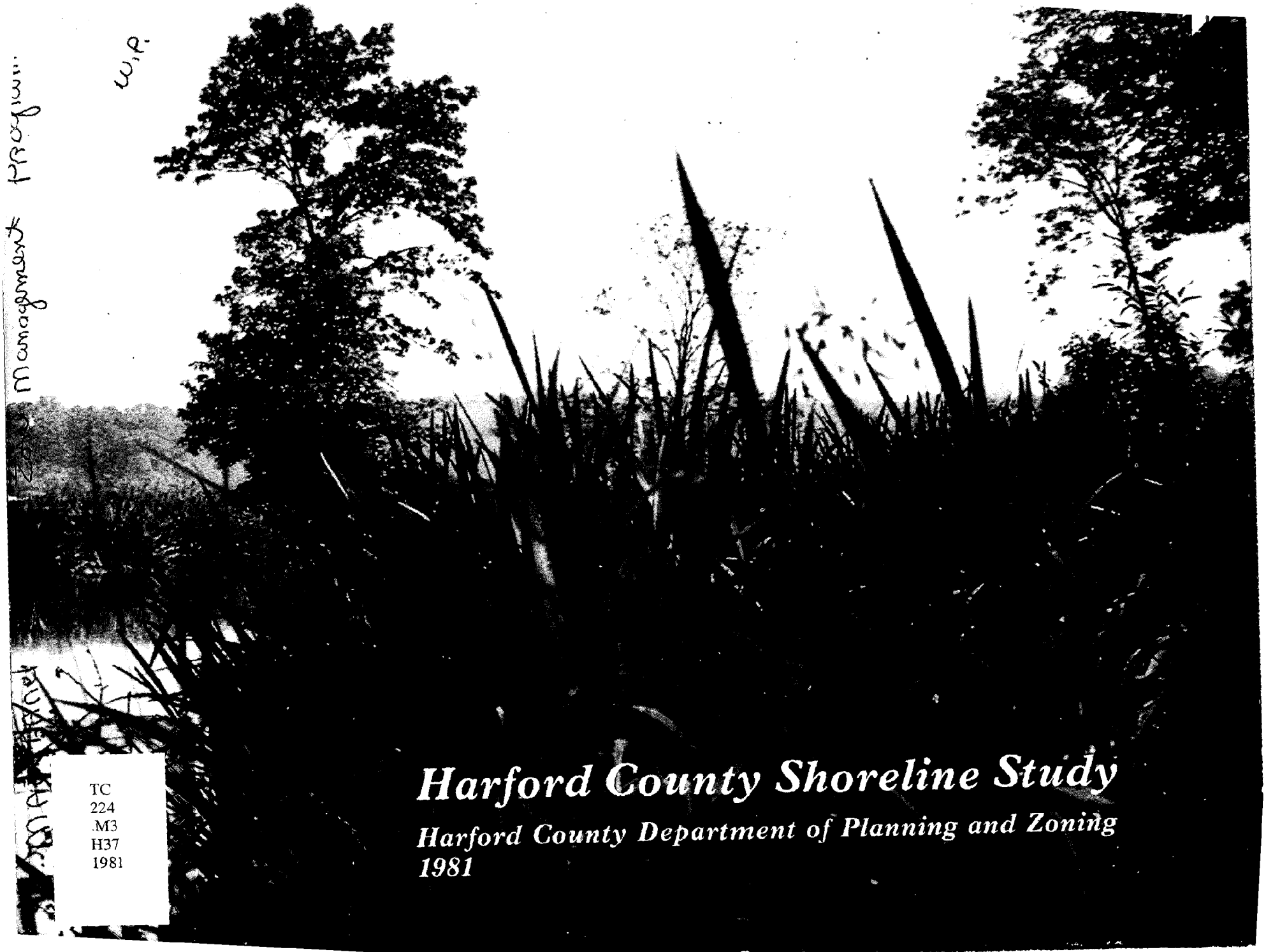

Harford County Shoreline Study

Harford County Department of Planning and Zoning
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Abstract

The Harford County Shoreline Study was conducted in the summer of 1980. Extensive field analysis was used to examine the land near the water's edge in order to locate areas with potential for passive and active recreational use and to identify some of the sensitive coastline environments that may need to be protected.

The study concludes that there are many possibilities for increased public access to the waterways of the County. It was also found that the coastline marshes need further protection to prevent environmental degradation.

This study was funded by the Maryland Coastal Management Program through a grant from the Office of Coastal Zone Management, National Oceanic Atmospheric Administration (NOAA).

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Harford County Shoreline Study

Harford County Department of Planning and Zoning
1981

County Executive: ***J. Thomas Barranger***
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District E: ***Barbara O. Kreamer***
District F: ***Frank J. Hutchins***

Director, Department of Planning and Zoning: ***Guy W. Hager***
Chief, Long Range Planning and Research Division: ***Uri P. Avin***
Project Director: ***Robert S. Lynch***
Contributor, Harford County Marshes: ***Stanley Kollar,***
Assistant Professor Biology, Harford Community College
Project Assistant: ***Michael Luzier***
Editor: ***Marilyn W. Norris***
Maps: ***Michael Luzier***
Graphic Design: ***Sandra R. Sparks***
Photographs: ***Wayne Nield, Robert S. Lynch***

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Executive Summary

Harford County has 106 miles of shoreline, of which only a quarter is accessible to the public. This shoreline study was undertaken in an effort to gather information about the natural features of this important resource, to identify areas with potential for recreational use and areas requiring conservation management.

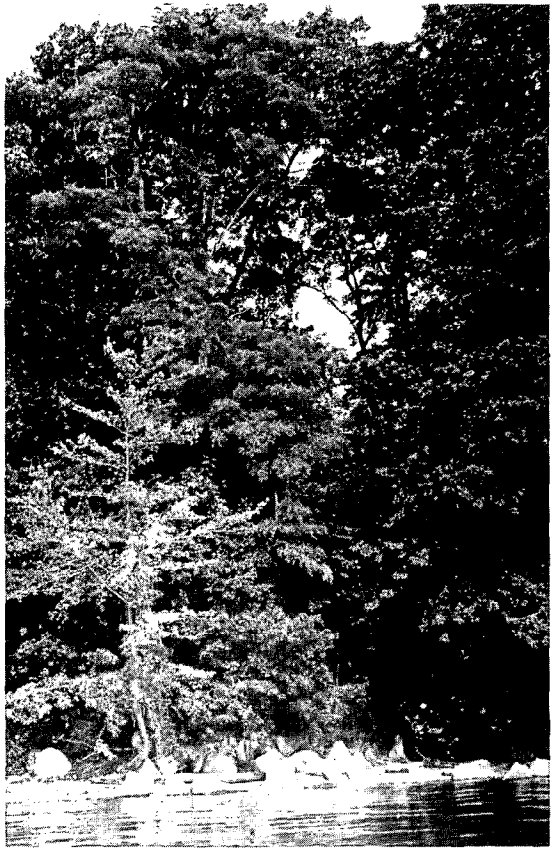
The Department of Natural Resources funded the study. Field survey techniques were used to observe and gather information from the perspective of the waterside. The area within the U.S. Army testing installation at Aberdeen Proving Ground was not included in the study.

In order to accurately describe the condition of the shoreline, three types of information were collected: natural features (land, shore, and vegetation), constructed features (erosion-control structures, piers, houses) and natural processes (erosion, sedimentation, and succession).

Natural Features

The Harford County shoreline can be categorized according to five basic shoreline types. These typologies contain generalized characteristics found in different combinations of shore and fastland zones.

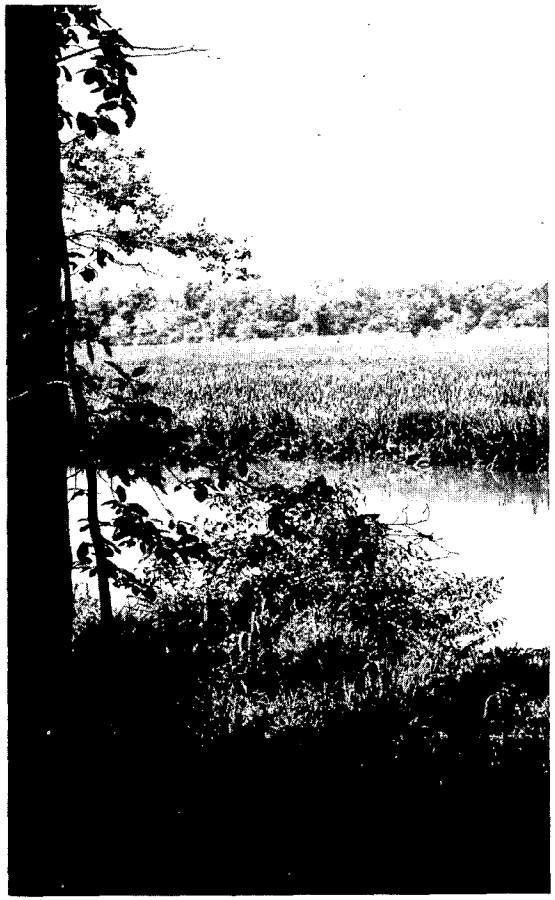
Natural/Overhang
A natural shore with overhanging mixed hardwood vegetation. Found along the Susquehanna River, the Oakington Shore, and the coves of Swan Creek, the Bush and the Gunpowder Rivers.



Rocky/Overhang
Similar to the natural overhang shoreline except containing numerous rocks of varying sizes. Found along the Susquehanna River, the Oakington Shore, and the coves of Swan Creek, the Bush and the Gunpowder Rivers.

Sandy/Vegetation
A sandy beach with mixed hardwood vegetation. Inshore landscape is usually recessed (sloping), but some are bluffed. Found along the Bush and Gunpowder Rivers.

Gravelly/Vegetation
Gravelly beach with mixed hardwood vegetation. Found along the Susquehanna River and the Chesapeake Bay.



Marsh
Low wetland, periodically inundated. Considerable growth of grasses, sedges, cattails, and rushes. Found in the Swan Creek and the Bush and Gunpowder Rivers.

Natural Processes

Two major natural processes were documented. Vegetational succession was observed and recorded. Erosion and sedimentation were noted together because they are related in occurrence.

Vegetational Succession

- Most of the inland zone along the Harford County shoreline is in the climax stage of succession. Mixed hardwood forests contain beech-maple and oak-hickory as the dominant tree association.
- Swan Creek Point is the only shoreline area that is still in the process of succession, exhibiting vegetation of a stage preceding climax.

Erosion/Sedimentation

- Swan Creek is bearing increased sediment loads because of development that is occurring upstream. Increased sedimentation may also be due to the blocking of waterflow by the U.S. Army Spesutie Causeway.
- The Bush River drainage system contains nine potential point-source polluters, ranging from industries to sewage-treatment plants to a quarry. Runoff from urban areas, construction sites and agricultural lands contributes to the sedimentation problems as well.
- Bush Creek Marsh appears to have a low vegetational diversity which could have been caused by increasing sedimentation rates.
- Heavy siltation has been occurring in the Gunpowder River because of runoff from construction sites and agricultural land and the sand and gravel operations on the tributaries at the head of the tidal portion of the river.
- Otter Creek Marsh acts as a buffer for the water passing through it. Nutrients and heavy sediments from several large developments near Route 40 percipitate out here.

Constructed Features

The Harford County shoreline exhibits several types of constructed features.

Year-round Dwellings

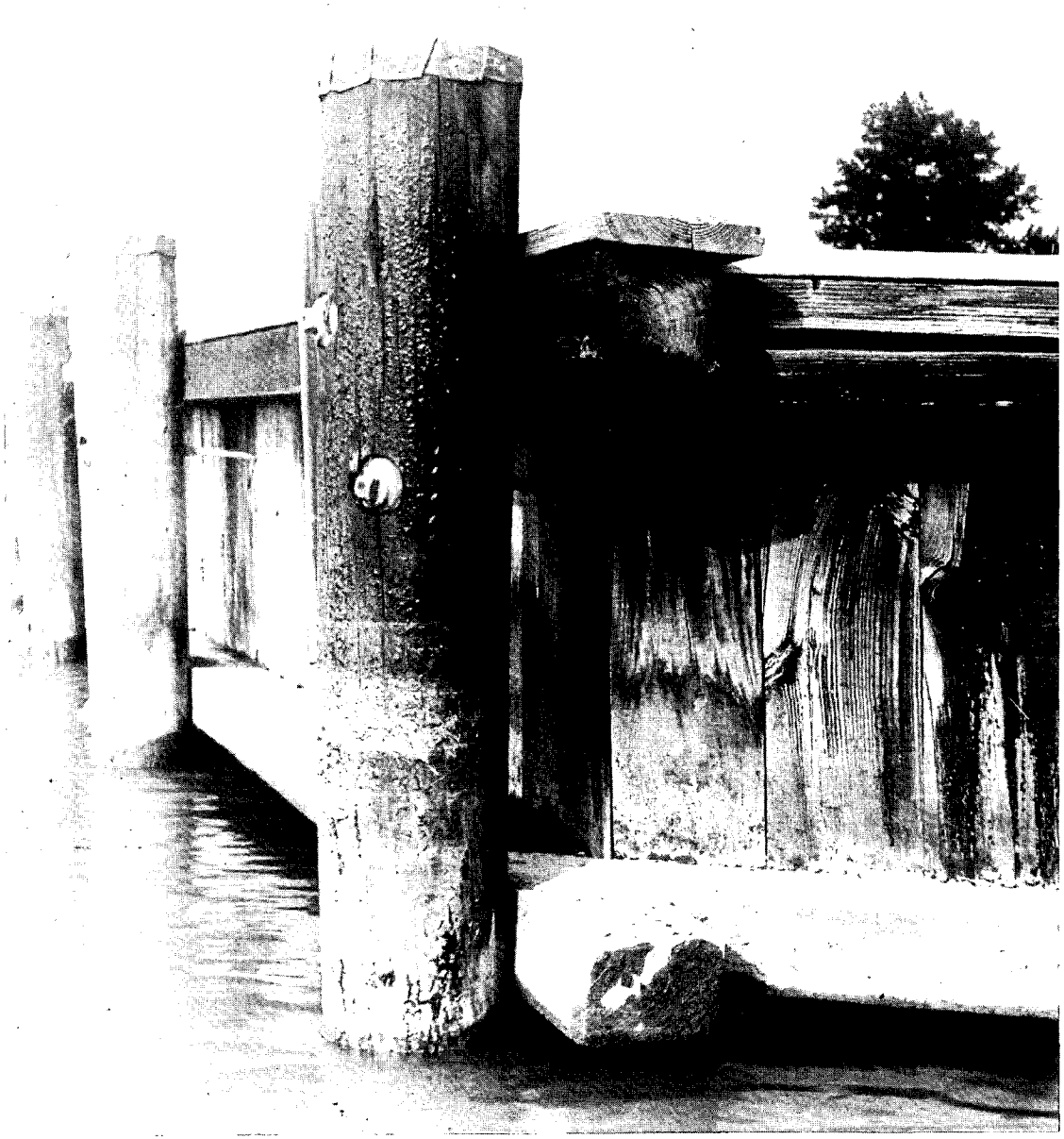
- Havre de Grace is an 18th century city located on the Susquehanna River. The city plan of streets and buildings offers unique vistas from the waterside into town and from the town onto the water.
- Joppatowne has extensively landscaped single-family houses and townhouses located on many of the coves of the Gunpowder River.
- The west shore of Foster Branch is lined with residential units.
- A few houses appear along the Susquehanna near the mouth of Deer Creek.
- Seasonal homes converted to year-round use are located along Broad Creek.
- Homes of varying size, style and quality of repair are found along the Bush River. Seasonal and year-round housing are mixed.
- Several homes are located on top of the steep banks of Swan Creek.

Seasonal Dwellings

- Cabins dot the waterfront land owned by the Philadelphia Electric Company on the Susquehanna River above the Conowingo Dam and along Broad Creek.
- Seasonal housing is found along the Bush River.

Bulkheads and Piers

- Bulkheads have been built along the shorelines of Joppatowne and Havre de Grace and in some places along the Bush River.
- There are piers and docking and launching facilities on the Susquehanna near the mouth of Broad Creek and at Havre de Grace, on the Bush River, on Foster Branch and at Joppatowne.



Introduction

Harford County is situated along the western shore of the upper Chesapeake Bay. The Susquehanna River serves as the county's northeast boundary with Cecil County. To the southeast, the county is bordered by the Little Gunpowder River, a boundary shared with Baltimore County.

Harford County begins in the Northern Piedmont area and slopes gently down to the shores of the Chesapeake Bay, the largest estuary in North America. The 106 miles of county shoreline which border the bay and its rivers, estuaries and marshes rank among the finest natural assets of this largely agricultural area. Only 26 miles (25%) of the Harford County shoreline is directly accessible to the public. The U.S. Army's testing installation at the Aberdeen Proving Ground (APG) controls the rest. This control extends to portions of county shoreline bordering the Chesapeake Bay, Bush River and Gunpowder River. This situation makes the accessible shoreline of even greater importance to the County.

The objectives of the Harford County Shoreline Study were:

- to gather information on shoreline conditions, wildlife habitat, submerged aquatic vegetation, and other natural features that make the shoreline a unique environmental system.
- to identify areas with potential for passive or active recreational use.
- to identify areas which require conservation management.
- to identify policy issues which affect land use, shoreline access and use, and conservation management.

Funding for this study was provided by the Department of Natural Resources, Tidewater Administration, Maryland Coastal Zone Management Program.

Legislative support for the study goes back to the Coastal Zone Management Act (CZMA) passed by Congress in 1972. This act was passed because unplanned growth and uncontrolled development in coastal areas had led to "loss of living marine resources, wildlife, nutrient-rich areas, permanent and adverse changes to ecological systems, decreasing open space available for public use and shoreline erosion." Congress recognized that there are "important ecological, cultural, historical, and esthetic values in the coastal zone which are essential to the well-being of all citizens" and which are subject to forces that may irrevocably alter them.

Harford County has actively participated in the Coastal Zone Management Program since 1977. In that time, progress has been made at the local level through the passage of legislation that regulates stormwater runoff, sediment control and flood plain management. This legislation helps to protect the county's waterbodies from environmental degradation.

There continue to be requests for use of the coastal area in ways which are not compatible with the sensitive nature of the coastal zone and its adjoining shoreline. For example, there are proposals for new residential developments in areas adjacent to Church Creek Marsh and Otter Point Marsh. In addition, expansion of county, municipal, and federal sewage treatment facilities is currently underway. It is critical that the possible negative environmental impact of such activities be understood.

This study included conventional data sources relating to the shoreline, e.g., United States Geographical Survey maps, aerial photographs, photogrammetric maps, and Department of Natural Resources maps. However, field surveying was the essential technique employed. Observation of the shoreline and data collection were accomplished from the water. This provided the unique opportunity to examine shoreline land use from the perspective of the waterways rather than from the land. Apart from furnishing accurate and up-to-date information, this approach offered certain unique insights about the natural shore and the urban areas adjacent to it.

The study excluded the lands of the Aberdeen Proving Ground (APG) which are owned by the federal government. However, discussions have been held with members of APG's Facilities Engineering-Environmental Staff concerning the possibility of allowing public access to some of their shoreline recreational space.

Harford County Shoreline Segments

A shoreline is the contact point between a body of water and the land. It is a complicated and fragile ecosystem. Any attempt to document the character of a shoreline requires simplification and generalization upon the various single elements which, in fact, function as a complex system. Although this method introduces some measure of error, it provides a way of assembling a total picture of the system.

For purposes of study, the Harford County shoreline was divided into six geographical areas. Each of these areas is described separately in this chapter. Each geographical unit is composed of three interactive physical elements: the fastland, the shore and the near shore (See Figure 1). Together, the three elements function as a single ecotone with each element performing a different function in the working of the system. (An ecotone is the transition zone between two different ecological units.) In this case the zone provides a transition between upland areas and tidal waters.

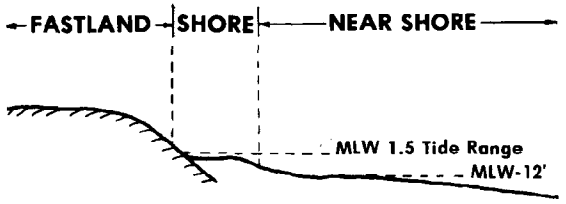


Figure 1: An illustration of the definition of the three components of the shorelands. Source: William H. Queen -Chesapeake Research Consortium, Inc. "Physical Alterations of Coastal Shorelines

In order to accurately describe the condition of the Harford County shoreline, three types of information are needed: natural features, constructed features and natural processes. Constructed features include erosion-control structures, piers, and houses. The natural processes of importance are erosion, sedimentation, and succession.

Natural Features

The natural features of a shoreline are what makes it a unique environmental setting. The natural features were classified into four categories below.

Fastland

The fastland zone extends landward from the shore zone. It is a relatively stable area and is the site of most development activity. In Harford County the fastland supports a mixed hardwood forest with beech-maple and oak-hickory as the dominant tree associations.

Fastland landscape is classified as recessed, bluffed or beached bench/slope. A recessed landscape slopes uniformly toward the water's edge, while a bluffed landscape slopes abruptly to the water. A bench/slope is characterized by a plateau on top of a recess or a bluff, usually followed by an additional steep slope. Access to beaches often depends upon the type of inshore landscape. Typically, recessed or bench/slope landscapes offer greater access to the waterfront.

The Shore Zone

The shore zone is a buffer area between the fastland and the water. The shore width (measured from the fastland towards the water) fluctuates with the daily tides. The seaward limit of the shore zone is the break in slope between the steeper shore surface and the more gently sloped near shore.

In this study, the shore has been classified as beach, natural shore or marsh. The distinction between beach and natural shore is an important one. The natural shore is an extension of the fastland; a beach is formed by material deposited by the rivers as they move toward the sea. The beaches in Harford County are characterized as either sandy or gravelly and according to the severity of their slope (flat, moderate, severe or bluff).

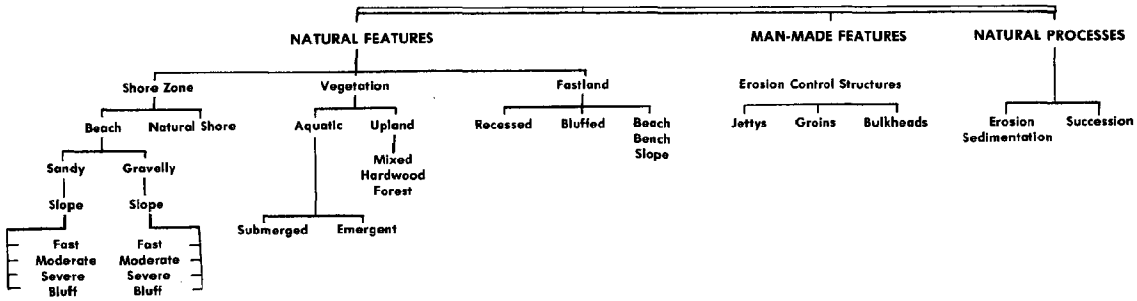


Figure 2: An illustration of the shoreline characteristics inventoried.

There are several marshes along the Harford County shoreline. An explanation of the unique features of the marshy shore zone is included in the introduction to the chapter on Harford County marshes.

Near-Shore Zone

The near-shore zone is the area that extends from the seaward limit of the shore zone to the 6-foot contour line, which is an area always below water. The near-shore bottom material is an important feature in the estuarine system because it is where aquatic vegetation is rooted. The firmness of the bottom material depends upon the mixture of sand, silt and clay particles and it determines what type of vegetation will be able to take root. Furthermore, the firmness of the bottom is an important consideration in choosing areas for recreational use.

Vegetation

Aquatic and upland vegetation were inventoried in this study. Both submerged aquatic and emergent vegetation were encountered in the field. Each of these types play a vital role in maintaining the health of an estuarine system. Likewise, the mixed hardwood forests of the upland are important as they provide a habitat for wildlife and protect the fastland from erosion.

Constructed Features

Constructed features have the potential to alter the natural conditions of the shoreline. Erosion-control structures such as jetties, groins and bulkheads, are often placed in the shore zone. The types and locations of erosion-control structures as well as other constructed features such as piers and houses were inventoried in this study.

Natural Processes

Soil erosion, sedimentation and succession are the natural processes that are relevant to the shoreline study. Soil erosion and sedimentation were considered together because sedimentation is the product of erosion. Both of these processes can damage the ecosystem. As land mass erodes, the material that is removed is deposited somewhere else on the landscape. Soil erosion results in the loss of valuable topsoil and sedimentation increases the turbidity of the water and can harm aquatic life. Turbidity decreases the amount of light available for plants and sediment clogs the gills of fish.

Succession is the natural progression of vegetation types to the climax community which is indigenous to the area. A mixed hardwood forest is the climax community of this region and is the dominant vegetative cover found on the inshore regions of the Harford County shoreline. These areas were identified, but the actual stage of succession was not determined.

Harford County Waterways

Harford County is fortunate in having a geographical location that places it in close proximity to major waterways. Portions of the Susquehanna, Bush and Gunpowder Rivers flow through the County. In addition the County borders on the Chesapeake Bay. Each waterway is unique in that flow characteristics, species of wildlife supported, or length and width of waterbody may differ. However, all the County waterways are tied together into a beautiful but fragile natural system. This system is often under stress from land use activities that occur on the shore and negatively alter the balance of the system.

This chapter on Waterways discusses features of the Rivers and Bay and examines the adjoining shoreline.

Susquehanna River/Broad Creek

The Susquehanna River is the largest river in the eastern United States. It is a major water resource not only for Harford County and the State of Maryland but also for Pennsylvania and New York. The Susquehanna River Basin extends 160 miles to the west (near Altoona, Pennsylvania) and 225 miles to the north (near Binghamton, New York). The river drains an area of 27,500 square miles: 6,300 in New York; 20,900 in Pennsylvania; and 300 in Maryland. The drainage basin in Maryland includes parts of both Harford and Cecil Counties.

The average flow of the Susquehanna River is 25 billion gallons per day. During the period that records have been kept, the flow has varied from a low of one billion gallons per day in 1932 to 536 billion during the flood of 1936. At least fifty percent of the fresh water entering the Chesapeake Bay comes from the Susquehanna.

The Conowingo Dam is situated at a point approximately five miles south of the Maryland/Pennsylvania line. Between this line and the dam, the river is relatively calm and reaches a depth of seventy feet. The Peach Bottom Atomic Power Plant is on the river north of the Maryland line and is visible in the distance. In this area, the Harford

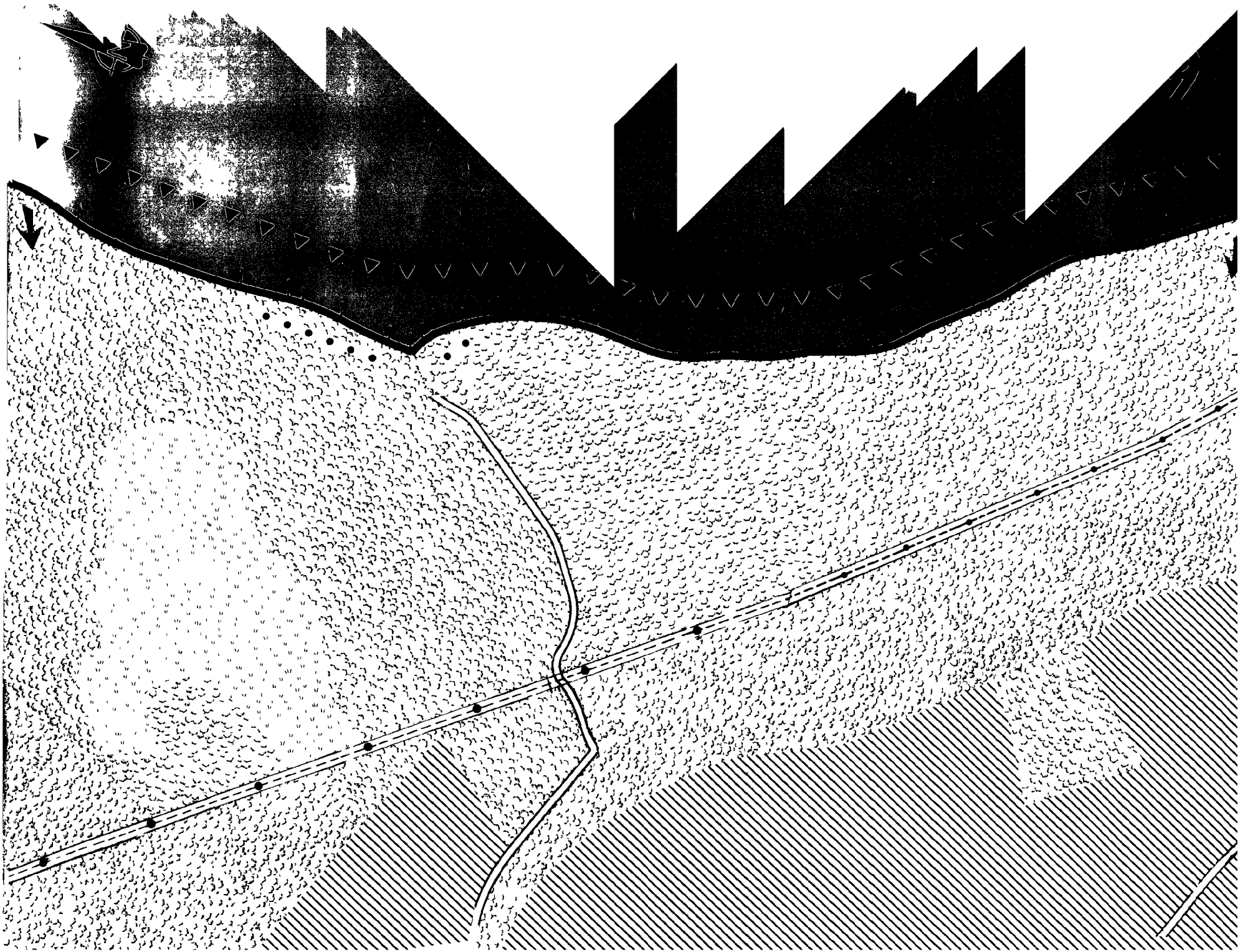
County shoreline is heavily wooded and the ground rises sharply from the water's edge. The vegetation is mixed hardwood forest made up primarily of oak-hickory and beech-maple associations. The waterfront land is owned by the Philadelphia Electric Company and is dotted with cabins.

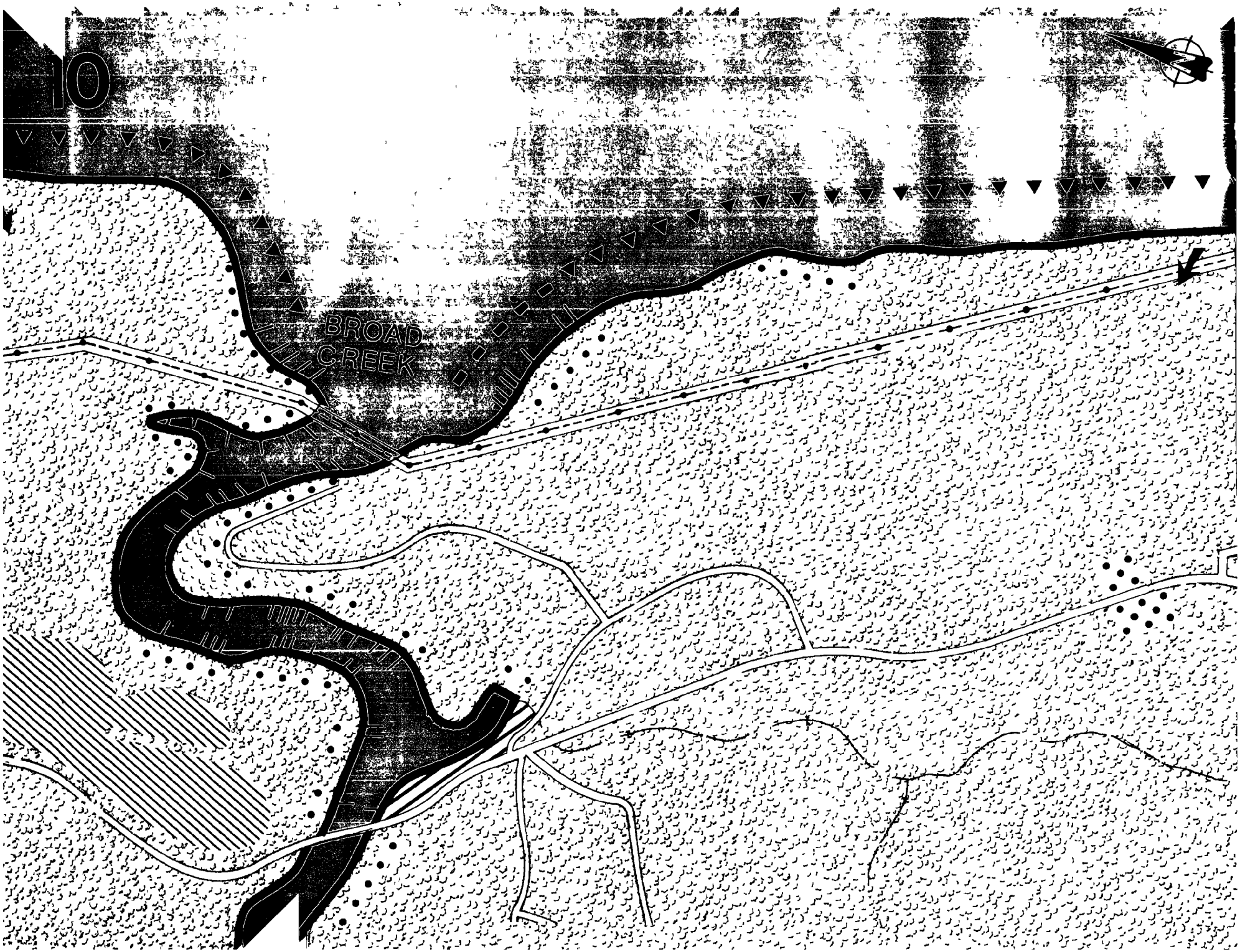
One and one-half miles south of the Maryland/Pennsylvania line is the mouth of Broad Creek. Broad Creek drains the northeastern corner of Harford County and is one of the county's main stream valleys. Steep slopes frame most of the creek's shoreline. A number of tributaries run into the creek. The stream banks are quite heavily wooded, providing shelter for wildlife and creating areas of great natural beauty. The Broad Creek Steatite Quarry, a prehistoric Indian Quarry used from 2,000 to 1,000 B.C., is also situated on the creek. There is also a Boy Scout Camp.

From the mouth of Broad Creek west approximately 300 feet beyond the bridge on Route 623, the banks of the creek are dotted with residential structures. Some of these cabins appear to have been built about forty years ago while others are more modern. Initially, these cabins were built as seasonal residences but over the years they have been converted to year-round use.

The majority of the land immediately fronting on Broad Creek is owned by the Philadelphia Electric Company. The Company leases the land to individuals who wish to build or purchase a cabin there. During the summer months, the Broad Creek area is very busy with recreational activity. The waters at the mouth of the creek are excellent for canoeing, boating and fishing. The County Department of Parks and Recreation maintains a boat-launching facility there. A short distance below the mouth of the Broad Creek, along the Susquehanna River, there is a private marina offering daily boat rentals.

A notable change in the shoreline is found in Hopkins Cove, immediately above the Conowingo Dam. Much debris has collected in the cove. Old logs, brush, plastic bottles and metal drums have washed downriver from the upstate region. In the past, such debris has been a problem to both the Philadelphia Electric Company, which operates the dam, and property owners in Havre de Grace where much of the debris eventually settles. The problem is most severe in early spring when ice begins to thaw and release trapped debris.

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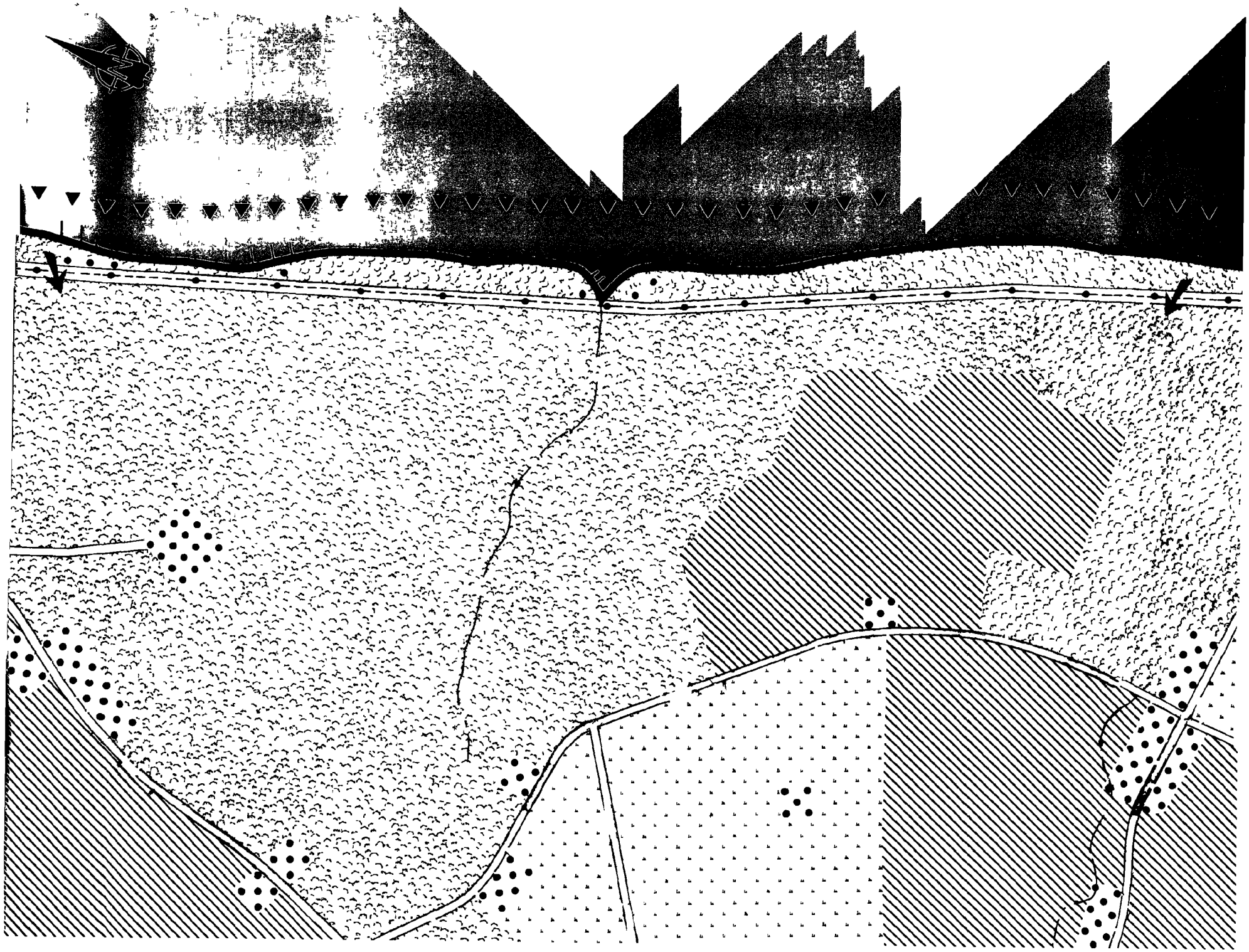

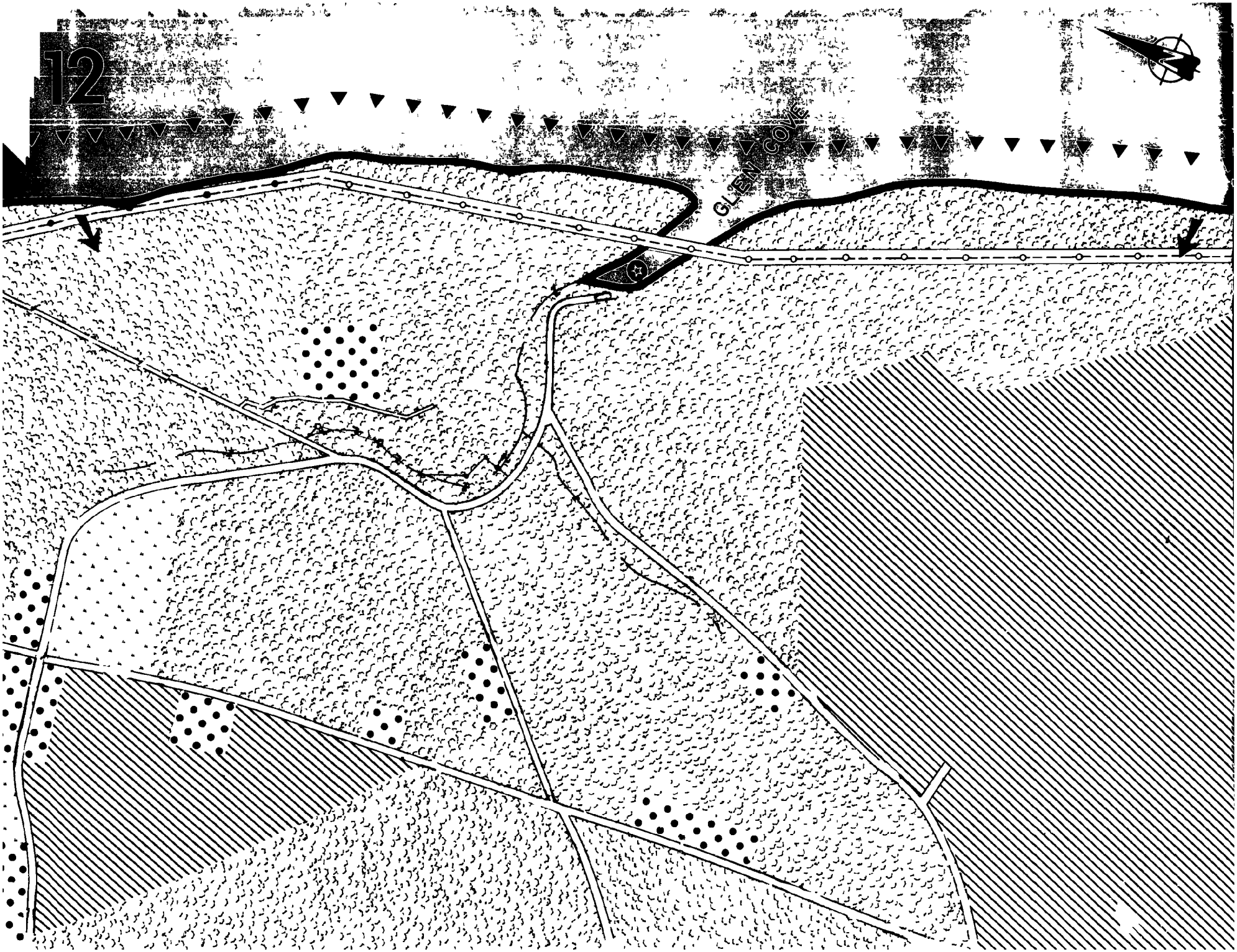
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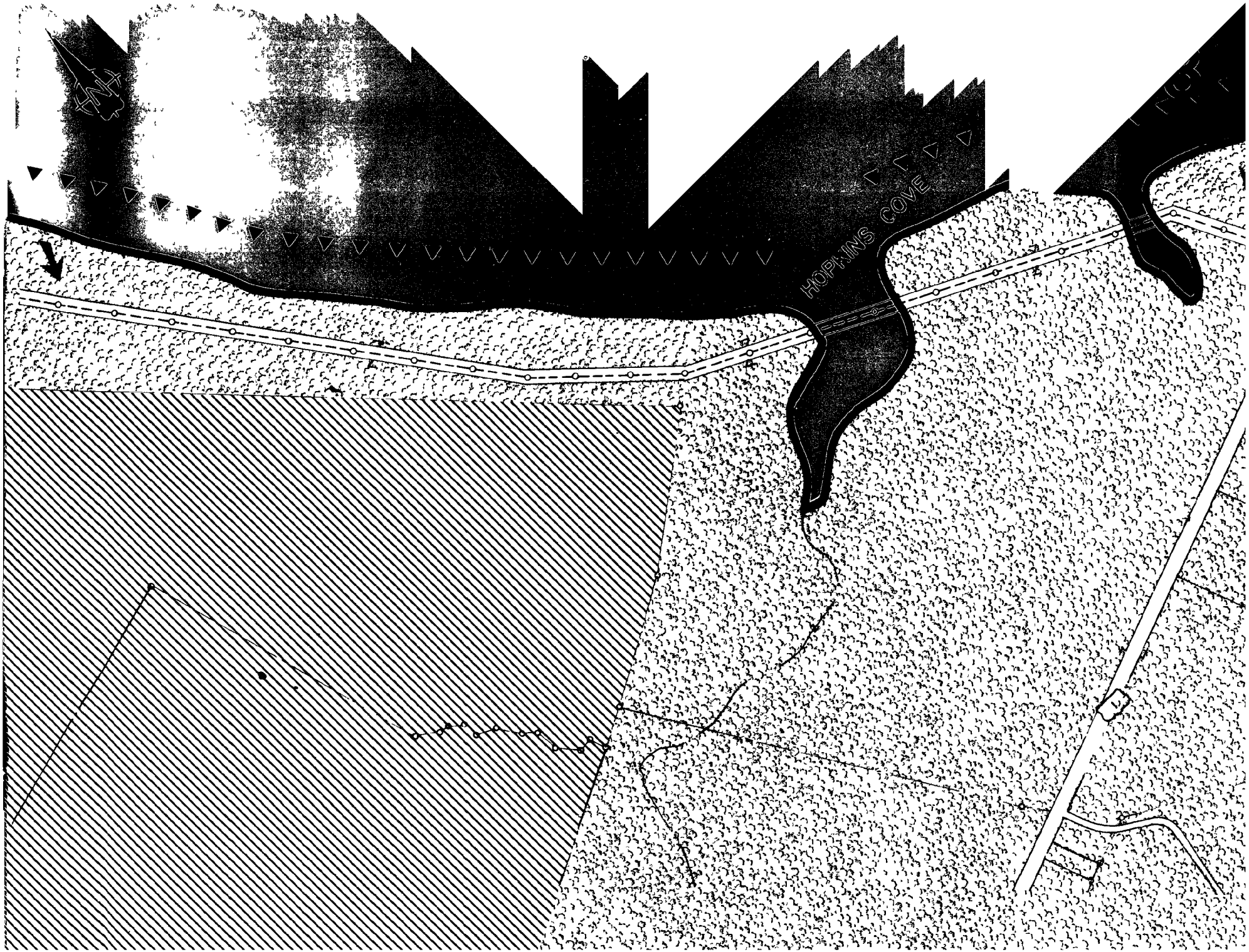
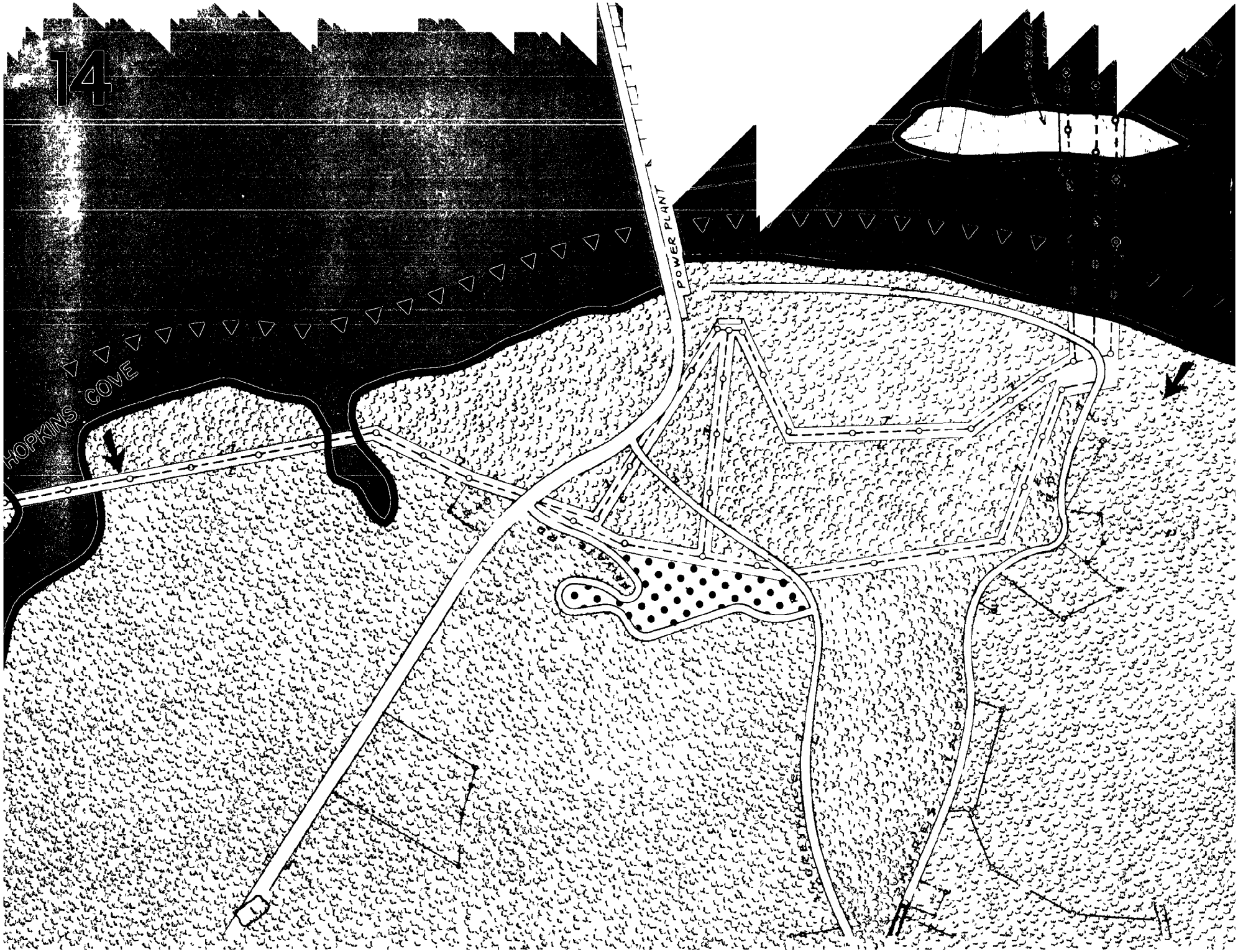

HOPKINS COVE


14
POWER PLANT
HOPKINS COVE

Susquehanna River/Conowingo Dam to Havre de Grace

Though the Conowingo Dam successfully tames the mighty Susquehanna River upstream, its wildness is uncontained below the dam to Havre de Grace where it empties into the Chesapeake Bay. The fact that a dam structure 4,648 feet long and 105 feet high is required to impound the river's flow is a testament to the awesome power of the Susquehanna.

The dam has two effects on the visual character of the river downstream. The most obvious is that the visual continuity of the river and shoreline is broken by such an imposing structure. A more subtle effect is the dam's alteration of the river's flow characteristics. When the Philadelphia Electric Company does not spill water for a long period of time, the stream channel below the dam becomes virtually empty. At times it is possible to walk from Harford to Cecil County across a nearly dry river bed. Undoubtedly, it would have been a rare occasion in the river's history if such a condition had existed prior to the dam's construction.

Over the years both fishermen and Maryland agencies have criticized the low-water conditions which have caused fish kills in the lower Susquehanna. As recently as July 1980, during a 48-hour period, an estimated 16,959 white perch, 1310 striped bass, 1208 menhaden and 162 carp died in the river. The Maryland Department of Natural Resources, Tidewater Administration/Tidal Fisheries Division concluded that the fish kill was caused by low levels of dissolved oxygen in the water, resulting from low-flow conditions.

Another concern expressed by various governmental agencies and fishers alike is the need for a fish ladder at the Conowingo Dam. Large numbers of anadromous fish once migrated up the Susquehanna River to spawn. They travelled through Maryland and Pennsylvania and often as far upstream as New York. Records of the National Marine Fisheries Service indicate that over 7 million pounds of American shad were taken commercially in Maryland in 1889, prior to major dam construction on the Susquehanna. Three dams were constructed on the Susquehanna River in Pennsylvania in the early 1900's, blocking access to upstream spawning areas. Since that time, American shad fishery in the Susquehanna River has declined to extremely low levels. (In addition to the physical obstruction of migration, problems of water quality and fishery management also appear to have contributed to the decline.)

A number of studies of the decline of the anadromous fishery resources and the feasibility of such passage facilities have been conducted by state and federal agencies, the licensees of the Conowingo Dam and others. The interested parties continue to hold differing positions on the economic feasibility and technical suitability of installing fish-passage facilities at the Dam. The Federal Energy Regulatory Commission (FERC) addressed the issue during the recent relicensing procedures of the Conowingo Dam, but decided to defer resolution of the question while going forward with issuing a new license for the dam. A public hearing is scheduled for late 1981 to determine the status of anadromous fishery in the Susquehanna River basin and what measures, if any, would be required of the licensees.

Further downstream, the dam drops out of sight. Steep banks, sloping to the water's edge and forested with mixed hardwoods, confine the view so that the only vistas are up and down river. These spectacular banks are covered with lush vegetation which is interrupted by rock outcropping that reveals the region's geologic history. Along this portion of the river, human presence is marked only by a few houses and an occasional corn field set high on top of the steep banks.

The point where Deer Creek flows into the Susquehanna roughly marks the fall line, which separates the Coastal Plain from the Piedmont

Uplands Region. Below this transition line the river is subject to the tidal action of the bay. The mouth of Deer Creek is rocky and can be treacherous due to the combined swift currents of the creek and the river. The creek itself is navigable only by canoe.

The Deer Creek River valley contains some of the richest farmland in the state. A recent study by the Maryland Department of Natural Resources addressed the uniqueness and beauty of this valley. The Deer Creek Scenic River Study made recommendations for the management and conservation of the creek. As a result, the Deer Creek Scenic River Advisory Board was formed. A group of farmers and landowners was appointed to monitor land use near the creek. In addition, county legislation has established a buffer strip extending 150 feet on either side of the creek.

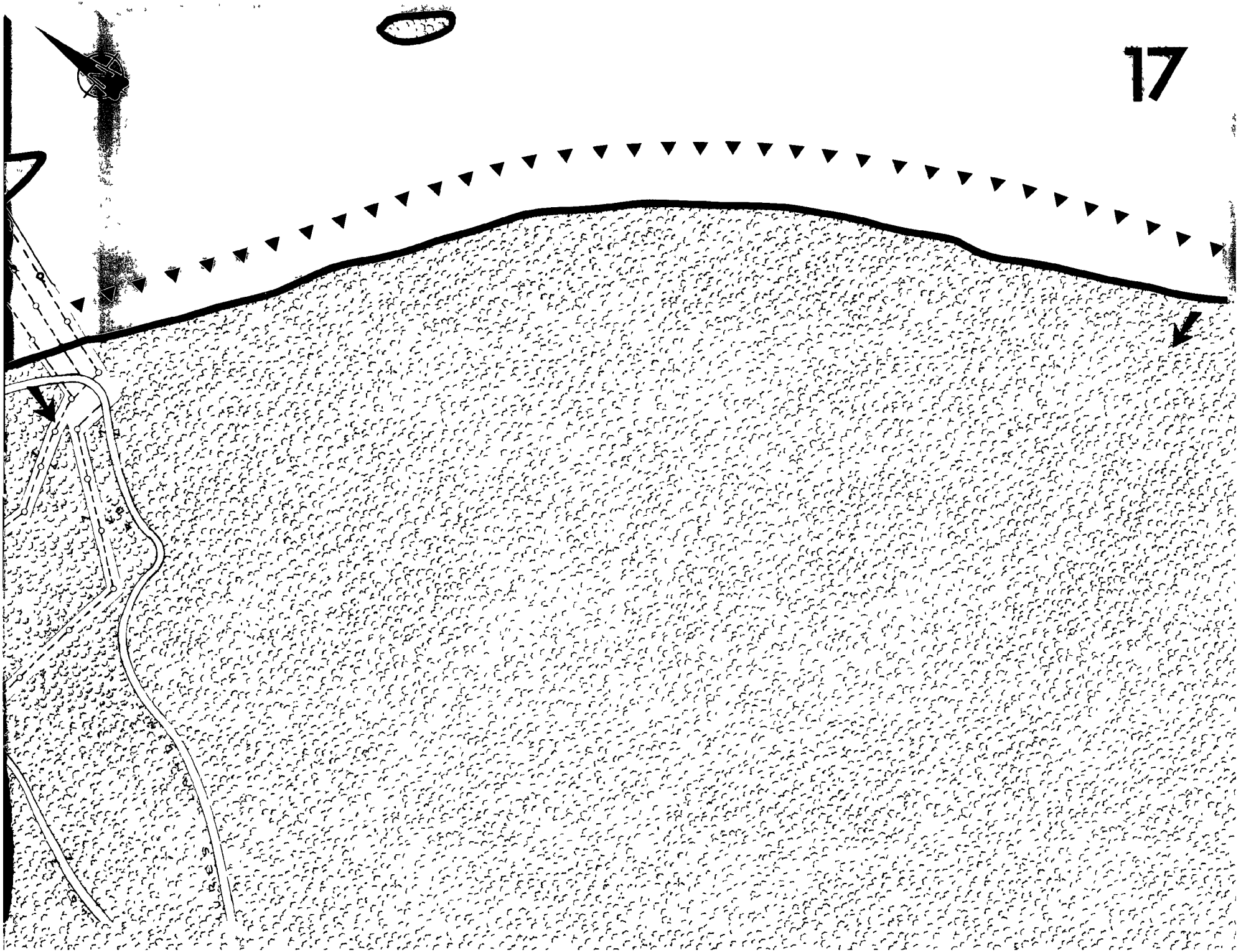
Moving further into the Susquehanna River, four distant bridges become visible, signaling the presence of Havre de Grace. In contrast to the Conowingo Dam, these structures seem light, almost gracious. The eastern-most bridge is the approximate point at which the City of Havre de Grace begins. Havre de Grace is located just east of where the Piedmont ends and the Coastal Plain begins. Since the Plain is lower and flatter than the Piedmont, Havre de Grace has a much different character than any of the areas upstream.

Havre de Grace was planned perhaps as early as 1785, but certainly by 1795. In Tidewater Maryland, there is a special physical relationship between the water and the town on the shore. Several historic buildings combined with the unique plan of the town recreate in Havre de Grace the experience of life in the early days of the region. The plan provided for a series of two-way vistas. More than twenty streets not only allow those in town to look out onto the water, but also allow those on the water to look into the town. With its docks, bulkheads and piers, the town literally reaches out into the water, creating a very special relationship between the natural and the constructed environment. While the coal and ice wharves no longer exist, the "town wharf," the

"shipyard" and the Seneca Warehouse, as well as the shoreline configuration remain as they were drawn in 19th-century atlases.

Havre de Grace survives from a time when the Chesapeake Bay and its tributaries were a primary transportation system. Havre de Grace has been a commercial service center at the crossing of major transportation since the 17th century when it was known as Susquehanna Lower Ferry. The Old Post Road to Philadelphia crossed the Susquehanna at this point. The Susquehanna and Tidewater Canal terminated at Havre de Grace and the city was served by both the B&O and PW&B railroads.

Today, U.S. Route 40 and the Amtrak System loom above the town and the river on their respective bridges. Some commercial water traffic still passes Havre de Grace and an ever-increasing number of pleasure boats fills the waterways. The town is a navigational landmark, indicating the uppermost shores of the Chesapeake Bay.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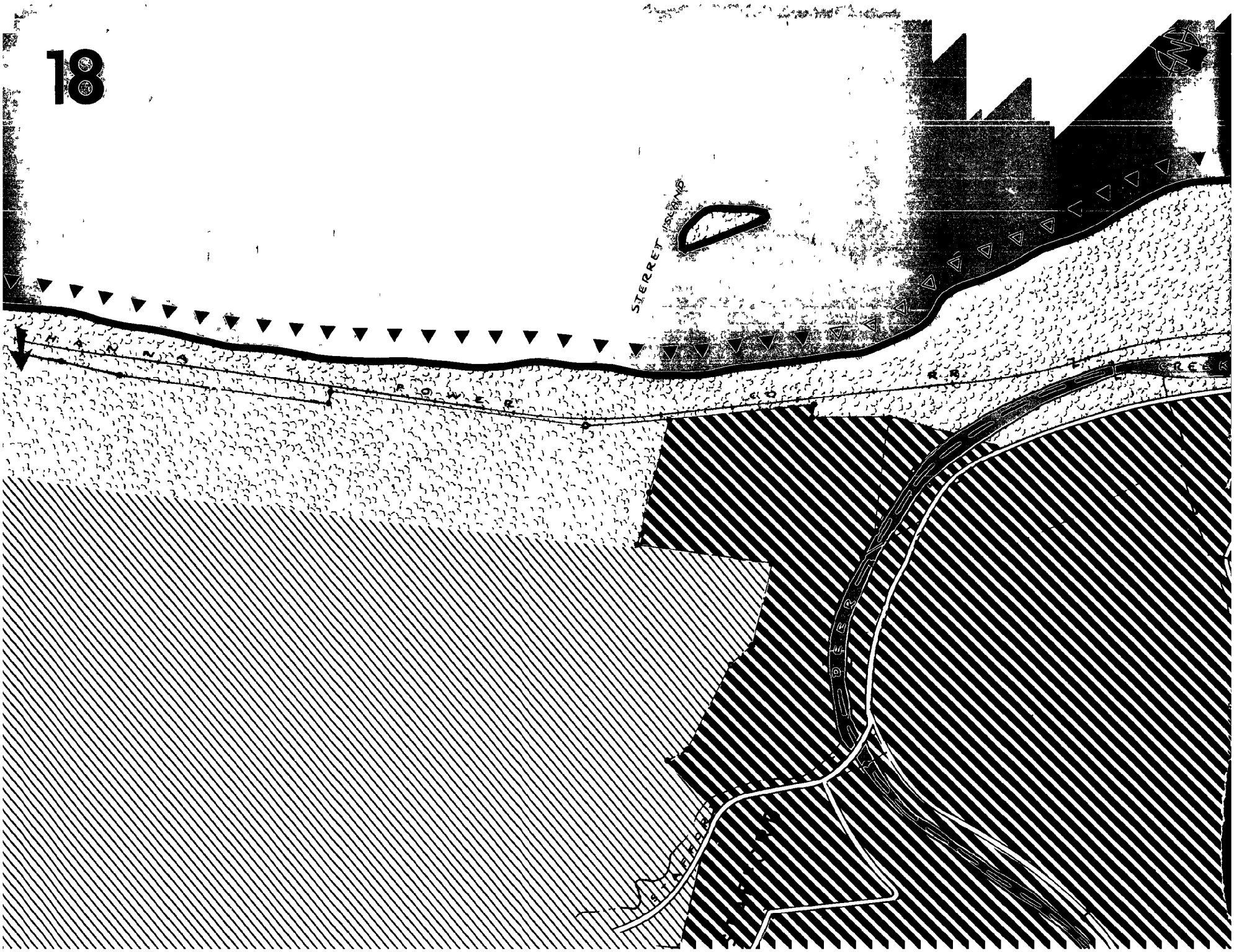
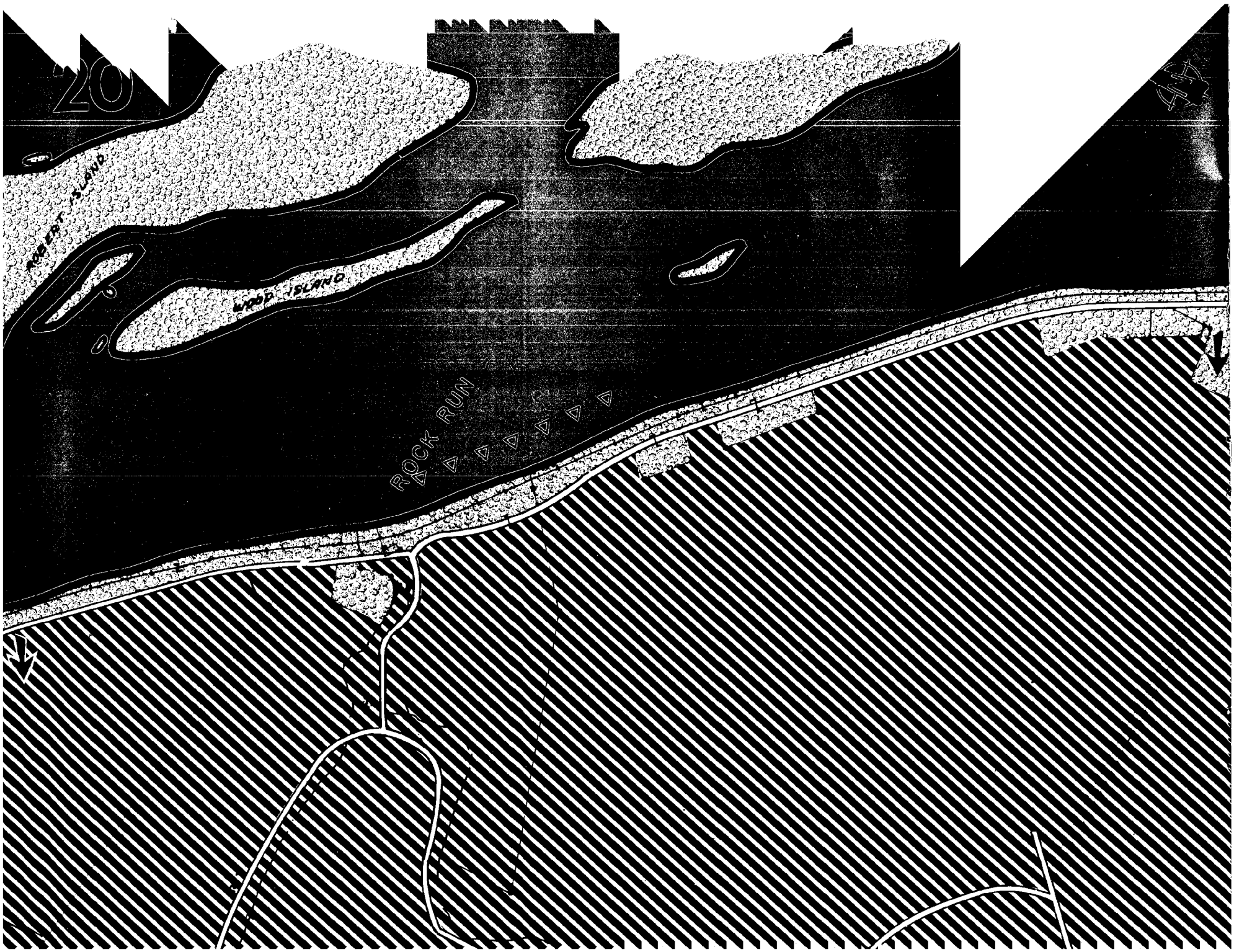

18
STERRET ISLAND
HANNA POWER CO
DEER CREEK

19
ROBERT ISLAND
BIRD ISLAND
ROCK RUN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ROBERT JS LAND
WOOD ISLAND
ROCK RUN

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LAPIDUM
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KENNEDY MEMORIAL HWY.

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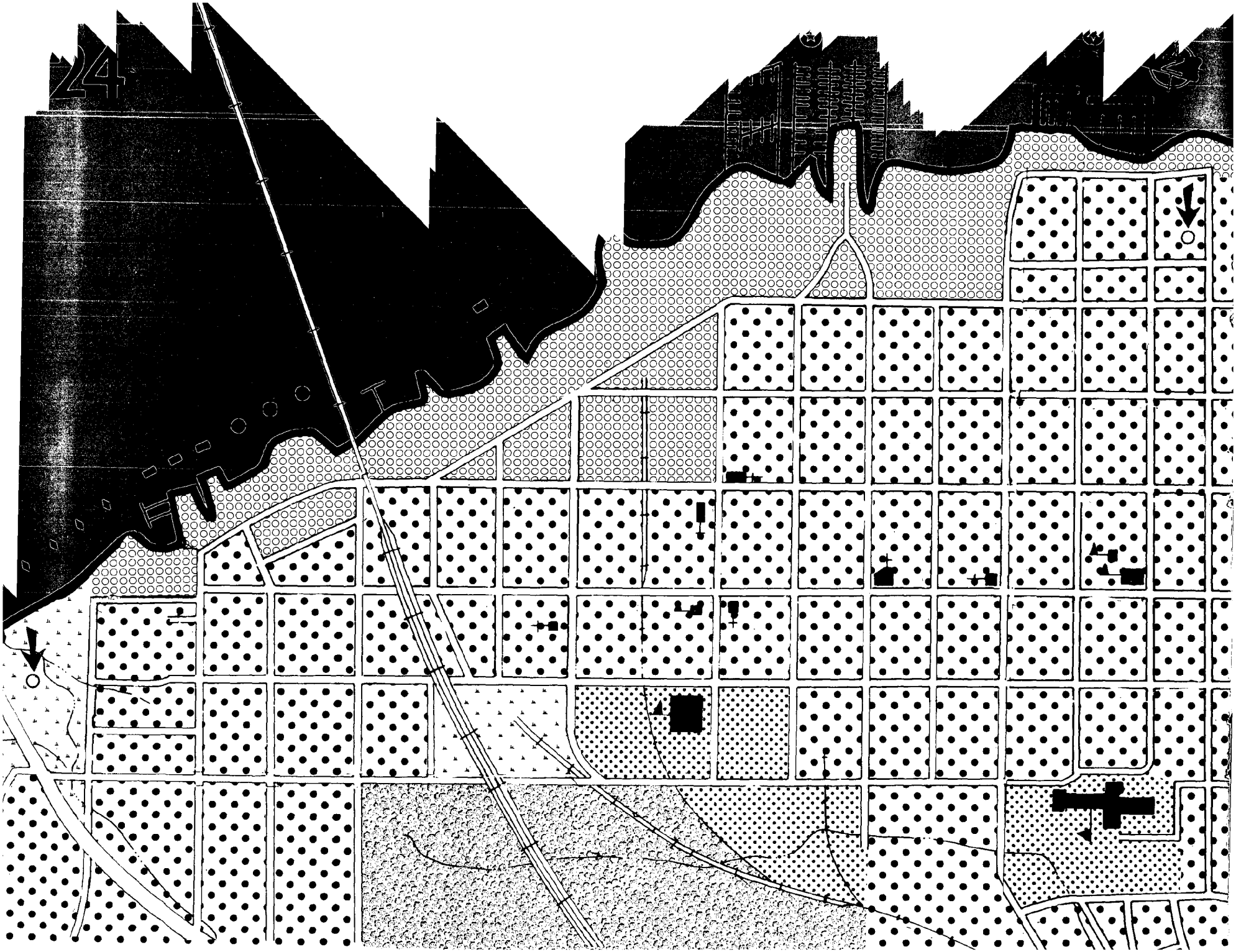
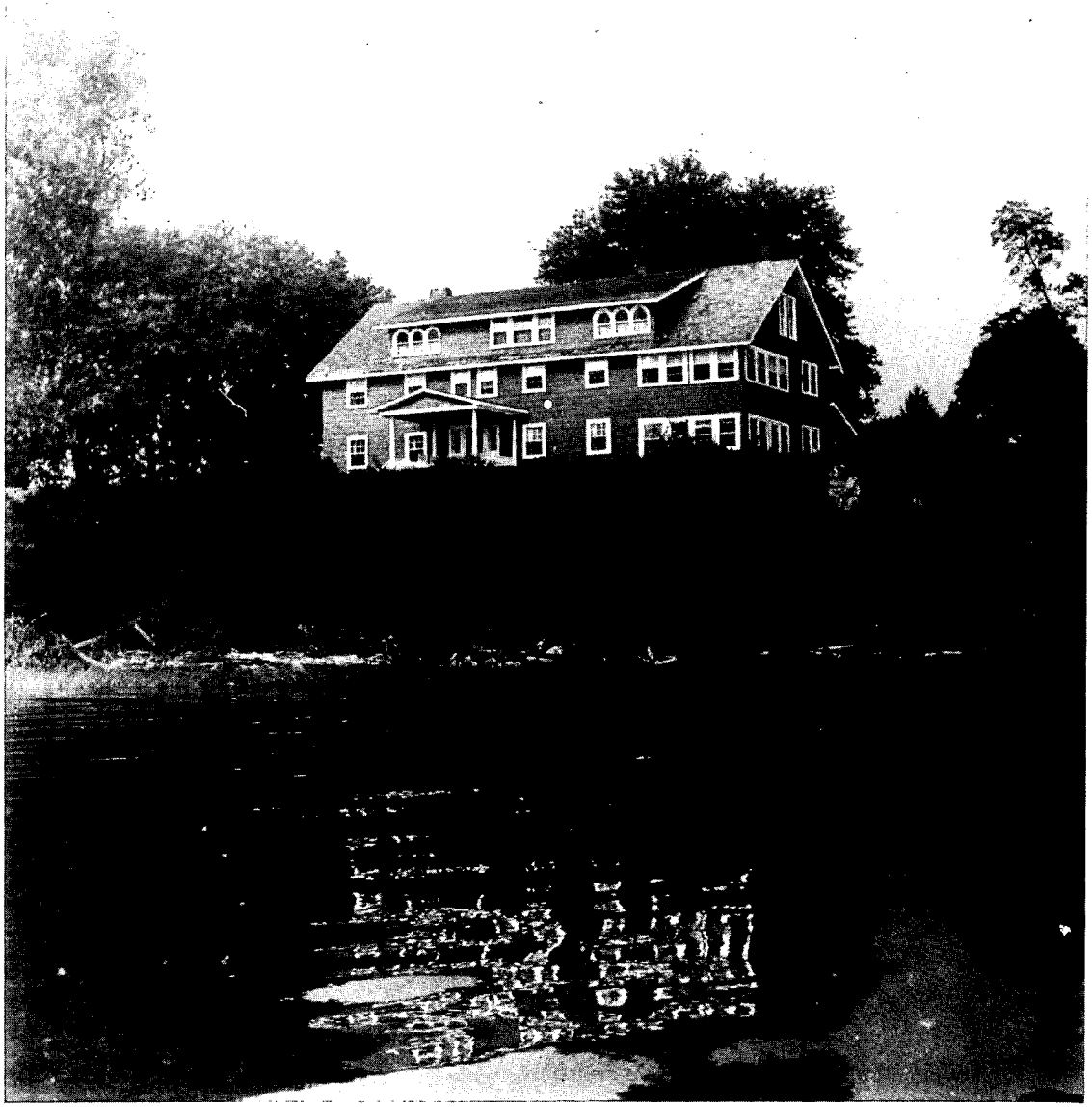

24

Havre de Grace to Swan Creek Point

The stretch of shore between Havre de Grace and Swan Creek Point is the only area within the County's jurisdiction that borders the Chesapeake Bay. This is the single location in the county with a view of the great expanse of water that suggests the enormity of the bay. In contrast to the confined vistas which the rivers offer, this area is completely open with the Cecil County shore forming a backdrop on the horizon.

The shore zone is predominantly natural, with a few short sandy and gravelly beaches. These beaches are often difficult to see because of the mature trees which overhang the shore. Extensive submerged aquatic vegetation lines the shallow water's edge. Mixed hardwood vegetation covers a steeply recessed and bluffed inshore landscape. Bordering this shore are large farms and estates with lush green fields of crops. Heading southwest from Havre de Grace the steep banks rise gradually. The bluff appears to reach its highest point (about 14 feet) near Oakington. From Oakington to Swan Creek Point the steep banks fall to an elevation of two to three feet above sea level.

Swan Creek Point is the only area that does not contain hardwood trees; it is covered with successional vegetation consisting of small shrubs and grasses. This vegetation and the varying bluff height add visual diversity to an otherwise constant segment of shore. The point is very narrow and appears to draw the viewer inward, away from the bay and into the Swan Creek.



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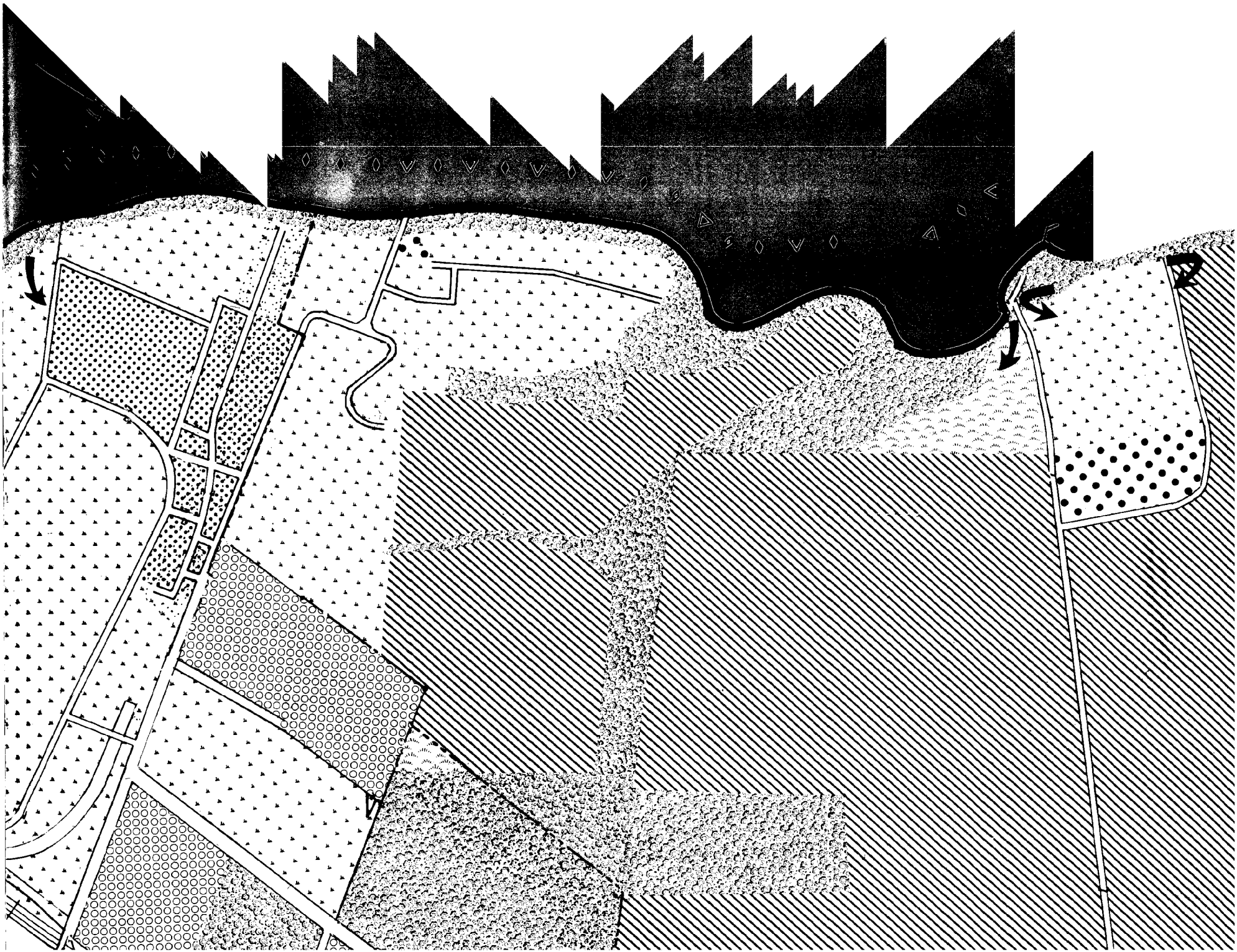
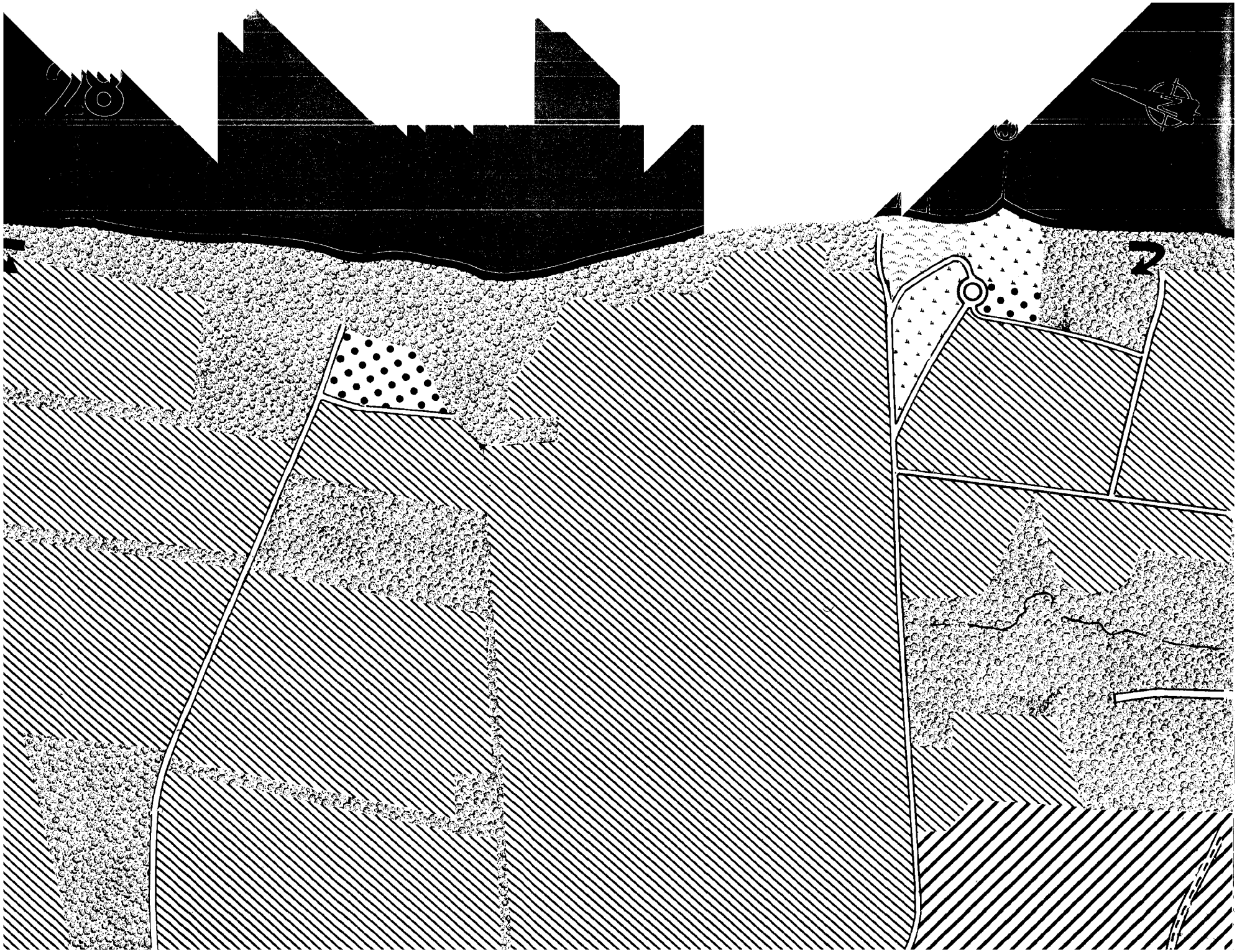



2

Swan Creek

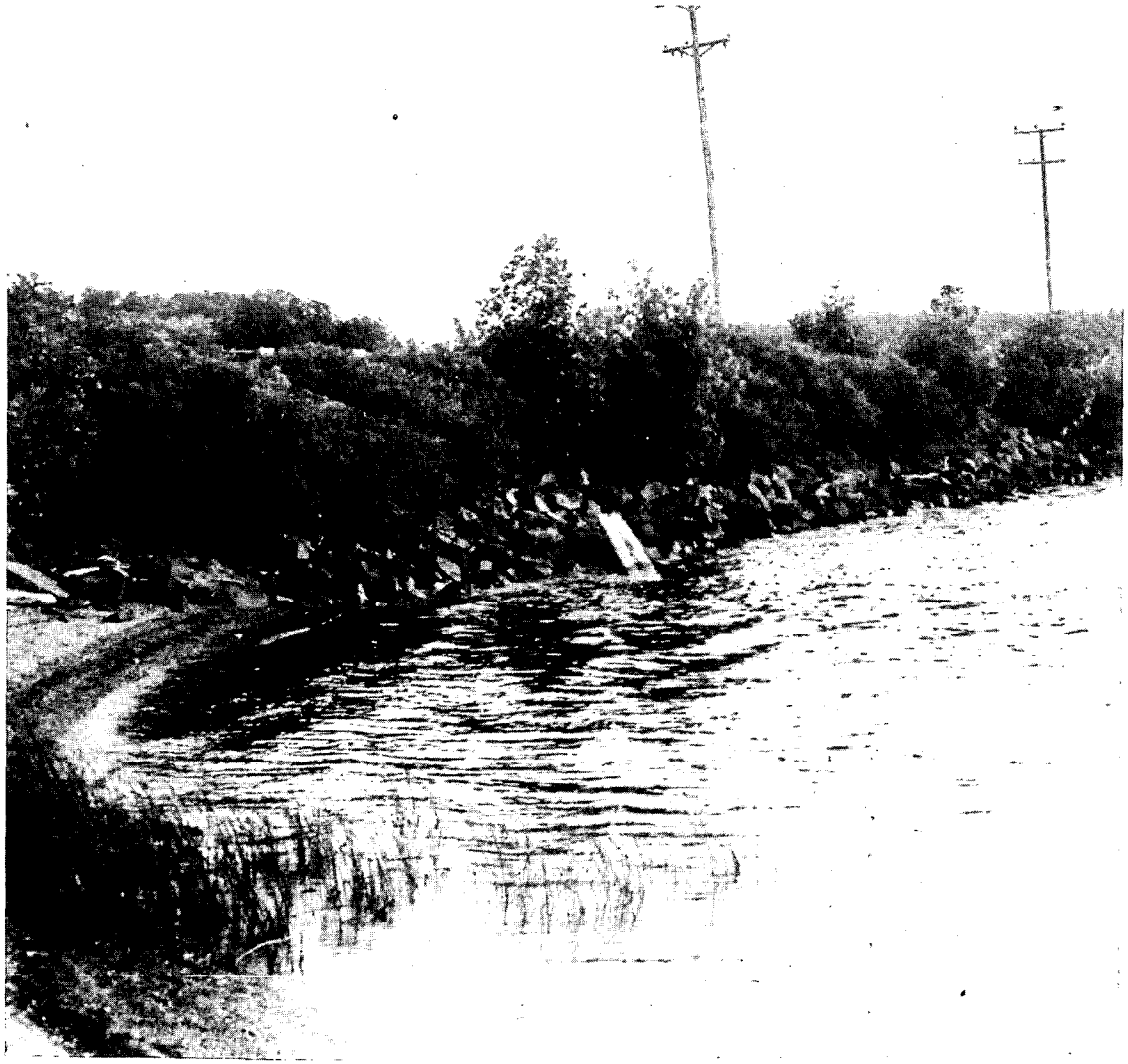
Swan Creek Point separates the creek from the Chesapeake Bay and is largely responsible for the unique character of this area. On the bayside of the point, choppy water extends to the visual horizon. In contrast, the creek is serene and the views are confined by land—Harford County to the north and Aberdeen Proving Ground to the south.

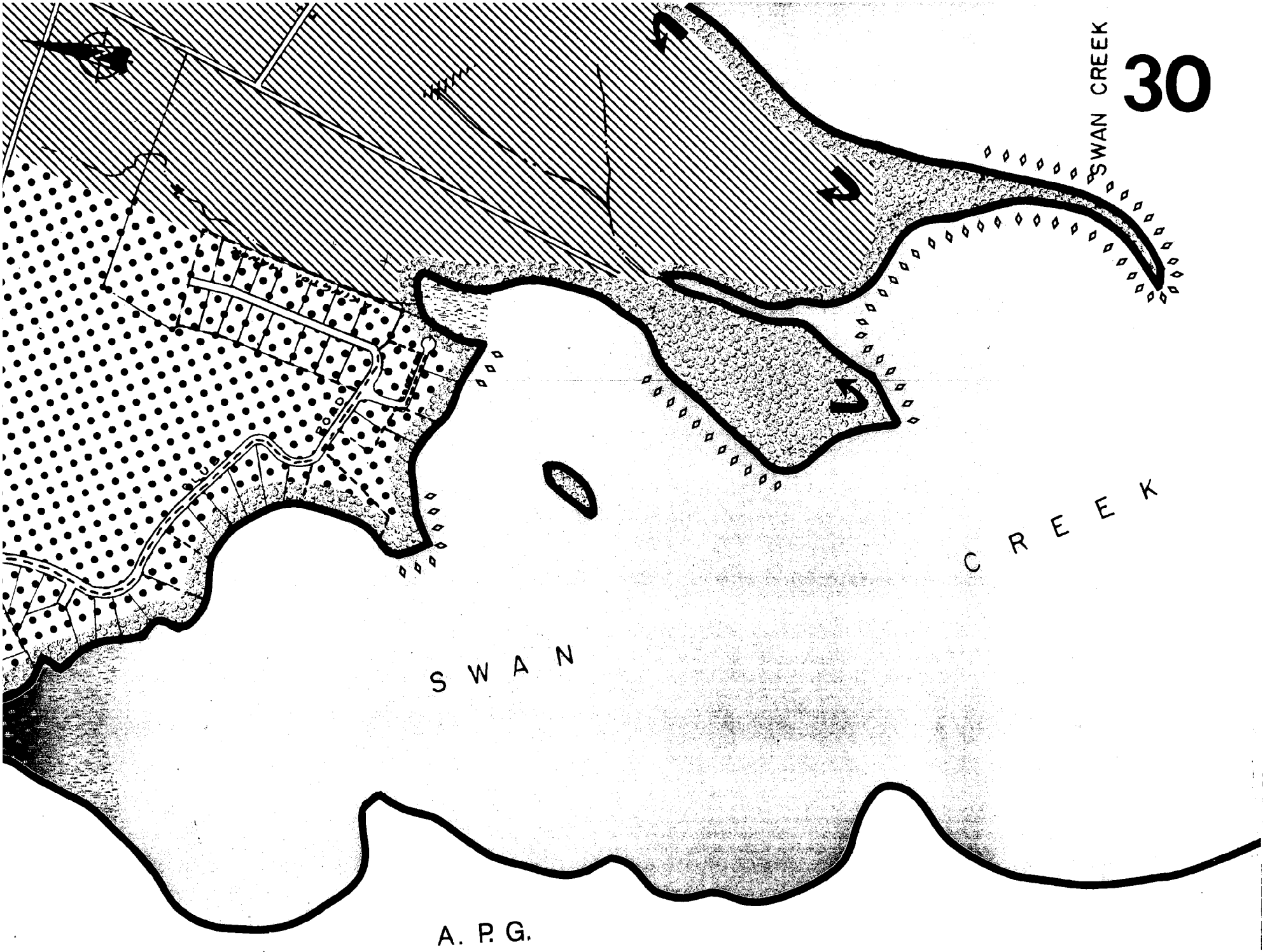
The shoreline along Swan Creek seems to exist in a relatively natural state. Heavy inshore vegetation overhangs the shore. Wildflowers grow on the banks and grasses protrude from the water. The forces of erosion and strong winds have caused trees to fall into the water, adding to the "natural" setting. The two marshes on the creek also contribute to the beauty and the wilderness character of this area. The steeply recessed inshore landscape creates a feeling of enclosure.

There are several homes on top of the steep banks, but they do not interrupt the continuity of the shoreline because they are set back from the water's edge. Few piers and bulkheads have been constructed; therefore the shoreline is not dominated by such structures. This natural state is a direct result of the fact that the creek has very limited access by land. In fact, the only direct public access is by boat.

The U.S. Army land which lines the south side of the creek is undeveloped except for a small docking facility near the mouth of the creek. The Army currently maintains a sewage-treatment plant that discharges into the northern reaches of the creek. This sewage plant has contributed to the poor water quality of Swan Creek. There is a plan to phase this plant out of operation over the next few years.

Extensive siltation has occurred because of both natural processes and human activities. Development upstream has increased the sediment loads which the creek is forced to bear. Various groups of fishermen, government officials and recreational boaters have charged that much of the increased sedimentation in the creek has resulted from the U.S. Army's 1963 construction of the Spesutie Causeway. These claims state that the causeway, by blocking the flow of water in the bay and near the mouth of the creek, has caused sediment to be deposited in the creek. Discussions are ongoing between county officials and the Army to explore the possibility of opening the causeway and allowing the water to flow unimpeded.




SWAN CREEK
30
SWAN
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Bush River/Otter Point Creek

In contrast to the Susquehanna River which cuts its way from the Piedmont towards the Chesapeake Bay, the Bush River is located in the Coastal Plain and is a product of the processes that formed the bay. As a result, the Bush River looks like a large basin rather than a river. Another distinguishing characteristic of the Bush River is that most of its inshore land is developed. The only undeveloped areas are around Church Creek Marsh, Otter Point Marsh and areas owned by the federal government.

Development in this area began as people built summer cottages in the 1920's. A full-scale community has evolved complete with two marinas, two boat yards, a public boat landing and numerous private piers jutting into the river. In addition, bulkheads have been constructed along much of the shoreline in an effort to prevent erosion.

The developed shoreline gives the Bush River a visual character much different than any other area in Harford County. Although the Broad Creek shoreline is also developed, its narrow width and steeply recessed inshore landscape are much different from the Bush River's openness and more subtle shaping. The character of the homes in these two areas is also very different. Homes on the Bush River vary greatly in size, style and quality of repair as opposed to the similarity of the homes on Broad Creek. There are many homes on the Bush River which look as though they have been neglected for a long time. These homes are often situated between more well-kept residences. The wide range of housing types and quality of upkeep gives the impression that the transformation from summer resort area to permanent community is not yet complete.

The Bush River is 9.8 miles long and has numerous tributaries. Bynum Run and Winters Run are the major water courses flowing into the river. The total drainage area is 139.7 square miles and the watershed lies in both the Piedmont and Coastal Plain.

The Bush River waters are used heavily for recreational boating. The river is an important fish nursery and feeding area and the wetland at Otter Point Creek is of great value to wildlife. Recreational fishing occurs in the Bush River, but there is no shellfish harvesting. All recreational beaches on Bush River, once prime swimming areas, were closed in 1966 because of high bacteria counts. They were reopened in the late 1960's, were closed again in 1971 and remain so.

The Bush drainage system contains nine potential point-source polluters, ranging from industries to sewage-treatment plants to a quarry. Runoff from urban areas, construction sites and agricultural lands and failing septic systems contribute to the nutrient, bacteria and sedimentation problems in the river. Test firing of ammunition into the river at Aberdeen Proving Ground also creates potential problems, especially due to exploded and unexploded shells in the river's bottom.

Failing septic systems, sewer-line overflows and discharge of untreated waste from boats have caused bacteria and nutrient problems. The flushing action of the river is very slow, requiring a 48-day cycle. This allows for nutrient build-up which causes eutrophic conditions and algae formation.

Several measures have been taken to reduce the pollution of the river: implementation of sediment control, storm-water management practices, and extension of sewer lines to areas with failing septic systems. In addition, the Harford County Department of Public Works has undertaken a study of water quality and sediment loading in the Winters Run watershed. If bacteria levels and sediment problems can be controlled, the Bush River has the potential of becoming the beautiful estuarine body it once was.

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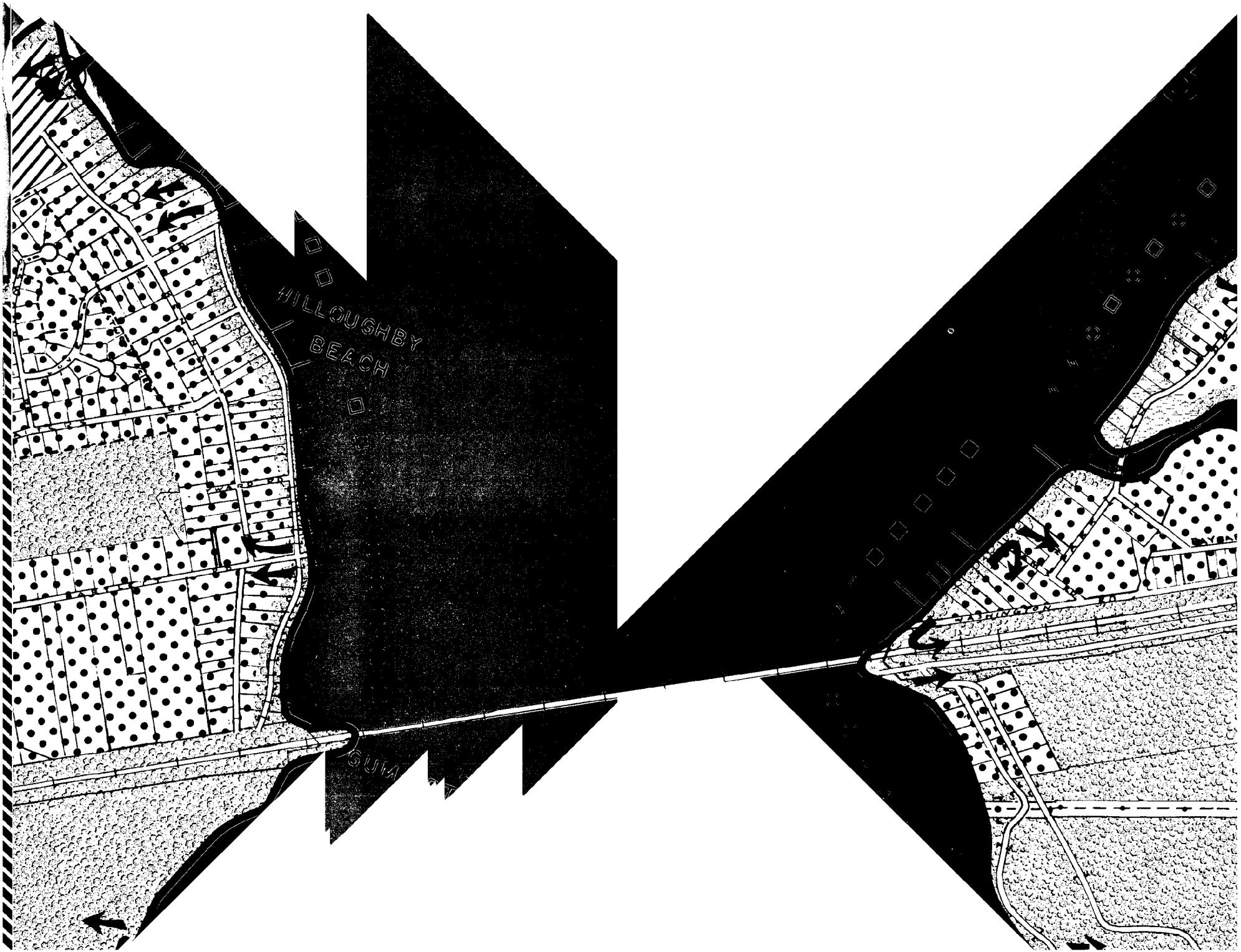
SOD RUN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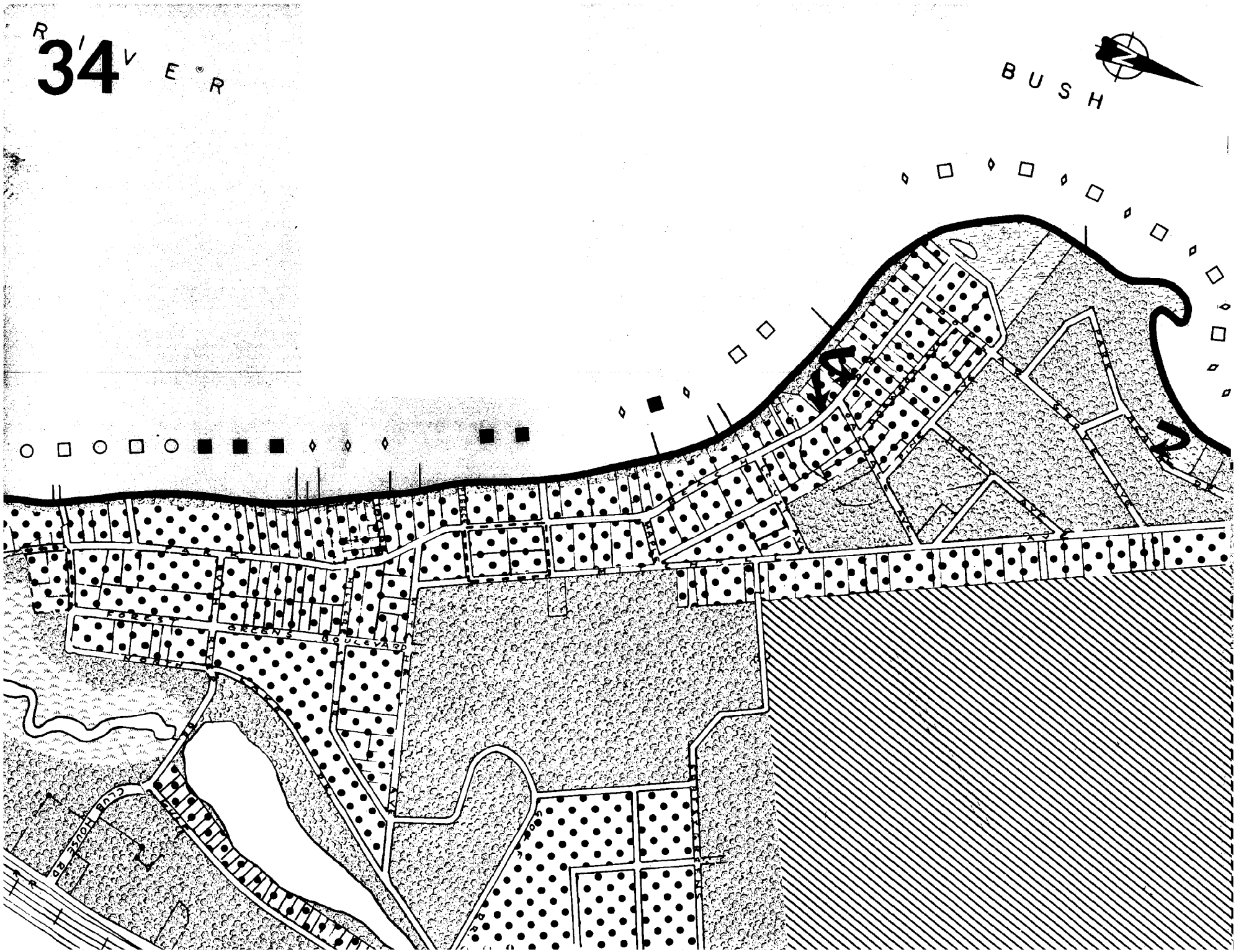
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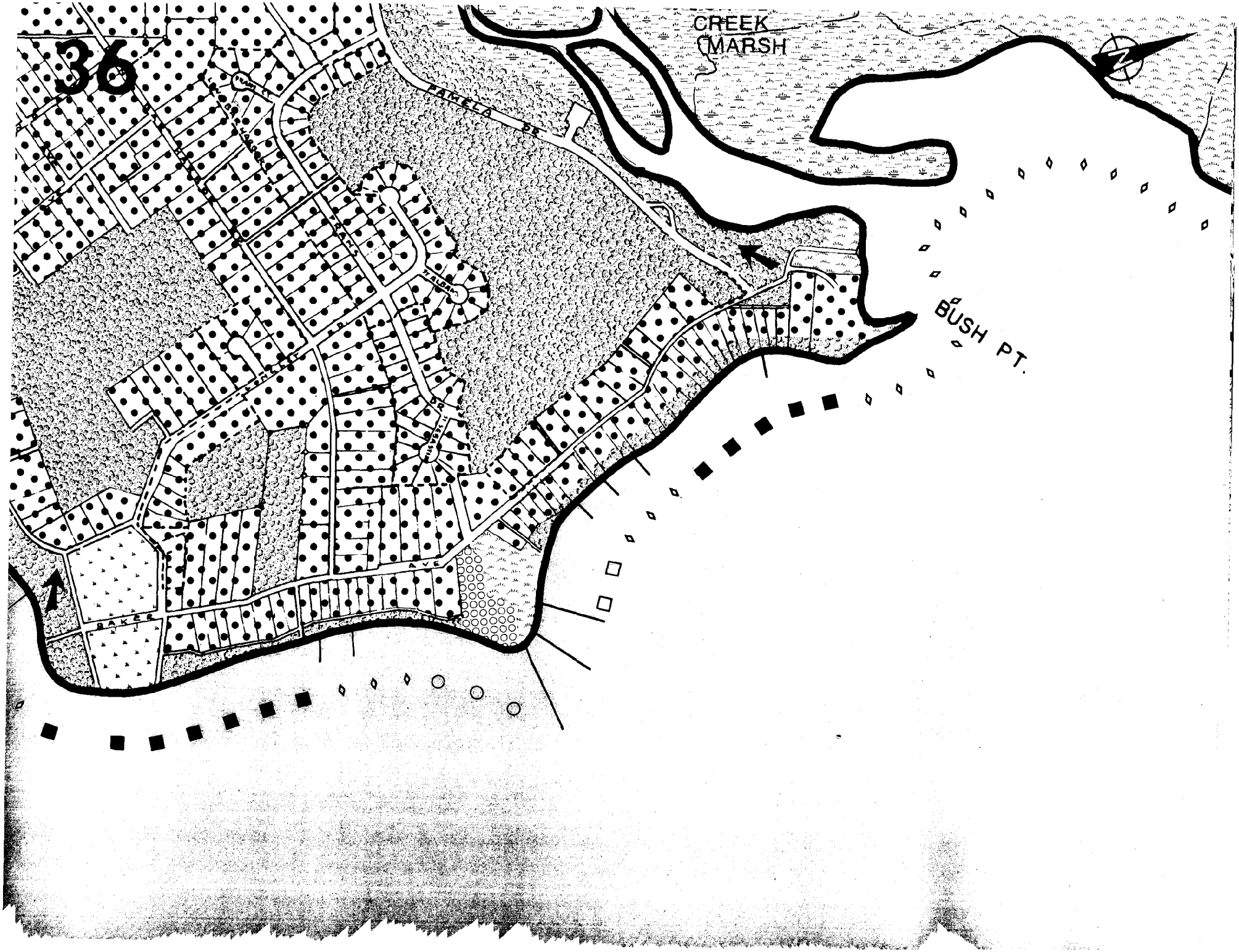
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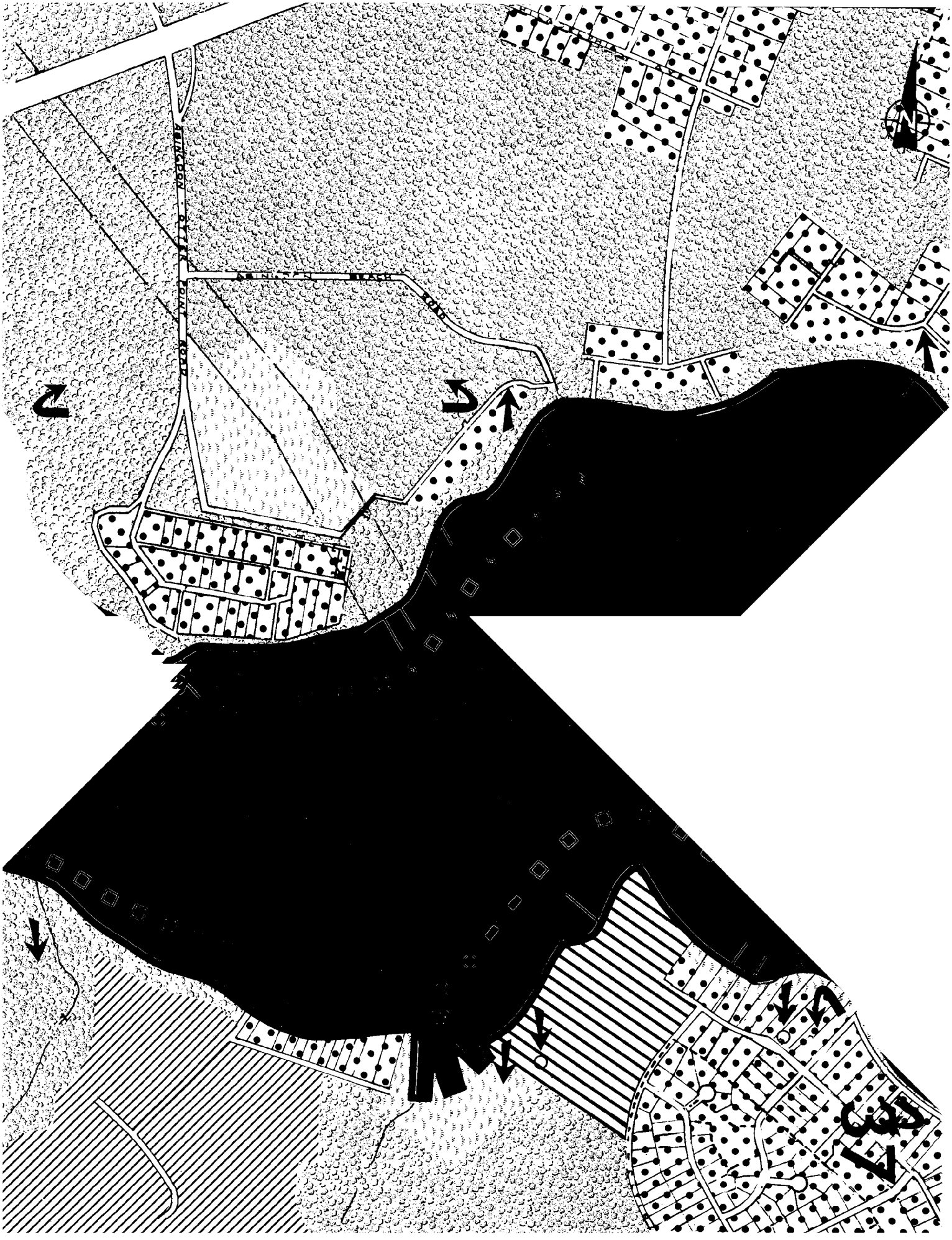
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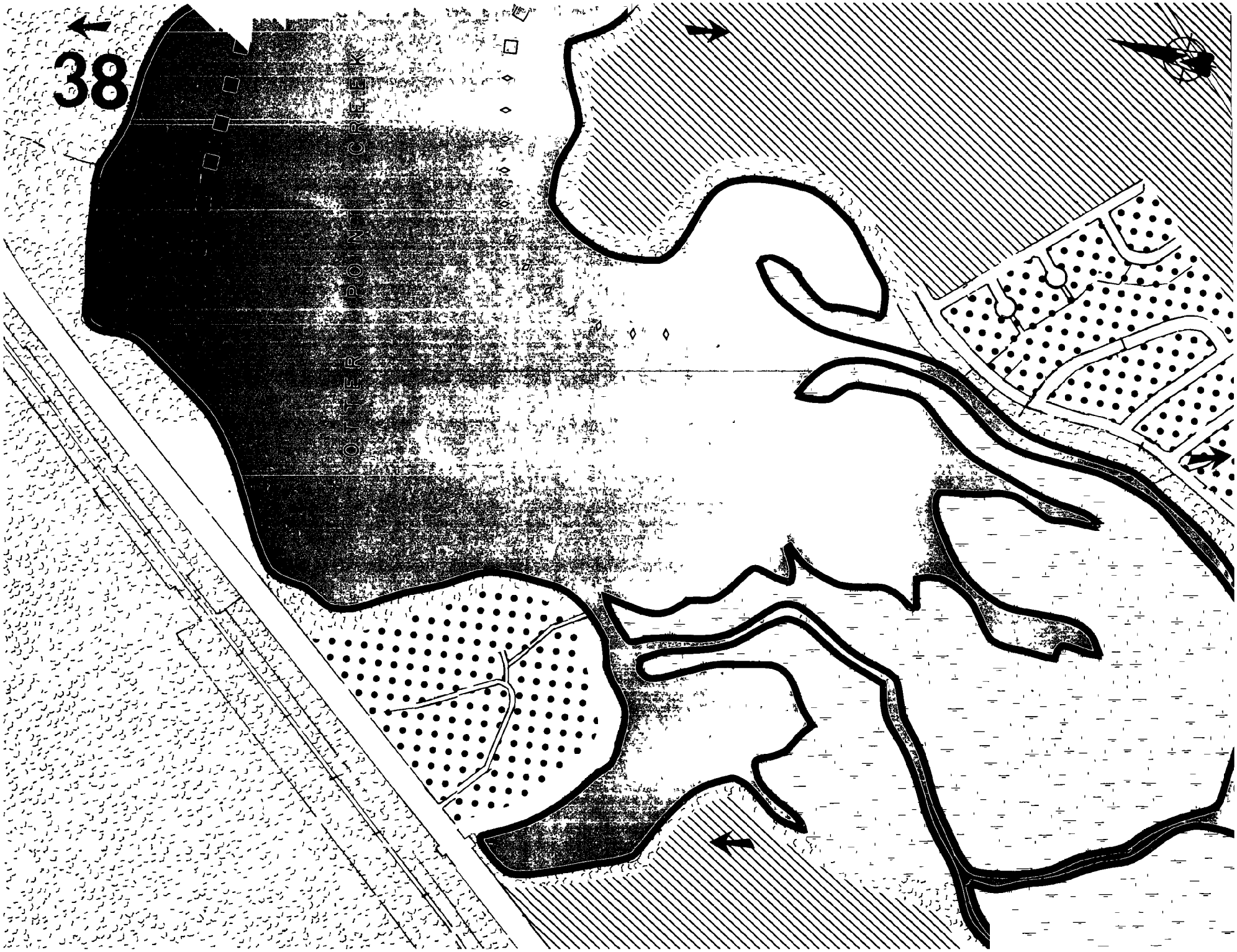
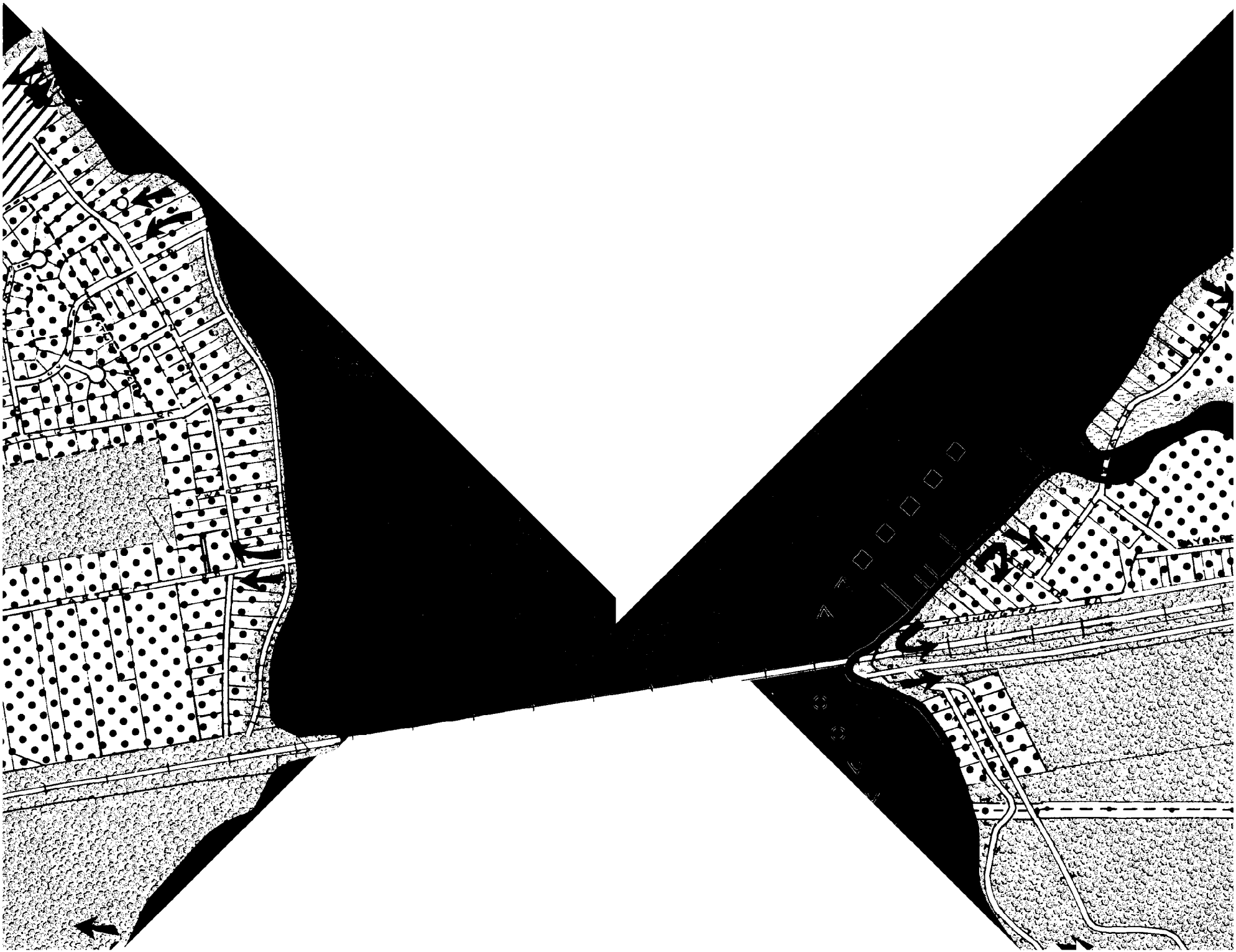

38
OTTER POINT CREEK



The Gunpowder River

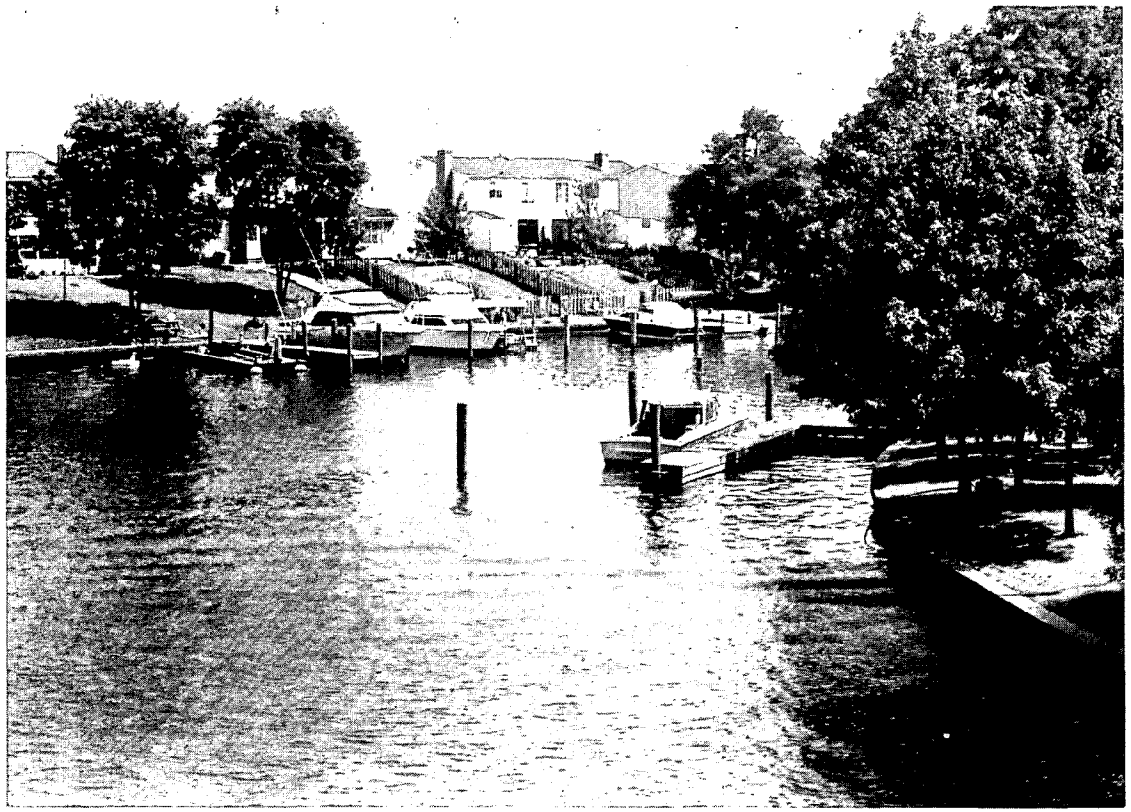
The Gunpowder River is the channel through which most of the 472 square miles of the Gunpowder River basin drain into the Chesapeake Bay. In contrast to the basin-like appearance of the Bush River, the Harford County portion of the Gunpowder River is very narrow and marshy. The river lies in the Coastal Plain and is characterized by low elevations and relatively flat land forms. Broad tidal estuaries divide the area into narrow, terrace-like peninsulas of low relief. There are extensive tidal marshes surrounding these peninsulas.

The river is bordered by Baltimore County, Harford County and the federal land of Aberdeen Proving Ground. Harford County's jurisdiction extends southward to the railroad bridge over the river, where federal jurisdiction begins. Across the river to the west is Baltimore County.

The Harford County communities of Joppatowne and Rumsey Island are not visible from the railroad bridge area. An extensive marsh with emergent grasses screens these dense residential communities. A narrow dredged channel marks the boating entrance into the area.

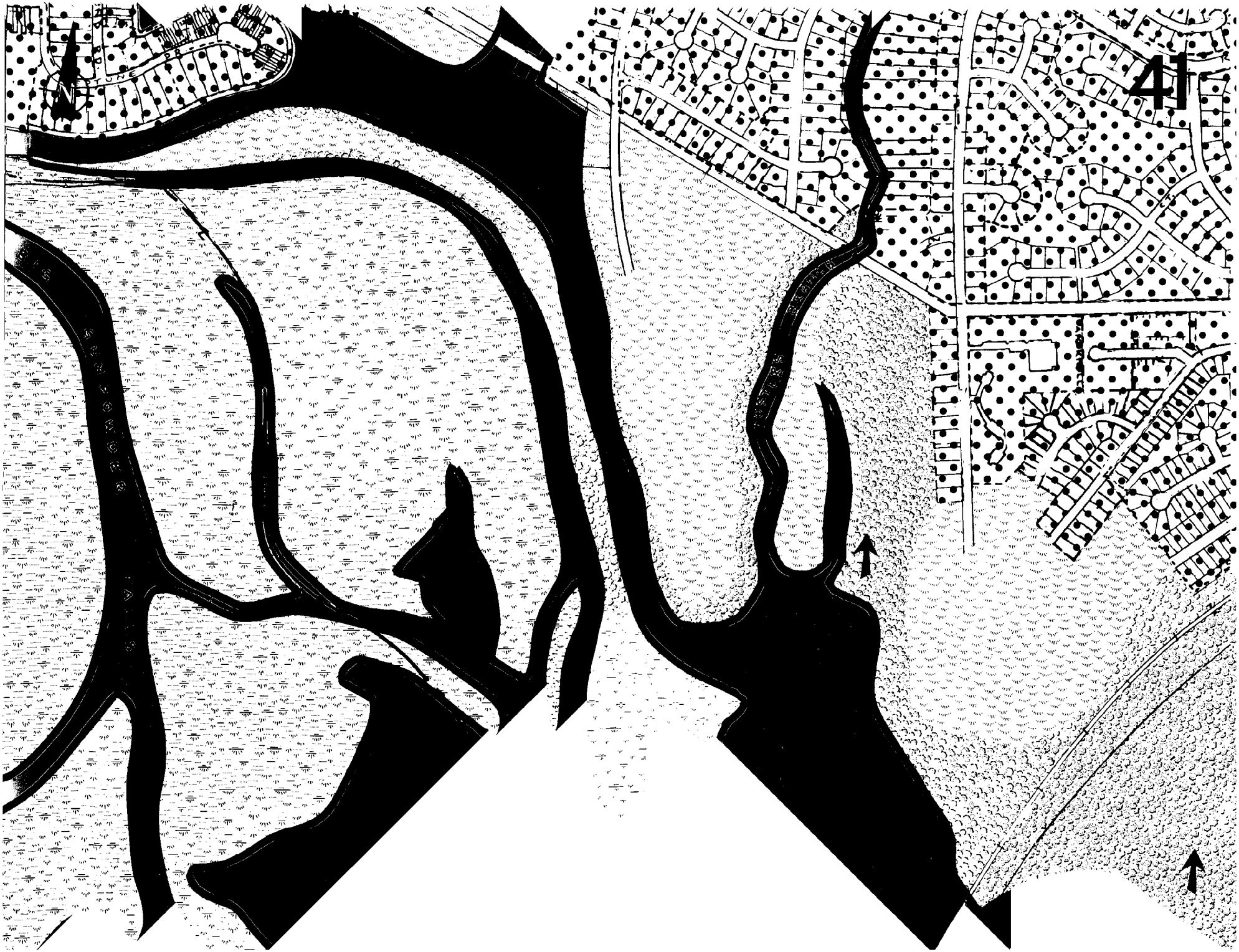
Foster Branch sits just east of the channel, but it is difficult to see because of the surrounding marsh vegetation. The west shore of Foster Branch is lined with residential units, many with piers and docking facilities for recreational boating. The east shore is mostly marsh and is undeveloped. From the water, Foster Branch appears to be very quiet and secluded.

The shores of the dredged channel leading into Joppatowne are covered with wild flowers and emergent grasses. Upon entering the Joppatowne community, the vista includes hundreds of boats docked at a large marina and in front of homes. All of Joppatowne is neatly protected with bulkheads of concrete and steel. There are many coves, each containing several townhouses and boats. Most of the single-family and townhouse units are of similar style. However, tree plantings by individual property owners offer some landscaping diversity which contributes to a pleasant visual experience.



The waters of the Gunpowder River are relatively healthy. Applicable water-quality standards for dissolved oxygen, temperature, acidity/alkalinity and bacteria have been met, in contrast to the Bush River, which has received poor marks on these criteria. The major pollution of the Gunpowder River stems from sedimentation and a higher-than-normal algae population during summer months. High nutrient loading from urban and agricultural runoff, septic system failure and contributions from upstream have led to shifts in the species of plants on the river bottom and heavy algae blooms in the mouths of the large tributaries. Heavy siltation has been caused by runoff from construction sites, agricultural runoff and sand and gravel operations on the tributaries at the head of the tidal portion of the river.

The Gunpowder River offers wide visual diversity ranging from unique wildlife and natural vegetation to a high concentration of pleasure boats in Joppatowne. While this study did not examine the shoreline of Aberdeen Proving Ground, notice was made of the abundant underwater vegetation and extensive sandy beaches. These appear to be some of the finest shoreline beaches in Harford County.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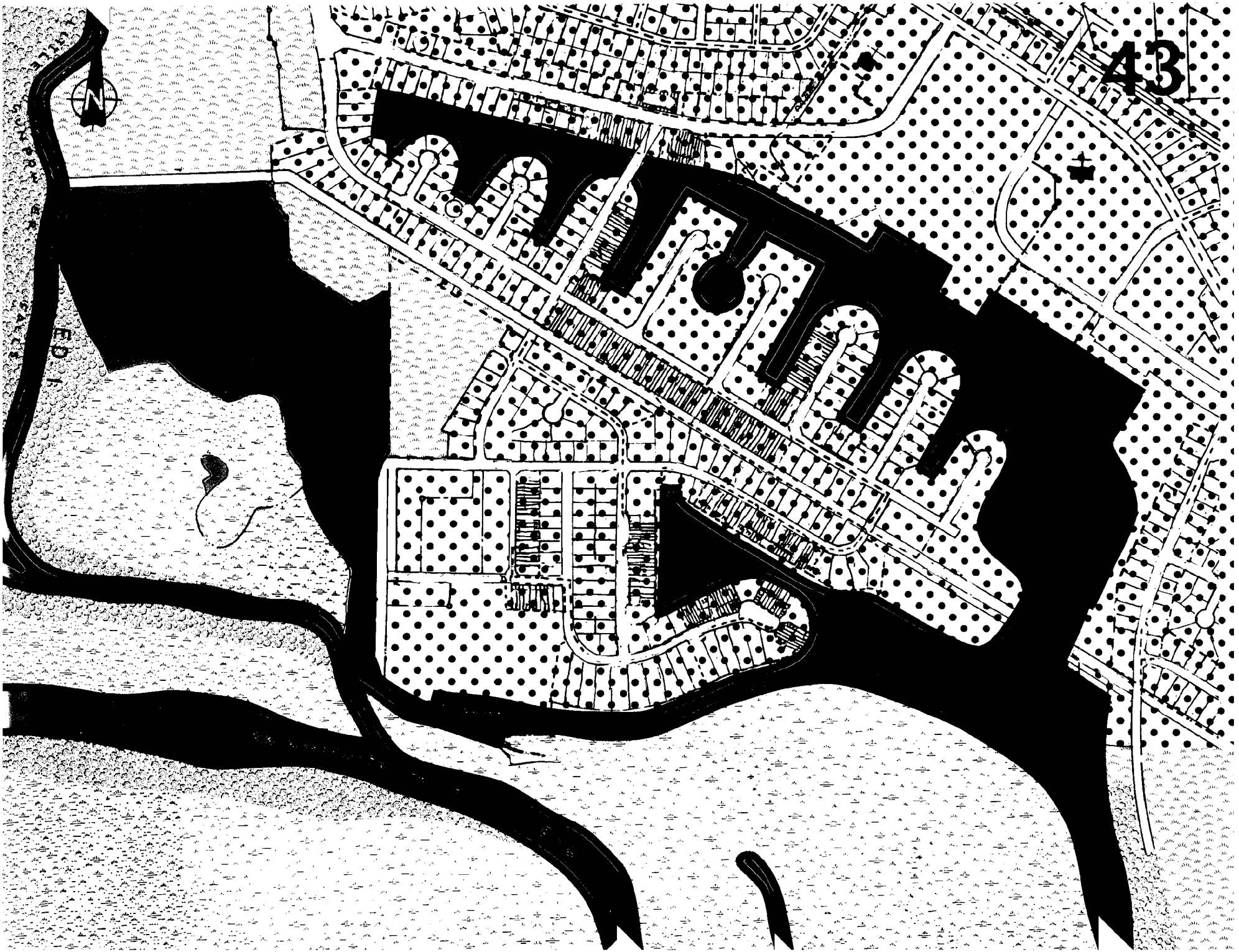
43
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Harford County Marshes

Marshes are characterized by soils which are waterlogged during the growing season, often being covered by 6 inches to 3 feet of water. Plant diversity is usually low. Grasses, sedges, rushes and various broadleaf species dominate the shallow areas. Cattails, arrowhead, smartweed and pickerelweed grow in areas of greater depth.

In spite of their low species diversity, marshes are exceedingly important. They provide food and habitat for migratory waterfowl and act as spawning or breeding grounds for large numbers of fish, birds, and mammals. Many open-ocean species begin their lives in freshwater marshes far from the waters in which they will mature.

Few plant species can tolerate having their roots underwater all of the time, but those which have adapted to these somewhat stressful conditions support an abundant wildlife. There are not many ecosystems which can surpass the number of bird species found in the marshes surrounding the Chesapeake Bay. Egret, heron, osprey, eagles, hawks, gulls, geese, and numerous duck species are only a few of the birds commonly sighted in this area. Fish such as white and yellow perch, striped bass, catfish and herring and invertebrates such as blue crabs and oysters are prized by many. These and other aquatic organisms are supported at least partially by the marshland vegetation.

Marsh areas also act as natural filters, slowing the movement of sediment and other debris from upland sites and collecting nutrients which might cause eutrophication of open-water habitats. This is true particularly during the warm summer months. Although tidal marshlands have naturally high concentrations of organic matter and nutrients, these are not a typical characteristic of an open-water ecosystem. The process of eutrophication usually affects only aged open-water systems or results when fecal contamination (human or animal), high phosphate detergents or fertilizer runoff increase nutrient levels above normal. This condition permits microscopic algae to undergo a population explosion. The life spans of these algae are short and, as large numbers die off, they are decomposed by

organisms which use up the oxygen that is normally available for fish and other organisms. Thus, when temperatures are high and nutrient levels excessive, algal growth and death are rapid. Decomposition causes oxygen levels to drop to near zero, many fish die and foul odors result.

High sediment levels can also cause ecosystem disruption by covering bottom dwellers, clogging the gills of fish and invertebrates and cutting the supply of sunlight to aquatic plants. As a result there is a reduction in photosynthesis, increased decomposition and decreased species diversity.

Tidal marshes are among the most productive ecosystems in the world. The biomass produced there often moves far out to sea, providing food for many oceanic species. Productivity in tidal marshes has been calculated to be about three times the output of the most productive agricultural lands.

Thus, although considered "useless" in the past, marshes fulfill a number of important functions which are necessary to ecosystem stability and human endeavor alike. Without tidal marshes there would be fewer waterfowl, fish or invertebrates and many open-water areas would be clogged by silt and plagued by eutrophic conditions. For these reasons, marshes and estuaries are now being protected by federal, state and local governments and by private individuals and institutions as well. Activities such as dredging and filling are severely restricted to protect the many resources which they could affect.

Harford County has marshes which exhibit both freshwater and saltwater species. From the mouth of the Chesapeake Bay to its headwaters, plant-species composition gradually shifts from strict saltmarsh species, such as cordgrass and glasswort, to those plants found only in freshwater marshes, such as cattails and wild rice.

The headwaters of the bay are farthest from the saltwater of the Atlantic Ocean. The marshes in this vicinity are close to the Susquehanna River which is the bay's source of fresh water. Near Bush River, surface-water salinities average one or fewer parts-per-thousand during the spring and between four and five parts-per-thousand during the autumn when freshwater inflow is less. Lower stream flows in autumn reduce the total amount of fresh water that is available to mix with the saltwater from the ocean. Spring salinities in the Gunpowder River (further south) average slightly higher than one part-per-thousand, while autumn levels are between six and seven parts-per-thousand. Because of this, the Gunpowder marshes contain some saltwater species which are absent in the marshes further north.

The marshes discussed in this study are classified as freshwater estuarine river marshes. Tidal variations are especially pronounced in these marshes and vegetation tends to be distributed according to water depth. Those species most well-adapted to being covered by water will occupy the channel edges and the less tolerant will colonize the higher ground. Since special adaptations are required for plants to tolerate consistently deep water, most species tend to occupy higher sites. It should be noted that, since this survey was conducted during August 1980, some spring and early-summer species may have been absent.

The following freshwater estuarine river marshes were observed: Swan Creek Marsh, Church Creek Marsh, Bush Creek Marsh, Otter Point Marsh, and Gunpowder Marsh. Although there are freshwater estuarine bay marshes in Harford County, they are located predominantly within the Aberdeen Proving Ground and were not included in this study.

Swan Creek Marsh

This marsh is on Swan Creek southeast of the Town of Aberdeen. Some of the marsh is within Aberdeen Proving Ground. Most of the marsh is undeveloped. It is a productive natural area and a prime wildlife habitat.

The mouth of the Swan Creek drainage basin is partially sheltered by a sandy spit which extends down from the northeast. Millet grass and water willow grow along the shoreline. Several small marshy areas are encountered as one moves upstream by boat. The Swan Creek Marsh itself forms a broad delta which is 2,000 feet across. Anyone travelling upstream, however, would first encounter a mudflat which extends 600 feet downstream from the marsh vegetation and all the way across the delta. These mud flats become exposed during the lowest tides. Water here is very muddy.

The marsh encompasses approximately 110 acres and is cut by two primary channels. Arrow-arum and pickerelweed form the bulk of the lower marsh growth with wild rice emerging in more shallow areas. Rice-cutgrass and smartweed also occur frequently. The upper reaches of the marsh are dominated by cattail and smartweed intermingled with river bulrush. It eventually grades into a red-maple swamp. In several areas the cardinal flower emerges through the vegetation.

The Swan Creek Marsh supports a number of bird species. Blue and white heron, snowy egret, and red-winged blackbirds were all sighted in the area. The presence of wild rice indicates this would be a prime water-fowl area during migration.

Church Creek Marsh

Church Creek Marsh is the northernmost of the three marshes supported by the Bush River and lies at the head of the Bush River near Belcamp. It is a long marsh (5,000 feet) extending primarily along the western edge of Church Creek. The total area of the marsh is estimated at 70 acres.

Although arrow-arum and pickerelweed dominate the deeper waters along the edge of the channel, mallow forms fairly dense stands at some locations. Cattails are found in the higher areas of the marsh which extend in from upland sites. Approximately 1,200 feet upstream from the mouth of the creek is a stand of elephant grass. Isolated stands of pickerelweed and arrow-arum also occur throughout the marsh. The uppermost reaches are again dominated by cattails with smartweed, pickerelweed and arrow-arum along water's edge. Of the three marshes in the Bush River area, this creek appears to have the greatest vegetational diversity.

Mallard ducks, common egret and green heron were spotted in Church Creek. Muskrat are known to make their homes in this marsh.

Bush Creek Marsh

This marsh is located between Church Creek and Otter Point Creek at the headwaters of Bush River and Long Bar harbor. It is a comparatively small wetland but is significant for fish and wildlife support. The marsh encompasses approximately 45 acres to the south of Route 40 and another 30 acres to the north of the highway. The marsh delta is bordered by a mud flat which grades into the typical pickerelweed and arrow-arum. These species also border the marsh along its northern edge and grade into cattails as elevation increases. The southwestern reaches of the lower marsh contain a number of marsh mallow mixed with cattails. A central strip of the marsh is dominated by smartweed and rice-cutgrass. The inland marsh which is located to the north of Route 40 is composed primarily of cattails with a mixture of smartweed and arrow-arum in the center. Red-winged blackbirds are common in the area.

Of the areas surveyed, the Bush Creek Marsh appeared to have the lowest vegetational diversity. This could be due to increased sedimentation rates which keep the marsh in a constant state of change, preventing species which require greater stability from establishing themselves. A comparison of 1957 and 1977 aerial photographs revealed considerable erosion on upland sites in this watershed, causing an increase in sedimentation in the Bush Creek Marsh.

Otter Point Creek Marsh

Otter Point Creek Marsh with approximately 400 acres of wetland, was the largest surveyed. (Although the Gunpowder River Marsh is actually much larger, only a portion of it is in Harford County.) The mouth of Otter Point Creek Marsh is nearly 2,200 feet wide and the wetland extends 3,600 feet upstream. A comparison of aerial

photographs taken in 1957 and 1977 shows that this marsh has grown considerably. During this 20-year span, a number of housing developments have been built in the vicinity. Construction may have caused considerable amounts of soil to wash from these sites into the marsh, extending its total area.

The watercourses in Otter Point Creek Marsh are bordered by sweetflag and pickerelweed. Pickerelweed and wild rice cover vast areas of the marsh, with cattails occupying the slightly higher areas. Wild rice forms several large islands with pickerelweed and sweetflag borders. River bulrush, jewelweed, smartweed and golden club also grow throughout the marsh. Water milfoil and wild celery, two submerged plants, occur in the shallow water in front of the marsh.

Wading birds are frequent visitors to this marsh. Blue heron and egret are most common, while yellow-crowned night heron and green heron are less frequently observed. In more shallow areas, upland plovers, sandpipers and yellowlegs are seen occasionally. Virginia rails, marsh wrens, and white herons are not uncommon. Muskrat and raccoon frequent the marsh, and otter slides have been noted nearby. The value of this area as a spawning ground for several anadromous fish has been recognized. Anadromous fish spend the earlier stages of their life cycle in fresh waters and migrate to ocean areas as they mature. The marsh acts as a nursery for these and many other species as well.

The comparative size of this marsh makes it a highly desirable area for wildlife. The relatively high plant diversity provides a variety of food sources for the birds and mammals which visit the area. The large size also insulates more sensitive species from the influences of human activity. This can be especially important during nesting periods.

This marsh also has a buffering effect on water which passes through it. Nutrients and heavier sediments from several large developments near Route 40 precipitate out here prior to entering Bush River when they would exacerbate an already precarious water-quality condition.

Gunpowder River Marsh

The Gunpowder River Marsh is the largest of those being discussed in this text. However, the majority of its land is located in Baltimore County and will not be included in this discussion. In addition, much of what was wetland habitat has been dredged and reclaimed and is now part of the Joppatowne development. This has considerably altered the wetland configuration. The total marsh, including the Foster Branch area, now comprises around 125 acres.

When compared with the other county marshes, the topography of this land is quite different. Whereas the others were low areas with slight or gradual changes in slope, here the land rises rather abruptly from the watercourses. This has the effect of limiting marsh vegetation to thin fringing areas along the water's edge. The predominant species in the foreground are cattails, river bulrush, and smartweed. Located immediately behind are marsh and rose mallows and a number of shrubs, including marsh elders and sea myrtle— two salt tolerant species. The watercourses in the area are turbid due to power boats which usually travel at high speeds. This turbidity may have had a severe impact upon shoreline vegetation. In sheltered areas the vegetation is more well developed and more diverse.

One extensive marsh area exists between the main channel into Joppatowne and the Baltimore County line. This area is dominated by cattails, sweetflag, pickerelweed and arrow-arum. Elsewhere there are a number of mud flat areas which support a rather dense population of water-milfoil.

Foster Branch is one of the more interesting botanical areas. Pickerelweed, sweetflag, smartweed, and arrow-arum line the eastern edge of the channel. Water milfoil is present, as well. In several areas, yellow and white water lilies are found and cardinal flowers dot the bank. Mallow, elephant grass and wild rice are present on higher soil.

Green heron, whistling swans, mallard ducks and an American bittern were sighted in this vicinity.

Recommendations

The Harford County Shoreline Study was undertaken to accomplish four basic objectives:

- gather information on shoreline conditions, wildlife habitat, submerged aquatic vegetation and other natural features that make the shoreline a unique environmental system.
- to identify areas with potential for active or passive recreational use.
- to identify areas which require conservation management.
- to identify policy issues which affect land use, shoreline access and use and conservation management.

Recommendations relating to each of these objectives are included in the text that follows.

Information

A knowledge and understanding of existing shoreline conditions and the dynamics of these natural systems are essential before planners can make recommendations about proposed land use. This research effort has provided an opportunity for mapping the county's shoreline and for gathering baseline information that identifies not only present land use and shoreline conditions but, more importantly, suggests parameters for policy considerations about the future of the Harford County shoreline. Although this study was done under rather strict time constraints and can be, therefore, only a general reference, it was possible to identify some of the major vegetational and physiographic characteristics of the Harford County waterways and marshes.

On the basis of the information presented in the previous sections of this report, the following recommendations are made:

- The Department of Planning and Zoning should continue to work with the City of Havre de Grace on their Waterfront Study.
- The information from this Shoreline Study should be used in the development of an informational program for county residents.
- The Department of Planning and Zoning should investigate the possibility of conducting future shoreline studies which would provide updated information on a regular basis.

Recreational Use

During this study, many shoreline activities were observed. The recommendations that follow are examples of the opportunities that are available in the county. Recommendations for specific shore-site development are not intended to imply that these are the only opportunities which should be explored for public access.

On the basis of the information presented in the previous sections of this report, the following recommendations are made:

- Discussion should be initiated between the Philadelphia Electric Company and Harford County to consider the development of hiking trails along the Susquehanna River and a bicycle trail along the banks of the old canal.
- Discussions with U.S. Army officials at the Aberdeen Proving Ground should explore public use of some of the waterfront space within the Proving Grounds (including the beach south of the Bush River railroad bridge) and the development of a nature trail around the Swan Creek Marsh.
- The Harford County Parks and Recreation Open Space Plan should include a study of methods of providing greater public access to the waterfront areas of the county in conjunction with the study of county recreational needs.
- The Department of Planning and Zoning and the City of Havre de Grace should continue their study of Tydings Island as a recreational site. The island, located in the Chesapeake Bay at the mouth of the Susquehanna River, offers several recreational possibilities: a picnic site on the bluffed and partially wooded northern side; swimming at the sandy beach on the southeast; and other passive recreational activities on the southwest corner which could accommodate dredge spoil material.

- Discussion should be initiated between the county and the Baltimore Gas and Electric Company to consider public access to the beach front property along the Bush River between Bush River Neck Road and Sod Run. Although the river is closed for swimming, this area lends itself to use for fishing, nature trails, and more active recreation.
- The abandoned gravel pit on Otter Point Road should be examined for possible reclamation and conversion to a recreational site. Although no overt reclamation efforts have been made, the area is covered with successional vegetation. It has the potential as a site for picnicking, bicycling, and active recreation.
- The point adjacent to Otter Point and Flying Point Park should be investigated as a site for active and passive recreation. The eastern side of this point is a sloping sandy beach on Otter Point Creek. The western side borders on the Otter Point Marsh. Water-contact activities would need to be postponed until tests of bacteria levels indicate safe ranges; however, hiking and nature trails could be instituted immediately

Conservation Management

Residential and commercial development of land in Harford County is an important aspect of the economic growth of the county. Unfortunately, such development often has adverse effects on county rivers, streams, and wetlands. As new construction alters the land uses, the landscape, waterways and marshes are plagued by increased stormwater runoff, sedimentation and chemical pollution.

In recent years, the Harford County government has worked to provide for more effective environmental controls and regulations. The Sediment Control, Storm Water Management and Flood Plain Zoning Legislation were attempts at reducing the degradation of the county's natural water resources. The 208 Water Quality Program stresses the control of soil erosion and water runoff from both agricultural and residential development sites. However, the use of soil-management techniques has met with mixed success because of the lack of personnel to enforce the regulations. Recently, enforcement capabilities have been increased and a higher rate of compliance will hopefully result.

Late in 1981 the Harford County Department of Planning and Zoning will begin a comprehensive zoning review. Such a review has not been made since the initial zoning effort in 1957. Difficult and complex land-use issues relating to housing, transportation, economic development and environment protection will be addressed. The comprehensive zoning review will include concern for the preservation and conservation of the county's natural resources and various zoning techniques will be explored to find the most practical and effective strategies for preserving the unique environmental features of the county.

On the basis of the information presented in the previous sections of this report, the following recommendations are made:

- Further efforts should be made to educate county residents about the importance of environmental controls in stemming the pollution and destruction of Harford County waterways and marshes.
- Closer contact should be maintained with organizations like the Chesapeake Bay Foundation and the Maryland Environmental Trust which provide funding and educational programs for protecting environmental resources.
- Harford County should provide proper zoning designations for sensitive environmental areas. These zones would protect the environment by allowing only those uses which are compatible with the natural environment. The integrity of the wetland habitat in the marsh areas is especially in need of protection by the establishment of buffer zones of from 100 to 200 feet, depending on site conditions.
- Regulations should be designed to reduce sediment loading which is often caused by sand and gravel extraction in the river basin and improper sediment control techniques during land development.
- An effective debris-removal program should be employed at the Conowingo Dam by Philadelphia Electric Company to stop the annual flood of debris that settles in the Havre de Grace Yacht Basin.
- The U.S. Army should open the causeway connecting the Proving Ground to Spesutie Island by immediately placing pipes in the causeway to allow bay waters to flow freely and reduce the sedimentation of Swan Creek.
- In order to retard the loss of farmland and to preserve watersheds, Harford County should consider rural conservation zoning legislation. The Rural Conservation Zone could establish a residential density appropriate for the land beyond the urban-rural demarcation line; use percent-of-slope and soil types in a watershed zone to restrict development; and require environmental impact statements if a proposed zoning reclassification might affect water quality in a watershed or in any public reservoir.
- Harford County should act immediately to include local Critical Area Designations into its overall planning program. On November 20, 1980, the Maryland Department of State Planning published a list of areas which are of unusual or significant importance based on physical, social, economic or governmental conditions or trends. The Secretary designated these areas as deserving special management attention to assure the preservation, conservation, or utilization of their special values. Five Harford County marshes were designated as being of Critical State Concern: Swan Creek, Church Creek, Bush Creek, Otter Point, and Gunpowder Delta. Local zoning, subdivision-growth management and other planning decisions must be consistent with the preservation of the designated areas. At the end of each year, an assessment of these areas should be included in the planning agency's annual report.
- Immediate attention should be given to the actions which presently threaten the five marsh areas previously described. The fragile marsh environment must be respected by man.

Swan Creek Marsh

The Aberdeen Proving Ground Master Plan reserves an area adjacent to the wetlands for military housing. Increased sedimentation of the marsh could occur if adequate buffer zones and sedimentation controls are not employed.

Effluent from the APG sewage-treatment plant currently discharges into the creek and causes extensive pollution. (The Army plans to move the discharge from this plant away from the creek in the near future.)

Church Creek Marsh

Development on the land north of the marsh poses an increased siltation problem which would have a negative impact on spawning grounds and sensitive vegetation.

Proposed zoning reclassification of a large agricultural area bordering on Gray's Run which feeds this marsh threatens life in the marsh unless adequate precautions are taken before development begins.

Bush Creek Marsh

The immediate threat to the Bush River north of U.S. Route 40 is the Bata Riverside development. Stringent enforcement of environmental regulations and maintenance of storm-water and sediment-control facilities are critical to the protection of the marsh. Even with the proper execution of these development requirements, the quality of water runoff could prove to be detrimental to the life of the marsh.

A secondary impact on the marsh comes from upstream development. The main stream feeding into the marsh, Bynum Run, is on the edge of the County Master Plan Development Envelope. The major portion of county residential growth is expected to occur in the corridor running west of Bynum Run within the coastal zone along I-95 and Route 40. Protection of the Bynum Run stream valley is imperative in order to protect Bush Creek Marsh. The strict enforcement of existing environmental protection ordinances will help to reduce negative development impacts on the marsh.

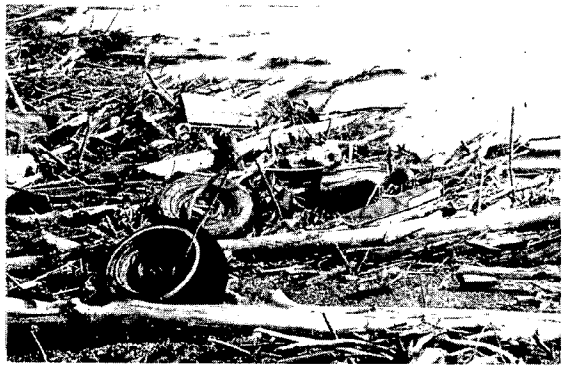
Otter Point Marsh

Development of some portions of the marsh, in accordance with current zoning and water/sewer plans, will have a negative impact on the life of the marsh.

A bridge across the Bush River Marsh area to alleviate traffic congestion on Willoughby Beach Road would be a significant threat to the ecosystem of the marsh and would destroy some of Harford County's most beautiful shosreline vistas.

Gunpowder Delta and Marsh

The single most important issue involving the protection of the wetlands, the water quality, and the scenic beauty of the Gunpowder River delta is the presence of mineral resources along the Gunpowder and Little Gunpowder Falls. About 92% of the delta is owned by mining interests. This situation creates a conflict between conservation of natural resources and the need for mining the aggregate found in the region.

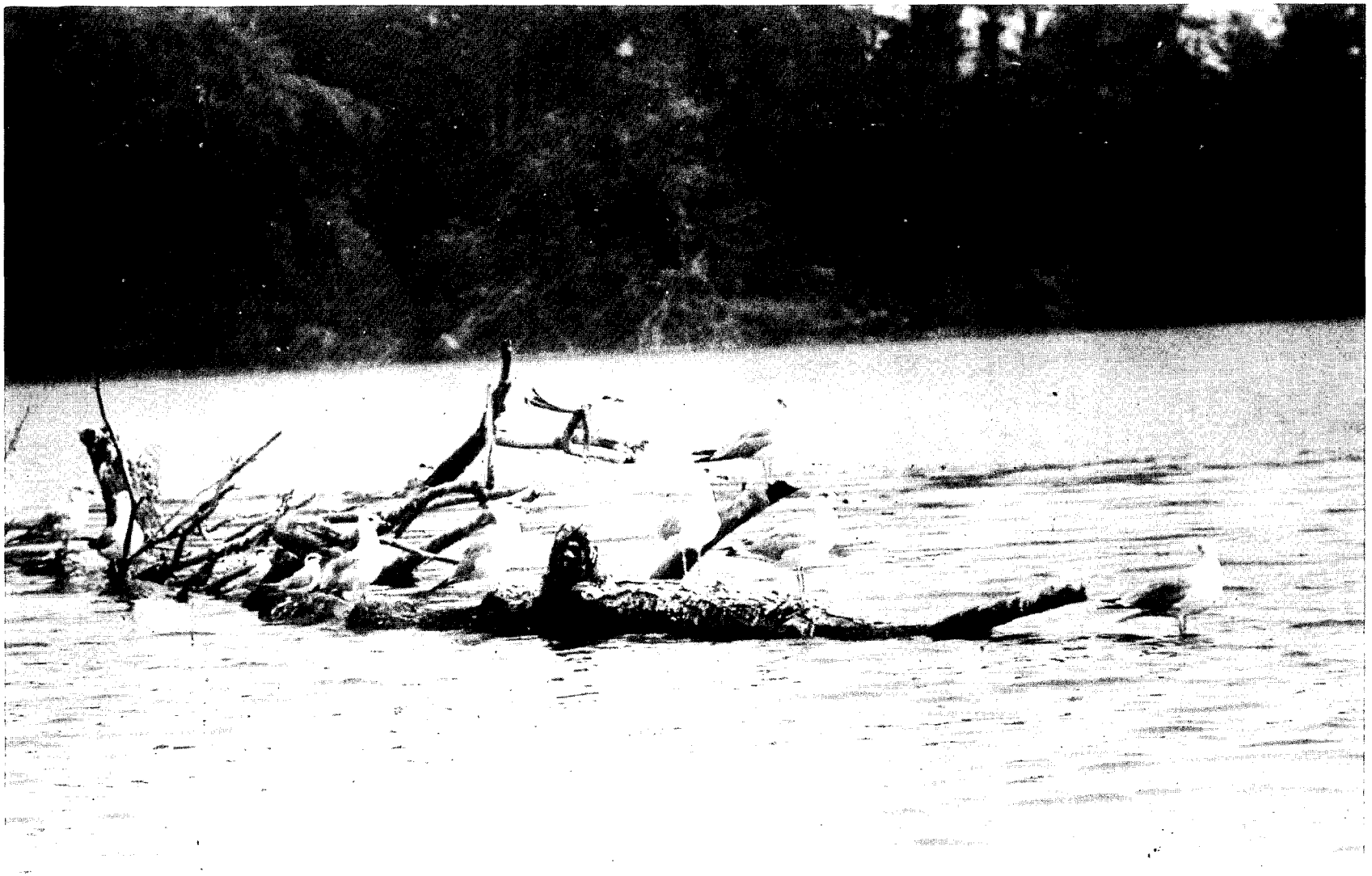


Policy Issues

Policies help to set parameters within which decisions can be most appropriately made. Every decision presents a different set of trade-offs. In making decisions about land use, perhaps the trade-off does not need to be recreational use or conservation, development or preservation. Carefully formed policies can help to achieve a balance between these two choices rather than an elimination of one or the other.

On the basis of the information presented in the previous sections of this report, the following recommendations are made:

- The Harford County Government must pursue an active policy of recognizing the uniqueness of the Coastal Zone and encouraging land use which is in harmony with the land and water edge. This goal can be realized through proper land use and development controls.
- Continued citizen support of the Maryland Coastal Zone Program is necessary to insure continued funding of local Coastal Planners whose primary function is to address land use conflicts which are unique to the Coastal Zone.
- The County Master Plan indicates as one of its stated goals that "Waterfront Recreation Areas for public use will be protected." County parkland along the water's edge is scarce. The Department of Parks and Recreation should take every opportunity to use its Open Space Program to acquire and develop waterfront parks.
- To retard erosion and stabilize the existing shore, the Planning and Zoning Department should use the 100-year-flood-plain and shoreline erosion rates to determine minimum set-back regulations for residential construction.
- A Shore Zone District should be established in order to regulate land use in the Coastal Zone. Only one-story homes might be permitted near the water to protect the view of those who live further inland. Access to the shore for property owners on the uplands might be assured through a system of rights-of-way. Coastal vistas might be preserved by considering visual impact of a proposed land use in addition to environmental impact.
- The county should examine the impact of industrial growth in the Route 40 corridor on the Coastal Zone. The effect of industrialization on water quality, shoreline access and the coastal environment should be considered.



Methodology

The first step in the Shoreline Study was to select field maps which were large enough to show the essential features of the shoreline. County tax maps (at 1:600 scale) were used for mapping all of the shoreline except the Bush River, which was mapped on photogrammetric maps at 1:200 scale. All maps in the final report use the 1:600 scale to provide consistent representation of the shoreline.

Before visiting the field, the inventory team studied aerial photographs and maps showing historical shorelines, wetland areas, distribution of submerged aquatic vegetation and shoreline structures. The team then travelled the waterways, observing the entire shoreline by boat. The importance of conducting the inventory from the water cannot be overemphasized. Many shoreline areas would have been inaccessible by any other means. In addition, mapping the accurate location of submerged aquatic vegetation would have been much more difficult.

Recording field observations proved to be the most difficult task in the Shoreline Study because of the number of variety of features to be mapped. Beach length, shape, composition, aquatic vegetation, inshore vegetation, visual appearance, and wildlife were the natural features to be documented. The constructed features included piers, erosion-control structures and buildings along the shoreline. Natural processes to be observed were erosion,

sedimentation and successional vegetative growth. Since this information could not be recorded directly onto maps in the field, the team needed a fast and accurate way of documenting information so that it could be mapped in the office at a later time. An inventory matrix was developed to categorize all the essential information.

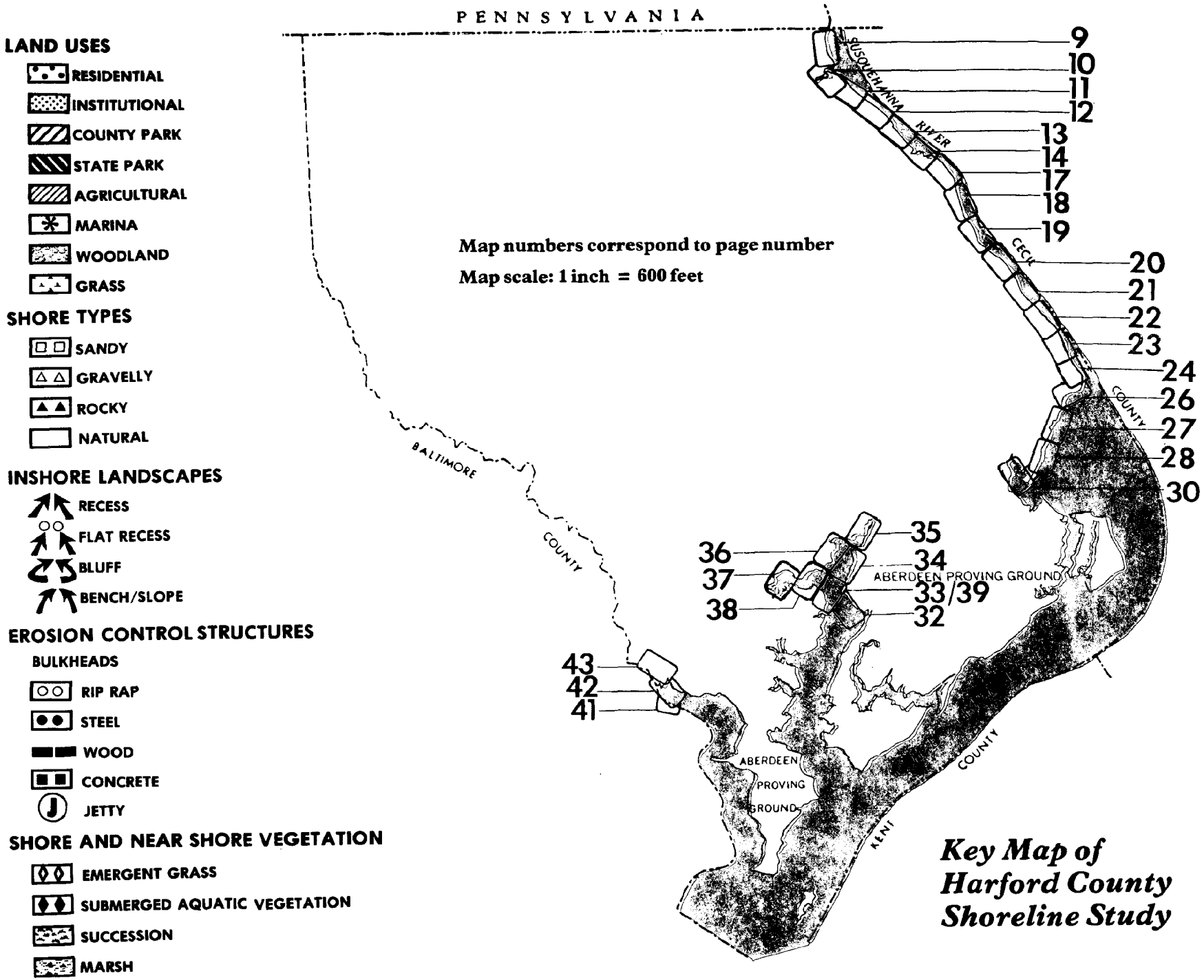
The vertical axis of the matrix contains a list of all shore types that would be encountered in the field. The type of shore zone on the vertical axis was then used as the criterion to divide the shoreline into mapping units. A uniform segment of shore was considered a single mapping unit; all information pertaining to that particular segment was recorded on the matrix, the segment was located on the map, and the segment and matrix were numbered correspondingly.

The horizontal axis of the matrix lists all other features to be noted. As a segment of shoreline was viewed, the type of beach, vegetation, erosion, bottom material and wildlife were checked off in the appropriate boxes. The location of piers, bulkheads, houses, and submerged aquatic vegetation was the only information that had to be recorded in separate notation.

The matrix is organized in a way that automatically ranks the shoreline in terms of recreational suitability. The shore zones are listed hierarchically so that the type of shore most suitable for recreation (sandy) is at the top while the shore that offers the least recreational opportunity (natural rocky shore) is at the bottom. The horizontal axis is also ordered so that the more checks a shore segment receives in the categories on the left of the matrix the more recreational opportunity that segment offers. For example, a flat, sandy beach 1500 feet long and 20 feet wide with no erosion or sedimentation, and mixed decidious vegetation is better suited for recreation than would be a heavily eroded, natural rock shore which is short in length and width and has submerged aquatic vegetation.

Glossary of Plants Observed

Arrow-Arum *(Peltandra virginiana)*
Cardinal Flower *(Lobelia cardinalis)*
Cattails *(Typha spp.)*
Cordgrass *(Spartina alterniflora)*
Elephant Grass *(Phragmites communis)*
Glasswort *(Salicornia spp.)*
Golden Club *(Orontium aquaticum)*
Jewel Weed *(Impatiens capensis)*
Marsh Mallow *(Hibiscus palustris)*
Miller Grass *(Milium effusum)*
Pickerelweed *(Pontederia cordata)*
Red Maple *(Acer rubrum)*
Rice Cutgrass *(Leersia oryzoides)*
River Bull Rush *(Scirpus fluviatilis)*
Sea Myrtle *(Baccharis halimifolia)*
Smartweed *(Polygonum spp.)*
Sweet Flag *(Acorus calamus)*
Water Milfoil *(Myriophyllium spicatum)*
Water Lilies *(Nuphar advena)*
Water Willow *(Justica americana)*
White Water Lilies *(Nymphaea odorata)*
Wild Celery *(Vallisneria americana)*
Wild Rice *(Zizania aquatica)*


LAND USES
RESIDENTIAL
INSTITUTIONAL
COUNTY PARK
STATE PARK
AGRICULTURAL
MARINA
WOODLAND
GRASS
SHORE TYPES
SANDY
GRAVELLY
ROCKY
NATURAL
INSHORE LANDSCAPES
RECESS
FLAT RECESS
BLUFF
BENCH/SLOPE
EROSION CONTROL STRUCTURES
BULKHEADS
RIP RAP
STEEL
WOOD
CONCRETE
JETTY
SHORE AND NEAR SHORE VEGETATION
EMERGENT GRASS
SUBMERGED AQUATIC VEGETATION
SUCCESSION
MARSH
PENNSYLVANIA
SUSQUEHANNA
RIVER
CECIL
COUNTY
BALTIMORE
COUNTY
ABERDEEN PROVING GROUND
ABERDEEN
PROVING
GROUND
HARFORD
COUNTY
KENT
Map numbers correspond to page number
Map scale: 1 inch = 600 feet
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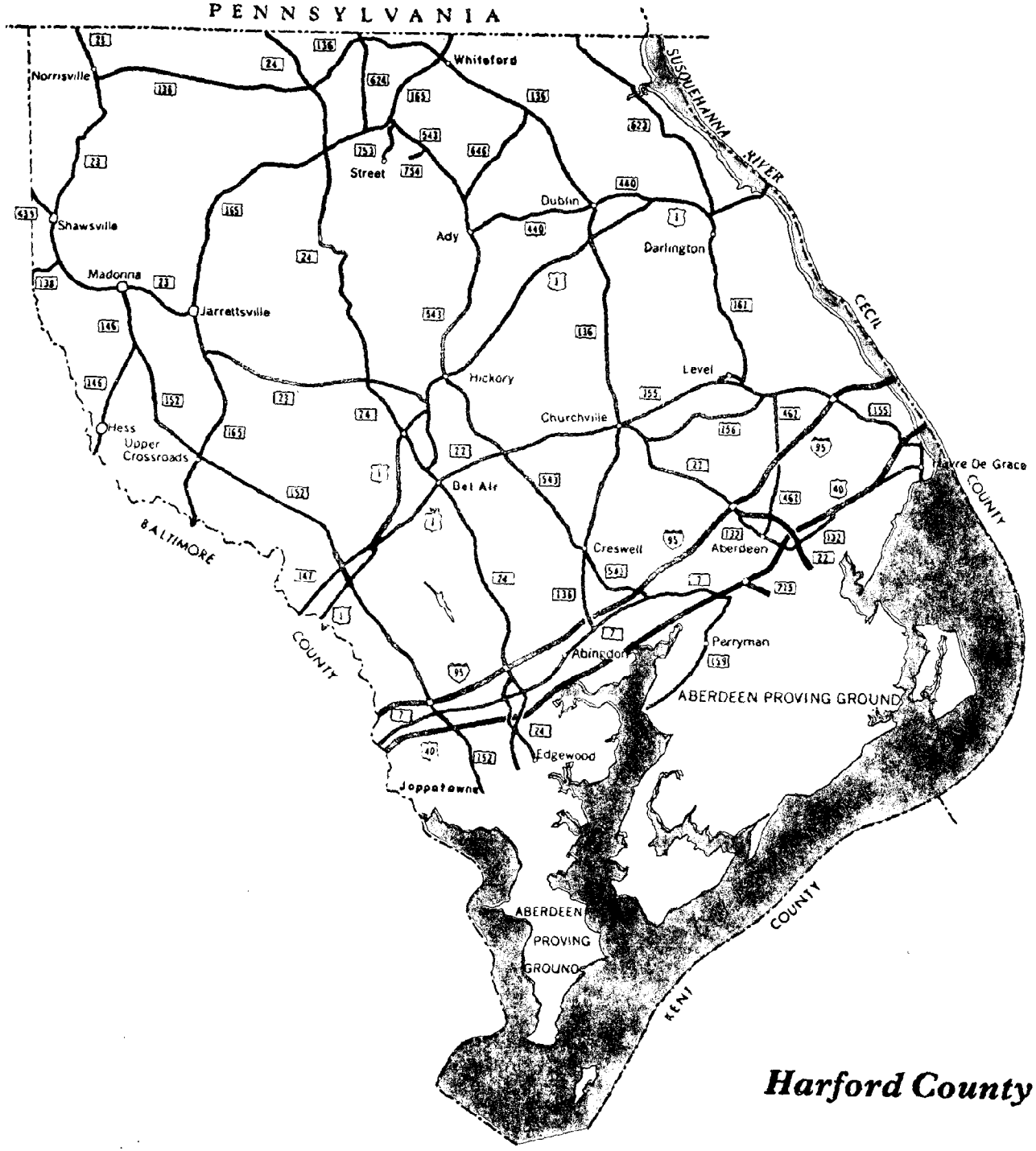
Key Map of
Harford County
Shoreline Study



Harford County Maryland

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