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York County Shoreline Situation Report 1999

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York County Shoreline Situation Report 1999

Supported by the Environmental Protection Agency, Region III,
Wetlands Protection Division, through Grant Assistance
CD993566-01-0, and the College of William and Mary,
Virginia Institute of Marine Science, Center for Coastal
Management and Policy

Special Report in Applied Marine Science and Ocean
Engineering No 352 of the Virginia Institute of Marine Science

RMAP.99.001.1



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York County Shoreline Situation Report 1999

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Cover photo by Michael Campana

CHAPTER I. Introduction

1.1 Background

By the early 1980s, the Virginia Institute of Marine Science (VIMS) published a number of reports which document conditions along the major tributaries in Virginia waters. The basic characteristics and uses of the shore zone are summarized in the *Shoreline Situation Report Series* (VIMS, 1975), and the stability of this zone was evaluated on a reach by reach basis in the 1977 report, *Shoreline Erosion in Tidewater Virginia* (VIMS, 1977). These documents were intended to provide planners and managers at the local and state agency level with information to assist in decisions regarding shoreline issues.

Both reports provide a combination of mapped and tabular data as a medium for conveying surveyed information. Low altitude photography, nautical charts, and topographic sheets provided the basic data sources. Site visits augmented information these sources could not convey.

The Shoreline Situation Report Series was published on a county by county basis and covered all the Tidewater cities and localities in Virginia. A summary report entitled *Summary of Shoreline Situation Reports for Virginia's Tidewater Localities* (Hobbs et.al., 1979), summarized important characteristics and attributes reported for each locality. *Shoreline Erosion in Tidewater Virginia* (VIMS, 1977) spoke to the stability of the shorezone by calculating erosion and accretion rates along shoreline reaches using historic (1850s) maps, and recent (1940s) topographic maps.

The need for shore land information continues since coastal development still pressures the natural environment. Newly emerging pressures in the upper reaches of creeks and watersheds now present new management challenges. These areas have not been well surveyed in the past, but are now included in this inventory.

1.2 Purpose and Goals

This report represents the first attempt to update the earlier Shoreline Situation Reports. Its purpose is to present recent shoreline conditions, and

evaluate, where possible, the change in shore condition since previous reports. New information is presented for areas not previously surveyed. Additional attributes have also been added in phase two. Some information, however, was not computed as part of this second reporting phase, and reference to earlier conditions may be presented. For example, revised shoreline erosion and accretion rates were not computed, but knowledge of previous rates may be of interest in some areas. These are included in this report.

1.3 Report Organization

This report is organized in two major sections. Chapter 2. Recent Shoreline Conditions, describes the most current shoreline conditions measured in 1993. Shoreline conditions are quantified in a series of tables, and illustrated in a series of numbered map compositions (Plates). Section 2.1. *Approach and Analysis* details the techniques used to develop and report the data.

Chapter 3. Historical Trends, presents trends which compare data collected in 1985 with data collected in 1993. These data are illustrated in a series of graphs and charts. Comparison with earlier data sets (1970s) was not possible because of the significant disparity in data collection and reporting methods. Section 3.2. *Approach and Analysis* outlines techniques used to calculate trends in shoreline condition.

1.4 Acknowledgments

This project was funded by the Environmental Protection Agency, Region III, Wetlands Protection Grant Program (grant assistance CD993566-01-0). The Virginia Institute of Marine Science (VIMS), Center for Coastal Management and Policy provided matching funds. The Hampton Roads Planning District Commission, and the counties of York and James City provided valuable data to assist in data creation and map development.

This project evolved over several years, and draws on expertise from a number of individuals and agencies. George Thomas of VIMS' Shoreline Programs and Sam White, retired pilot of the VIMS aircraft, are acknowledged for

the collection of the aerial videography used as the source for the shoreline data. Staff of the Hampton Roads Planning District Commission, lead by John Carlock, Director of Physical and Environmental Planning, drafted the video data to large scale tax maps following protocols developed at VIMS. This effort was funded through a grant by the Chesapeake Bay Local Assistance Department.

The digital data was developed at the Comprehensive Coastal Inventory Program's (CCI) GIS facility at VIMS. GIS Specialist, Sharon Dewing, assisted by graduate students, Jennifer Reed and Kevin Groszkowski, converted the hardcopy drafted material to digital coverages. They performed all the required frequency tests to quantify the data on a reach by reach basis. Dan Schatt compared these data to historic files available in the VIMS archive, and developed illustrative graphs and charts. Harry Berquist, Mike Campana, Sharon Dewing, and Dan Schatt developed the final map compositions to illustrate current shoreline conditions.

Scott Hardaway and Bob Byrne provided valuable insight into the development of earlier shoreline inventories, and were available to answer questions as necessary. The VIMS Publication Center, as always, worked cooperatively with the GIS team to generate the final hardcopy inventory report.

Groinfield - Groins are low profile timber structures that sit perpendicular to the shore. They are generally positioned at, or slightly above, the mean low water line. Groins are constructed in a series known as a groin field which may extend along a stretch of shoreline for some distance. The purpose of a groin is to trap sediment moving along shore in the littoral current. Sediment is deposited on the updrift side of the structure and can, if enough sediment is available in the system, accrete a small beach area. Groin fields, however, can starve property downdrift by depleting the littoral sediment supply. This accelerates erosion there. The concept of the low profile groin was intended to allow some sediment to pass over the structure during intermediate and high tide stages. Some groin fields are immediately nourished with beach fill material when constructed. This approach does not diminish the supply of sediment available downdrift, and offers immediate protection to the fastland behind the groin field. This survey does not map individual groins in a groin field. Rather, the line feature represents the linear extent along the shore encompassed by a field of groins.

Breakwater - Like groins, breakwaters generally occur in a series along the shore. In contrast, though, breakwaters are structures which sit parallel to the shore. Their purpose is to attenuate incoming wave energy, and maintain a healthy beach behind the structure. The position of the breakwater offshore, the number of breakwaters in a series, and their length depends on the size of the beach which must be maintained for shoreline protection. Most breakwater systems sit with the top at or near MHW and are partially exposed during low water. Breakwaters can be composed of a variety of materials. Popular today are rock breakwaters, or breakwaters constructed of gabion baskets filled with stone. In this survey, individual breakwaters are not mapped. Instead, the survey depicts the extent along the shore where the breakwater series is located.

Bulkhead/Breakwater/Groin field - On rare occasions, a combination of these three structures may be present along a stretch of shoreline. The bulkhead offers protection from erosion of the bank or fastland. The breakwater attenuates wave energy which reduces waves impinging on the bulkhead. At the same time, the wave attenuation can allow for more sediment to accumulate on the updrift side of the groins. The mapped delineation represents the length of the shoreline where all three structures are located together.

Bulkhead/Groin field - In their independent descriptions above, these two structures are performing very different functions even when occurring together at a site. Bulkheads are defensive structures which protect the fastland; groin fields are offensive structures and are present to trap and retain sediment for beach development. Since bulkheads prevent sediment from entering the system through bank protection, beaches tend to be very narrow or absent along reaches with extensive bulkheading. Property owners may construct groin fields in the nearshore zone to trap sediment which is transported in the littoral drift. The map compositions illustrate the combined presence of these two structures as one color coded line segment parallel to the shore.

Riprap/Groinfield - It is possible to find stretches of shore where property owners have constructed riprap to protect the bank, and groin fields to trap sediment. As with bulkheads, extensive riprapping can cut off sediment available to nourish beaches. This leads to thin, sand starved beaches. Property owners may install groins to offset this starvation. These are mapped as color coded linear features parallel to the shoreline.

Bulkhead/Riprap - Bulkheads can be found in conjunction with riprap, particularly when failure of the bulkhead wall has occurred. Both structures perform the same basic function. Use of bulkheading preceded riprap construction. Today, however, riprap is preferred. Therefore, when bulkheads fail, riprap may be constructed in front of, or in place of the failed structure.

No Structure-Unstable - These linear stretches of shoreline represent places where no defense (or offensive) structures have been constructed for any purpose. These shores may be dominated by a marsh fringe, a sandy beach, or fastland bank with no buffer to wave action at all. From the video, some appreciable amount of undercutting, scarps, or slumping was observed, to suggest the shore is in a state of erosion or instability. For this reason the stretch has been classified as "no structure - unstable".

Miscellaneous - It is possible to find miscellaneous material deposited along a shore to help stabilize an eroding bank. Tires, concrete block, and railroad ties are a few examples of what constitutes a miscellaneous linear feature.

No Structures-Stable - Stretches of shoreline which remain unaltered by protection structures, and appear to be stable are characterized as "No Structures-Stable". Docks or piers are excluded here, so a stretch of shoreline with this classification might have a point feature. Stability is an observed phenomenon in this case. Shoreline considered stable are those where there is no signs of undercutting by waves, no slumping along the bank, or no scarps along the shore edge.

Point Features

Jetty - Jetties are often confused with groins, but they perform very different functions. Jetties are designed to keep the longshore sediment load from entering an area. They are typically found at the entrance to navigation channels and waterways. Constructed perpendicular to the shore, they trap sediment on the updrift side of the structure (like a groin), and prevent deposition in the inlet. Often small recreational beaches may accrete in these areas. Jetties can be constructed of timbers or can be massive rock structures depending on the location and need. As a secondary effect, jetties stabilize the bank along the inlet entrance. In this survey, the location of a jetty is noted as a point feature marking where along the shore the structure begins. No effort was made to map the length of the structure.

Marina - Marinas are denoted as point features in this survey. They generally comprise a series of docks and wharfs which can extend along an appreciable length of shore. A marina may offer boat ramp facilities for public or private use. The actual location of these features, if present, is not indicated.

Wharf - By definition in this survey, a wharf is a structure, generally constructed of wood, which is built parallel to the shore. Wharfs are more common in commercial shore operations, or large public docking facilities. They provide a place for vessels to dock and unload. This survey did not trace the extent of a wharf as a linear feature along the shore, but rather only noted its relative position as a point.

Dock/Pier - By definition in this survey, a dock or pier is a structure, generally constructed of wood, which is built perpendicular to the shore. These are typical on private property, particularly residential areas. They provide

access to the water, usually for recreational purposes. Docks and piers are mapped as point features on the shore. No effort to survey their length is made.

Abandoned Dock/Pier/Wharf - These point features denote where these structures have been observed, and are not in suitable condition to perform their intended function.

Covered Dock/Pier - Covered docks and piers include boat houses, or piers with awnings. They are mapped as point features.

Failed Covered Dock/Pier - These points denote structures where the pier, the adjacent boat house, or cover are in disrepair.

Tires, Concrete Blocks, etc. - These point features represent short isolated segments along the shore where material has been dumped, usually as an unsatisfactory attempt to protect a section of shore which is undergoing chronic erosion. This feature is similar to the linear feature "miscellaneous" except it doesn't extend along a measurable length of shoreline.

Boat Ramp - Boat ramps provide vessels access to the waterway. They are usually constructed of concrete, but wooden and gravel ramps can also be found. The point identification of boat ramps surveyed here does not discriminate based on type, size, material, or quality of the launch. Access at these sites is not guaranteed, as many may be located on private property.

2.1c Digital Data Development

ArcInfo Geographic Information System (GIS) software was used to convert the hardcopy map delineations to digital record. The local government provided existing GIS data which included a high resolution digital shoreline coverage; in some cases the same shoreline mapped on the tax map used for delineating the shoreline characteristics. These data are high precision, fully rectified data contracted by the county for planning activities.

This shoreline coverage was brought into ArcInfo as a working copy. Using ArcInfo functions, the working copy was segmented, and coded to

correspond to the shoreline attributes mapped on the corresponding hardcopy basemap. All segmentation occurred on-screen. No direct digitizing of the tax map using a cursor and digitizing tablet was necessary.

The completed coverage codes all shoreline in the county shoreline file. The digital file codes segments which were not surveyed through the video collection as "no data" segments. All other segments are coded with one of the line feature attributes listed in the section above. The final inventory of maps does not code "no data" segments. These segments are illustrated as thin, solid black lines, and are usually natural extensions of the color coded line features.

Point features were generated as a separate ArcInfo coverage. To create this coverage the same shoreline layer was displayed, and the points were digitized using onscreen digitizing techniques. Again, no digitizing tablet was necessary. Each point was coded.

The two coverages are combined in this inventory illustratively. The tables and map legend report point data separately from line features. Section 2.3. *Map Display*, describes how the maps were generated, and how to interpret the information displayed.

2.2 Shoreline Reaches

2.2a History of Shoreline Reaches

A shoreline reach can be loosely defined as a stretch of shore with a common set of elements that distinguish it from adjacent pieces of shoreline. Shoreline reaches can, therefore, be very short units or very long units, depending on the criteria for defining a reach break.

In 1977, shoreline reaches were originally designated in the report *Shoreline Erosion in Tidewater Virginia* (VIMS, 1977). Reach segments were defined first through a comparison of historic (1850s), and recent shoreline positions (1940s). Where these two shorelines intersect, a reach boundary would be defined. This boundaries may have been shifted slightly along the shore to a neighboring creek mouth, if appropriate. Some reach segments were

defined merely by the entrance to a creek or tributary. This was the case along reaches where shore conditions remained constant in between two river mouths.

The shoreline reaches became a mapping unit for reporting conditions. In the 1977 report, data was calculated on a reach by reach basis. Through the years, these reaches have been carried through to other projects, and have served as a unit of comparison for analyzing temporal change. Although the reach boundaries have been argued as being ambiguous and ill defined, they still represent a map unit which can be used to compare conditions over time.

2.2b Application of Shoreline Reaches

In this inventory, the reaches are again used as a mapping unit to report conditions measured along the shore. On the map display, current data is quantified on a reach by reach basis. Since this inventory covers areas not addressed in earlier reports, new reaches have been added to the original suite. These reaches usually cover the shorelines of the small creeks and tributaries. Newest reaches follow the same numbering convention of the original reaches. They are usually denoted by a reach number followed by either a letter, or a decimal value (ex. 10A, 333.1).

More important, perhaps for evaluating the situation of the shoreline, is the use of reaches as a comparative unit to measure historic trends. Since the reach boundaries are geographically fixed, we can call data from earlier studies to compare information for one reach segment over time. Chapter 3 addresses historic trends, and uses the reach units to compare data computed in this survey with data surveyed in 1985. The trends are reported on a reach by reach basis. Figure 1 illustrates the reach boundaries. The map compositions also illustrate the reach boundaries.

2.3 Map Display

The shoreline situation maps follow section 2.4 The Shoreline Situation. The maps report the shoreline situation as observed in 1993 videography. They are organized as a series of plates which display the data at an appropriate scale for viewing. An index of the plates is shown in Figure 2. All maps are

York County

River Reaches



Figure 1. River Reaches

York County Plate Index

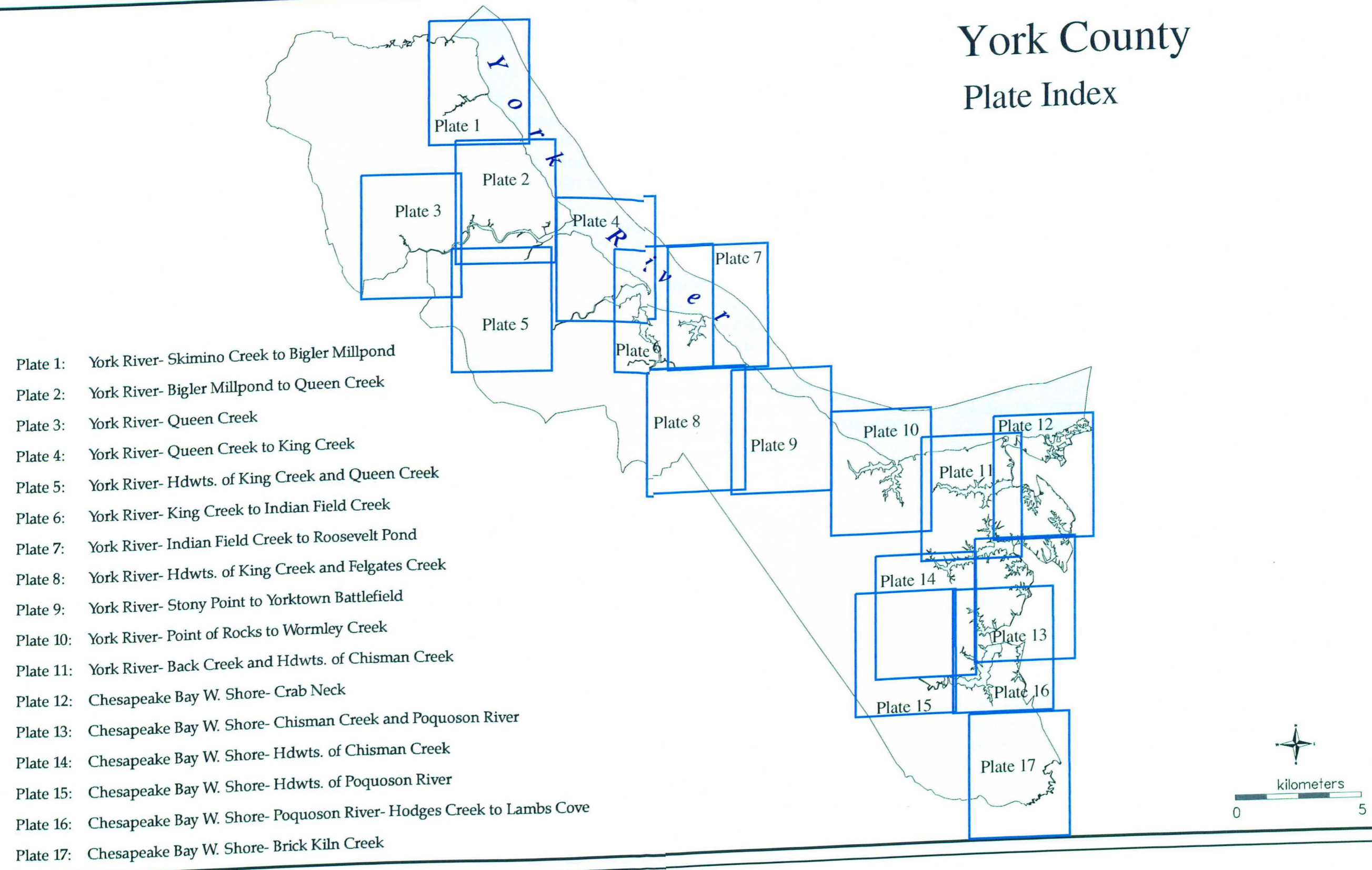


Figure 2. Plate Index

published at a scale of 1:24,000 or 1 inch = 2,000 feet. This scale is equivalent to the scale of a USGS 7.5 minute topographic quadrangle.

2.3a Base Map Description

Digital Raster Graphs (DRGs) were selected as the base map for this inventory. DRGs are scanned products of the common USGS 7.5 minute topographic quadrangle. The topographic maps were scanned at approximately 250 dpi through a joint funding effort between the USGS, and the VA Department of Mines, Minerals, and Energy (MME). These data are distributed on CD through a number of agencies including the USGS and MME. The DRG series for the state of Virginia was developed using the most recent USGS 7.5 minute quadrangles published at the time the contract was negotiated. For most of Virginia, the dates range from the late 1970s to the mid 1980s.

DRGs were selected as a base map for this product because they provide the user with additional information not commonly available on traditional line maps. On the DRGs, users can observe road networks, topographic contours, bathymetric contours, important geographic places, federal property boundaries, parks, and very general building footprints. This information pertains to the period when the original topographic map was published, and may not represent present conditions. This is particularly true along creeks where residential development has increased, and many more building and private roads have been constructed.

2.3b Symbology and Map Legend

The GIS data developed from the shoreline survey has been superimposed to this base map, and illustrated as a series of color coded points and lines. The line features described above are mapped along the shoreline. Since the original line features were developed using a high resolution 1:4,800 scale map, they do not lie directly over the 1:24,000 shoreline illustrated on the DRG. Although some of this discrepancy is due to changes in shoreline position over time, much of the difference can be attributed to the difference in scale, and should not be associated with major shoreline erosion or accretion.

The reach boundaries are also illustrated on the maps. In places where reaches have been added subreaches may be located within a larger reach. Arrows may be used in areas where reach boundaries are difficult to detect. Otherwise, reaches are numbered, and their boundaries designated by thick black lines perpendicular to the shore.

The legend defines the attribute symbology on the maps. In addition, a frequency analysis was performed for each composition to quantify the extent of each feature, on a reach by reach basis, per map composition. Data are reported in a table as an extension of the legend where the attribute symbol is on the left, and the reach number is across the top. Values pertain only to the amount quantified for the segment of the reach illustrated on the map. A reach may extend onto other plates where the attribute is measured separately. Linear features are measured in meters. Point features are reported as the number of features occurring in a reach within the map composition. Reaches labeled "Reach #000" in the extension table are blank fields. Columns reporting zeroes indicate that no feature was found within that reach. Plates may require additional pages to report all the reach information.

2.3c Tables

Table 1, in section 2.4 The Shoreline Situation, summarizes the data for all the reaches reported in the new maps illustrated here. These reaches include the new segments added as part of this study. The data reflect the 1993 conditions. They report primarily on the shoreline situation with respect to linear and point features surveyed along the shore. Linear features are quantified in meters/reach. Point features are quantified as the number of point features/reach.

2.4 The Shoreline Situation

The County of York, and its tributaries drain into the York River, and the waters of the western shore of the Chesapeake Bay. In addition to the primary York River shore, major creeks surveyed include, Queen Creek, King Creek, Felgates Creek, Indian Field Creek, and Wormley Creek. On the western shore of the Chesapeake Bay, Back Creek, Chisman Creek, Boathouse Creek, Goose Creek, Claxton Creek, the Poquoson River, Patricks Creeks, Hodges Cove, Moores Creek, Quarter March Creek, Lambs Creek, and Bay Tree Creek. The Thorofare and the outer shoreline of Goodwin Island is also included.

Along the York River, the shore is moderately low in elevation with bluffs at intermittent places. Moderate to critical erosion is noted in isolated sections. Various types of shoreline structures have been constructed to mediate these problems. A large portion of the York River shore is federally owned land including the Colonial National Historic Park, the Camp Perry Military Reservation, and the Yorktown Naval Weapons Station. This southern shore of the York River receives high energy waves generated by the dominant northeast storms. The reaches closest to the mouth are the most vulnerable since the fetch here is longest. In 1977, 52 miles of shoreline on the York River in York County was analyzed. Seventy-seven percent of this area was considered beaches and the rest marsh. Beaches, however, may be only very narrow fringes of sand which are submerged at high water. Averaged over 100 years, erosion rates for the marsh shorelines were estimated at 0.75 hectares per year (1.86 acres/yr). Changes in shoreline position along other areas were calculated to be -0.27 m/yr (-0.9ft/yr); where negative numbers reflect a landward shift in the shoreline position.

Since the 1970s, a series of breakwaters have been constructed in the vicinity of Camp Perry and Bigler Millpond where historic rates approached -0.80 m/yr (2.6 ft/yr). A severe erosion problem was indicated in 1977 at the west entrance to the Thorofare known as the Sandbox. Erosion rates greater than 1 m/yr (3.5 ft/yr) were computed. Bulkheading and riprap was constructed prior to 1977. Since then, additional riprap has been installed to reinforce an existing bulkhead, and a 240 m groinfield was constructed. No revised erosion or accretion rates are available to evaluate the impacts of these structures.

Table 1. York County: Summary of Shoreline Attributes - 1993

Reach #	Linear Features (meters)												Point Features (#/reach)														
	Riprap	Bulkhead	Groin	Breakwater/ Bulkhead	Breakwater/ Groin	Breakwater	Bulkhead/ Breakwater/ Groin	Groin/ Bulkhead	Groin/ Riprap	Groin/ Bulkhead/ Riprap	Bulkhead/ Riprap	No structures- unstable	Misc.	No structures- stable	No aerial coverage	Jetty	Marinas	Wharfs	Piers/ Docks	Abandoned Piers	Covered Piers/Docks	Failed Covered Piers/Docks	Misc.	Boat Ramps			
11														3140.5													
12						820.9								1156.4													
12A	284.3															1											
13														839.9													
14													2239.1														
15													1265.0														
15A	129.6													53230.7		1			10					1			
16	1157.7												2006.5	522.2					2								
17													1563.9														
18														13053.4					1								
19													1986.1	14422.5													
20	2629.4												477.7														
21													5646.2	805.3					1								
22													234.0														
23	878.1					162.2							2029.1														
24	1062.1												1298.4						1								
25	942.5	54.9	138.6			85.6								511.1					3								
26	1800.5												639.4	132.1					4								
27	97.4												530.1	196.3													
28		659.7											2310.5	178.1			1		13		12	1					
28A		40.6												6567.6				4	1								
29	413.6	853.4											8729.5	202.7	439.5		2		51	2	6	1			5		
30	990.3	309.3	41.7			463.4		205.3	185.7		287.1	2219.2	255.2	289.3				8	1								
31													1328.7														
32													3347.4														
33													966.5														
81	265.9	350.1											4660.9	250.7					20		3						
82	29.7	373.0											91.7	3616.4					20		5				4		
83	29.7	60.2											5109.5						10	2	1				1		
84													531.9						1	1	1				1		
85		47.7											3978.3	402.3					3	1							
86	87.9	457.7											4772.3						23	2	2				2		
87	310.9	634.0										89.5	5593.6	297.0	44.9				24		4				5		
88	137.1	113.6											516.7						10								
89	203.4	327.2											75.2	921.2	36.4				9		1						

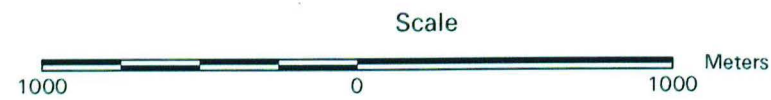
Table 1. York County: Summary of Shoreline Attributes – 1993 (cont.)

Reach #	Linear Features (meters)											Point Features (#/reach)												
	Riprap	Bulkhead	Groin	Breakwater/ Bulkhead	Breakwater/ Groin	Breakwater	Bulkhead/ Breakwater/ Groin	Groin/ Bulkhead	Groin/ Riprap	Groin/ Bulkhead/ Riprap	Bulkhead/ Riprap	No structures- unstable	Misc.	No structures- stable	No aerial coverage	Jetty	Marinas	Wharfs	Piers/ Docks	Abandoned Piers	Covered Piers/Docks	Failed Covered Piers/Docks	Misc.	Boat Ramps
90	115.7	27.1										168.6	41.2					2						
91	97.8	41.6										265.7	15.6	127.4				2						1
92												1120.1						2	2					
93	105.9	23.1										6746.3	63.6					12						
94		150.0										1372.8						8		1				
95		61.5										1435.1						6		1				1
96												973.6						4						
97	48.6	250.4										722.0	151.3	403.3				9		1				
98	115.5	60.6										413.3	257.3					4		2				3
99	389.9	226.5										5051.9	146.4					4		2				
100	119.2	39.1										894.5	78.6					18		3				4
101	931.4	4046.6						97.4	33.1		79.2	32.2						3						
101A	31.9	14.1										15241.7	1008.8	7285.9	1	5		164	17	19		1		21
101B		494.2										2370.7												
102	202.2	302.6										1762.0	55.5	1010.2										
103	826.9	2285.7										5856.2		285.2				21	3	1				4
104	123.2	476.4										5727.1	176.0	466.2				80	3	5				6
105	173.2										33.7	1236.0	110.3	4464.2				11	2	1				2
106	195.7	1271.3																						
107											49.7	300.8						45		1				4
108		108.9							119.1		156.9	1759.4						1	2					
109												9676.6						4						
110												3540.0												
111	293.4	961.0										11392.2						1						
112	568.6	1146.9										14540.4	106.5	119.3		3	1	55	4	8				2
											121.5	1817.3	329.5	36.2		1		10	5	3				5

The shoreline reaches along the western shore of the Chesapeake Bay in York county tend to be low lying fringe and extensive marshes. Their exposure to northeast storm activity is denoted by the obvious evidence of erosion. Earlier reports of the Bay shore proper along Crab Neck indicated moderate erosion. These conditions prevail today, and no protection structures have been installed. The extensive shorelines along tributaries to the Poquoson River and Chisman Creek are mixed with shoreline structures amidst areas of undefended stable and unstable shore. This is a relatively low lying area with the adjacent upland bank less than five feet in height. Land use here is dominated by residential development, with a small amount of commercial and industrial facilities. Pier construction is prevalent in these communities, and a number of these are enhanced with boat houses or covers.



1993 Shoreline Situation



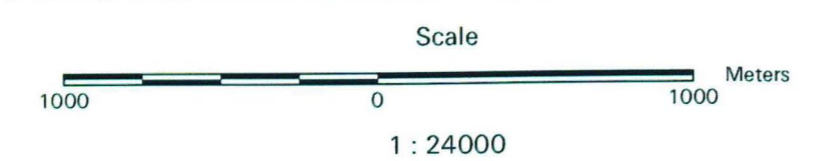
1 : 24000

Features	Reach# 11	Reach# 12	Reach# 12A	Reach# 13
Meters per Reach				
Riprap	0	0	284.3	0
Bulkhead	0	0	0	0
Groinfield	0	0	0	0
Breakwater	0	820.9	0	0
Bulkhead/Breakwater/Groinfield	0	0	0	0
Bulkhead/Groinfield	0	0	0	0
Riprap/Groinfield	0	0	0	0
Bulkhead/Riprap	0	0	0	0
No Structure-Unstable	0	1156.4	0	0
Miscellaneous	0	0	0	0
No Structure-Stable	3140.5	0	0	407.9
Number per Reach				
Jetty	0	0	1	0
Marina	0	0	0	0
Wharf	0	0	0	0
Dock/Pier	0	0	0	0
Abandoned Dock/Pier/Wharf	0	0	0	0
Covered Dock/Pier	0	0	0	0
Failed Covered Dock/Pier	0	0	0	0
Tires, Concrete Blocks, etc.	0	0	0	0
Boat Ramp	0	0	0	0
258 Reach				

SHORELINE FEATURES York County VA

PLATE 1



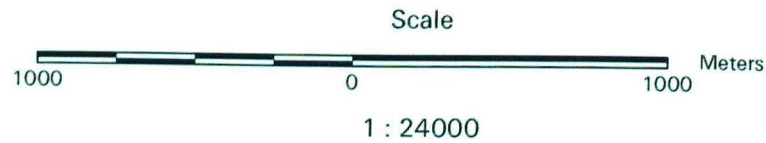
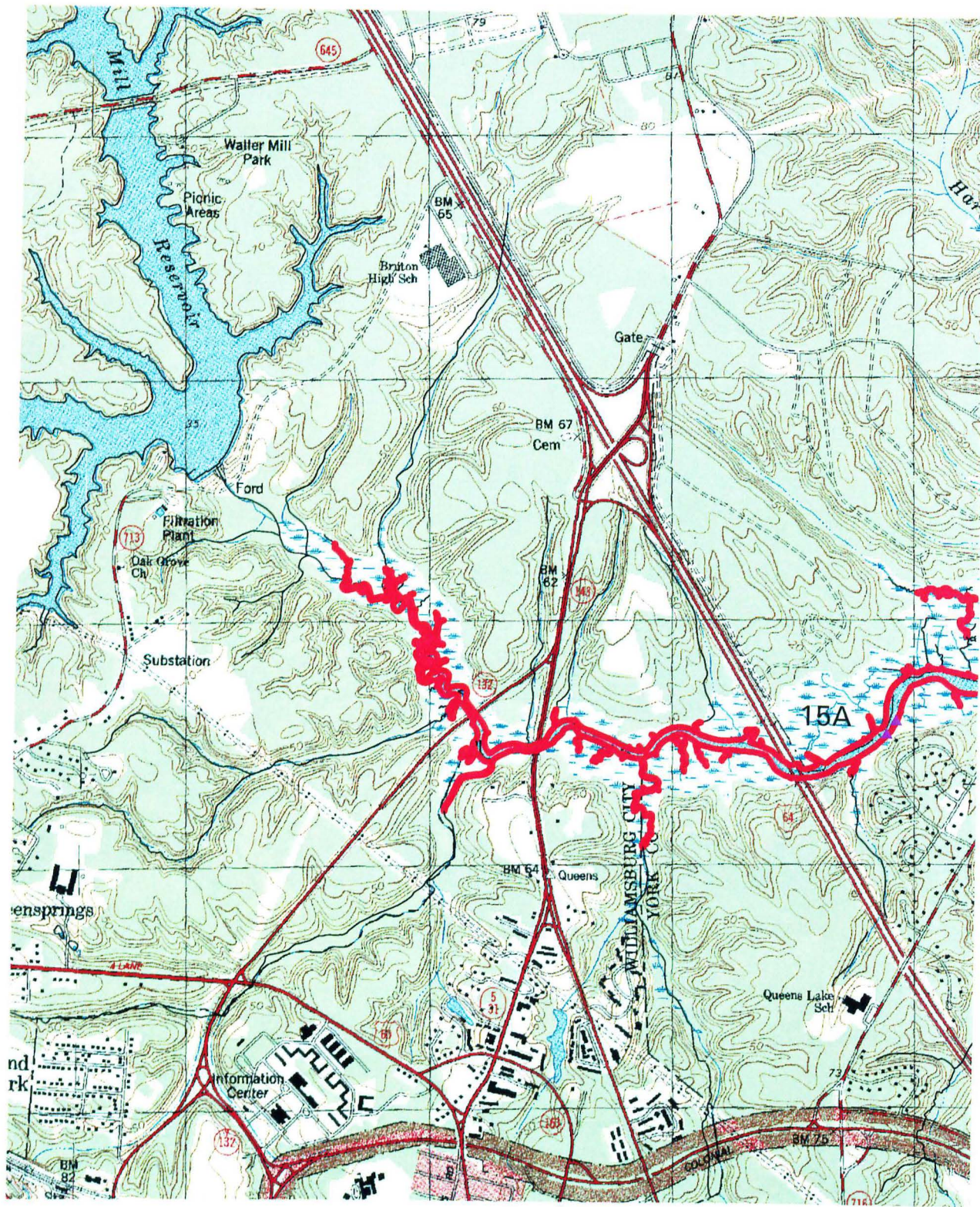


Features	Reach# 13	Reach# 14	Reach# 15	Reach# 15A
Meters per Reach				
Riprap	0	0	0	0
Bulkhead	0	0	0	0
Groinfield	0	0	0	0
Breakwater	0	0	0	0
Bulkhead/Breakwater/Groinfield	0	0	0	0
Bulkhead/Groinfield	0	0	0	0
Riprap/Groinfield	0	0	0	0
Bulkhead/Riprap	0	0	0	0
No Structure-Unstable	0	2239.1	76.5	0
Miscellaneous	0	0	0	0
No Structure-Stable	660.5	0	0	25579.6
Number per Reach				
Jetty	0	0	0	0
Marina	0	0	0	1
Wharf	0	0	0	0
Dock/Pier	0	0	0	8
Abandoned Dock/Pier/Wharf	0	0	0	0
Covered Dock/Pier	0	0	0	0
Failed Covered Dock/Pier	0	0	0	0
Tires, Concrete Blocks, etc.	0	0	0	0
Boat Ramp	0	0	0	1
258 Reach				

SHORELINE FEATURES York County VA

PLATE 2



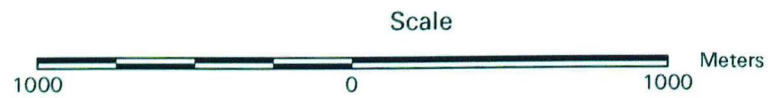


Features	Reach# 15A	Reach# 000	Reach# 000	Reach# 000
Meters per Reach				
Riprap	0	0	0	0
Bulkhead	0	0	0	0
Groinfield	0	0	0	0
Breakwater	0	0	0	0
Bulkhead/Breakwater/Groinfield	0	0	0	0
Bulkhead/Groinfield	0	0	0	0
Riprap/Groinfield	0	0	0	0
Bulkhead/Riprap	0	0	0	0
No Structure-Unstable	0	0	0	0
Miscellaneous	0	0	0	0
No Structure-Stable	15724.0	0	0	0
Number per Reach				
Jetty	0	0	0	0
Marina	0	0	0	0
Wharf	0	0	0	0
Dock/Pier	2	0	0	0
Abandoned Dock/Pier/Wharf	0	0	0	0
Covered Dock/Pier	0	0	0	0
Failed Covered Dock/Pier	0	0	0	0
Tires, Concrete Blocks, etc.	0	0	0	0
Boat Ramp	0	0	0	0
258 Reach				

**SHORELINE FEATURES
York County VA**

PLATE 3









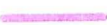















1 : 24000

Features	Reach# 15	Reach# 15A	Reach# 16	Reach# 17
Meters per Reach				
Riprap	0	127.9	1157.7	0
Bulkhead	0	0	0	0
Groinfield	0	0	0	0
Breakwater	0	0	0	0
Bulkhead/Breakwater/Groinfield	0	0	0	0
Bulkhead/Groinfield	0	0	0	0
Riprap/Groinfield	0	0	0	0
Bulkhead/Riprap	0	0	0	0
No Structure-Unstable	1155.9	0	2006.5	1563.9
Miscellaneous	0	0	522.2	0
No Structure-Stable	0	12107.4	0	0
Number per Reach				
Jetty	0	0	0	0
Marina	0	0	0	0
Wharf	0	0	0	0
Dock/Pier	0	0	2	0
Abandoned Dock/Pier/Wharf	0	0	0	0
Covered Dock/Pier	0	0	0	0
Failed Covered Dock/Pier	0	0	0	0
Tires, Concrete Blocks, etc.	0	0	0	0
Boat Ramp	0	0	0	0
258 Reach				

SHORELINE FEATURES York County VA

PLATE 4

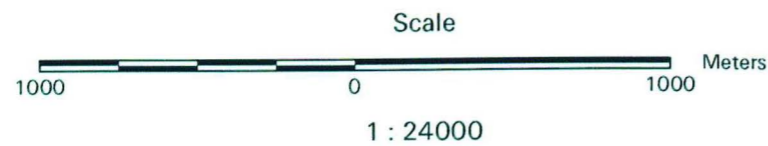
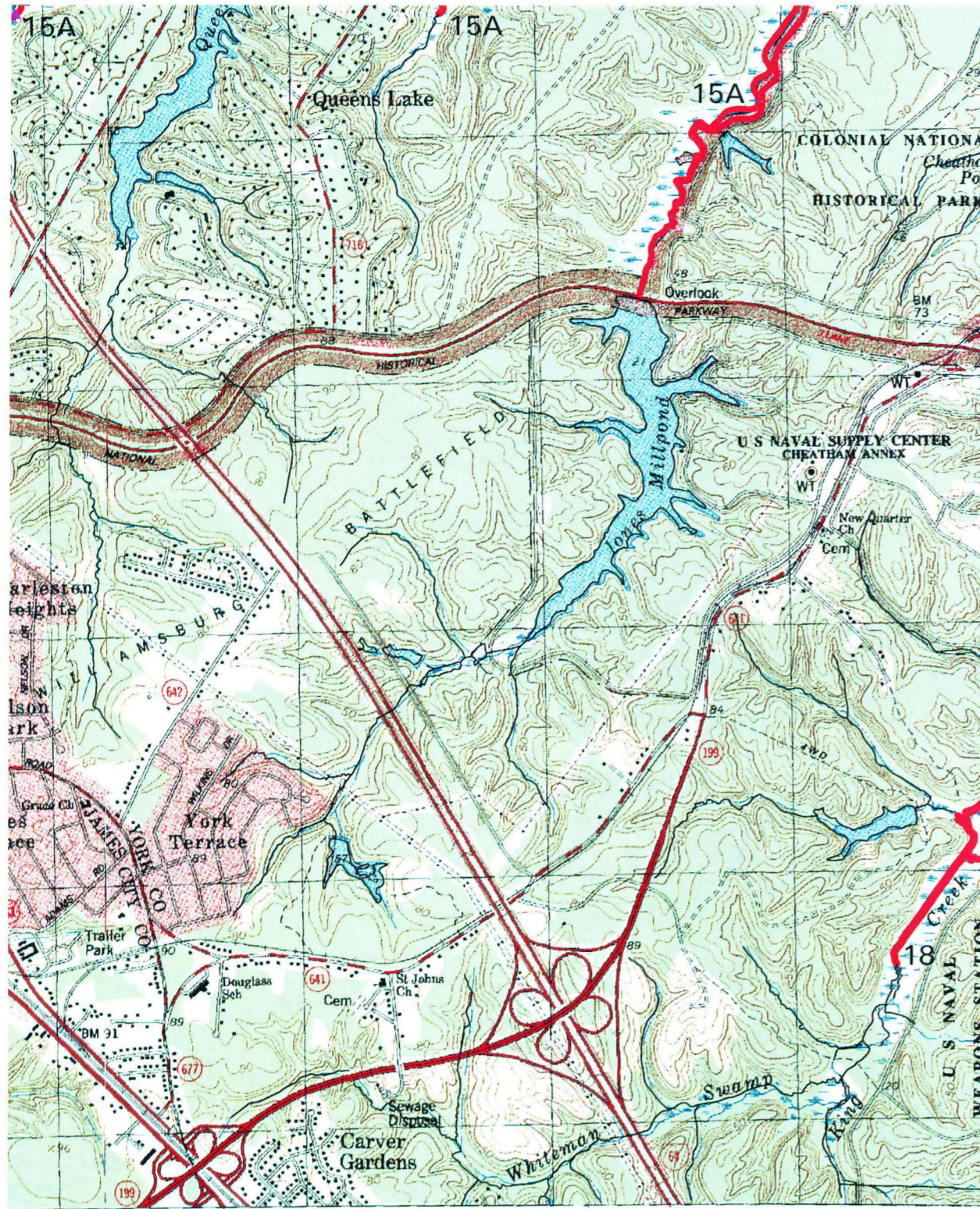


Features	Reach# 18	Reach# 19	Reach# 20	Reach# 000	Reach# 000	Reach# 000	Reach# 000	Reach# 000	Reach# 000	Reach# 000
Meters per Reach										
 Riprap	0	0	383.9	0	0	0	0	0	0	0
 Bulkhead	0	0	0	0	0	0	0	0	0	0
 Groinfield	0	0	0	0	0	0	0	0	0	0
 Breakwater	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Breakwater/Groinfield	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Groinfield	0	0	0	0	0	0	0	0	0	0
 Riprap/Groinfield	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Riprap	0	0	0	0	0	0	0	0	0	0
 No Structure-Unstable	0	1483.0	337.2	0	0	0	0	0	0	0
 Miscellaneous	0	0	0	0	0	0	0	0	0	0
 No Structure-Stable	9254.4	1502.7	0	0	0	0	0	0	0	0
Number per Reach										
 Jetty	0	0	0	0	0	0	0	0	0	0
 Marina	0	0	0	0	0	0	0	0	0	0
 Wharf	0	0	0	0	0	0	0	0	0	0
 Dock/Pier	1	0	0	0	0	0	0	0	0	0
 Abandoned Dock/Pier/Wharf	0	0	0	0	0	0	0	0	0	0
 Covered Dock/Pier	0	0	0	0	0	0	0	0	0	0
 Failed Covered Dock/Pier	0	0	0	0	0	0	0	0	0	0
 Tires, Concrete Blocks, etc.	0	0	0	0	0	0	0	0	0	0
 Boat Ramp	0	0	0	0	0	0	0	0	0	0

SHORELINE FEATURES
York County VA

PLATE 4 CONTINUED

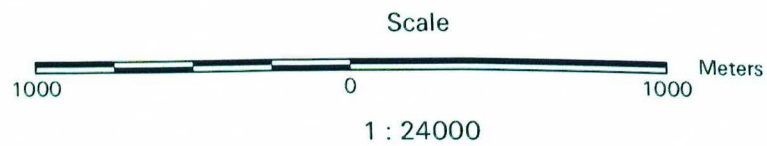
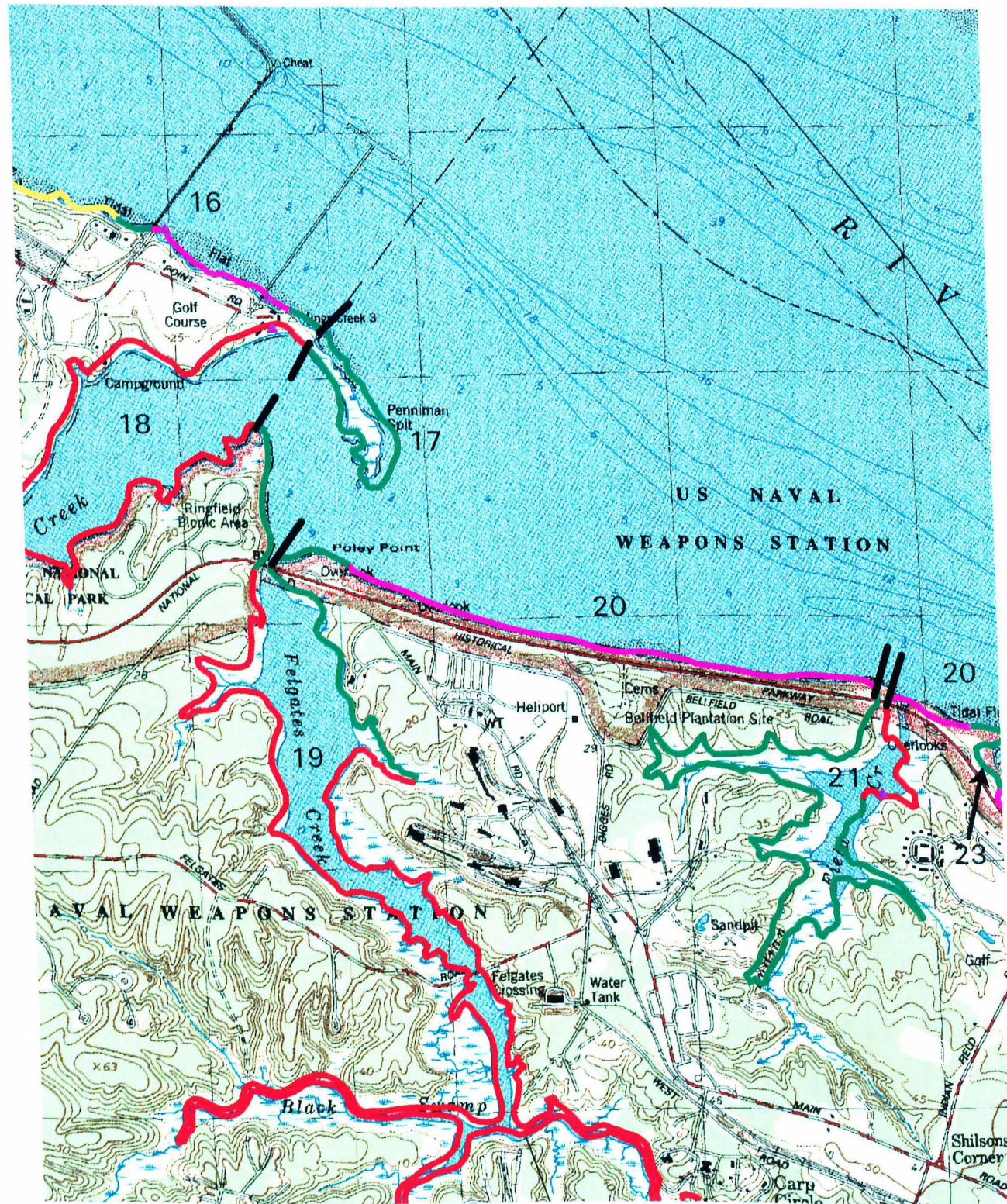




Features	Reach# 15A	Reach# 18	Reach# 000	Reach# 000
Meters per Reach				
Riprap	0	0	0	0
Bulkhead	0	0	0	0
Groinfield	0	0	0	0
Breakwater	0	0	0	0
Bulkhead/Breakwater/Groinfield	0	0	0	0
Bulkhead/Groinfield	0	0	0	0
Riprap/Groinfield	0	0	0	0
Bulkhead/Riprap	0	0	0	0
No Structure-Unstable	0	0	0	0
Miscellaneous	0	0	0	0
No Structure-Stable	2723.7	1960.4	0	0
Number per Reach				
Jetty	0	0	0	0
Marina	0	0	0	0
Wharf	0	0	0	0
Dock/Pier	1	0	0	0
Abandoned Dock/Pier/Wharf	0	0	0	0
Covered Dock/Pier	0	0	0	0
Failed Covered Dock/Pier	0	0	0	0
Tires, Concrete Blocks, etc.	0	0	0	0
Boat Ramp	0	0	0	0
258 Reach				

SHORELINE FEATURES York County VA





















PLATE 5



Features	Reach# 16	Reach# 17	Reach# 18	Reach# 19
Meters per Reach				
Riprap	675.8	0	0	0
Bulkhead	0	0	0	0
Groinfield	0	0	0	0
Breakwater	0	0	0	0
Bulkhead/Breakwater/Groinfield	0	0	0	0
Bulkhead/Groinfield	0	0	0	0
Riprap/Groinfield	0	0	0	0
Bulkhead/Riprap	0	0	0	0
No Structure-Unstable	311.0	1563.9	0	1986.1
Miscellaneous	522.2	0	0	0
No Structure-Stable	0	0	3599.4	12564.1
Number per Reach				
Jetty	0	0	0	0
Marina	0	0	0	0
Wharf	0	0	0	0
Dock/Pier	2	0	1	0
Abandoned Dock/Pier/Wharf	0	0	0	0
Covered Dock/Pier	0	0	0	0
Failed Covered Dock/Pier	0	0	0	0
Tires, Concrete Blocks, etc.	0	0	0	0
Boat Ramp	0	0	0	0
258 Reach				

SHORELINE FEATURES York County VA

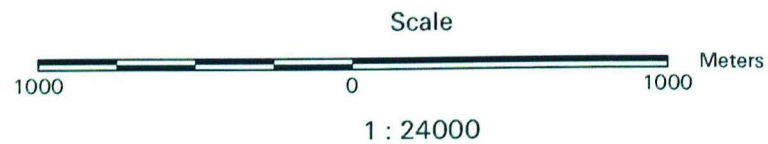
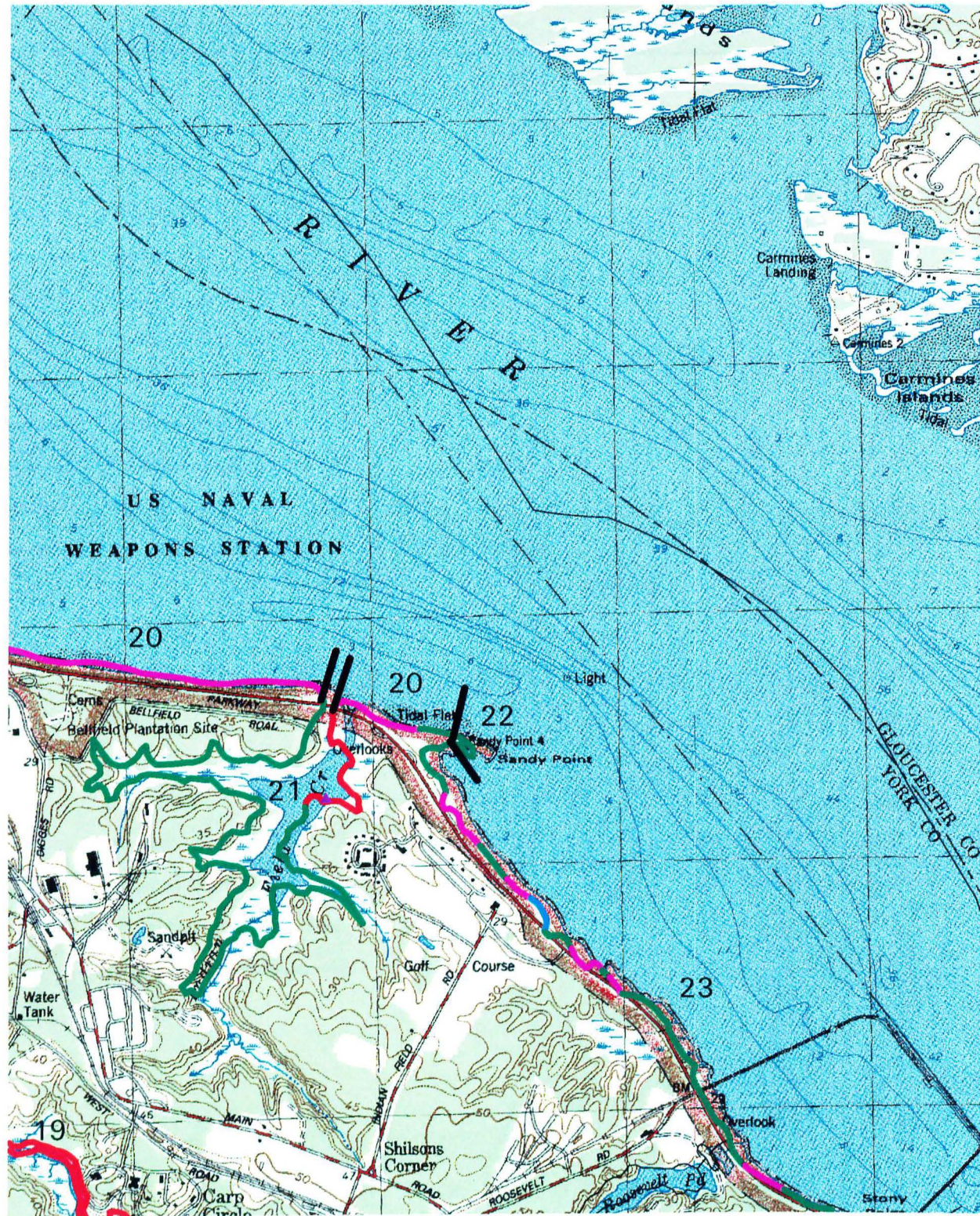
PLATE 6

Features	Reach# 20	Reach# 21	Reach# 23	Reach# 000	Reach# 000	Reach# 000	Reach# 000	Reach# 000	Reach# 000	Reach# 000
Meters per Reach										
 Riprap	2629.4	0	80.5	0	0	0	0	0	0	0
 Bulkhead	0	0	0	0	0	0	0	0	0	0
 Groinfield	0	0	0	0	0	0	0	0	0	0
 Breakwater	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Breakwater/Groinfield	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Groinfield	0	0	0	0	0	0	0	0	0	0
 Riprap/Groinfield	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Riprap	0	0	0	0	0	0	0	0	0	0
 No Structure-Unstable	454.5	5646.2	329.6	0	0	0	0	0	0	0
 Miscellaneous	0	0	0	0	0	0	0	0	0	0
 No Structure-Stable	0	805.3	0	0	0	0	0	0	0	0
Number per Reach										
 Jetty	0	0	0	0	0	0	0	0	0	0
 Marina	0	0	0	0	0	0	0	0	0	0
 Wharf	0	0	0	0	0	0	0	0	0	0
 Dock/Pier	0	1	0	0	0	0	0	0	0	0
 Abandoned Dock/Pier/Wharf	0	0	0	0	0	0	0	0	0	0
 Covered Dock/Pier	0	0	0	0	0	0	0	0	0	0
 Failed Covered Dock/Pier	0	0	0	0	0	0	0	0	0	0
 Tires, Concrete Blocks, etc.	0	0	0	0	0	0	0	0	0	0
 Boat Ramp	0	0	0	0	0	0	0	0	0	0

SHORELINE FEATURES
York County VA

PLATE 6 CONTINUED

























Features	Reach # 19	Reach# 20	Reach# 21	Reach# 22
Meters per Reach				
Riprap	0	1729.7	0	0
Bulkhead	0	0	0	0
Groinfield	0	0	0	0
Breakwater	0	0	0	0
Bulkhead/Breakwater/Groinfield	0	0	0	0
Bulkhead/Groinfield	0	0	0	0
Riprap/Groinfield	0	0	0	0
Bulkhead/Riprap	0	0	0	0
No Structure-Unstable	0	140.5	5646.2	234.0
Miscellaneous	0	0	0	0
No Structure-Stable	1443.5	0	805.3	0
Number per Reach				
Jetty	0	0	0	0
Marina	0	0	0	0
Wharf	0	0	0	0
Dock/Pier	0	0	1	0
Abandoned Dock/Pier/Wharf	0	0	0	0
Covered Dock/Pier	0	0	0	0
Failed Covered Dock/Pier	0	0	0	0
Tires, Concrete Blocks, etc.	0	0	0	0
Boat Ramp	0	0	0	0
258 Reach				

SHORELINE FEATURES York County VA

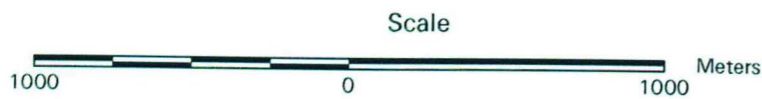
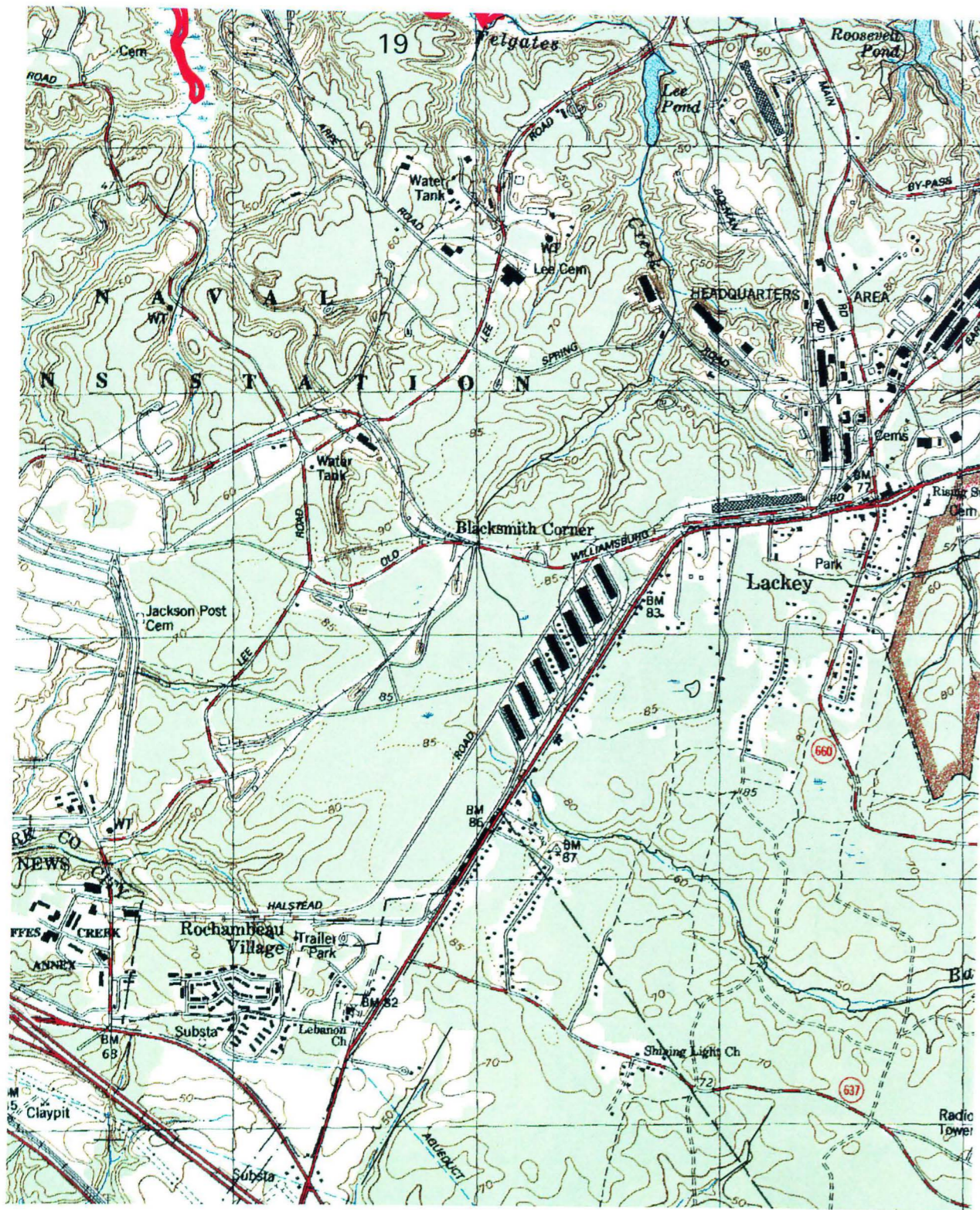
PLATE 7



Features	Reach# 23	Reach# 000	Reach# 000	Reach# 000	Reach# 000	Reach# 000	Reach# 000	Reach# 000	Reach# 000	Reach# 000	Reach# 000
Meters per Reach											
 Riprap	878.1	0	0	0	0	0	0	0	0	0	0
 Bulkhead	0	0	0	0	0	0	0	0	0	0	0
 Groinfield	0	0	0	0	0	0	0	0	0	0	0
 Breakwater	162.2	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Breakwater/Groinfield	0	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Groinfield	0	0	0	0	0	0	0	0	0	0	0
 Riprap/Groinfield	0	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Riprap	0	0	0	0	0	0	0	0	0	0	0
 No Structure-Unstable	1828.7	0	0	0	0	0	0	0	0	0	0
 Miscellaneous	0	0	0	0	0	0	0	0	0	0	0
 No Structure-Stable	0	0	0	0	0	0	0	0	0	0	0
Number per Reach											
 Jetty	0	0	0	0	0	0	0	0	0	0	0
 Marina	0	0	0	0	0	0	0	0	0	0	0
 Wharf	0	0	0	0	0	0	0	0	0	0	0
 Dock/Pier	0	0	0	0	0	0	0	0	0	0	0
 Abandoned Dock/Pier/Wharf	0	0	0	0	0	0	0	0	0	0	0
 Covered Dock/Pier	0	0	0	0	0	0	0	0	0	0	0
 Failed Covered Dock/Pier	0	0	0	0	0	0	0	0	0	0	0
 Tires, Concrete Blocks, etc.	0	0	0	0	0	0	0	0	0	0	0
 Boat Ramp	0	0	0	0	0	0	0	0	0	0	0

SHORELINE FEATURES
York County VA

PLATE 7 CONTINUED



1 : 24000

258

Features	Reach# 19	Reach# 000	Reach# 000	Reach# 000
Meters per Reach				
Riprap	0	0	0	0
Bulkhead	0	0	0	0
Groinfield	0	0	0	0
Breakwater	0	0	0	0
Bulkhead/Breakwater/Groinfield	0	0	0	0
Bulkhead/Groinfield	0	0	0	0
Riprap/Groinfield	0	0	0	0
Bulkhead/Riprap	0	0	0	0
No Structure-Unstable	0	0	0	0
Miscellaneous	0	0	0	0
No Structure-Stable	1904.8	0	0	0
Number per Reach				
Jetty	0	0	0	0
Marina	0	0	0	0
Wharf	0	0	0	0
Dock/Pier	0	0	0	0
Abandoned Dock/Pier/Wharf	0	0	0	0
Covered Dock/Pier	0	0	0	0
Failed Covered Dock/Pier	0	0	0	0
Tires, Concrete Blocks, etc.	0	0	0	0
Boat Ramp	0	0	0	0

SHORELINE FEATURES York County VA

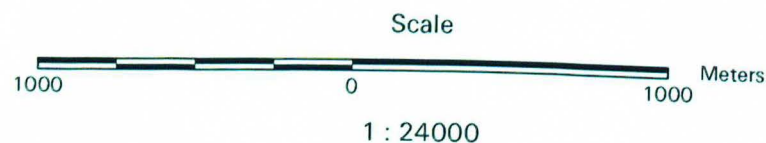
PLATE 8

Comprehensive Coastal Inventory





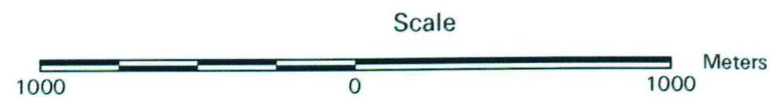
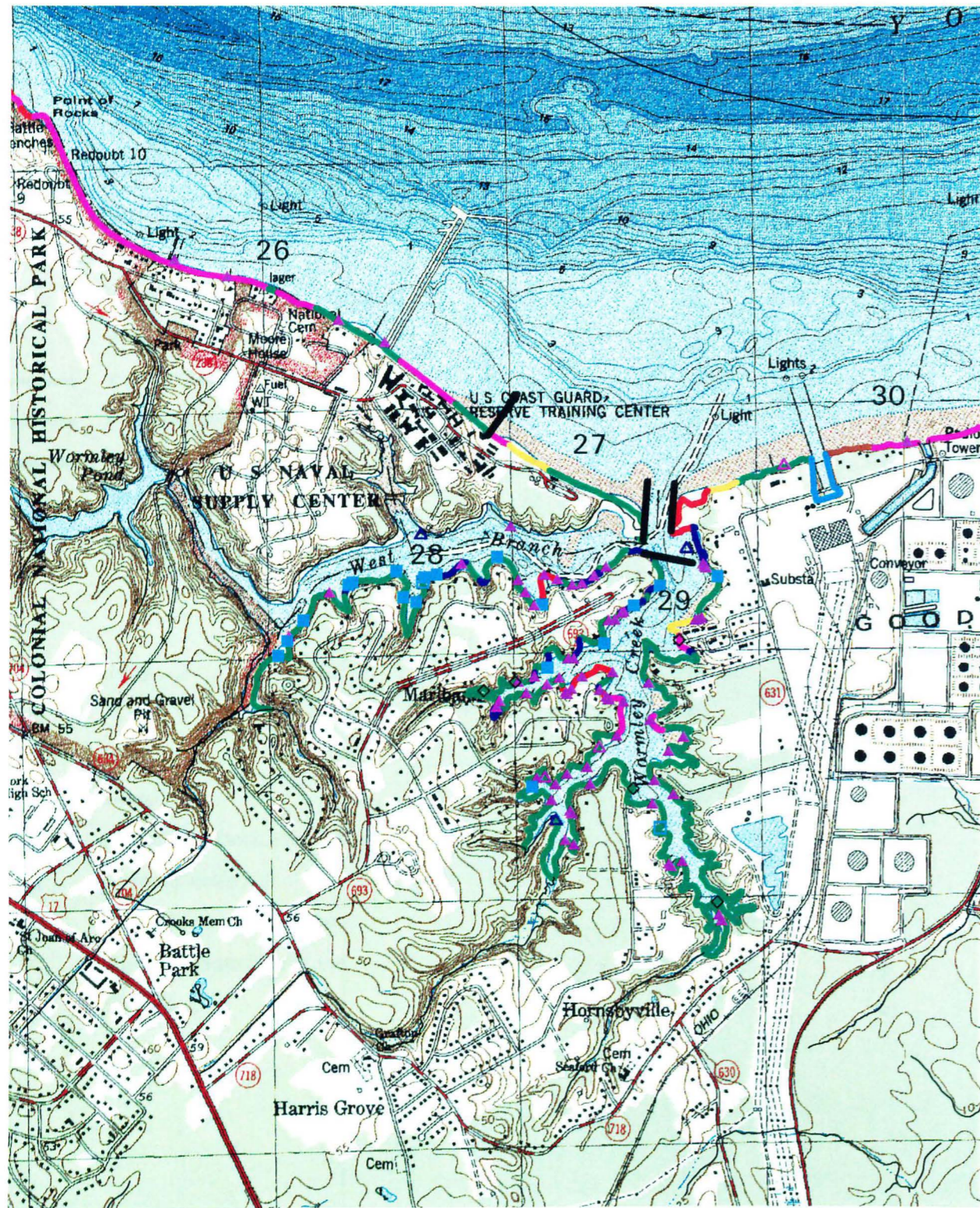
Features	Reach# 24	Reach# 25	Reach# 26	Reach# 000
Meters per Reach				
Riprap	1061.8	938.6	0	0
Bulkhead	0	54.9	0	0
Groinfield	0	137.4	0	0
Breakwater	0	85.6	0	0
Bulkhead/Breakwater/Groinfield	0	0	0	0
Bulkhead/Groinfield	0	0	0	0
Riprap/Groinfield	0	0	0	0
Bulkhead/Riprap	0	0	0	0
No Structure-Unstable	1288.2	0	0	0
Miscellaneous	0	0	0	0
No Structure-Stable	0	511.8	60.0	0
Number per Reach				
Jetty	0	0	0	0
Marina	0	0	0	0
Wharf	0	0	0	0
Dock/Pier	1	3	0	0
Abandoned Dock/Pier/Wharf	0	0	0	0
Covered Dock/Pier	0	0	0	0
Failed Covered Dock/Pier	0	0	0	0
Tires, Concrete Blocks, etc.	0	0	0	0
Boat Ramp	0	0	0	0
258 Reach				



SHORELINE FEATURES York County VA

PLATE 9

























1 : 24000

Features	Reach# 26	Reach# 27	Reach# 28	Reach# 29
Meters per Reach				
Riprap	1800.4	97.4	0	414.0
Bulkhead	0	0	657.5	852.0
Groinfield	0	0	0	0
Breakwater	0	0	0	0
Bulkhead/Breakwater/Groinfield	0	0	0	0
Bulkhead/Groinfield	0	0	0	0
Riprap/Groinfield	0	0	0	0
Bulkhead/Riprap	0	0	0	0
No Structure-Unstable	639.2	530.1	2307.3	8711.5
Miscellaneous	0	196.3	0	201.9
No Structure-Stable	101.7	0	177.3	435.1
Number per Reach				
Jetty	0	0	0	0
Marina	0	0	1	2
Wharf	0	0	0	0
Dock/Pier	4	0	13	51
Abandoned Dock/Pier/Wharf	0	0	0	2
Covered Dock/Pier	0	0	12	6
Failed Covered Dock/Pier	0	0	1	1
Tires, Concrete Blocks, etc.	0	0	0	0
Boat Ramp	0	0	0	5
258 Reach				

SHORELINE FEATURES York County VA

PLATE 10

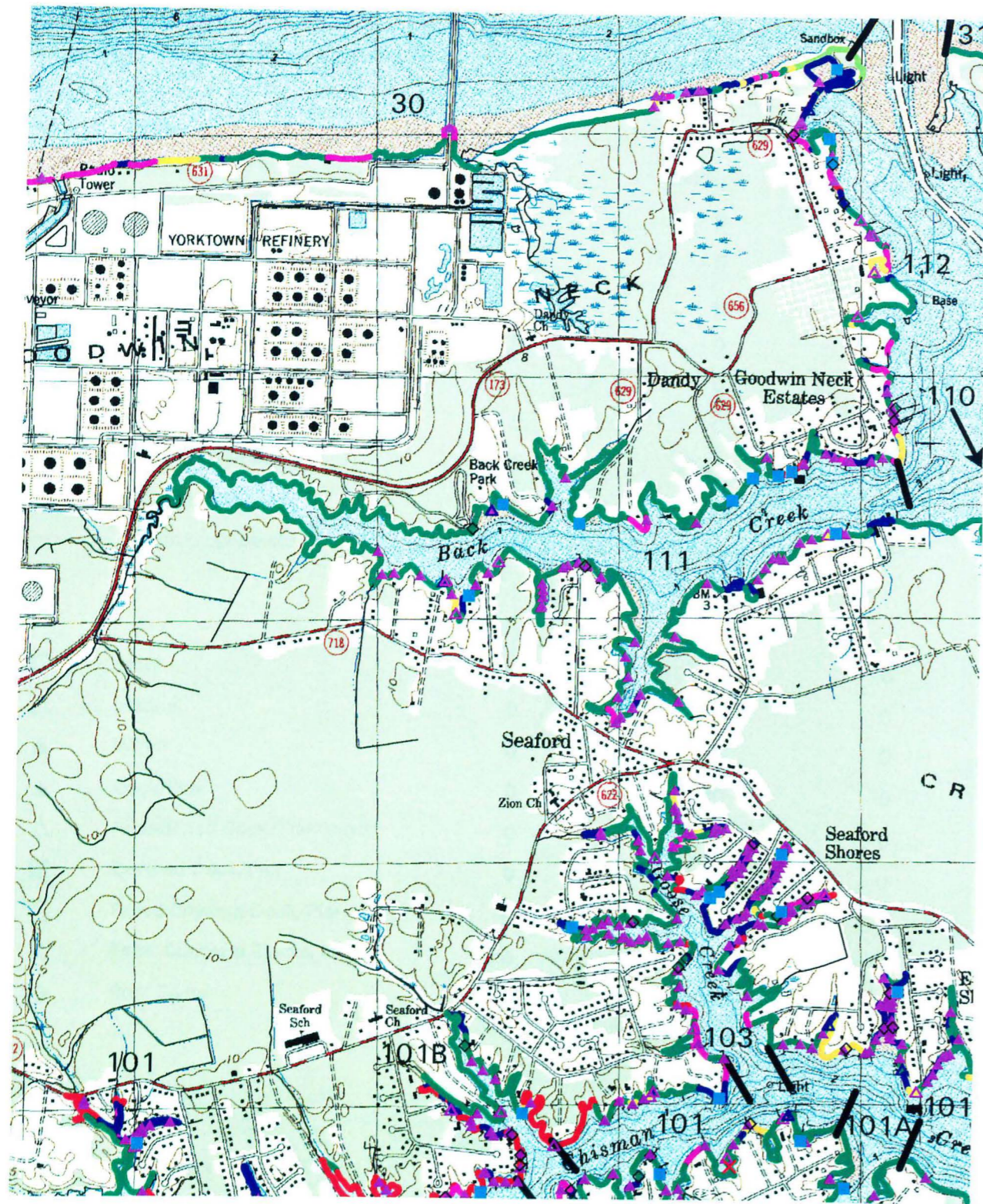


Features	Reach# 30	Reach# 000	Reach# 000	Reach# 000	Reach# 000	Reach# 000	Reach# 000	Reach# 000	Reach# 000	Reach# 000	Reach# 000
Meters per Reach											
 Riprap	436.7	0	0	0	0	0	0	0	0	0	0
 Bulkhead	20.1	0	0	0	0	0	0	0	0	0	0
 Groinfield	0	0	0	0	0	0	0	0	0	0	0
 Breakwater	462.1	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Breakwater/Groinfield	0	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Groinfield	0	0	0	0	0	0	0	0	0	0	0
 Riprap/Groinfield	185.7	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Riprap	0	0	0	0	0	0	0	0	0	0	0
 No Structure-Unstable	340.3	0	0	0	0	0	0	0	0	0	0
 Miscellaneous	124.0	0	0	0	0	0	0	0	0	0	0
 No Structure-Stable	286.6	0	0	0	0	0	0	0	0	0	0
Number per Reach											
 Jetty	0	0	0	0	0	0	0	0	0	0	0
 Marina	0	0	0	0	0	0	0	0	0	0	0
 Wharf	0	0	0	0	0	0	0	0	0	0	0
 Dock/Pier	1	0	0	0	0	0	0	0	0	0	0
 Abandoned Dock/Pier/Wharf	1	0	0	0	0	0	0	0	0	0	0
 Covered Dock/Pier	0	0	0	0	0	0	0	0	0	0	0
 Failed Covered Dock/Pier	0	0	0	0	0	0	0	0	0	0	0
 Tires, Concrete Blocks, etc.	0	0	0	0	0	0	0	0	0	0	0
 Boat Ramp	0	0	0	0	0	0	0	0	0	0	0

SHORELINE FEATURES
York County VA

PLATE 10 CONTINUED

























1 : 24000

Features	Reach# 30	Reach# 31	Reach# 101	Reach# 101A
Meters per Reach				
Riprap	882.6	0	516.4	0
Bulkhead	308.9	0	2801.9	14.1
Groinfield	41.6	0	0	0
Breakwater	0	0	0	0
Bulkhead/Breakwater/Groinfield	0	0	0	0
Bulkhead/Groinfield	205.1	0	0	0
Riprap/Groinfield	0	0	0	0
Bulkhead/Riprap	287.0	0	0	0
No Structure-Unstable	1877.9	191.8	5854.8	1214.8
Miscellaneous	131.1	0	825.0	0
No Structure-Stable	0	0	2220.5	0
Number per Reach				
Jetty	0	0	0	0
Marina	0	0	3	0
Wharf	0	0	0	0
Dock/Pier	8	0	87	0
Abandoned Dock/Pier/Wharf	0	0	10	0
Covered Dock/Pier	0	0	8	0
Failed Covered Dock/Pier	0	0	0	0
Tires, Concrete Blocks, etc.	0	0	1	0
Boat Ramp	0	0	16	0
Reach	258			

SHORELINE FEATURES York County VA

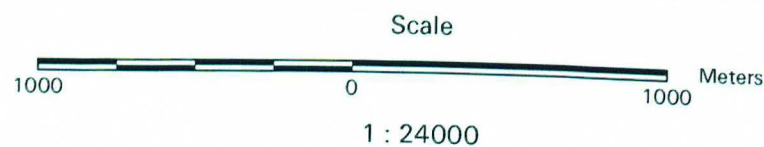
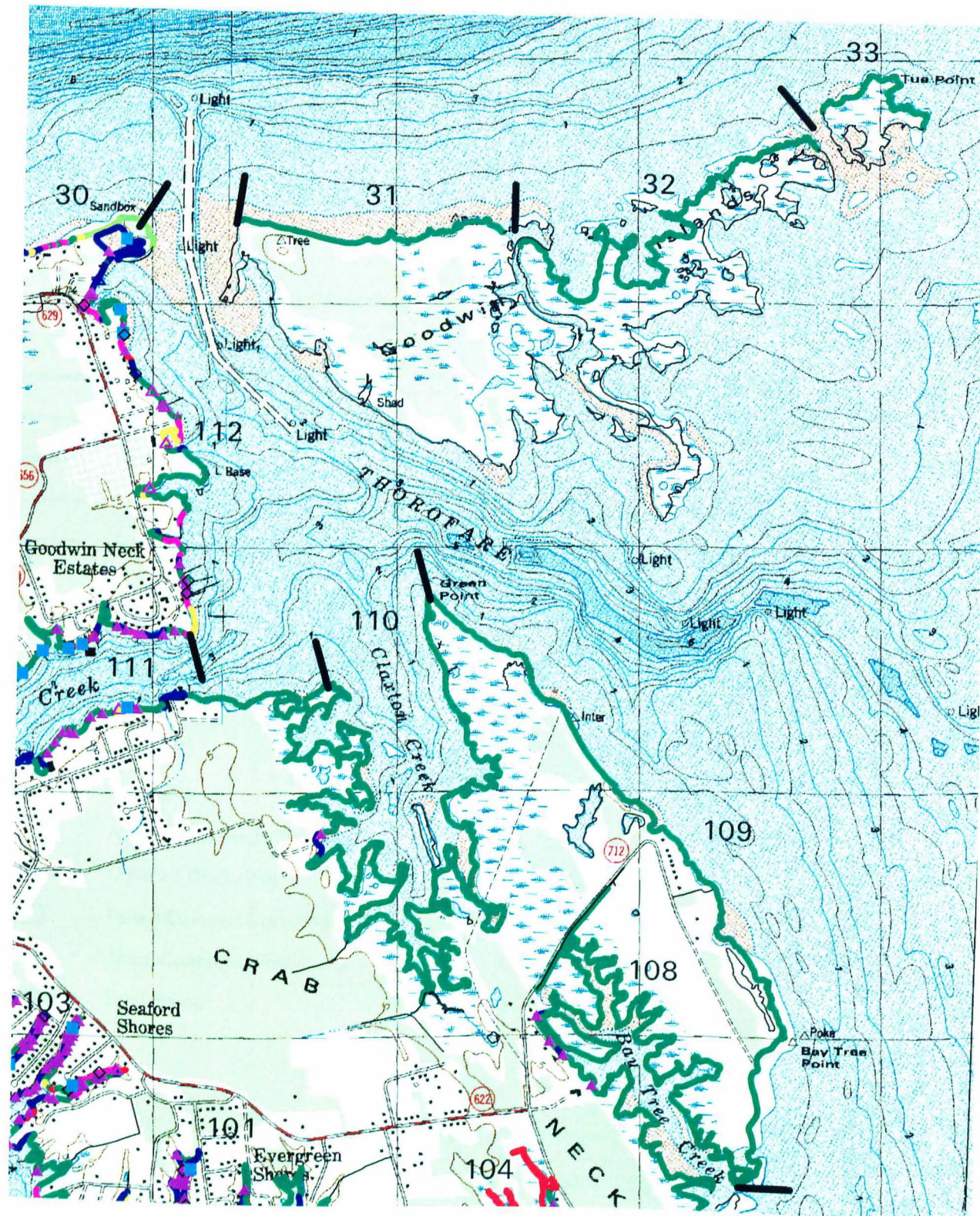
PLATE 11

Features	Reach# 101B	Reach# 103	Reach# 110	Reach# 111	Reach# 112	Reach# 000	Reach# 000	Reach# 000	Reach# 000	Reach# 000
Meters per Reach										
 Riprap	0	826.1	0	293.8	567.3	0	0	0	0	0
 Bulkhead	493.7	2283.8	0	959.6	1146.2	0	0	0	0	0
 Groinfield	0	0	0	0	0	0	0	0	0	0
 Breakwater	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Breakwater/Groinfield	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Groinfield	0	0	0	0	0	0	0	0	0	0
 Riprap/Groinfield	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Riprap	0	0	0	0	121.4	0	0	0	0	0
 No Structure-Unstable	1761.5	5721.8	5.5	14102.6	1814.3	0	0	0	0	0
 Miscellaneous	55.5	175.9	0	107.7	328.9	0	0	0	0	0
 No Structure-Stable	1009.7	465.2	0	119.3	36.2	0	0	0	0	0
Number per Reach										
 Jetty	0	0	0	0	0	0	0	0	0	0
 Marina	0	0	0	3	1	0	0	0	0	0
 Wharf	0	0	0	1	0	0	0	0	0	0
 Dock/Pier	0	80	0	55	10	0	0	0	0	0
 Abandoned Dock/Pier/Wharf	0	3	0	4	5	0	0	0	0	0
 Covered Dock/Pier	0	5	0	8	3	0	0	0	0	0
 Failed Covered Dock/Pier	0	0	0	0	0	0	0	0	0	0
 Tires, Concrete Blocks, etc.	0	0	0	0	0	0	0	0	0	0
 Boat Ramp	0	6	0	2	5	0	0	0	0	0

SHORELINE FEATURES
York County VA

PLATE 11 CONTINUED

























Features	Reach# 30	Reach# 31	Reach# 32	Reach# 33
Meters per Reach				
Riprap	88.2	0	0	0
Bulkhead	91.5	0	0	0
Groinfield	0	0	0	0
Breakwater	0	0	0	0
Bulkhead/Breakwater/Groinfield	0	0	0	0
Bulkhead/Groinfield	0	0	0	0
Riprap/Groinfield	0	0	0	0
Bulkhead/Riprap	287.0	0	0	0
No Structure-Unstable	60.3	1321.3	3307.5	953.5
Miscellaneous	65.0	0	0	0
No Structure-Stable	0	0	0	0
Number per Reach				
Jetty	0	0	0	0
Marina	0	0	0	0
Wharf	0	0	0	0
Dock/Pier	0	0	0	0
Abandoned Dock/Pier/Wharf	0	0	0	0
Covered Dock/Pier	0	0	0	0
Failed Covered Dock/Pier	0	0	0	0
Tires, Concrete Blocks, etc.	0	0	0	0
Boat Ramp	0	0	0	0
258 Reach				

SHORELINE FEATURES York County VA

PLATE 12

Comprehensive Coastal Inventory

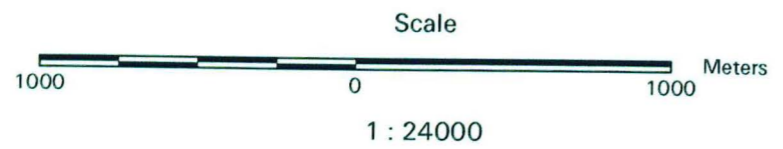
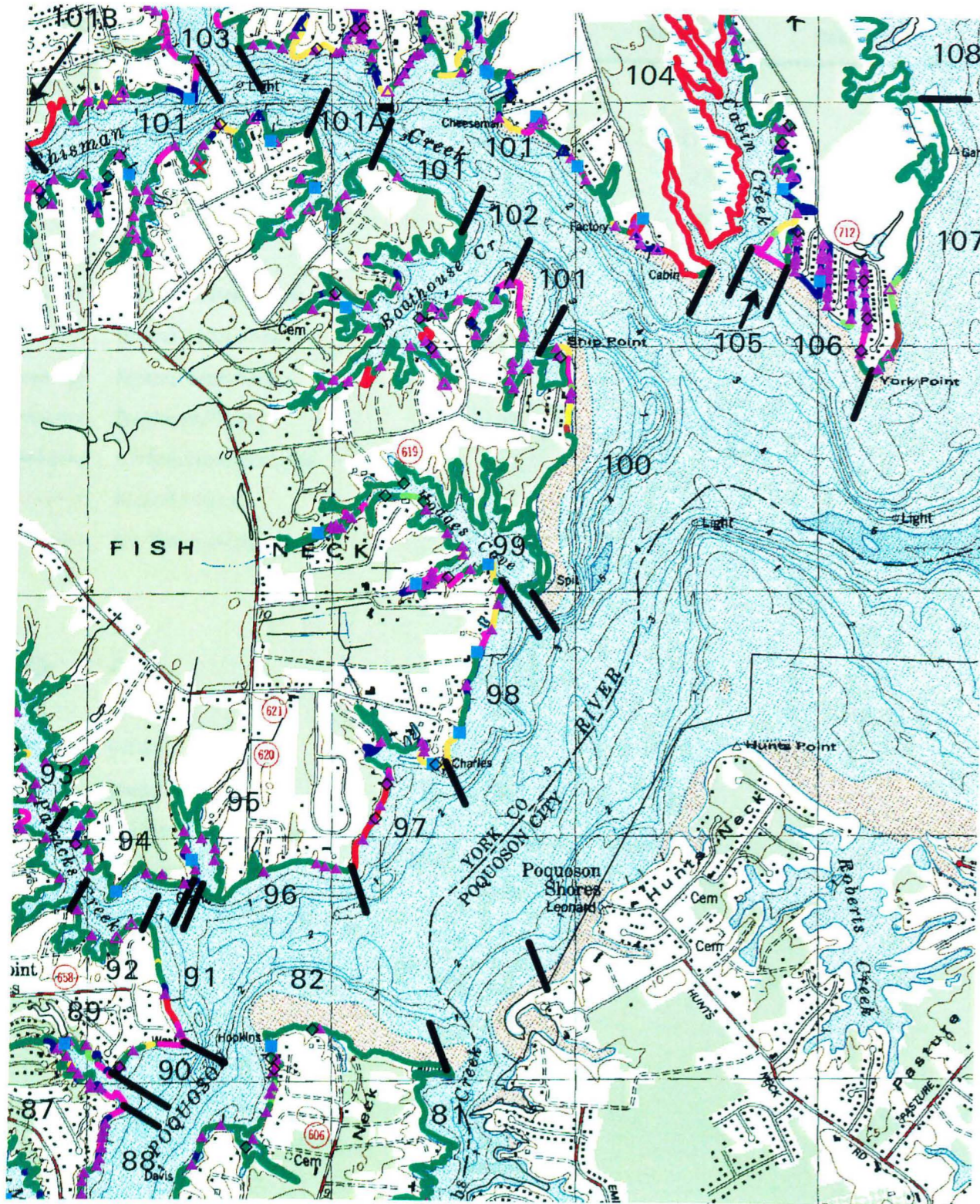


Features	Reach# 101	Reach# 103	Reach# 104	Reach# 108	Reach# 109	Reach# 110	Reach# 111	Reach# 112	Reach# 000	Reach# 000
Meters per Reach										
 Riprap	0	372.2	0	0	0	0	52.6	567.3	0	0
 Bulkhead	808.1	1263.7	0	108.9	0	115.9	627.3	1146.2	0	0
 Groinfield	0	0	0	0	0	0	0	0	0	0
 Breakwater	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Breakwater/Groinfield	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Groinfield	0	0	0	0	0	0	0	0	0	0
 Riprap/Groinfield	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Riprap	1018.7	0	0	0	0	0	0	121.4	0	0
 No Structure-Unstable	60.0	1371.5	68.6	8308.1	3515.5	11328.0	2791.3	1814.3	0	0
 Miscellaneous	0	48.9	0	0	0	0	33.0	328.9	0	0
 No Structure-Stable	9.9	235.8	1064.9	0	0	0	119.3	36.2	0	0
Number per Reach										
 Jetty	0	0	0	0	0	0	0	0	0	0
 Marina	1	0	0	0	0	0	2	1	0	0
 Wharf	0	0	0	0	0	0	0	0	0	0
 Dock/Pier	15	40	1	4	0	1	20	10	0	0
 Abandoned Dock/Pier/Wharf	0	1	0	0	0	0	1	5	0	0
 Covered Dock/Pier	1	2	0	0	0	0	5	3	0	0
 Failed Covered Dock/Pier	0	0	0	0	0	0	0	0	0	0
 Tires, Concrete Blocks, etc.	0	0	0	0	0	0	0	0	0	0
 Boat Ramp	3	3	0	0	0	0	0	5	0	0

SHORELINE FEATURES
York County VA

PLATE 12 CONTINUED

























Features	Reach# 81	Reach# 82	Reach# 87	Reach# 88
Meters per Reach				
Riprap	0	29.6	0	137.1
Bulkhead	0	99.5	52.2	113.5
Groinfield	0	0	0	0
Breakwater	0	0	0	0
Bulkhead/Breakwater/Groinfield	0	0	0	0
Bulkhead/Groinfield	0	0	0	0
Riprap/Groinfield	0	0	0	0
Bulkhead/Riprap	0	91.7	0	0
No Structure-Unstable	1352.0	2594.5	519.6	245.9
Miscellaneous	0	0	18.8	0
No Structure-Stable	0	0	0	0
Number per Reach				
Jetty	0	0	0	0
Marina	0	0	0	0
Wharf	0	0	0	0
Dock/Pier	0	10	0	9
Abandoned Dock/Pier/Wharf	0	0	0	0
Covered Dock/Pier	0	1	0	0
Failed Covered Dock/Pier	0	0	0	0
Tires, Concrete Blocks, etc.	0	0	0	0
Boat Ramp	0	4	0	0
258 Reach				

SHORELINE FEATURES York County VA

PLATE 13























Features	Reach# 89	Reach# 90	Reach# 91	Reach# 92	Reach# 93	Reach# 94	Reach# 95	Reach# 96	Reach# 97	Reach# 98
Meters per Reach										
 Riprap	203.3	116.4	97.0	0	105.8	0	0	0	48.6	115.1
 Bulkhead	325.0	27.1	41.6	0	23.1	149.3	61.5	0	249.0	60.6
 Groinfield	0	0	0	0	0	0	0	0	0	0
 Breakwater	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Breakwater/Groinfield	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Groinfield	0	0	0	0	0	0	0	0	0	0
 Riprap/Groinfield	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Riprap	75.1	0	0	0	0	0	0	0	0	0
 No Structure-Unstable	919.9	168.5	265.7	1116.3	3882.6	1369.9	1430.4	972.7	720.7	411.9
 Miscellaneous	35.7	41.2	15.6	0	34.3	0	0	0	151.1	257.2
 No Structure-Stable	0	0	127.4	0	0	0	0	0	403.2	0
Number per Reach										
 Jetty	0	0	0	0	0	0	0	0	0	0
 Marina	0	0	0	0	0	0	0	0	0	0
 Wharf	0	0	0	0	0	0	0	0	0	0
 Dock/Pier	9	2	2	2	11	8	6	4	9	4
 Abandoned Dock/Pier/Wharf	0	0	0	2	0	0	0	0	0	0
 Covered Dock/Pier	1	0	0	0	0	1	1	0	1	2
 Failed Covered Dock/Pier	0	0	0	0	0	0	0	0	0	0
 Tires, Concrete Blocks, etc.	0	0	0	0	0	0	0	0	0	0
 Boat Ramp	0	1	0	0	0	1	0	0	3	0

SHORELINE FEATURES
York County VA

PLATE 13 CONTINUED























Features	Reach# 99	Reach# 100	Reach# 101	Reach# 101A	Reach# 101B	Reach# 102	Reach# 103	Reach# 104	Reach# 105	Reach# 106
Meters per Reach										
 Riprap	389.6	119.2	624.9	31.9	0	202.2	399.3	123.2	173.0	194.8
 Bulkhead	226.3	39.1	1838.7	14.2	0	302.0	0	475.7	0	1269.2
 Groinfield	0	0	0	0	0	0	0	0	0	0
 Breakwater	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Breakwater/Groinfield	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Groinfield	0	97.4	0	0	0	0	0	0	0	0
 Riprap/Groinfield	0	33.1	35.5	0	0	0	0	0	0	0
 Bulkhead/Riprap	79.1	32.2	0	0	0	0	0	33.7	0	49.7
 No Structure-Unstable	5045.3	893.3	9096.5	2365.5	0	5845.1	625.7	1234.9	0	301.6
 Miscellaneous	146.3	78.6	1007.4	0	0	0	0	110.2	0	0
 No Structure-Stable	0	0	763.7	0	171.7	284.6	0	3926.4	0	0
Number per Reach										
 Jetty	0	0	0	0	0	0	0	0	0	0
 Marina	0	0	5	0	0	0	0	0	0	0
 Wharf	0	0	0	0	0	0	0	0	0	0
 Dock/Pier	18	3	75	0	0	21	2	11	0	45
 Abandoned Dock/Pier/Wharf	0	0	12	0	0	3	1	2	0	0
 Covered Dock/Pier	3	0	9	0	0	1	0	1	0	1
 Failed Covered Dock/Pier	0	0	0	0	0	0	0	0	0	0
 Tires, Concrete Blocks, etc.	0	0	1	0	0	0	0	0	0	0
 Boat Ramp	4	0	12	0	0	4	0	2	0	4

SHORELINE FEATURES
York County VA

PLATE 13 CONTINUED

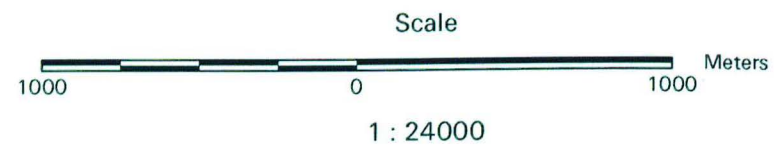
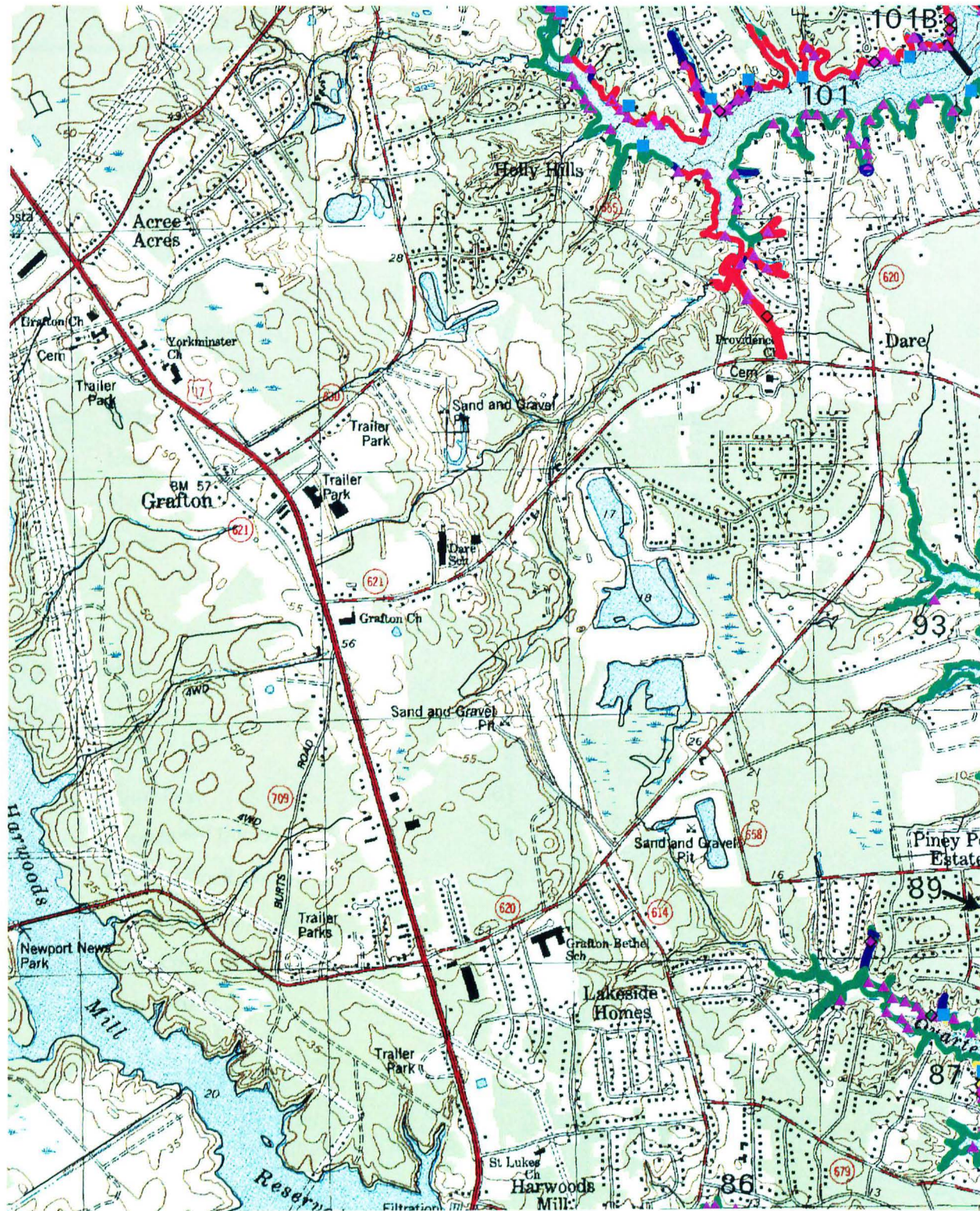


Features	Reach# 107	Reach# 108	Reach# 000	Reach# 000	Reach# 000	Reach# 000	Reach# 000	Reach# 000	Reach# 000	Reach# 000	Reach# 000
Meters per Reach											
 Riprap	0	0	0	0	0	0	0	0	0	0	0
 Bulkhead	0	0	0	0	0	0	0	0	0	0	0
 Groinfield	0	0	0	0	0	0	0	0	0	0	0
 Breakwater	0	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Breakwater/Groinfield	0	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Groinfield	0	0	0	0	0	0	0	0	0	0	0
 Riprap/Groinfield	118.2	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Riprap	156.9	0	0	0	0	0	0	0	0	0	0
 No Structure-Unstable	1732.5	1594.2	0	0	0	0	0	0	0	0	0
 Miscellaneous	0	0	0	0	0	0	0	0	0	0	0
 No Structure-Stable	0	0	0	0	0	0	0	0	0	0	0
Number per Reach											
 Jetty	0	0	0	0	0	0	0	0	0	0	0
 Marina	0	0	0	0	0	0	0	0	0	0	0
 Wharf	0	0	0	0	0	0	0	0	0	0	0
 Dock/Pier	1	0	0	0	0	0	0	0	0	0	0
 Abandoned Dock/Pier/Wharf	2	0	0	0	0	0	0	0	0	0	0
 Covered Dock/Pier	0	0	0	0	0	0	0	0	0	0	0
 Failed Covered Dock/Pier	0	0	0	0	0	0	0	0	0	0	0
 Tires, Concrete Blocks, etc.	0	0	0	0	0	0	0	0	0	0	0
 Boat Ramp	0	0	0	0	0	0	0	0	0	0	0

SHORELINE FEATURES
York County VA

PLATE 13 CONTINUED

























Features	Reach# 86	Reach# 87	Reach# 89	Reach# 93
Meters per Reach				
Riprap	0	167.6	0	37.2
Bulkhead	0	580.9	0	23.1
Groinfield	0	0	0	0
Breakwater	0	0	0	0
Bulkhead/Breakwater/Groinfield	0	0	0	0
Bulkhead/Groinfield	0	0	0	0
Riprap/Groinfield	0	0	0	0
Bulkhead/Riprap	0	0	0	0
No Structure-Unstable	76.6	4820.2	107.1	3868.0
Miscellaneous	0	151.2	0	28.3
No Structure-Stable	0	8.8	0	0
Number per Reach				
Jetty	0	0	0	0
Marina	0	0	0	0
Wharf	0	0	0	0
Dock/Pier	1	19	0	5
Abandoned Dock/Pier/Wharf	0	0	0	0
Covered Dock/Pier	0	3	0	0
Failed Covered Dock/Pier	0	0	0	0
Tires, Concrete Blocks, etc.	0	0	0	0
Boat Ramp	0	5	0	0
258 Reach				

SHORELINE FEATURES York County VA

PLATE 14

Comprehensive Coastal Inventory

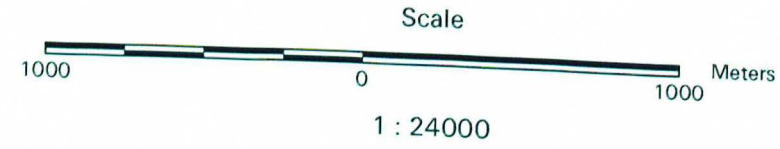
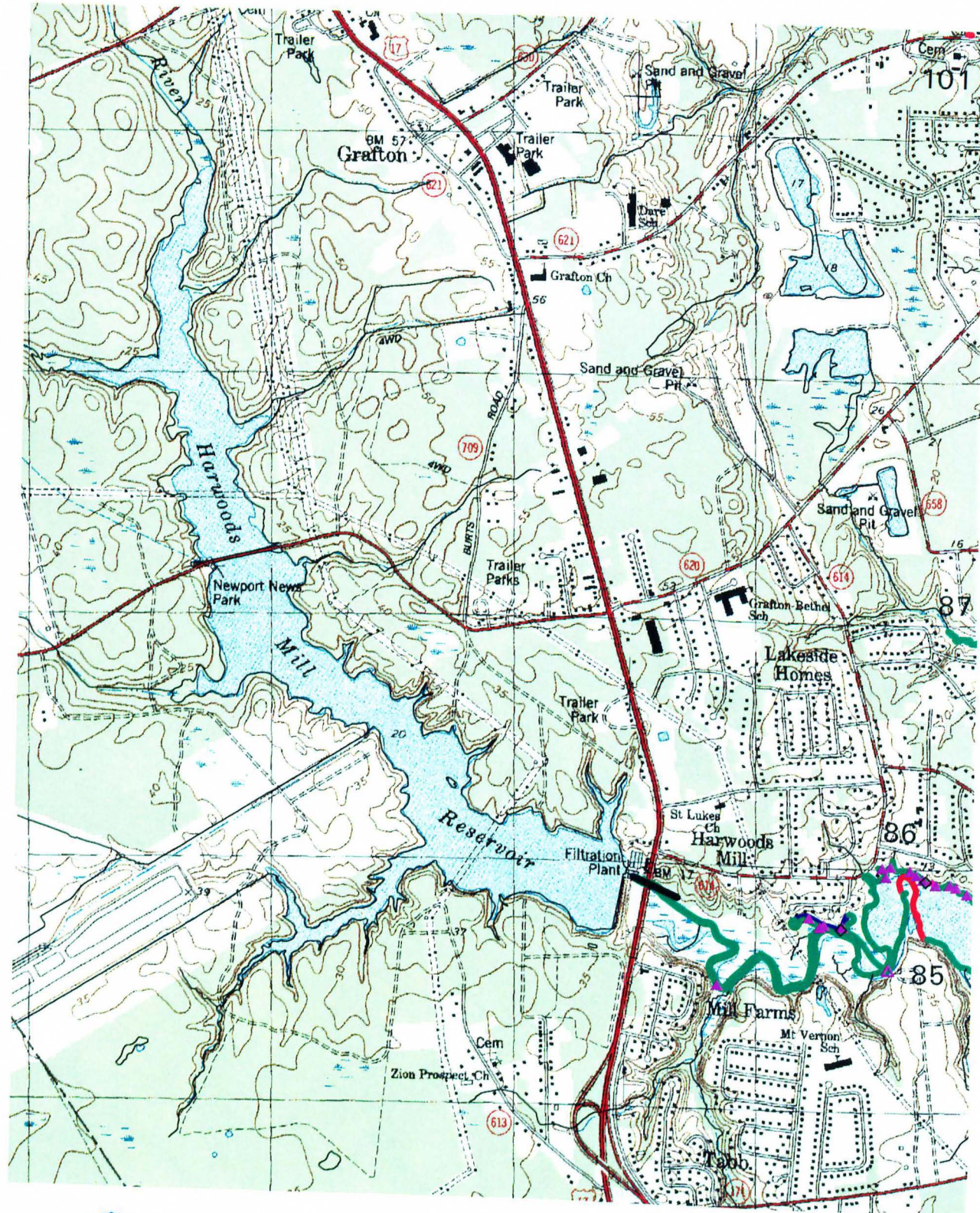


Features	Reach# 101	Reach# 101B	Reach# 000	Reach# 000	Reach# 000	Reach# 000	Reach# 000	Reach# 000	Reach# 000	Reach# 000	Reach# 000
Meters per Reach											
 Riprap	305.6	71.3	0	0	0	0	0	0	0	0	0
 Bulkhead	1098.2	0	0	0	0	0	0	0	0	0	0
 Groinfield	0	0	0	0	0	0	0	0	0	0	0
 Breakwater	0	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Breakwater/Groinfield	0	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Groinfield	0	0	0	0	0	0	0	0	0	0	0
 Riprap/Groinfield	0	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Riprap	0	0	0	0	0	0	0	0	0	0	0
 No Structure-Unstable	5415.9	0	0	0	0	0	0	0	0	0	0
 Miscellaneous	0	0	0	0	0	0	0	0	0	0	0
 No Structure-Stable	5997.3	362.0	0	0	0	0	0	0	0	0	0
Number per Reach											
 Jetty	1	0	0	0	0	0	0	0	0	0	0
 Marina	0	0	0	0	0	0	0	0	0	0	0
 Wharf	0	0	0	0	0	0	0	0	0	0	0
 Dock/Pier	61	0	0	0	0	0	0	0	0	0	0
 Abandoned Dock/Pier/Wharf	3	0	0	0	0	0	0	0	0	0	0
 Covered Dock/Pier	8	0	0	0	0	0	0	0	0	0	0
 Failed Covered Dock/Pier	0	0	0	0	0	0	0	0	0	0	0
 Tires, Concrete Blocks, etc.	0	0	0	0	0	0	0	0	0	0	0
 Boat Ramp	7	0	0	0	0	0	0	0	0	0	0

SHORELINE FEATURES
York County VA

PLATE 14 CONTINUED



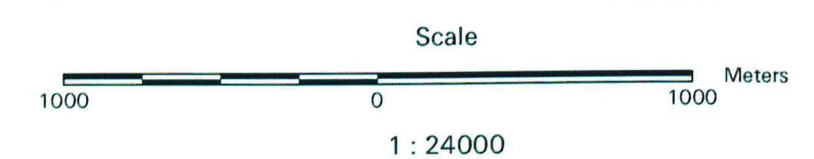
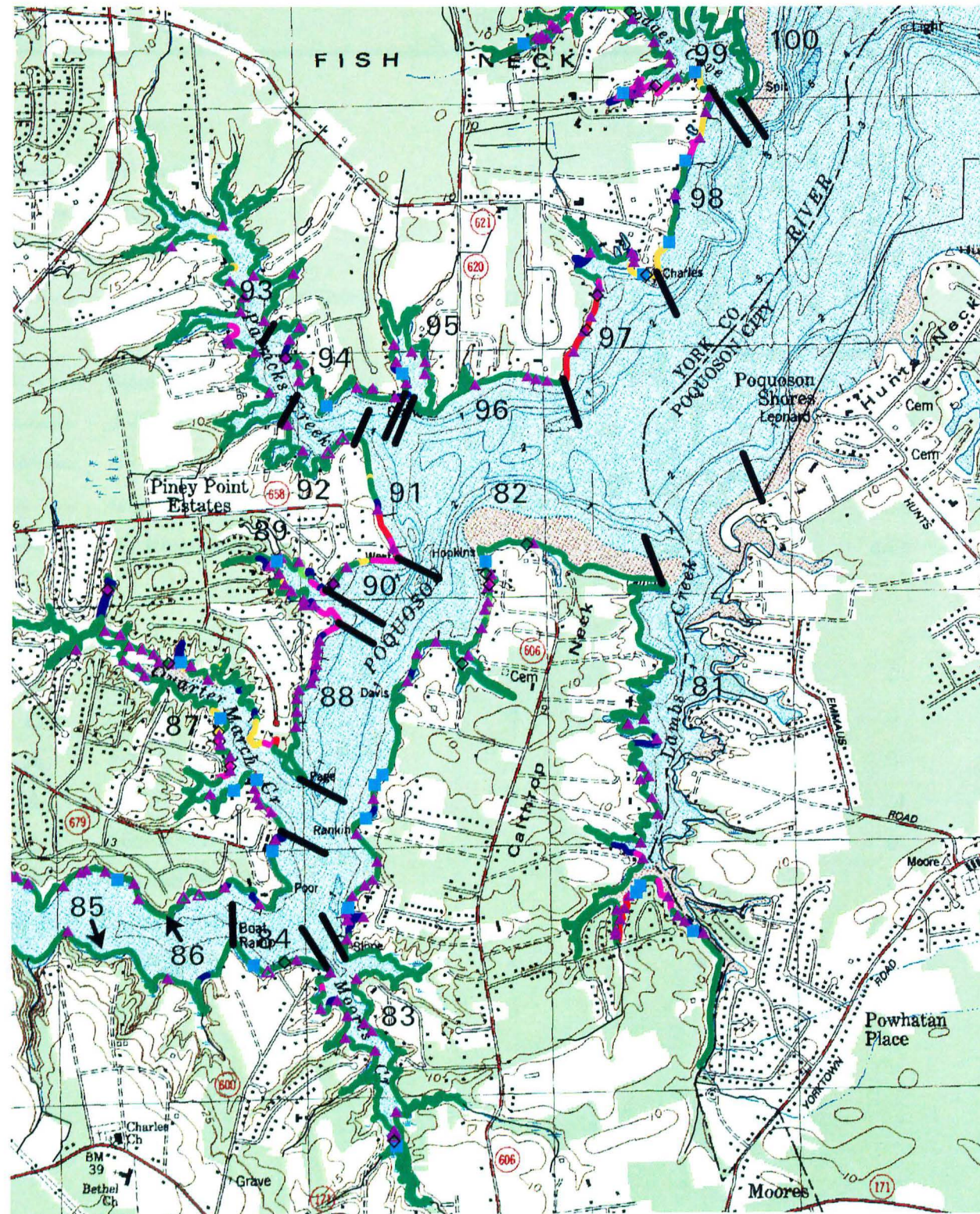


Features	Reach# 85	Reach# 86	Reach# 87	Reach# 101
Meters per Reach				
Riprap	0	49.6	0	0
Bulkhead	0	274.4	0	0
Groinfield	0	0	0	0
Breakwater	0	0	0	0
Bulkhead/Breakwater/Groinfield	0	0	0	0
Bulkhead/Groinfield	0	0	0	0
Riprap/Groinfield	0	0	0	0
Bulkhead/Riprap	0	0	0	0
No Structure-Unstable	2604.9	3284.9	335.7	0
Miscellaneous	0	0	0	0
No Structure-Stable	401.9	0	0	21.3
Number per Reach				
Jetty	0	0	0	0
Marina	0	0	0	0
Wharf	0	0	0	0
Dock/Pier	1	14	0	0
Abandoned Dock/Pier/Wharf	1	0	0	0
Covered Dock/Pier	0	0	0	0
Failed Covered Dock/Pier	0	0	0	0
Tires, Concrete Blocks, etc.	0	0	0	0
Boat Ramp	0	2	0	0
258 Reach				

SHORELINE FEATURES York County VA

PLATE 15

























Features	Reach# 81	Reach# 82	Reach# 83	Reach# 84
Meters per Reach				
Riprap	265.8	29.6	29.7	0
Bulkhead	349.9	372.3	60.2	0
Groinfield	0	0	0	0
Breakwater	0	0	0	0
Bulkhead/Breakwater/Groinfield	0	0	0	0
Bulkhead/Groinfield	0	0	0	0
Riprap/Groinfield	0	0	0	0
Bulkhead/Riprap	0	91.7	0	0
No Structure-Unstable	4654.8	3610.7	5085.1	531.5
Miscellaneous	0	0	0	0
No Structure-Stable	250.6	0	0	0
Number per Reach				
Jetty	0	0	0	0
Marina	0	0	0	0
Wharf	0	0	0	0
Dock/Pier	20	20	10	1
Abandoned Dock/Pier/Wharf	0	0	2	1
Covered Dock/Pier	3	5	1	1
Failed Covered Dock/Pier	0	0	0	0
Tires, Concrete Blocks, etc.	0	0	0	0
Boat Ramp	0	4	1	1
258 Reach				

SHORELINE FEATURES York County VA

PLATE 16























Features	Reach# 85	Reach# 86	Reach# 87	Reach# 88	Reach# 89	Reach# 90	Reach# 91	Reach# 92	Reach# 93	Reach# 94
Meters per Reach										
 Riprap	0	37.9	309.0	137.1	203.3	116.4	97.0	0	105.8	0
 Bulkhead	47.6	182.4	633.0	113.5	325.0	27.1	41.6	0	23.1	149.3
 Groinfield	0	0	0	0	0	0	0	0	0	0
 Breakwater	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Breakwater/Groinfield	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Groinfield	0	0	0	0	0	0	0	0	0	0
 Riprap/Groinfield	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Riprap	0	0	89.4	0	75.1	0	0	0	0	0
 No Structure-Unstable	1500.5	1691.8	5520.8	514.4	919.9	168.5	265.6	1116.3	6718.0	1369.9
 Miscellaneous	0	0	295.5	0	35.7	41.2	15.6	0	62.6	0
 No Structure-Stable	0	0	44.4	0	0	0	127.4	0	0	0
Number per Reach										
 Jetty	0	0	0	0	0	0	0	0	0	0
 Marina	0	0	0	0	0	0	0	0	0	0
 Wharf	0	0	0	0	0	0	0	0	0	0
 Dock/Pier	2	11	24	10	9	2	2	2	12	8
 Abandoned Dock/Pier/Wharf	0	2	0	0	0	0	0	2	0	0
 Covered Dock/Pier	0	2	4	0	1	0	0	0	0	1
 Failed Covered Dock/Pier	0	0	0	0	0	0	0	0	0	0
 Tires, Concrete Blocks, etc.	0	0	0	0	0	0	0	0	0	0
 Boat Ramp	0	0	5	0	0	1	0	0	0	1

SHORELINE FEATURES
York County VA

PLATE 16 CONTINUED

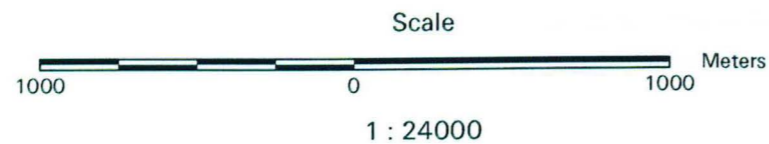
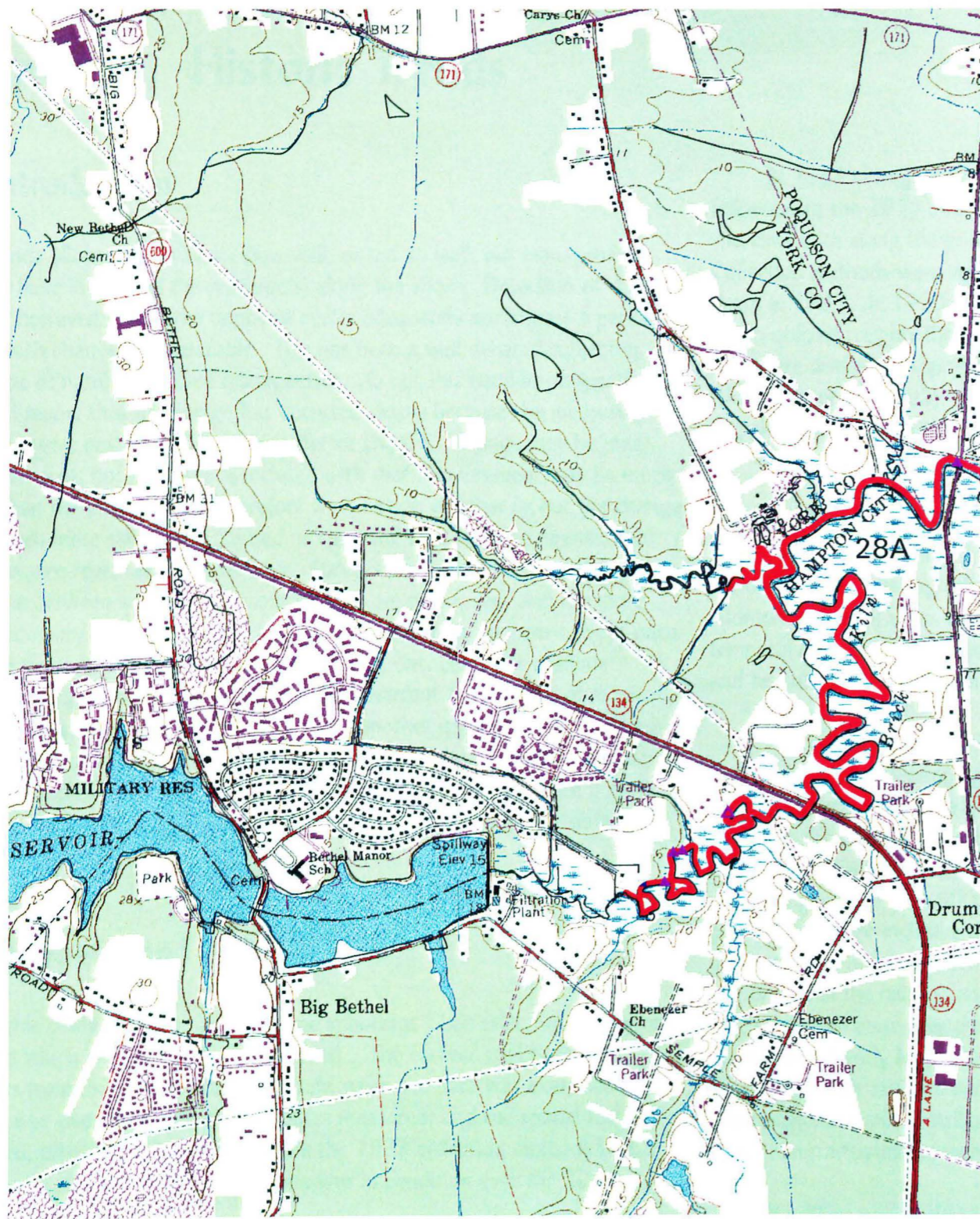


Features	Reach# 95	Reach# 96	Reach# 97	Reach# 98	Reach# 99	Reach# 100	Reach# 000	Reach# 000	Reach# 000	Reach# 000
Meters per Reach										
 Riprap	0	0	48.6	115.1	389.6	0	0	0	0	0
 Bulkhead	61.5	0	249.0	60.5	226.3	0	0	0	0	0
 Groinfield	0	0	0	0	0	0	0	0	0	0
 Breakwater	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Breakwater/Groinfield	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Groinfield	0	0	0	0	0	0	0	0	0	0
 Riprap/Groinfield	0	0	0	0	0	0	0	0	0	0
 Bulkhead/Riprap	0	0	0	0	79.1	0	0	0	0	0
 No Structure-Unstable	1430.4	972.7	720.7	411.9	3715.7	494.8	0	0	0	0
 Miscellaneous	0	0	151.1	257.2	146.3	0	0	0	0	0
 No Structure-Stable	0	0	403.2	0	0	0	0	0	0	0
Number per Reach										
 Jetty	0	0	0	0	0	0	0	0	0	0
 Marina	0	0	0	0	0	0	0	0	0	0
 Wharf	0	0	0	0	0	0	0	0	0	0
 Dock/Pier	6	4	9	4	18	0	0	0	0	0
 Abandoned Dock/Pier/Wharf	0	0	0	0	0	0	0	0	0	0
 Covered Dock/Pier	1	0	1	2	3	0	0	0	0	0
 Failed Covered Dock/Pier	0	0	0	0	0	0	0	0	0	0
 Tires, Concrete Blocks, etc.	0	0	0	0	0	0	0	0	0	0
 Boat Ramp	0	0	3	0	3	0	0	0	0	0

SHORELINE FEATURES
York County VA

PLATE 16 CONTINUED





Features	Reach# 28A	Reach# 000	Reach# 000	Reach# 000
Meters per Reach				
Riprap	0	0	0	0
Bulkhead	40.6	0	0	0
Groinfield	0	0	0	0
Breakwater	0	0	0	0
Bulkhead/Breakwater/Groinfield	0	0	0	0
Bulkhead/Groinfield	0	0	0	0
Riprap/Groinfield	0	0	0	0
Bulkhead/Riprap	0	0	0	0
No Structure-Unstable	0	0	0	0
Miscellaneous	0	0	0	0
No Structure-Stable	6567.3	0	0	0
Number per Reach				
Jetty	0	0	0	0
Marina	0	0	0	0
Wharf	0	0	0	0
Dock/Pier	4	0	0	0
Abandoned Dock/Pier/Wharf	1	0	0	0
Covered Dock/Pier	0	0	0	0
Failed Covered Dock/Pier	0	0	0	0
Tires, Concrete Blocks, etc.	0	0	0	0
Boat Ramp	0	0	0	0
258 Reach				

SHORELINE FEATURES York County VA

PLATE 17



Chapter 3. Historic Trends

3.1 Introduction

Trends allow us to evaluate how well, or not so well, our management decisions have influenced the resource(s) along the shore. Detection of change is useful, however, only if the temporal cycles adequately encompass a period within which change is measurable. This has been a well debated subject in most areas of natural resource management. To put this issue in perspective, one could report that no change has occurred simply because the measuring techniques were not refined enough to detect change. Change may be measured in an area, but the error associated with that measurement may be much greater than the change itself, therefore we question whether or not the change is real. Even more simple and pointed, is the issue of cost. Measurements of change require repeatability in surveys. Surveys are expensive. The shorter the time frame between surveys, the more surveys are performed, and the more money necessary. In other words, it is more expensive to perform surveys once every five years, than once every ten years. Upfront, one must evaluate whether the resource changes substantially to warrant the expense of monitoring every five years versus ten years. Finally, another issue becomes comparability. As measuring techniques improve, the types of data we collect can be refined and expanded. At some point, it is plausible that we generate a product which can not be adequately compared to earlier data because they differ markedly.

3.2 Approach and Analysis

In this study, the later issue became important when selecting the historic base from which change would be measured. The earliest studies report conditions from the 1970s. Unfortunately, when the data was examined closely it was clear that both the attributes measured, and the spatial records maintained, differed so significantly from the 1993 collection methods that a comparison would not yield accurate changes in condition over the 20 year span.

In 1985 videography was used to collect shoreline characteristics as a follow-up to the 1970 data collection. Low altitude videography collected shoreline data along the primary tributaries to the Chesapeake Bay in Virginia. Collection methods were very comparable in scale and quality to the videography flown in 1993. In 1990, these video were reviewed again for another study which utilized roughly the same set of shoreline features catalogued here. These data were drafted to topographic scale maps, and digitized in ArcInfo (Hardaway et.al., 1992). The original shoreline reaches were also used as a mapping unit for reporting data.

The 1985 dataset was a very comparable inventory for a number of reasons. First, the data collection methods were the same. The attributes measured were nearly identical. The processing was similar, and the geographic regions overlap, although the 1993 data covers more shoreline territory. In addition, the eight years separating the two surveys provides a reasonable temporal reference for comparison. Within eight years we would expect to see, and be able to measure, change.

A principal difference between the two sets is in the digital shoreline coverage used for developing the digital data. The 1985 series used a 1:24,000 scale shoreline from the USGS topographic quadrangles as the basemap. These were available state wide and could accommodate the large regional demands of the 1985 project. The 1993 data used a high resolution shoreline coverage (1:4,800) provided by the locality. This base map is more precise, and more inclusive than the USGS quadrangle. The effect of this difference is a more detailed shoreline in 1993, or more shoreline measured. The impact in the historic analysis is the comparison of shoreline features on a reach by reach basis over time. Since the 1993 shoreline is more detailed, the reaches are slightly longer in length despite the fact that they have the same geographic start and end points as the 1985 reaches. Therefore, they can potentially have more attributes measured. To accommodate some this discrepancy, minor adjustments were made to the 1993 reach boundaries.

No effort was made to revise earlier estimates of shoreline erosion or accretion originally reported in VIMS, 1977. This analysis, although desirable, is beyond the scope of this project. Nevertheless, historic rates of change may

still be relevant today, particularly if an area has remained untouched since early estimates. Table 2 summarizes these earlier estimates for those reaches which were surveyed in 1977. The amount of shorezone lost to erosion or gained through accretion is measured in hectares for a 100 year period. The erosion rate for each reach is reported in meters/year. These estimates are based on comparisons between 1850 and 1940 shoreline positions. The table does not include the minor creeks and tributaries added in subsequent years.

In addition, Table 2 gives very general shoreline descriptions for each reach, as reported in 1977. This early study limited the shore zone classification to either beach (B) or marsh (M). Shorelines which did not include fringe, embayed, or extensive marshes were catalogued as beach, even in the absence of any sand. The fastland height (bank), is also estimated in meters, based on topographic contours measured from USGS quadrangles.

3.3 Graphs and Charts

Data comparison was performed in ArcInfo using the reach segments as the unit of comparison between 1985 and 1993 data. This trends analysis is limited to the original reach segments, not the newest segments added as part of the 1993 survey. As indicated above, there are slight differences in the reach lengths between 1985 and 1993 because of the difference in the shoreline coverages used. Only linear features are compared, as point features such as docks and piers were not surveyed in 1985.

Data is illustrated in a series of chart and graphs at the end of this section. Pie charts quantify the percent of the total reach length which is: altered by a particular structure, unstructured and stable, or unstructured and unstable. Two charts, one for 1985, and one for 1993 are shown. Aside, a bar graph compares features along the shoreline for 1985 and 1993, measured in meters. Both, pie charts and bar graphs display only the attributes surveyed in the reach. This may not include all 11 possible attributes. Two pie charts and one bar graph are illustrated for each reach common to the 1985 and 1993 datasets.

Table 2. York County Shoreline Conditions from 1977

Reach No.	Shoreline Type	Erosion (hectares)	Accretion (hectares)	Erosion Rate (m/yr)	Fastland Height (m)	Reach No.	Shoreline Type	Erosion (hectares)	Accretion (hectares)	Erosion Rate (m/yr)	Fastland Height (m)
11	B	21.2		0.7	3.0	96	B				
12	B	16.4		0.8	3.0	97	B	3.3		0.3	1.5
13	M	2.3		0.3	1.5	98	B				
14	B	5.4		0.3	3.0	99	B	7.7		0	1.2
15	B	4.4		0.4	3.0	100	B	5.2		0.5	1.5
16	B	23.4		0.6	6.1	101	B	47.5		0	1.2
17	M	3.1		0	0.9	102	B	10.6		0	0.9
18	B					103	B	11.6		0	1.2
19	B					104	M	12.6		0	0.9
20	B	10.0		0.5	7.6	105	M		0.5	0.2	0.9
21	B					106	B	1.3		0.3	0.9
22	B		2.6	0	0.9	107	B	7.8		0.3	0.9
23	B		2.1	0	2.7	108	M	11.3		0	0.9
24	B					109	B	31.3		1.2	0.9
25	B	7.7		0.2	12.2	110	M	19.6		0	0.9
26	B	15.3		0.5	10.7	111	B	19.3		0	1.2
27	B					112	B	11.4		0.5	1.5
28	B	5.1		0	1.5						
29	B										
30	B	42.1									
31	M	17.2		1.1	3.0						
32	M	16.6		0	1.2						
33	M	5.9		0	0.9						
81	B	17.0		0	0.9						
82	B	14.6		0	0.9						
83	B			0.5	1.2						
84	B	1.7									
85	B			0.4	1.5						
86	B	8.3									
87	B	4.8		0.5	1.5						
88	B			0	1.5						
89	B	1.3									
90	B	1.0		0	1.2						
91	B			0.3	1.5						
92	B		1.5	0.3	1.5						
93	B	3.8									
94	B			0.5	1.2						
95	B	0.8		0	1.2						

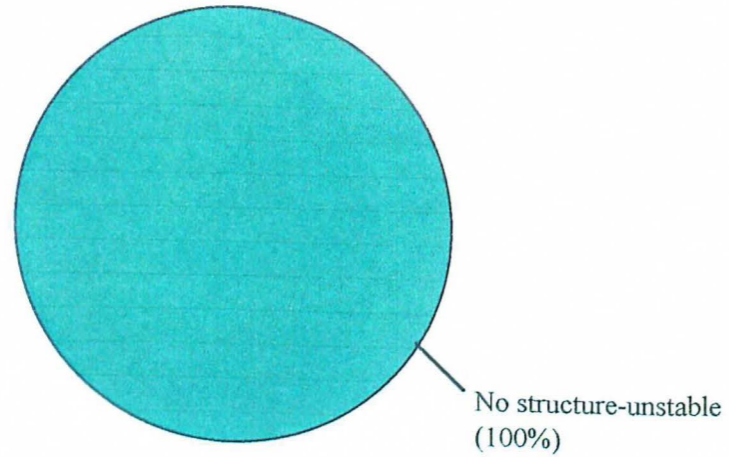
Historic Trends 1985 - 1993

York River

Reach 011

Shoreline Conditions
(% of total reach length)

1985

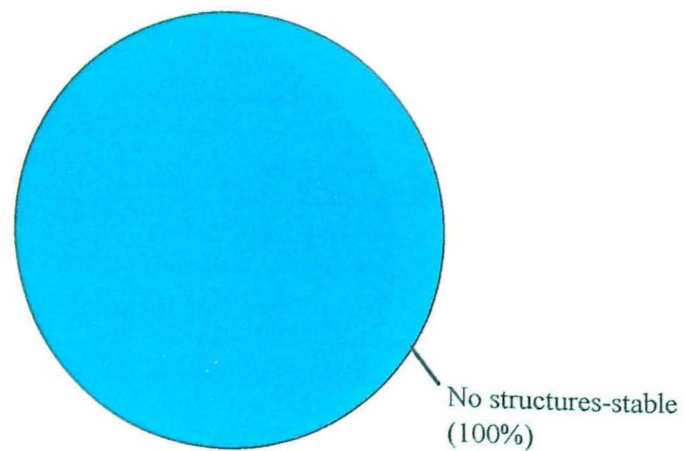


York River

Reach 011

Shoreline Conditions
(% of total reach length)

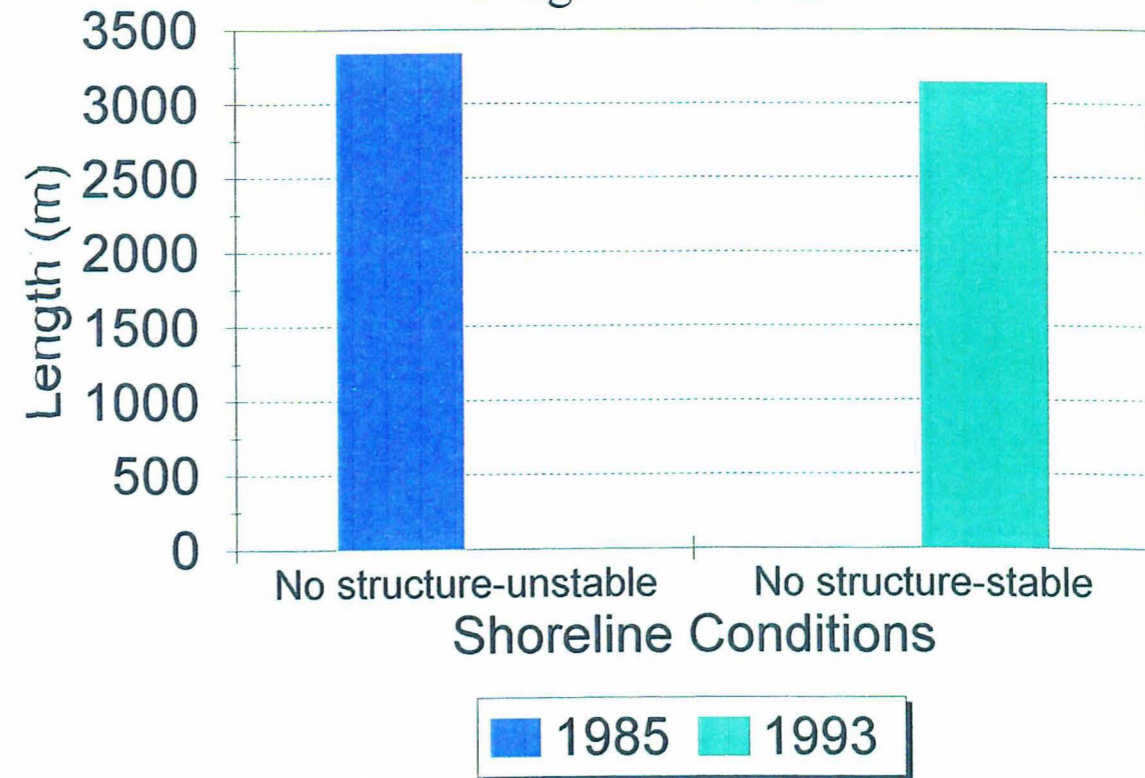
1993



York River

Reach 011

Length = 3239 m

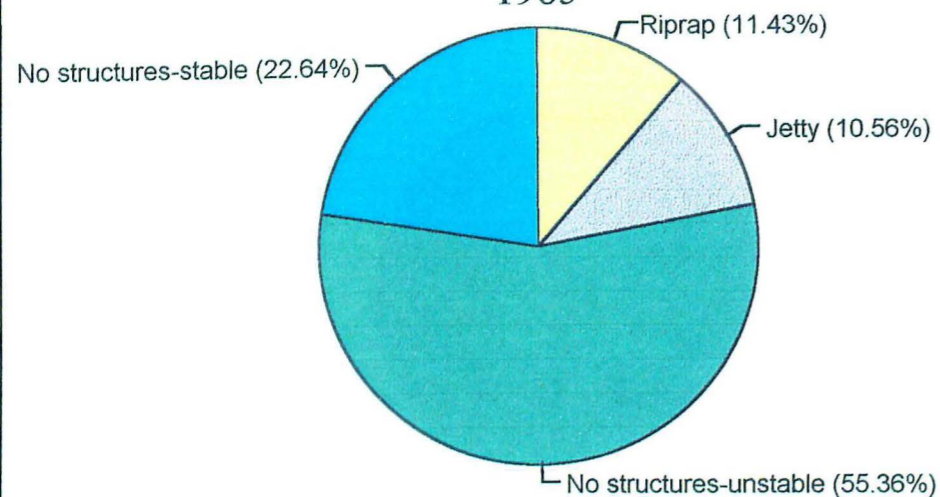


York River

Reach 012

Shoreline Conditions
(% of total reach length)

1985

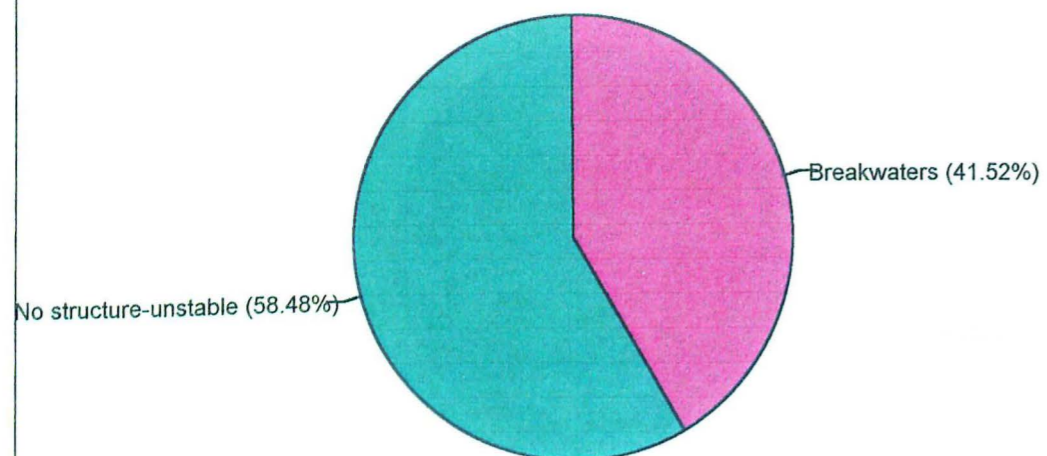


York River

Reach 012

Shoreline Conditions
(% of total reach length)

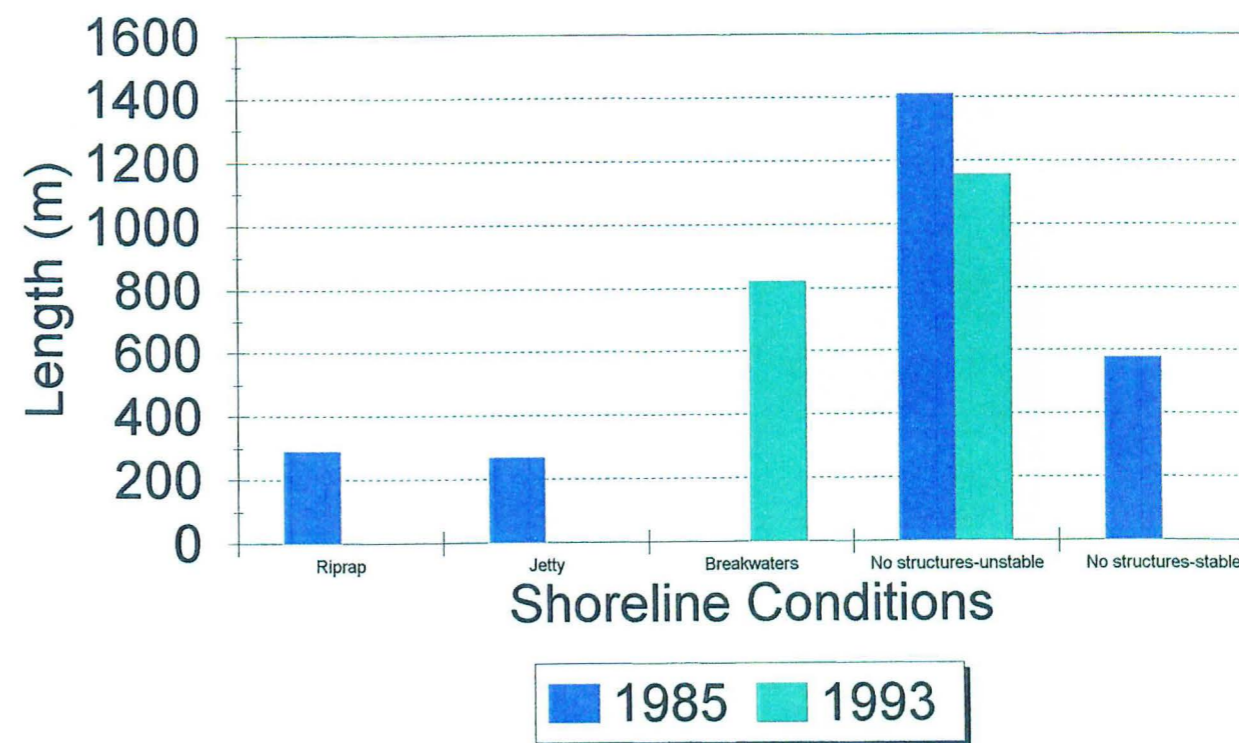
1993



York River

Reach 012

Length = 2262 m

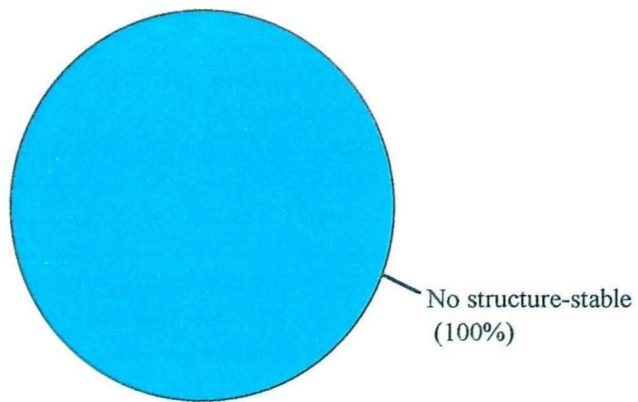


York River

Reach 013

Shoreline Conditions
(% of total reach length)

1985

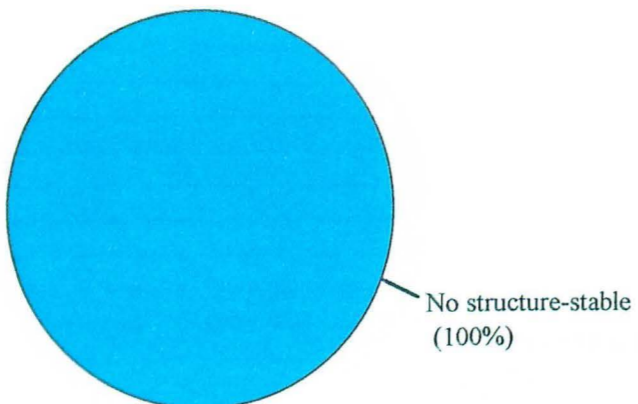


York River

Reach 013

Shoreline Conditions
(% of total reach length)

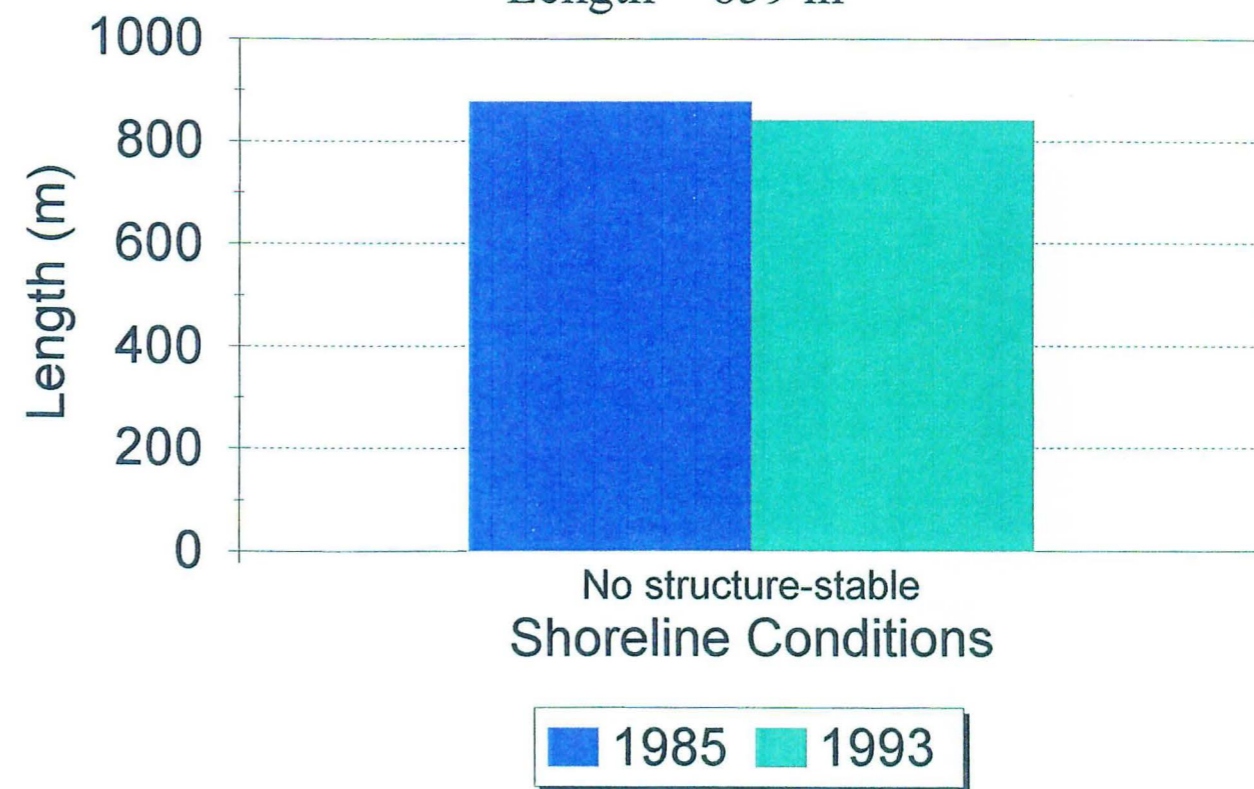
1993



York River

Reach 013

Length = 859 m

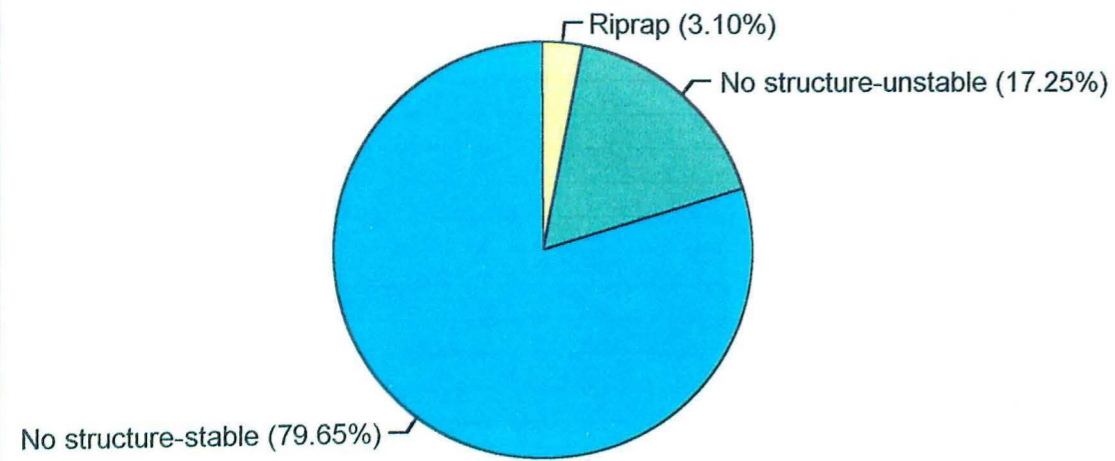


York River

Reach 014

Shoreline Conditions
(% of total reach length)

1985

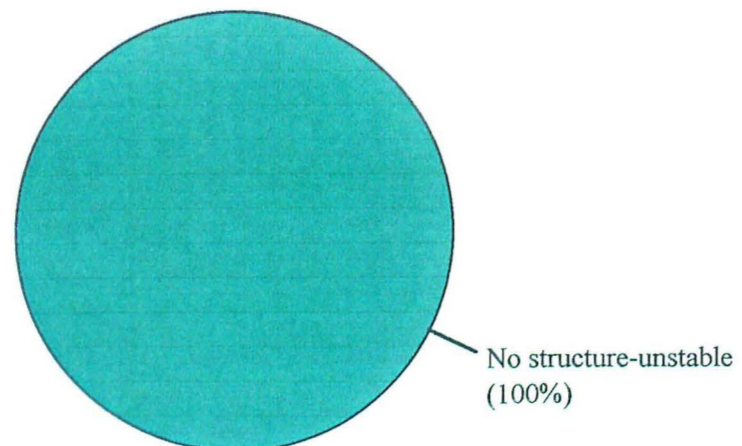


York River

Reach 014

Shoreline Conditions
(% of total reach length)

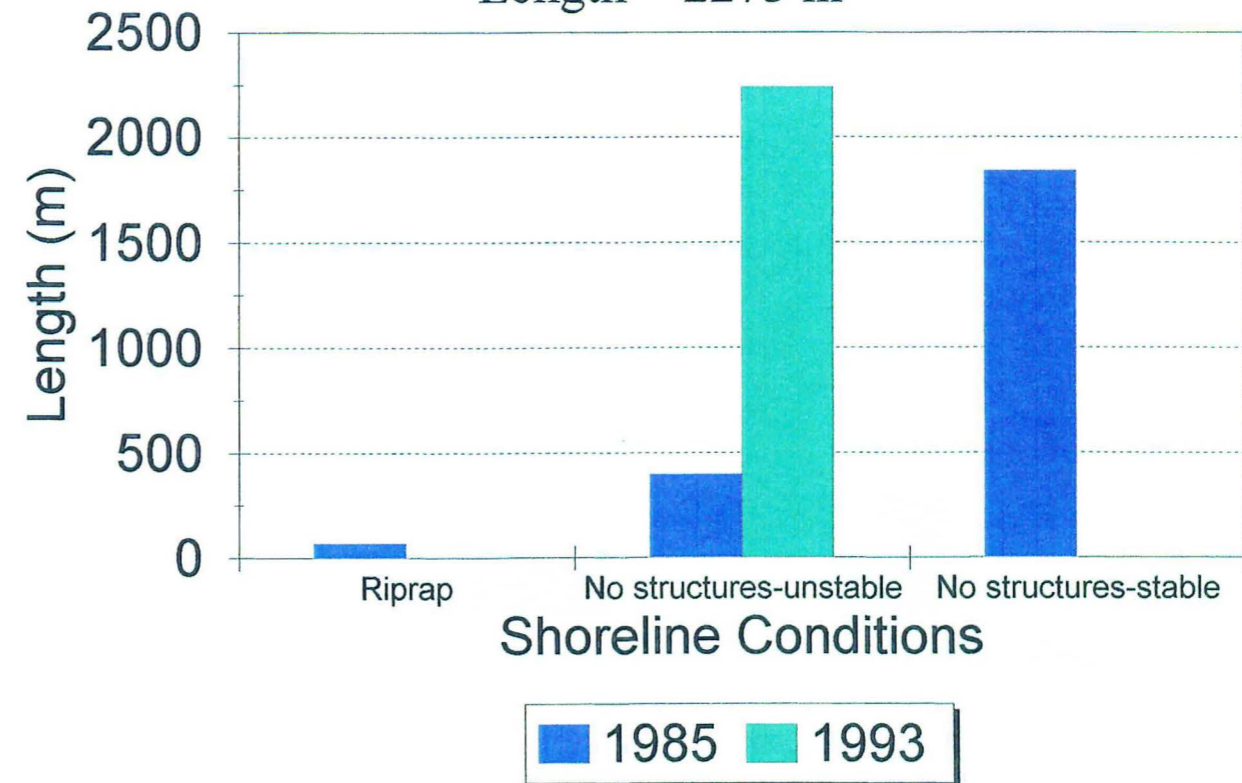
1993



York River

Reach 014

Length = 2273 m

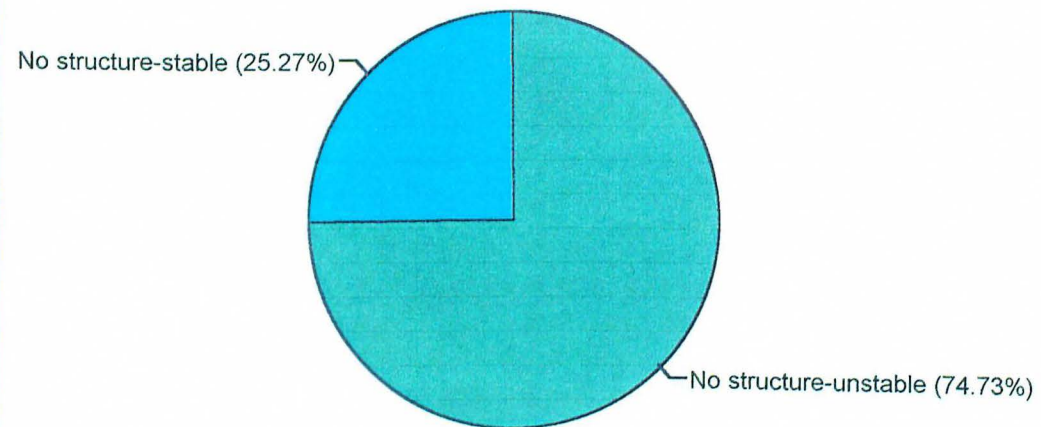


York River

Reach 015

Shoreline Conditions
(% of total reach length)

1985

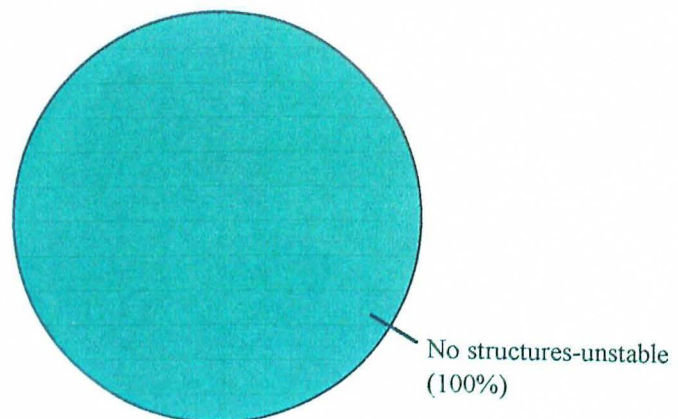


York River

Reach 015

Shoreline Conditions
(% of total reach length)

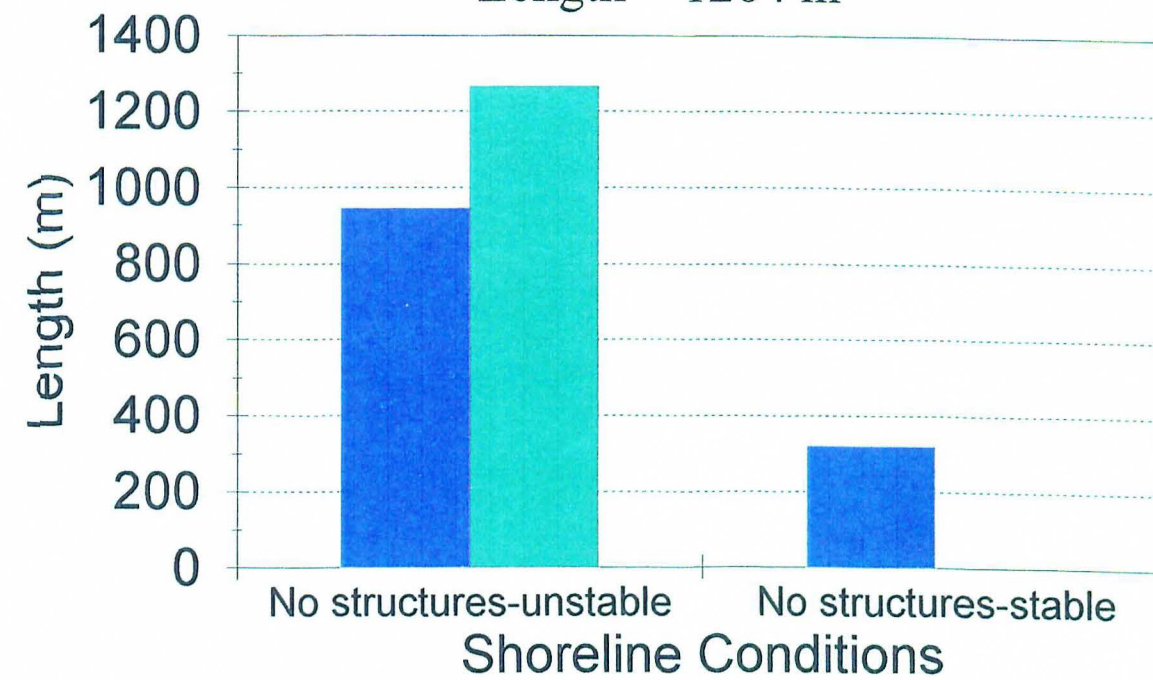
1993



York River

Reach 015

Length = 1264 m



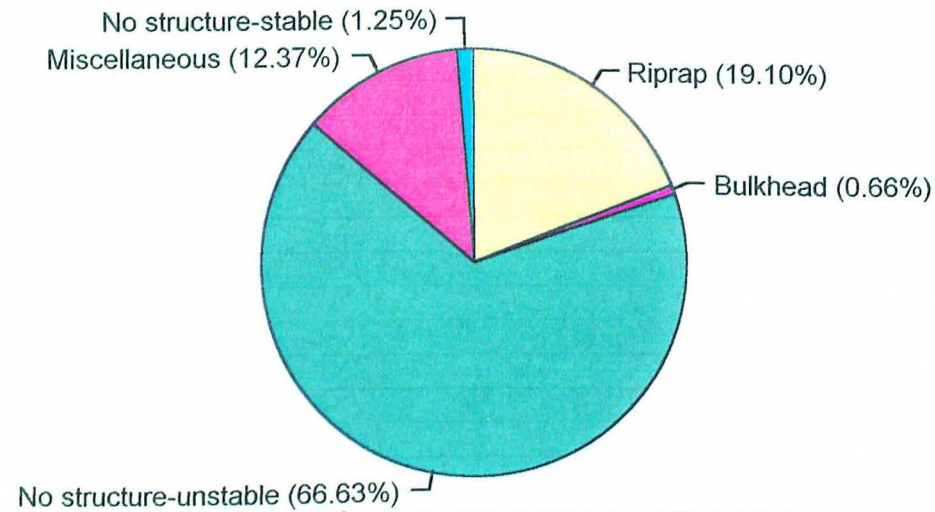
1985 1993

York River

Reach 016

Shoreline Conditions
(% of total reach length)

1985

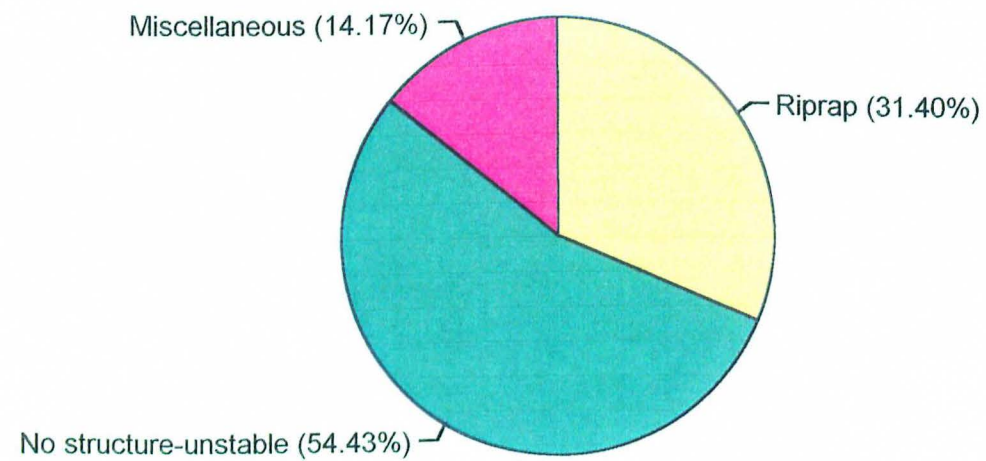


York River

Reach 016

Shoreline Conditions
(% of total reach length)

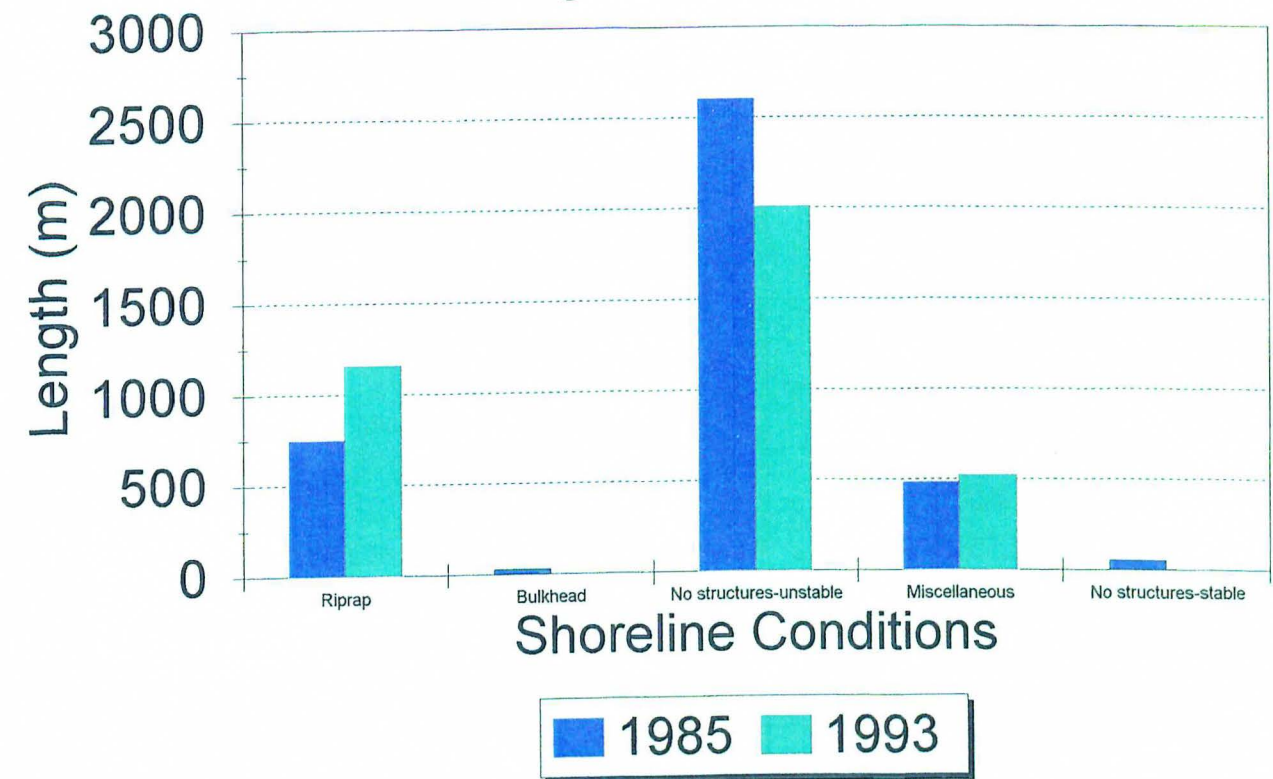
1993



York River

Reach 016

Length = 3795 m

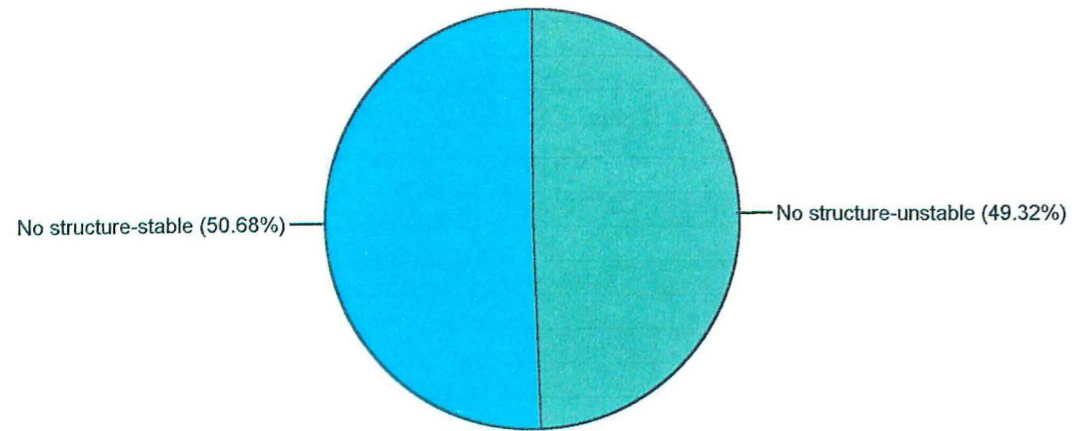


York River

Reach 017

Shoreline Conditions
(% of total reach length)

1985

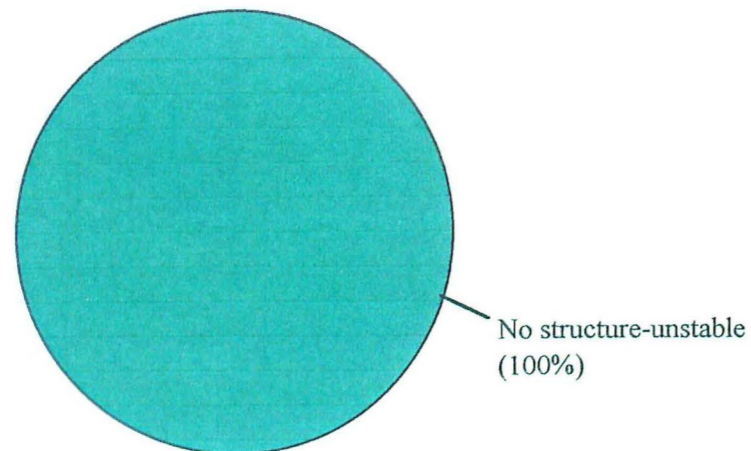


York River

Reach 017

Shoreline Conditions
(% of total reach length)

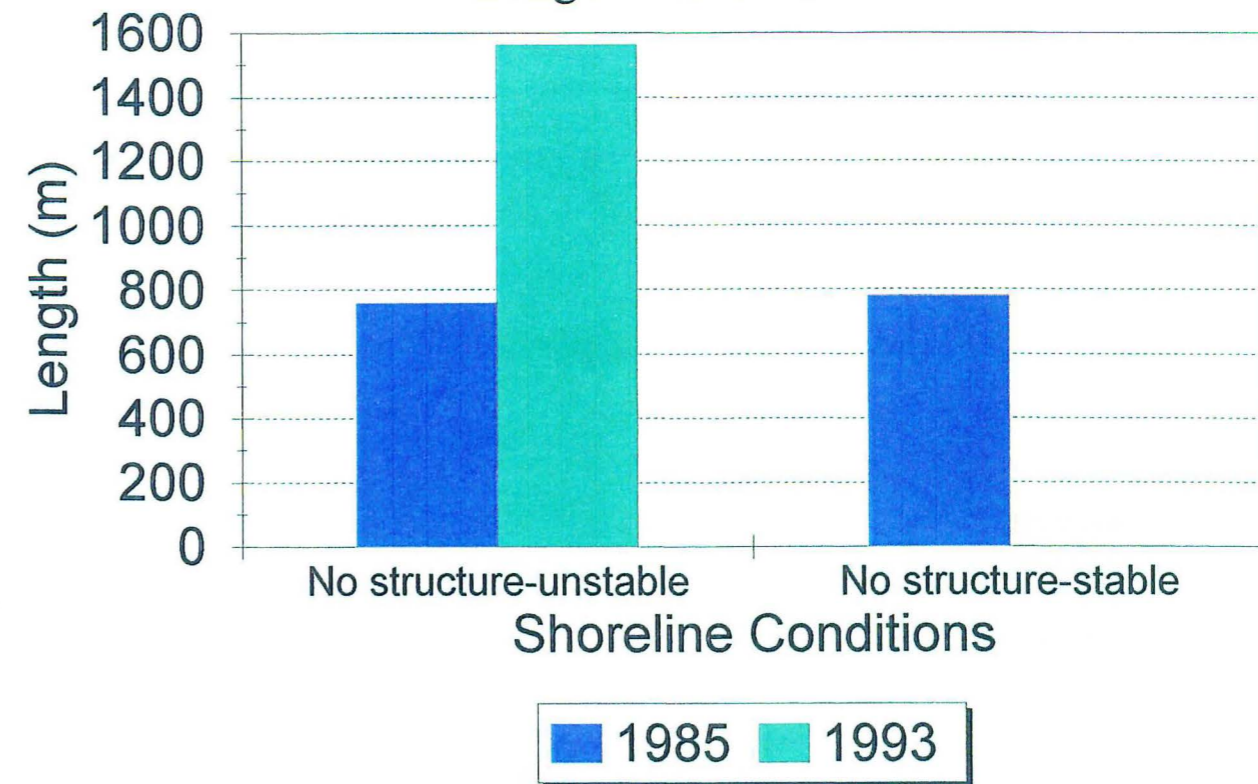
1993



York River

Reach 017

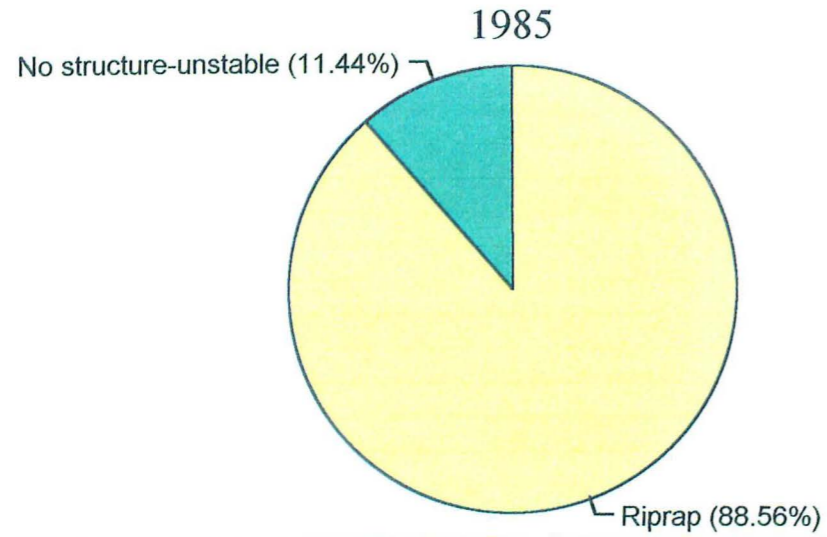
Length = 1552 m



York River

Reach 020

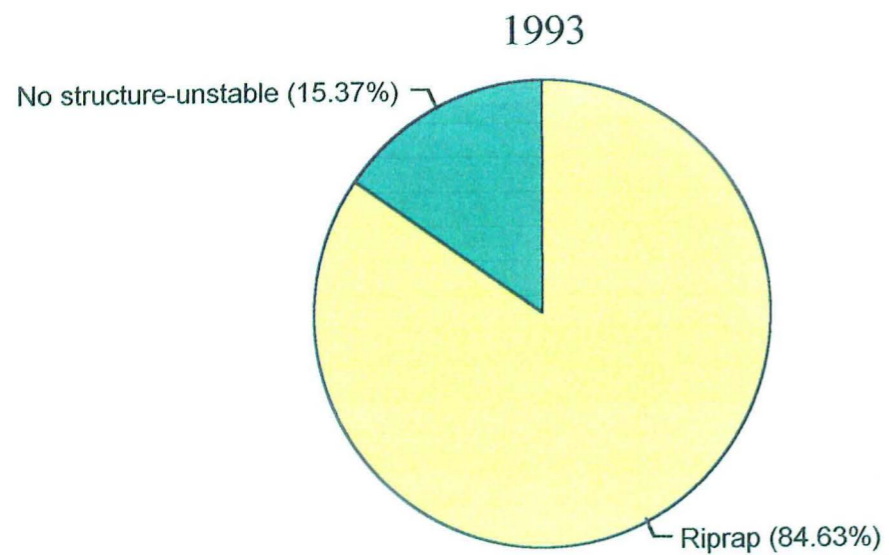
Shoreline Conditions
(% of total reach length)



York River

Reach 020

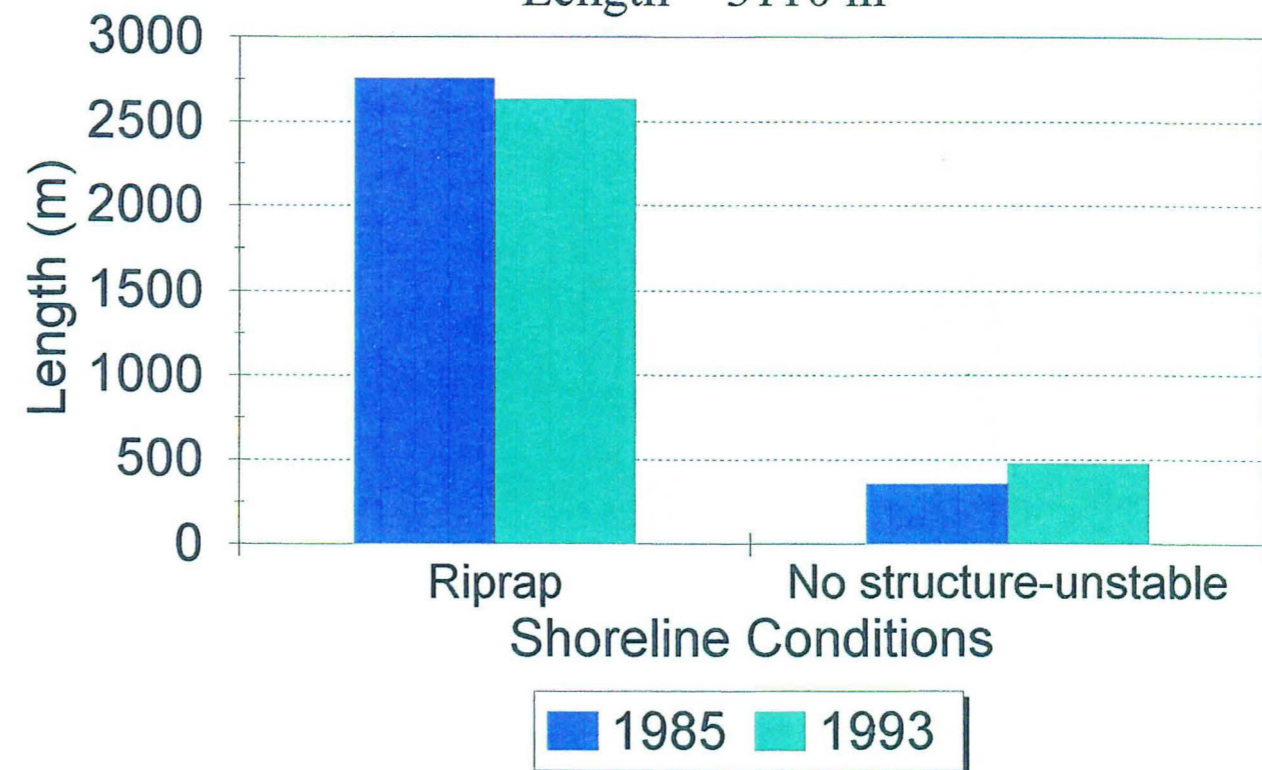
Shoreline Conditions
(% of total reach length)



York River

Reach 020

Length = 3110 m

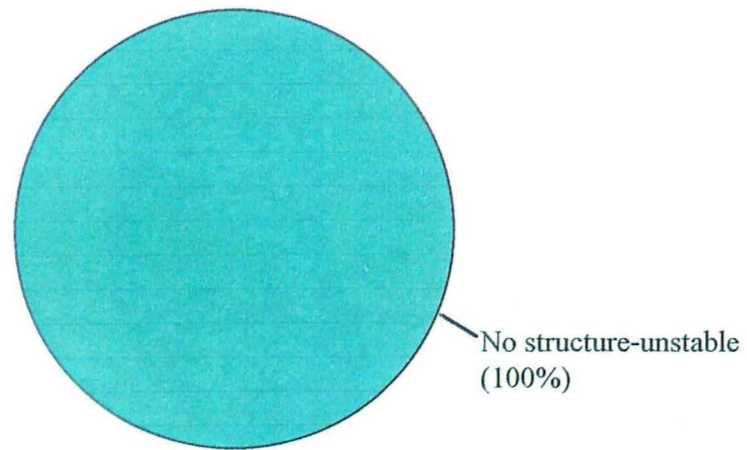


York River

Reach 022

Shoreline Conditions
(% of total reach length)

1985

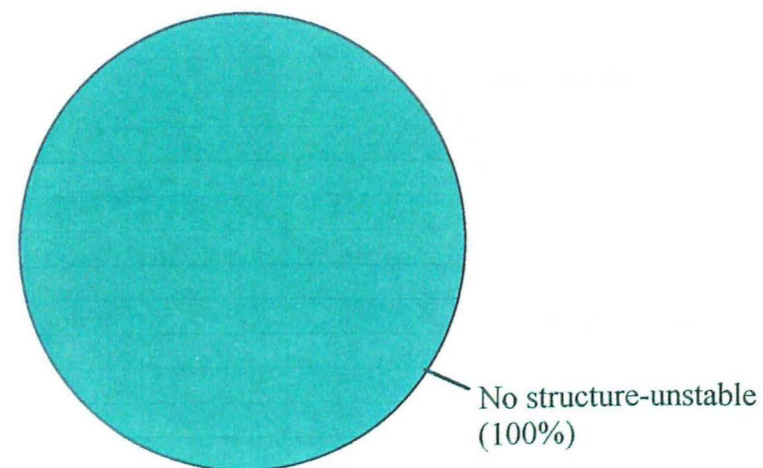


York River

Reach 022

Shoreline Conditions
(% of total reach length)

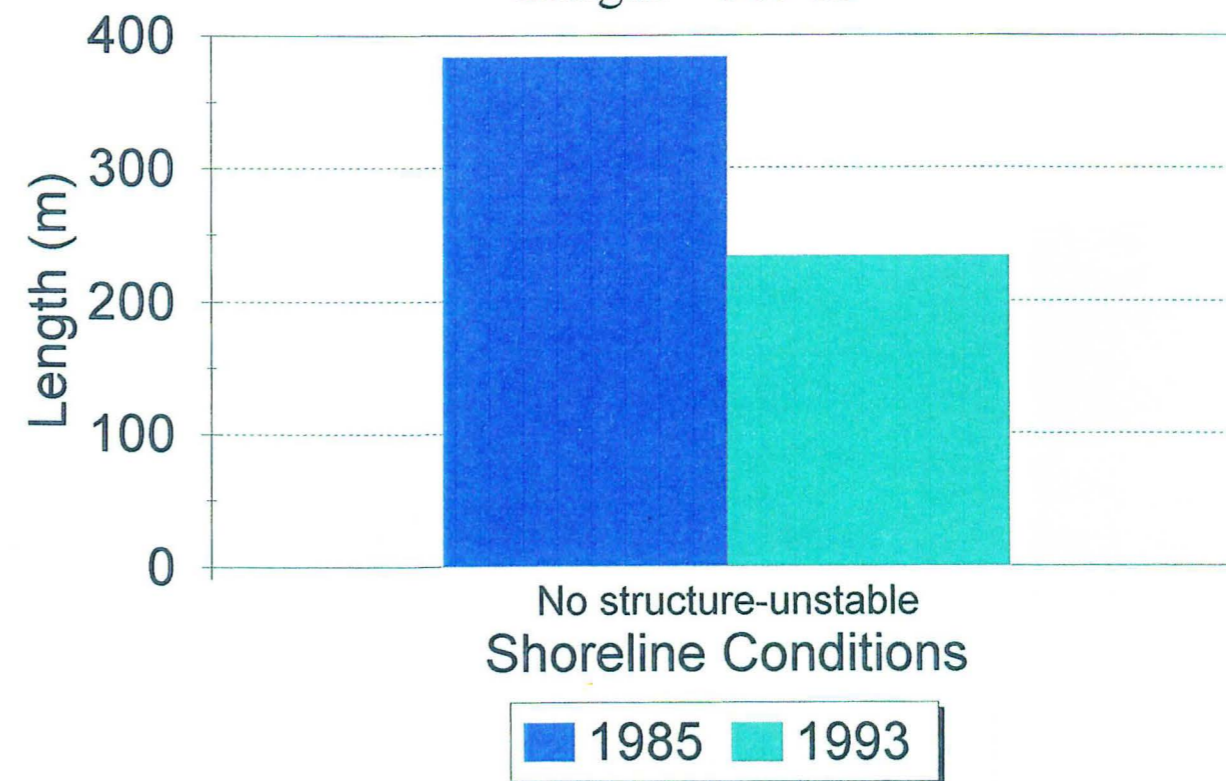
1993



York River

Reach 022

Length = 309 m

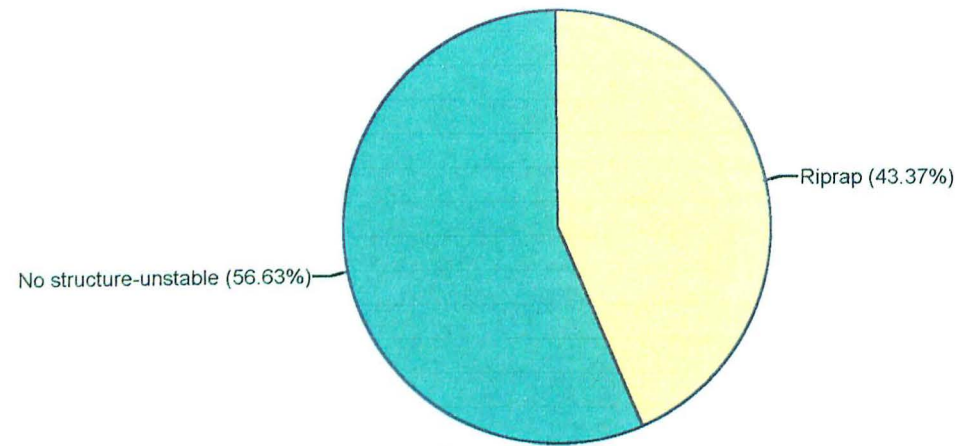


York River

Reach 023

Shoreline Conditions
(% of total reach length)

1985

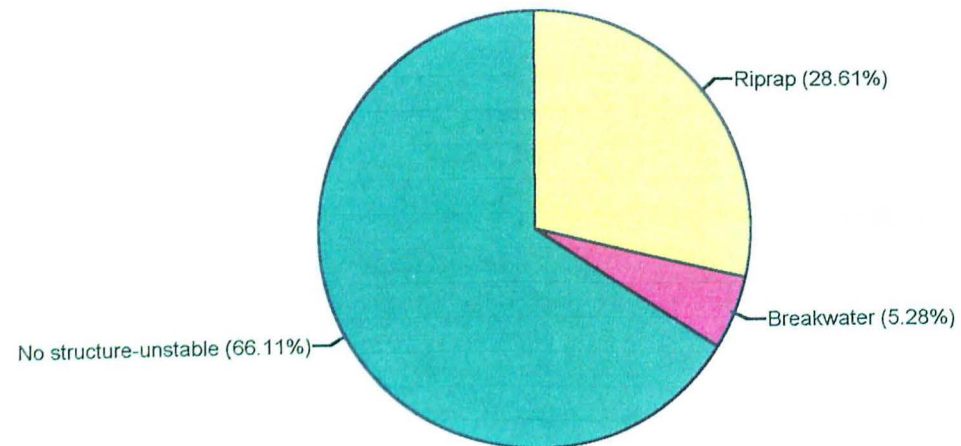


York River

Reach 023

Shoreline Conditions
(% of total reach length)

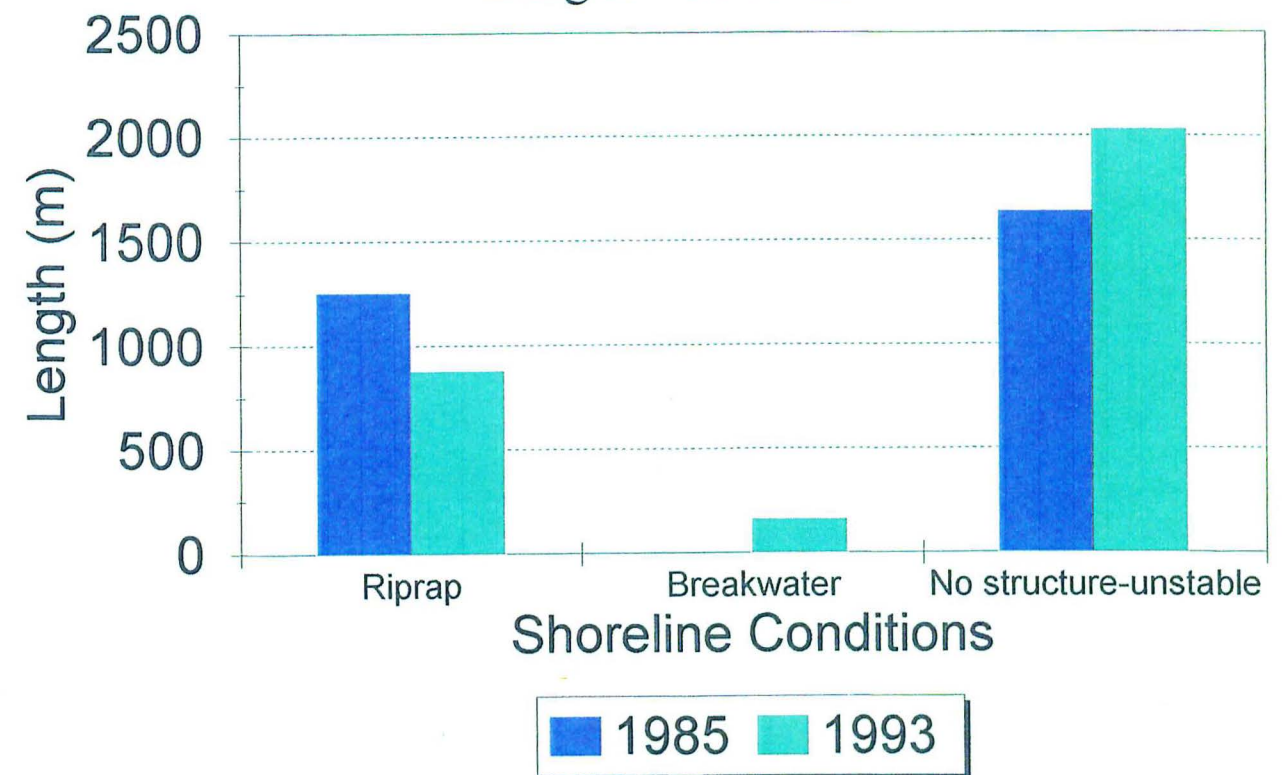
1993



York River

Reach 023

Length = 2979 m

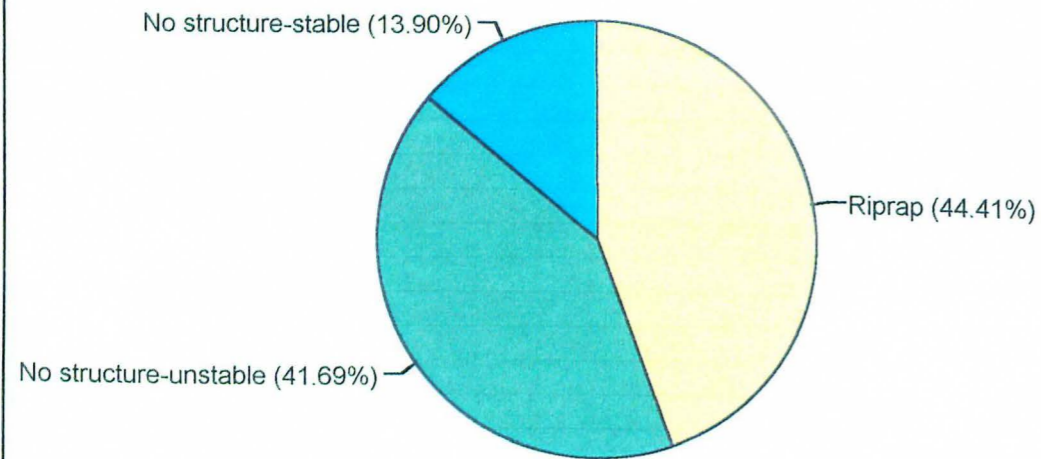


York River

Reach 024

Shoreline Conditions
(% of total reach length)

1985

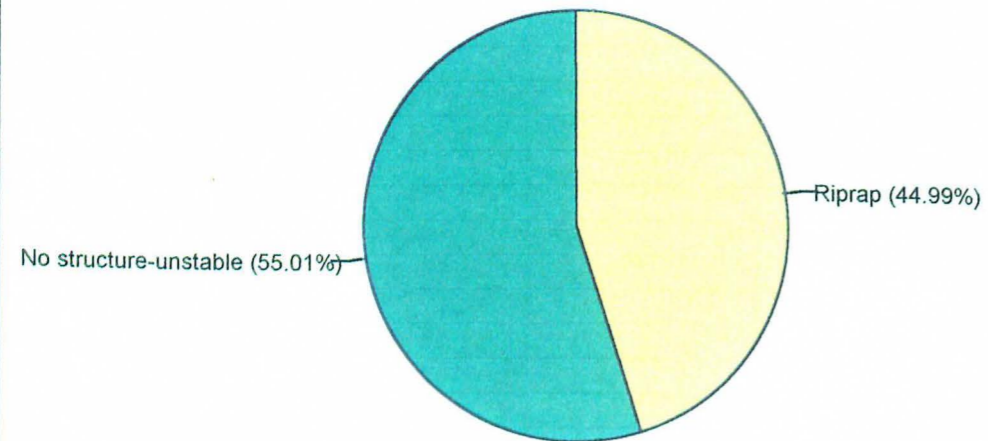


York River

Reach 024

Shoreline Conditions
(% of total reach length)

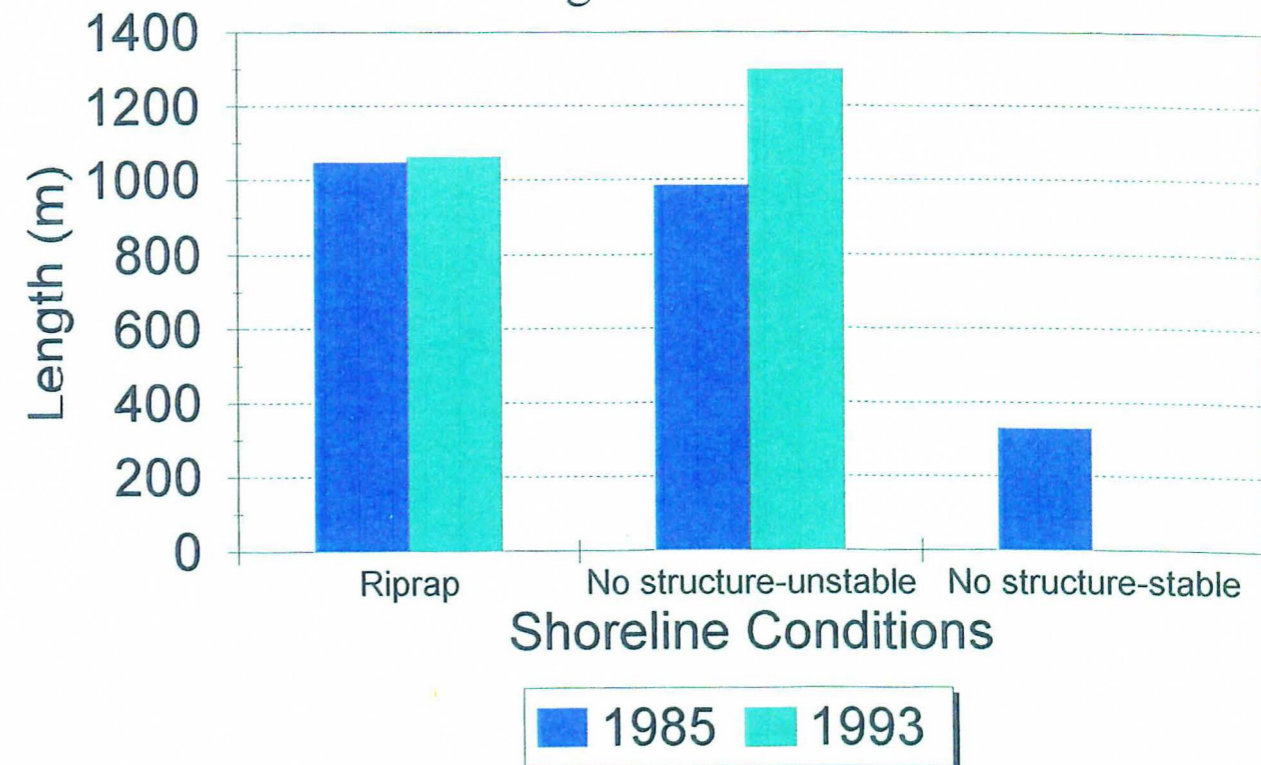
1993



York River

Reach 024

Length = 2360 m

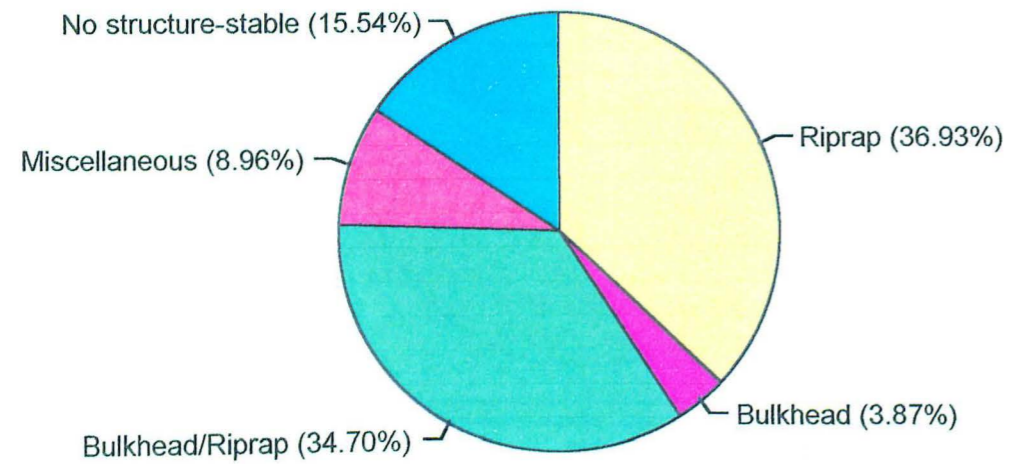


York River

Reach 025

Shoreline Conditions
(% of total reach length)

1985

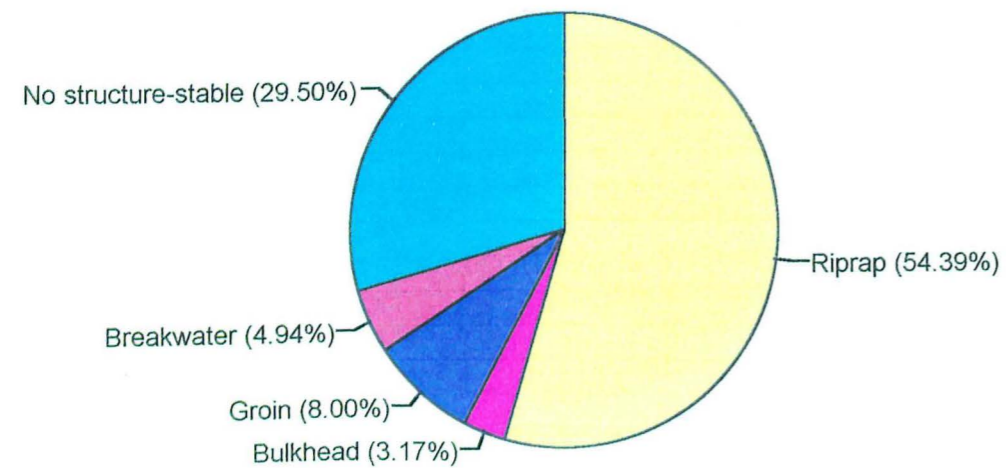


York River

Reach 025

Shoreline Conditions
(% of total reach length)

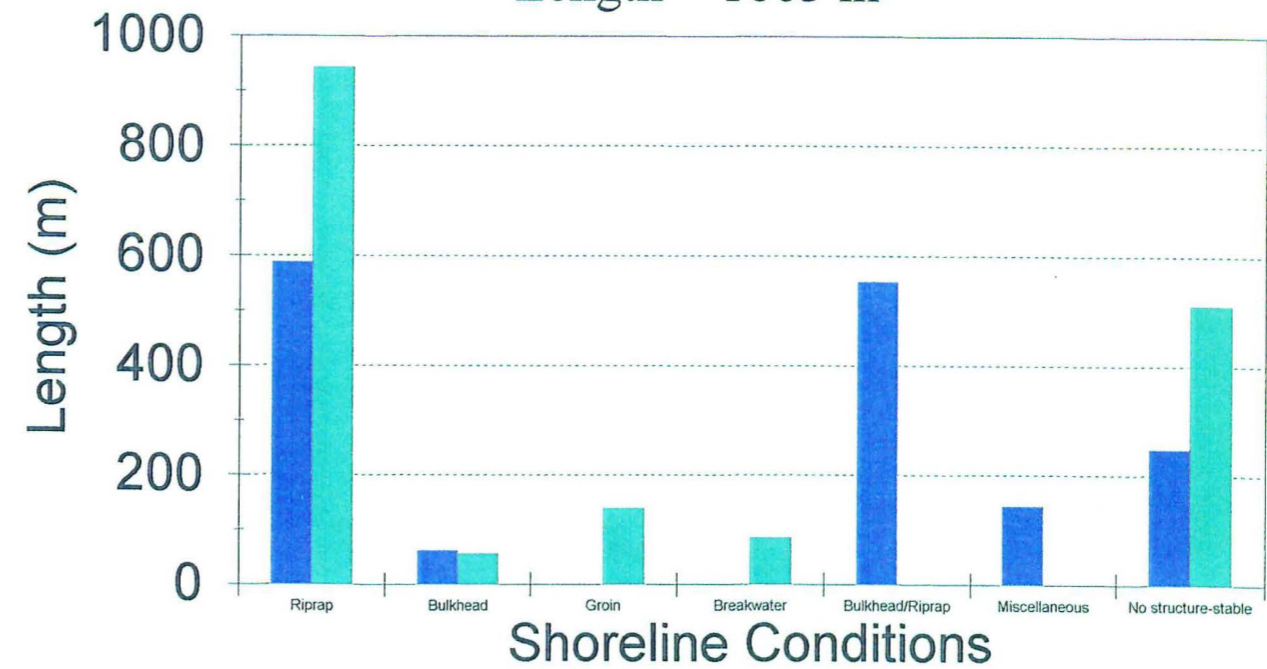
1993



York River

Reach 025

Length = 1663 m

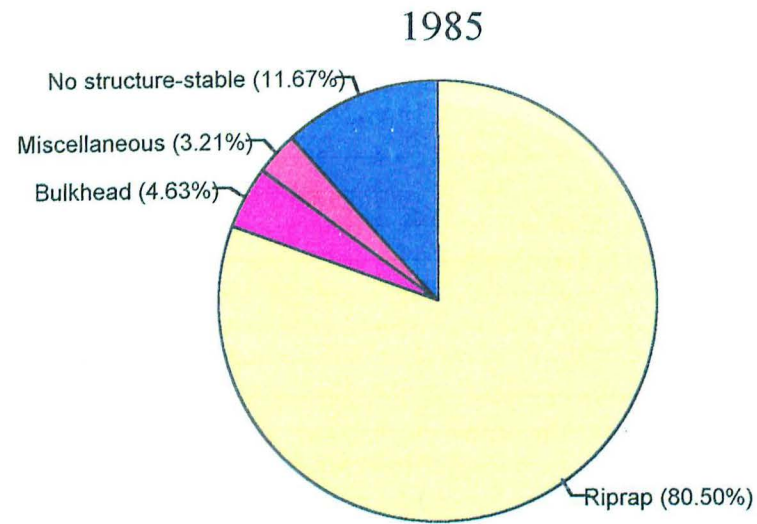


■ 1985 ■ 1993

Western Bay Shore

Reach 026

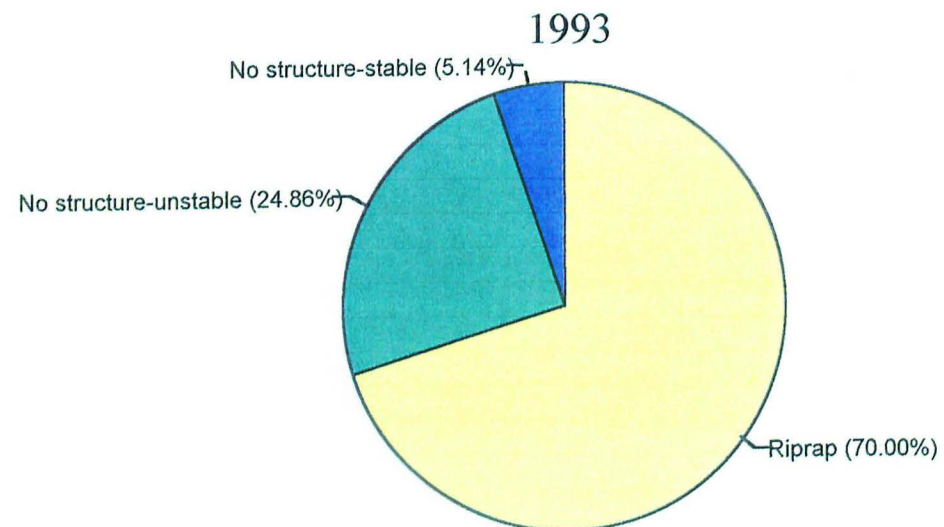
Shoreline Conditions
(% of total reach length)



Western Bay Shore

Reach 026

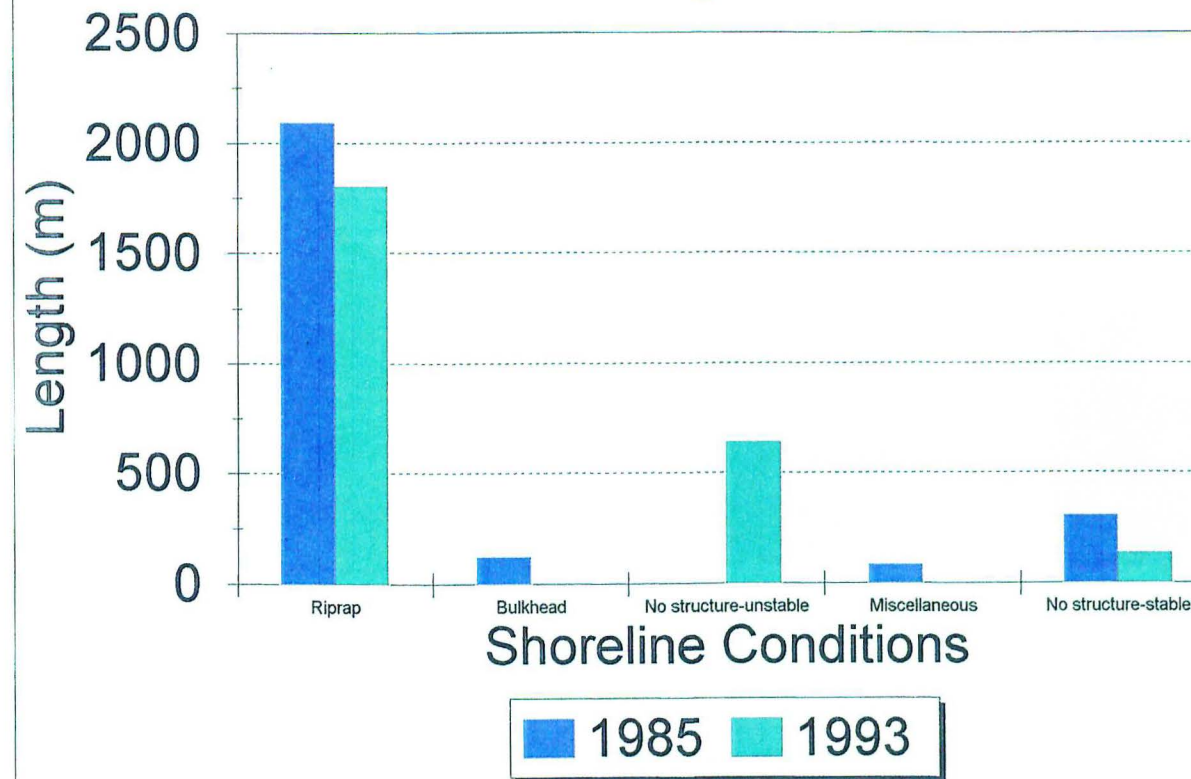
Shoreline Conditions
(% of total reach length)



Western Bay Shore

Reach 026

Reach Length = 2585 m

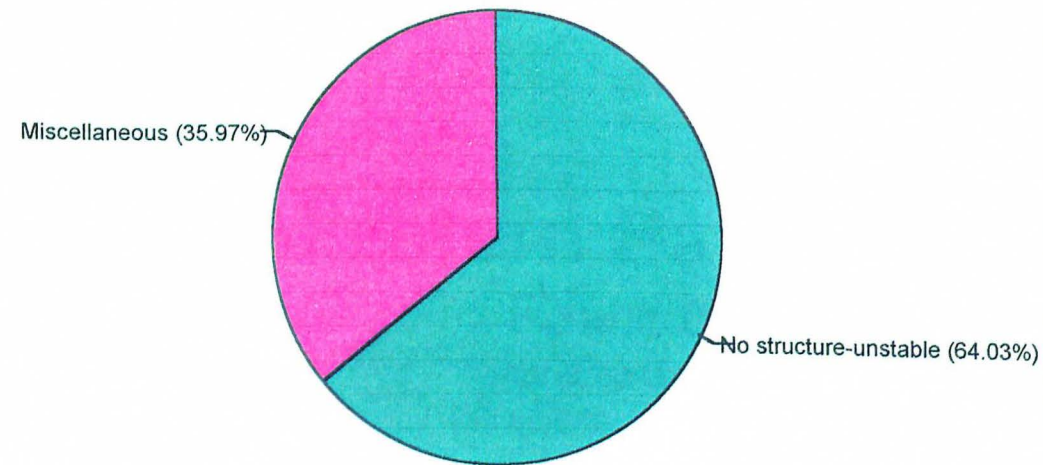


Western Bay Shore

Reach 027

Shoreline conditions
(% of total reach code)

1985

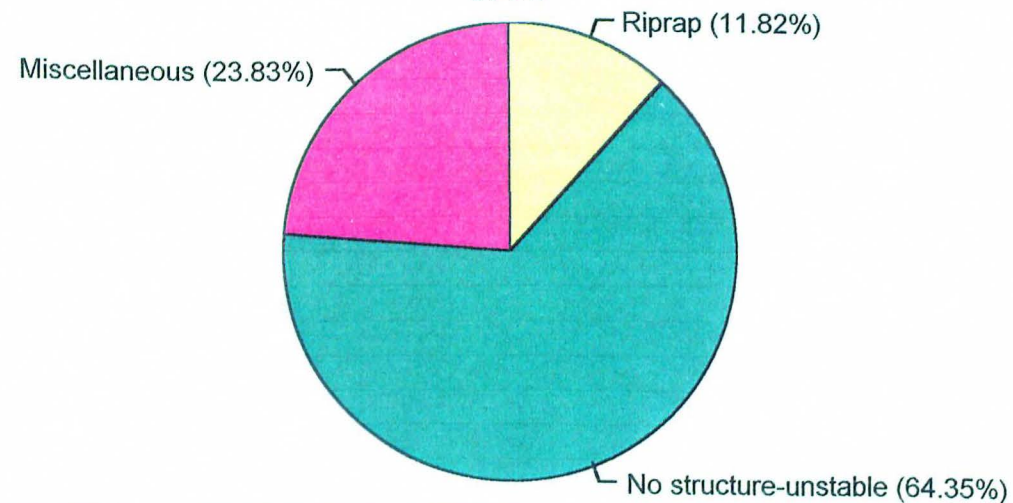


Western Bay Shore

Reach 027

Shoreline conditions
(% of total reach code)

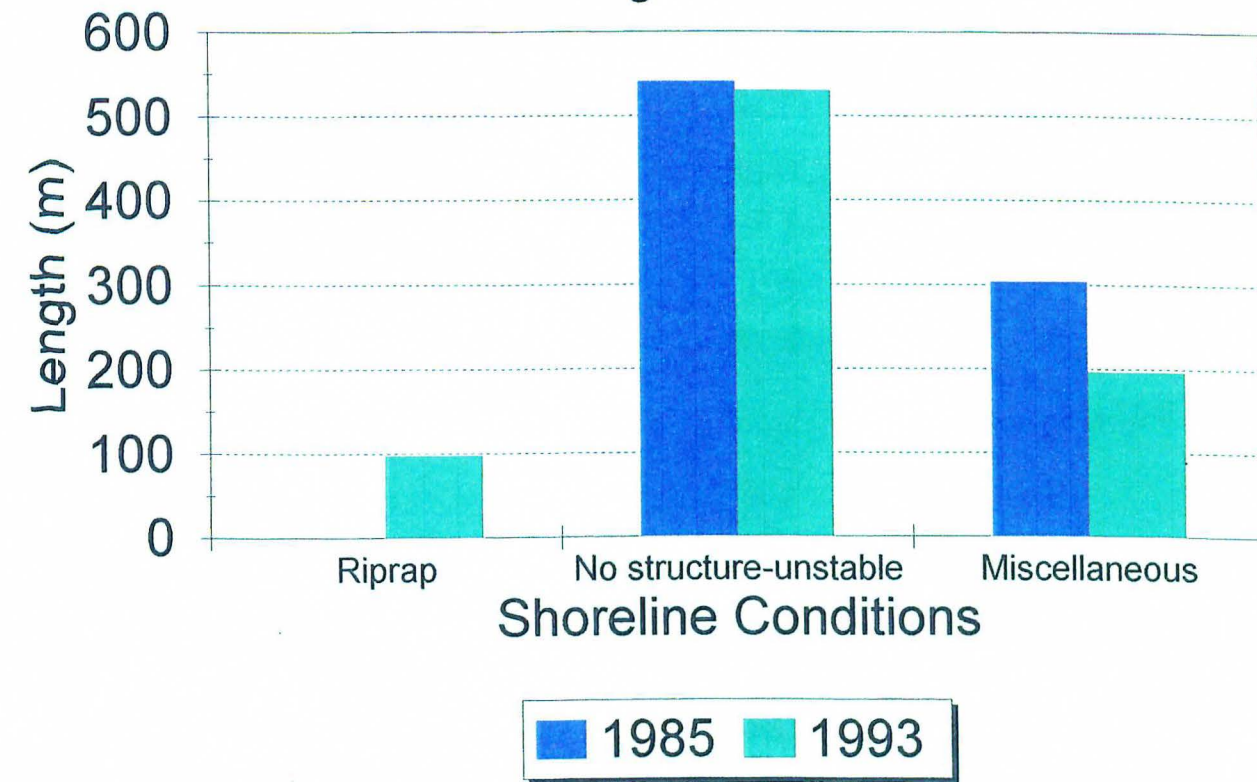
1993



Western Bay Shore

Reach 027

Reach Length = 834 m

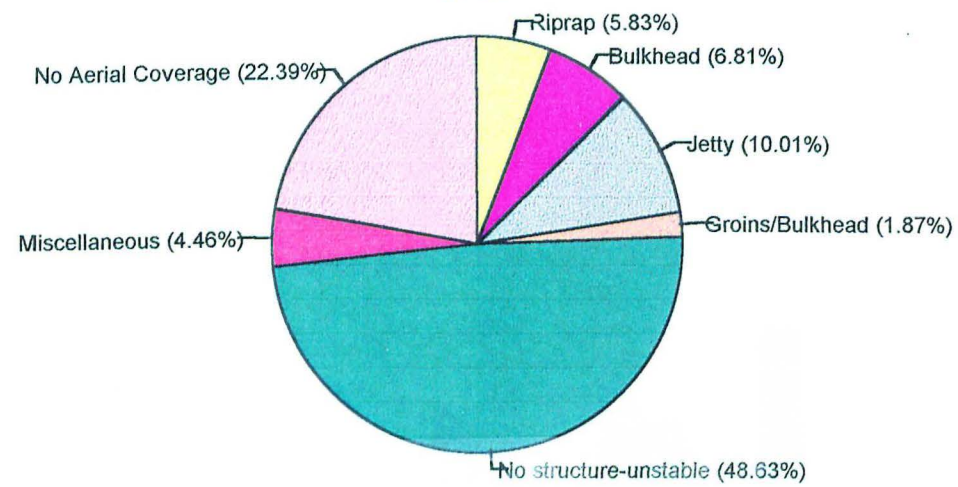


Western Bay Shore

Reach 030

Shoreline Conditions
(% of total reach length)

1985

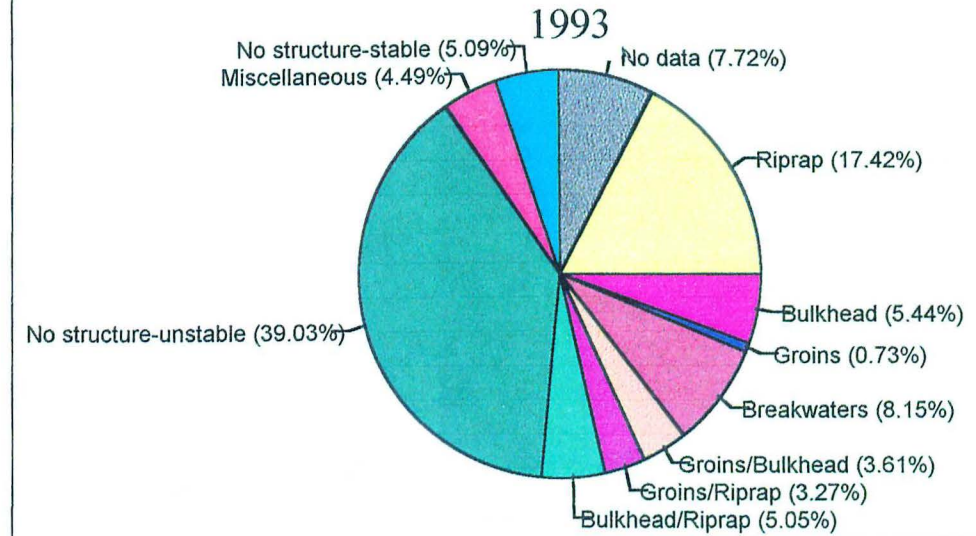


Western Bay Shore

Reach 030

Shoreline Conditions
(% of total reach length)

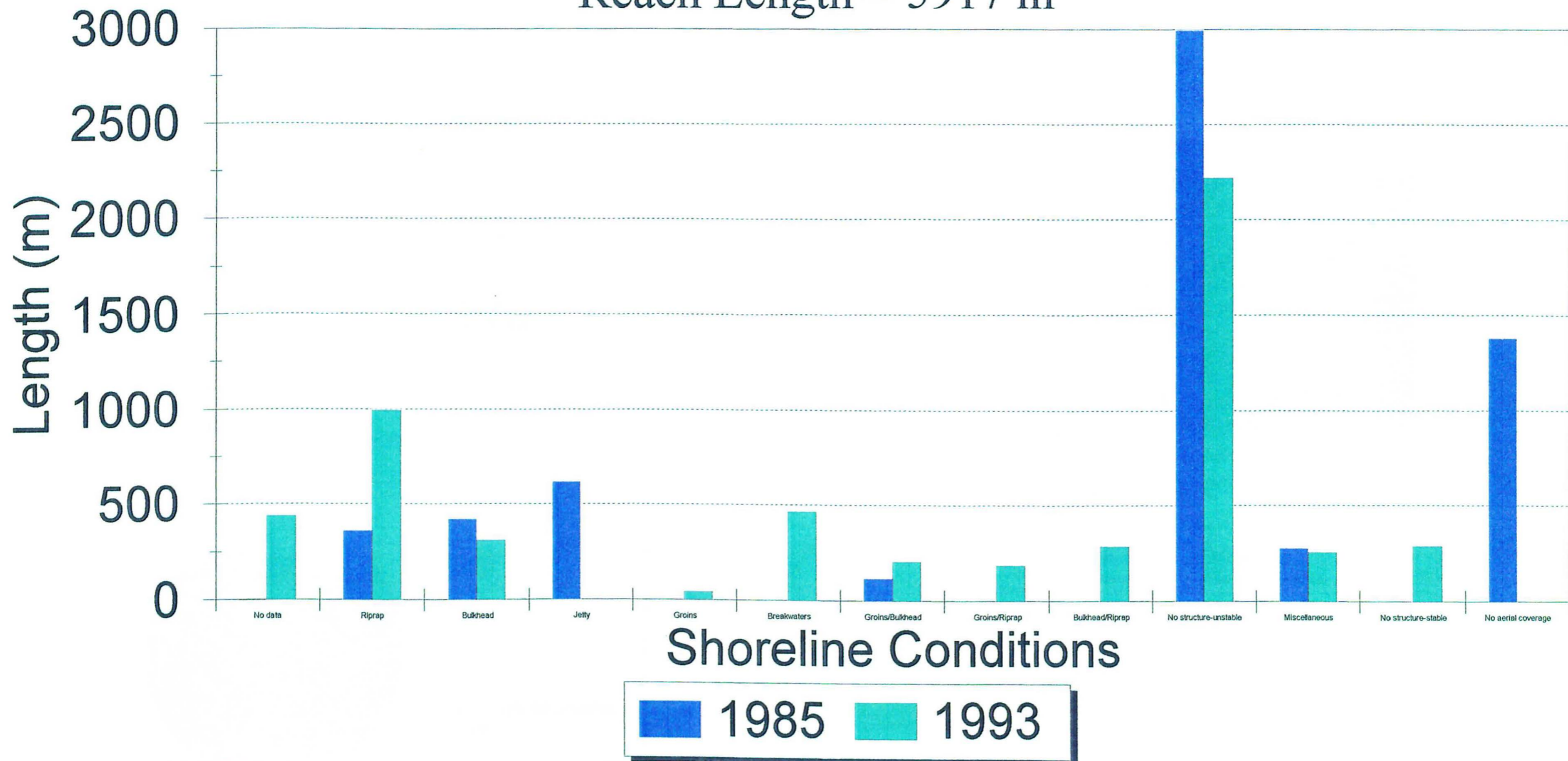
1993



Western Bay Shore

Reach 030

Reach Length = 5917 m

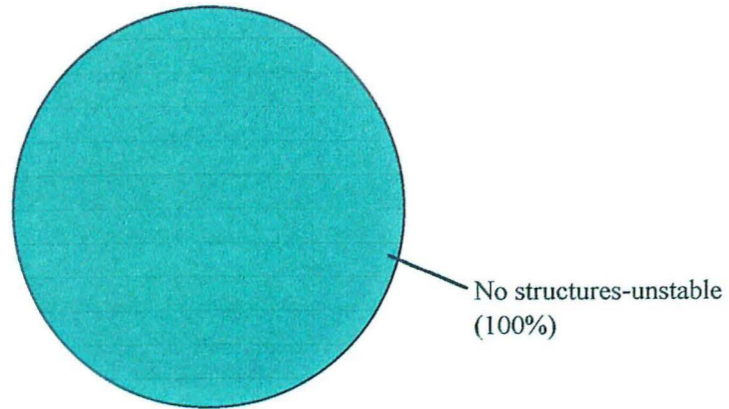


Western Bay Shore

Reach 031

Shoreline Conditions
(% of total reach length)

1985

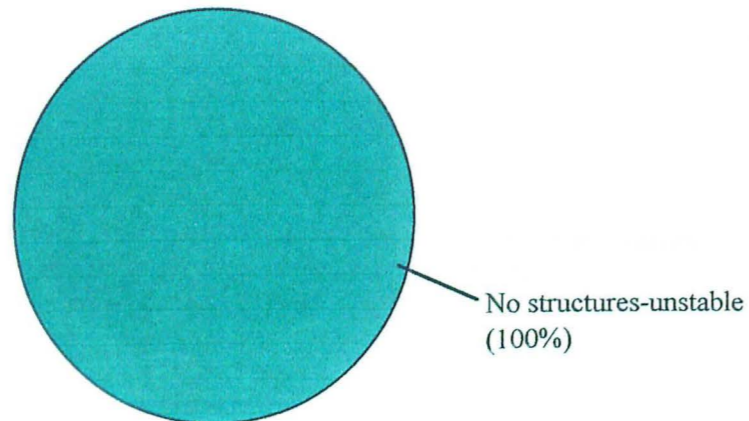


Western Bay Shore

Reach 031

Shoreline Conditions
(% of total reach length)

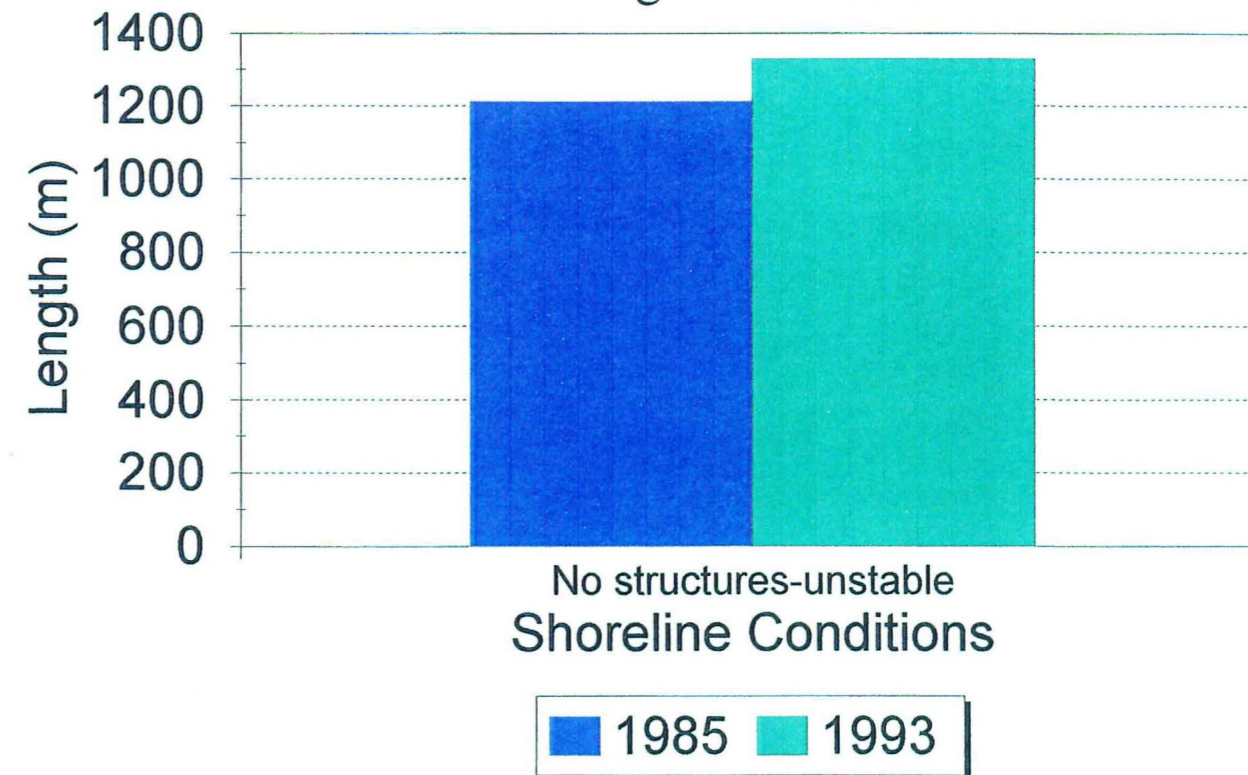
1993



Western Bay Shore

Reach 031

Reach Length = 1270 m

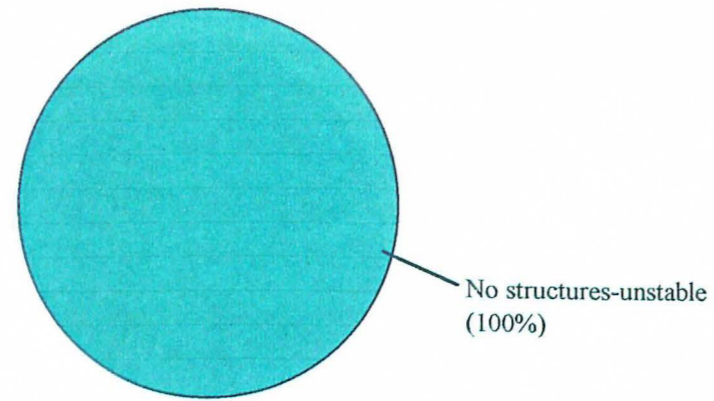


Western Bay Shore

Reach 032

Shoreline Conditions
(% of total reach length)

1985

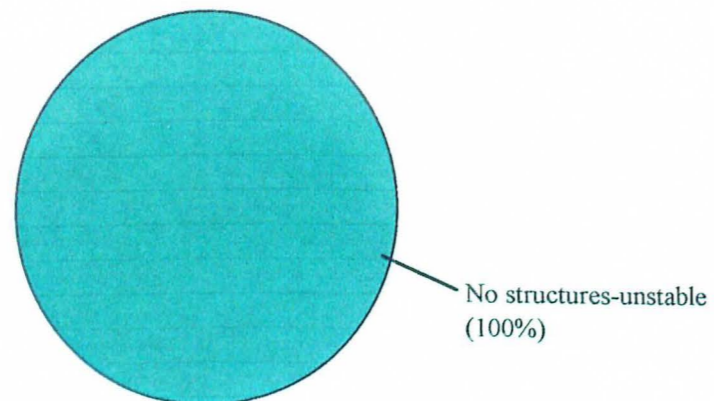


Western Bay Shore

Reach 032

Shoreline Conditions
(% of total reach length)

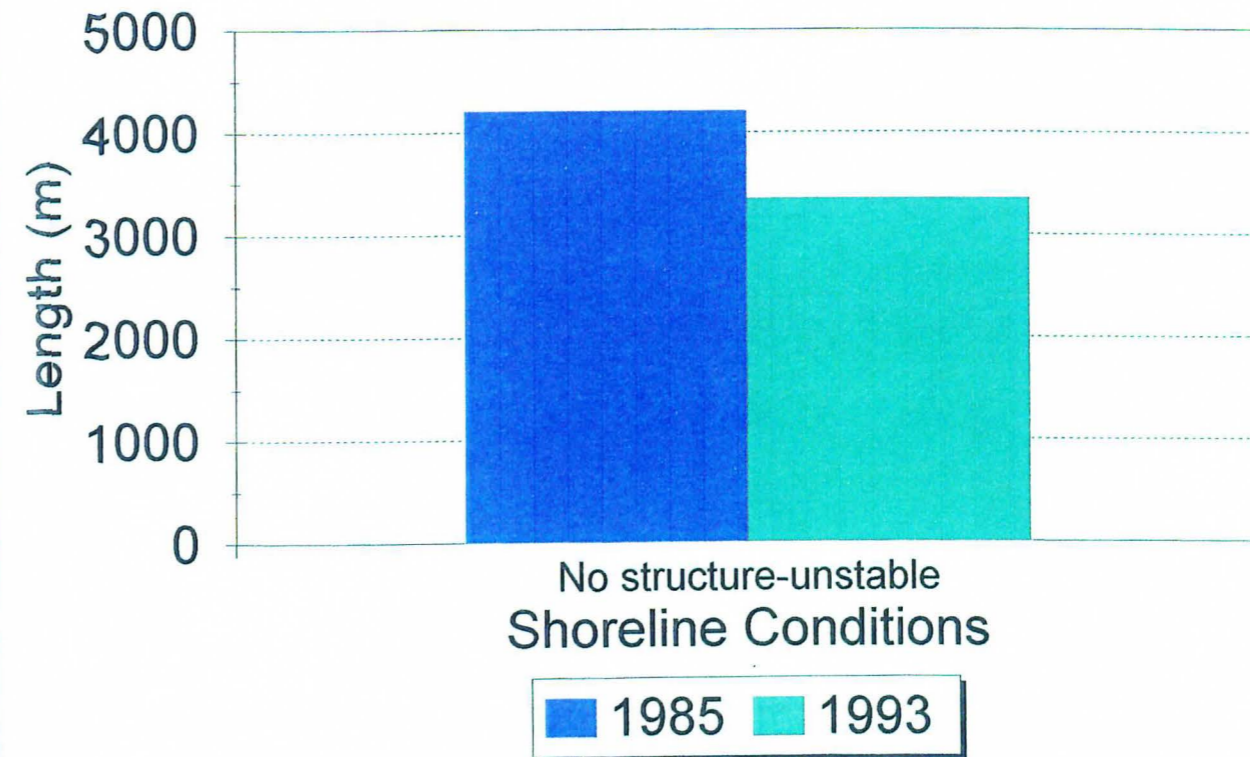
1993



Western Bay Shore

Reach 032

Reach Length = 3776 m

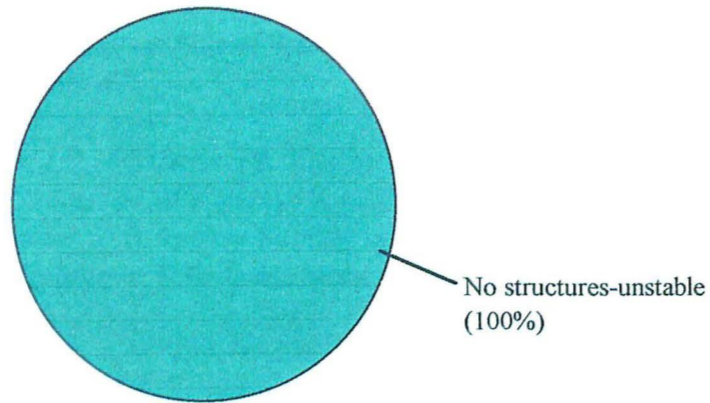


Western Bay Shore

Reach 033

Shoreline Conditions
(% of total reach length)

1985

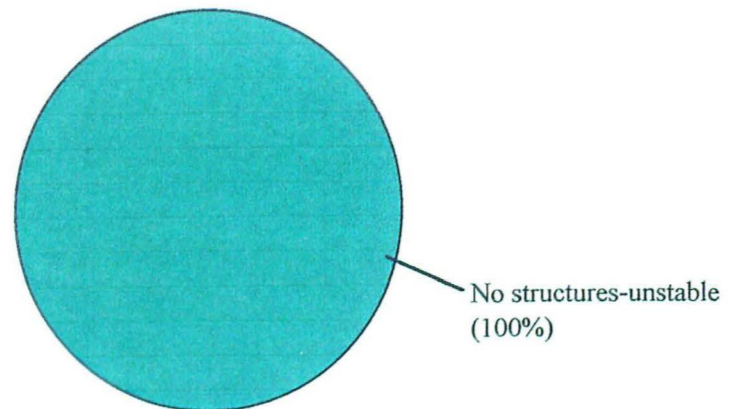


Western Bay Shore

Reach 033

Shoreline Conditions
(% of total reach length)

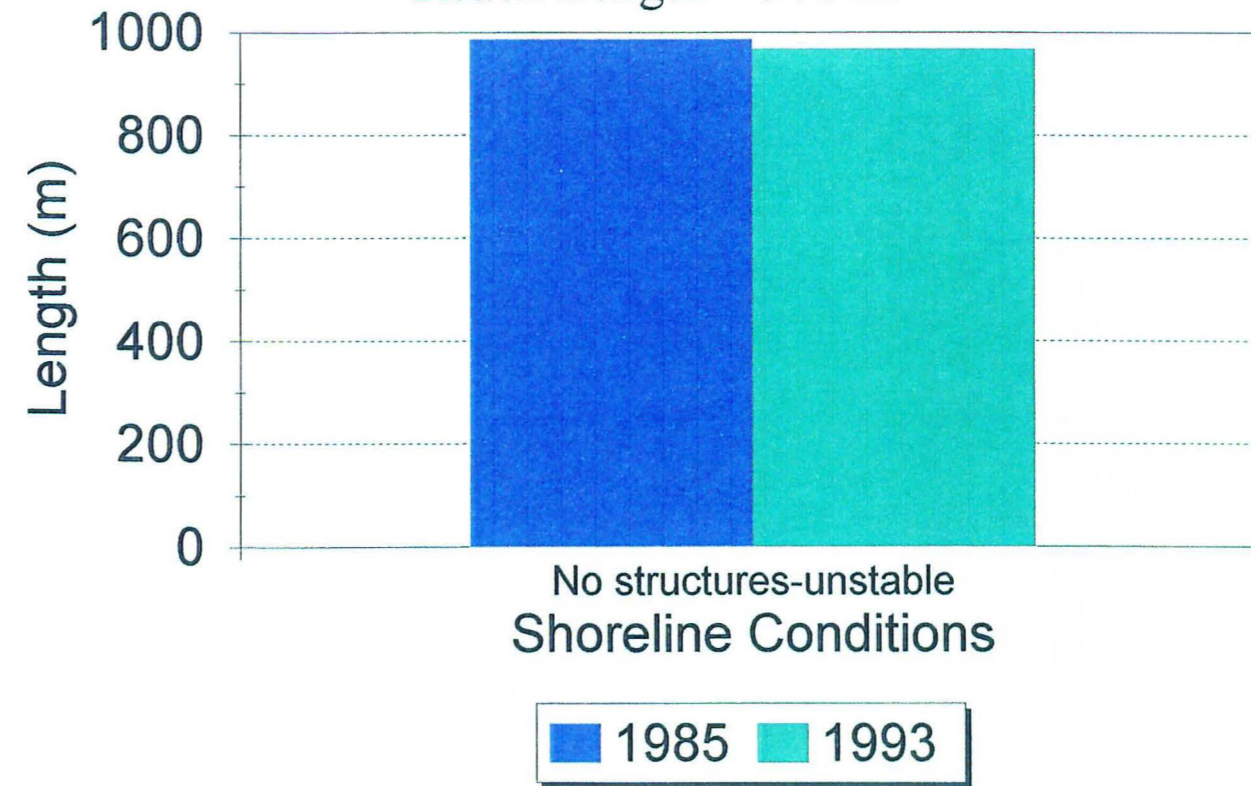
1993



Western Bay Shore

Reach 033

Reach Length = 976 m



References/Suggested Readings

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