ABSTRACT

Title of Thesis: **INSTITUTE OF URBAN AQUACULTURE & CHESAPEAKE LEARNING CENTER**

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Degree and Year: Master of Architecture, 2006

Thesis Directed By: Steven Hurtt, Professor

Twelve thousand years ago the Susquehanna River carried water from melting glaciers in what is now New York south to the Atlantic Ocean. As the glaciers disappeared the seas rose and the Chesapeake Bay was born. The Bay now has nineteen principal rivers and 400 lesser creeks and streams, forming more then 4,600 miles of tidal shoreline. (1)

In the 16th century European settlers discovered the bounty of the bay. People have been moving in ever since raising today's population to over ten million inhabitants living near the shores. Some use the tidewaters for fishing, hunting, crabbing, and recreation; others don't pay attention to the estuary but are none the less play a major role in the Chesapeake's ecosystem.

The diversity and health of the bay and its tributaries have been devastated by the hand and stomach of humankind. Large tracts of grassy shoreline have been turned into manicured, "monospecific gardens". In the water, great dead zones were formed from

excess amounts of nutrient run-off from suburban lawns and farms and sediment from urban construction. The great ecological diversity of the country's largest estuary is in jeopardy.

The Institute of Urban Aquaculture and the Chesapeake Learning Center will explore ways to promote restoration and conservation of the Bay region. Through public education and demonstration the Institute will lead by example. The center's focus is on education, research, and restoration of the Chesapeake's great diversity of plants and animals. Ridgley's Cove will be a national example of how we can balance needs for development and our place in the ecosystem.

THE INSTITUTE OF URBAN AQUACULTURE
AND
CHESAPEAKE LEARNING CENTER

By
Devin Stewart Kimmel

Thesis Submitted to the Faculty of the
Graduate School of the
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of the requirements for the degree of
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Professor Steven Hurtt, Chair
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INTRODUCTION

The use and abuse of our water systems in America has in recent years been one of the most critical and sometimes most difficult of environmental challenges. The ecological values of wetlands in urban areas are arguably more crucial then those in rural or undeveloped landscapes. Historical wetlands and tidal marshes in urban environments have been devastated by dredging, filling, and altering the edge condition for human use. Plants and animals throughout the Chesapeake Bay area have suffered over the past centuries due to high amounts of nutrient runoff, sedimentation and loss of habitat due to construction, agriculture and urban sprawl. (White, Christopher P. (1994). Chesapeake Bay: A Field Guide " Nature of the Estuary" (4th ed.) Centerville, Maryland: Tidewater Publishers)

The Institute for Urban Aquaculture will explore water and light, ecosystems, biodiversity, and the restorative role people can play. The Institute will house state of art facilities for researching and restoring the flora and fauna of the Chesapeake Bay region and beyond. The campus itself will demonstrate techniques of environmentally responsive storm water management, while neutralizing polluted areas and restoring the waters edge.

On the other end, the Chesapeake Learning Center will be a place to demonstrate and study the Bay regions diverse plant communities. The center will have gardens for public education and enjoyment--while providing areas for refuge for local wildlife. Design objectives include; restoration of the Ridgley's Cove's natural areas, establishment of nursery areas for Bay plant restoration and study, a developed path system that connects various areas of the adjacent city neighborhoods, and areas for wildlife observation and interaction with nature.

This thesis is a study on the new rising discipline of land and water restoration. An area of study within the scope of ecology. Simply put, restoration in theory is an incremental and developmental process that attempts to restore an ecosystem to a historical state, or as close to a pre-human state as possible.

The thesis will establish a starting point for creating ecosystematic design, meaning that this project will reflect an understanding of the sites diverse ecosystem and blend that gained knowledge with our underlying need to build. This notion of building more ecologically is not a new term, but it is still in its youth. A lot of recent "sustainable" work in architecture has focused on the buildings mechanical and solar powered systems. While, that is a great step, this project will go a bit further, and will begin to synthesize the notion of building within the landscape, not just "landscaped", by allowing the ecosystem to be a part of the building--to capture and harness the ebb and flow of nature is the goal.

CHAPTER I: THE CHESAPEAKE

The Chesapeake Bay is the largest estuary in the United States and one of the largest in the world with more than ten million people and over two thousand species of plants and animals. Tidal marshes in urban areas have a growing value. Restoration of urban wetlands is viewed as high priority. Development and industry has destroyed historical wetlands leading to desolate and lifeless zones beneath the water and along the shores. Over fishing, harvesting, construction, and farming are the leading causes for the Bays decline in health. It wasn't always this way. Only in recent centuries people have had the ability to alter and destroy the environment in such catastrophic ways. But all is not lost, with education and understanding, much can be done about the problem.

The Chesapeake formed around twenty thousand years ago near the end of the Pleistocene Era. Temperatures were much colder then and the sea level was 325 feet lower. At about this period melting water from glaciers formed the Susquahanna River that meandered south through what is now Pennsylvania, Maryland, and finally reaching the Atlantic on the coast of Virginia. Around 18,000 years ago the earth's temperature began to rise causing the glaciers throughout the world to melt. Overtime the sea level rose, and by 3,000 years ago the mouth of Susquahanna reached its present location at the top of the Bay much further north. (White, Christopher P. (1994). Chesapeake Bay: A Field Guide " Nature of the Estuary" (4th ed.) Centerville, Maryland: Tidewater Publishers)

Today the bay has nineteen principal rivers, four hundred lesser creeks and streams, and more than four thousand six hundred miles of tidal shoreline. The bay is relatively shallow with an average depth of 20 feet and deepest just south of Annapolis reaching 174 feet. Tides rise and fall twice daily and vary in magnitude along the length of the bay. Near the ocean in Virginia, tides average three feet and in the northern reaches near Baltimore tides average one foot. (Lippson, Alice Jane and Robert L. (1997) Life in the Chesapeake Bay (2nd ed.) Baltimore Maryland: The Johns Hopkins University Press.)

The Bay area is within a temperate geographic zone that experiences seasonal changes in water temperature but rarely freezes completely. Migratory species like fish and crabs, move from deep channels into warmer shallows during the spring months. Herrings and shads travel from the sea to tributary streams to spawn. Bottom dwelling vertebrates begin to forge and grow. Many of these species of fish feed on abundant schools of smaller fish and animals. In the fall the cycle reverses and many species migrate out of the shallows

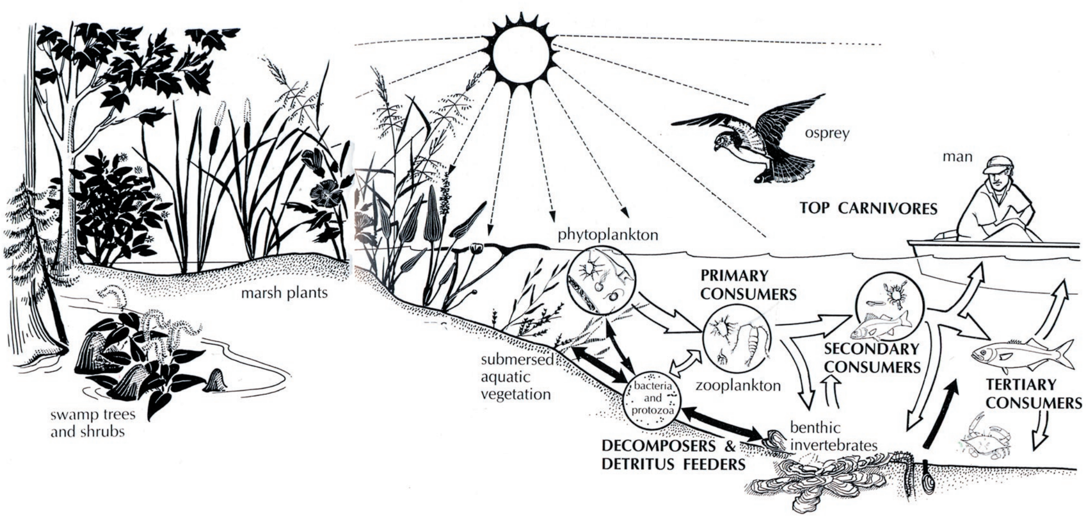


Figure 1: The Chesapeake Ecosystem (Chesapeake Bay: A Field Guide “ Nature of the Estuary”)

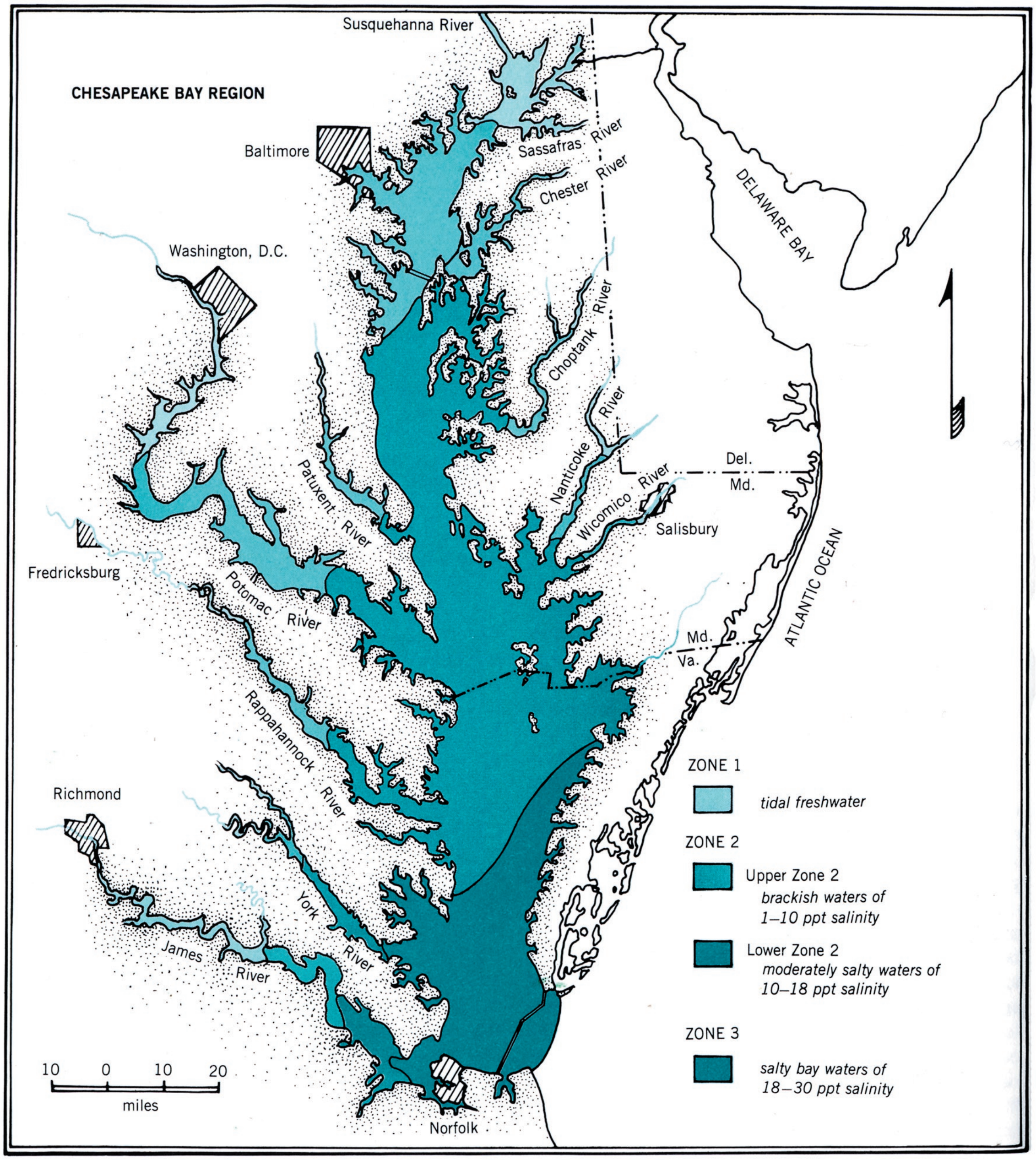


Figure 2: Salinity levels in the Bay (Chesapeake Bay: A Field Guide " Nature of the Estuary")

and into the deeper waters of the ocean. So, during winter months there is a great decrease in bay activity. Understanding seasonal changes in the bay is imperative when considering development along the bay.

Salinity in the Bay

An estuary can be defined as a restricted embayment in which fresh water mixes with ocean water. Salt content and its distribution throughout the bay ranges from fresh water in the northern tributaries to high ocean like salinity levels near the mouth. Near the top of the bay and it's tributaries little salinity is found, therefore many plant and animal species differ from north to south. Midway down the length of the bay, the salinity

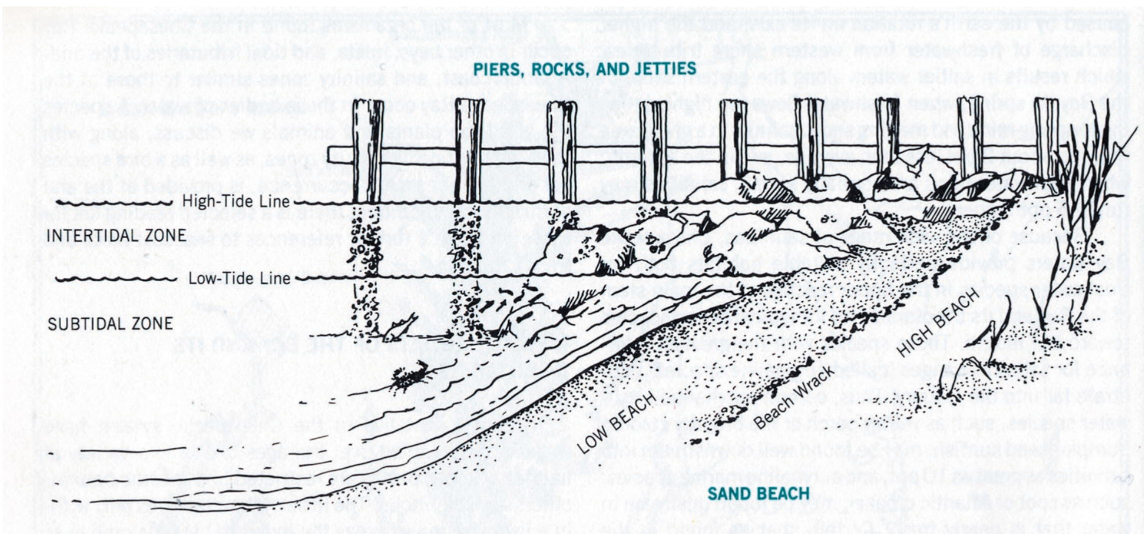


Figure 3: Habitats of the Bay, (Sub-tidal Zones and Sand Beach, Chesapeake Bay: A Field Guide " Nature of the Estuary")

concentration averages 15 parts salt to 1,000 parts water, i.e. 15ppt, as compared, ocean water is 30-35 ppt. Salinity also increased from surface to bottom water. The surface areas tend to show an increase of 2 to 3 ppt. (Lippson, Alice Jane and Robert L. (1997) Life in the Chesapeake Bay (2nd ed.) Baltimore Maryland: The Johns Hopkins University Press.) Other influences on salinity are the earth's rotation and influxes of fresh water in the tributaries. The Ridgley's Cove site can easily be considered a fresh water tidal marsh found in zone 1 as illustrated on figure 2.

Habitat's of the Bay.

Many species live and have evolved in the bay. The species can be defined as pelagic plants and animals or benthic plants and animals. Pelagic species are comprised of open water creatures such as fish, plankton, and microscopic animals. Benthic species live at or near the bottom and are comprised of alleges seaweeds, rooted aquatic vegetation,

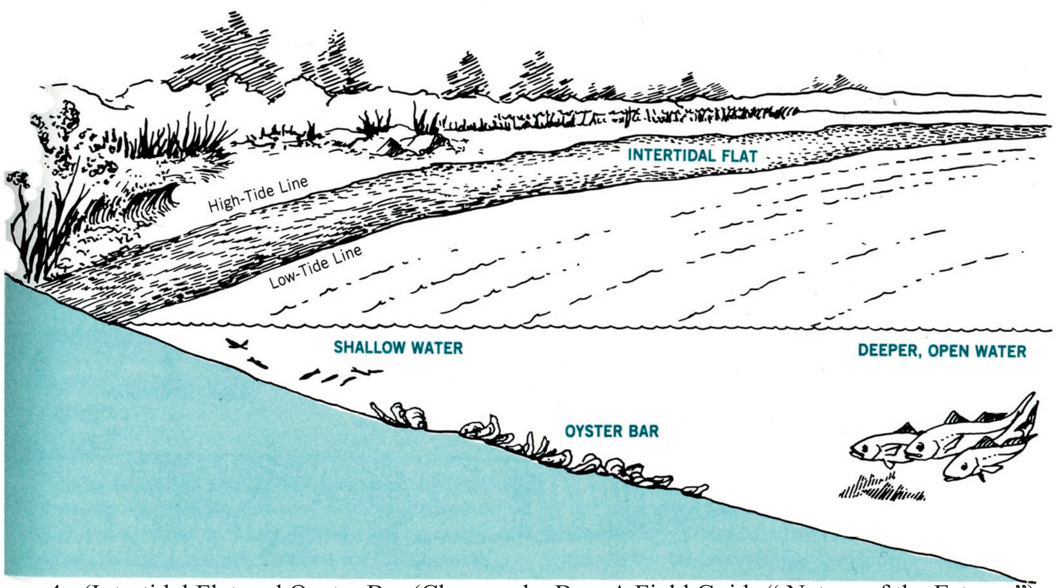


Figure 4: (Intertidal Flat and Oyster Bar (Chesapeake Bay: A Field Guide " Nature of the Estuary")

and animals that crawl or attach themselves to hard substrates. These types of plants and animals are found in a variety of different circumstances described below. (Lippson, Alice Jane and Robert L. (1997) Life in the Chesapeake Bay (2nd ed.) Baltimore Maryland: The Johns Hopkins University Press.)

Sand Beaches

The bay does not have beaches like the ocean. There are no large expanses of beach or dunes to protect the shoreline from large waves and ocean winds. The beaches are however similar to ocean beaches through similarities in zoning. The zones are created by the tides. These zones are termed intertidal zone, sub tidal zone, low beach, and high beach. As illustrated in figure 4. Intertidal zones remains intermittently submerged while the upper beach zone is wet during high tides. During low tide, high beach is exposed allowing birds and other animals to feed on species below the surface. (Lippson, Alice Jane and Robert L. (1997) Life in the Chesapeake Bay (2nd ed.) Baltimore Maryland: The Johns Hopkins University Press.)

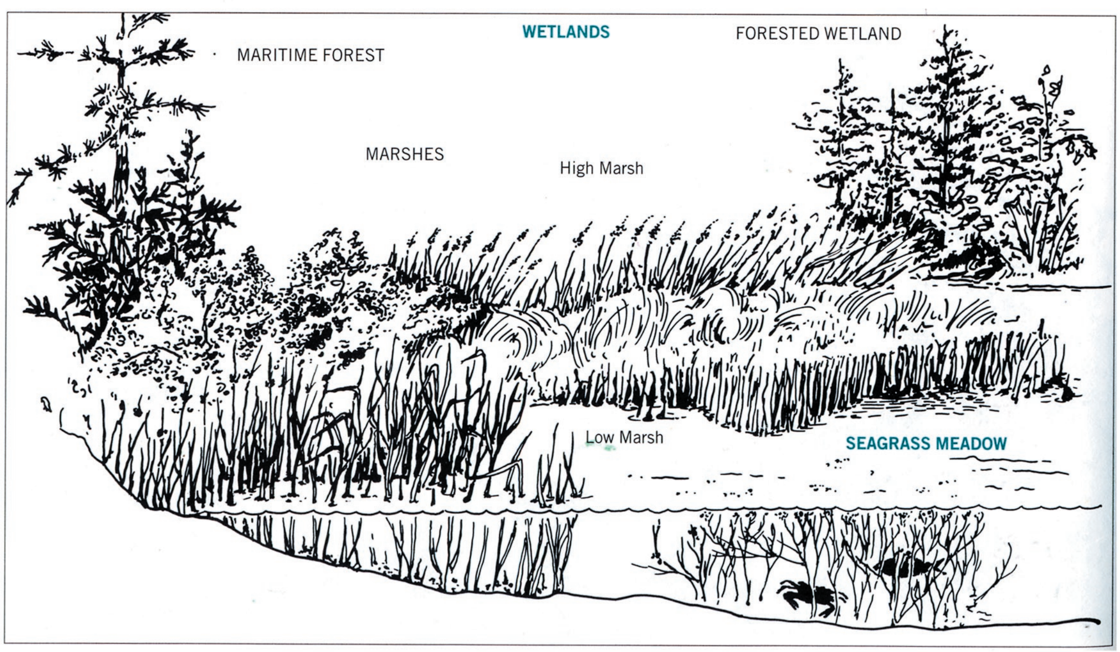


Figure 5: Marshes and Seagrass Meadows (Chesapeake Bay: A Field Guide " Nature of the Estuary")

Intertidal Flats

These flats occur where areas of the bottom are exposed during low tide. The substrate is composed of fine silts and muds. The area may appear lifeless but usually houses a variety of marine species buried beneath the surface. The flat may be bordered by mud banks or high marsh areas.

Piers and Jetties

Many human made objects provide habitat for plants and animals that need hard surfaces to attach. In examining one pier or piling species will differ from top to bottom. Some species need to be submerged while others need only moisture in the air. These animals provide multiple fish communities with steady food.

Shallow waters

The shallow sub-tidal zone is only a couple of feet deep and supplies habitat for varieties of benthic life similar to the intertidal zones. Some of these creatures are only found in sub tidal zones. The pelagic plants and animals are numerous in this zone, but often go unnoticed due to the miniature world in which they inhabit. The shallow waters often provide the right conditions for multiple types of submerged vegetation. These marshes form a separate habitat. (Lippson, Alice Jane and Robert L. (1997) Life in the Chesapeake Bay (2nd ed.) Baltimore Maryland: The Johns Hopkins University Press.)

Seagrass Meadows and Weed beds

Submerged vegetation can cover the soft silty bottom of a shallow, creating a diverse ecosystem filled with fish, invertebrates and water fowl. Besides filtering water, using carbon dioxide, and creating oxygen, plants create needed habitat for many of the Bays animals. In the upper zones, zones 1 and 2 sago pondweed, redhead grass, horned pondweed, and widgeon grass form meadows just under the surface. The aquatic vegetation is one of the first things to die in a human caused nutrient overloaded area. The plants die, which leaves no habitat for certain marine animals to live and breed, which causes a chain reaction throughout the food web.

Wetlands

Wetlands range from low fresh and salt water marshes to high marsh, forested wetlands, and maritime forests. Aquatic plants grow in the shallow water mud flats close to shore creating low marshes. Moving landward plant species become more diverse in what is considered a high marsh. The high marsh is only submerged partly during high tides and storms. The high marsh is the border between upland terrestrial vegetation called maritime forests or bay edge forests and the marsh. This is where salt tolerant high marsh plant species intermix with freshwater tolerant plants. Further up in elevation are wetland forests, where large trees and understory shrubs flourish in wet-feet or waterlogged soil. Many varieties of animals find homes within each of these different areas. Some animals attach to grasses in the low marsh, while some live in the trees, and some can move between the different zones to feed and reproduce. (Lippson, Alice Jane and Robert L. (1997) Life in the Chesapeake Bay (2nd ed.) Baltimore Maryland: The Johns Hopkins University Press.)

Oyster Bars

Oyster bars can be found throughout the lower Chesapeake. The bar habitat is a distinct community very important for the health of the Bay. Oysters are considered the Bays filters. At one time oyster beds covered great expanses of the Bays floor. Oysters attach themselves to hard substrates--most commonly other oysters--and can eventually cover large areas. Due to over harvesting these large bars are nearly extinct. (Lippson, Alice Jane and Robert L. (1997) Life in the Chesapeake Bay (2nd ed.) Baltimore Maryland: The Johns Hopkins University Press.)

Deep and Open water

Benthic flora and fauna change in the deeper spans of water. The deeper the water the less light penetrates the bottom leading to few plants and animals living in the immediate substrate. The fine silty bottom lacks oxygen, but the moving water just above supports numerous pelangic communities. This is were the schools of fish live and thrive. (Lippson, Alice Jane and Robert L. (1997) Life in the Chesapeake Bay (2nd ed.) Baltimore Maryland: The Johns Hopkins University Press.)

In conclusion the Bay is a diverse and fantastic example of the evolution and adaptation of plant and animal communities to a specific area or ecological region. The Bay itself has a variety of smaller communities with in the whole. Each of these communities plays a vital role in the ecological diversity of the bay and has direct influence on the rest of the world. Now is the time. Our understanding of the ecosystem has never been greater. And most of todays knowledge of our role in nature has only been truly uncovered in the last half century. We now know that everything is connected. And for this reason special care and consideration needs to be taken to promote the conservation, restoration, and expansion of our ecological landscapes.

CHAPTER II: THE SITE

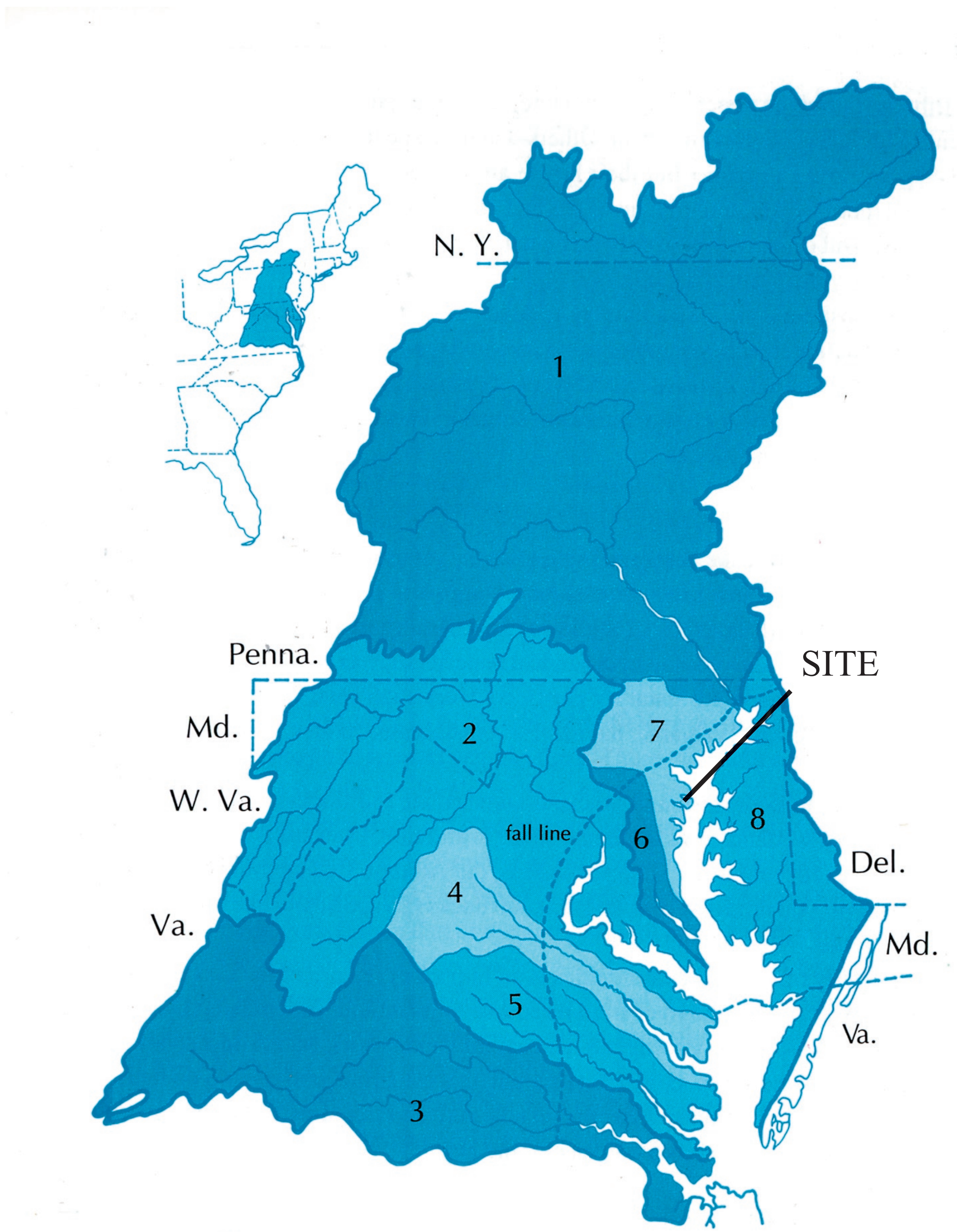


Figure 6: The Chesapeake Bay Watershed (Chesapeake Bay: A Field Guide " Nature of the Estuary")

The location and site can best be explained as a complex river system with miles of shoreline and numerous rivers and creeks. (. . . 52 miles in length and covering 542 square miles, with two major components, the river basin and harbor, and the main branch). The river basin is 170 miles from the Atlantic ocean to the north west harbor and middle branch. The basin's edge includes Baltimore's downtown business and industrial district and extends 14 miles to the mouth of the Patapsco. The mouth of the river is at it's widest point, at about 4 miles measuring from fort small wood on the south bank to fort Howard on the

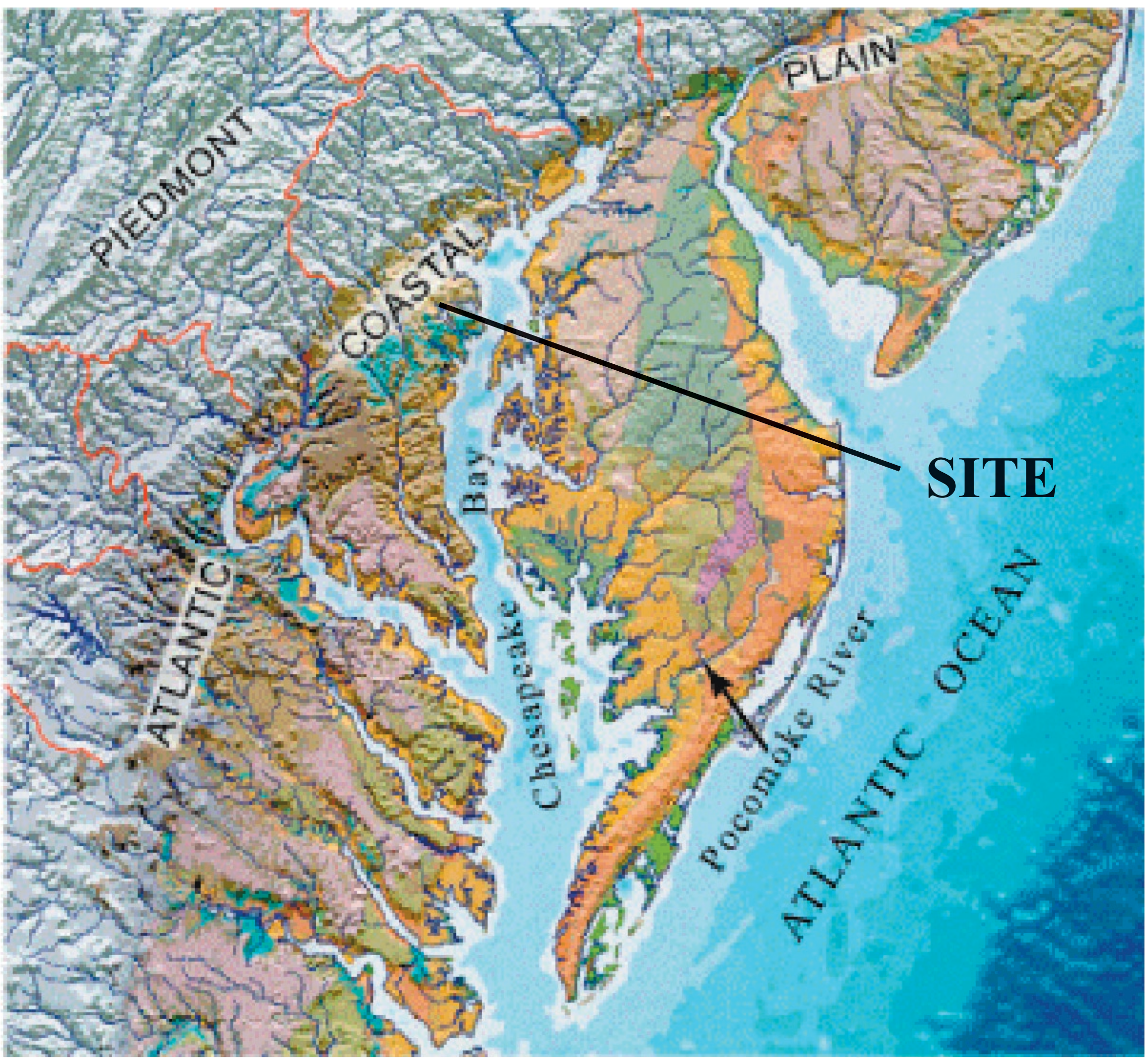


Figure 7: The Chesapeake Bay, Arrow pointing to Site location and Patapsco River Basin (Travers, Paul J. (1990) The Patapsco: Baltimore's River of History)

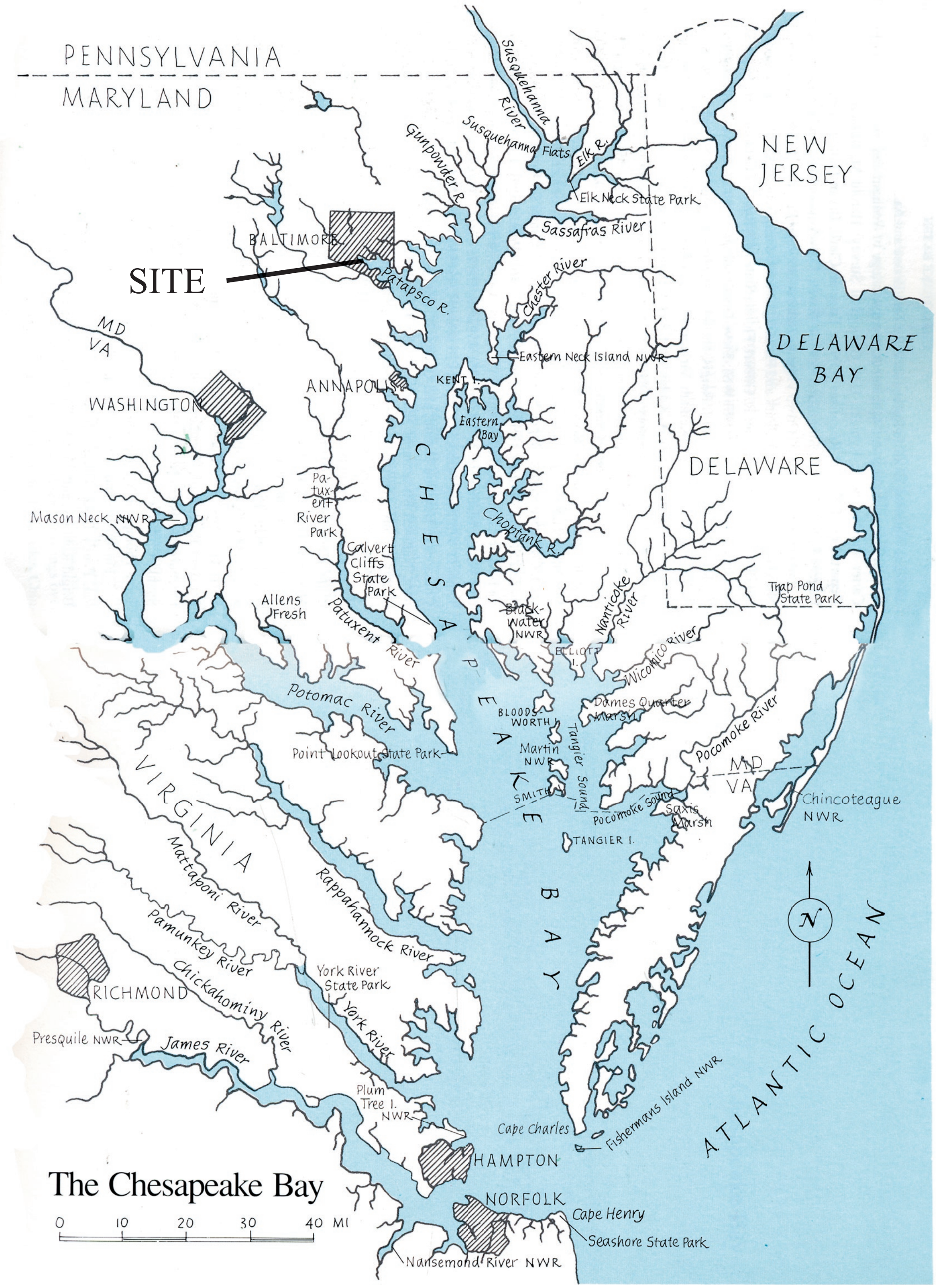


Figure 8: Map of the Chesapeake Bay (White, Christopher P. (1994). Chesapeake Bay: A Field Guide " Nature of the Estuary" (4th ed.) Centerville, Maryland: Tidewater Publishers)

north. Going up river the width decreases. There are many creeks, like Rock Creek, Bodkin Creek and Stony Creek that were never indutrialised, while Curtis Creek was eaten up by Bethlehem Steel at Sparrow's Point, and Dundalk marine terminal. Eight miles from the river basin at the harbor tunnel is the narrowest point. One mile from this point to the northwest the river divides into two sections resembling a horseshoe, with Fort Mchenry and Locust Point forming the center. The basin branches to the north to form the inner harbor and to the south and west to form the Middle Branch and Ridgley's Cove. Along the harbor basin are a series of rivers and creeks flowing into the basin. The largest to the north is the Jones Falls entering the inner harbor. The Jones Falls was piped and culverted through the city in the early 20th century. Gwynn's Falls empties from the west into the middle branch and forms Ridgley's Cove. There are large expanses of tidal marsh land just west of Locust

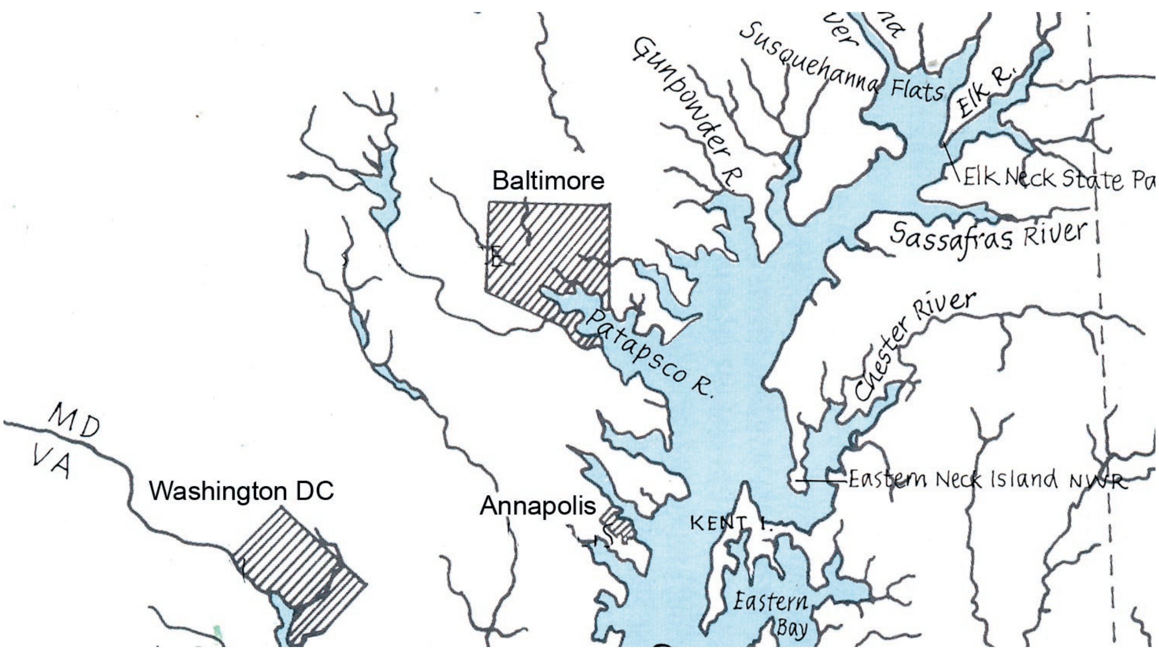


Figure 9: Location of the Site in Baltimore, MD and the Middle Branch of the Patapsco River (White, Christopher P. (1994). Chesapeake Bay: A Field Guide " Nature of the Estuary" (4th ed.) Centerville, Maryland: Tidewater Publishers)

Point, and just south of what today is Camden Yards and the M & T Bank Stadium.

The largest river is the Patapsco or main branch flows southwest into the harbor basin near Harbor hospital center. The mouth is marked by a marshland that has been turned into a city landfill--a marsh mountain. From this point the main branch turns south six and a half miles to the town of Elkridge then turns west for twenty six miles passing Elicott City, Oleo, Daniels, and Woodstock . At a point south of Mariattesville the river forks into the North Branch which continues into Carroll County, and the South Branch that continues past Mariettesville and Woodbine. The harbor basin has channel depths of 50 feet, which is good for shipping, while the main branch is relatively narrow and shallow. The middle branch has a channel about twenty feet deep which climbs quickly to merely one to two feet

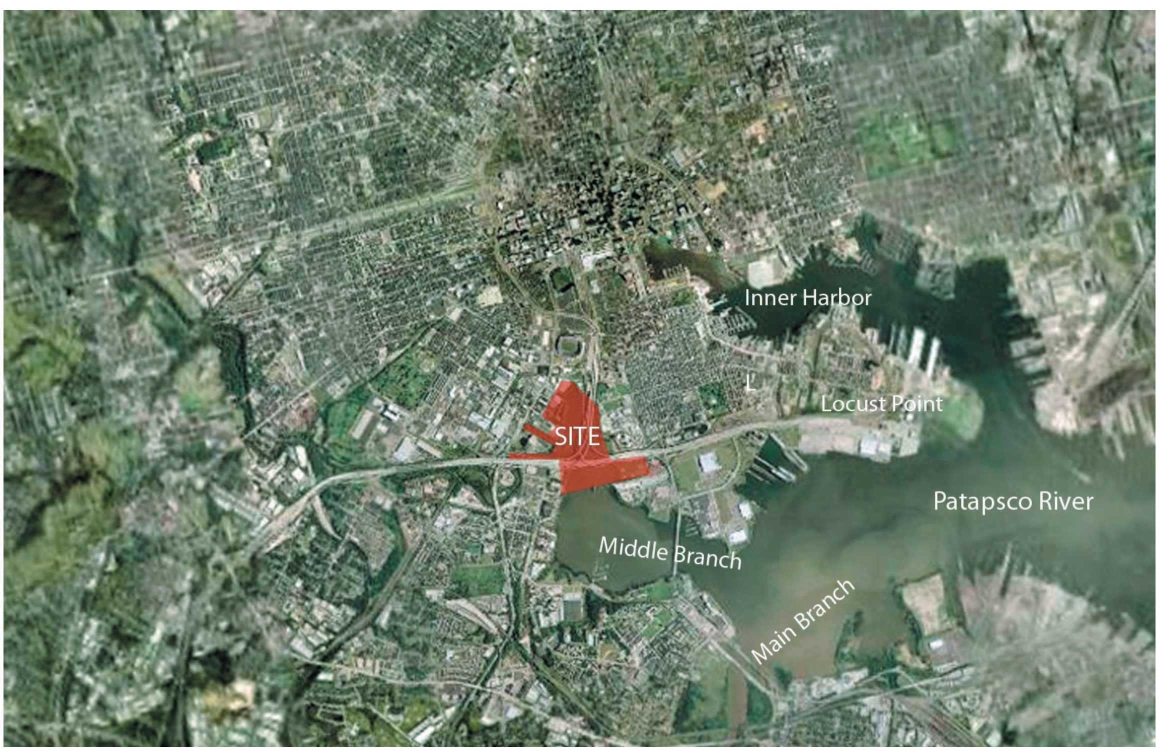


Figure 10: Location of the Site in Baltimore, MD and the Middle Branch of the Patapsco River (Google)

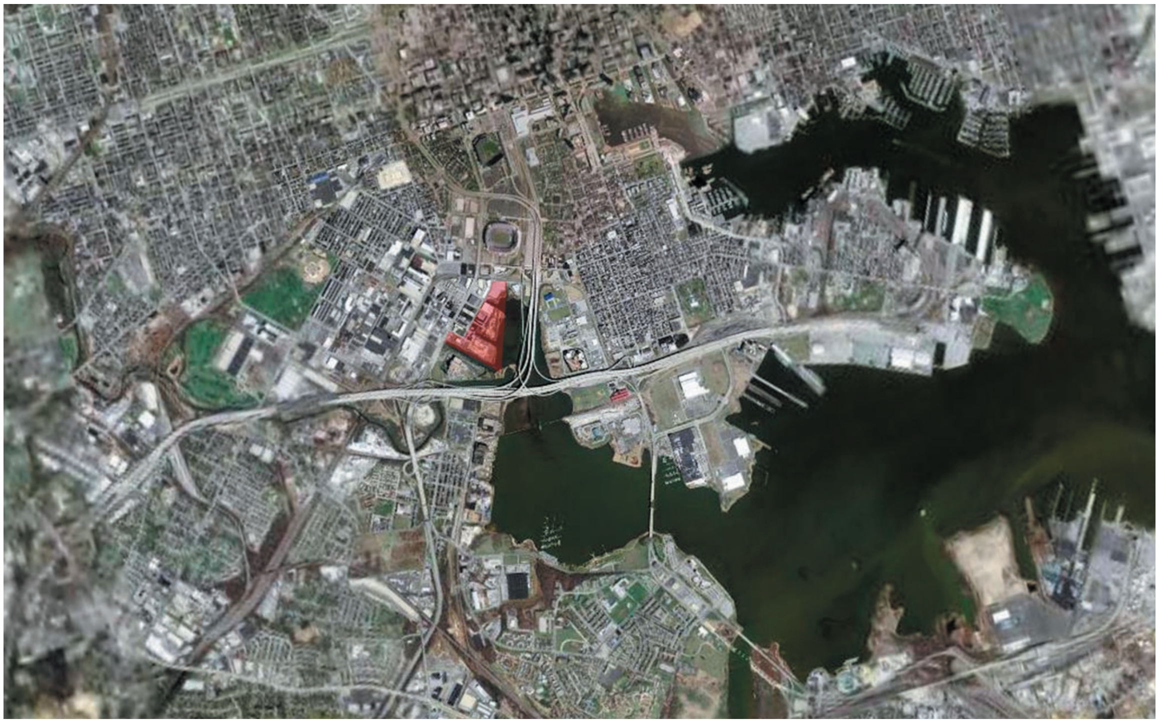


Figure 11: Location of Site in Baltimore, M&T Bank Stadium can be seen just to the north (Google.com)

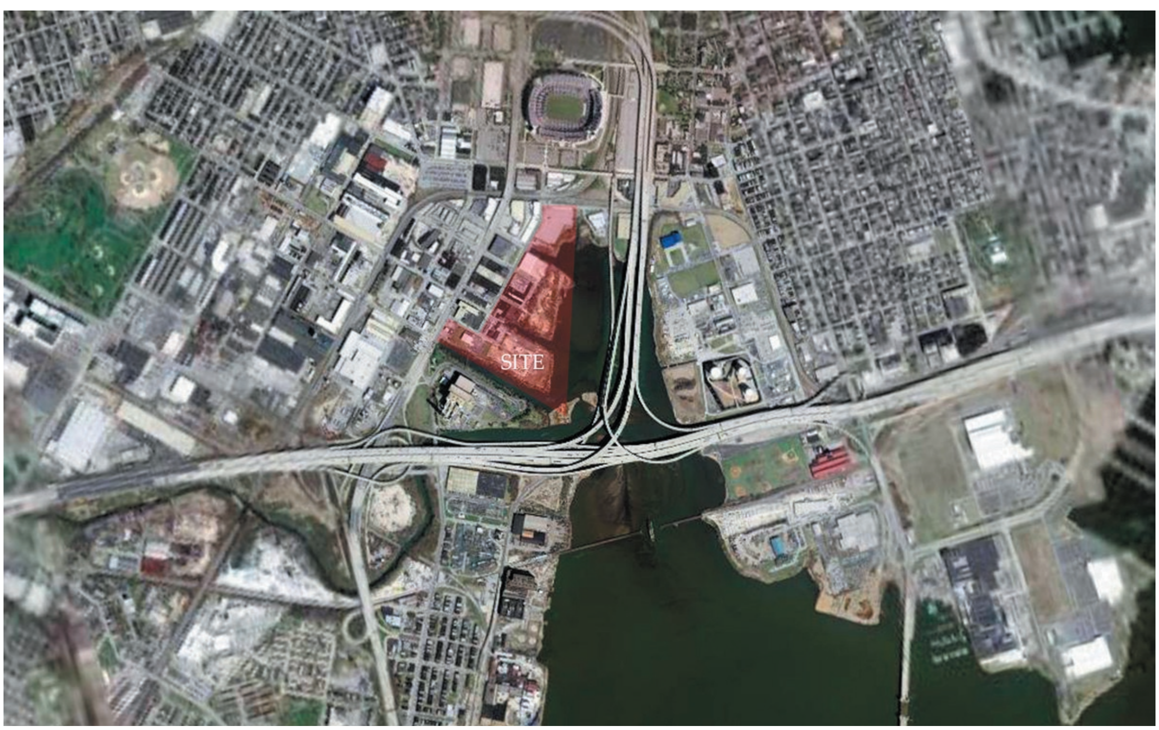


Figure 12: The site with routes I-95 and 395 bridging the central portion (Google.com)

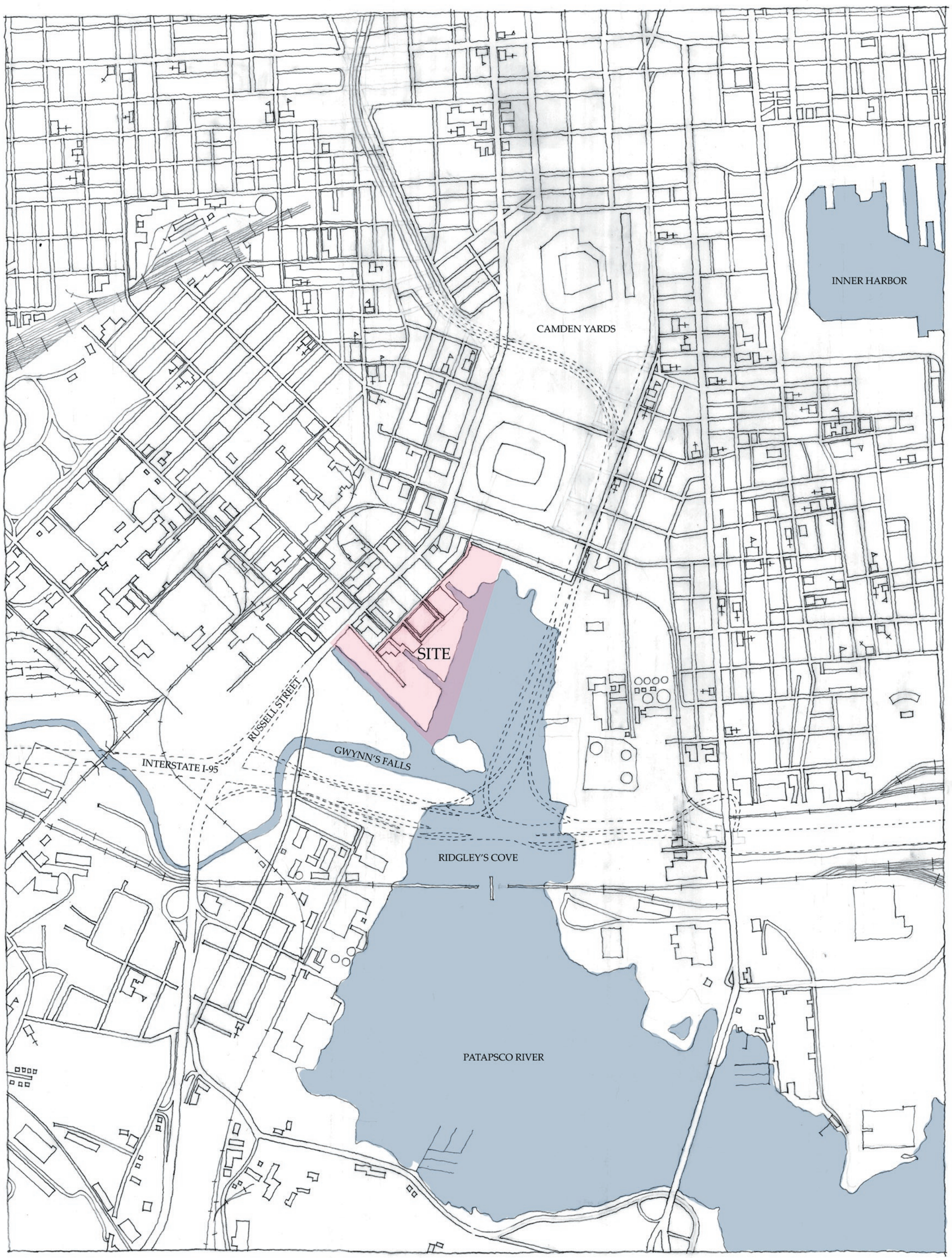


Figure 12: The site in its context with Interstate I-95 to the south and M&T Bank Stadium to the north

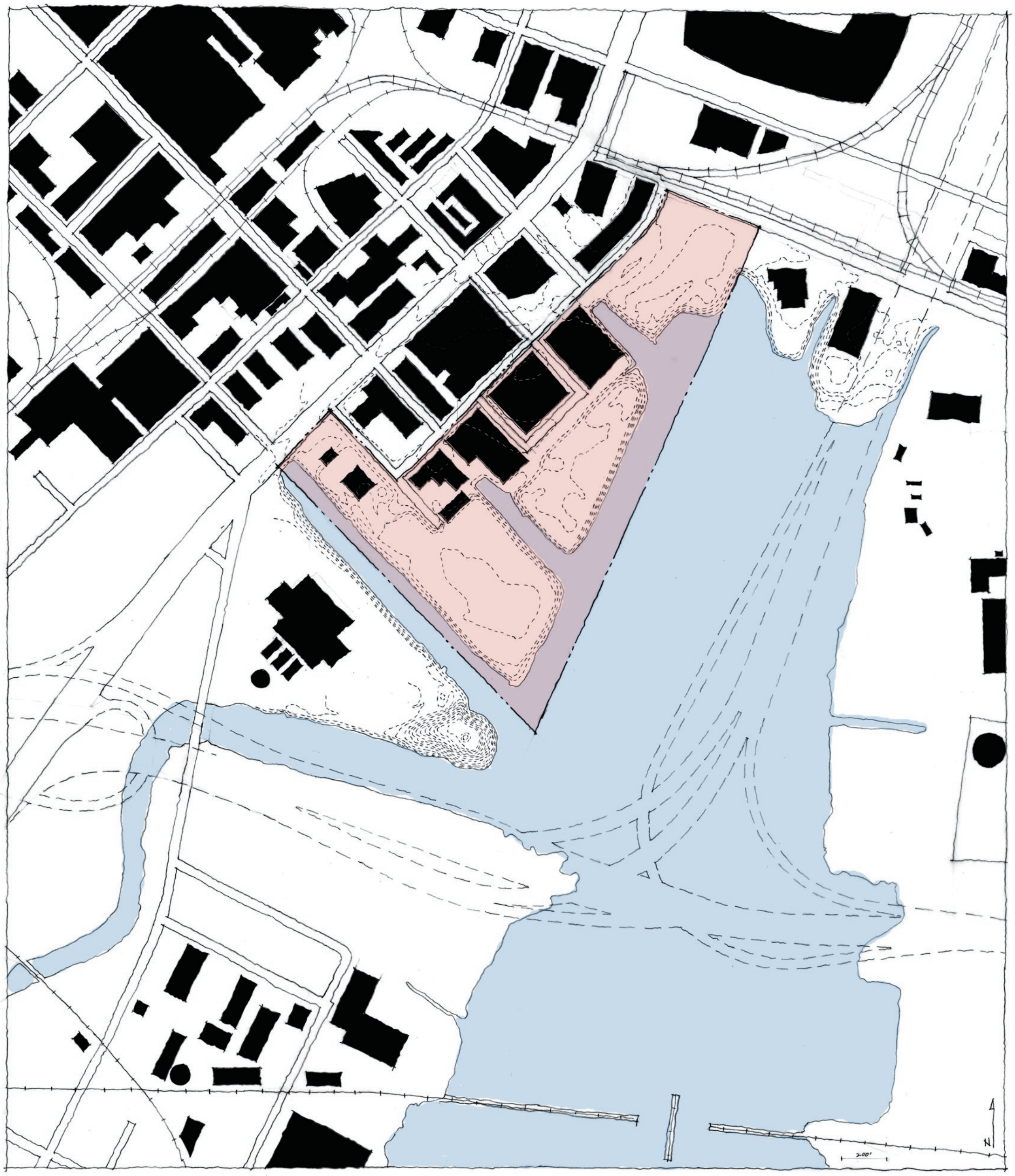


Figure 12: The site clearly defined with existing building in black

throughout the Ridgley's Cove marshland. This shallow depth in the Cove is a result of a centuries worth of construction runoff into the local steams.

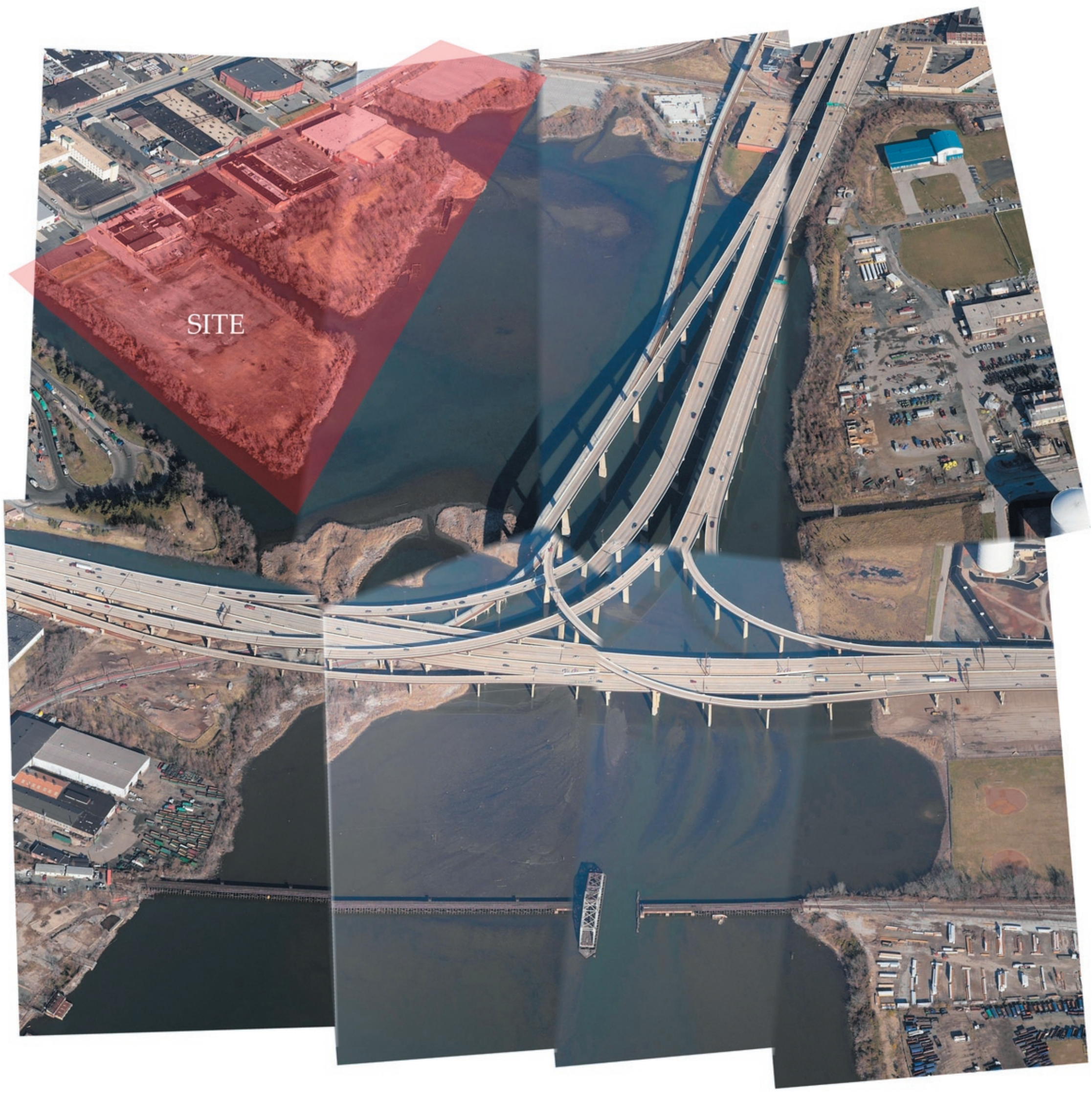


Figure 12: The site with routes I-95 and 395 bridging the central portion (microsoftlivelocal.com)

Ridgley's Cove has a number of small streams entering from the North and West which have been culverted in the early 1900's. The largest tributary to the cove is the Gwynn's Falls that winds it way into the cove from the west. Gwynn's Falls has not been culverted or industrialized and has become parkland for most of the river's length. The

Gwynn's Falls trail follows the river and through the site into the heart of the city. According to the Olmsted Brothers plan in nineteenth century the park was intended to connect city parks through green ways to larger tracts of preserved natural areas south along the main branch to the Bay.

The site itself is covered by about 10 percent water with the land to the west along Russell Street, north of the Baltimore incinerator, and south of M and T Bank Stadium. The topography is relatively flat except for areas near the water, or west side of the cove which will house the new Institute, where it appears dredged soil was dumped raising the land by about fourteen feet. The west side is also the area with old one story warehouses and old factories to be revitalized according the City's urban redevelopment strategies.

Figure 16: North toward downtown from eastern border of site on Russell Street

Figure 17: Chemical building on Russell St.


Figure 18: North on Russell St., Stadium in back

Figure 19: Russell & Bayard Streets

Figure 20: Russell & Bayard Streets

Figure 21: East Bayard St. from Warner St.

Figure 22: Storage at Worchester & Warner St.

Figure 23: West on Worchester from Warner St.

Figure 24: East on Worchester from Warner St.

Figure 25: East on Worchester from Russell St.

Figure 26: Factory at Worchester & Warner St.

Figure 27: East on Worchester factory

Figure 28: South on Warner from Alluvion St.

Figure 29: North behind warehouse from

Figure 30: East behind warehouse, Warner street in the distance

Figure 31: Gas station at Haines St. & Incinerator

Figure 32: Baltimore Incinerator at Russell St.

Figure 33: Incinerator smoke stack

Figure 34: Gwynn's Falls and the Incinerator

Figure 35: Gwynn's Falls leaving site under I-95

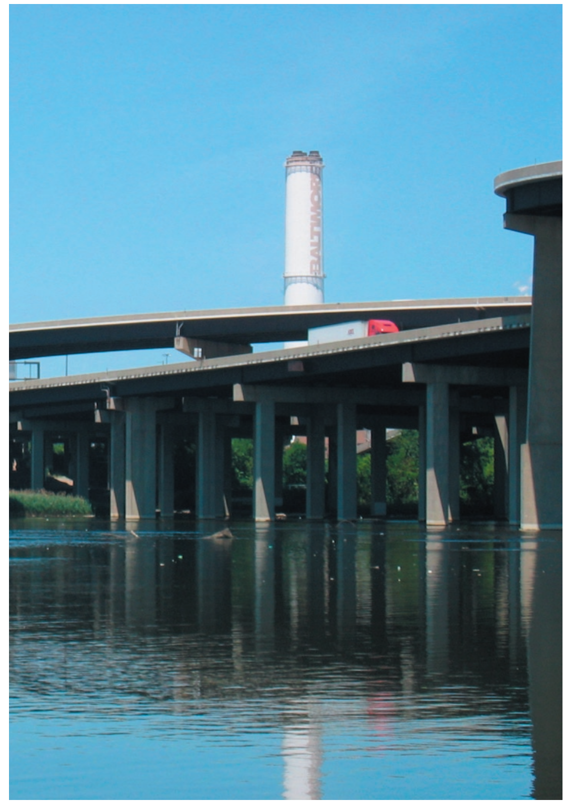


Figure 36: Mouth of the Gwynn's Falls just past and to the right of the I95 bridge.

Figure 37: South on Gwynn's Park Trail showing Incinerator from site.

Figure 38: Bridge crossing Alluvion St. creek.

Figure 39: Sign marking Gwynn's Falls Trail.

Figure 40: North on Gwynn's Falls Park trail just east of Worchester Street.

Figure 41: M&T Bank Stadium and foot bridge over creek at Alluvion Street. Looking north

Figure 42: Gwynn's Falls Trail foot bridge crossing creek at Bush Street

Figure 43: East down creek at Bush Street

Figure 44: West down Existing Creek at Bush Street

Figure 45: View of 395 through successional growth from the new park at the east end of Bayard Street.

Figure 46: West, Creek at Alluvion Street. Note that the creek is culverted from site westward

Figure 47: West, Worchester & Warner St.

Figure 48: West, Worchester & Warner St.

Figure 49: West, Worchester & Warner St.

Figure 50: North end of Ridgley's Cove with foot bridge on the left and 395 to the right.

Figure 51: Successional forest near Alluvion St.

Figure 52: High marsh at north end of cove.

Figure 53: West, Worchester & Warner St.

Figure 54: 395 at the north end of the site.

Figure 55: New Parkland east of Haines Street

Figure 56: Successional growth on site just east of Haines street. 395 and I-95 in the distance.

Figure 57: Successional growth east of HainesSt.

Figure 58: Under 395 near M&T Bank stadium

Figure 59: Route 395 and light rail crossing cove. Note the tide is out exposing intertidal flats.

Figure 60: Route 395 bridge crossing center of cove. Looking east.

Figure 61: I-95 bridge as seen from Swann Park

Figure 62: West across cove I-95 above and main building site just past the I-95 bridge.

Figure 63: Swann Park, east from waters edge

Figure 64: Trash in the cove at Swann Park

Figure 65: Swann Park forms the southeast border of the site.

Figure 66: The CSX retired turn bridge marks the channel into the cove and southern border of site.

SITE HISTORY

The Patapsco was first explored by Western Civilitation by Captain John Smith during the spring of 1608. The Patapsco was named Bolus Flu for the red clay cliffs along the river and later to be named Federal Hill in Baltimore in honer of the ratification of the Constitution in 1788. Bolus Flu title was later in the 1600's replaced with Patapsco originating from several variations of the native tongue inhabiting the region. (Travers, Paul J. (1990) The Patapsco: Baltimore's River of History (1st ed.) Centerville, Maryland: Tidewater Publishers)

The word Patapsco was first written in this form after appearing on older maps like,

Figure 67: Map of Bolus Flu (Patapsco River) 1700's (Maryland Historical Society)

Patapscoe (1666), Patapsico(1673), andPotapscoo(1699). The exact meaning of the word is unclear. There are two theories and both reflect what is known from the Algonquian language. One theory claims Patapsco means “backwater” or “tide covered in froth”. The other theory takes its root from word fragments to get the meaning “White Rocks” which may refer to an out crop of limestone near the mouth of the River. (Travers, Paul J. (1990) The Patapsco: Baltimore’s River of History (1st ed.) Centerville, Maryland: Tidewater Publishers)

By the time John Smith sailed into the Patapsco area it had already been abandoned by natives due to warfare over the area. It was never a constant home for any tribe but was constantly being fought over. The land was valued for hunting and fishing and created conflict over ownership, not only from the newly arrived colonists but also between multiple tribes. The Patapsco River valley had large and small game including deer, black bear, elk, wolves, cougars, beaver, and turkey, The river teamed with fish and shellfish including herring, shad, rockfish, oyster, clams, shrimp and crabs.

The Patapsco River wilderness was needed by both the warlike Susquahannock from the north and the more peaceful Piscataway Empire from the south. The wilderness provided survival for both nations. A constant battle for this land would eventually devastate and end both tribes and create great conflicts with settlers. (Travers, Paul J. (1990) The Patapsco: Baltimore’s River of History (1st ed.) Centerville, Maryland: Tidewater Publishers)

The Piscataways or Conoys were the first group to be documented near the future town of Elkridge along the Patapsco. Piscataways were a major tribe of the great Confederation Adaqwinn Nation. Other smaller tribes in the area under the Confederation were the Mattawomans, Patuxents, Chopticans, Potopacs, Mattapanys, and the Yaocomicoes. These tribes lived to the south of the Patapsco. The Piscataways were peaceful and traded with the colonists. But, western diseases like small pox along with the great battle over land with Susquahannocks and colonists would devastate and eradicate the Piscataways over time. (Travers, Paul J. (1990) The Patapsco: Baltimore's River of History (1st ed.) Centerville,

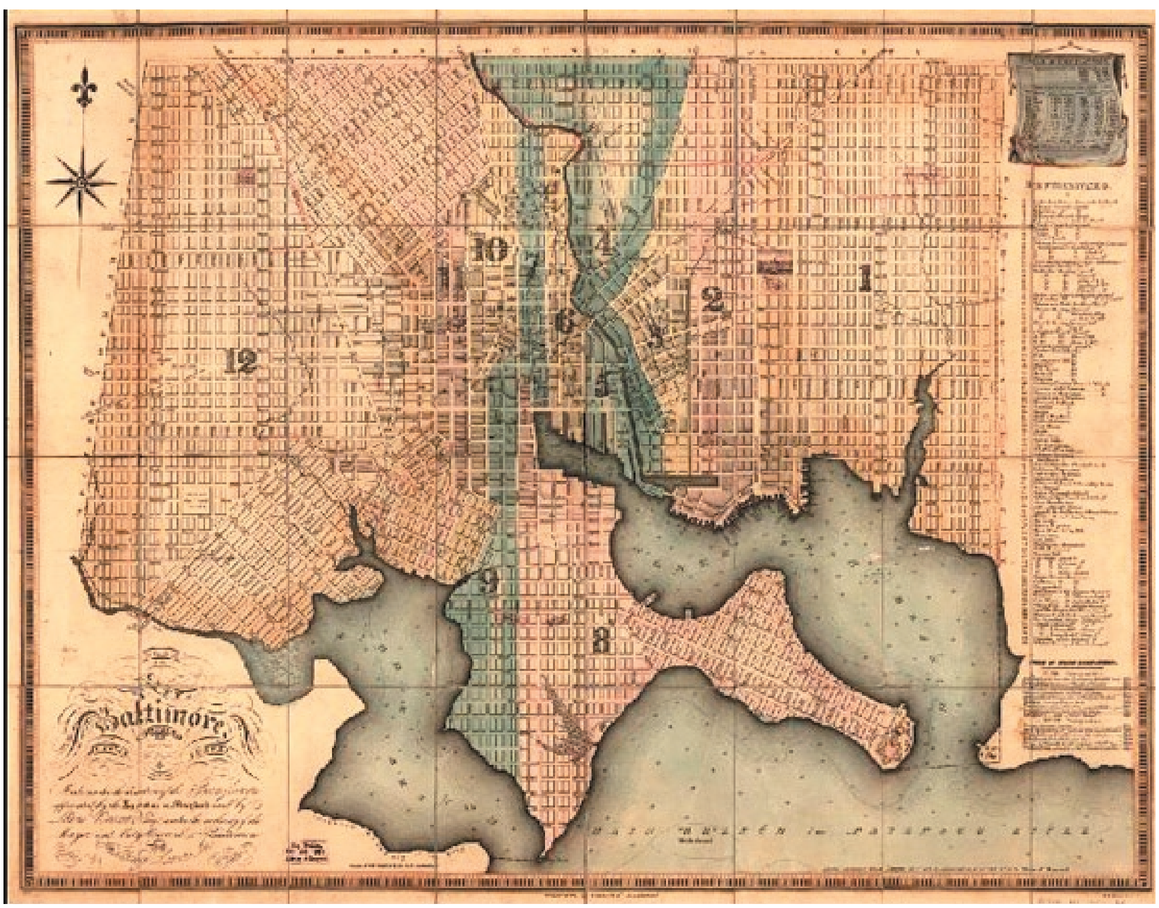


Figure 68: 1836 Map of Baltimore (Maryland Historical Society)

Maryland: Tidewater Publishers)

The Susquannocks lived to the north in southern Pennsylvania as well as northern and eastern Maryland. They were not friendly to the colonists and caused precautions to be set in place to protect new settlers. The Susquahannocks after many events were finally pushed out by settlers. There civilization ended with a final battle against the Piscataways. However, neither tribe could withstand the constant influx of settlers with superior technology. With the end of the Susquahannocks and Piscataways after more than 1000 years of ownership of the region marked a great change. (Travers, Paul J. (1990) The Patapsco: Baltimore's River of History (1st ed.) Centerville, Maryland: Tidewater

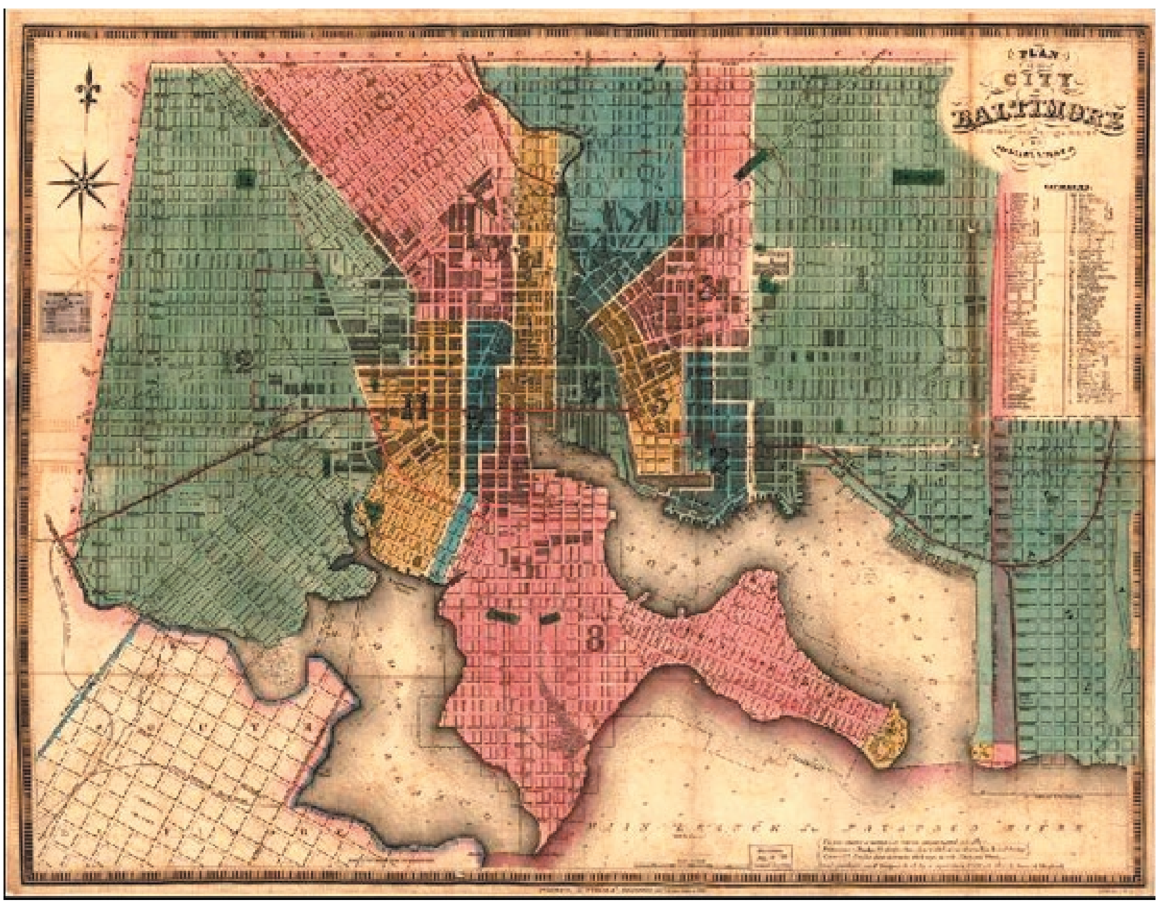


Figure 69: 1836 Map of Baltimore. (Maryland Historical Society)

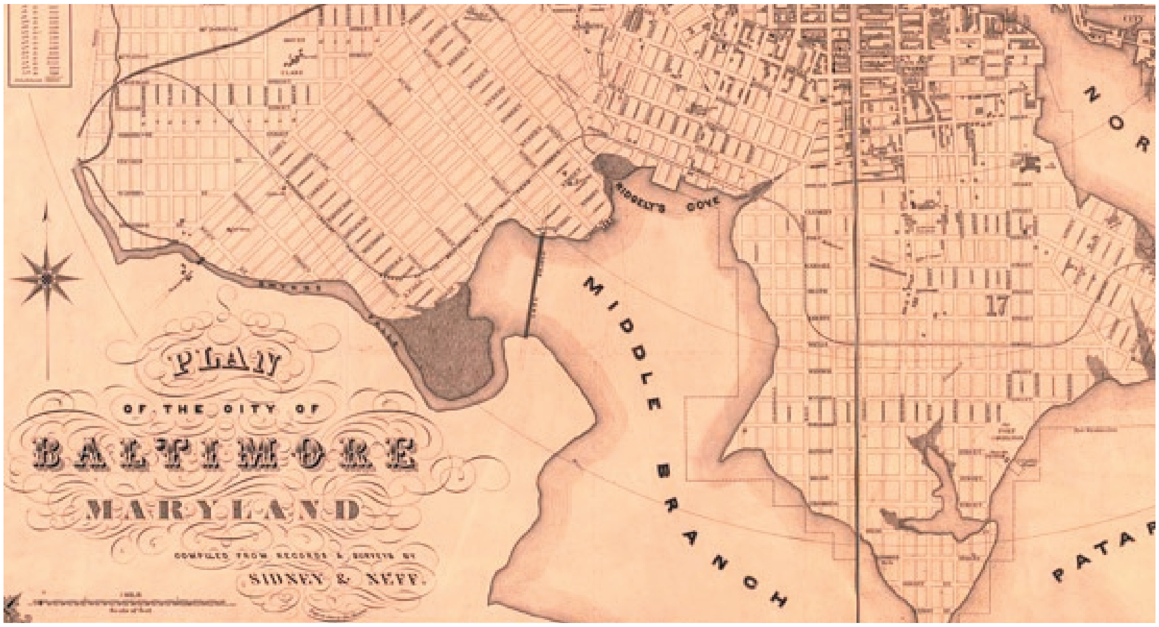


Figure 70: 1851 map of Baltimore, zoom in on the Middle Branch of the Patapsco (Maryland Historical Society

Publishers)

Baltimore

The seaport got its named from George Calvert's title as the first Lord Baltimore. Baltimore officially became a town in 1729 and by 1752 consisted of two hundred inhabitants and twenty five houses. The shipping trade blossomed and a new trade route between Baltimore and the West Indies was established. The new shipping availability spawned development of flour mills near the harbor. The Ellicott Brother's mill on the Patapsco gave steady business and allowed the port to grow at high rates. (Travers, Paul J. (1990) The Patapsco: Baltimore's River of History (1st ed.) Centerville, Maryland: Tidewater Publishers)

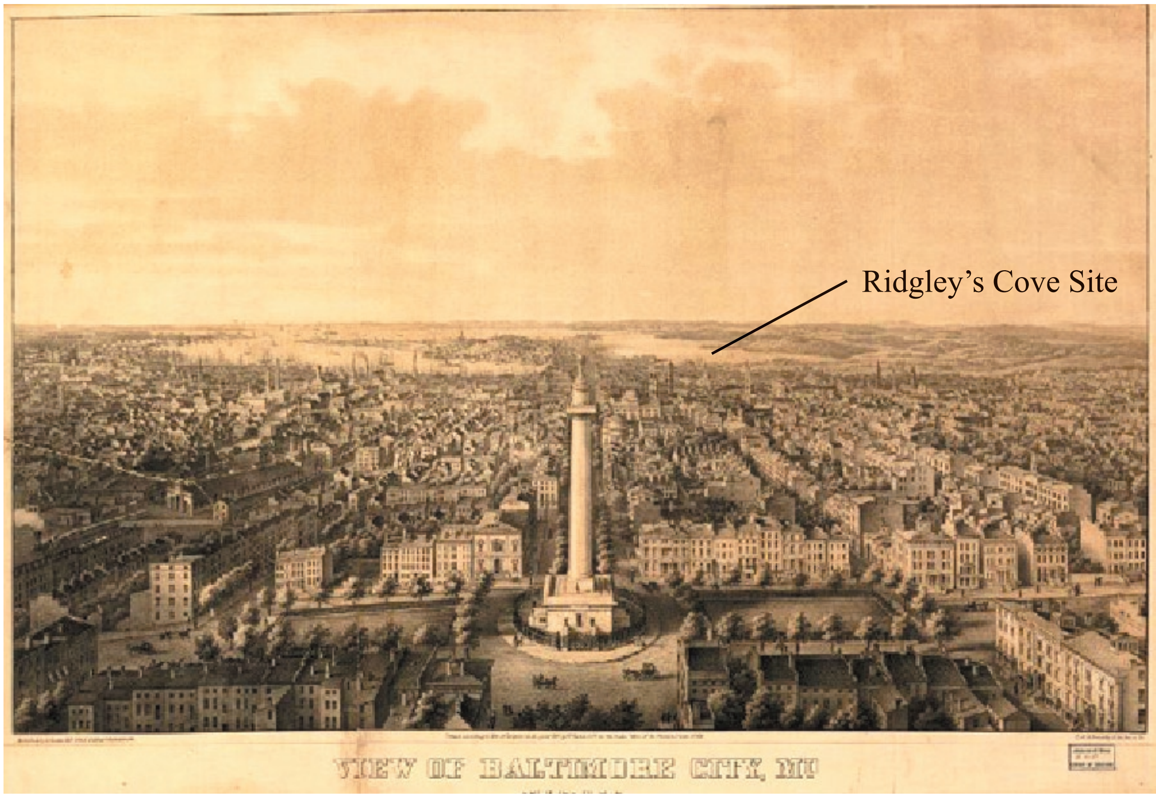


Figure 71: A view of Baltimore in 1862 with Ridgley's Cove in the distance and Washington Monument in the foreground. Looking south and slightly east. (Maryland Historical Society)

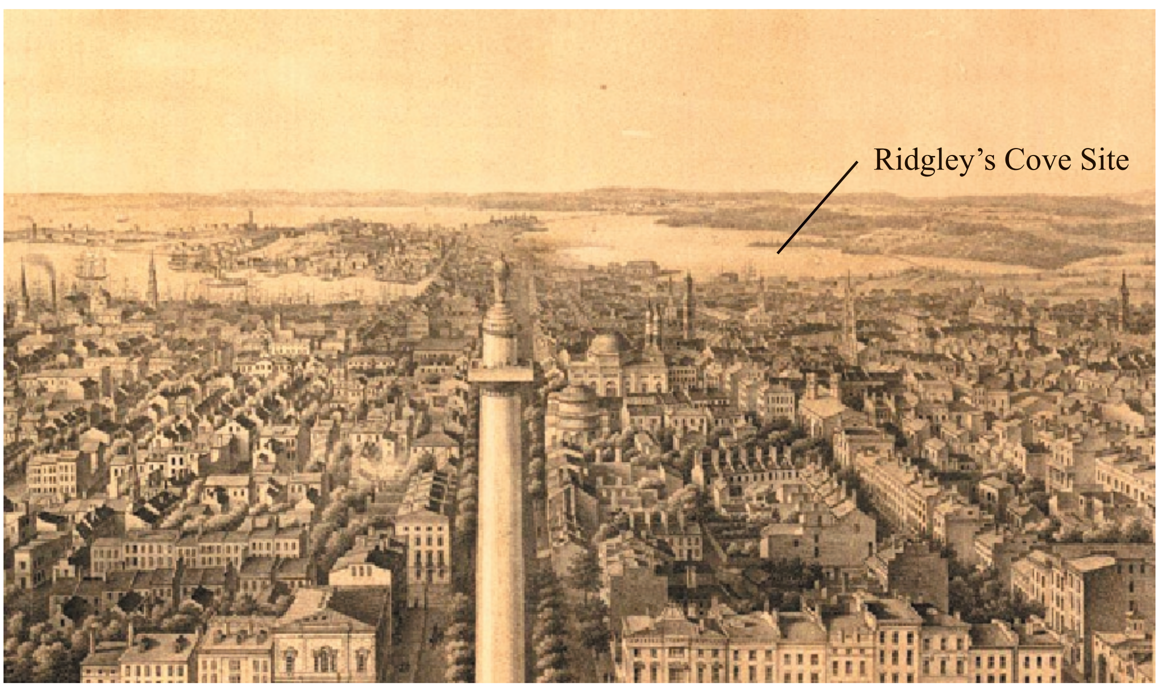


Figure 72: Zoom in of the 1862 panorama above clearly showing Ridgley's Cove and it's relationship with downtown. (Maryland Historical Society)

Baltimore became the major seaport in the Chesapeake region and a deep water port in 1773. By the early 1800's Baltimore had become an international commercial and financial center. Steam power moved in 1813 allowing faster shipments to ports throughout the Chesapeake and up and down the East Coast.

The harbor has seen many changes over the past centuries. Today the harbor still has a flourishing international port. Large areas of waterfront property are changing uses. The waterfront is being converted from industrial ports to residential and entertainment. In the 1970's the Rouse company converted the Inner harbor from an outdated port with vacant warehouses and docs into a viable public amenity with retail pavilions and entertainment facilities. The Inner harbor has been a great asset to the city allowing the public access to the water.

Ridgley's Cove never saw the same amount of use due to shallower waters. But, the area has still been devastated by modern construction and sedimentation build up. The cove was home to the Baltimore Gas Company to the east, Camden Train yards to the north and farms to the west that would eventually become factories and warehouses during the nineteenth century.

In conclusion it is necessary to look at the history of the site in two ways: one, is the history of people inhabiting the area, and two, the natural history of the site described

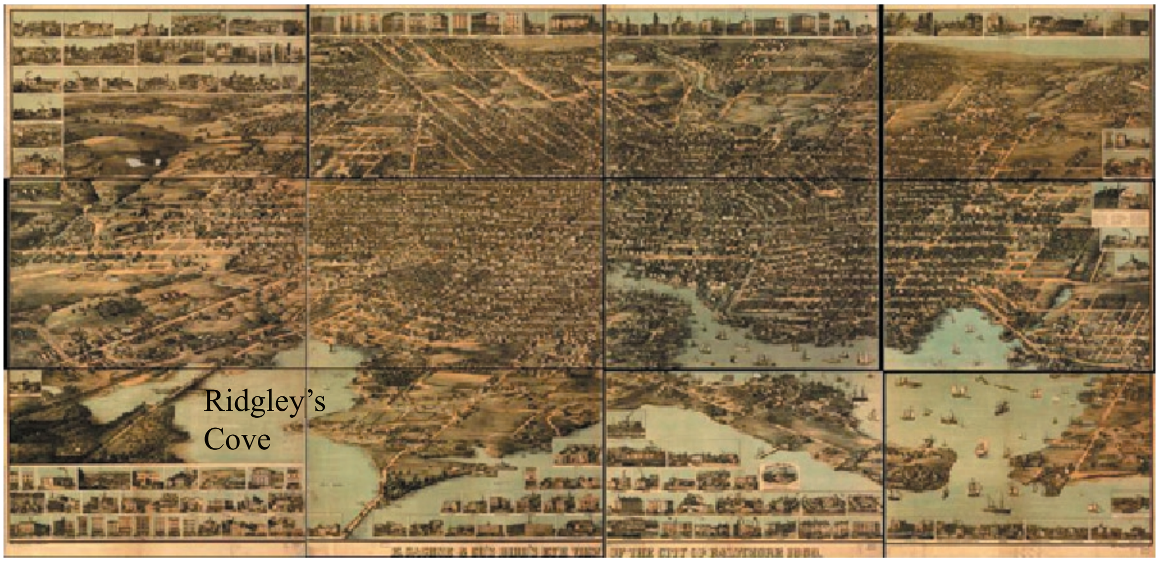


Figure 73: An 1869 lithograph of downtown Baltimore City. The Inner Harbor is at about the center of the image and Ridgley's Cove is in the bottom left corner. (Maryland Historical Society)

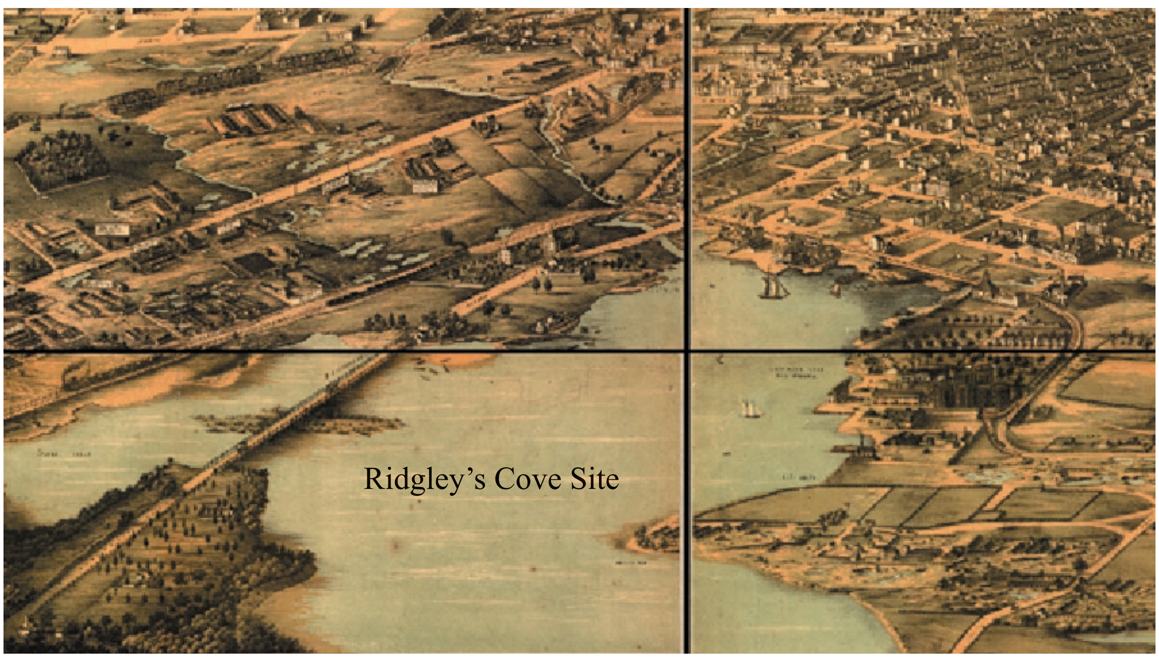


Figure 74: Zoom in of the 1869 Lithograph showing Ridgley's Cove. Note the bridge connecting south Baltimore and the City grid to the north. (Maryland Historical Society)

earlier. Though the native Americans had less environmental impacts then the later settlers. It must be mentioned that they still caused species depletion through hunting and fishing, and sentiment runoff from agricultural, roads and large settlements. Overtime native populations would have grown as they did in Central and South America where huge

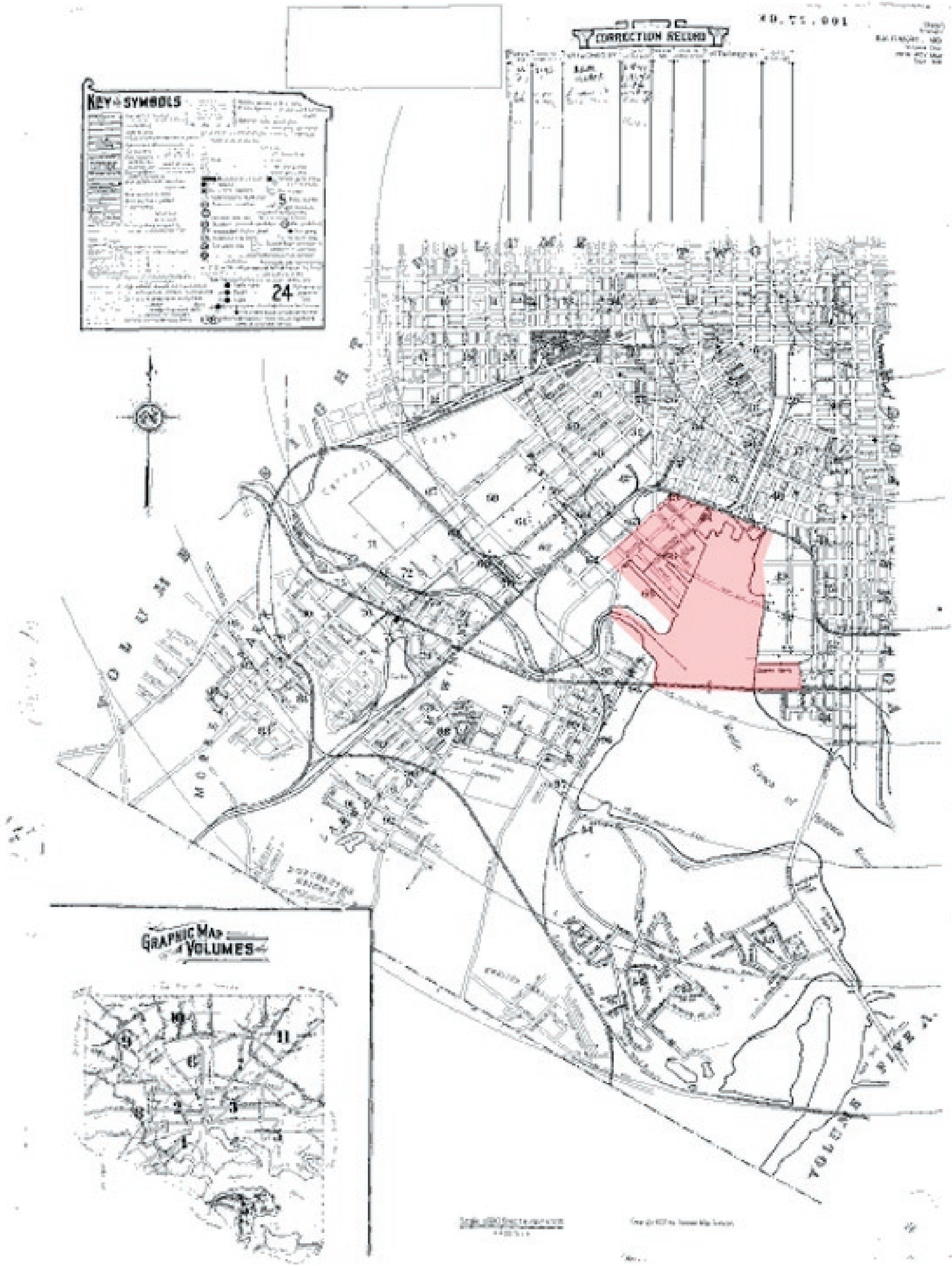


Figure 75: Site in red on the 1951 Sanborn Map (Maryland Historical Society)

cities were constructed and of course had major impacts on the environment. The point is that it does not matter what type of human inhabits an area, what matters is that humans knowledge of the environment and how to live with it. Unfortunately western civilization rew faster then its knowledge of the world causing mass extictions and major habitat loss.

In recent years our understanding of the environment has grown. In the 1990's the University of Maryland established the Center for Environmental Studies, which now has three facilities around the region. One is the Appalachian Research center studying the headwaters of the Bay, the second is the Solomons Research Facility studying marine biology, and the third and most recent is the Horn Point Facility that studies aquaculture and restoration of the Bays ecosystem. The proposed Institute of Urban Aquaculture at Ridgley's Cove will be the fourth component in the Center of Environmental Studies. It will promote the restoration of urban marshlands and Chesapeake ecosystem.

The history of the site has had major changes take place over the past centuries. However, today is a turning point in its history. Our knowledge of the environment has increased greatly and public awareness and understanding is at an all time high. This is an ideal time to build an Institute that will enable children and adults to fully understand the great necessity of our natural resources and be educated about the Chesapeake environment which is so precious to the World's great diverse biological make up. The Institute will draw inspiration from both the natural and human history of the site. It is important to remember the places our culture has evolved from and how we can improve both socially and environmentally.

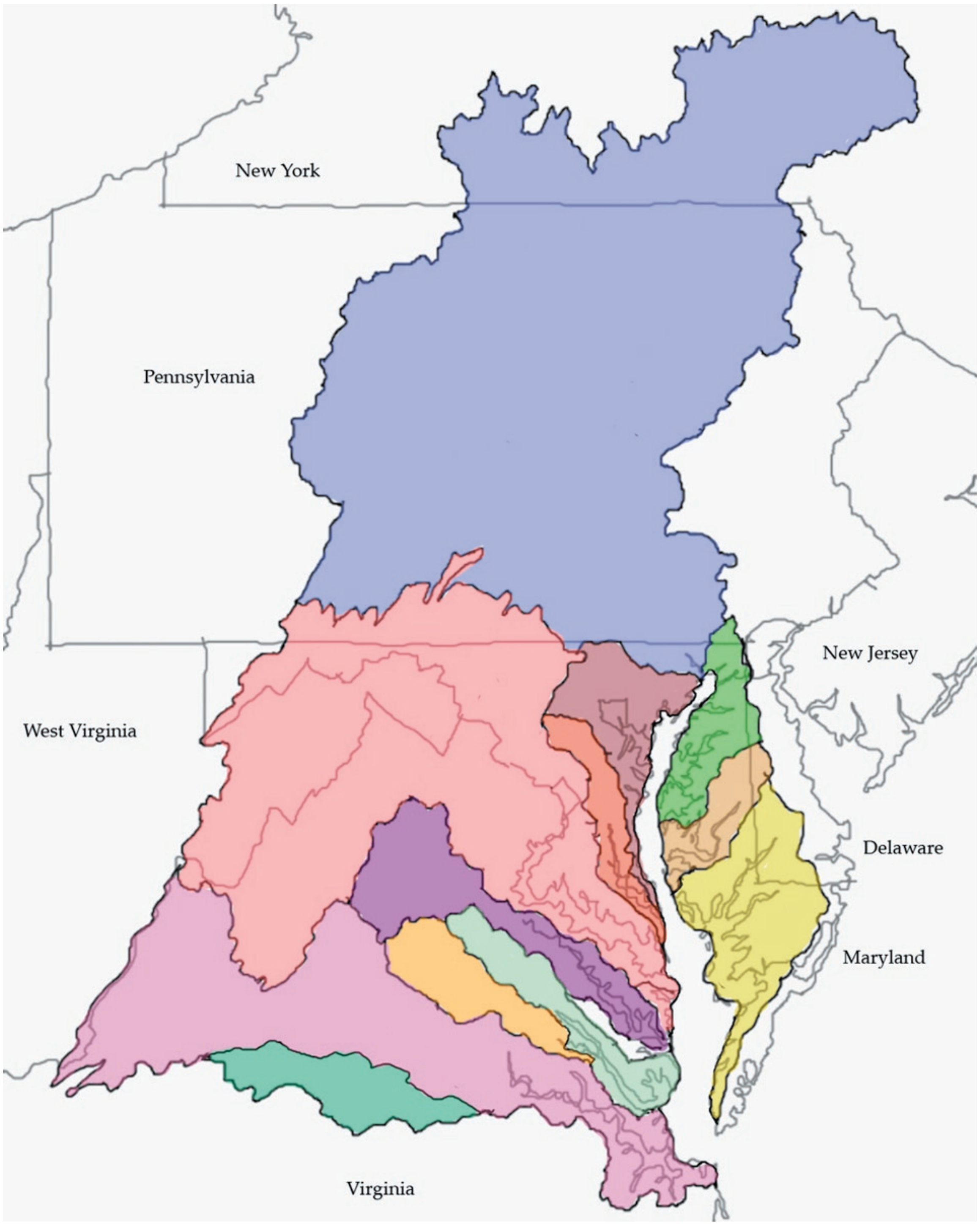


Figure 76: The Chesapeake Watershed and it Tributaries

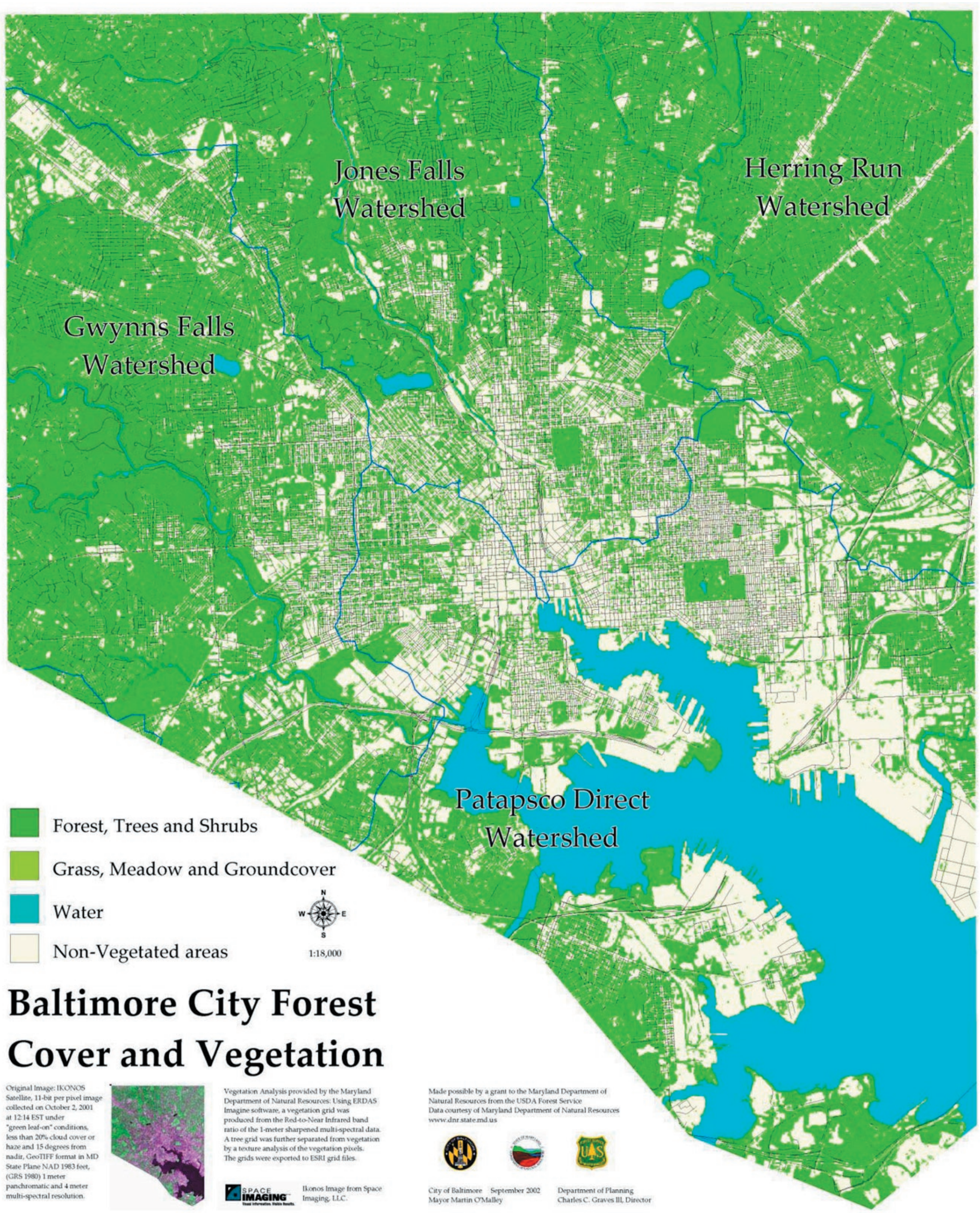


Figure 77: Map showing Baltimore's Forest Cover (Baltimore Department of Planning and Zoning)

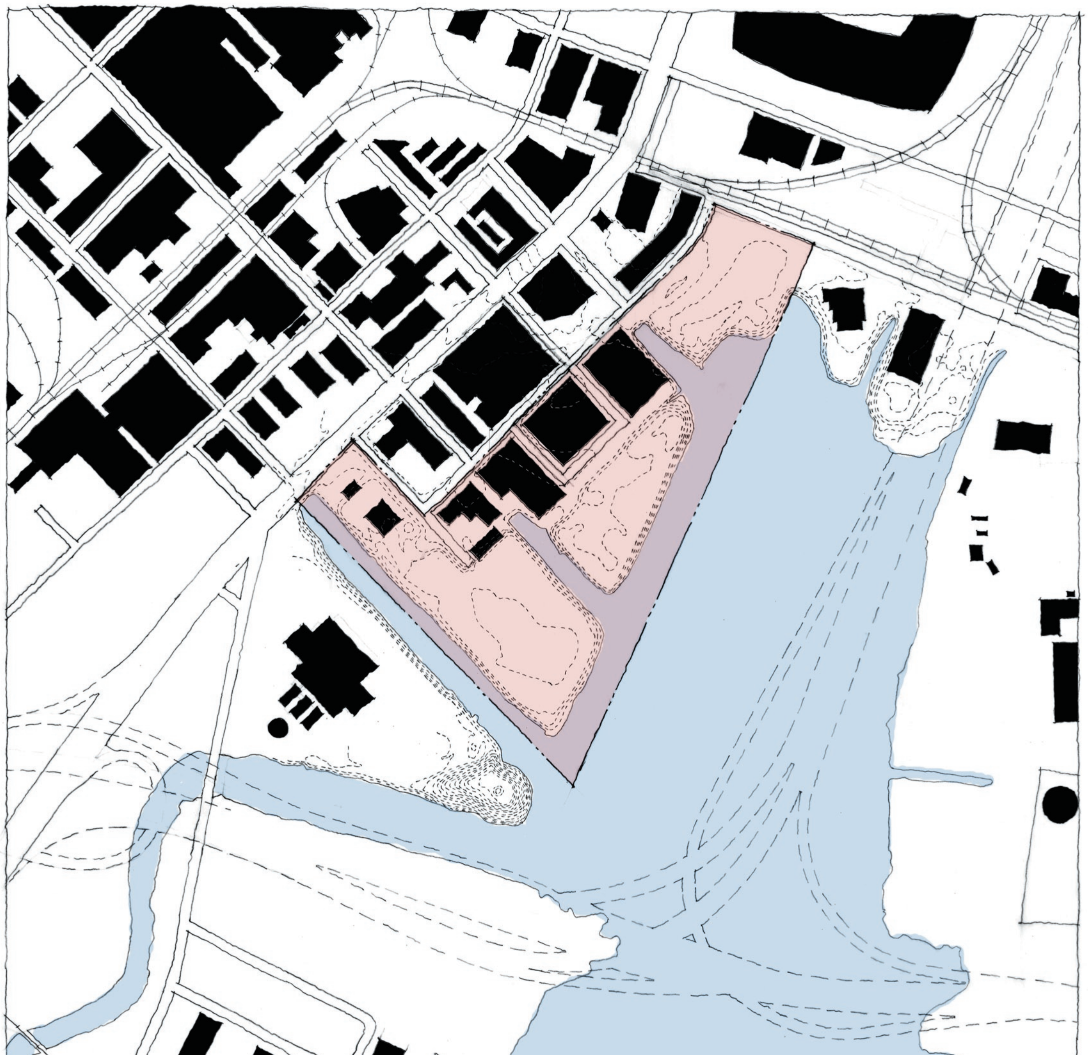


Figure 78: Ridgley's Cove Site

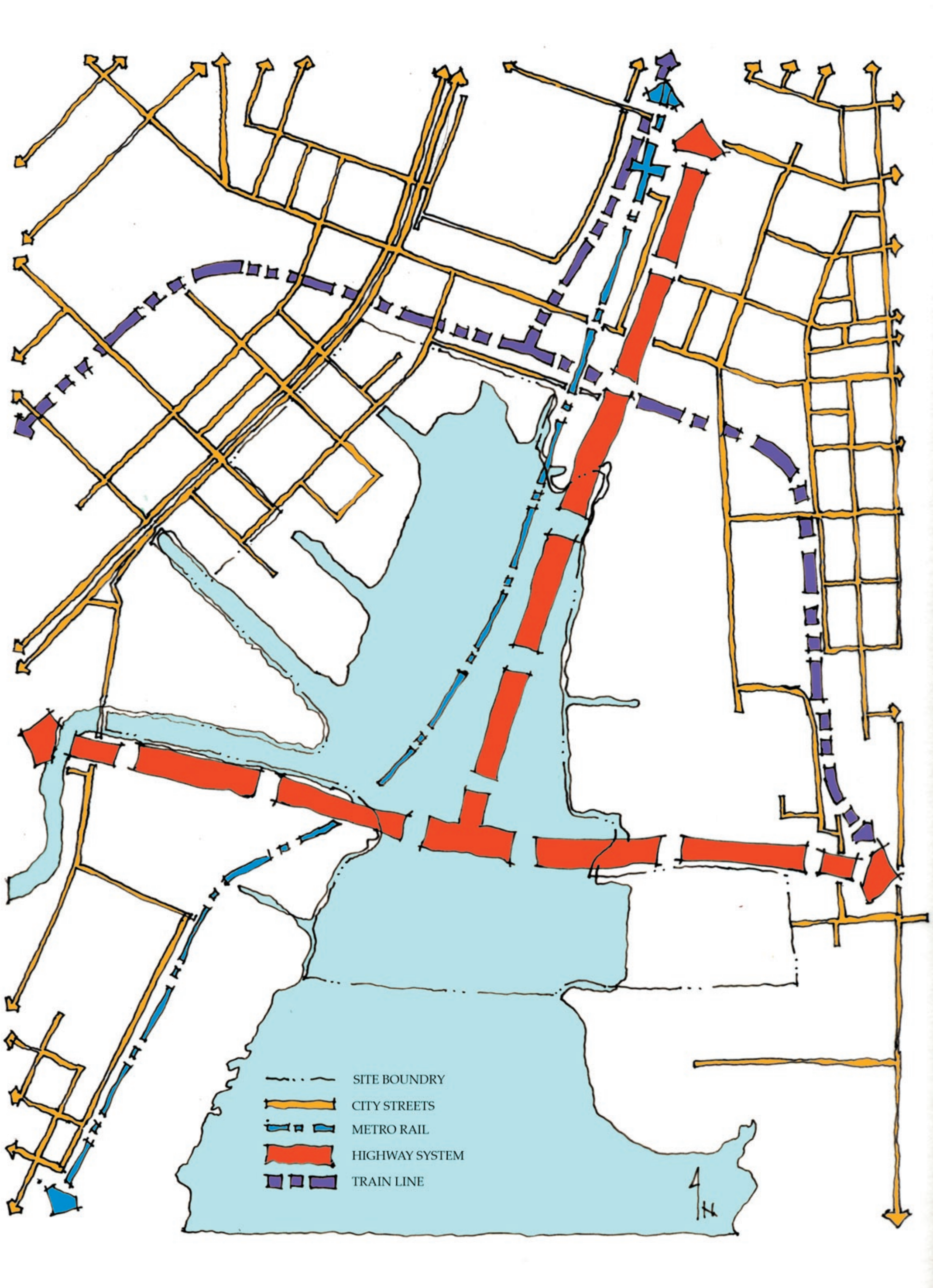


Figure 79: Circulation Study

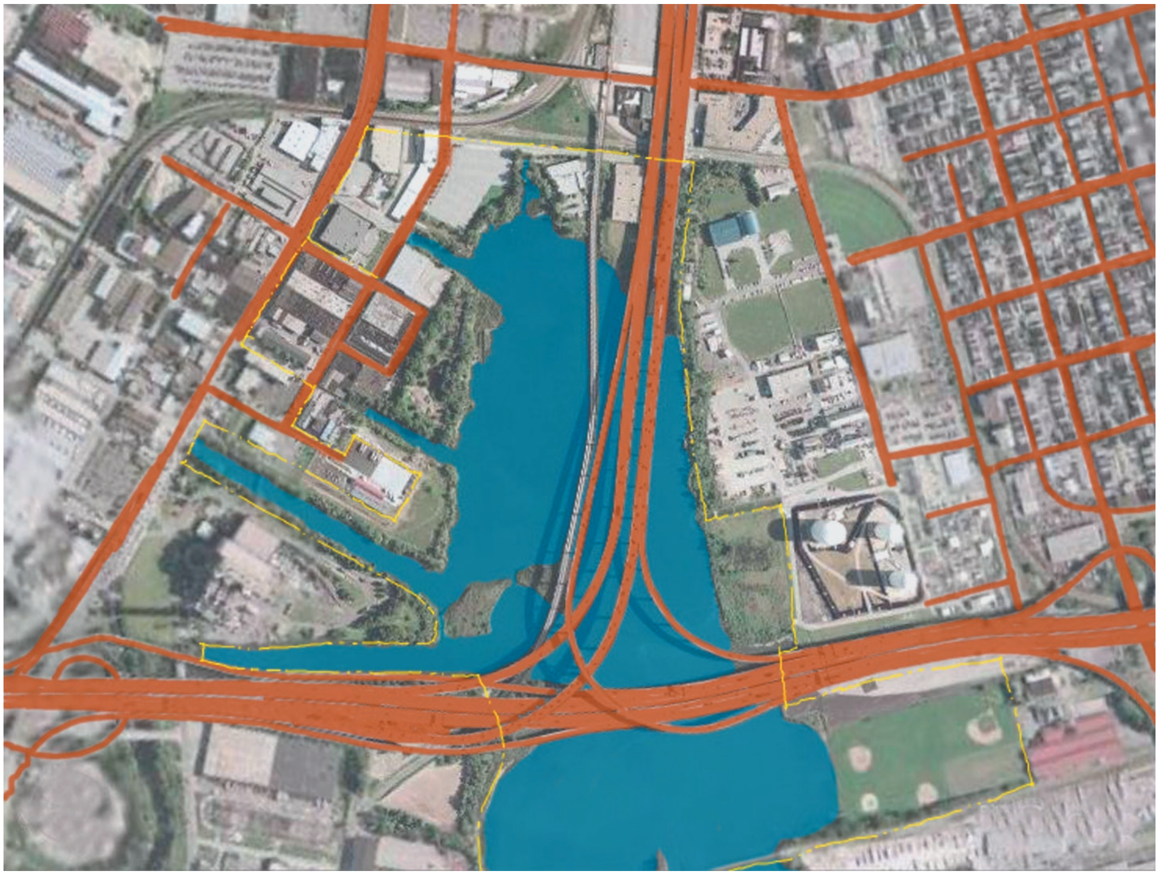


Figure 80: Road Systems (Google.com)

Figure 81: Green Space (Google.com)

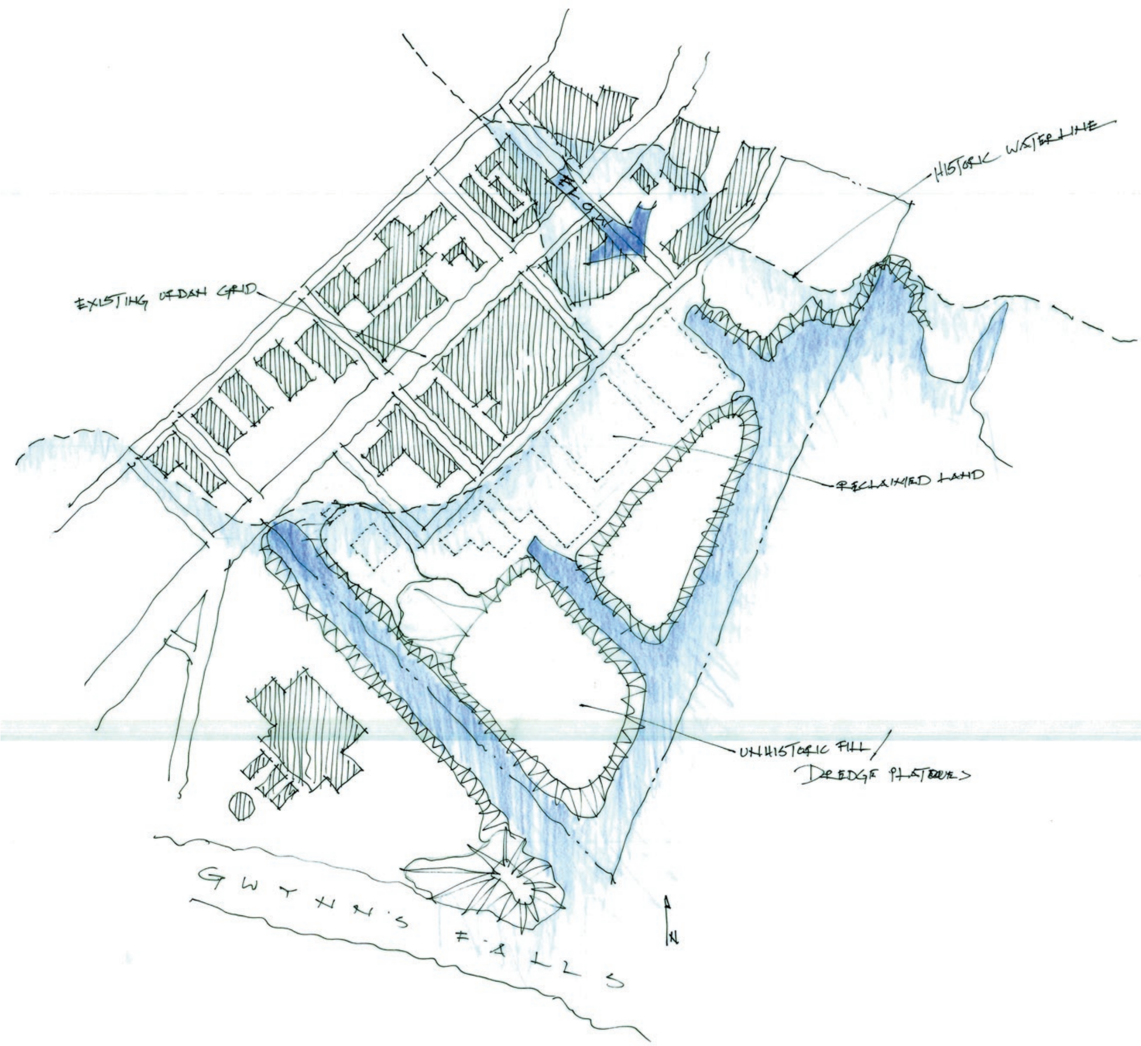


Figure 82: Topographic plan with historic water-line. Note the raised plateaus of the areas to the left in the drawing

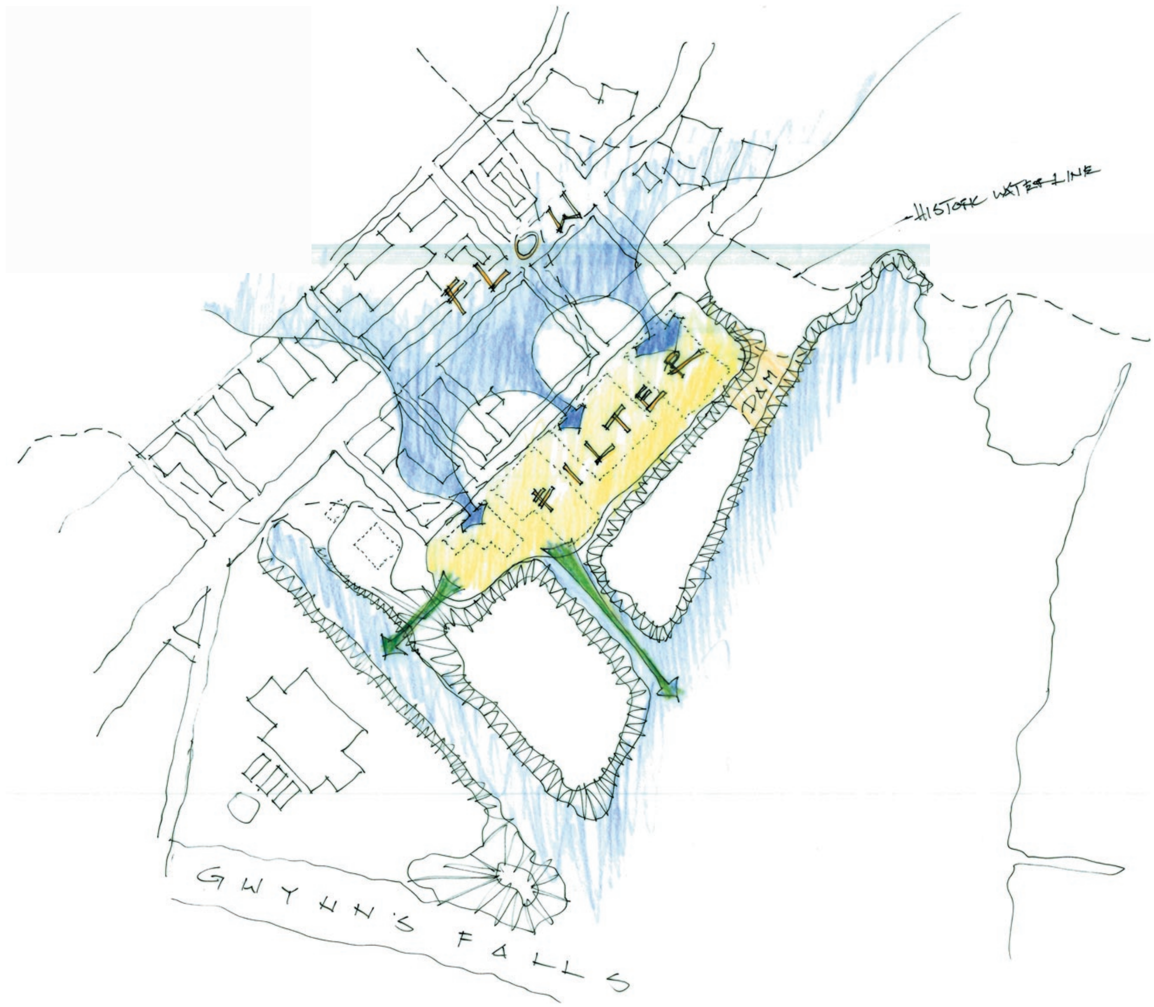


Figure 83: Hydrology Diagram: Drawing shows the flow of water through the site. Note the restricted movement due to the island like dredge fill sites just to the south of the area marked filter

CHAPTER 111: THE PROGRAM

Program Introduction:

The program will consist of three general sections, the Institute of Urban Aquaculture, the Chesapeake Learning Center, and the brown field restoration. The Institutes main focus is on research and restoration of the Chesapeake's ecological system as well as University education programs, while the Learning Center will act as a visitor center, aquarium, meeting house, and a learning environment for public education. The brown field restoration will establish the site as a place for nature.

The Institute of Urban Aquaculture at Ridgley's Cove is located on the banks of the Middle Branch of the Patapsco River, a tributary of the Chesapeake Bay in the City of Baltimore. The Institute will function as part of the University of Marshlands Center for Environmental Studies (UMES) and become a sister facility to the centers at Horn Point on Maryland's eastern shore, Appalacian Laboratory in the Allagainy Mountains, and the research facility at Solomons Island in Southern Maryland.

The Institute's laboratories will be an interdisciplinary facility with faculty engaged in research on the biology, chemistry, physics, and ecology of organisms and ecosystems from wetlands and estuarine waters of the Chesapeake Bay to the continental shelf and open waters of the world's oceans. Areas of scientific expertise include oceanography, plankton dynamics, marine macrophyte and wetland ecology, systems ecology, nutrient dynamics and eutrophication, physiological ecology of benthic invertebrates, benthic-pelagic interactions, and aquaculture and restoration of existing Bay conditions.

The facilities will also include a cafeteria, classrooms, multi-purpose spaces, auditoriums, flex lab spaces, green houses, outdoor and indoor growth tanks, outdoor ponds, storage and maintenance space, parking, and a dorms adjacent to the laboratory buildings.

The Chesapeake Learning Center will house the visitor center to both the Institute and Botanic gardens, along with an interactive educational Aquarium with indoor and outdoor demonstration ecosystems and habitat components. The visitor center will have gallery space, an auditorium, classrooms, a laboratory, and meeting rooms. The Aquarium will demonstrate live plants and animals from the all over Chesapeake watershed. These habitats will demonstrate the different zones starting at the ocean and moving up to the mountains, exemplifying ecosystems found along the way.

The brown field restoration will become a showplace of how natural gardens can be used in urban settings. There will be demonstration gardens--including rain gardens, butterfly gardens, sediment control gardens, ecosystem and habitat refuges, freshwater swamps, marshlands, forested wetlands, etc. . . The restored wetland gardens will contain open space for recreation, a trail network and boardwalk system that will connect the Gwynn's Falls trail to Federal Hill and Locust Point and most importantly, vast areas for natural habitat.

PROGRAM DESCRIPTIONS

1. The Institute of Urban Aquaculture

Entrance Lobby/ Reception/ Gallery Space/ Coat Room 3,450 sf

This space is the formal and main entrance to the laboratory and classroom building. It serves as a reception space, and where all administration for the laboratory will take place. There will be flexible display space for rotating exhibits and a waiting area for quests. Security is an issue for laboratories like this one, so there will be space provided for the necessary equipment.

Cafeteria 3,700 sf

The cafeteria will be an informal place for students and faculty to eat. The space will be open to the main lobby and accessible by students 24 hours. Outdoor seating will be provided as well; however, this will not be a cafeteria for public uses.

Classrooms 4,150 sf

The Laboratory building will house graduate and undergraduate education facilities. There will be a main lecture hall for guest lecturers, multiple classrooms, a computer lab, and a multi-purpose room.

Laboratories 100,000 sf

The Ridgley's Cove Facility will have a multi-disciplinary team of scientists which specialize in aquaculture of fish and shellfish, marsh and seagrass ecology, marine macrophyte tissue culture, and water quality of coastal systems and are actively involved in the science to support holistic and proactive restoration of oysters, submerged aquatic vegetation, fish, and wetlands.

Research emphasis of the aquaculture restoration ecology group extends from shoreline erosion and remediation impact on SAV, ecosystem responses to nutrient management, estuarine macropyhte production, effect of turbidity and light on SAV, oyster culture and restoration technology and evaluation, fish culture technology, sturgeon enhancement, and aquatic plant nutrient management applications. Projects address both basic and applied issues primarily within the Chesapeake Bay, its tributaries and Mid-Atlantic area coastal bays and actively involve partners and stakeholders and include diverse educational programs.

Hatcheries 10,000

The Hatcheries are where different species of animals are hatched and raised to be released at strategic locations throughout the Bay. Hatcheries contain large tanks, both indoor and outdoor, pond systems and areas for imitation streams.

Service 10,000 sf

The service area will handle trash removal services, recycling services, delivery handling, and building and ground maintenance facilities.

2. Chesapeake Learning Center

Aquarium and Visitor Center 18,250 sf

The Chesapeake Learning Center acts as the public visitor center and education facility. The Station will have an aquarium, outdoor and indoor demonstration ecosystems, classrooms, and some laboratory operations.

PROGRAM TABULATIONS:

Aquaculture and Restoration Ecology Laboratory building

Entry		
	Exterior Foyer	500 sf
	Foyer	500 sf
	Reception Desk	200 sf
	Administrative Space	750 sf
	Coat Room	150 sf
	Flexible Display Space	200 sf
	Waiting Area	200 sf
	Rest Rooms (2 @ 200sq. ft.)	400 sf
		3,450 sf
Cafe		
	Seating Area for Tables	1,000 sf
	Kitchen	150 sf
	Prep Space	100 sf
	Storage	100 sf
	Cold Storage	50 sf
	Rest Rooms (2 @ 150 sf.)	300 sf
		1,700 sf
Classrooms		
	Main Lecture Hall	1,000 sf
	Minor Lecture Classrooms (4 @ 500 sf)	2,000 sf
	Multi-Function Room	350 sf
	Computer Lab	200 sf
	Storage	200 sf
	Rest Rooms (2 @ 200 sf)	400 sf
		4,150 sf
Laboratories		
	Main Labs	15,000 sf
	Flex Labs	2,000 sf
	Greenhouse Lab Space	10,000 sf
	High Security Lab Space	2,000 sf
	Storage	1500 sf
	Cold Storage	1000 sf
	Multi-use Rooms (4 @ 250 sf)	1000 sf
	Rest Rooms (4 @ 200 sf)	800 sf
	Locker Rooms (2 @ 500 sf)	1000 sf
		47,800 sf
	Net Square Feet	**57,100 sf**

Hatcheries	
Indoor Hatching Area	5,000 sf
Outdoor Hatcheries	5,000 sf

Chesapeake Learning Center

Foyer	500 sf
Outdoor Foyer	500 sf
Reception Desk	200 sf
Rest Rooms (2 @ 300 sf)	600 sf
Administration Space	500 sf
Rest Rooms (2 @ 200 sf)	400 sf
Flexible Display Space	500 sf
Aquarium	10,000 sf
Classrooms (2 @ 300 sf)	600 sf
Multi-Purpose Room	400 sf
Lecture Hall	1000 sf
Store	500 sf
Cafe	500 sf
Kitchen	250 sf
Rest Rooms (2 @ 300 sf)	600 sf
Loading Dock	600 sf
Storage	600 sf
	18,250 sf

Net Square Feet 10,750sf

Laboratory Building
Net Square Feet **57,100 sf**

Hatcheries
Net Square Feet **10,000 sf**

Chesapeake Learning Center
Net Square Feet **18,250 sf**

TOTAL NET SQUARE FEET
85,350 sf

CHAPTER IV: PRECEDENTS

The building and land use precedents discussed are all similar in attitude about the site and the materials. Each building or set of buildings have in some way fit into the landscape. Each project, in a distinct way, engages the land around it. The precedents included have emphasized the importance of the natural environment and in most cases glorified it. Each orchestrates an experience through the site. This direct interaction with land can greatly enhance the educational, environmental, and emotional aspects of the final design.

The projects chosen for this Institute and botanical Gardens include: The Flint Riverquarium, Georgia, by Antone Predock; The National Aquarium's Center for Aquatic life and Conservation (unbuilt), Baltimore Maryland, by Ayers, Saint, Gross Architects, and Michael Vergason Landscape Architects; The University of Maryland Center for Environmental Studies, Horn Point Research and Restoration Facility on Maryland's Eastern Shore, by ANG Architects, and Myhan Rykiel Landscape Architects; and the Matthaei Botanical Gardens, Nichols Arboretum, Chicago, Illinois, work, by Ohme, van Sweden Landscape Architects.

The Flint Riverquarium, Albany, Georgia
Architect Antone Predock

This project is a nature center devoted to the ecology and geology of the Flint River basin and attempts to weave building, landscape, and exhibitions together. The building itself creates a sequence of spaces that enable the visitor to see first hand the ecological components of the River Basin. In plan the building is arranged around a courtyard. The courtyard houses the Riverquariums outdoor lagoon ecosystem.


Figure 84: Demonstration riverscape (www.antonepredock.com)

The buildings massing resembles an organic assemblage of mound and ridges. The visitor enters through a low horizontal concrete beam with a large waterfeature flowing down from the left. The riverquarium seems to give the feeling of entering a sub-teranial world.


Figure 85: Building massing of Flint Riverquarium (www.antonepredock.com)

Figure 86: Main entrance
(www.antonepredock.com)

Figure 87: Demonstration fish hatcheries
(www.antonepredock.com)

Figure 88: Main entrance and River Fountain
(www.antonepredock.com)

Figure 89: Main circulation
(www.antonepredock.com)

Figure 90: The building site and its relationship with the flint river (www.antonepredock.com)

The National Aquarium's Center for Aquatic Life and Conservation (unbuilt)

Landscape Architect Michael Vergason

The National Aquarium's Center for Aquatic Life and Conservation if built would provide space for research of aquatic life. The centers design from the start tries to tie the project to the site. In the plan below interactions between building and landscape are evident.

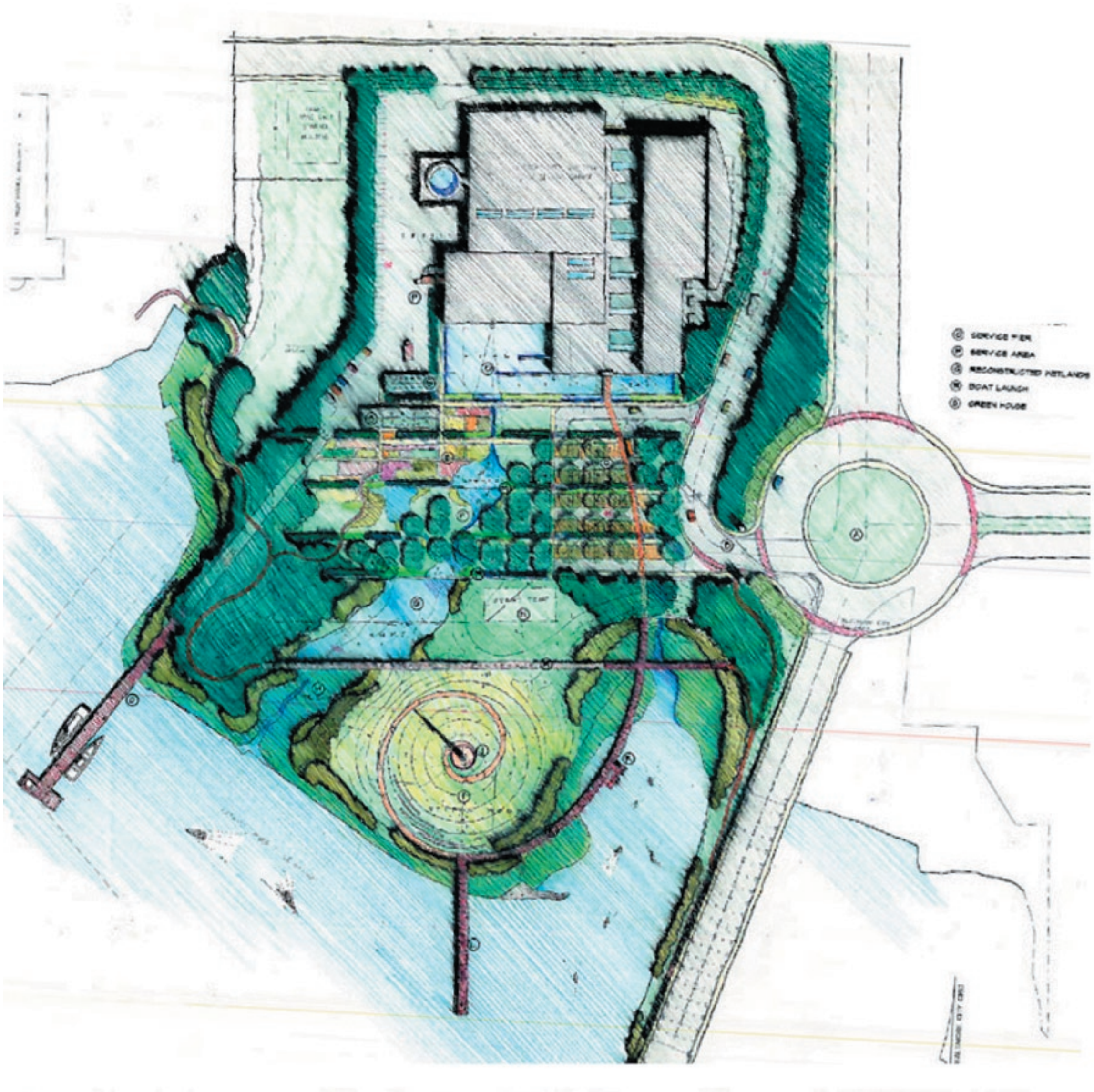


Figure 91: Proposed plan for Center for Aquatic life and Conservation (Courtesy of Michael Vergason)

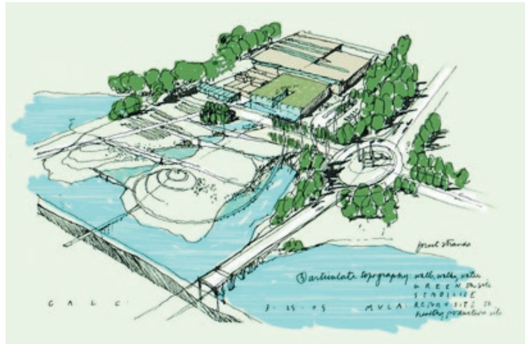


Figure 92: Proposed Aquarium Center (Courtesy of Michael Vergason)

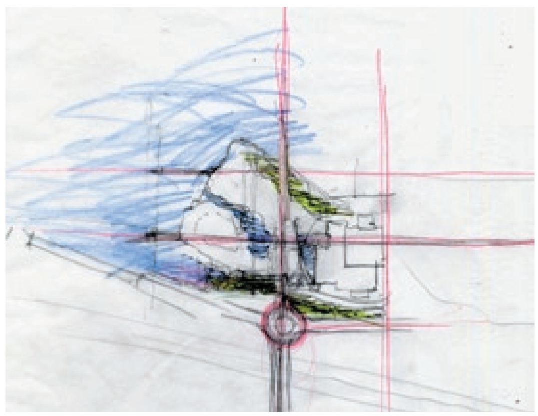


Figure 93: Circulation (Courtesy of Michael Vergason)

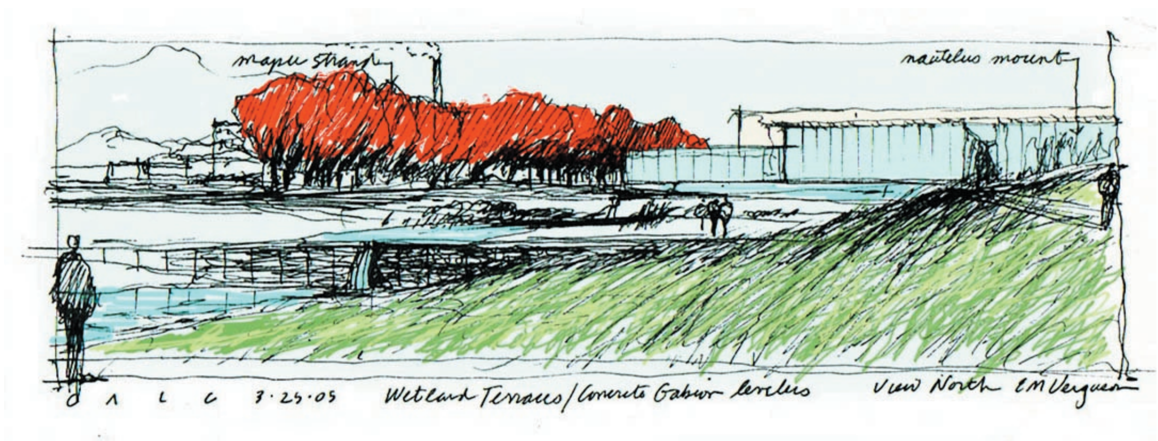


Figure 94: Building and landscape (Courtesy of Michael Vergason)

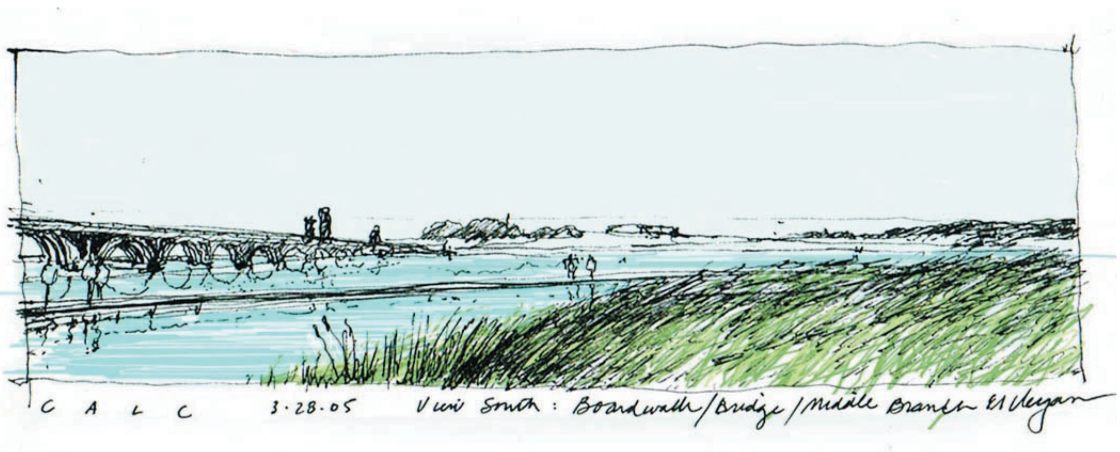


Figure 95: Proposed boardwalk and marsh grassland (Courtesy of Michael Vergason)


Figure 96: Aerial view of Aquarium Center (Courtesy of Michael Vergason)

Horn Point Research and Restoration Facility on Maryland’s Eastern Shore,

ANG Architects, and Myhan Rykiel Landscape Architects

The Horn Point Facility was built in 2003 for research and restoration of the Chesapeake Bay. The property has laboratories, twenty seven flavors of saltwater, indoor hatchery tanks, outdoor pond and tanks, etc. . . Horn Point is the functional model for the Institute of Urban Aqua cultures program. The Institute will be a sister facility to Horn Point and will have many of the same traits. But, unlike Horn Point it will focus more on research for urban aquaculture restoration.

Figure 97: Horn Point Facility, Eastern shore Maryland (umes.umd.edu)

Figure 98: Hatchery (umes.umd.edu)

Figure 99: Oyster Hatchery (umes.umd.edu)

Figure 100: Saltwater Tanks (umes.umd.edu)

Figure 101: Laboratory (umes.umd.edu)

Figure 102: Horn Point Facility, Eastern shore Maryland (umes.umd.edu)

CHAPTER V: DESIGN OBJECTIVES

The Institute of Urban Aquaculture design will focus on three parts. One, the research building; two, the Chesapeake learning center; and three, the restoration of the industrial brown fields. As mentioned earlier the design objectives include; restoration of the Ridgley's Cove's natural areas, establishment of nursery areas for Bay plant restoration and study, a developed path system that connects various areas of the adjacent city neighborhoods, and areas for wildlife observation and interaction with nature.

The laboratory and research building's design objective will be to create a building that is sustainable and works with its urban context and surrounding landscape. The Chesapeake Learning Centers objectives are to create a memorable place for public education and understanding of the Bay's ecosystem. The objective for the brown field restoration part of the project will be to revitalize the historic shoreline of the site by recreating natural habitats and forming a new public park.

CHAPTER VI: DESIGN STRATEGIES

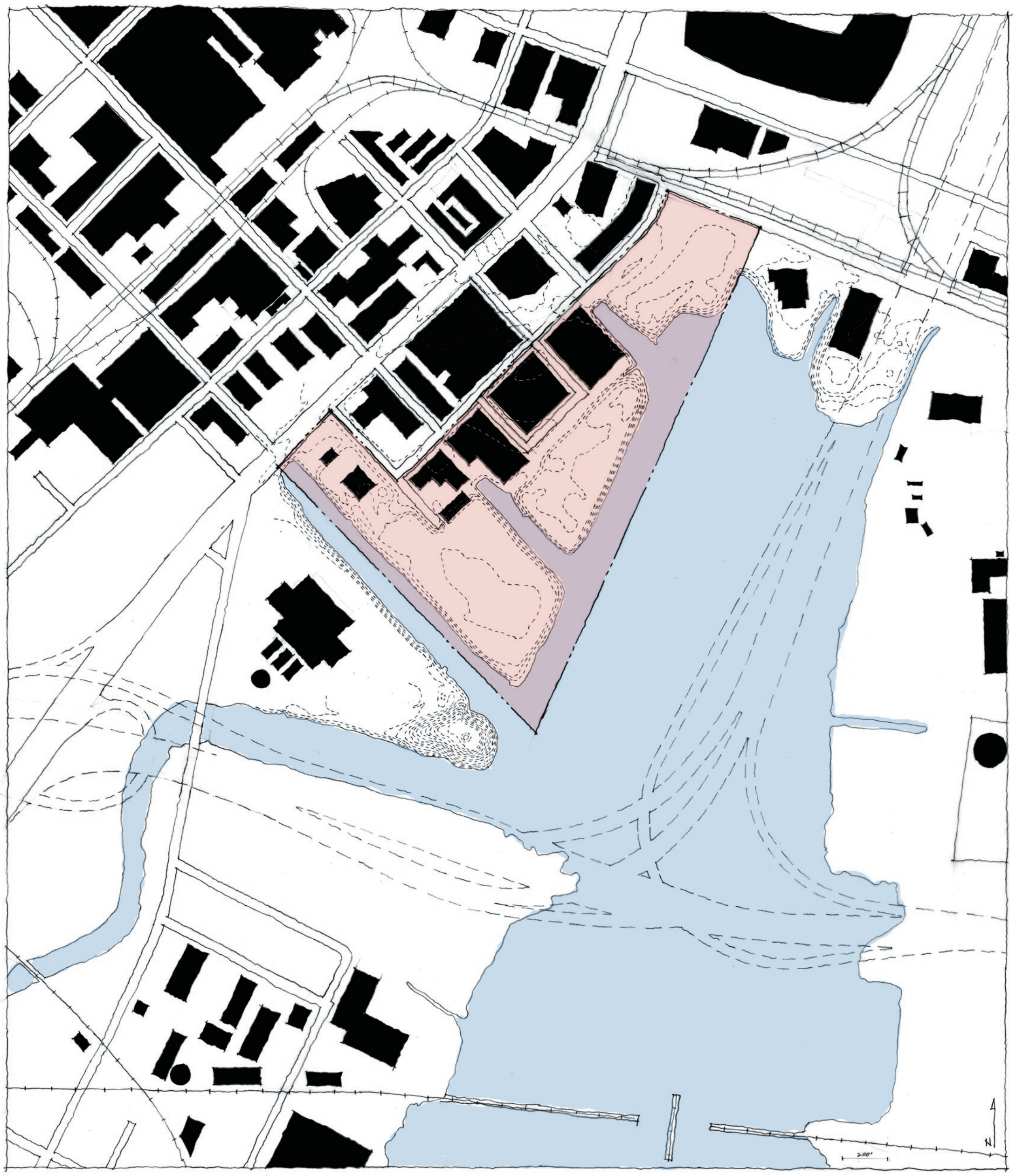


Figure 103: Ridgley's Cove Site with Existing Figure Ground

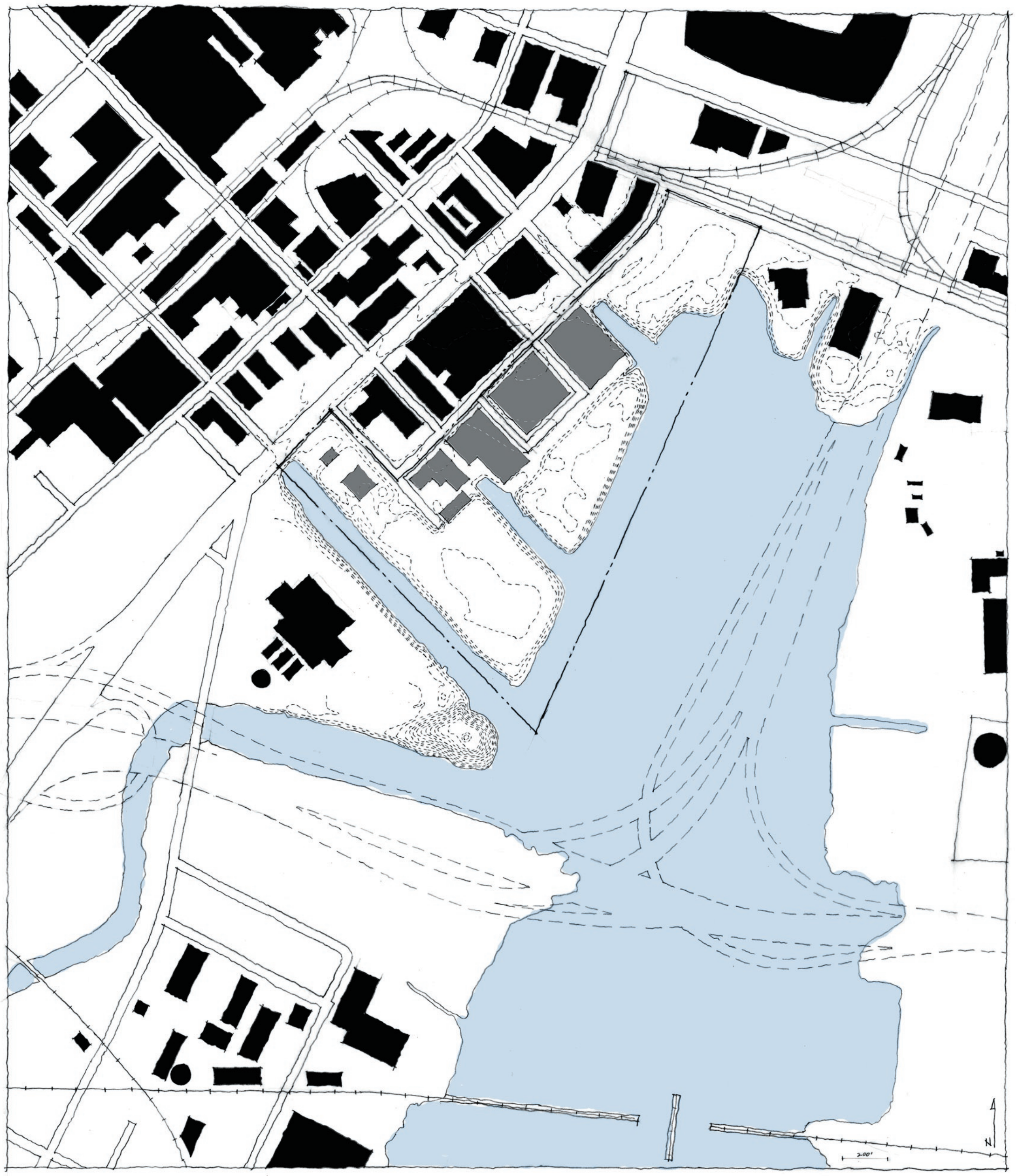


Figure 104: Proposed removal of existing buildings for wetland restoration and establishment of historic shoreline.

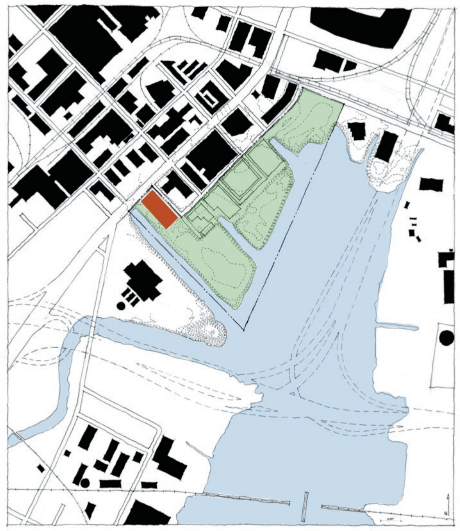


Figure 105: Final Scheme: The building will be placed with in the city block allowing park to remain open

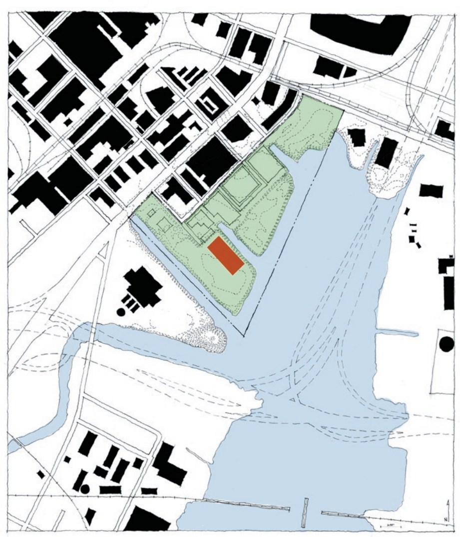


Figure 106: Earlier Scheme: The building as object in the park

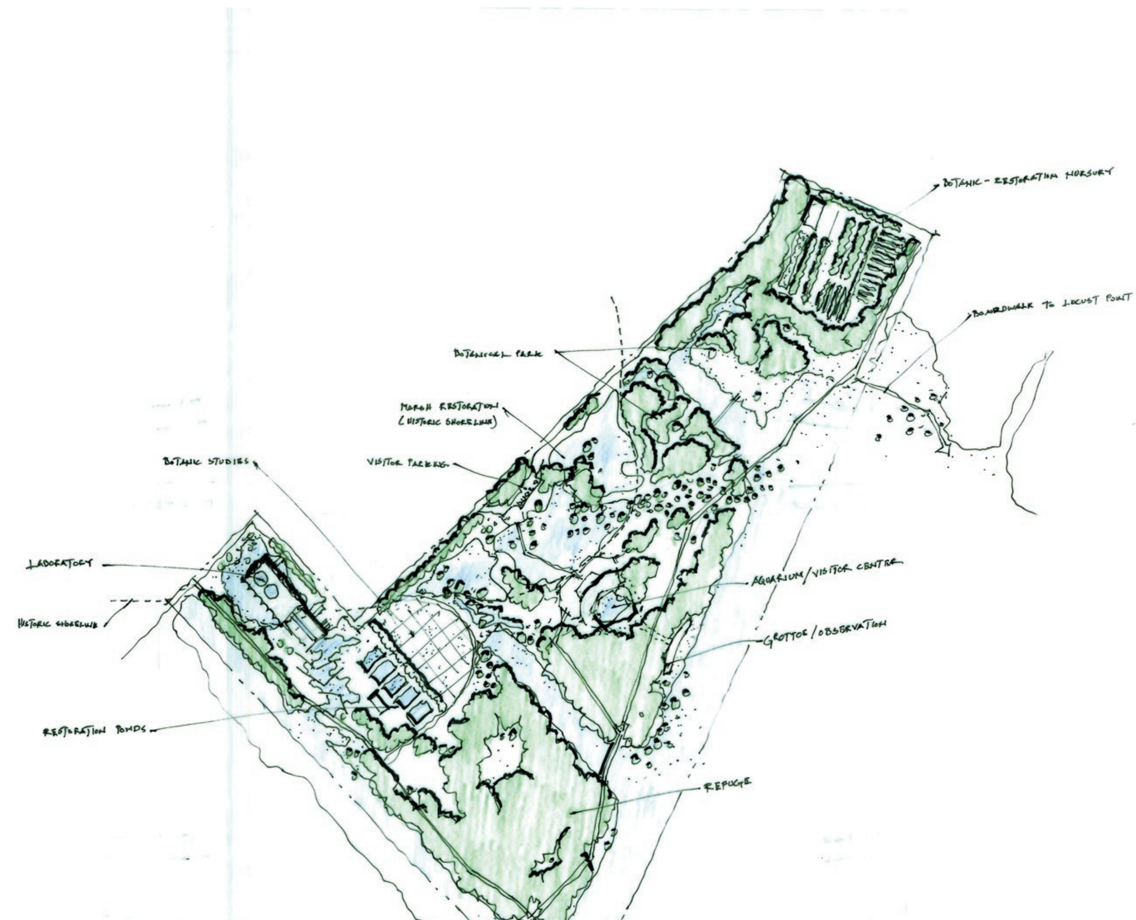


Figure 107: Early Site Plan: The marsh has been restored with new research and restoration facility

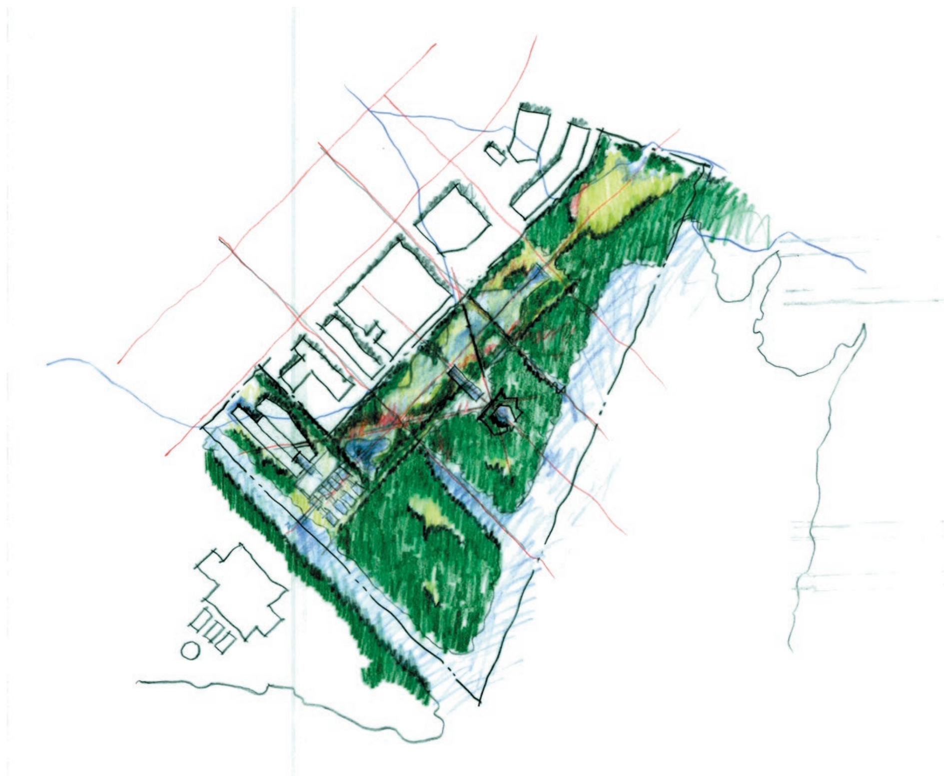


Figure 108: Early Site Plan 2: Further development of site and building

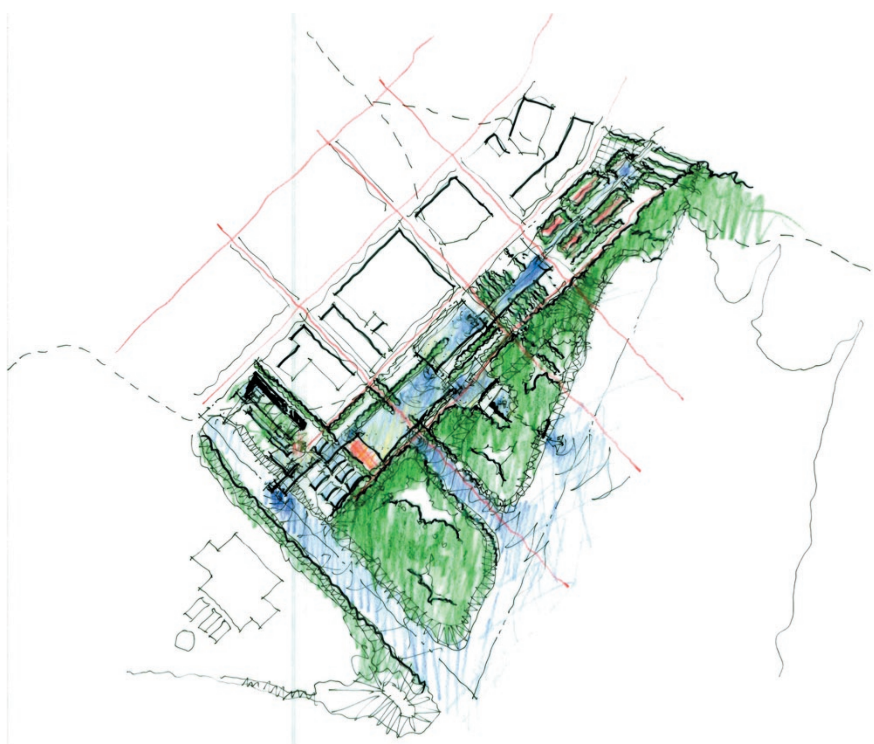


Figure 109: Early Site Plan 3: Further development of site and building

CHAPTER VII: DESIGN CONCLUSIONS

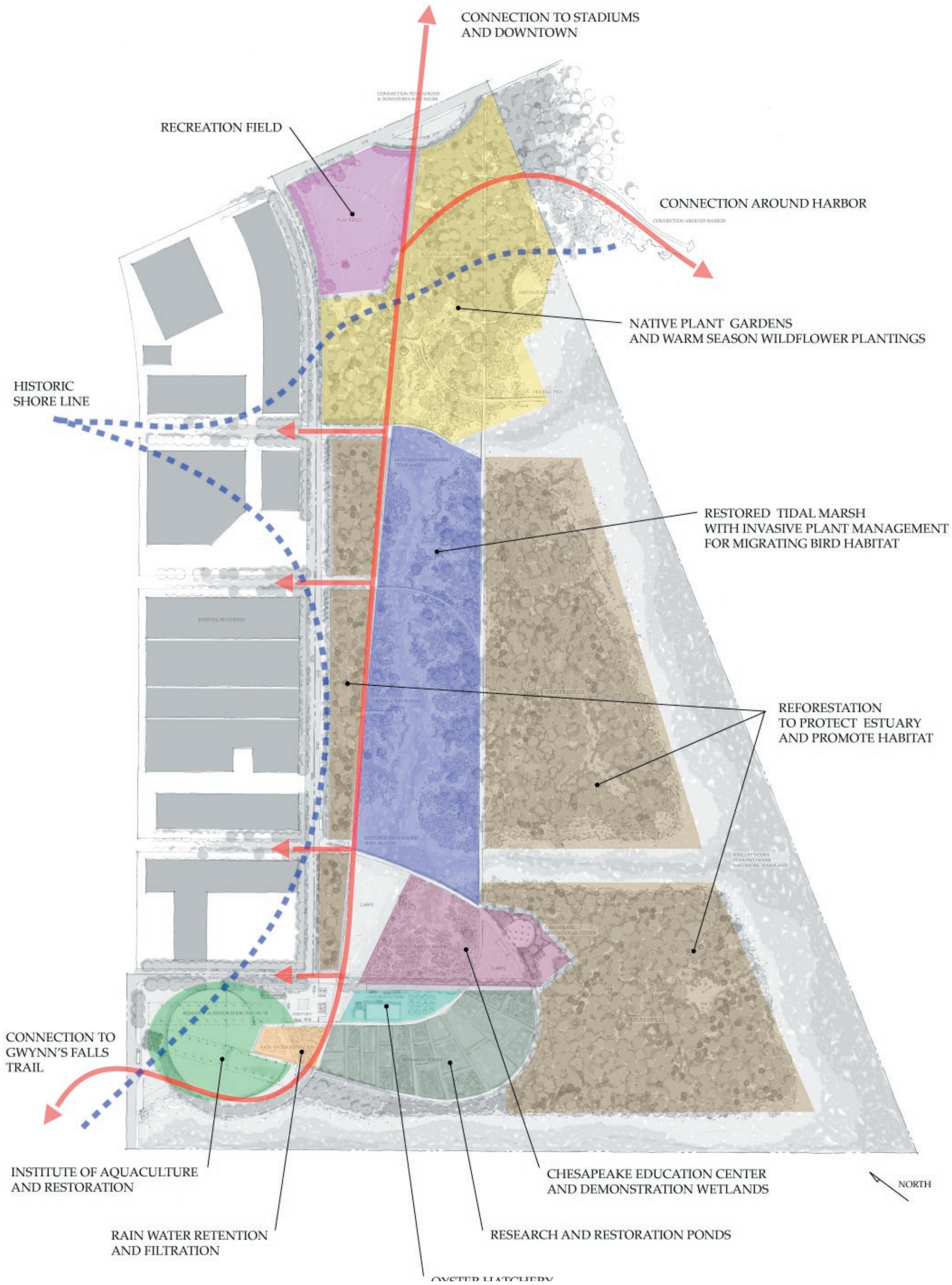


Figure 110: Site Diagram

Figure 111: Master Site Plan

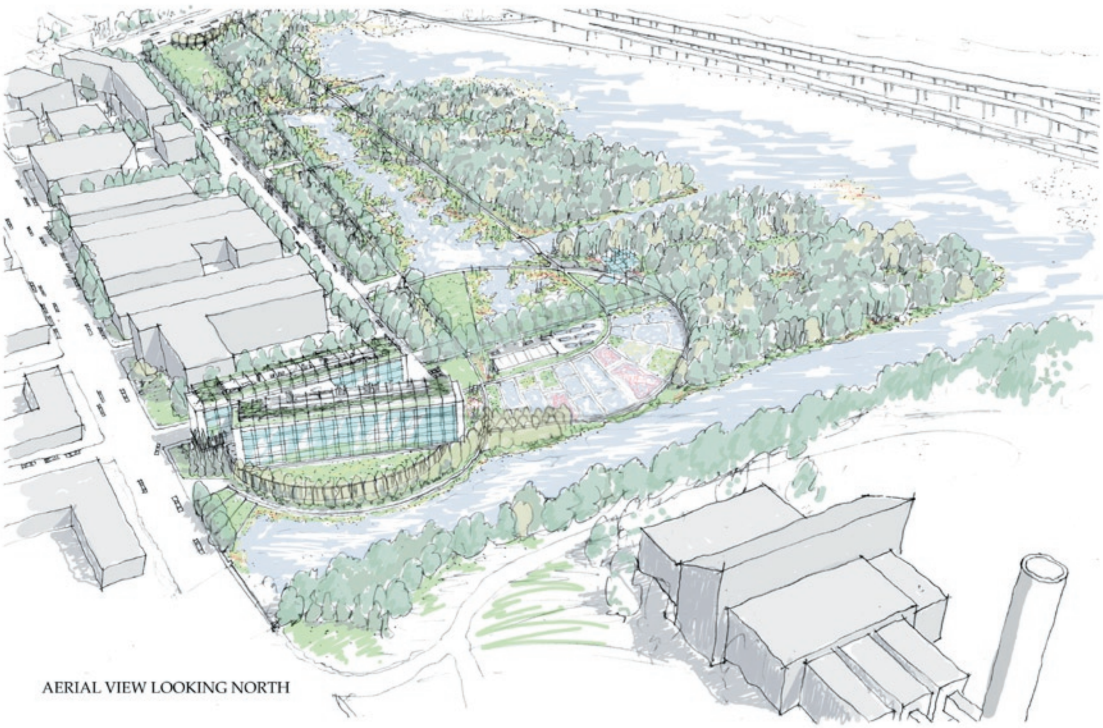


Figure 112: Aerial view of site

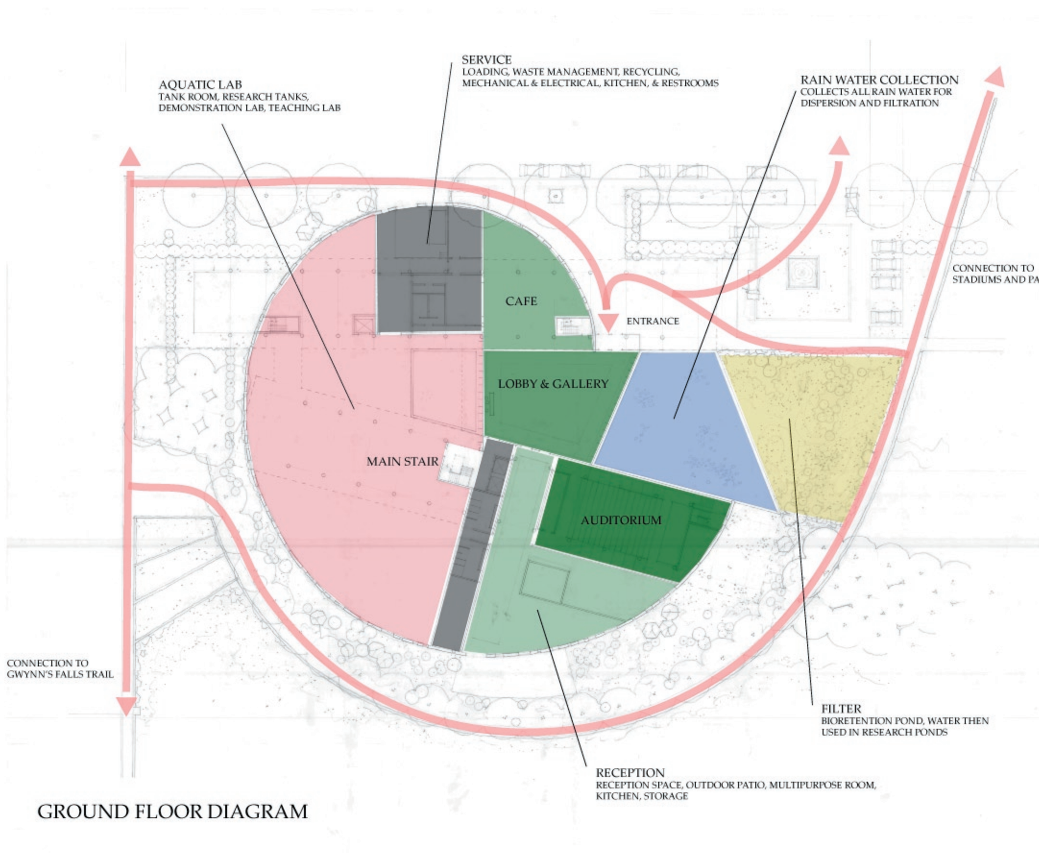
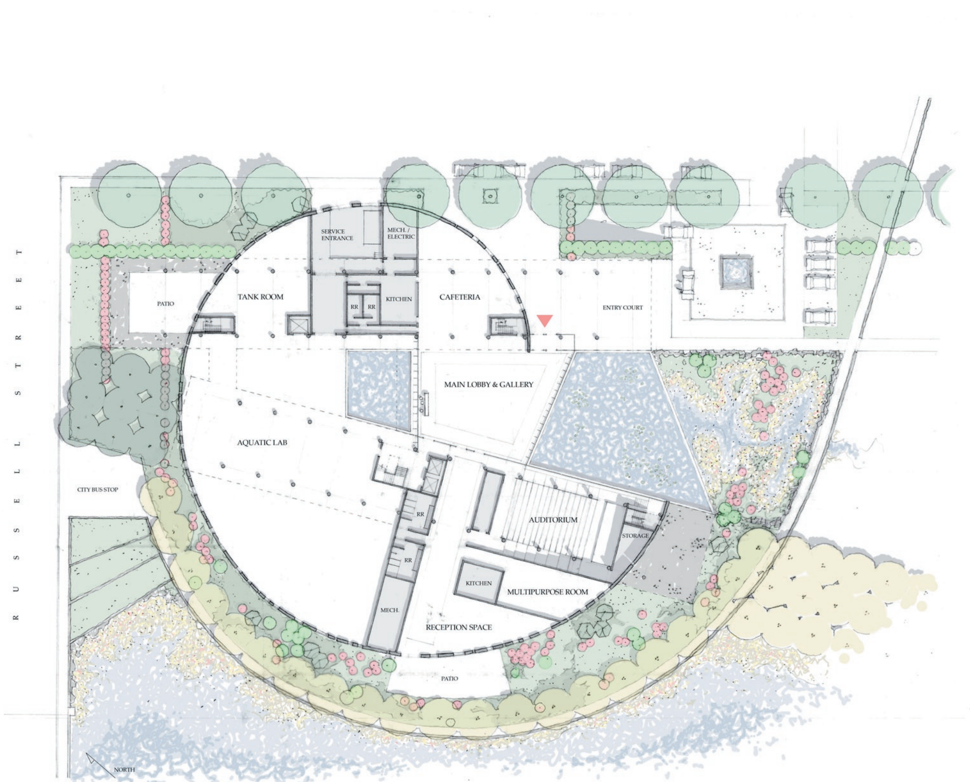


Figure 113: Plan Diagram



GROUND FLOOR PLAN

Figure 114: Ground Floor Plan

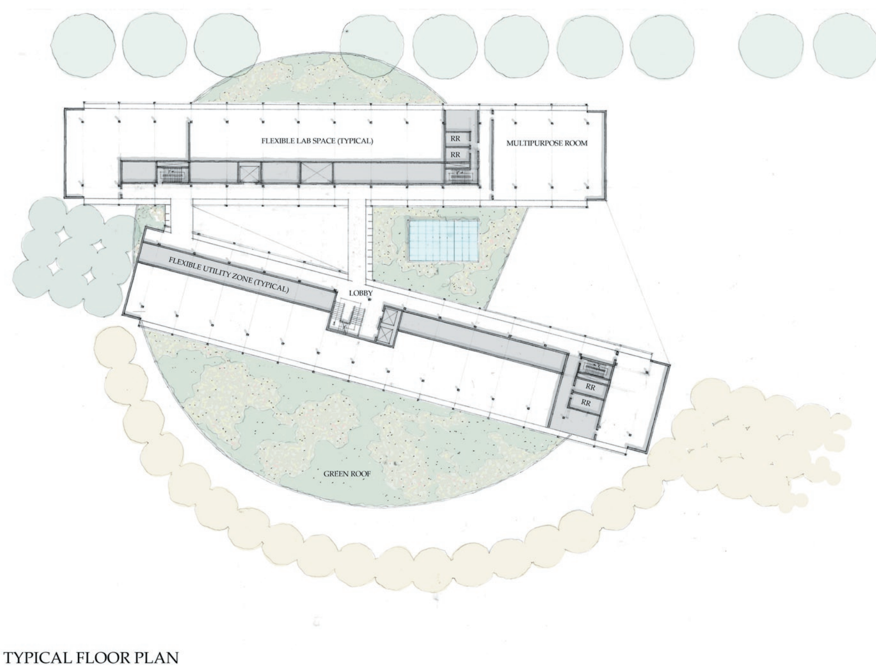


Figure 115: Typical Floor Plan

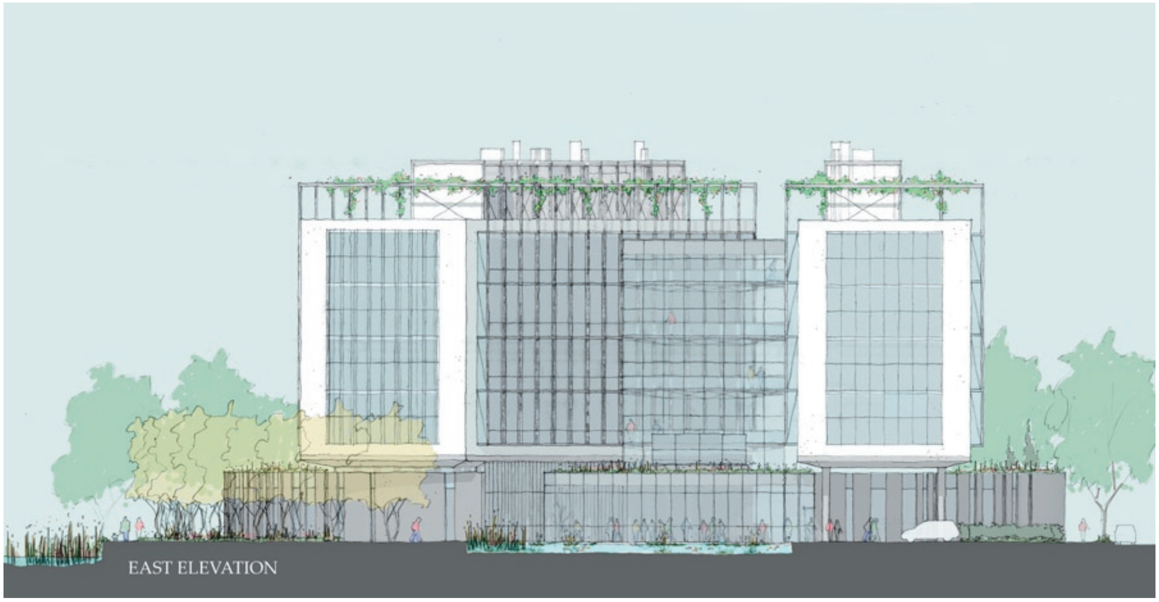


Figure 116: East Elevation

Figure 117: West Elevation

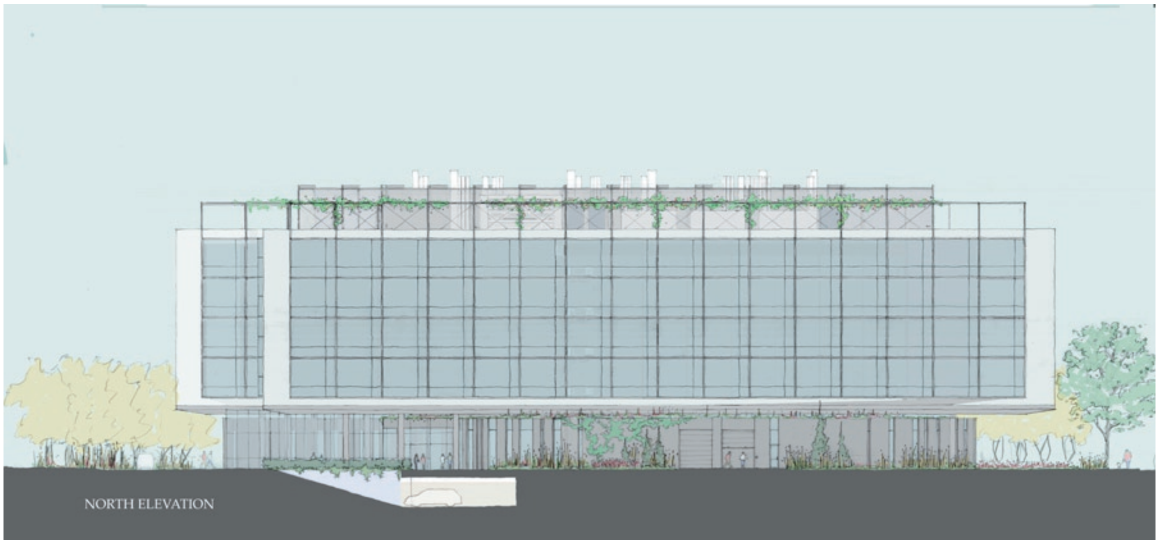


Figure 118: North Elevation

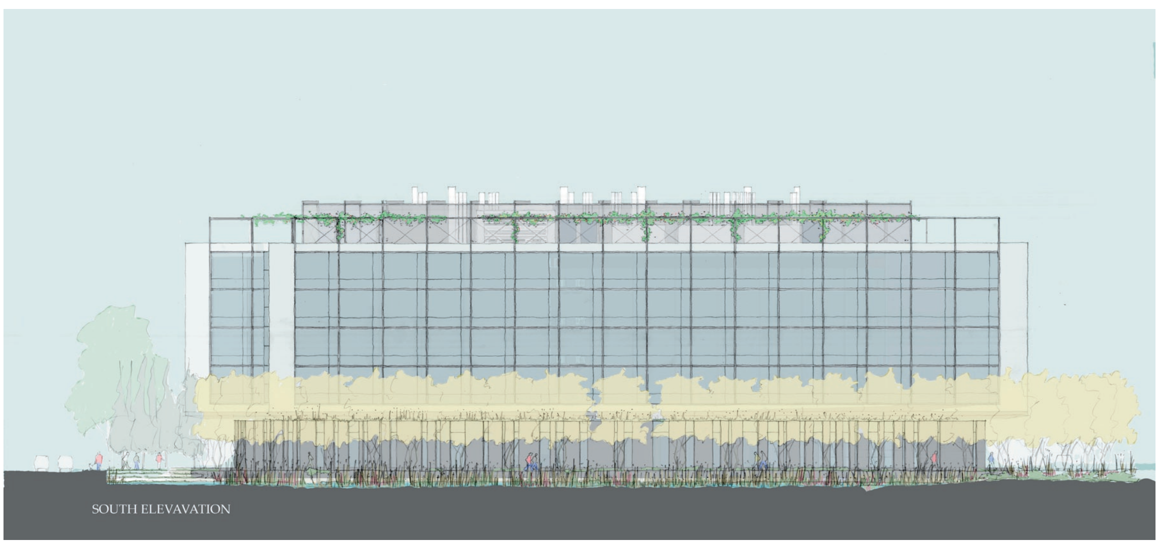


Figure 119: South Elevation

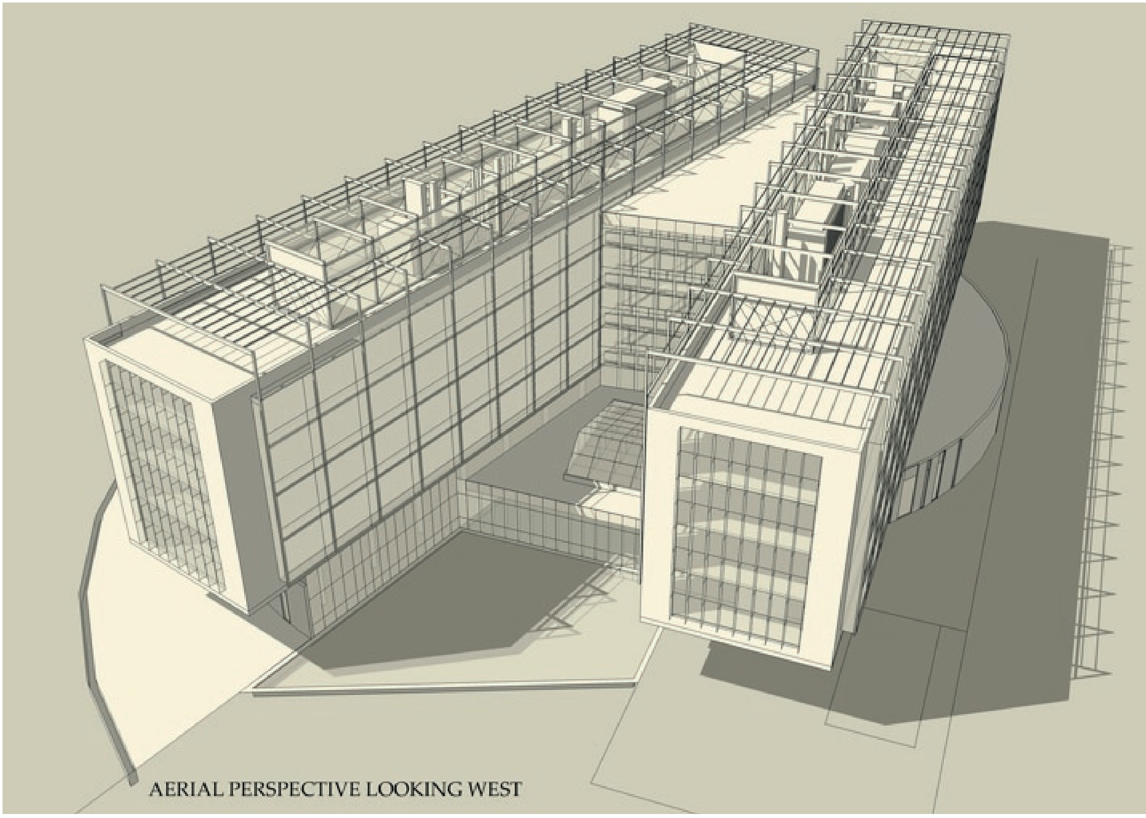


Figure 120: Proposed building from east

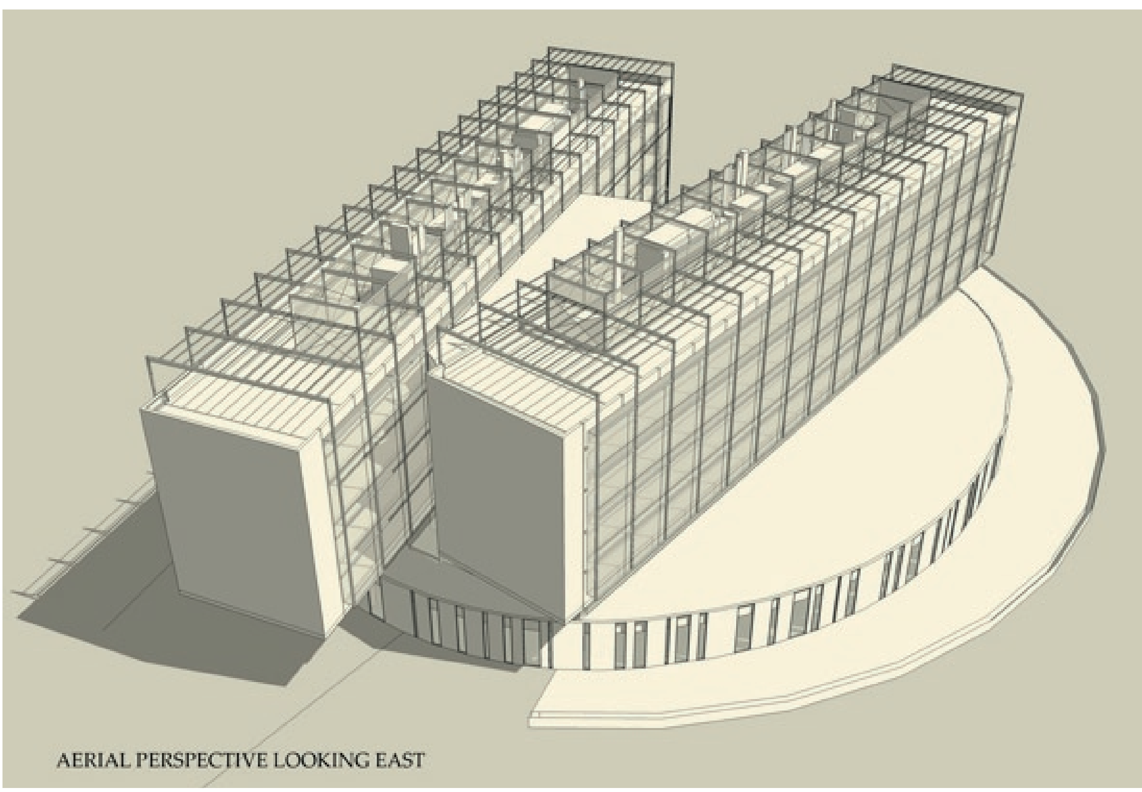


Figure 121: Proposed building from the west

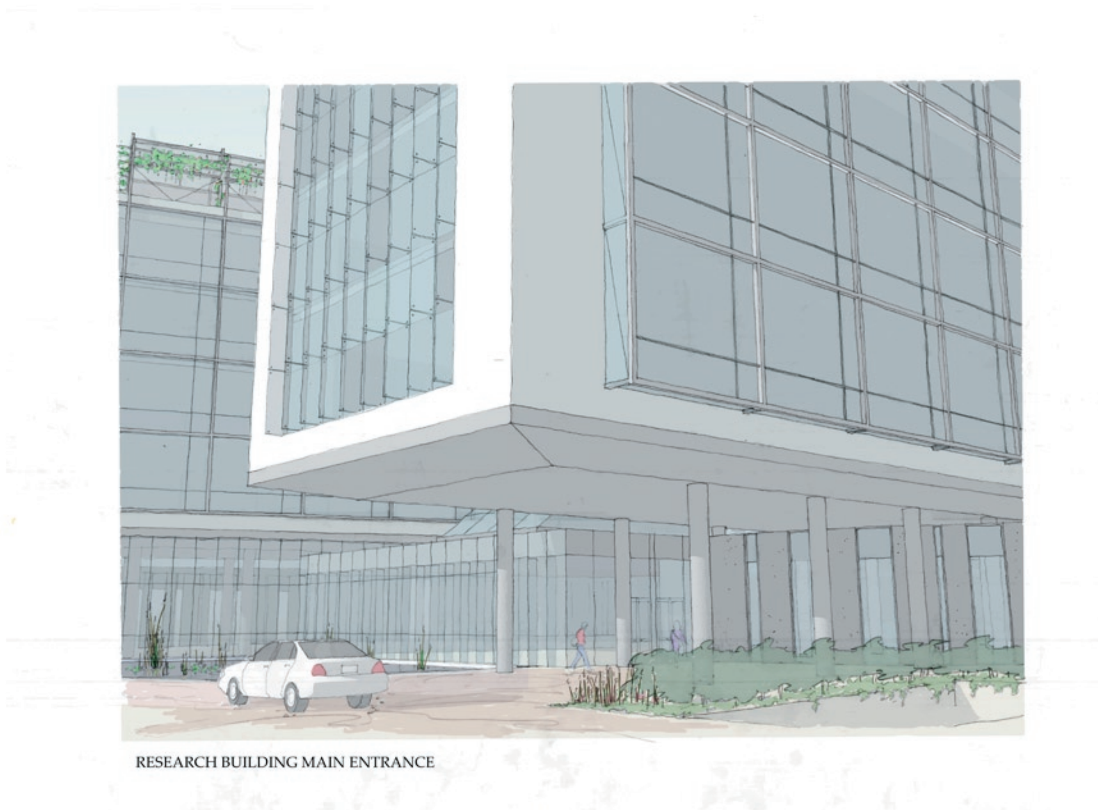


Figure 122: Perspective of main entrance

Figure 123: Perspective view of east elevation

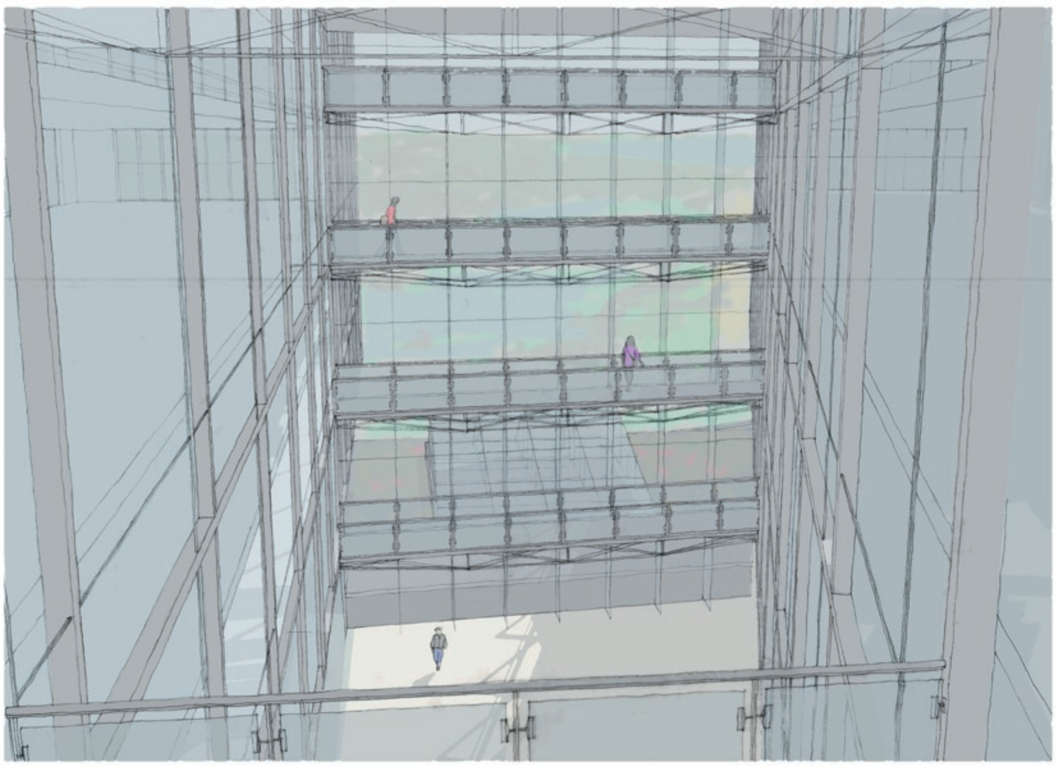


Figure 124: Interior Perspective

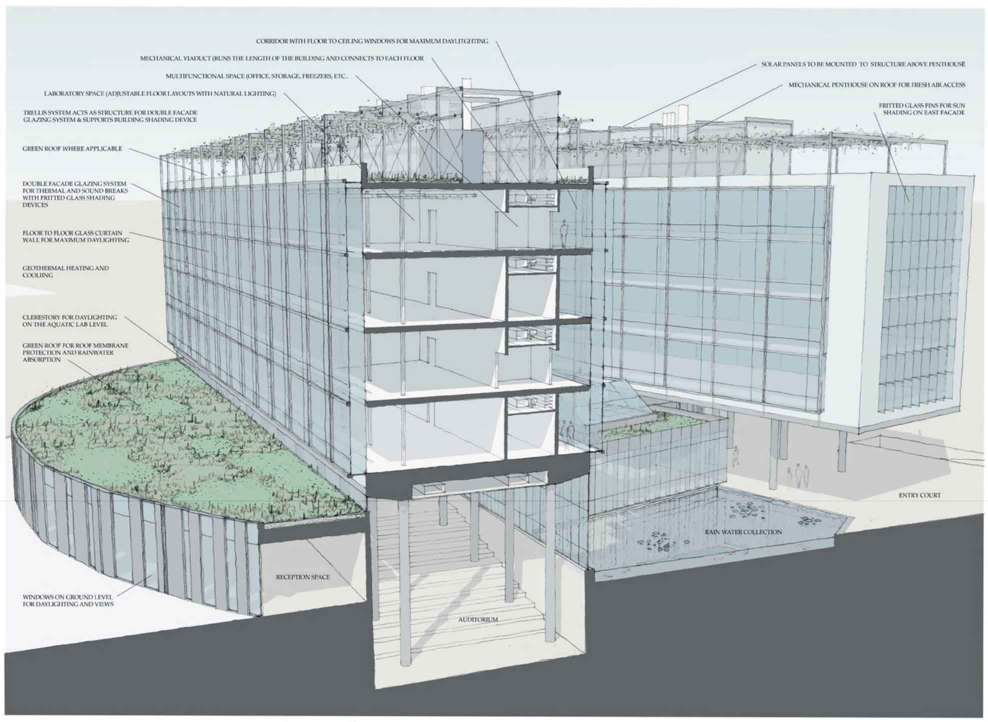


Figure 125: Section Perspective showing how building functions

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