
Reports

12-2012

Shoreline Evolution: City of Virginia Beach, Virginia, Chesapeake Bay, Lynnhaven River, Broad Bay, and Atlantic Ocean Shorelines

Donna A. Milligan
Virginia Institute of Marine Science

Christine Wilcox
Virginia Institute of Marine Science

C. Scott Hardaway Jr.
Virginia Institute of Marine Science

Mary C. Cox
Virginia Institute of Marine Science

Follow this and additional works at: <https://scholarworks.wm.edu/reports>



Part of the [Environmental Indicators and Impact Assessment Commons](#), [Environmental Monitoring Commons](#), and the [Natural Resources Management and Policy Commons](#)

Recommended Citation

Milligan, D. A., Wilcox, C., Hardaway, C., & Cox, M. C. (2012) Shoreline Evolution: City of Virginia Beach, Virginia, Chesapeake Bay, Lynnhaven River, Broad Bay, and Atlantic Ocean Shorelines. Virginia Institute of Marine Science, William & Mary. <https://doi.org/10.21220/V5BW26>

This Report is brought to you for free and open access by W&M ScholarWorks. It has been accepted for inclusion in Reports by an authorized administrator of W&M ScholarWorks. For more information, please contact scholarworks@wm.edu.

Shoreline Evolution: City of Virginia Beach, Virginia Chesapeake Bay, Lynnhaven River, Broad Bay and Atlantic Ocean Shorelines



Virginia Institute of Marine Science
College of William & Mary
Gloucester Point, Virginia

December 2012

Shoreline Evolution: City of Virginia Beach, Virginia Chesapeake Bay, Lynnhaven River, Broad Bay, and Atlantic Ocean Shorelines

Data Summary Report

Donna A. Milligan
Christine Wilcox
C. Scott Hardaway, Jr.
Mary C. Cox

Shoreline Studies Program
Department of Physical Sciences
Virginia Institute of Marine Science
College of William & Mary
Gloucester Point, Virginia



This project was funded by the Virginia Coastal Zone Management Program at the Department of Environmental Quality through Grant #NA11NOS4190122 of the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, under the Coastal Zone Management Act of 1972, as amended. The views expressed herein are those of the authors and do not necessarily reflect the views of the U.S. Department of Commerce, NOAA, or any of its subagencies.

December 2012

Table of Contents

Table of Contents	i
List of Figures	i
List of Tables	i
1 Introduction	1
2 Methods	1
2.1 Photo Rectification and Shoreline Digitizing	1
2.2 Rate of Change Analysis	2
3 Summary	3
4 References	5

Appendix A. End Point Rate of Shoreline Change Maps

Appendix B. Historical Shoreline Photo Maps

List of Figures

Figure 1. Location of City of Virginia Beach within the Chesapeake Bay estuarine system	1
Figure 2. Index of shoreline plates.	4

List of Tables

Table 1. Average end point rate of change (ft/yr) between 1937 and 2009 for segments along City of Virginia Beach's shoreline.	3
--	---

Cite this report as:

Milligan, D.A., C. Wilcox, C.S. Hardaway, Jr., and M. C. Cox, 2012. Shoreline Evolution: City of Virginia Beach, Virginia, Chesapeake Bay, Lynnhaven River, Broad Bay, and Atlantic Ocean Shorelines. Report prepared for the Virginia Department of Environmental Quality's Coastal Zone Management Program. Shoreline Studies Program, Virginia Institute of Marine Science, College of William & Mary, Gloucester Point, Virginia.

1 Introduction

The City of Virginia Beach is situated along both the Atlantic Ocean and Chesapeake Bay (Figure 1). Through time, the City's shoreline has evolved, and determining the rates and patterns of shore change provides the basis to know how a particular coast has changed through time and how it might proceed in the future. Along Chesapeake Bay's estuarine shores, winds, waves, tides and currents shape and modify coastlines by eroding, transporting and depositing sediments.

The purpose of this report is to document how the shore zone of the City of Virginia Beach has evolved since 1937. Aerial imagery was taken for most of the Bay region beginning that year and can be used to assess the geomorphic nature of shore change. Aerial photos show how the coast has changed, how beaches, dunes, bars, and spits have grown or decayed, how barriers have breached, how inlets have changed course, and how one shore type has displaced another or has not changed at all. Shore change is a natural process but, quite often, the impacts of man, through shore hardening or inlet stabilization, come to dominate a given shore reach. In addition to documenting historical shorelines, the change in shore positions along the rivers and larger creeks in the City of Virginia Beach will be quantified in this report. The shorelines of very irregular coasts, small creeks around inlets, and other complicated areas will be shown but not quantified. In addition to the Atlantic Ocean and Chesapeake Bay shorelines, the Lynnhaven River and Broad Bay shorelines were analyzed for change. Back Bay was not included.

2 Methods

2.1 Photo Rectification and Shoreline Digitizing

An analysis of aerial photographs provides the historical data necessary to understand the suite of processes that work to alter a shoreline. Images of the City of Virginia Beach Shoreline from 1937, 1954, 1970, 1980, 1994, 2002, 2009, and 2011 were used in the analysis. The 1994, 2002, 2009, and 2011 images were available from other sources. The 1994 imagery was orthorectified by the U.S. Geological Survey (USGS) and the 2002, 2009, and 2011 imagery was orthorectified by the Virginia Base Mapping Program (VBMP). The 1937, 1954, 1970, and 1980 photos are part of the VIMS Shoreline Studies Program archives. The historical aerial images acquired to cover the entire shoreline were not always flown on the same day. The dates for each year are:

1937 - April 21, August 15;

1954 - October 11 and 6;

1970 - February 17 and 19;

1980 - March 15

The 2002, 2009, and 2011 were all flown in February and March of their respective years. We could not ascertain the exact dates the 1994 images were flown.

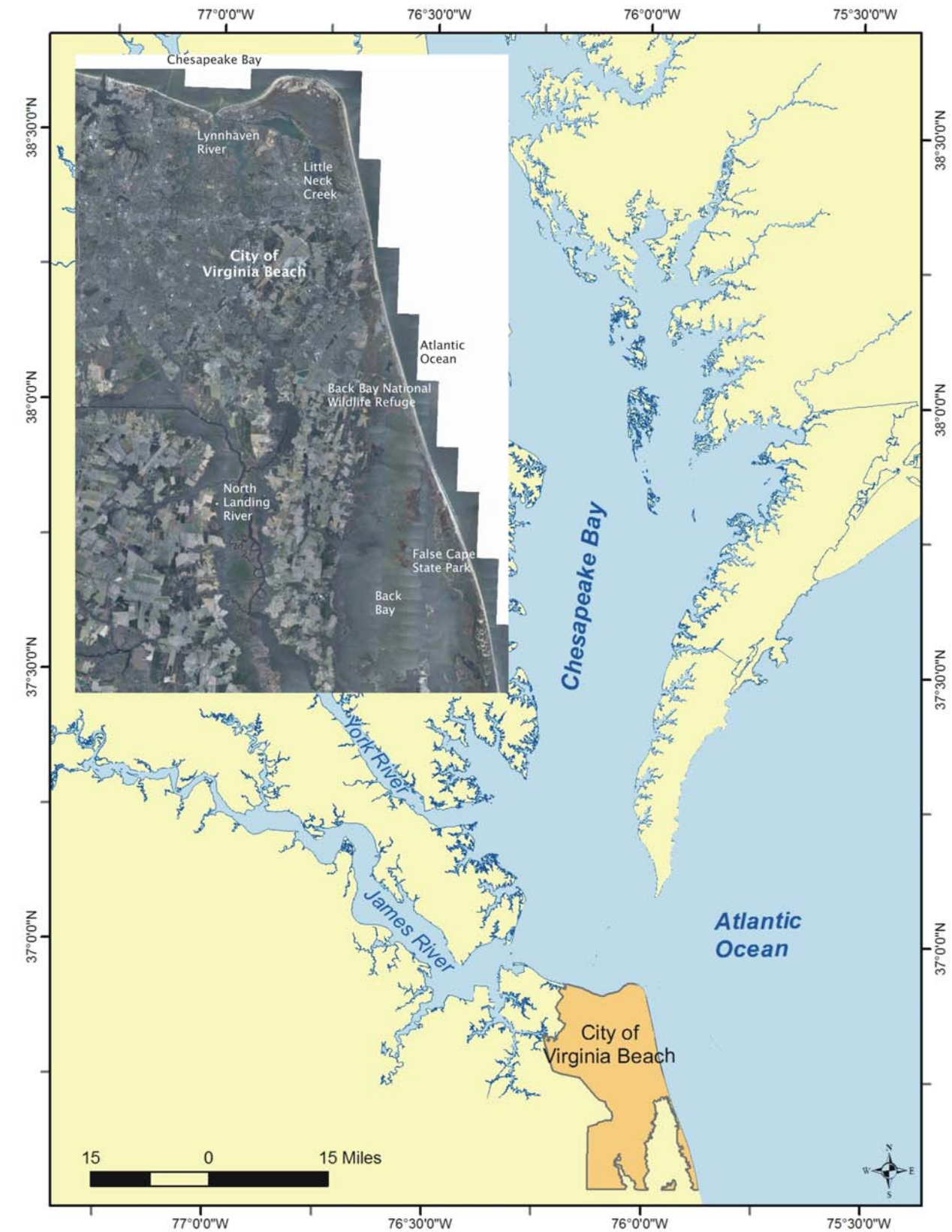


Figure 1. Location of the City of Virginia Beach within the Chesapeake Bay estuarine system.

The 1937, 1954, 1970, and 1980 images were scanned as tiffs at 600 dpi and converted to ERDAS IMAGINE (.img) format. These aerial photographs were orthographically corrected to produce a seamless series of aerial mosaics following a set of standard operating procedures. The 1994 Digital Orthophoto Quarter Quadrangles (DOQQ) from USGS were used as the reference images. The 1994 photos are used rather than higher quality, more recent aeriels because of the difficulty in finding control points that match the earliest 1937 images.

ERDAS Orthobase image processing software was used to orthographically correct the individual flight lines using a bundle block solution. Camera lens calibration data were matched to the image location of fiducial points to define the interior camera model. Control points from 1994 USGS DOQQ images provide the exterior control, which is enhanced by a large number of image-matching tie points produced automatically by the software. The exterior and interior models were combined with a digital elevation model (DEM) from the USGS National Elevation Dataset to produce an orthophoto for each aerial photograph. The orthophotographs were adjusted to approximately uniform brightness and contrast and were mosaicked together using the ERDAS Imagine mosaic tool to produce a one-meter resolution mosaic .img format. To maintain an accurate match with the reference images, it is necessary to distribute the control points evenly, when possible. This can be challenging in areas given the lack of ground features and poor photo quality on the earliest photos. Good examples of control points were manmade features such as road intersections and stable natural landmarks such as ponds and creeks that have not changed much over time. The base of tall features such as buildings, poles, or trees can be used, but the base can be obscured by other features or shadows making these locations difficult to use accurately. Some areas of the City were difficult to rectify, either due to the lack of development when compared to the reference images or due to no development in the historical and the reference images. Even areas with development could be problematic in that some areas of the City have changed a great deal over the years with roads being widened and/or moved.

Once the aerial photos were orthorectified and mosaicked, the shorelines were digitized in ArcMap with the mosaics in the background. The morphologic toe of the beach or edge of marsh was used to approximate low water along the shorelines of Lynnhaven River and Broad Bay. In these areas, high water limit of runup can be difficult to determine on the shoreline due to narrow or non-existent beaches against upland banks or vegetated cover. Along the sandy Chesapeake Bay and Atlantic Ocean shorelines, the approximate position of high water was mapped since it is much more readily visible on the more recent images. In areas where the shoreline was not clearly identifiable on the aerial photography, the location was estimated based on the experience of the digitizer. The displayed shorelines are in shapefile format. One shapefile was produced for each year that was mosaicked.

Horizontal positional accuracy is based upon orthorectification of scanned aerial photography against the USGS digital orthophoto quadrangles. For vertical control, the USGS 30m DEM data was used. The 1994 USGS reference images were developed in accordance with National Map Accuracy Standards (NMAS) for Spatial Data Accuracy at the 1:12,000 scale. The 2002, 2009, and 2011 Virginia Base Mapping Program's orthophotography were developed in accordance with the National Standard for Spatial Data Accuracy (NSSDA). Horizontal root mean square error (RMSE) for historical mosaics was held to less than 20 ft.

2.2 Rate of Change Analysis

The Digital Shoreline Analysis System (DSAS) was used to determine the rate of change for the City's shoreline (Himmelstoss, 2009). All DSAS input data must be managed within a personal geodatabase, which includes all the baselines created for the City of Virginia Beach and the digitized shorelines for 1937, 1954, 1970, 1980, 1994, 2002, 2009, and 2011. Baselines were digitized about 200 feet, more or less, depending on features and space, seaward of the 1937 shoreline and encompassed most of the City's main shorelines but generally did not include the smaller creeks. It also did not include areas that have unique shoreline morphology such as creek mouths and spits. DSAS generated transects perpendicular to the baseline about 33 ft apart, which were manually checked and cleaned up. For the City of Virginia Beach, this method represented about 62 miles of shoreline along 9939 transects.

The End Point Rate (EPR) is calculated by determining the distance between the oldest and most recent shoreline in the data and dividing it by the number of years between them. This method provides an accurate net rate of change over the long term and is relatively easy to apply to most shorelines since it only requires two dates. This method does not use the intervening shorelines so it may not account for changes in accretion or erosion rates that may occur through time. However, Milligan *et al.* (2010a, 2010b, 2010c, 2010d) found that in several localities within the bay, EPR is a reliable indicator of shore change even when intermediate dates exist. Average rates between 1937 and 2009 were calculated along selected areas of the shore; segments are labeled in [Appendix A](#) and shown in [Table 1](#). The photo for a small section of shoreline at Cape Henry was whited out in 1937 so the EPR for this area only was calculated between 1954 and 2009.

Using methodology reported in Morton *et al.* (2004) and National Spatial Data Infrastructure (1998), estimates of error in orthorectification, control source, DEM and digitizing were combined to provide an estimate of total maximum shoreline position error. The data sets that were orthorectified (1937, 1954, 1970, and 1980) have an estimated total maximum shoreline position error of 20.0 ft, while the total maximum shoreline error for the four existing datasets are estimated at 18.3 ft for USGS and 10.2 ft for VBMP. The maximum annualized error for the shoreline data is ± 0.7 ft/yr. The

smaller rivers and creeks are more prone to error due to their lack of good control points for photo rectification, narrower shore features, tree and ground cover and overall smaller rates of change. These areas are digitized but due to the higher potential for error, rates of change analysis are not calculated. Several areas of the City of Virginia Beach have shore change rates that fall within the calculated error. Some of the areas that show very low accretion can be due to errors within the method described above.

The City of Virginia Beach shoreline was divided into 23 plates (Figure 2) in order to display that data in Appendices A and B. In Appendix A, the 2009 image is shown with only the 1937 and 2009 shorelines to show the long-term trends along. In Appendix B, one photo date and the associated shoreline is shown on each. These include the photos taken in 1937, 1954, 1970, 1980, 1994, 2002, 2009, and 2011.

3 Summary

The rates of change shown in Table 1 are averaged across large sections of shoreline and may not be indicative of rates at specific sites within the reach. Some areas of the City, where the shoreline change rates are categorized as accretion, have structures along the shoreline which results in a positive long-term rate of change due to the structures themselves. Little Creek is an example of this. Many modifications to the shoreline by the military has resulted in a small, positive, long-term rate of change. Some of the areas with very low accretion, particularly in the smaller creeks and rivers, may be the result of errors within photo rectification and digitizing wooded shorelines. Many reaches of shoreline in Virginia Beach have been the recipient of beach nourishment projects. In these areas, the EPR may not adequately reflect the rate of change because data from the projects are not included. The EPR does reflect how well the City has maintained its beaches over time.

Segment B extends along the southern shore of Chesapeake Bay between Little Creek and Lynnhaven Inlet. Generally, the shoreline from Little Creek to the Chesapeake Bay Bridge Tunnel is erosional while the shoreline east of the Bridge Tunnel to Lynnhaven Inlet is accretionary. The City regularly places the sand dredged from the maintenance of the Lynnhaven Inlet on the shoreline just west of the Inlet which creates a positive rate of change for that section of shore.

The shoreline that was analyzed for rates of change in Lynnhaven River, Segment C, show that the shoreline generally has low erosion. This is due not only to the lower energy impacting the shoreline, but also because much of the shoreline has been protected over the years with bulkheads and revetments.

Segment F extends from Lynnhaven Inlet to Fort Story. Since sand transport is generally toward the west along the southern shore of Chesapeake Bay and because of complex ebb shoal dynamics, the section of shoreline just east of Lynnhaven Inlet is naturally highly accretionary. The central section of Segment F around Lynnhaven shores has had limited change through time. However infrastructure was located close to the

shoreline so a beach nourishment project took place recently along this section of coast. Farther east along Cape Henry toward the mouth of Chesapeake Bay is highly and very highly accretionary due to the influx of ocean sand and, more recently, the migration of beach renourishment material from the ocean coast. Segment G, along Virginia Beach's Resort Beach north of Rudee Inlet has been renourished regularly since the 1950s. This has resulted in a positive rate of change. Material has not been regularly placed on the northern-most section of Segment G, but sediment transport is to the north along most of Virginia Beach's ocean coast. As a result, a wide dune and beach system has accreted. South of Rudee Inlet, Segment H has very low erosion increasing to low and medium erosion south along the coast. Sections of Segment H and all of Segment I have been the recipients of beach nourishment projects over time.

Previous research as indicated a change in sediment transport direction just south of Little Island Park (Everts *et al.*, 1983) and higher than average breaking wave heights (Wright *et al.*, 1987) which results in the region having the highest rate of shoreline recession on the southeast Virginia coast (Wikel *et al.*, 2005). These factors result in the southern end of Back Bay National Wildlife Refuge and False Cape State Park, Segment K, have lesser rates of change.

Table 1. Average end point rate of change (ft/yr) between 1937 and 2009 for segments along the City of Virginia Beach's shoreline. Segment locations are shown on maps in Appendix A.

Segment Name	Location	Average Rate of Change (ft/yr)
A	Little Creek	0.4
B	Chesapeake Bay, Little Creek to Lynnhaven Inlet	-0.4
C	Lynnhaven River	-0.1
D	Broad Bay	-0.5
E	Link Horn Bay and Little Neck Creek	-0.1
F	Chesapeake Bay, Lynnhaven Inlet to Fort Story	2.8
G	Atlantic Ocean, Fort Story to Rudee Inlet	3.0
H	Atlantic Ocean, Rudee Inlet to Sandbridge	-1.2
I	Atlantic Ocean, Sandbridge to Back Bay NWR	-1.5
J	Atlantic Ocean, Back Bay NWR to False Cape State Park	-2.8
K	Atlantic Ocean, False Cape State Park to State Line	-0.7

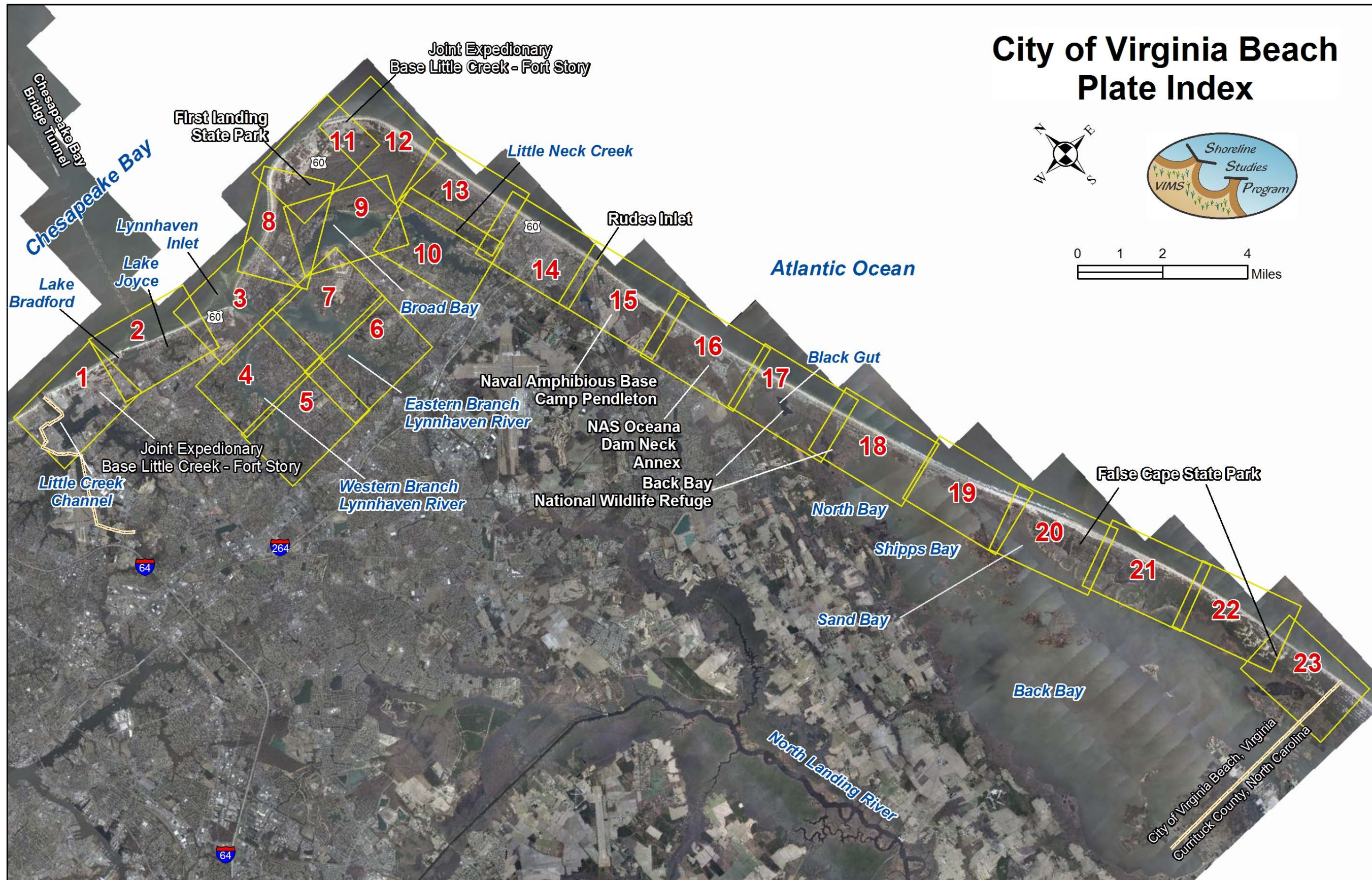


Figure 2. Index of shoreline plates.

4 References

- Everts, C.H., 1983. Shoreline Movements Report 1: Cape Henry, Virginia to Cape Hatteras, North Carolina, 1849-1980. Technical Report, Coastal Engineering Research Center, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, 1-111.
- Himmelstoss, E.A., 2009. "DSAS 4.0 Installation Instructions and User Guide" in: Thieler, E.R., Himmelstoss, E.A., Zichichi, J.L., and Ergul, Ayhan. 2009 Digital Shoreline Analysis System (DSAS) version 4.0 — An ArcGIS extension for calculating shoreline change: U.S. Geological Survey Open-File Report 2008-1278.
- Milligan, D. A., K.P. O'Brien, C. Wilcox, C. S. Hardaway, JR, 2010a. Shoreline Evolution: City of Newport News, Virginia James River and Hampton Roads Shorelines. Virginia Institute of Marine Science. College of William & Mary, Gloucester Point, VA. http://web.vims.edu/physical/research/shoreline/docs/dune_evolution/NewportNews/1NewportNews_Shore_Evolve.pdf
- Milligan, D. A., K.P. O'Brien, C. Wilcox, C. S. Hardaway, JR, 2010b. Shoreline Evolution: City of Poquoson, Virginia, Poquoson River, Chesapeake Bay, and Back River Shorelines. Virginia Institute of Marine Science. College of William & Mary, Gloucester Point, VA. http://web.vims.edu/physical/research/shoreline/docs/dune_evolution/Poquoson/1Poquoson_Shore_Evolve.pdf
- Milligan, D. A., K.P. O'Brien, C. Wilcox, C. S. Hardaway, JR, 2010c. Gloucester County, Virginia York River, Mobjack Bay, and Piankatank River Shorelines. Virginia Institute of Marine Science, College of William & Mary, Gloucester Point, VA. http://web.vims.edu/physical/research/shoreline/docs/dune_evolution/Gloucester/1Gloucester_Shore_Evolve.pdf
- Milligan, D. A., K.P. O'Brien, C. Wilcox, C. S. Hardaway, JR, 2010d. Shoreline Evolution: York County, Virginia York River, Chesapeake Bay and Poquoson River Shorelines. Virginia Institute of Marine Science. College of William & Mary, Gloucester Point, VA. http://web.vims.edu/physical/research/shoreline/docs/dune_evolution/York/1York_Shore_Evolve.pdf
- Morton, R.A., T.L. Miller, and L.J. Moore, 2004. National Assessment of Shoreline Change: Part 1 Historical Shoreline Change and Associated Coastal Land Loss along the U.S. Gulf of Mexico. U.S. Department of the Interior, U.S. Geological Survey Open-File Report 2004-1043, 45 p.
- National Spatial Data Infrastructure, 1998. Geospatial Positional Accuracy Standards, Part 3: National Standard for Spatial Data Accuracy. Subcommittee for Base Cartographic Data. Federal Geographic Data Committee. Reston, VA.
- Wikel, G.L., D.A. Milligan, A.G. Browder, C.S. Hardaway, Jr., J.E. McNinch, and C.H. Hobbs, 111, 2006. Beach Nourishment Monitoring Protocol and Assessment of the Subaerial and Nearshore Region of Sandbridge, Virginia. In: Field Testing of a Physical/Biological Monitoring Methodology for Offshore Dredging and Mining Operation. Prepared for the U.S. Department of the Interior, Mineral Management Service. Virginia Institute of Marine Science, College of William & Mary, Gloucester Point, VA. <http://web.vims.edu/physical/research/shoreline/docs/Dredging%20and%20Mining/Monitoring%20Methods%20for%20Offshore%20dredging%20and%20Mining/Exercise%20and%20Review%20of%20Monitoring%20Protocol.pdf>
- Wright, L.D., C.S. Kim, C.S. Hardaway, Jr., S.M. Kimball, and M.O. Green. Shoreface and Beach Dynamics of the Coastal Region from Cape Henry to False Cape, Virginia. Technical Report, Virginia Institute of Marine Science, Gloucester Point, VA, 116.

Appendix A

End Point Rate of Shoreline Change Maps

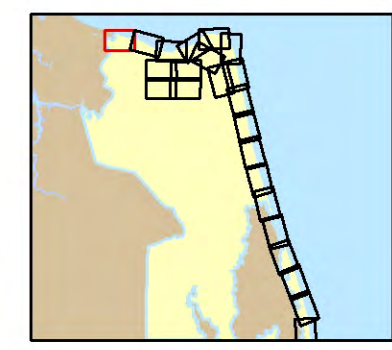
Shoreline change rate segments are shown on the top map. The calculated rates of change for each transect within the segment were averaged to determine an average rate of change as shown in Table 1 of the report.

Note: The location labels on the plates come from U.S. Geological Survey topographic maps, Google Earth, and other map sources and may not be accurate for the historical or even more recent images. They are for reference only.

Plate 1	Plate 7	Plate 13	Plate 19
Plate 2	Plate 8	Plate 14	Plate 20
Plate 3	Plate 9	Plate 15	Plate 21
Plate 4	Plate 10	Plate 16	Plate 22
Plate 5	Plate 11	Plate 17	Plate 23
Plate 6	Plate 12	Plate 18	

City of Virginia Beach Virginia

Plate 1



Legend

- 1937 Shoreline
- 2009 Shoreline

- Shoreline Rates of Change**
- ◆ Very High Accretion: > +10 (ft/yr)
 - High Accretion: +10 to +5 (ft/yr)
 - Medium Accretion: +5 to +2 (ft/yr)
 - Low Accretion: +2 to +1 (ft/yr)
 - Very Low Accretion: +1 to 0 (ft/yr)
 - Very Low Erosion: 0 to -1 (ft/yr)
 - Low Erosion: -1 to -2 (ft/yr)
 - Medium Erosion: -2 to -5 (ft/yr)
 - High Erosion: -5 to -10 (ft/yr)

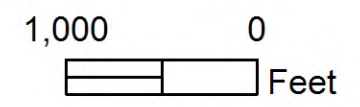


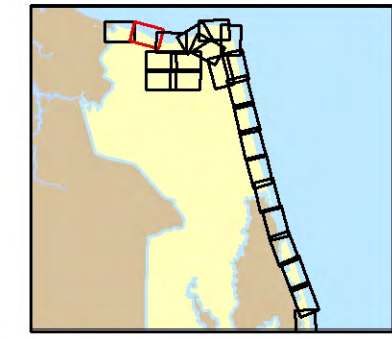
Photo Date: 2009





City of Virginia Beach Virginia

Plate 2



Legend

- 1937 Shoreline
- 2009 Shoreline

- Shoreline Rates of Change**
- ◆ Very High Accretion: > +10 (ft/yr)
 - High Accretion: +10 to +5 (ft/yr)
 - Medium Accretion: +5 to +2 (ft/yr)
 - Low Accretion: +2 to +1 (ft/yr)
 - Very Low Accretion: +1 to 0 (ft/yr)
 - Very Low Erosion: 0 to -1 (ft/yr)
 - Low Erosion: -1 to -2 (ft/yr)
 - Medium Erosion: -2 to -5 (ft/yr)
 - High Erosion: -5 to -10 (ft/yr)

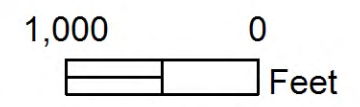
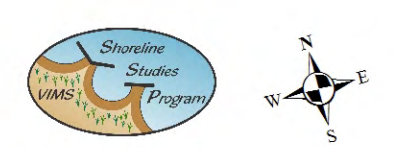
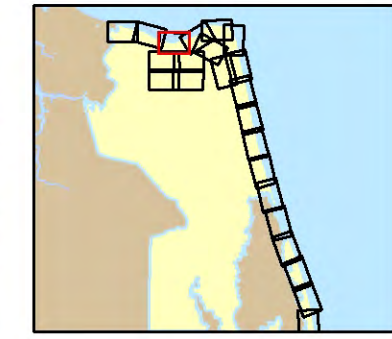


Photo Date: 2009



City of Virginia Beach Virginia

Plate 3



Legend

- 1937 Shoreline
- 2009 Shoreline

- Shoreline Rates of Change**
- ◆ Very High Accretion: > +10 (ft/yr)
 - High Accretion: +10 to +5 (ft/yr)
 - Medium Accretion: +5 to +2 (ft/yr)
 - Low Accretion: +2 to +1 (ft/yr)
 - Very Low Accretion: +1 to 0 (ft/yr)
 - Very Low Erosion: 0 to -1 (ft/yr)
 - Low Erosion: -1 to -2 (ft/yr)
 - Medium Erosion: -2 to -5 (ft/yr)
 - High Erosion: -5 to -10 (ft/yr)

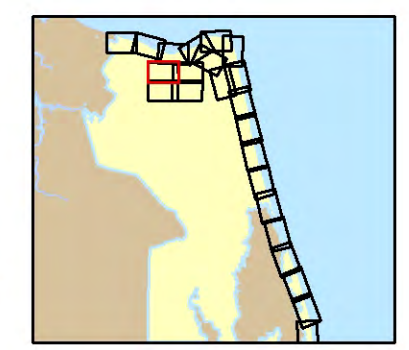


Photo Date: 2009



City of Virginia Beach Virginia

Plate 4



Legend

- 1937 Shoreline
- 2009 Shoreline

- Shoreline Rates of Change**
- ◆ Very High Accretion: > +10 (ft/yr)
 - High Accretion: +10 to +5 (ft/yr)
 - Medium Accretion: +5 to +2 (ft/yr)
 - Low Accretion: +2 to +1 (ft/yr)
 - Very Low Accretion: +1 to 0 (ft/yr)
 - Very Low Erosion: 0 to -1 (ft/yr)
 - Low Erosion: -1 to -2 (ft/yr)
 - Medium Erosion: -2 to -5 (ft/yr)
 - High Erosion: -5 to -10 (ft/yr)

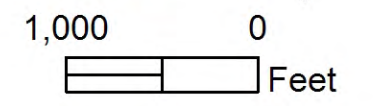
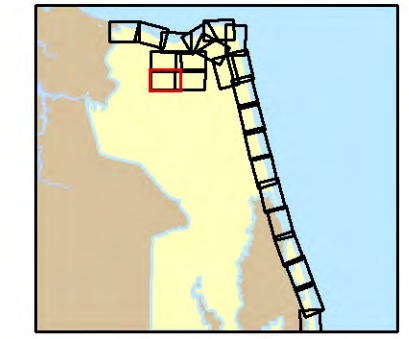


Photo Date: 2009



City of Virginia Beach Virginia

Plate 5



Legend

- 1937 Shoreline
- 2009 Shoreline

- Shoreline Rates of Change**
- ◆ Very High Accretion: > +10 (ft/yr)
 - High Accretion: +10 to +5 (ft/yr)
 - Medium Accretion: +5 to +2 (ft/yr)
 - Low Accretion: +2 to +1 (ft/yr)
 - Very Low Accretion: +1 to 0 (ft/yr)
 - Very Low Erosion: 0 to -1 (ft/yr)
 - Low Erosion: -1 to -2 (ft/yr)
 - Medium Erosion: -2 to -5 (ft/yr)
 - High Erosion: -5 to -10 (ft/yr)

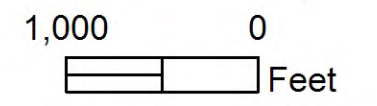
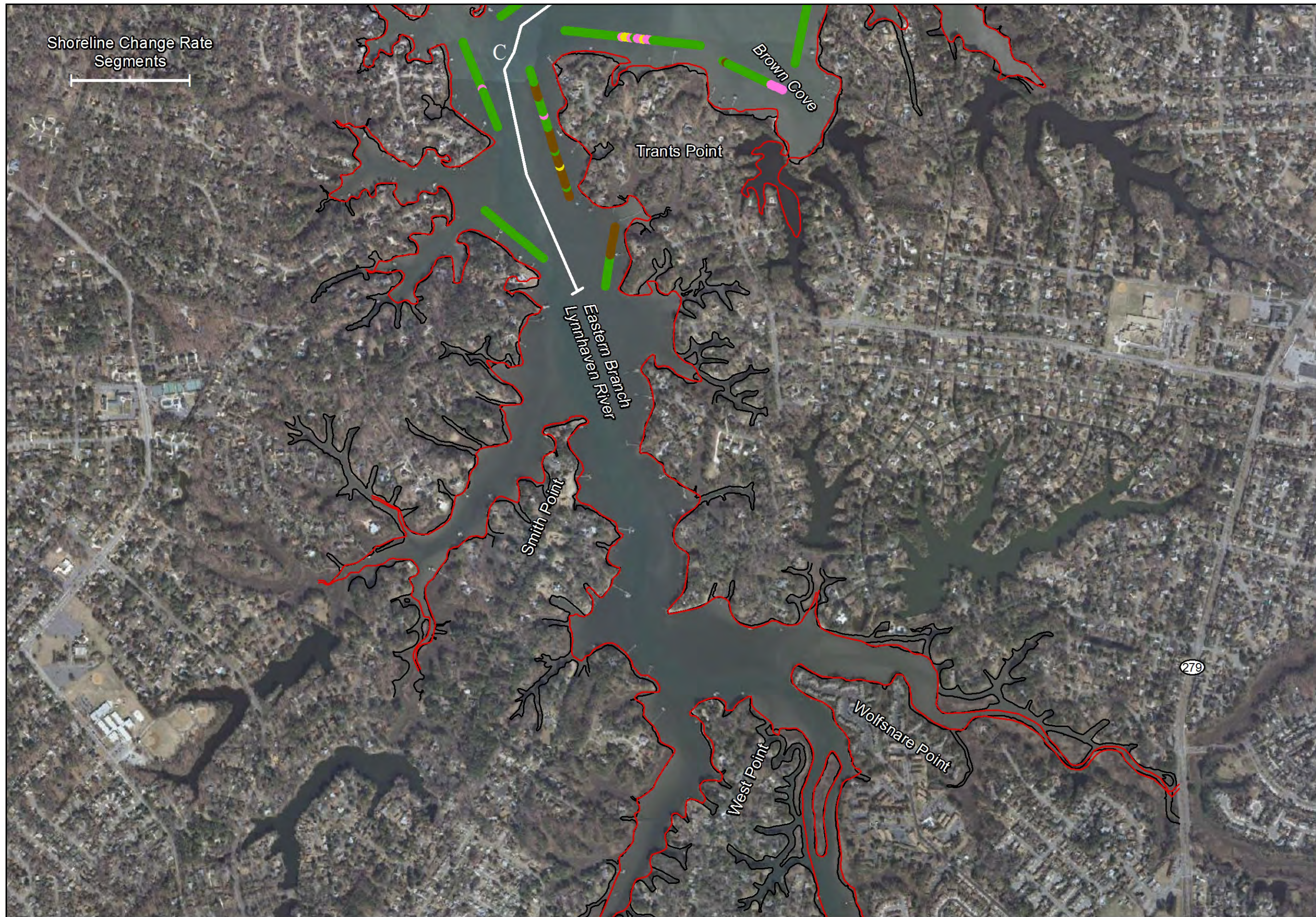
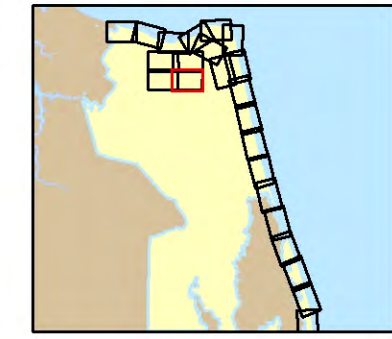


Photo Date: 2009



City of Virginia Beach Virginia

Plate 6



Legend

- 1937 Shoreline
- 2009 Shoreline

- Shoreline Rates of Change**
- ◆ Very High Accretion: > +10 (ft/yr)
 - High Accretion: +10 to +5 (ft/yr)
 - Medium Accretion: +5 to +2 (ft/yr)
 - Low Accretion: +2 to +1 (ft/yr)
 - Very Low Accretion: +1 to 0 (ft/yr)
 - Very Low Erosion: 0 to -1 (ft/yr)
 - Low Erosion: -1 to -2 (ft/yr)
 - Medium Erosion: -2 to -5 (ft/yr)
 - High Erosion: -5 to -10 (ft/yr)

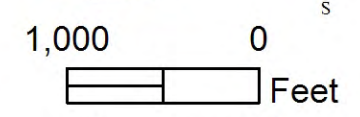
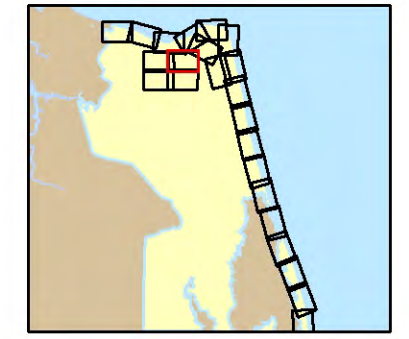


Photo Date: 2009



City of Virginia Beach Virginia

Plate 7



Legend

- 1937 Shoreline
- 2009 Shoreline

- Shoreline Rates of Change**
- ◆ Very High Accretion: > +10 (ft/yr)
 - High Accretion: +10 to +5 (ft/yr)
 - Medium Accretion: +5 to +2 (ft/yr)
 - Low Accretion: +2 to +1 (ft/yr)
 - Very Low Accretion: +1 to 0 (ft/yr)
 - Very Low Erosion: 0 to -1 (ft/yr)
 - Low Erosion: -1 to -2 (ft/yr)
 - Medium Erosion: -2 to -5 (ft/yr)
 - High Erosion: -5 to -10 (ft/yr)

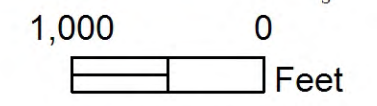
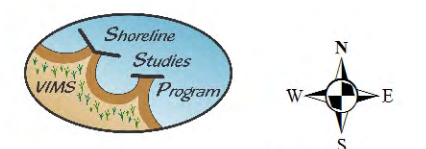
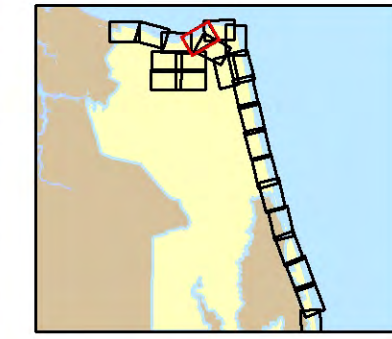


Photo Date: 2009



City of Virginia Beach Virginia

Plate 8



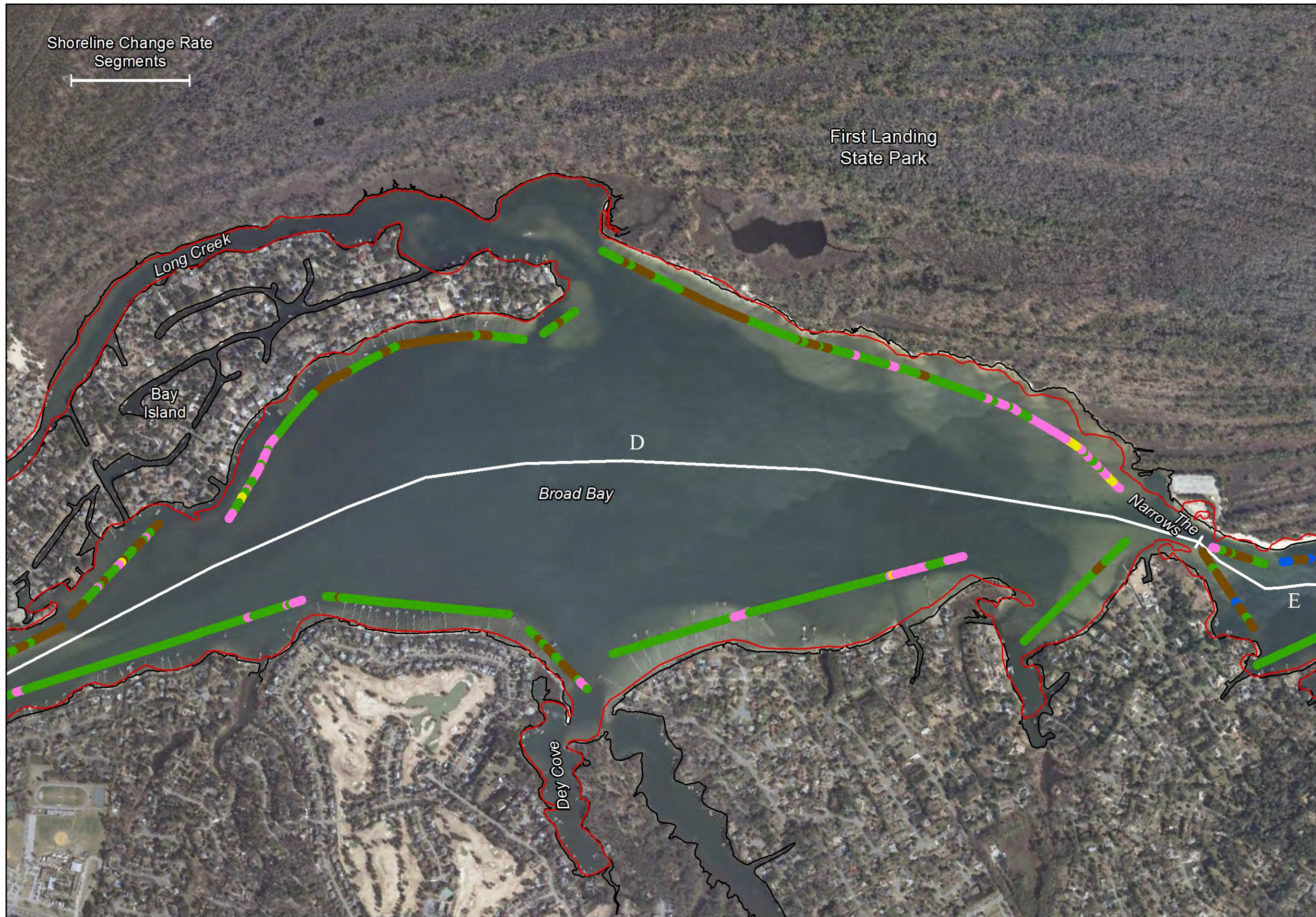
Legend

- 1937 Shoreline
- 2009 Shoreline

- Shoreline Rates of Change**
- ◆ Very High Accretion: > +10 (ft/yr)
 - High Accretion: +10 to +5 (ft/yr)
 - Medium Accretion: +5 to +2 (ft/yr)
 - Low Accretion: +2 to +1 (ft/yr)
 - Very Low Accretion: +1 to 0 (ft/yr)
 - Very Low Erosion: 0 to -1 (ft/yr)
 - Low Erosion: -1 to -2 (ft/yr)
 - Medium Erosion: -2 to -5 (ft/yr)
 - High Erosion: -5 to -10 (ft/yr)

1,000 0 Feet

Photo Date: 2009



Shoreline Change Rate Segments

First Landing State Park

Long Creek

Bay Island

D

Broad Bay

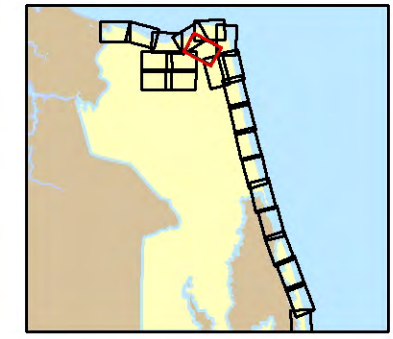
The Narrows

E

Dey Cove

City of Virginia Beach Virginia

Plate 9



Legend

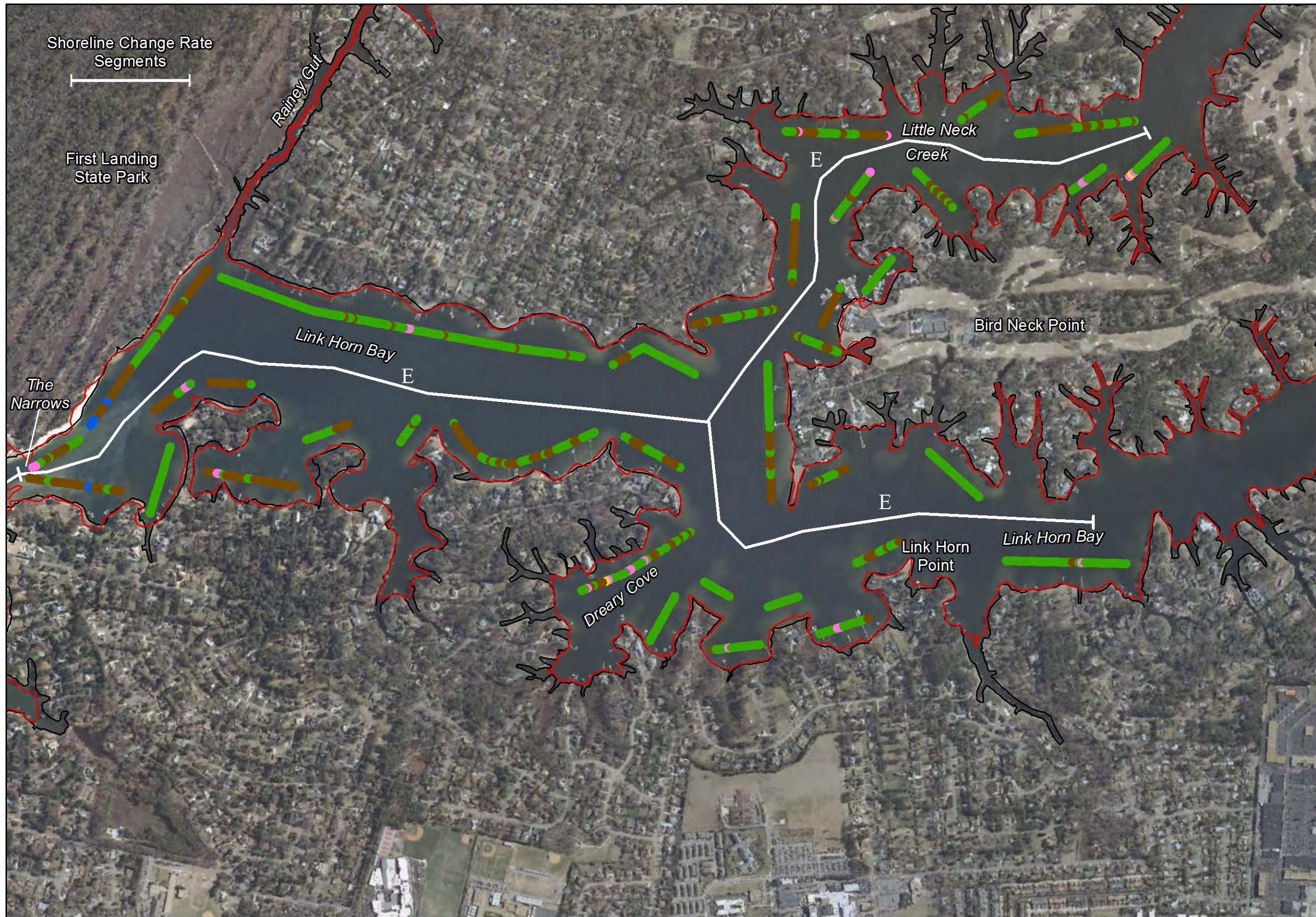
- 1937 Shoreline
- 2009 Shoreline

- Shoreline Rates of Change**
- ◆ Very High Accretion: > +10 (ft/yr)
 - High Accretion: +10 to +5 (ft/yr)
 - Medium Accretion: +5 to +2 (ft/yr)
 - Low Accretion: +2 to +1 (ft/yr)
 - Very Low Accretion: +1 to 0 (ft/yr)
 - Very Low Erosion: 0 to -1 (ft/yr)
 - Low Erosion: -1 to -2 (ft/yr)
 - Medium Erosion: -2 to -5 (ft/yr)
 - High Erosion: -5 to -10 (ft/yr)



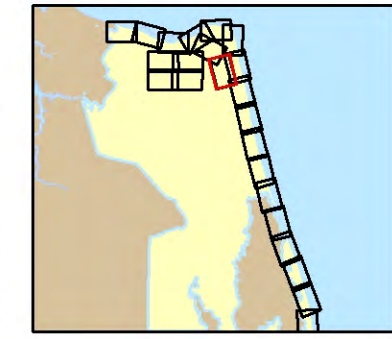
1,000 0 Feet

Photo Date: 2009



City of Virginia Beach Virginia

Plate 10



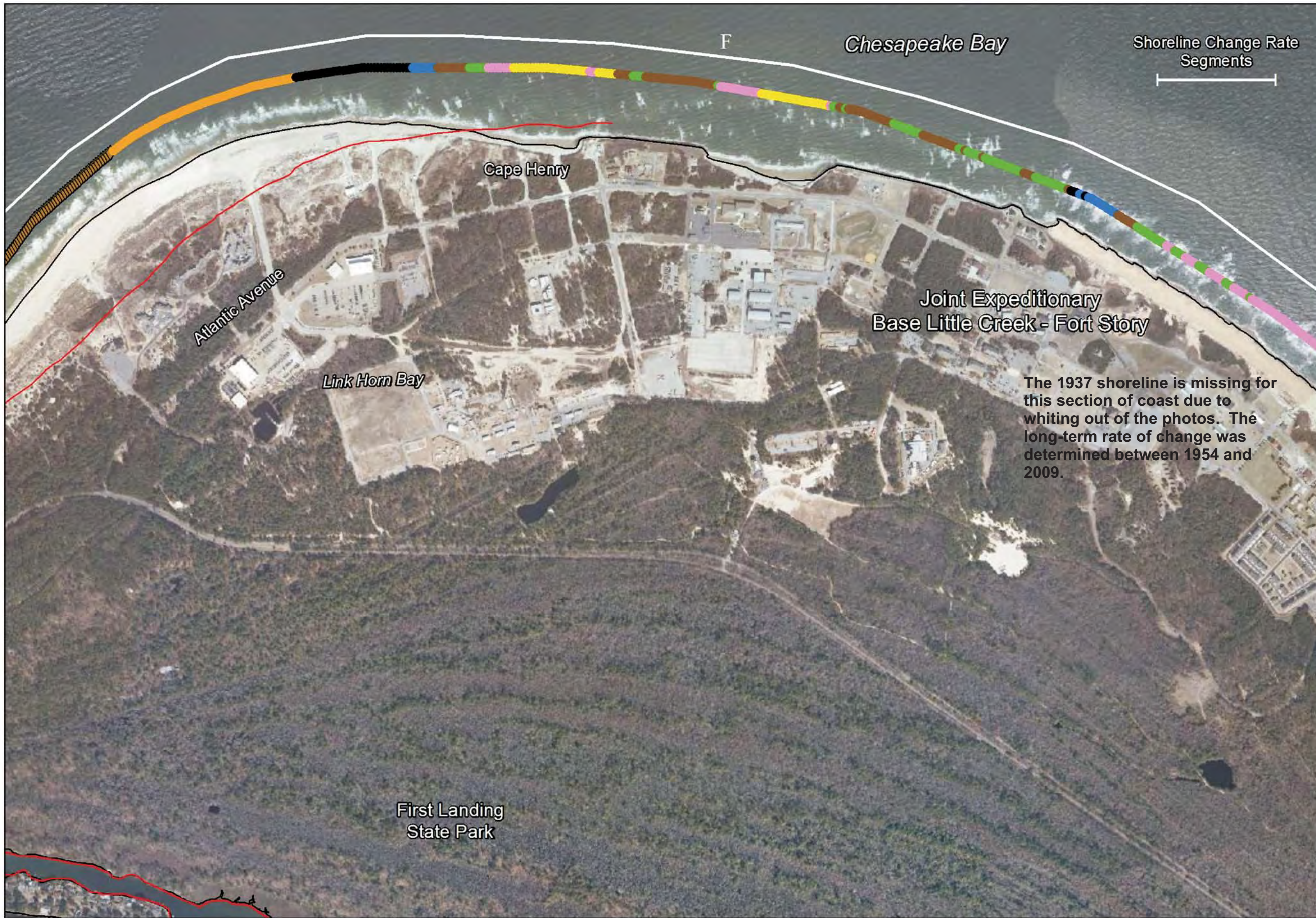
Legend

- 1937 Shoreline
- 2009 Shoreline

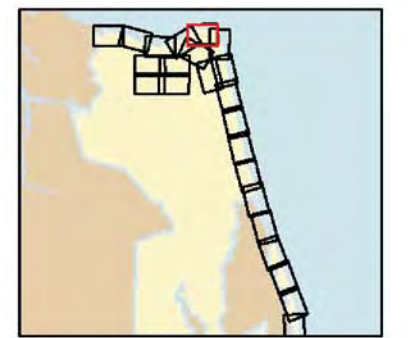
- Shoreline Rates of Change**
- ◆ Very High Accretion: > +10 (ft/yr)
 - High Accretion: +10 to +5 (ft/yr)
 - Medium Accretion: +5 to +2 (ft/yr)
 - Low Accretion: +2 to +1 (ft/yr)
 - Very Low Accretion: +1 to 0 (ft/yr)
 - Very Low Erosion: 0 to -1 (ft/yr)
 - Low Erosion: -1 to -2 (ft/yr)
 - Medium Erosion: -2 to -5 (ft/yr)
 - High Erosion: -5 to -10 (ft/yr)

1,000 0 Feet

Photo Date: 2009



City of Virginia Beach Virginia
Plate 11

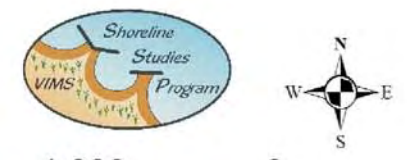


Legend

- 1937 Shoreline
- 2009 Shoreline

- Shoreline Rates of Change**
- ◆ Very High Accretion: > +10 (ft/yr)
 - High Accretion: +10 to +5 (ft/yr)
 - Medium Accretion: +5 to +2 (ft/yr)
 - Low Accretion: +2 to +1 (ft/yr)
 - Very Low Accretion: +1 to 0 (ft/yr)
 - Very Low Erosion: 0 to -1 (ft/yr)
 - Low Erosion: -1 to -2 (ft/yr)
 - Medium Erosion: -2 to -5 (ft/yr)
 - High Erosion: -5 to -10 (ft/yr)

The 1937 shoreline is missing for this section of coast due to whiting out of the photos. The long-term rate of change was determined between 1954 and 2009.

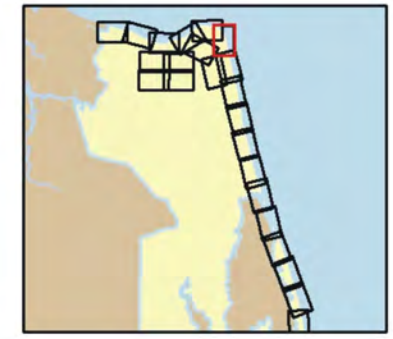


1,000 0 Feet

Photo Date: 2009



City of Virginia Beach Virginia
Plate 12



Legend

- 1937 Shoreline
- 2009 Shoreline

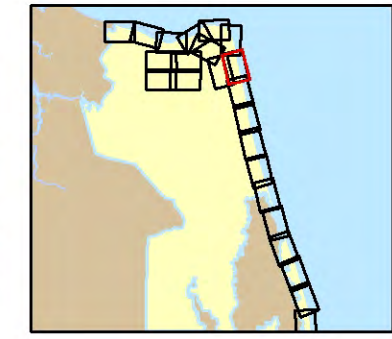
- Shoreline Rates of Change**
- ◆ Very High Accretion: > +10 (ft/yr)
 - High Accretion: +10 to +5 (ft/yr)
 - Medium Accretion: +5 to +2 (ft/yr)
 - Low Accretion: +2 to +1 (ft/yr)
 - Very Low Accretion: +1 to 0 (ft/yr)
 - Very Low Erosion: 0 to -1 (ft/yr)
 - Low Erosion: -1 to -2 (ft/yr)
 - Medium Erosion: -2 to -5 (ft/yr)
 - High Erosion: -5 to -10 (ft/yr)

1,000 0 Feet

Photo Date: 2009



City of Virginia Beach Virginia
Plate 13



Legend

- 1937 Shoreline
- 2009 Shoreline

- Shoreline Rates of Change**
- ◆ Very High Accretion: > +10 (ft/yr)
 - High Accretion: +10 to +5 (ft/yr)
 - Medium Accretion: +5 to +2 (ft/yr)
 - Low Accretion: +2 to +1 (ft/yr)
 - Very Low Accretion: +1 to 0 (ft/yr)
 - Very Low Erosion: 0 to -1 (ft/yr)
 - Low Erosion: -1 to -2 (ft/yr)
 - Medium Erosion: -2 to -5 (ft/yr)
 - High Erosion: -5 to -10 (ft/yr)

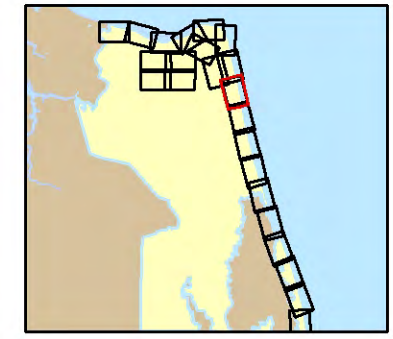
Shoreline Studies Program
VIMS

1,000 0 Feet
Photo Date: 2009



City of Virginia Beach Virginia

Plate 14



Legend

- 1937 Shoreline
- 2009 Shoreline

- Shoreline Rates of Change**
- ◆ Very High Accretion: > +10 (ft/yr)
 - High Accretion: +10 to +5 (ft/yr)
 - Medium Accretion: +5 to +2 (ft/yr)
 - Low Accretion: +2 to +1 (ft/yr)
 - Very Low Accretion: +1 to 0 (ft/yr)
 - Very Low Erosion: 0 to -1 (ft/yr)
 - Low Erosion: -1 to -2 (ft/yr)
 - Medium Erosion: -2 to -5 (ft/yr)
 - High Erosion: -5 to -10 (ft/yr)

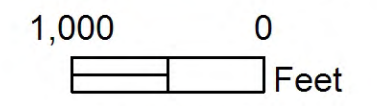
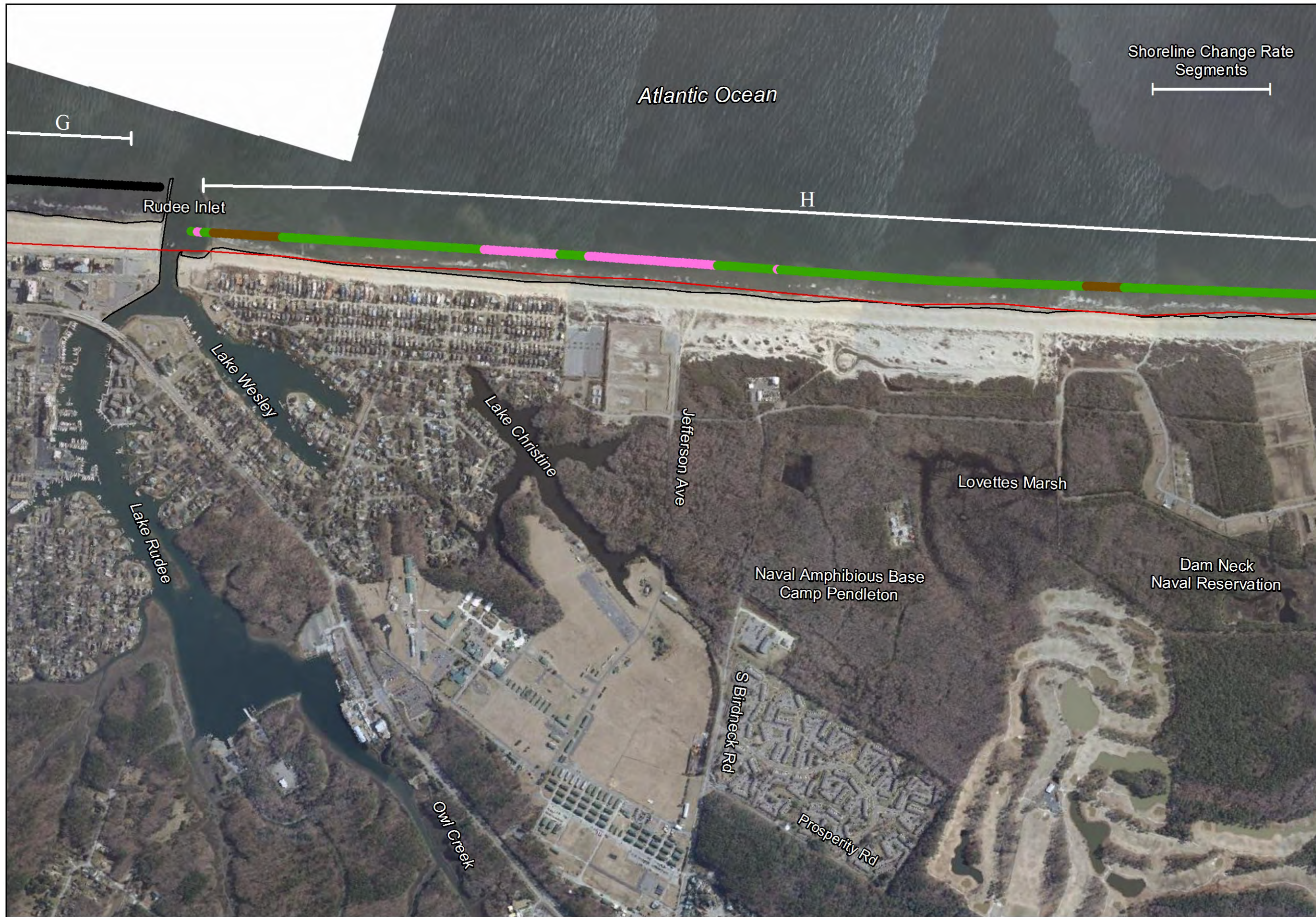
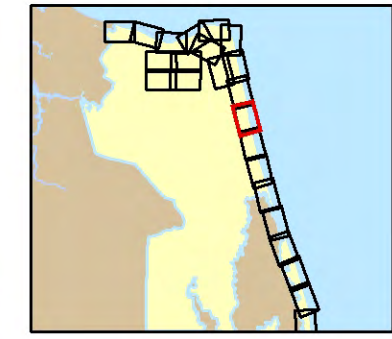


Photo Date: 2009



City of Virginia Beach Virginia

Plate 15



Legend

- 1937 Shoreline
- 2009 Shoreline

- Shoreline Rates of Change**
- ◆ Very High Accretion: > +10 (ft/yr)
 - High Accretion: +10 to +5 (ft/yr)
 - Medium Accretion: +5 to +2 (ft/yr)
 - Low Accretion: +2 to +1 (ft/yr)
 - Very Low Accretion: +1 to 0 (ft/yr)
 - Very Low Erosion: 0 to -1 (ft/yr)
 - Low Erosion: -1 to -2 (ft/yr)
 - Medium Erosion: -2 to -5 (ft/yr)
 - High Erosion: -5 to -10 (ft/yr)

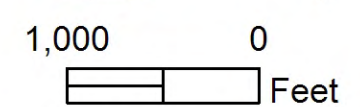
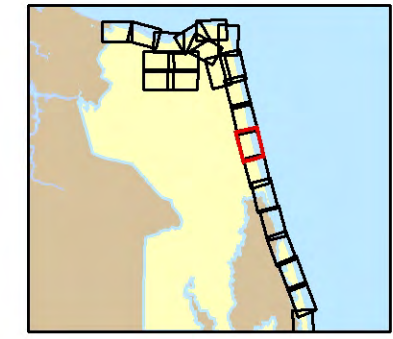


Photo Date: 2009



City of Virginia Beach Virginia

Plate 16



Legend

- 1937 Shoreline
- 2009 Shoreline

- Shoreline Rates of Change**
- ◆ Very High Accretion: > +10 (ft/yr)
 - High Accretion: +10 to +5 (ft/yr)
 - Medium Accretion: +5 to +2 (ft/yr)
 - Low Accretion: +2 to +1 (ft/yr)
 - Very Low Accretion: +1 to 0 (ft/yr)
 - Very Low Erosion: 0 to -1 (ft/yr)
 - Low Erosion: -1 to -2 (ft/yr)
 - Medium Erosion: -2 to -5 (ft/yr)
 - High Erosion: -5 to -10 (ft/yr)

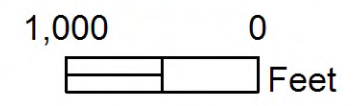
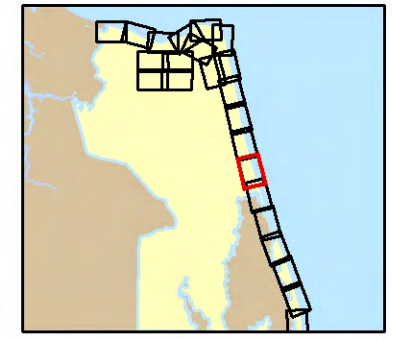


Photo Date: 2009



City of Virginia Beach Virginia

Plate 17



Legend

- 1937 Shoreline
- 2009 Shoreline

- Shoreline Rates of Change**
- ◆ Very High Accretion: > +10 (ft/yr)
 - High Accretion: +10 to +5 (ft/yr)
 - Medium Accretion: +5 to +2 (ft/yr)
 - Low Accretion: +2 to +1 (ft/yr)
 - Very Low Accretion: +1 to 0 (ft/yr)
 - Very Low Erosion: 0 to -1 (ft/yr)
 - Low Erosion: -1 to -2 (ft/yr)
 - Medium Erosion: -2 to -5 (ft/yr)
 - High Erosion: -5 to -10 (ft/yr)

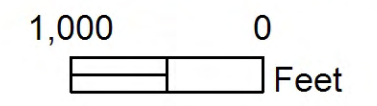
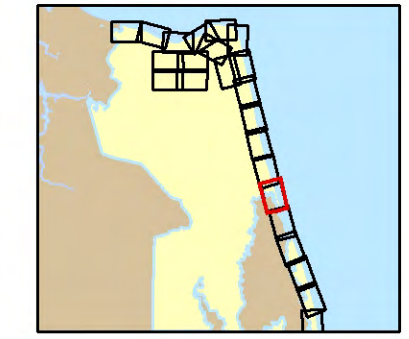


Photo Date: 2009



City of Virginia Beach Virginia

Plate 18



Legend

- 1937 Shoreline
- 2009 Shoreline

- Shoreline Rates of Change**
- ◆ Very High Accretion: > +10 (ft/yr)
 - High Accretion: +10 to +5 (ft/yr)
 - Medium Accretion: +5 to +2 (ft/yr)
 - Low Accretion: +2 to +1 (ft/yr)
 - Very Low Accretion: +1 to 0 (ft/yr)
 - Very Low Erosion: 0 to -1 (ft/yr)
 - Low Erosion: -1 to -2 (ft/yr)
 - Medium Erosion: -2 to -5 (ft/yr)
 - High Erosion: -5 to -10 (ft/yr)

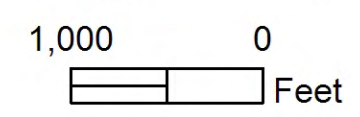
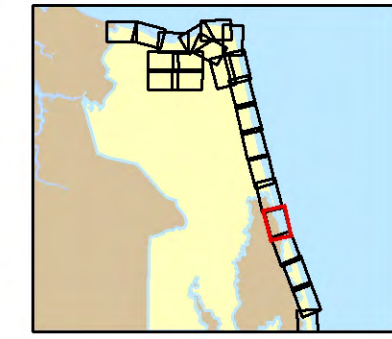


Photo Date: 2009



City of Virginia Beach Virginia
Plate 19



Legend

- 1937 Shoreline
- 2009 Shoreline

- Shoreline Rates of Change**
- ◆ Very High Accretion: > +10 (ft/yr)
 - High Accretion: +10 to +5 (ft/yr)
 - Medium Accretion: +5 to +2 (ft/yr)
 - Low Accretion: +2 to +1 (ft/yr)
 - Very Low Accretion: +1 to 0 (ft/yr)
 - Very Low Erosion: 0 to -1 (ft/yr)
 - Low Erosion: -1 to -2 (ft/yr)
 - Medium Erosion: -2 to -5 (ft/yr)
 - High Erosion: -5 to -10 (ft/yr)

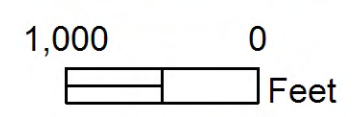
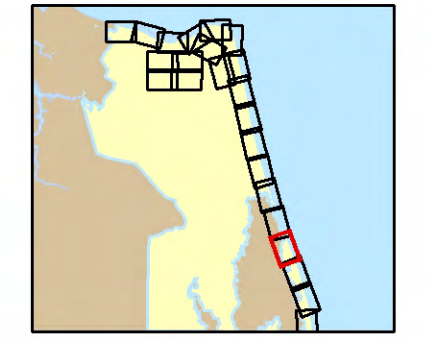


Photo Date: 2009



City of Virginia Beach Virginia

Plate 20



Legend

- 1937 Shoreline
- 2009 Shoreline

- Shoreline Rates of Change**
- ◆ Very High Accretion: > +10 (ft/yr)
 - High Accretion: +10 to +5 (ft/yr)
 - Medium Accretion: +5 to +2 (ft/yr)
 - Low Accretion: +2 to +1 (ft/yr)
 - Very Low Accretion: +1 to 0 (ft/yr)
 - Very Low Erosion: 0 to -1 (ft/yr)
 - Low Erosion: -1 to -2 (ft/yr)
 - Medium Erosion: -2 to -5 (ft/yr)
 - High Erosion: -5 to -10 (ft/yr)

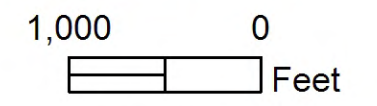
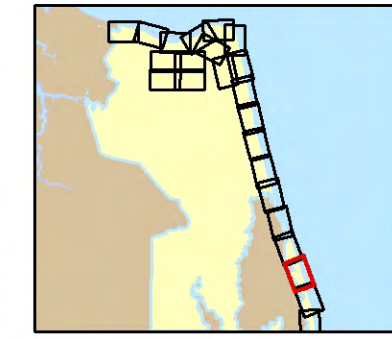


Photo Date: 2009



City of Virginia Beach Virginia

Plate 21



Legend

- 1937 Shoreline
- 2009 Shoreline

- Shoreline Rates of Change**
- ◆ Very High Accretion: > +10 (ft/yr)
 - High Accretion: +10 to +5 (ft/yr)
 - Medium Accretion: +5 to +2 (ft/yr)
 - Low Accretion: +2 to +1 (ft/yr)
 - Very Low Accretion: +1 to 0 (ft/yr)
 - Very Low Erosion: 0 to -1 (ft/yr)
 - Low Erosion: -1 to -2 (ft/yr)
 - Medium Erosion: -2 to -5 (ft/yr)
 - High Erosion: -5 to -10 (ft/yr)

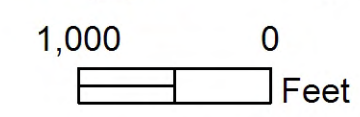
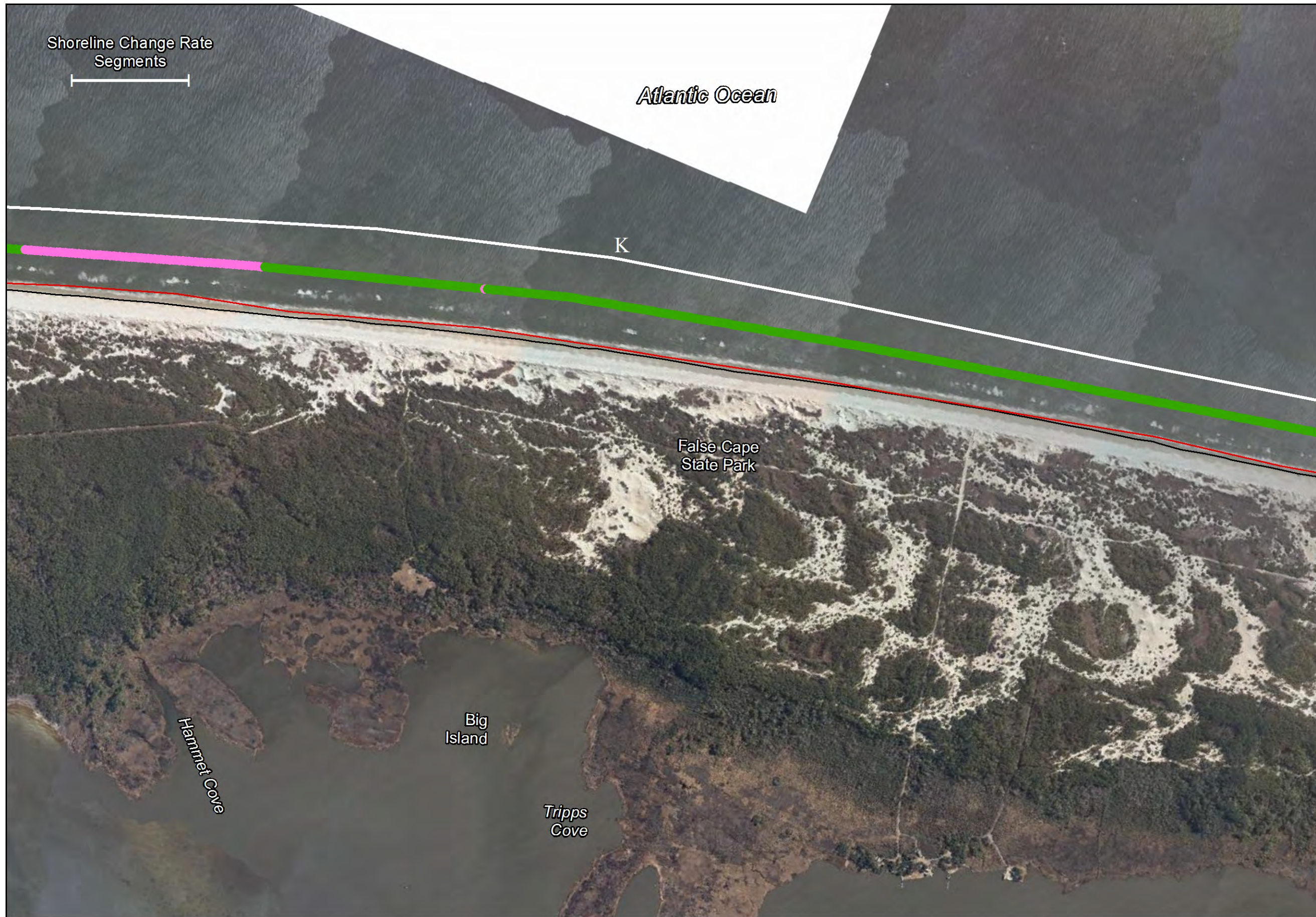
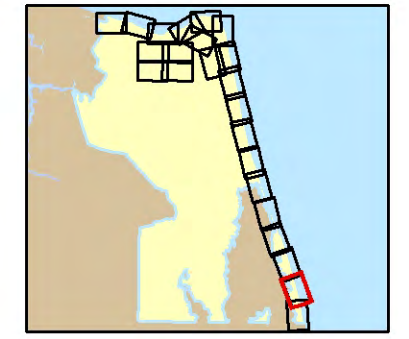


Photo Date: 2009



City of Virginia Beach Virginia

Plate 22



Legend

- 1937 Shoreline
- 2009 Shoreline

- Shoreline Rates of Change**
- ◆ Very High Accretion: > +10 (ft/yr)
 - High Accretion: +10 to +5 (ft/yr)
 - Medium Accretion: +5 to +2 (ft/yr)
 - Low Accretion: +2 to +1 (ft/yr)
 - Very Low Accretion: +1 to 0 (ft/yr)
 - Very Low Erosion: 0 to -1 (ft/yr)
 - Low Erosion: -1 to -2 (ft/yr)
 - Medium Erosion: -2 to -5 (ft/yr)
 - High Erosion: -5 to -10 (ft/yr)

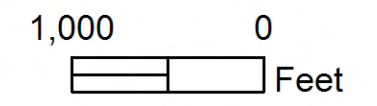
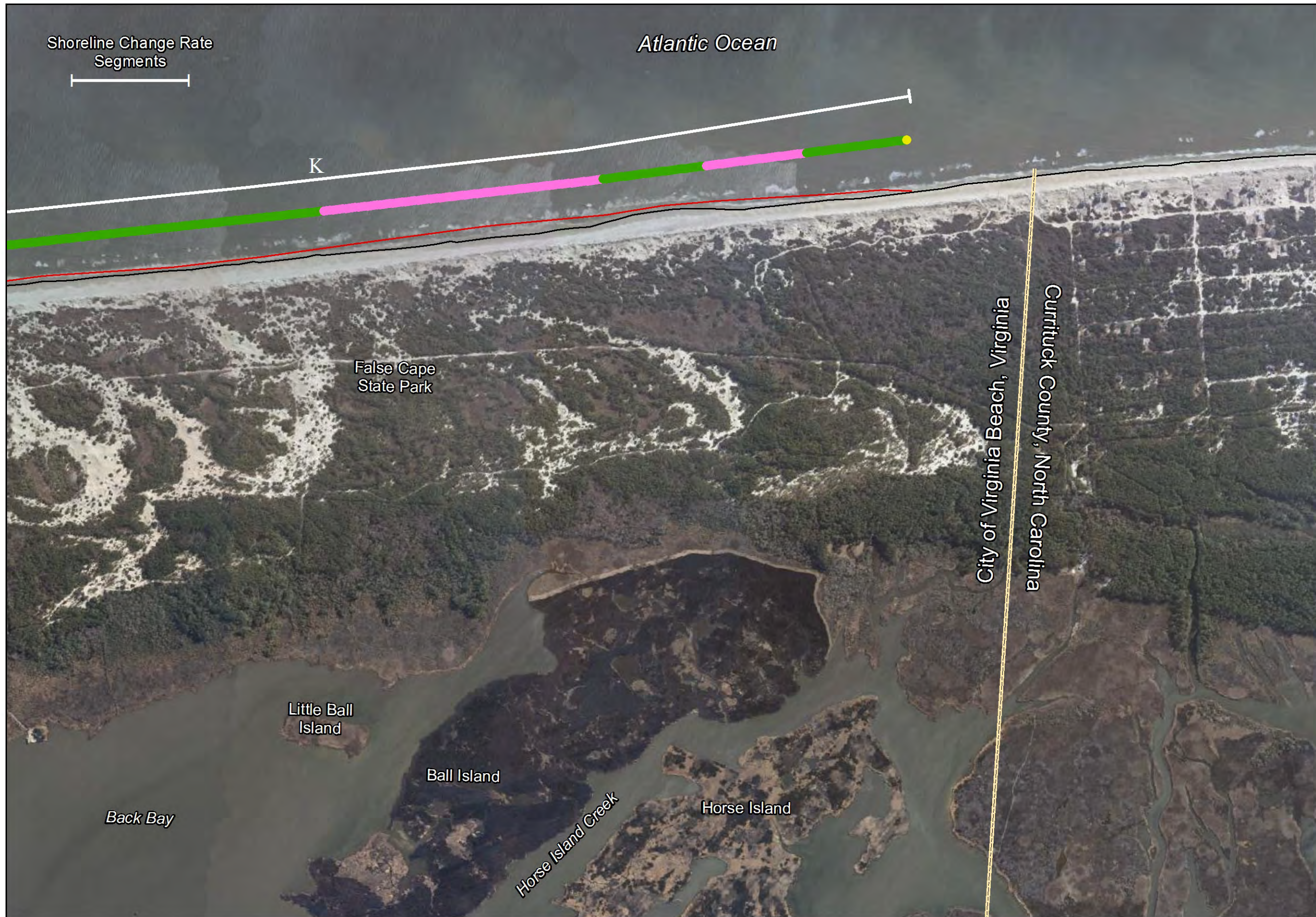
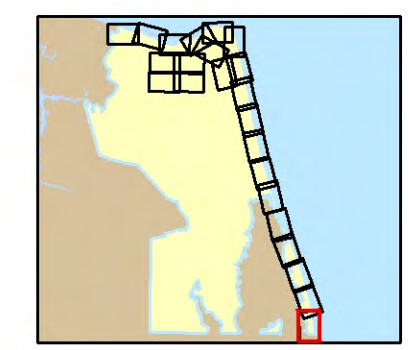


Photo Date: 2009



City of Virginia Beach Virginia

Plate 23



Legend

- 1937 Shoreline
- 2009 Shoreline

- Shoreline Rates of Change**
- ◆ Very High Accretion: > +10 (ft/yr)
 - High Accretion: +10 to +5 (ft/yr)
 - Medium Accretion: +5 to +2 (ft/yr)
 - Low Accretion: +2 to +1 (ft/yr)
 - Very Low Accretion: +1 to 0 (ft/yr)
 - Very Low Erosion: 0 to -1 (ft/yr)
 - Low Erosion: -1 to -2 (ft/yr)
 - Medium Erosion: -2 to -5 (ft/yr)
 - High Erosion: -5 to -10 (ft/yr)

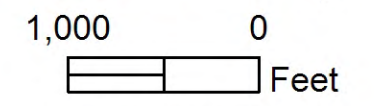


Photo Date: 2009

Appendix B

Historical Shoreline Photo Maps

Note: The location labels on the plates come from U.S. Geological Survey topographic maps, Google Earth, and other map sources and may not be accurate for the historical or even more recent images. They are for reference only.

Plate 1

Plate 7

Plate 13

Plate 19

Plate 2

Plate 8

Plate 14

Plate 20

Plate 3

Plate 9

Plate 15

Plate 21

Plate 4

Plate 10

Plate 16

Plate 22

Plate 5

Plate 11

Plate 17

Plate 23

Plate 6

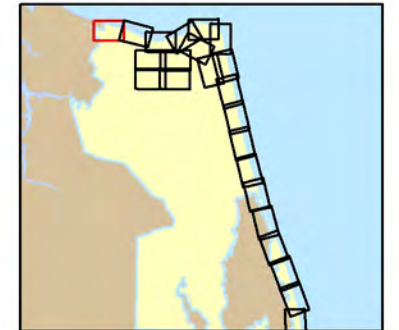
Plate 12

Plate 18



City of Virginia Beach Virginia

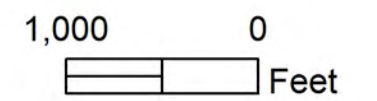
Plate 1



Legend

— 1937 Shoreline

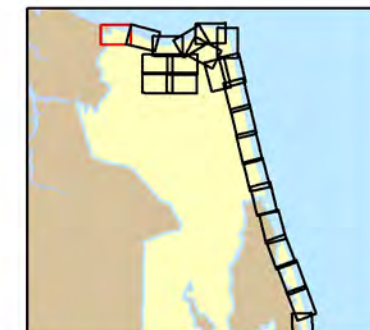
Photo Date: 1937





City of Virginia Beach Virginia

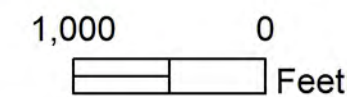
Plate 1



Legend

— 1954 Shoreline

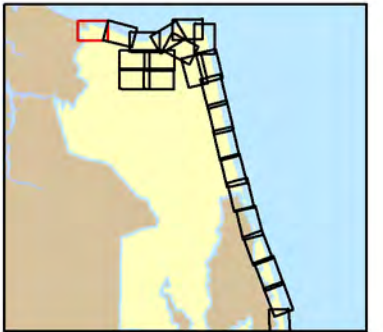
Photo Date: 1954





City of Virginia Beach Virginia

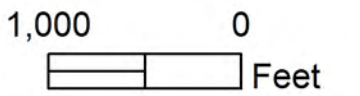
Plate 1



Legend

- 1970 Shoreline

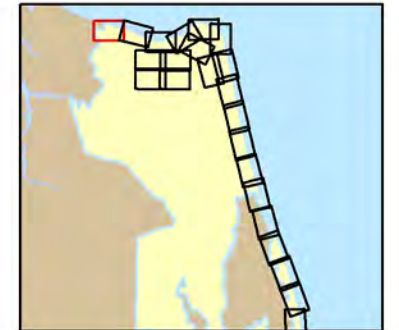
Photo Date: 1970





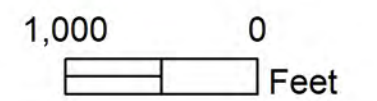
City of Virginia Beach Virginia

Plate 1



Legend
 — 1980 Shoreline

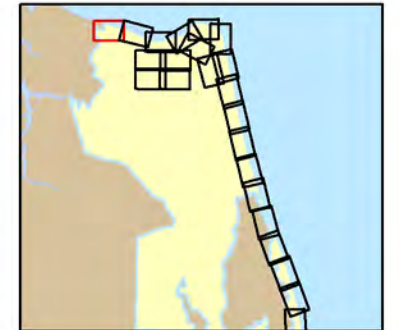
Photo Date: 1980





City of Virginia Beach Virginia

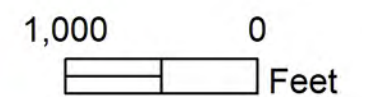
Plate 1



Legend

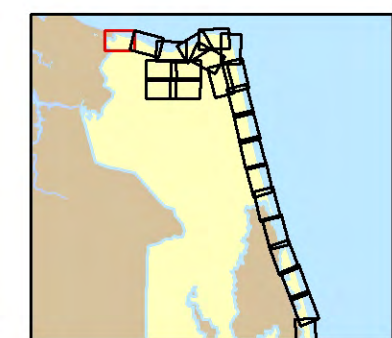
— 1994 Shoreline

Photo Date: 1994



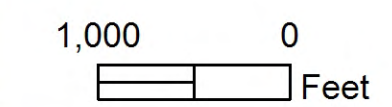
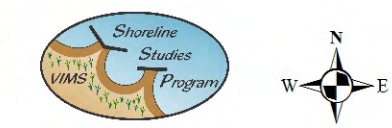


City of Virginia Beach Virginia
Plate 1



Legend
— 2002 Shoreline

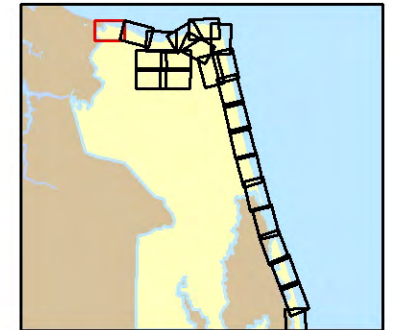
Photo Date: 2002





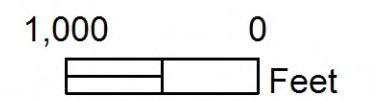
City of Virginia Beach Virginia

Plate 1



Legend
 — 2009 Shoreline

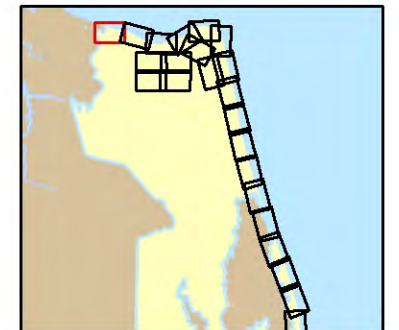
Photo Date: 2009





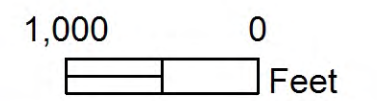
City of Virginia Beach Virginia

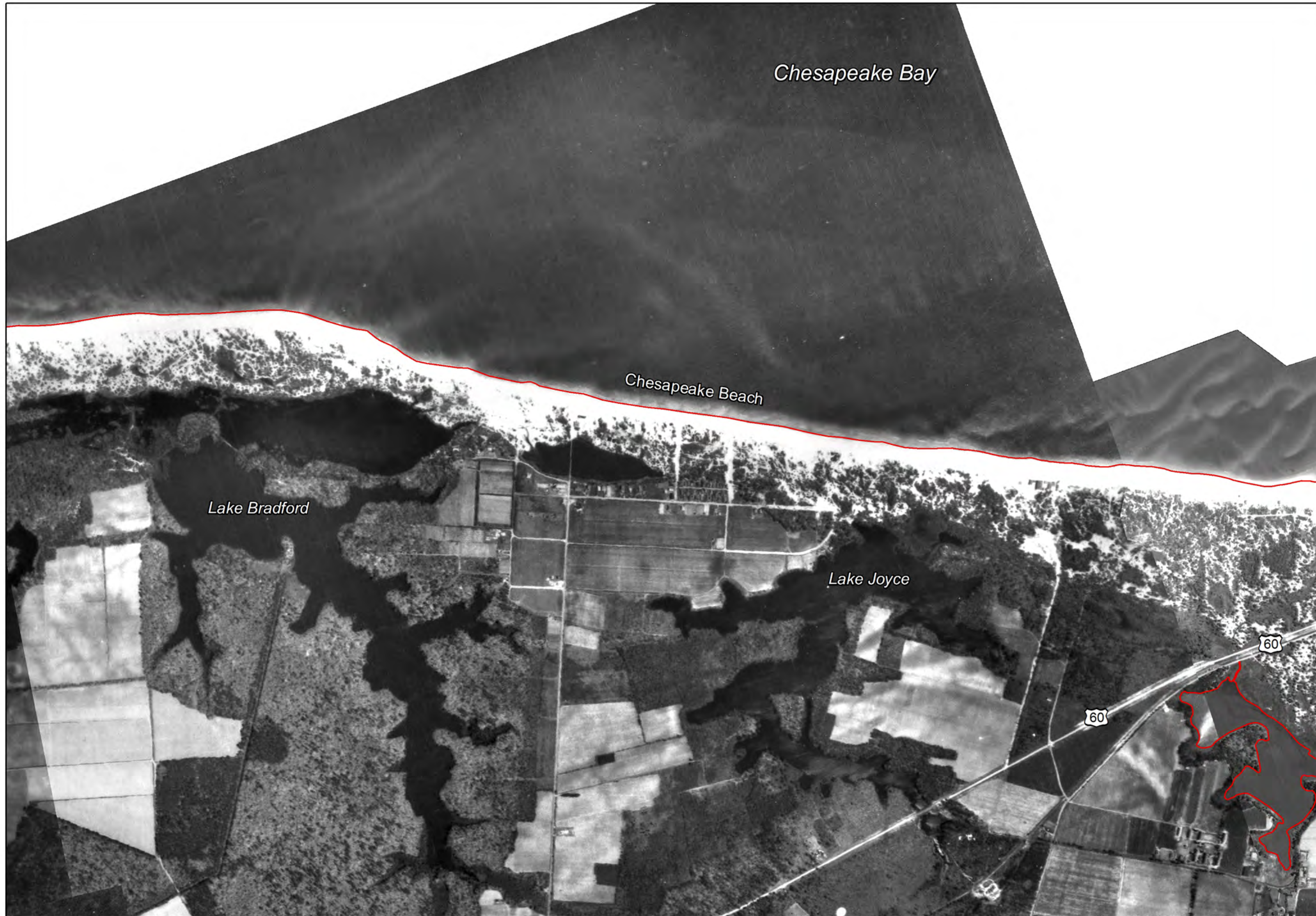
Plate 1



- Legend**
- 1937 Shoreline
 - 1954 Shoreline
 - 1970 Shoreline
 - 1980 Shoreline
 - 1994 Shoreline
 - 2002 Shoreline
 - 2009 Shoreline
 - 2011 Shoreline

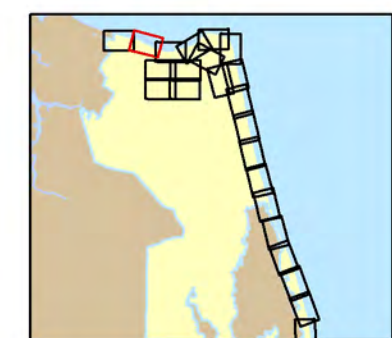
Photo Date: 2011





City of Virginia Beach Virginia

Plate 2



Legend

— 1937 Shoreline

Photo Date: 1937





City of Virginia Beach Virginia

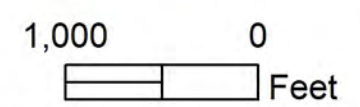
Plate 2



Legend

— 1954 Shoreline

Photo Date: 1954



City of Virginia Beach Virginia

Plate 2



Legend

— 1970 Shoreline

Photo Date: 1970

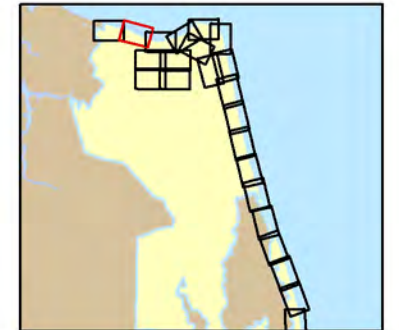


1,000 0
Feet



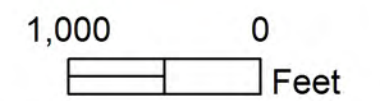
City of Virginia Beach Virginia

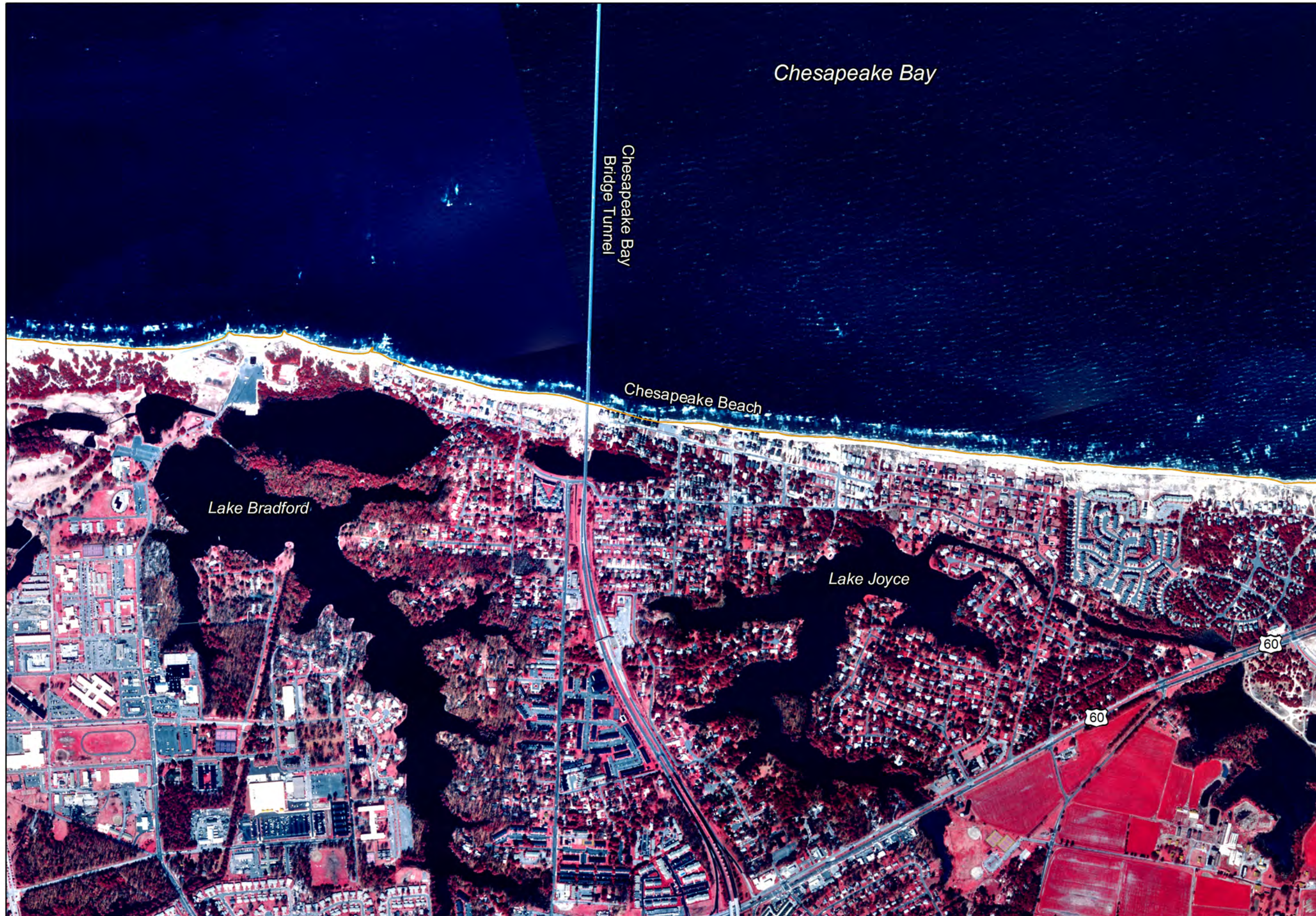
Plate 2



Legend
— 1980 Shoreline

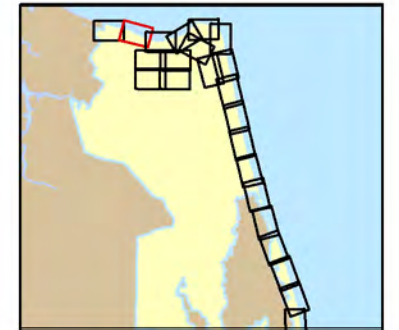
Photo Date: 1980





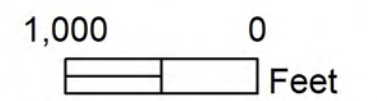
City of Virginia Beach Virginia

Plate 2



Legend
— 1994 Shoreline

Photo Date: 1994





Chesapeake Bay

Chesapeake Bay
Bridge Tunnel

Chesapeake Beach

Lake Bradford

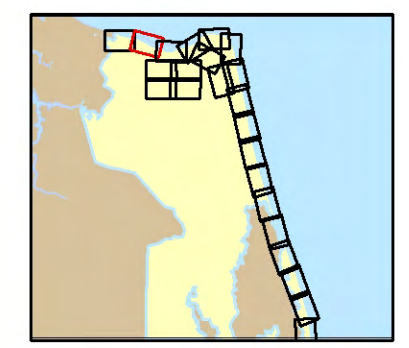
Lake Joyce

60

60

City of Virginia Beach Virginia

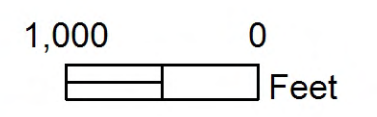
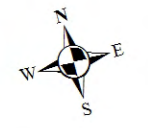
Plate 2

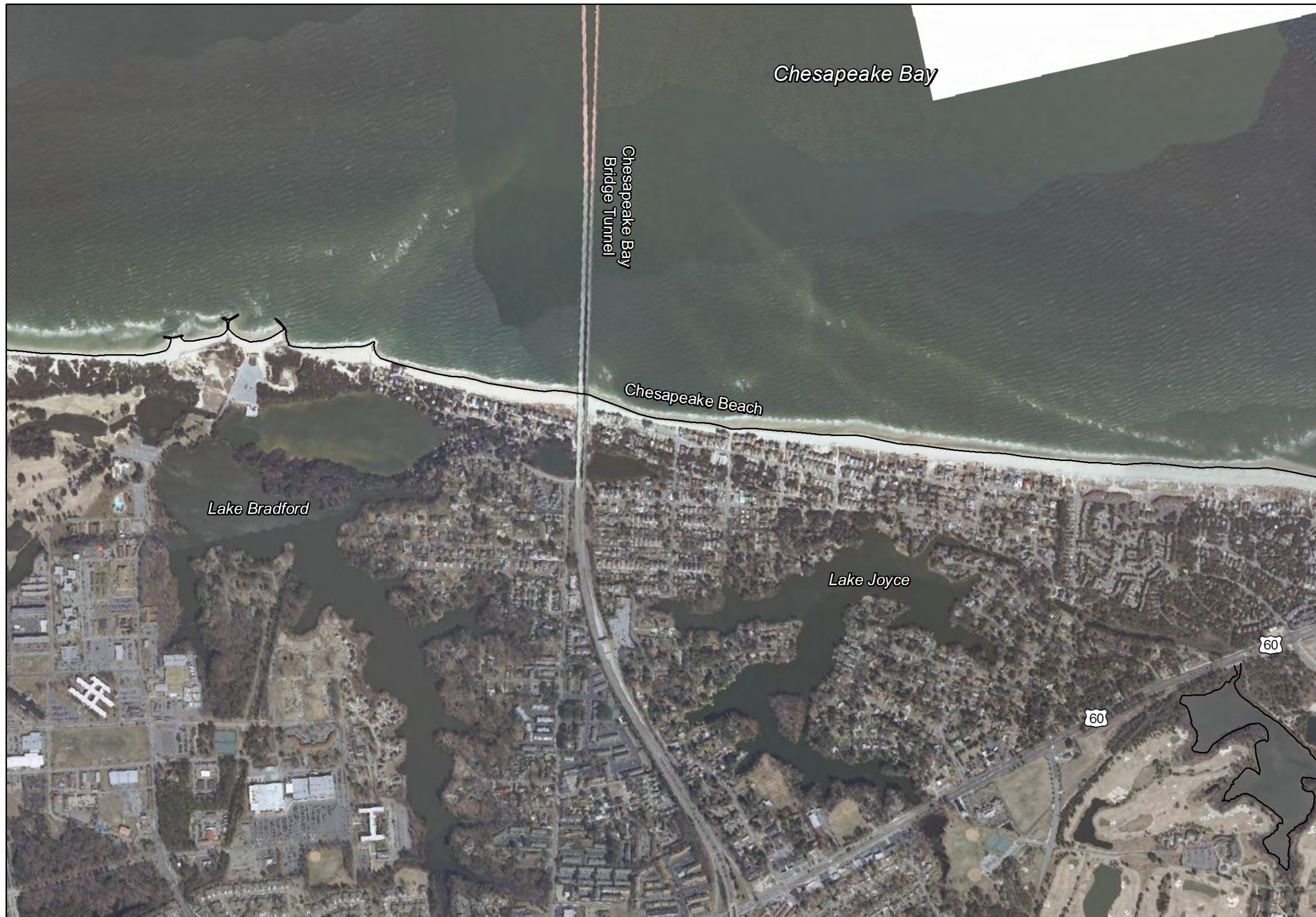


Legend

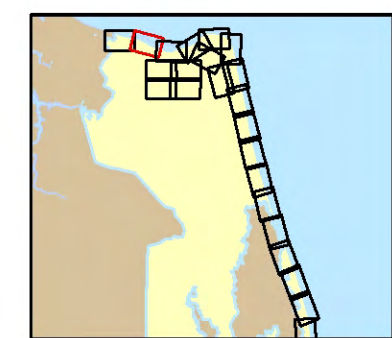
— 2002 Shoreline

Photo Date: 2002



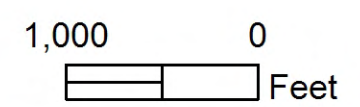


City of Virginia Beach Virginia
Plate 2



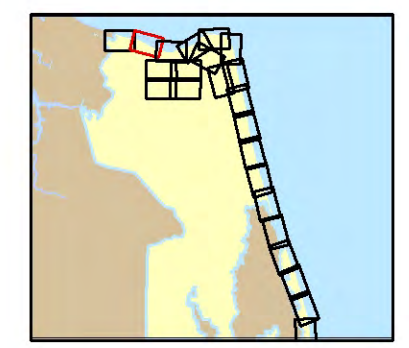
Legend
— 2009 Shoreline

Photo Date: 2009



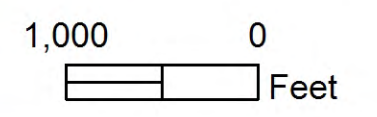
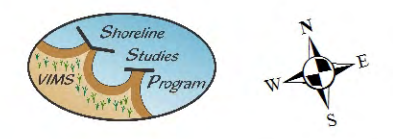


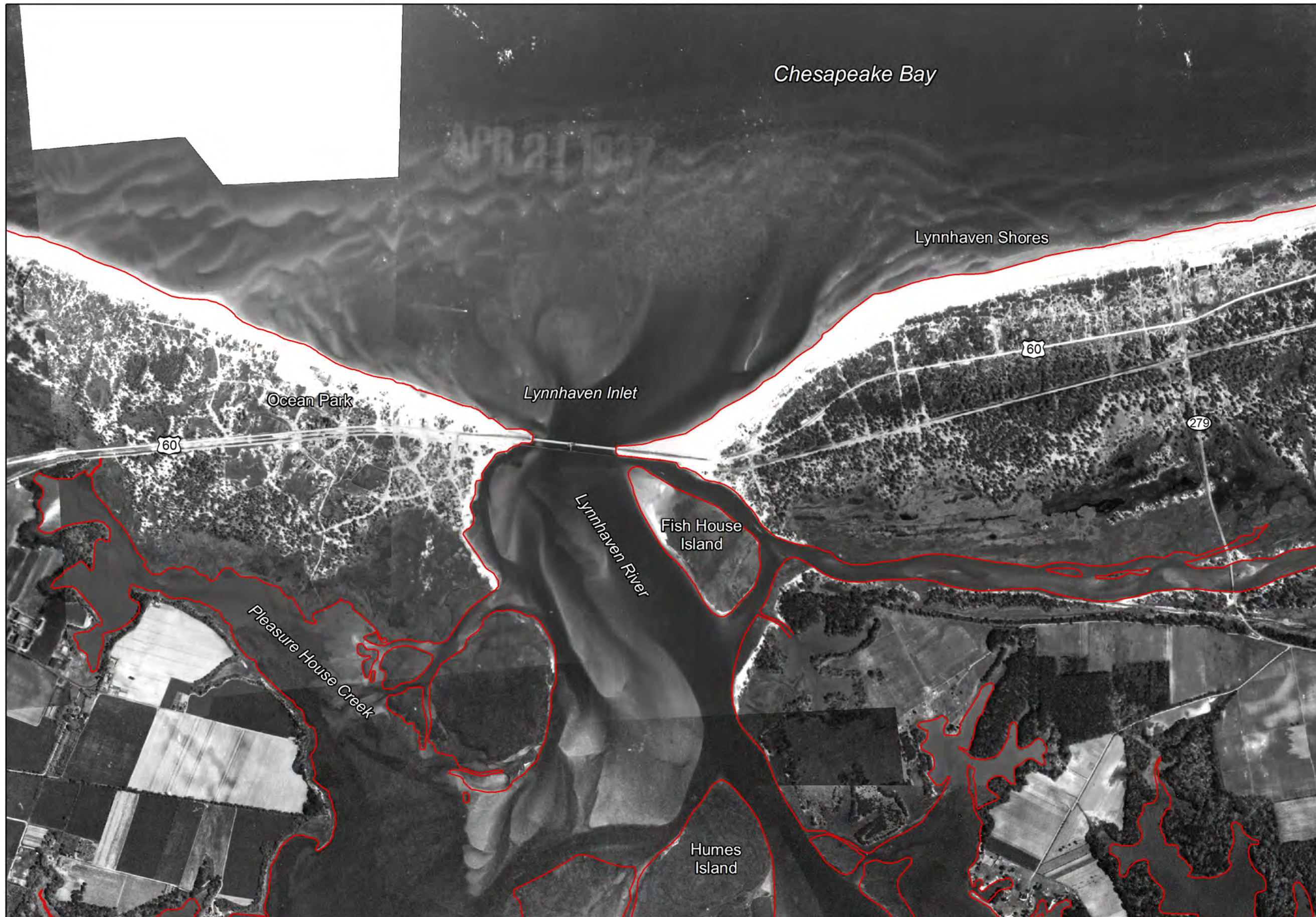
City of Virginia Beach Virginia
Plate 2



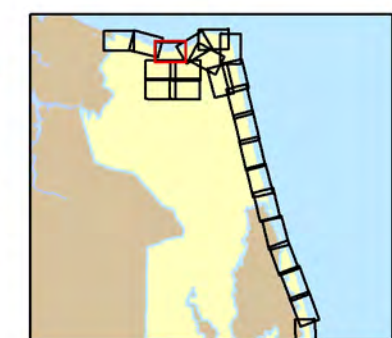
- Legend**
- 1937 Shoreline
 - 1954 Shoreline
 - 1970 Shoreline
 - 1980 Shoreline
 - 1994 Shoreline
 - 2002 Shoreline
 - 2009 Shoreline
 - 2011 Shoreline

Photo Date: 2011





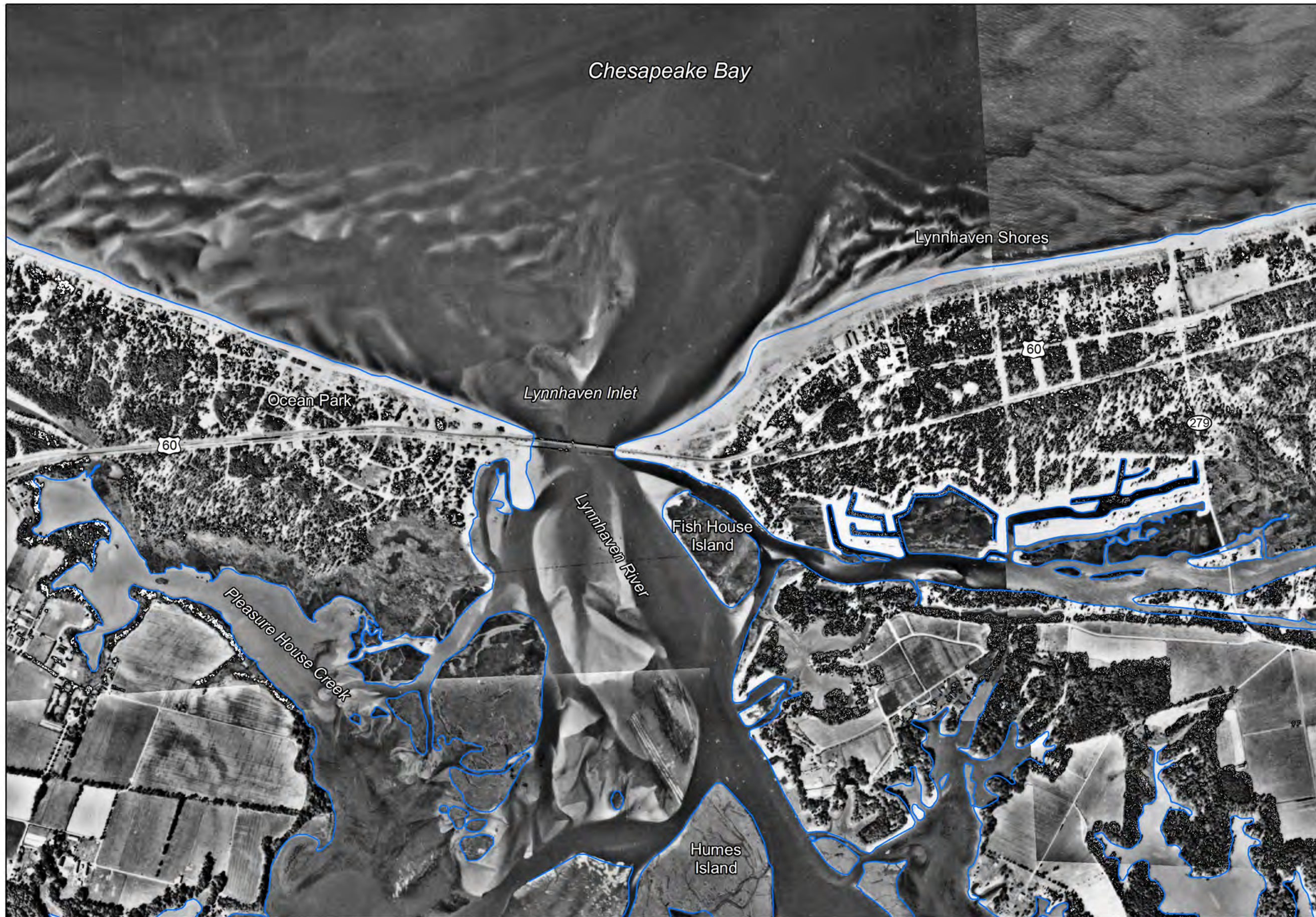
City of Virginia Beach Virginia
Plate 3



Legend
— 1937 Shoreline

Photo Date: 1937





City of Virginia Beach Virginia

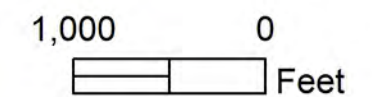
Plate 3



Legend

— 1954 Shoreline

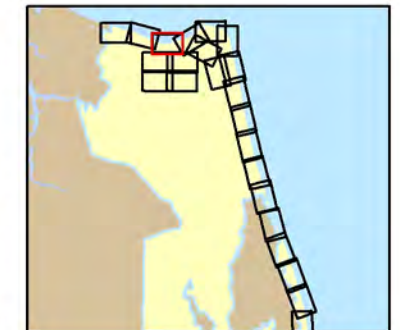
Photo Date: 1954





City of Virginia Beach Virginia

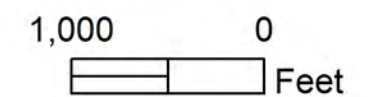
Plate 3



Legend

- 1970 Shoreline

Photo Date: 1970



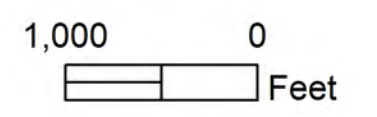


City of Virginia Beach Virginia
Plate 3



Legend
— 1980 Shoreline

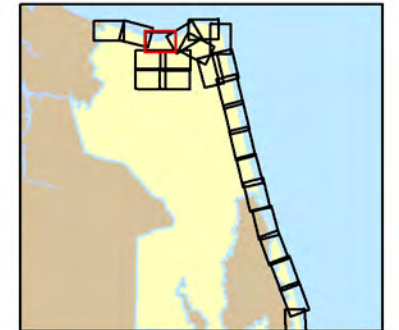
Photo Date: 1980





City of Virginia Beach Virginia

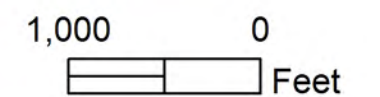
Plate 3



Legend

— 1994 Shoreline

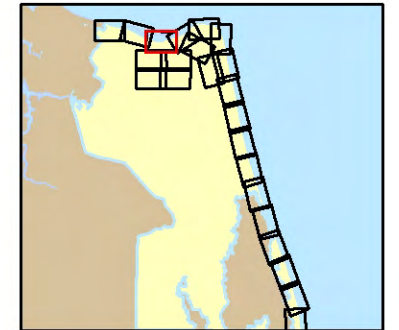
Photo Date: 1994





City of Virginia Beach Virginia

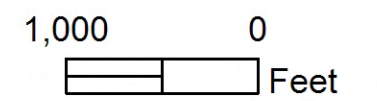
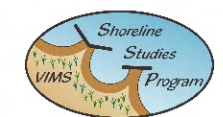
Plate 3

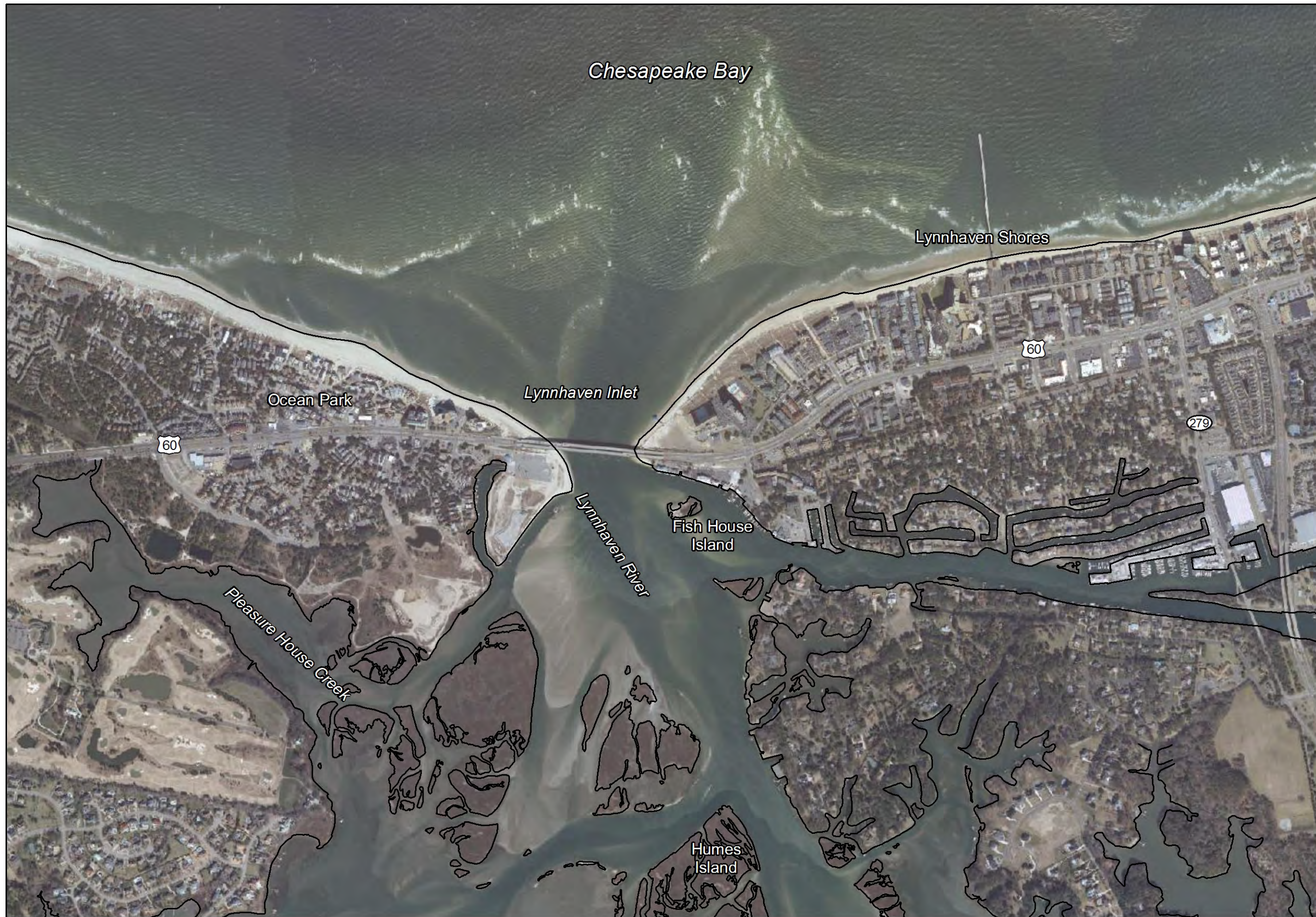


Legend

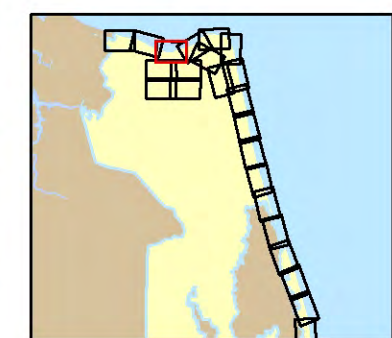
— 2002 Shoreline

Photo Date: 2002



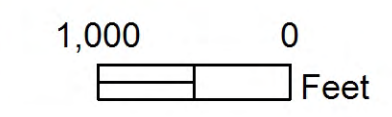


**City of
Virginia Beach
Virginia**
Plate 3



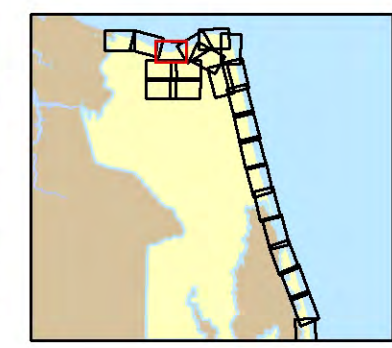
Legend
— 2009 Shoreline

Photo Date: 2009



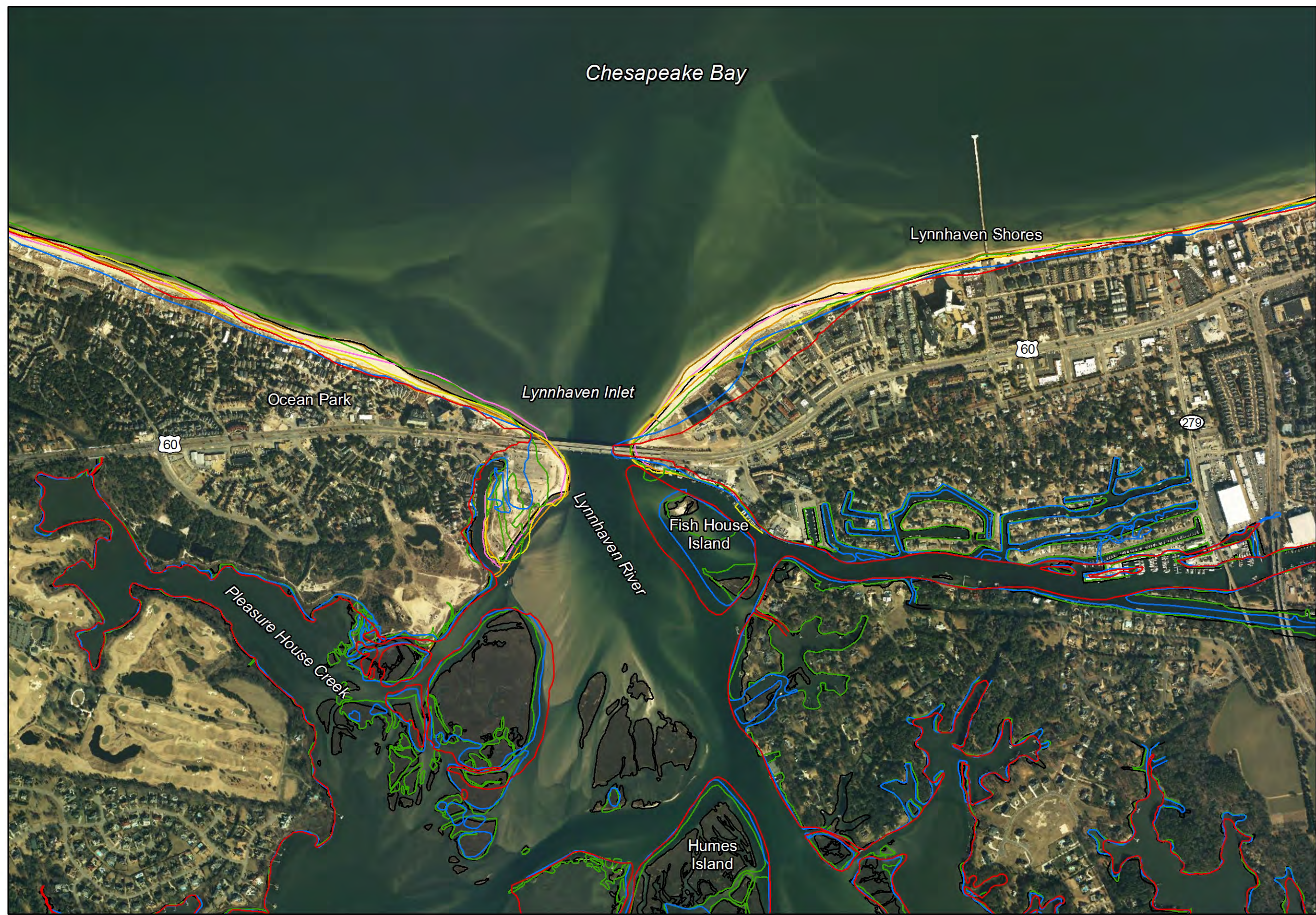
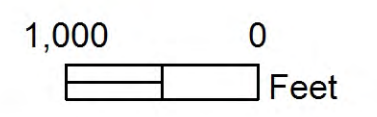
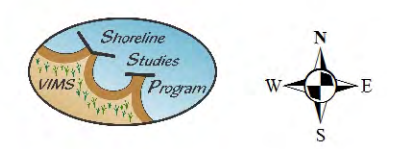
City of Virginia Beach Virginia

Plate 3



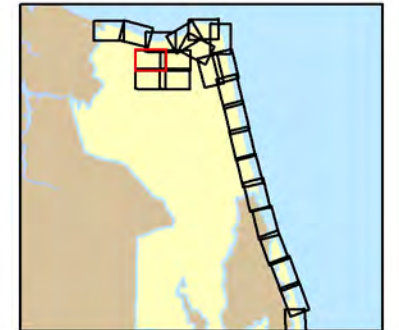
- Legend**
- 1937 Shoreline
 - 1954 Shoreline
 - 1970 Shoreline
 - 1980 Shoreline
 - 1994 Shoreline
 - 2002 Shoreline
 - 2009 Shoreline
 - 2011 Shoreline

Photo Date: 2011



City of Virginia Beach Virginia

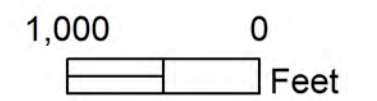
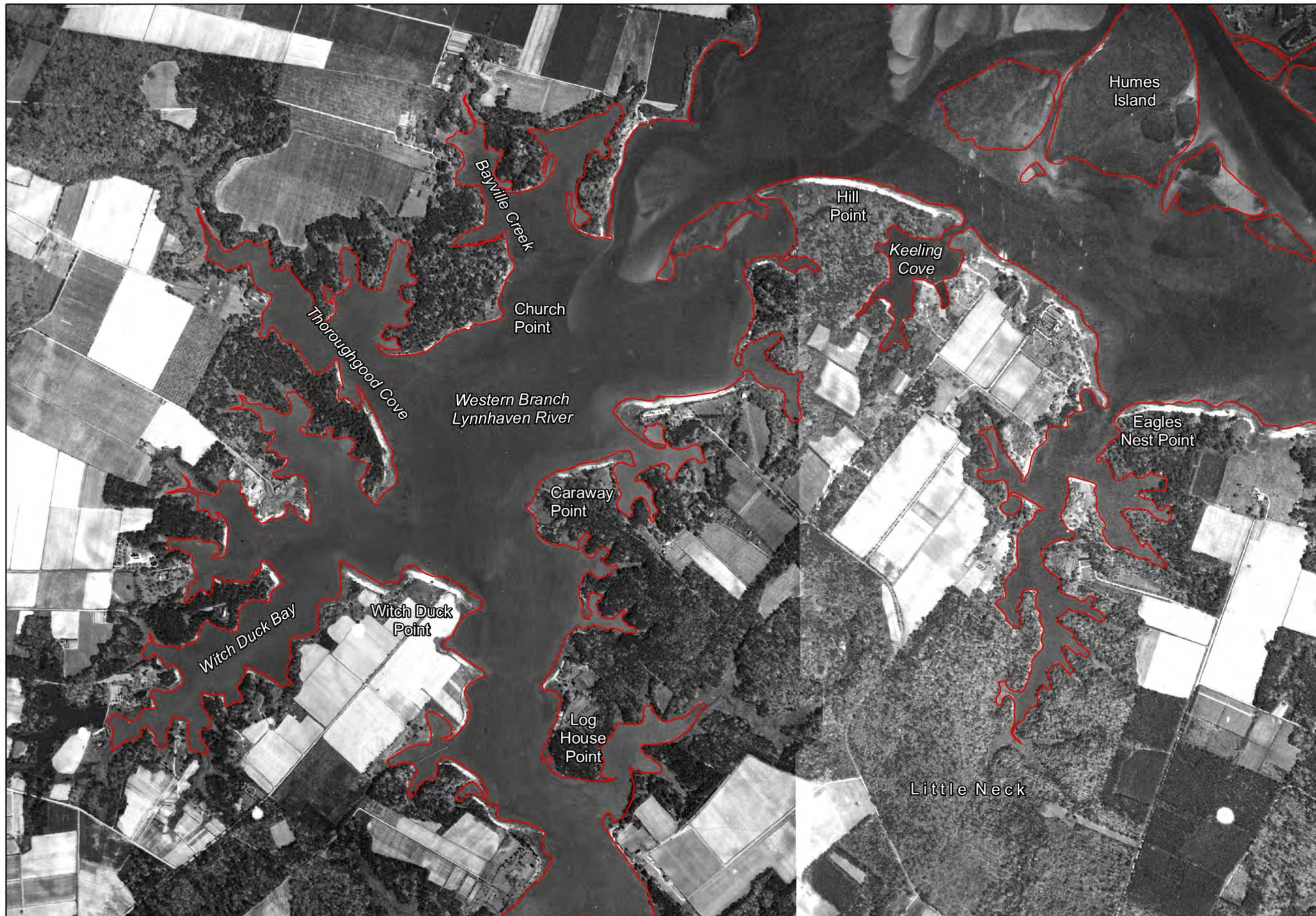
Plate 4



Legend

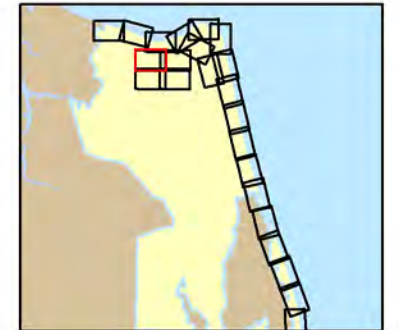
— 1937 Shoreline

Photo Date: 1937



City of Virginia Beach Virginia

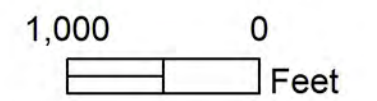
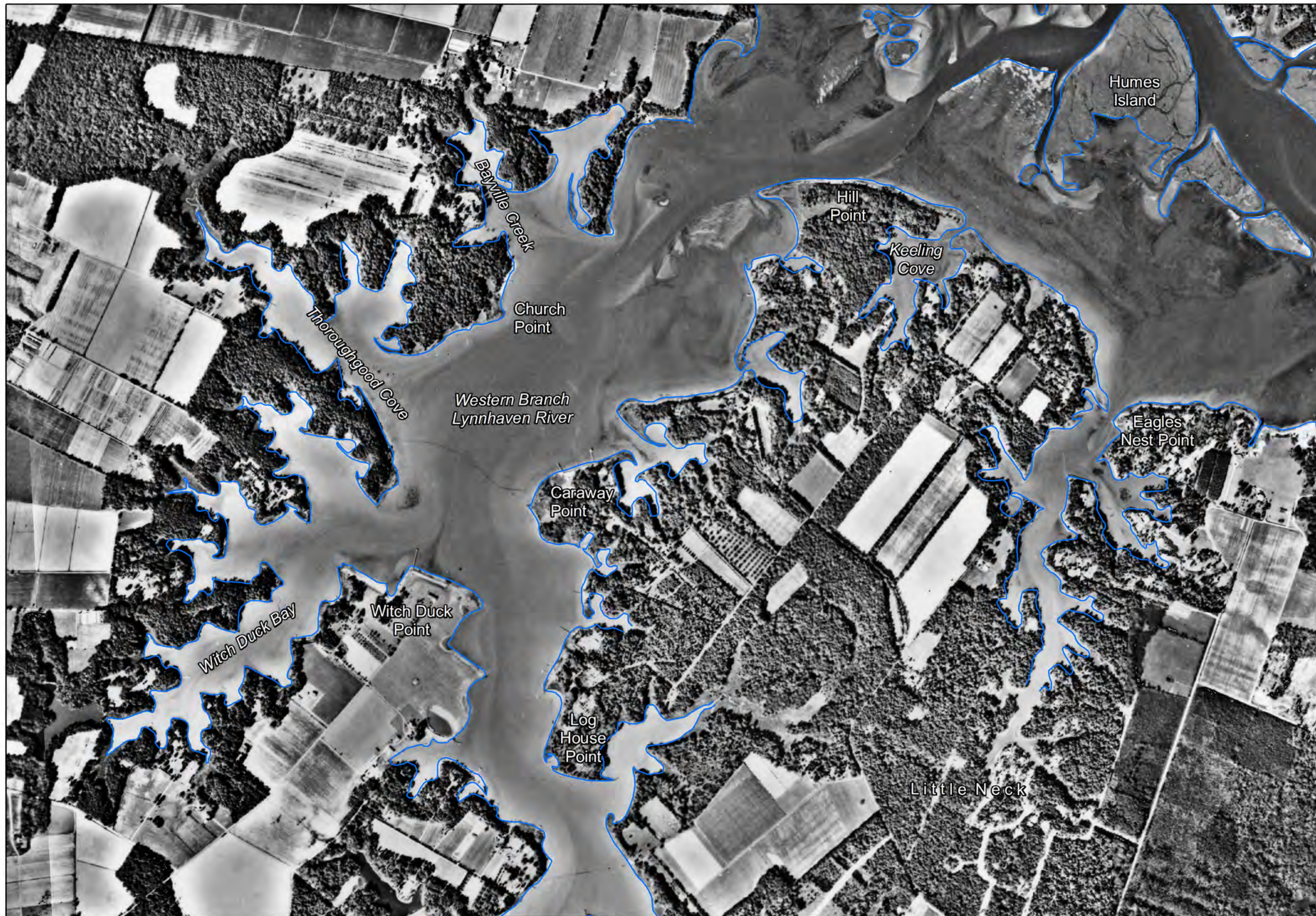
Plate 4



Legend

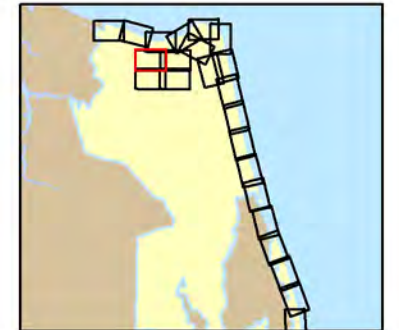
— 1954 Shoreline

Photo Date: 1954



City of Virginia Beach Virginia

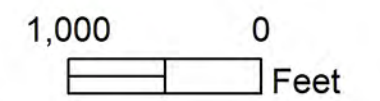
Plate 4



Legend

— 1970 Shoreline

Photo Date: 1970



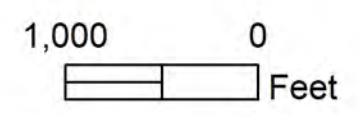
City of Virginia Beach Virginia

Plate 4



Legend
— 1980 Shoreline

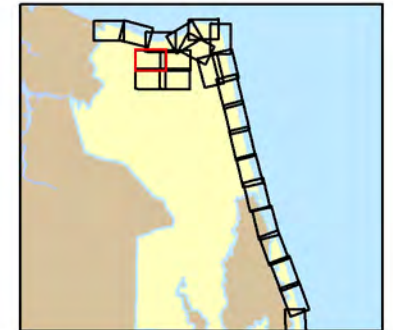
Photo Date: 1980





City of Virginia Beach Virginia

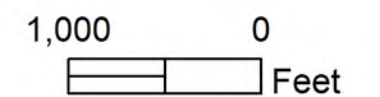
Plate 4



Legend

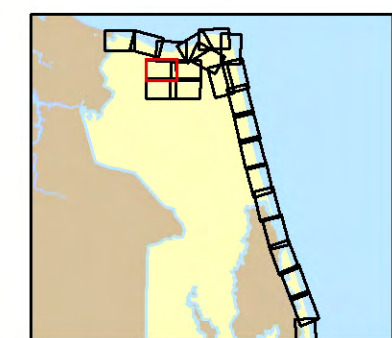
— 1994 Shoreline

Photo Date: 1994



City of Virginia Beach Virginia

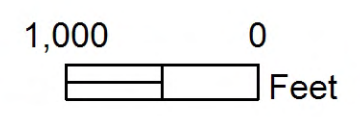
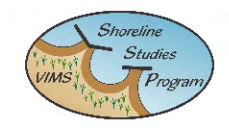
Plate 4



Legend

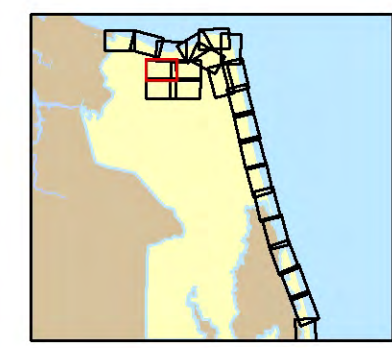
— 2002 Shoreline

Photo Date: 2002



City of Virginia Beach Virginia

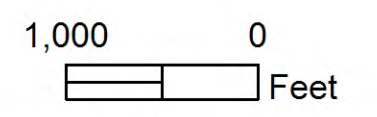
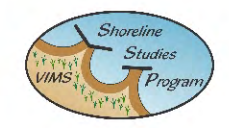
Plate 4



Legend

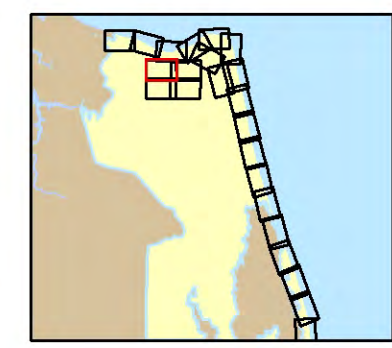
— 2009 Shoreline

Photo Date: 2009



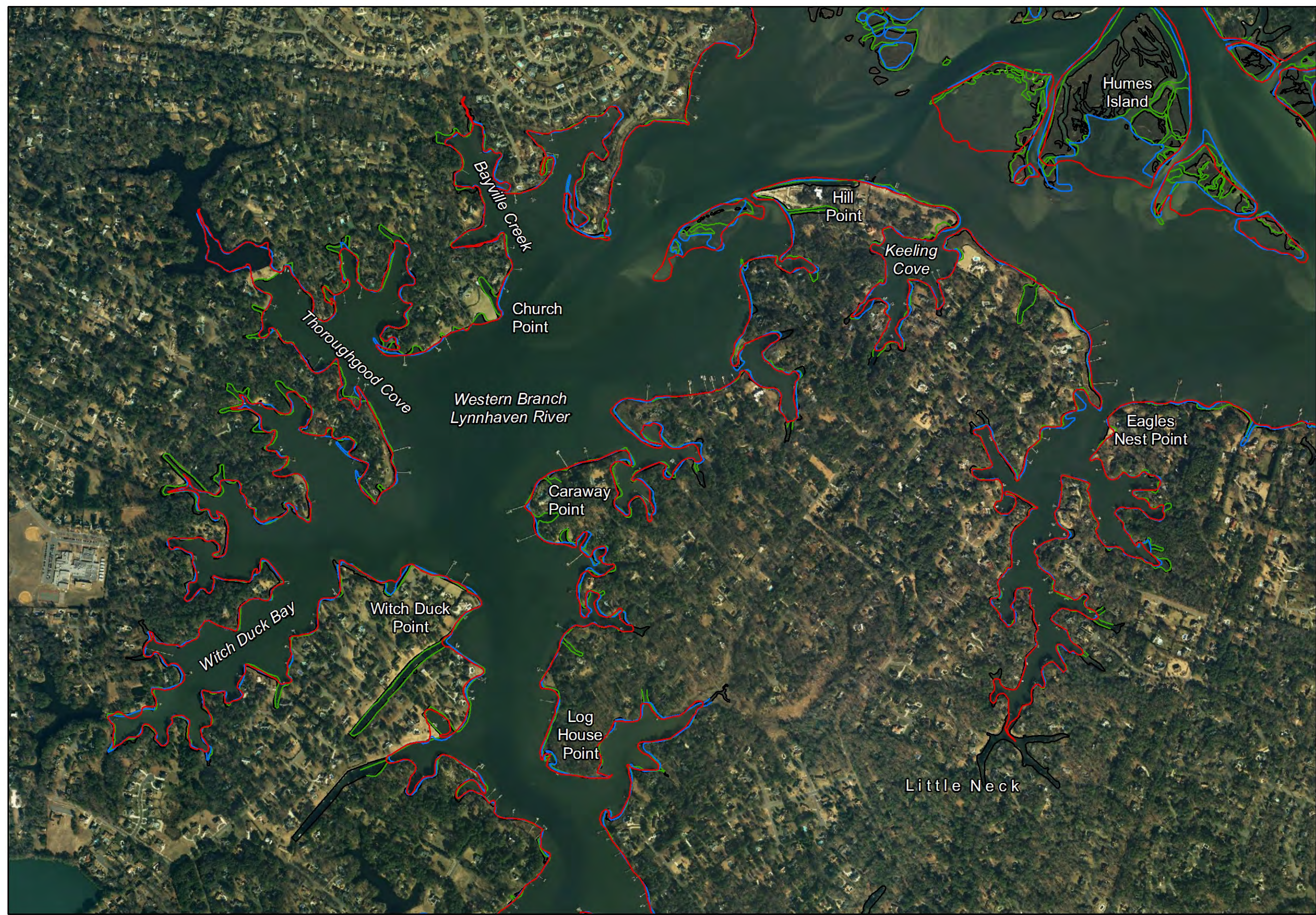
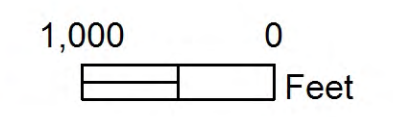
City of Virginia Beach Virginia

Plate 4



- Legend**
- 1937 Shoreline
 - 1954 Shoreline
 - 1970 Shoreline
 - 1980 Shoreline
 - 1994 Shoreline
 - 2002 Shoreline
 - 2009 Shoreline
 - 2011 Shoreline

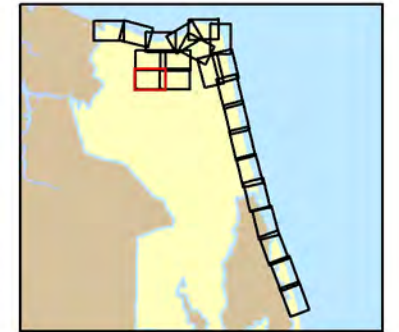
Photo Date: 2011





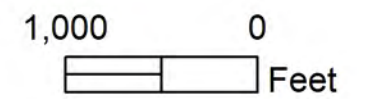
City of Virginia Beach Virginia

Plate 5



Legend
— 1937 Shoreline

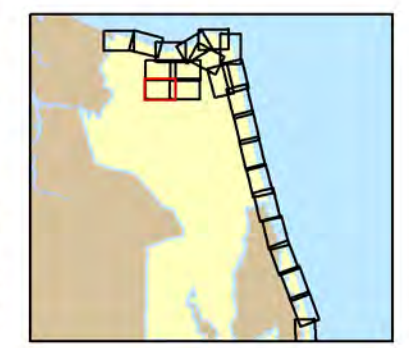
Photo Date: 1937





City of Virginia Beach Virginia

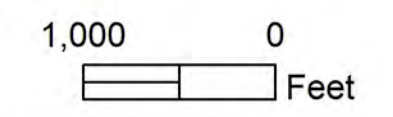
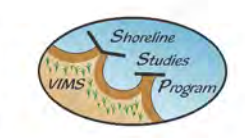
Plate 5



Legend

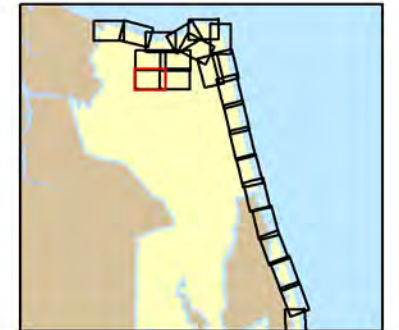
— 1954 Shoreline

Photo Date: 1954



City of Virginia Beach Virginia

Plate 5



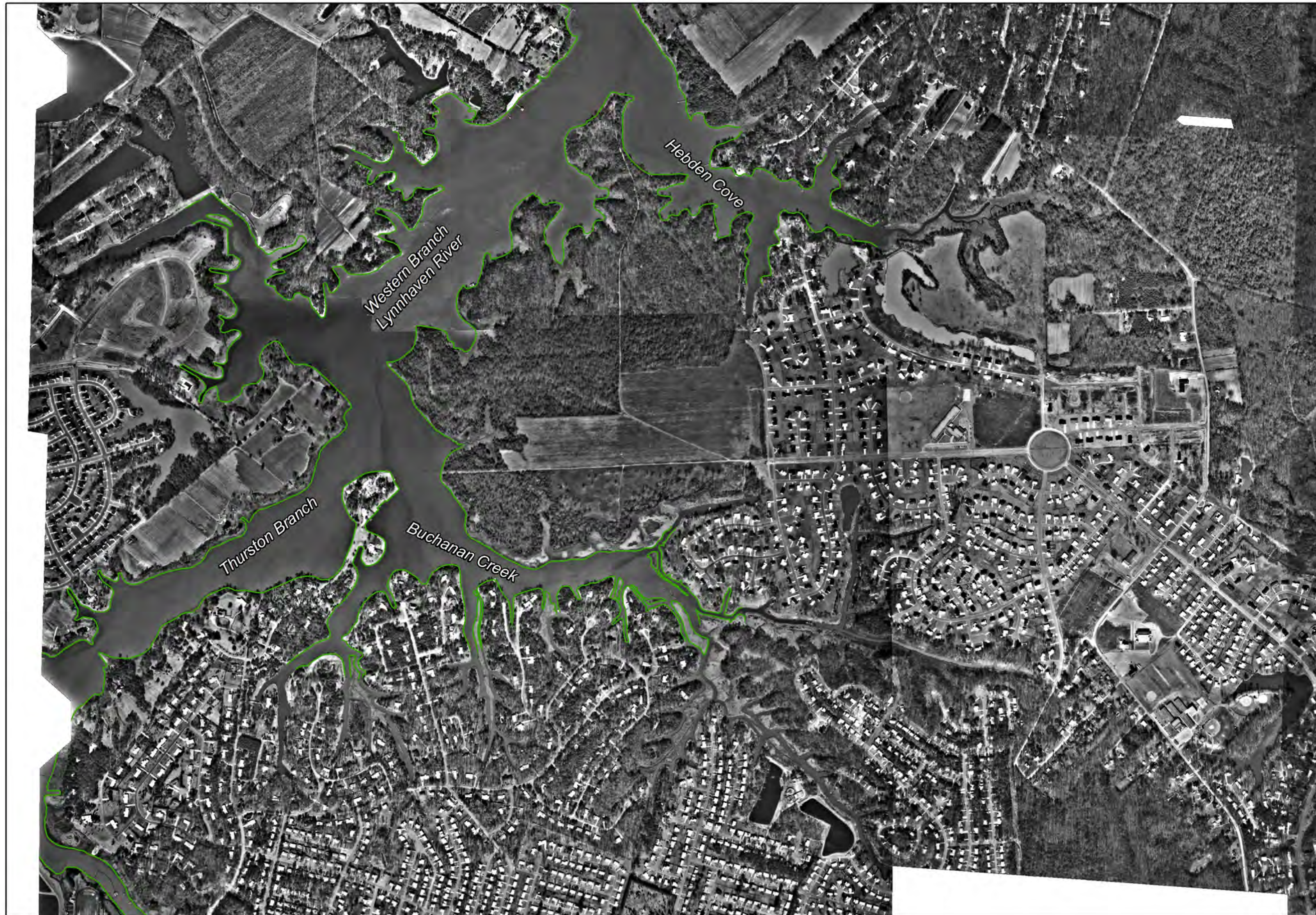
Legend

— 1970 Shoreline

Photo Date: 1970



1,000 0
Feet



City of Virginia Beach Virginia

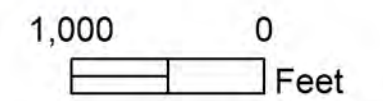
Plate 5



Legend

— 1980 Shoreline

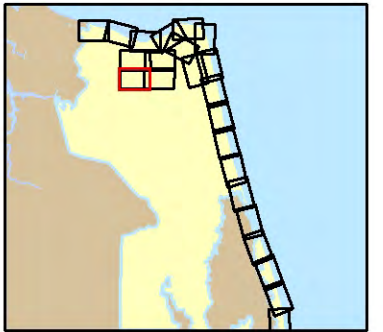
Photo Date: 1980





City of Virginia Beach Virginia

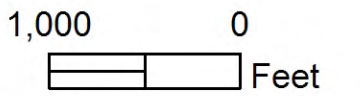
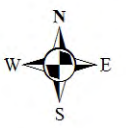
Plate 5



Legend

— 1994 Shoreline

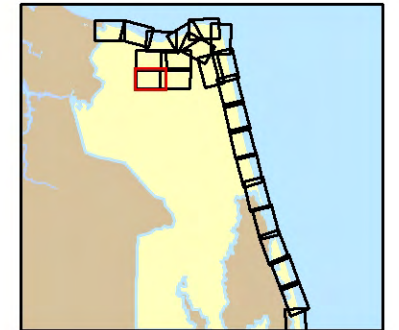
Photo Date: 1994





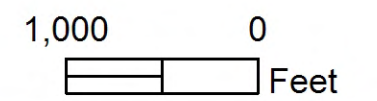
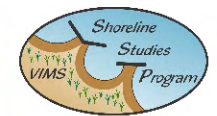
City of Virginia Beach Virginia

Plate 5



Legend
— 2002 Shoreline

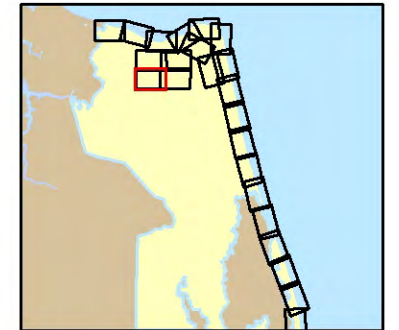
Photo Date: 2002





City of Virginia Beach Virginia

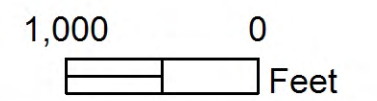
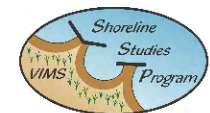
Plate 5



Legend

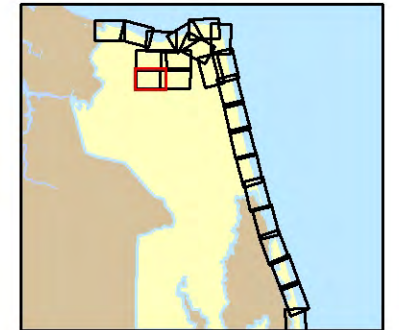
— 2009 Shoreline

Photo Date: 2009



City of Virginia Beach Virginia

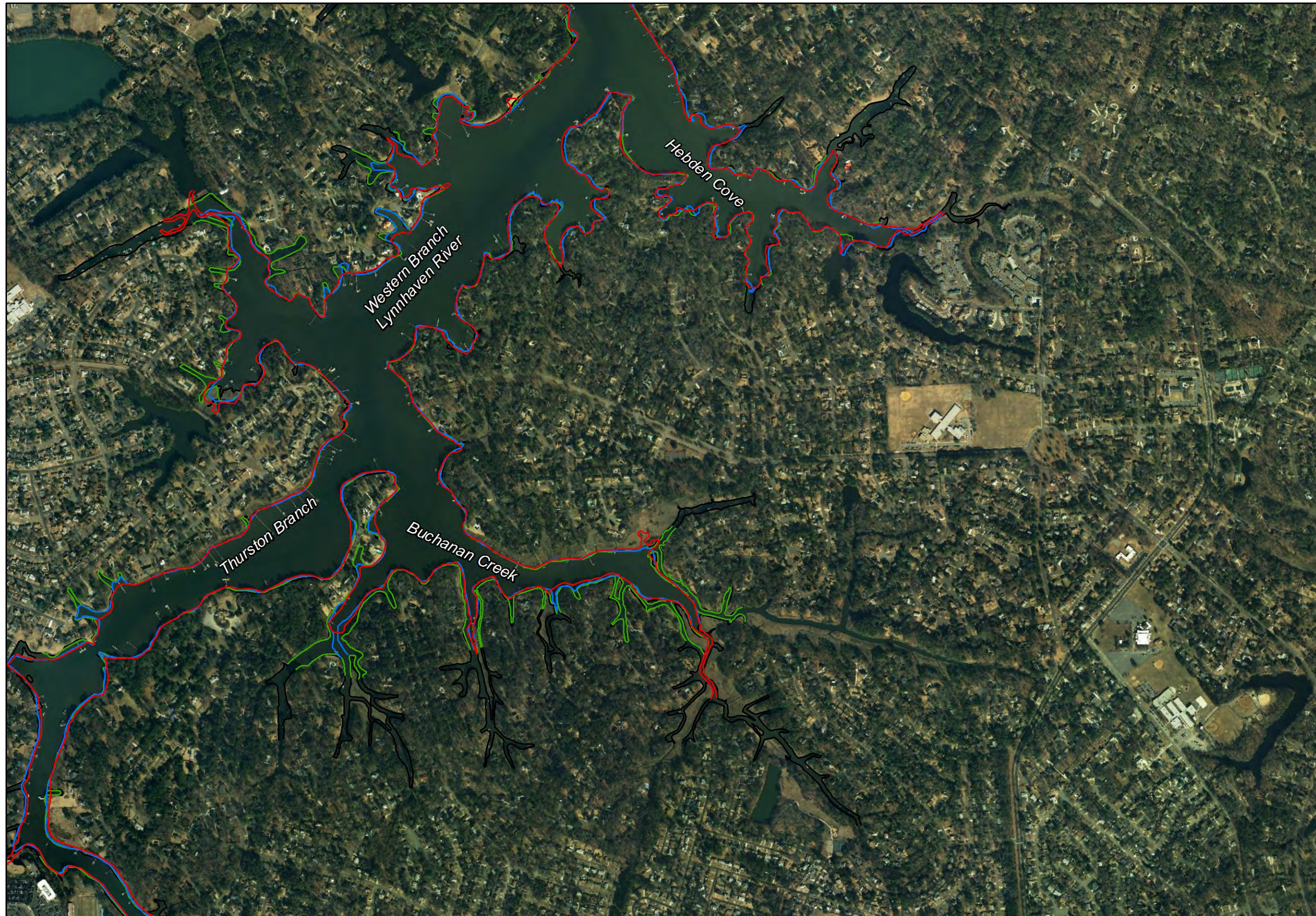
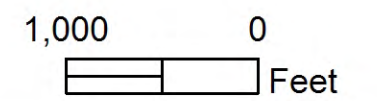
Plate 5



Legend

- 1937 Shoreline
- 1954 Shoreline
- 1970 Shoreline
- 1980 Shoreline
- 1994 Shoreline
- 2002 Shoreline
- 2009 Shoreline
- 2011 Shoreline

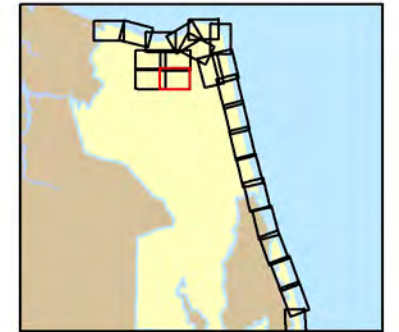
Photo Date: 2011





City of Virginia Beach Virginia

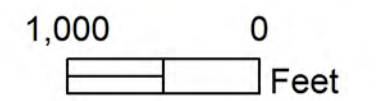
Plate 6

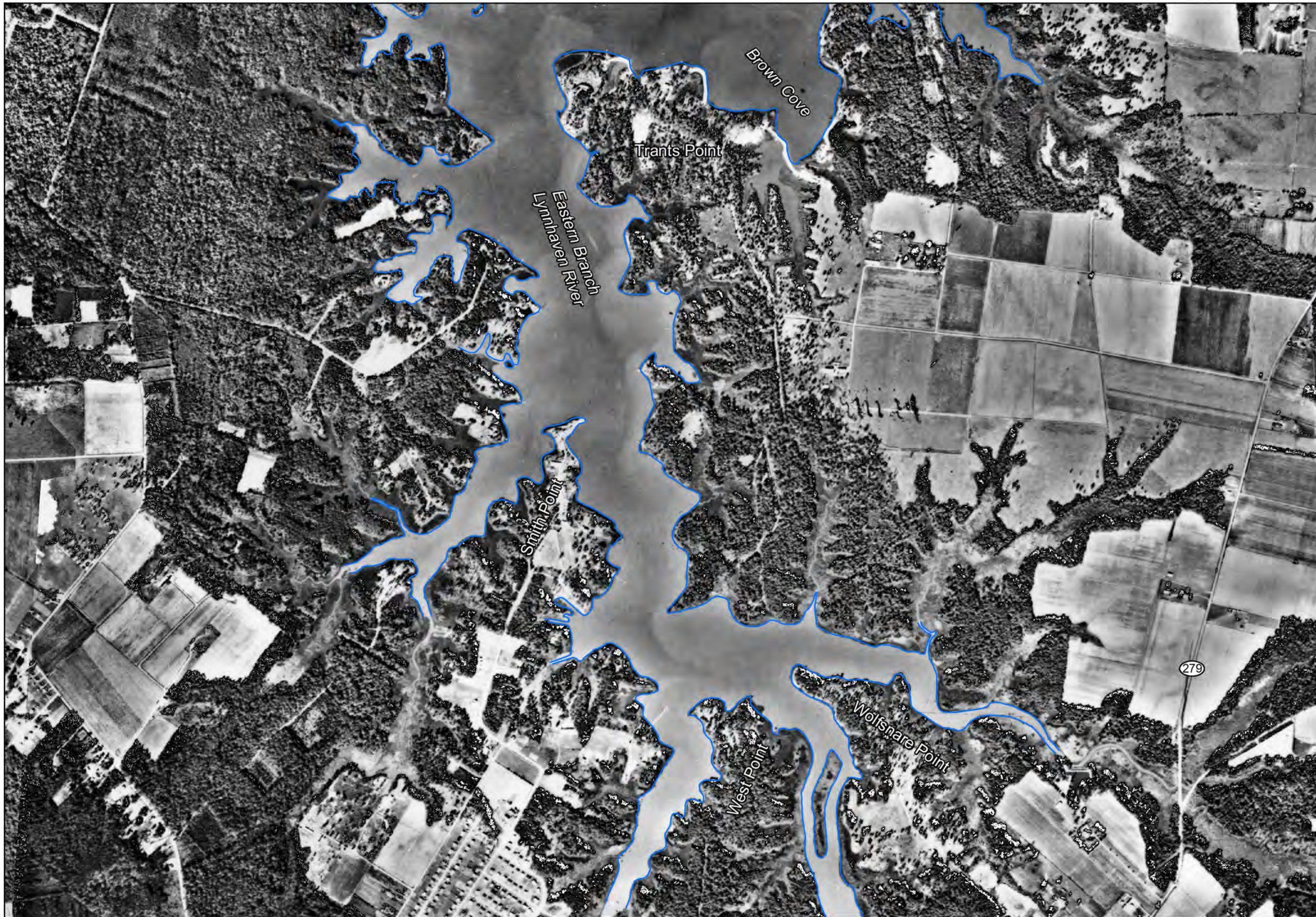


Legend

— 1937 Shoreline

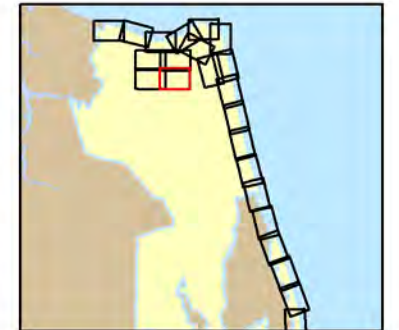
Photo Date: 1937





City of Virginia Beach Virginia

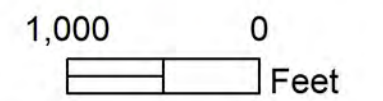
Plate 6

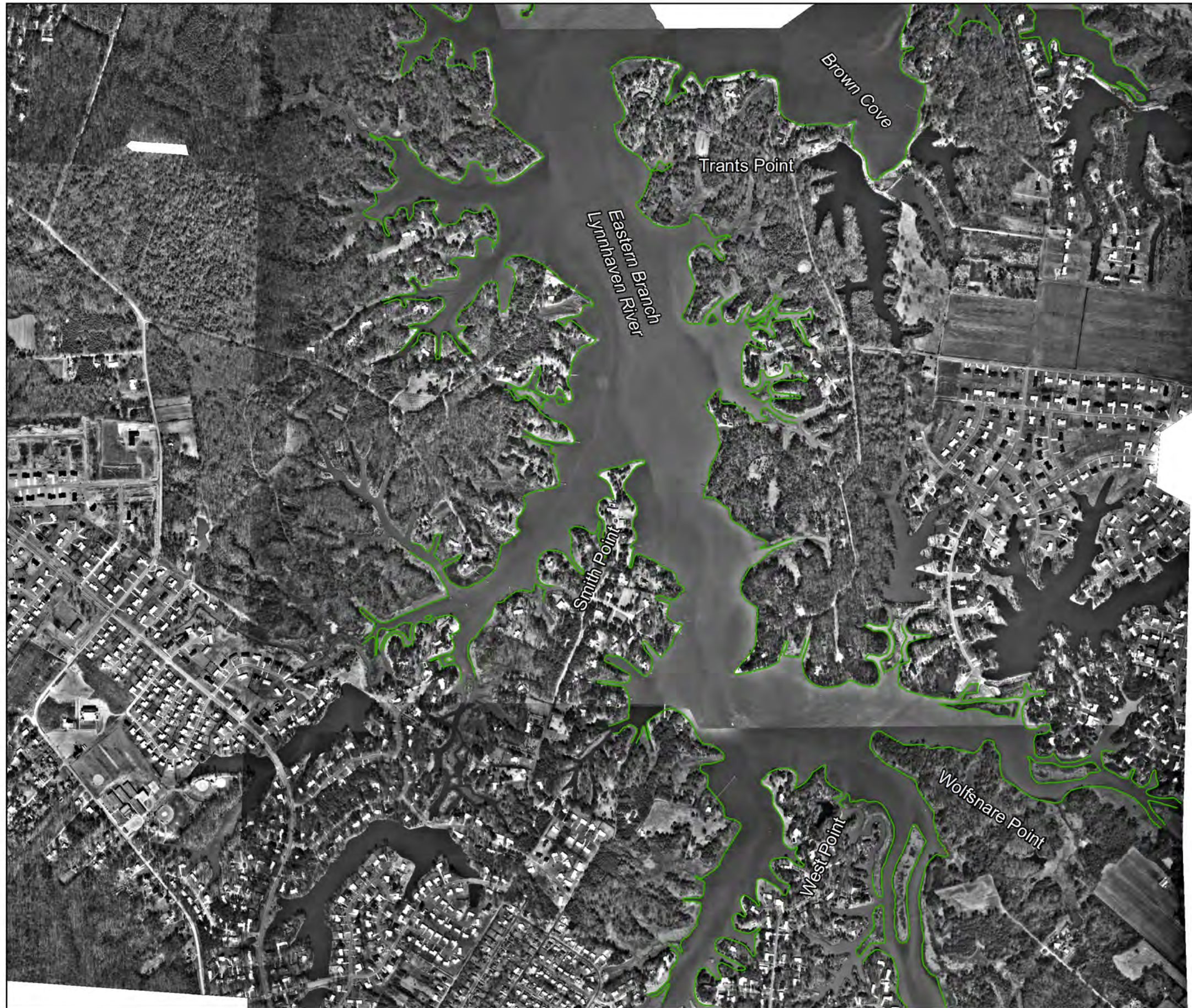


Legend

— 1954 Shoreline

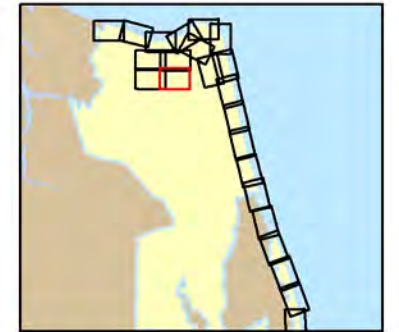
Photo Date: 1954





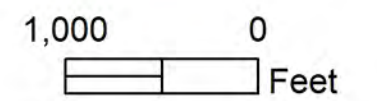
City of Virginia Beach Virginia

Plate 6



Legend
— 1970 Shoreline

Photo Date: 1970





City of Virginia Beach Virginia

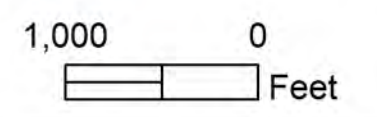
Plate 6



Legend

— 1980 Shoreline

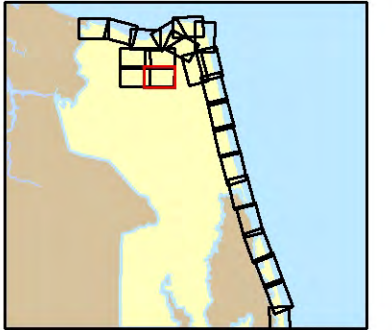
Photo Date: 1980





City of Virginia Beach Virginia

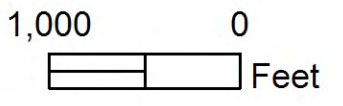
Plate 6



Legend

— 1994 Shoreline

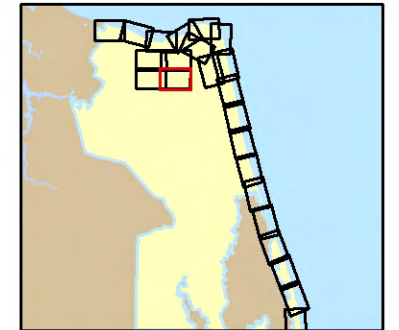
Photo Date: 1994





City of Virginia Beach Virginia

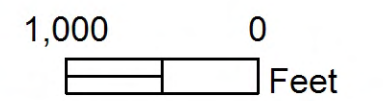
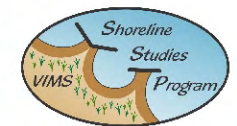
Plate 6



Legend

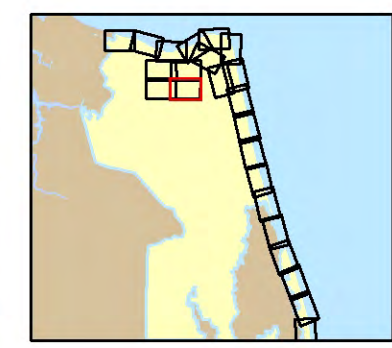
— 2002 Shoreline

Photo Date: 2002



City of Virginia Beach Virginia

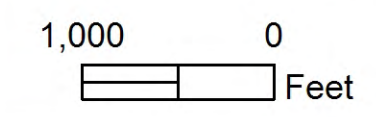
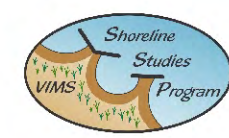
Plate 6



Legend

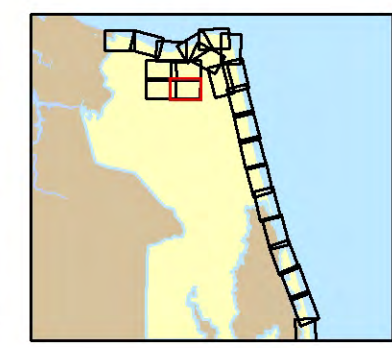
— 2009 Shoreline

Photo Date: 2009



City of Virginia Beach Virginia

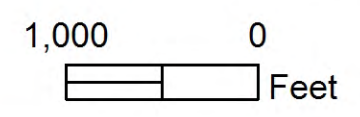
Plate 6



Legend

- 1937 Shoreline
- 1954 Shoreline
- 1970 Shoreline
- 1980 Shoreline
- 1994 Shoreline
- 2002 Shoreline
- 2009 Shoreline
- 2011 Shoreline

Photo Date: 2011





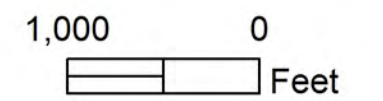
City of Virginia Beach Virginia

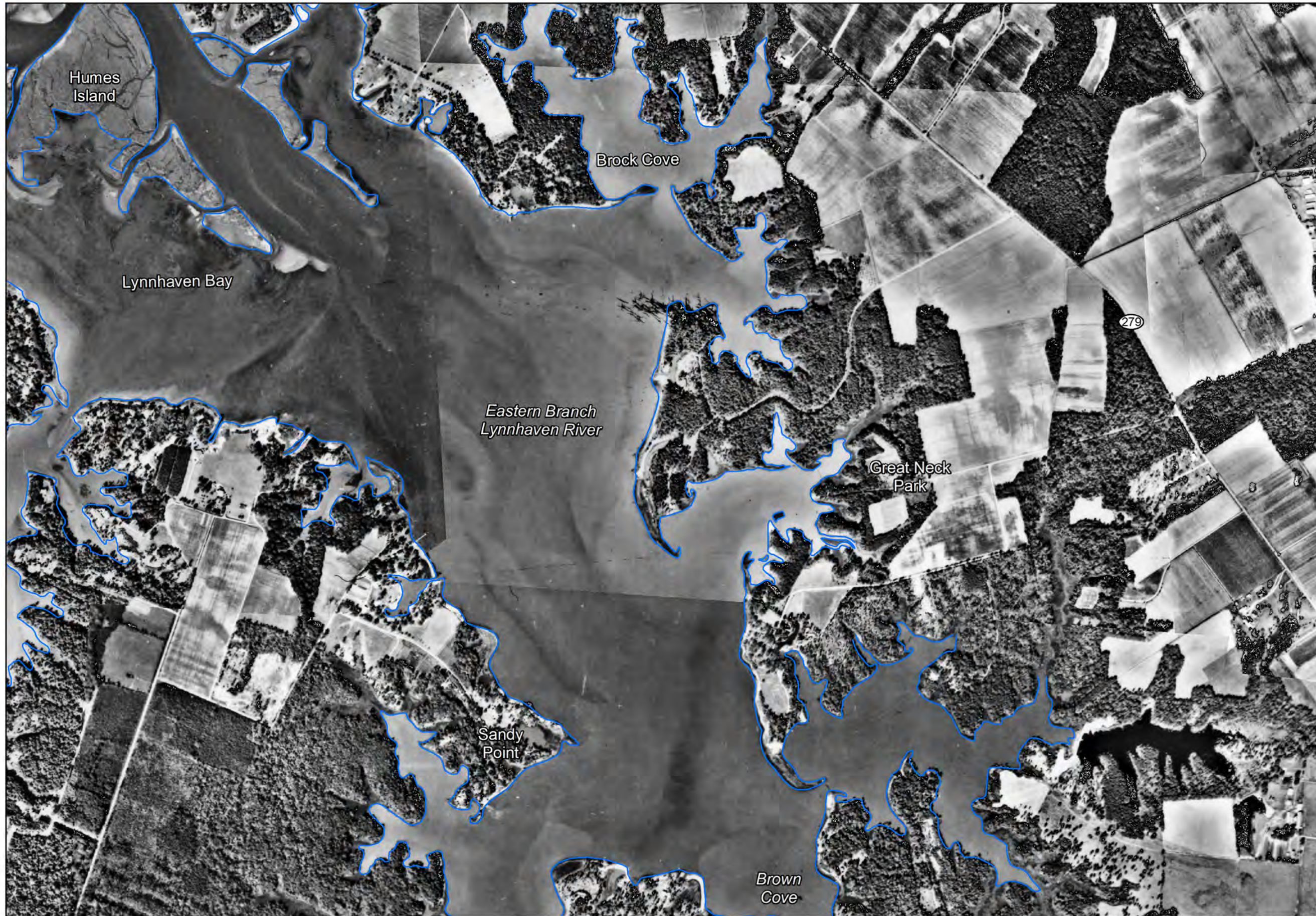
Plate 7



Legend
— 1937 Shoreline

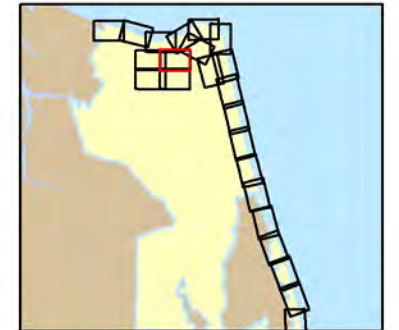
Photo Date: 1937





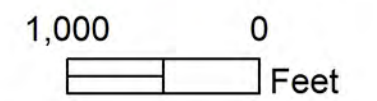
City of Virginia Beach Virginia

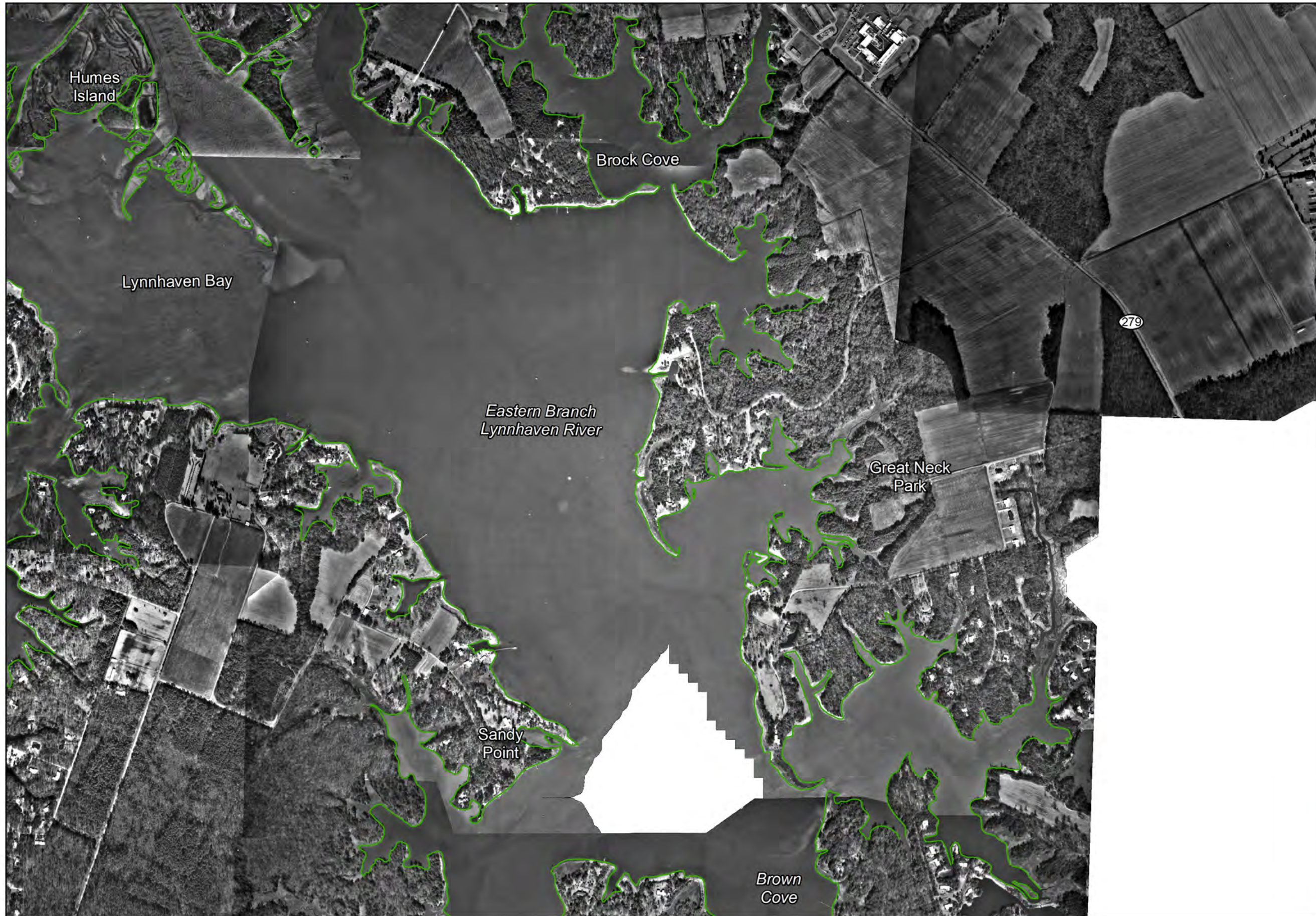
Plate 7



Legend
— 1954 Shoreline

Photo Date: 1954





City of Virginia Beach Virginia

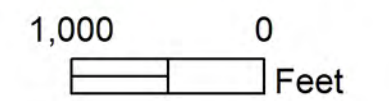
Plate 7



Legend

— 1970 Shoreline

Photo Date: 1970





Humes Island

Brock Cove

Lynnhaven Bay

*Eastern Branch
Lynnhaven River*

Great Neck
Park

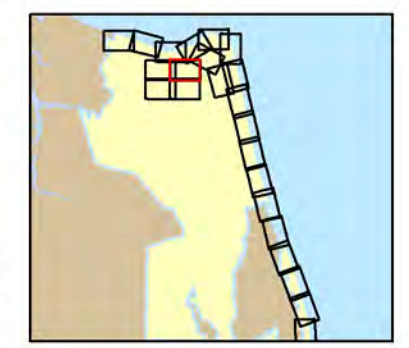
Sandy
Point

Brown
Cove

279

City of Virginia Beach Virginia

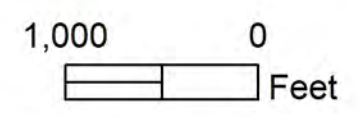
Plate 7



Legend

— 1980 Shoreline

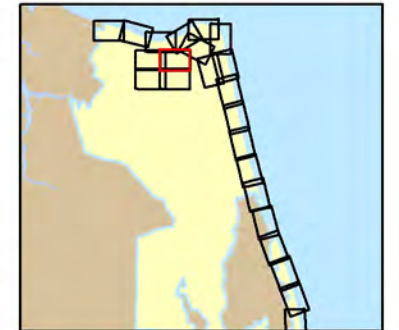
Photo Date: 1980





City of Virginia Beach Virginia

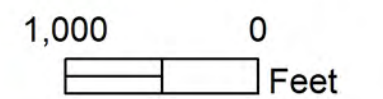
Plate 7



Legend

- 1994 Shoreline

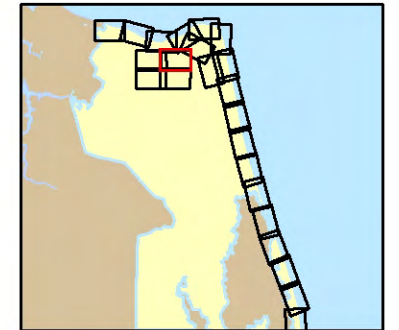
Photo Date: 1994





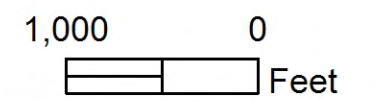
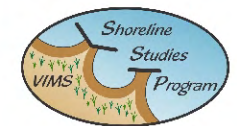
City of Virginia Beach Virginia

Plate 7



Legend
— 2002 Shoreline

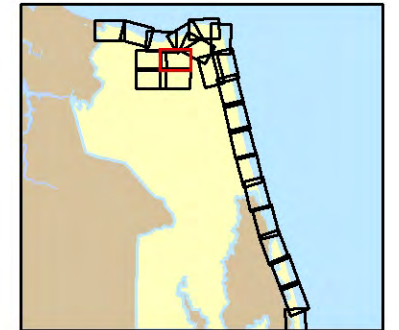
Photo Date: 2002





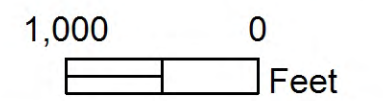
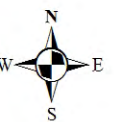
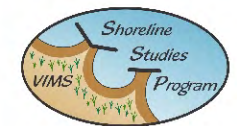
City of Virginia Beach Virginia

Plate 7



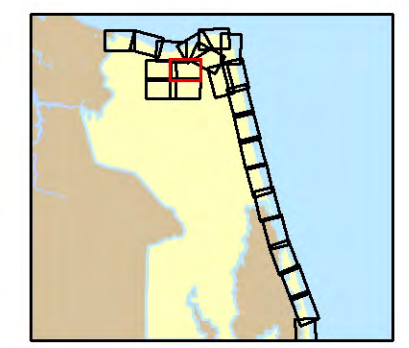
Legend
— 2009 Shoreline

Photo Date: 2009



City of Virginia Beach Virginia

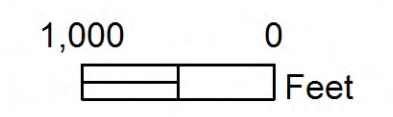
Plate 7

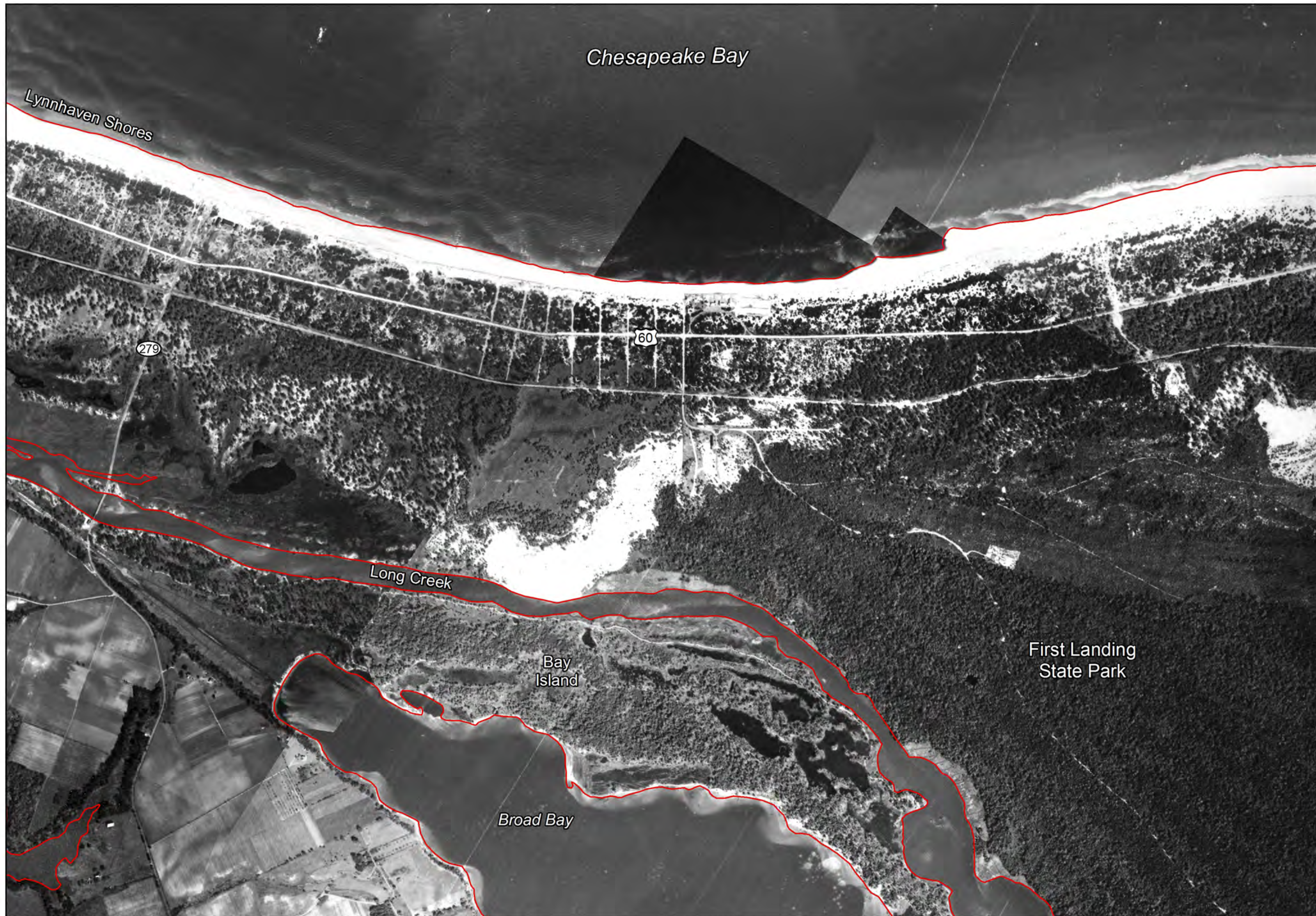


Legend

- 1937 Shoreline
- 1954 Shoreline
- 1970 Shoreline
- 1980 Shoreline
- 1994 Shoreline
- 2002 Shoreline
- 2009 Shoreline
- 2011 Shoreline

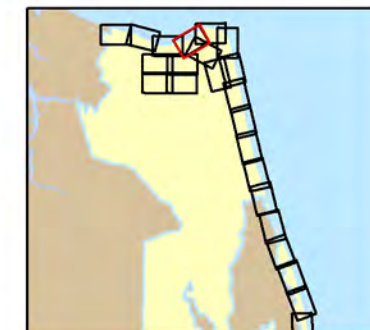
Photo Date: 2011





City of Virginia Beach Virginia

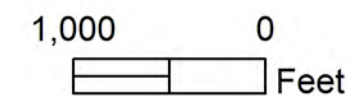
Plate 8



Legend

— 1937 Shoreline

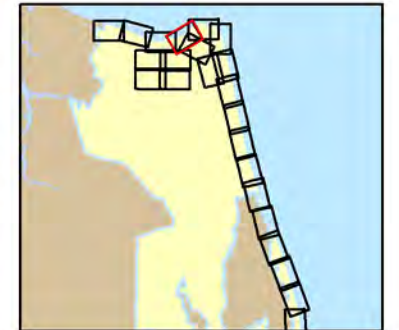
Photo Date: 1937





City of Virginia Beach Virginia

Plate 8



Legend

— 1954 Shoreline

Photo Date: 1954



1,000 0 Feet

A scale bar showing 1,000 feet and 0 feet.



Chesapeake Bay

Lynnhaven Shores

279

60

Long Creek

Bay Island

First Landing State Park

Broad Bay

City of Virginia Beach Virginia

Plate 8



Legend

— 1970 Shoreline

Photo Date: 1970





City of Virginia Beach Virginia

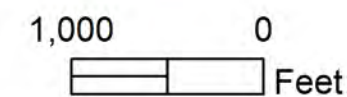
Plate 8



Legend

— 1980 Shoreline

Photo Date: 1980





City of Virginia Beach Virginia

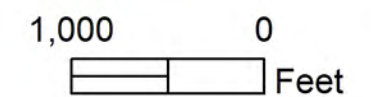
Plate 8



Legend

— 1994 Shoreline

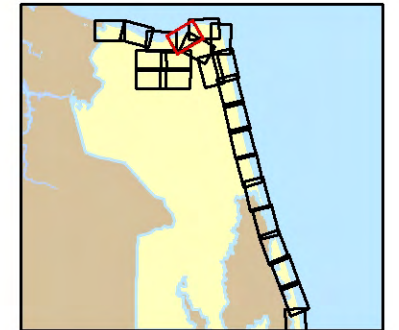
Photo Date: 1994





City of Virginia Beach Virginia

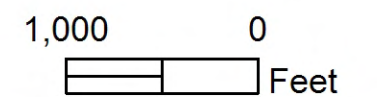
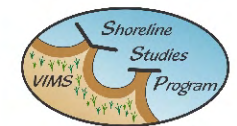
Plate 8

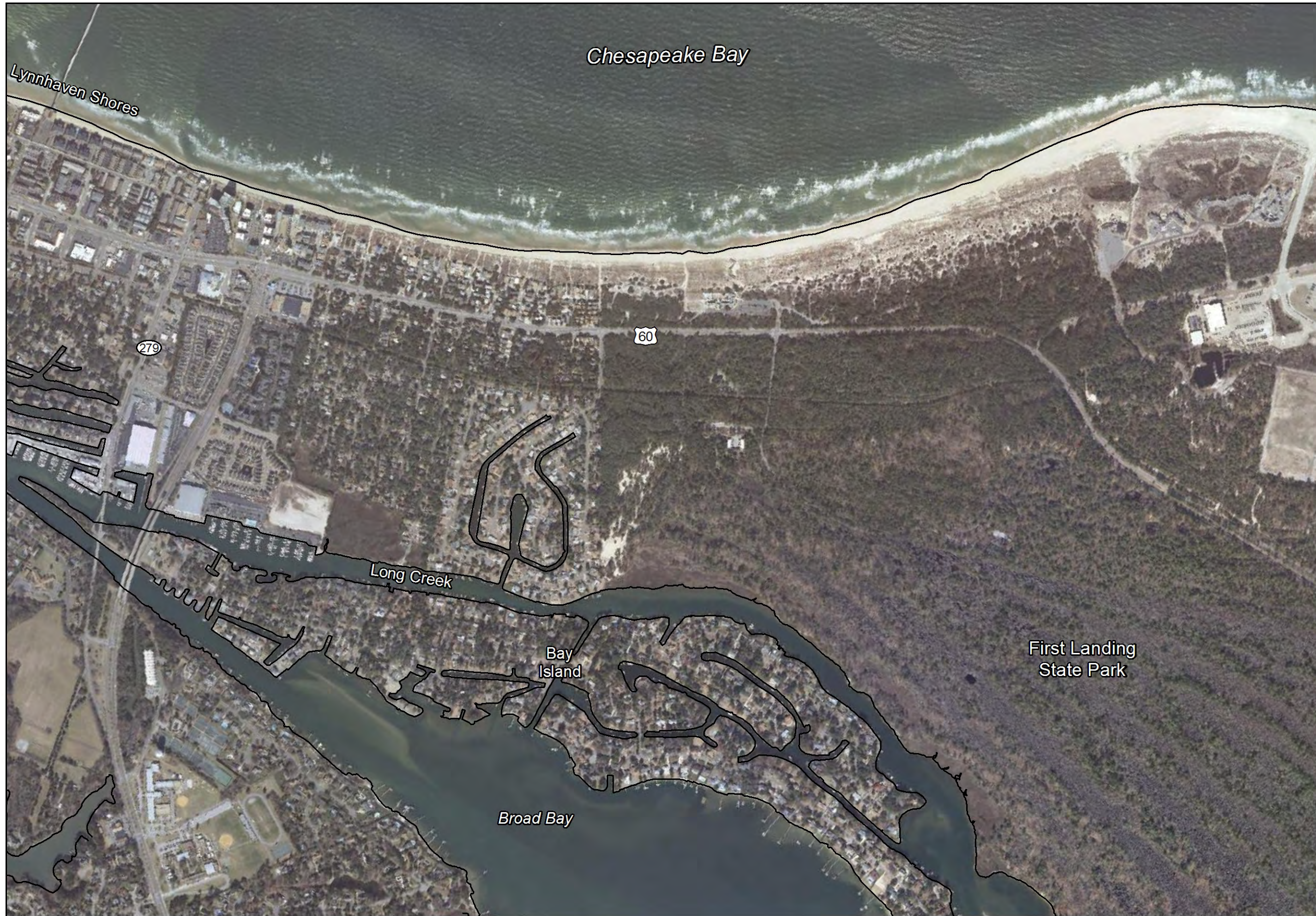


Legend

- 2002 Shoreline

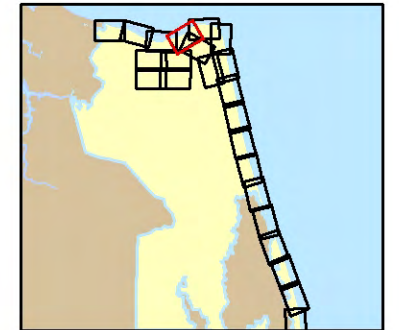
Photo Date: 2002





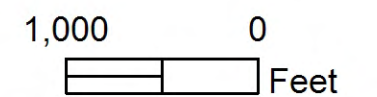
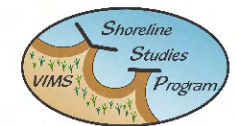
City of Virginia Beach Virginia

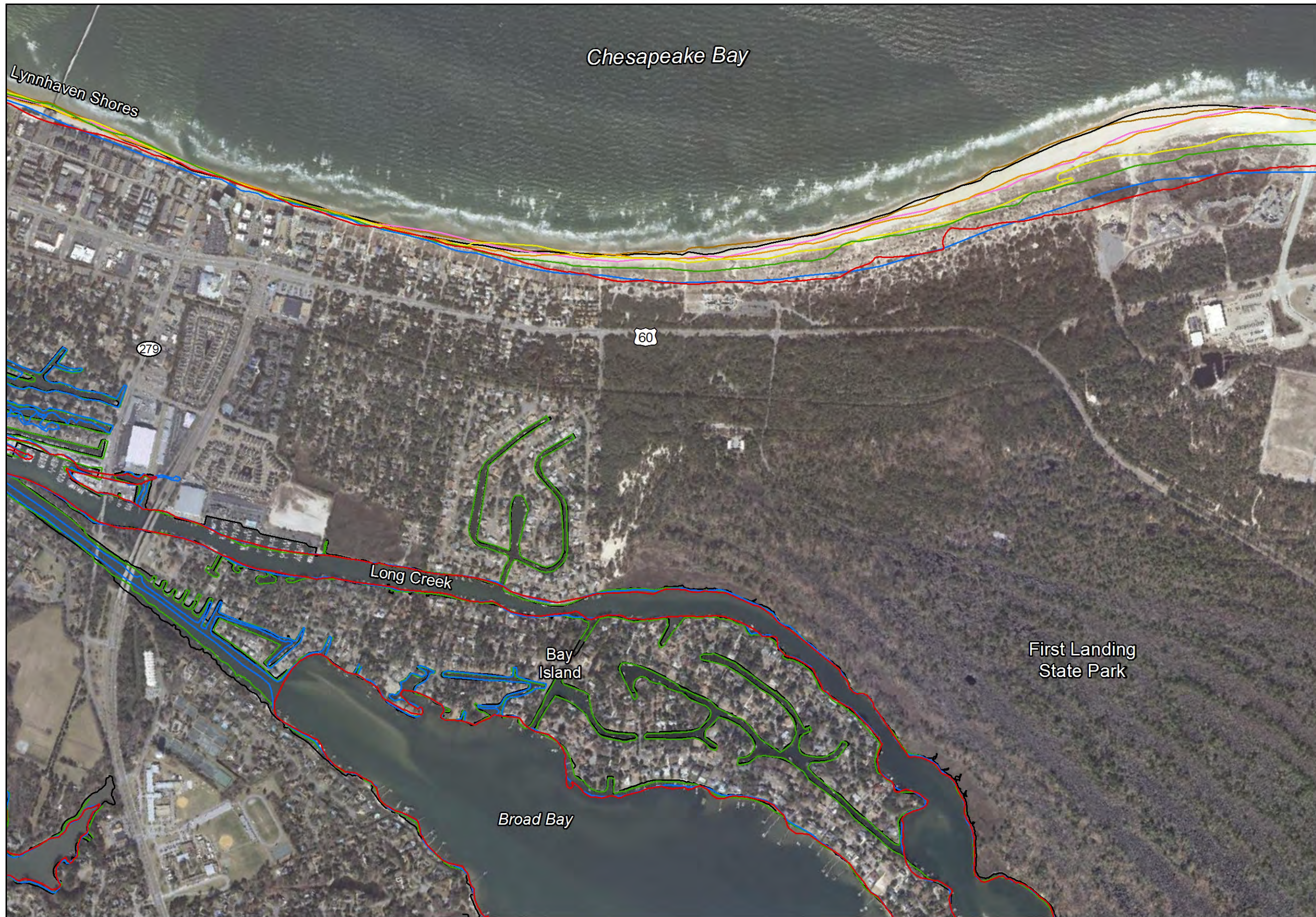
Plate 8



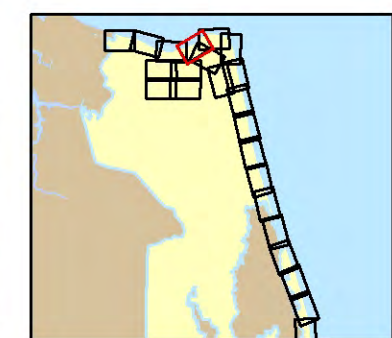
Legend
 — 2009 Shoreline

Photo Date: 2009



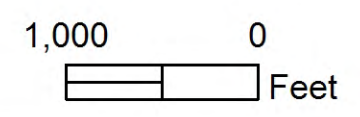


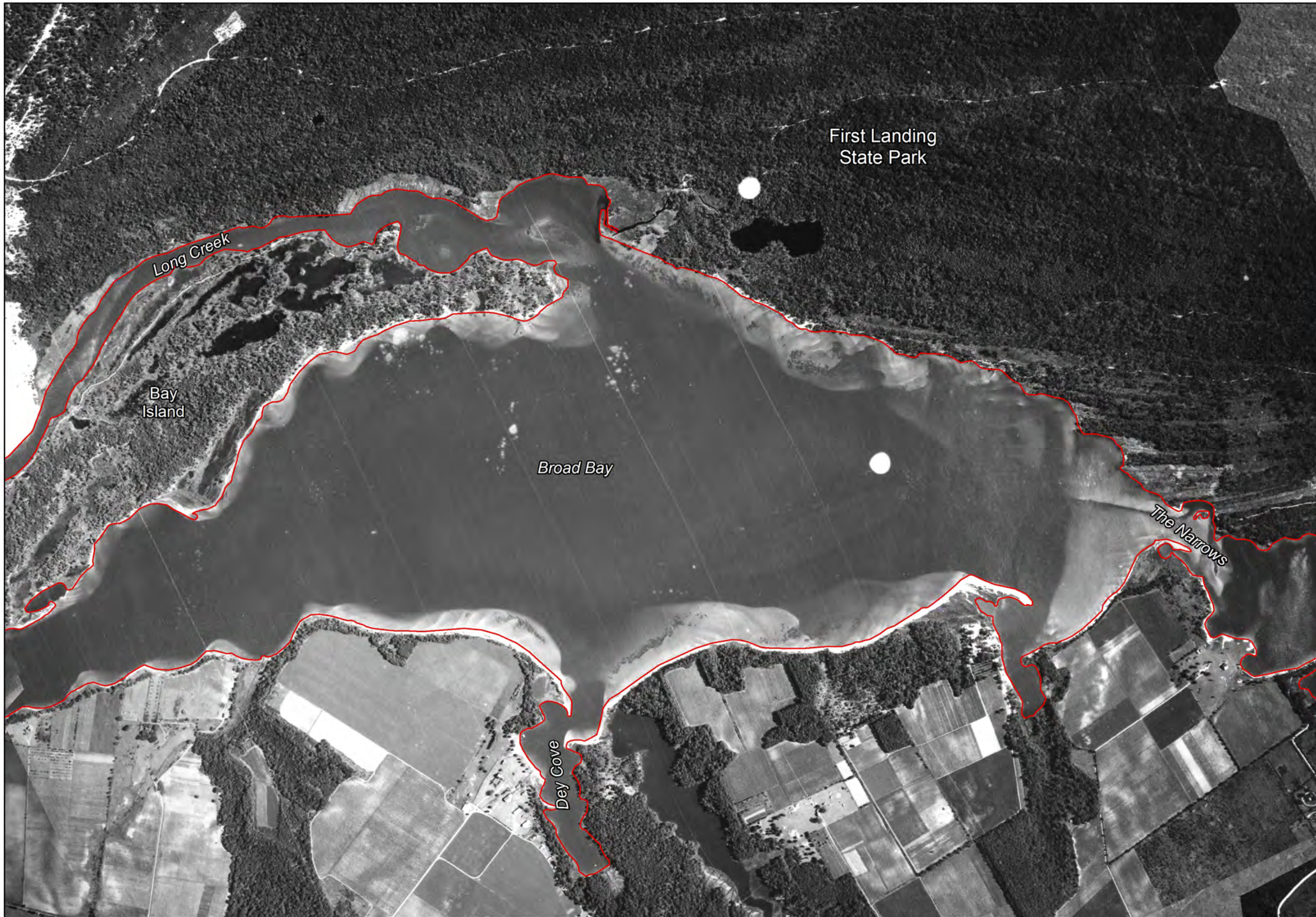
City of Virginia Beach Virginia
Plate 8



- Legend**
- 1937 Shoreline
 - 1954 Shoreline
 - 1970 Shoreline
 - 1980 Shoreline
 - 1994 Shoreline
 - 2002 Shoreline
 - 2009 Shoreline
 - 2011 Shoreline

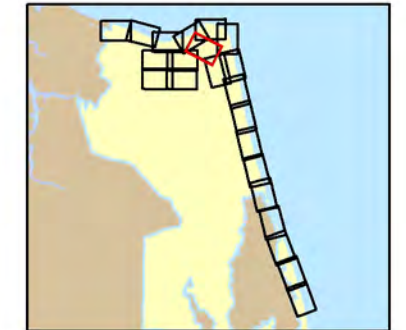
Photo Date: 2011





City of Virginia Beach Virginia

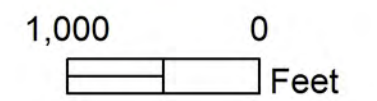
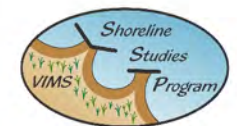
Plate 9

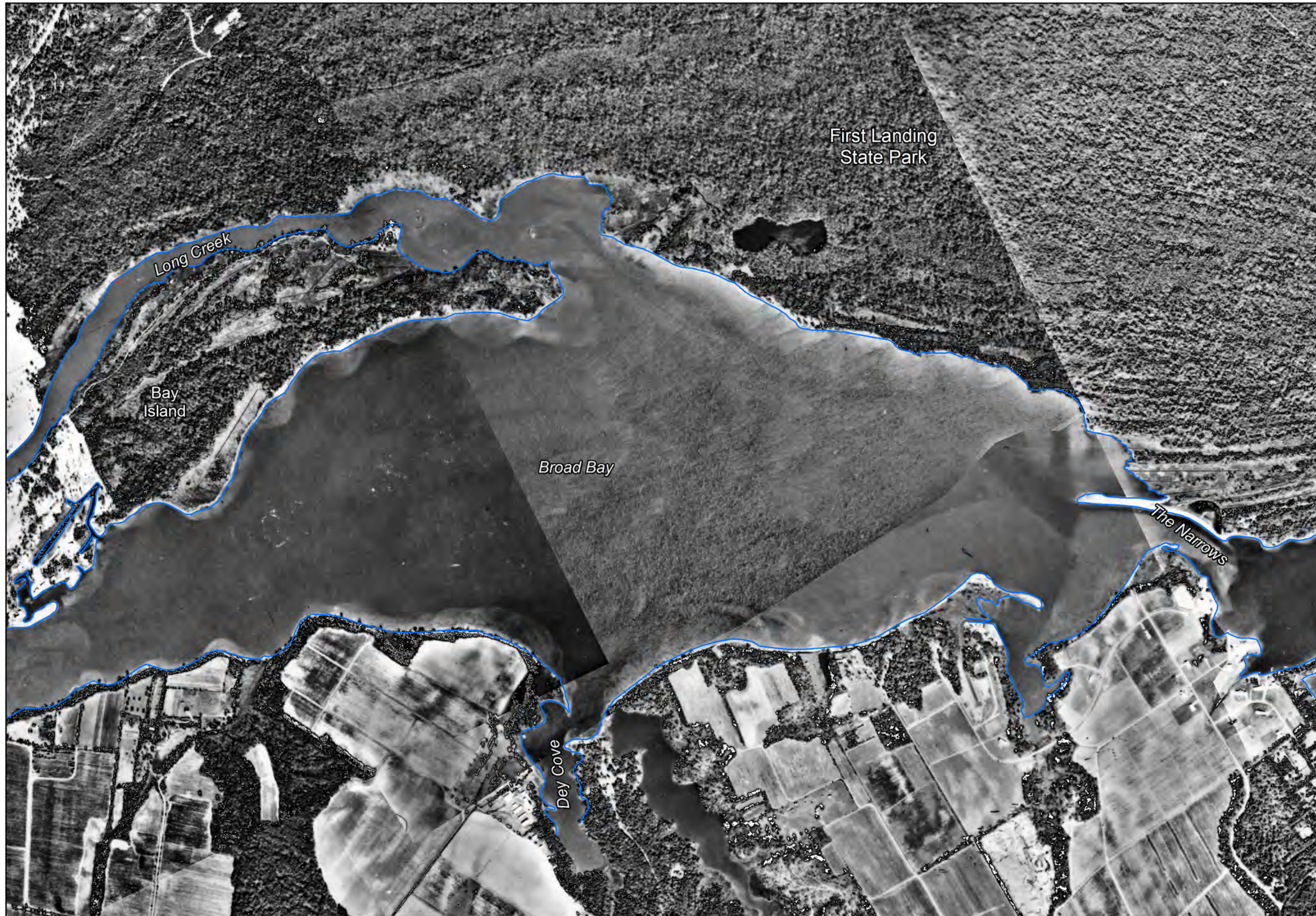


Legend

— 1937 Shoreline

Photo Date: 1937





City of Virginia Beach Virginia

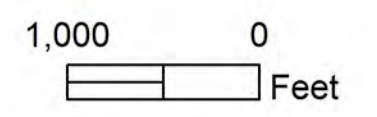
Plate 9



Legend

— 1954 Shoreline

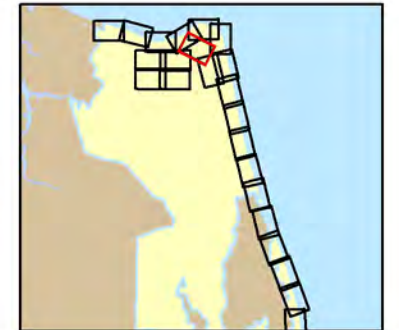
Photo Date: 1954





City of Virginia Beach Virginia

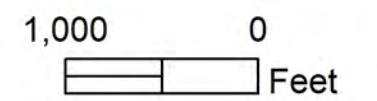
Plate 9



Legend

— 1970 Shoreline

Photo Date: 1970





City of Virginia Beach Virginia

Plate 9



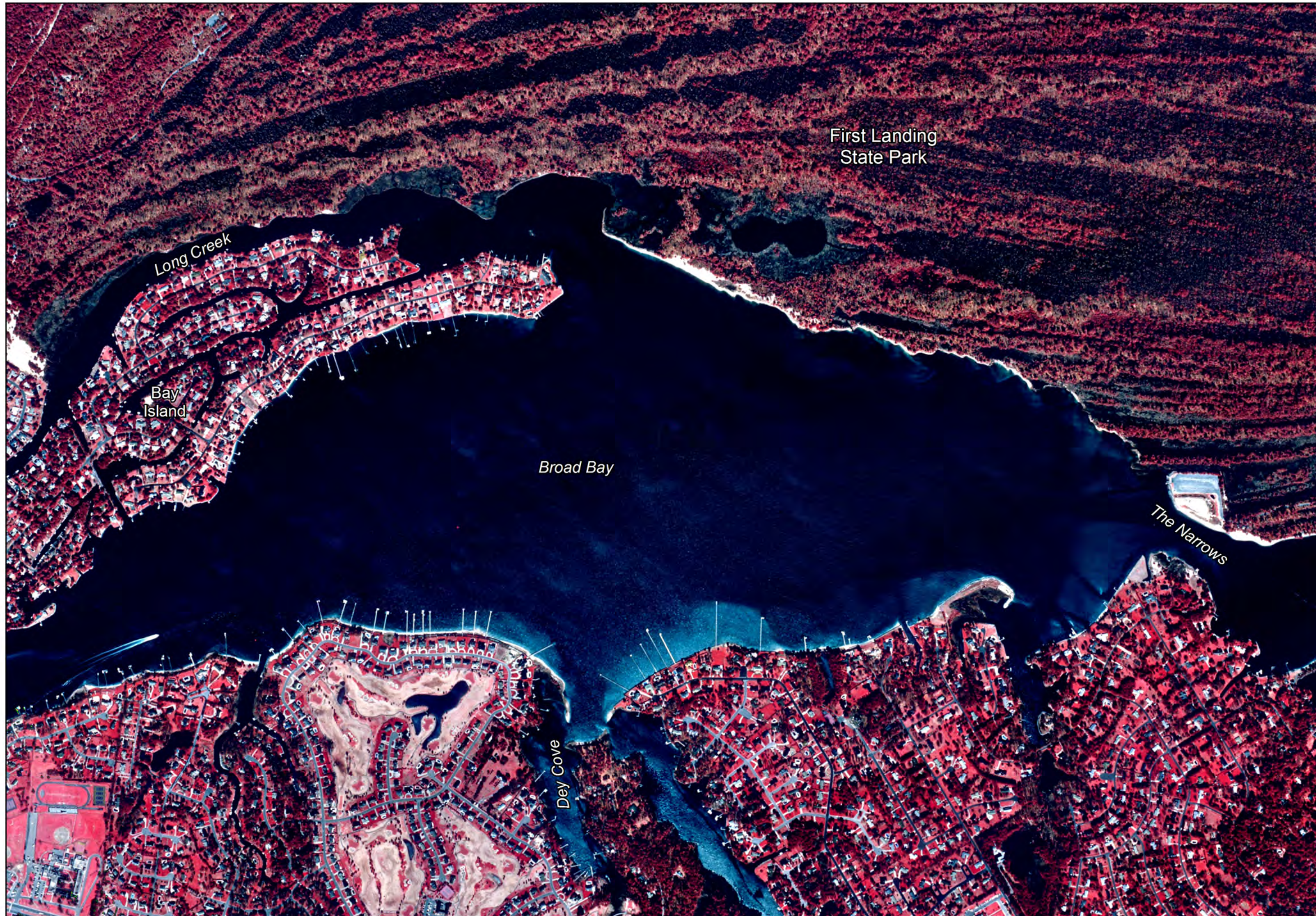
Legend

— 1980 Shoreline

Photo Date: 1980

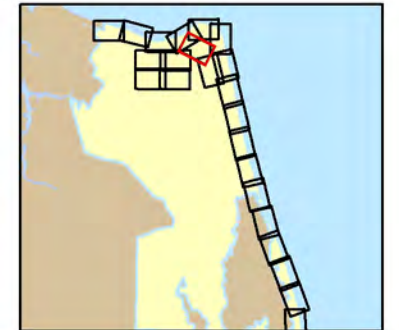


1,000 0 Feet



City of Virginia Beach Virginia

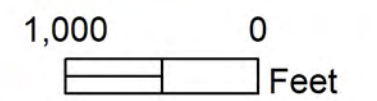
Plate 9



Legend

— 1994 Shoreline

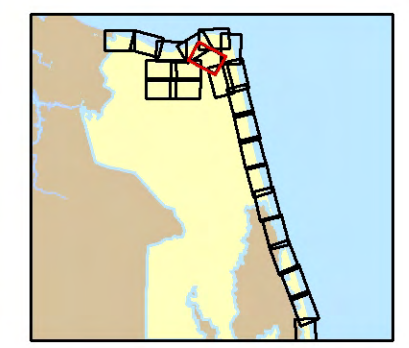
Photo Date: 1994





City of Virginia Beach Virginia

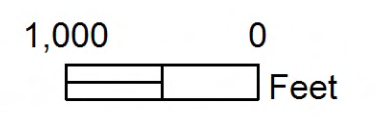
Plate 9



Legend

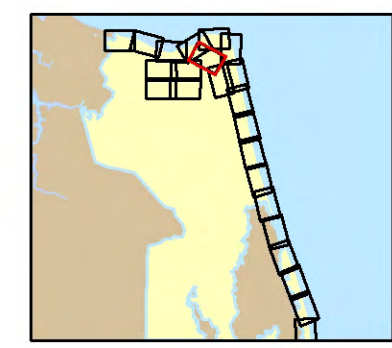
— 2002 Shoreline

Photo Date: 2002



City of Virginia Beach Virginia

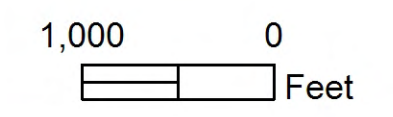
Plate 9



Legend

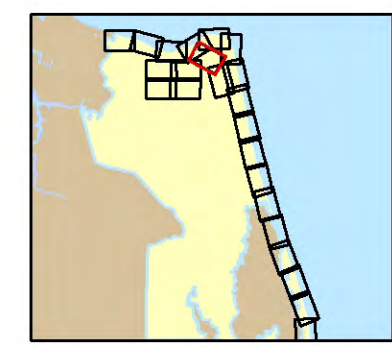
— 2009 Shoreline

Photo Date: 2009



City of Virginia Beach Virginia

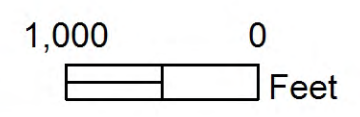
Plate 9



Legend

- 1937 Shoreline
- 1954 Shoreline
- 1970 Shoreline
- 1980 Shoreline
- 1994 Shoreline
- 2002 Shoreline
- 2009 Shoreline
- 2011 Shoreline

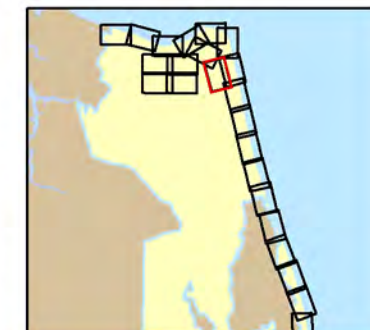
Photo Date: 2011





City of Virginia Beach Virginia

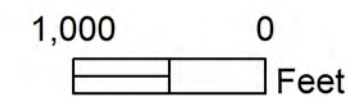
Plate 10

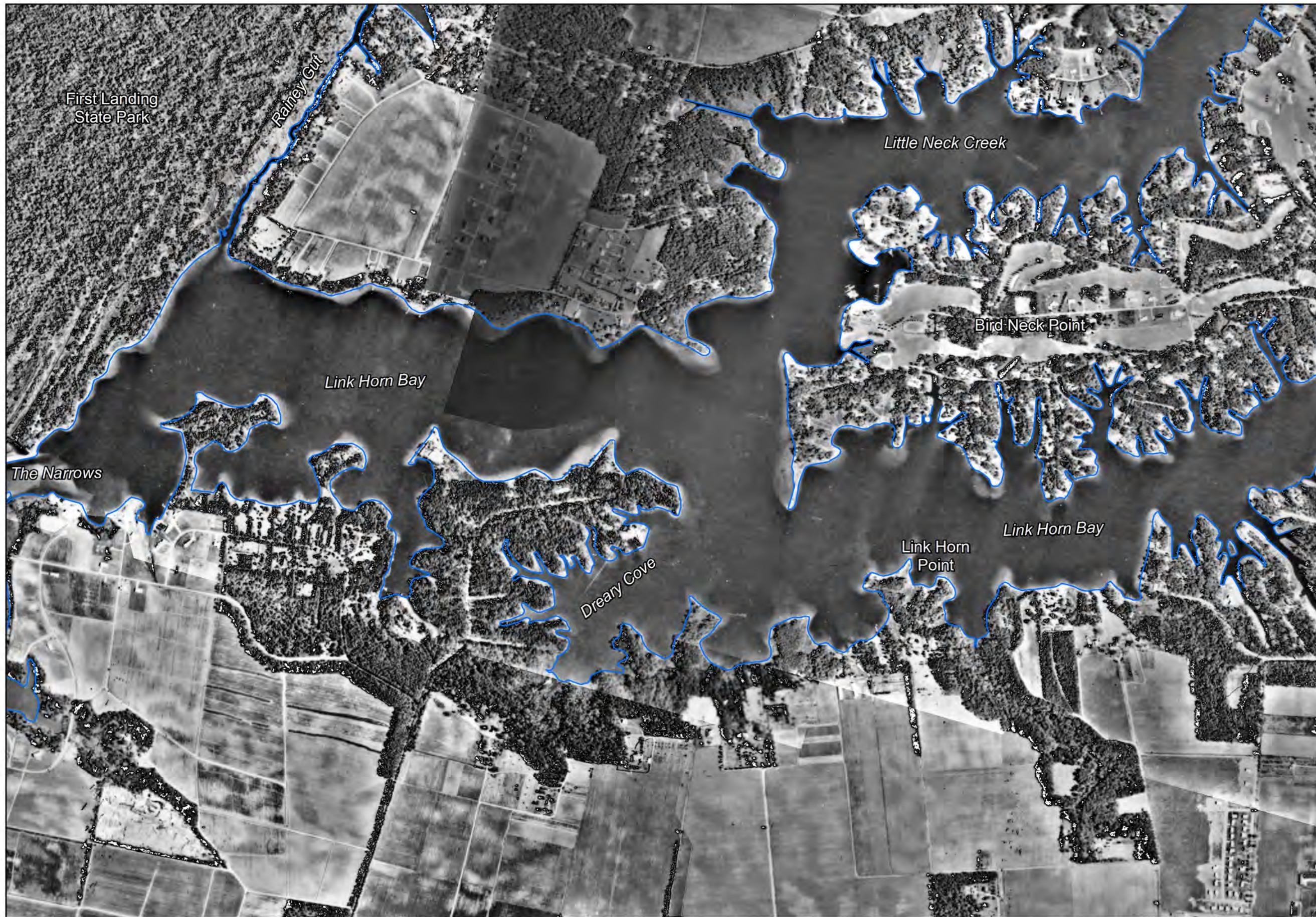


Legend

— 1937 Shoreline

Photo Date: 1937





City of Virginia Beach Virginia

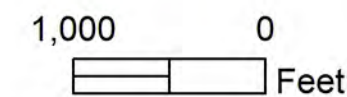
Plate 10



Legend

— 1954 Shoreline

Photo Date: 1954





First Landing State Park

Rainey Cut

Little Neck Creek

Bird Neck Point

Link Horn Bay

The Narrows

Dreary Cove

Link Horn Point

Link Horn Bay

City of Virginia Beach Virginia

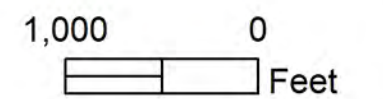
Plate 10



Legend

— 1970 Shoreline

Photo Date: 1970





City of Virginia Beach Virginia

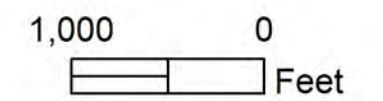
Plate 10



Legend

— 1980 Shoreline

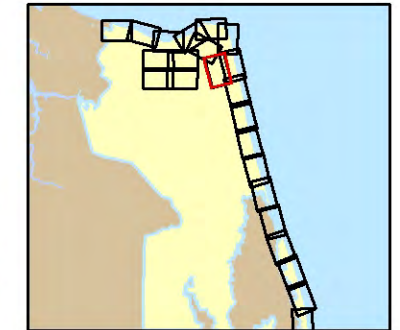
Photo Date: 1980





City of Virginia Beach Virginia

Plate 10



Legend

— 1994 Shoreline

Photo Date: 1994

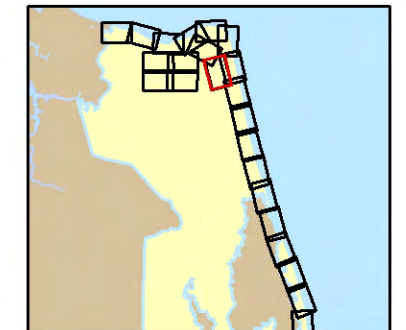


1,000 0 Feet



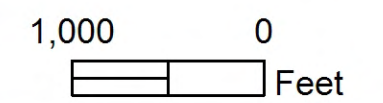
City of Virginia Beach Virginia

Plate 10



Legend
— 2002 Shoreline

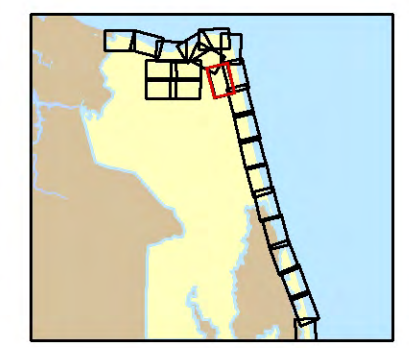
Photo Date: 2002





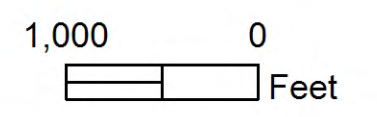
City of Virginia Beach Virginia

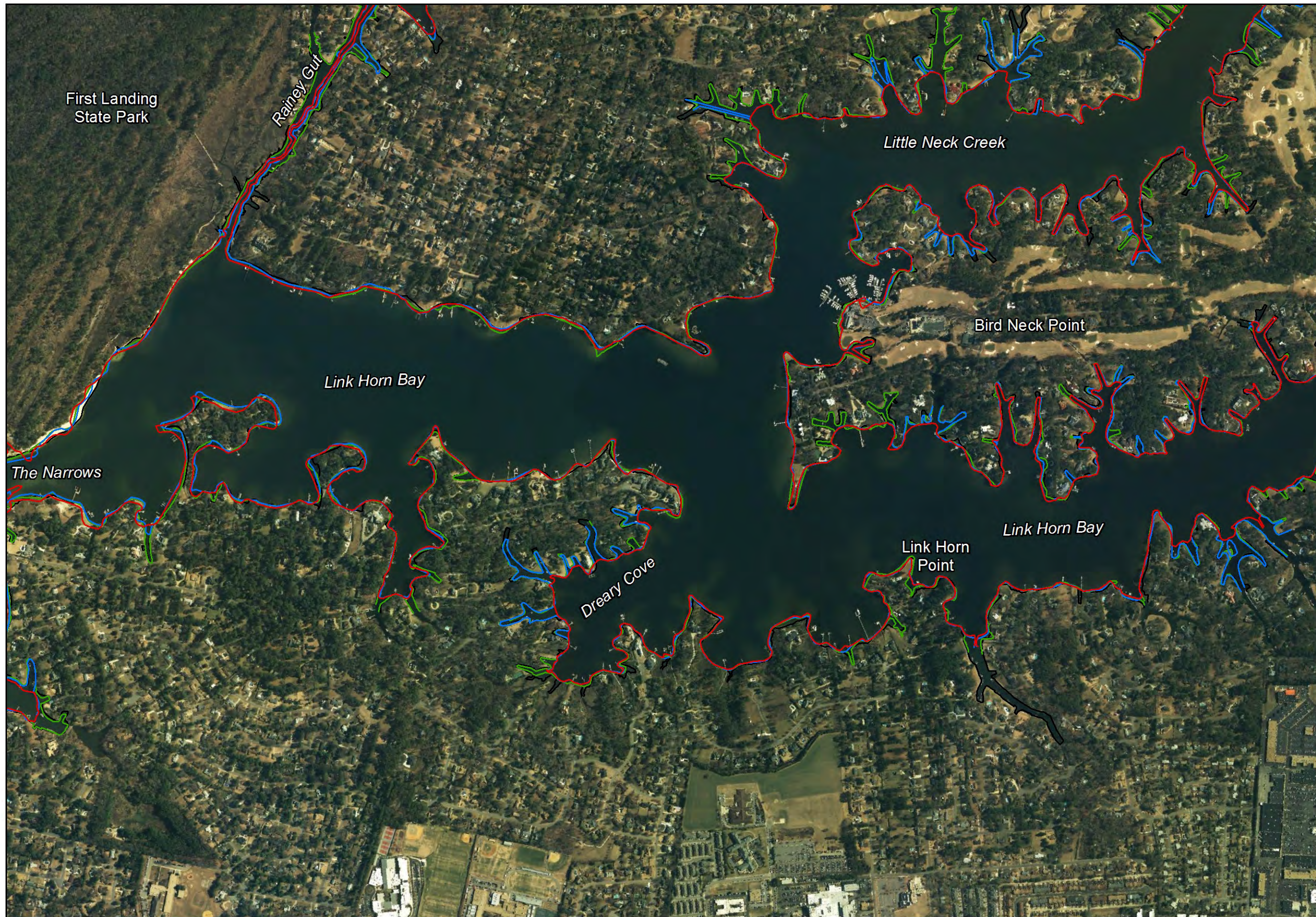
Plate 10



Legend
— 2009 Shoreline

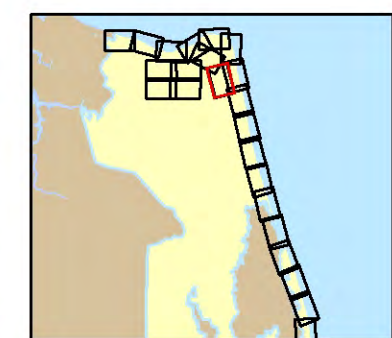
Photo Date: 2009





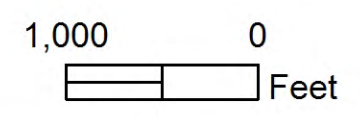
City of Virginia Beach Virginia

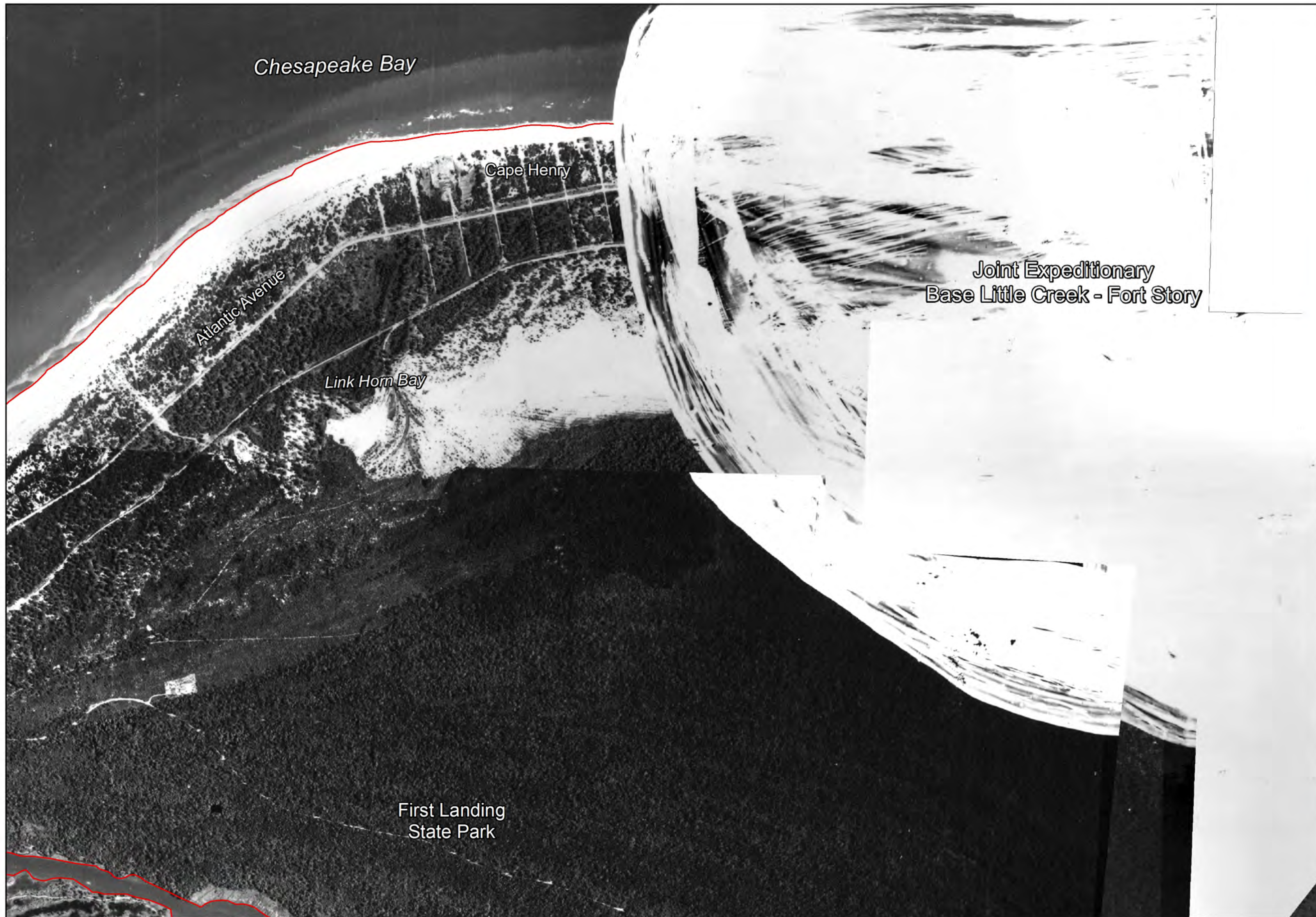
Plate 10



- Legend**
- 1937 Shoreline
 - 1954 Shoreline
 - 1970 Shoreline
 - 1980 Shoreline
 - 1994 Shoreline
 - 2002 Shoreline
 - 2009 Shoreline
 - 2011 Shoreline

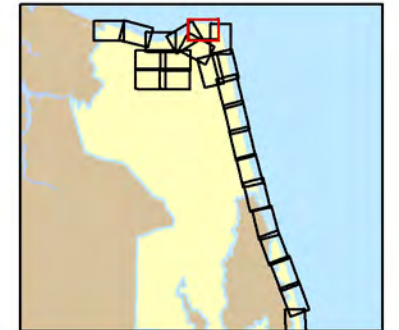
Photo Date: 2011





City of Virginia Beach Virginia

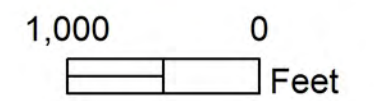
Plate 11



Legend

— 1937 Shoreline

Photo Date: 1937



Chesapeake Bay

Cape Henry

Atlantic Avenue

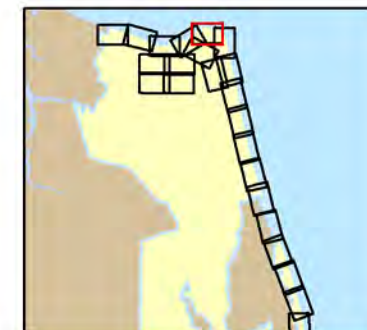
Link Horn Bay

Joint Expeditionary
Base Little Creek - Fort Story

First Landing
State Park

City of Virginia Beach Virginia

Plate 11



Legend

— 1954 Shoreline

Photo Date: 1954



1,000 0 Feet

Chesapeake Bay

Cape Henry

Atlantic Avenue

Link Horn Bay

Joint Expeditionary
Base Little Creek - Fort Story

First Landing
State Park

City of Virginia Beach Virginia

Plate 11



Legend

— 1970 Shoreline

Photo Date: 1970



1,000 0 Feet

Chesapeake Bay

Cape Henry

Atlantic Avenue

Link Horn Bay

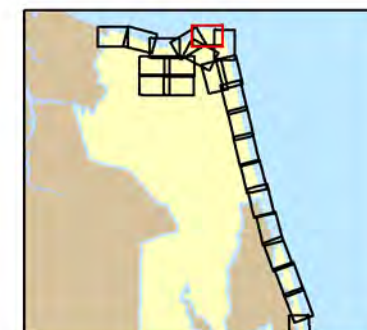
Joint Expeditionary
Base Little Creek - Fort Story

1: 12000

First Landing
State Park

City of Virginia Beach Virginia

Plate 11



Legend

— 1980 Shoreline

Photo Date: 1980



1,000 0 Feet

Chesapeake Bay

Cape Henry

Atlantic Avenue

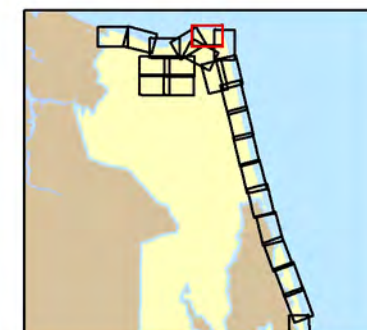
Link Horn Bay

Joint Expeditionary
Base Little Creek - Fort Story

First Landing
State Park

City of Virginia Beach Virginia

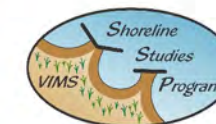
Plate 11



Legend

— 1994 Shoreline

Photo Date: 1994



1,000 0 Feet

Chesapeake Bay

Cape Henry

Atlantic Avenue

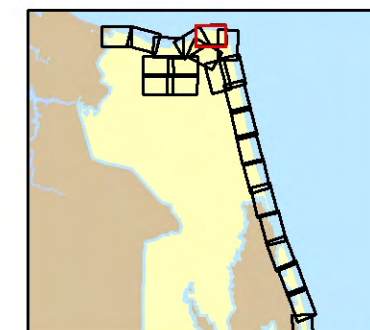
Link Horn Bay

Joint Expeditionary
Base Little Creek - Fort Story

First Landing
State Park

City of Virginia Beach Virginia

Plate 11



Legend

— 2002 Shoreline

Photo Date: 2002



1,000 0 Feet

Chesapeake Bay

Cape Henry

Atlantic Avenue

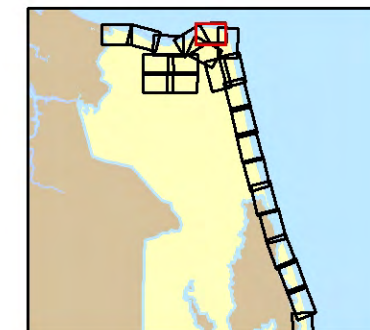
Link Horn Bay

Joint Expeditionary
Base Little Creek - Fort Story

First Landing
State Park

City of Virginia Beach Virginia

Plate 11



Legend

— 2009 Shoreline

Photo Date: 2009



1,000 0
Feet

Chesapeake Bay

Cape Henry

Atlantic Avenue

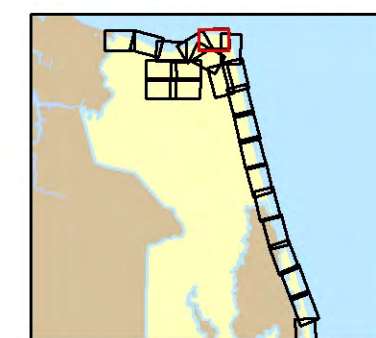
Link Horn Bay

Joint Expeditionary
Base Little Creek - Fort Story

First Landing
State Park

City of Virginia Beach Virginia

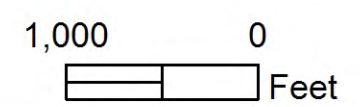
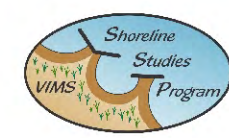
Plate 11

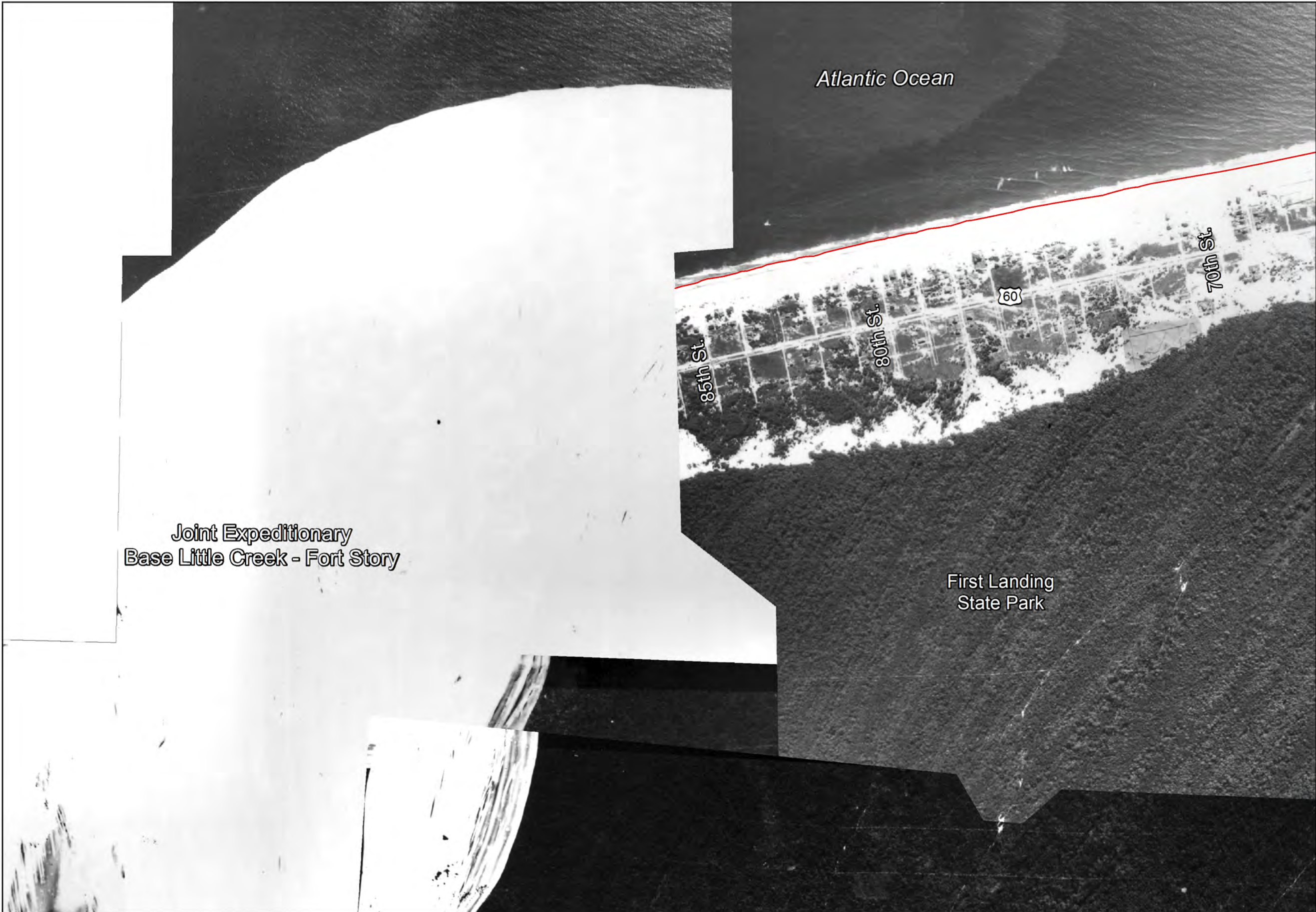


Legend

- 1937 Shoreline
- 1954 Shoreline
- 1970 Shoreline
- 1980 Shoreline
- 1994 Shoreline
- 2002 Shoreline
- 2009 Shoreline
- 2011 Shoreline

Photo Date: 2011





Atlantic Ocean

Joint Expeditionary
Base Little Creek - Fort Story

First Landing
State Park

85th St.

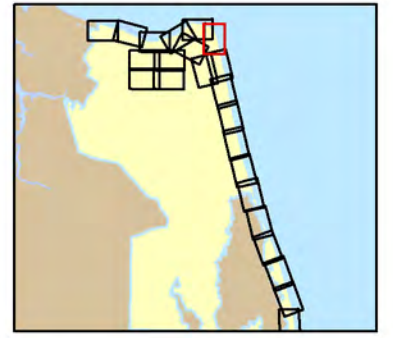
80th St.

70th St.

60

City of Virginia Beach Virginia

Plate 12



Legend

— 1937 Shoreline

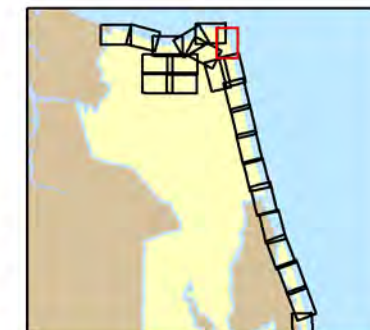
Photo Date: 1937





City of Virginia Beach Virginia

Plate 12



Legend

— 1954 Shoreline

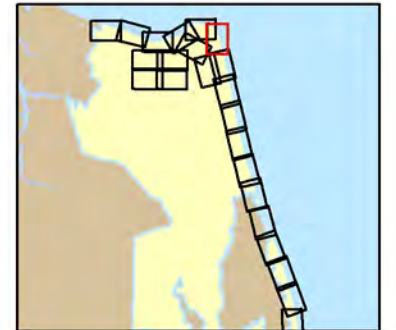
Photo Date: 1954



1,000 0 Feet

City of Virginia Beach Virginia

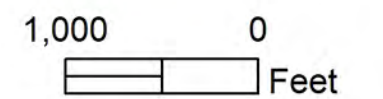
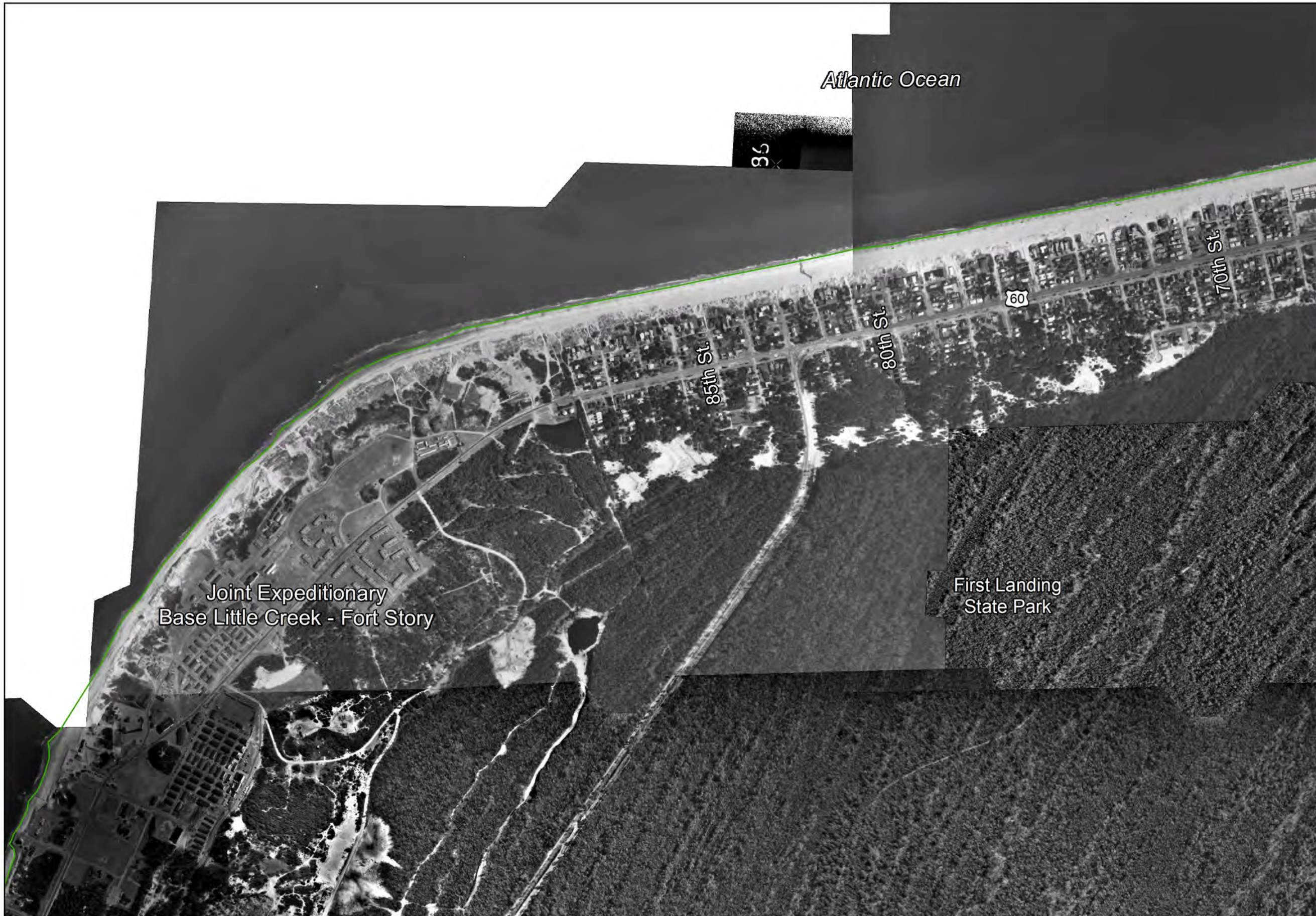
Plate 12



Legend

— 1970 Shoreline

Photo Date: 1970





City of Virginia Beach Virginia

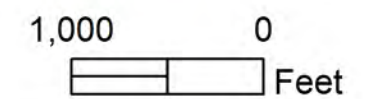
Plate 12



Legend

— 1980 Shoreline

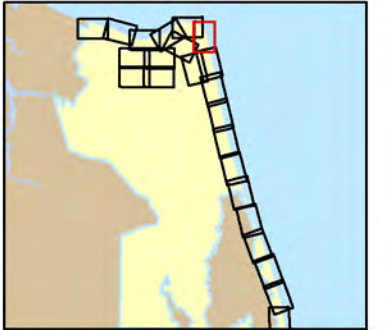
Photo Date: 1980





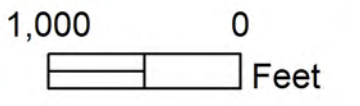
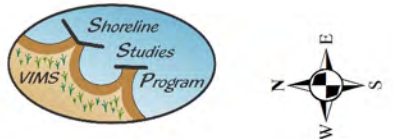
City of Virginia Beach Virginia

Plate 12



Legend
— 1994 Shoreline

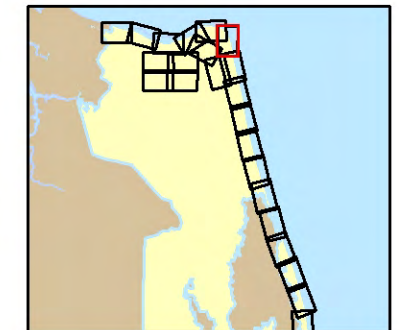
Photo Date: 1994





City of Virginia Beach Virginia

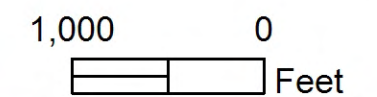
Plate 12

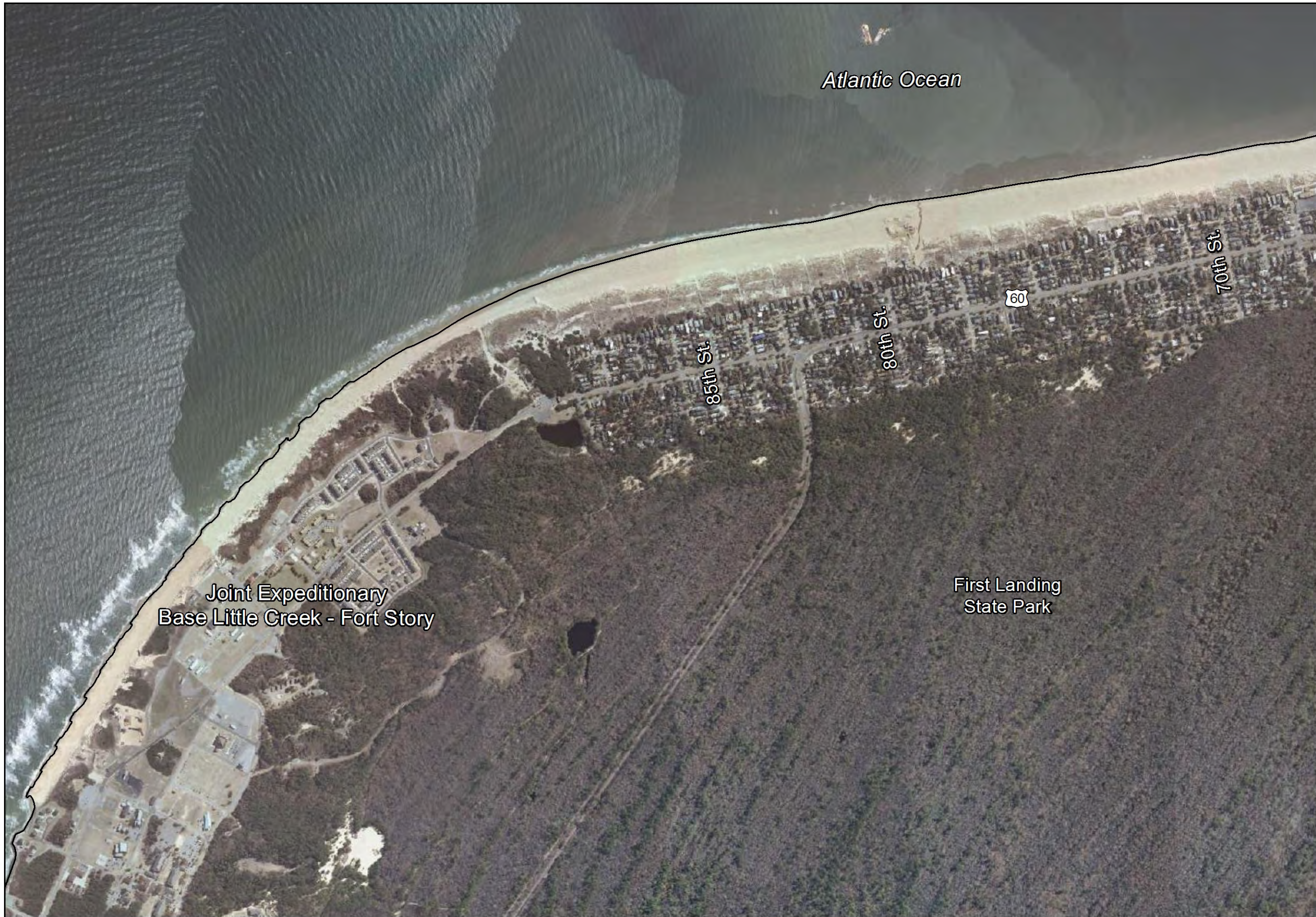


Legend

— 2002 Shoreline

Photo Date: 2002

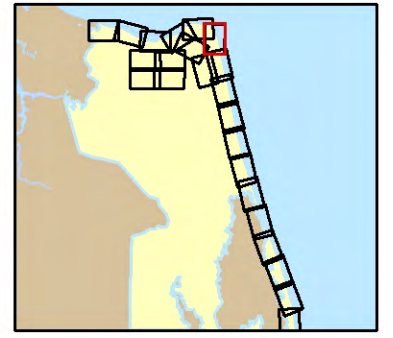




Atlantic Ocean

City of Virginia Beach Virginia

Plate 12

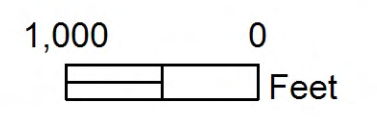
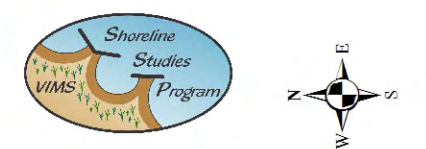


Legend
— 2009 Shoreline

Photo Date: 2009

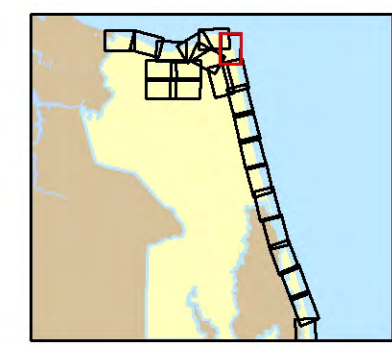
Joint Expeditionary
Base Little Creek - Fort Story

First Landing
State Park



City of Virginia Beach Virginia

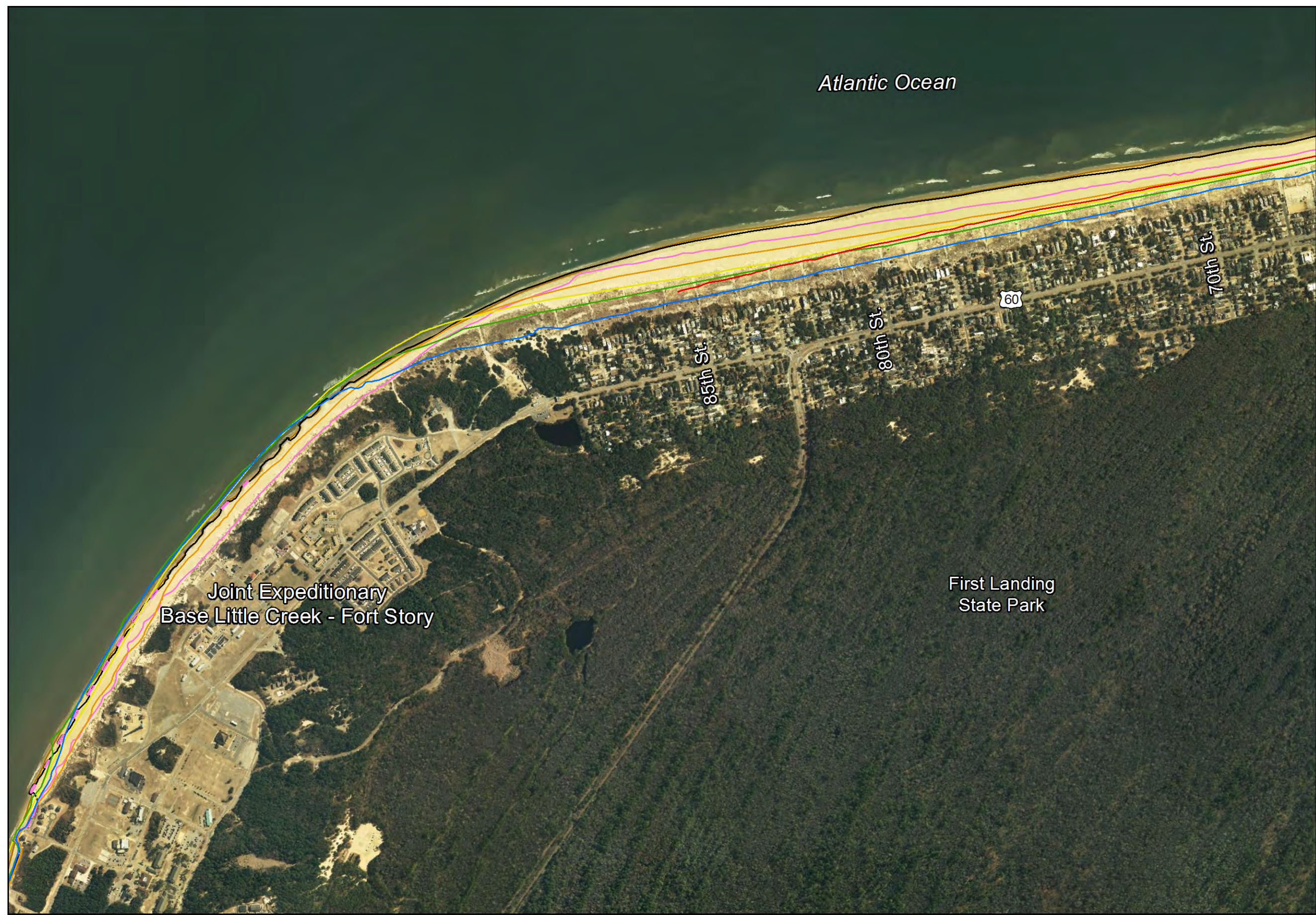
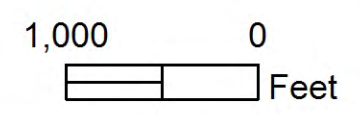
Plate 12

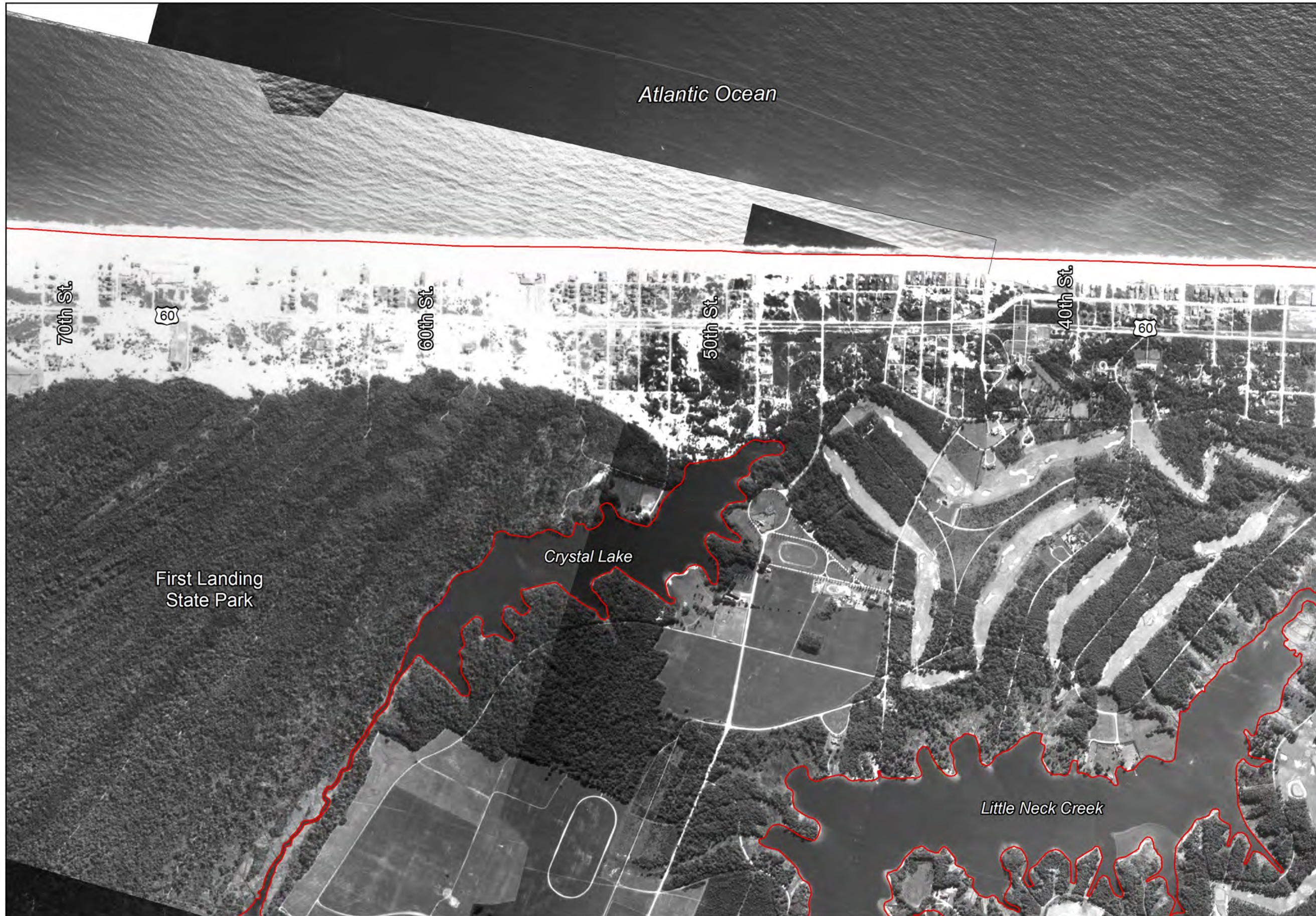


Legend

- 1937 Shoreline
- 1954 Shoreline
- 1970 Shoreline
- 1980 Shoreline
- 1994 Shoreline
- 2002 Shoreline
- 2009 Shoreline
- 2011 Shoreline

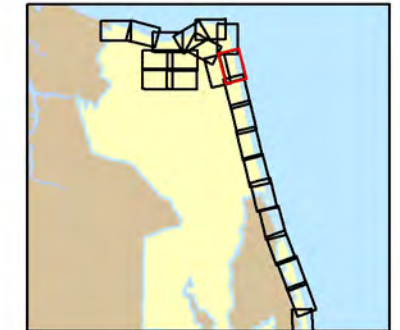
Photo Date: 2011





City of Virginia Beach Virginia

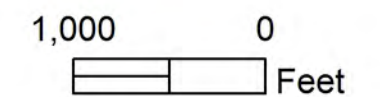
Plate 13



Legend

— 1937 Shoreline

Photo Date: 1937





City of Virginia Beach Virginia

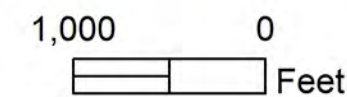
Plate 13

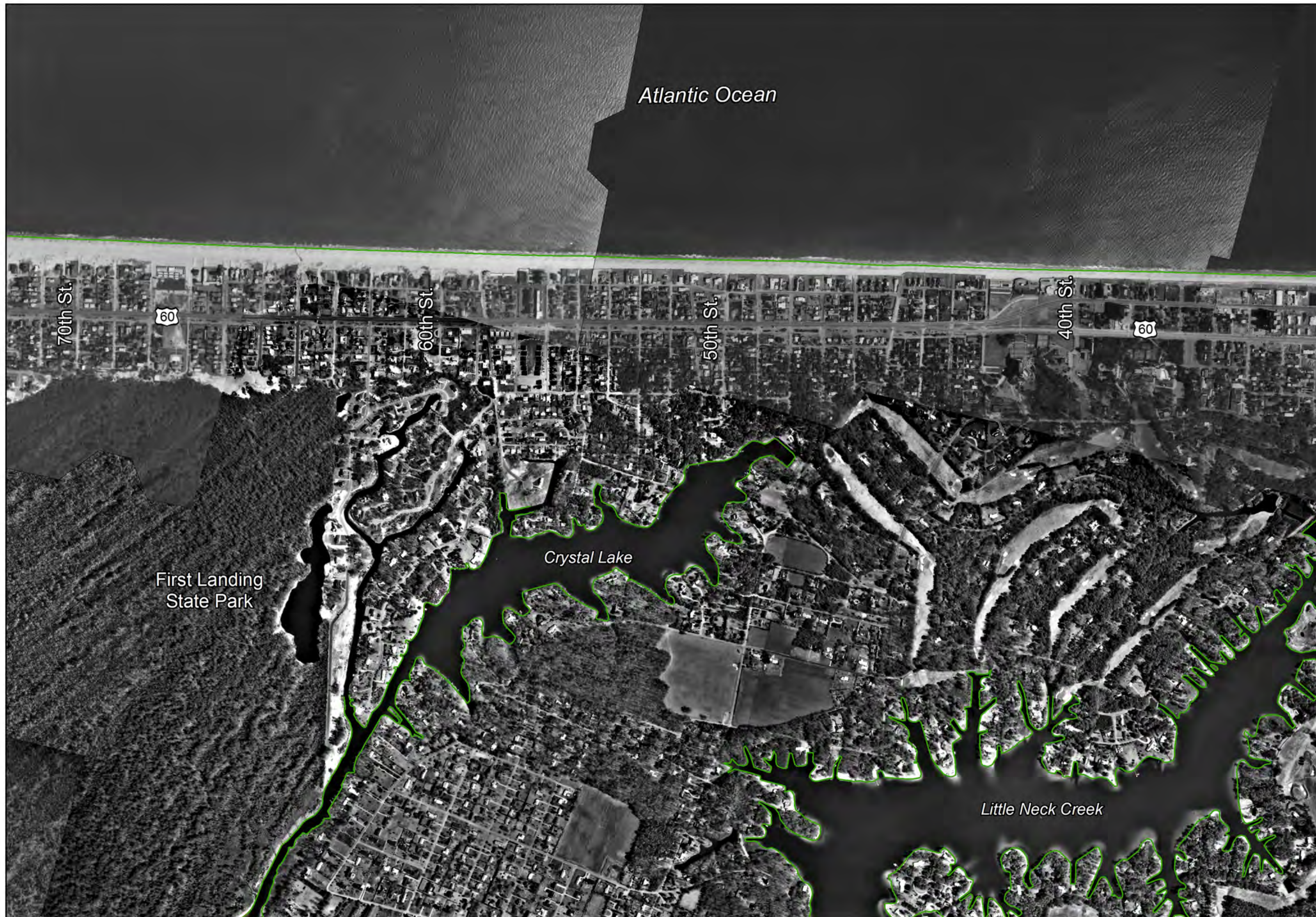


Legend

— 1954 Shoreline

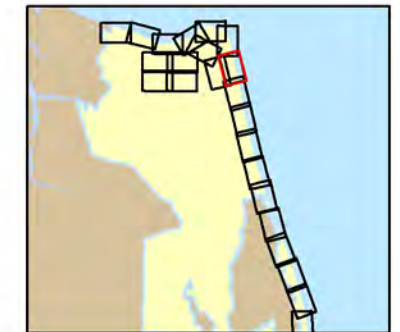
Photo Date: 1954





City of Virginia Beach Virginia

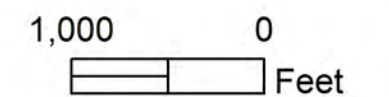
Plate 13



Legend

- 1970 Shoreline

Photo Date: 1970





City of Virginia Beach Virginia

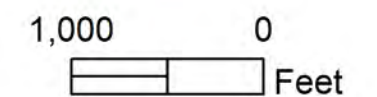
Plate 13



Legend

— 1980 Shoreline

Photo Date: 1980





City of Virginia Beach Virginia

Plate 13



Legend

— 1994 Shoreline

Photo Date: 1994

First Landing
State Park

Crystal Lake

Little Neck Creek

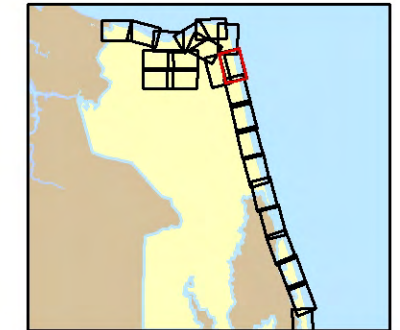


1,000 0
Feet



City of Virginia Beach Virginia

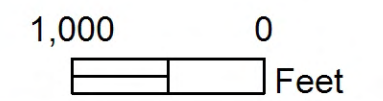
Plate 13

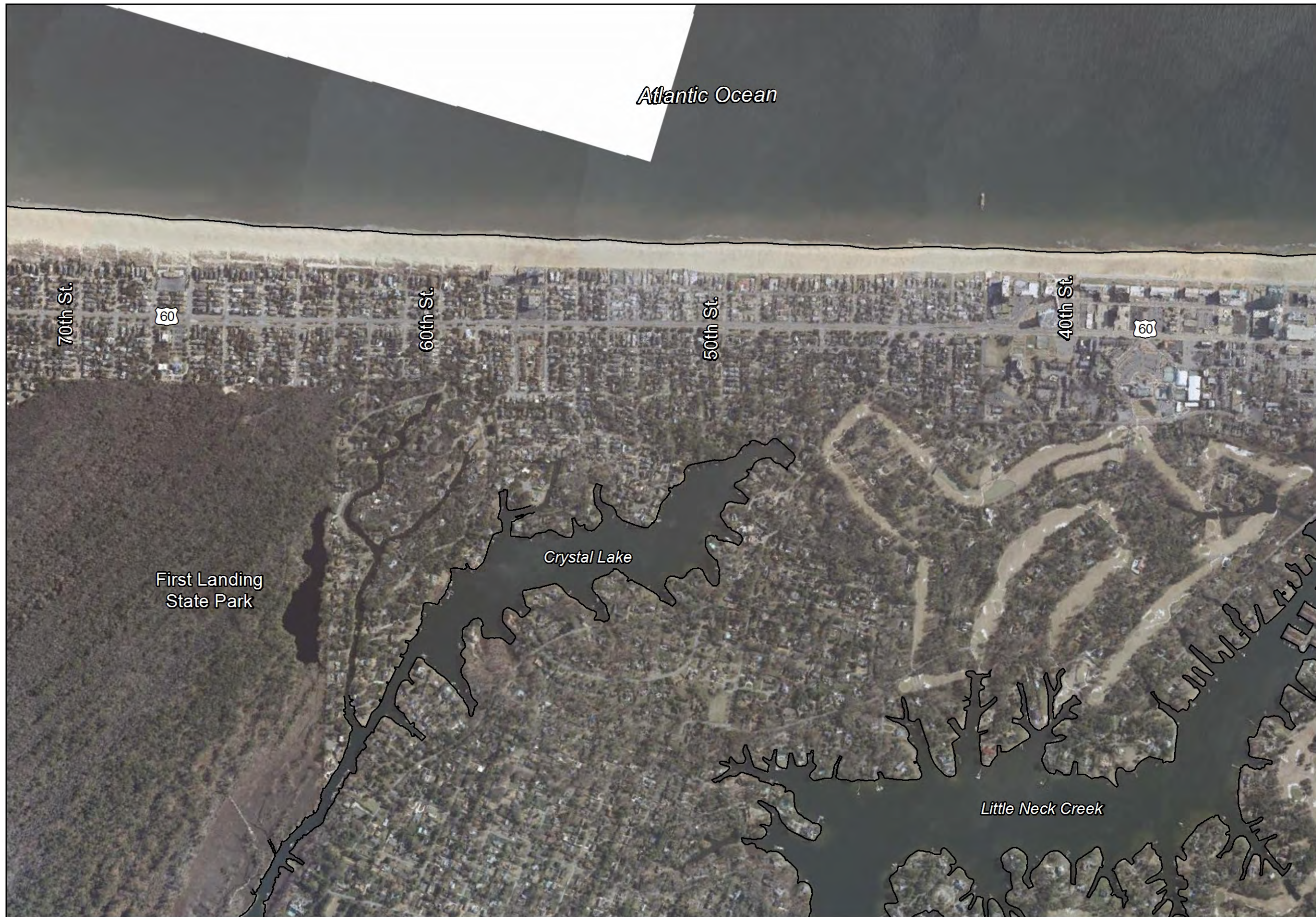


Legend

— 2002 Shoreline

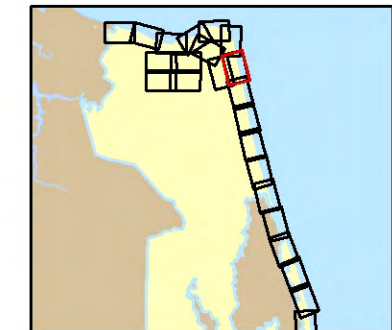
Photo Date: 2002





City of Virginia Beach Virginia

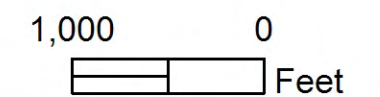
Plate 13



Legend

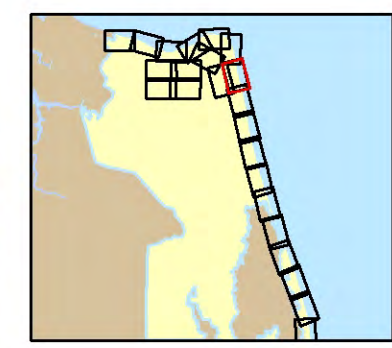
— 2009 Shoreline

Photo Date: 2009



City of Virginia Beach Virginia

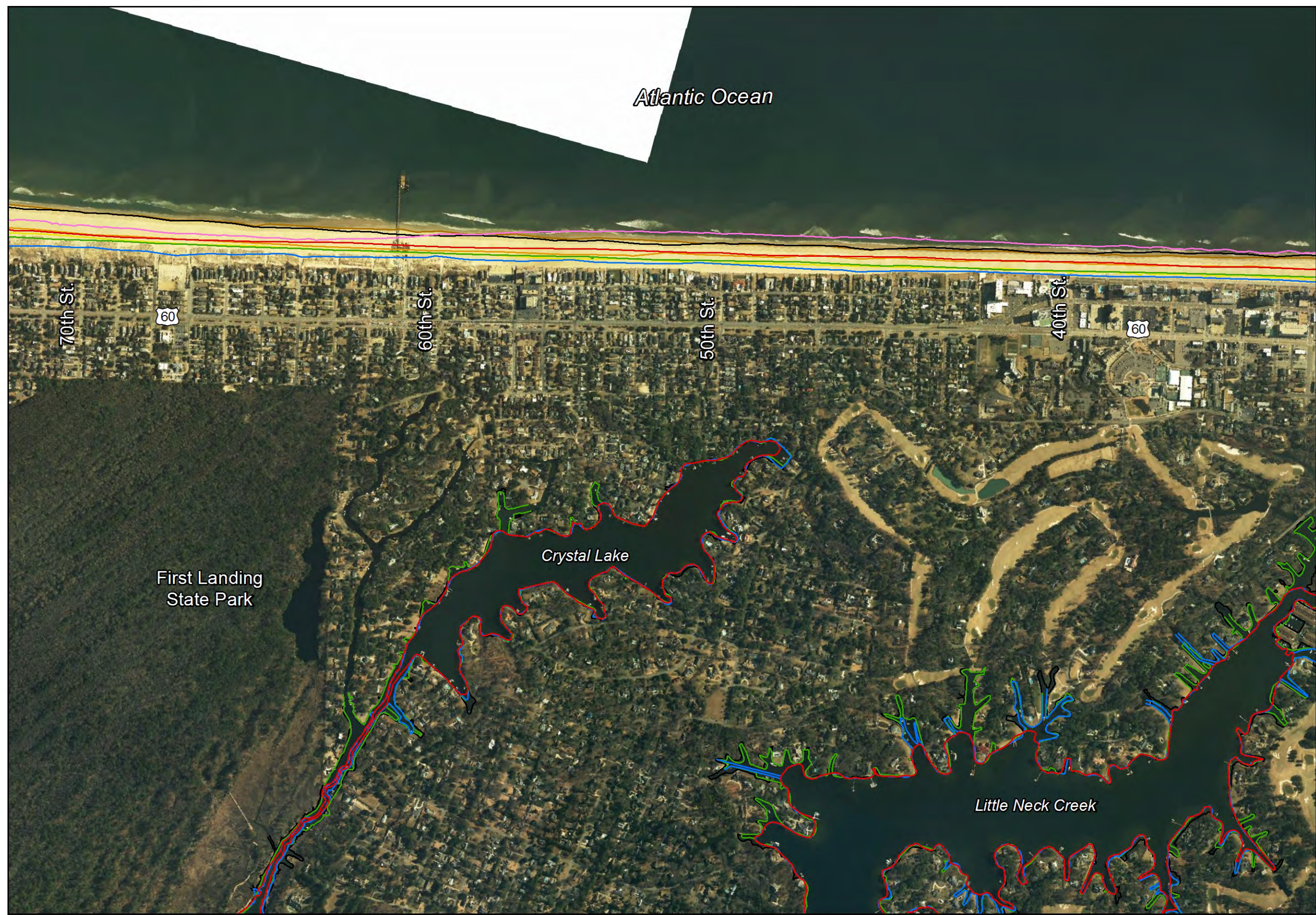
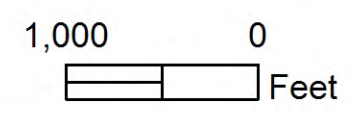
Plate 13



Legend

- 1937 Shoreline
- 1954 Shoreline
- 1970 Shoreline
- 1980 Shoreline
- 1994 Shoreline
- 2002 Shoreline
- 2009 Shoreline
- 2011 Shoreline

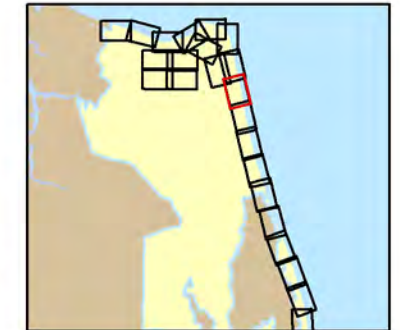
Photo Date: 2011





City of Virginia Beach Virginia

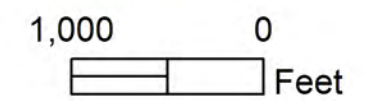
Plate 14

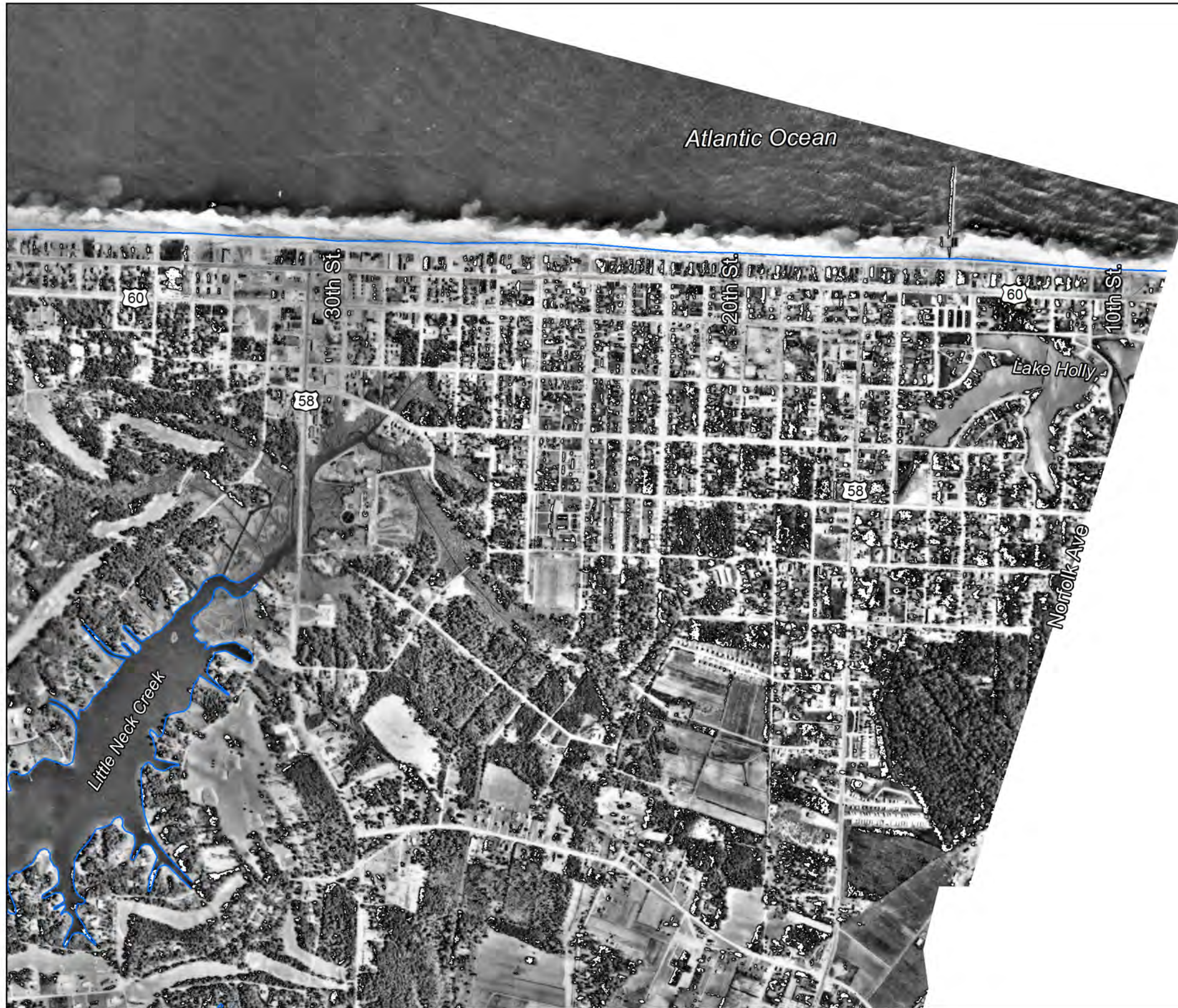


Legend

— 1937 Shoreline

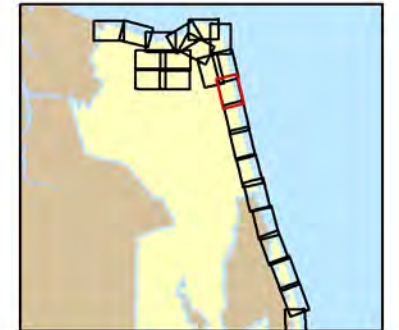
Photo Date: 1937





City of Virginia Beach Virginia

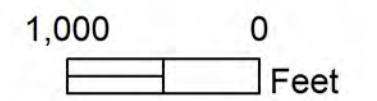
Plate 14



Legend

— 1954 Shoreline

Photo Date: 1954





City of Virginia Beach Virginia

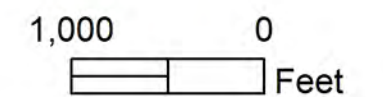
Plate 14



Legend

- 1970 Shoreline

Photo Date: 1970





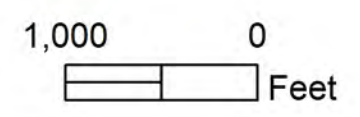
City of Virginia Beach Virginia

Plate 14



Legend
— 1980 Shoreline

Photo Date: 1980





City of Virginia Beach Virginia

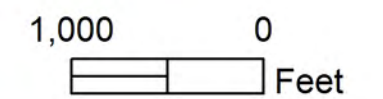
Plate 14

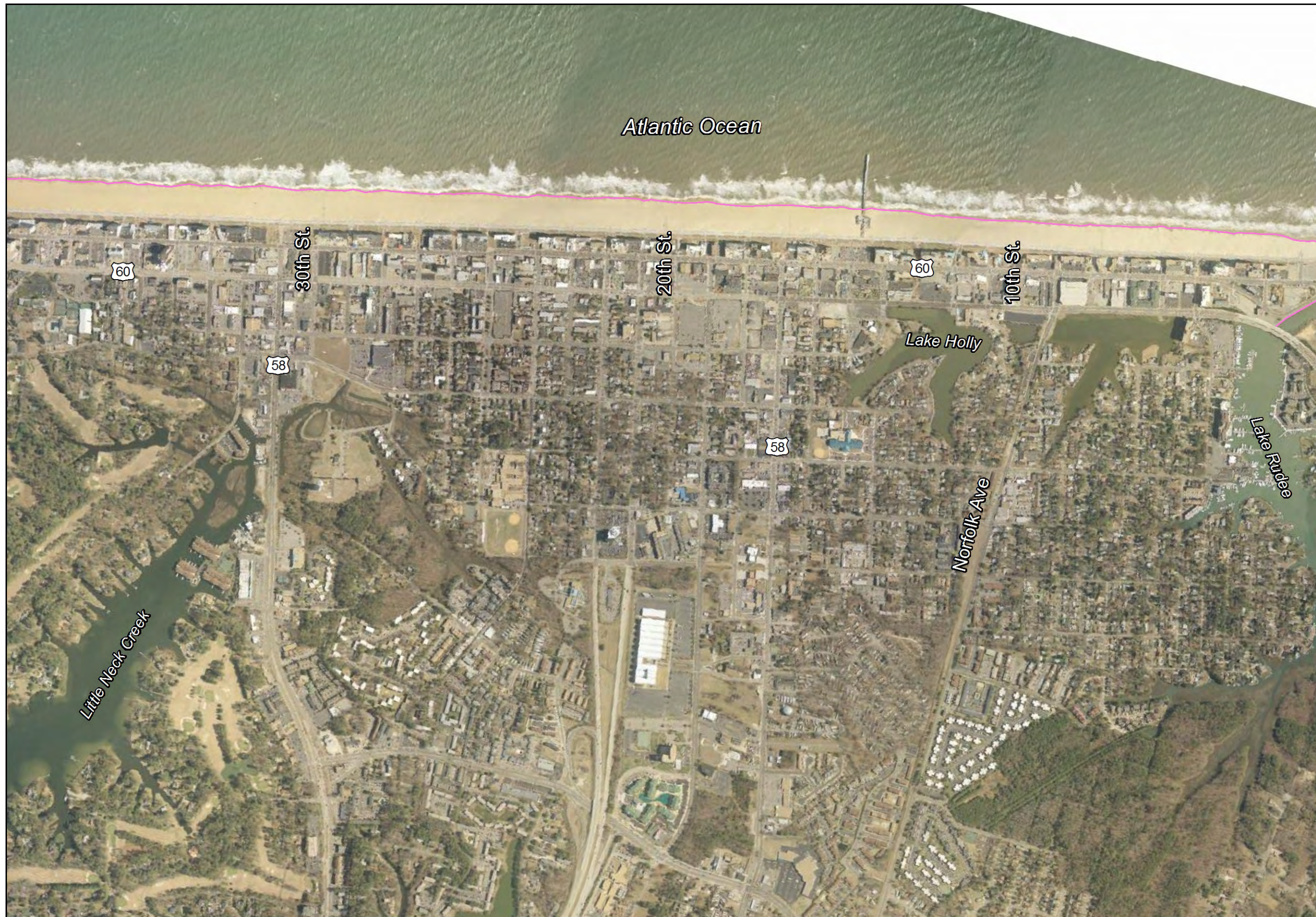


Legend

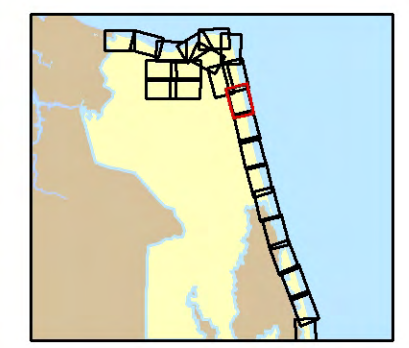
— 1994 Shoreline

Photo Date: 1994



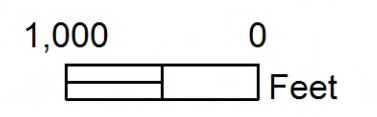


City of Virginia Beach Virginia
Plate 14



Legend
— 2002 Shoreline

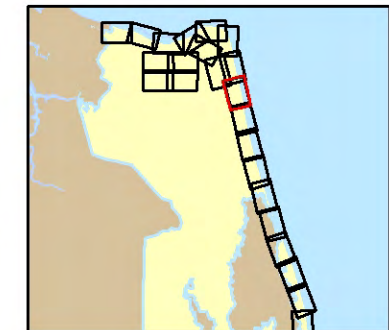
Photo Date: 2002





City of Virginia Beach Virginia

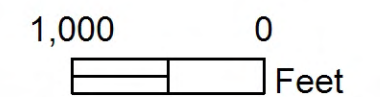
Plate 14



Legend

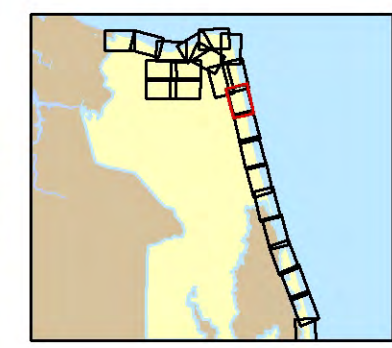
— 2009 Shoreline

Photo Date: 2009



City of Virginia Beach Virginia

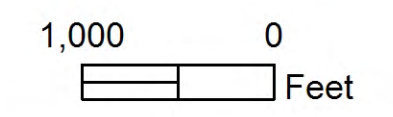
Plate 14



Legend

- 1937 Shoreline
- 1954 Shoreline
- 1970 Shoreline
- 1980 Shoreline
- 1994 Shoreline
- 2002 Shoreline
- 2009 Shoreline
- 2011 Shoreline

Photo Date: 2011





Atlantic Ocean

Lake Wesley

Lake Christine

Lake Rudee

Owl Creek

Jefferson Ave

S Birdneck Rd

Prosperity Rd

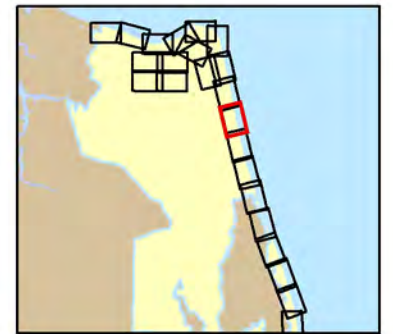
Lovettes Marsh

Naval Amphibious Base
Camp Pendleton

Dam Neck
Naval Reservation

City of Virginia Beach Virginia

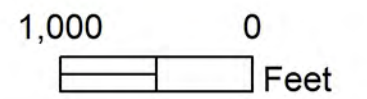
Plate 15



Legend

— 1937 Shoreline

Photo Date: 1937





City of Virginia Beach Virginia

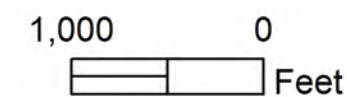
Plate 15

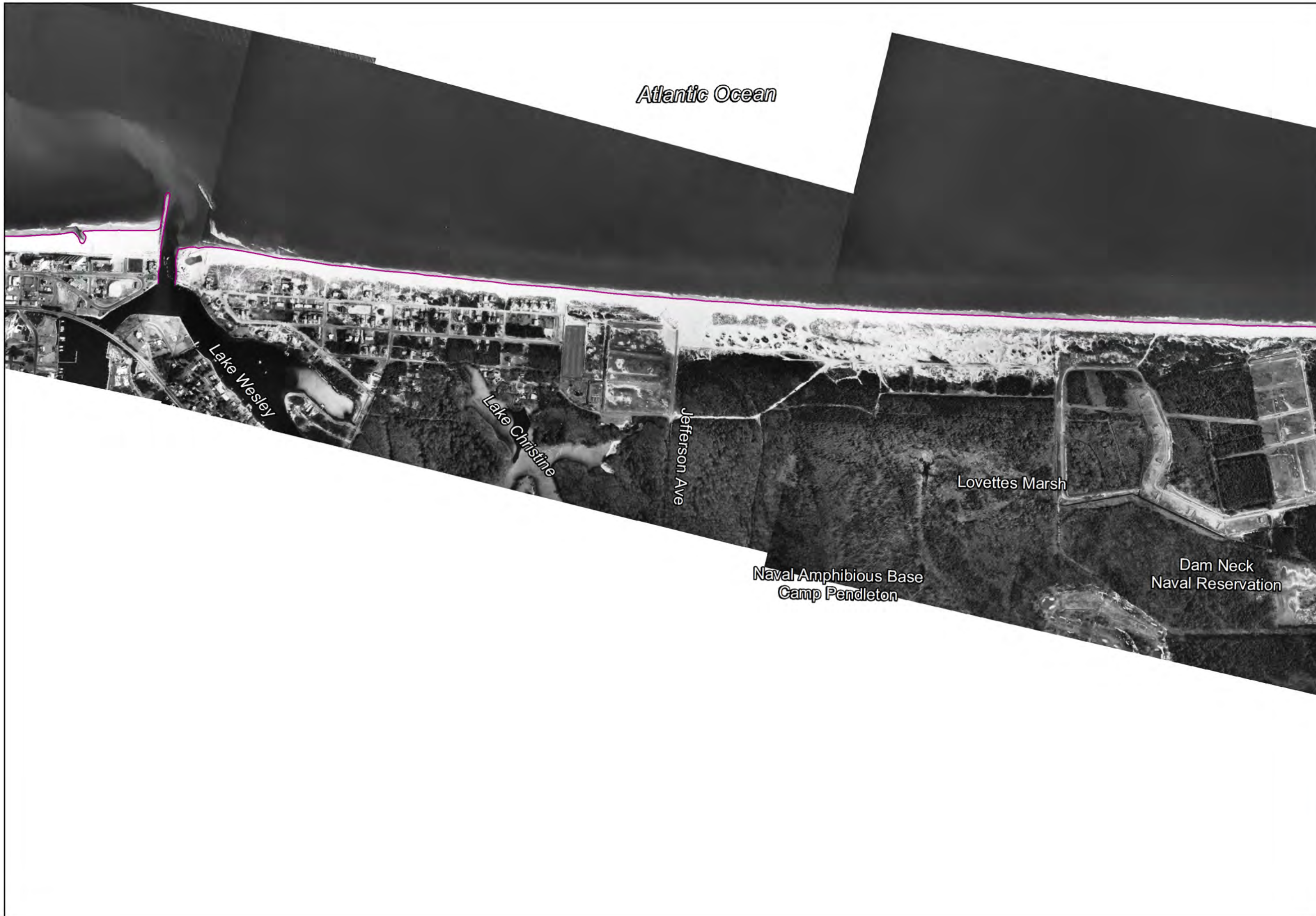


Legend

— 1970 Shoreline

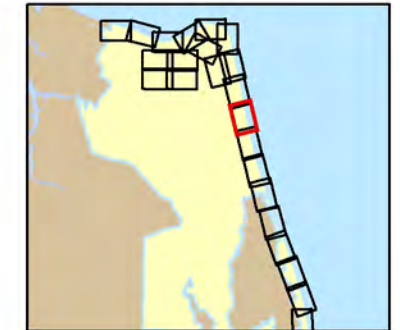
Photo Date: 1970





City of Virginia Beach Virginia

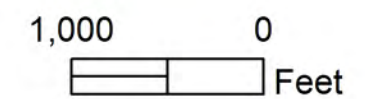
Plate 15



Legend

— 1985 Shoreline

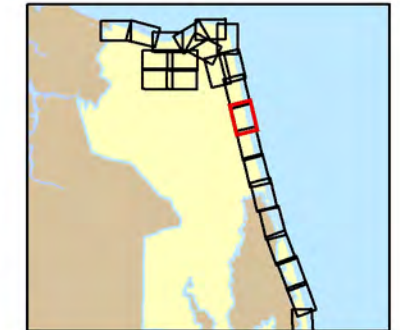
Photo Date: 1985





City of Virginia Beach Virginia

Plate 15



Legend

— 1994 Shoreline

Photo Date: 1994



1,000 0 Feet



Atlantic Ocean

Lake Wesley

Lake Christine

Lake Rudee

Owl Creek

Jefferson Ave

Lovettes Marsh

Naval Amphibious Base
Camp Pendleton

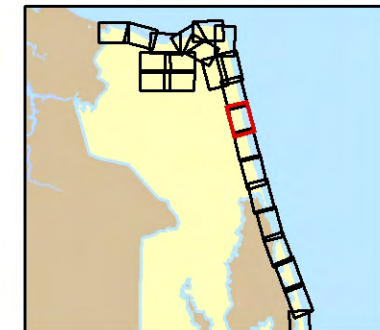
S Birdneck Rd

Prosperity Rd

Dam Neck
Naval Reservation

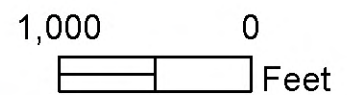
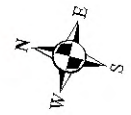
City of Virginia Beach Virginia

Plate 15



Legend
 — 2002 Shoreline

Photo Date: 2002





Atlantic Ocean

Lake Wesley

Lake Christine

Lake Rudee

Owl Creek

Jefferson Ave

S Birdneck Rd

Prosperity Rd

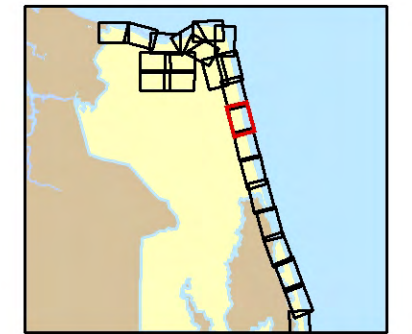
Lovettes Marsh

Naval Amphibious Base
Camp Pendleton

Dam Neck
Naval Reservation

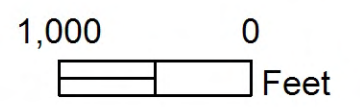
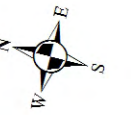
City of Virginia Beach Virginia

Plate 15



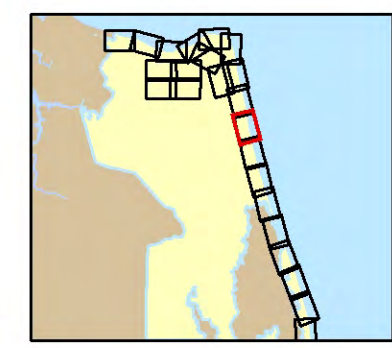
Legend
— 2009 Shoreline

Photo Date: 2009



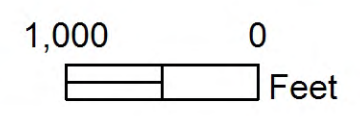
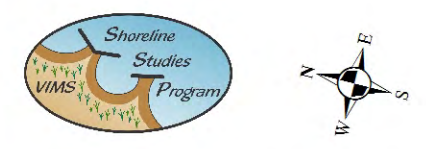
City of Virginia Beach Virginia

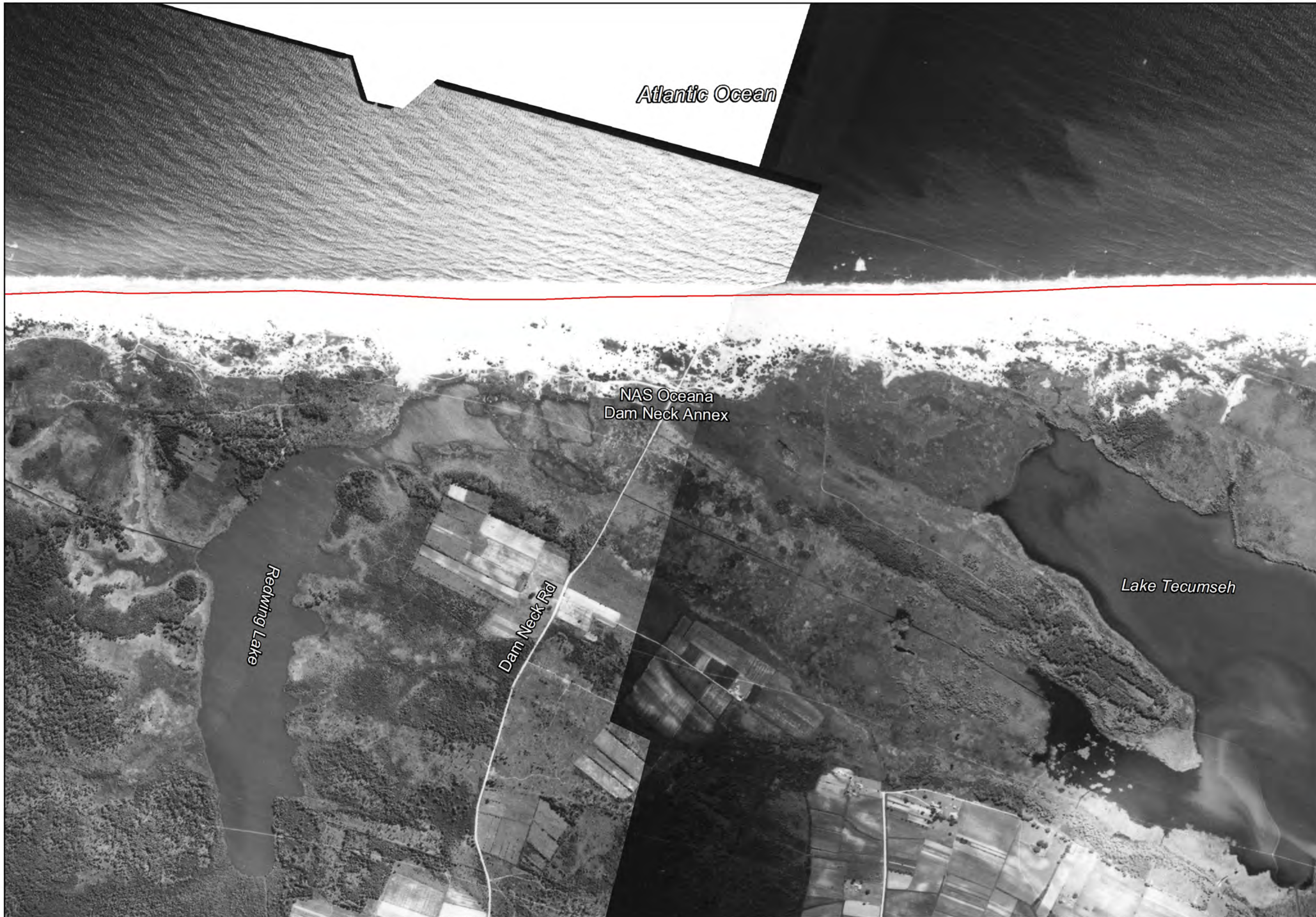
Plate 15



- Legend**
- 1937 Shoreline
 - 1954 Shoreline
 - 1970 Shoreline
 - 1985 Shoreline
 - 1994 Shoreline
 - 2002 Shoreline
 - 2009 Shoreline
 - 2011 Shoreline

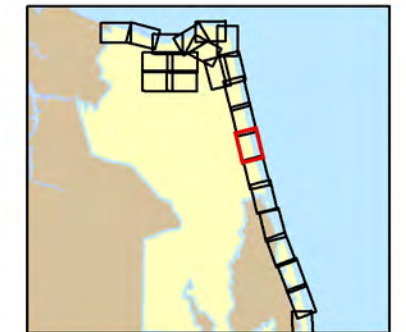
Photo Date: 2011





City of Virginia Beach Virginia

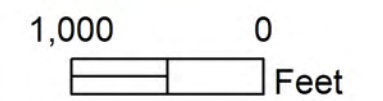
Plate 16



Legend

— 1937 Shoreline

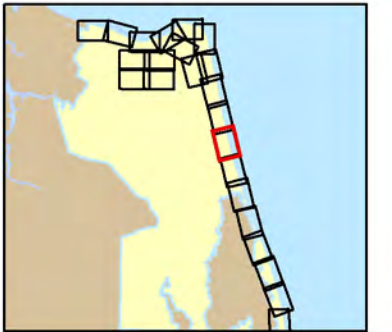
Photo Date: 1937





City of Virginia Beach Virginia

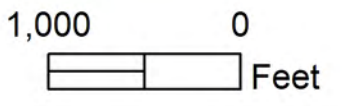
Plate 16



Legend

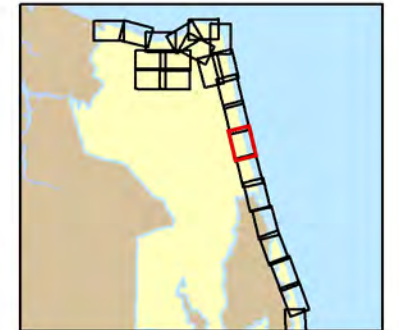
— 1970 Shoreline

Photo Date: 1970



City of Virginia Beach Virginia

Plate 16



Legend

— 1985 Shoreline

Photo Date: 1985

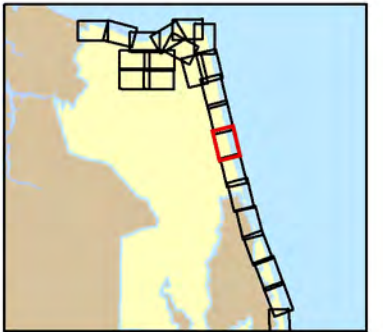


1,000 0
Feet



City of Virginia Beach Virginia

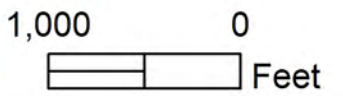
Plate 16



Legend

— 1994 Shoreline

Photo Date: 1994





Atlantic Ocean

NAS Oceana
Dam Neck Annex

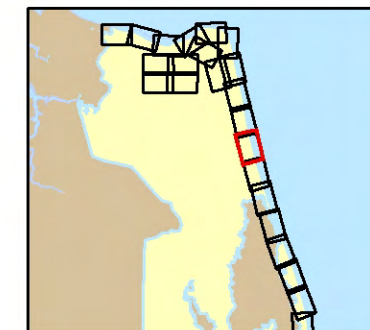
Redwing Lake

Dam Neck Rd

Lake Tecumseh

City of Virginia Beach Virginia

Plate 16



Legend

— 2002 Shoreline

Photo Date: 2002



1,000 0
Feet



Atlantic Ocean

NAS Oceana
Dam Neck Annex

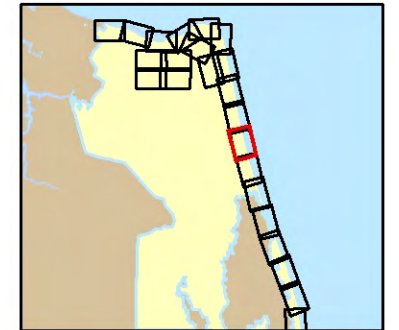
Redwing Lake

Dam Neck Rd

Lake Tecumseh

City of Virginia Beach Virginia

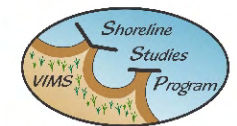
Plate 16



Legend

— 2009 Shoreline

Photo Date: 2009



1,000 0
Feet



Atlantic Ocean

NAS Oceana
Dam Neck Annex

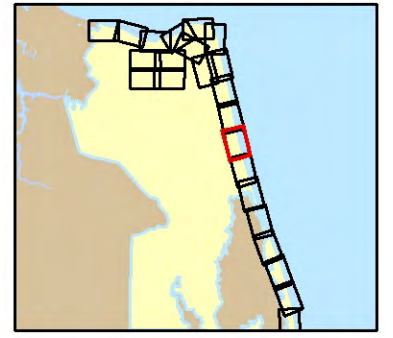
Redwing Lake

Dam Neck Rd

Lake Tecumseh

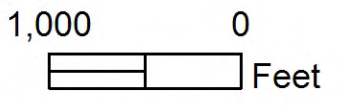
City of Virginia Beach Virginia

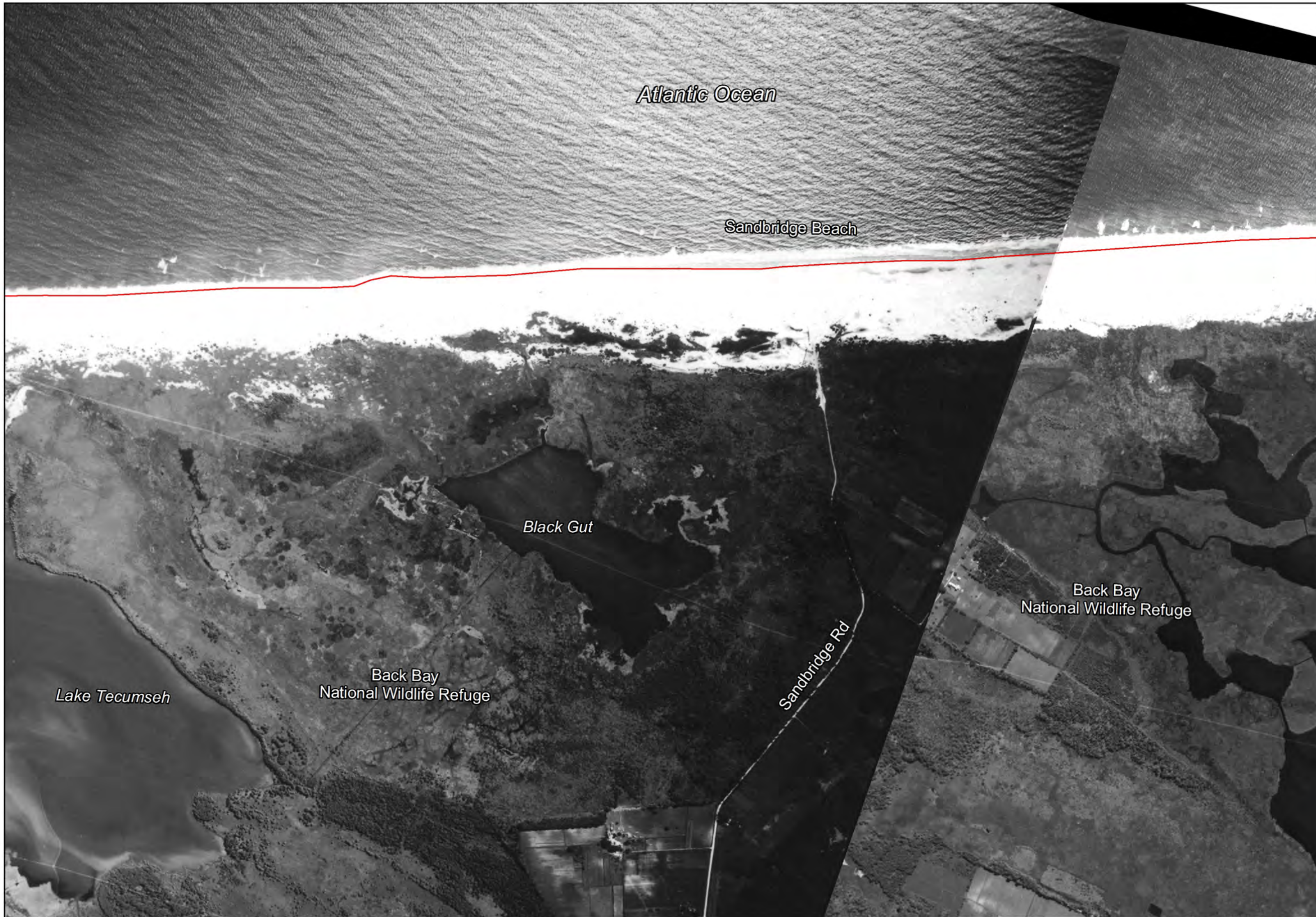
Plate 16



- Legend**
- 1937 Shoreline
 - 1954 Shoreline
 - 1970 Shoreline
 - 1985 Shoreline
 - 1994 Shoreline
 - 2002 Shoreline
 - 2009 Shoreline
 - 2011 Shoreline

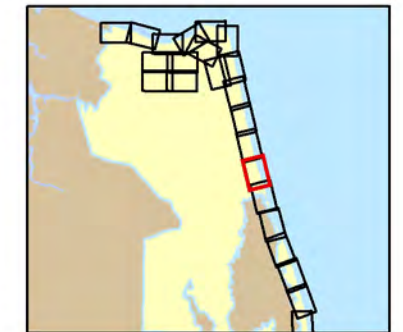
Photo Date: 2011





City of Virginia Beach Virginia

Plate 17



Legend

— 1937 Shoreline

Photo Date: 1937

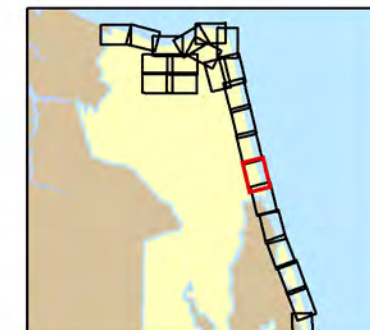


1,000 0
Feet



City of Virginia Beach Virginia

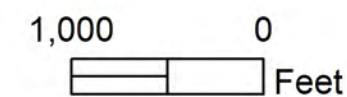
Plate 17

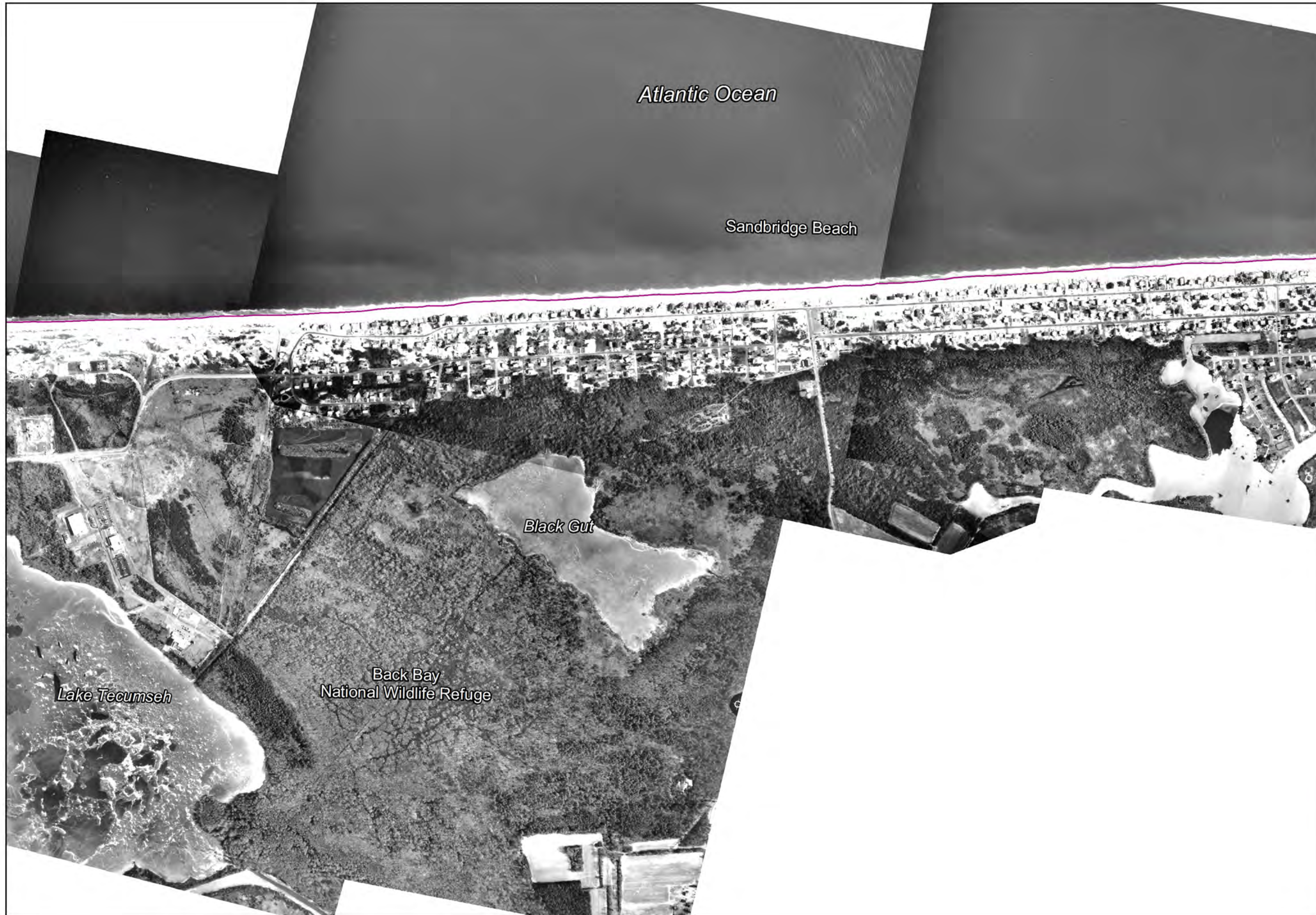


Legend

— 1970 Shoreline

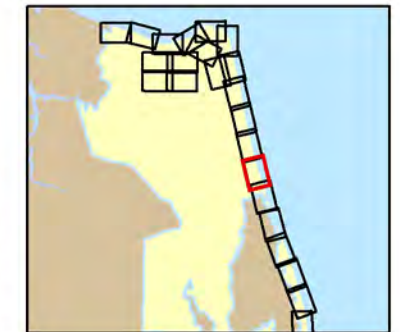
Photo Date: 1970





City of Virginia Beach Virginia

Plate 17



Legend

— 1985 Shoreline

Photo Date: 1985



1,000 0
Feet



City of Virginia Beach Virginia

Plate 17



Legend

— 1994 Shoreline

Photo Date: 1994

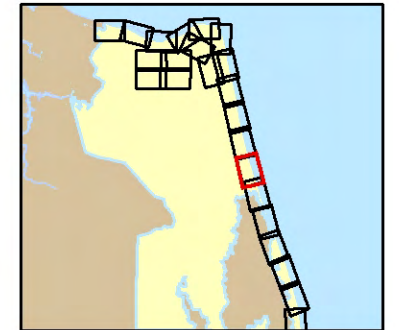


1,000 0
Feet



City of Virginia Beach Virginia

Plate 17



Legend

— 2002 Shoreline

Photo Date: 2002

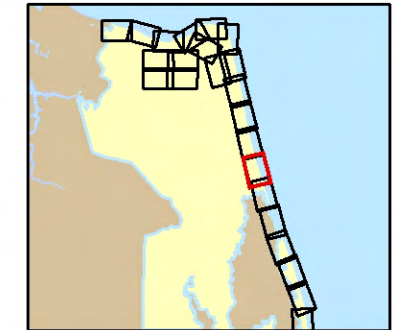


1,000 0
Feet



City of Virginia Beach Virginia

Plate 17



Legend

— 2009 Shoreline

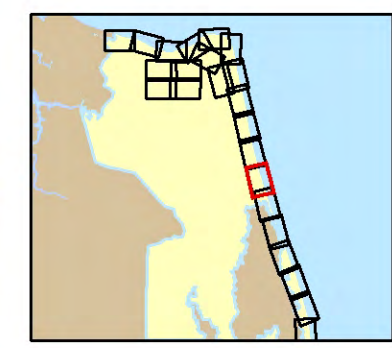
Photo Date: 2009



1,000 0
Feet

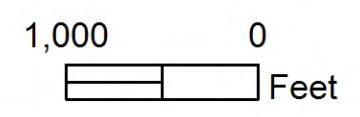
City of Virginia Beach Virginia

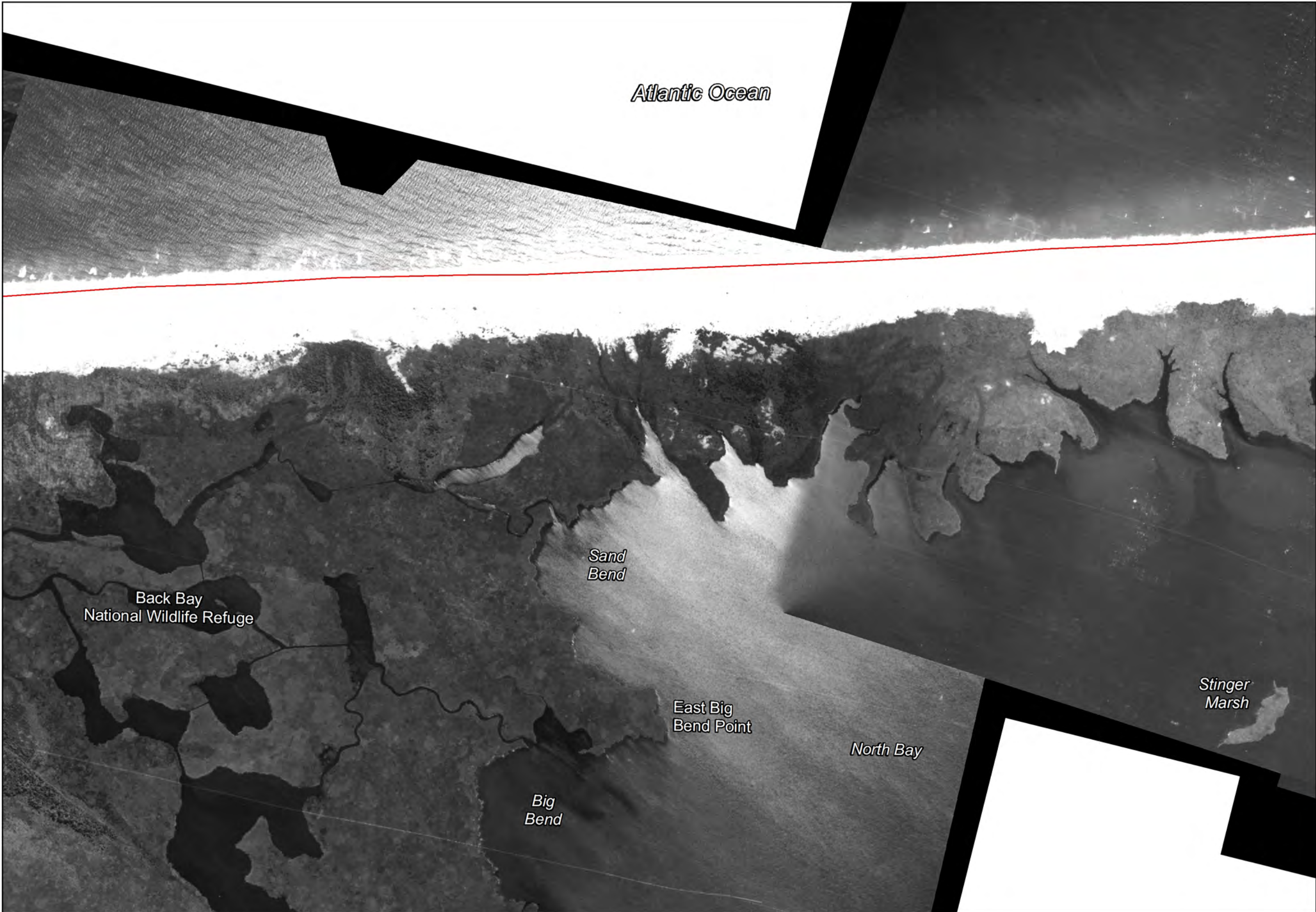
Plate 17



- Legend**
- 1937 Shoreline
 - 1954 Shoreline
 - 1970 Shoreline
 - 1985 Shoreline
 - 1994 Shoreline
 - 2002 Shoreline
 - 2009 Shoreline
 - 2011 Shoreline

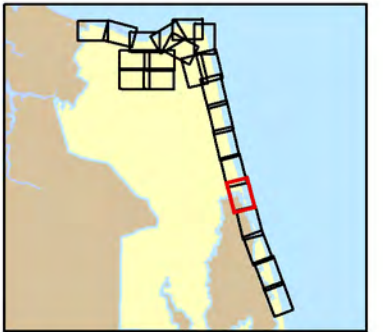
Photo Date: 2011





City of Virginia Beach Virginia

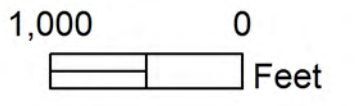
Plate 18



Legend

— 1937 Shoreline

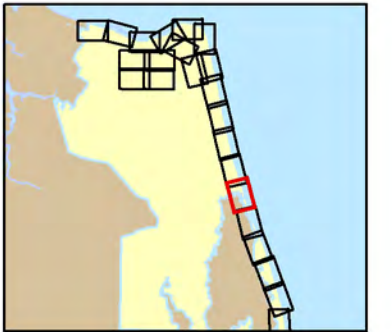
Photo Date: 1937





City of Virginia Beach Virginia

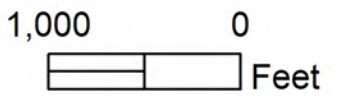
Plate 18



Legend

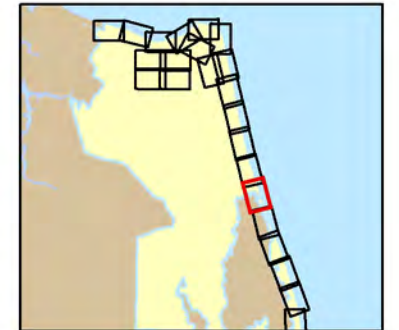
— 1970 Shoreline

Photo Date: 1970



City of Virginia Beach Virginia

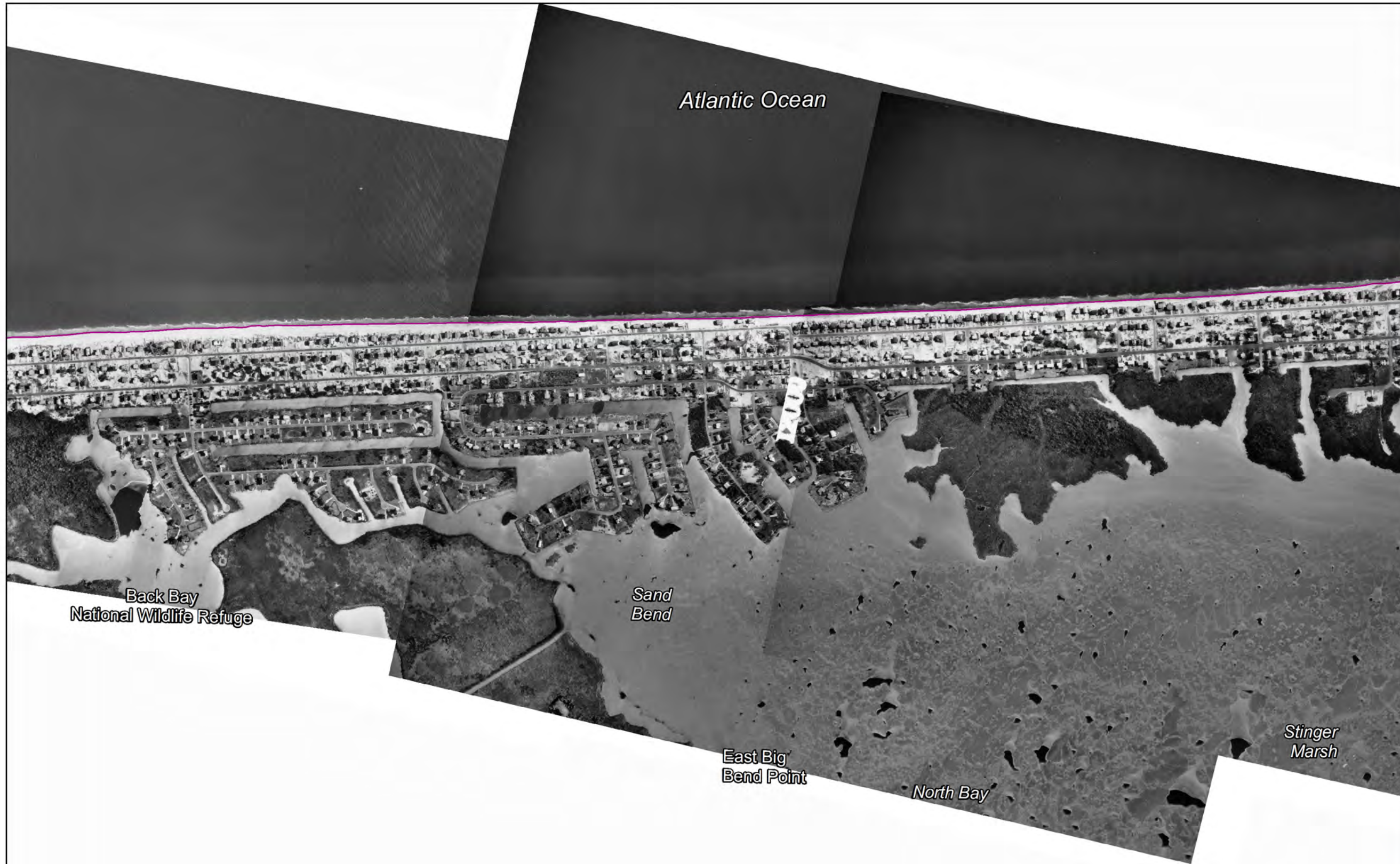
Plate 18



Legend

— 1985 Shoreline

Photo Date: 1985



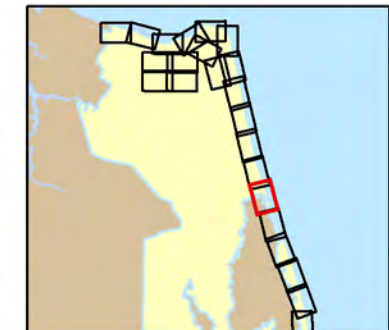
1,000 0
Feet



Atlantic Ocean

City of Virginia Beach Virginia

Plate 18



Legend

— 1994 Shoreline

Photo Date: 1994

Back Bay
National Wildlife Refuge

Sand Bend

East Big
Bend Point

North Bay

*Stinger
Marsh*

*Big
Bend*

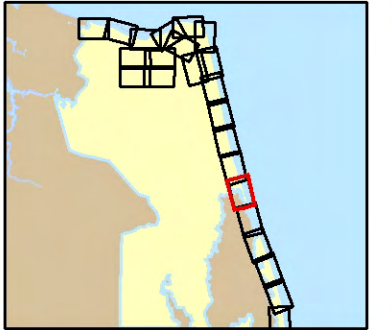


1,000 0
Feet



City of Virginia Beach Virginia

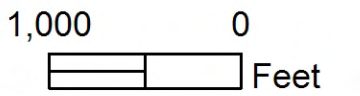
Plate 18

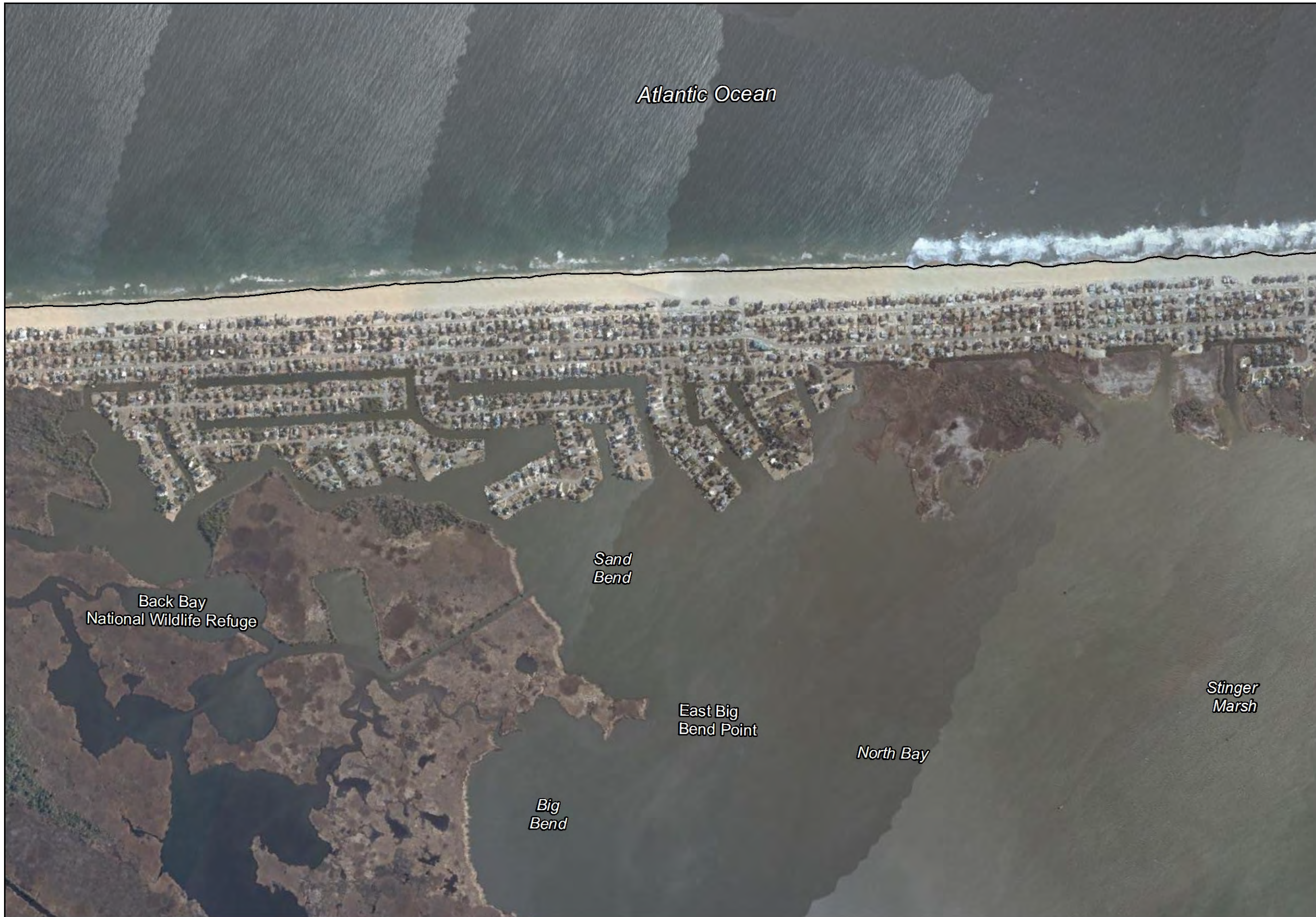


Legend

— 2002 Shoreline

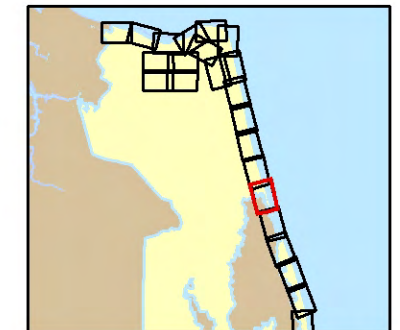
Photo Date: 2002





City of Virginia Beach Virginia

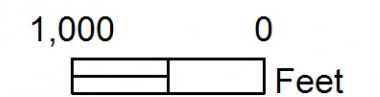
Plate 18



Legend

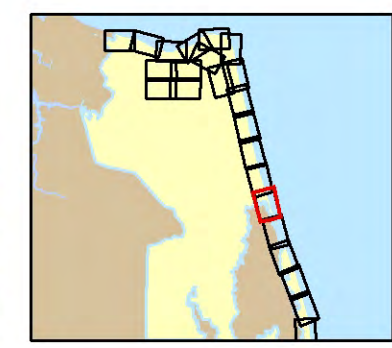
— 2009 Shoreline

Photo Date: 2009



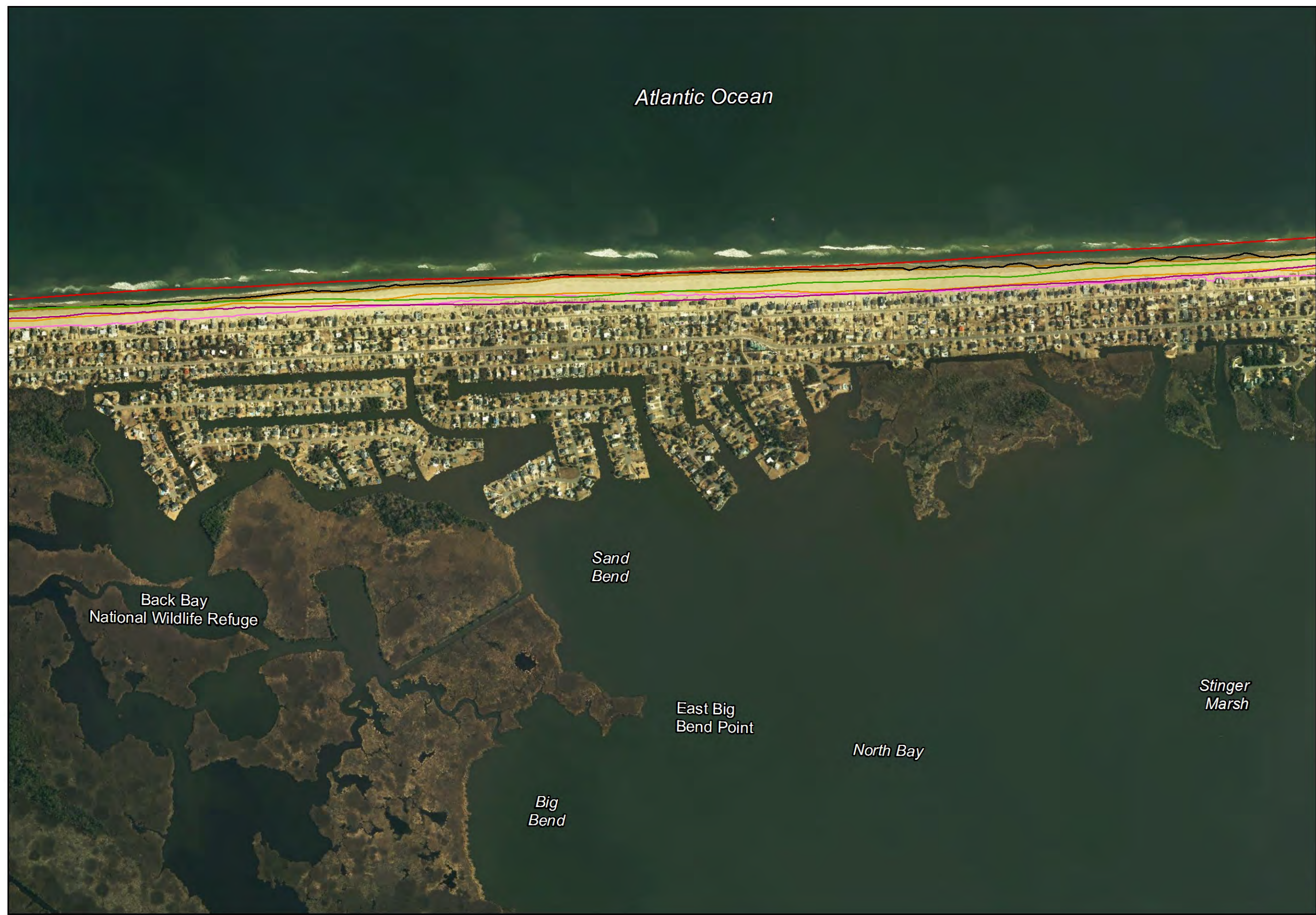
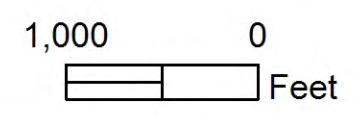
City of Virginia Beach Virginia

Plate 18



- Legend**
- 1937 Shoreline
 - 1954 Shoreline
 - 1970 Shoreline
 - 1985 Shoreline
 - 1994 Shoreline
 - 2002 Shoreline
 - 2009 Shoreline
 - 2011 Shoreline

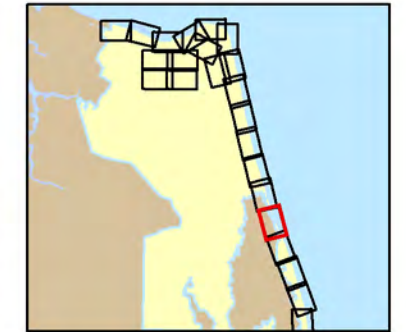
Photo Date: 2011





City of Virginia Beach Virginia

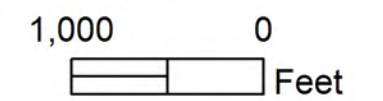
Plate 19

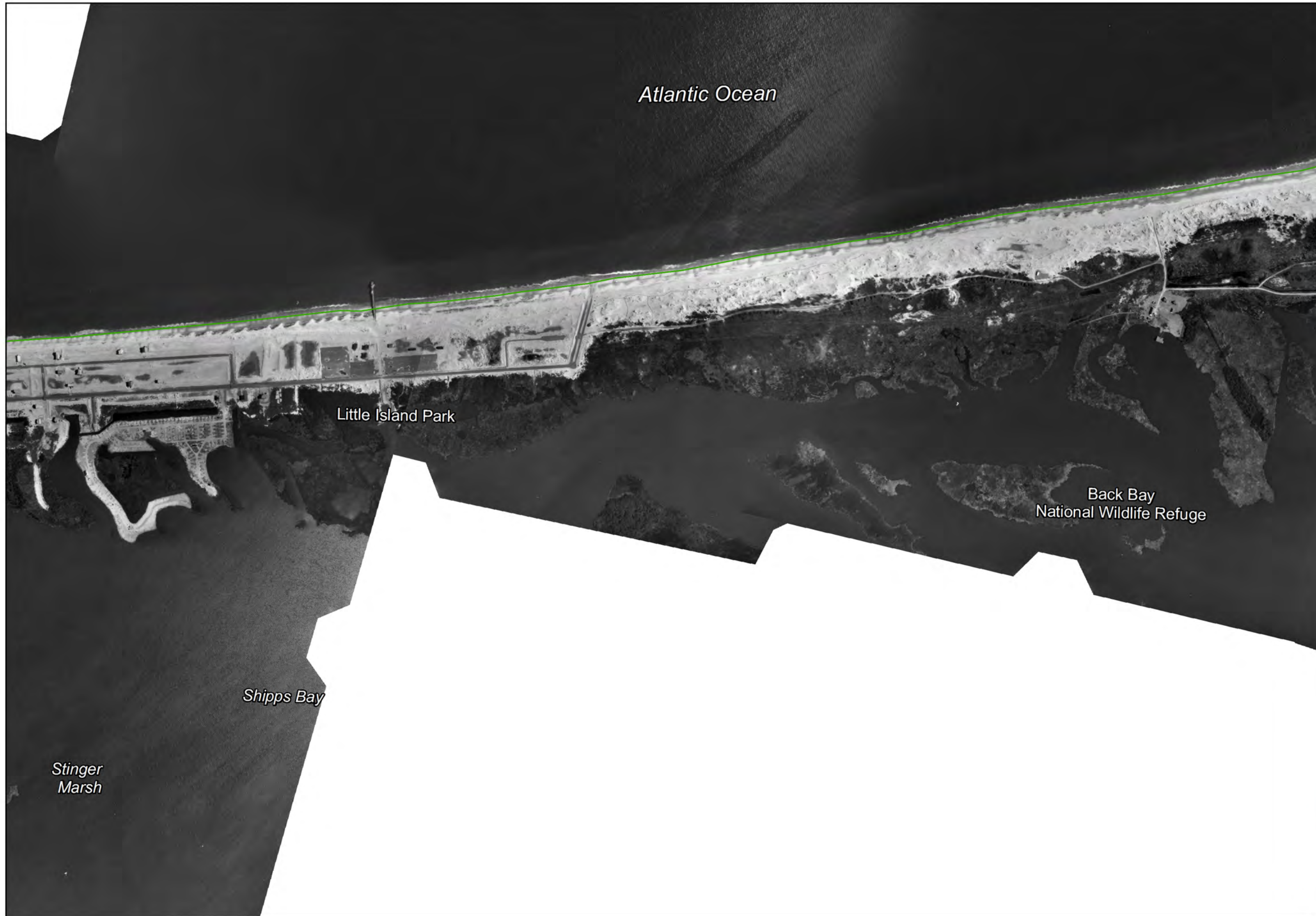


Legend

— 1937 Shoreline

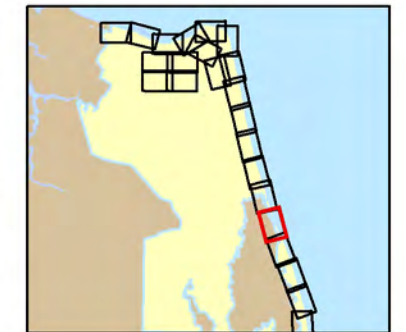
Photo Date: 1937





City of Virginia Beach Virginia

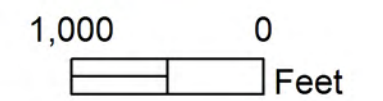
Plate 19



Legend

— 1970 Shoreline

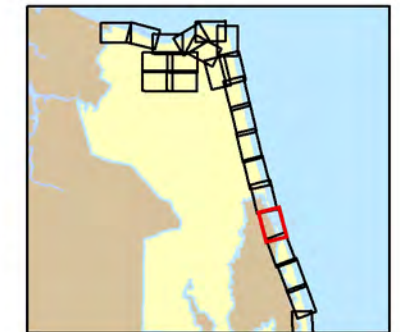
Photo Date: 1970





City of Virginia Beach Virginia

Plate 19



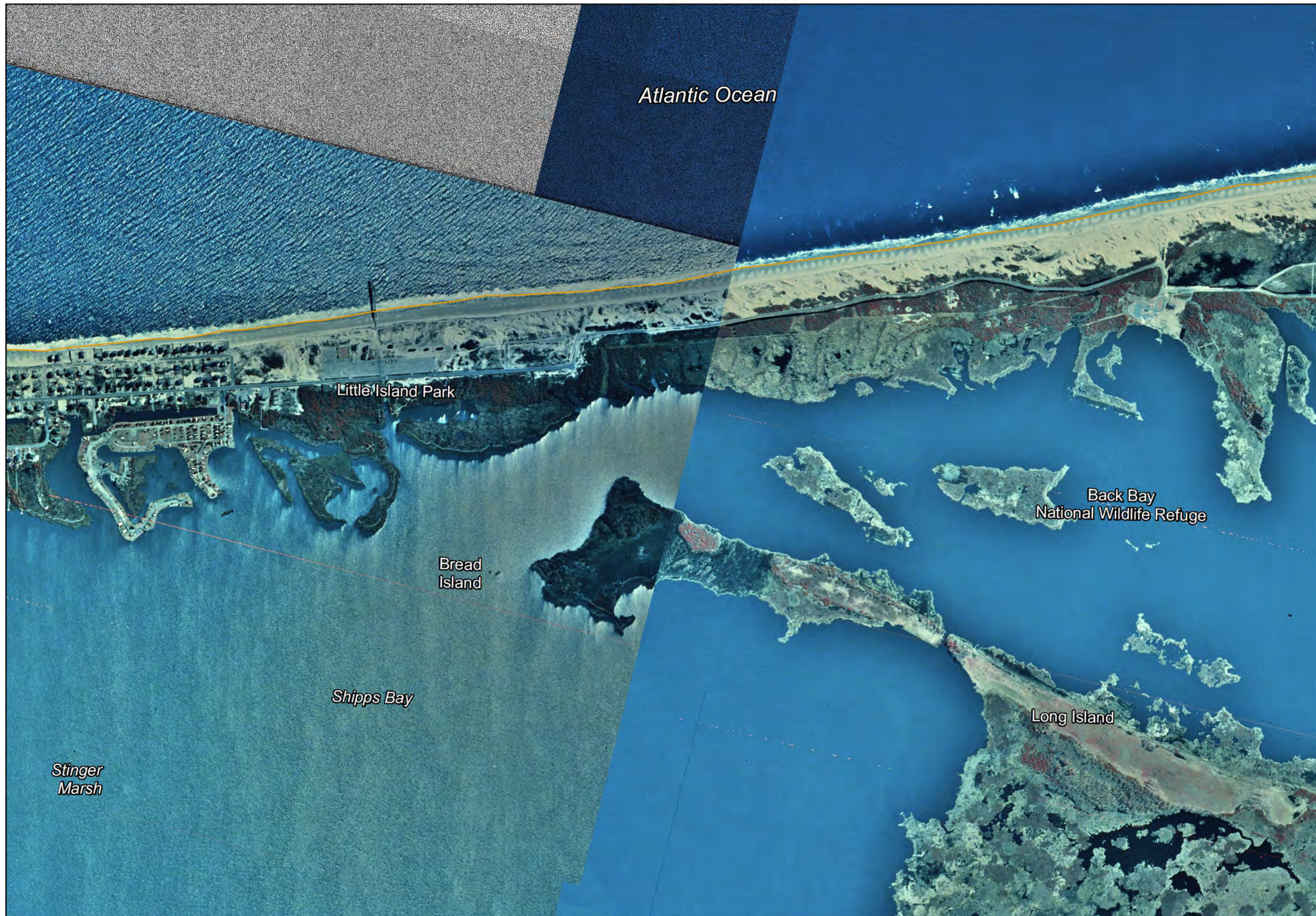
Legend

— 1985 Shoreline

Photo Date: 1985

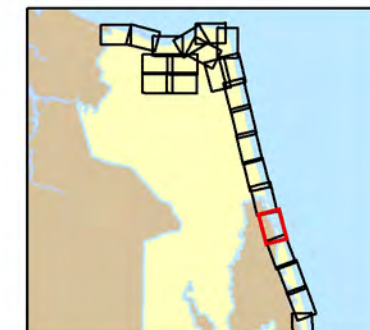


1,000 0
Feet



City of Virginia Beach Virginia

Plate 19



Legend

— 1994 Shoreline

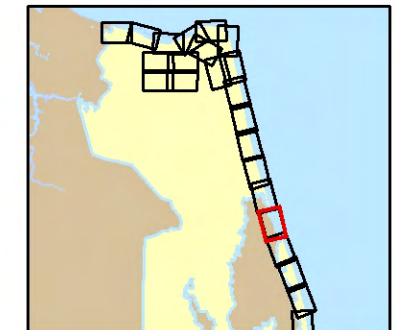
Photo Date: 1994





City of Virginia Beach Virginia

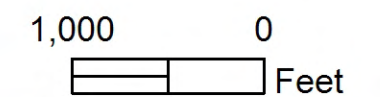
Plate 19



Legend

— 2002 Shoreline

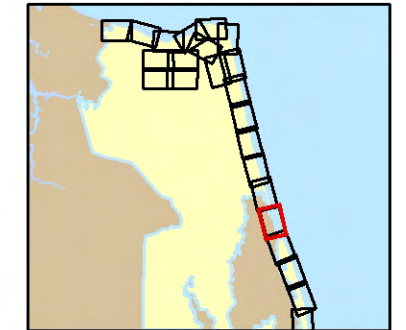
Photo Date: 2002





City of Virginia Beach Virginia

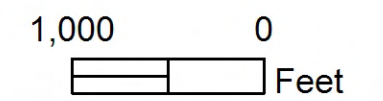
Plate 19



Legend

— 2009 Shoreline

Photo Date: 2009





Atlantic Ocean

Little Island Park

Bread Island

Shipps Bay

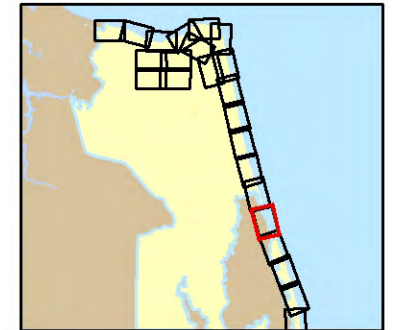
Stinger Marsh

Back Bay National Wildlife Refuge

Long Island

City of Virginia Beach Virginia

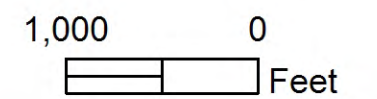
Plate 19

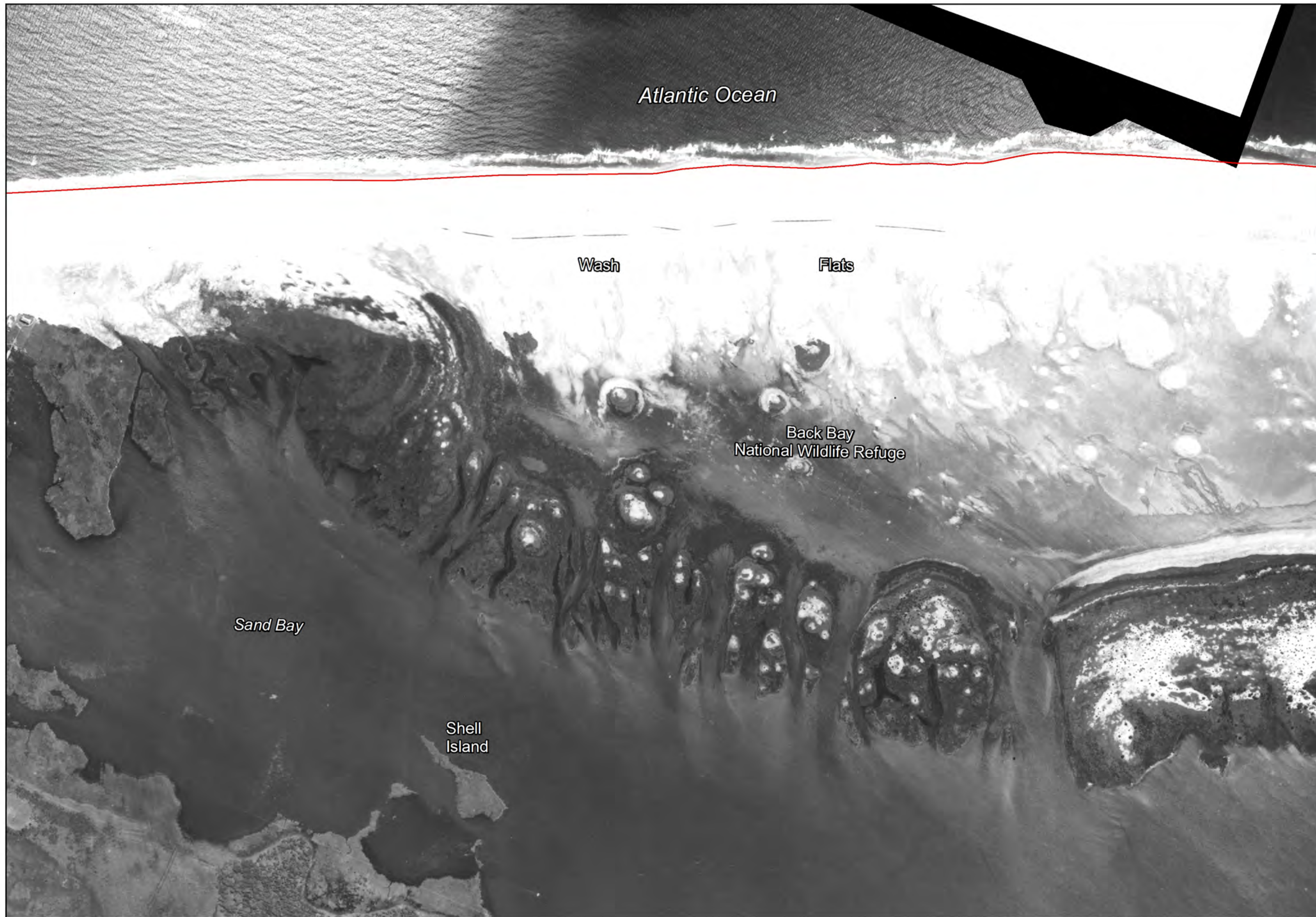


Legend

- 1937 Shoreline
- 1954 Shoreline
- 1970 Shoreline
- 1985 Shoreline
- 1994 Shoreline
- 2002 Shoreline
- 2009 Shoreline
- 2011 Shoreline

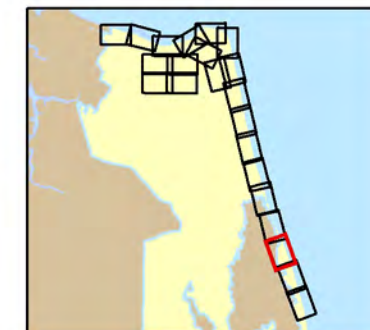
Photo Date: 2011





City of Virginia Beach Virginia

Plate 20



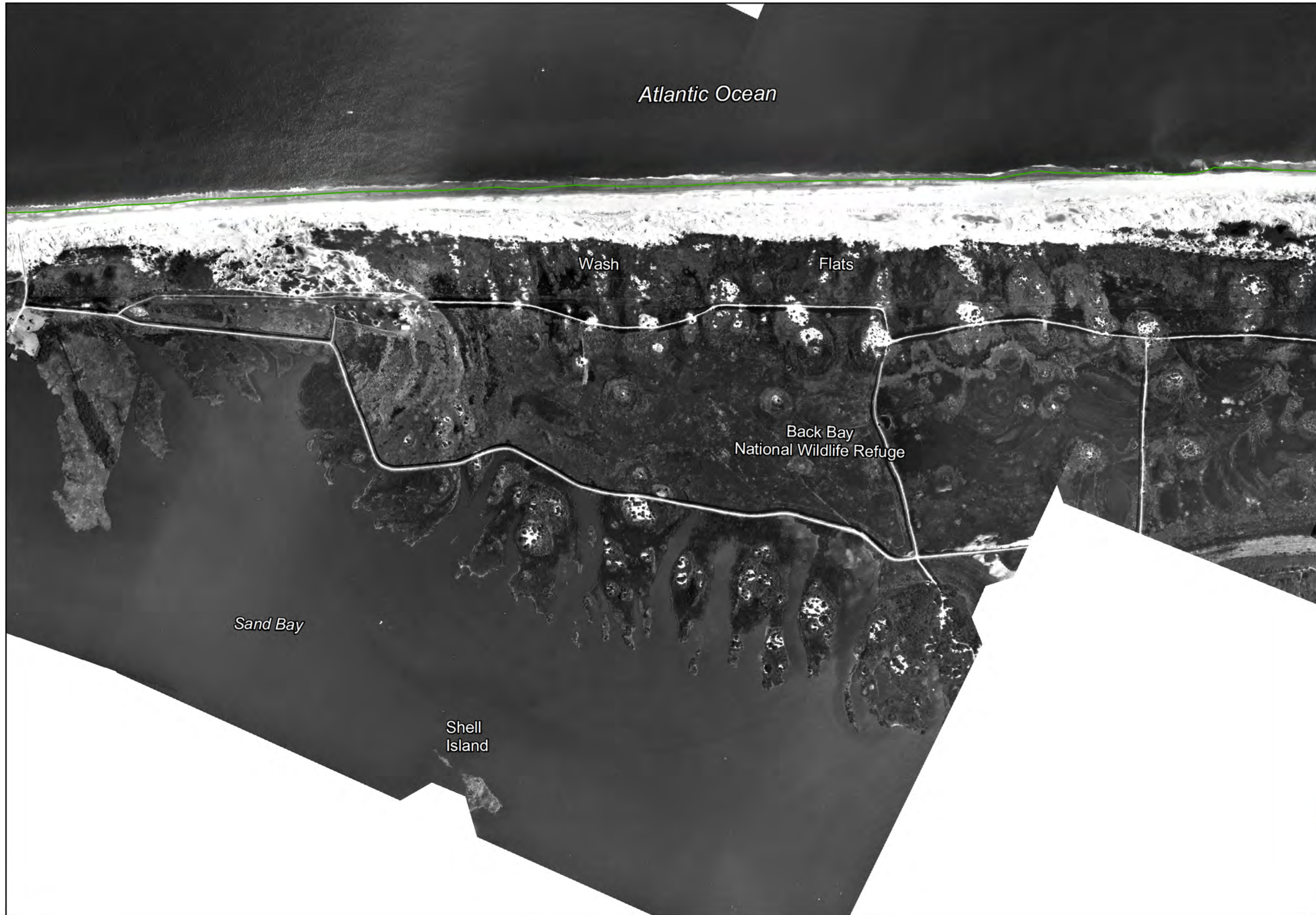
Legend

— 1937 Shoreline

Photo Date: 1937

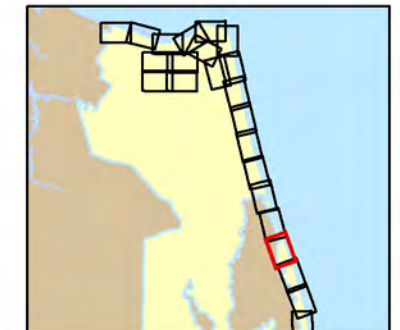


1,000 0 Feet



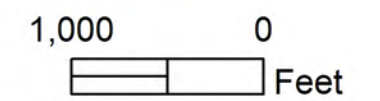
City of Virginia Beach Virginia

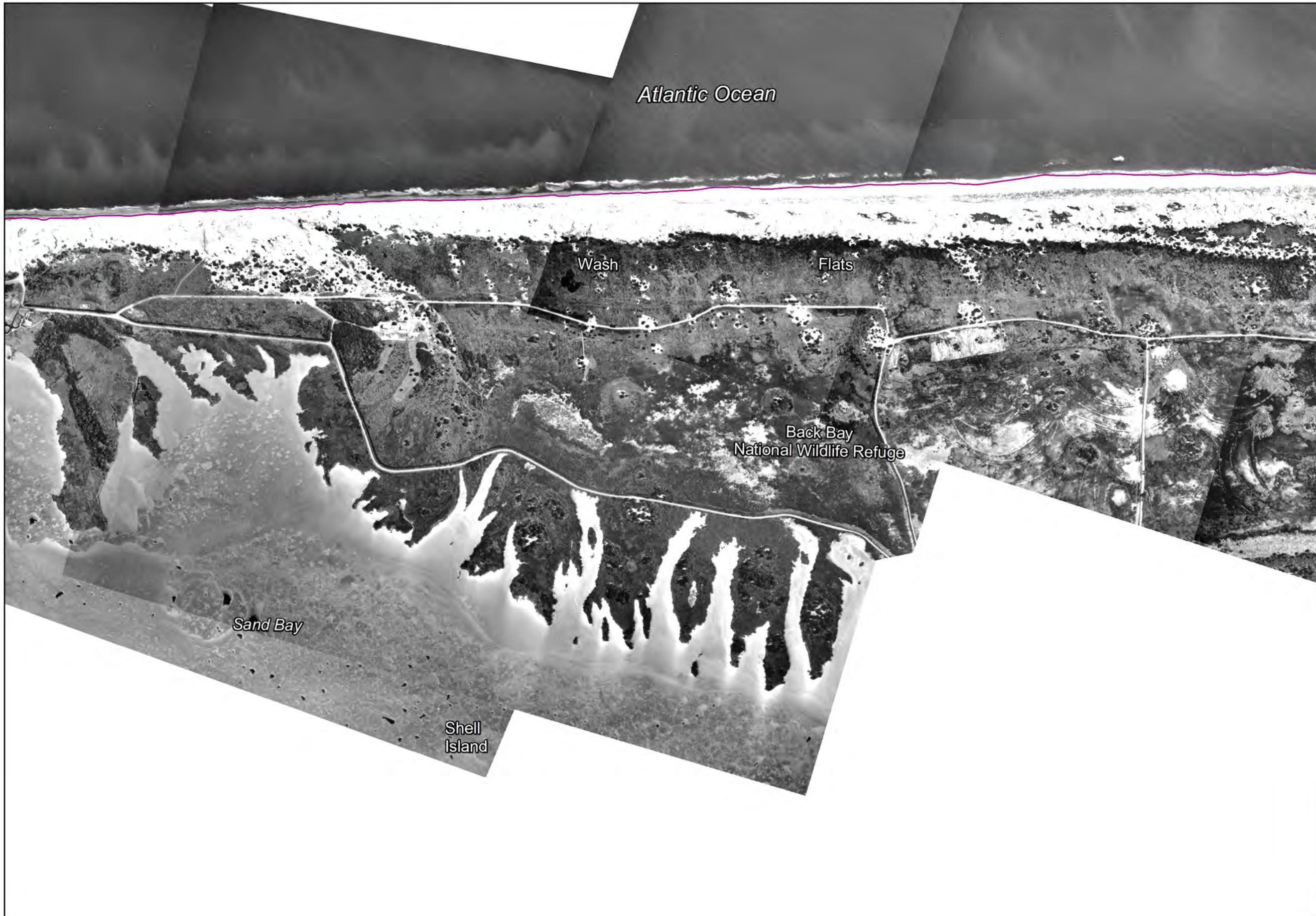
Plate 20



Legend
— 1970 Shoreline

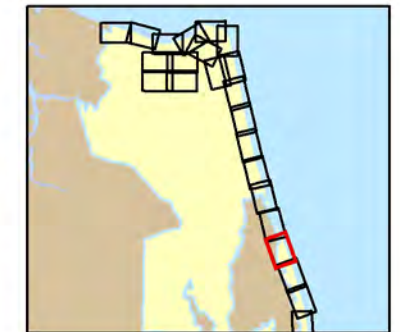
Photo Date: 1970





City of Virginia Beach Virginia

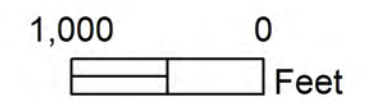
Plate 20



Legend

- 1985 Shoreline

Photo Date: 1985





City of Virginia Beach Virginia

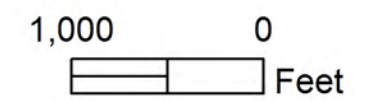
Plate 20



Legend

— 1994 Shoreline

Photo Date: 1994





Atlantic Ocean

Wash

Flats

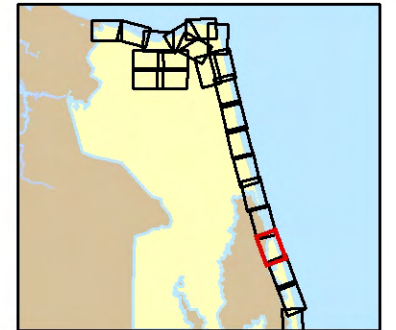
Back Bay
National Wildlife Refuge

Sand Bay

Shell
Island

City of Virginia Beach Virginia

Plate 20



Legend

— 2002 Shoreline

Photo Date: 2002

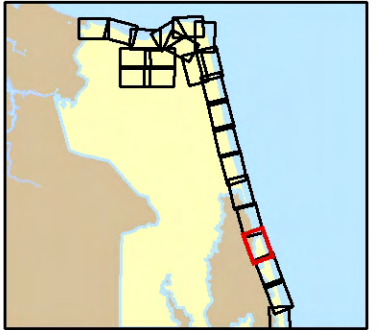


1,000 0
Feet



City of Virginia Beach Virginia

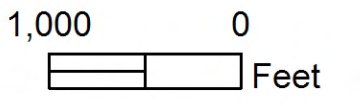
Plate 20



Legend

— 2009 Shoreline

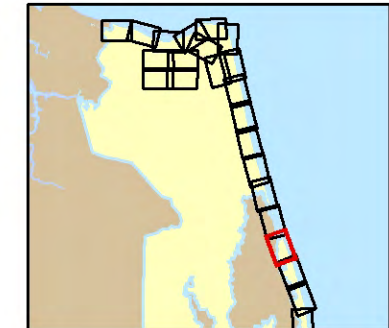
Photo Date: 2009





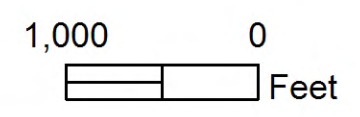
City of Virginia Beach Virginia

Plate 20



- Legend**
- 1937 Shoreline
 - 1954 Shoreline
 - 1970 Shoreline
 - 1985 Shoreline
 - 1994 Shoreline
 - 2002 Shoreline
 - 2009 Shoreline
 - 2011 Shoreline

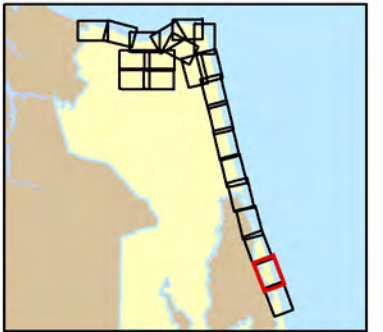
Photo Date: 2011





City of Virginia Beach Virginia

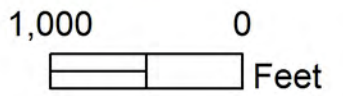
Plate 21



Legend

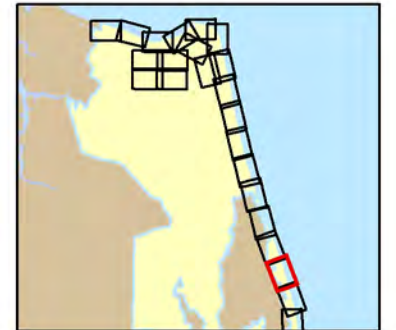
— 1937 Shoreline

Photo Date: 1937



City of Virginia Beach Virginia

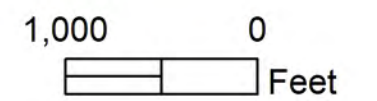
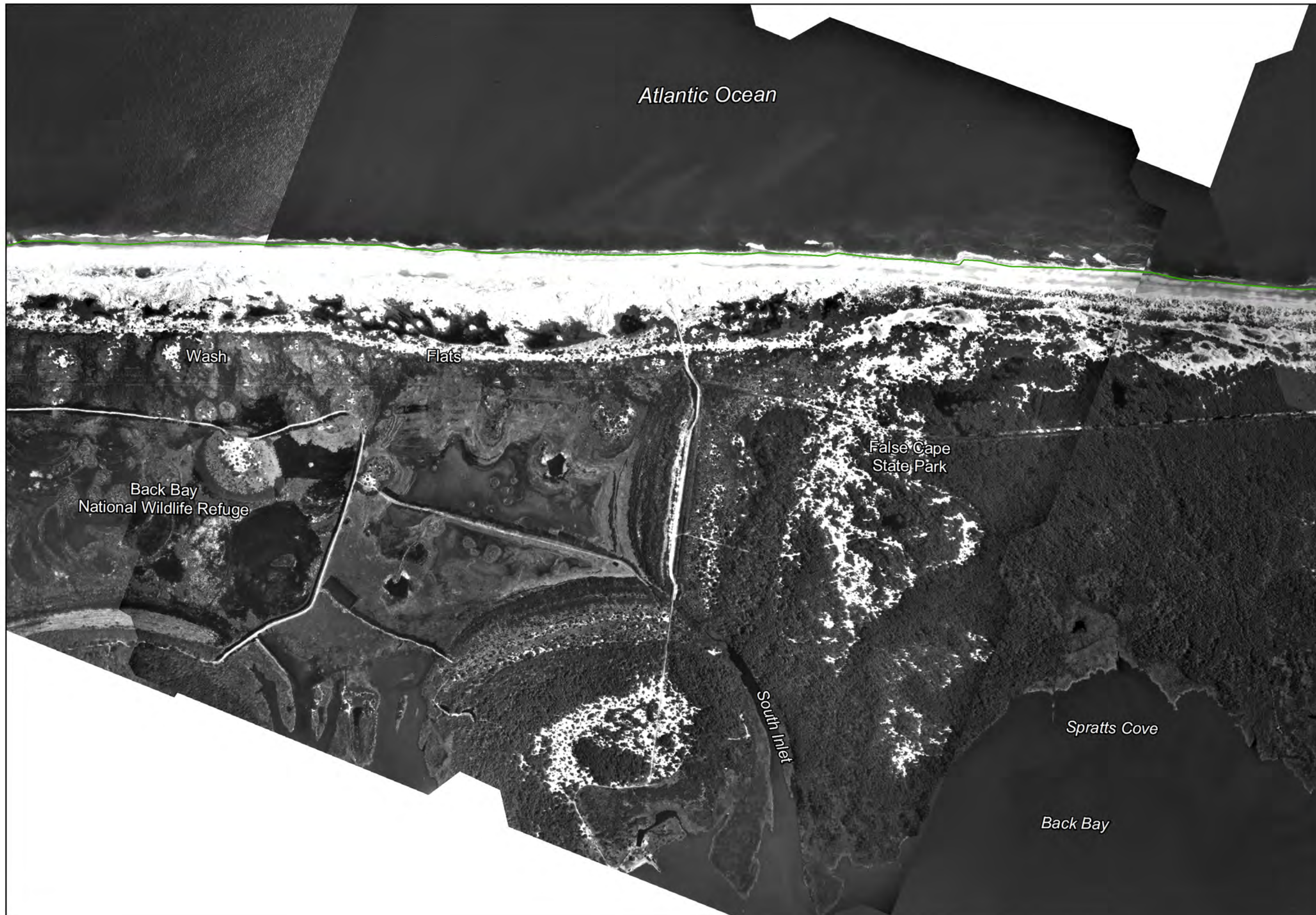
Plate 21

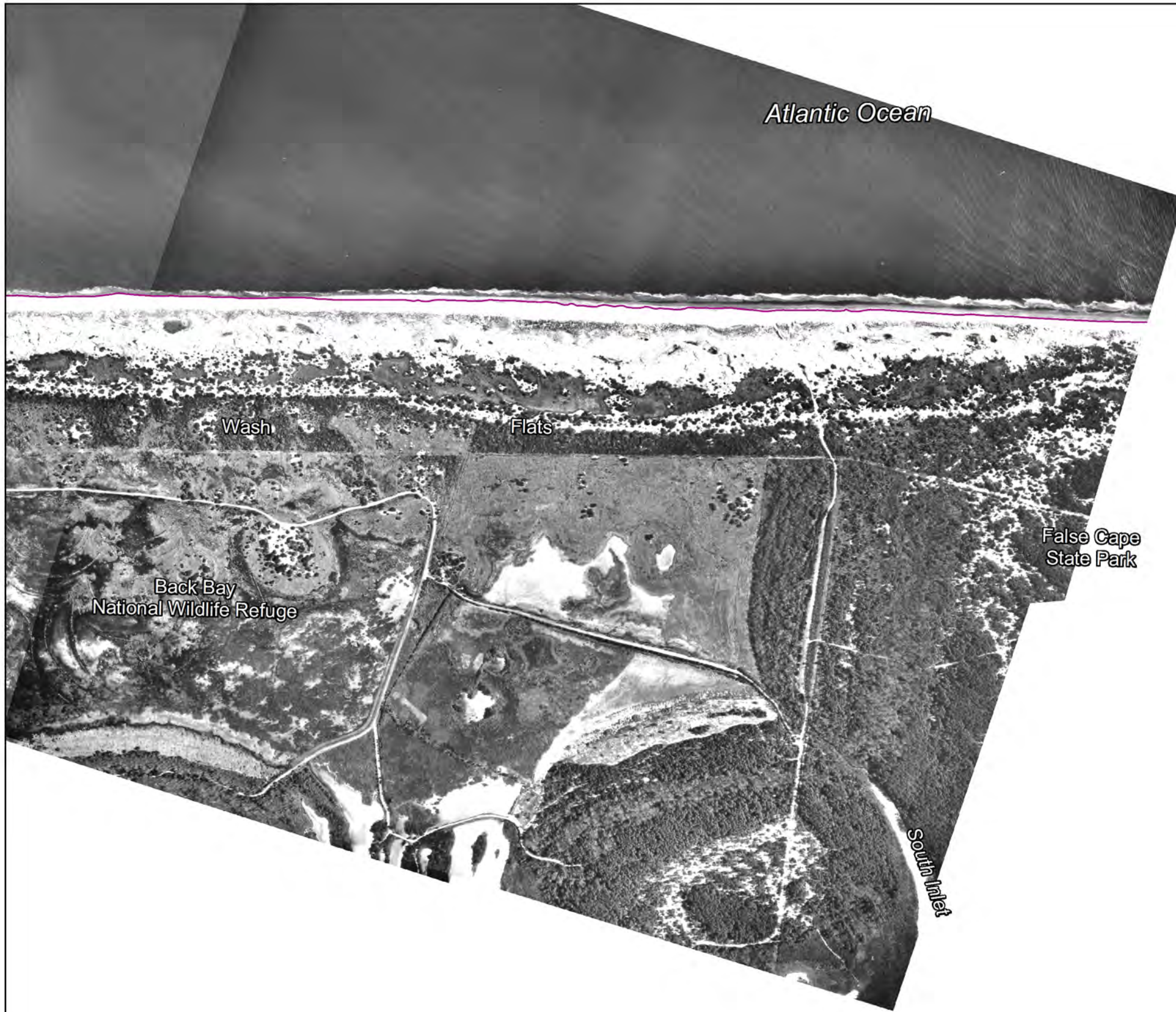


Legend

— 1970 Shoreline

Photo Date: 1970





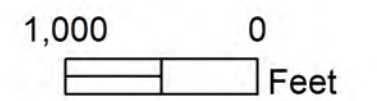
City of Virginia Beach Virginia

Plate 21



Legend
— 1985 Shoreline

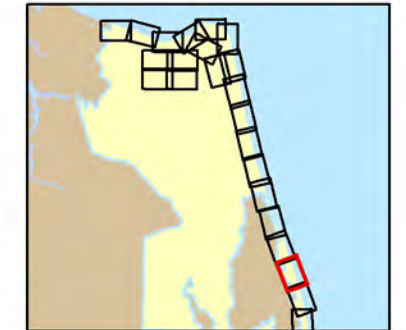
Photo Date: 1985





City of Virginia Beach Virginia

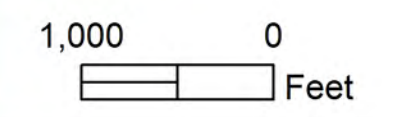
Plate 21



Legend

— 1994 Shoreline

Photo Date: 1994





Atlantic Ocean

Wash

Flats

Back Bay
National Wildlife Refuge

False Cape
State Park

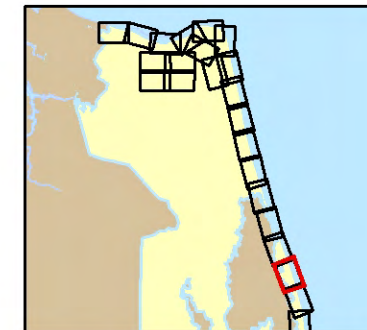
South Inlet

Spratts Cove

Back Bay

City of Virginia Beach Virginia

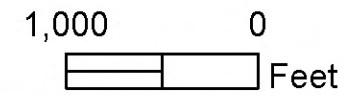
Plate 21



Legend

— 2002 Shoreline

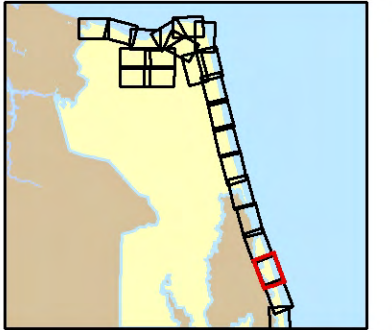
Photo Date: 2002





City of Virginia Beach Virginia

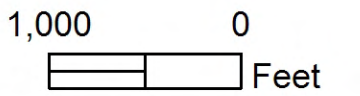
Plate 21



Legend

— 2009 Shoreline

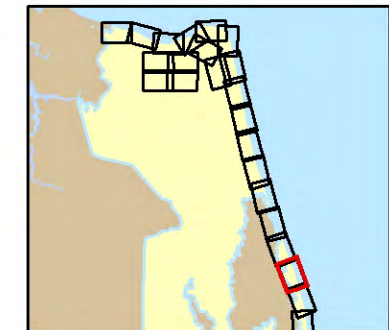
Photo Date: 2009





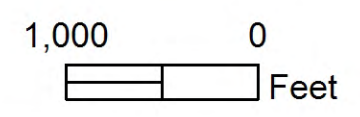
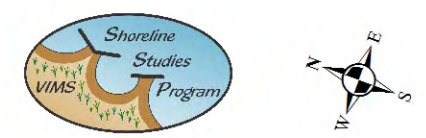
City of Virginia Beach Virginia

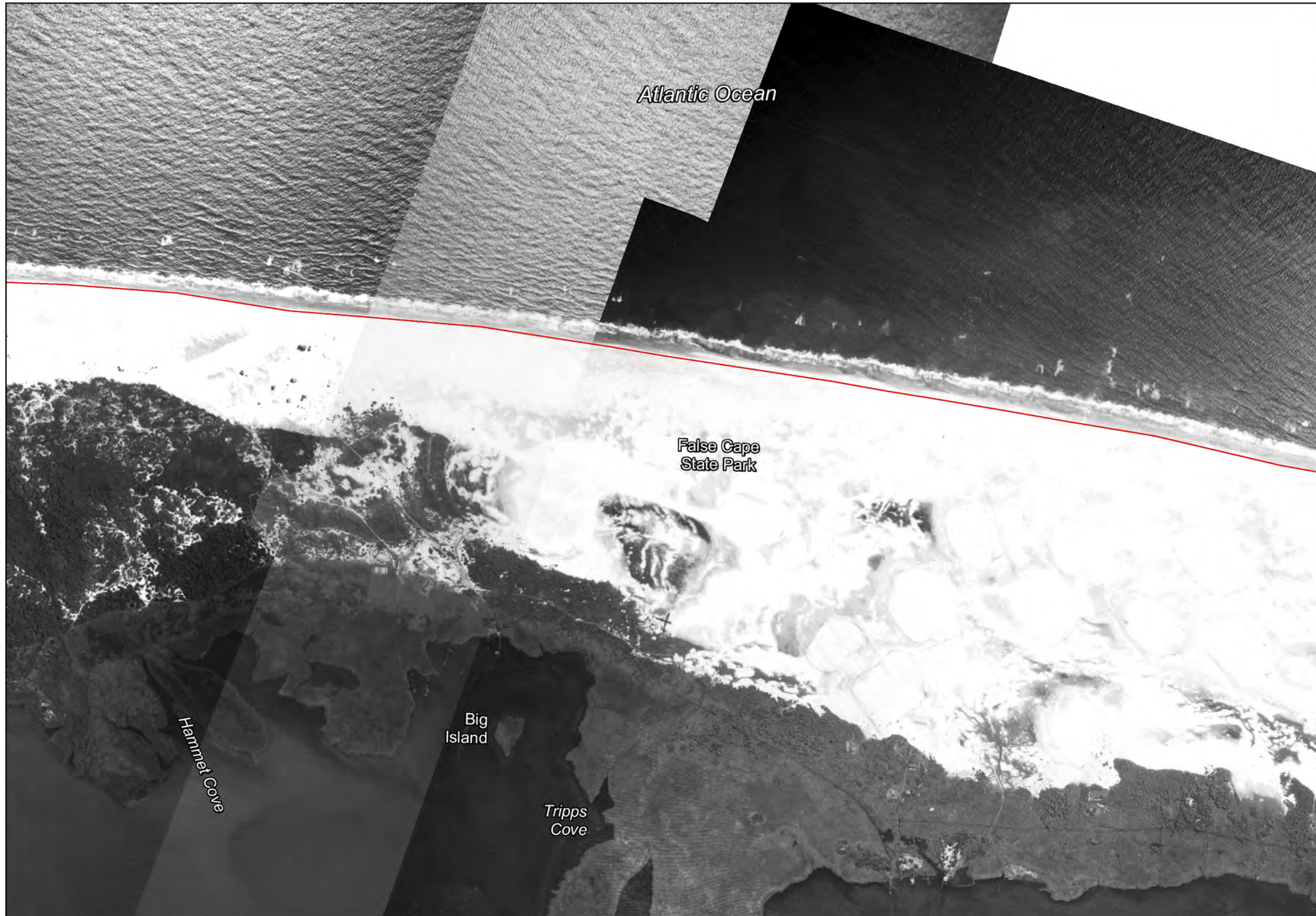
Plate 21



- Legend**
- 1937 Shoreline
 - 1954 Shoreline
 - 1970 Shoreline
 - 1985 Shoreline
 - 1994 Shoreline
 - 2002 Shoreline
 - 2009 Shoreline
 - 2011 Shoreline

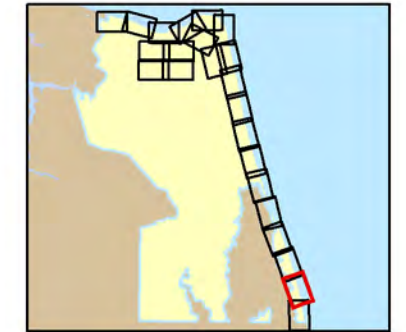
Photo Date: 2011





City of Virginia Beach Virginia

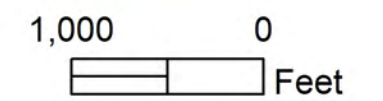
Plate 22

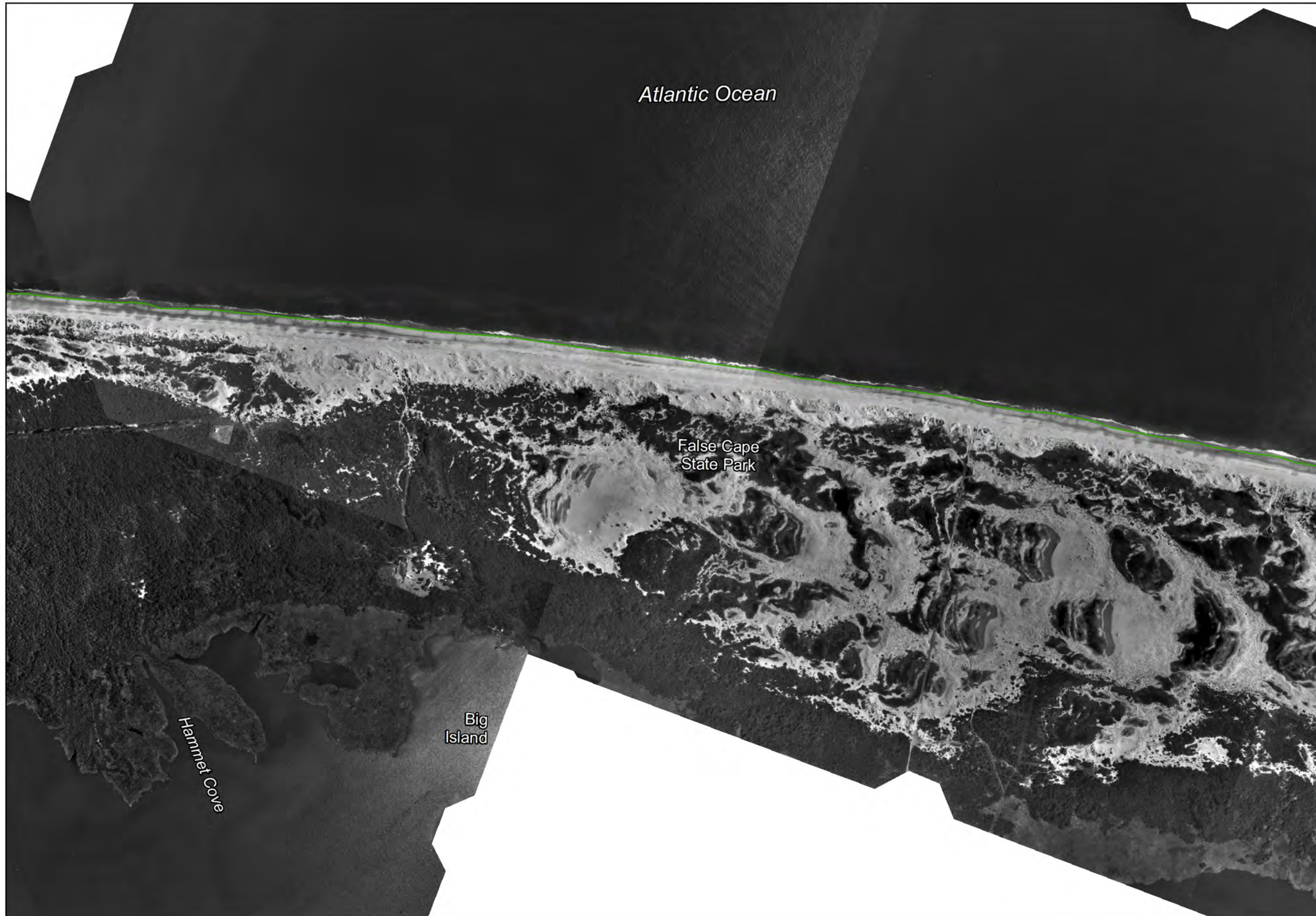


Legend

— 1937 Shoreline

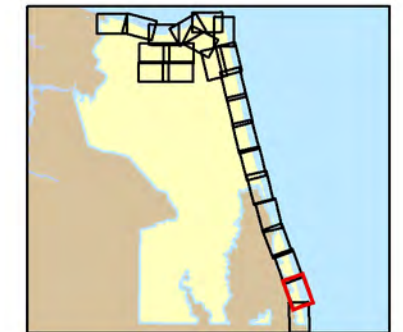
Photo Date: 1937





City of Virginia Beach Virginia

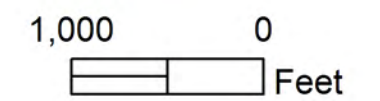
Plate 22



Legend

— 1970 Shoreline

Photo Date: 1970



City of Virginia Beach Virginia

Plate 22

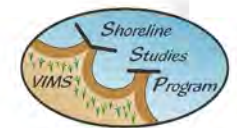


Legend

— 1985 Shoreline

Photo Date: 1985

No Data Available



1,000 0
Feet



Atlantic Ocean

False Cape State Park

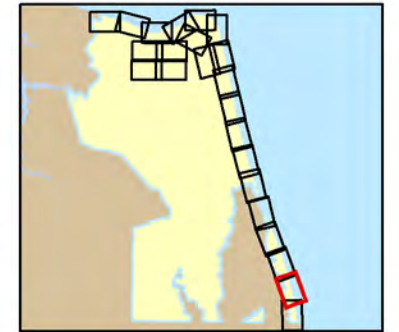
Hammet Cove

Big Island

Tripps Cove

City of Virginia Beach Virginia

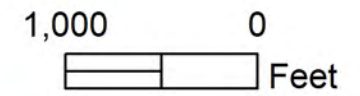
Plate 22



Legend

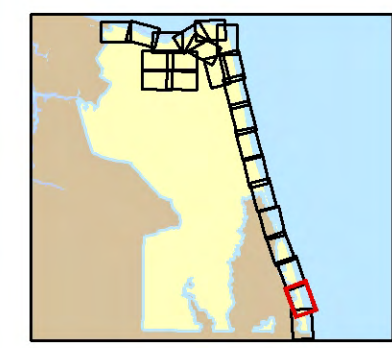
— 1994 Shoreline

Photo Date: 1994



City of Virginia Beach Virginia

Plate 22



Legend

— 2002 Shoreline

Photo Date: 2002

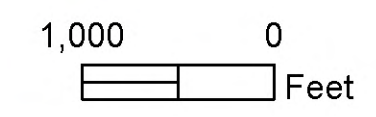
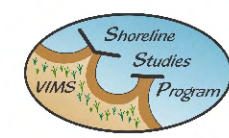
Atlantic Ocean

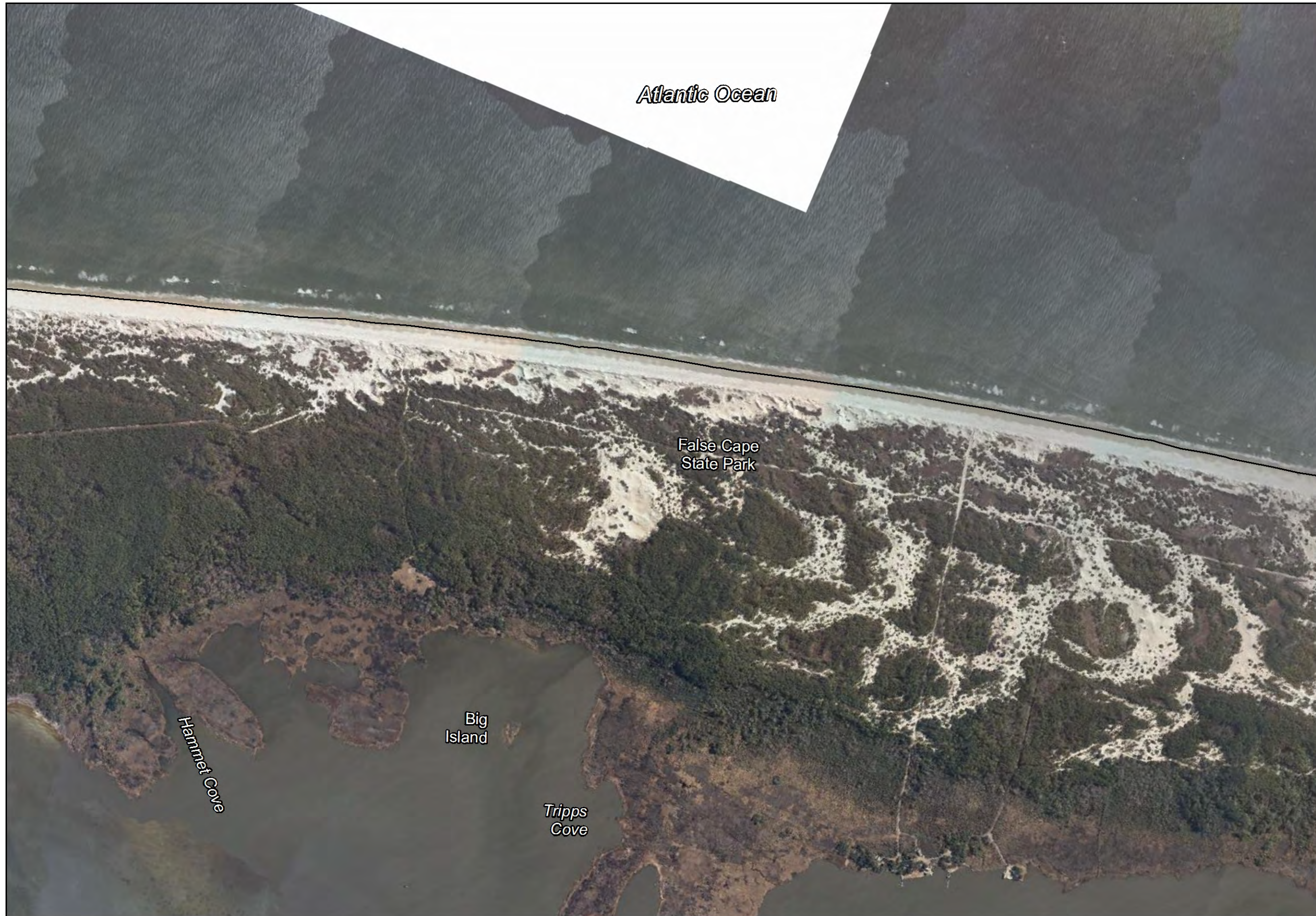
False Cape
State Park

Big
Island

Hammet
Cove

Tripps
Cove





Atlantic Ocean

False Cape State Park

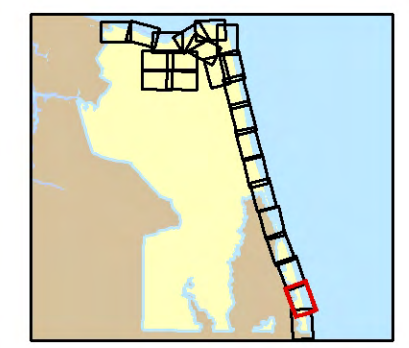
Hemmet Cove

Big Island

Tripps Cove

City of Virginia Beach Virginia

Plate 22



Legend
— 2009 Shoreline

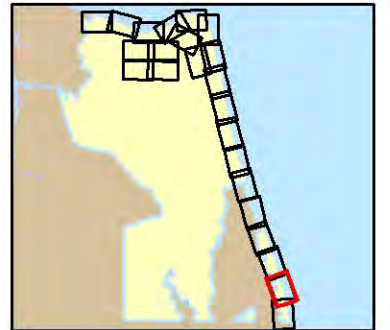
Photo Date: 2009



1,000 0 Feet

City of Virginia Beach Virginia

Plate 22



Atlantic Ocean

No 2011 Data Available

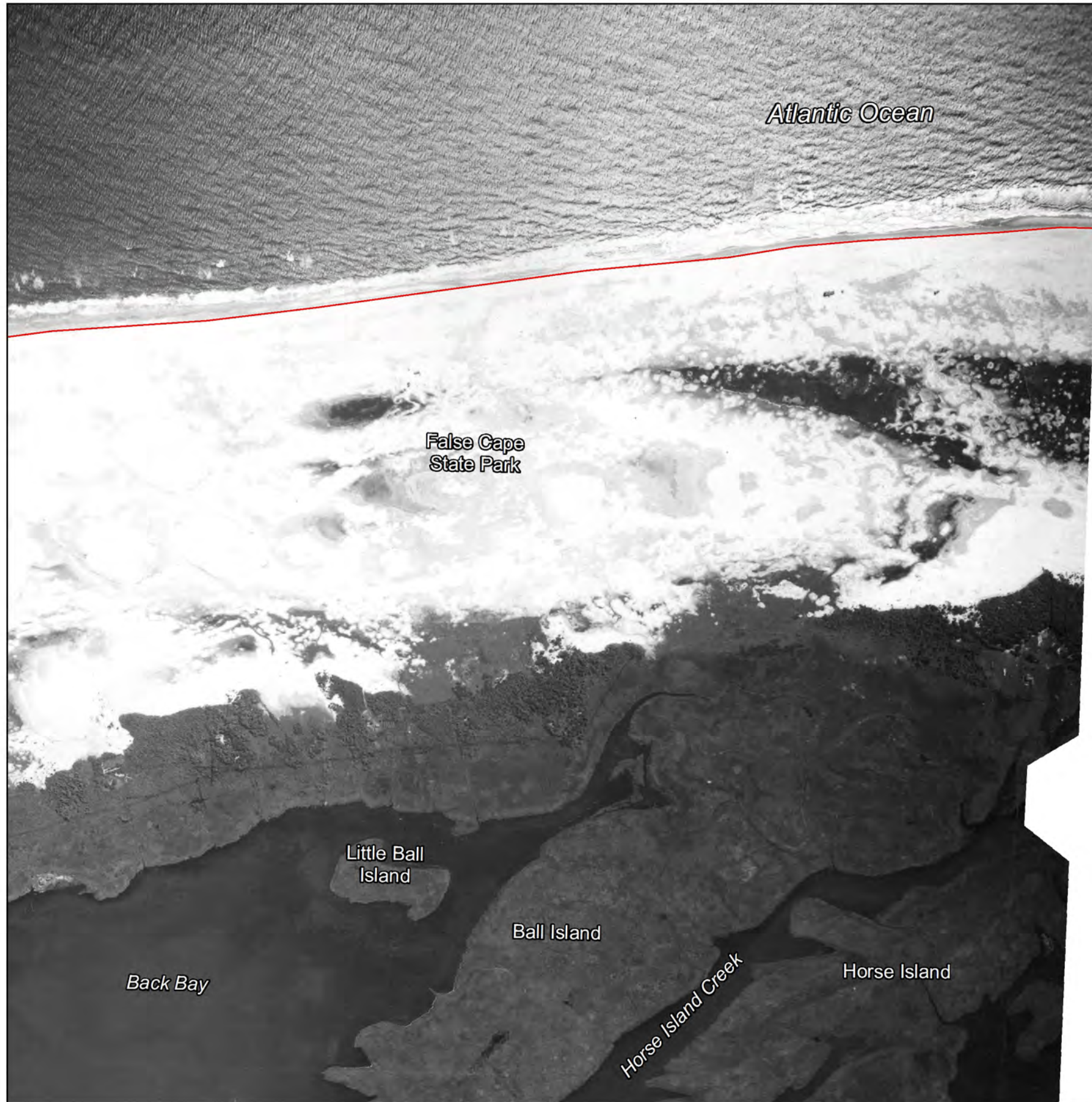
Legend

- 1937 Shoreline
- 1954 Shoreline
- 1970 Shoreline
- 1985 Shoreline
- 1994 Shoreline
- 2002 Shoreline
- 2009 Shoreline
- 2011 Shoreline

Photo Date: 2011



1,000 0
Feet



Atlantic Ocean

False Cape State Park

Little Ball Island

Ball Island

Horse Island Creek

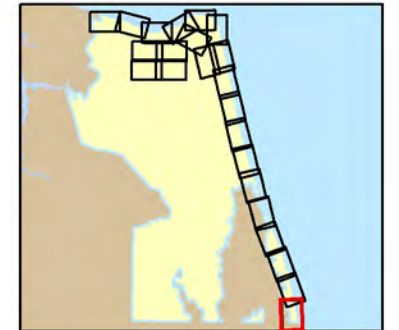
Horse Island

Back Bay

City of Virginia Beach, Virginia
Currituck County, North Carolina

City of Virginia Beach Virginia

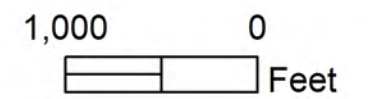
Plate 23

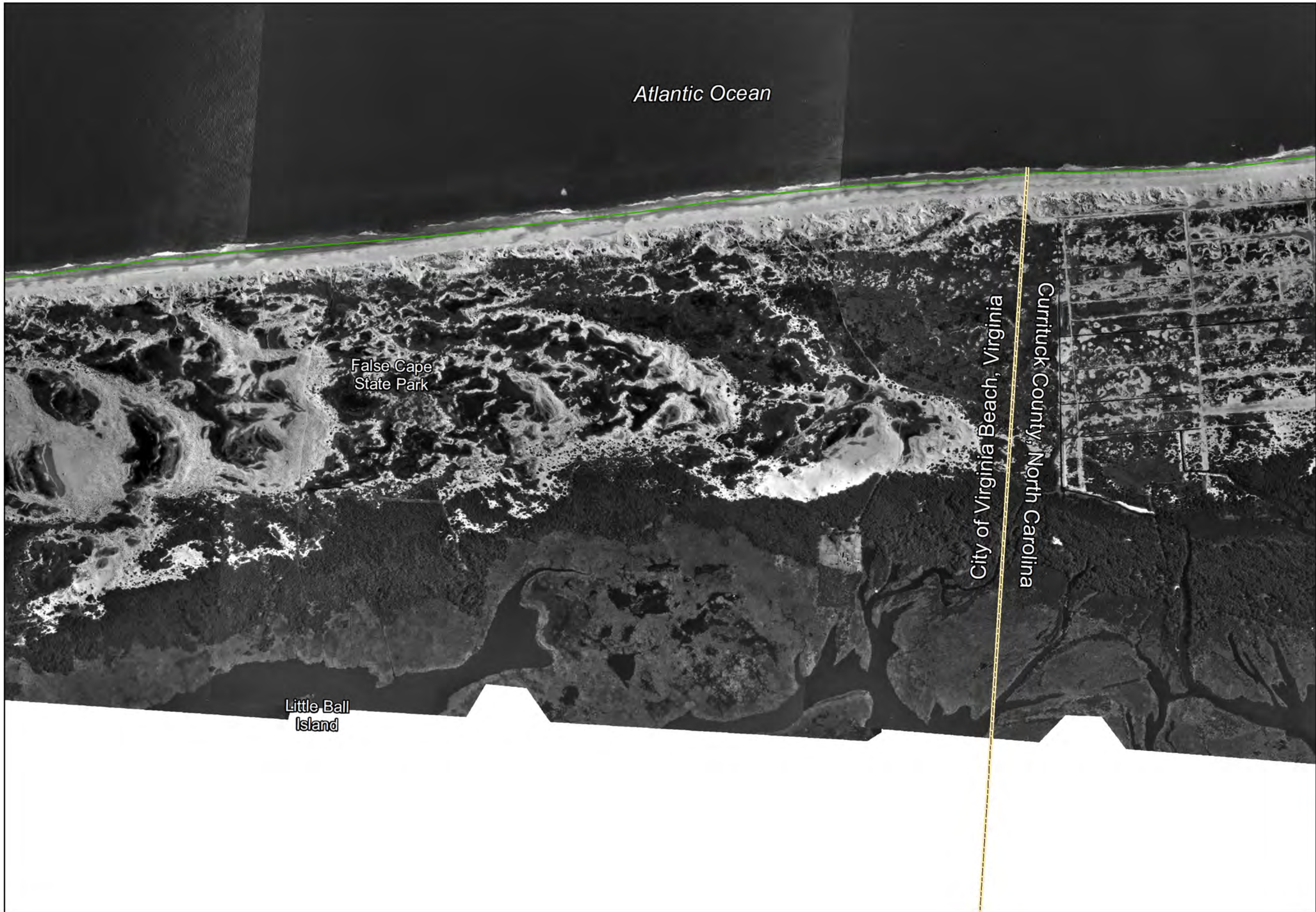


Legend

— 1937 Shoreline

Photo Date: 1937





Atlantic Ocean

False Cape State Park

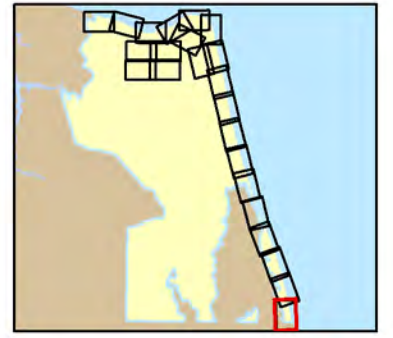
Little Ball Island

City of Virginia Beach, Virginia

Currituck County, North Carolina

City of Virginia Beach Virginia

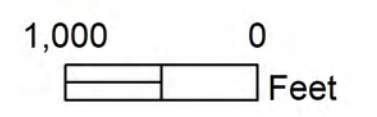
Plate 23



Legend

— 1970 Shoreline

Photo Date: 1970



City of Virginia Beach Virginia

Plate 23



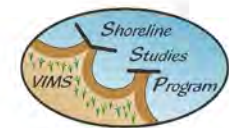
Legend

— 1985 Shoreline

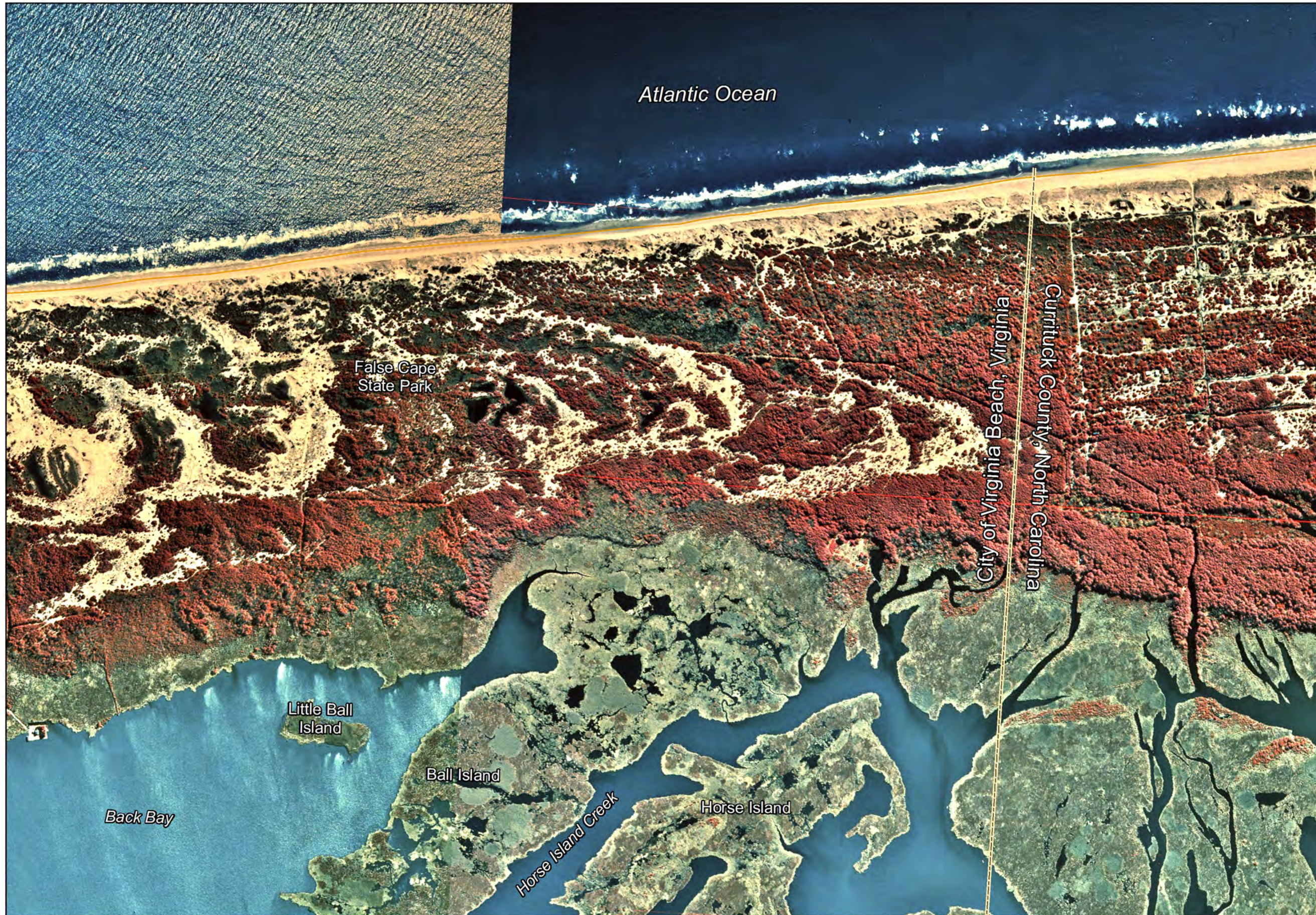
Photo Date: 1985

No Data Available

City of Virginia Beach, Virginia
Currituck County, North Carolina



1,000 0
Feet



Atlantic Ocean

False Cape State Park

Little Ball Island

Ball Island

Horse Island Creek

Horse Island

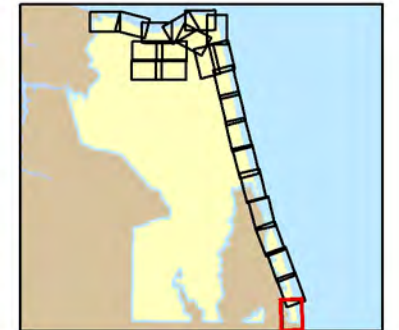
City of Virginia Beach, Virginia

Currituck County, North Carolina

Back Bay

City of Virginia Beach Virginia

Plate 23



Legend

— 1994 Shoreline

Photo Date: 1994

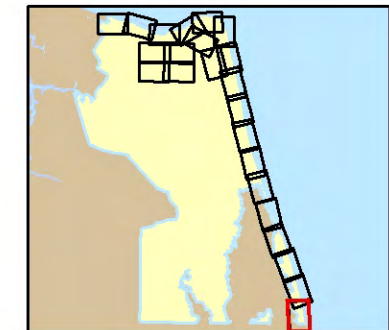


1,000 0 Feet



City of Virginia Beach Virginia

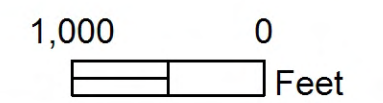
Plate 23



Legend

— 2002 Shoreline

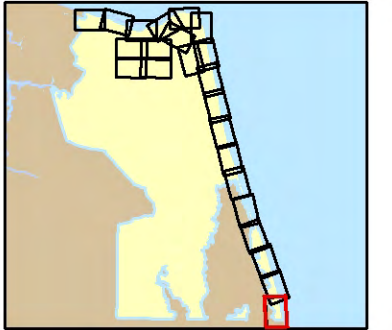
Photo Date: 2002





City of Virginia Beach Virginia

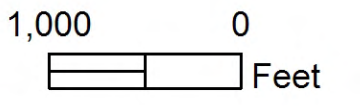
Plate 23



Legend

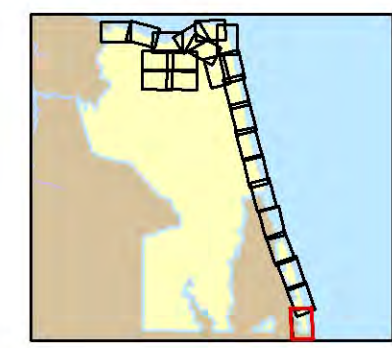
— 2009 Shoreline

Photo Date: 2009



City of Virginia Beach Virginia

Plate 23



- Legend**
- 1937 Shoreline
 - 1954 Shoreline
 - 1970 Shoreline
 - 1985 Shoreline
 - 1994 Shoreline
 - 2002 Shoreline
 - 2009 Shoreline
 - 2011 Shoreline

Photo Date: 2011

