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Shoreline Situation Report JAMES CITY COUNTY, VIRGINIA

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Special Report In Applied Marine Science and Ocean Engineering Number 81 of the

VIRGINIA INSTITUTE OF MARINE SCIENCE
Gloucester Point, Virginia 23062

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CHAPTER 1

Introduction

CHAPTER 1
INTRODUCTION

1.1 PURPOSES AND GOALS

It is the objective of this report to supply an assessment, and at least a partial integration, of those important shoreland parameters and characteristics which will aid the planners and the managers of the shorelands in making the best decisions for the utilization of this limited and very valuable resource. The report gives particular attention to the problem of shore erosion and to recommendations concerning the alleviation of the impact of this problem. In addition we have tried to include in our assessment some of the potential uses of the shoreline, particularly with respect to recreational use, since such information could be of considerable value in the way a particular segment of coast is perceived by potential users.

The basic advocacy of the authors in the preparation of the report is that the use of shorelands should be planned rather than haphazardly developed in response to the short term pressures and interests. Careful planning could reduce the conflicts which may be expected to arise between competing interests. Shoreland utilization in many areas of the country, and indeed in some places in Virginia, has proceeded in a manner such that the very elements which attracted people to the shore have been destroyed by the lack of planning and forethought.

The major man-induced uses of the shorelands are:

- Residential, commercial, or industrial development

- Recreation
- Transportation
- Waste disposal
- Extraction of living and non-living resources

Aside from the above uses, the shorelands serve various ecological functions.

The role of planners and managers is to optimize the utilization of the shorelands and to minimize the conflicts arising from competing demands. Furthermore, once a particular use has been decided upon for a given segment of shoreland, both the planners and the users want that selected use to operate in the most effective manner. A park planner, for example, wants the allotted space to fulfill the design most efficiently. We hope that the results of our work are useful to the planner in designing the beach by pointing out the technical feasibility of altering or enhancing the present configuration of the shore zone. Alternately, if the use were a residential development, we would hope our work would be useful in specifying the shore erosion problem and by indicating defenses likely to succeed in containing the erosion. In summary our objective is to provide a useful tool for enlightened utilization of a limited resource, the shorelands of the Commonwealth.

Shorelands planning occurs, either formally or informally, at all levels from the private owner of shoreland property to county governments, to planning districts and to the state and federal agency level. We feel our results will be useful at all these levels. Since the most basic level of comprehensive planning and zoning is at the county or city level, we have executed our report on that level although we realize some of the information

may be most useful at a higher governmental level. The Commonwealth of Virginia has traditionally chosen to place, as much as possible, the regulatory decision processes at the county level. The Virginia Wetlands Act of 1972 (Chapter 2.1, Title 62.1, Code of Virginia), for example, provides for the establishment of County Boards to act on applications for alterations of wetlands. Thus, our focus at the county level is intended to interface with and to support the existing or pending county regulatory mechanisms concerning activities in the shorelands zone.

1.2 ACKNOWLEDGEMENTS

This report was prepared with funds provided by the Research Applied to National Needs Program (RANN) of the National Science Foundation administered through the Chesapeake Research Consortium (CRC), Inc. George Dawes and Gene Silberhorn of the VIMS Wetlands Section contributed many useful ideas and criticisms. Dennis Owen and Gaynor Williams assisted with the data reduction. Beth Marshall typed the manuscript. Jane Davis, Kay Stubblefield, Peter Rosen, Joe Gilley, Russell Bradley, Ken Thornberry, and Bill Jenkins prepared the graphics. We also thank the numerous other persons in Maryland and Virginia who have criticized and commented upon our ideas and methods.

CHAPTER 2
Approach Used and Elements Considered

CHAPTER 2

APPROACH USED AND ELEMENTS CONSIDERED

2.1 APPROACH TO THE PROBLEM

In the preparation of this report the authors utilized existing information wherever possible. For example, for such elements as water quality characteristics, zoning regulations, or flood hazard, we reviewed relevant reports by local, state, or federal agencies. Much of the desired information, particularly with respect to erosional characteristics, shoreland types, and use was not available, so we performed the field work and developed classification schemes. In order to analyze successfully the shoreline behavior we placed heavy reliance on low altitude, oblique, color, 35 mm photography. We photographed the entire shoreline of each county and cataloged the slides for easy access at VIMS, where they remain available for use. We then analyzed these photographic materials, along with existing conventional aerial photography and topographic and hydrographic maps, for the desired elements. We conducted field inspection over much of the shoreline, particularly at those locations where office analysis left questions unresolved. In some cases we took additional photographs along with the field visits to document the effectiveness of shoreline defenses.

The basic shoreline unit considered is called a subsegment, which may range from a few hundred feet to several thousand feet in length. The end points of the subsegments were generally chosen on physiographic consideration such as changes in the character of erosion or deposition. In those cases where a radical change in land use occurred, the point of change was taken as a boundary point of

the subsegment. Segments are a grouping of subsegments. The boundaries for segments also were selected on physiographic units such as necks or peninsulas between major tidal creeks. Finally, the county itself is considered as a sum of shoreline segments.

The format of presentation in the report follows a sequence from general summary statements for the county (Chapter 3) to tabular segment summaries and finally detailed descriptions and maps for each subsegment (Chapter 4). The purpose in choosing this format was to allow selective use of the report since some users' needs will adequately be met with the summary overview of the county while others will require the detailed discussion of particular subsegments.

2.2 CHARACTERISTICS OF THE SHORELANDS INCLUDED IN THE STUDY

The characteristics which are included in this report are listed below followed by a discussion of our treatment of each.

- a) Shorelands physiographic classification
- b) Shorelands use classification
- c) Shorelands ownership classification
- d) Zoning
- e) Water quality
- f) Shore erosion and shoreline defenses
- g) Potential shore uses
- h) Distribution of marshes
- i) Flood hazard levels
- j) Shellfish leases and public shellfish grounds
- k) Beach quality

- a) Shorelands Physiographic Classification:
The shorelands of the Chesapeake Bay System

may be considered as being composed of three interacting physiographic elements: the fastlands, the shore and the nearshore. A physiographic classification based upon these three elements has been devised as it provides the opportunity to examine joint relationships among the elements. As an example, the application of the system permits the user to determine miles of high bluff shoreland interfacing with marsh in the shore zone.

Definitions:

Shore Zone

This is the zone of beaches and marshes. It is a buffer zone between the water body and the fastland. The seaward limit of the shore zone is the break in slope between the relatively steeper shoreface and the less steep nearshore zone. The approximate landward limit is a contour line representing one and a half times the mean tide range above mean low water (refer to Figure 1A). In operation with topographic maps the inner fringe of the marsh symbols is taken as the landward limit.

The physiographic character of the marshes has also been separated into three types (see Figure 1B). Fringe marsh is that which is less than 400 feet in width and which runs in a band parallel to the shore. Extensive marsh is that which has extensive acreage projecting into an estuary or river. An embayed marsh is a marsh which occupies a reentrant or drowned creek valley. The purpose in delineating these marsh types is that the effectiveness of the various functions of the marsh will, in part, be determined by type of exposure to the estuarine system. A fringe marsh may, for example, have maximum value as a buffer to wave erosion of the fastland. An extensive marsh, on

the other hand, is likely a more efficient transporter of detritus and other food chain materials due to its greater drainage density than an embayed marsh. The central point is that planners, in the light of ongoing and future research, will desire to weight various functions of marshes and the physiographic delineation aids their decision making by denoting where the various types exist. The classification used is:

Beach

Marsh

Fringe marsh, < 400 ft. (122 m) in width along shores

Extensive marsh

Embayed marsh, occupying a drowned valley or reentrant

Artificially stabilized

Fastland Zone

The zone extending from the landward limit of the shore zone is termed the fastland. The fastland is relatively stable and is the site of most material development or construction. The physiographic classification of the fastland (see Table 1) is based upon the slope of the land near the water.

Low shore, 20-ft. (6 m) contour > 400 ft.

(122 m) from fastland-shore boundary

Moderately low shore, 20-ft. (6 m) contour

< 400 ft. (122 m); with or without cliff

Moderately high shore, 40-ft. (12 m) contour

< 400 ft. (122 m); with or without cliff

High shore, 60-ft. (18 m) contour < 400 ft.

(122 m); with or without cliff

Dune

Artificial fill, urban and otherwise

Nearshore Zone

The nearshore zone extends from the shore zone to the minus 12-foot (MLW datum) contour. In the smaller tidal rivers the 6-foot depth is taken as the reference depth. The 12-foot depth is probably the maximum depth of significant sand transport by waves in the Chesapeake Bay area. Also, the distinct drop-off into the river channels begins roughly at the 12-foot depth. The nearshore zone includes any tidal flats.

The class limits for the nearshore zone classifications were chosen following a simple statistical study. The distance to the 12-foot underwater contour (isobath) was measured on the appropriate charts at one-mile intervals along the shorelines of Chesapeake Bay and the James, York, Rappahannock, and Potomac Rivers. Means and standard deviations for each of the separate regions and for the entire combined system were calculated and compared. Although the distributions were non-normal, they were generally comparable, allowing the data for the combined system to determine the class limits.

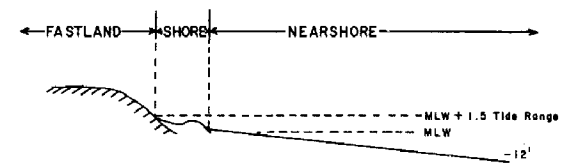
The calculated mean was 919 yards with a standard deviation of 1,003 yards. As our aim was to determine general, serviceable class limits, these calculated numbers were rounded to 900 and 1,000 yards respectively. The class limits were set at half the standard deviation (500 yards) each side of the mean. Using this procedure a narrow nearshore zone is one 0-400 yards in width, intermediate 400-1,400, and wide greater than 1,400.

These definitions have no legal significance and were constructed for our classification purposes.

Narrow, 12-ft. (3.7 m) isobath located < 400

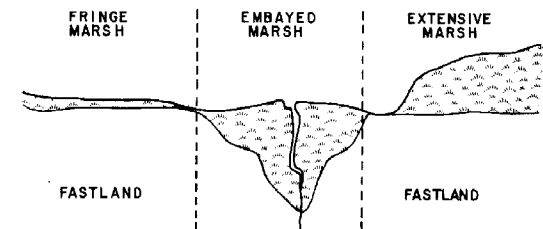
yards from shore
Intermediate, 12-ft. (3.7 m) isobath 400-1,400 yards from shore
Wide, 12-ft. (3.7 m) isobath > 1,400 yards
Subclasses: with or without bars
with or without tidal flats
with or without submerged vegetation

Figure 1A



An illustration of the definition of the three components of the shorelands.

Figure 1B



A generalized illustration of the three different marsh types.

b) Shorelands Use Classification:

Fastland Zone

Residential

Includes all forms of residential use with the exception of farms and other isolated dwellings. In general, a residential area consists of four or more residential buildings adjacent to one another. Schools, churches, and isolated businesses may be included in a residential area.

Commercial

Includes buildings, parking areas, and other land directly related to retail and wholesale trade and business. This category includes small industry and other anomalous areas within the general commercial context. Marinas are considered commercial shore use.

Industrial

Includes all industrial and associated areas. Examples: warehouses, refineries, shipyards, power plants, railyards.

Government

Includes lands whose usage is specifically controlled, restricted, or regulated by governmental organizations: e.g., Camp Peary, Fort Story.

Recreation and Other Public Open Spaces

Includes designated outdoor recreation lands and miscellaneous open spaces. Examples: golf courses, tennis clubs, amusement parks, public beaches, race tracks, cemeteries, parks.

Preserved

Includes lands preserved or regulated for

environmental reasons, such as wildlife or wild-fowl sanctuaries, fish and shellfish conservation grounds, or other uses that would preclude development.

Agricultural

Includes fields, pastures, croplands, and other agricultural areas.

Unmanaged

Includes all open or wooded lands not included in other classifications:

- a) Open: brush land, dune areas, wastelands; less than 40% tree cover.
- b) Wooded: more than 40% tree cover.

The shoreland use classification applies to the general usage of the fastland area to an arbitrary distance of half mile from the shore or beach zone or to some less distant, logical barrier. In multi-usage areas one must make a subjective selection as to the primary or controlling type of usage.

Shore Zone

Bathing
Boat launching
Bird watching
Waterfowl hunting

Nearshore Zone

Pound net fishing
Shellfishing
Sport fishing
Extraction of non-living resources
Boating
Water sports

c) Shorelands Ownership Classification

The shorelands ownership classification used has two main subdivisions, private and governmental, with the governmental further divided into federal, state, county, and town or city. Application of the classification is restricted to fastlands alone since the Virginia fastlands ownership extends to mean low water. All bottoms below mean low water are in State ownership.

d) Water Quality

The ratings of satisfactory, intermediate or unsatisfactory assigned to the various subsegments are taken from a listing at the Virginia Bureau of Shellfish Sanitation, based on information from water samples collected in the various tidewater shellfishing areas. The Bureau attempts to visit each area at least once a month.

The ratings are defined primarily in regard to number of coliform bacteria. For a rating of satisfactory the maximum limit is an MPN (Most Probable Number) of 70 per 100 ml. The upper limit for fecal coliforms is an MPN of 23. Usually any count above these limits results in an unsatisfactory rating, and, from the Bureau's standpoint, results in restricting the waters from the taking of shellfish for direct sale to the consumer.

There are instances, however, when the total coliform MPN may exceed 70, although the fecal MPN does not exceed 23, and other conditions are acceptable. In these cases an intermediate rating may be assigned temporarily, and the area will be permitted to remain open pending an improvement in conditions.

Although these limits are somewhat more stringent than those used in rating recreational waters

(see Virginia State Water Control Board, Water Quality Standards 1946, amended 1970), they are used here because the Bureau of Shellfish Sanitation provides the best areawide coverage available at this time. In general, any waters fitting the satisfactory or intermediate categories would be acceptable for water recreation.

e) Zoning

In cases where zoning regulations have been established the existing information pertaining to the shorelands has been included in the report.

f) Shore Erosion and Shoreline Defenses

The following ratings are used for shore erosion:

slight or none - less than 1 foot per year

moderate - - - 1 to 3 feet per year

severe - - - - greater than 3 feet per year

The locations with moderate and severe ratings are further specified as being critical or non-critical. The erosion is considered critical if buildings, roads, or other such structures are endangered.

The degree of erosion was determined by several means. In most locations the long term trend was determined using map comparisons of shoreline positions between the 1850's and the 1940's. In addition, aerial photographs of the late 1930's and recent years were utilized for an assessment of more recent conditions. Finally, in those areas experiencing severe erosion field inspections and interviews were held with local inhabitants.

The existing shoreline defenses were evaluated as to their effectiveness. In some cases repetitive visits were made to monitor the effec-

tiveness of recent installations. In instances where existing structures are inadequate, we have given recommendations for alternate approaches. Furthermore, recommendations are given for defenses in those areas where none currently exist. The primary emphasis is placed on expected effectiveness with secondary consideration to cost.

g) Potential Shore Uses

We placed particular attention in our study on evaluating the recreational potential of the shore zone. We included this factor in the consideration of shoreline defenses for areas of high recreational potential. Furthermore, we gave consideration to the development of artificial beaches if this method were technically feasible at a particular site.

h) Distribution of Marshes

The acreage and physiographic type of the marshes in each subsegment are listed. These estimates of acreages were obtained from topographic maps and should be considered only as approximations. Detailed county inventories of the wetlands are being conducted by the Virginia Institute of Marine Science under the authorization of the Virginia Wetlands Act of 1972 (Code of Virginia 62.1-13.4). These surveys include detailed acreages of the grass species composition within individual marsh systems. The material in this report is provided to indicate the physiographic types of marshes and to serve as a rough guide on acreages until detailed surveys are completed. Additional information of the wetlands characteristics may be found in Coastal Wetlands of Virginia: Interim Report by Marvin L. Wass and Thomas D.

Wright, SRAMSOE Report No. 10, Virginia Institute of Marine Science, 1969, and in other VIMS publications.

i) Flood Hazard Levels

The assessment of tidal flooding hazard for the whole of the Virginia tidal shoreland is still incomplete. However, the United States Army Corps of Engineers has prepared reports for a number of localities which were used in this report. Two tidal flood levels are customarily used to portray the hazard. The Intermediate Regional Flood is that flood with an average recurrence time of about 100 years. An analysis of past tidal floods indicates it to have an elevation of approximately 8 feet above mean water level in the Chesapeake Bay area. The Standard Project Flood level is established for land planning purposes which is placed at the highest probable flood level.

j) Shellfish Leases and Public Grounds

The data in this report show the leased and public shellfish grounds as portrayed in the Virginia State Water Control Board publication "Shellfish growing areas in the Commonwealth of Virginia: Public, leased and condemned," November 1971, and as periodically updated in other similar reports. Since the condemnation areas change with time they are not to be taken as definitive. However, some insight to the conditions at the date of the report are available by a comparison between the shellfish grounds maps and the water quality maps for which water quality standards for shellfish were used.

k) Beach Quality

Beach quality is a subjective judgment based on such considerations as the nature of the beach material, the length and width of the beach area, and the general aesthetic appeal of the beach setting.

CHAPTER 3

Present Shorelands Situation

3.1 THE SHORELANDS OF JAMES CITY COUNTY

This report is concerned with approximately 152 statute miles of shoreline in James City County, Virginia along the James, York, and Chickahominy Rivers and their tributary creeks. Seventeen miles, eleven percent, are in the York River system. About half of this is along the York itself, the remainder is along Skimino, Taskinas, and Ware Creeks. Most of the land is low shore, 9.4 miles, with the remainder being moderately low, moderately high, and high shore, all with a bluff. The shore itself is nearly equally divided between fringe marsh on the York River and embayed marsh along the creeks. The majority of the land is unmanaged and privately owned with a small portion of residential use. The federal government controls 2.6 miles of shoreline in and around Camp Peary. The state of Virginia has 3.8 miles which are planned for use as a York River State Park near Taskinas Creek.

The Chickahominy River and its tributaries comprise the largest individual segment of the county's shoreline, 78 miles or just over half of the total. Almost ninety percent of this is low shore with the remainder being nearly equal portions of bluffed, moderately low, moderately high, and high shore. Marsh, fringe 35.3, extensive, 24.6, and embayed 16.2 miles, accounts for all but 2 miles of shore. There is very little beach and some areas have been artificially stabilized, primarily by bulkhead. The fastland is privately owned and all but 8 miles are unmanaged. Marinas account for the areas of commercial use, and the remainder is agricultural or residential. The residential might be considered recreational as

many of the dwellings are second or vacation homes.

The five segments on the James River, totaling 57 miles are the most varied shorelands in the county. Nearly a third, 18 miles, are controlled by the federal government within the Jamestown Island National Historical Park or along the Colonial National Historical Parkway. All the other fastland is privately owned. Shoreland physiography is a fastland of mostly low shore with some higher, bluffed stretches, beach and fringe marsh along the river and embayed marsh in the tributary creeks, and a nearshore zone with widths generally from 400 to 1,400 yards. Most of the land, outside federal control, is unmanaged, agricultural or residential, however as the Kingsmill and First Colony developments grow, the extent of residential usage will increase.

This is the portion of James City County's shorelands that does and will experience the greatest pressure for human use. Some sections, specifically Carters Grove and the National Park areas act as natural buffers to very dense population concentrations and as green belts or buffers providing public recreation or open spaces. As discussed in the pages on erosion, the James River portion of James City County's shoreline also is the most dynamic section in terms of physical processes. Thus, any action affecting long term shorelands use or alteration should not be undertaken without considerable forethought and care.

3.2 SHORE EROSION IN JAMES CITY COUNTY, VIRGINIA

Each of the three primary rivers of James City County, the James, the York, and the Chickahominy, have distinct and different erosion problems. Specific long term historical erosion data is not available for portions of the James River, but shorter term measurements fill most of the gaps.

The most severe and virtually all the critical erosion areas are on the James River shoreline. Along Subsegment 5A, between Skiffes Creek and College Creek, most of the shoreline is bluff, and erosion, although only one to two feet per year, is quite dramatic. The problem, however, is one of normal downslope wasting occasionally accelerated by storm or flood action on the river. In areas where there is pressure to reduce erosion, the expenditure of effort and funds on decreasing slopes and on planting firmly rooted ground cover vegetation probably would be as successful as intricate shore defense structures. Assuming that shore defense, not enhancement, is the goal, shore structures such as large stone riprap, gabions, or wall structures - bulkheads, seawalls, retaining walls - would help stabilize the shoreline. Any wall structure would, in part, act as a retaining wall, helping to reduce slope erosion, and would feel pressure from both land and river generated forces. As in any area, prior to any attempt to control a portion of shoreline, there should be significant thought about end effects and about up and downstream consequences of the action.

The federally owned areas of the James River shoreline around the Colonial Parkway and Jamestown Island experience light to moderate erosion and need little action other than maintenance of

the present structures. There are several hundred feet of riprap that is quite successful in protecting given segments of the shore. Any other portions of Subsegments 4A and 4C deemed to require protection would adequately be protected by a continuation of the present defenses.

The real area of shoreline erosion problems in James City County is the area upstream of Jamestown Island. Some portions of the First Colony development show erosion rates of over ten feet per year. Areas of present and planned dwellings should be protected and protection should be constructed on an area rather than a cadastral basis. Construction of shore defense structures on the basis of individual properties with different contractors and different methods and at different times causes greatly increased cost and reduced effectiveness. It appears that bulkheading is the most successful tool in protecting this stretch of shoreline. Proper landscaping, that is slope reduction and proper vegetation, can significantly aid the effectiveness of the bulkhead. Also, the great clay content of the bluff and resulting impermeability of the soil require that the bulkhead be carefully constructed with a filter cloth backing and weep holes. The top of the bulkhead should be high enough to prevent frequent overtopping by waves. It is very important that any water behind the bulkhead be allowed a free channel through the wall; otherwise the increased hydrostatic pressure on the back of the wall will hasten failure and the great volume of water trapped behind the bulkhead will soften the ground creating the potential for muddy ponds behind the bulkhead. The addition of a channel of coarse, permeable backfill material behind the

wall is strongly recommended.

The reasons for great erosion here are numerous. Surface runoff works steadily to carve the slope. The unconsolidated soil is not highly resistant to erosion, the large amount of clay, when wetted, lubricates the downslope movement of overlying material and the shoreline is exposed to relatively large, about five miles, open water fetches.

Groins are not particularly recommended as primary shore defense structures here as they must trap a significant quantity of coarse material before they are effective in protecting the fastland. In order to trap material there must be a source and a sufficient quantity of material. There is not a great quantity of sandy material in the bluffs of this area and the increased extent of bulkhead causes a reduced source. Groins may be used in conjunction with bulkheads to buttress the bulkhead and to attempt to catch a small beach, and, indeed small beaches have been established by some of the groins, but the use of groins here as a primary defense structure would be futile. It appears that the sediment trapped by the groins is collected from the very shallow, wide nearshore zone.

Large, well placed riprap and gabions probably would be suitable alternatives to bulkheading. The comments about permeability and extent apply equally to these structures as to more conventional bulkheads.

Erosion on the Chickahominy generally is slight and poses no significant problems. In fact one area has a historical average accretion rate of 6 feet per year. In the Chickahominy Haven area there are about 4,000 feet of bulkhead which are mostly for "convenience" or "cosmetic" reasons

rather than for erosion protection. In any portion of the Chickahominy where it might be desirable to decrease even the very low natural erosion rates, virtually any method of shore armor, gabions, ripraping or bulkheading would be fairly successful. Artificial beaches might be established, between groins, along many portions of the river. The extensive marsh areas of the lower Chickahominy have varied considerably in extent through the last few decades, but the fastland has remained relatively stable.

The York River shoreline is intermediate between the activity of the James and the tranquility of the Chickahominy. Erosion rates increase from roughly one foot per year near Ware Creek to two feet per year along part of the Camp Peary shoreline near Skimino Creek. There are now no shore protective structures along the segment and none appear necessary. If there were a need to protect isolated stretches of the segment, riprapping or gabions would be sufficient. The present unused nature of the land and the planned park near Taskinas Creek would tend to discourage modifications of the shoreline in order to allow the continuation of natural processes.

In summary, severe erosion in James City County is limited to the James River, north of Jamestown Island. Here population pressure virtually requires area wide shore protection measures. Elsewhere in the James and York Rivers, erosion is moderate and probably could be controlled by any of a number of methods. The Chickahominy River shoreline is relatively stable and requires little action.

3.3 POTENTIAL USE ENHANCEMENT OF THE JAMES CITY COUNTY SHORELINE

The generally low potential use enhancement rating of James City County's shorelands does not fully reflect the quality of the county's shorelands. 16 percent of the county's shoreline is controlled by government agencies (state or federal) and hence has little potential for altered use patterns. Of the remaining 84 percent, some of the use is strongly affected by adjacent uses. The nearly 6 miles of Subsegment 5B (almost 4 percent of the county total) have virtually no water associated potential as the use of Skiffes Creek is controlled by the port at Fort Eustis. Similarly, the James River shoreline just north of Skiffes Creek is an industrial use, thus the chance of significant alteration of the land use toward public use is slight. Other areas along the James River, specifically the Kingsmill Neck and First Colony sections, are now being developed for residential and associated uses. This trend probably is toward the best utilization of the land as James City County is experiencing, and will continue to experience, steady population growth.

The land remaining for enhanced public use, then, is, along the York River, the Chickahominy River, Powhatans and College Creeks, and a limited portion of the James River above First Colony. The area in Segment 1, on the York River, adjoins a planned state park so its present unmanaged (i.e., unused) condition probably is ideal. Alternatively, low pressure uses such as low density residential or agricultural uses would be best for the area.

Along the James River there is or will be pressure for increased public access. A planned

marina at Kingsmill should alleviate some of this problem. Any additional strain would have to be absorbed by existing or expanded facilities on College Creek. Great care, however, must be taken so as not to overload the creek system. As mentioned in an earlier section, erosion along the James River is severe, with rates in the area of ten feet per year, so high intensity development of the shorelands would require a significant economic commitment for shoreline stabilization.

The Chickahominy River area is similar to the York in that it is less subject to development pressure than the James. The present utilization of the Chickahominy, centered at a small number of specific locations, probably should be maintained. Very limited and controlled development of the Chickahominy shorelands will help preserve the scenic qualities that make the river area desirable for recreational use.

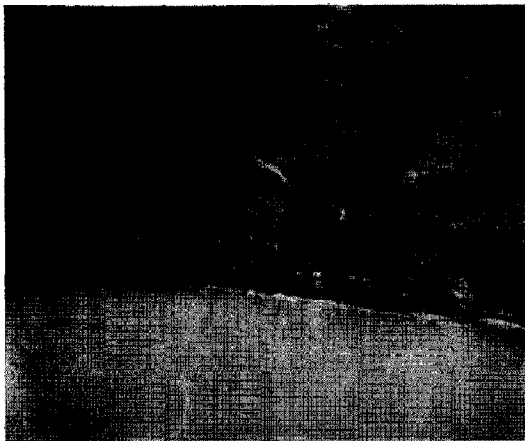


FIGURE 2

Figure 2: Sycamore Landing on the York River. This area has actively eroding high bluffs. The scarp in the lower right corner of the photograph is over 50 feet high.

Figure 3: A ground view of the bluff shown in the previous picture. Most of the erosion is slumping of the cliff face caused by surface runoff and occasionally aggravated by undercutting from storm tides and waves.

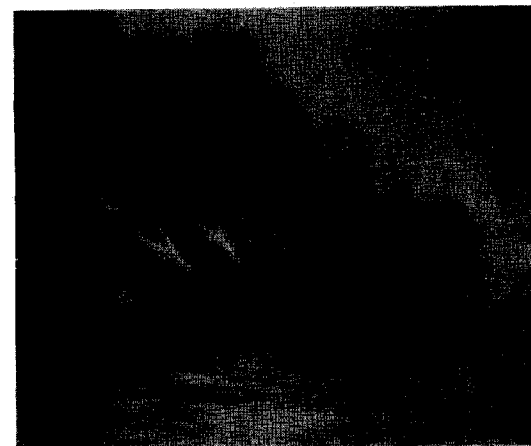


FIGURE 3



FIGURE 4

Figure 4: Chickahominy Haven, one of the most intensely developed shoreline areas in James City County. Recent environmental legislation limits the construction of dead-end canals such as those that exist here.



FIGURE 5

Figure 5: The erosion of the agricultural area along the James River near the mouth of the Chickahominy might be decreased by not plowing or working the area within 10 feet of the bank. This type of passive shore protection would allow the growth of large plants with root structure that would help stabilize the bank, thus slowing the erosion.

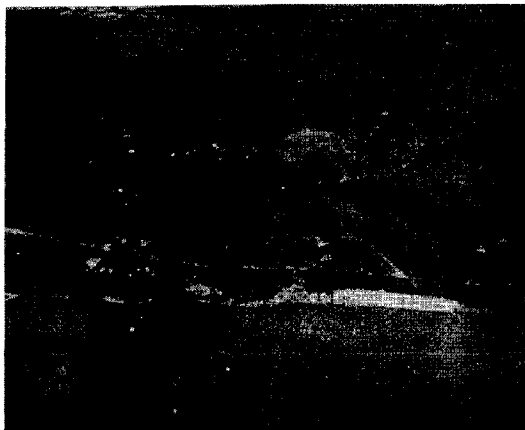


FIGURE 6



FIGURE 7

Figure 6: First Colony, a residential development on the James River. The area has low bluffs with a clay substrate. Erosion is severe in the unprotected areas, where the bluff is retreating at a rate of approximately a foot a month. This area desperately needs a unified shore protection plan, especially as many of the individual attempts at shore protection have either caused more problems or have been less successful than desired.

Figure 7: View upstream along First Colony. The fallen and isolated trees are mute evidence of the rapid erosion.

Figure 8: View downstream along First Colony. The fallen trees are clear evidence of the magnitude of the erosion. The bluff is approximately 20 feet high and consists primarily of clay. The erosion problem probably could best be managed by the use of properly designed and installed riprap or bulkheads, terracing and fill with permeable material, and vegetation.

Figure 9: A partially successful bulkhead at First Colony. The bulkhead is preventing the erosion of the land immediately behind it. However, because the adjacent shoreline was not protected and has continued to erode, the bulkhead's return walls have been flanked, initiating a process leading to failure of the bulkhead. Also, the bulkhead is not high enough to prevent overtopping by waves, and provisions have not been made for the return of overwash or rain waters to the river.



FIGURE 8

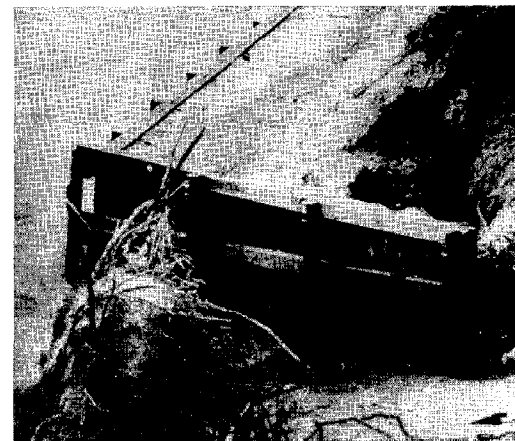


FIGURE 9

Figure 10: Jamestown Festival Park and the Jamestown-Surry ferry pier on the James River. There is a marina on Powhatan Creek (in the upper right corner of the photograph). This is one of the several water related or historical recreational areas in the county.

Figure 11: A view up Powhatan Creek. The creek is protected from rough waters and is easily navigable, making it a haven for many small pleasure boats.



FIGURE 10



FIGURE 11



FIGURE 12

Figure 12: Jamestown Island National Historical Park. The James River shoreline, foreground, is protected by concrete revetment and riprap. The separation of the groins from the shoreline indicates earlier great rates of erosion and the general ineffectiveness of groins in this area. Revetments are an effective means of controlling shoreline retreat, although they are quite costly and frequently preclude the maintenance of a beach.

Figure 13: View upstream across Jamestown Island. The linear tree covered features in the foreground probably are old beach ridges.

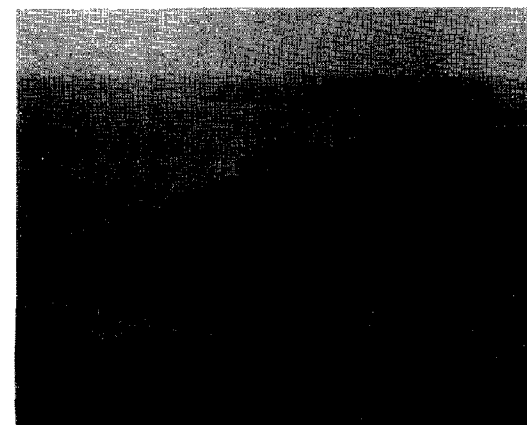
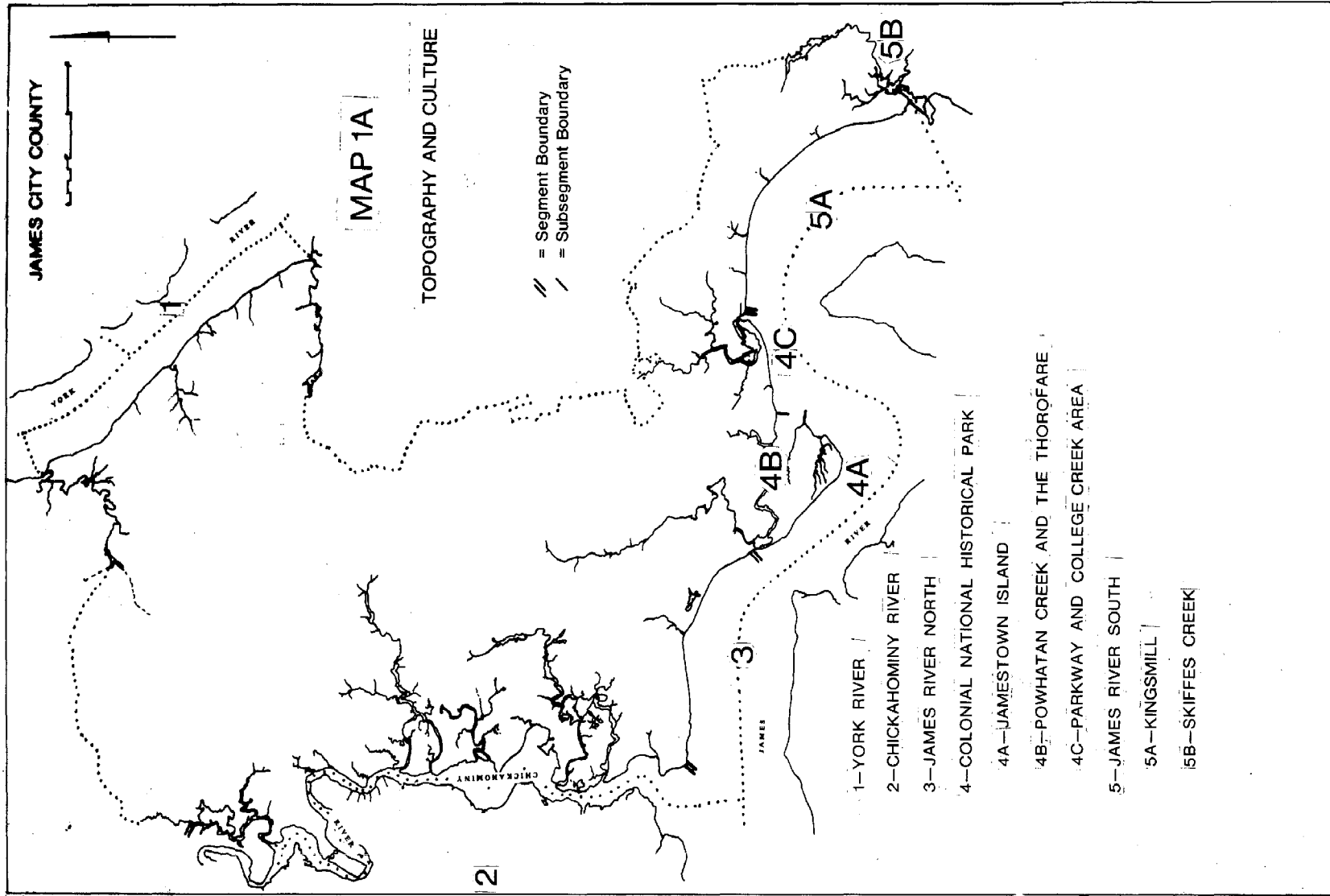
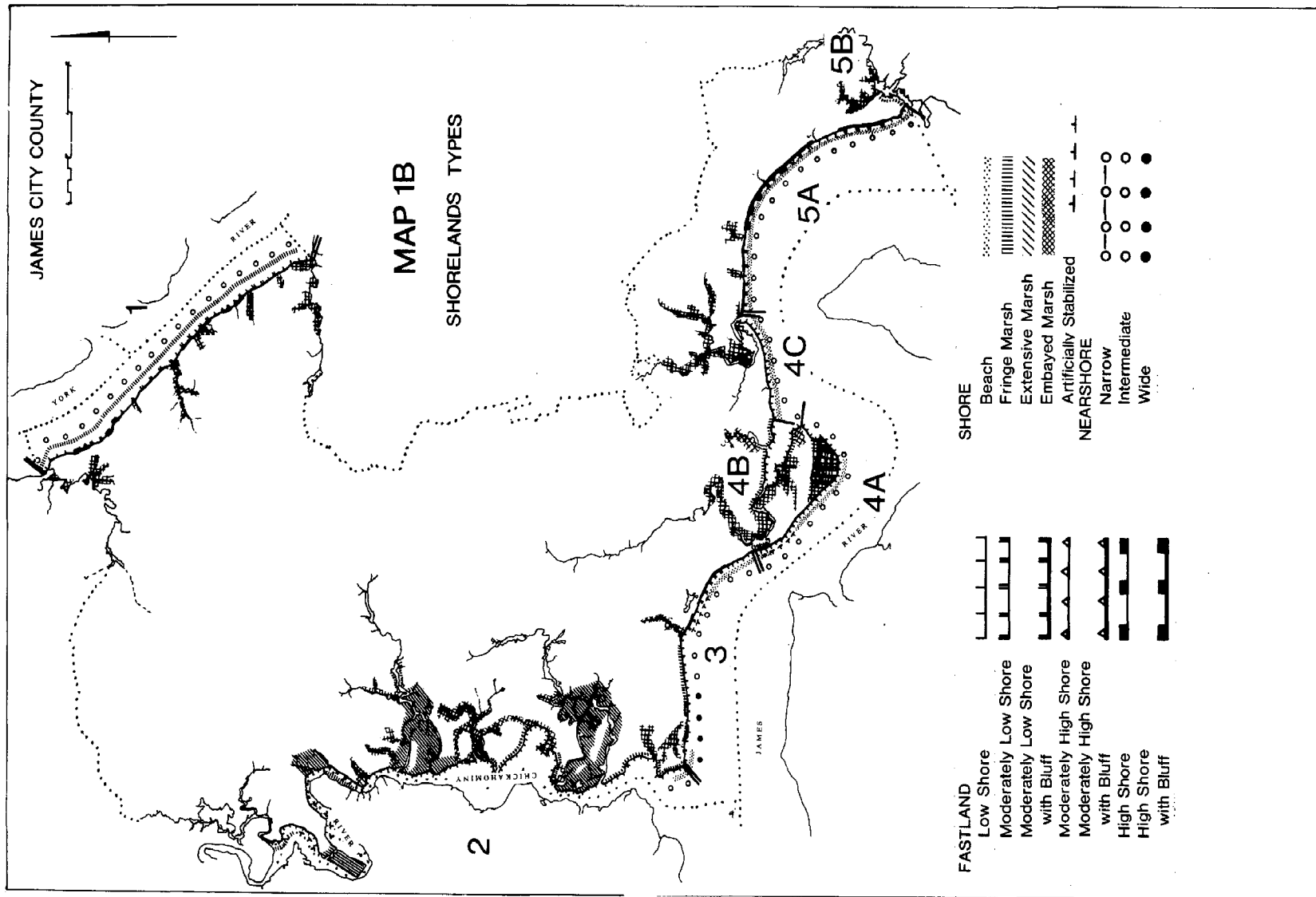
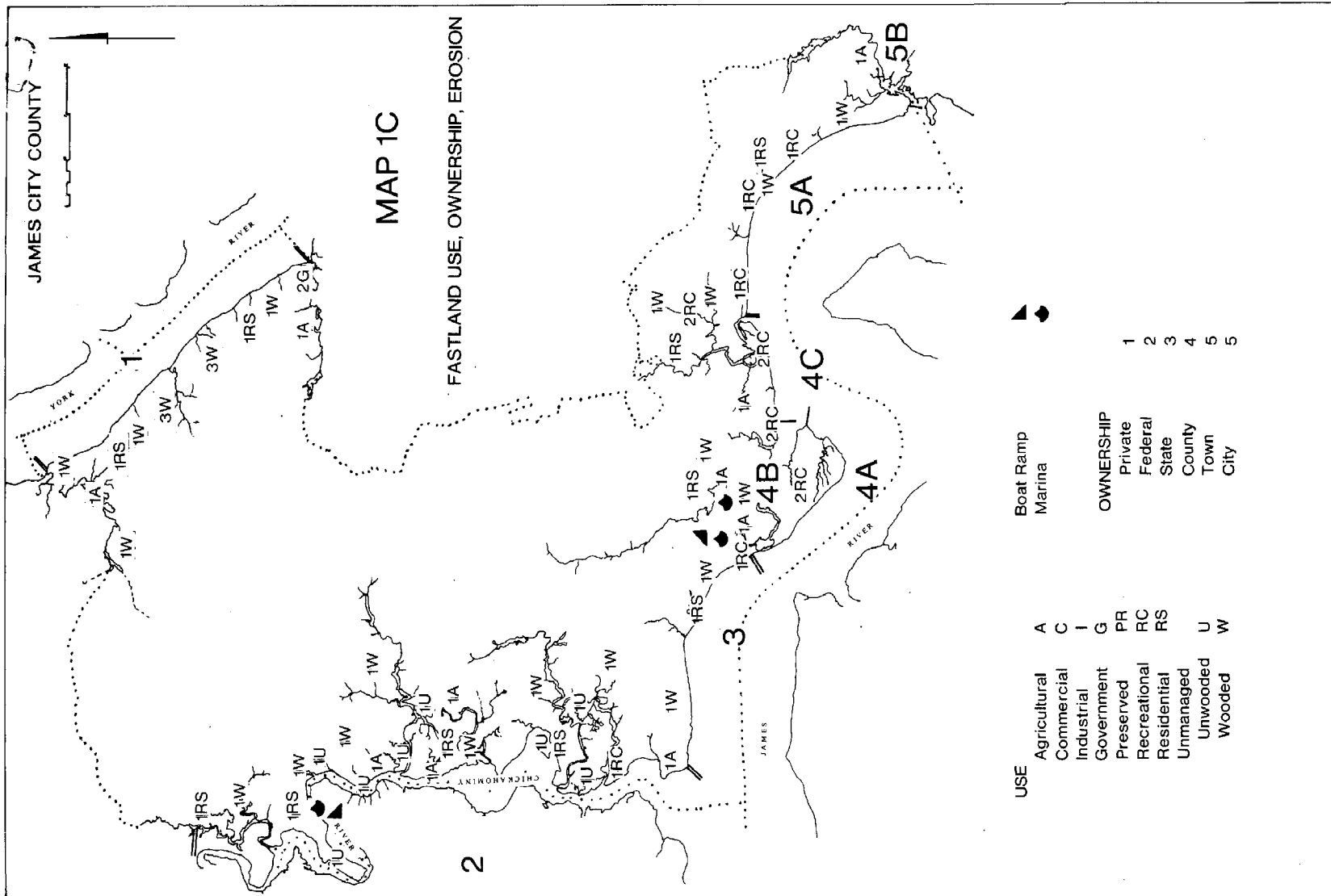
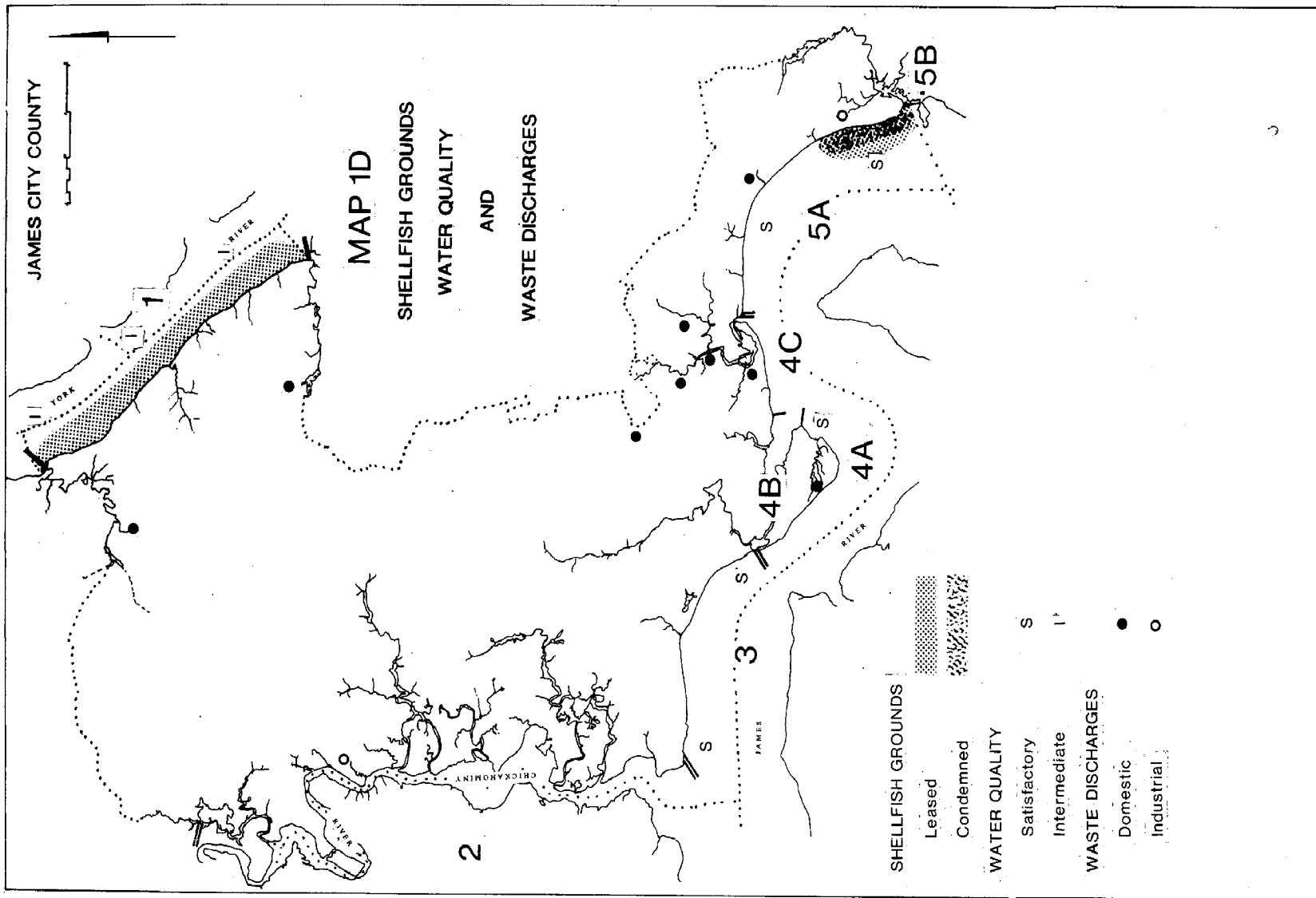


FIGURE 13









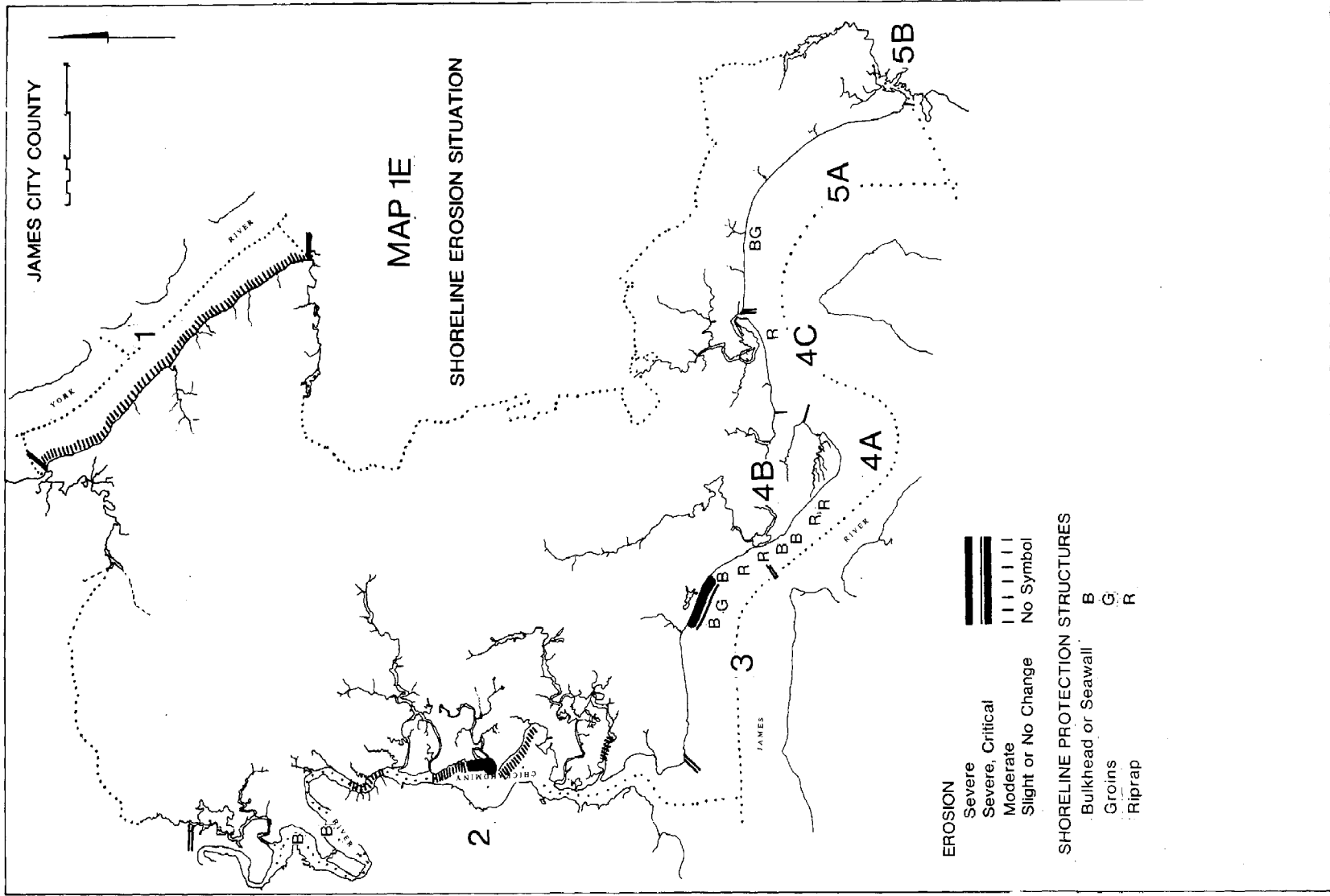


TABLE 1. SUMMARY OF JAMES CITY COUNTY SHORELANDS PHYSIOGRAPHY, FASTLAND USE AND OWNERSHIP (STATUTE MILES) *

Physiographic, use and ownership classifi- cation Subsegment	SHORELANDS PHYSIOGRAPHY										FASTLANDS USE						OWNERSHIP			TOTAL MILES			
	FASTLANDS				SHORE					NEARSHORE													
	LOW SHORE	MODERATELY LOW SHORE WITH BLUFF	MODERATELY HIGH SHORE WITH BLUFF	HIGH SHORE	BEACH	FRINGE MARSH	EXTENSIVE MARSH	EMBAYED MARSH	ARTIFICIALLY STABILIZED	NARROW	INTERMEDIATE	WIDE											
1	9.4	3.9	1.2	2.6		8.2		8.8		8.0				2.3	1.6	2.6		1.0	13.4	10.6	2.6	3.8	17.0
2	67.9	3.9	3.1	3.1	0.4	35.3	24.6	16.2	1.5									3.9	70.2	78.0			78.0
3	4.2	2.2			2.5	1.3		1.4	1.2		3.8	1.4	0.6				1.3	0.1	4.4	6.4			6.4
4A	4.2				1.4			1.2	1.6	2.2	2.0						4.2				4.2		4.2
4B	17.0				0.3	5.0		11.7					5.9				9.9	1.2	5.6	11.4			17.0
4C	16.4				2.1	6.1		8.0	0.2		2.2		3.8				2.0	0.8	9.8	14.0	2.4		16.4
5A	2.6	2.6	0.6	1.4	7.0				0.2	1.0	6.2						3.6	0.1	3.5	7.2			7.2
5B	5.0	0.8				2.2		3.6										5.8	5.8				5.8
SUBTOTAL	126.7	13.4	4.9	7.1	13.7	58.1	24.6	50.9	4.7	3.2	22.2	1.4	12.6	1.6	2.6	21.0	5.9	106.8	127.6	20.6	3.8		152.0
% of SHORELINE	83.3	8.9	3.2	4.6	9.0	38.2	16.2	33.5	3.1	2.1	14.6	0.9	8.3	1.1	1.7	13.8	3.9	71.2	83.9	13.6	2.5		100.0

CHAPTER 4

4.1 Table of Subsegment Summaries

4.2 Segment and Subsegment Descriptions

4.3 Segment and Subsegment Maps

4.1 Table of Subsegment Summaries

TABLE 2: SHORELINE SITUATION REPORT SEGMENT SUMMARY, JAMES CITY COUNTY, VIRGINIA

SUBSEGMENT	SHORELANDS TYPE	SHORELANDS USE	OWNERSHIP	ZONING	FLOOD HAZARD	WATER QUALITY	BEACH QUALITY	SHORE EROSION SITUATION	POTENTIAL USE ENHANCEMENT
1 YORK RIVER 17.0 miles	PASTLAND: Low shore - 55%, moderately low shore - 23%, moderately high shore - 7%, and high shore usually with bluff - 15%. SHORE: Embayed marsh - 52% and fringe marsh - 48%. NEARSHORE: Intermediate width.	PASTLAND: Unmanaged, wooded - 79%, governmental, Camp Peary - 15%, and residential - 6%. SHORE: Recreational and unused. NEARSHORE: Water sports.	Private - 63%, State - 22%, Federal - 15%.	Agricultural - 53%, Public - 37%, Residential - 4%.	Low, noncritical.	Satisfactory.	Poor, there is little beach in the segment.	Moderate, noncritical. The erosion rate along the York River is 1-2 feet per year. There are no endangered structures or shore protection structures. No action appears necessary.	Moderate. Taskinas Creek is the proposed site for a state park. The undeveloped, privately owned sections probably could be developed into a low density, residential area. Shoreline utilization is limited by the shallow offshore and the lack of potential beaches.
2 CHICKAHOMINY 78 miles	PASTLAND: Low shore - 87%, moderately low shore - 5%, moderately high shore - 4%, and high shore - 4%. SHORE: Fringe marsh - 45%, extensive marsh - 31%, embayed marsh - 21%, and artificially stabilized - 2%. NEARSHORE: Discum Creek is narrow. Chickahominy River is narrow upstream and intermediate and narrow downstream.	PASTLAND: Unmanaged, wooded and unwooded - 90%, residential - 5%, agricultural - 3%, and commercial - 2%. SHORE: Unused and recreational. NEARSHORE: Boating and water sports.	Private.	All agricultural except Chickahominy Haven which is residential.	Low along Discum Creek, moderate to high, noncritical along the Chickahominy.	No data.	Poor.	The shoreline is relatively stable. There are no endangered structures. There are approximately 4,000 feet of bulkhead in the vicinity of Chickahominy Haven.	Moderate. Improving public access to the water with the creation of artificial beaches and more boat ramps would increase the shoreline utilization.
3 JAMES RIVER NORTH 6.4 miles	PASTLAND: Low shore - 65%, low shore with bluff - 35%. SHORE: Beach - 39%, embayed marsh - 22%, fringe marsh - 20%, artificially stabilized - 19%. NEARSHORE: Intermediate width.	PASTLAND: Unmanaged, wooded - 69%, recreational - 20%, agricultural - 9%, and residential - 2%. SHORE: Recreational and unused. NEARSHORE: Water sports.	Private.	Agricultural - 77%, Residential - 19%, Business - 4%.	Moderate to high, noncritical.	Satisfactory.	Poor.	Severe, critical. The erosion rate is approximately 10 feet per year. All unprotected structures are endangered. There are over 3,000 feet of bulkhead, 400 feet of riprap, 10 groins, and one jetty. More uniform and complete riprapping of bulkheading is needed.	Low.
4A JAMESTOWN ISLAND 4.2 miles	PASTLAND: Low shore. SHORE: Artificially stabilized - 30%, beach - 33%, and embayed marsh - 29%. NEARSHORE: Intermediate width.	PASTLAND: Recreational. SHORE: Recreational. NEARSHORE: Boating, fishing, and water sports.	Federal.	Public.	Moderate, noncritical.	Satisfactory.	Fair.	Moderate, noncritical. There are 1,300 feet of bulkhead, 400 feet of riprap, and 4 old groins which all appear to be acting satisfactorily. Groins, riprap, or bulkheading could be used to protect selected areas if there were a need.	Low. The present use as a national park appears near optimum.
4B FOURTHAN CREEK and the THOROPARE 17.0 miles	PASTLAND: Low shore. SHORE: Embayed marsh - 69%, fringe marsh - 29%, beach - 2%. CREEK: Shallow, tidal creek.	PASTLAND: Recreational - 58.2%, agricultural - 34.6%, unmanaged - 7.2%. SHORE: Recreation and unused. CREEK: Water sports.	Federal - 67% and Private - 33%.	Public and Agricultural.	Low, noncritical upstream becoming moderate, noncritical downstream.	No data.	Poor.	The erosion rate is slight to moderate with a maximum of 1.5 feet per year. There are no shore protective structures or endangered structures. No action appears necessary.	Low. The area is primarily parkland.
4C COLLEGE CREEK 16.4 miles	PASTLAND: Low shore and some moderately high shore. SHORE: Embayed marsh - 49%, fringe marsh - 37%, beach - 13%, and artificially stabilized - 1%. NEARSHORE: Intermediate width along the James River.	PASTLAND: Recreational along the immediate shore, agricultural, residential, and unmanaged, wooded, inland. SHORE: Some recreation. NEARSHORE: Water sports.	Private - 85%, Federal - 15%.	Public, Agricultural, and Residential.	Low.	Satisfactory.	Poor.	Slight to moderate, noncritical with a maximum historical average rate of 1.1 feet per year. No structures are endangered. There are 900 feet of riprap working satisfactorily.	Low. There is little reason to alter the present land use patterns.
5A KINGSMILL 7.2 miles	PASTLAND: Low shore - 36%, moderately low shore - 36%, moderately high shore - 8%, and high shore - 20%. SHORE: Beach - 97%, artificially stabilized - 3%. NEARSHORE: Intermediate width and narrow.	PASTLAND: Recreational - 50%, unmanaged, wooded - 50% (being developed to residential). SHORE: Recreational. NEARSHORE: Boating.	Private.	Residential, Agricultural, Industrial.	Low, noncritical.	Satisfactory.	Fair to poor.	Moderate, noncritical, 1 to 1.5 feet per year. There are 4 groins and 200 feet of bulkhead. No action appears necessary.	Moderate. The industrial and Carter's Grove areas are fixed uses. Much of the remaining area is being developed as a residential community.
5B SKIFFER CREEK 5.8 miles	PASTLAND: Low shore - 86% and moderately low shore - 14%. SHORE: Fringe and embayed marsh. CREEK: Narrow and shallow.	PASTLAND: Unmanaged, wooded. SHORE: Unused. CREEK: The upper part is unused, the mouth is a harbor for Port Bustle.	Private and Federal.	Agricultural, Industrial.	Low, noncritical.	No data.	No beaches.	Stable.	Low. The access is severely limited by the Port Bustle Harbor.

4.2 Segment and Subsegment Descriptions

THE YORK RIVER, JAMES CITY COUNTY, VIRGINIA
SEGMENT 1 (Maps 2 and 3)

EXTENT: 17.0 miles including 4.2 miles along Ware Creek, 3.0 miles along Skimino Creek, 2.0 miles along Taskinas Creek, and 7.3 miles along the York River. The segment is bounded on the north by New Kent County and on the south by York County.

SHORELANDS TYPE

FASTLAND: Low shore - 55% (9.4 mi.), moderately low shore - 23% (3.9 mi.), moderately high shore - 7% (1.2 mi.), and high shore, usually with bluff - 15% (2.6 mi.).

SHORE: Embayed marsh - 52% (8.8 mi.) and fringe marsh - 48% (8.2 mi.). The York River shoreline is almost entirely fringe marsh. In some locations there is some very narrow beach (unmeasured) with the fringe marsh.

NEARSHORE: Intermediate width.

SHORELANDS USE

FASTLAND: Unmanaged, wooded - 79% (13.4 mi.), government, Camp Peary - 15% (2.6 mi.), and residential - 6% (1.0 mi.). There is some agricultural use and the residential usage is relatively low density.

SHORE: Mostly unused, some recreational use near the residential area north of Mount Folly and along the Camp Peary shoreline.

NEARSHORE: Fishing, shellfishing, and boating.

OFFSHORE: The York River Channel which is used for the shipping of pulpwood and pulpwood products.

OWNERSHIP: Private - 63% (10.6 mi.), State - 22% (3.8 mi.), and Federal (Camp Peary) - 15% (2.6 mi.).

ZONING: Agricultural - 59% (9.8 mi.), Public - 37% (6.4 mi.), and Residential - 4% ($\frac{3}{4}$ mi.).

FLOOD HAZARD: Low, noncritical.

WATER QUALITY: Satisfactory.

BEACH QUALITY: Poor. There are only a few small areas of narrow, thin beach.

WIND AND SEA EXPOSURE: The shoreline trends from

NW - SE. The fetch across the river from the NE is $1\frac{1}{2}$ -2 nautical miles. Fetches from the N and E exceed 3 nautical miles.

SHORE EROSION SITUATION

EROSION RATE: Moderate, noncritical. The VIMS Historical Erosion Survey indicates a rate of 1.1 to 2.0 feet per year.

DANGEROUS STRUCTURES: None.

SHORE PROTECTIVE STRUCTURES: None.

Suggested Action: None.

OTHER SHORE STRUCTURES: There are 11 piers and 2 boat ramps.

POTENTIAL USE ENHANCEMENT: Moderate. Taskinas Creek area is the site of a planned state park. The undeveloped nature of most of the shoreland renders the area quite suitable for recreational use, only the poor quality of the beach detracts from the overall potential.

MAPS: USGS, 7.5 Min.Ser. (Topo.), GRESSIT Quadr., 1965, TOANO Quadr., 1965, WILLIAMSBURG Quadr., 1965, photorevised 1970.
C&GS, #495, 1:40,000 scale, YORK RIVER, Yorktown to West Point, 1971.

PHOTOS: Aerial-VIMS 7Dec73 JC-1 54-83.

CHICKAHOMINY, JAMES CITY COUNTY, VIRGINIA
SEGMENT 2 (Maps 4, 5, 6, and 7)

EXTENT: 78 miles of shoreline along the Chickahominy River, Diascund Creek, Shipyard Creek, Yarmouth Creek, Blackstump Creek, Nettles Creek, Gordon Creek, and other smaller creeks. Barrets Point, at the mouth of the Chickahominy River, is the southern limit of the segment.

SHORELANDS TYPE

PASTLAND: Low shore - 87% (67.9 mi.), moderately low shore - 5% (3.9 mi.), moderately high shore - 4% (3.1 mi.), and high shore - 4% (3.1 mi.).
SHORE: Fringe marsh - 45% (35.3 mi.), extensive marsh - 31% (24.6 mi.), embayed marsh - 21% (16.2 mi.), artificially stabilized - 2% (1.5 mi.), and beach - 0.5% (0.4 mi.).
NEARSHORE: Diascund Creek is narrow and shallow. The Chickahominy River is narrow upstream from Chickahominy Haven and alternates from narrow to intermediate width downstream.

SHORELANDS USE

PASTLAND: Unmanaged, wooded and unwooded - 90% (70.2 mi.), residential - 5% (3.9 mi.), agricultural - 3% (2.3 mi.), and commercial - 2% (1.6 mi.).
SHORE: Mostly unused, some recreation.
NEARSHORE: Boating, fishing, and water sports.

OWNERSHIP: Private.

ZONING: Agricultural, except for Chickahominy Haven which is residential.

FLOOD HAZARD: Low, noncritical along Diascund Creek increasing down the Chickahominy to moderate or high, noncritical.

WATER QUALITY: No data.

WIND AND SEA EXPOSURE: Fetches are severely limited from all directions.

SHORE EROSION SITUATION

EROSION RATE: Slight or none.
ENDANGERED STRUCTURES: None.
SHORE PROTECTIVE STRUCTURES: There are 4,000 feet of bulkhead at Chickahominy Haven.

Suggested Action: None.

OTHER SHORE STRUCTURES: There are 43 piers, mostly near Chickahominy Haven, and 2 boat ramps.

POTENTIAL USE ENHANCEMENT: Moderate. Improved access to the water would raise the recreational use of the segment. The Chickahominy - Diascund Creek area should be able to support an increased residential and recreational population. If it were desired, fairly stable, artificial, sandy bathing beaches probably could be established in one or more areas. Also, the number of point services for boating and fishing could probably be increased.

MAPS: USGS, 7.5 Min.Ser. (Topo.), NORGE Quadr., 1965, photorevised 1972, BRANDON Quadr., 1965, and SURRY Quadr., 1965.
C&GS, #530, 1:40,000 scale, JAMES RIVER, Jamestown Island to Jordan Point, 1971.

PHOTOS: Aerial-VIDMS 1Feb74 JC-2 84-133.

JAMES RIVER NORTH, JAMES CITY COUNTY, VIRGINIA
SEGMENT 3 (Map 7)

EXTENT: 6.4 miles along the James River from Barrets Point at the mouth of the Chickahominy River to the upstream boundary of the Colonial National Historical Park.

SHORELANDS TYPE

FASTLAND: Low shore - 65% (4.2 mi.) and low shore with bluff - 35% (2.2 mi.).
SHORE: Beach - 39% (2.5 mi.), embayed marsh - 22% (1.4 mi.), fringe marsh - 20% (1.3 mi.), and artificially stabilized - 19% (1.2 mi.).
NEARSHORE: Intermediate (3.8 mi.) and wide (1.4 mi.).

SHORELANDS USE

FASTLAND: Unmanaged, wooded - 69%, recreational (Jamestown Festival Park) - 20%, agricultural - 9%, and residential - 2%.
SHORE: Some recreation, mostly unused.
NEARSHORE: Water sports.

OFFSHORE: James River Shipping Channel.

OWNERSHIP: Private.

ZONING: Agricultural - 77% (5.2 mi.), Residential, First Colony - 19% (1.2 mi.), and Business - 4% ($\frac{1}{4}$ mi.).

FLOOD HAZARD: High, noncritical from Barrets Point, 2.2 miles east. The remainder is moderate or low, noncritical. All buildings are above the 10-foot contour.

WATER QUALITY: Satisfactory.

BEACH QUALITY: Poor. The beaches are very narrow and thin. Usually the sediment is very fine, reflecting the high clay content of the bluff material.

WIND AND SEA EXPOSURE: The shoreline trend varies from E - W to NW - SE. The fetch from the S is $2\frac{1}{4}$ miles, from the SW is $4\frac{1}{2}$ miles, and from the SE is 5 miles.

SHORE EROSION SITUATION

EROSION RATE: Severe, critical. Recent study indicates that the unprotected bluff area has

retreated at approximately 10 feet per year.

ENDANGERED STRUCTURES: Several of the new houses in the development would have been endangered if they had not taken protective action.

SHORE PROTECTIVE STRUCTURES: Over 3,000 feet of bulkhead, 1 jetty, 400 feet of riprap, and approximately 10 groins. Most of the bulkheading is well constructed, but 2 or 3 feet too low to prevent wave overtopping. Also much of the bulkhead is without weep holes or one way drainage, allowing the water to pond behind the bulkhead. The groins are marginally effective.

Suggested Action: Where there is bulkheading it should be continuous as individual unprotected lots will erode quite rapidly. A large series of closely spaced groins should not be constructed until the effectiveness of individual groins can be analyzed to determine optimum groins spacing and size.

OTHER SHORE STRUCTURES: There are 12 piers, a bridge, and a boat ramp.

POTENTIAL USE ENHANCEMENT: Low. The lack of a suitable area for beach or other large recreation areas, coupled with the marsh or bluff physiography, significantly limits further recreational development. The very great clay content of the soil hampers residential development.

MAPS: USGS, 7.5 Min.Ser. (Topo.), SURRY Quadr., 1965.
C&GS, #530, 1:40,000 scale, JAMES RIVER, Jamestown Island to Jordon Point, 1971.

PHOTOS: Aerial-VIMS 20Jan74 JC-3 134-153.

Ground - VIMS JC-3 14-22, 25-38.

JAMESTOWN ISLAND, JAMES CITY COUNTY, VIRGINIA
SEGMENT 4A (Maps 7 and 8)

EXTENT: 4.2 miles along the James River from the upstream boundary of the Colonial National Historical Park downstream to Black Point on Jamestown Island.

SHORELANDS TYPE

PASTLAND: Low shore.
SHORE: Artificially stabilized - 38% (1.6 mi.), beach - 33% (1.4 mi.), and embayed marsh - 29% (1.2 mi.).
NEARSHORE: Intermediate width.

SHORELANDS USE

PASTLAND: Recreational, National Historical Park.
SHORE: Recreational.
NEARSHORE: Boating, fishing, and water sports.

OFFSHORE: James River Shipping Channel.

OWNERSHIP: Federal.

ZONING: Public.

FLOOD HAZARD: Moderate, noncritical.

WATER QUALITY: Satisfactory.

BEACH QUALITY: Fair.

WIND AND SEA EXPOSURE: The shoreline trends from NW - SE for about 3 nautical miles, then SW - NE. The fetch from the SW is about $1\frac{1}{2}$ nautical miles.

SHORE EROSION SITUATION

EROSION RATE: Moderate, noncritical.
ENDANGERED STRUCTURES: None.
SHORE PROTECTIVE STRUCTURES: There are 4 old groins, 200 feet of riprap, and 1,300 feet of bulkhead. All structures appear satisfactory.

Suggested Action: If there were a need gabions, riprap, or bulkheading could be used to protect selected areas.

OTHER SHORE STRUCTURES: None.

POTENTIAL USE ENHANCEMENT: Low, the area already

is a national park and should remain as public open space. If there were a need, the beach areas probably could be improved by nourishment.

MAPS: USGS, 7.5 Min.Ser. (Topo.), SURRY Quadr., 1965, and HOG ISLAND Quadr., 1965, photorevised 1972.

C&GS, #529, 1:40,000 scale, JAMES RIVER, Newport News to Jamestown Island, 1971.

PHOTOS: Aerial-VIMS 1Feb74 JC-4A 162-166, 168, 170-183, 185-190.

Ground - VIMS 23Apr73 JC-4A 1-13.

POWHATAN CREEK AND THE THOROPARE,
JAMES CITY COUNTY, VIRGINIA
SEGMENT 4B (Maps 7 and 8)

EXTENT: 17.0 miles including 6.2 miles along Powhatan Creek and 4 miles along Mill Creek.

SHORELANDS TYPE

PASTLAND: Low shore.
SHORE: Embayed marsh - 68.8% (11.7 mi.), fringe marsh - 29.4% (5.0 mi.), and beach - 1.8% (0.3 mi.).
CREEK: Shallow, tidal creek.

SHORELANDS USE

PASTLAND: Recreational - 58.2% (9.9 mi.), agricultural - 34.6% (5.9 mi.), and unmanaged, wooded - 7.2% (1.2 mi.).
SHORE: Some recreation, mostly unused.
CREEK: Boating and water sports.

OWNERSHIP: Federal - 67% (11.4 mi.) and Private - 33% (5.6 mi.).

ZONING: Public and Agricultural.

FLOOD HAZARD: Low, noncritical along the Parkway. Moderate to high, noncritical on Jamestown Island.

WATER QUALITY: No data.

BEACH QUALITY: Poor. There is little beach along this subsegment.

SHORE EROSION SITUATION

EROSION RATE: Slight to moderate, noncritical, 1 to 1.5 feet per year.
ENDANGERED STRUCTURES: None.
SHORE PROTECTIVE STRUCTURES: None.

Suggested Action: None.

POTENTIAL USE ENHANCEMENT: Minimal, mostly parkland.

MAPS: USGS, 7.5 Min.Ser. (Topo.), SURRY Quadr., 1965, and HOG ISLAND Quadr., 1965, photorevised 1972.
C&GS, #529, 1:40,000 scale, JAMES RIVER, Newport News to Jamestown Island, 1971.

PHOTOS: Aerial-VIMS 27Oct72 JC-4B 1;
VIMS 1Feb73 JC-4B 154-161, 167,
169, 184, 191, 192.

COLLEGE CREEK AREA, JAMES CITY COUNTY, VIRGINIA
SUBSEGMENT 4C (Maps 8 and 9)

EXTENT: 16.4 miles from Route 617 to and including
14 miles of shoreline along College Creek.

SHORELANDS TYPE

FASTLAND: Low shore except for some moderately
high shore along the interior of College Creek.
SHORE: Embayed marsh - 49% (8.0 mi.), fringe
marsh - 37% (6.1 mi.), beach - 13% (2.1 mi.),
and artificially stabilized - 1% (0.2 mi.).
NEARSHORE: Intermediate width along the James
River.

SHORELANDS USE

FASTLAND: Entirely recreational. The James
River shore borders on a narrow band of the
Colonial National Historical Parkway. Behind
this the land use is primarily agricultural and
unmanaged, wooded. Along College Creek the
land is agricultural, residential, and unmanaged,
wooded.
SHORE: Mostly unused, some recreational.
NEARSHORE: Water sports.

OFFSHORE: James River Channel.

OWNERSHIP: Private - 85% (14.0 mi.), Federal -
15% (2.4 miles along the James River).

ZONING: Public, Agricultural, and Residential.

FLOOD HAZARD: Low.

WATER QUALITY: Satisfactory.

BEACH QUALITY: There is very little beach in
this subsegment.

WIND AND SEA EXPOSURE: The shoreline trend is
WSW - ENE. Fetches are S - $4\frac{1}{4}$ miles, SSE -
 $1\frac{1}{2}$ miles, and ESE - $4\frac{3}{4}$ miles.

SHORE EROSION SITUATION

EROSION RATE: Slight to moderate, noncritical,
0.7 to 1.1 feet per year.
ENDANGERED STRUCTURES: None.
SHORE PROTECTIVE STRUCTURES: There are 900
feet of riprap that seem to be satisfactory.

OTHER SHORE STRUCTURES: There are a pier and 2
bridges in this subsegment.

POTENTIAL USE ENHANCEMENT: Low. The present
shoreland use is probably the best to which the
area is suited.

MAPS: USGS, 7.5 Min.Ser. (Topo.), HOG ISLAND
Quadr., 1965, photorevised 1972.
C&GS, #529, 1:40,000 scale, JAMES RIVER, Newport
News to Jamestown Island, 1971.

PHOTOS: Aerial-VIMS 27Oct72 JC-4C 2-15;
VIMS 1Feb73 JC-4C 193-203.

KINGSMILL, JAMES CITY COUNTY, VIRGINIA

SUBSEGMENT 5A (Maps 9 and 10)

EXTENT: 7.2 miles from College Creek to Skiffes Creek.

SHORELANDS TYPE

PASTLAND: Low shore - 36% (2.6 mi.), moderately low shore - 36% (2.6 mi.), moderately high shore - 8% (0.6 mi.), and high shore - 20% (1.4 mi.).
SHORE: Beach - 97% (7.0 mi.) and artificially stabilized - 3% (0.2 mi.).
NEARSHORE: Intermediate width - 80% (6.2 mi.) and narrow - 14% (1 mi.).

SHORELANDS USE

PASTLAND: Recreational - 50% (3.6 mi.), unmanaged, wooded - 50% (3.6 mi.). The area presently is being developed as a planned residential area.
SHORE: Mostly unused, some recreation. There are plans for a large marina.
NEARSHORE: Boating.

OFFSHORE: James River Channel.

OWNERSHIP: Private.

ZONING: Residential, Agricultural, and Industrial.

FLOOD HAZARD: Low, noncritical.

WATER QUALITY: Satisfactory.

BEACH QUALITY: Fair to poor. The beaches are generally narrow and thin. The area just offshore is shallow and frequently has a clay bottom.

WIND AND SEA EXPOSURE: The shoreline trend is E - W for $1\frac{1}{2}$ nautical miles, then NW - SE for $4\frac{1}{4}$ nautical miles. The fetch to the SE is about 5 nautical miles across Cobham Bay. The fetch from the S to Hog Point is $1\frac{1}{2}$ nautical miles, the fetch from the SE is over 5 nautical miles.

SHORE EROSION SITUATION

EROSION RATE: Moderate, noncritical, 1 to 1.5 feet per year.
ENDANGERED STRUCTURES: None.
SHORE PROTECTIVE STRUCTURES: There are 4 groins and 200 feet of bulkhead.

Suggested Action: None.

OTHER SHORE STRUCTURES: There are 2 boat ramps and 1 pier along this subsegment.

POTENTIAL USE ENHANCEMENT: The present and planned uses limit significant alterations of the land use patterns. The present shorelands usage with the southern industrial area, Carters Grove historical area, and the Kingsmill residential area seems to be satisfactory and stable. The development of a properly designed public access marina on the James River would increase the recreational utilization of the shore area.

MAPS: USGS, 7.5 Min.Ser. (Topo.), HOG ISLAND Quadr., 1965, photorevised 1972, and YORKTOWN Quadr., 1965, photorevised 1970.
C&GS, #529, 1:40,000 scale, JAMES RIVER, Newport News to Jamestown Island, 1972.

PHOTOS: Aerial-VIMS 27Oct72 JC-5A 16-53.

SKIFFES CREEK, JAMES CITY COUNTY, VIRGINIA

SUBSEGMENT 5B (Map 10)

EXTENT: 5.8 miles of shoreline including Wood Creek.

SHORELANDS TYPE

PASTLAND: Low shore - 86% (5.0 mi.) and moderately low shore - 14% (0.8 mi.).
SHORE: Fringe and embayed marsh.
NEARSHORE: Skiffes Creek is narrow and shallow.

SHORELANDS USE

PASTLAND: Unmanaged, wooded.
SHORE: Unused.
CREEK: The upper creek is very little used. The creek mouth is a controlled harbor for Fort Rustis.

OWNERSHIP: Private and Federal.

ZONING: Agricultural and Industrial.

FLOOD HAZARD: Low, noncritical.

WATER QUALITY: No data.

BEACH QUALITY: There are no beaches in this subsegment.

SHORE EROSION SITUATION

EROSION RATE: Slight, noncritical.
ENDANGERED STRUCTURES: None.
SHORE PROTECTIVE STRUCTURES: None.

Suggested Action: None.

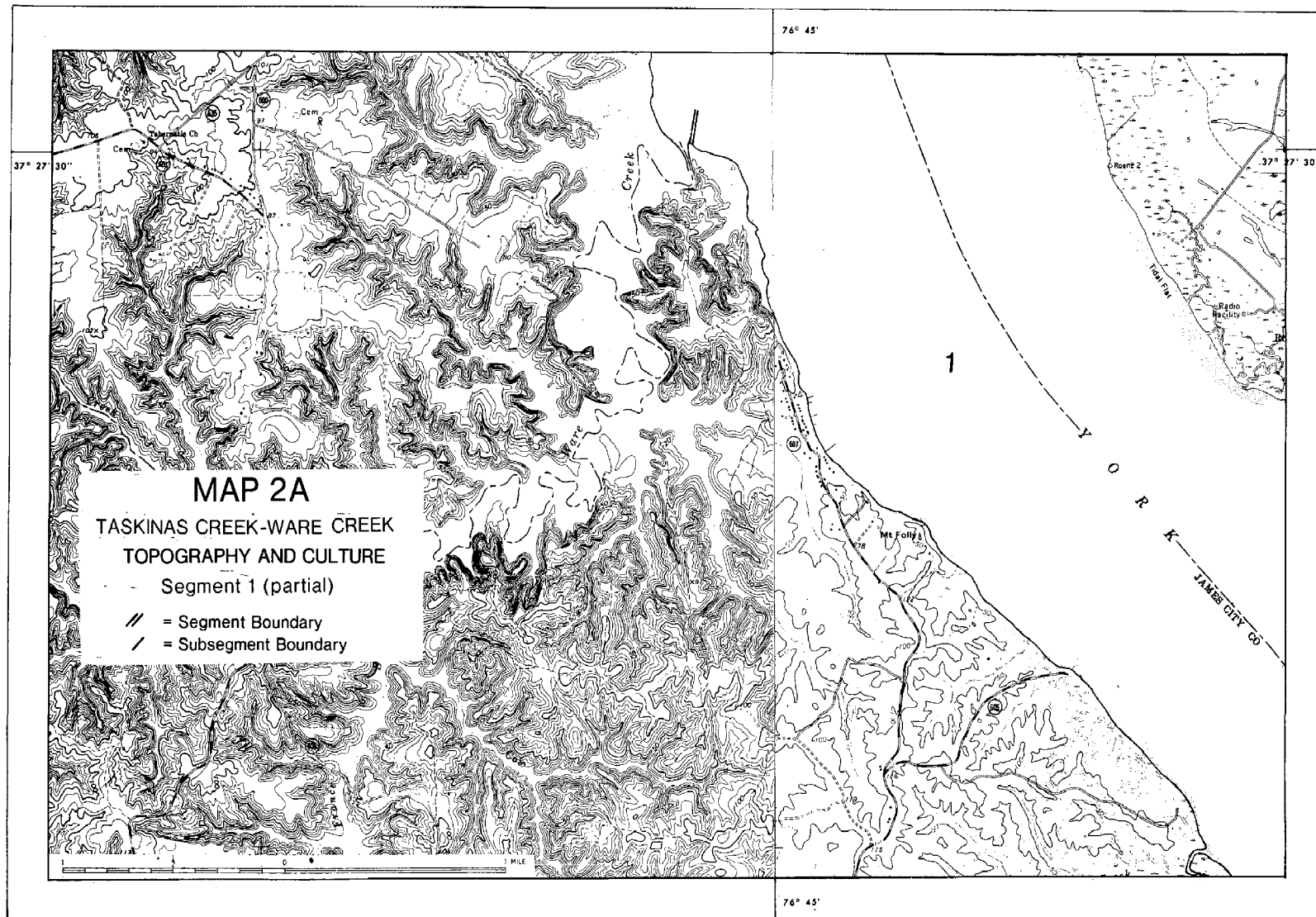
OTHER SHORE STRUCTURES: None.

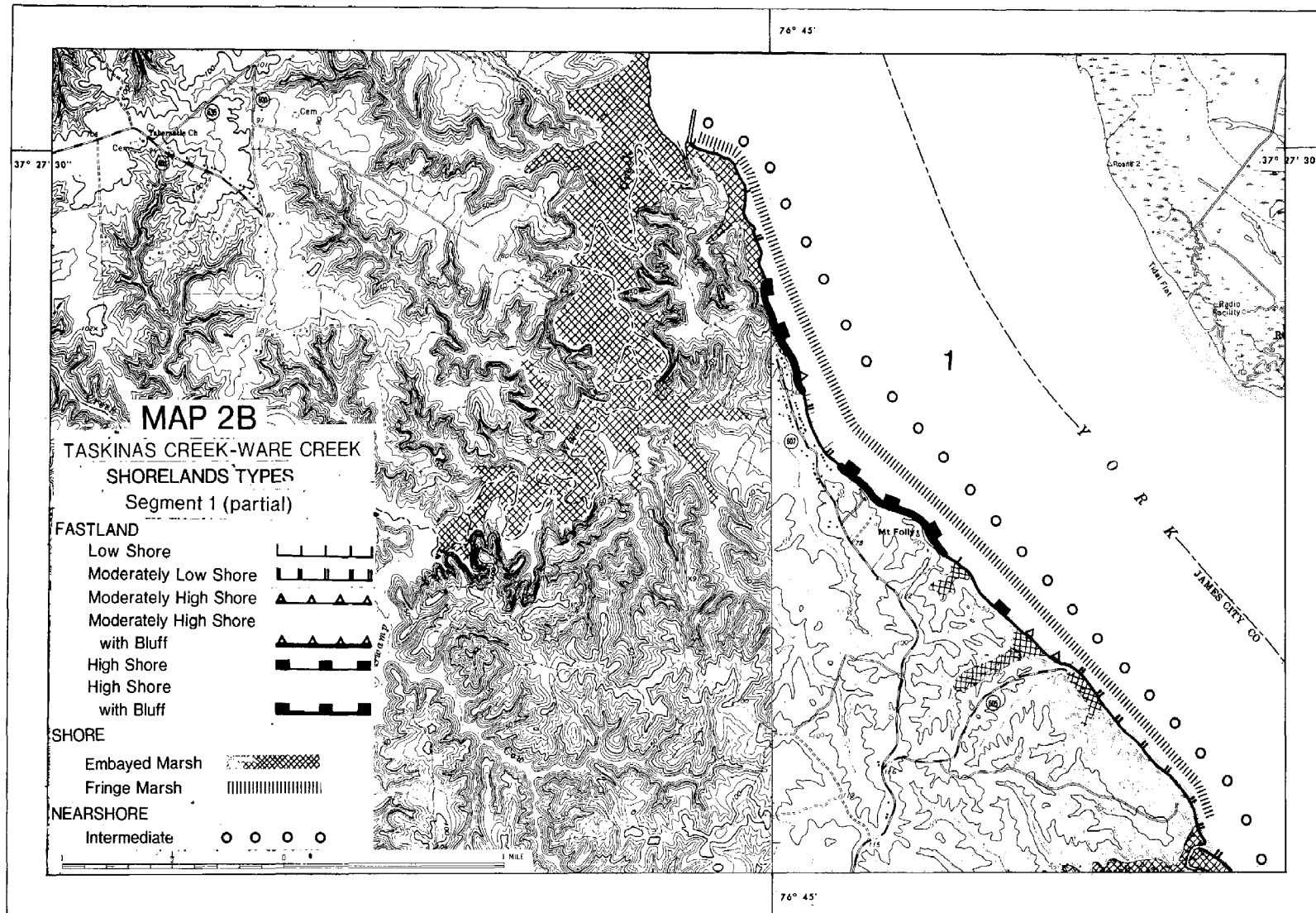
POTENTIAL USE ENHANCEMENT: Low. The nature of the harbor at Fort Rustis limits further development of the waterway.

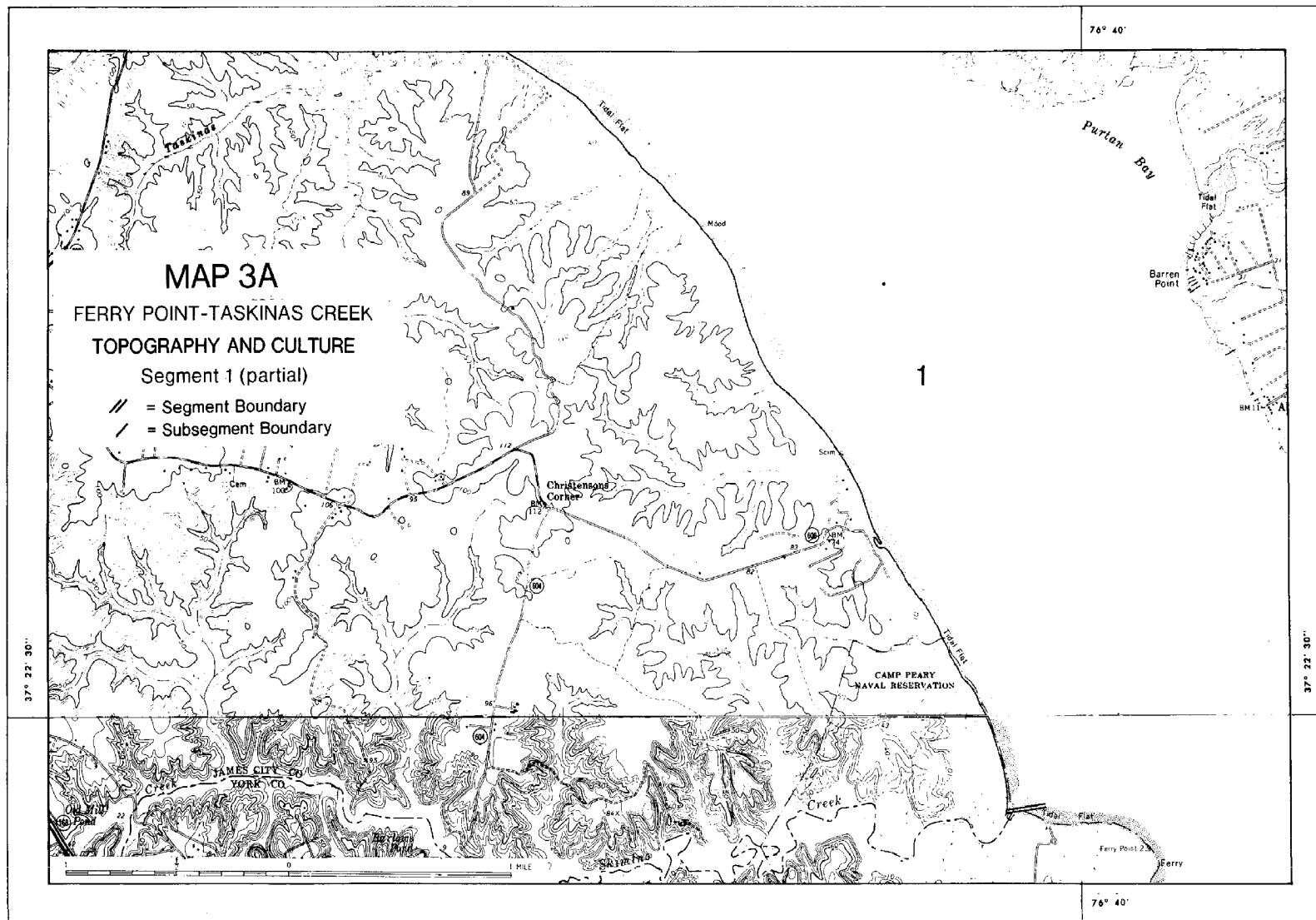
MAPS: USGS, 7.5 Min.Ser. (Topo.), YORKTOWN Quadr., 1965, photorevised 1972.
C&GS, #529, 1:40,000 scale, JAMES RIVER, Newport News to Jamestown Island, 1972.

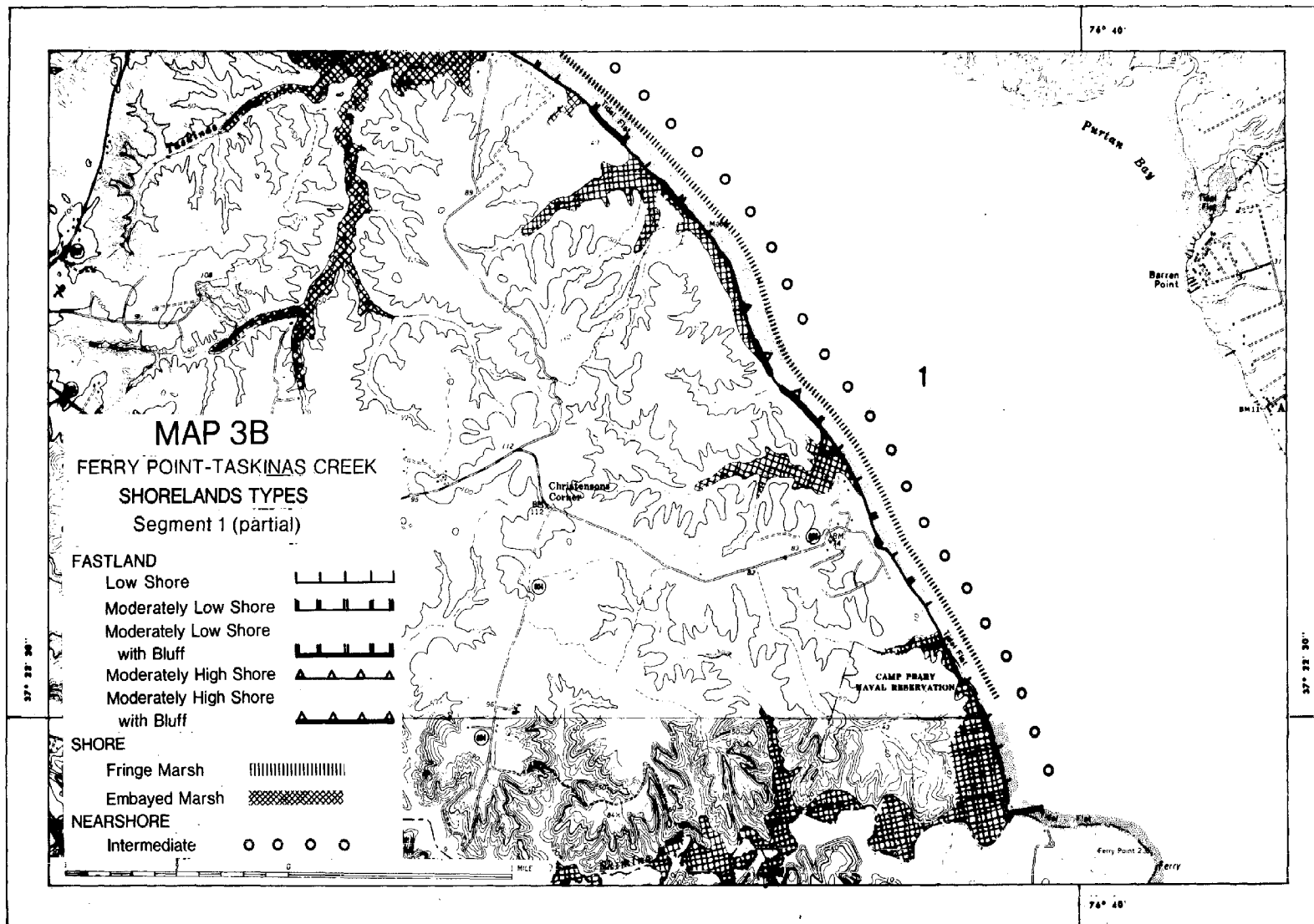
PHOTOS: Aerial-VIMS 30Apr73 NN-1 142-161.

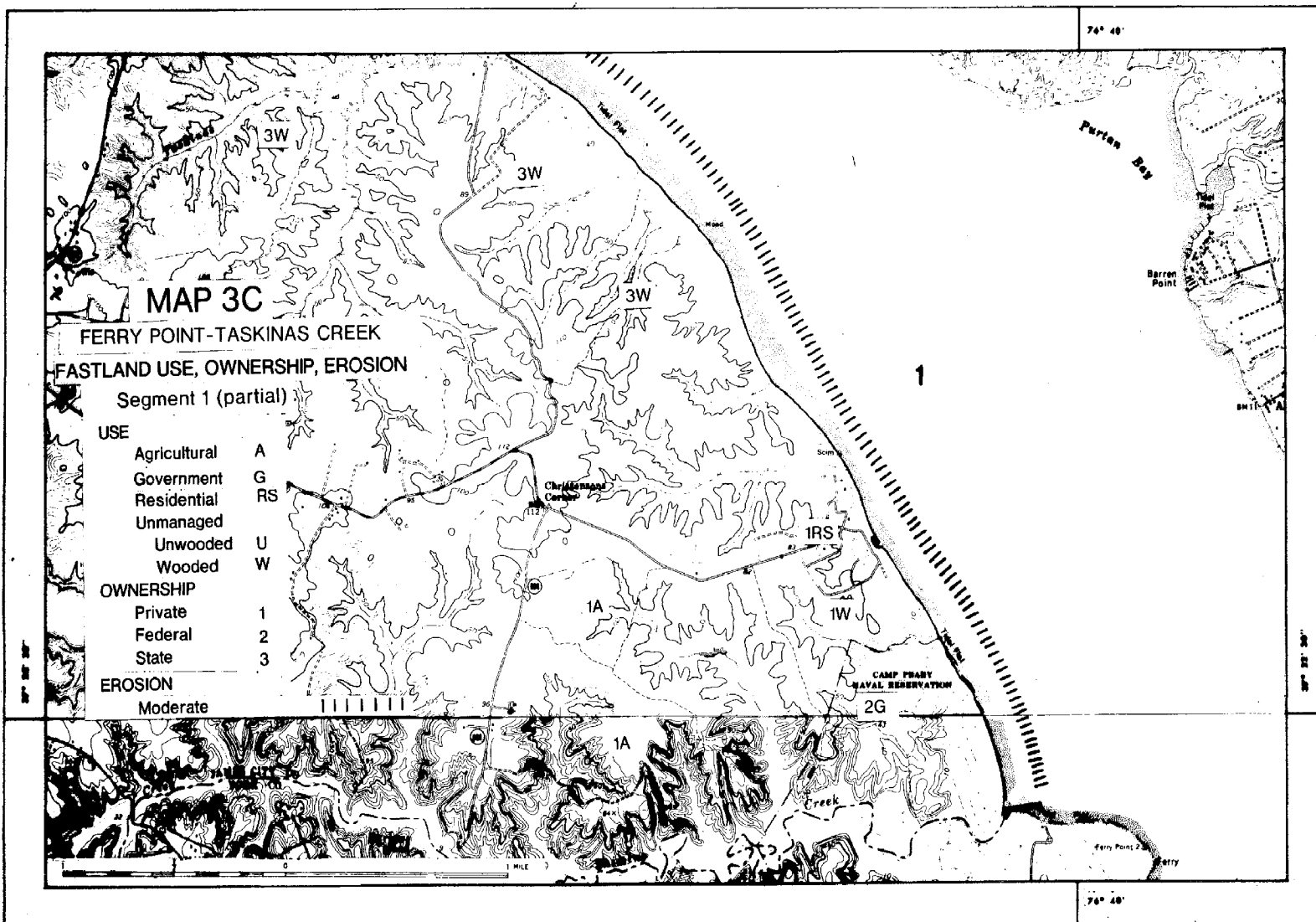
4.3 Segment and Subsegment Maps

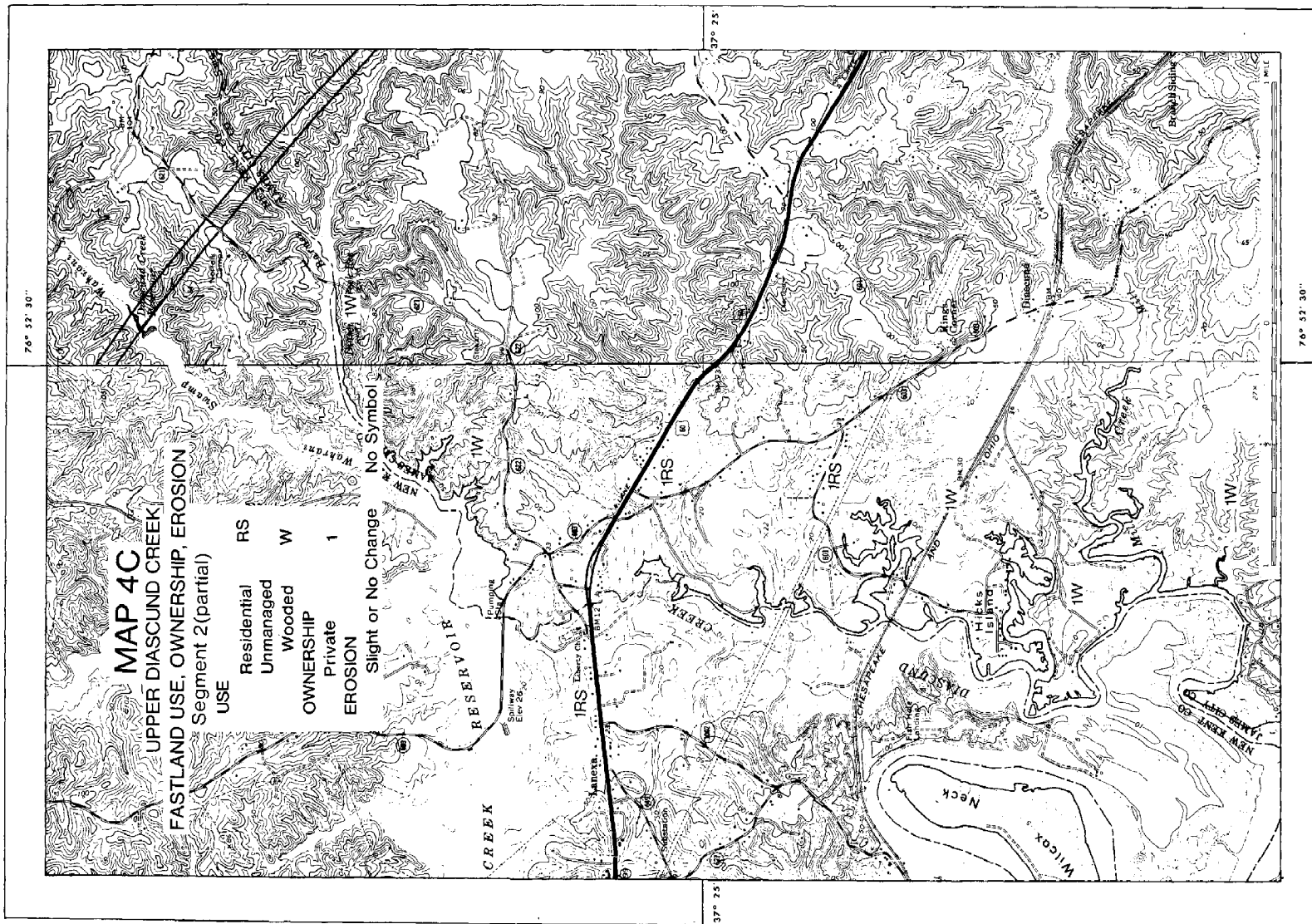


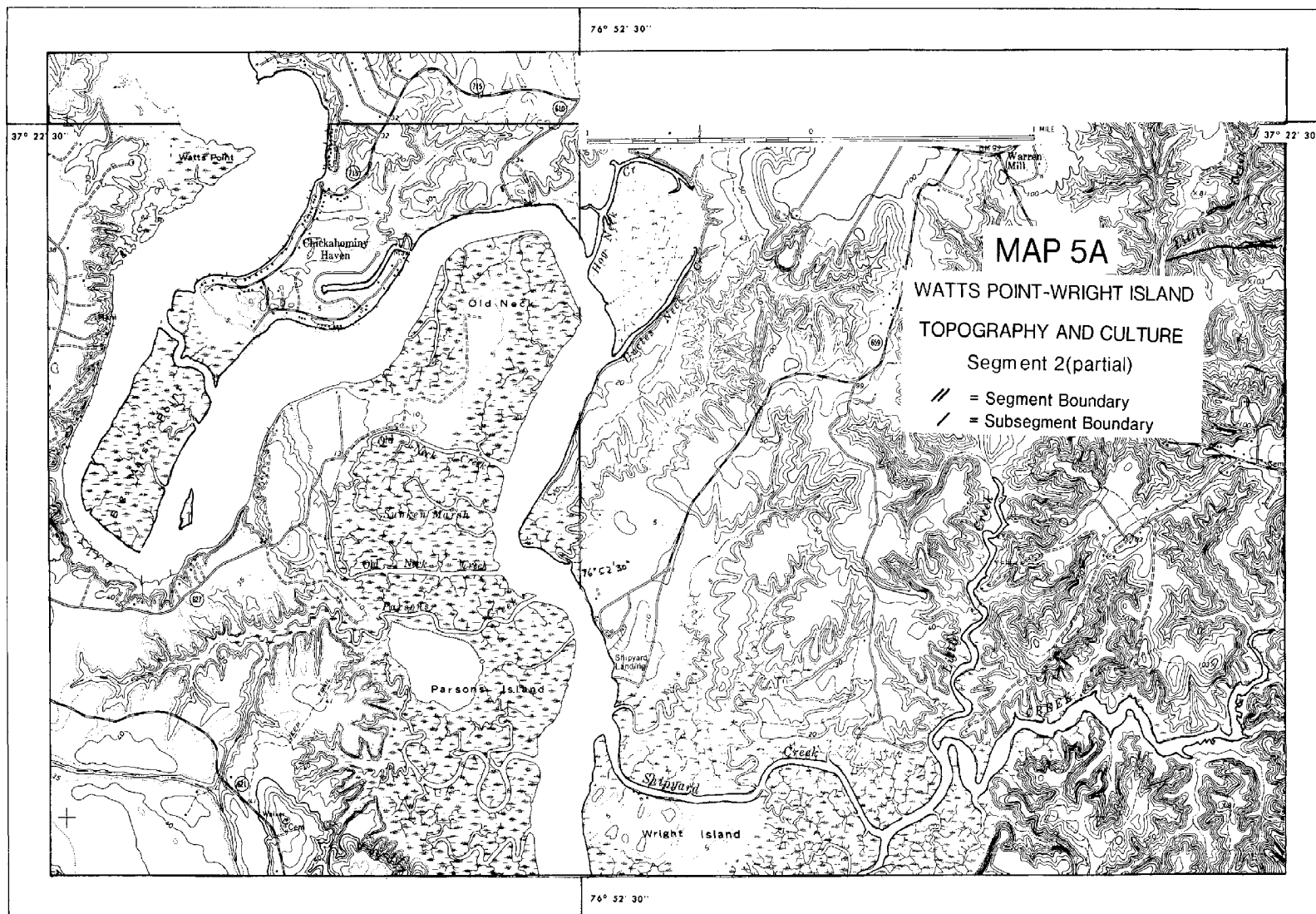


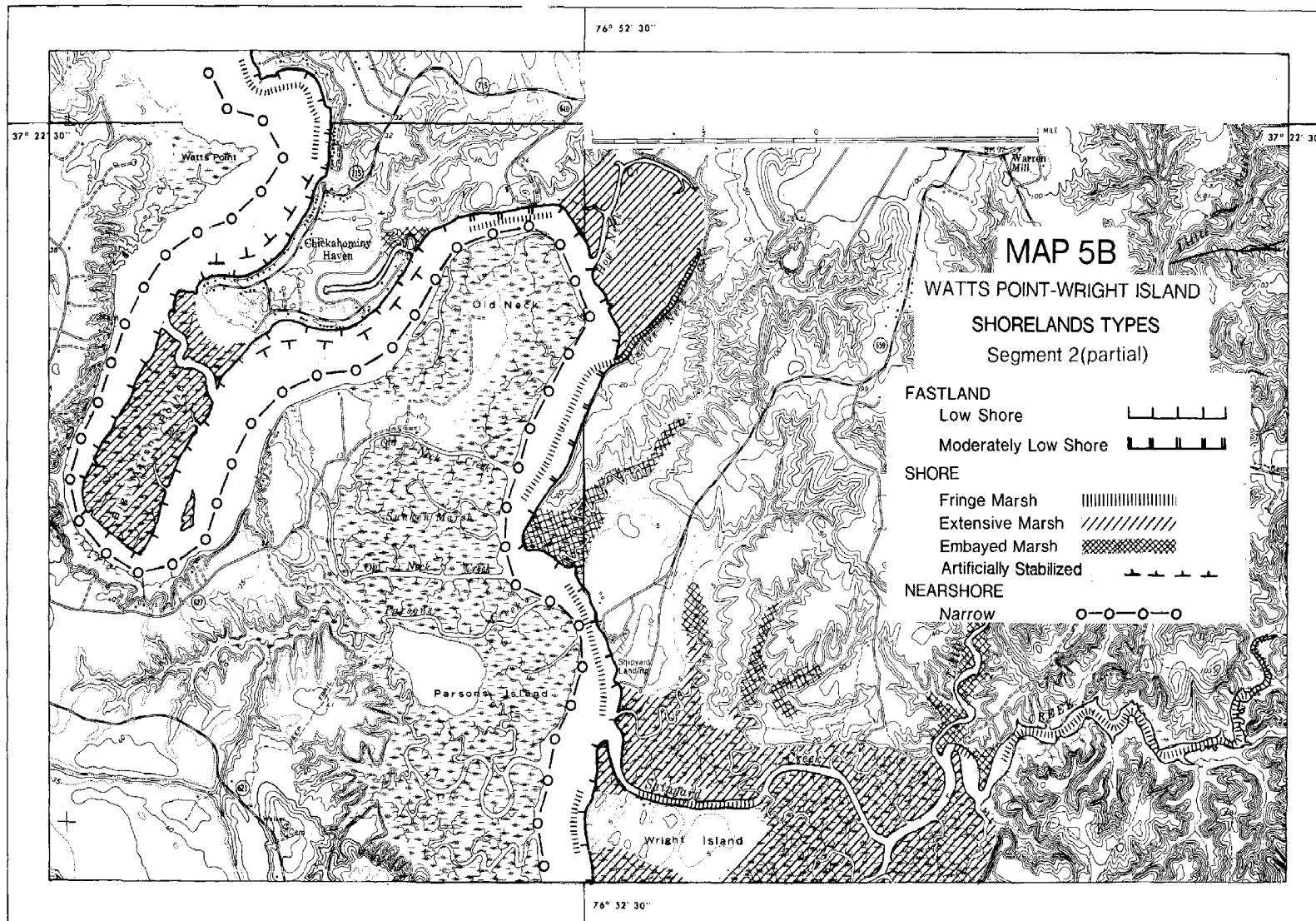


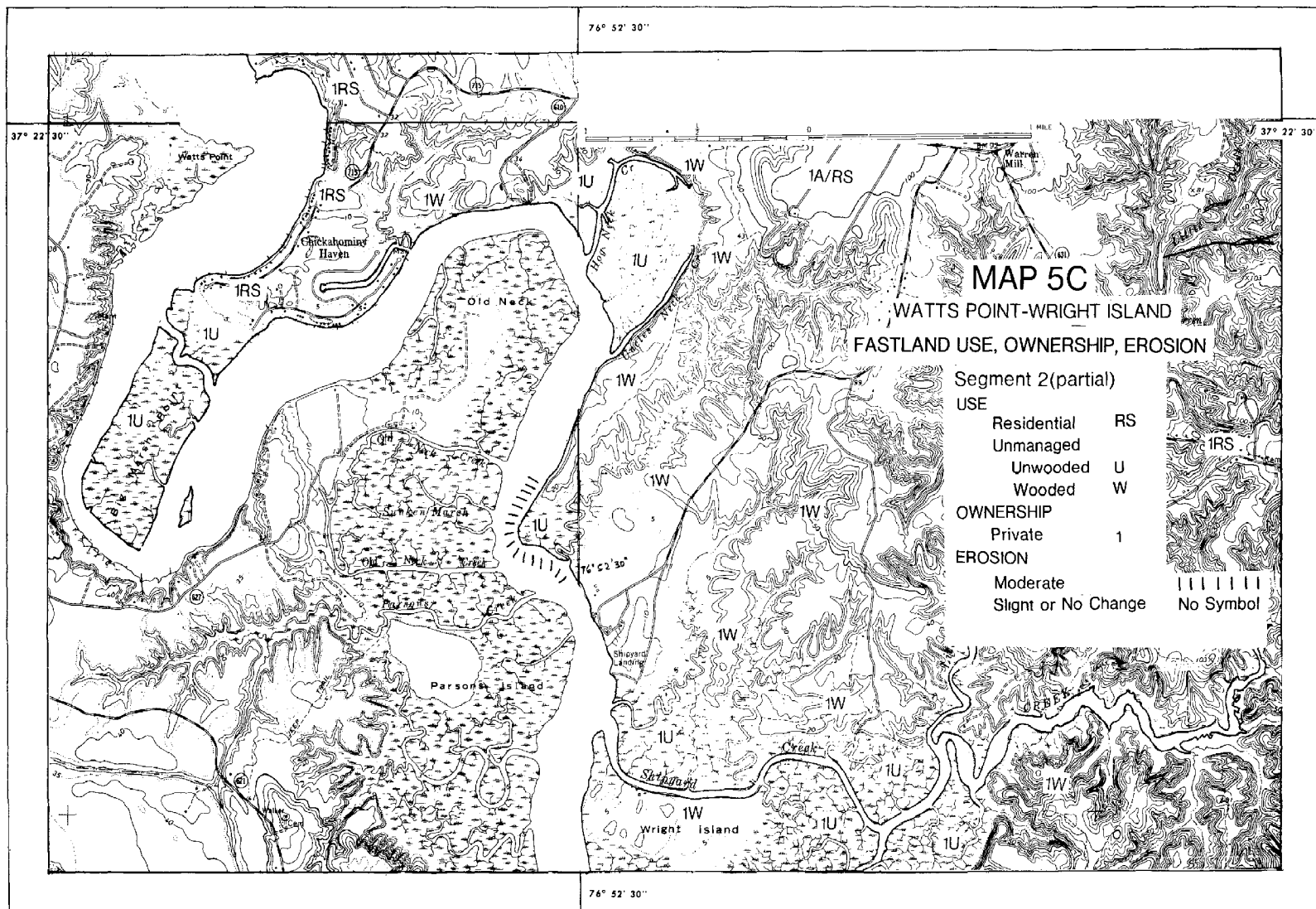


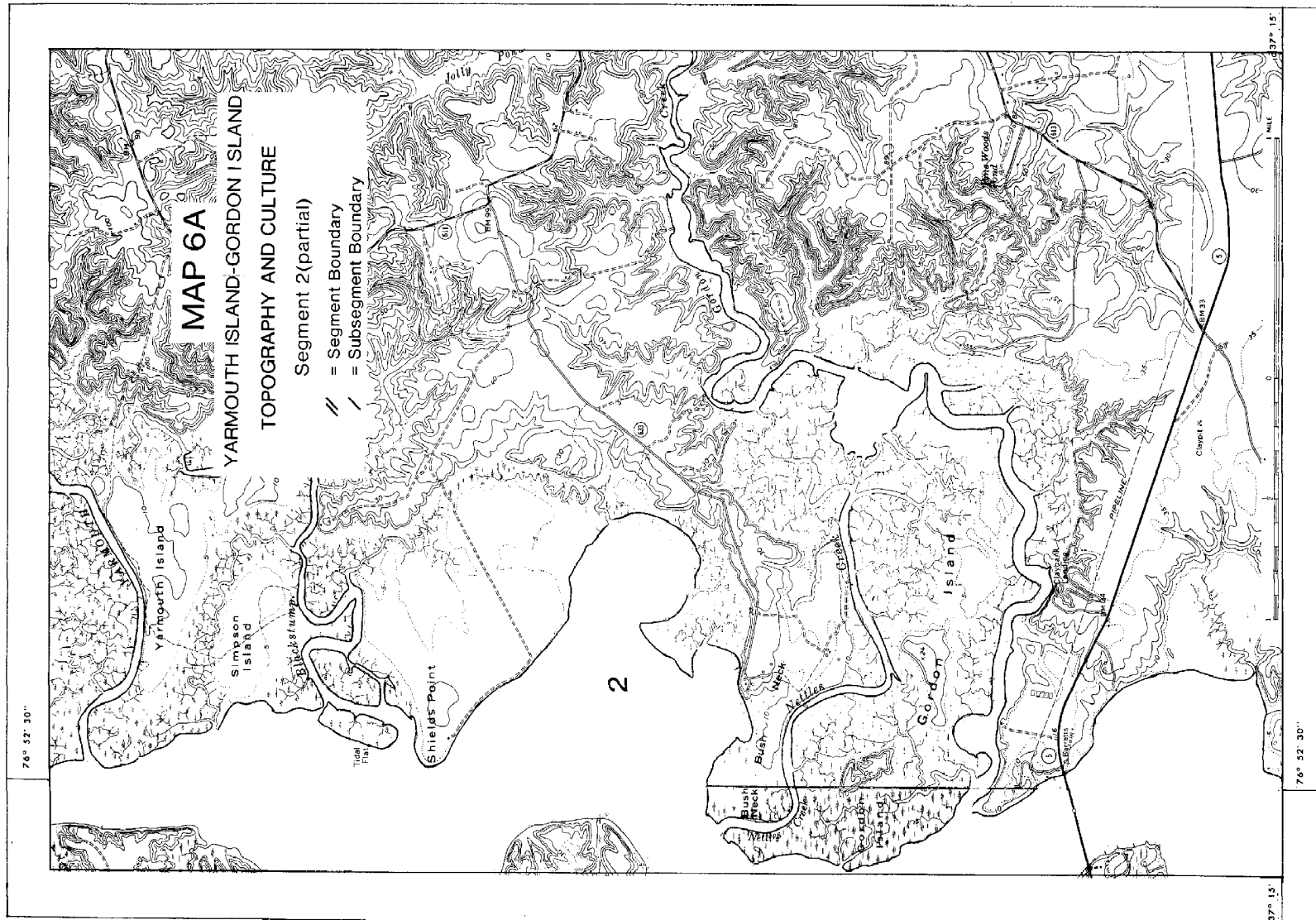


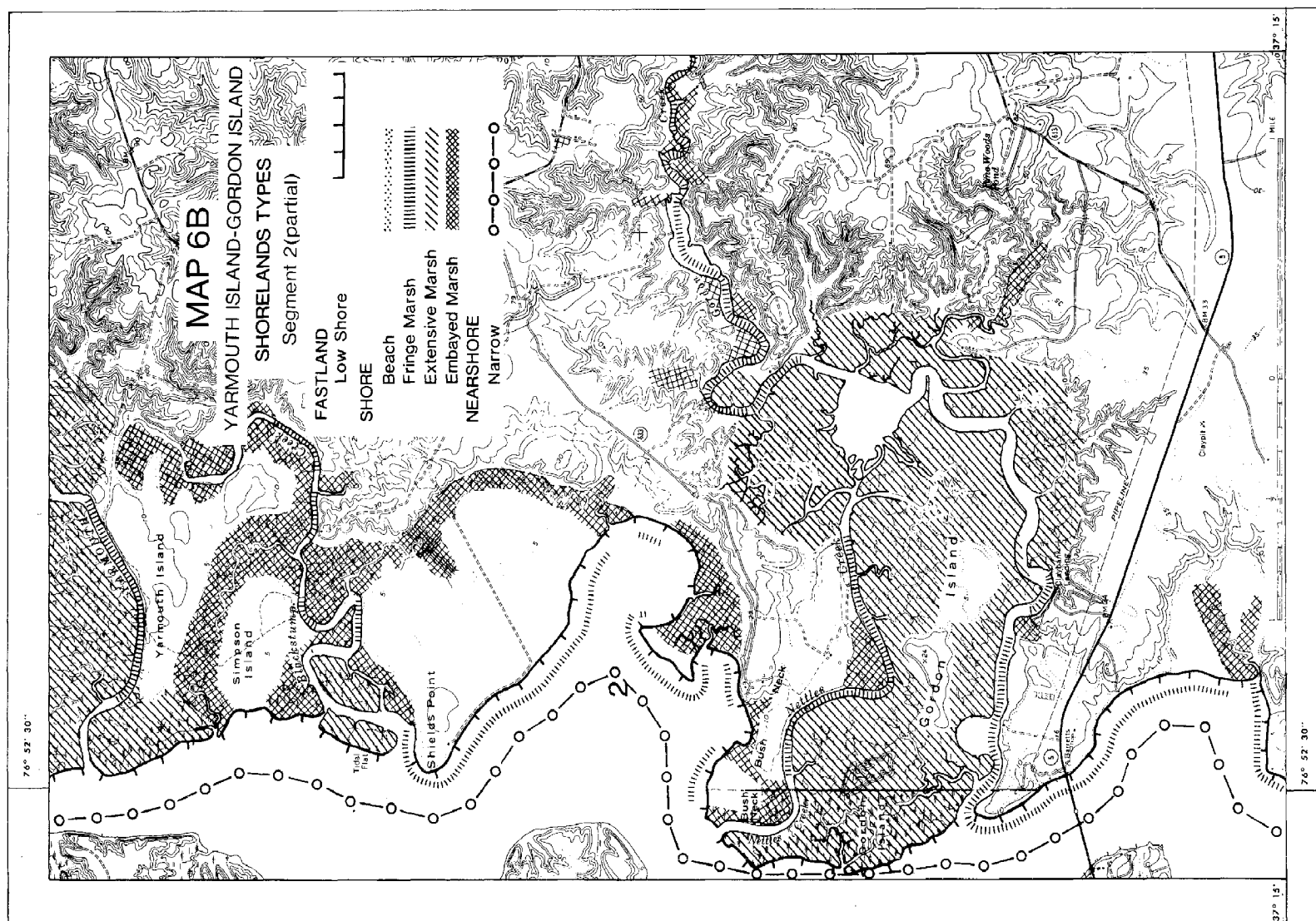


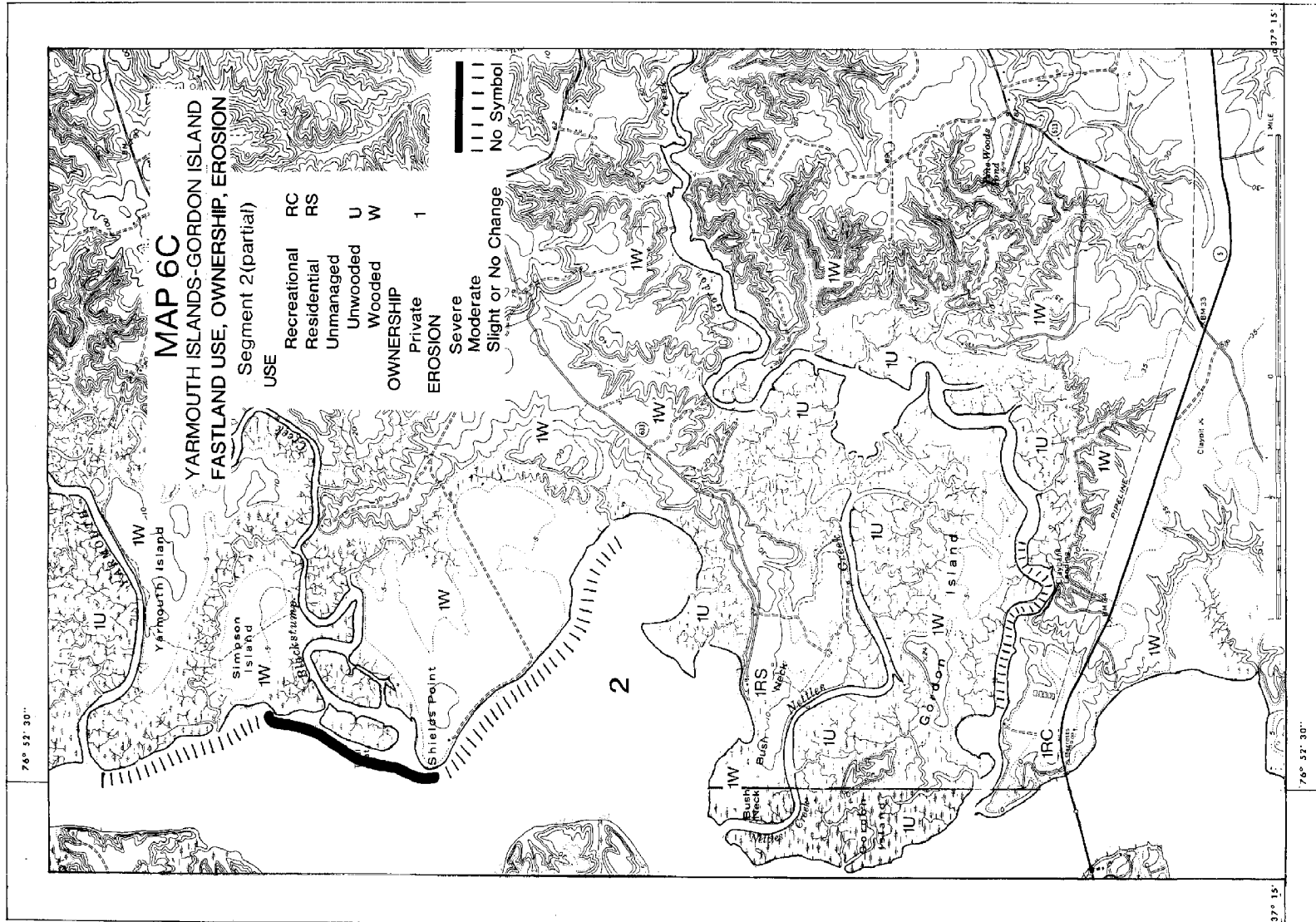


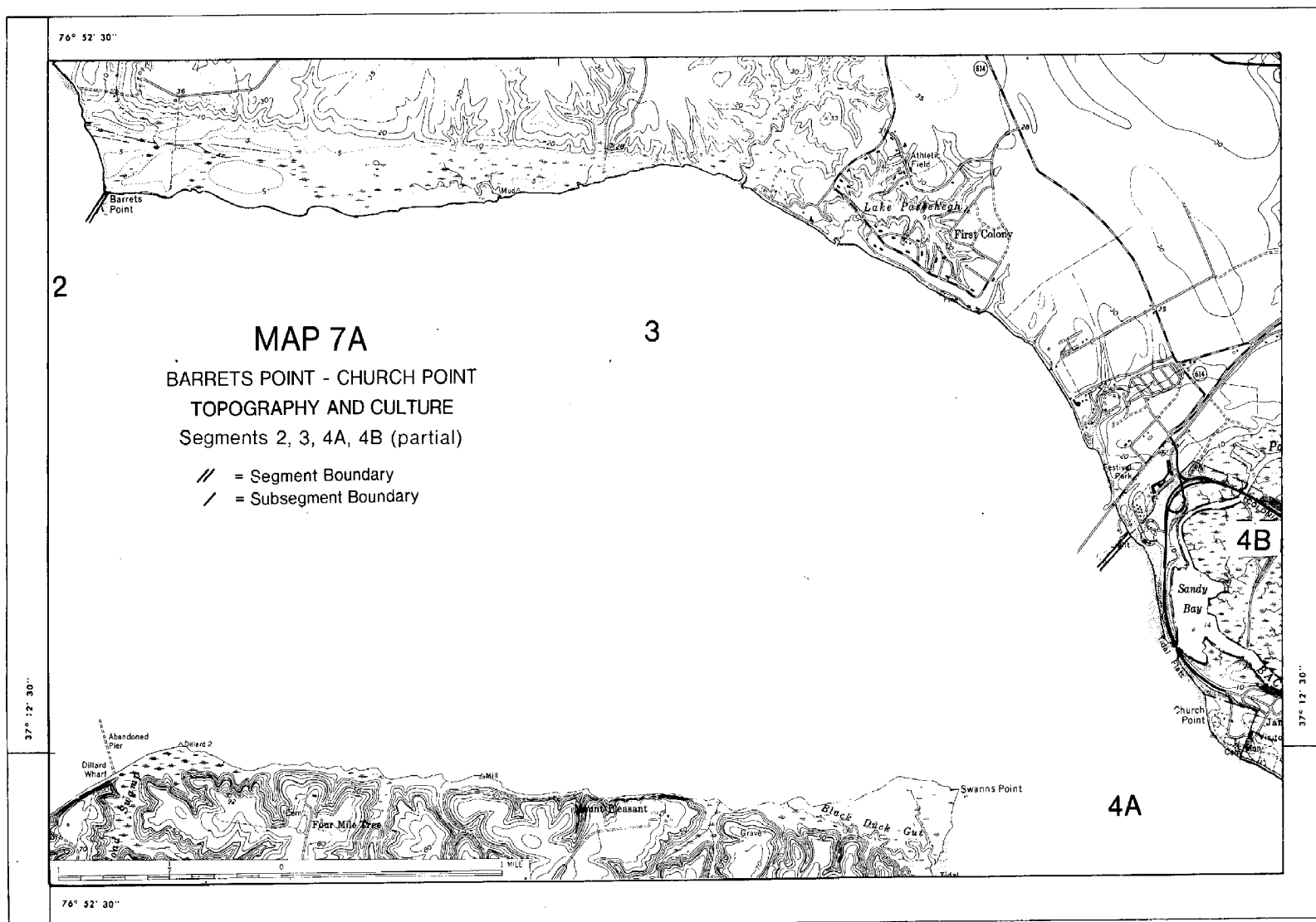


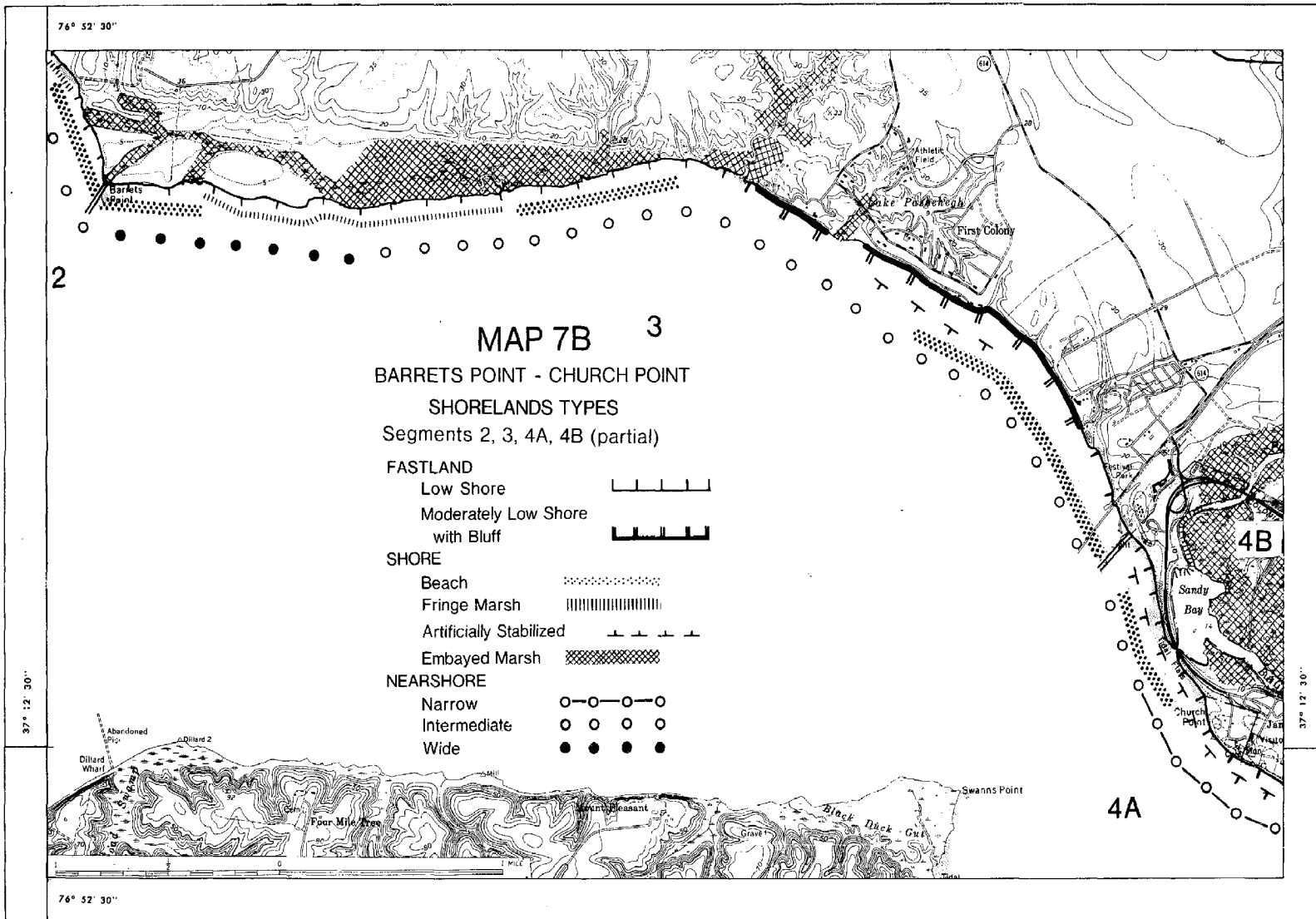


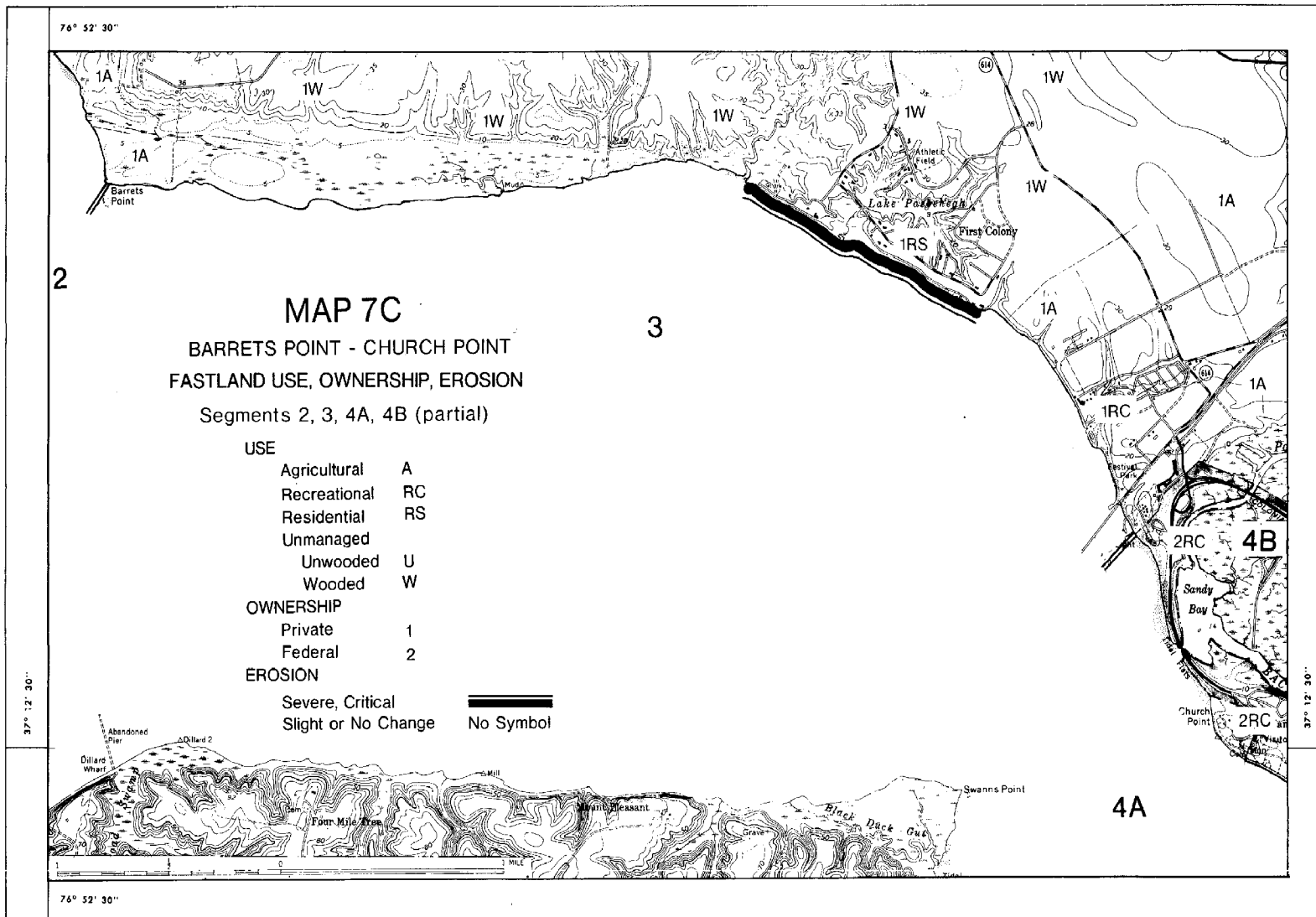


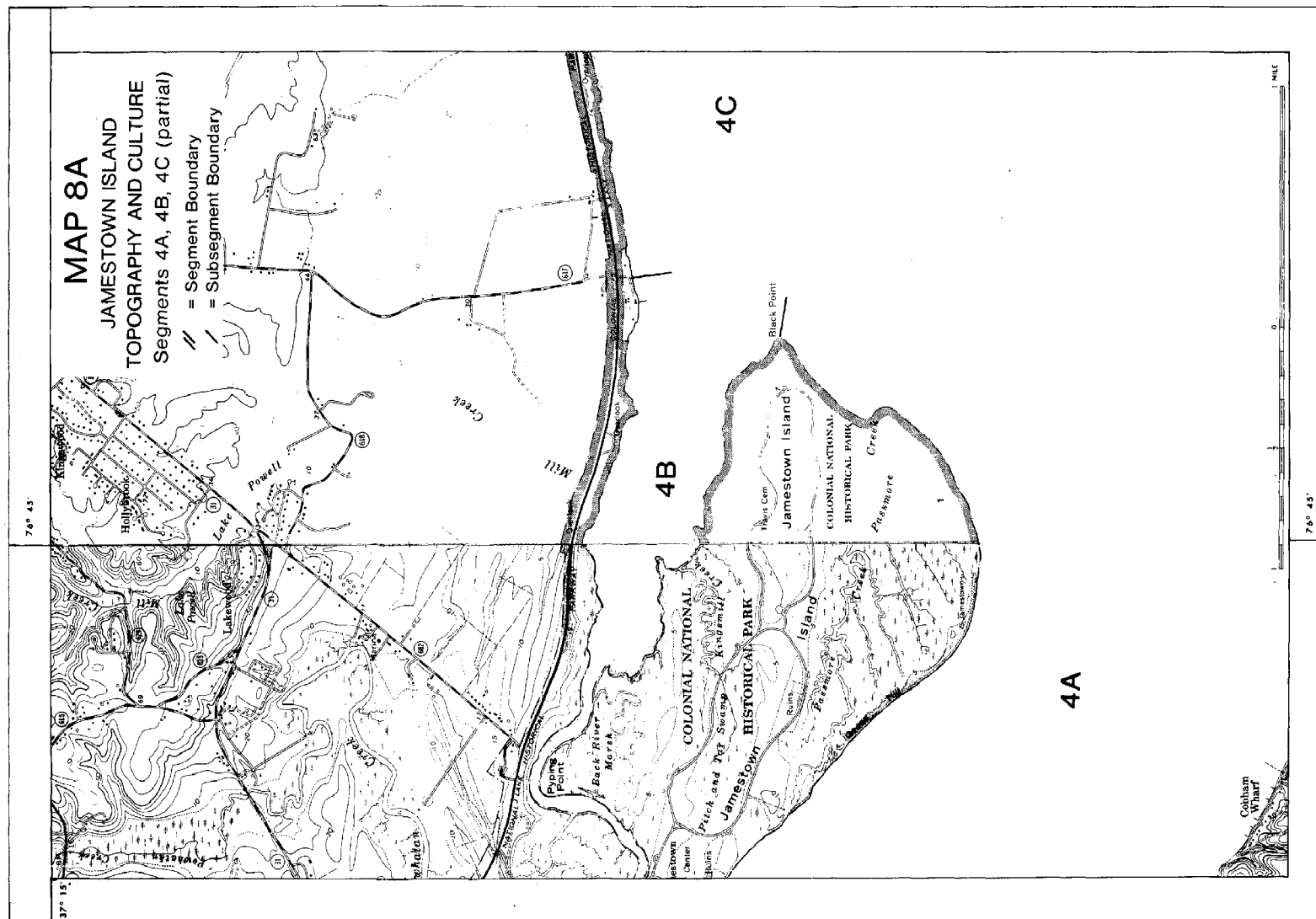


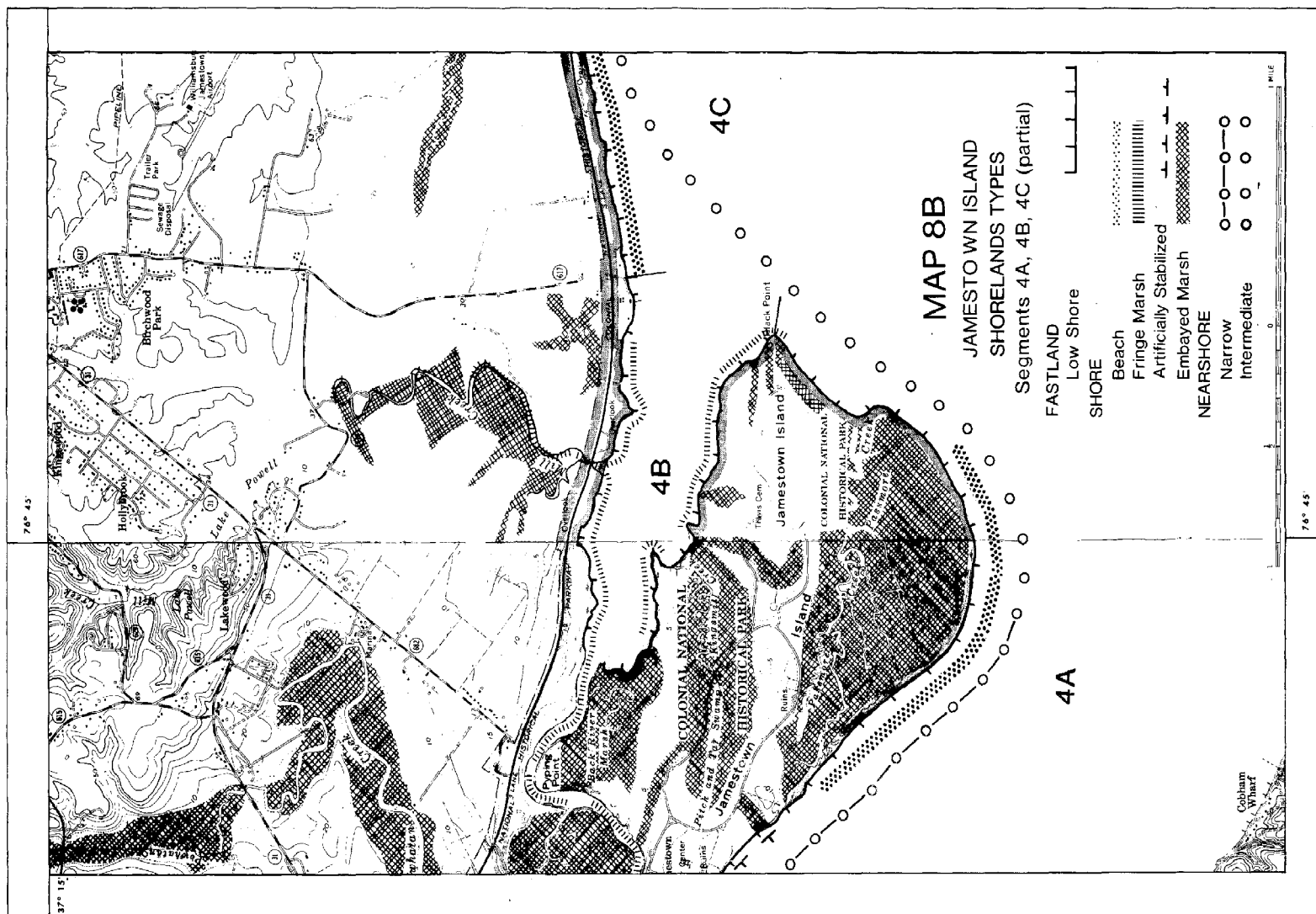


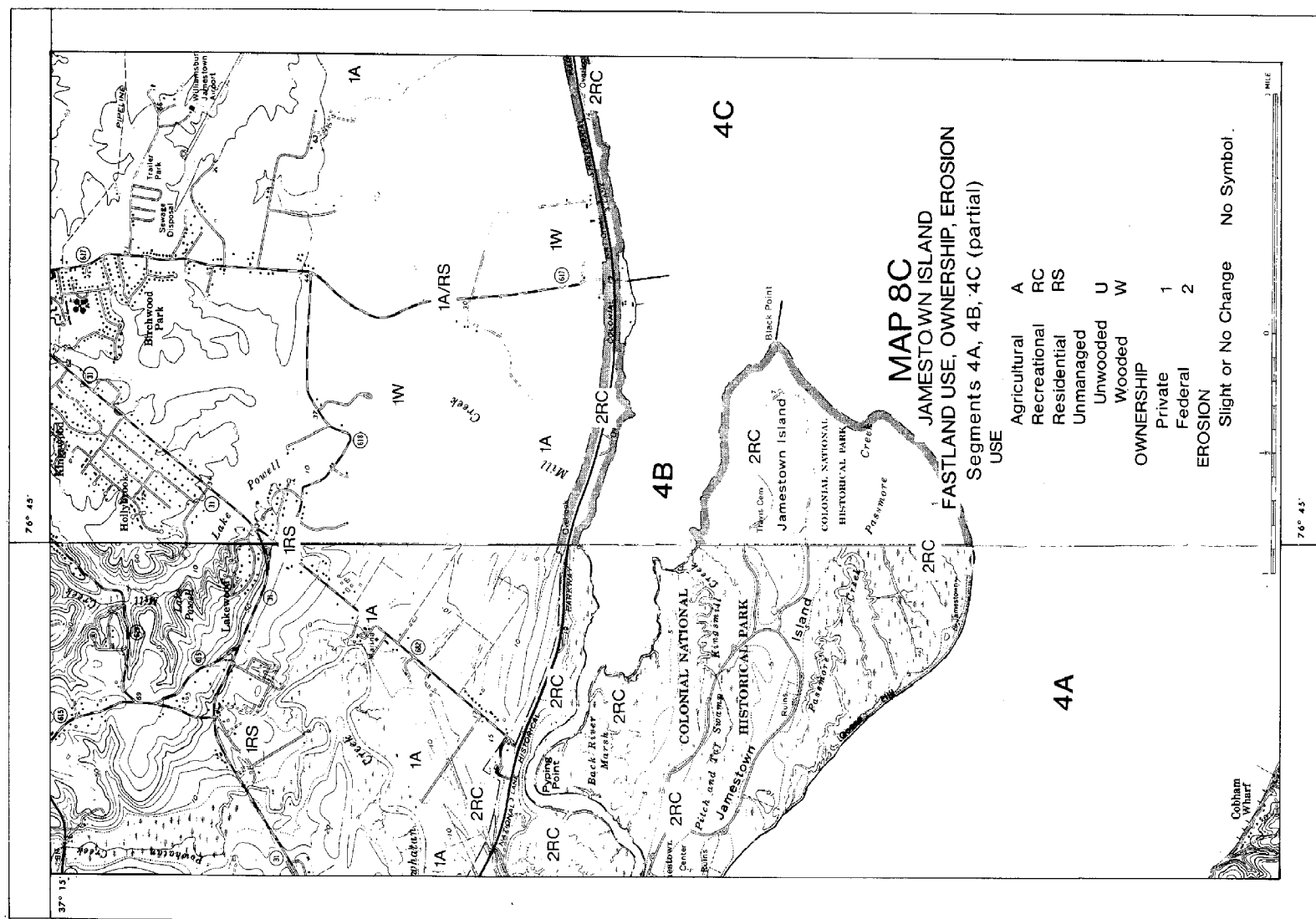


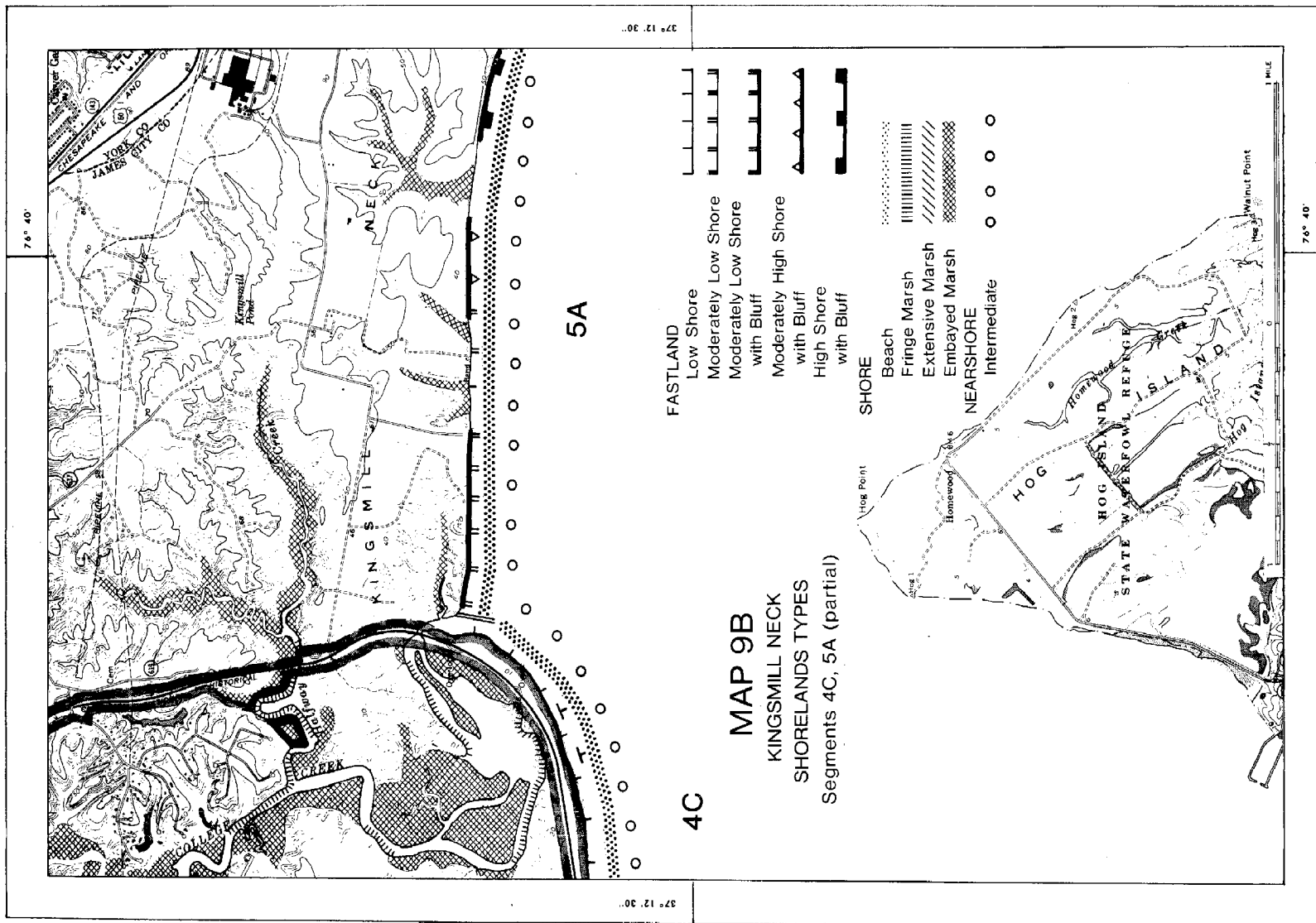


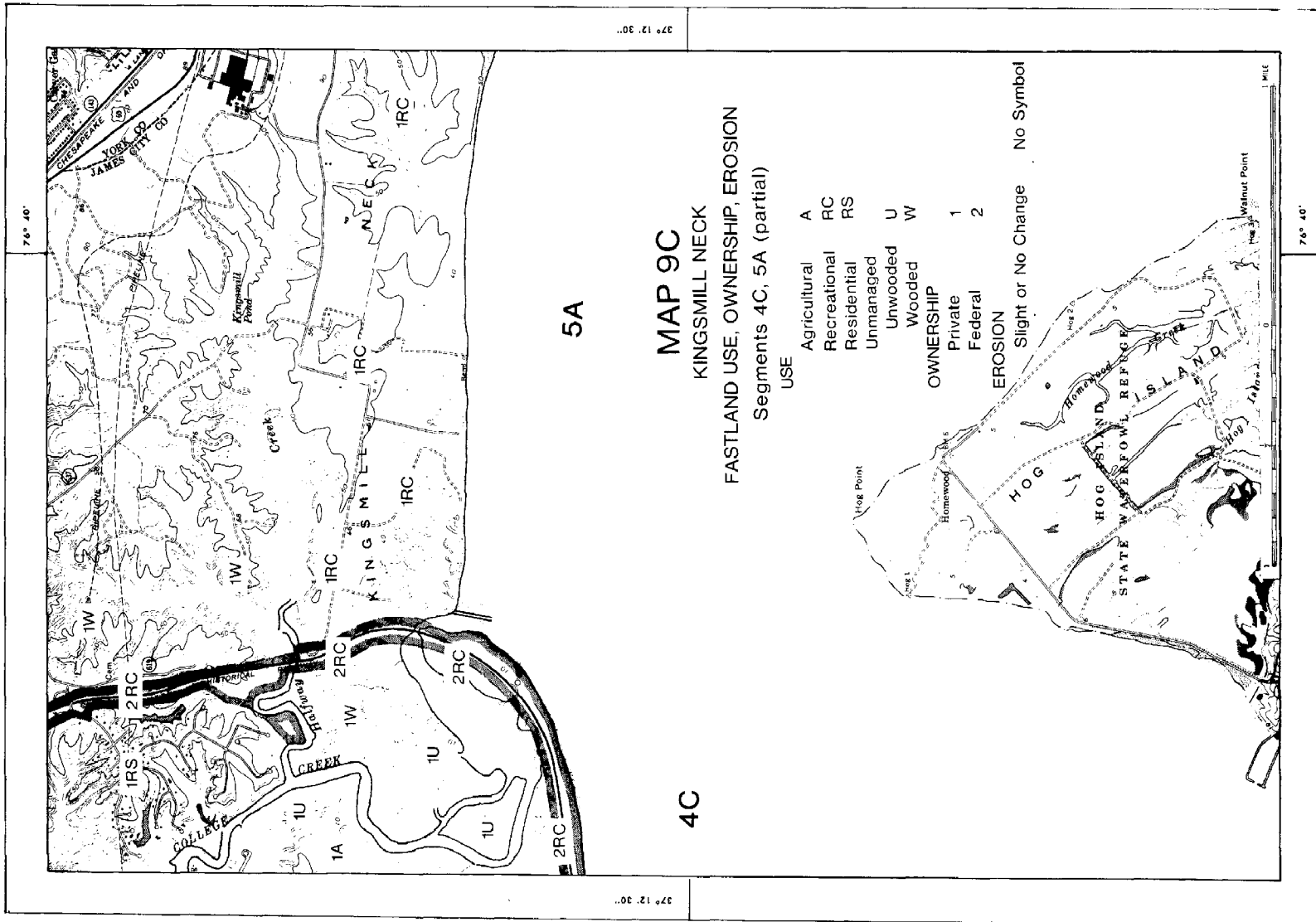


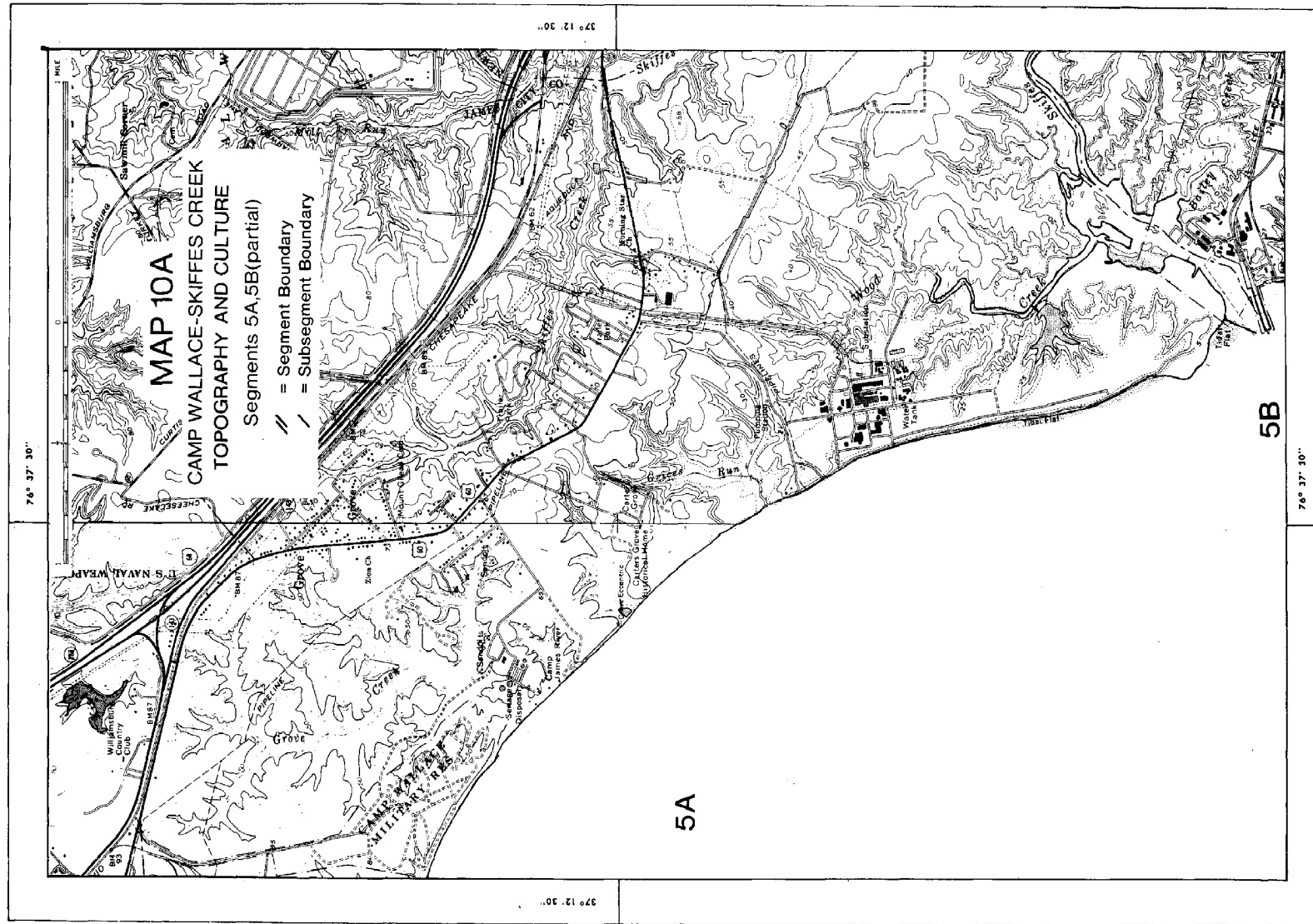












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