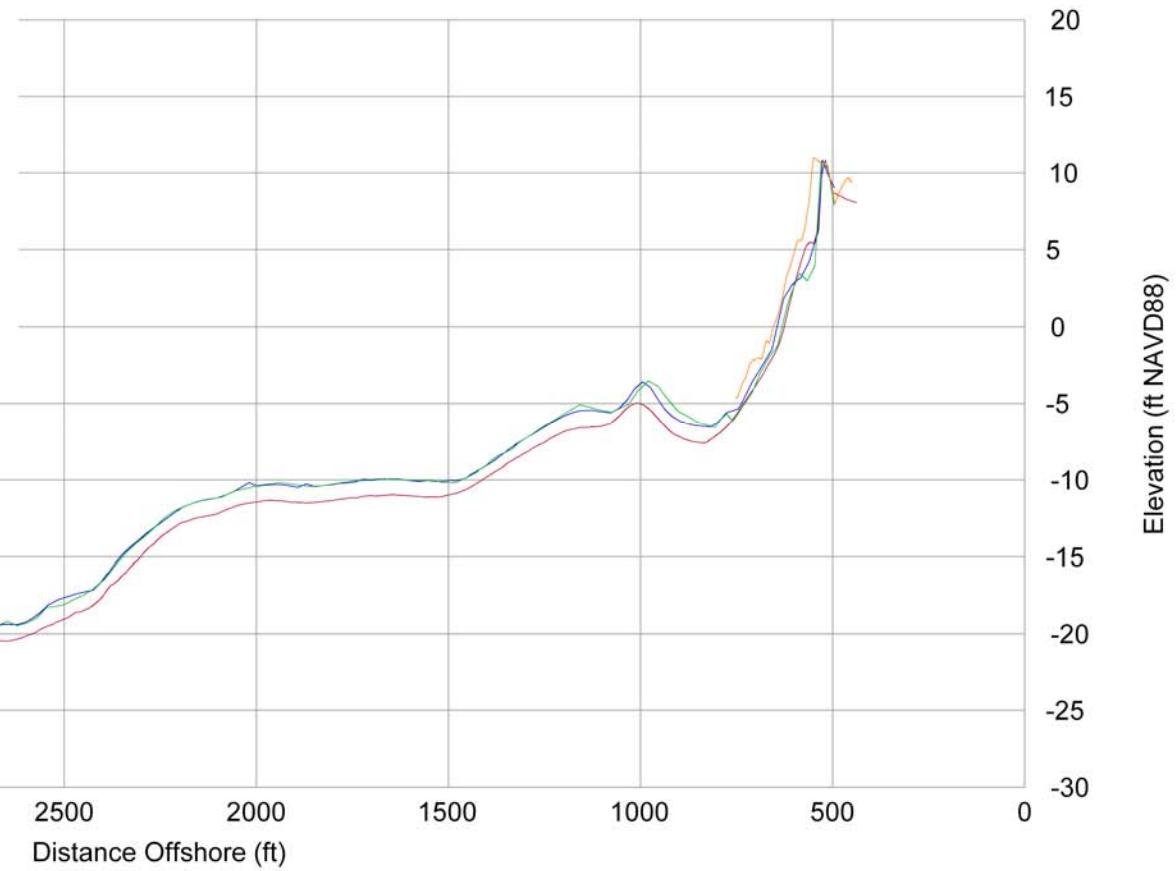
OCTOBER 2008	—
APRIL 2009	—
OCTOBER 2009	—
POST-FILL	—

Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. 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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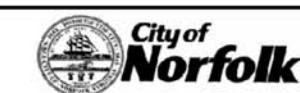
Survey Transect 37+50	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at M HW (0.98 ft NAVD88)	-5.20 ft/yr	-18.37 ft
Volume Change Above -15 ft NAVD88	-59.57 cy/ft/yr	-60.74 cy/ft
Volume Change Above 0 ft NAVD88	2.13 cy/ft/yr	0.20 cy/ft

LEGEND:

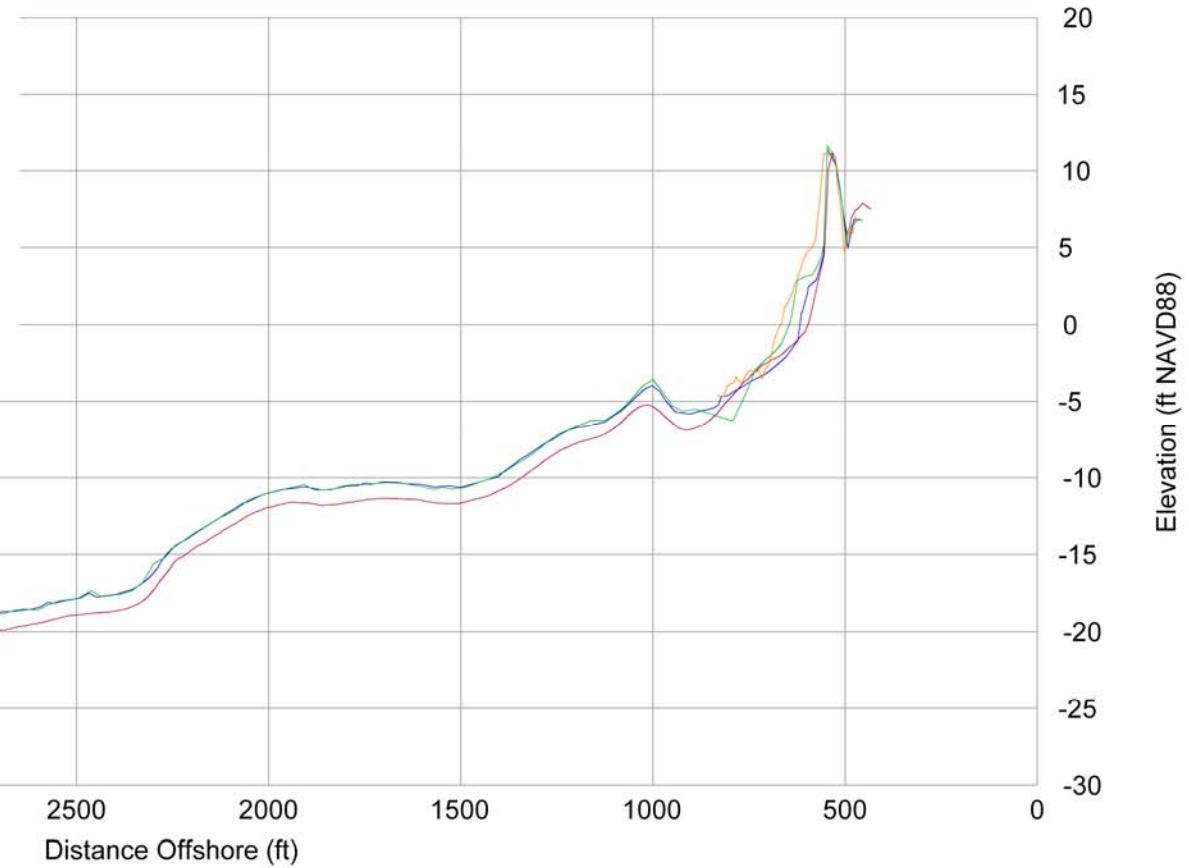
OCTOBER 2008 —
 APRIL 2009 —
 OCTOBER 2009 —
 POST-FILL —

Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. 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 40+00	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-50.25 ft/yr	-23.42 ft
Volume Change Above -15 ft NAVD88	-60.49 cy/ft/yr	-53.77 cy/ft
Volume Change Above 0 ft NAVD88	-6.96 cy/ft/yr	-2.32 cy/ft

LEGEND:

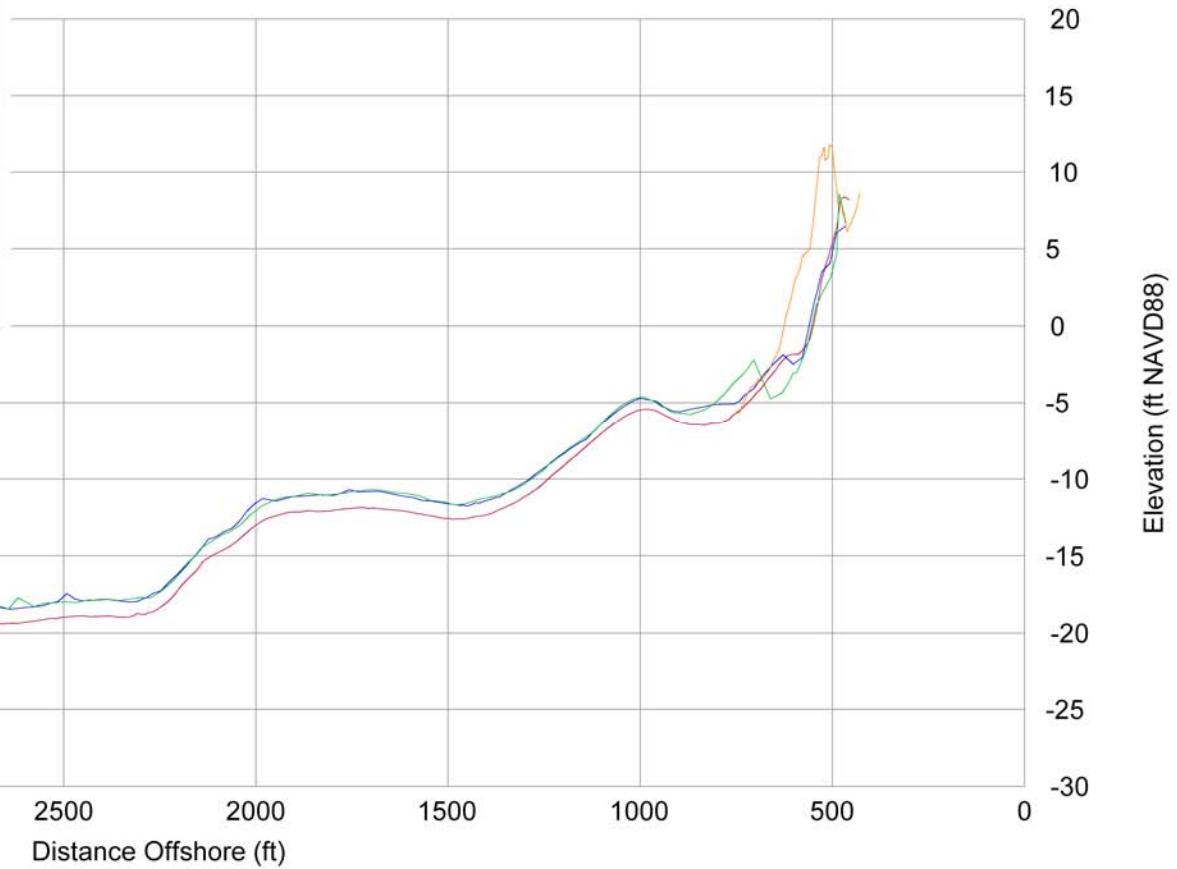
OCTOBER 2008 —
 APRIL 2009 —
 OCTOBER 2009 —
 POST-FILL —

Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. 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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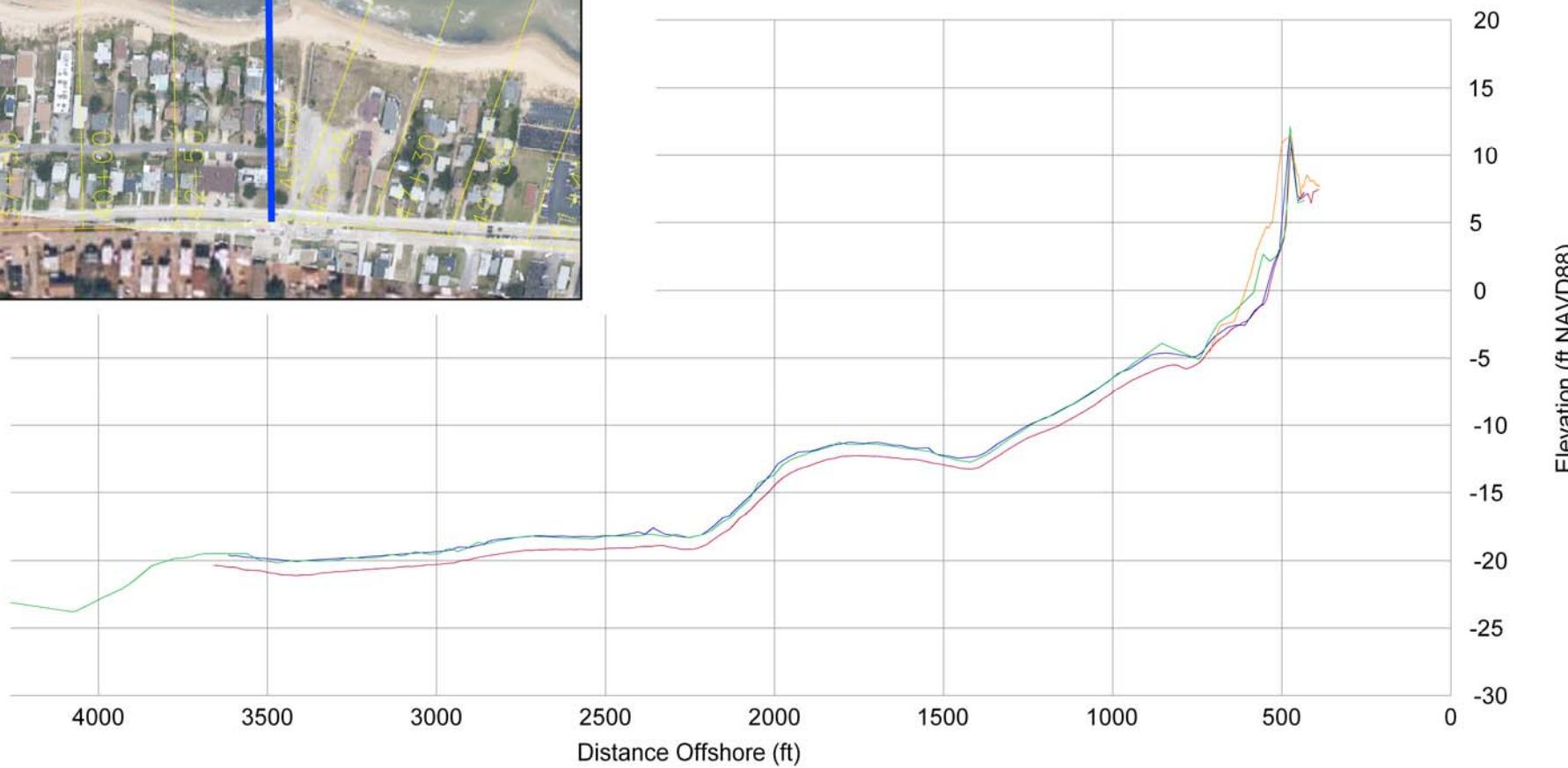
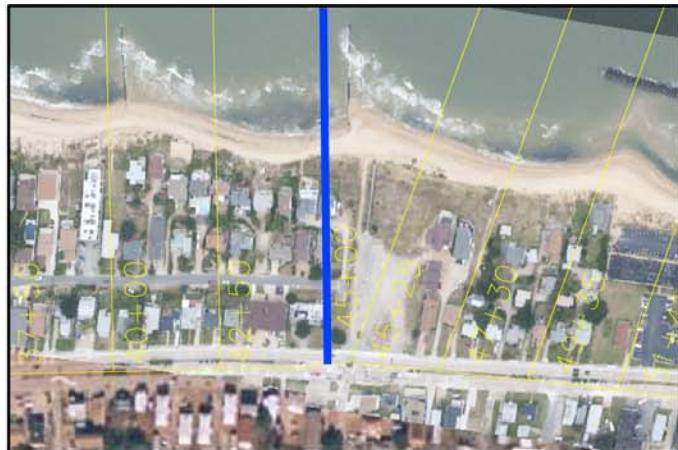


Survey Transect 42+50	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-3.70 ft/yr	-10.16 ft
Volume Change Above -15 ft NAVD88	-47.04 cy/ft/yr	-51.47 cy/ft
Volume Change Above 0 ft NAVD88	2.64 cy/ft/yr	-0.53 cy/ft



Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.



Survey Transect 45+00	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-43.01 ft/yr	-5.60 ft
Volume Change Above -15 ft NAVD88	-58.07 cy/ft/yr	-52.01 cy/ft
Volume Change Above 0 ft NAVD88	-4.60 cy/ft/yr	-3.03 cy/ft

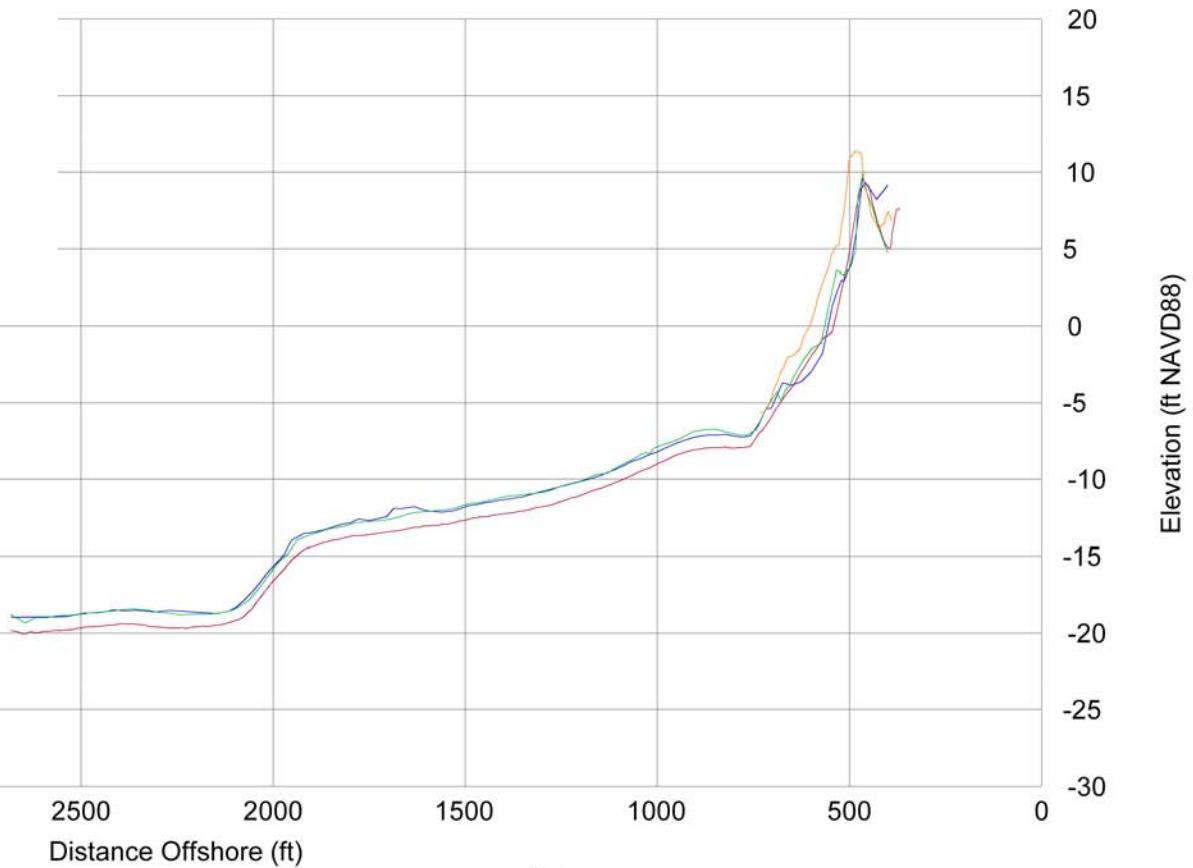
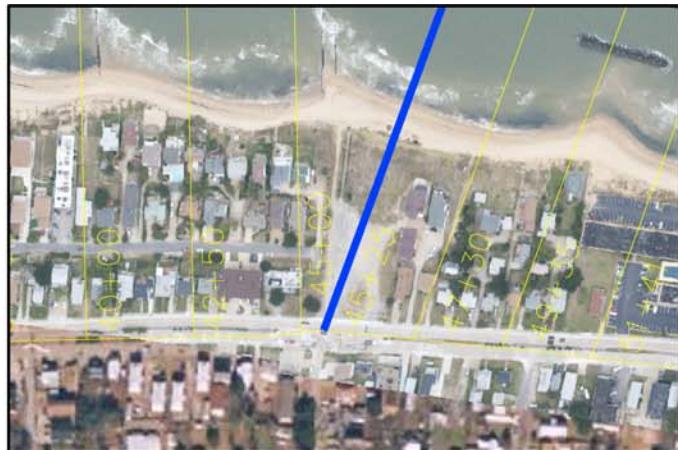


Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. 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 45+25	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-24.28 ft/yr	-15.12 ft
Volume Change Above -15 ft NAVD88	-47.99 cy/ft/yr	-42.12 cy/ft
Volume Change Above 0 ft NAVD88	-1.22 cy/ft/yr	0.10 cy/ft

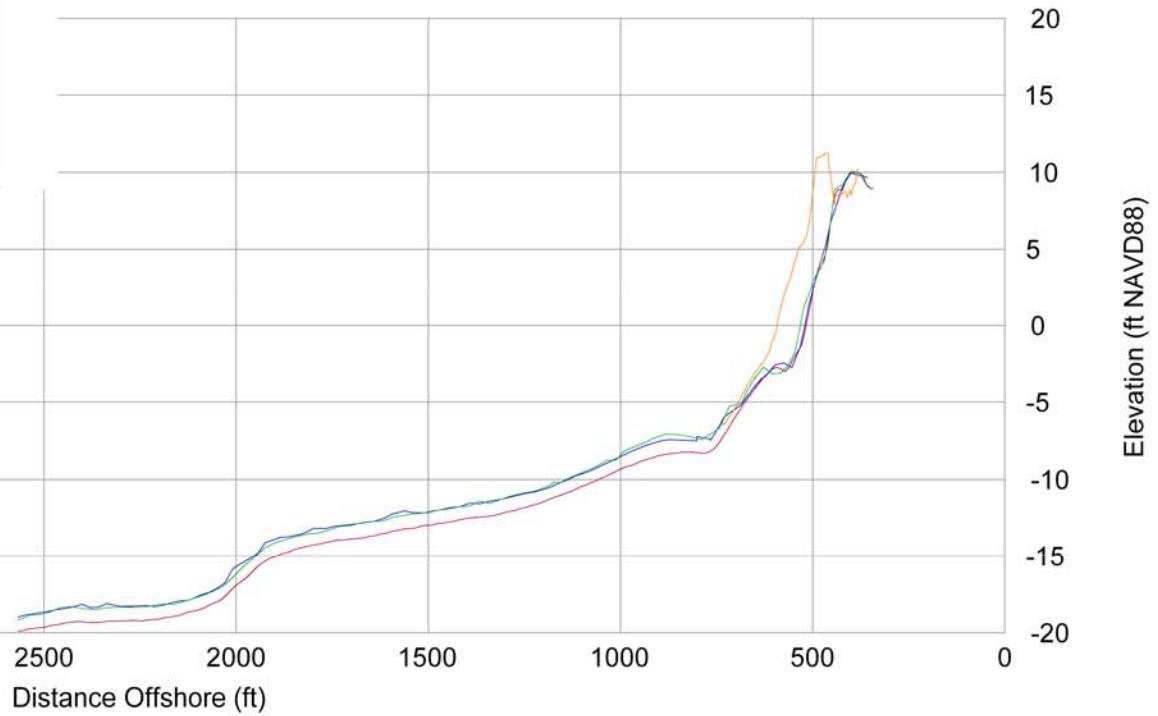


Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. 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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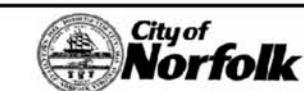
Survey Transect 47+30	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-15.89 ft/yr	-3.31 ft
Volume Change Above -15 ft NAVD88	-46.56 cy/ft/yr	-42.19 cy/ft
Volume Change Above 0 ft NAVD88	-1.14 cy/ft/yr	0.80 cy/ft

LEGEND:

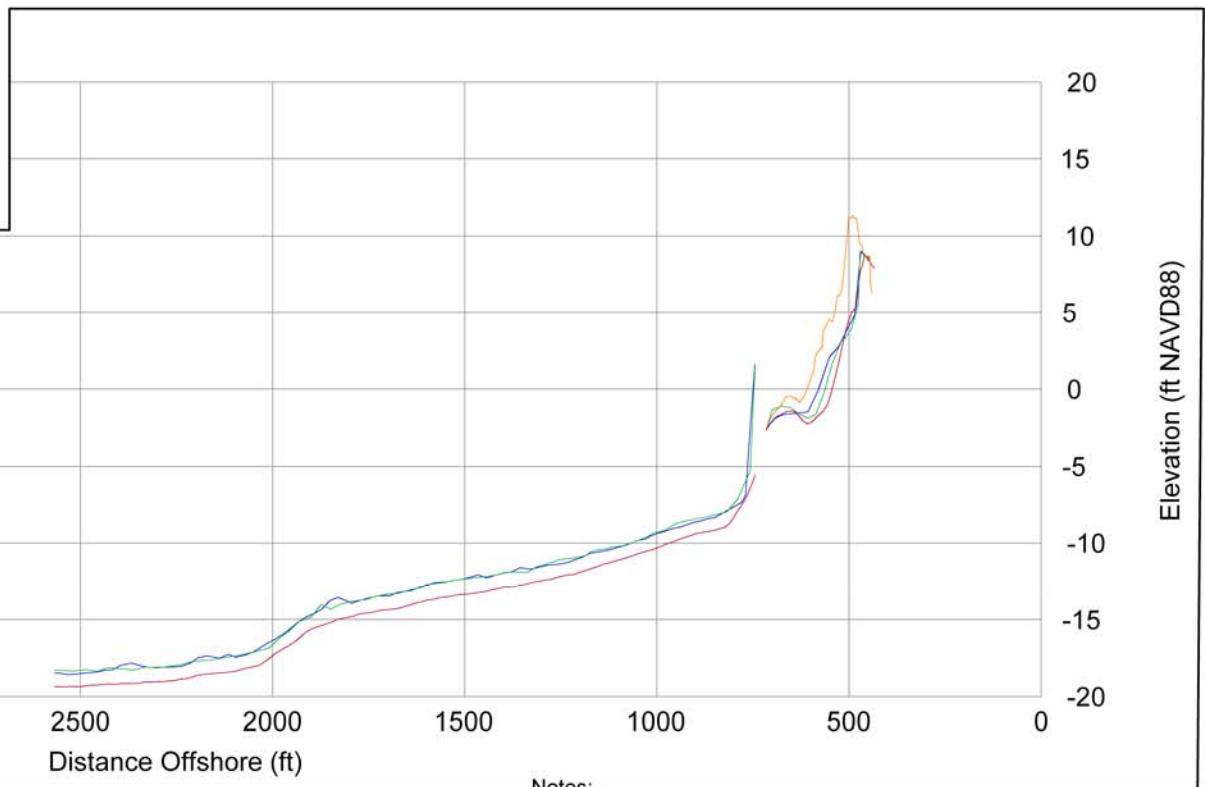
OCTOBER 2008 —
 APRIL 2009 —
 OCTOBER 2009 —
 POST-FILL —

Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.



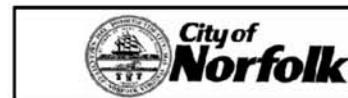
OCEAN VIEW PERIODIC
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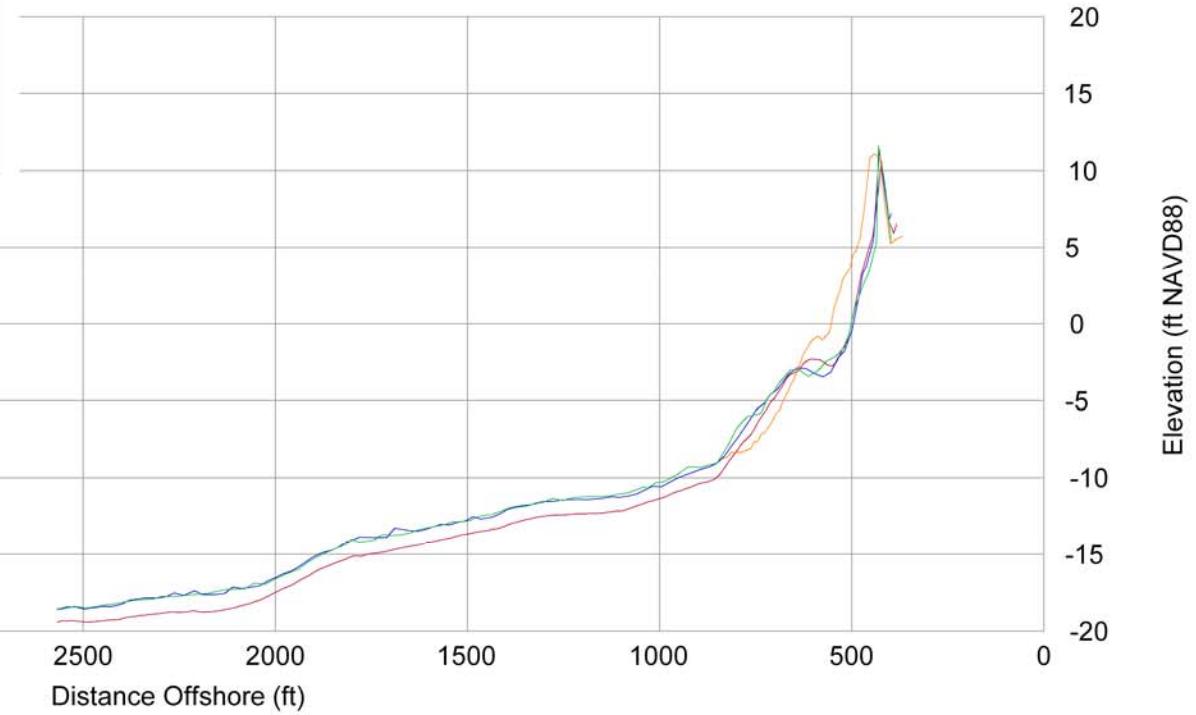
Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.

Survey Transect 49+35	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	20.01 ft/yr	-31.74 ft
Volume Change Above -15 ft NAVD88	0.63 cy/ft/yr	-6.32 cy/ft
Volume Change Above 0 ft NAVD88	-1.04 cy/ft/yr	-3.26 cy/ft



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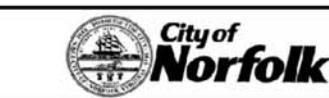


Survey Transect 51+41	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	1.06 ft/yr	5.17 ft
Volume Change Above -15 ft NAVD88	-39.78 cy/ft/yr	-36.15 cy/ft
Volume Change Above 0 ft NAVD88	2.19 cy/ft/yr	0.71 cy/ft

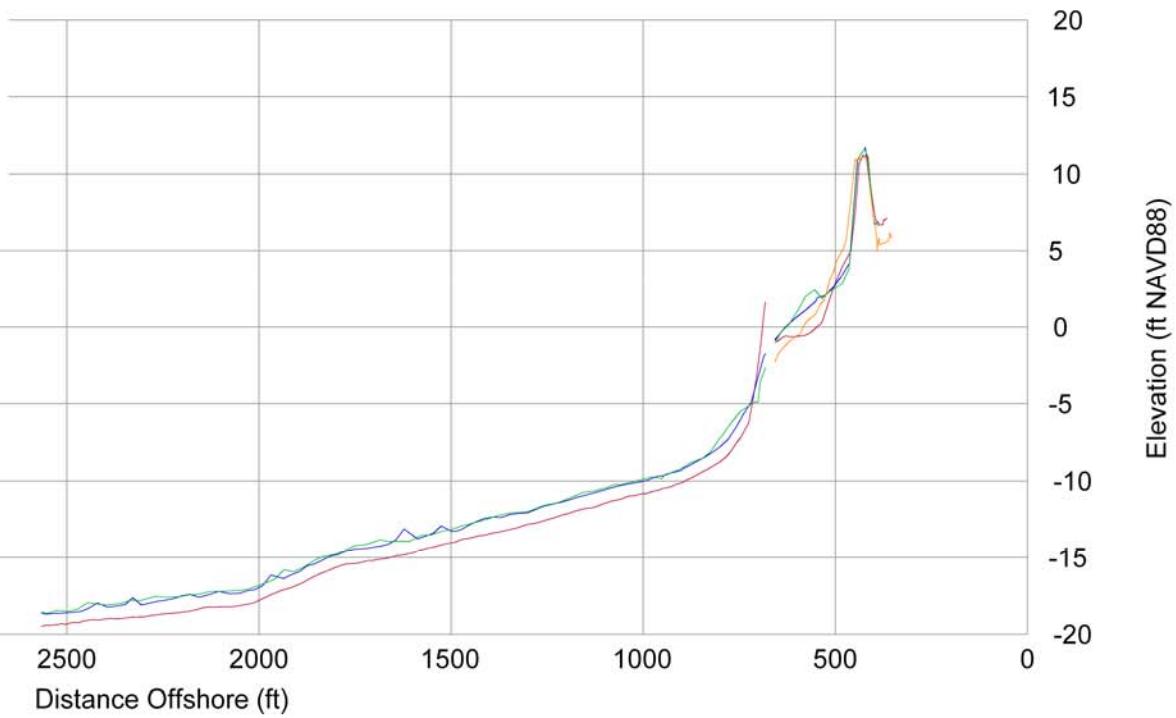


Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. 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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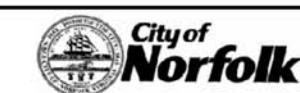
Survey Transect 53+46	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-74.29 ft/yr	-57.73 ft
Volume Change Above -15 ft NAVD88	-47.09 cy/ft/yr	-41.97 cy/ft
Volume Change Above 0 ft NAVD88	-5.77 cy/ft/yr	-4.50 cy/ft

LEGEND:

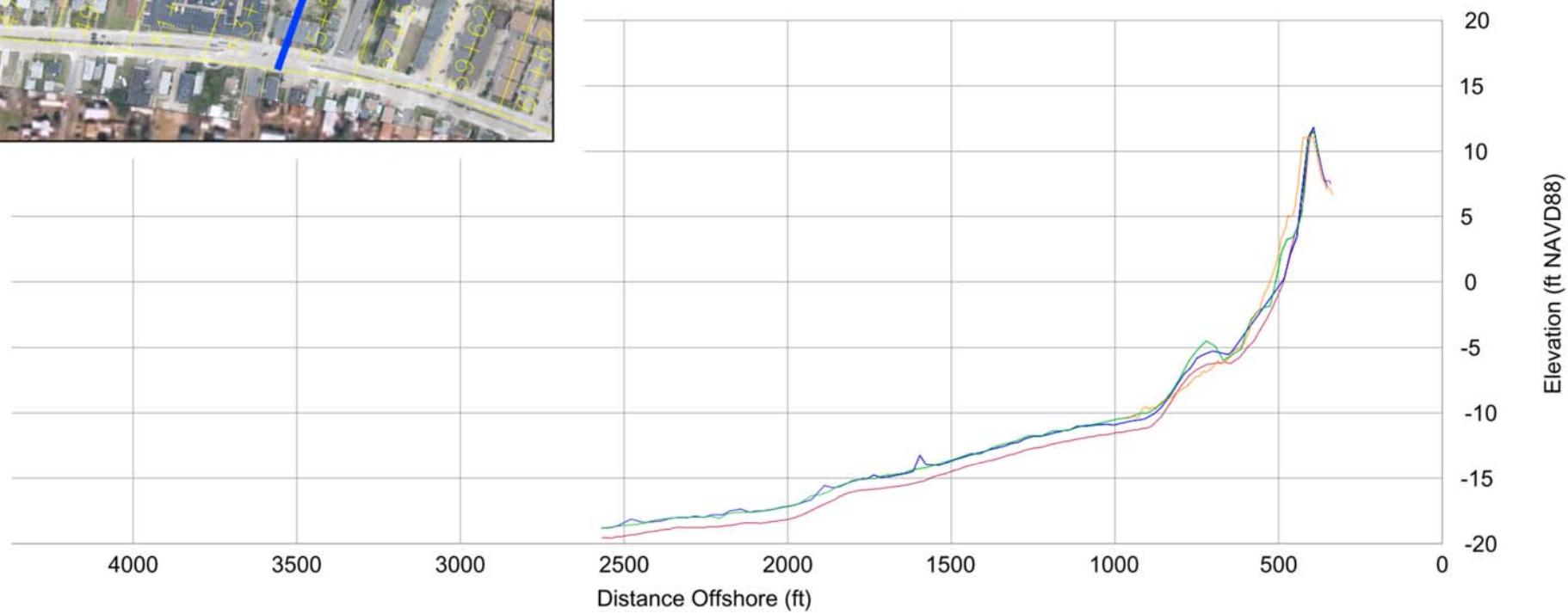
OCTOBER 2008 —
 APRIL 2009 —
 OCTOBER 2009 —
 POST-FILL —

Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. 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 55+51	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-25.04 ft/yr	0.29 ft
Volume Change Above -15 ft NAVD88	-45.17 cy/ft/yr	-37.70 cy/ft
Volume Change Above 0 ft NAVD88	-3.42 cy/ft/yr	-0.80 cy/ft

LEGEND:

OCTOBER 2008 —
 APRIL 2009 —
 OCTOBER 2009 —
 POST-FILL —

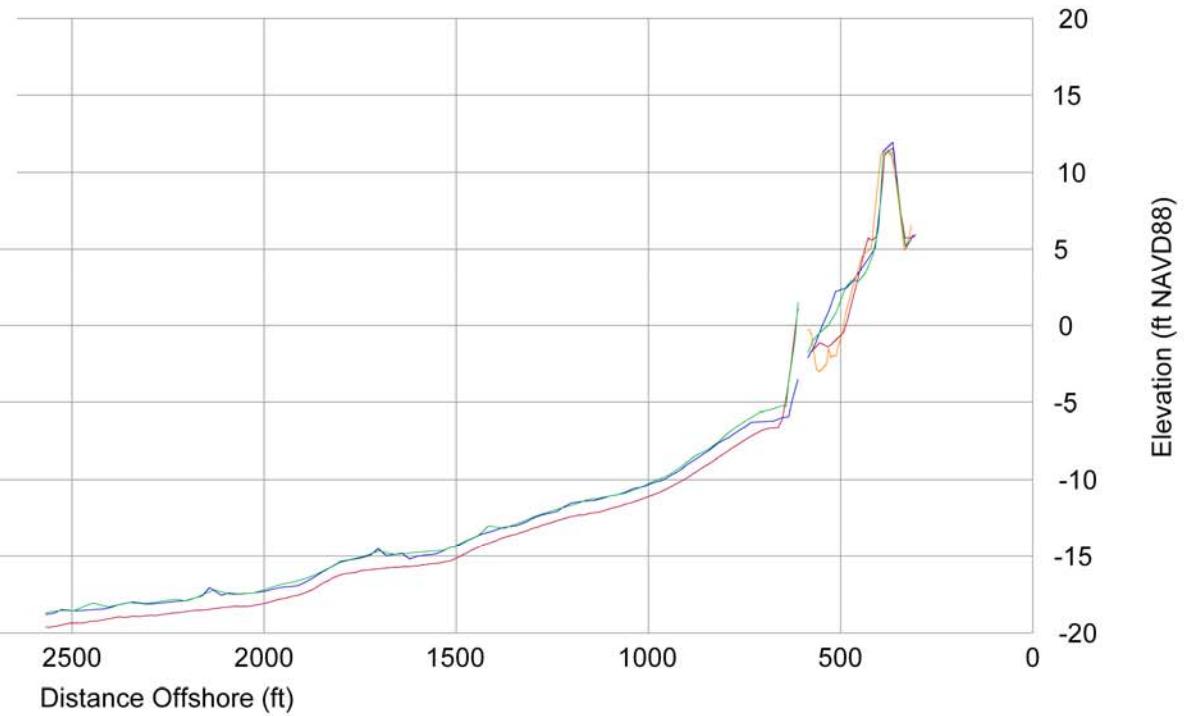
Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.



Norfolk

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ANALYSIS



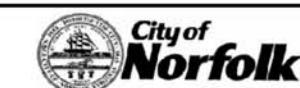
Survey Transect	October 2008 - October 2009	April 2009 - October 2009
57+57		
Shoreline Change at MHW (0.98 ft NAVD88)	-34.48 ft/yr	-54.15 ft
Volume Change Above -15 ft NAVD88	-28.02 cy/ft/yr	-31.99 cy/ft
Volume Change Above 0 ft NAVD88	-0.96 cy/ft/yr	-4.19 cy/ft

LEGEND:

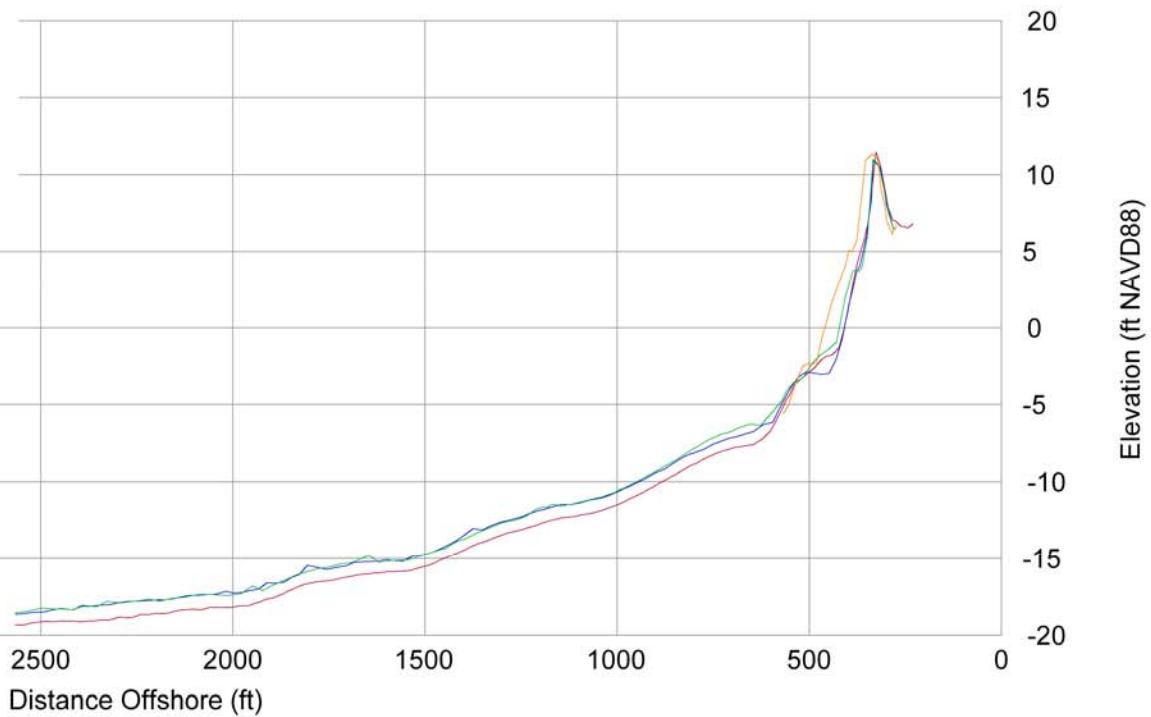
OCTOBER 2008 —
 APRIL 2009 —
 OCTOBER 2009 —
 POST-FILL —

Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.



OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS



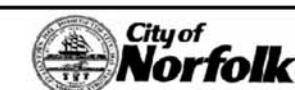
Survey Transect 59+62	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-15.28 ft/yr	-0.62 ft
Volume Change Above -15 ft NAVD88	-33.68 cy/ft/yr	-24.62 cy/ft
Volume Change Above 0 ft NAVD88	-0.37 cy/ft/yr	1.31 cy/ft

LEGEND:

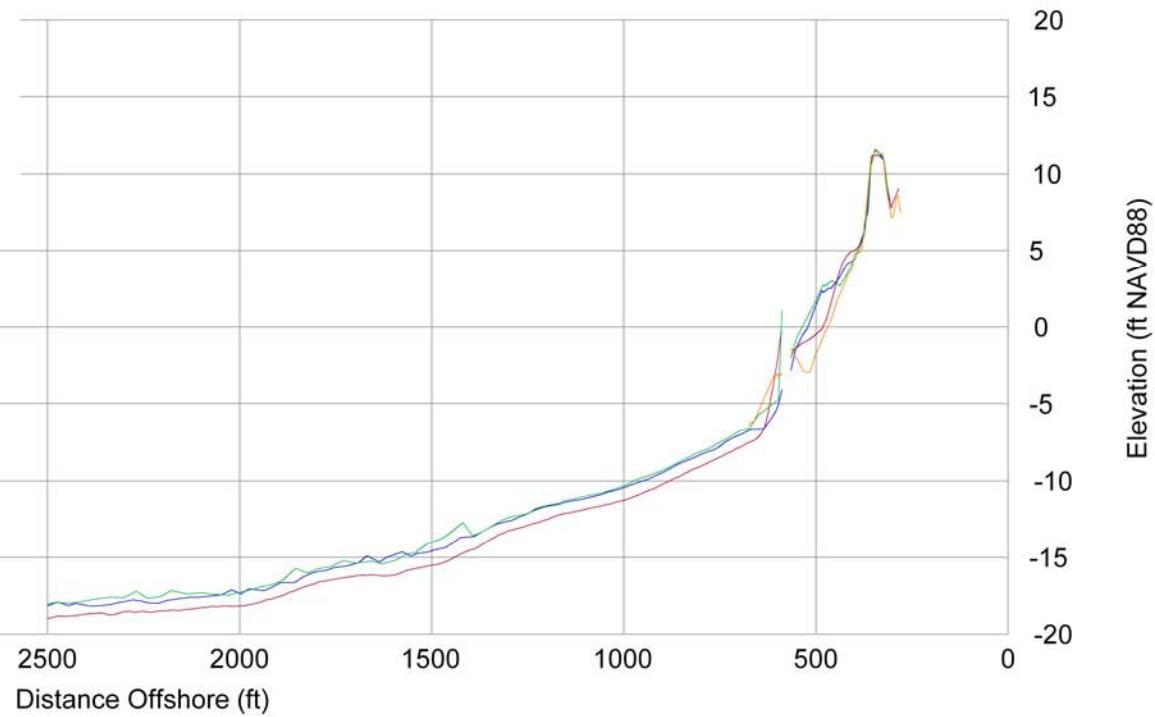
OCTOBER 2008 —
 APRIL 2009 —
 OCTOBER 2009 —
 POST-FILL —

Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. 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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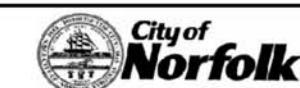
Survey Transect 61+62	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-47.95 ft/yr	-39.34 ft
Volume Change Above -15 ft NAVD88	-29.64 cy/ft/yr	-29.20 cy/ft
Volume Change Above 0 ft NAVD88	-2.76 cy/ft/yr	-2.18 cy/ft

LEGEND:

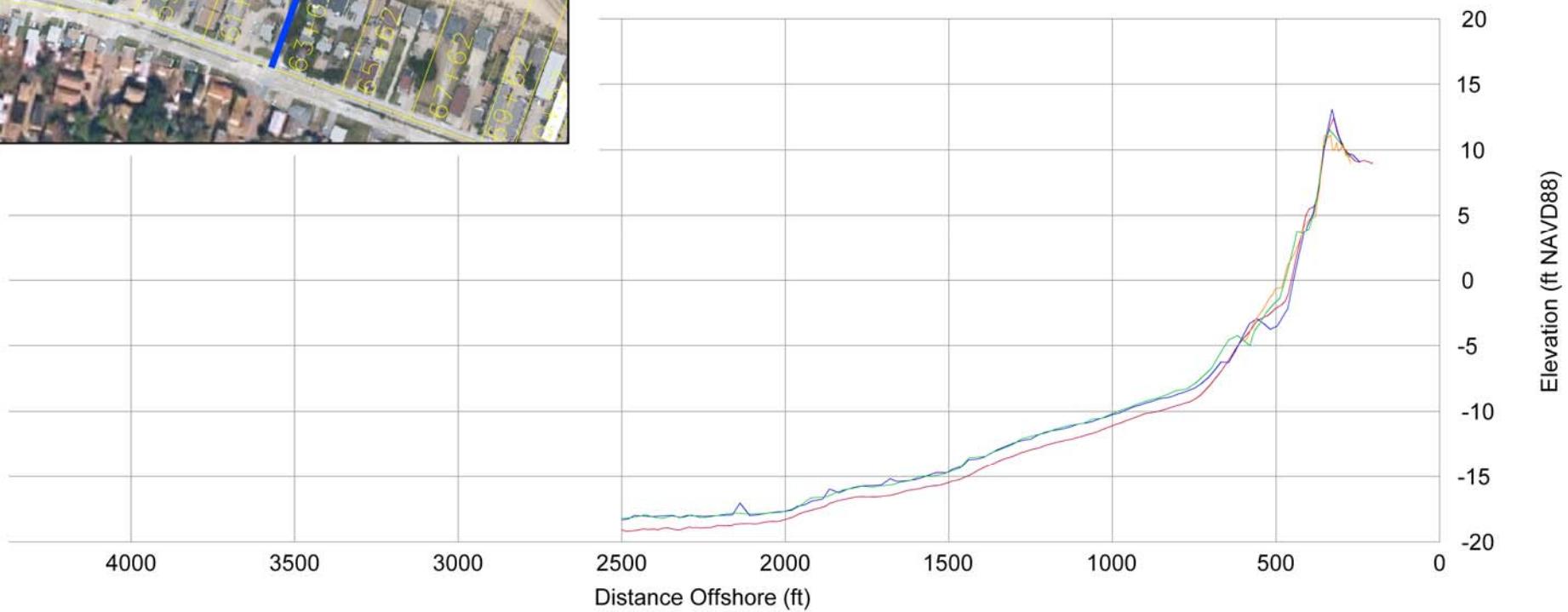
OCTOBER 2008 —
 APRIL 2009 —
 OCTOBER 2009 —
 POST-FILL —

Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. 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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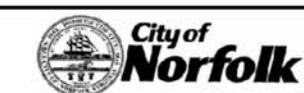
Survey Transect 63+62	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-17.17 ft/yr	6.22 ft
Volume Change Above -15 ft NAVD88	-35.06 cy/ft/yr	-23.90 cy/ft
Volume Change Above 0 ft NAVD88	-0.17 cy/ft/yr	1.15 cy/ft

LEGEND:

OCTOBER 2008 —
 APRIL 2009 —
 OCTOBER 2009 —
 POST-FILL —

Notes:

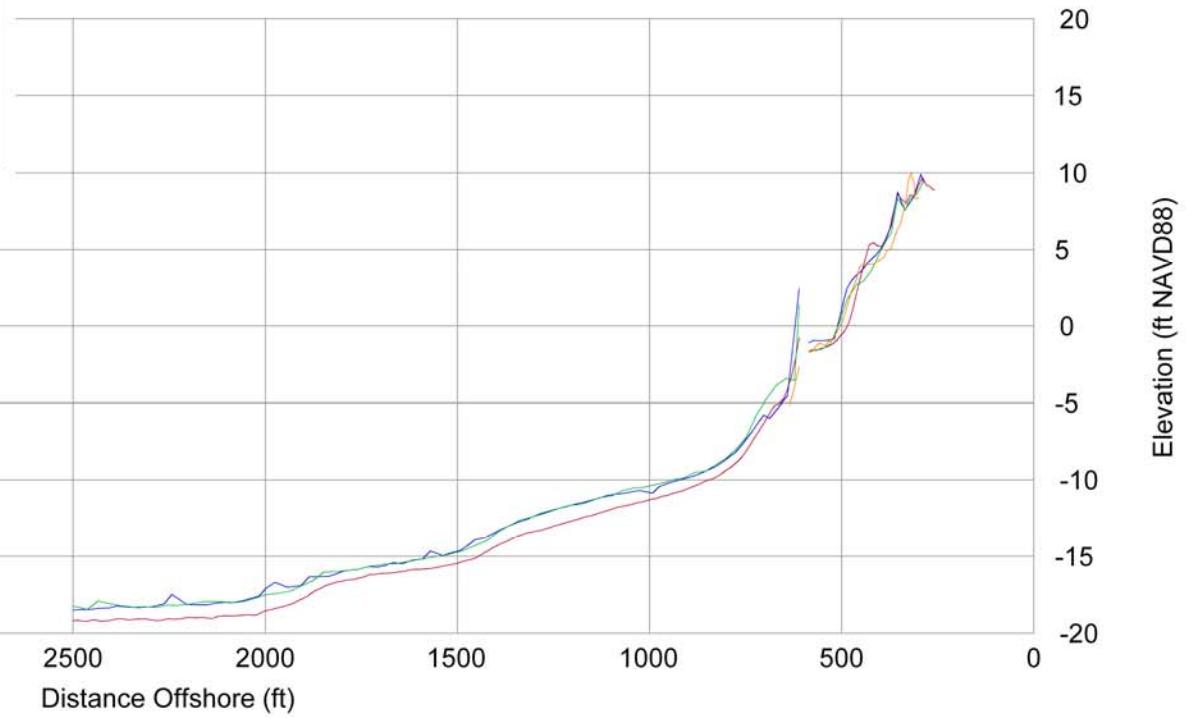
1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.



OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS

ST 63+62 Pg 33 OF 126

FALL 2009



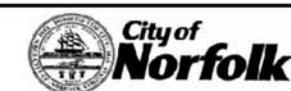
Survey Transect 65+62	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-23.62 ft/yr	-28.75 ft
Volume Change Above -15 ft NAVD88	-28.66 cy/ft/yr	-23.33 cy/ft
Volume Change Above 0 ft NAVD88	1.64 cy/ft/yr	-1.80 cy/ft

LEGEND:

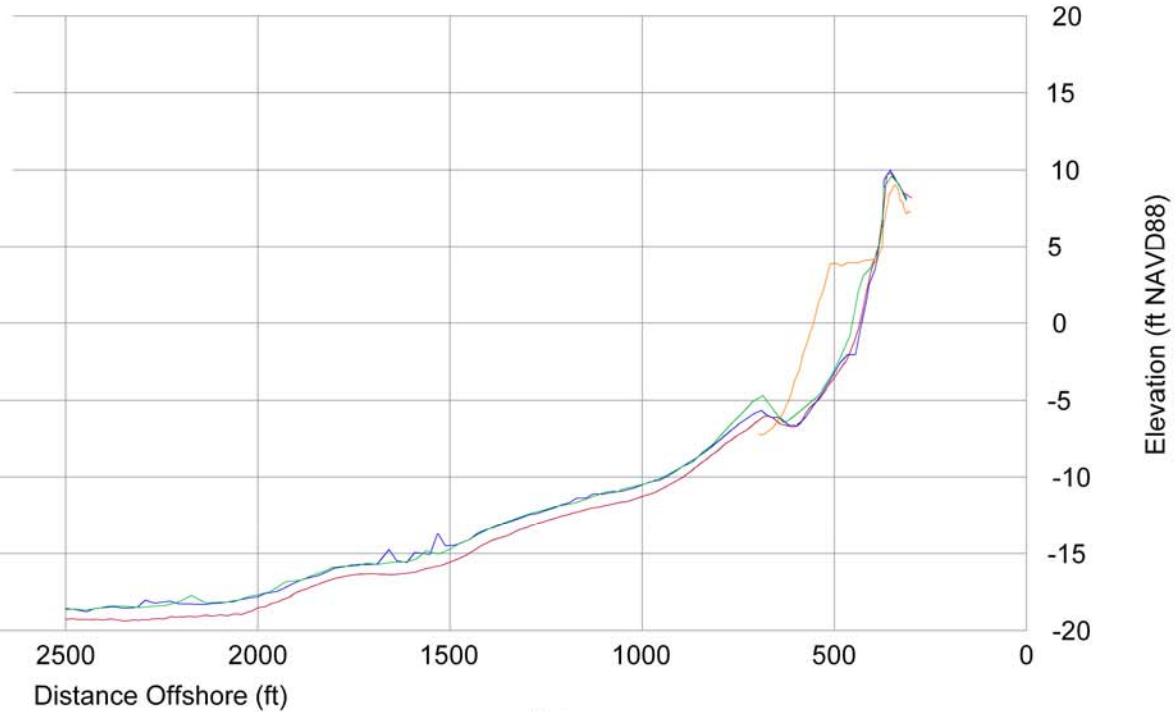
OCTOBER 2008 —
 APRIL 2009 —
 OCTOBER 2009 —
 POST-FILL —

Notes:

1. Stationing From West To East At Varying Intervals.
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Survey Transect 67+62	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-20.84 ft/yr	4.42 ft
Volume Change Above -15 ft NAVD88	-32.97 cy/ft/yr	-23.05 cy/ft
Volume Change Above 0 ft NAVD88	-2.33 cy/ft/yr	0.72 cy/ft

LEGEND:

OCTOBER 2008
APRIL 2009
OCTOBER 2009
POST-FILL

Notes:

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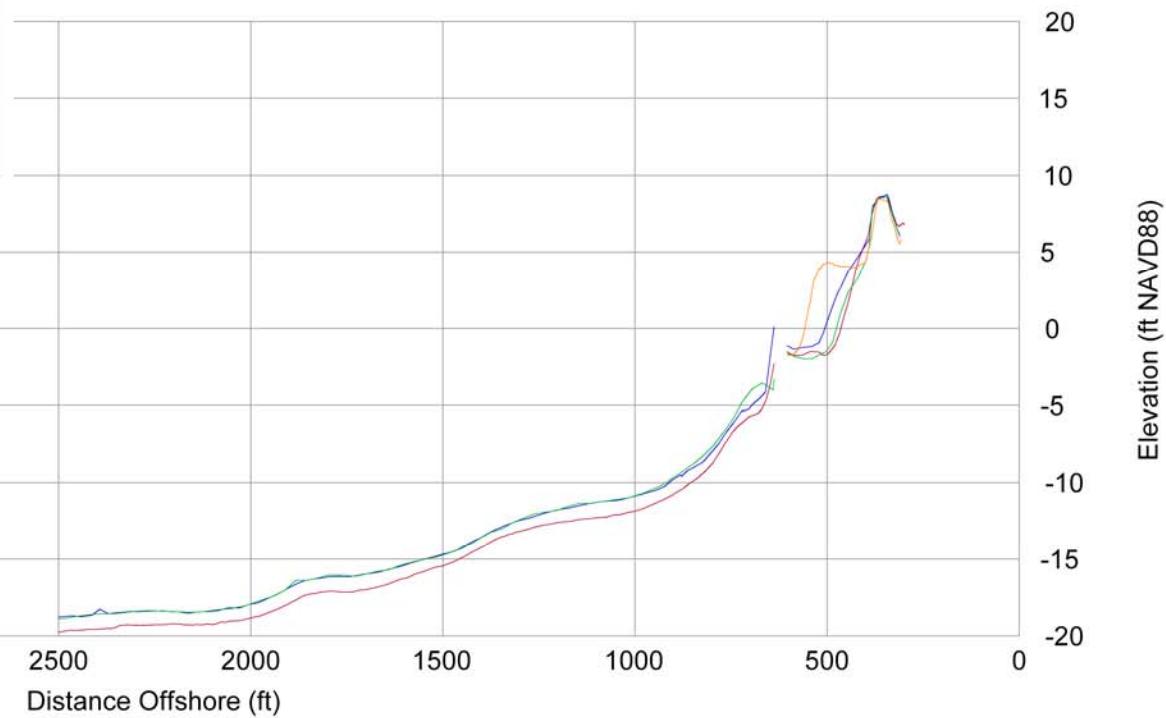
City of
Norfolk

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS

ST 67+62

35 OF 126

FALL 2009



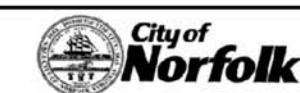
Survey Transect 69+62	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-11.52 ft/yr	-38.82 ft
Volume Change Above -15 ft NAVD88	-28.36 cy/ft/yr	0.39 cy/ft
Volume Change Above 0 ft NAVD88	1.04 cy/ft/yr	-4.69 cy/ft

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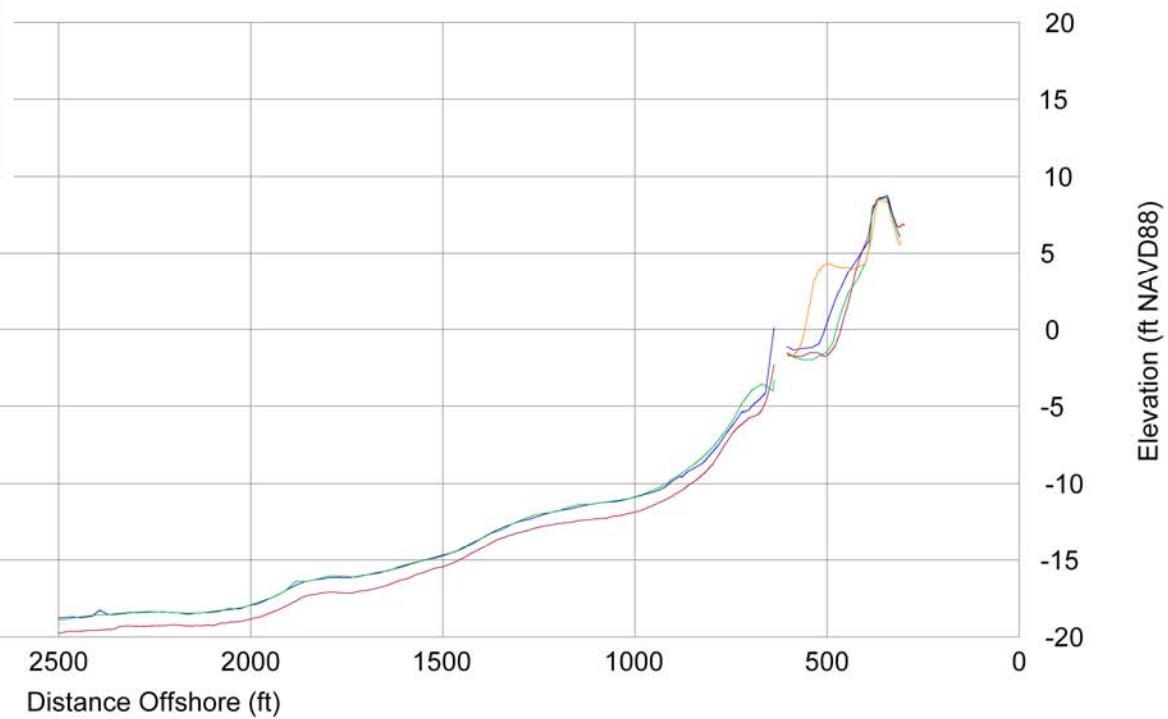
OCTOBER 2008 —
 APRIL 2009 —
 OCTOBER 2009 —
 POST-FILL —

Notes:

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OCEAN VIEW PERIODIC
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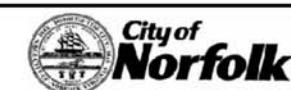


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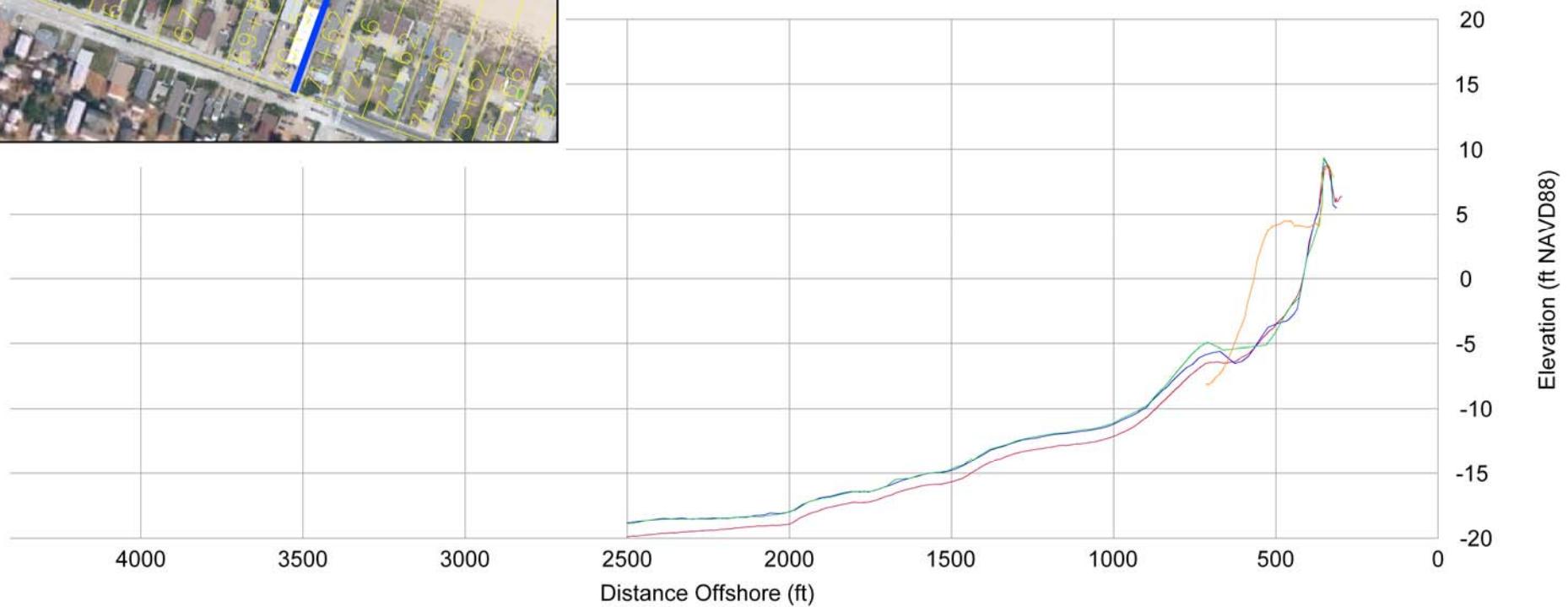
- OCTOBER 2008
- APRIL 2009
- OCTOBER 2009
- POST-FILL

Notes:

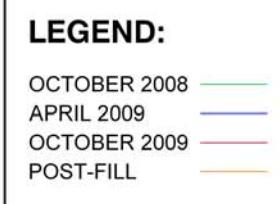
1. Stationing From West To East At Varying Intervals.
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OCEAN VIEW PERIODIC
SURVEYING DATA &
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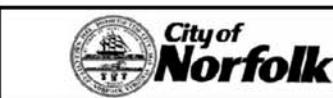


Survey Transect 71+62	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	0.13 ft/yr	-0.12 ft
Volume Change Above -15 ft NAVD88	-30.52 cy/ft/yr	-24.93 cy/ft
Volume Change Above 0 ft NAVD88	1.30 cy/ft/yr	-0.74 cy/ft

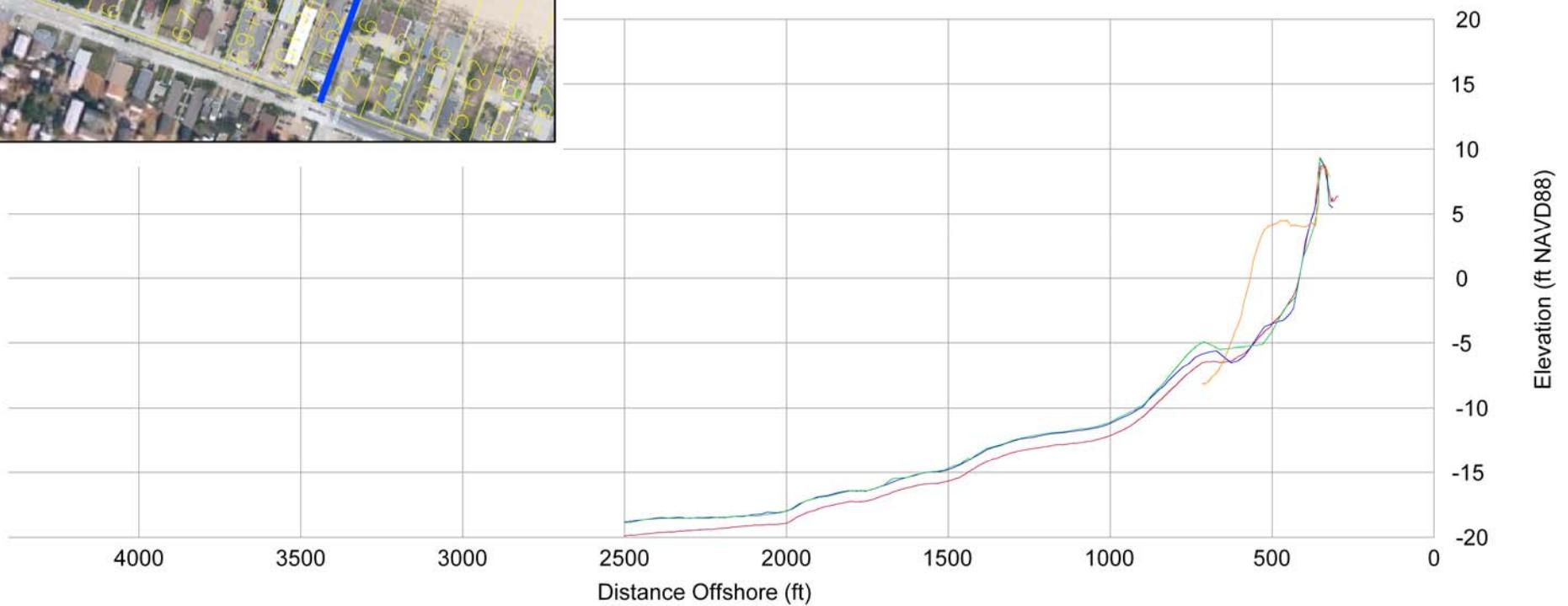


Notes:

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OCEAN VIEW PERIODIC
SURVEYING DATA &
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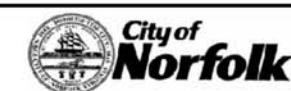


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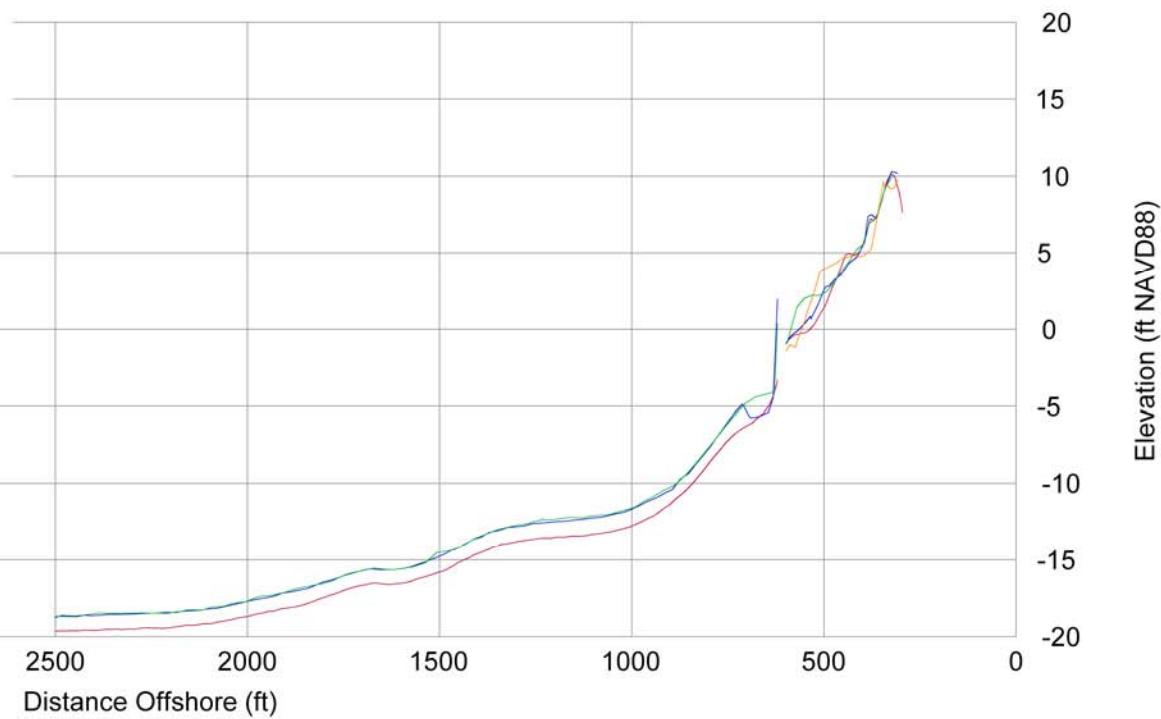
- OCTOBER 2008
- APRIL 2009
- OCTOBER 2009
- POST-FILL

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OCEAN VIEW PERIODIC
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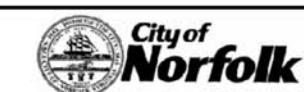
Survey Transect 73+62	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-65.19 ft/yr	-17.58 ft
Volume Change Above -15 ft NAVD88	-5.31 cy/ft/yr	-32.72 cy/ft
Volume Change Above 0 ft NAVD88	-4.71 cy/ft/yr	-1.79 cy/ft

LEGEND:

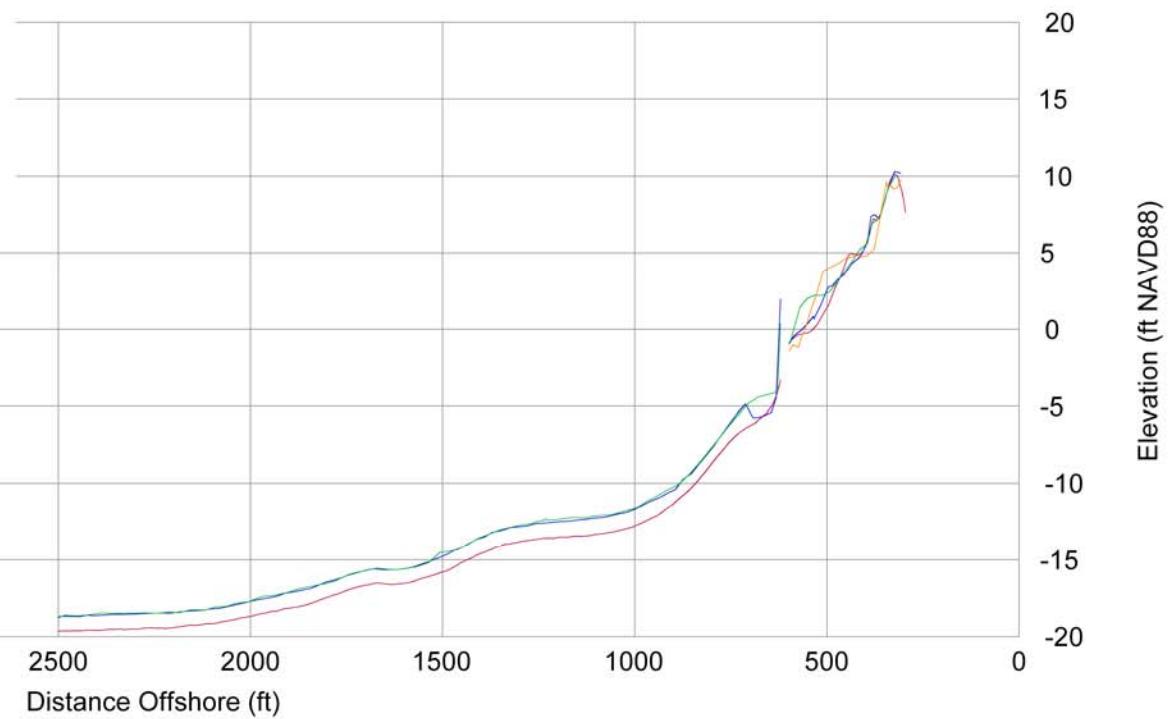
OCTOBER 2008 —
 APRIL 2009 —
 OCTOBER 2009 —
 POST-FILL —

Notes:

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OCEAN VIEW PERIODIC
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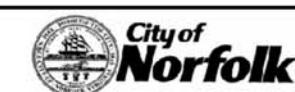


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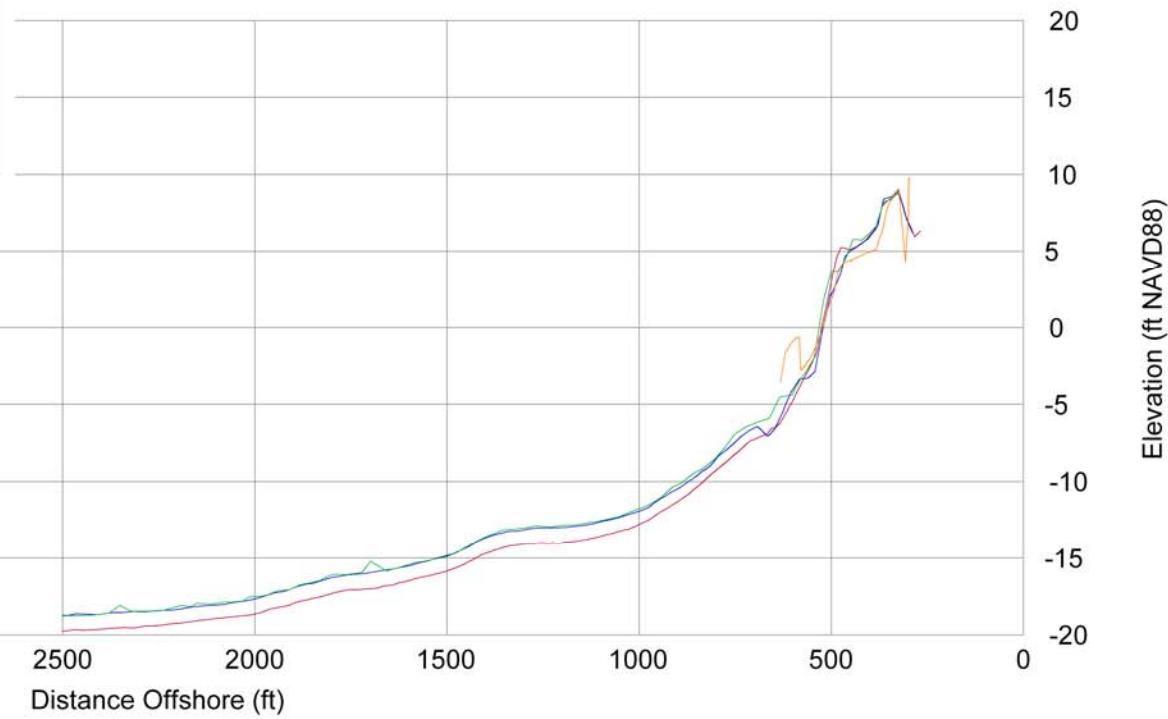
- OCTOBER 2008
- APRIL 2009
- OCTOBER 2009
- POST-FILL

Notes:

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OCEAN VIEW PERIODIC
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Survey Transect 75+62	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-9.15 ft/yr	4.44 ft
Volume Change Above -15 ft NAVD88	-35.48 cy/ft/yr	2.17 cy/ft
Volume Change Above 0 ft NAVD88	-0.73 cy/ft/yr	2.17 cy/ft

LEGEND:

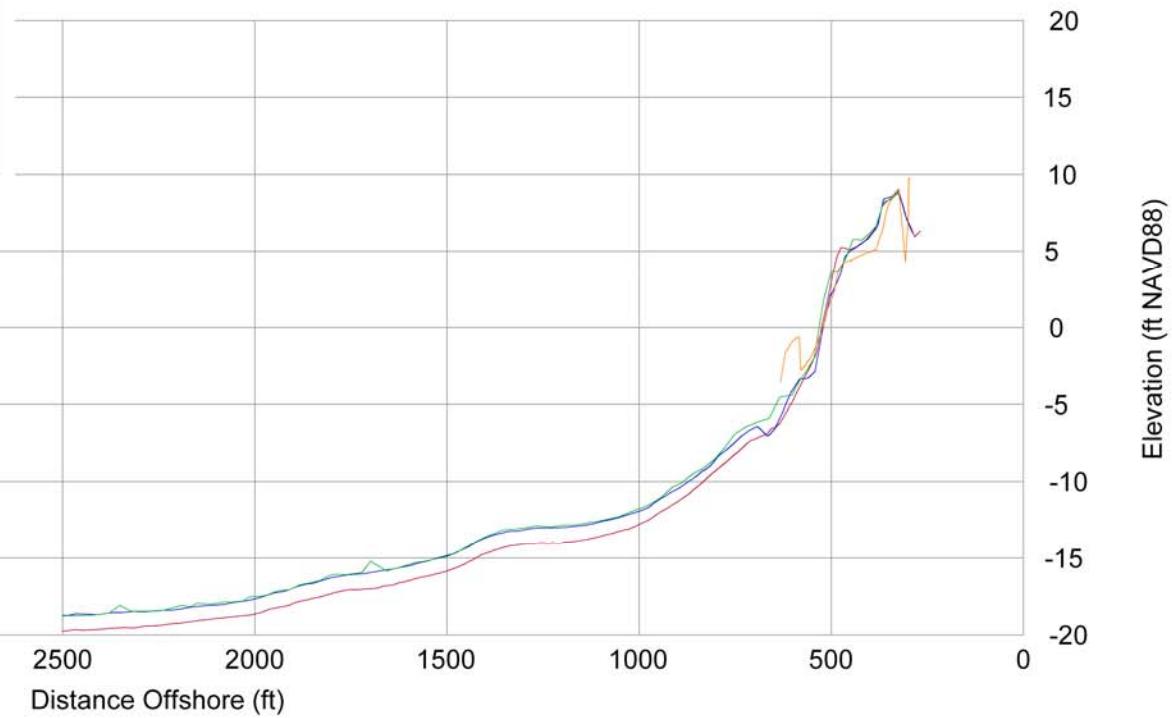
OCTOBER 2008 —
 APRIL 2009 —
 OCTOBER 2009 —
 POST-FILL —

Notes:

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OCEAN VIEW PERIODIC
SURVEYING DATA &
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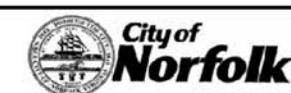


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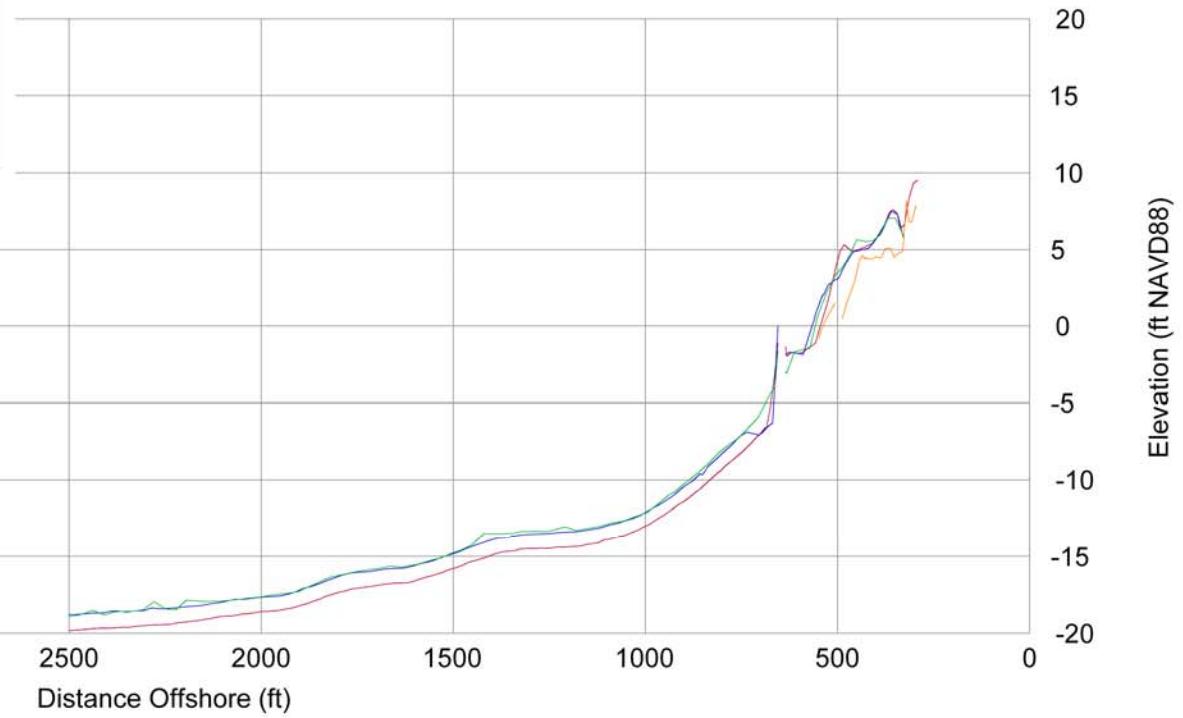
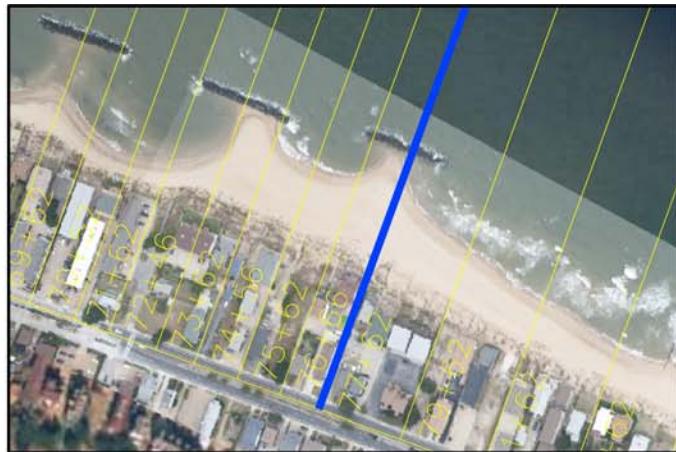
- OCTOBER 2008
- APRIL 2009
- OCTOBER 2009
- POST-FILL

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OCEAN VIEW PERIODIC
SURVEYING DATA &
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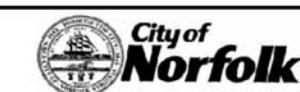
Survey Transect	October 2008 - October 2009	April 2009 - October 2009
77+62		
Shoreline Change at MHW (0.98 ft NAVD88)	-13.95 ft/yr	-21.80 ft
Volume Change Above -15 ft NAVD88	-34.02 cy/ft/yr	-26.21 cy/ft
Volume Change Above 0 ft NAVD88	0.11 cy/ft/yr	0.33 cy/ft

LEGEND:

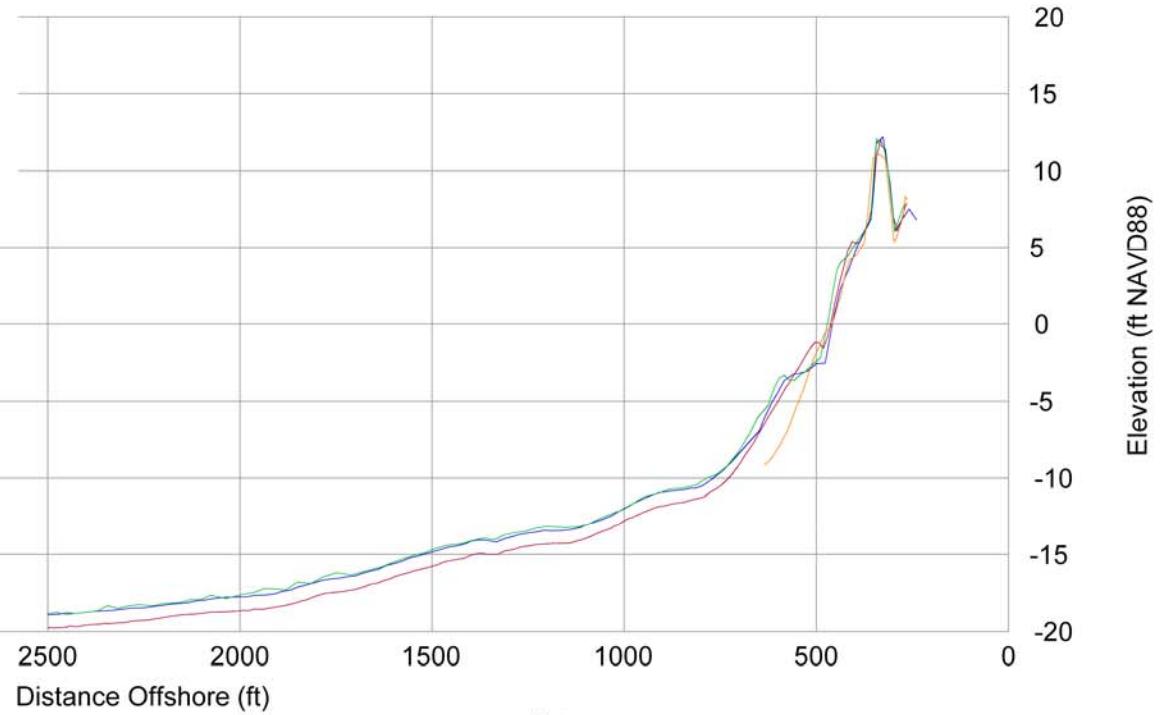
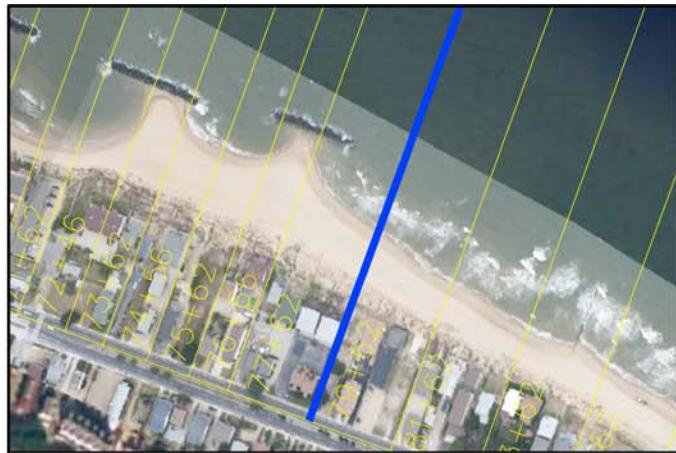
OCTOBER 2008 —
APRIL 2009 —
OCTOBER 2009 —
POST-FILL —

Notes:

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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS



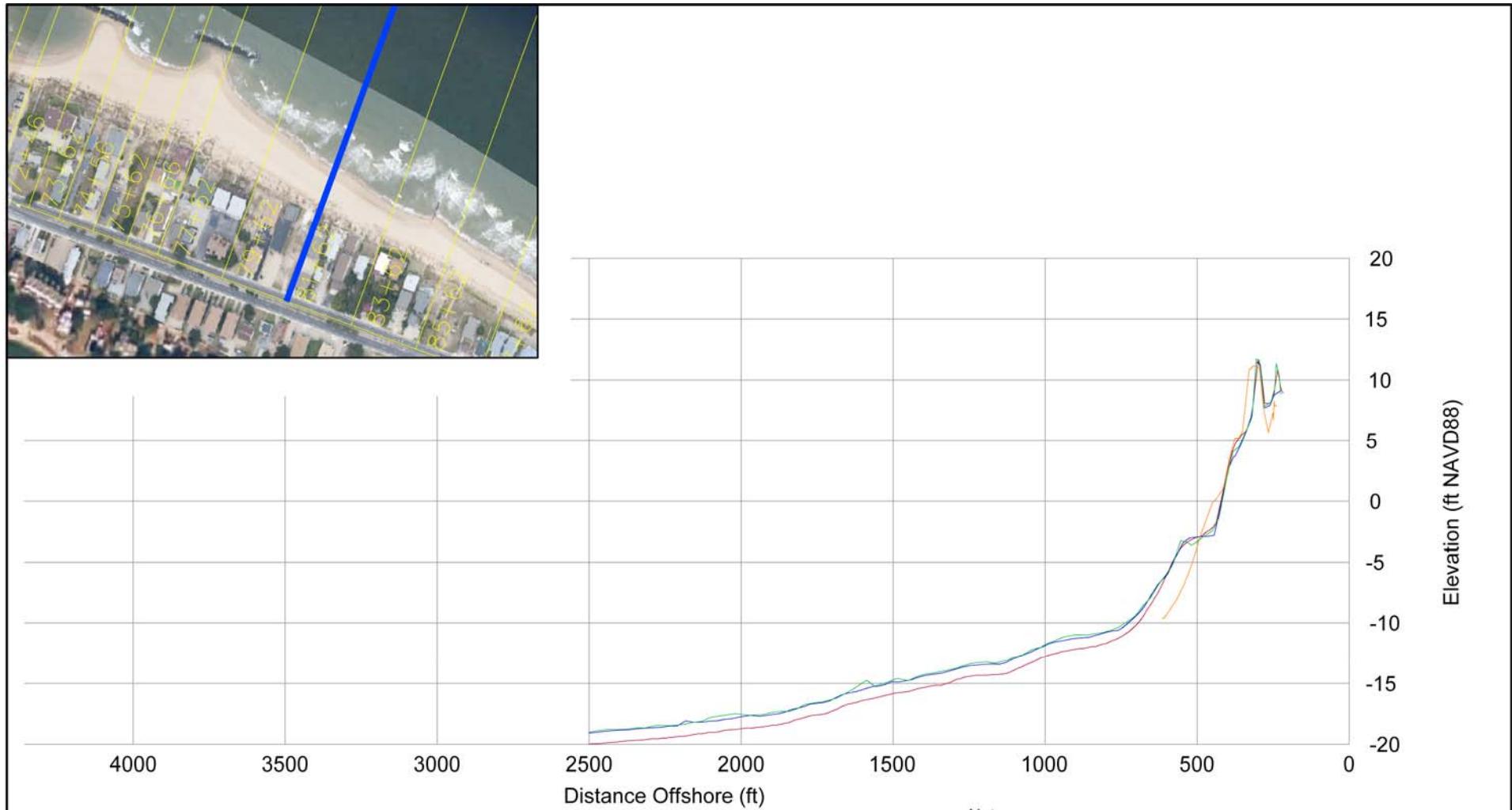
Survey Transect 79+62	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-9.63 ft/yr	5.12 ft
Volume Change Above -15 ft NAVD88	-32.73 cy/ft/yr	-20.95 cy/ft
Volume Change Above 0 ft NAVD88	-2.49 cy/ft/yr	1.75 cy/ft



Notes:

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 City of Norfolk	OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS	
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Survey Transect 81+62	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	3.60 ft/yr	2.54 ft
Volume Change Above -15 ft NAVD88	-28.66 cy/ft/yr	-22.61 cy/ft
Volume Change Above 0 ft NAVD88	0.84 cy/ft/yr	2.53 cy/ft

LEGEND:

OCTOBER 2008
APRIL 2009
OCTOBER 2009
POST-FILL

Notes:

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City of
Norfolk

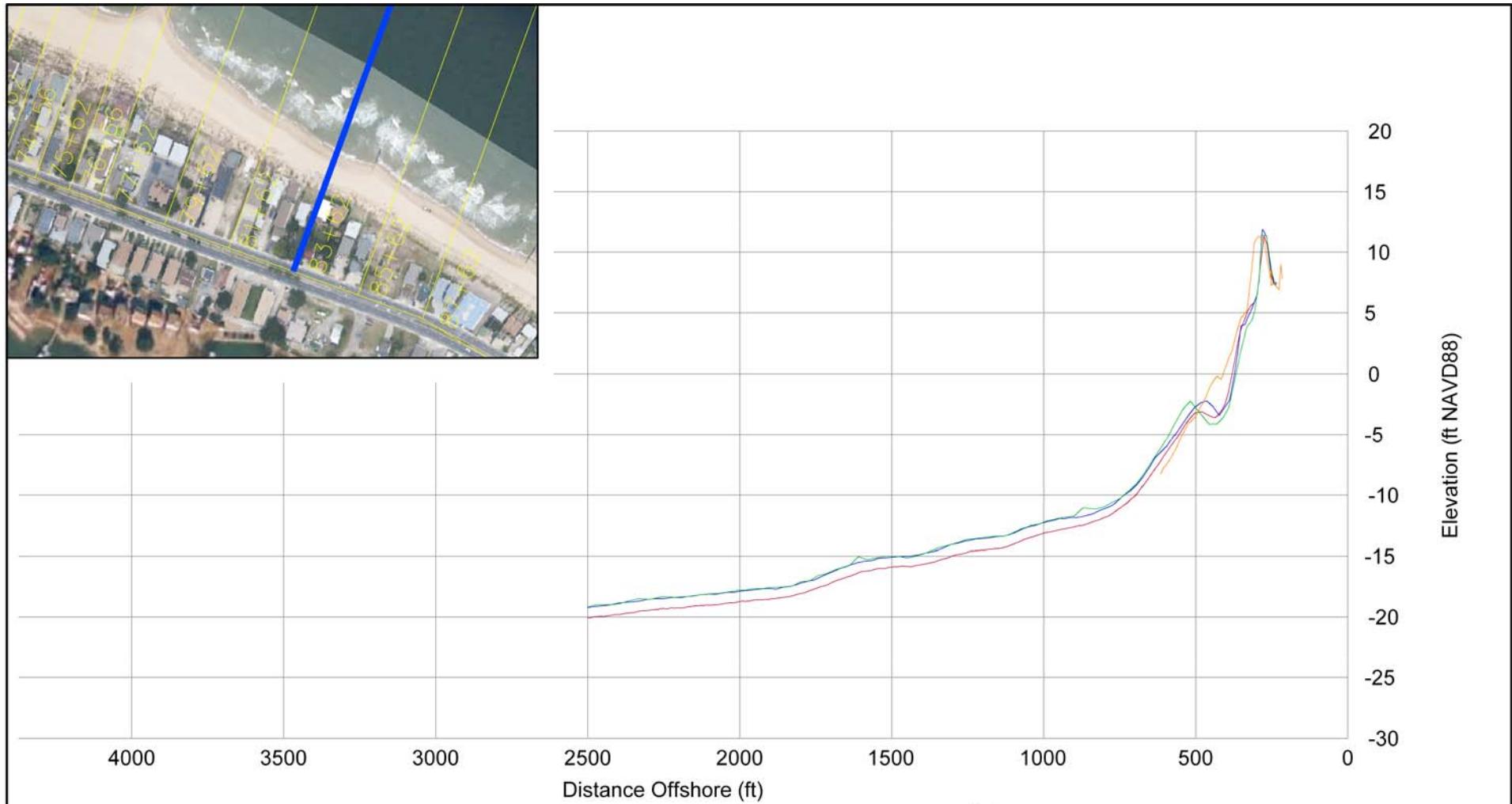
OCEAN VIEW PERIODIC
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ST 81+62

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FALL 2009

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Survey Transect 83+62	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	13.21 ft/yr	6.12 ft
Volume Change Above -15 ft NAVD88	-26.38 cy/ft/yr	-26.47 cy/ft
Volume Change Above 0 ft NAVD88	2.88 cy/ft/yr	0.16 cy/ft

LEGEND:

OCTOBER 2008
APRIL 2009
OCTOBER 2009
POST-FILL

Notes:

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City of
Norfolk

OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS

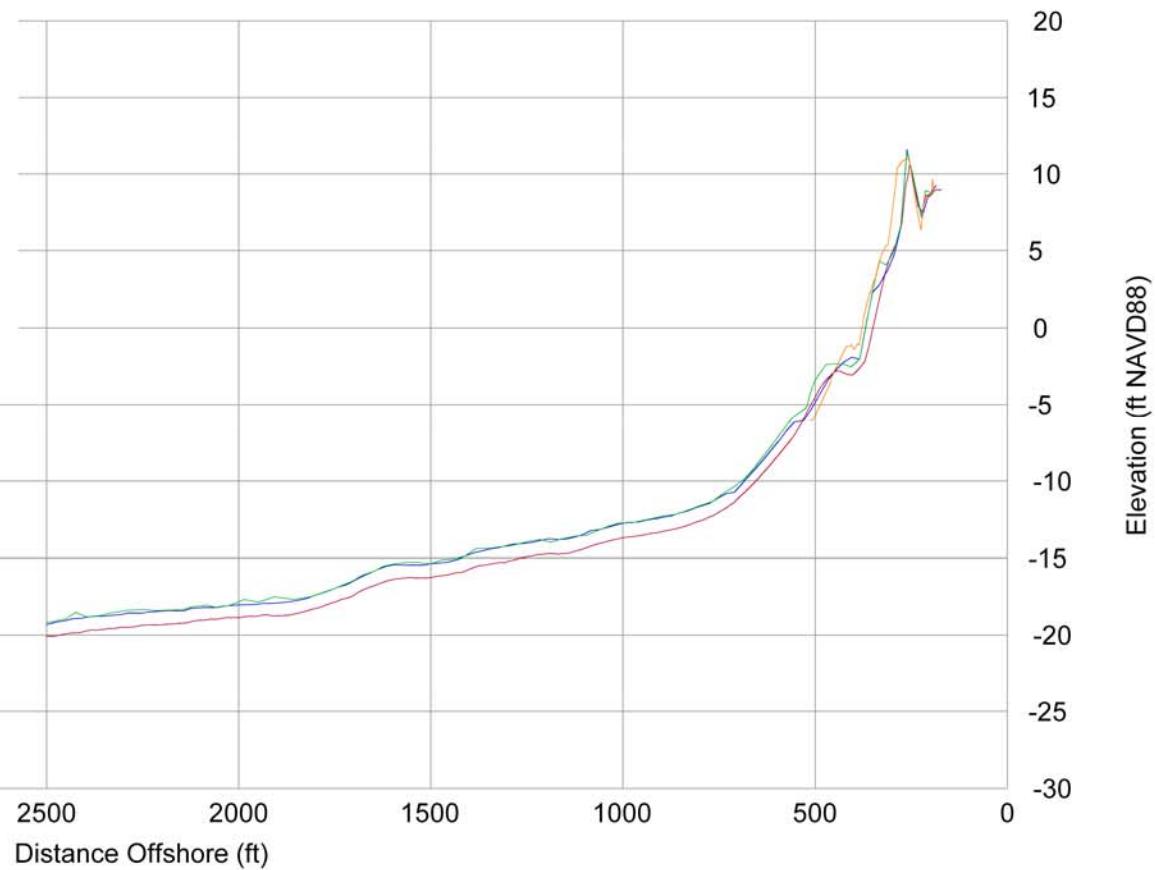
ST 83+62

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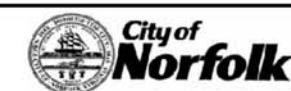
Survey Transect 85+62	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-20.16 ft/yr	-20.22 ft
Volume Change Above -15 ft NAVD88	-39.99 cy/ft/yr	-32.49 cy/ft
Volume Change Above 0 ft NAVD88	-4.46 cy/ft/yr	-2.54 cy/ft

LEGEND:

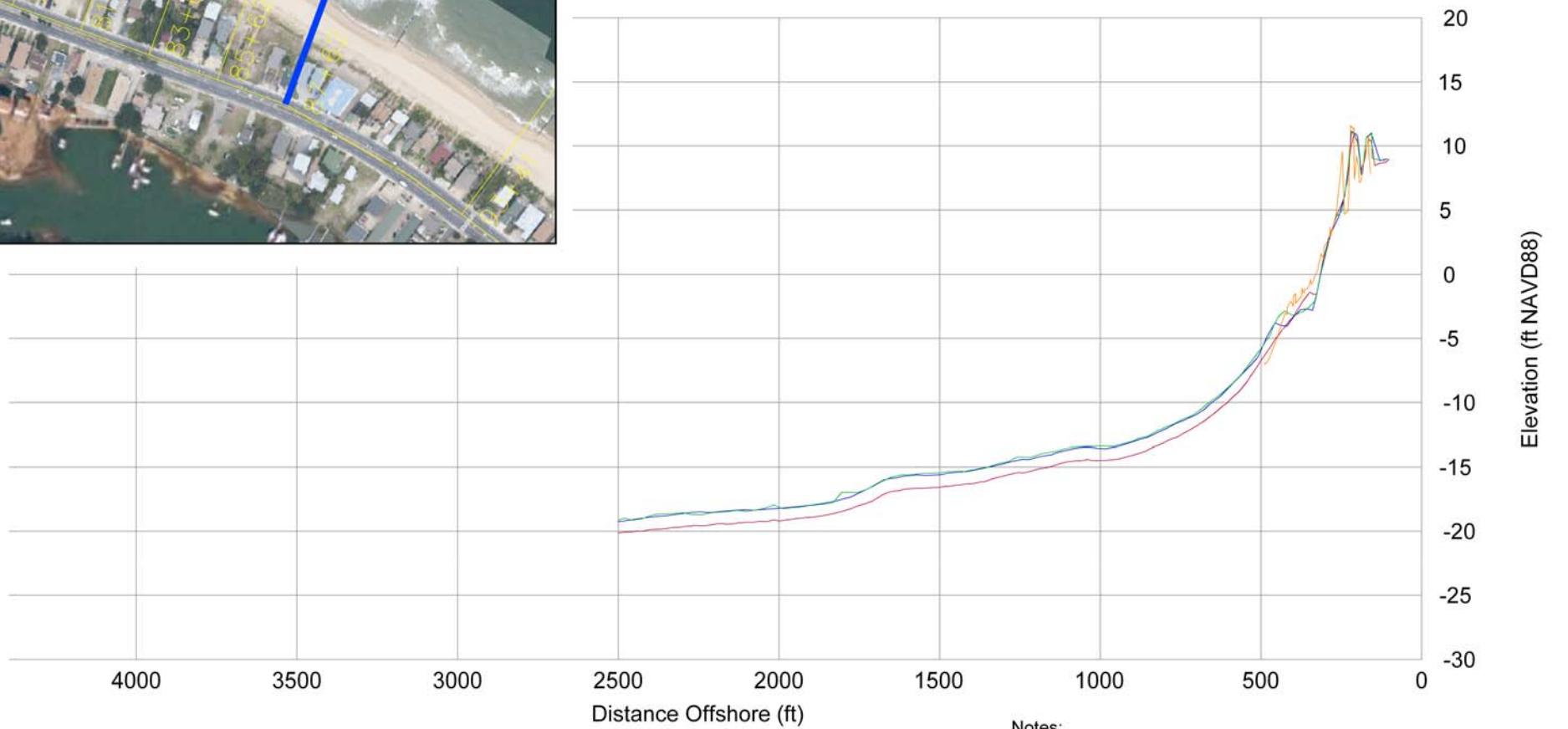
OCTOBER 2008 —
 APRIL 2009 —
 OCTOBER 2009 —
 POST-FILL —

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OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS

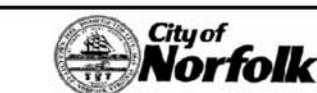


Survey Transect 87+62	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-1.11 ft/yr	-3.28 ft
Volume Change Above -15 ft NAVD88	-34.27 cy/ft/yr	-29.98 cy/ft
Volume Change Above 0 ft NAVD88	-1.03 cy/ft/yr	-2.15 cy/ft

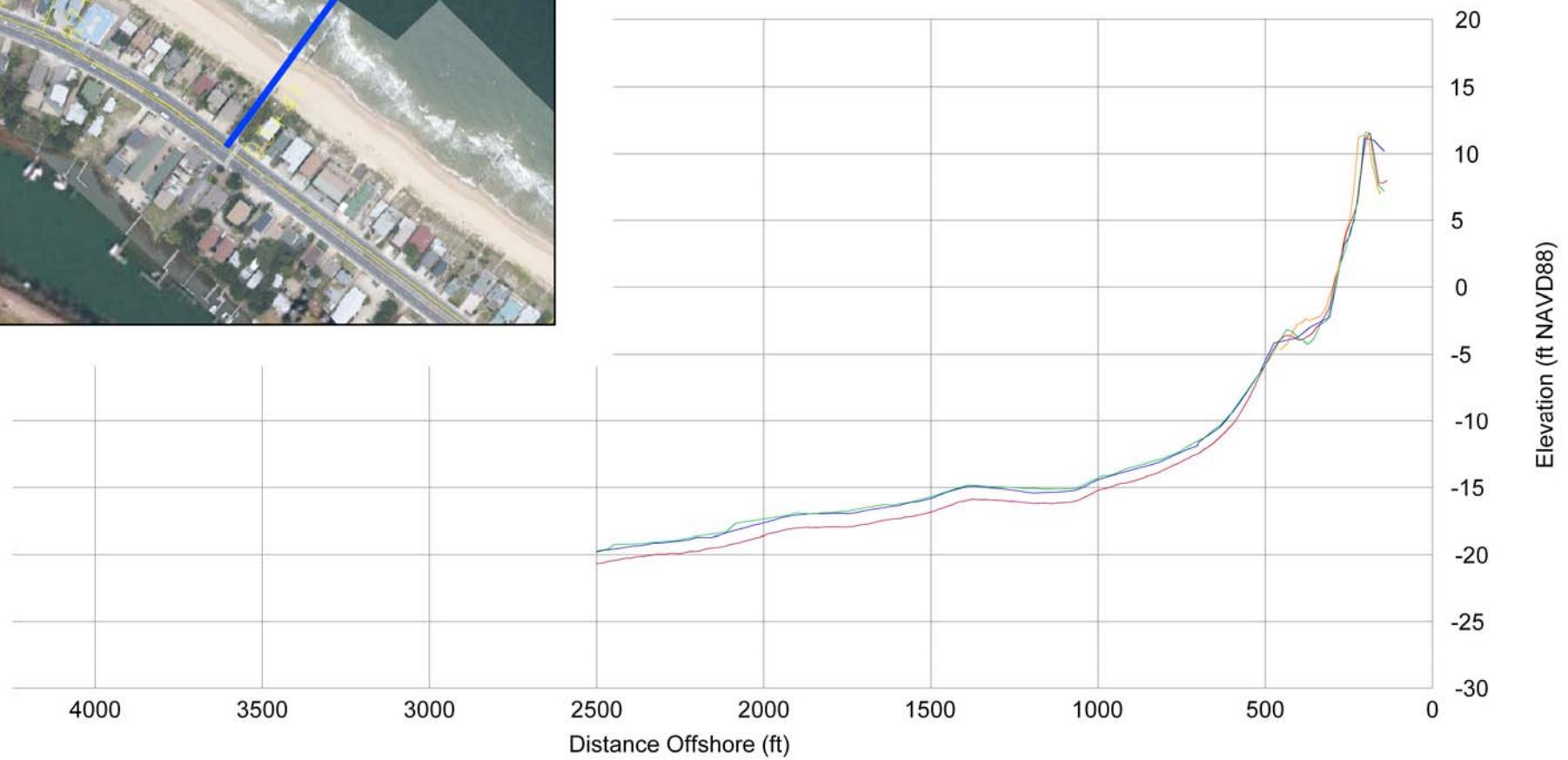


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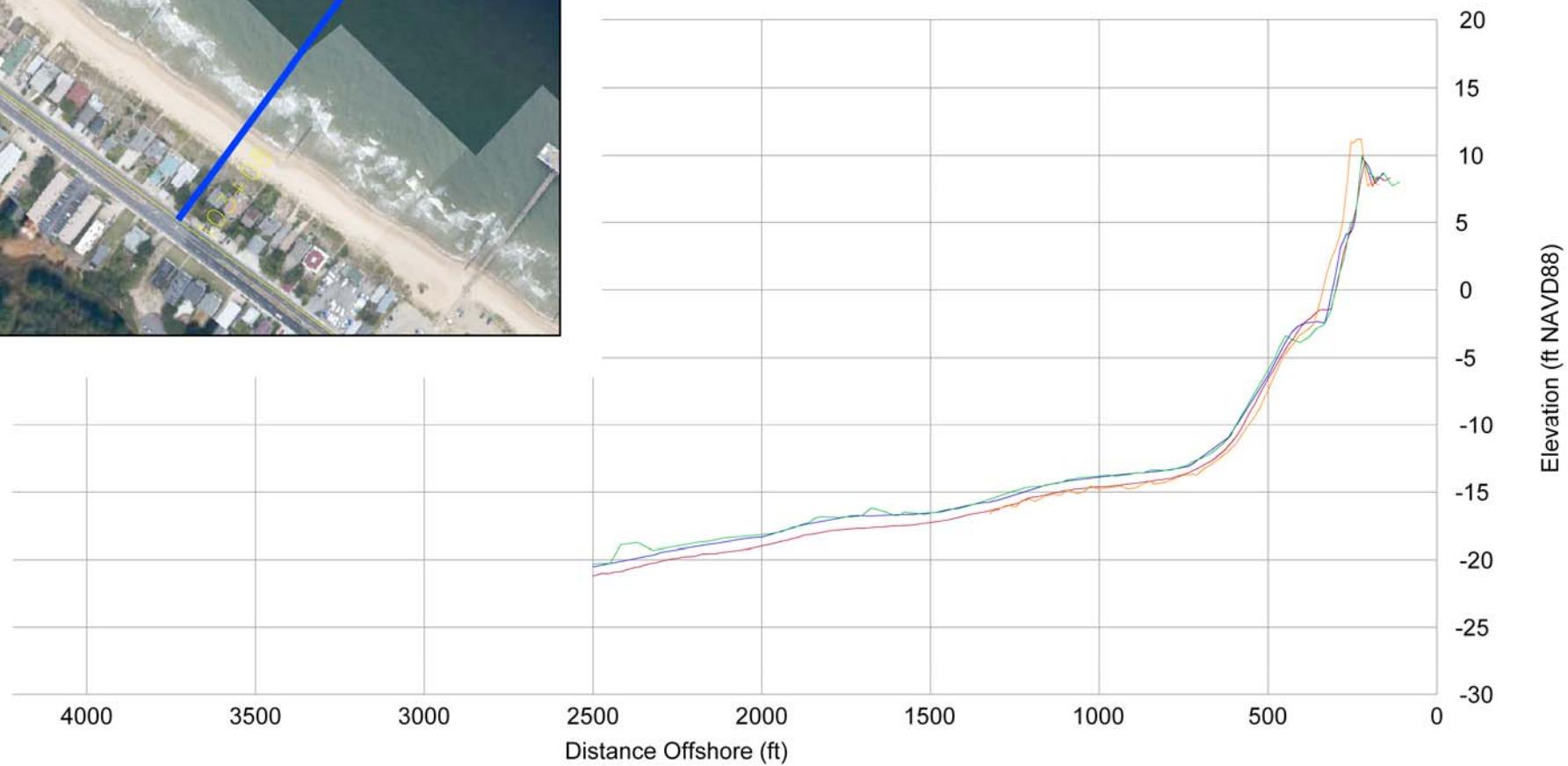
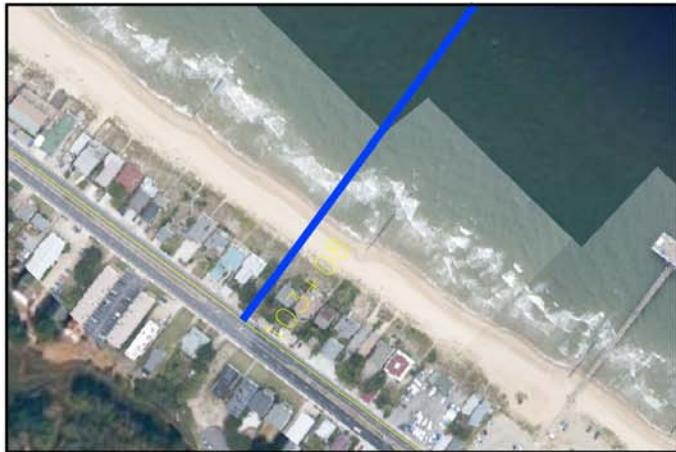


Survey Transect 93+41	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	4.14 ft/yr	4.73 ft
Volume Change Above -15 ft NAVD88	-15.07 cy/ft/yr	-14.03 cy/ft
Volume Change Above 0 ft NAVD88	1.48 cy/ft/yr	0.84 cy/ft

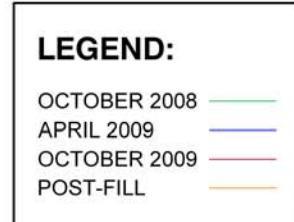


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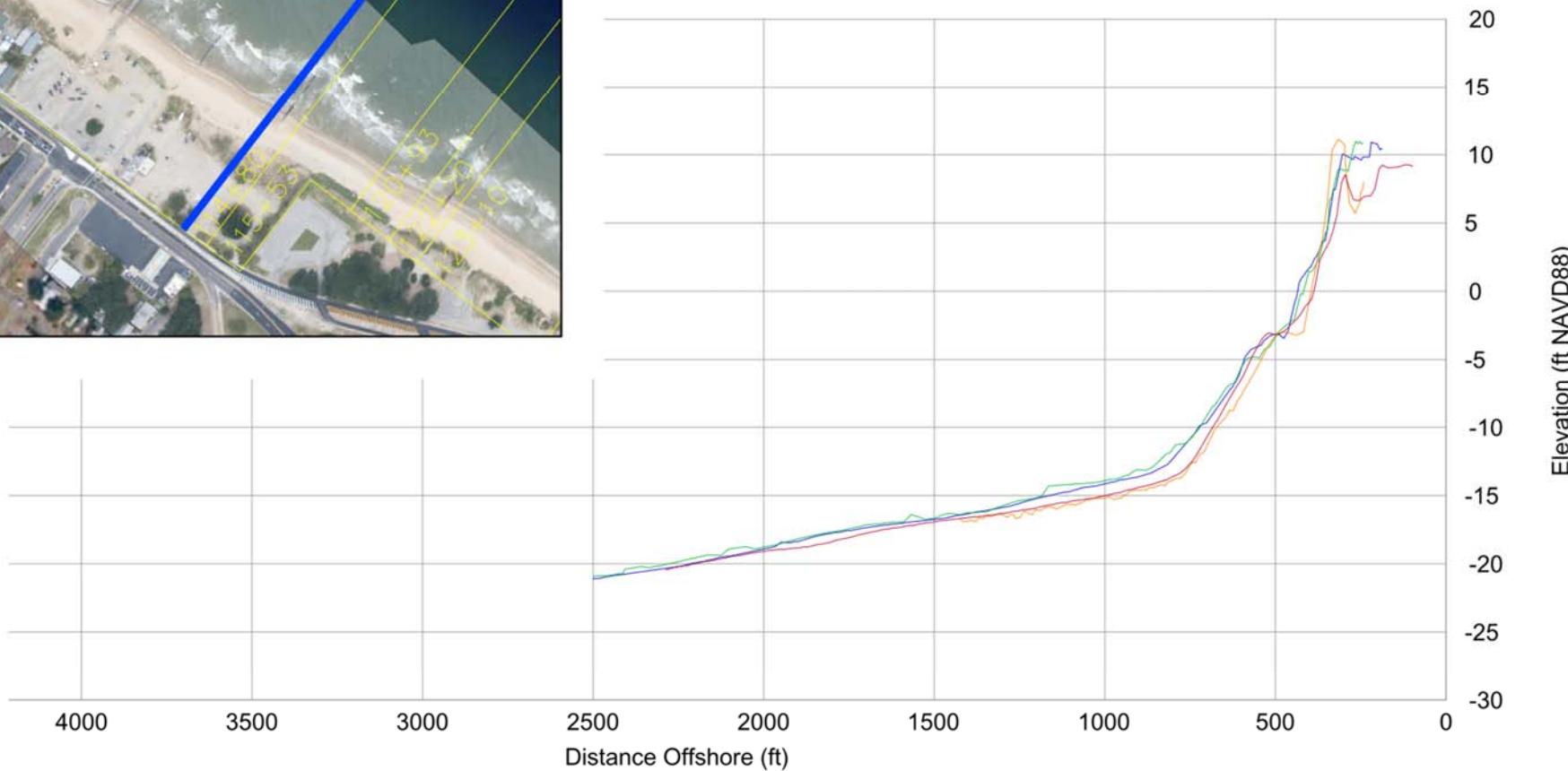
Survey Transect 103+08	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-1.28 ft/yr	-11.21 ft
Volume Change Above -15 ft NAVD88	-17.28 cy/ft/yr	-20.12 cy/ft
Volume Change Above 0 ft NAVD88	-0.89 cy/ft/yr	-2.48 cy/ft



Notes:

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LEGEND:

- OCTOBER 2008
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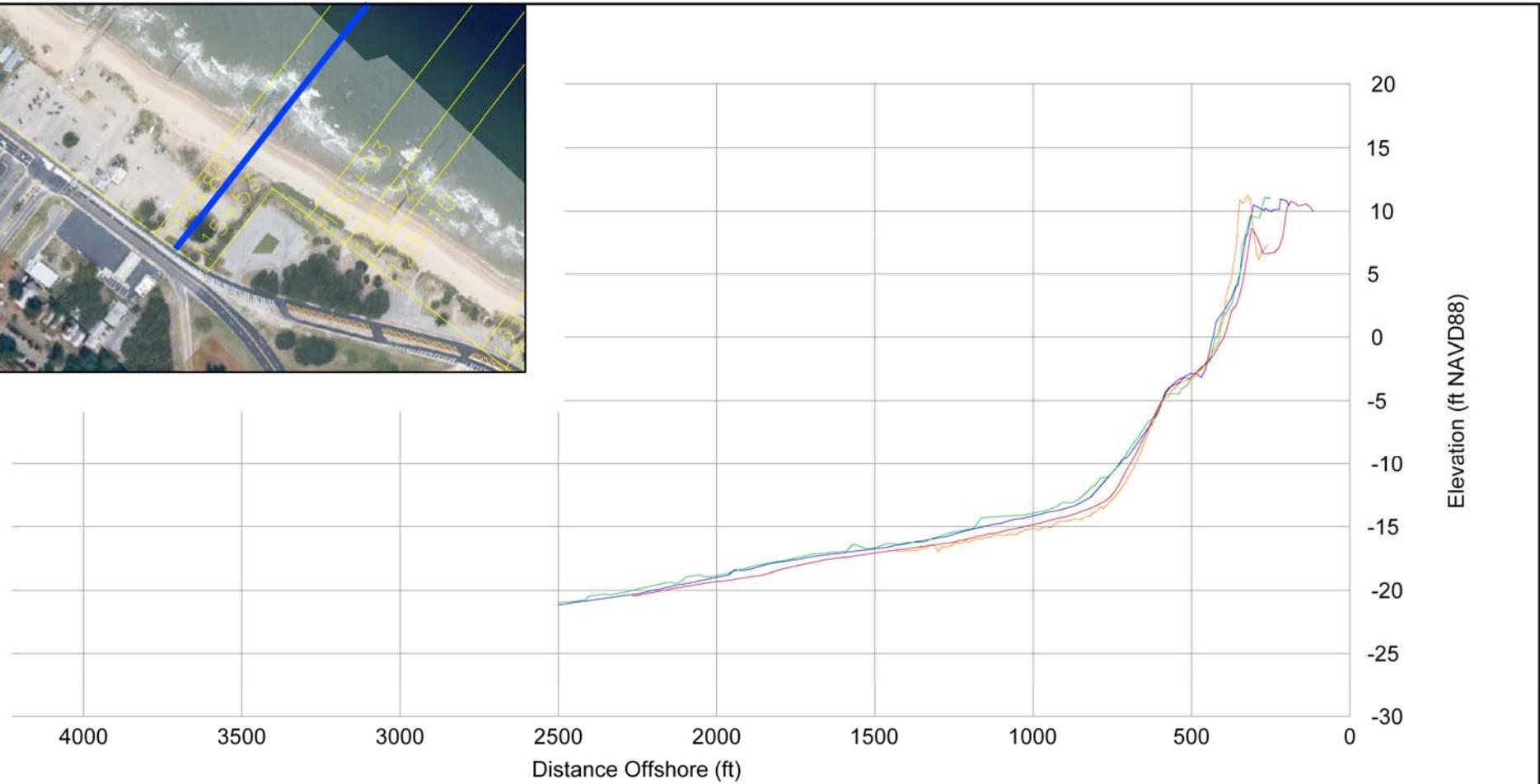
Notes:

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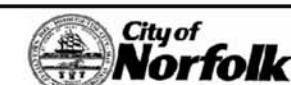


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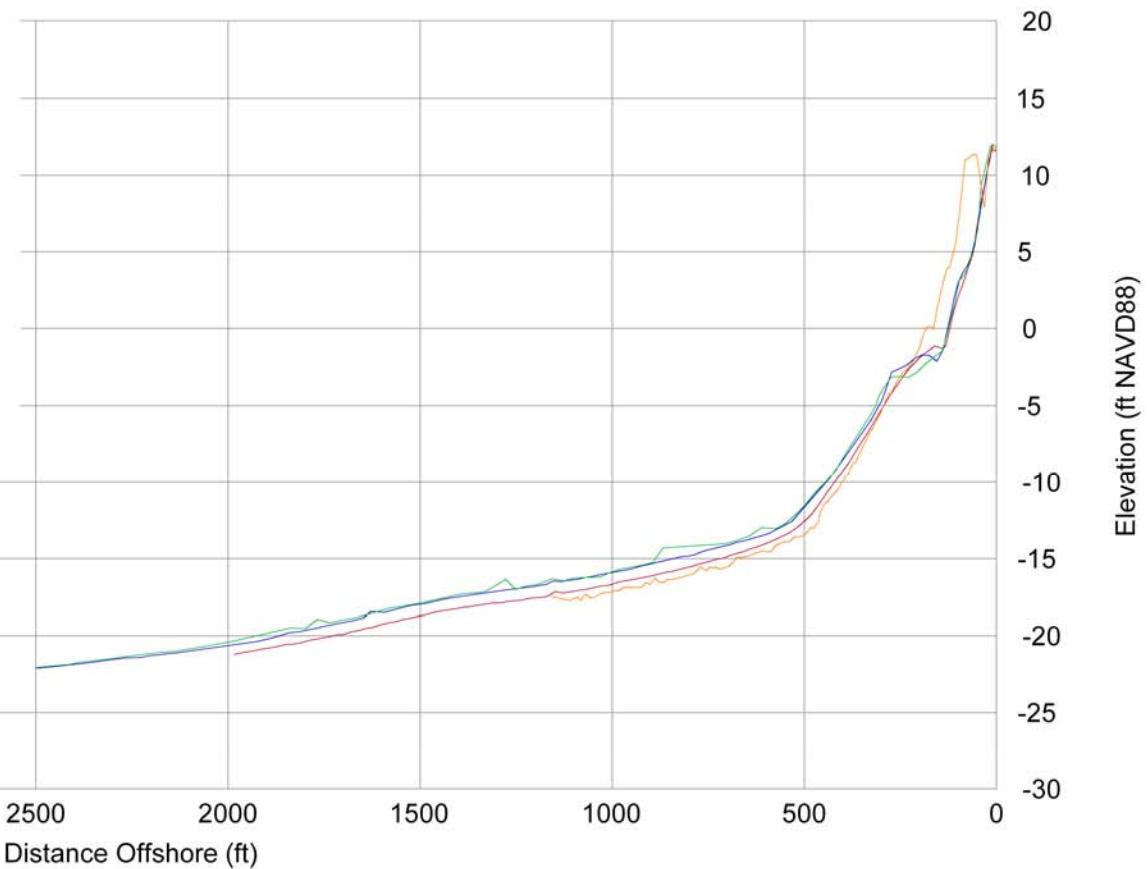
- OCTOBER 2008
- APRIL 2009
- OCTOBER 2009
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OCEAN VIEW PERIODIC
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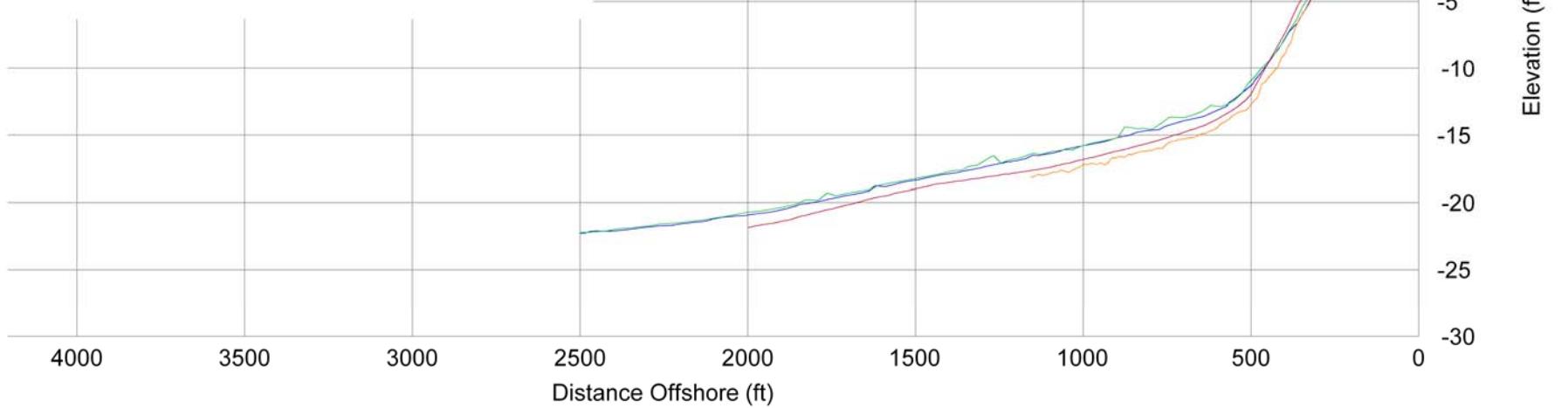


Survey Transect 120+93	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-2.87 ft/yr	-5.45 ft
Volume Change Above -15 ft NAVD88	-20.13 cy/ft/yr	-15.57 cy/ft
Volume Change Above 0 ft NAVD88	-1.81 cy/ft/yr	-1.36 cy/ft



Notes:

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2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.

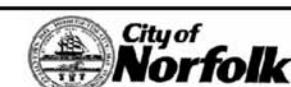


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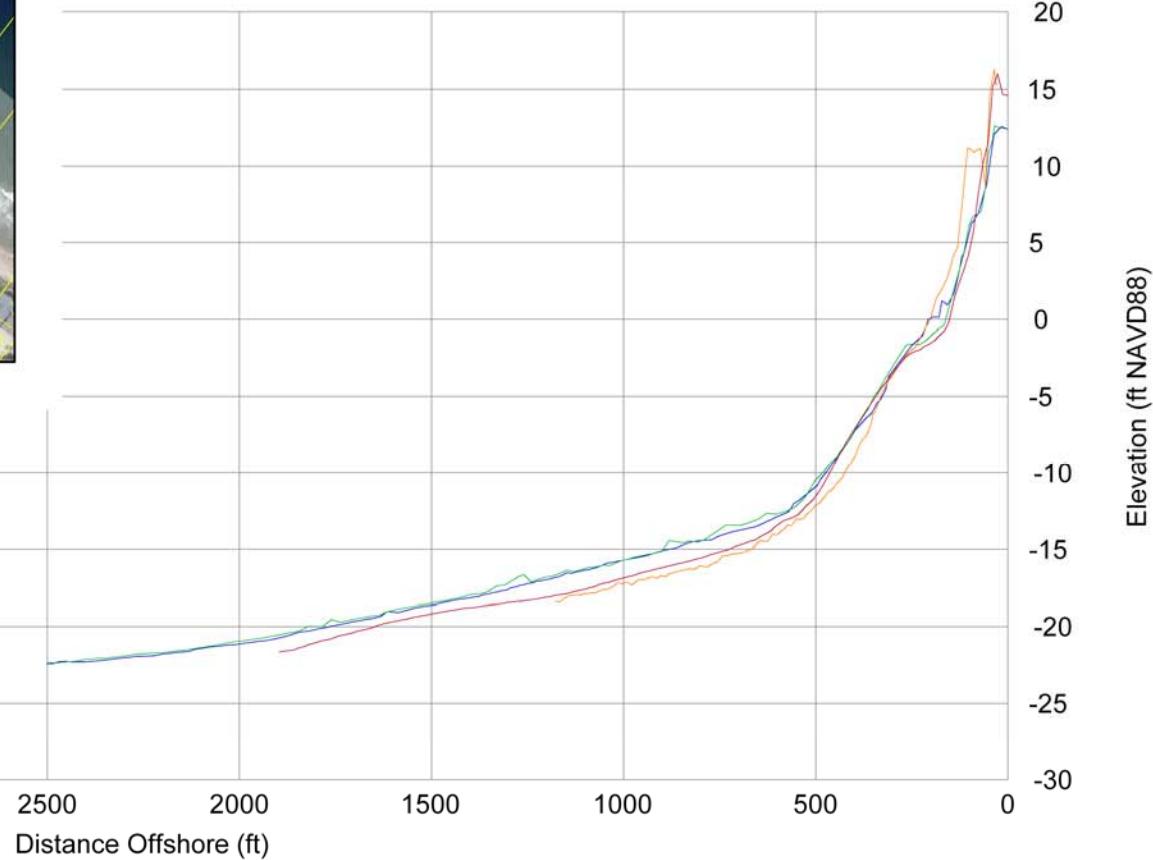
- OCTOBER 2008
- APRIL 2009
- OCTOBER 2009
- POST-FILL

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LEGEND:

OCTOBER 2008
APRIL 2009
OCTOBER 2009
POST-FILL

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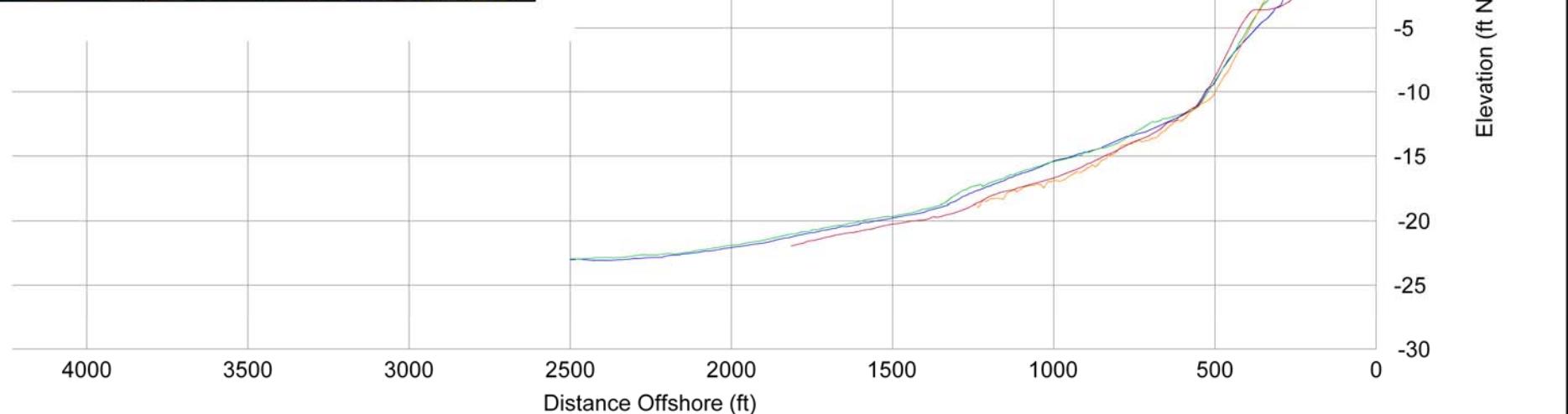
OCEAN VIEW PERIODIC
SURVEYING DATA &
ANALYSIS

ST 123+10

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FALL 2009

FALL 2009

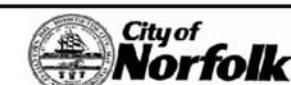


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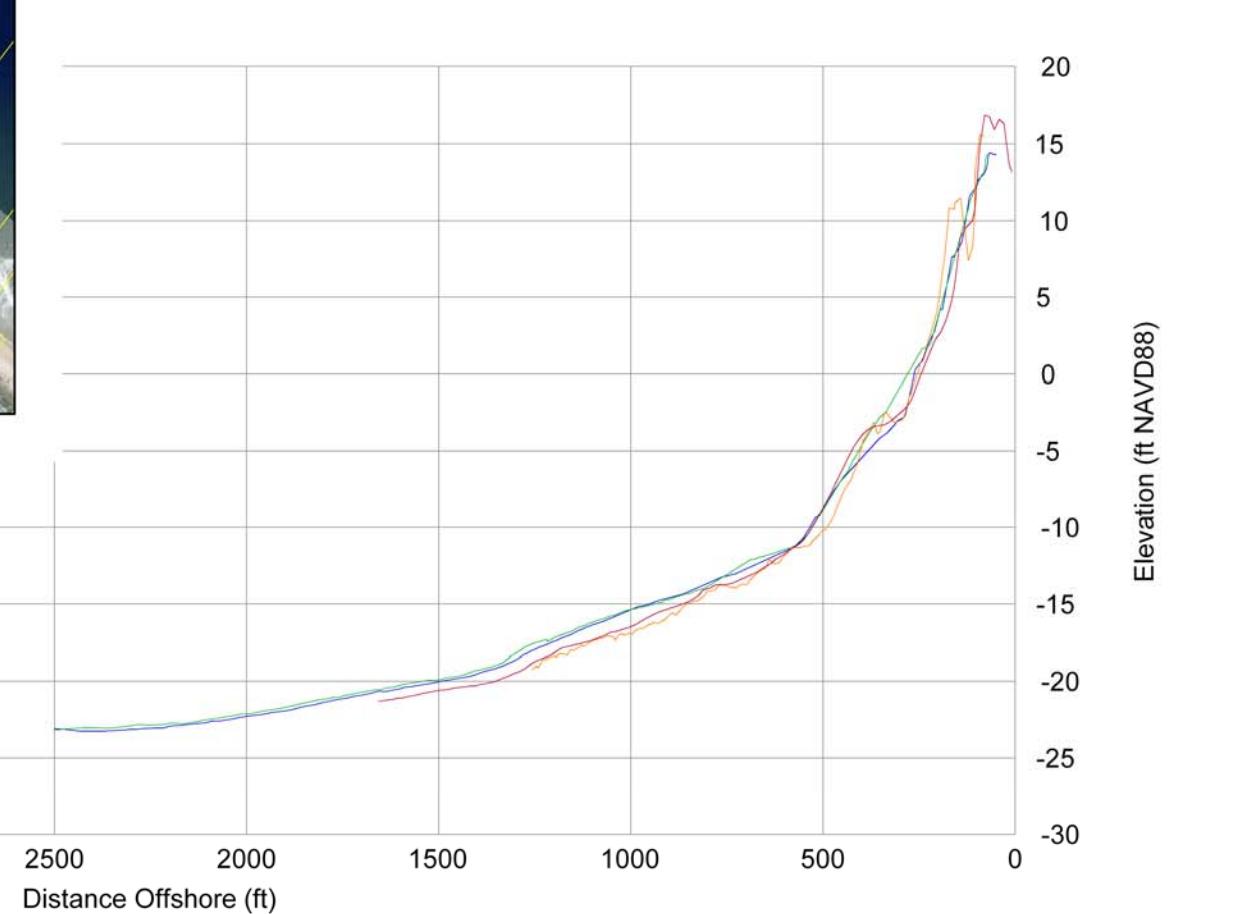
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- APRIL 2009 —————
- OCTOBER 2009 —————
- POST-FILL —————

Notes:

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OCEAN VIEW PERIODIC
SURVEYING DATA &
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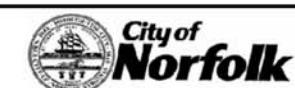


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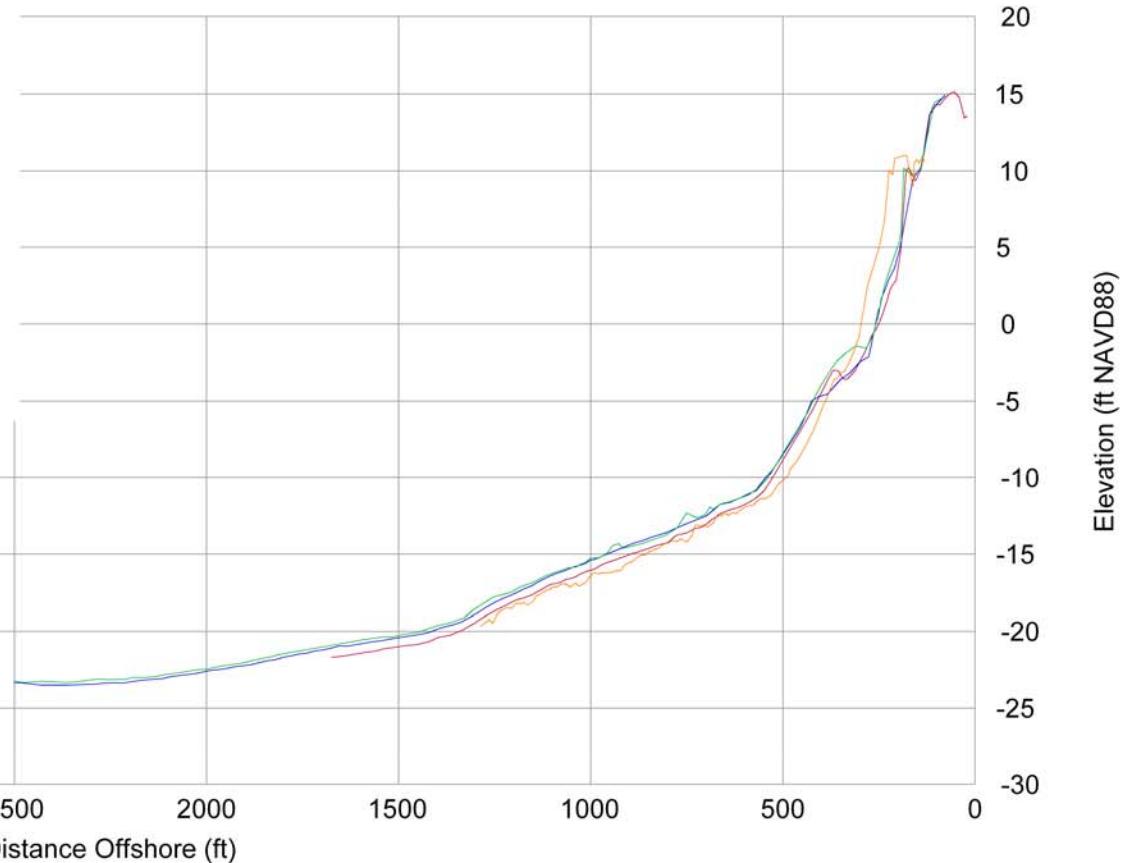
- OCTOBER 2008
- APRIL 2009
- OCTOBER 2009
- POST-FILL

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Survey Transect 129+17	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-14.45 ft/yr	-12.89 ft
Volume Change Above -15 ft NAVD88	-19.72 cy/ft/yr	-9.60 cy/ft
Volume Change Above 0 ft NAVD88	-4.10 cy/ft/yr	-0.86 cy/ft

LEGEND:

OCTOBER 2008
APRIL 2009
OCTOBER 2009
POST-FILL

Notes:

1. Stationing From West To East At Varying Intervals.
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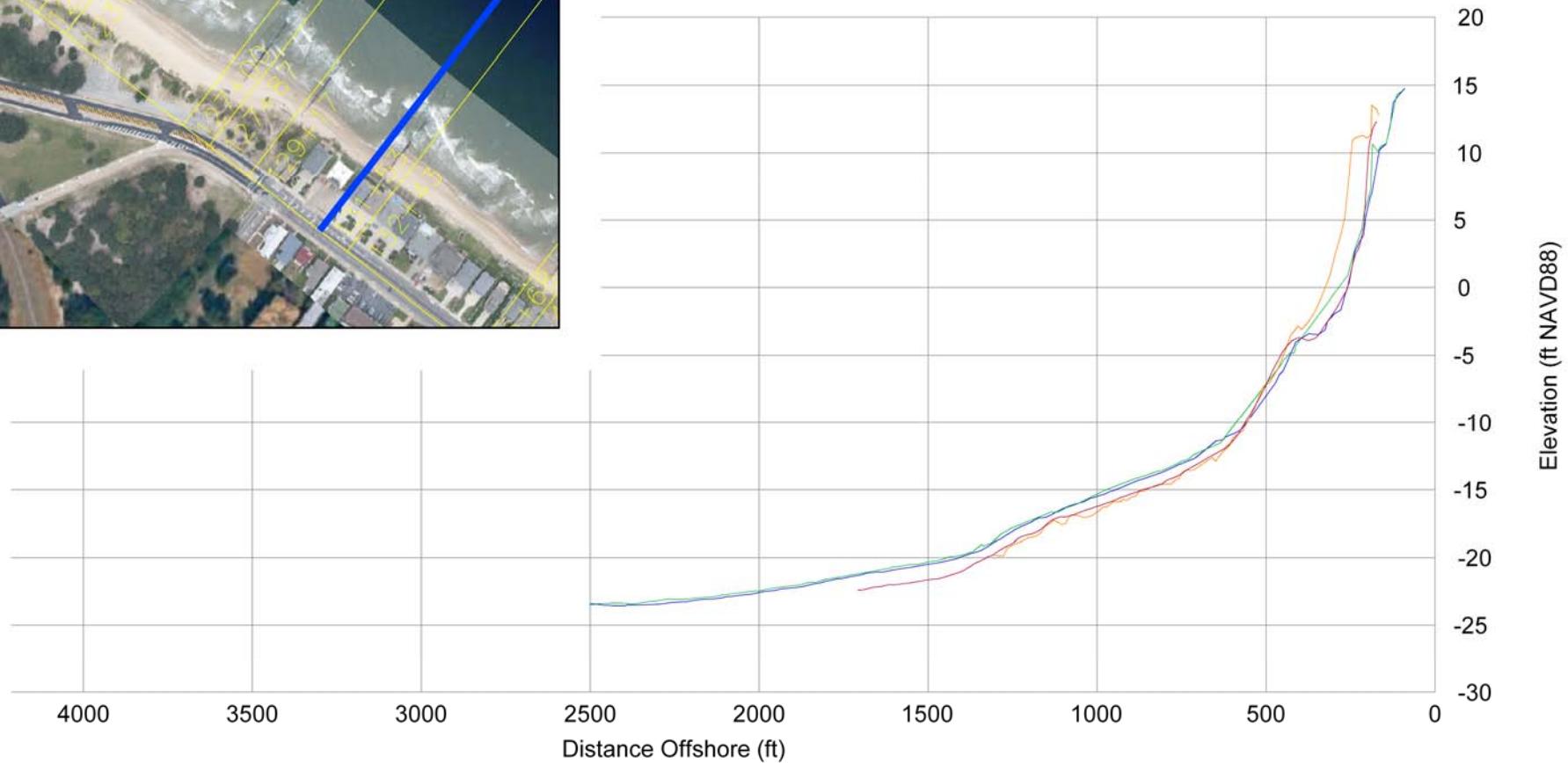
City of
Norfolk

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SURVEYING DATA &
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ST 129+17

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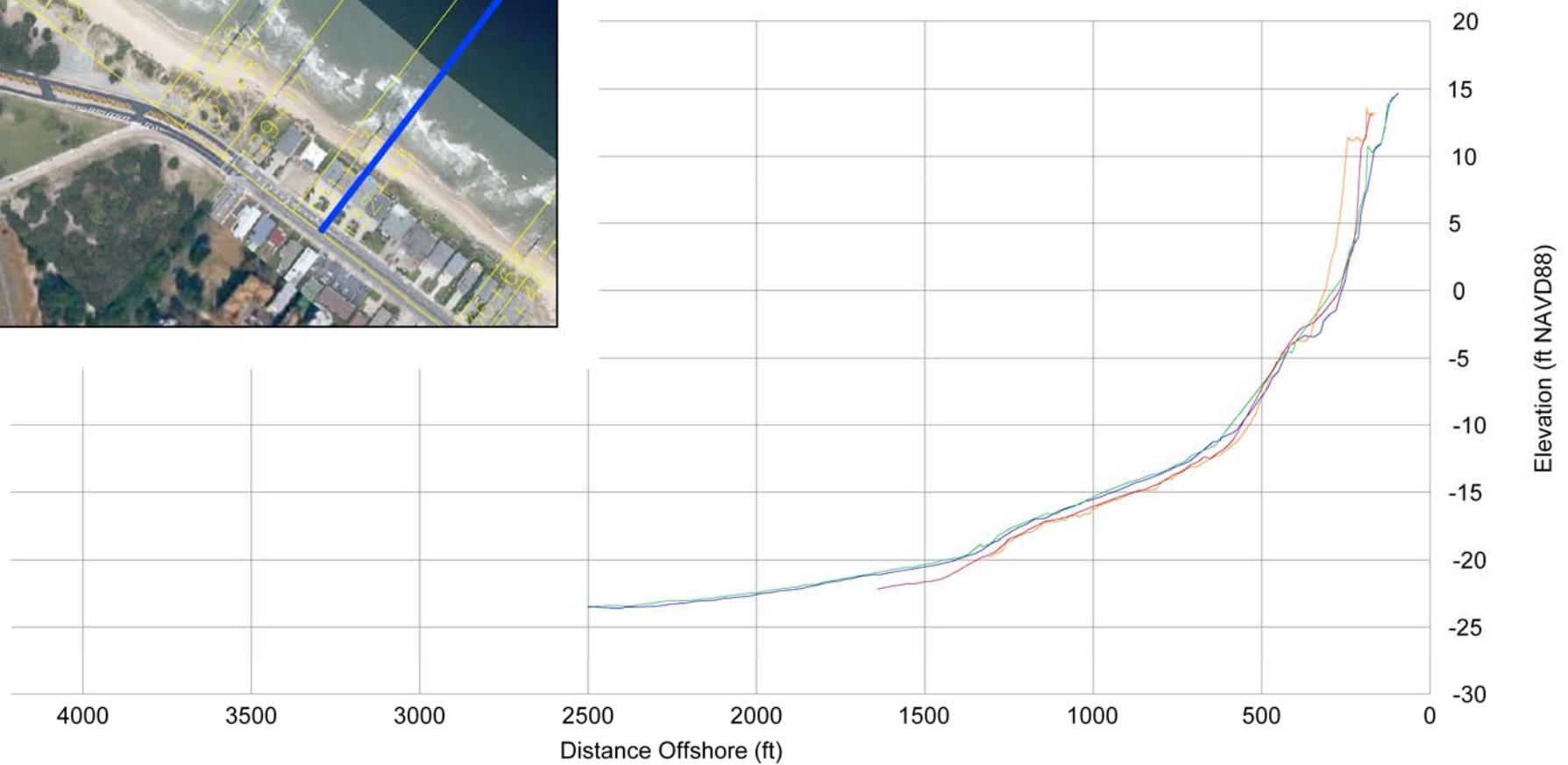


Notes:

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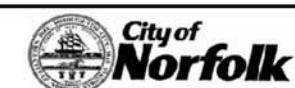


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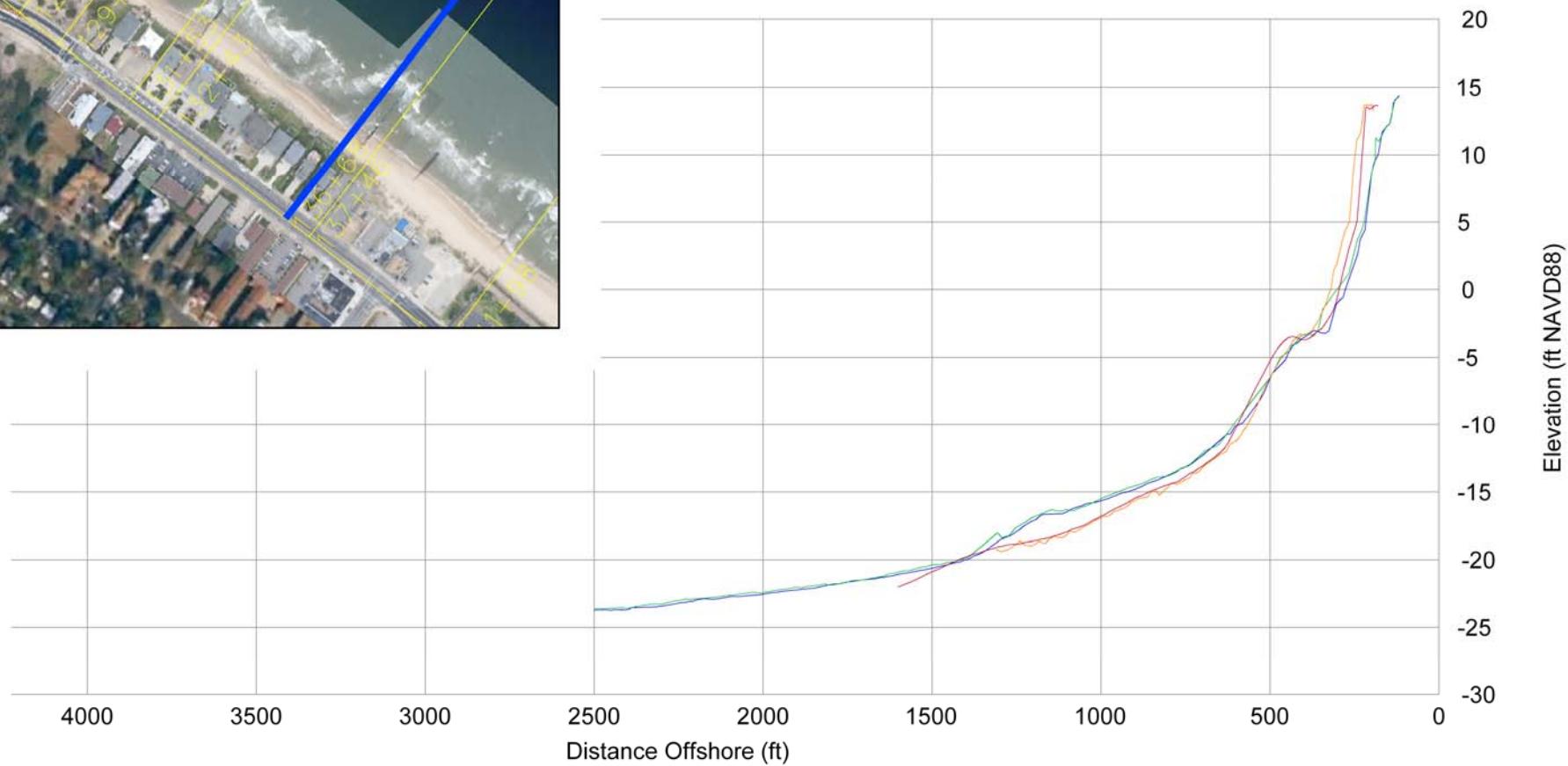
- OCTOBER 2008
- APRIL 2009
- OCTOBER 2009
- POST-FILL

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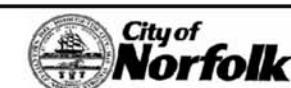


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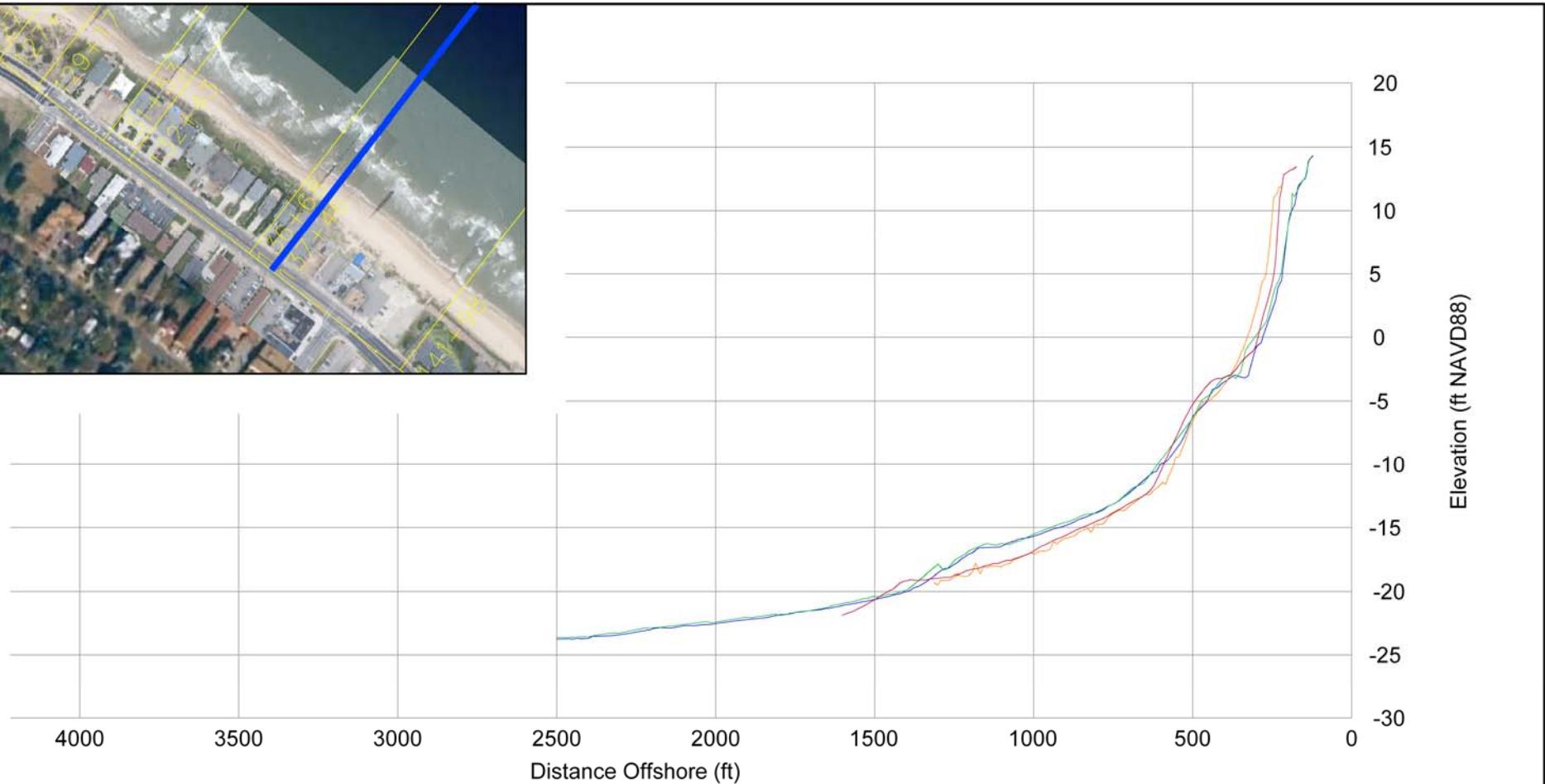
- OCTOBER 2008 —
- APRIL 2009 —
- OCTOBER 2009 —
- POST-FILL —

Notes:

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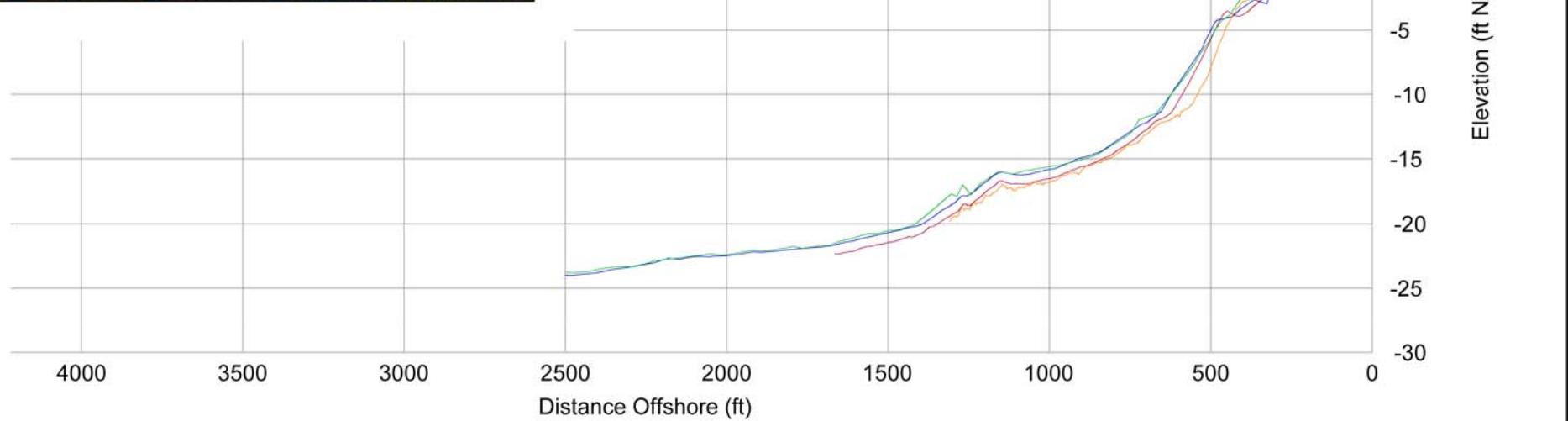
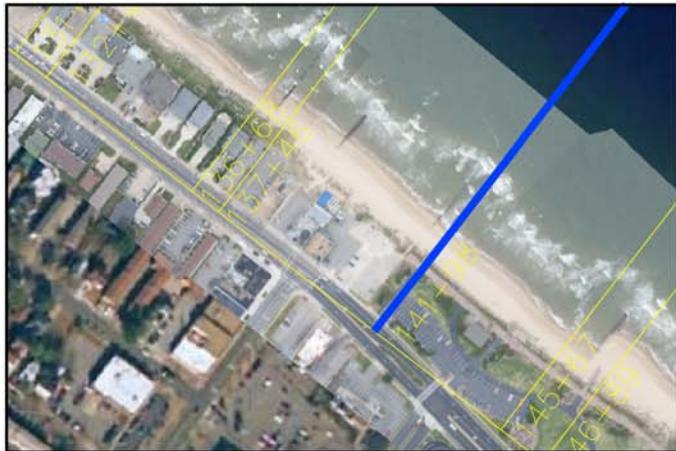
- OCTOBER 2008
- APRIL 2009
- OCTOBER 2009
- POST-FILL

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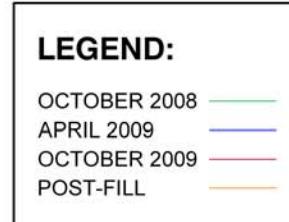
1. Stationing From West To East At Varying Intervals.
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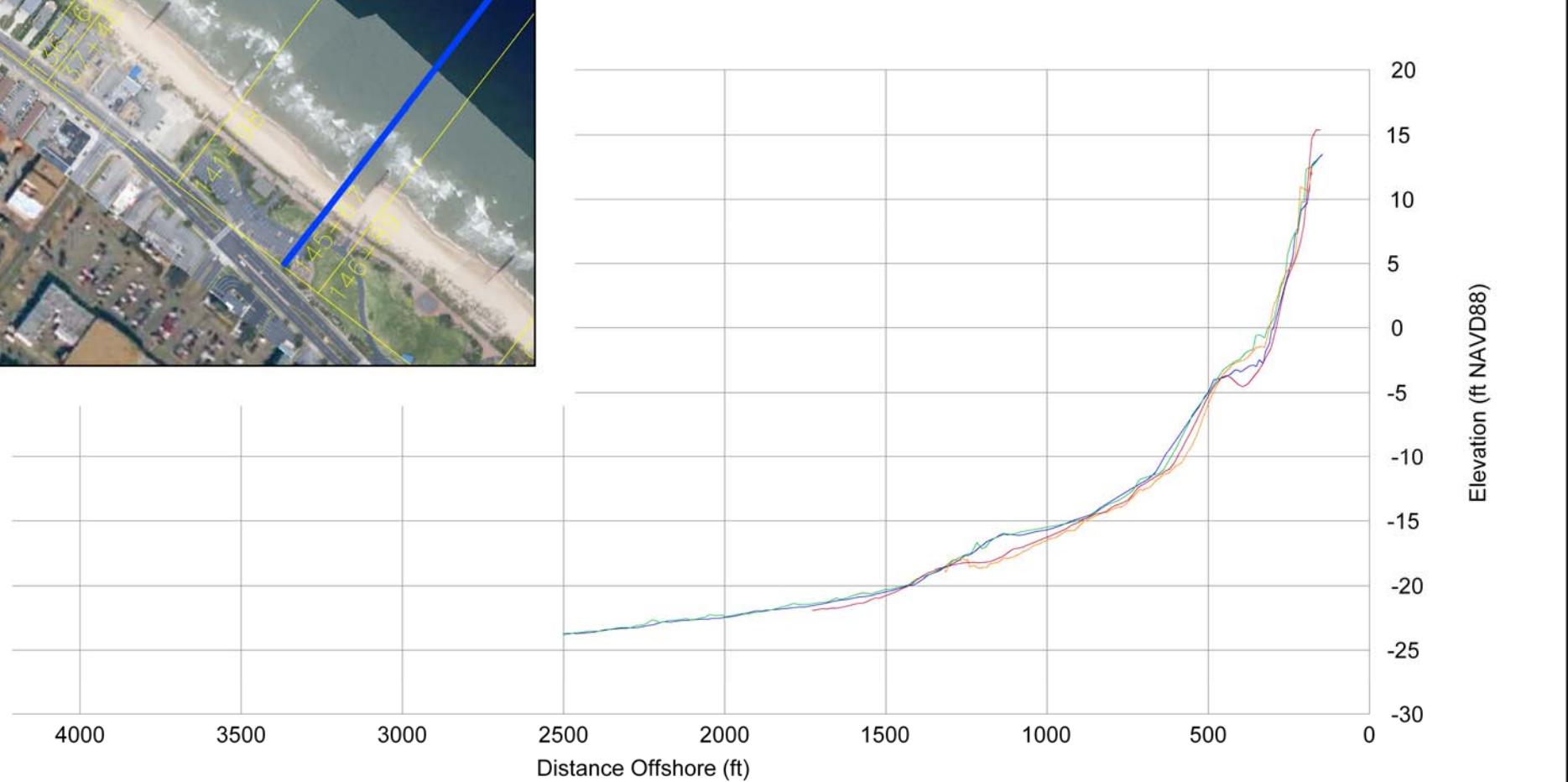


Survey Transect 141+98	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-10.09 ft/yr	-7.30 ft
Volume Change Above -15 ft NAVD88	-16.88 cy/ft/yr	-13.72 cy/ft
Volume Change Above 0 ft NAVD88	-1.00 cy/ft/yr	-0.62 cy/ft



Notes:

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3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.

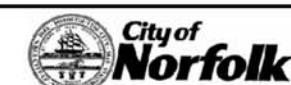


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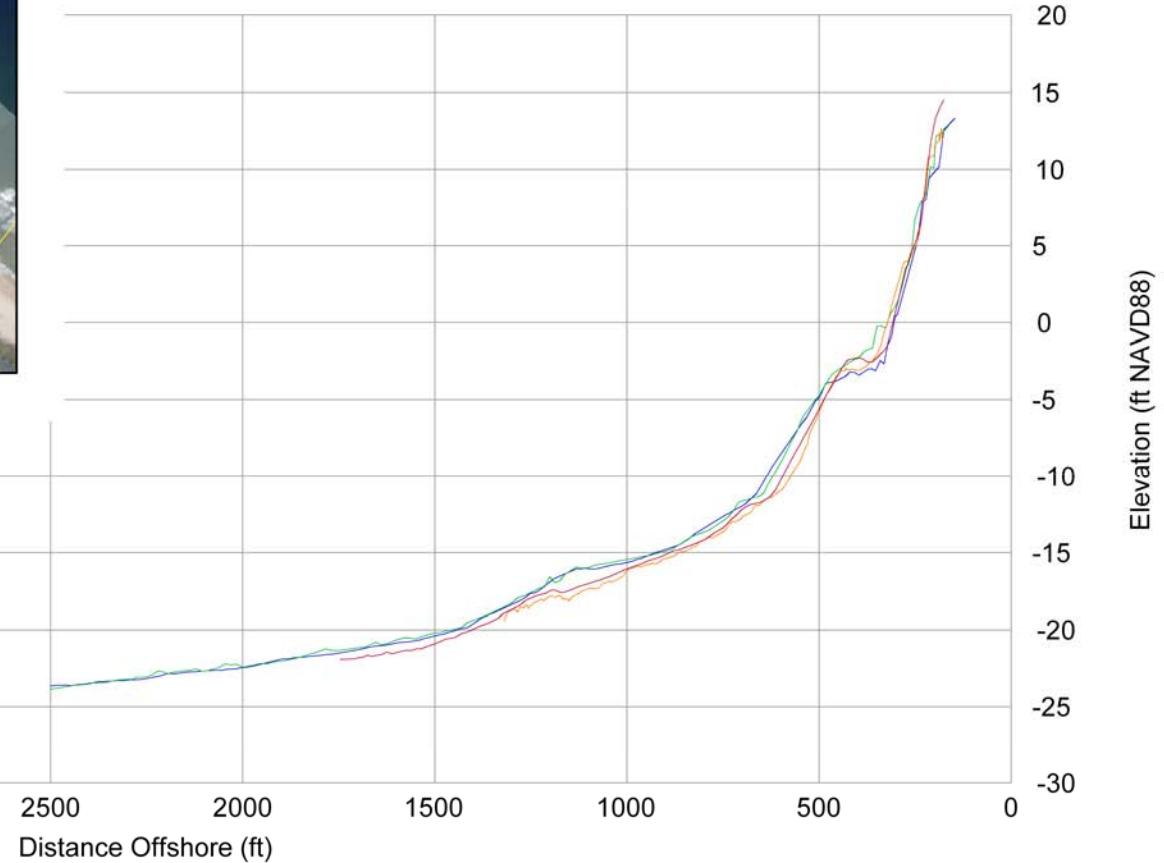
- OCTOBER 2008
- APRIL 2009
- OCTOBER 2009
- POST-FILL

Notes:

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2. Sections Are Viewed Toward Increasing Stationing.
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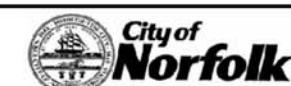


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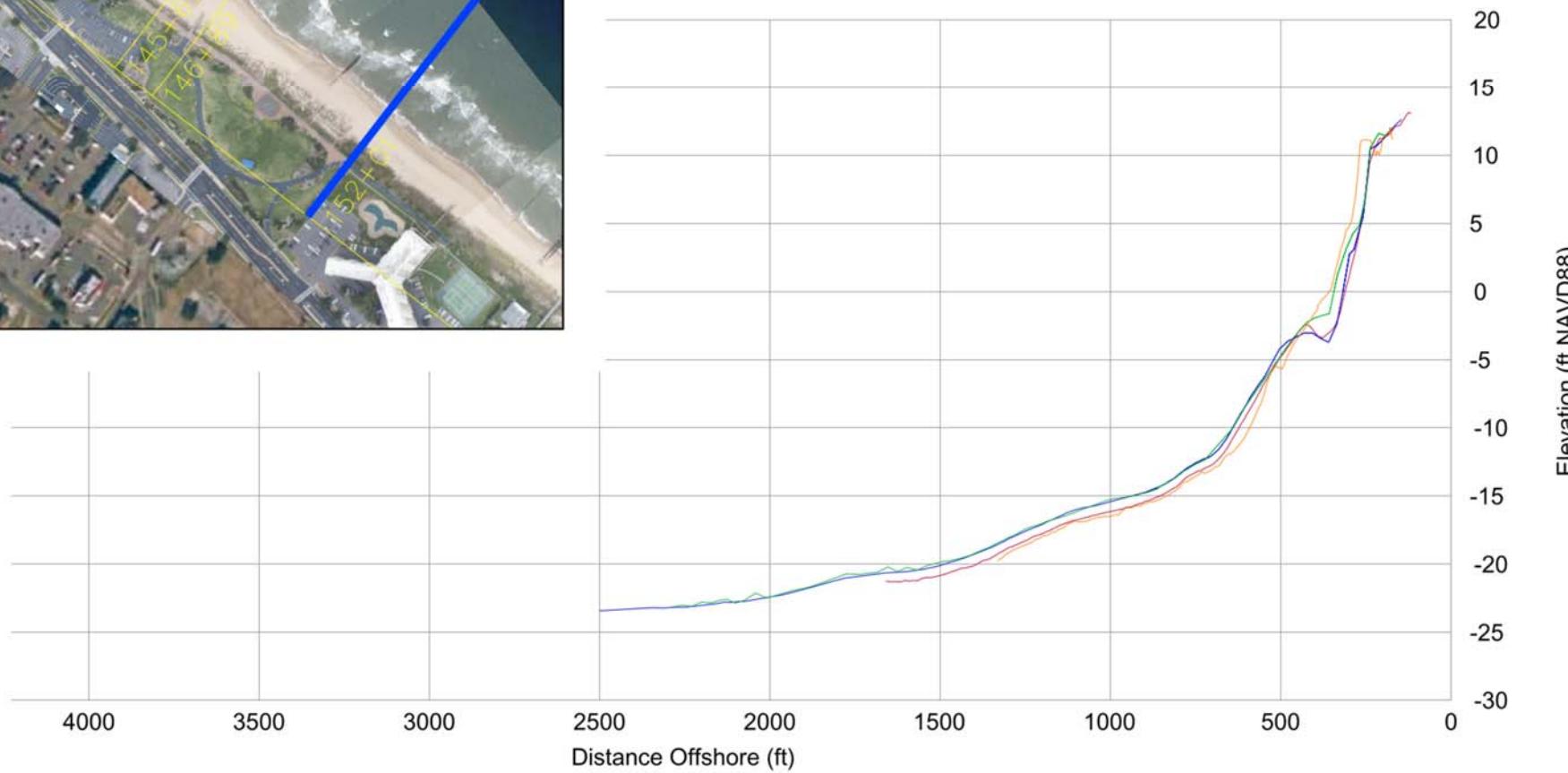
- OCTOBER 2008
- APRIL 2009
- OCTOBER 2009
- POST-FILL

Notes:

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Survey Transect	October 2008 - October 2009	April 2009 - October 2009
152+01		
Shoreline Change at MHW (0.98 ft NAVD88)	-34.73 ft/yr	-9.72 ft
Volume Change Above -15 ft NAVD88	-21.74 cy/ft/yr	-11.59 cy/ft
Volume Change Above 0 ft NAVD88	-6.37 cy/ft/yr	-2.05 cy/ft

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OCTOBER 2008	—
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OCTOBER 2009	—
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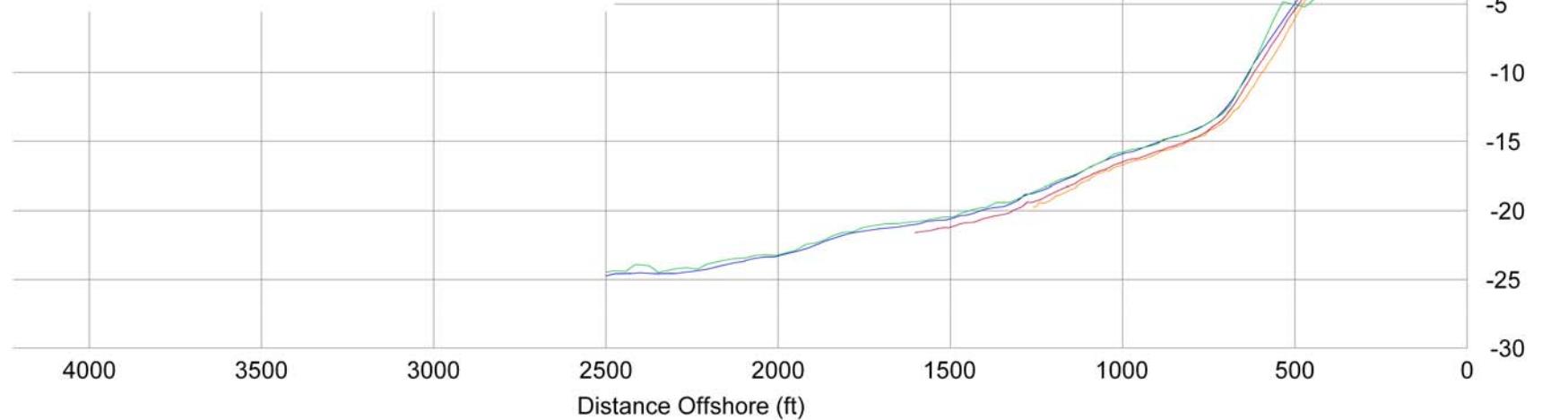
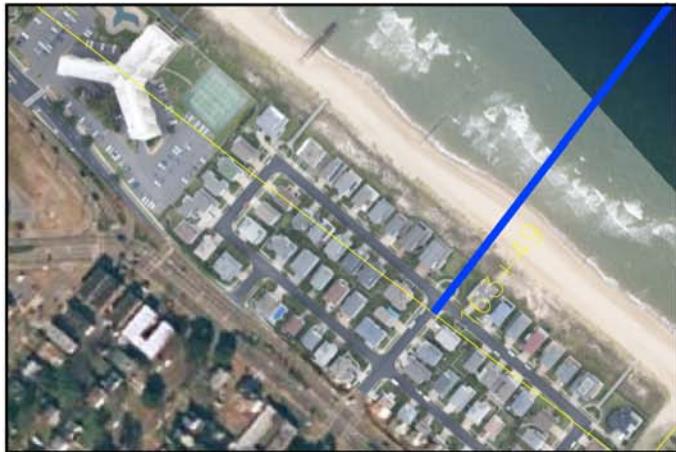
Notes:

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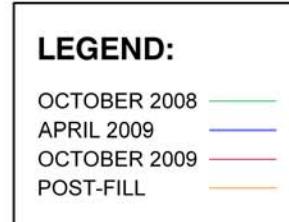


**City of
Norfolk**

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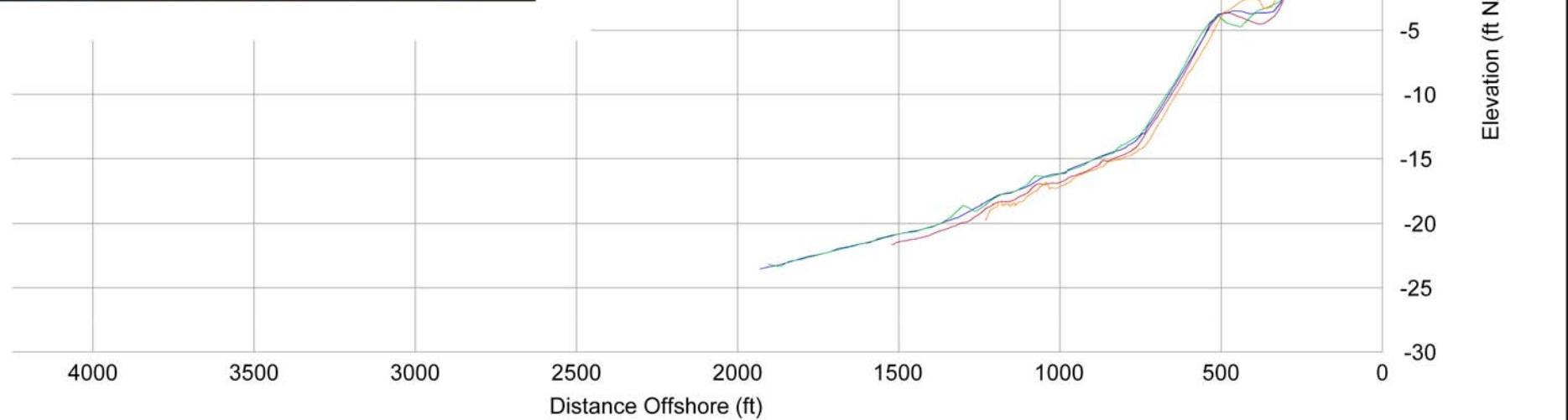
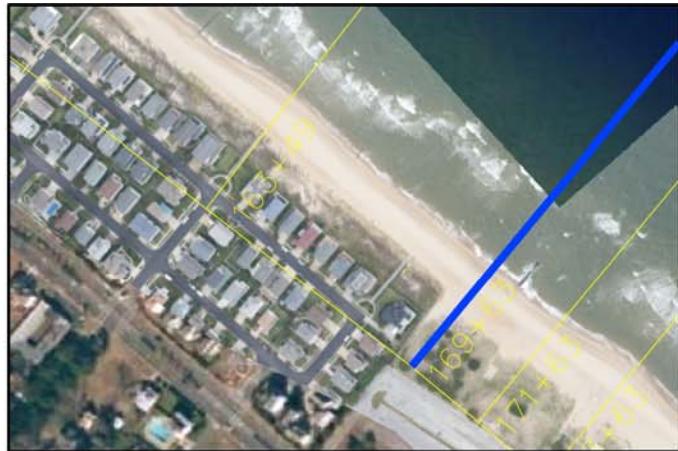


Survey Transect 163+49	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	14.35 ft/yr	0.81 ft
Volume Change Above -15 ft NAVD88	1.98 cy/ft/yr	-4.66 cy/ft
Volume Change Above 0 ft NAVD88	2.43 cy/ft/yr	1.73 cy/ft



Notes:

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2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.

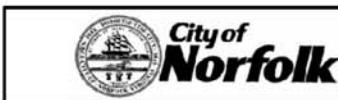


Survey Transect 169+63	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-3.07 ft/yr	-8.75 ft
Volume Change Above -15 ft NAVD88	-8.91 cy/ft/yr	-8.65 cy/ft
Volume Change Above 0 ft NAVD88	-0.22 cy/ft/yr	-0.44 cy/ft

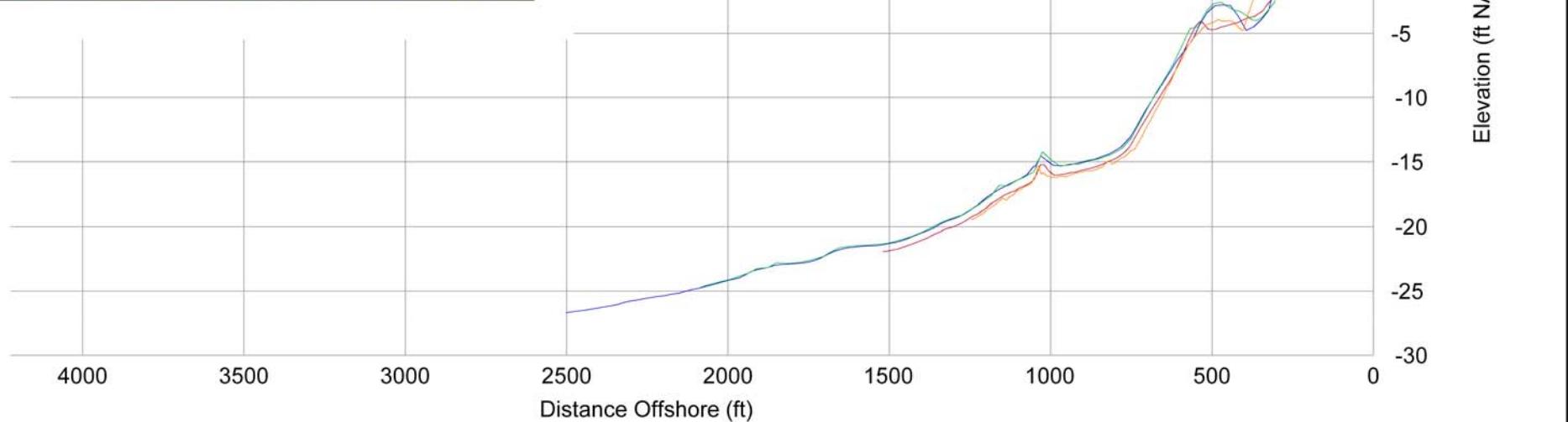


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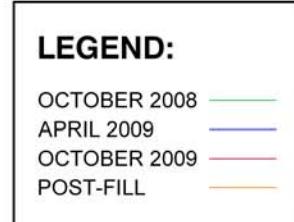
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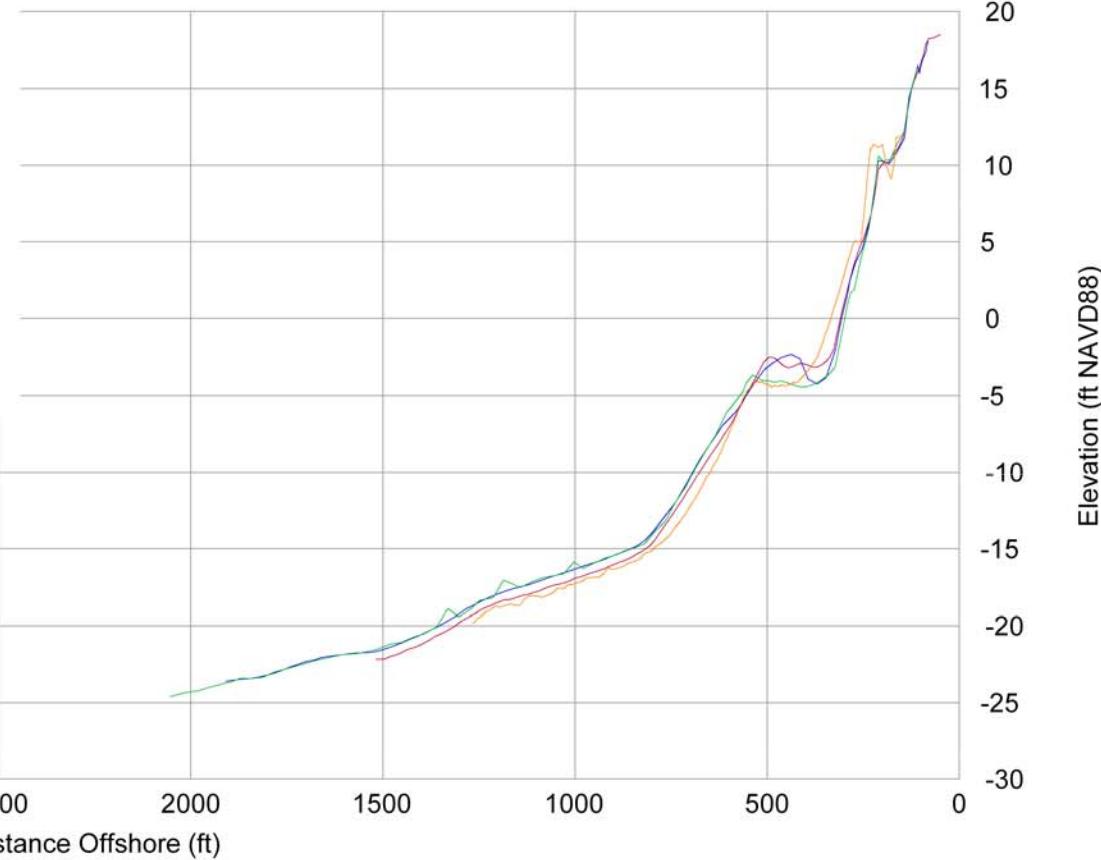


Survey Transect 171+63	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	1.02 ft/yr	-8.91 ft
Volume Change Above -15 ft NAVD88	-14.04 cy/ft/yr	-11.81 cy/ft
Volume Change Above 0 ft NAVD88	-1.31 cy/ft/yr	-2.04 cy/ft



Notes:

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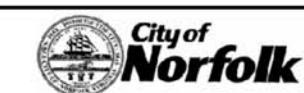
Survey Transect 173+63	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	10.06 ft/yr	3.56 ft
Volume Change Above -15 ft NAVD88	4.66 cy/ft/yr	-2.71 cy/ft
Volume Change Above 0 ft NAVD88	1.79 cy/ft/yr	0.82 cy/ft

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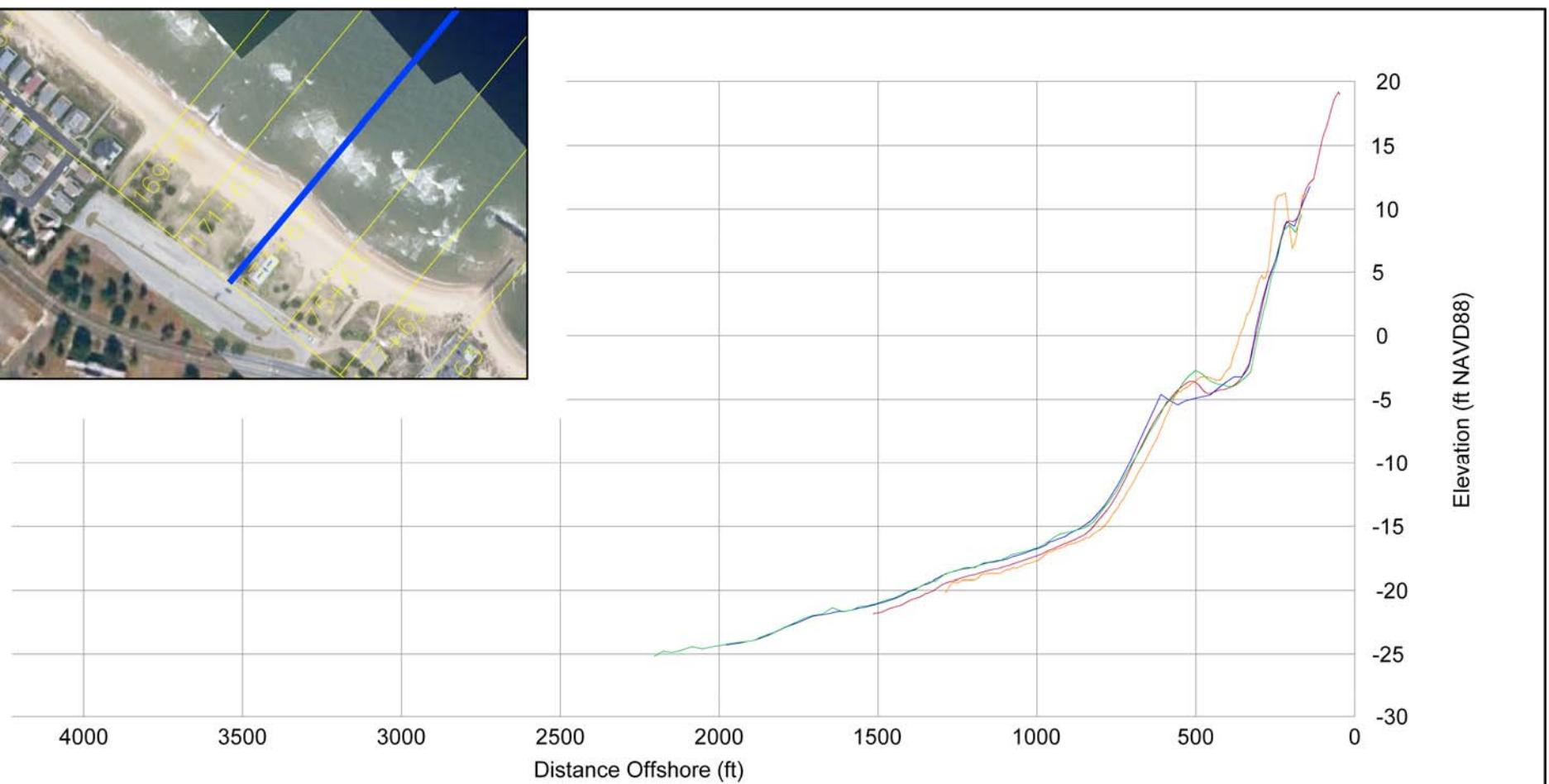
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 APRIL 2009 —
 OCTOBER 2009 —
 POST-FILL —

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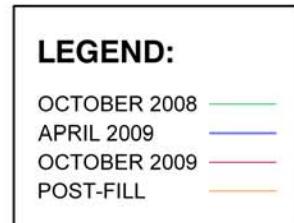
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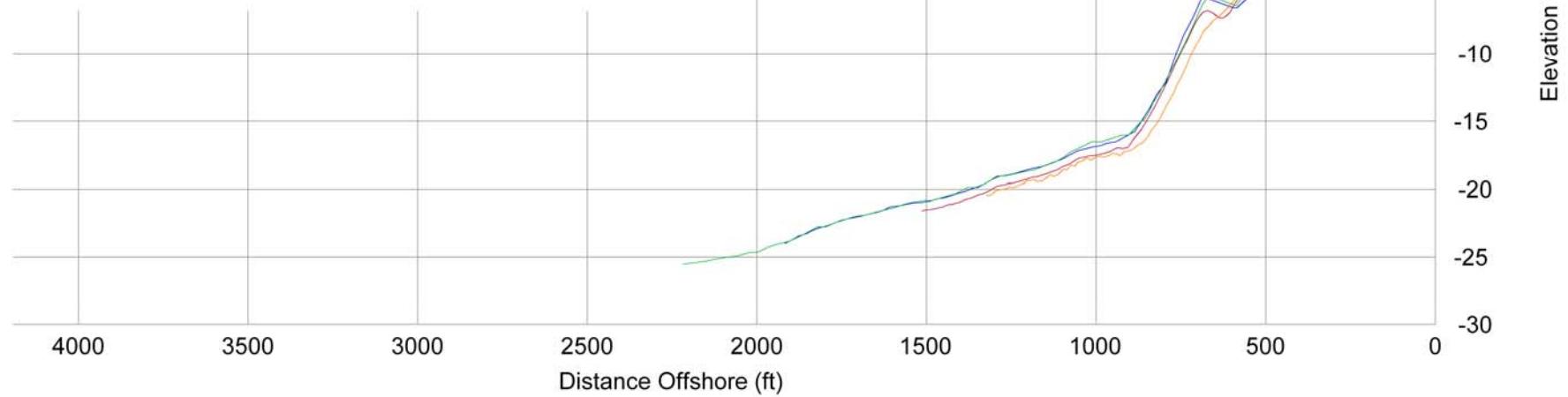


Survey Transect 175+63	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	7.05 ft/yr	-4.56 ft
Volume Change Above -15 ft NAVD88	-0.84 cy/ft/yr	-3.65 cy/ft
Volume Change Above 0 ft NAVD88	3.01 cy/ft/yr	0.24 cy/ft



Notes:

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2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.



Survey Transect 177+63	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	13.13 ft/yr	-14.40 ft
Volume Change Above -15 ft NAVD88	-2.19 cy/ft/yr	-5.53 cy/ft
Volume Change Above 0 ft NAVD88	0.44 cy/ft/yr	-3.17 cy/ft

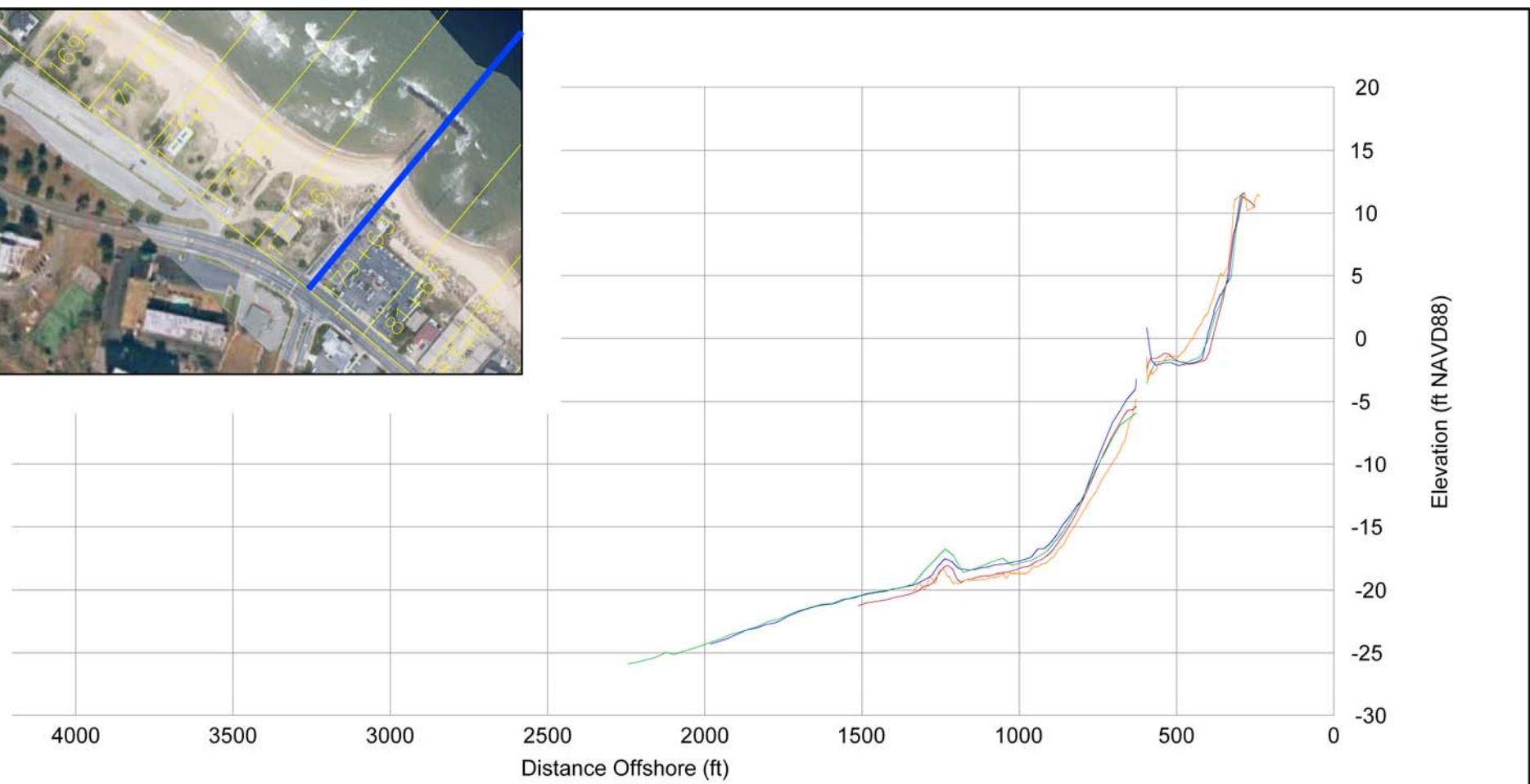


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Survey Transect 179+63	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-11.52 ft/yr	-17.82 ft
Volume Change Above -15 ft NAVD88	-2.52 cy/ft/yr	-1.48 cy/ft
Volume Change Above 0 ft NAVD88	0.12 cy/ft/yr	-2.23 cy/ft

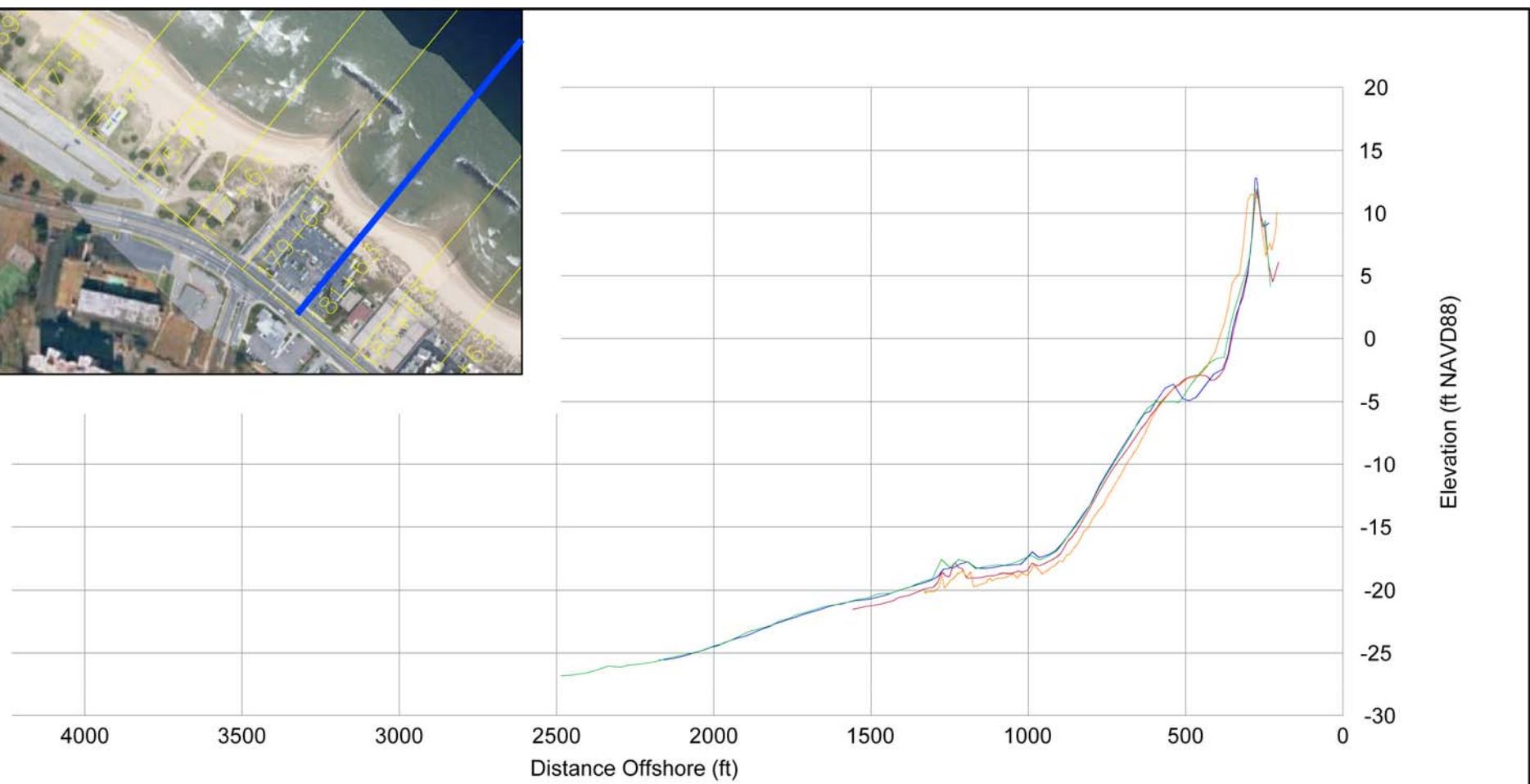


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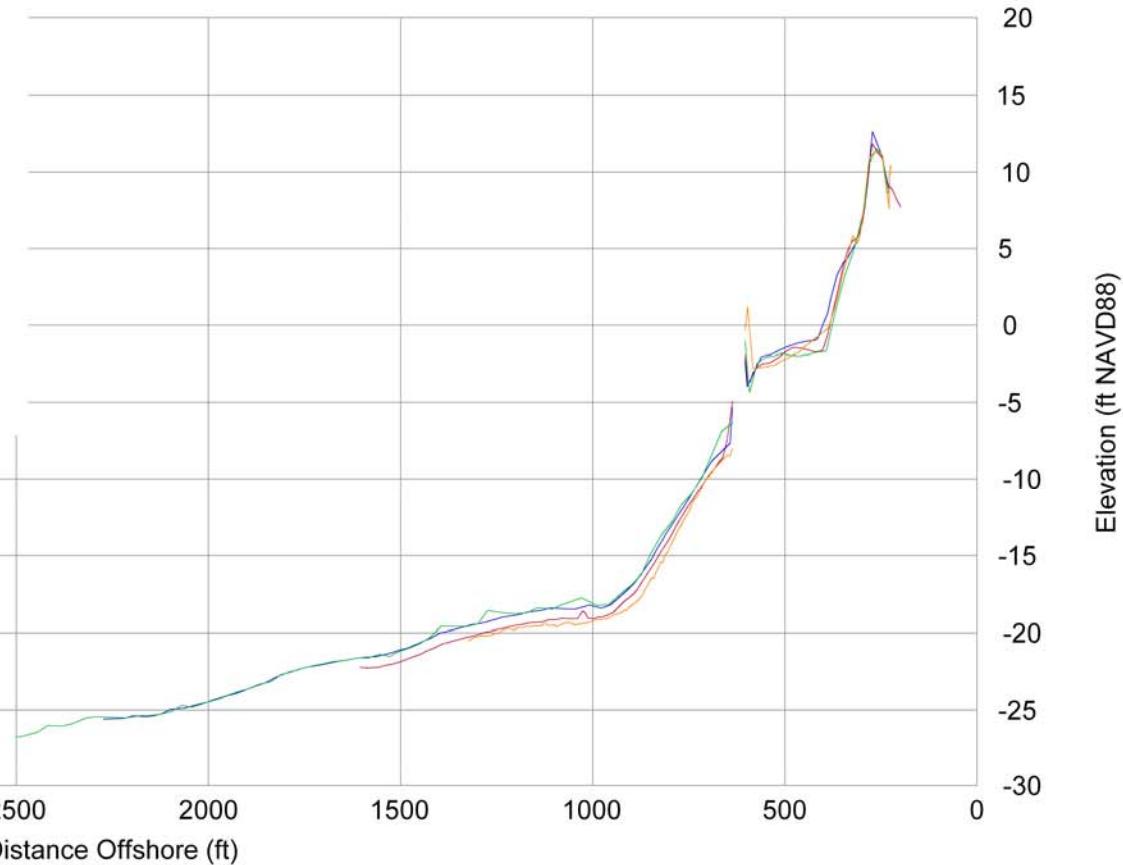


Survey Transect 181+63	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-14.27 ft/yr	-4.30 ft
Volume Change Above -15 ft NAVD88	-8.40 cy/ft/yr	-3.26 cy/ft
Volume Change Above 0 ft NAVD88	-2.83 cy/ft/yr	-0.92 cy/ft



Notes:

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3. All Survey Elevations In Feet Referenced to NAVD88.
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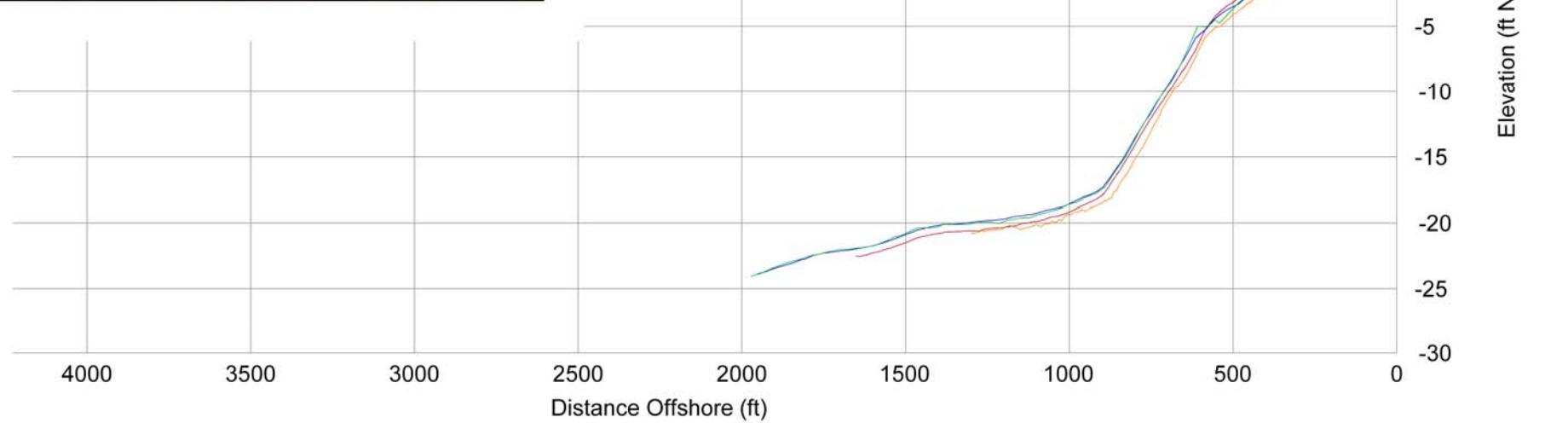


Survey Transect 183+63	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at M HW (0.98 ft NAVD88)	6.74 ft/yr	-12.53 ft
Volume Change Above -15 ft NAVD88	-3.41 cy/ft/yr	-9.49 cy/ft
Volume Change Above 0 ft NAVD88	1.93 cy/ft/yr	-2.13 cy/ft

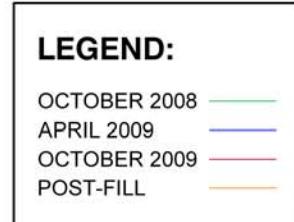


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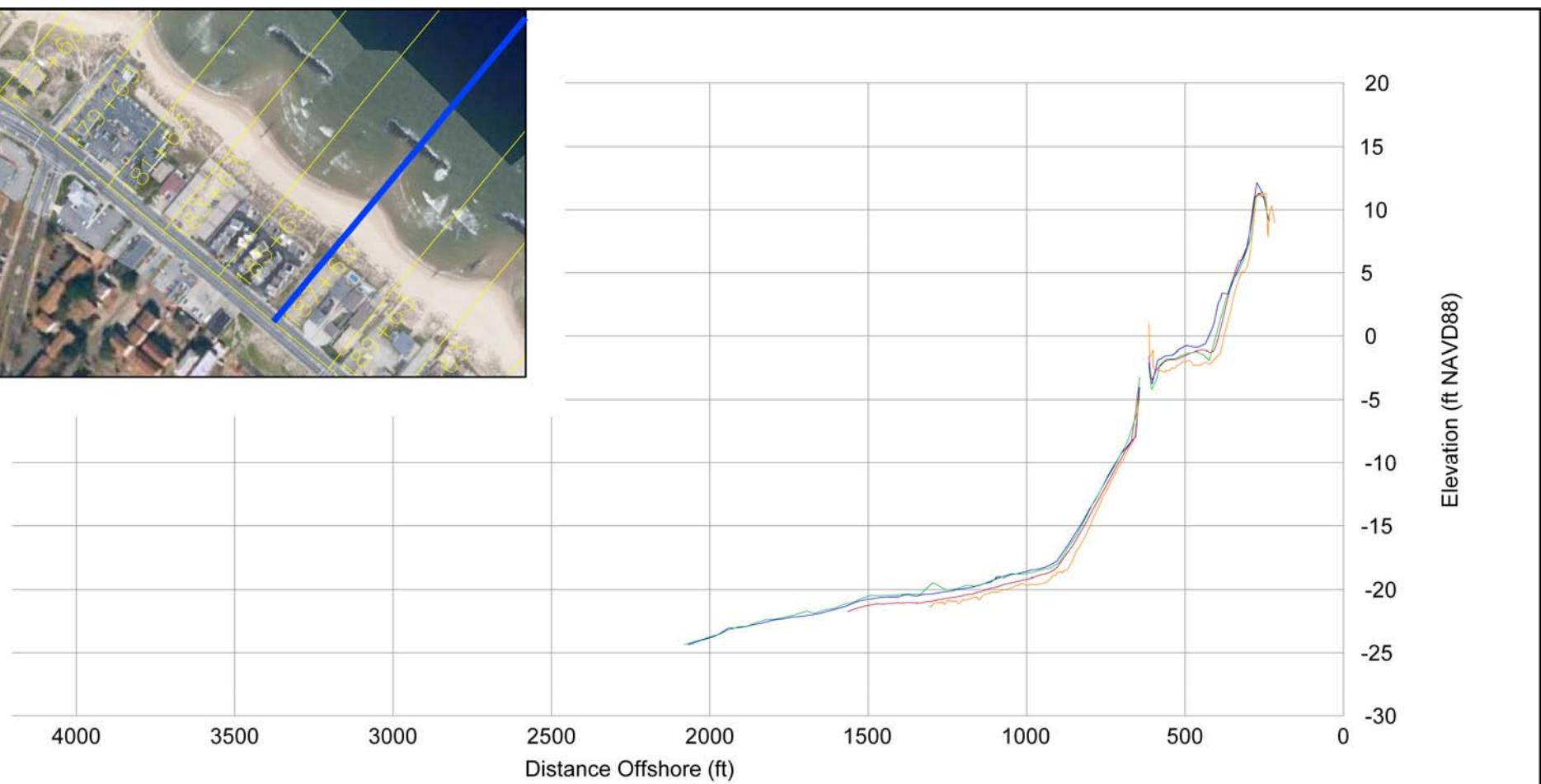


Survey Transect 185+63	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	3.76 ft/yr	5.48 ft
Volume Change Above -15 ft NAVD88	-1.17 cy/ft/yr	-0.17 cy/ft
Volume Change Above 0 ft NAVD88	0.47 cy/ft/yr	1.37 cy/ft



Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.

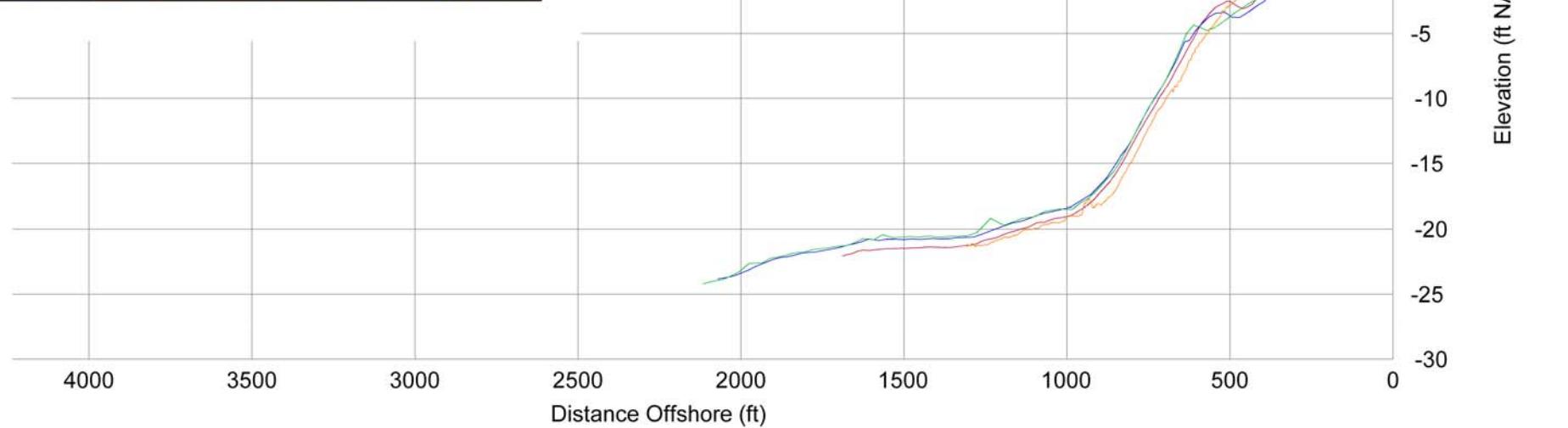


Survey Transect 187+63	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-7.98 ft/yr	-24.75 ft
Volume Change Above -15 ft NAVD88	-2.39 cy/ft/yr	-10.09 cy/ft
Volume Change Above 0 ft NAVD88	0.23 cy/ft/yr	-3.58 cy/ft



Notes:

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2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.

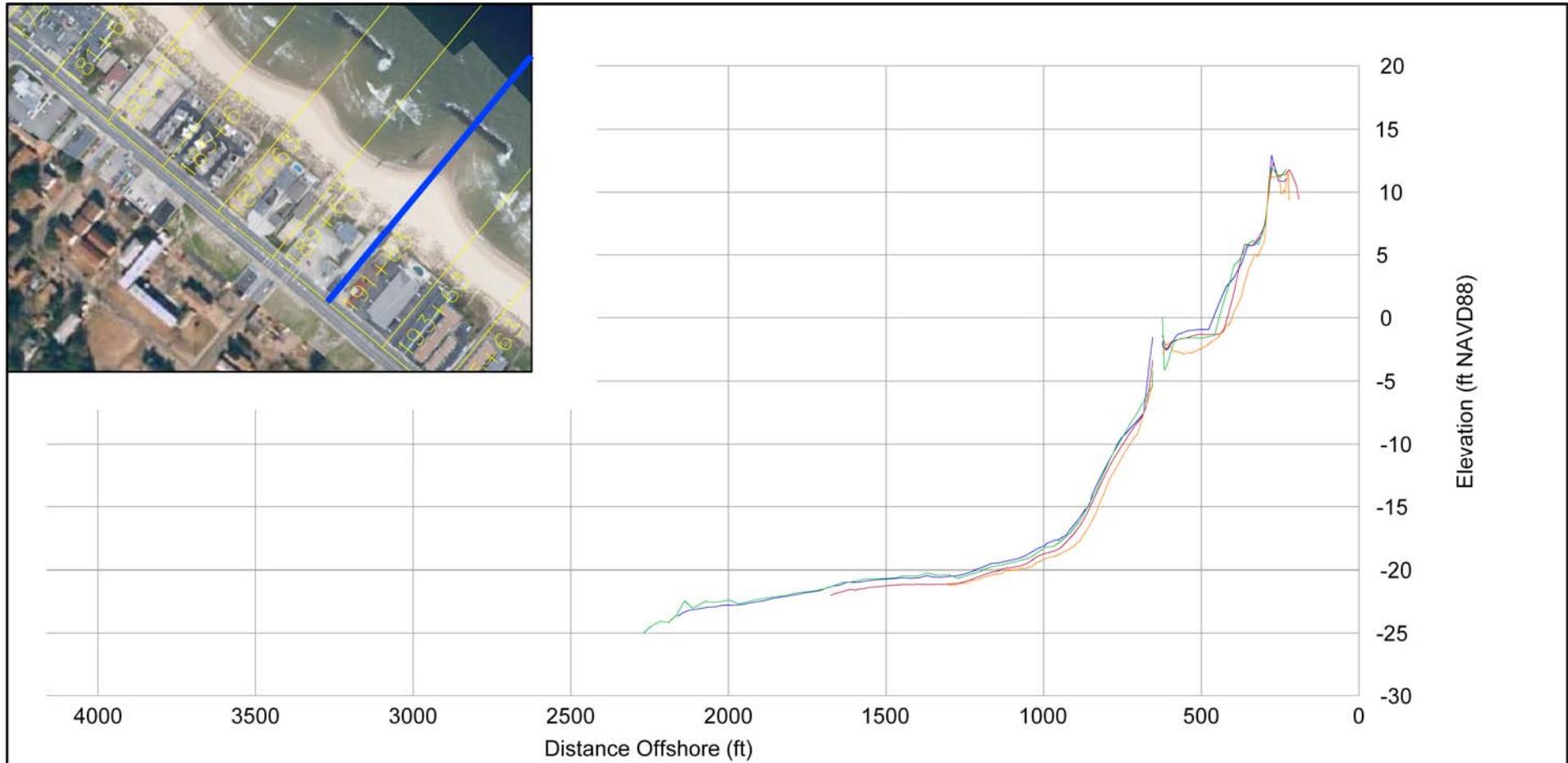


Survey Transect 189+63	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	6.82 ft/yr	11.25 ft
Volume Change Above -15 ft NAVD88	1.17 cy/ft/yr	2.71 cy/ft
Volume Change Above 0 ft NAVD88	2.04 cy/ft/yr	2.58 cy/ft



Notes:

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3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.



Survey Transect 191+63	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-25.44 ft/yr	-39.59 ft
Volume Change Above -15 ft NAVD88	-6.75 cy/ft/yr	-10.09 cy/ft
Volume Change Above 0 ft NAVD88	-3.43 cy/ft/yr	-3.21 cy/ft

LEGEND:

OCTOBER 2008
APRIL 2009
OCTOBER 2009
POST-FILL

Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
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City of
Norfolk

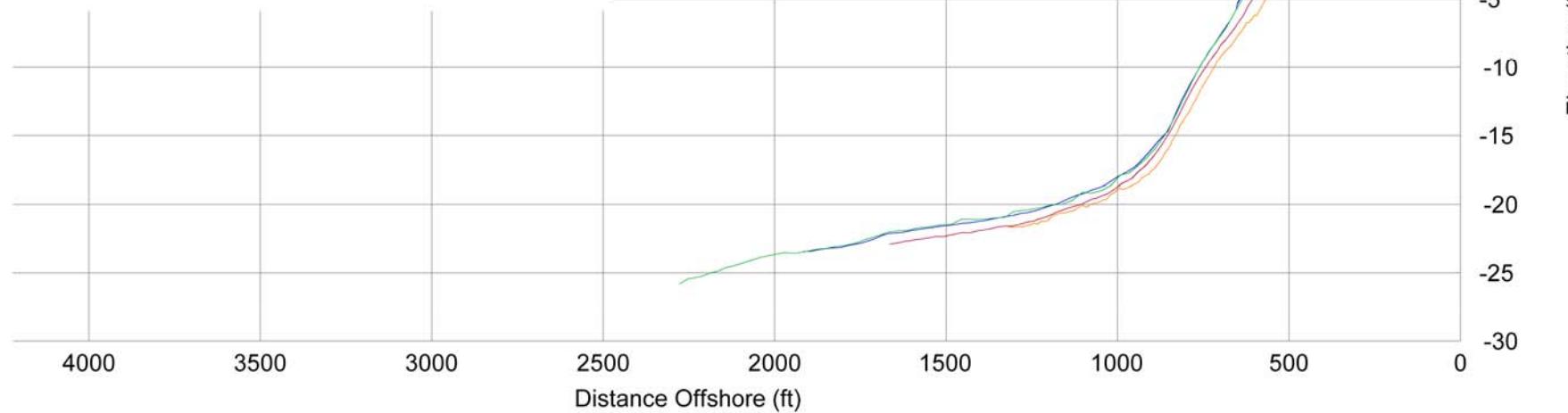
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SURVEYING DATA &
ANALYSIS

ST 191+63

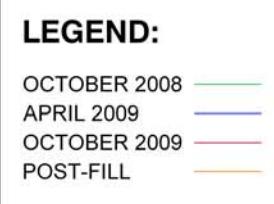
80 OF 126

FALL 2009

FALL 2009

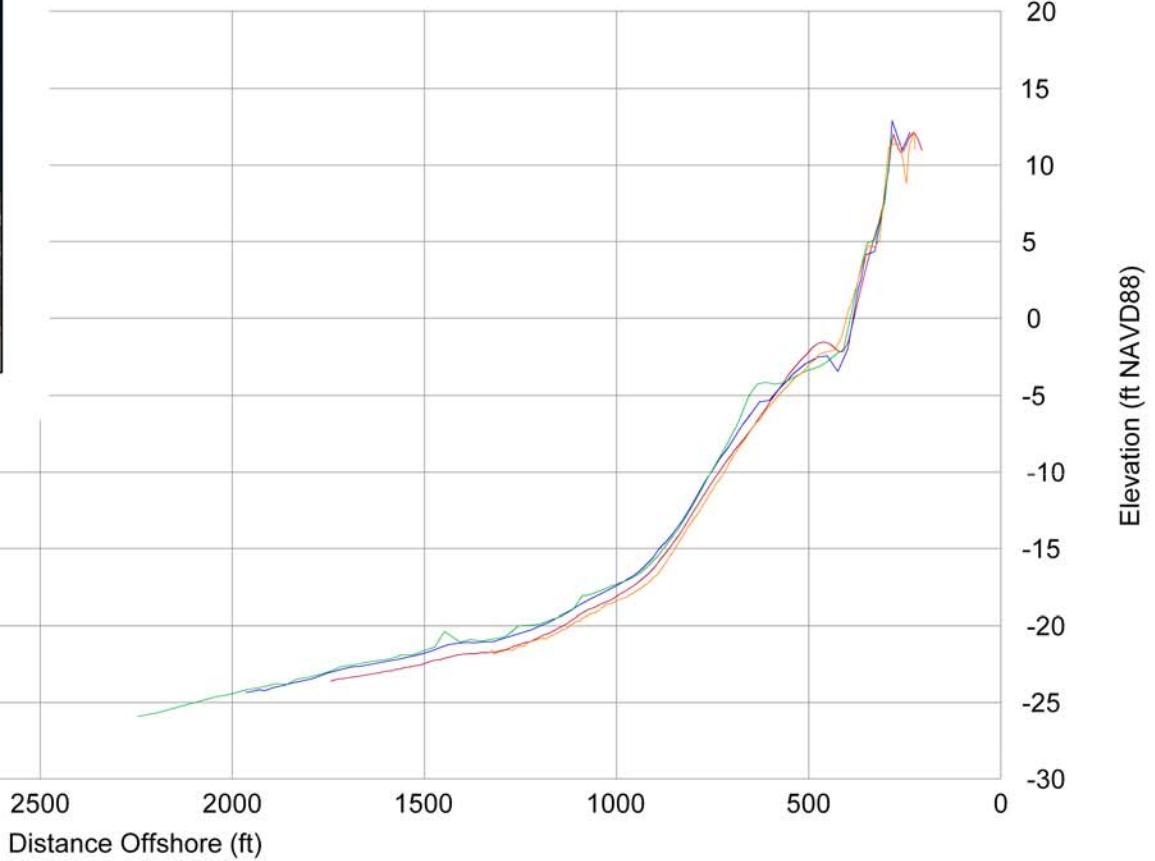


Survey Transect 193+63	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-8.81 ft/yr	-11.58 ft
Volume Change Above -15 ft NAVD88	-9.05 cy/ft/yr	-6.97 cy/ft
Volume Change Above 0 ft NAVD88	-2.08 cy/ft/yr	-0.86 cy/ft



Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.

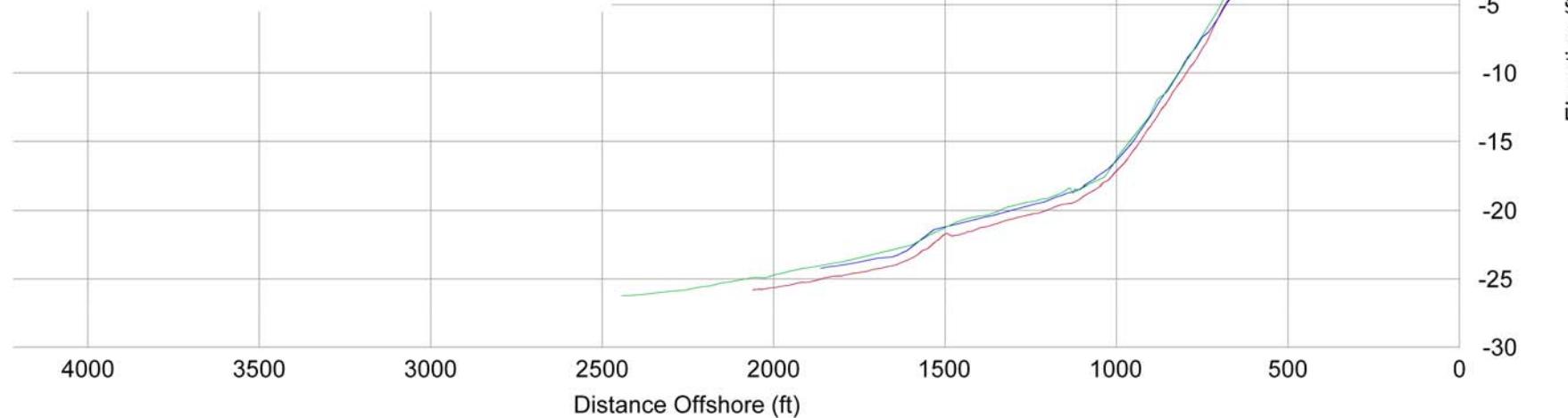
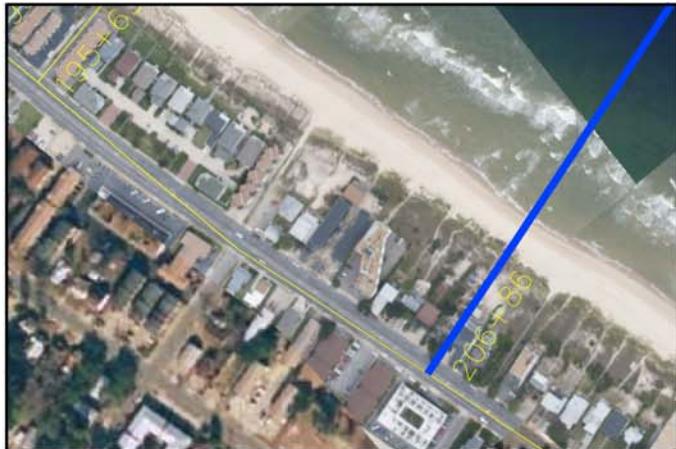


Survey Transect 195+63	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-10.05 ft/yr	-4.19 ft
Volume Change Above -15 ft NAVD88	-9.81 cy/ft/yr	-4.70 cy/ft
Volume Change Above 0 ft NAVD88	-2.09 cy/ft/yr	-1.26 cy/ft

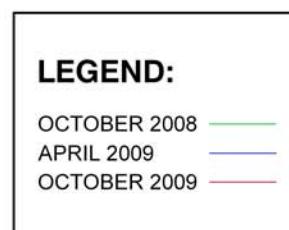


Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.

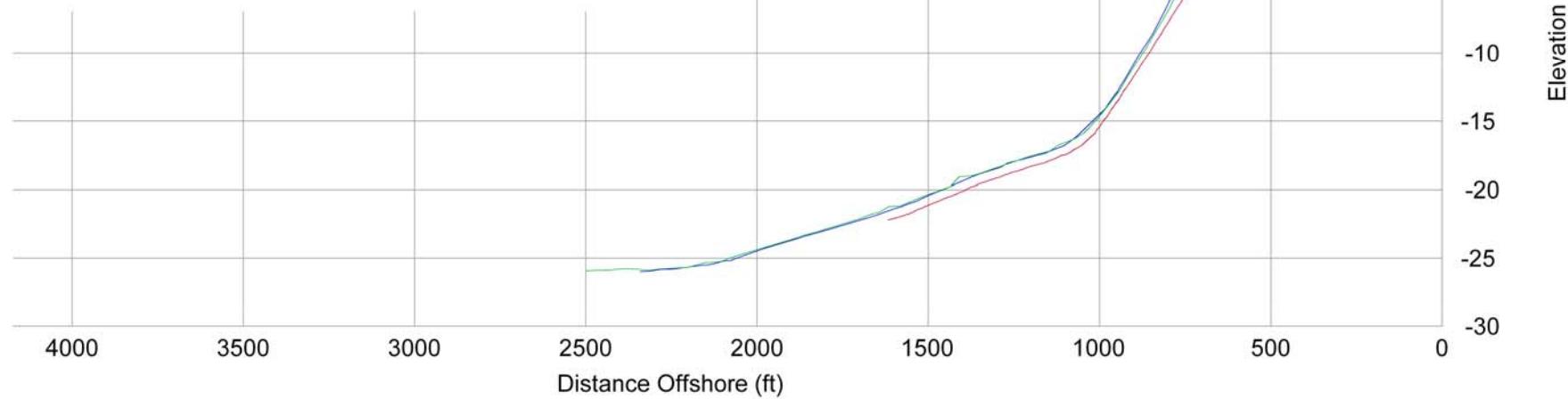
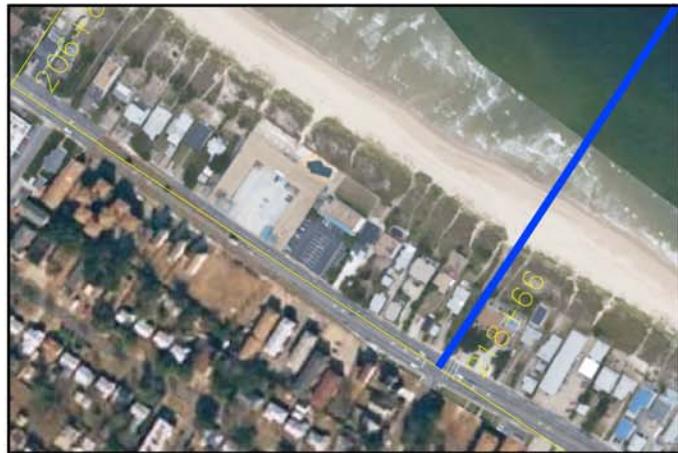


Survey Transect	October 2008 - October 2009	April 2009 - October 2009
206+86		
Shoreline Change at MHW (0.98 ft NAVD88)	-15.57 ft/yr	-18.91 ft
Volume Change Above -15 ft NAVD88	-14.01 cy/ft/yr	-15.29 cy/ft
Volume Change Above 0 ft NAVD88	-1.51 cy/ft/yr	-3.68 cy/ft

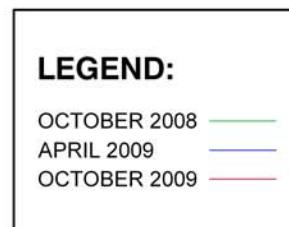


Notes:

1. Stationing From West To East At Varying Intervals.
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3. All Survey Elevations In Feet Referenced to NAVD88.
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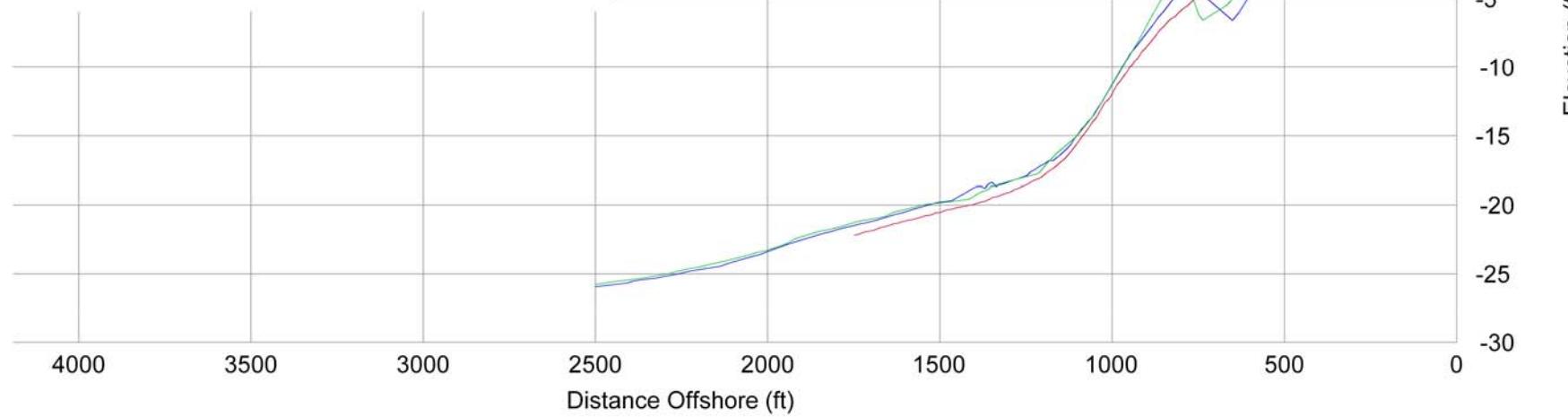
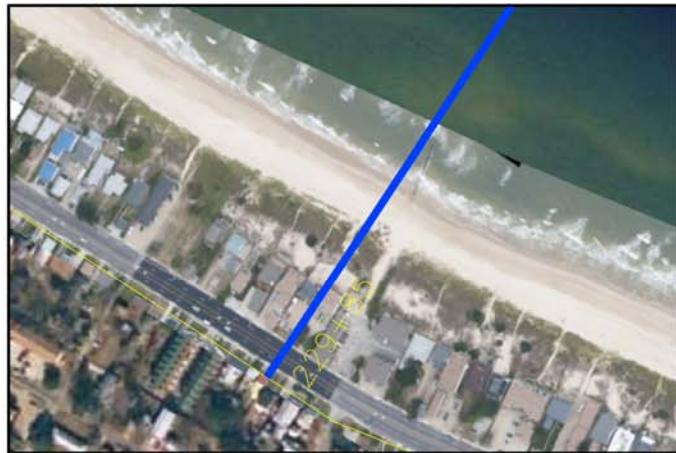


Survey Transect 218+66	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	13.13 ft/yr	4.31 ft
Volume Change Above -15 ft NAVD88	0.67 cy/ft/yr	-12.92 cy/ft
Volume Change Above 0 ft NAVD88	3.23 cy/ft/yr	-0.57 cy/ft

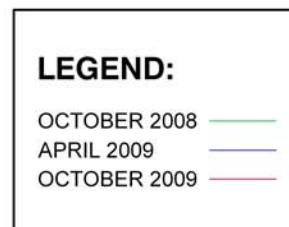


Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.

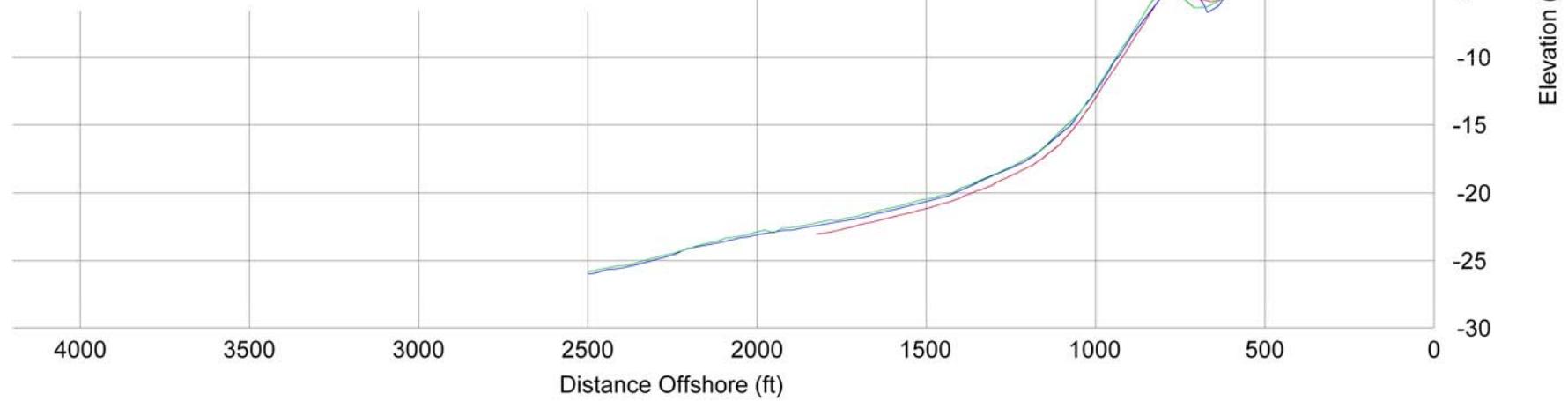
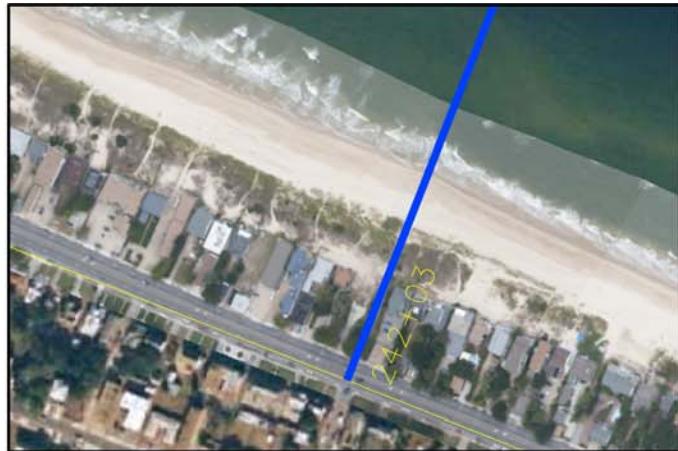


Survey Transect 229+85	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	9.16 ft/yr	7.47 ft
Volume Change Above -15 ft NAVD88	-4.31 cy/ft/yr	-0.57 cy/ft
Volume Change Above 0 ft NAVD88	2.97 cy/ft/yr	-0.16 cy/ft

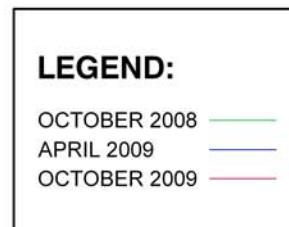


Notes:

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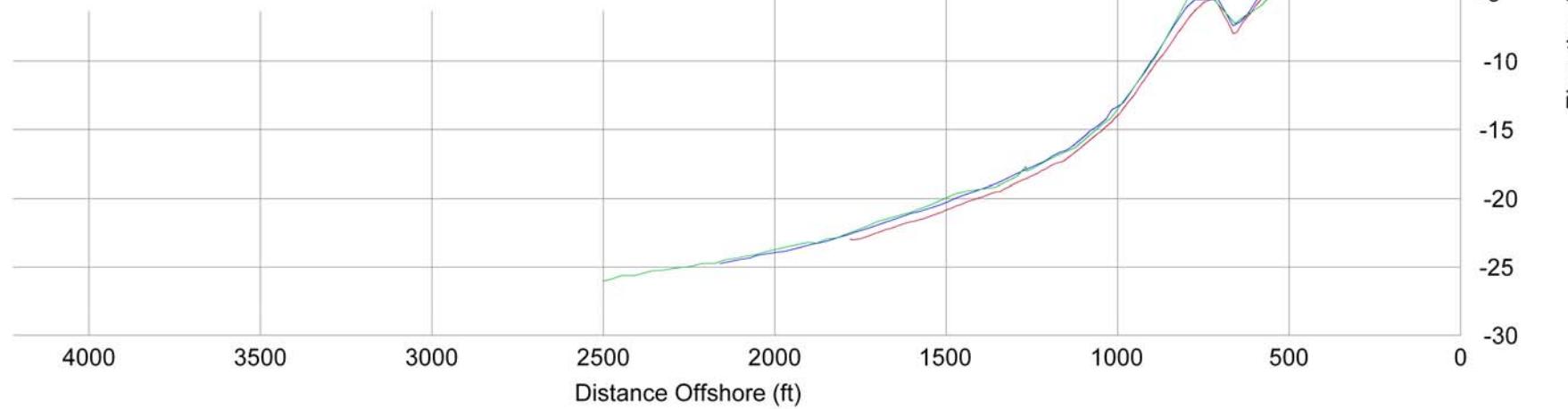
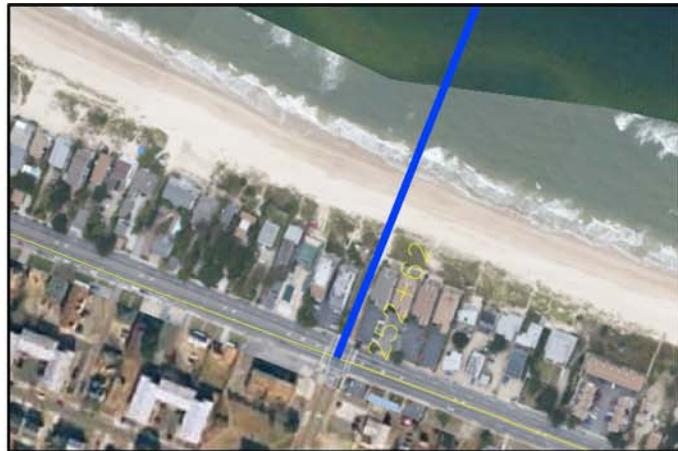


Survey Transect 242+03	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-24.34 ft/yr	-25.13 ft
Volume Change Above -15 ft NAVD88	-2.36 cy/ft/yr	-4.93 cy/ft
Volume Change Above 0 ft NAVD88	1.20 cy/ft/yr	-2.38 cy/ft

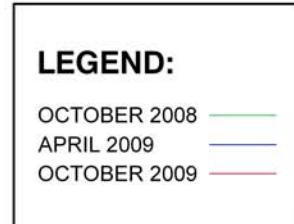


Notes:

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2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.



Survey Transect 252+62	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	6.29 ft/yr	-13.57 ft
Volume Change Above -15 ft NAVD88	-4.29 cy/ft/yr	-15.80 cy/ft
Volume Change Above 0 ft NAVD88	1.57 cy/ft/yr	-3.08 cy/ft

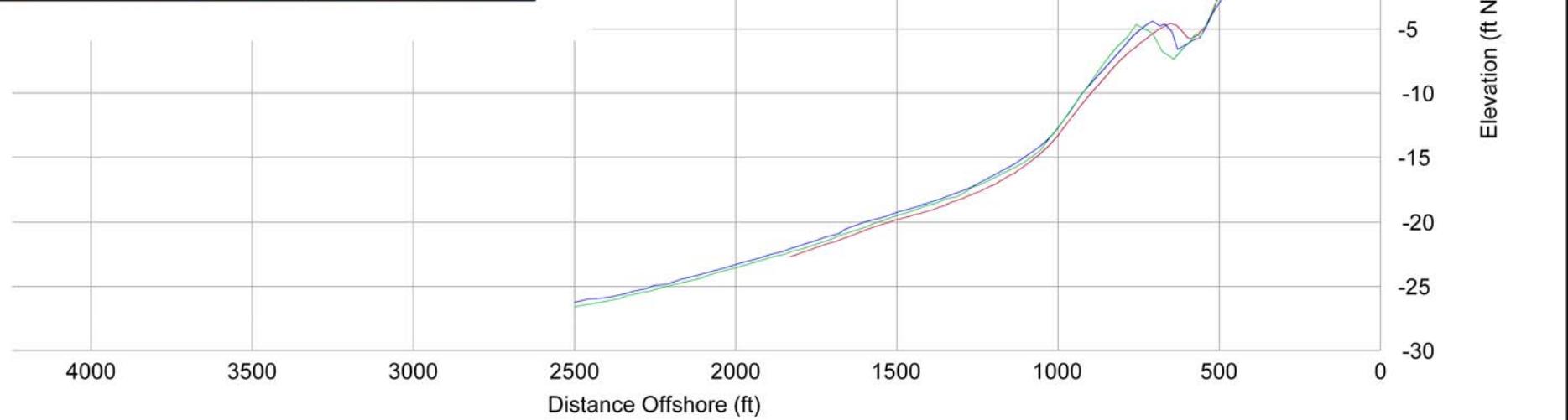
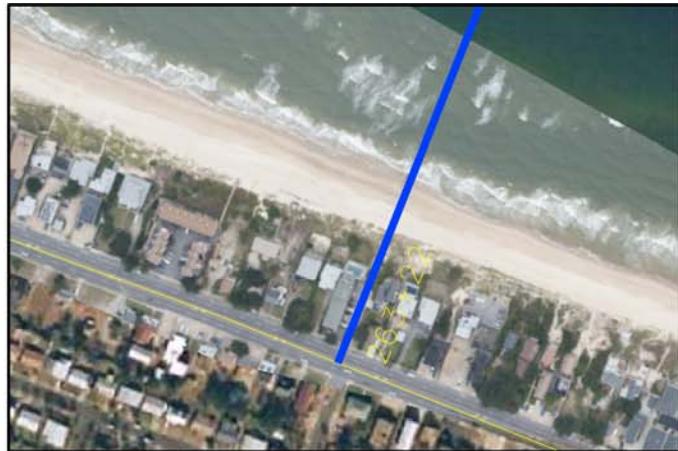


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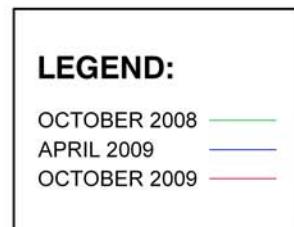
1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.



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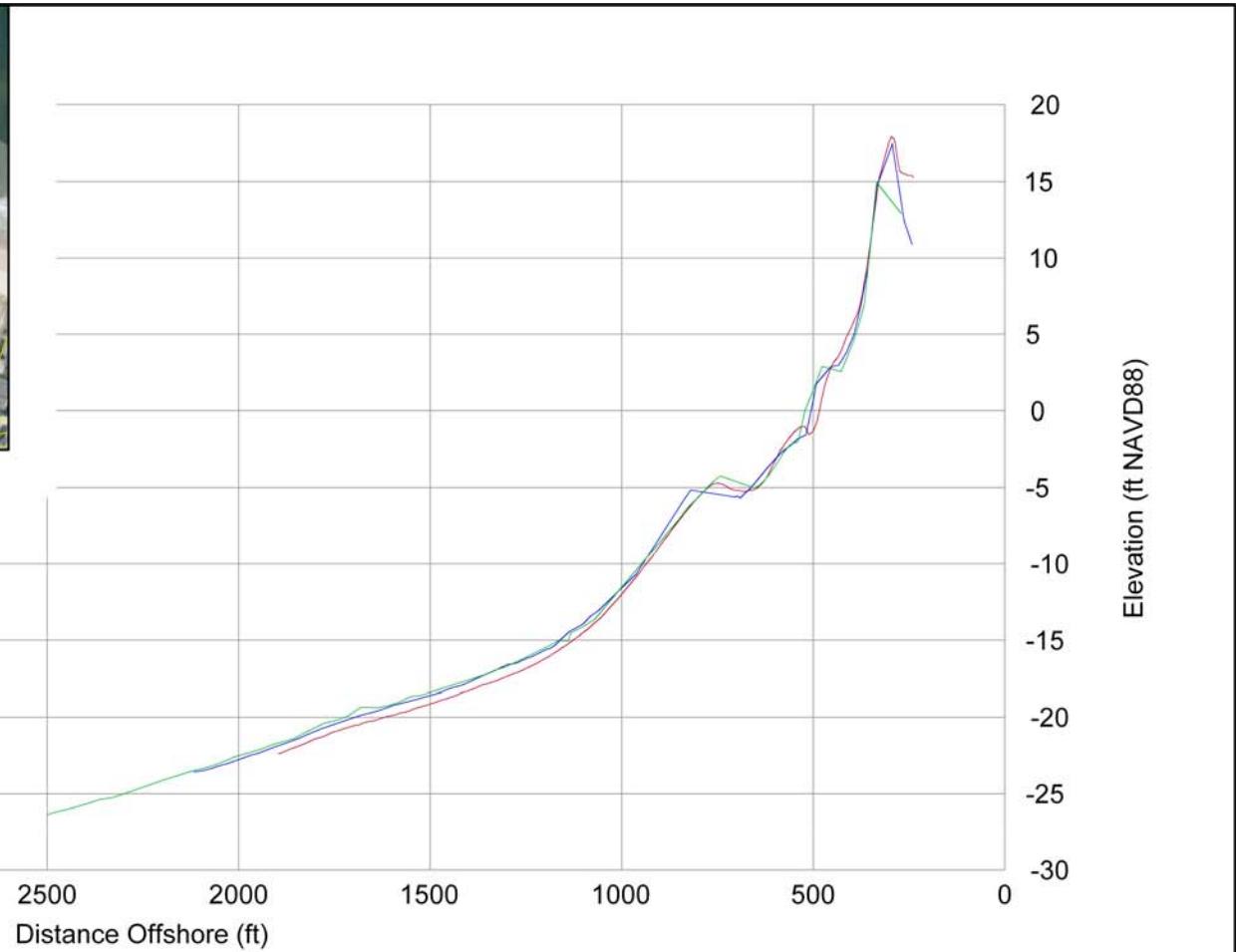
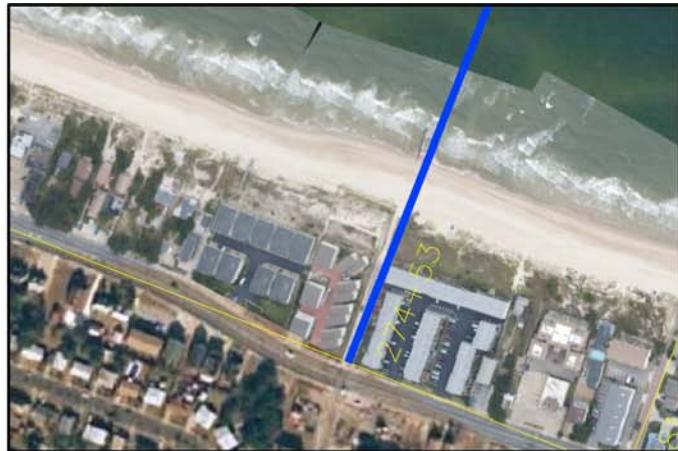


Survey Transect 263+22	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	0.15 ft/yr	1.69 ft
Volume Change Above -15 ft NAVD88	-1.11 cy/ft/yr	-4.27 cy/ft
Volume Change Above 0 ft NAVD88	2.13 cy/ft/yr	1.19 cy/ft

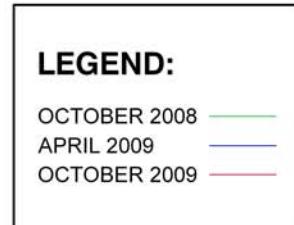


Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.



Survey Transect 274+53	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-29.88 ft/yr	-21.72 ft
Volume Change Above -15 ft NAVD88	0.94 cy/ft/yr	-0.88 cy/ft
Volume Change Above 0 ft NAVD88	6.89 cy/ft/yr	5.32 cy/ft

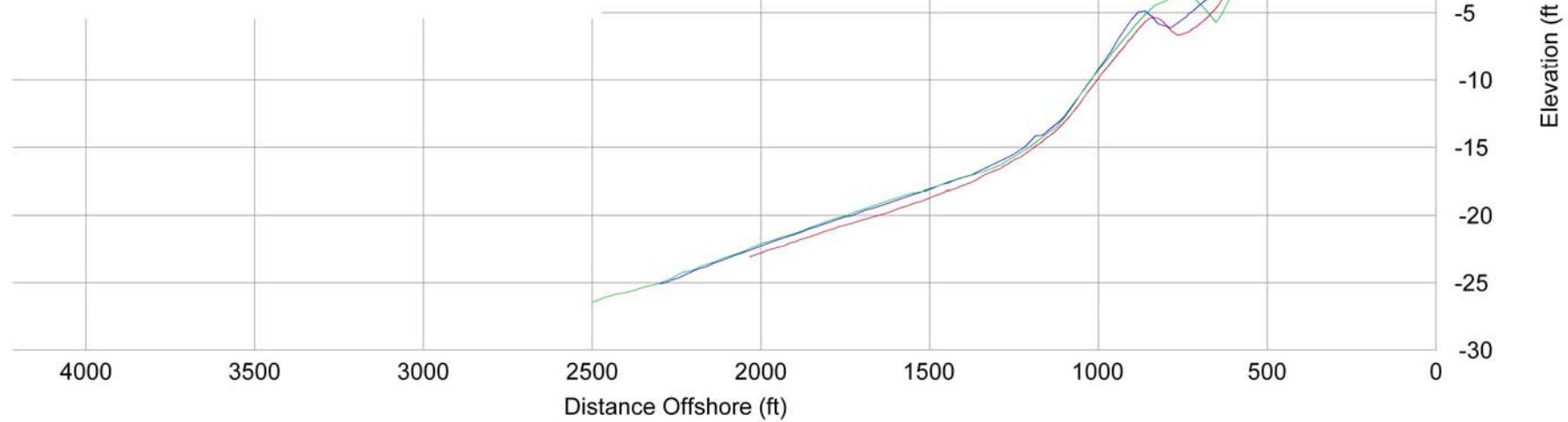
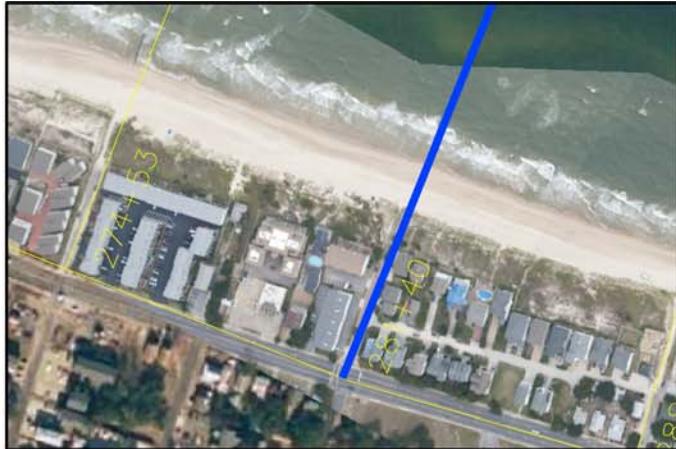


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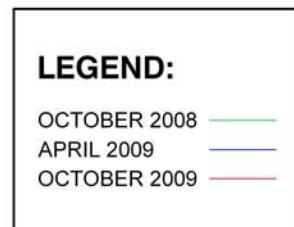
1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.

City of Norfolk

ST 274+53	Pg 89 OF 126	FALL 2009
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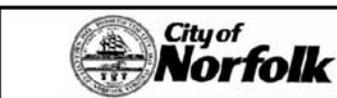


Survey Transect	October 2008 - October 2009	April 2009 - October 2009
281+40		
Shoreline Change at MHW (0.98 ft NAVD88)	-9.28 ft/yr	-7.67 ft
Volume Change Above -15 ft NAVD88	-12.02 cy/ft/yr	-14.56 cy/ft
Volume Change Above 0 ft NAVD88	3.66 cy/ft/yr	-0.44 cy/ft

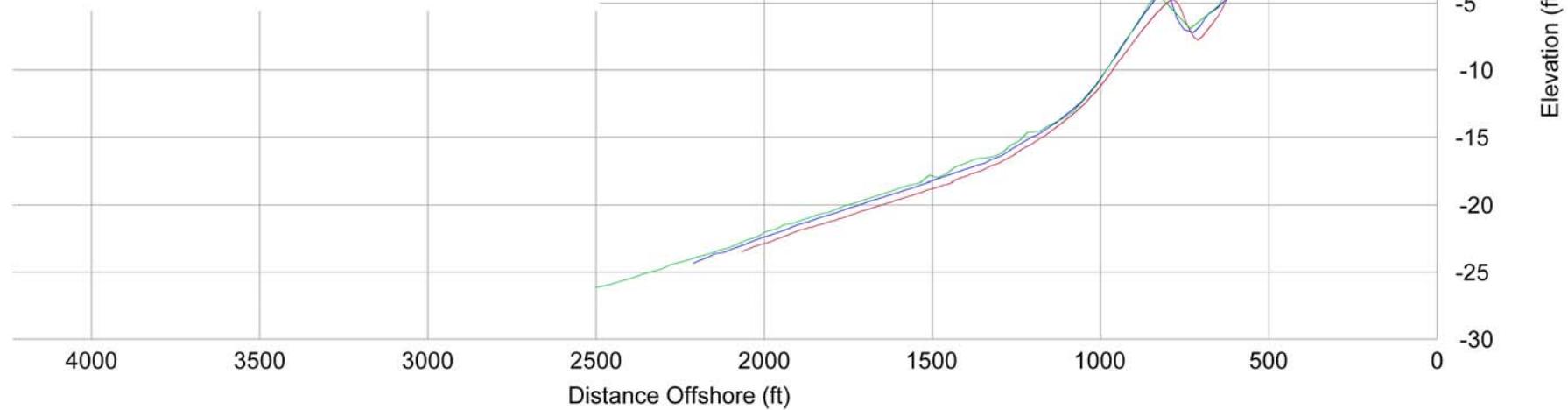
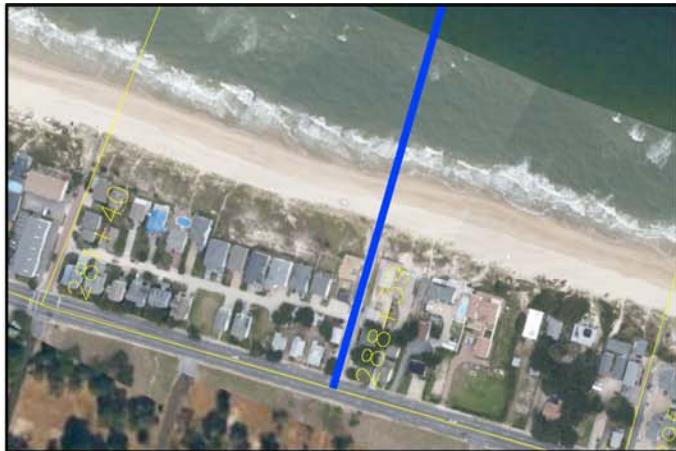


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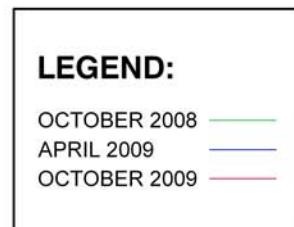
1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
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OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS



Survey Transect 288+39	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-35.34 ft/yr	-25.38 ft
Volume Change Above -15 ft NAVD88	-11.07 cy/ft/yr	-11.61 cy/ft
Volume Change Above 0 ft NAVD88	2.70 cy/ft/yr	-2.91 cy/ft

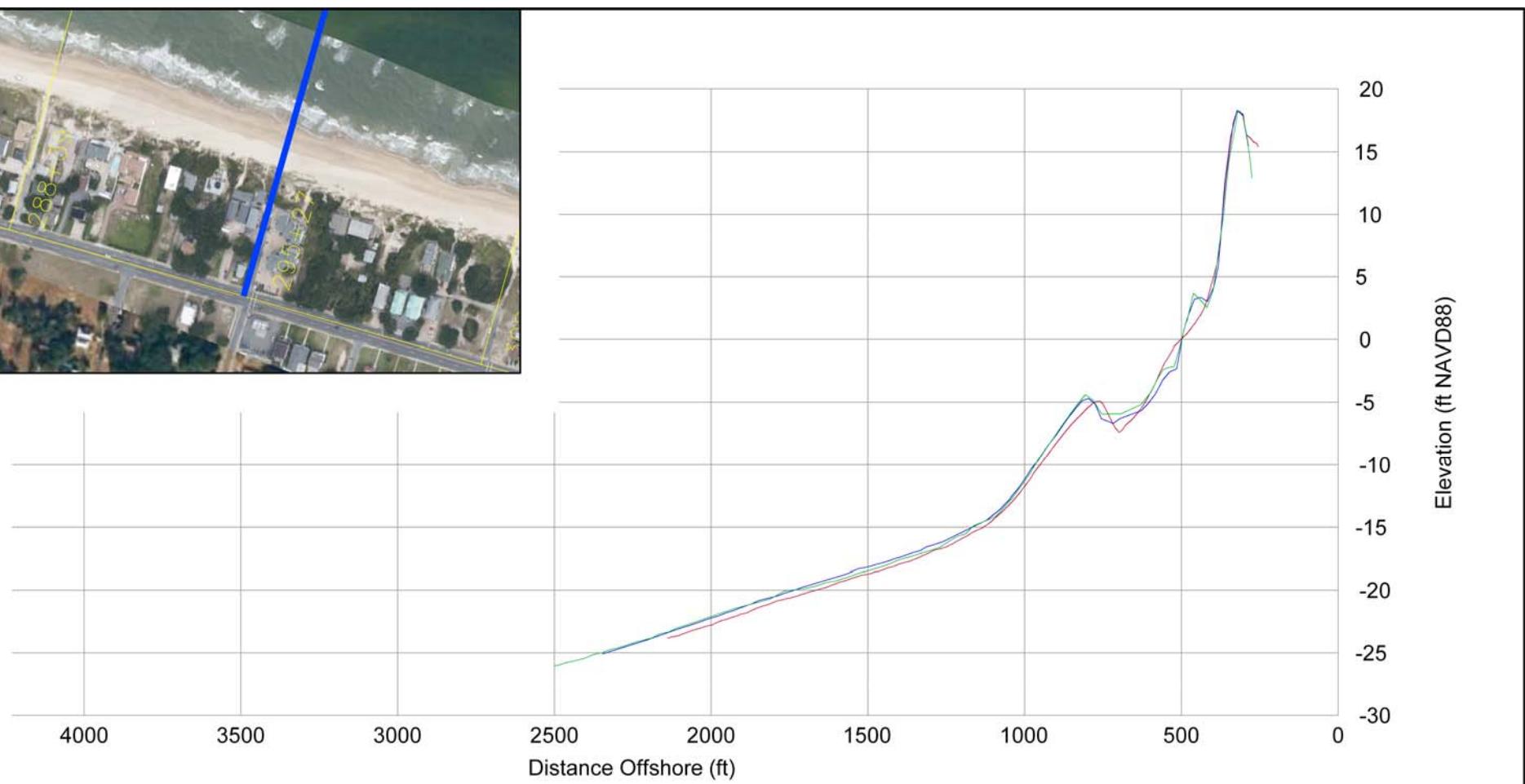


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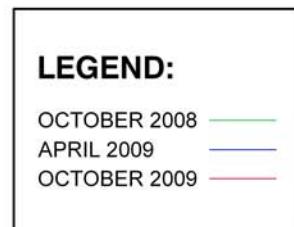
1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
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Survey Transect 295+27	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-23.30 ft/yr	-23.37 ft
Volume Change Above -15 ft NAVD88	-9.37 cy/ft/yr	-6.64 cy/ft
Volume Change Above 0 ft NAVD88	-0.69 cy/ft/yr	-3.14 cy/ft

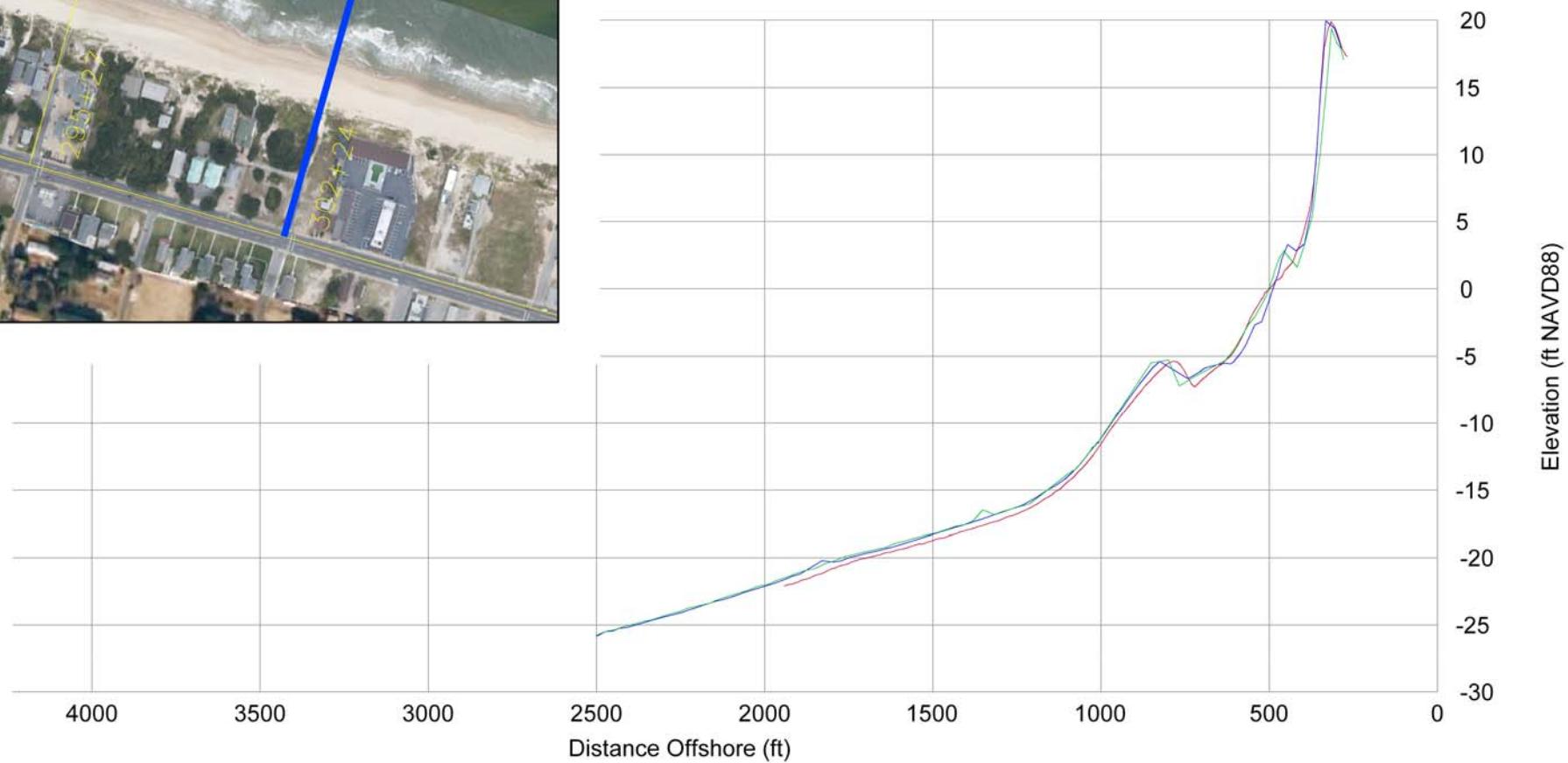


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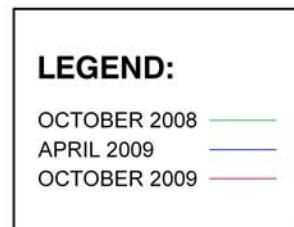
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2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
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5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To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

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ST 295+27	Pg 92 OF 126	OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS
FALL 2009		

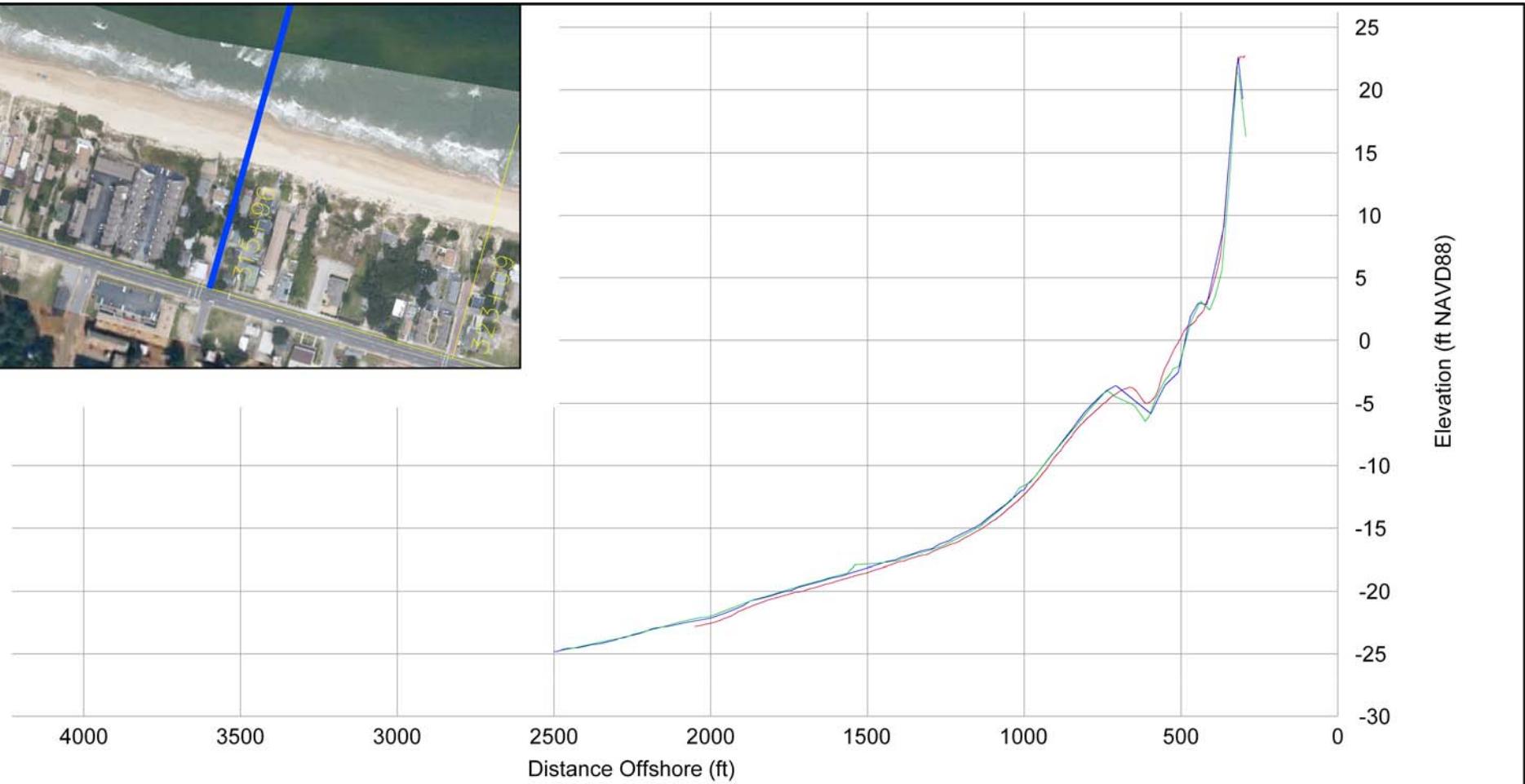
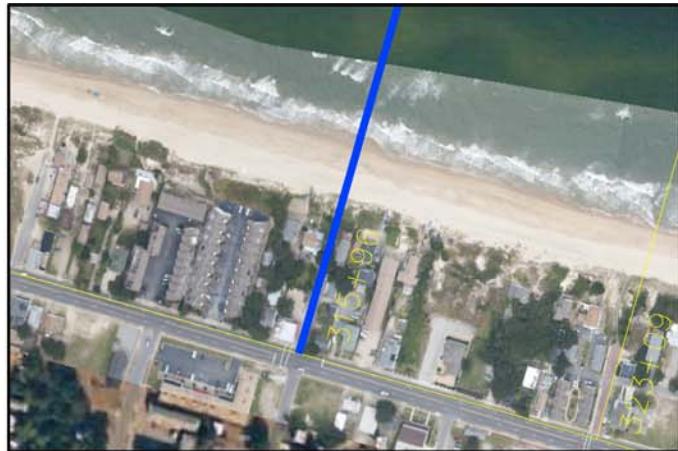


Survey Transect 302+24	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at M HW (0.98 ft NAVD88)	-26.53 ft/yr	-14.31 ft
Volume Change Above -15 ft NAVD88	-0.17 cy/ft/yr	-3.28 cy/ft
Volume Change Above 0 ft NAVD88	6.91 cy/ft/yr	-1.56 cy/ft

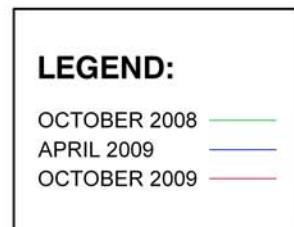


Notes:

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2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
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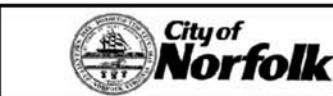


Survey Transect 315+96	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	9.12 ft/yr	4.10 ft
Volume Change Above -15 ft NAVD88	8.14 cy/ft/yr	-4.01 cy/ft
Volume Change Above 0 ft NAVD88	7.62 cy/ft/yr	-2.06 cy/ft

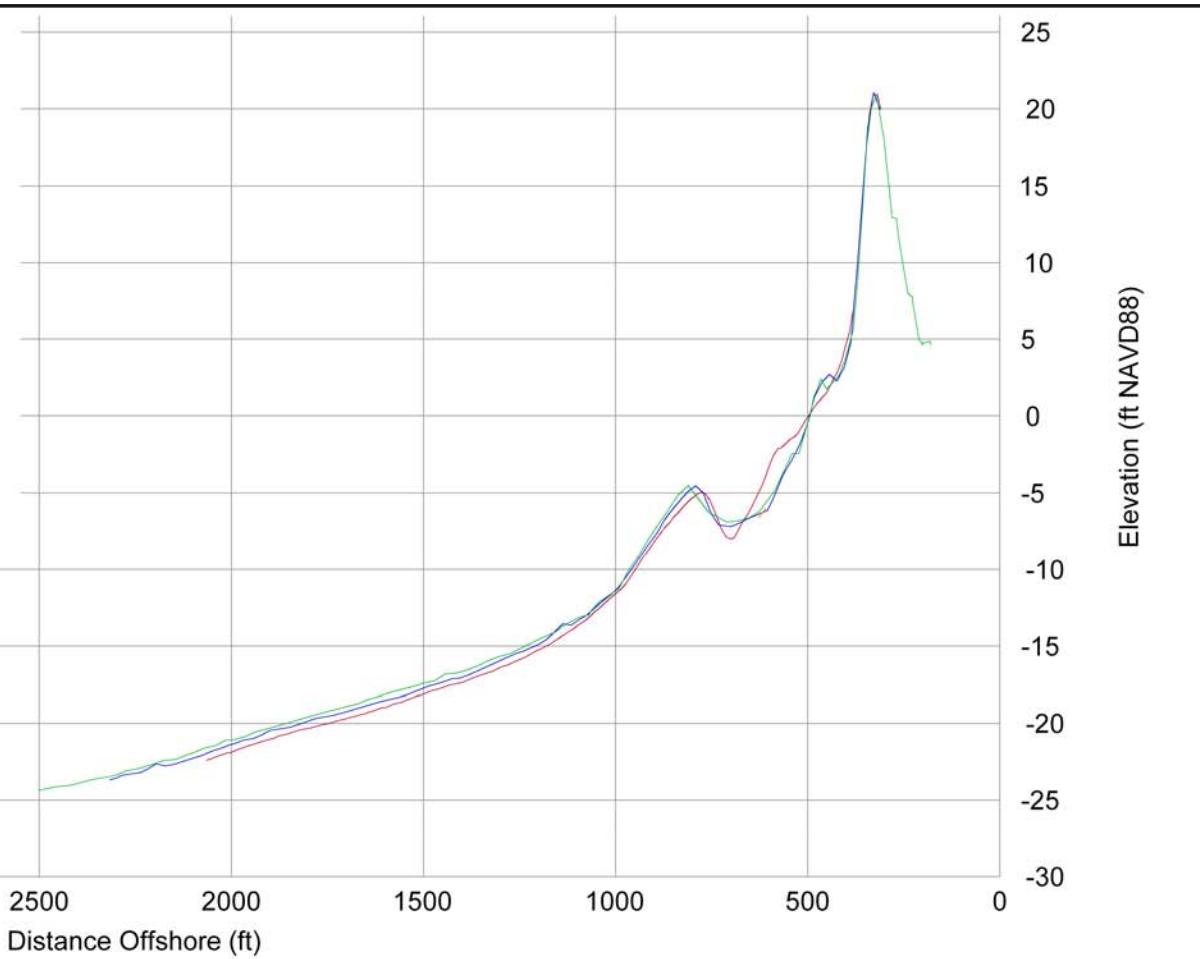


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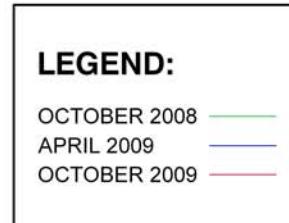
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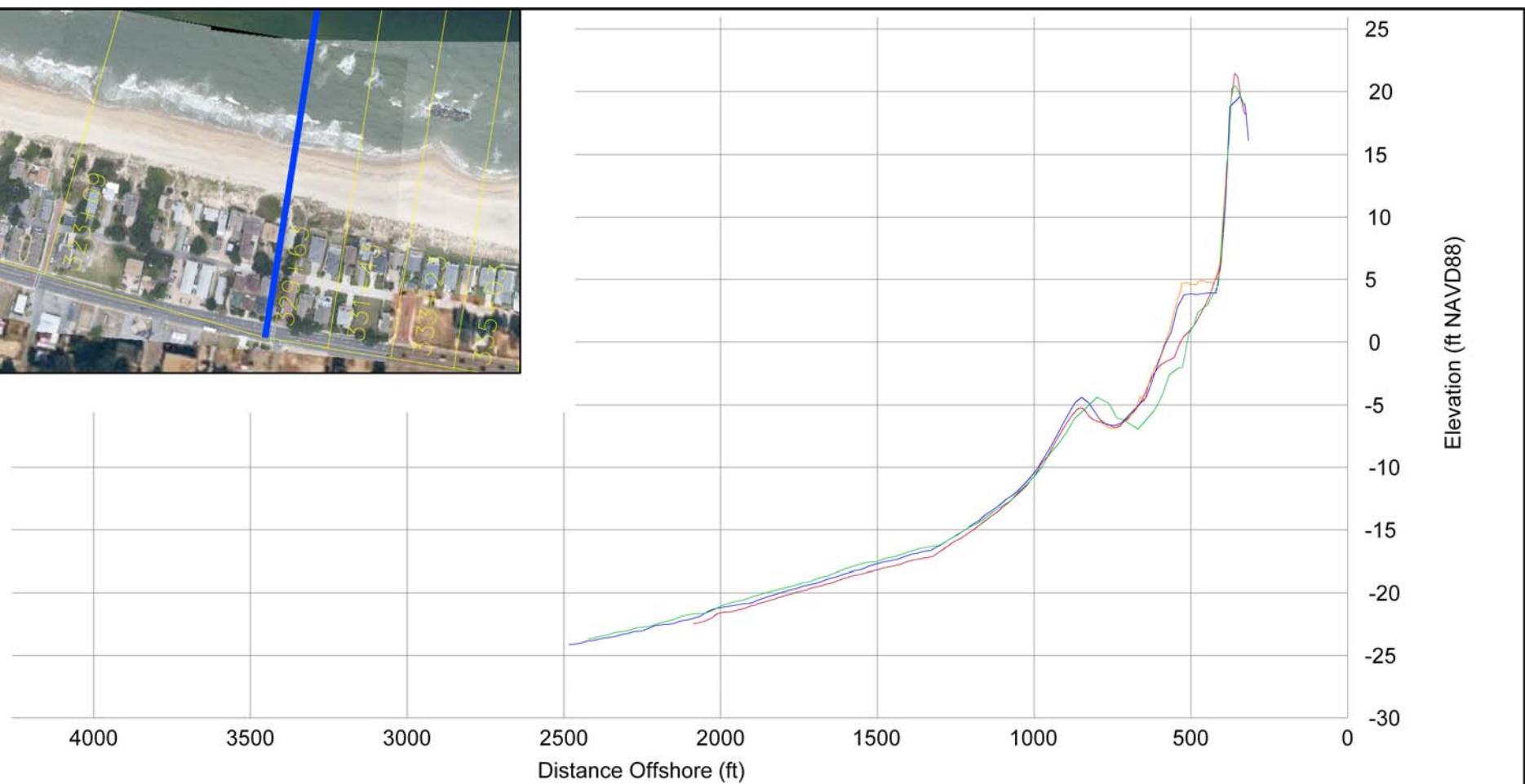


Survey Transect 323+09	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	-16.95 ft/yr	-15.89 ft
Volume Change Above -15 ft NAVD88	0.00 cy/ft/yr	2.03 cy/ft
Volume Change Above 0 ft NAVD88	1.59 cy/ft/yr	-0.01 cy/ft



Notes:

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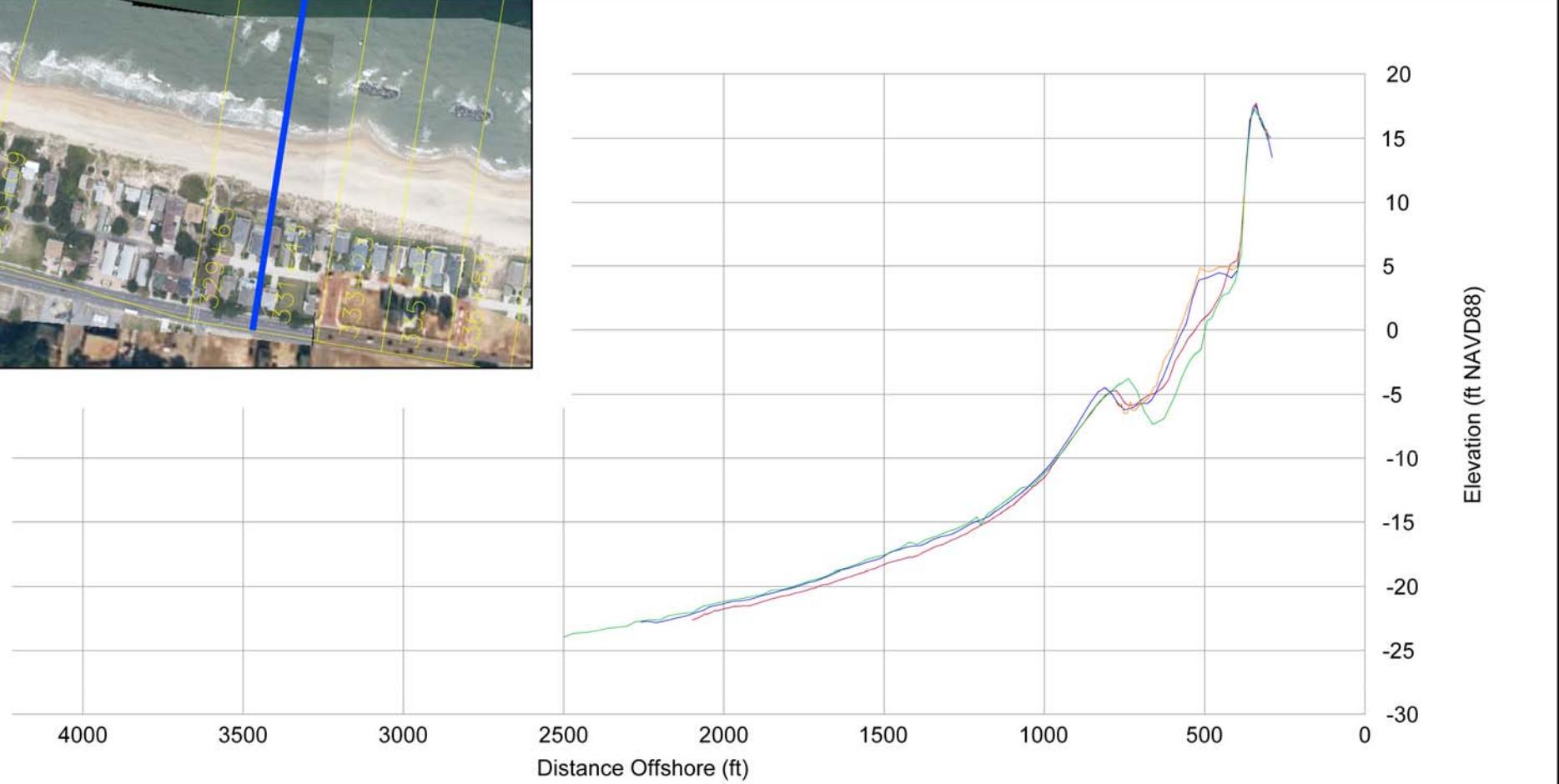


Survey Transect 329+63	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	1.19 ft/yr	-59.93 ft
Volume Change Above -15 ft NAVD88	8.71 cy/ft/yr	-17.47 cy/ft
Volume Change Above 0 ft NAVD88	0.45 cy/ft/yr	-8.05 cy/ft



Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.



Survey Transect 331+43	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	20.94 ft/yr	-53.62 ft
Volume Change Above -15 ft NAVD88	11.93 cy/ft/yr	-18.05 cy/ft
Volume Change Above 0 ft NAVD88	5.28 cy/ft/yr	-9.28 cy/ft

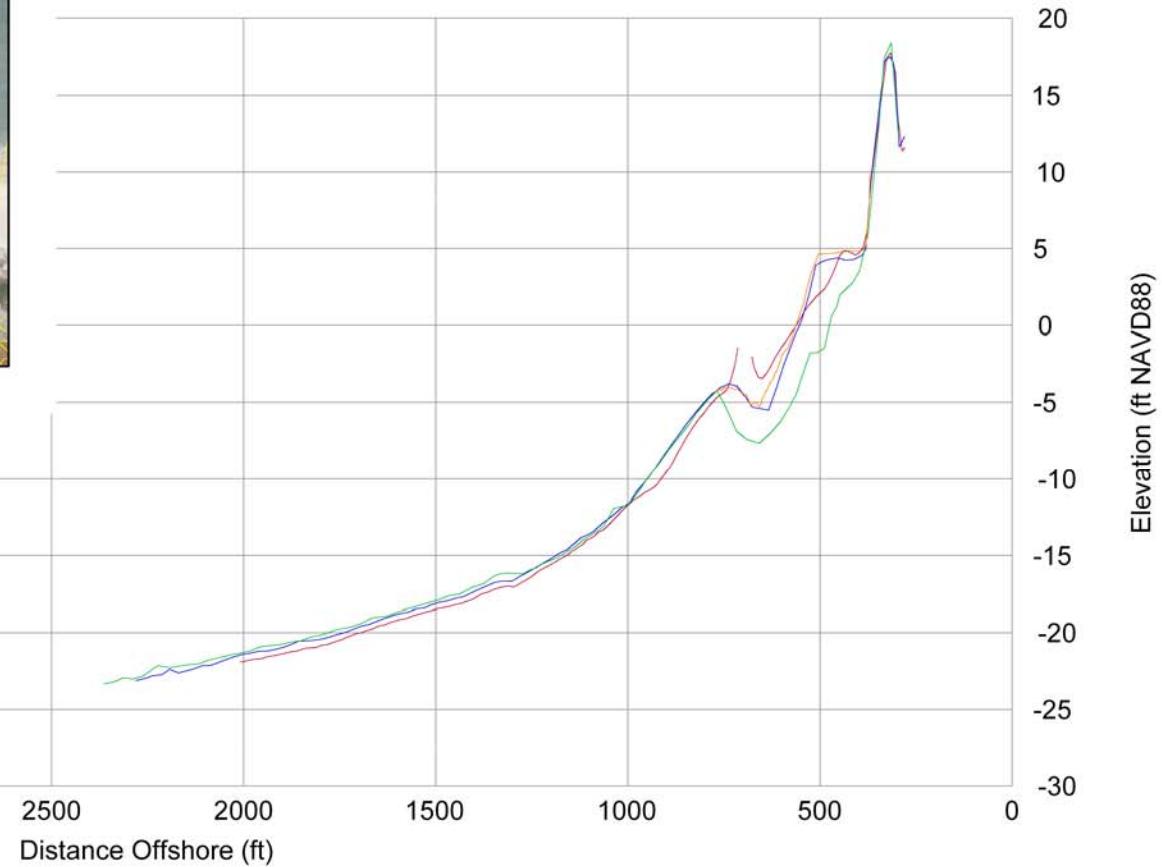


Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. 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	October 2008 - October 2009	April 2009 - October 2009
333+23		
Shoreline Change at MHW (0.98 ft NAVD88)	77.60 ft/yr	-1.34 ft
Volume Change Above -15 ft NAVD88	-8.23 cy/ft/yr	-13.60 cy/ft
Volume Change Above 0 ft NAVD88	12.89 cy/ft/yr	-3.65 cy/ft

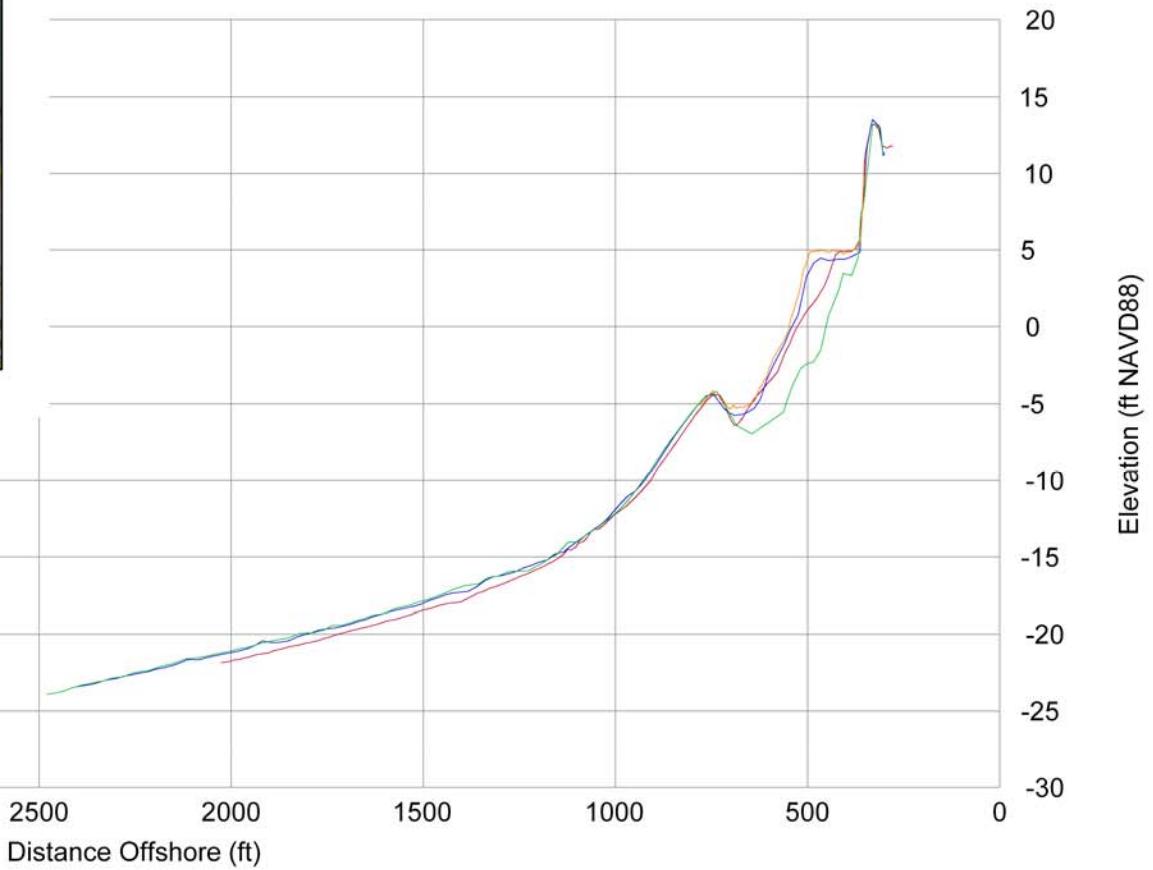


Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. 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 335+03	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	61.32 ft/yr	-19.69 ft
Volume Change Above -15 ft NAVD88	24.35 cy/ft/yr	-12.52 cy/ft
Volume Change Above 0 ft NAVD88	10.78 cy/ft/yr	-5.51 cy/ft

LEGEND:

OCTOBER 2008
APRIL 2009
OCTOBER 2009
POST-FILL

Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.



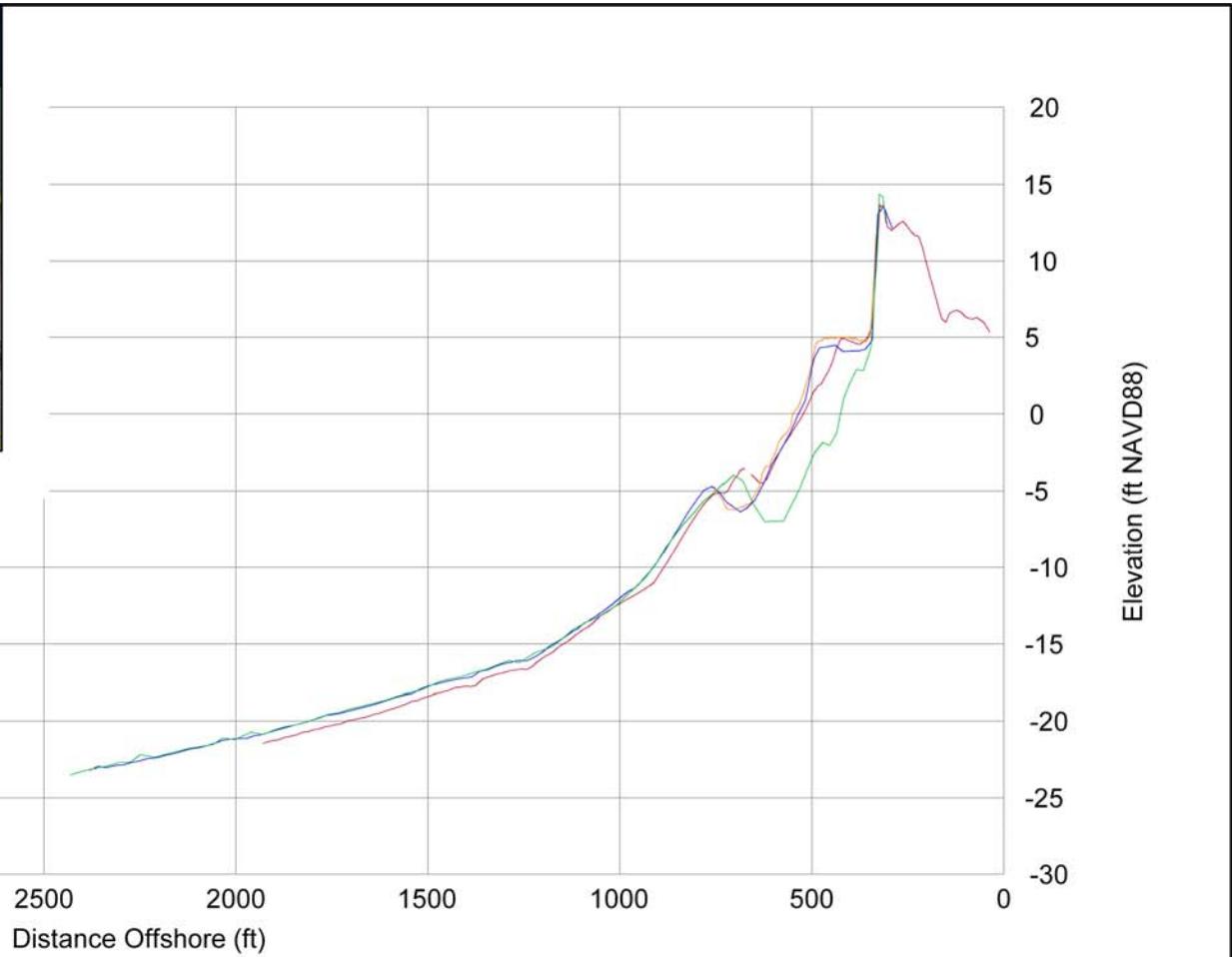
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Survey Transect	October 2008 - October 2009	April 2009 - October 2009
336+83		
Shoreline Change at MHW (0.98 ft NAVD88)	86.54 ft/yr	-12.90 ft
Volume Change Above -15 ft NAVD88	-8.29 cy/ft/yr	-13.82 cy/ft
Volume Change Above 0 ft NAVD88	14.80 cy/ft/yr	-3.73 cy/ft

LEGEND:

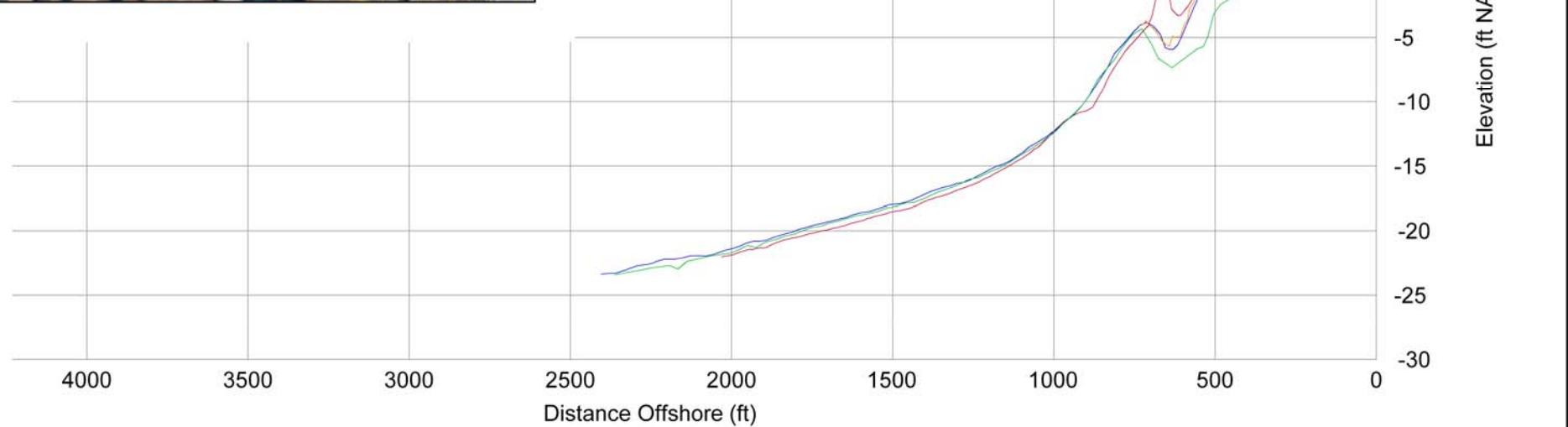
OCTOBER 2008
 APRIL 2009
 OCTOBER 2009
 POST-FILL

Notes:

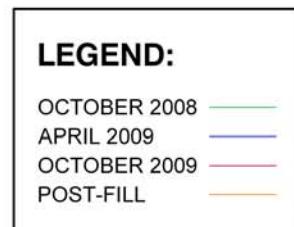
1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.



OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

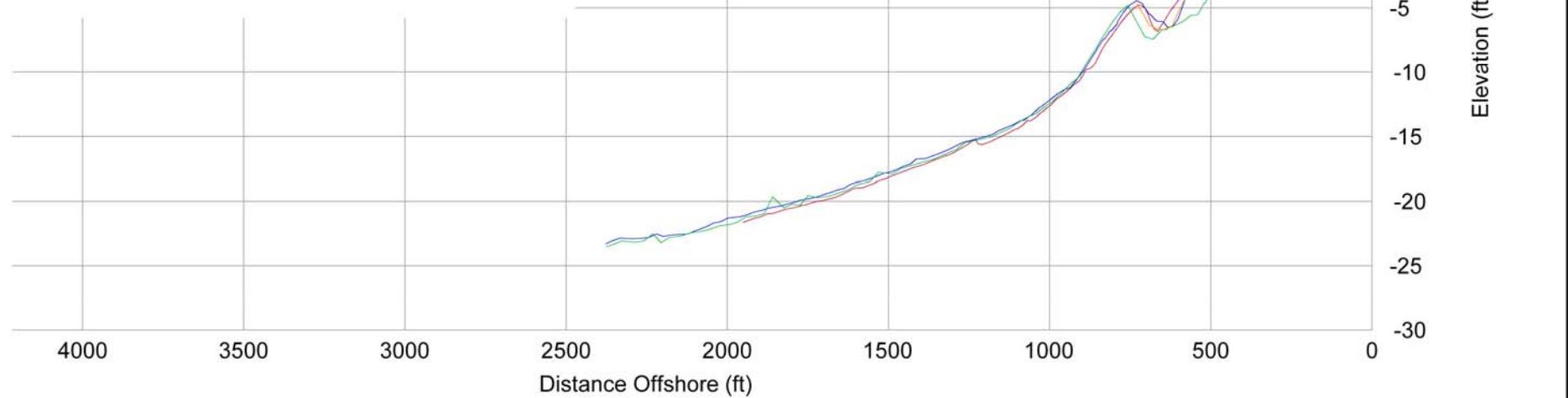


Survey Transect 338+63	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	100.83 ft/yr	-7.48 ft
Volume Change Above -15 ft NAVD88	-8.58 cy/ft/yr	-10.38 cy/ft
Volume Change Above 0 ft NAVD88	15.12 cy/ft/yr	-1.48 cy/ft



Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.

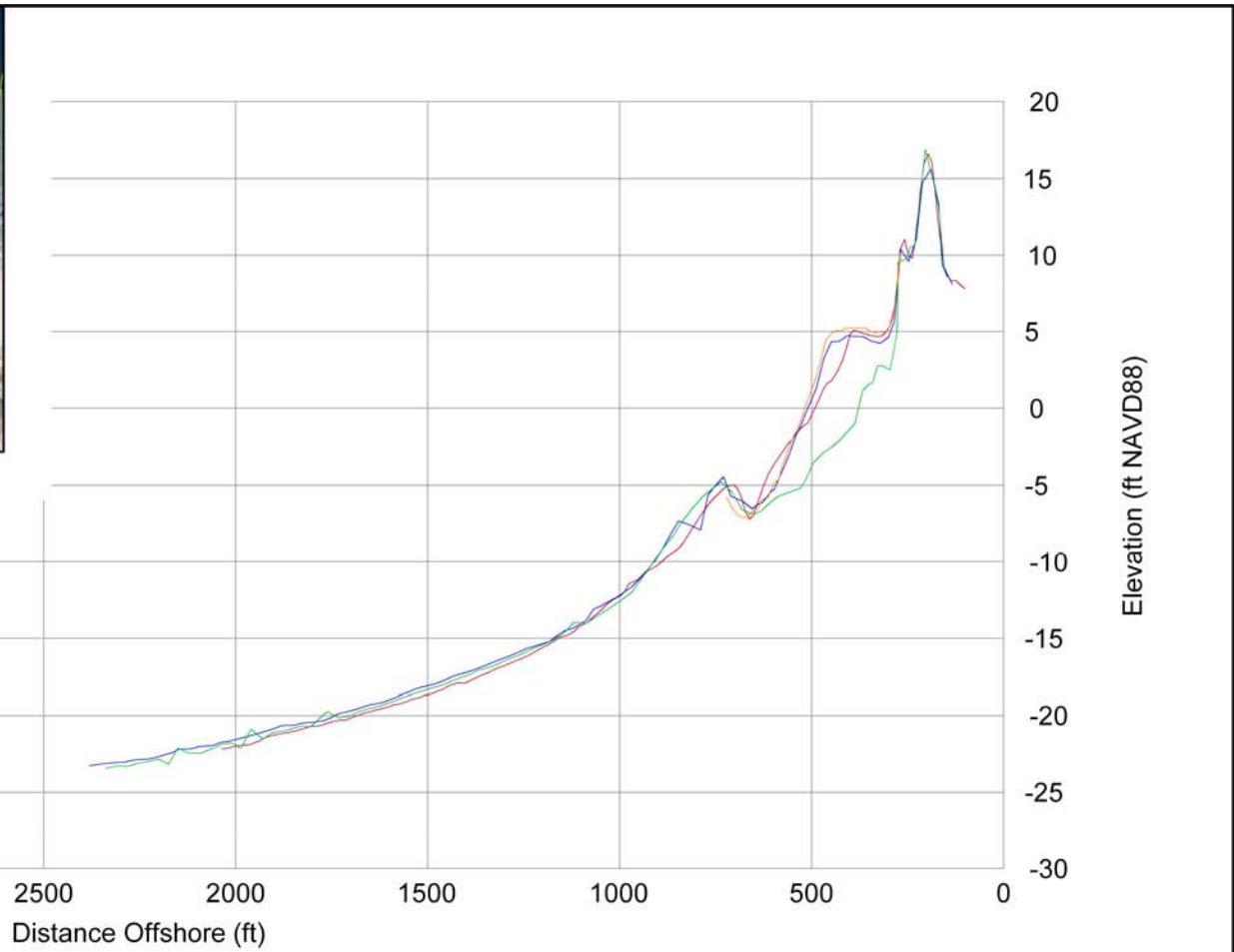


Survey Transect 340+43	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	113.69 ft/yr	-16.96 ft
Volume Change Above -15 ft NAVD88	32.95 cy/ft/yr	-13.89 cy/ft
Volume Change Above 0 ft NAVD88	16.48 cy/ft/yr	-6.82 cy/ft



Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.



Survey Transect 342+23	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	105.55 ft/yr	-18.69 ft
Volume Change Above -15 ft NAVD88	41.41 cy/ft/yr	-5.80 cy/ft
Volume Change Above 0 ft NAVD88	22.08 cy/ft/yr	-3.12 cy/ft

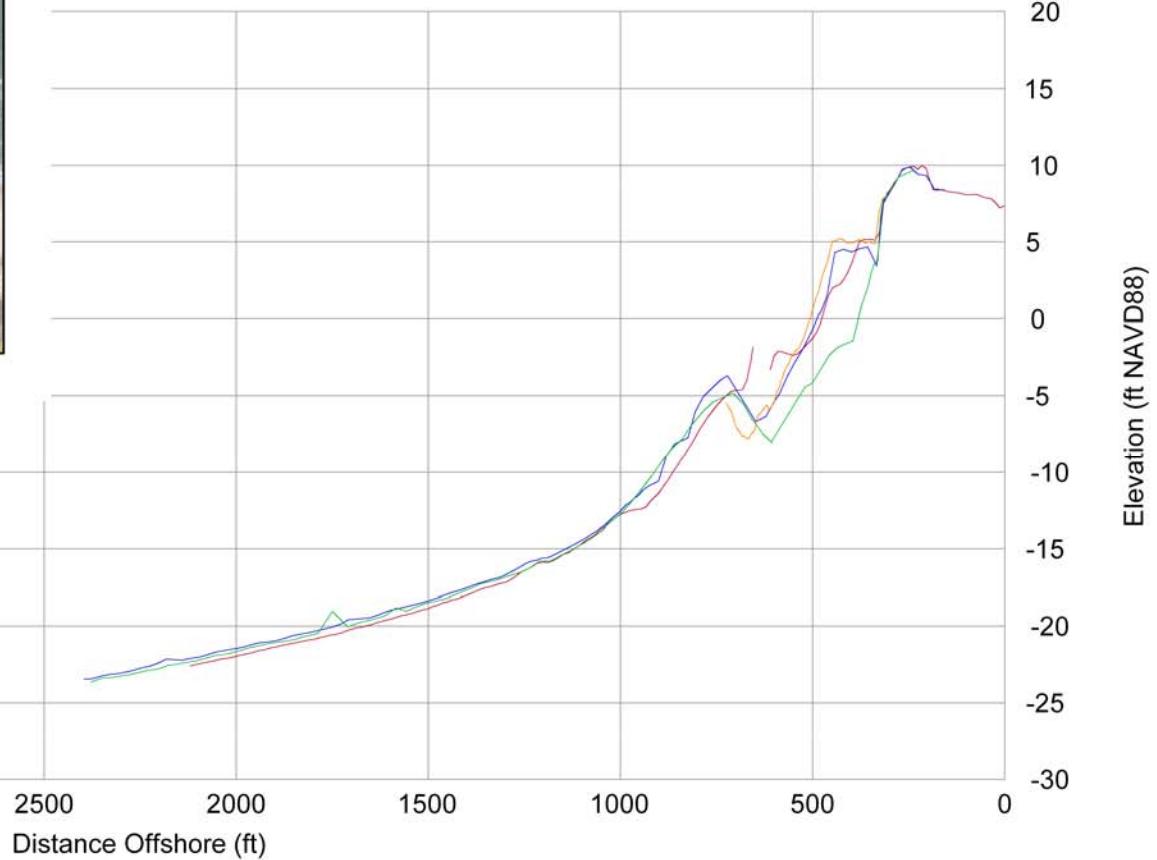


Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. 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 344+05	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	94.28 ft/yr	-5.17 ft
Volume Change Above -15 ft NAVD88	-10.02 cy/ft/yr	-16.22 cy/ft
Volume Change Above 0 ft NAVD88	14.75 cy/ft/yr	-1.58 cy/ft

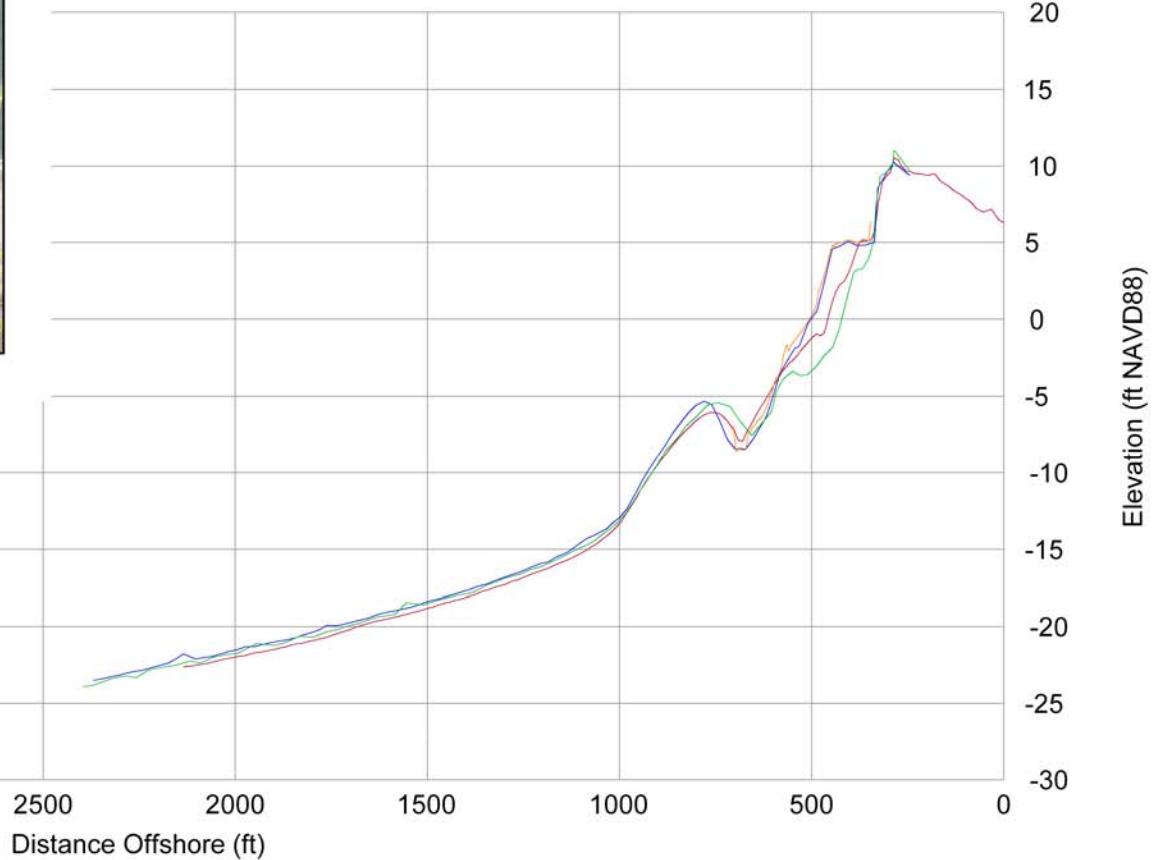


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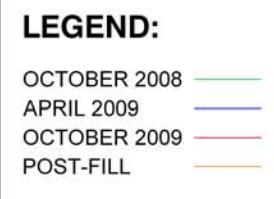
1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.

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Survey Transect 345+85	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	35.82 ft/yr	-33.91 ft
Volume Change Above -15 ft NAVD88	10.45 cy/ft/yr	-14.70 cy/ft
Volume Change Above 0 ft NAVD88	4.70 cy/ft/yr	-8.82 cy/ft

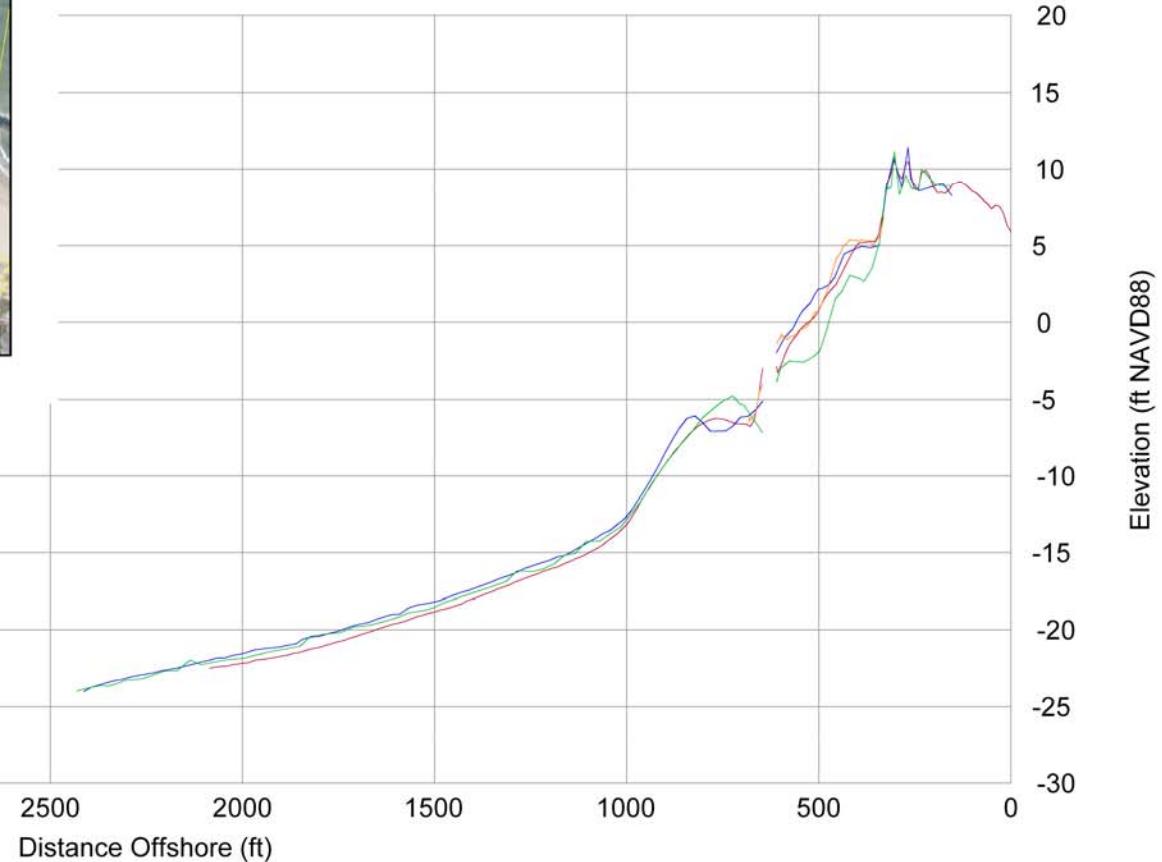


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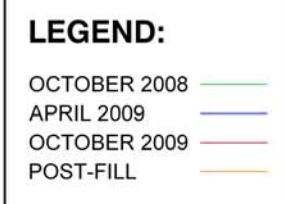
1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
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Survey Transect 347+63	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	33.71 ft/yr	-36.25 ft
Volume Change Above -15 ft NAVD88	-6.49 cy/ft/yr	-6.22 cy/ft
Volume Change Above 0 ft NAVD88	10.36 cy/ft/yr	-3.53 cy/ft

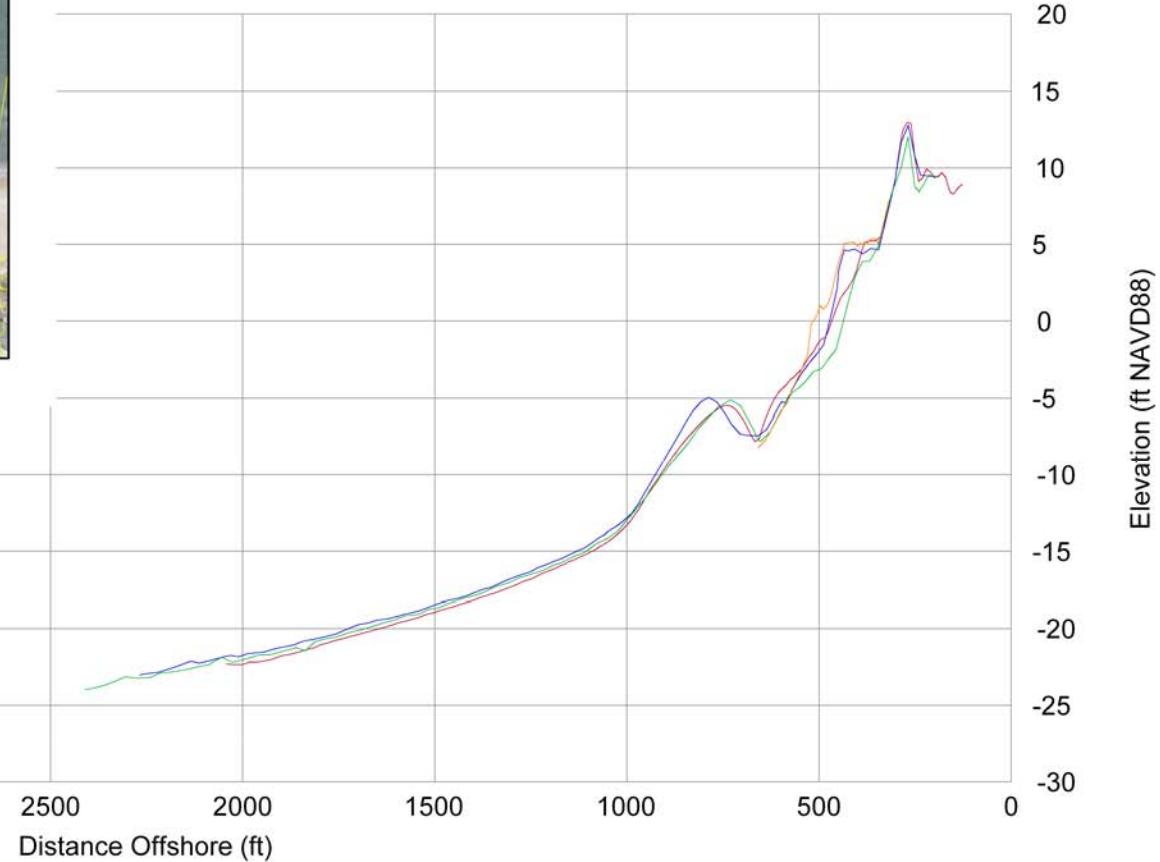


Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
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Survey Transect 349+43	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	25.95 ft/yr	-10.92 ft
Volume Change Above -15 ft NAVD88	17.31 cy/ft/yr	-6.32 cy/ft
Volume Change Above 0 ft NAVD88	8.03 cy/ft/yr	-3.13 cy/ft

LEGEND:

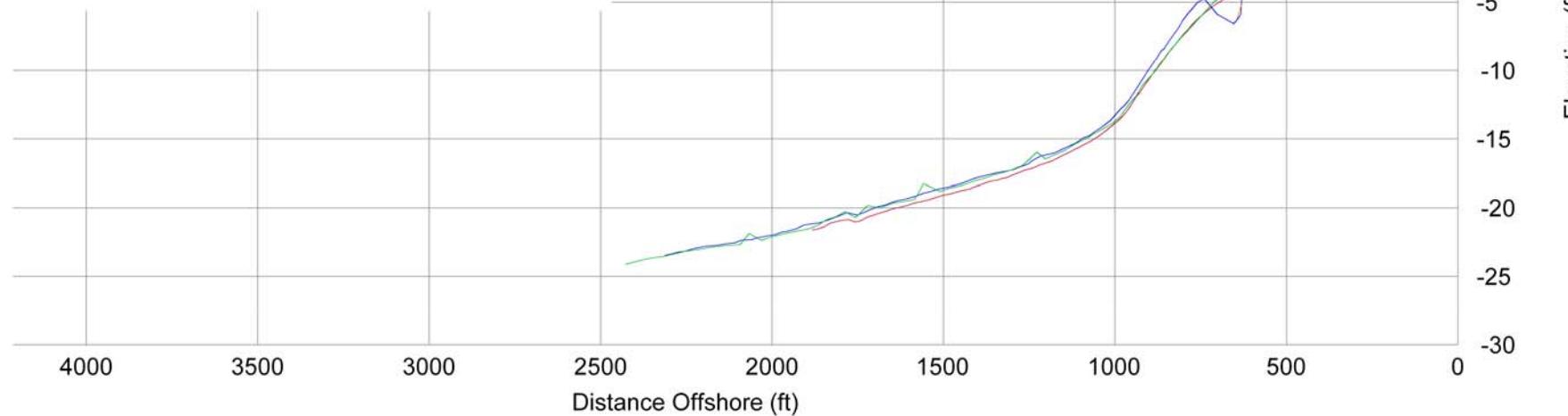
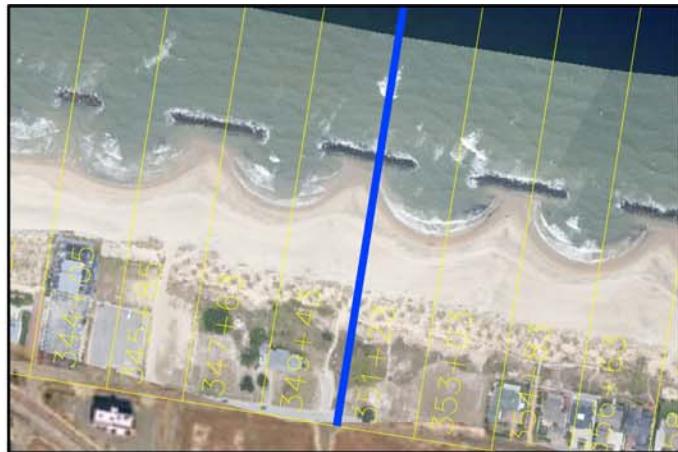
OCTOBER 2008 —
 APRIL 2009 —
 OCTOBER 2009 —
 POST-FILL —

Notes:

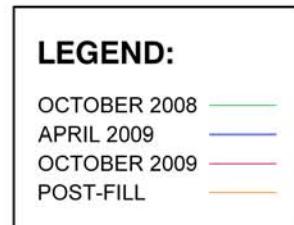
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Survey Transect 351+23	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	32.58 ft/yr	-1.26 ft
Volume Change Above -15 ft NAVD88	13.66 cy/ft/yr	-11.68 cy/ft
Volume Change Above 0 ft NAVD88	9.12 cy/ft/yr	-1.91 cy/ft

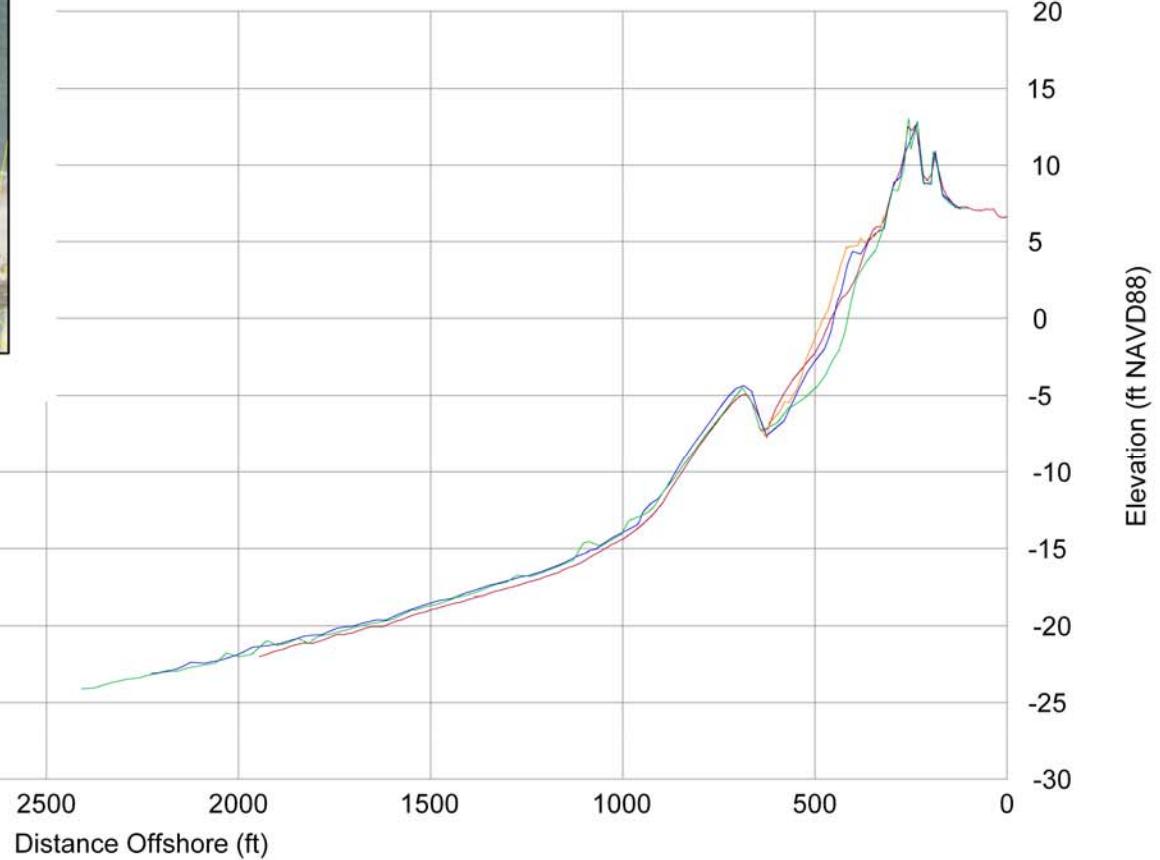


Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.

City of Norfolk

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Survey Transect	October 2008 - October 2009	April 2009 - October 2009
353+03		
Shoreline Change at MHW (0.98 ft NAVD88)	30.93 ft/yr	-5.47 ft
Volume Change Above -15 ft NAVD88	15.22 cy/ft/yr	-3.56 cy/ft
Volume Change Above 0 ft NAVD88	6.54 cy/ft/yr	-1.22 cy/ft

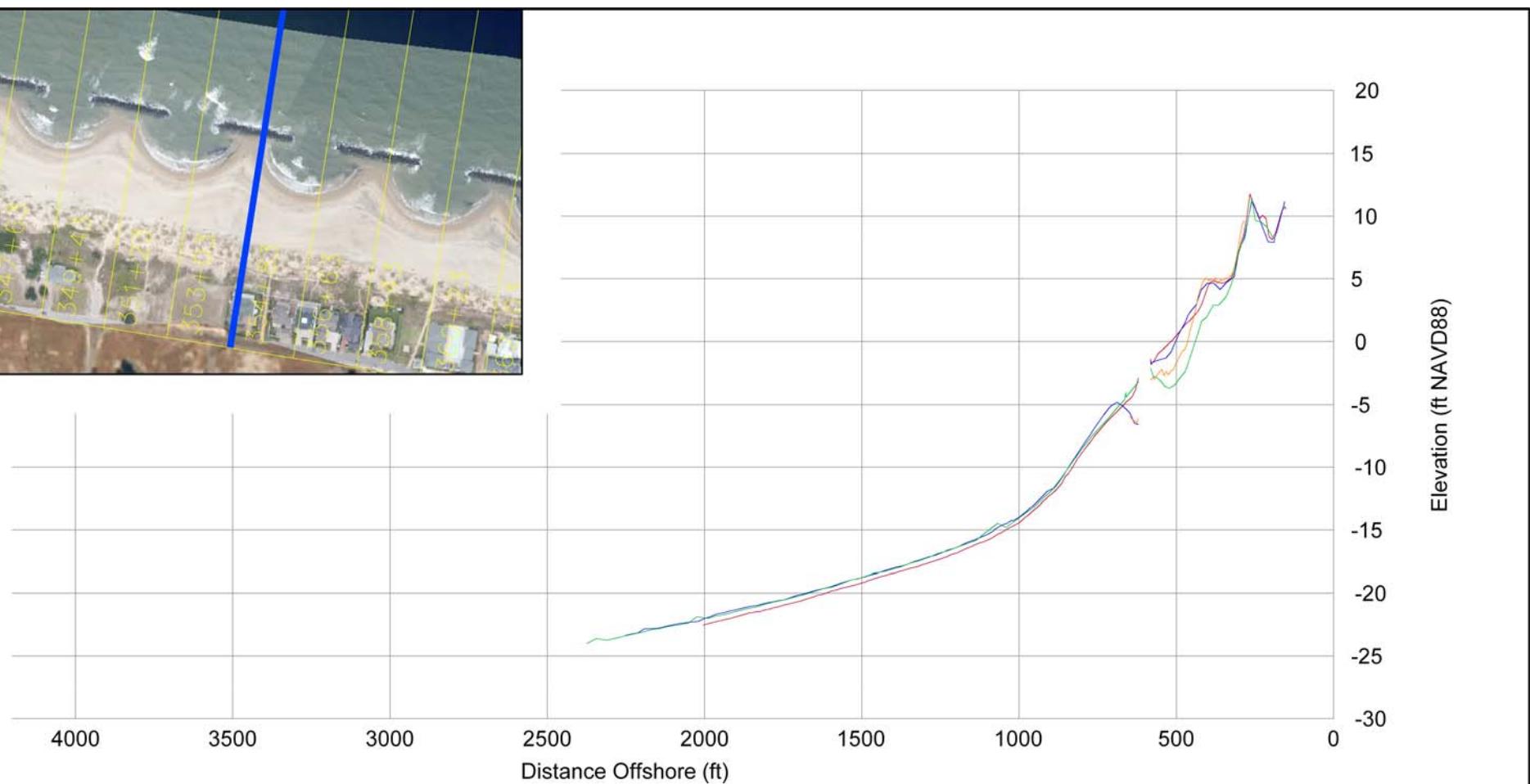


Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. 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 354+83	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	56.25 ft/yr	-0.52 ft
Volume Change Above -15 ft NAVD88	-3.76 cy/ft/yr	-4.76 cy/ft
Volume Change Above 0 ft NAVD88	11.90 cy/ft/yr	1.19 cy/ft



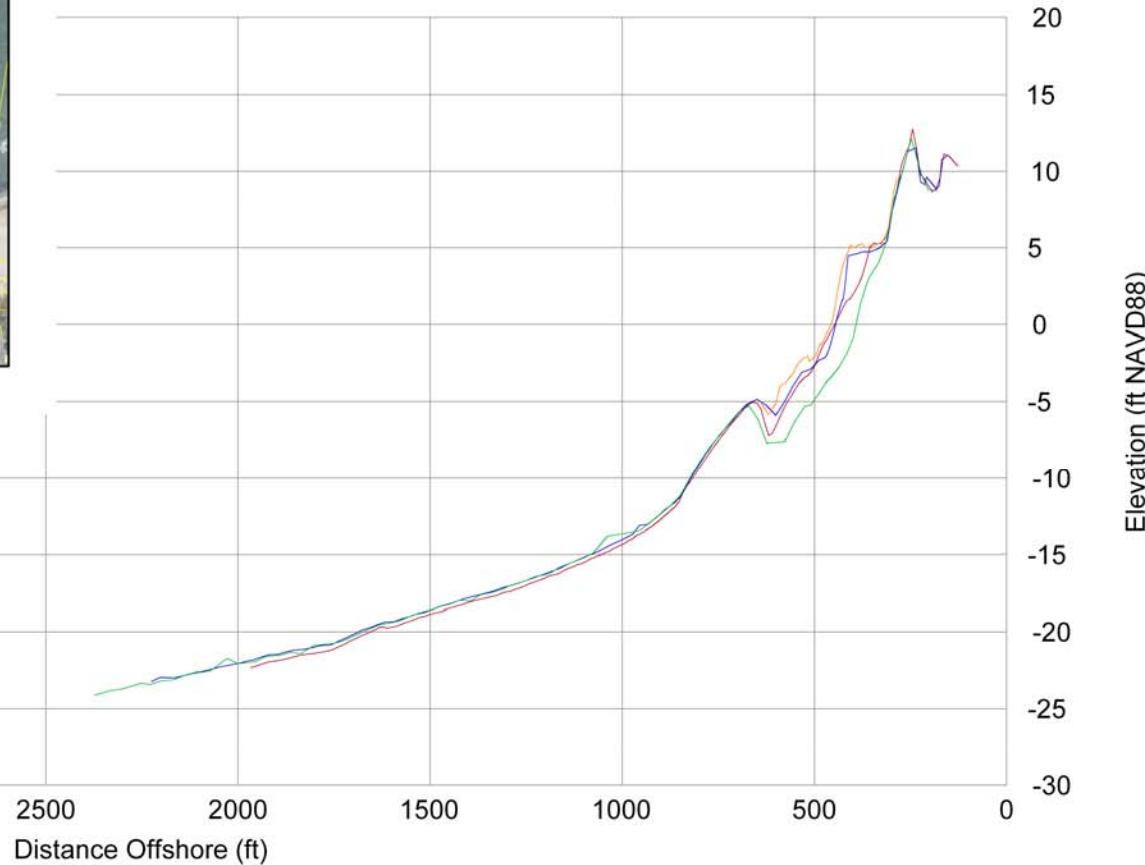
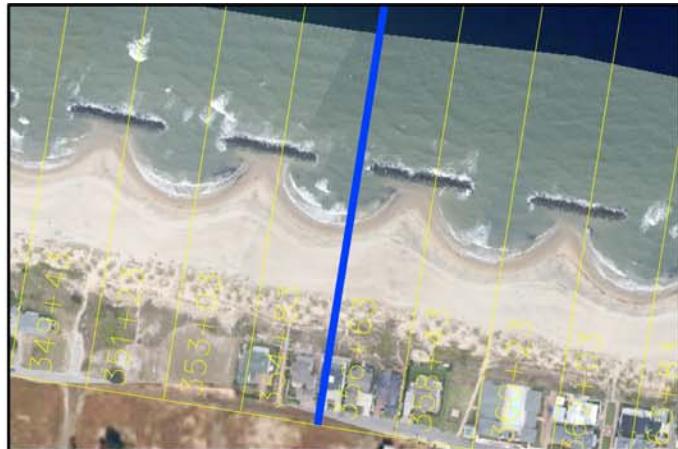
Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.

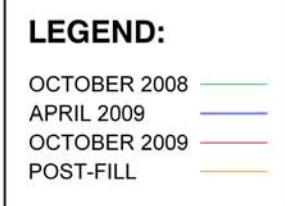
City of Norfolk

OCEAN VIEW PERIODIC SURVEYING DATA & ANALYSIS

ST 354+83	Pg 110 OF 126	FALL 2009
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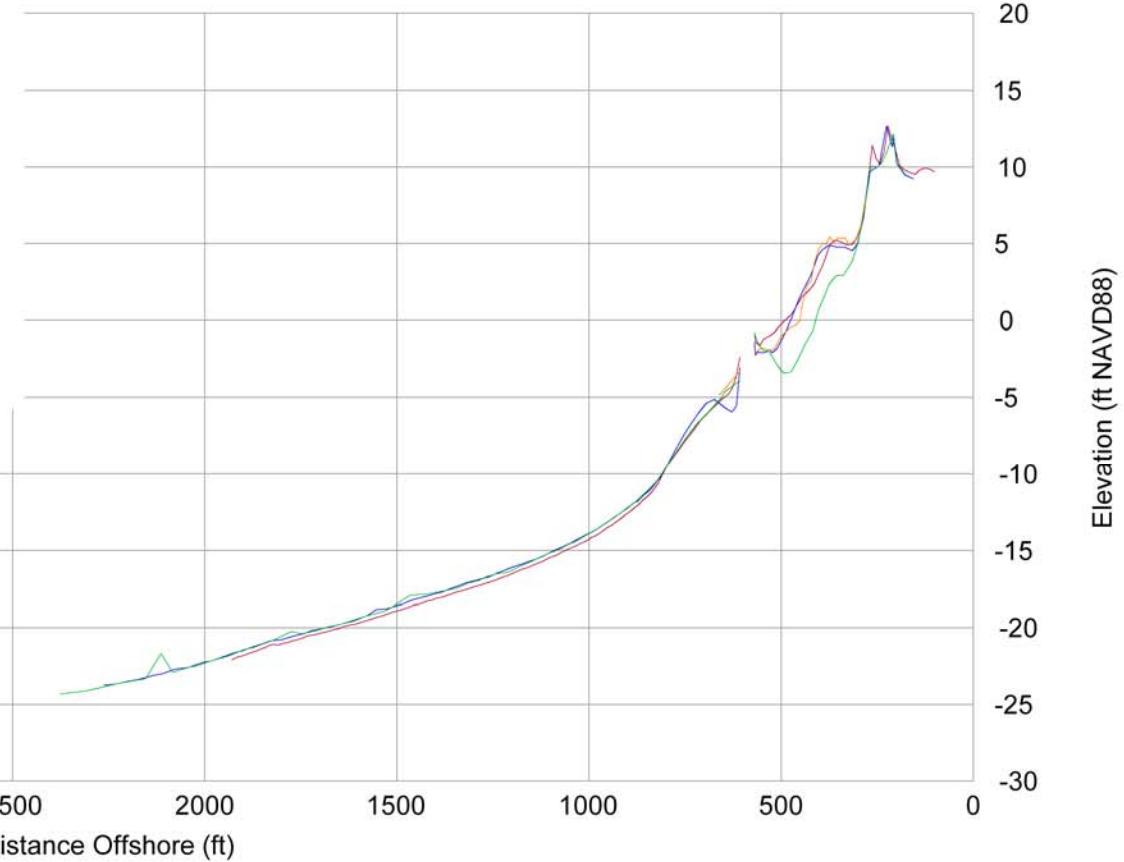


Survey Transect	October 2008 - October 2009	April 2009 - October 2009
356+63		
Shoreline Change at MHW (0.98 ft NAVD88)	44.44 ft/yr	-7.10 ft
Volume Change Above -15 ft NAVD88	20.68 cy/ft/yr	-9.32 cy/ft
Volume Change Above 0 ft NAVD88	7.68 cy/ft/yr	-2.95 cy/ft

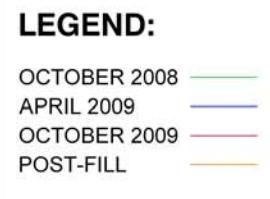


Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.



Survey Transect 358+43	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	61.20 ft/yr	-1.00 ft
Volume Change Above -15 ft NAVD88	19.64 cy/ft/yr	-5.88 cy/ft
Volume Change Above 0 ft NAVD88	13.51 cy/ft/yr	-0.02 cy/ft

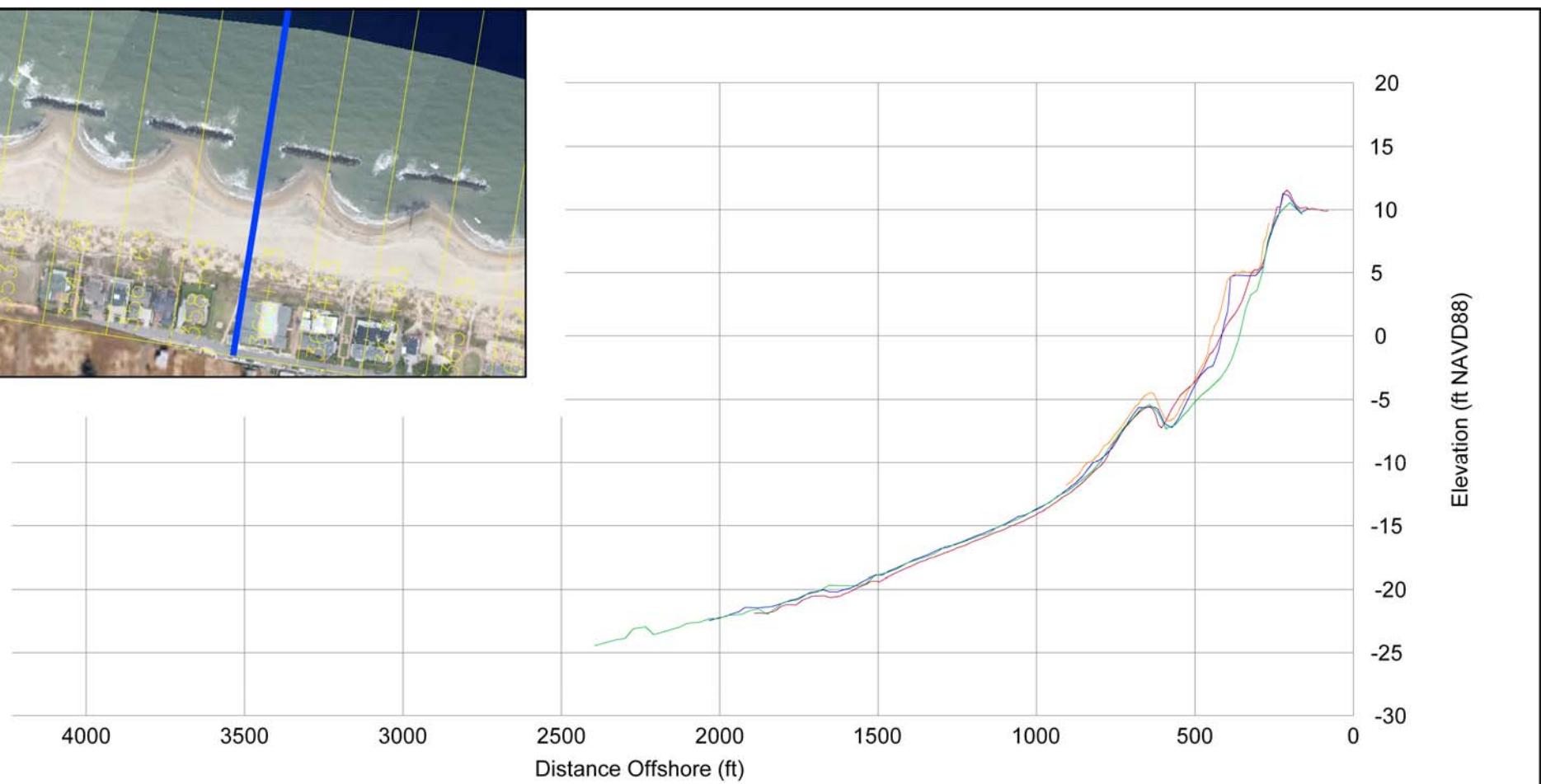


Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. 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	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	46.21 ft/yr	-10.52 ft
Volume Change Above -15 ft NAVD88	20.46 cy/ft/yr	-5.28 cy/ft
Volume Change Above 0 ft NAVD88	8.94 cy/ft/yr	-4.06 cy/ft

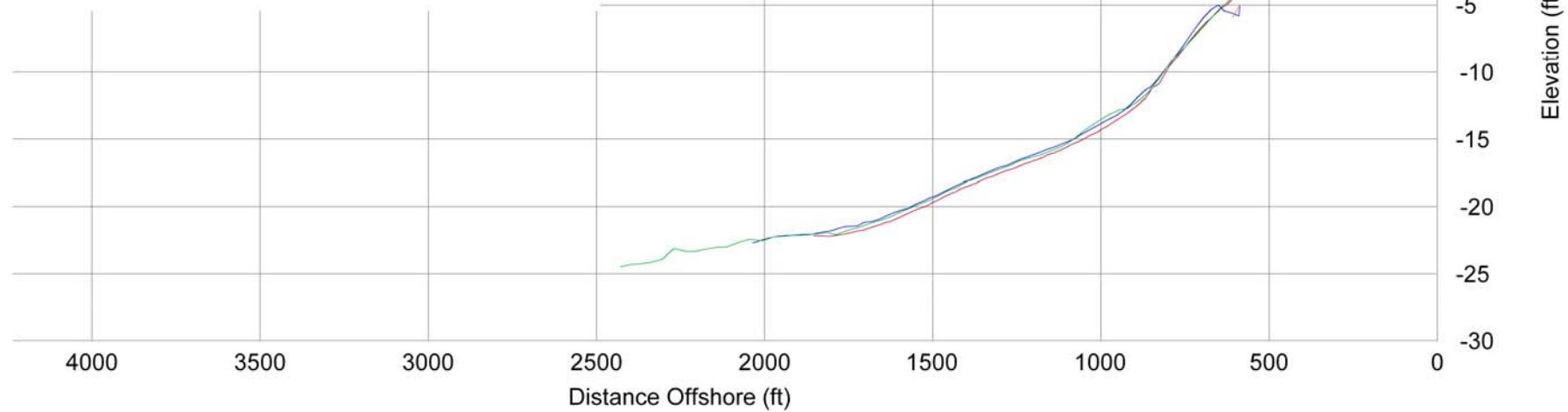


Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.

City of Norfolk

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Survey Transect 362+03	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	76.68 ft/yr	-8.47 ft
Volume Change Above -15 ft NAVD88	22.41 cy/ft/yr	-3.57 cy/ft
Volume Change Above 0 ft NAVD88	14.88 cy/ft/yr	0.17 cy/ft

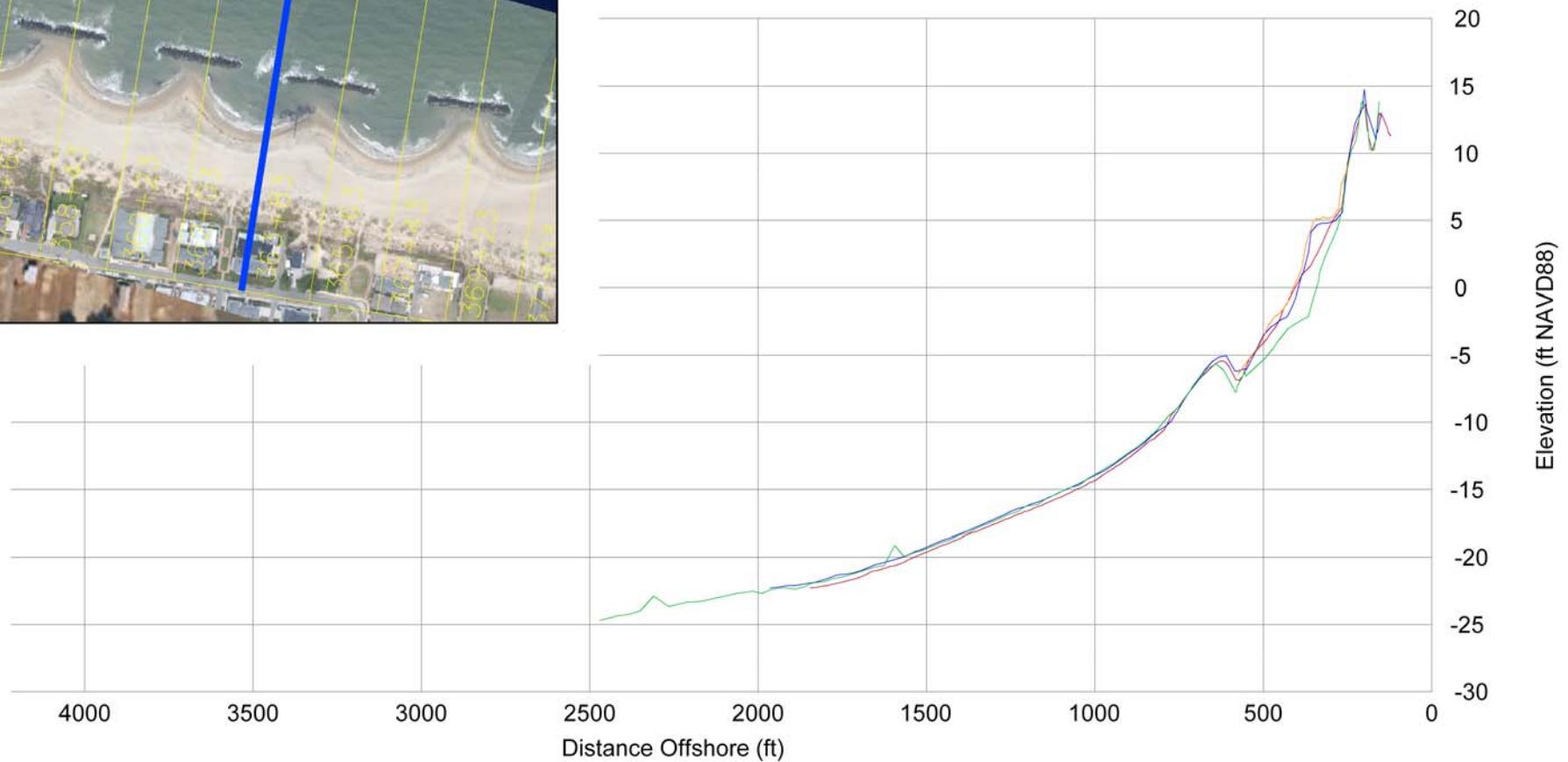


Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. 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	October 2008 - October 2009	April 2009 - October 2009
363+83		
Shoreline Change at MHW (0.98 ft NAVD88)	49.71 ft/yr	-1.96 ft
Volume Change Above -15 ft NAVD88	17.42 cy/ft/yr	-9.16 cy/ft
Volume Change Above 0 ft NAVD88	7.41 cy/ft/yr	-5.36 cy/ft

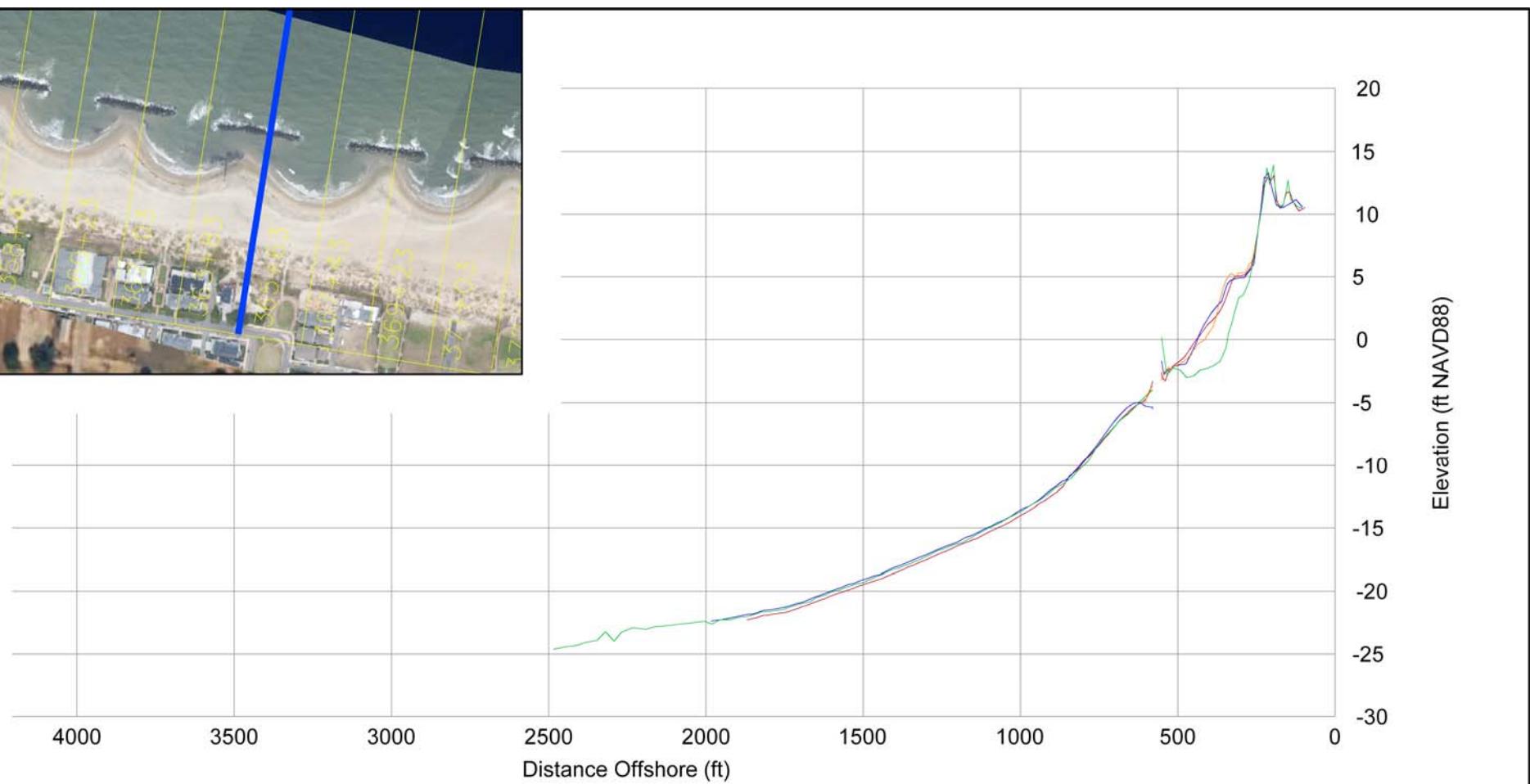


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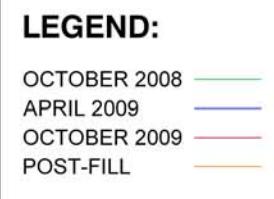
1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
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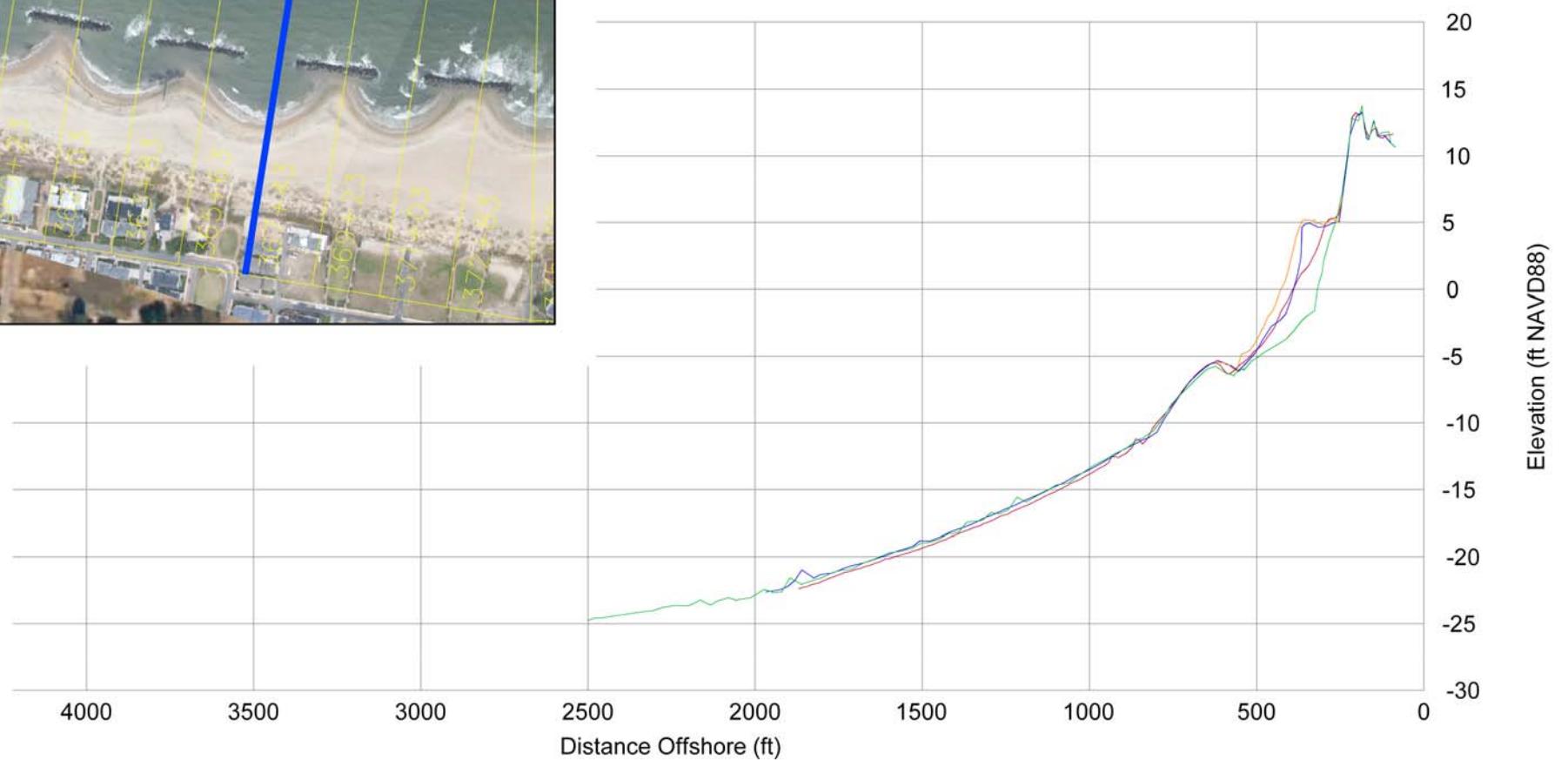


Survey Transect 365+63	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	79.09 ft/yr	-9.07 ft
Volume Change Above -15 ft NAVD88	19.98 cy/ft/yr	-4.93 cy/ft
Volume Change Above 0 ft NAVD88	11.19 cy/ft/yr	-0.36 cy/ft



Notes:

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2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.



Survey Transect	October 2008 - October 2009	April 2009 - October 2009
367+43		
Shoreline Change at MHW (0.98 ft NAVD88)	62.92 ft/yr	-8.51 ft
Volume Change Above -15 ft NAVD88	19.77 cy/ft/yr	-6.48 cy/ft
Volume Change Above 0 ft NAVD88	7.69 cy/ft/yr	-4.86 cy/ft

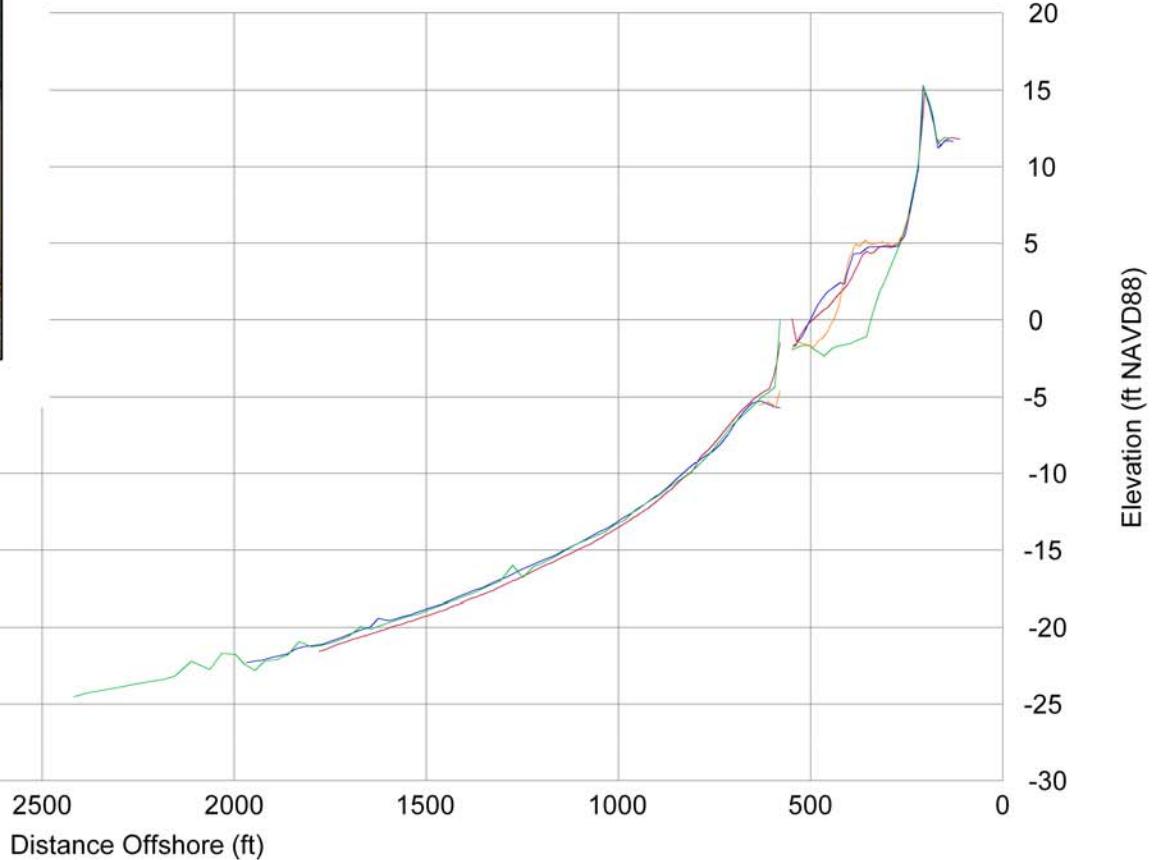


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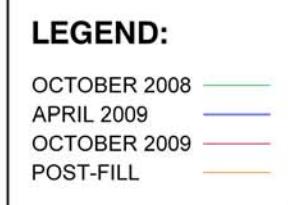
1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.

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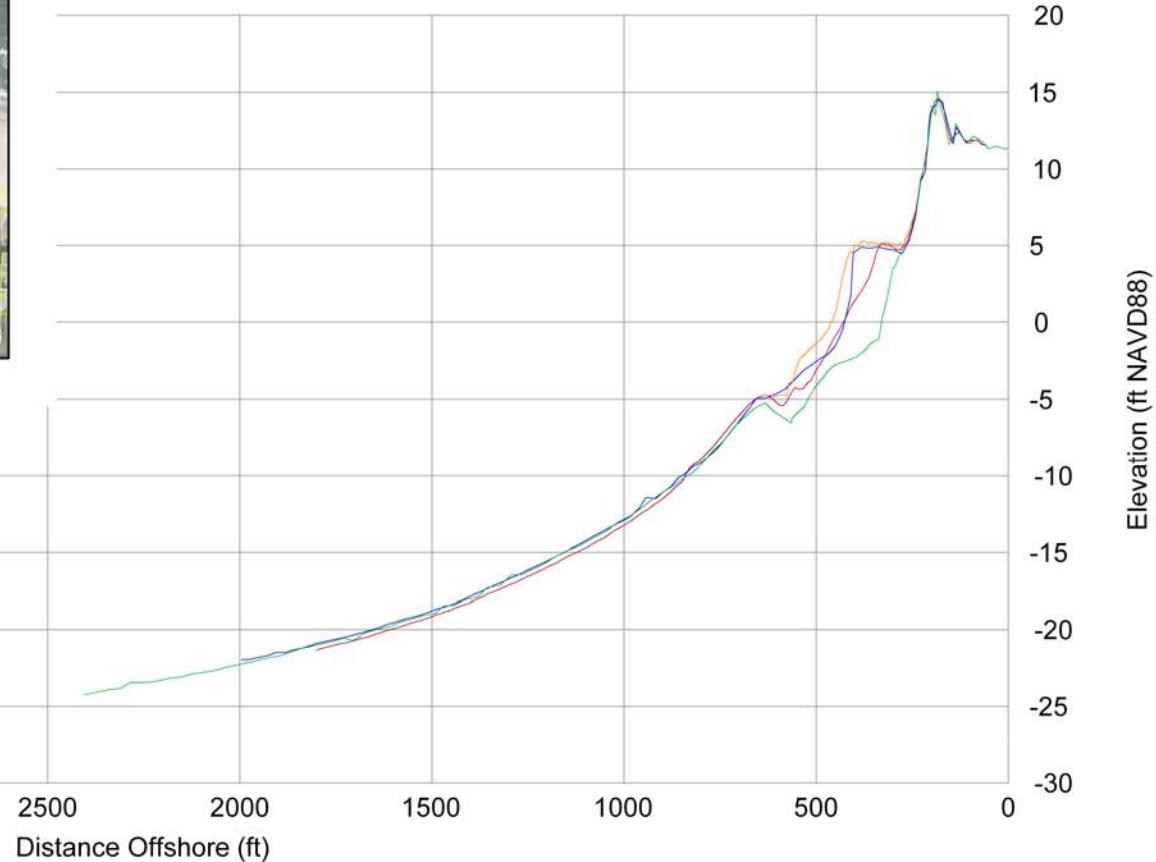


Survey Transect 369+23	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	117.89 ft/yr	-31.61 ft
Volume Change Above -15 ft NAVD88	-1.50 cy/ft/yr	-8.63 cy/ft
Volume Change Above 0 ft NAVD88	16.86 cy/ft/yr	-3.93 cy/ft



Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.



Survey Transect 371+03	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	88.85 ft/yr	-7.18 ft
Volume Change Above -15 ft NAVD88	28.54 cy/ft/yr	-10.48 cy/ft
Volume Change Above 0 ft NAVD88	12.96 cy/ft/yr	-4.87 cy/ft

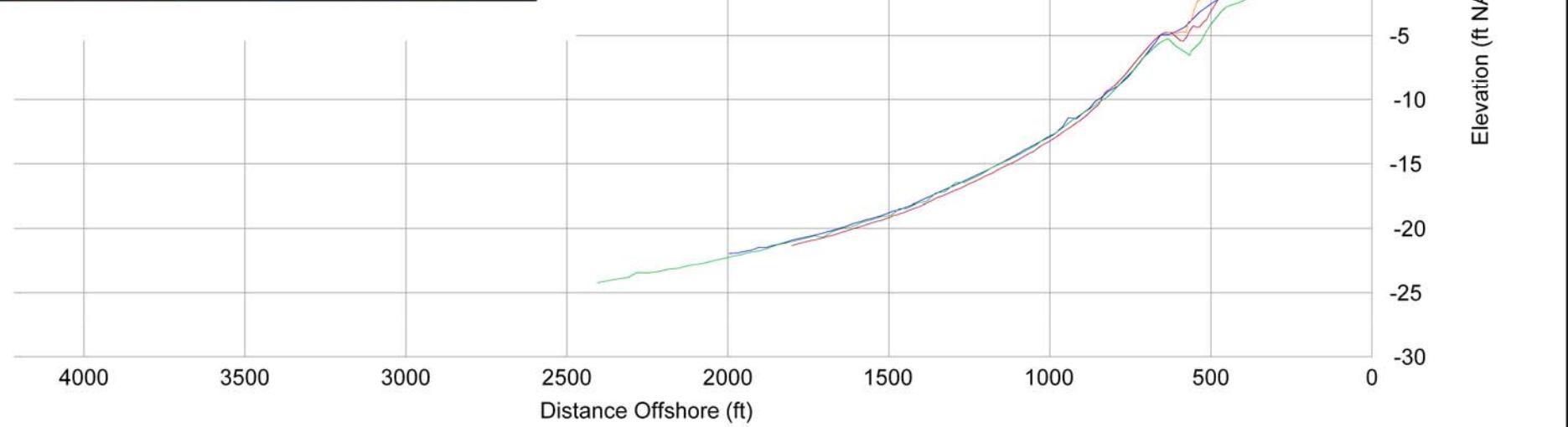


Notes:

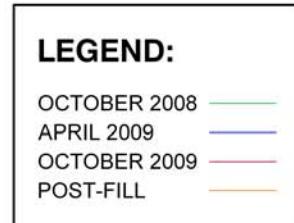
1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.

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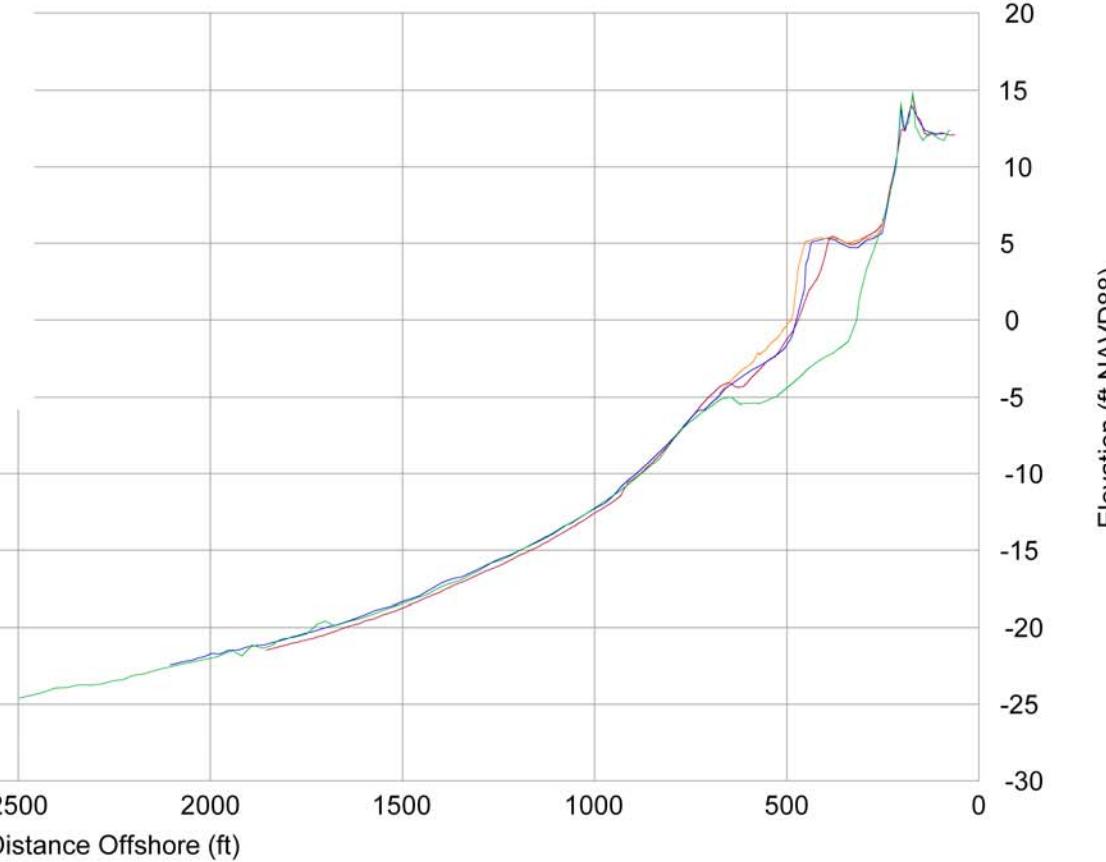
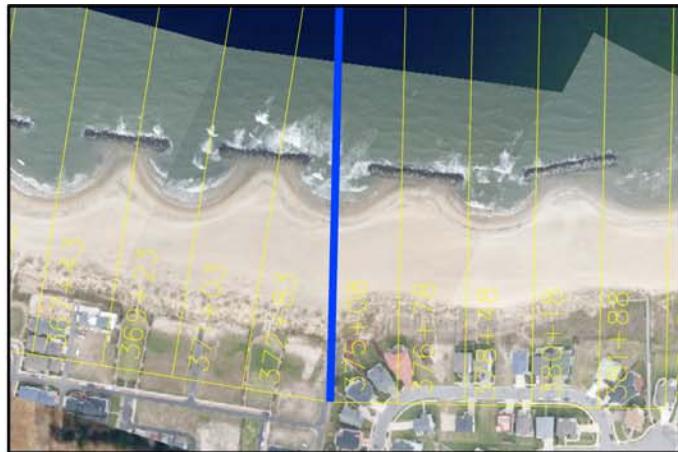


Survey Transect 372+83	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	172.95 ft/yr	-29.15 ft
Volume Change Above -15 ft NAVD88	-2.75 cy/ft/yr	-6.33 cy/ft
Volume Change Above 0 ft NAVD88	30.23 cy/ft/yr	-0.97 cy/ft

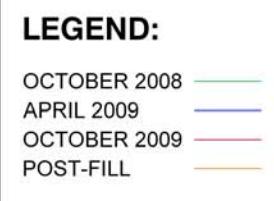


Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.



Survey Transect	October 2008 - October 2009	April 2009 - October 2009
375+08		
Shoreline Change at MHW (0.98 ft NAVD88)	143.06 ft/yr	-8.62 ft
Volume Change Above -15 ft NAVD88	53.74 cy/ft/yr	-7.63 cy/ft
Volume Change Above 0 ft NAVD88	26.58 cy/ft/yr	-3.74 cy/ft

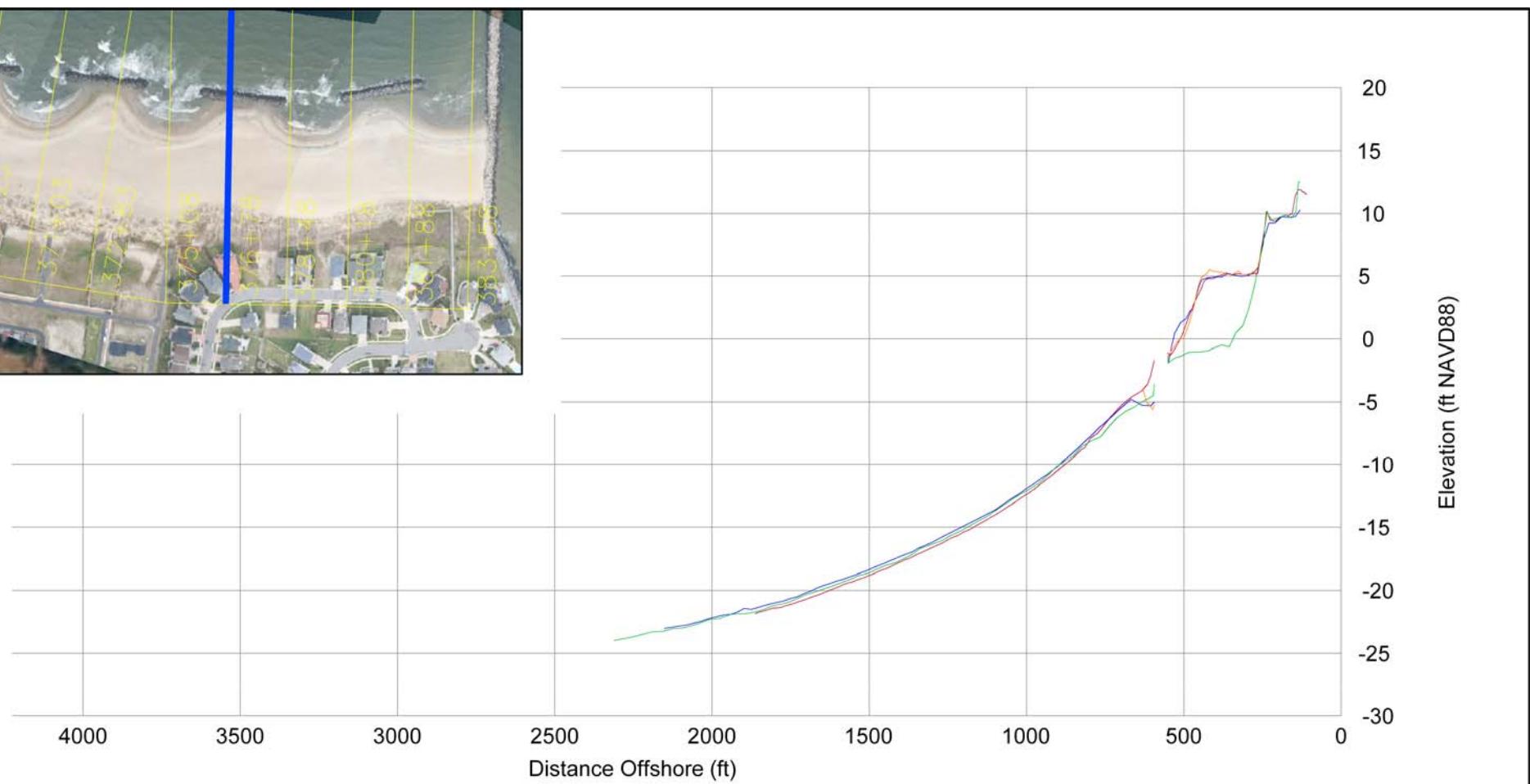
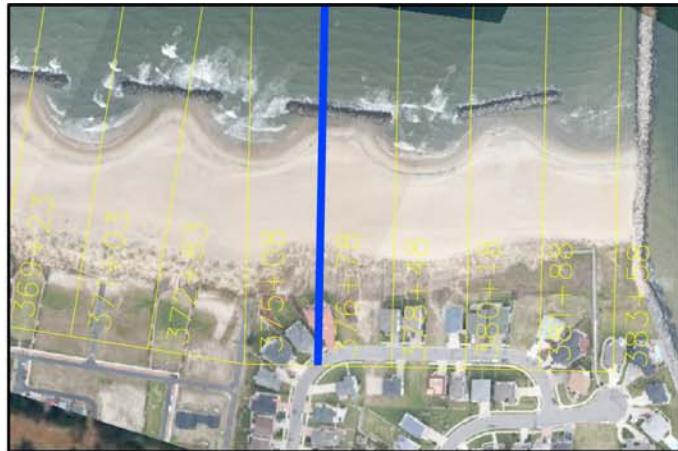


Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. 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 376+78	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	180.26 ft/yr	-21.94 ft
Volume Change Above -15 ft NAVD88	-3.53 cy/ft/yr	-7.02 cy/ft
Volume Change Above 0 ft NAVD88	33.17 cy/ft/yr	0.09 cy/ft

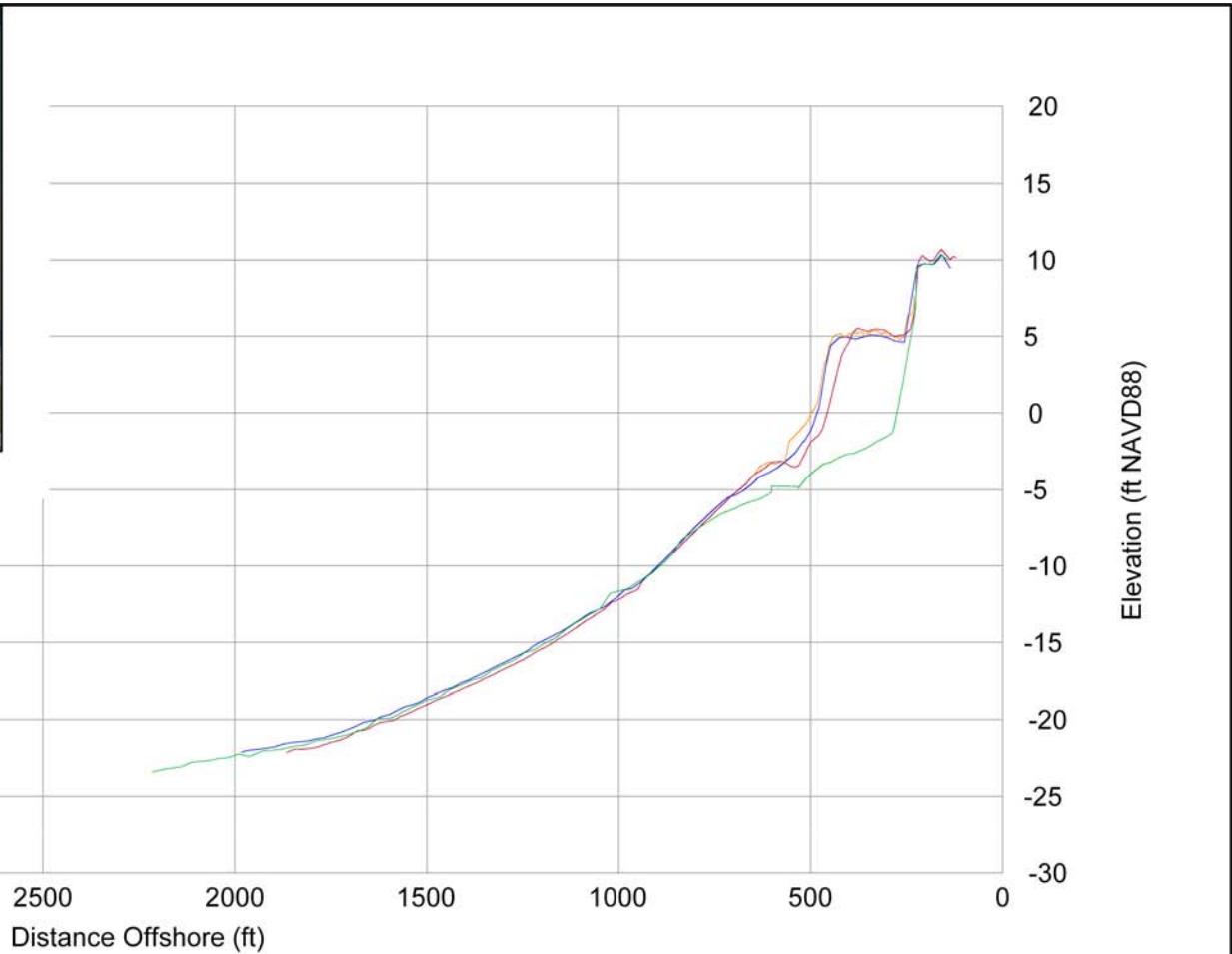


Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. 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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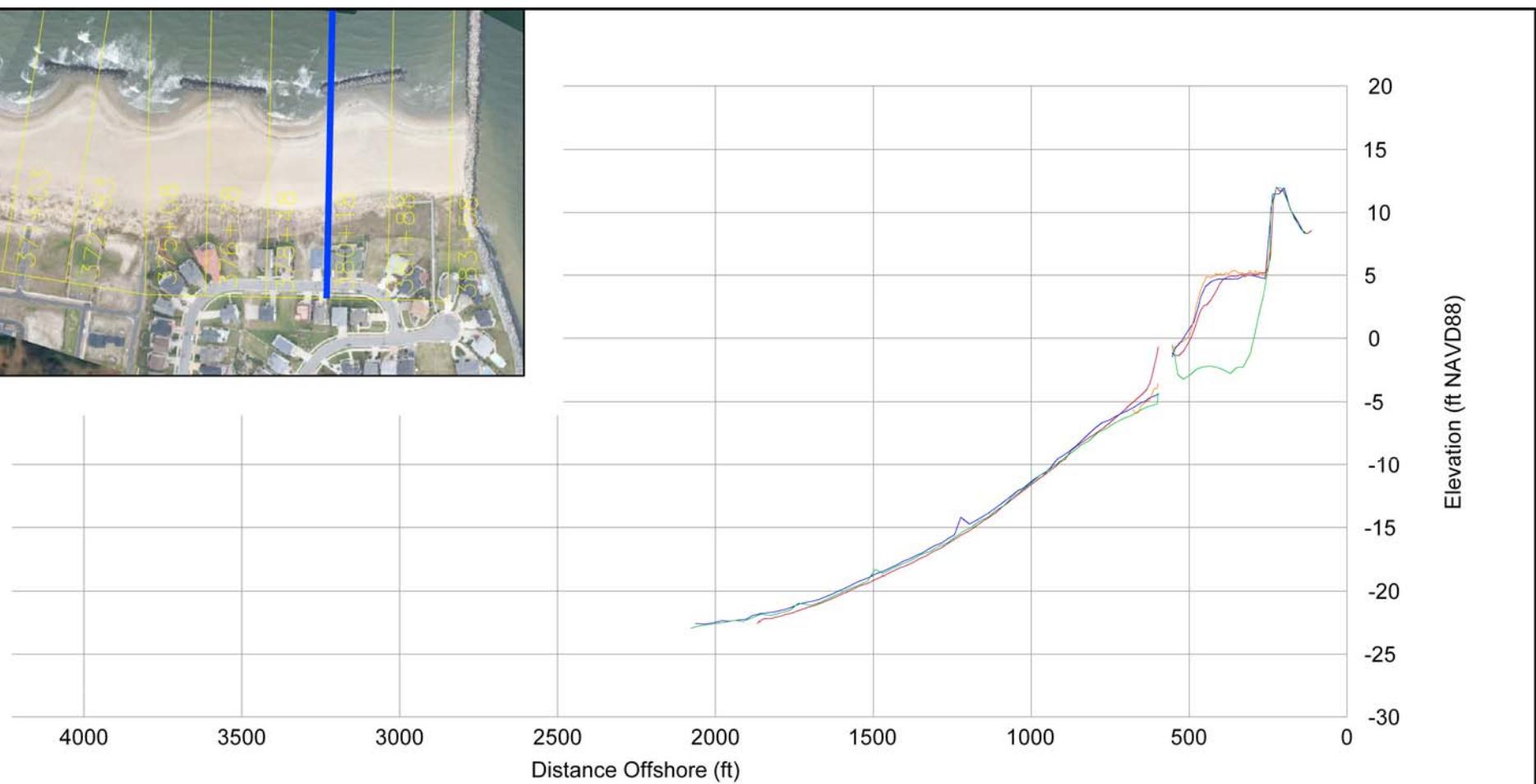


Survey Transect 378+48	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	179.24 ft/yr	-27.21 ft
Volume Change Above -15 ft NAVD88	63.01 cy/ft/yr	-10.11 cy/ft
Volume Change Above 0 ft NAVD88	34.85 cy/ft/yr	-4.02 cy/ft



Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.



Survey Transect 380+18	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	193.71 ft/yr	-12.73 ft
Volume Change Above -15 ft NAVD88	50.02 cy/ft/yr	-11.83 cy/ft
Volume Change Above 0 ft NAVD88	31.46 cy/ft/yr	-4.75 cy/ft

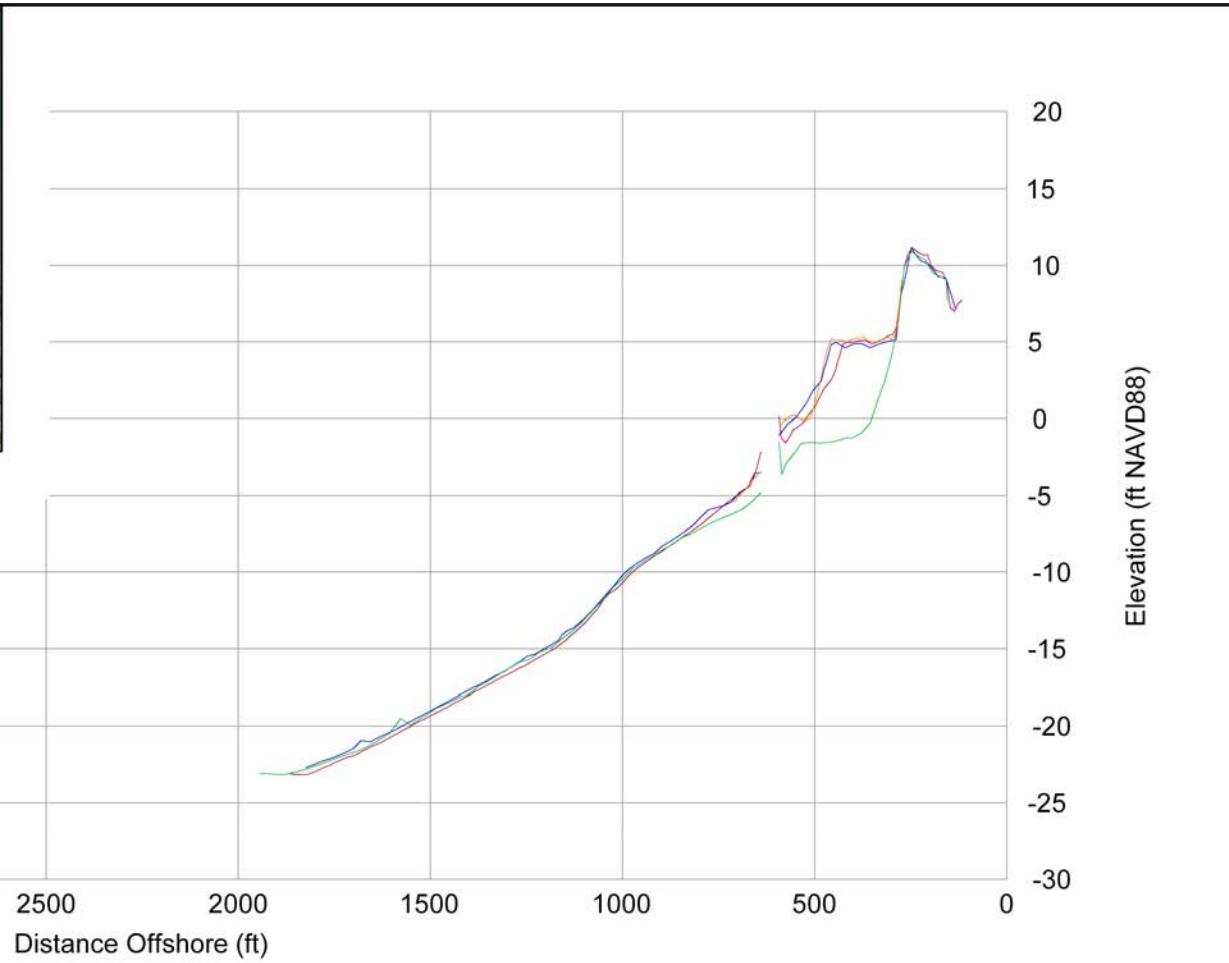


Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. 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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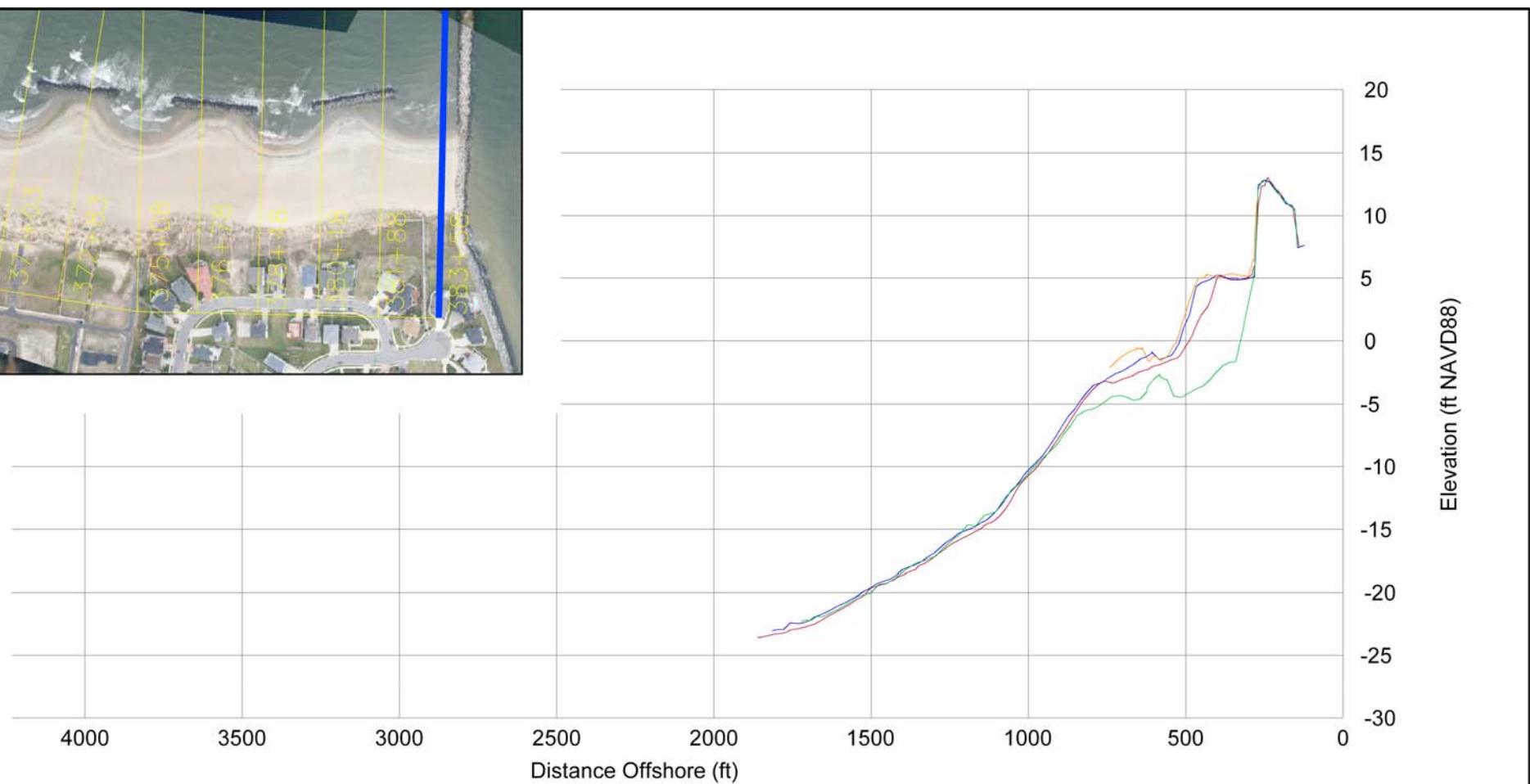


Survey Transect 381+88	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	156.11 ft/yr	-27.75 ft
Volume Change Above -15 ft NAVD88	-0.98 cy/ft/yr	-9.49 cy/ft
Volume Change Above 0 ft NAVD88	28.95 cy/ft/yr	-2.38 cy/ft



Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. For Transects With Offshore Breakwaters, Volume Change Calculations Were Limited To The Portions Of The Profiles Both Landward And Seaward Of The Breakwater.

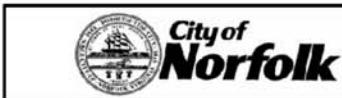


Survey Transect 383+58	October 2008 - October 2009	April 2009 - October 2009
Shoreline Change at MHW (0.98 ft NAVD88)	154.18 ft/yr	-36.40 ft
Volume Change Above -15 ft NAVD88	60.18 cy/ft/yr	-21.97 cy/ft
Volume Change Above 0 ft NAVD88	24.89 cy/ft/yr	-8.51 cy/ft



Notes:

1. Stationing From West To East At Varying Intervals.
2. Sections Are Viewed Toward Increasing Stationing.
3. All Survey Elevations In Feet Referenced to NAVD88.
4. Survey Comparison Made To October 2008 and April 2009.
5. 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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Appendix C: Summary of Shoreline Change and Volume Change Tables

**Table C-1. Summary of Shoreline Change and Volume Change
(October 2008 to October 2009)**

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 October 1, 2008 to November 6, 2009.

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 NAVD 88 (cy/ft/yr)
0+00	10/1/2008	11/6/2009	-17.15	0.86	-83.81
2+50	10/1/2008	11/6/2009	-15.23	1.63	-72.41
5+00	10/1/2008	11/6/2009	-2.81	3.37	-103.16
7+50	10/1/2008	11/6/2009	3.67	3.46	-100.29
10+00	10/1/2008	11/6/2009	-1.72	-0.32	-70.98
12+50	10/1/2008	11/6/2009	2.68	6.57	6.57
15+00	10/1/2008	11/6/2009	1.36	4.15	-71.38
17+50	10/1/2008	11/6/2009	-4.83	4.73	-57.54
20+00	10/1/2008	11/6/2009	-16.32	1.32	-72.06
22+50	10/1/2008	11/6/2009	-10.44	1.58	-55.64
25+00	10/1/2008	11/6/2009	-25.62	-2.78	-69.56
27+50	10/1/2008	11/6/2009	10.09	0.96	-64.23
30+00	10/1/2008	11/6/2009	-20.58	-3.63	-56.88
32+50	10/1/2008	11/6/2009	-13.71	5.63	-66.65
35+00	10/1/2008	11/6/2009	-50.09	-5.54	-61.93
37+50	10/1/2008	11/6/2009	-4.74	1.94	-53.27
40+00	10/1/2008	11/6/2009	-45.74	-6.33	-54.15
42+50	10/1/2008	11/6/2009	-3.37	2.41	-41.98
45+00	10/1/2008	11/6/2009	-39.15	-4.18	-51.83
45+25	10/1/2008	11/6/2009	-22.10	-1.11	-43.29
47+30	10/1/2008	11/6/2009	-14.47	-1.04	-41.39
49+35	10/1/2008	11/6/2009	18.22	-0.94	-42.58
51+41	10/1/2008	11/6/2009	0.96	1.99	-33.92
53+46	10/1/2008	11/6/2009	-67.62	-5.25	-34.21
55+51	10/1/2008	11/6/2009	-22.79	-3.12	-38.53
57+57	10/1/2008	11/6/2009	-31.38	-0.87	-30.06
59+62	10/1/2008	11/6/2009	-13.91	-0.33	-29.66
61+62	10/1/2008	11/6/2009	-43.65	-2.52	-29.23
63+62	10/1/2008	11/6/2009	-15.63	-0.15	-30.41
65+62	10/1/2008	11/6/2009	-21.50	1.50	-25.71
67+62	10/1/2008	11/6/2009	-18.97	-2.12	-28.76
69+62	10/1/2008	11/6/2009	-10.49	0.94	-25.71
71+62	10/1/2008	11/6/2009	0.11	1.20	-27.78
73+62	10/1/2008	11/6/2009	-59.34	-4.28	-37.71
75+62	10/1/2008	11/6/2009	-8.33	-0.66	-30.84
77+62	10/1/2008	11/6/2009	-12.70	0.10	-26.63
79+62	10/1/2008	11/6/2009	-8.76	-2.27	-0.28
81+62	10/1/2008	11/6/2009	3.28	0.77	-22.03
83+62	10/1/2008	11/6/2009	12.02	2.62	-22.02
85+62	10/1/2008	11/6/2009	-18.35	-4.06	-33.30
87+62	10/1/2008	11/6/2009	-1.01	-0.94	-27.13

**Table C-1. Summary of Shoreline Change and Volume Change
(October 2008 to October 2009) 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 October 1, 2008 to November 6, 2009.

Transect Number (Station)	Old Survey Date	New Survey Date	Shoreline Change Rate at MHW (ft/yr)	Volume Change Rate Above 0 ft NAVD 88 (cy/ft/yr)	Volume Change Rate Above -15 ft NAVD88 (cy/ft/yr)
93+41	10/1/2008	11/6/2009	3.77	1.34	-11.52
103+08	10/1/2008	11/6/2009	-1.17	-0.81	-13.84
120+93	10/1/2008	11/6/2009	-2.61	-1.65	-13.87
129+17	10/1/2008	11/6/2009	-13.15	-3.74	-16.96
141+98	10/1/2008	11/6/2009	-9.19	-0.91	-14.87
152+01	10/1/2008	11/6/2009	-31.61	-5.79	-19.06
163+49	10/1/2008	11/6/2009	13.06	2.21	2.60
169+63	10/1/2008	11/6/2009	-2.79	-0.20	-7.71
171+63	10/1/2008	11/6/2009	0.93	-1.19	-11.65
173+63	10/1/2008	11/6/2009	9.16	1.63	4.45
175+63	10/1/2008	11/6/2009	6.42	2.74	-0.65
177+63	10/1/2008	11/6/2009	11.96	0.40	-1.93
179+63	10/1/2008	11/6/2009	-10.49	0.11	0.39
181+63	10/1/2008	11/6/2009	-12.99	-2.58	-7.56
183+63	10/1/2008	11/6/2009	6.14	1.75	-2.27
185+63	10/1/2008	11/6/2009	3.42	0.43	-1.03
187+63	10/1/2008	11/6/2009	-7.26	0.21	-1.77
189+63	10/1/2008	11/6/2009	6.20	1.86	1.13
191+63	10/1/2008	11/6/2009	-23.16	-3.12	-7.48
193+63	10/1/2008	11/6/2009	-8.02	-1.90	-8.17
195+63	10/1/2008	11/6/2009	-9.15	-1.90	-8.81
206+86	10/1/2008	11/6/2009	-14.17	-1.38	-12.26
218+66	10/1/2008	11/6/2009	11.95	2.94	0.85
229+85	10/1/2008	11/6/2009	8.34	2.70	-3.78
242+03	10/1/2008	11/6/2009	-22.15	1.10	-1.86
252+62	10/1/2008	11/6/2009	5.73	1.43	-3.76
263+22	10/1/2008	11/6/2009	0.13	1.94	-0.95
274+53	10/1/2008	11/6/2009	-27.20	6.27	1.00
281+40	10/1/2008	11/6/2009	-8.44	3.33	-10.87
288+39	10/1/2008	11/6/2009	-32.17	2.46	-9.38
295+27	10/1/2008	11/6/2009	-21.21	-0.63	-8.23
302+24	10/1/2008	11/6/2009	-24.15	6.29	0.18
315+96	10/1/2008	11/6/2009	8.30	6.93	7.49
323+09	10/1/2008	11/6/2009	-15.43	1.45	0.61
329+63	10/1/2008	11/6/2009	1.08	0.41	8.11
331+43	10/1/2008	11/6/2009	19.06	4.81	11.09
333+23	10/1/2008	11/6/2009	70.64	11.74	40.63
335+03	10/1/2008	11/6/2009	55.82	9.81	22.30
336+83	10/1/2008	11/6/2009	78.77	13.47	31.47
338+63	10/1/2008	11/6/2009	91.78	13.76	44.88
340+43	10/1/2008	11/6/2009	103.48	15.00	30.15
342+23	10/1/2008	11/6/2009	96.07	20.10	37.70

**Table C-1. Summary of Shoreline Change and Volume Change
(October 2008 to October 2009) 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 October 1, 2008 to November 6, 2009.

Transect Number (Station)	Old Survey Date	New Survey Date	Shoreline Change Rate at MHW (ft/yr)	Volume Change Rate Above 0 ft NAVD 88 (cy/ft/yr)	Volume Change Rate Above -15 ft NAVD88 (cy/ft/yr)
344+05	10/1/2008	11/6/2009	85.82	13.43	39.02
345+85	10/1/2008	11/6/2009	32.61	4.28	9.66
347+63	10/1/2008	11/6/2009	30.68	9.43	13.44
349+43	10/1/2008	11/6/2009	23.62	7.31	15.82
351+23	10/1/2008	11/6/2009	29.66	8.30	14.97
353+03	10/1/2008	11/6/2009	28.16	5.95	14.51
354+83	10/1/2008	11/6/2009	51.20	10.83	20.31
356+63	10/1/2008	11/6/2009	40.45	6.99	19.16
358+43	10/1/2008	11/6/2009	55.70	12.30	20.08
360+23	10/1/2008	11/6/2009	42.06	8.14	18.80
362+03	10/1/2008	11/6/2009	69.80	13.55	21.36
363+83	10/1/2008	11/6/2009	45.25	6.74	16.00
365+63	10/1/2008	11/6/2009	71.99	10.19	16.34
367+43	10/1/2008	11/6/2009	57.27	7.00	18.24
369+23	10/1/2008	11/6/2009	107.31	15.35	24.26
371+03	10/1/2008	11/6/2009	80.88	11.79	26.18
372+83	10/1/2008	11/6/2009	157.42	27.52	39.40
375+08	10/1/2008	11/6/2009	130.22	24.19	49.06
376+78	10/1/2008	11/6/2009	164.07	30.19	37.95
378+48	10/1/2008	11/6/2009	163.15	31.72	57.42
380+18	10/1/2008	11/6/2009	176.32	28.64	55.32
381+88	10/1/2008	11/6/2009	142.10	26.35	42.31
383+58	10/1/2008	11/6/2009	140.34	22.66	55.32

**Table C-2. Summary of Shoreline Change and Volume Change
(April 2009 to October 2009)**

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 May 1, 2009 to November 6, 2009.

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	5/1/2009	11/6/2009	-71.29	-1.65	-106.05
2+50	5/1/2009	11/6/2009	-8.75	1.56	-93.89
5+00	5/1/2009	11/6/2009	12.56	-0.22	-104.78
7+50	5/1/2009	11/6/2009	8.33	3.66	-104.74
10+00	5/1/2009	11/6/2009	2.02	-0.05	4.40
12+50	5/1/2009	11/6/2009	-23.90	4.32	6.03
15+00	5/1/2009	11/6/2009	-7.99	4.21	-77.60
17+50	5/1/2009	11/6/2009	-5.84	3.82	-69.16
20+00	5/1/2009	11/6/2009	-18.59	0.06	-76.79
22+50	5/1/2009	11/6/2009	-4.51	2.01	-60.80
25+00	5/1/2009	11/6/2009	-16.51	-0.90	-69.56
27+50	5/1/2009	11/6/2009	-18.16	-3.72	-72.48
30+00	5/1/2009	11/6/2009	-18.37	-3.13	-67.95
32+50	5/1/2009	11/6/2009	-11.15	3.61	-61.93
35+00	5/1/2009	11/6/2009	-20.34	-4.90	-62.45
37+50	5/1/2009	11/6/2009	-18.37	0.20	-59.63
40+00	5/1/2009	11/6/2009	-23.42	-2.32	-52.98
42+50	5/1/2009	11/6/2009	-10.16	-0.53	-48.97
45+00	5/1/2009	11/6/2009	-5.60	-3.03	-51.15
45+25	5/1/2009	11/6/2009	-15.12	0.10	-44.62
47+30	5/1/2009	11/6/2009	-3.31	0.80	-40.65
49+35	5/1/2009	11/6/2009	-31.74	-3.26	-48.73
51+41	5/1/2009	11/6/2009	5.17	0.71	-33.25
53+46	5/1/2009	11/6/2009	-57.73	-4.50	-35.38
55+51	5/1/2009	11/6/2009	0.29	-0.80	-34.20
57+57	5/1/2009	11/6/2009	-54.15	-4.19	-24.95
59+62	5/1/2009	11/6/2009	-0.62	1.31	-23.44
61+62	5/1/2009	11/6/2009	-39.34	-2.18	-21.38
63+62	5/1/2009	11/6/2009	6.22	1.15	-21.68
65+62	5/1/2009	11/6/2009	-28.75	-1.80	-29.44
67+62	5/1/2009	11/6/2009	4.42	0.72	-20.58
69+62	5/1/2009	11/6/2009	-38.82	-4.69	-35.29
71+62	5/1/2009	11/6/2009	-0.12	-0.49	-24.93
73+62	5/1/2009	11/6/2009	-17.58	-1.79	-33.82
75+62	5/1/2009	11/6/2009	4.44	2.17	-22.37
77+62	5/1/2009	11/6/2009	-21.80	0.33	-24.61
79+62	5/1/2009	11/6/2009	5.12	1.75	5.11
81+62	5/1/2009	11/6/2009	2.54	2.53	-19.18
83+62	5/1/2009	11/6/2009	6.12	0.16	-24.49
85+62	5/1/2009	11/6/2009	-20.22	-2.54	-29.33
87+62	5/1/2009	11/6/2009	-3.28	-2.15	-26.49

**Table C-2. Summary of Shoreline Change and Volume Change
(April 2009 to October 2009) 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 May 1, 2009 to November 6, 2009.

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	5/1/2009	11/6/2009	4.73	0.84	-15.03
103+08	5/1/2009	11/6/2009	-11.21	-2.48	-18.59
120+93	5/1/2009	11/6/2009	-5.45	-1.36	-13.90
129+17	5/1/2009	11/6/2009	-12.89	-0.86	-8.80
141+98	5/1/2009	11/6/2009	-7.30	-0.62	-12.88
152+01	5/1/2009	11/6/2009	-9.72	-2.05	-10.42
163+49	5/1/2009	11/6/2009	0.81	1.73	-3.55
169+63	5/1/2009	11/6/2009	-8.75	-0.44	-9.14
171+63	5/1/2009	11/6/2009	-8.91	-2.04	-10.63
173+63	5/1/2009	11/6/2009	3.56	0.82	-2.52
175+63	5/1/2009	11/6/2009	-4.56	0.24	-3.67
177+63	5/1/2009	11/6/2009	-14.40	-3.17	-5.69
179+63	5/1/2009	11/6/2009	-17.82	-2.23	-14.20
181+63	5/1/2009	11/6/2009	-4.30	-0.92	-3.88
183+63	5/1/2009	11/6/2009	-12.53	-2.13	-9.91
185+63	5/1/2009	11/6/2009	5.48	1.37	-0.08
187+63	5/1/2009	11/6/2009	-24.75	-3.58	-9.12
189+63	5/1/2009	11/6/2009	11.25	2.58	2.66
191+63	5/1/2009	11/6/2009	-39.59	-3.21	-13.51
193+63	5/1/2009	11/6/2009	-11.58	-0.86	-7.49
195+63	5/1/2009	11/6/2009	-4.19	-1.26	-3.54
206+86	5/1/2009	11/6/2009	-18.91	-3.68	-15.45
218+66	5/1/2009	11/6/2009	4.31	-0.57	-12.31
229+85	5/1/2009	11/6/2009	7.47	-0.16	-0.62
242+03	5/1/2009	11/6/2009	-25.13	-2.38	-4.29
252+62	5/1/2009	11/6/2009	-13.57	-3.08	-15.49
263+22	5/1/2009	11/6/2009	1.69	1.19	-3.87
274+53	5/1/2009	11/6/2009	-21.72	5.32	-4.04
281+40	5/1/2009	11/6/2009	-7.67	-0.44	-14.11
288+39	5/1/2009	11/6/2009	-25.38	-2.91	-11.14
295+27	5/1/2009	11/6/2009	-23.37	-3.14	-6.35
302+24	5/1/2009	11/6/2009	-14.31	-1.56	-3.02
315+96	5/1/2009	11/6/2009	4.10	-2.06	-2.88
323+09	5/1/2009	11/6/2009	-15.89	-0.01	2.23
329+63	5/1/2009	11/6/2009	-59.93	-8.05	-17.27
331+43	5/1/2009	11/6/2009	-53.62	-9.28	-18.01
333+23	5/1/2009	11/6/2009	-1.34	-3.65	1.72
335+03	5/1/2009	11/6/2009	-19.69	-5.51	-12.32
336+83	5/1/2009	11/6/2009	-12.90	-3.73	-7.31
338+63	5/1/2009	11/6/2009	-7.48	-1.48	4.61
340+43	5/1/2009	11/6/2009	-16.96	-6.82	-13.98

**Table C-2. Summary of Shoreline Change and Volume Change
(April 2009 to October 2009) 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 May 1, 2009 to November 6, 2009.

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	5/1/2009	11/6/2009	-18.69	-3.12	-5.77
344+05	5/1/2009	11/6/2009	-5.17	-1.58	0.32
345+85	5/1/2009	11/6/2009	-33.91	-8.82	-13.76
347+63	5/1/2009	11/6/2009	-36.25	-3.53	-7.57
349+43	5/1/2009	11/6/2009	-10.92	-3.13	-5.97
351+23	5/1/2009	11/6/2009	-1.26	-1.91	-4.70
353+03	5/1/2009	11/6/2009	-5.47	-1.22	-3.39
354+83	5/1/2009	11/6/2009	-0.52	1.19	-0.09
356+63	5/1/2009	11/6/2009	-7.10	-2.95	-9.20
358+43	5/1/2009	11/6/2009	-1.00	-0.02	-0.27
360+23	5/1/2009	11/6/2009	-10.52	-4.06	-5.14
362+03	5/1/2009	11/6/2009	-8.47	0.17	2.12
363+83	5/1/2009	11/6/2009	-1.96	-5.36	-9.06
365+63	5/1/2009	11/6/2009	-9.07	-0.36	-1.66
367+43	5/1/2009	11/6/2009	-8.51	-4.86	-6.02
369+23	5/1/2009	11/6/2009	-31.61	-3.93	2.75
371+03	5/1/2009	11/6/2009	-7.18	-4.87	-10.21
372+83	5/1/2009	11/6/2009	-29.15	-0.97	-1.43
375+08	5/1/2009	11/6/2009	-8.62	-3.74	-7.46
376+78	5/1/2009	11/6/2009	-21.94	0.09	0.00
378+48	5/1/2009	11/6/2009	-27.21	-4.02	-9.87
380+18	5/1/2009	11/6/2009	-12.73	-4.75	-4.00
381+88	5/1/2009	11/6/2009	-27.75	-2.38	-6.85
383+58	5/1/2009	11/6/2009	-36.40	-8.51	-21.80

Table C-3. Summary of Shoreline Change and Volume Change from East Ocean View Nourishment (November 2003 to October 2009)

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 March 20, 2009 to November 6, 2009.

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 NAVD 88 (cy/ft/yr)
329+63	3/20/2009	11/6/2009	-104.88	-	-
331+43	3/20/2009	11/6/2009	-104.52	-21.67	-28.83
333+23	3/20/2009	11/6/2009	-15.34	-9.91	-10.45
335+03	3/20/2009	11/6/2009	-53.97	-15.34	-23.04
336+83	3/20/2009	11/6/2009	-37.94	-13.37	-17.35
338+63	3/20/2009	11/6/2009	-21.33	-10.03	-10.97
340+43	3/20/2009	11/6/2009	-44.99	-17.38	-15.25
342+23	3/20/2009	11/6/2009	-47.94	-15.36	-8.71
344+05	3/20/2009	11/6/2009	-47.79	-15.24	-18.36
345+85	3/20/2009	11/6/2009	-62.56	-16.01	-20.52
347+63	3/20/2009	11/6/2009	1.05	-4.91	-5.06
349+43	3/20/2009	11/6/2009	-57.39	-13.21	-10.55
351+23	3/20/2009	11/6/2009	26.76	-2.06	-0.32
353+03	3/20/2009	11/6/2009	-37.21	-11.01	-9.91
354+83	3/20/2009	11/6/2009	44.73	-1.60	-4.83
356+63	3/20/2009	11/6/2009	-31.04	-12.98	-24.73
358+43	3/20/2009	11/6/2009	21.87	-2.66	-5.57
360+23	3/20/2009	11/6/2009	-57.92	-16.85	-33.52
362+03	3/20/2009	11/6/2009	18.63	-5.09	-6.61
363+83	3/20/2009	11/6/2009	-15.42	-12.04	-15.55
365+63	3/20/2009	11/6/2009	35.49	-2.01	-0.85
367+43	3/20/2009	11/6/2009	-63.08	-17.31	-27.76
369+23	3/20/2009	11/6/2009	37.09	-2.54	-5.44
371+03	3/20/2009	11/6/2009	-57.53	-18.06	-31.00
372+83	3/20/2009	11/6/2009	31.20	-0.93	-0.71
375+08	3/20/2009	11/6/2009	-39.11	-13.56	-22.34
376+78	3/20/2009	11/6/2009	14.26	-1.48	-1.89
378+48	3/20/2009	11/6/2009	-51.84	-11.20	-21.59
380+18	3/20/2009	11/6/2009	-16.52	-10.10	-0.42
381+88	3/20/2009	11/6/2009	-7.76	-6.74	-9.54
383+58	3/20/2009	11/6/2009	-70.97	-19.74	-36.96

Table C-4. Summary of Shoreline Change and Volume Change from Central Ocean View Nourishment (March 2005 to October 2009)

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 March 15, 2005 to November 6, 2009.

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 NAVD 88 (cy/ft/yr)
15+00	3/15/2005	11/6/2009	8.13	2.80	4.91
17+50	3/15/2005	11/6/2009	10.58	2.23	0.23
20+00	3/15/2005	11/6/2009	0.07	0.06	0.11
22+50	3/15/2005	11/6/2009	-8.11	-2.49	-4.07
25+00	3/15/2005	11/6/2009	-6.95	-2.72	-2.38
27+50	3/15/2005	11/6/2009	-9.90	-2.51	-0.76
30+00	3/15/2005	11/6/2009	-8.49	-2.13	-2.43
32+50	3/15/2005	11/6/2009	-13.34	-4.46	-5.79
35+00	3/15/2005	11/6/2009	-10.98	-2.91	-4.20
37+50	3/15/2005	11/6/2009	-5.01	-2.59	-4.04
40+00	3/15/2005	11/6/2009	-15.50	-2.98	-4.24
42+50	3/15/2005	11/6/2009	-16.15	-5.20	-6.79
45+00	3/15/2005	11/6/2009	-14.05	-4.77	-6.23
45+25	3/15/2005	11/6/2009	-12.56	-4.01	-6.31
47+30	3/15/2005	11/6/2009	-16.29	-4.96	-7.39
49+35	3/15/2005	11/6/2009	-13.08	-4.25	-5.75
51+41	3/15/2005	11/6/2009	-11.43	-2.95	-3.49
53+46	3/15/2005	11/6/2009	-4.92	-1.15	-1.03
55+51	3/15/2005	11/6/2009	-7.83	-2.19	-4.73
57+57	3/15/2005	11/6/2009	-1.93	-0.44	0.00
59+62	3/15/2005	11/6/2009	-10.44	-2.36	-3.21
61+62	3/15/2005	11/6/2009	2.85	0.87	0.99
63+62	3/15/2005	11/6/2009	-4.72	0.29	-0.61
65+62	3/15/2005	11/6/2009	-3.65	0.47	0.24
67+62	3/15/2005	11/6/2009	-25.78	-2.89	-7.70
69+62	3/15/2005	11/6/2009	-20.85	-2.65	-3.82
71+62	3/15/2005	11/6/2009	-32.64	-4.92	-9.82
73+62	3/15/2005	11/6/2009	-7.47	-0.85	-0.75
75+62	3/15/2005	11/6/2009	1.03	1.55	-0.16
77+62	3/15/2005	11/6/2009	7.00	0.27	0.27
79+62	3/15/2005	11/6/2009	1.69	0.61	3.12
81+62	3/15/2005	11/6/2009	-0.45	-0.52	1.59
83+62	3/15/2005	11/6/2009	-5.02	-1.68	-2.80
85+62	3/15/2005	11/6/2009	-6.46	-2.19	-2.89
87+62	3/15/2005	11/6/2009	-3.02	-0.07	-0.81
93+41	3/15/2005	11/6/2009	-0.29	-0.60	-1.30
103+08	3/15/2005	11/6/2009	-8.23	-2.97	-1.53
120+93	3/15/2005	11/6/2009	-9.52	-4.27	-3.50
129+17	3/15/2005	11/6/2009	-11.63	-4.66	-3.15
141+98	3/15/2005	11/6/2009	-5.60	-1.40	0.29
152+01	3/15/2005	11/6/2009	-9.08	-3.10	-2.97

**Table C-4. Summary of Shoreline Change and Volume Change from
Central Ocean View Nourishment (March 2005 to October 2009)**
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 March 15, 2005 to November 6, 2009.

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 NAVD 88 (cy/ft/yr)
163+49	3/15/2005	11/6/2009	-4.11	-1.51	-0.22
169+63	3/15/2005	11/6/2009	-4.83	-1.26	-1.78
171+63	3/15/2005	11/6/2009	-8.09	-1.92	-2.53
173+63	3/15/2005	11/6/2009	-4.76	-1.88	0.28
175+63	3/15/2005	11/6/2009	-9.34	-2.53	-2.49
177+63	3/15/2005	11/6/2009	-8.05	-2.16	-1.81
179+63	3/15/2005	11/6/2009	-11.19	-2.00	-0.51
181+63	3/15/2005	11/6/2009	-7.66	-3.25	-2.48
183+63	3/15/2005	11/6/2009	0.36	0.08	0.39
185+63	3/15/2005	11/6/2009	-2.60	-0.61	1.69
187+63	3/15/2005	11/6/2009	3.75	1.31	2.60
189+63	3/15/2005	11/6/2009	0.21	1.06	3.05
191+63	3/15/2005	11/6/2009	4.83	1.98	4.26
193+63	3/15/2005	11/6/2009	-2.56	0.57	1.96
195+63	3/15/2005	11/6/2009	-3.36	-0.20	1.00