APPENDIX M

PROJECT MITIGATION

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This appendix presents two separate packages. The first is the Proposed Masonville Dredged Material Containment Facility Mitigation Plan. The second is the Proposed Masonville Dredged Material Containment Facility Tier II Mitigation Plan DRAFT. This Tier II Package presents a list of options that could be investigated to for suitability to replace existing mitigation options should the existing options are deemed unsuccessful.

The packages are presented separately. The separator page titled "Tier II Mitigation Package" marks the end of the Proposed Masonville Dredged Material Containment Facility Mitigation Plan.

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TIER I MITIGATION PACKAGE

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1.0 PROPOSED MITIGATION

1.1 INTRODUCTION

The Maryland Port Administration (MPA) is proposing the construction of a dredged material containment facility (DMCF) in the vicinity of the Masonville Marine Terminal. Construction of the facility would require mitigation to offset the facility's impacts. The proposed DMCF would fill 130 acres of tidal open water (one of which is resulting from the need to move sunken barges outside the DMCF footprint). In addition, the project would bury 10 acres of upland habitat within the Chesapeake Bay Critical Area buffer, and disturb approximately 1 acre of vegetated wetlands (delineated as 0.4 acres) and 0.38 acres of submerged aquatic vegetation (SAV). This package details the MPA's proposed mitigation plan and its development. Included in this package are:

1. A description of the area affected by the facility,
2. A description of the MPA's public outreach efforts and the public support for the project
3. Facts sheets describing each of the projects in the MPA's proposed mitigation plan.

1.2 AREA IMPACTED BY THE MASONVILLE DMCF

The area affected by the facility and its habitat value was studied in great detail during feasibility level studies conducted by the MPA. These studies were instrumental in the development of the mitigation plan and defined both the quantity and quality of the impacted area.

Quantity - Figure 1-1 illustrates the proposed area of the DMCF footprint, and Table 1-1 quantifies the areas of open water, uplands, and vegetated wetlands, which would be affected by the proposed project.

Figure 1-1 - Extent of Area Impacted by Proposed Facility

Notes: The design for the proposed facility uses sand and clay dikes to contain material dredged from the navigation channels within Baltimore Harbor. The green line delineates the footprint of the proposed facility. Table 1-1 breaks down the types of areas affected.

Table 1-1. Breakdown of Affected Areas

Line Item	Area (acres)
Open Water	130
Upland	10
Vegetated Wetlands	1
Total Affected Area	**141**

Existing Conditions - The quality of the 130 acres of affected open water habitat is poor. Benthic sampling within the affected area has shown the benthic condition to range from meeting restoration goals to severely degraded. The existing upland habitat (10 acres) within the alignment exists on fastland created from dredged material and is not providing unique or critical habitat. The vegetated wetlands are small, covering no more than 1 acre of land. One of these exists on fastland from past dredged material placement and the other is located in an industrial area, at the end of KIM channel. Both the upland areas and vegetated wetlands provide fragmented habitat exposed to noise and light from industrial activities. Chapter 2 of the proposed Masonville DEIS provides additional detail on the existing conditions of the proposed project site.

1.3 PUBLIC OUTREACH AND SUPPORT

Recognizing that an extensive mitigation plan would be required for the Masonville project, the MPA turned to the surrounding community and Port of Baltimore stakeholders for guidance on mitigation projects and community enhancements. Outreach was accomplished through Harbor Team meetings and discussions with various community groups. The community and stakeholders responded by offering the following list of suggestions and ideas for improving the adjacent Masonville Cove:

1) Limited public access
2) Clean shoreline
3) Shoreline trails
4) Observation towers
5) Habitat enhancements
6) Bird sanctuary
7) Passive recreation
8) Education center
9) Canoe/kayak launch
10) Wetlands
11) Community stewardship

These suggestions were instrumental in shaping the MPA's mitigation plan. This public involvement has created an atmosphere of support for the Masonville project, which has been publicly endorsed by the Brooklyn-Curtis Bay Coalition, the City of Baltimore, the Living Classrooms Foundation, the National Aquarium in Baltimore, and the Citizens' Advisory Committee.

1.4 PROPOSED MITIGATION PLAN

The MPA developed its mitigation plan by considering the value of the habitat to be impacted by the proposed facility, the surrounding community's suggestions, suggestions from the Bay Enhancement Working Group (BEWG), input from the Joint Evaluation Committee (JE) and comments provided by state and federal agencies. Table 1-2 lists the elements of the current (DRAFT) plan, associated acreages, and their estimated initial and monitoring and maintenance costs. The following sections provide brief summaries of the projects in the proposed mitigation plan.

The mitigation plan focuses on enhancement of the Masonville Cove. However, initial conversations with regulatory agencies revealed the possible need for additional projects. To determine the appropriate, additional mitigation projects located outside of the Masonville Cove area, the MPA relied on a ranking of projects provided by the BEWG. Many of the projects evaluated by BEWG are added to the mitigation plan.

The dollar amounts that may appear in these sections for mitigation proposals are not USACE figures, nor are they to be construed as minimum or maximum expenditures that may be incurred to perform compensatory mitigation obligations pursuant to a USACE permit, if issued. They are estimates, derived for comparative purposes, to allow some reviewers to gauge the level of compensation proposed for each element. In addition, a USACE permit (if issued) would contain requirements to mitigate for permanent impacts to aquatic resources though the State may undertake other projects it deems beneficial to address other project impacts and community needs.

Table 1-2 - Summary of Proposed Mitigation Plan

Item #		Description	Quantity	Units	Initial Costs		Maintenance/Monitoring Costs		Total Item Cost (Thru 5 yrs)	Long-Term Maintenance/Monitoring*	
					Unit Cost	Total	Annual	5-yr Total		Annual (Forever)	Incremental 15-yr Total
Aquatic Projects											
1		Wetland Enhancement	2.0	acres	$153,000	$306,000	$9,000	$45,000	$351,000	$4,500	$67,500
2		Wetland Creation	3.1	acres	$153,000	$474,300	$13,500	$67,500	$541,800	$6,750	$101,250
3		Non-Tidal Wetland	10.0	acres	$100,000	$1,000,000	$15,000	$75,000	$1,075,000	$7,500	$112,500
4		Reef and Fish Habitat (subtotal)	95.8	acres							
	a	*Reef and Fish Habitat*[1]	73.0	acres	$31,000	$2,263,000	$44,640	$223,200	$2,486,200	$22,320	$334,800
	b	*SWH Substrate Improvement*[2]	22.8	acres	$20,000	$552,000	$14,800	$74,000	$626,000	$7,400	$111,000
5		Fringe Wetland Creation (along dike)[3]	2.0	acres	$94,500	$189,000	$22,500	$112,500	$301,500	$11,250	$168,750
6		Eel Passages (3 Dams)	3.0	project	$140,000	$420,000	$32,000	$160,000	$580,000	$16,000	$240,000
7		Shad and Herring Restoration	1.0	project	$450,000	$450,000	$100,000	$500,000	$950,000	$0[4]	$0[4]
8		3 Trash Interceptors[5]	3.0	project	$500,000	$1,500,000	$50,000	$250,000	$1,750,000	$30,000	$450,000
9		Biddison Run (Reach O)[6]	1.0	project	$461,061	$461,061	$0[7]	$0[7]	$461,061	$0[7]	$0[7]
10		Biddison Run (Reach P)	1.0	project	$1,046,295	$1,046,295	$0[7]	$0[7]	$1,046,295	$0[7]	$0[7]
11		2 Trash Interceptors[5]	2.0	project	$500,000	$1,000,000	$33,000	$165,000	$1,165,000	$20,000	$300,000
12		Western Run (6 Reaches)[8]	1.0	project	$1,140,855	$1,140,855	$0[7]	$0[7]	$1,140,855	$0[7]	$0[7]
Aquatic Related Projects							**Aquatic Totals**		**$12,474,711**		**$1,885,800**
13		WQ Monitoring in Cove	1.0	project	$96,000	$96,000	$49,000	$245,000	$341,000	$49,000	$735,000
14		Landside and In-Water Cleanup	25.0	acres	$100,000	$2,500,000	$0[9]	$0[9]	$2,500,000	$0[9]	$0[9]
Non-Aquatic Projects							**Aquatic Related Totals**		**$2,841,000**		**$735,000**
15		Terrestrial Habitat Enhancement	10.0	acres	$84,000	$840,000	$30,000	$150,000	$990,000	$15,000	$225,000
16		Education Center/Trails (Allocation)[10]	1.0	project	$750,000	$750,000	$50,000	$250,000	$1,000,000	$0[10]	$0[10]
17		Education / Research $500,000 Allocation[11]	1.0	project	$0	$0	$0	$0	$0	$0	$0
18		Conservation Easement	25.0	acres	$0	$0	$0	$0	$0	$0	$0
Environmental Benefits from the Masonville DMCF							**Non-Aquatic Totals**		**$1,990,000**		**$225,000**
19		Sediment/Containment Encapsulation	123.0	acres	$0	$0	$0	$0	$0	$0	$0
20		Derelict Vessels (Remediation and Removal)	3.0	acres	$0	$3-5 Million[12]	$0	$0	$0	$0	$0
Relevant Totals						**$14,988,511**	**$463,440**	**$2,317,200**	**$17,305,711**	**$189,720**	**$2,845,800**

Projects in Blue are added in response to the August 30th 2006 Joint Evaluation Committee meeting.

20-yr Mitigation Package Total	$20,151,511

1 - Includes cost of deep water substrate improvement along west portion of DMCF.
2 - Includes cost of shallow water habitat creation along west portion of DMCF, and $112,000 for 0.8 acres of creation on the east portion of the Cove.
3 - Includes cost ($60,000) for planting upper and low marsh plants.
4 - The fish stocking is a 3-yr program that will be monitored for a total of 5 years. As such, long-term maintenance cost is not included.
5 - Long-term maintenance cost for trash interceptors reflects the cost of maintaining the structures and not the periodic trash removal.
6 - Biddison Run (Reach O) total project cost is $809,061, of which $348,000 is funded by other sources.
7 - The City's initial cost estimates are used to determine the adequate funding levels for each of the stream restoration projects. Mitigation package includes initial construction only. Maintenance and monitoring costs are not included in the package for the City's stream restoration projects. MPA proposes that Baltimore City retain responsibility for project maintenance and monitoring.
8 - Six reaches of Western Run were selected based on the analysis presented in the City's report "Western Run Stream Assessment".
9 - This item refers to the one-time cost for removal of debris (concrete drain pipe, scrap metal, insulators, etc.) initially necessary for opening areas of the Cove up to the public and for other improvements to occur. This cleanup is an initial task, and as such, maintenance does not apply.
10 - This item is a one-time allocation of money spread over a five-year period.
11 - This line item shows the funding slated for educational and research projects. This funding is included in maintenance and monitoring costs for individual projects above.
12 - Cost of Derelict Vessel (Remediation and Removal) is not included in the total Initial Cost.

***The 20-yr package total estimates costs through the first 20 years of the project. MPA commits to continuing maintenance support in perpetuity, utilizing a pay-as-you-go third party fund.**

2.0 MITIGATION PROJECTS 1 AND 2 - TIDAL WETLAND CREATION & ENHANCEMENT – MASONVILLE COVE

2.1 TIDAL WETLAND CREATION AND ENHANCEMENT PROJECTS LOCATION

The proposed wetland creation and restoration projects are located in Masonville Cove in the Patapsco River (Figure 2-1). The blue hatchings in Figure 2-1 represent the areas proposed for wetland creation and enhancement.

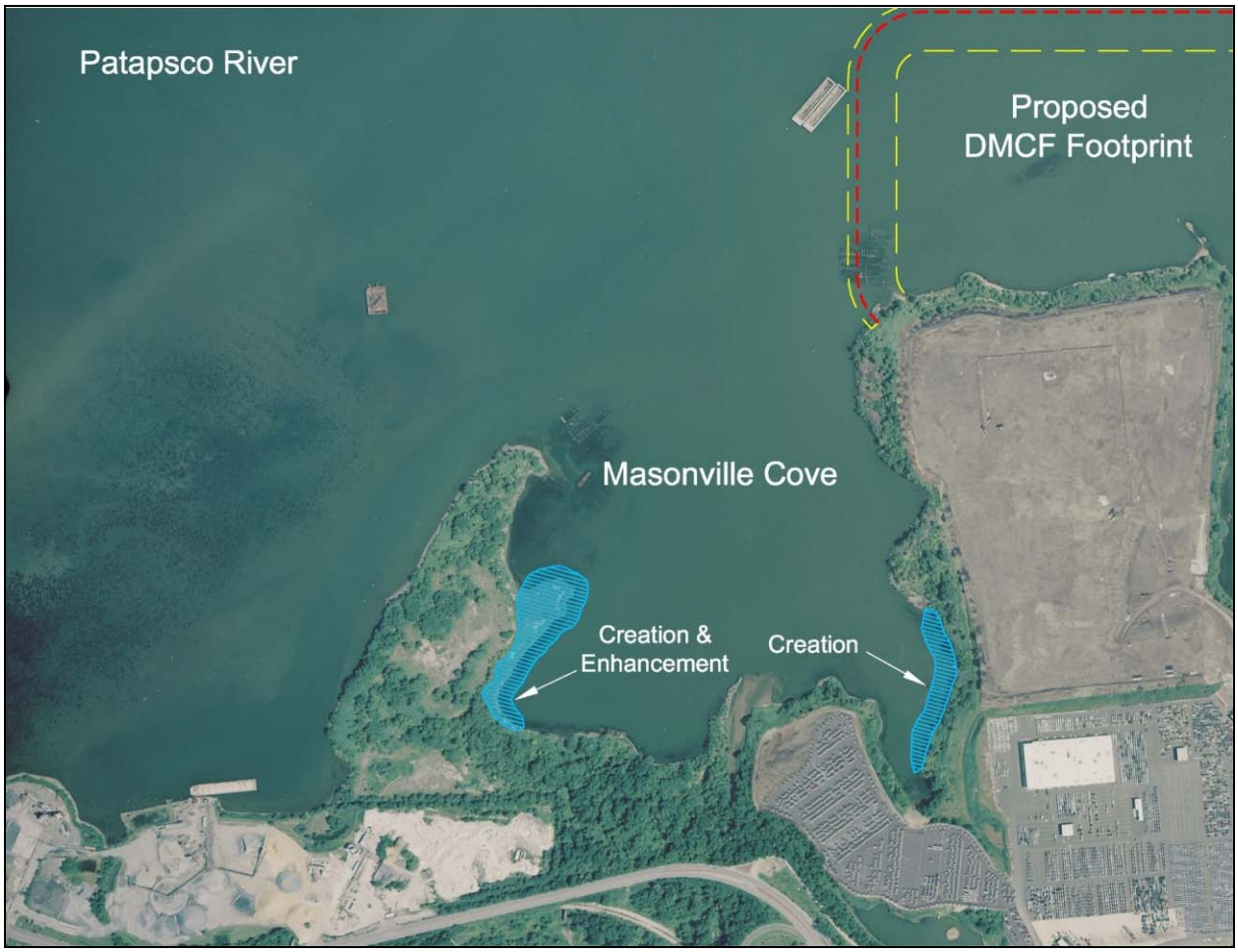

Figure 2-1 - Tidal Wetland Creation and Enhancement in Masonville Cove

2.2 MITIGATION PROJECTS 1 AND 2 DESCRIPTION

Existing Conditions – (Ownership: State of Maryland) **–** The creation projects on the east and west sides of Masonville Cove are located along the shoreline and in open water. The area that includes both creation and enhancement projects is located in existing tidal wetlands and open water. Existing condition studies found that the water within Masonville Cove provides refuge and forage opportunities for a variety of fish species including juvenile anadromous species, such as white perch (*Morone Americana*), striped bass (*Morone saxatilus*), yellow perch (*Perca flavescens*), and river herring (*Alosa pseudoharengus* and *Alosa aestivalis*), as well as forage species such as minnows, shiners, and silversides. The Cove also provides foraging and resting opportunities for many bird species. Waterfowl are common during the winter months and herons and egrets are common in

warmer months. Debris including tires, ceramic insulators, railroad ties, and trash is present in the shallow water and shoreline within the cove. The substrate consists primarily of fine grained material (silts and clays) with isolated sand pockets. The wetland area included in the enhancement project on the west side of the Cove is dominated by *Phragmites australis*.

2.3 PROPOSED ENHANCEMENT

Creation and Enhancement Project (Scope 5.1 acres) - The 1.5-acre creation portion of the creation and enhancement project would include placement of sand to appropriate elevation (+1 to 2 ft MLLW), construction of channels and inlets for hydrodynamic function, and planting of native vegetation. The 2-acre enhancement portion of the creation and enhancement project would include excavation for removal of *Phragmites*, placement of sand to appropriate elevation (+1 to 2 ft MLLW), construction of channels and inlets for hydrodynamic function, and the planting of native vegetation.

Eastern Creation Project – The 1.6-acre eastern creation project would include placement of sand to the appropriate elevation (+1 to 2 ft, MLLW), construction of channels and inlets for hydrodynamic function, and planting of native vegetation.

Benefits – The proposed project would improve substrate conditions and wetland habitat and would enhance of existing wetlands through the diversification of vegetation and improved tidal flushing. There would potentially be an increase in fish forage and refuge opportunities along the south shore of the Patapsco River, which is known to be an important anadromous fish nursery area within the River. The project would also enhance wading bird and waterfowl foraging opportunities.

Conceptual Cost Estimate – The estimated cost for the 1.6-acre eastern creation project is $248,000 or $155,000 per acre. The estimated cost for the 3.5-acre creation and enhancement project is $533,000 or $152,000 per acre. The total cost is estimated at $781,000 for 5.1 acres of improved habitat. So, the unit cost for the 5.1 acres is $153,000 per acre. The total acreage of wetland creation is 3.1 acres and the total acreage of wetland enhancement is 2.0 acres.

Maintenance and Monitoring

Wetland Enhancement - The 5-yr maintenance and monitoring costs are estimated at $9,000 per year, for a 5-yr total of $45,000. This cost is developed by scaling the Fort McHenry annual maintenance costs, and includes monitoring, quarterly clean-up events and invasive species control. Long-term maintenance costs taken as 50 percent of 5-year and start-up costs or $4,500 per year. This cost includes limited monitoring and regular clean-up events.

Wetland Creation - The 5-yr maintenance and monitoring costs are estimated at $13,500 per year, for a 5-yr total of $67,500. This cost is developed by scaling the Fort McHenry annual maintenance costs, and includes monitoring, quarterly clean-up events and invasive species control. Long-term maintenance costs taken as 50 percent of 5-year and start-up costs or $6,750 per year. This cost includes limited monitoring and regular clean-up events.

3.0 MITIGATION PROJECT 3 - NON-TIDAL WETLAND CREATION MASONVILLE COVE

3.1 NON-TIDAL WETLAND CREATION PROJECT LOCATION

The proposed non-tidal wetland creation and restoration project is located in Masonville Cove in the Patapsco River (Figure 3-1). The yellow hatching in Figure 3-1 represents the area proposed for non-tidal wetland creation.

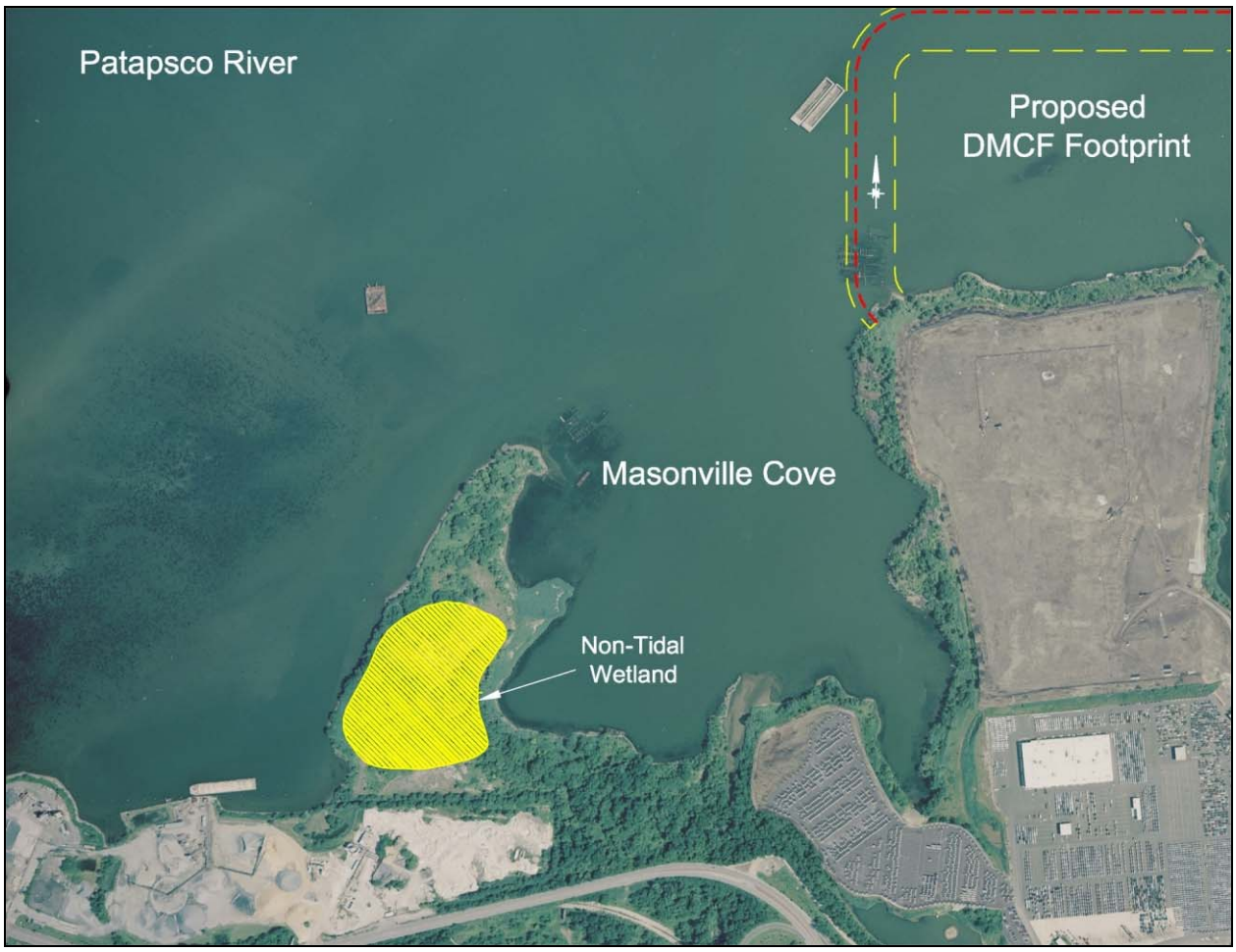

Figure 3-1. Non-Tidal Wetland Creation at Masonville

3.2 NON-TIDAL WETLAND CREATION PROJECT *DESCRIPTION*

Existing Conditions – (Ownership: State of Maryland) **–** The proposed project is located within the western peninsula that forms Masonville Cove. The area is currently upland with vegetation ranging from sparse groundcover to moderate coverage of small opportunistic trees and shrubs with marginal habitat value. Few bird or mammal species currently use this part of the site. The substrate is not well defined, but it is known that the area contains remnants from previous sand and gravel offloading operations. Some debris is present throughout the proposed project area.

Proposed Enhancement – (Scope: 10 Acres in Masonville Cove) – The 10-acre creation project would include excavation of existing material to achieve appropriate grades, construction of water level maintenance structures, and planting of native wetland vegetation. The species used for the wetlands planting would be consistent with those recommended by USFWS for wet and moist areas of the Maryland Coastal Plain. Plant species that have been successful in similar wetland creation projects include: switchgrass (*Panicum virgatum*), gamagrass (*Tripsacum dactyloides*), and herbaceous emergent species such as rose mallow (*Hibiscus moscheutos*) and rush species. Plants would be selected to be consistent with the other terrestrial habitat improvements proposed for the cove area to minimize the potential for invasive species and to accommodate an ecosystem-level restoration of the floodplain.

Benefits – Masonville Cove lies in the upper reach of the Patapsco River within the floodplain of the river. There is currently little wildlife utilization of this part of the site. Creation of non-tidal wetlands would enhance the existing area through diversification of vegetation and floodplain habitat. The wetlands would provide refuge and forage opportunities for freshwater fish species that are known to occur in the area, such as shiner and sunfish species. Non-tidal wetlands would also provide additional forage areas for wading and shorebirds and nesting opportunities for floodplain and wetland nesting waterfowl species. These functions are an improvement over the functions of most of the open water habitat within the proposed DMCF footprint which is too deep for wading or shorebird utilization, provides poor in-stream habitat for many fish species, and provides no nesting habitat. Creation of a freshwater wetland would have the addition benefit of providing a freshwater (drinking) source for birds and terrestrial wildlife in the area.

Cost Estimate – The estimated unit cost per acre of non-tidal wetland creation is $100,000. The total cost is estimated at $1,000,000 for 10 acres of improved habitat.

Maintenance and Monitoring – The 5-yr maintenance and monitoring costs are estimated at $15,000 per year, for a 5-yr total of $75,000. This cost is developed by scaling the Fort McHenry annual maintenance costs, and includes monitoring, minor clean-up events and invasive species control. Long-term maintenance costs taken as 50 percent of 5-year and start-up costs or $7,500 per year. This cost includes limited monitoring and regular clean-up events.

4.0 MITIGATION PROJECT 4A - REEF AND FISH HABITAT CREATION

4.1 REEF AND FISH HABITAT CREATION LOCATION

The proposed reef creation and substrate improvement are located in and adjacent to Masonville Cove in the Patapsco River (Figure 4-1). The green hatching in Figure 4-1 is a 100-acre area. It is proposed that reef and fish habitat will be created in 73 of the 100 acres.

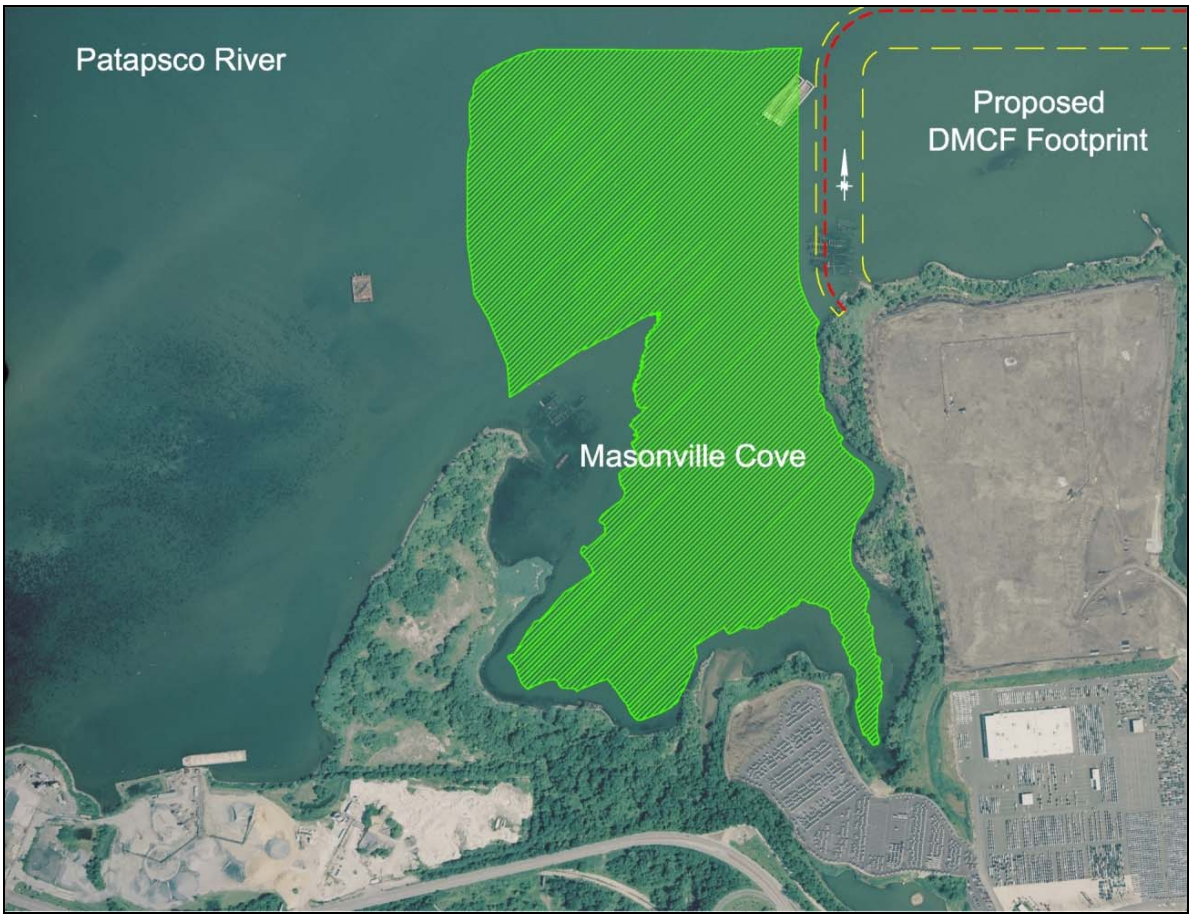

Figure 4-1 - Reef and Fish Habitat Creation in Masonville Cove

4.2 REEF AND FISH HABITAT CREATION PROJECT DESCRIPTION

Existing Conditions – (Ownership: State of Maryland) – Existing condition studies found that the waters within Masonville Cove provide refuge and forage opportunities for a variety of fish species including juvenile anadromous species, such as white perch (*Morone Americana*), striped bass (*Morone saxatilus*), yellow perch (*Perca flavescens*), and river herring (*Alosa pseudoharengus* and *Alosa aestivalis*), as well as forage species such as minnows, shiners, and silversides. This is expected of natural shoreline areas along the southern shore of the Patapsco River. However, habitat degradation due to water quality and excessive debris (e.g. tires, ceramic insulators, railroad ties, and trash) was apparent. The substrate consists primarily of fine grained material (silts and clays) with isolated sand pockets. The area labeled as outer cove has a marginal-to-poor benthic condition and low-to-average fish utilization for the Baltimore Harbor. The area labeled as inner cove contains some areas that are severely degraded. Fish utilization, based on seining studies, in the inner cove is

consistent with other area of the Baltimore Harbor. White perch and young striped bass dominated the open water collections in the proposed reef area outside the cove. The substrate consists primarily of fine grain material.

Proposed Enhancement – ***(Scope: 73 acres)*** – Prior to reef creation, debris removal would occur under Mitigation Project 14. Improvement of substrate would occur through spreading and creating underwater mounds of sand and gravel and placement of reef balls and rock piles. Also possible is the use of concrete rubble structures. The sand and gravel used to create the reef structures would come from an upland source approved for in-water placement.

Benefits – This project would improve substrate conditions, in-stream habitat, and vertical structure*. Substrate improvements would improve the benthic conditions, which would improve the forage opportunities for fish. Increase of in-stream three-dimensional structure would provide additional habitat for epibenthic colonization, cover for crabs, juvenile and small fish, and foraging sites for larger fish species. Many of the fish species known to utilize the cover are species that would benefit from the improved in-stream refugia. The hard vertical structure would provide substrate for encrusting bivalves such as platform mussels, which are known to occur within the cove, or oysters, which are found elsewhere in the Harbor. Once bivalve colonies establish themselves in the area, their filter feeding is expected to improve water clarity.

Cost Estimate – The estimated cost to improve 73 acres of substrate (nominal 1 ft thick sand layer with mounding) is approximately $1,533,000. The estimated cost to procure, transport, and place reef balls and other structure over the 73 acres is approximately $730,000. The total cost is $2,263,000. This results in a unit cost of $31,000 per acre.

Maintenance and Monitoring **–** The 5-yr maintenance and monitoring costs are estimated at $44,640 per year, for a 5-yr total of $223,200. This cost is based on a percentage of the initial construction cost

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* *A survey of available literature was conducted using the Web of Science. Searches included such keywords as "artificial reefs", "Reef Balls", "Chesapeake artificial reefs", and "estuary artificial reefs." The research included data on all types of artificial reefs, including oil rigs, sunken vessels, geotextile reefs, scrap tires, steel slag, and concrete reefs, from around the world. To select studies that may be relevant to assessing Reef Ball productivity in the Masonville Cove, issues inherent to estimating productivity changes in areas that contain Reef Balls versus those that do not were considered. The most significant issue stems from vast differences in latitude between the Chesapeake Bay region and the majority of the studies conducted. Outside of the Bay region, Reef Balls have generally been used to repair actual reef systems, and the bulk of monitoring data reflects vastly different communities. Monitoring often includes nearby areas of damaged or healthy reefs in areas of greatly different salinities and tropical/sub-tropical conditions. Temperate fouling communities are much different in terms of community structure and "productivity". However, a few monitoring studies that focus on an artificial reef in Delaware Bay that was created as mitigation for a dredged material disposal area were identified, and deemed the most appropriate in terms of general location (latitude).*

The Delaware Bay studies examined productivity of artificial reefs relative to lost productivity in areas that had been inundated with dredged material (Burton et al. 2002, Steimle et al. 2002). The results of this study indicate that that the artificial reef provides enhanced benthic secondary production per unit area (2,000–12,000 kcal/yr) over the lost habitat (177 kcal/yr). However, the overall reef installation was too small to completely mitigate for lost productivity. Steimle et al. (2002) compared the per area secondary productivity of the artificial reef to the per area productivity of nearby sand habitat. In this study, enhancement of productivity associated with the artificial reef varied annually, but the per area productivity of the reef epifaunal community was generally at least 20 times greater than the per area productivity of the nearby infaunal community.

Maryland Environmental Service and the MD Department of Natural Resources have installed Reef Balls to enhance/restore oyster productivity in various areas of the Chesapeake Bay. However, in terms of epibenthic habitat, many of the Reef Balls have been tremendously successful.

Studies directly applicable to the proposed installation of Reef Balls in Masonville Cove were not available. However, qualitative information on Reef Ball usage in the upper Chesapeake suggests that Reef Balls placed at Masonville Cove may be utilized by a variety of epibenthic species, including platform mussels. Additionally, studies of benthic secondary production from artificial reefs in the Delaware Bay suggest that installation of an adequate number of Reef Balls may result in secondary production from the reefs that is higher than that of the existing soft-bottom habitat.

annually and includes monitoring only. Long-term maintenance costs taken as 50 percent of 5-year and start-up costs or $22,320 per year. This cost includes limited monitoring.

5.0 MITIGATION PROJECT 4B - SHALLOW WATER SUBSTRATE IMPROVEMENT – MASONVILLE COVE

5.1 SHALLOW WATER SUBSTRATE IMPROVEMENT LOCATION

The proposed shallow water substrate improvement is located in and adjacent to Masonville Cove in the Patapsco River (Figure 5-1). The hatching in Figure 5-1 is the area of depth less than two meters that is considered Tier I/Tier II shallow water habitat (SWH). Approximately twenty-seven acres of area within the Cove or adjacent to the proposed DMCF would be of suitable depth, and the plan is to improve approximately 22 of the available acres. In addition to the 22 acres of improvement, SWH would be created over 0.8 acres within the Cove.

Figure 5-1 - Shallow Water Habitat at Masonville

5.2 SHALLOW WATER SUBSTRATE IMPROVEMENT PROJECT DESCRIPTION

Existing Conditions – (Ownership: State of Maryland) **–** SAV is sparse through out Baltimore Harbor. Existing conditions studies in Summer 2003 identified a very small patch of SAV in the southern part of Masonville Cove; the species was identified as the non-native Eurasian watermilfoil (*Myriophyllum spicatum*). The SAV patch had expanded significantly by the summer of 2004, comprising approximately half an acre of moderately dense growth. Spring and Summer 2006 SAV

surveys were be completed to assess the full extent of SAV in Masonville Cove and the proposed Masonville DMCF footprint. The June 2006 survey two species of SAV, one native [horned pondweed (*Zannichellia palustris*) and one non-native [Eurasian watermilfoil (*Myriophyllum spicatum*)] species. Horned pondweed was observed at 18 of the 109 locations surveyed within the Cove and Eurasian watermilfoil was found at 2 of the locations. No SAV was observed in Masonville Cove during the August 2006 survey. The complete results of this survey are available in Appendix B of the *Proposed Masonville DMCF Tiered FEIS* (EA 2006).

Existing condition studies found that the waters within Masonville Cove provide refuge and forage opportunities for a variety of fish species including juvenile anadromous species, such as white perch (*Morone Americana*), striped bass (*Morone saxatilus*), yellow perch (*Perca flavescens*), and river herring (*Alosa pseudoharengus and Alosa aestivalis*), as well as forage species such as minnows, shiners, and silversides. White perch and young striped bass dominated the open water collections in the area immediately outside the Cove. The substrate consists primarily of fine grain material with small pockets of sand and areas of embedded debris. Salinities ranged from two to seven ppt; turbidity was highly variable.

Proposed Enhancement – (Scope: 22 Acres of substrate improvement/creation and 0.8 acres SWH creation) Substrate would be improved by removing embedded debris and spreading of sand in a layer approximately seven inches thick. Sand would be obtained from an upland source approved for in-water placement. Shallow water habitat would be created in the Cove along the eastern shoreline by placing sand from the MLLW water line down to the Cove bottom at a 15:1 slope.

Benefits – Improved substrate should allow any existing plants or propagules within and adjacent to Masonville Cove to expand naturally. SAV provides cover for crabs, juvenile and small fish, and foraging sites for larger fish species. All of the fish species known to use the Cove and adjacent open water areas are species that would benefit from greater SAV occurrence within the Cove.

Challenges – The Maryland DNR SAV Restoration Targeting System output indicates that Masonville Cove may be unsuitable for SAV restoration, primarily because of poor light penetration. The reef improvements within the Cove should provide hard vertical substrate for encrusting bivalves such as platform mussels, which are known to occur within the Cove, or oysters, which are being established elsewhere in the Baltimore Harbor. Once bivalve colonies establish themselves in the area, their filter feeding is expected to improve water clarity.

Cost Estimate – It was assumed that 1,000 cubic yards of sand would be required per acre ($20,000 per acre) to achieve approximately seven inches of surface coverage. The total cost for substrate improvements to 22 acres would be $440,000. The $440,000 includes the creation and enhancement of the area along the DMCF. The cost for the 0.8 acres of creation in the Cove is an additional $112,000. The total cost estimate for this project is $552,000. No clean up costs are included in this estimate.

Maintenance and Monitoring – The 5-yr maintenance and monitoring costs are estimated at $14,800 per year, for a 5-yr total of $111,000. This cost is based on a percentage of the initial construction cost and includes monitoring only. Long-term maintenance costs taken as 50 percent of 5-year and start-up costs or $7,400 per year. This cost includes limited monitoring.

6.0 MITIGATION PROJECT 5 - FRINGE MARSH CREATION IN MASONVILLE COVE AND ALONG DMCF DIKE

6.1 FRINGE MARSH CREATION PROJECT LOCATION

The proposed fringe marsh is located along the western dike of the proposed Masonville DMCF project (Figure 6-1). The blue hatching in Figure 6-1 represents the area proposed for fringe marsh creation.

Figure 6. Fringe Marsh Creation along DMCF Dike

6.2 FRINGE MARSH CREATION PROJECT DESCRIPTION

Existing Conditions – (Ownership: State of Maryland) – Existing condition studies found that there is minimal fringe marsh habitat in the area of Masonville Cove. Existing fringe marsh habitat is degraded due to poor water quality and excessive debris (e.g. trash and tires). Surficial sediment samples from Masonville Cove exceed the Upper Bay Channel averages for several metals, PAHs, PCBs, and dioxins. Existing condition studies found that the waters within Masonville Cove provide refuge and forage opportunities for a variety of fish species including juvenile anadromous species, such as white perch (*Morone Americana*), striped bass (*Morone saxatilus*), yellow perch (*Perca*

flavescens), and river herring (*Alosa pseudoharengus* and *Alosa aestivalis*), as well as forage species such as minnows, shiners, and silversides. Forage opportunities are limited by the degraded benthic habitat and benthic community in some portions of the Cove. The Cove also provides foraging and resting opportunities for many bird species. Although waterfowl and wading birds are seasonally common, few shorebird species were encountered in seasonal observations.

Proposed Enhancement – (Scope: 2 acres along the DMCF) Improvement of habitat through placement of sand material to create a fringe marsh with a 20 ft wide berm at elevation +1 ft MLLW and a slope into the water at 15:1 until elevation –2 ft MLLW. The berm would be planted with *Spartina patens*, the slope would be planted with *Spartina alterniflora* where appropriate, and the DMCF dike slope above the berm would be planted with saltbush community vegetation. The fringe marsh would have a length of about 1,230 ft along the DMCF dike.

Benefits – The project would improve substrate conditions, increase fringe marsh habitat, and create Tier I shallow water habitat. Substrate enhancements, including the removal of trash and burial of contaminated sediments, would improve benthic conditions. Improvement of benthic conditions may lead to higher densities of benthic organisms and/or greater diversity of benthic species. An improved benthic community combined with substrate enhancements would improve fish foraging opportunities, which would benefit many of the fish species known to utilize Masonville Cove.

Improving the shore conditions and creating Tier I habitat would provide better habitat for SAV expansion and provide wading and shorebird foraging opportunities. Shorebird habitat, in particular, is currently lacking in the Cove.

Cost Estimate – The estimated costs to perform fringe marsh creation (including $60,000 for planting) along the dike are $189,000.

Maintenance and Monitoring **–** The 5-yr maintenance and monitoring costs are estimated at $22,500 per year, for a 5-yr total of $112,500. This cost is developed by scaling the Fort McHenry annual maintenance costs, and includes monitoring, quarterly clean-up events and invasive species control. Long-term maintenance costs taken as 50 percent of 5-year and start-up costs or $11,250 per year. This cost includes limited monitoring and regular clean-up events.

7.0 MITIGATION PROJECT 6 -AMERICAN EEL PASSAGE

7.1 AMERICAN EEL PASSAGE LOCATION

The proposed American eel passages would be installed at Bloede Dam, Simpkins Industry Dam and Daniels Dam on the main-stem of the Patapsco River (Figure 7-1).

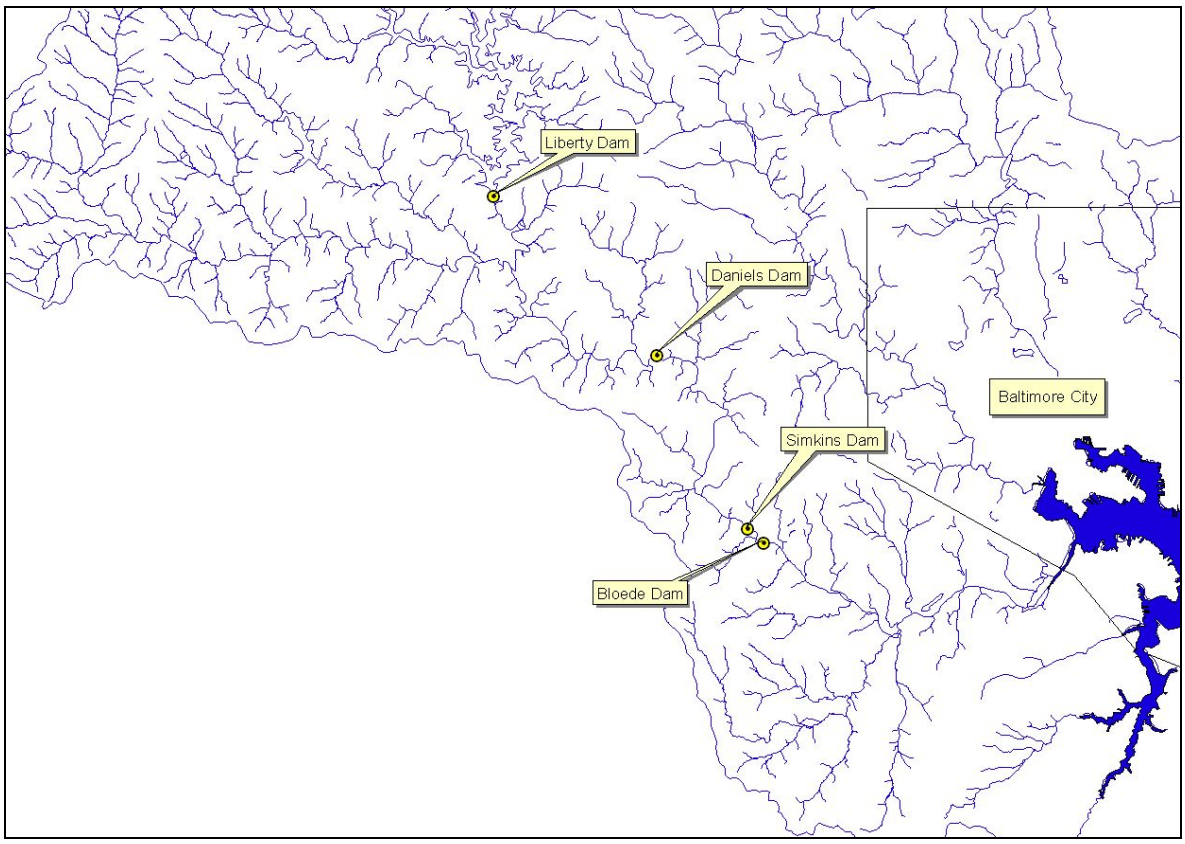

Figure 7-1 - Map of Patapsco River Dams

7.2 AMERICAN EEL PASSAGE DESCRIPTION

Existing Conditions - The American eel (*Anguilla rostrata*) occupies a significant and unique niche in the estuarine and freshwater habitats of the Atlantic coast. Eels ascend freshwater environments as juveniles. These fish reside in riverine habitats until reaching maturity, at which time they migrate to the Sargasso Sea, where they spawn once and die. Larval eels are transported by ocean currents to rivers along the eastern seaboard of the continent. Historically, American eels were very abundant in East Coast streams, comprising more than 25 percent of the total fish biomass in many locations. This abundance had declined from historic levels but remained relatively stable until the 1970s. Eel densities in surveyed tributaries have decreased since the 1980's and continue to decline. On July 6, 2005, the U.S. Fish and Wildlife Service (USFWS) decided to review the American eel for possible listing on the endangered species list. Bloede dam is the first blockage on the Patapsco River that prevents American eel from accessing the nearly 300 square miles of watershed above the dam. Data collected by the Maryland Biological Stream Survey (MBSS) reveal that Bloede dam is a significant barrier to eel migration (Figure 7-2). Fish passage was constructed at the dam in 1991 but was designed for shad and herring and is ineffective for eel passage. Simkins Dam and Daniels Dam

located 0.5 and 7 miles upstream of Bloede Dam also prevent American eel from reaching upstream habitat. Work at Daniels Dam assumes the removal of or the existence of an effective eel passage at Union Dam.

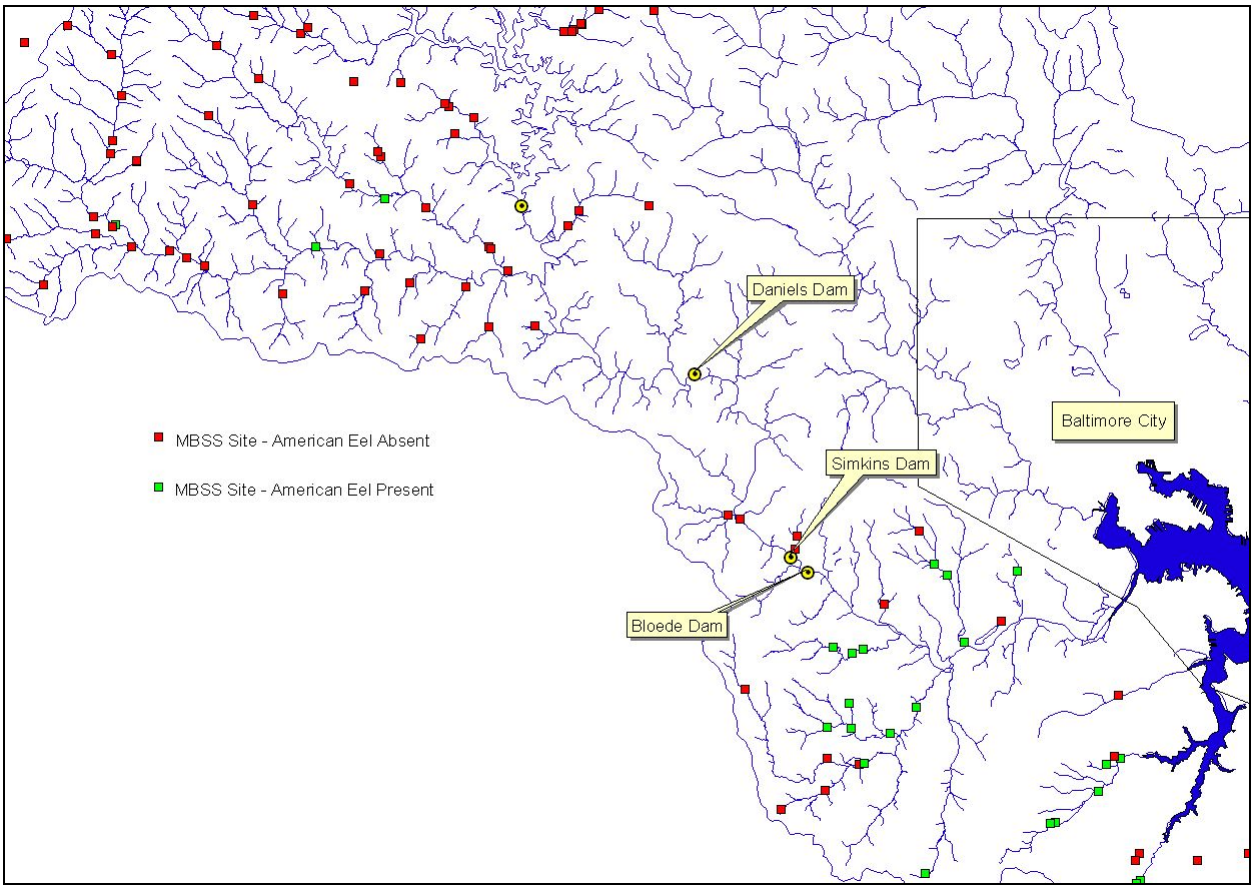

Figure 7-2 - Presence and Absence of American Eel in MBSS Patapsco River Survey

Proposed Enhancement - Specialized passage designed to accommodate eels is proposed for all three dams.

Benefits - Eel passage facilities constructed on three dams on the Patapsco River would allow eels to continue their migration upstream and would reopen a significant amount of habitat.

Monitoring – The Maryland Department of Natural Resources (DNR), the USFWS, and the National Marine Fisheries Service (NMFS) recommends monitoring the Patapsco eel ladders for a period of 5 years.

Objectives of the study:

1. Determine the extent of successful passage at each of the eel ladders
2. Determine periods of peak eel migration
3. Determine the variables that influence eel migration
4. Determine whether or not there is successful utilization of upstream habitat by the American eel

5. Determine and document migration rates between eel ladders.

The Maryland DNR would install PIT readers at all three eel ladders. At the first ladder on Bloede Dam, DNR would capture all eels passed at the ladder by securing a capture device on the upstream end of the ladder. All eels would be measured to the nearest millimeter, eels greater then 200mm would have a PIT tag inserted in the abdominal cavity and be released upstream. A sub sample of eels would be taken back to the lab where they would be weighed and sacrificed for age and sex determination and to document swimbladder parasite (*Anguillicola crassu*s) infestation rates. Eels migrating upstream would be counted as they pass by the PIT readers at the upstream ladders. In addition, random sampling with electrofishing by DNR and MBSS staff would track eel migrations throughout the watershed.

First year monitoring would occur a minimum of 1 to 2 times per week during appropriate times of the year depending on the strength of the eel migration and environmental conditions. Sampling would begin in May and extend through the fall. This preliminary sampling would determine when eels are most likely to migrate and which variables most influence eel migration.

Sampling during years 2 to 5 would seek to document successful habitat utilization in the upper Patapsco watershed. DNR staff would continue to monitor the eel ladders with PIT readers and collection devices and monitor growth rates of recaptured eels. Sampling by DNR and MBSS in the upper Patapsco watershed would document changes in American eel densities upstream of the ladders.

Cost Estimate - An eel passage was constructed at the Millville Dam on the Shenandoah River in 2003. Based on that project, eel passage could be completed for approximately $116,000 per dam. The MPA is currently proposing funding for three main-stem dams on the Patapsco River. The total proposed funding is $420,000.

Table 7-1 - Eel Passage Cost Estimate Details

Eel Passage Construction

Item	Design	Construction	Total
Bloede	$30,000	$150,000	$180,000
Simkins	$20,000	$100,000	$120,000
Daniels	$20,000	$100,000	$120,000
		Eel Passage Total	**$420,000**

Maintenance and Monitoring – The 5-yr maintenance and monitoring costs are estimated at $32,000 per year, for a 5-yr total of $160,000. This cost is developed by DNR and is broken down in Table 7-2. Long-term maintenance costs taken as 50 percent of 5-year and start-up costs or $16,000 per year.

Table 7-2 - Eel Passage Monitoring Cost Estimate Details[1]

Monitoring

Item	Cost	Total
Backpack Shocker (1)	$9,000	$9,000
PIT Reader (3, one @ each dam)	$3,500	$10,500
PIT Tags (1,000 each year)	$5,000	$25,000
Batteries, Cables, Power Supplies, Etc.	$500/yr.	$2,500
6 Month Seasonal Intern	$20,000/yr.	$100,000
Nets, Waders, Misc. Sampling Equipment	$1,800/yr.	$9,000
Present findings at National AFS	$4,000	$4,000
	Monitoring Total	**$160,000**

[1] The costs and project line items presented in this table may or may not be cost shareable should a cost share agreement between the MPA and USACE, Baltimore District be pursued.

8.0 MITIGATION PROJECT 7 – SHAD AND HERRING RESTORATION

8.1 SHAD AND HERRING RESTORATION LOCATION

The proposed anadromous species restoration would be conducted on the main-stem of the Patapsco River from Ellicott City, approximately two miles above Simkins Dam down to the mouth of the River (Figure 8-1).

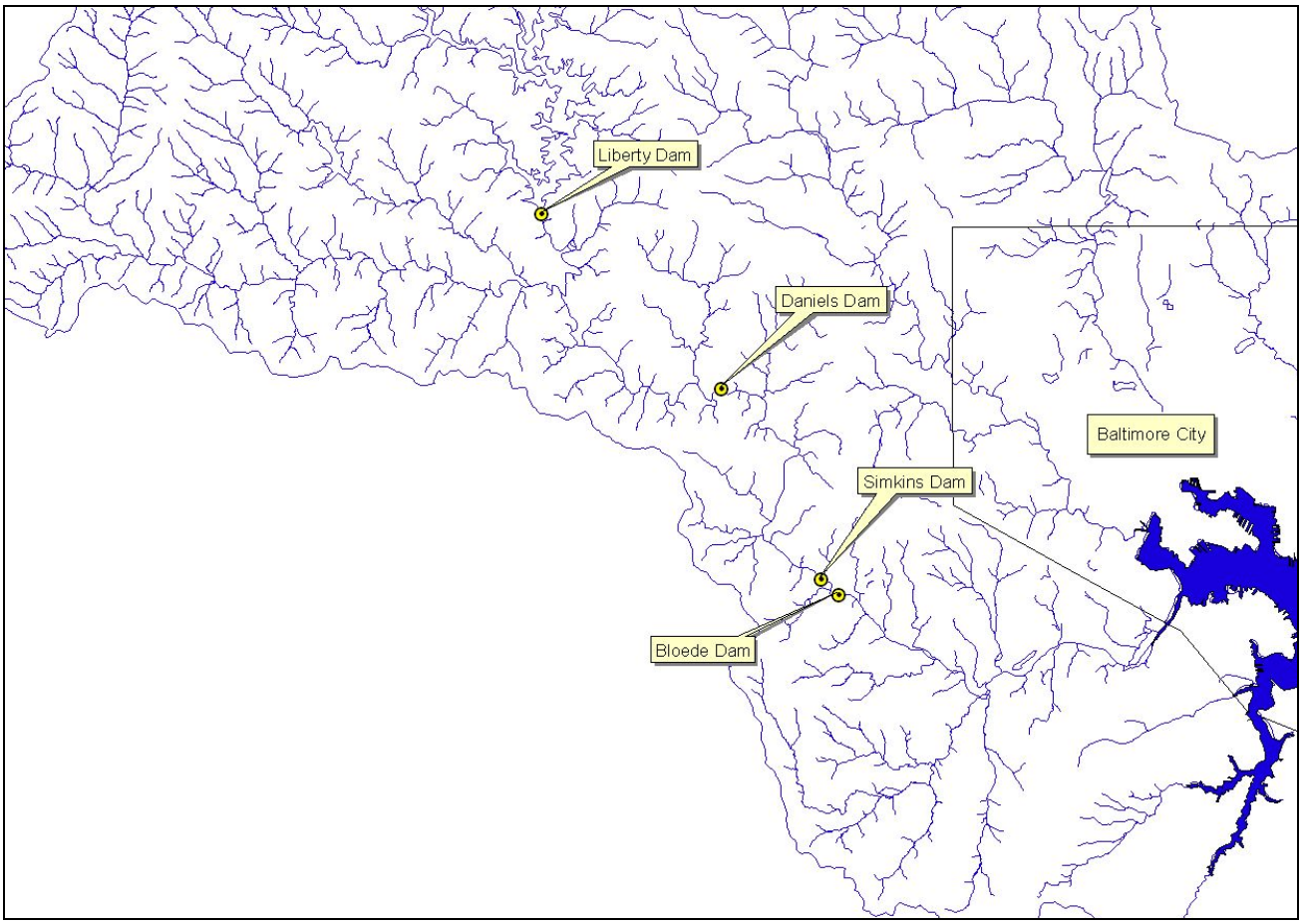

Figure 8-1 - Map of Patapsco River Dams

8.2 SHAD AND HERRING RESTORATION DESCRIPTION

***Existing Conditions* –** American shad (*Alosa sapidissima*), hickory shad (*Alosa mediocris*), blueback herring (*Alosa aestivalis*) and alewife (*Alosa pseudoharengus*) are anadromous species that historically occurred in all tributaries of Maryland's Chesapeake Bay. These migratory species live most of their life in marine environments and return to tidal freshwater habitat to spawn. Most shad and herring species are assumed to return to spawn in their natal tributaries.

American shad was once the most important commercial and recreational fish species in the Chesapeake Bay. In response to severe population declines from 1900 to the 1970s, Maryland closed its fishery in 1980. Severely depressed or extirpated native adult stocks do not presently use most

Chesapeake Bay tributaries, including the Patapsco River. Improvements in water quality, fishing moratoria and removal of many stream blockages have reopened potential shad spawning habitat. Because of their spawning characteristics, self-sustaining shad populations are not likely to return to tributaries without hatchery inputs.

Hickory shad experienced declining populations similar to American shad. A Maryland fishing moratorium was placed on hickory shad in 1981. The Upper Bay has a robust spawning population of hickory shad but it has not expanded to include lower Bay tributaries. Based on previous experience with hickory shad restoration in other tributaries, hatchery inputs could reintroduce a self-sustaining spawning population to the Patapsco River.

Blueback herring and alewife (these species are often referred to as river herring) historically occurred in the Patapsco River. They are an important resource in the Bay ecosystem and provide forage for predators such as rockfish. Fish passage construction at Bloede Dam and Simkins Dam has opened significant potential herring spawning habitat. Stocking hatchery-cultured river herring could reintroduce spawning populations to Patapsco River.

Proposed Enhancement

A) Produce, mark and stock cultured American shad, hickory shad and river herring in Patapsco River. River herring would be stocked as larvae and shad species would be stocked as larvae and juveniles. All stocked fish would receive a mark that would positively identify a fish as hatchery origin.

B) Monitor the abundance and mortality of larval and juvenile shad and herring using marked hatchery-produced fish.

C) Estimate the contribution of hatchery fish to the adult spawning population and monitor recovery of naturally produced stocks.

Benefits – Hatchery inputs are intended to provide adult spawners that would produce self-sustaining populations in the target tributary. Restoring shad stocks to tributaries that historically supported runs would increase fishing opportunities for anglers. Restoration of these species through hatchery stocking would fill an important niche in the Chesapeake Bay ecosystem.

Cost Estimate – The budget includes a one-time expense for hatchery upgrades and three years of culture, stocking and monitoring costs. Repairs and upgrades to Manning and Cedarville fish hatcheries (pond lining, valve repairs) are estimated to be $300,000. Culture costs are estimated at $50,000 per year. Three years of culturing are recommended. The total cost for fish stocking efforts is estimated to be $450,000.

Maintenance and Monitoring – Monitoring and assessment costs are estimated at $100,000 per year. Five years of monitoring would be performed to assess herring and hickory shad adults, bringing the 5-yr monitoring total to $500,000.

9.0 MITIGATION PROJECTS 8 & 11 – TRASH INTERCEPTORS MIDDLE BRANCH OF THE PATAPSCO

9.1 TRASH INTERCEPTORS LOCATION

The proposed trash interceptors are located in the northern portion of the Middle Branch of the Patapsco River (Figure 9-1).

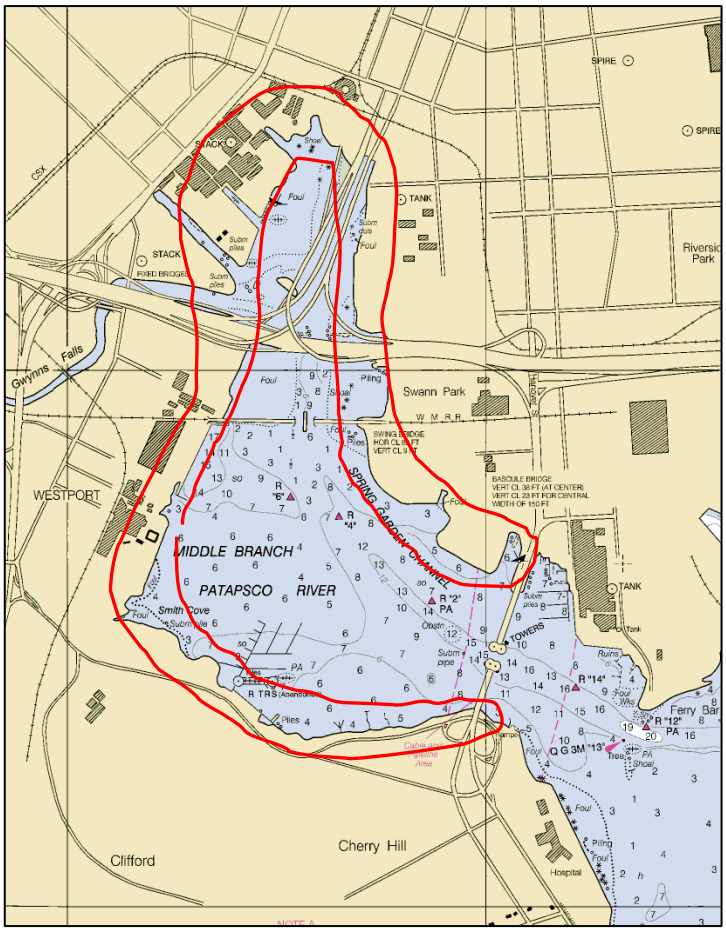

Figure 9-1 - Potential Trash Interceptor Location

9.2 TRASH INTERCEPTOR DESCRIPTION

Existing Conditions – (Ownership: Baltimore City) – Storm drain outfalls in Baltimore City carry large quantities of trash and debris into the Patapsco River and its tributaries. There are 15 outfalls located in the Middle Branch of the Patapsco. Of the 15 outfalls, five are north of the I-95 and I-395 intersection. Currently, there are few trash collection devices on outfalls in the Patapsco and none within the Middle Branch.

Proposed Enhancement – The project would include construction of a trash interceptor at one or more outfalls in the Middle Branch. The trash interceptors would consist of a netting system to catch trash and debris prior to it entering the Middle Branch. The interceptors would be emptied every two weeks and after major events. The trash would be disposed of as municipal waste.

Benefits – The interceptors would remove the trash from the outfalls in the Middle Branch of the Patapsco. Removal of debris and trash increases survivability of wetlands in the watershed, reduces future buildup of debris along shorelines, and provides aesthetic benefits to the community.

Cost Estimate – The estimated costs for trash interceptors in the Middle Branch range from $300,000 to $1,000,000. Costs vary based on the size of the outfall and the structure required to construct the interceptor. The MPA estimates that five trash interceptors would be constructed at $500,000.

Maintenance and Monitoring – The MPA would pay for $83,000 of maintenance costs for the five trash interceptors for five years. This cost is based on similar projects and assuming $1,000 per cleaning per interceptor. Following the 5th year, MPA would turn the maintenance of the bags and trash removal over to the City. The MPA would continue to maintain the physical structures in perpetuity. The long-term structural maintenance is conservatively estimated at 2 percent of the initial construction cost annually, or a total of $50,000 annually.

10.0 MITIGATION PROJECTS 9 AND 10 - STREAM RESTORATION - BIDDISON RUN

10.1 STREAM RESTORATION BIDDISON RUN LOCATION

The proposed stream restoration is for Biddison Run (Reaches O & P as described in the report referenced below), which is identified as needing significant restoration in the City's *Herring Run Watershed Stream Assessment and Restoration Concept Plan*[1] report. Figure 10-1 shows the location of Biddison Run.

Figure 10-1 – Location of Biddison Run

[1] *Herring Run Watershed Stream Assessment and Restoration Concept Plan Final Report*, Prepared for City of Baltimore, by A Morton Thomas & Associates, Inc. and Biohabitats, Inc., July 2004.

10.2 BIDDISON RUN DESCRIPTION

Existing Conditions – (Ownership: Baltimore City) – Biddison Run has a multitude of issues. These include eroding banks, suspected sewage leaks, invasive riparian species, fish barriers, and trash, and are described in detail in the City's report.

Proposed Enhancement **–** The proposed enhancements include bank stabilization, channel realignment, repair of sanitary lines, removal of fish barriers, riparian forest buffer replanting, trash removal, etc., and are described in detail in the City's report.

Benefits – The benefits to the projects include reduction in erosion of stream banks and thus sediment load to the watershed and are described in detail in the City's report.

Cost Estimate – Appendix I of the City's report contains the table labeled "Preliminary Construction Cost Estimate." This table lists the cost for Biddison Run Reach O as $809,061 (2006 dollars) and the cost for Biddison Run Reach P as $1,046,294 (2006 dollars). Rukert Terminals Corporation has already contributed $348,000 towards the Biddison Run restoration. Thus, the MPA's proposed payment for Biddison Run restoration is $809,061 - $348,000 + $1,046,294 = $1,507,355.

Maintenance and Monitoring – Maintenance and monitoring costs are not included in the plan for the City's stream restoration projects. The MPA proposes that Baltimore City retain responsibility for project maintenance and monitoring.

11.0 MITIGATION PROJECT 12 STREAM RESTORATION – WESTERN RUN

11.1 WESTERN RUN LOCATION

The proposed stream restoration includes three reaches identified in the City's *Western Run Stream Assessment*[2] report. Figure 11-1 shows the location of Western Run. The stream generally runs next to Kelly Ave.

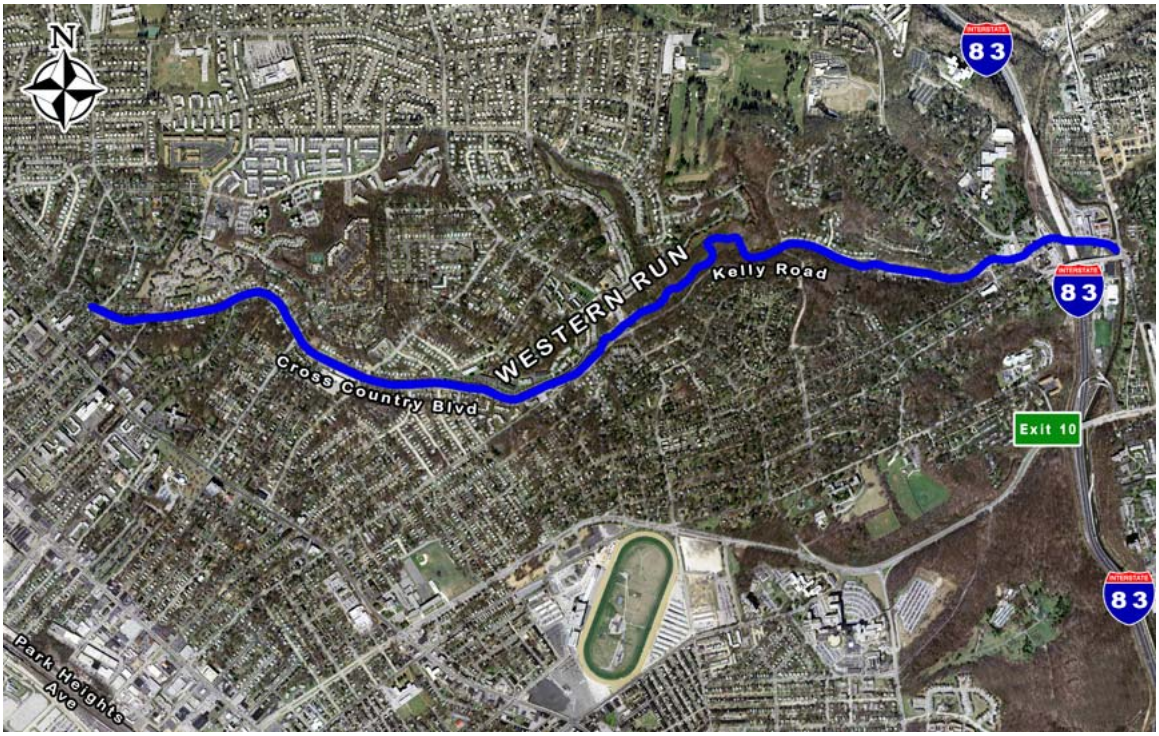

Figure 11-1 Location of Western Run (©2005 Google Earth Pro)

11.2 WESTERN RUN PROJECT SELECTION

Table 21 of the City's report, which is reproduced in Table 11-1 below, provides the cost-benefit ratios of 11 projects for the following three ranking categories; Geomorphic, Habitat, and Infrastructure. The City's report identified six of the eleven as having relatively low cost to benefit ratios. The shading in the table identifies these six projects.

[2] *Western Run Stream Assessment*, Prepared for Baltimore City Department of Public Works, by Greenman-Pedersen Inc. and Parsons Brinckerhoff, August 2004.

Table 11-1 - Table 21 from City's Report

Reach	Geomorphic Score	Geomorphic Cost Benefit Ratio (Cost/Score)	Reach	Habitat Score	Habitat Cost Benefit Ratio (Cost/Score)	Reach	Infrastructure Score	Infrastructure Cost Benefit Ratio (Cost/Score)
WR-00-00-11	117	$778	*WR-00-00-07*	162	$951	WR-00-00-21	36	$1,806
WR-00-00-21	72	$903	WR-00-00-21	117	$556	*WR-00-00-07*	18	$8,556
WR-00-00-14	108	$1,120	*WR-00-00-14*	135	$896	*WR-05-00-07*	39	$8,139
WR-00-00-07	72	$2,139	WR-00-00-11	99	$919	WR-00-00-11	9	$10,111
WR-05-00-07	135	$2,170	*WR-05-00-04*	117	$2,915	*WR-05-00-04*	27	$12,630
WR-05-00-04	144	$2,368	*WR-05-00-07*	90	$3,256	*WR-00-00-14*	9	$13,444
WR-00-00-12	207	$2,502	WR-00-00-12	144	$3,597	WR-02-00-02	12	$23,417
WR-02-00-02	108	$2,602	WR-04-00-02	126	$3,817	WR-00-00-12	18	$28,778
WR-02-00-01	90	$2,644	WR-02-00-01	48	$4,958	WR-04-00-02	9	$53,444
WR-04-00-02	117	$4,111	WR-02-00-02	30	$9,367	WR-00-00-05	18	$31,500
WR-00-00-05	153	$3,706	WR-00-00-05	126	$4,500	WR-02-00-01	0	No Benefit

MPA proposes to add the six shaded projects to the mitigation plan, based on the report findings presented in the above table.

11.3 WESTERN RUN DESCRIPTION

Existing Conditions – (Ownership: Baltimore City) – The three reaches have a multitude of issues. These include eroding banks and exposed sewer lines, and are described in detail in the City's report.

Proposed Enhancement – The proposed enhancements include bank stabilization, sewer leak investigations, and rock vane installation and are described in detail in the City's report.

Benefits – The benefits to the projects include reduction in erosion of stream banks and thus sediment load to the watershed and are described in detail in the City's report.

Cost Estimate – Table 11-2 presents the cost of the six selected projects in 2006 dollars, as reported in Table 20 of the City's report.

Table 11-2 - Cost of Selected Western Run Mitigation Projects

Reach	Cost (2006 $)
WR-00-00-07	$164,969
WR-00-00-11	$97,481
WR-00-00-14	$129,618
WR-00-00-21	$69,630
WR-05-00-04	$365,288
WR-05-00-07	$313,869
Total Cost	**$1,140,855**

Thus, the total cost of the selected Western Run stream restoration projects included in the proposed mitigation plan is $1,140,855.

Maintenance and Monitoring – Maintenance and monitoring costs are not included in the plan for the City's stream restoration projects. The MPA proposes that Baltimore City retain responsibility for project maintenance and monitoring.

12.0 MITIGATION PROJECT 13 – WATER QUALITY MONITORING AND HABITAT ASSESSMENT – MASONVILLE COVE

12.1 WATER QUALITY MONITORING STATIONS LOCATION

A water quality monitoring stations would be placed in the Patapsco River near Masonville Cove (Figure 12-1).

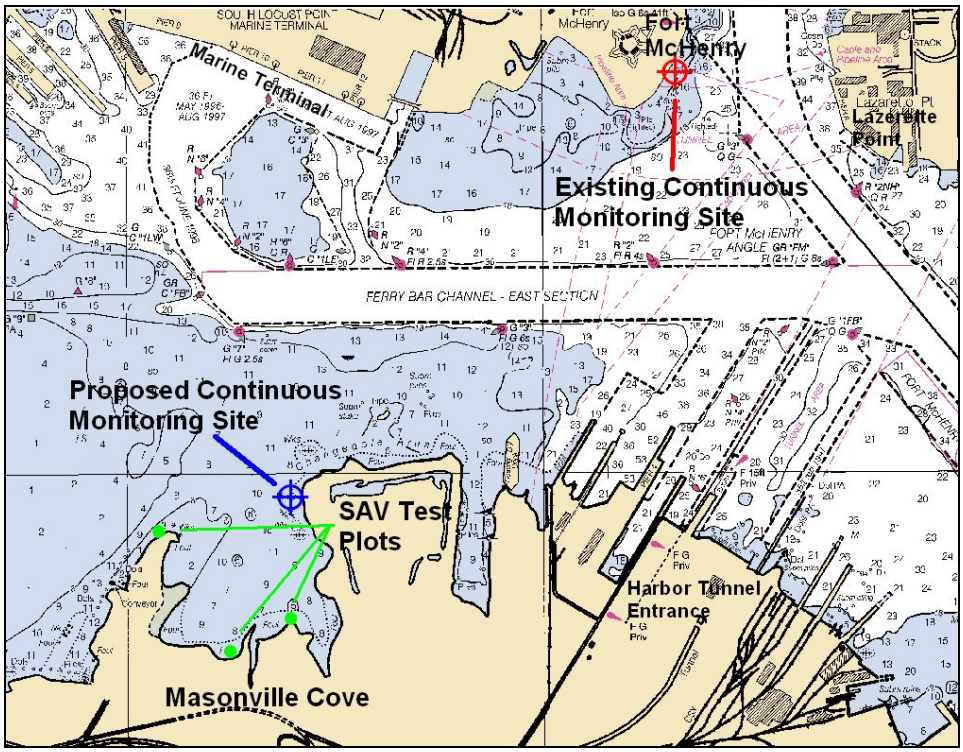

Figure 12-1 - Locations of Existing and Proposed Continuous Monitors

12.2 WATER QUALITY MONITORING STATIONS & HABITAT ASSESSMENT DESCRIPTION

Existing Conditions – The Maryland Department of Natural Resources (DNR) evaluates estuarine habitat conditions (a full suite of water quality chemical and physical parameters) throughout the Chesapeake Bay for a variety of purposes, including suitability of the habitat for living resources [fish, submerged aquatic vegetation (SAV), etc], identification of problem areas, tracking of restoration progress, and attainment of water quality criteria for regulatory purposes. Sites for assessing these conditions on the Patapsco River currently consist of one long-term site near the Key Bridge and a recently added continuous monitoring site at Fort McHenry (Figure 12-1). These two sites are adequate for evaluating conditions on a Chesapeake Bay-wide scale, but not for evaluating conditions on local scales such as the Masonville Cove project. Also, suitability for SAV restoration is unknown in Masonville Cove with existing data.

Proposed Enhancement – The Maryland DNR proposes adding two assessment components to the area. First, a new continuous monitoring site would be added within Masonville Cove (Figure 12). This site would monitor six key habitat components within the Cove every 15 minutes from April to October. Results would be telemetered in real-time to the DNR website and viewable on-line at

www.eyesonthebay.net. Key nutrients would be collected at Masonville Cove as the continuous monitoring instrument is serviced (every two weeks at each site using the same protocols as established by Maryland DNR Chesapeake Bay-Wide Shallow Water Monitoring Program). The Maryland DNR would provide annual reports on results of the assessments. Real-time continuous monitoring results would be viewable from a kiosk at the Masonville Education Center. Example of Continuous Monitoring Data:
http://mddnr.chesapeakebay.net/newmontech/contmon/eotb_results_graphs.cfm?station=mchenry

Second, the Maryland DNR would install SAV test plots as called for in the Chesapeake Bay Program's SAV Restoration Strategy and monitor them for two years. A final report would discuss results from the continuous monitoring and SAV test plots and assess specific locations and feasibility of large-scale restoration.

Benefits – The proposed assessments would provide several critical functions. First, they are an essential component of targeting and implementing SAV restoration projects. Second, they are the means by which we track progress of restoration projects. Third, they are the means by which Maryland would be assessing attainment of the new Chesapeake Bay water quality criteria recently agreed to by the USEPA. Finally, they serve as an important education and outreach tool to the public.

Cost Estimate – The table below was provided by the Maryland DNR. The table shows that the initial cost of this project is $96,000. The Maryland DNR noted that monitoring of the nature indicated by the "Year 2 And Following" column is necessary for a minimum of three years.

Table 12-1 – Water Quality Monitoring Cost Estimate (Maryland DNR)

	Year 1	**Year 2 And Following**
Equipment (2 YSI 6600 EDS with telemetry):	$28,000	
Supplies	$1,500	$1,500
Travel	$1,500	$1,500
SAV test plots	$4,000	
Nutrient analysis and calibration costs	$6,000	$6,000
Kiosk	$15,000	
Staff Time (one FTE per year)	$40,000	$40,000
TOTAL	**$96,000**	**$49,000**

Maintenance and Monitoring – The annual monitoring costs are $49,000, as indicated in Table 12-1. This is assumed to be the monitoring cost into perpetuity.

13.0 MITIGATION PROJECT 14 – LANDSIDE AND IN-WATER CLEANUP

13.1 LANDSIDE AND IN-WATER LOCATION

Location – The proposed landside cleanup areas is located within the terrestrial area and along the shores of the in-water portions of Masonville Cove. The landside cleanup area would include any portion of the area shown as hatched in Figure 13-1. The amount of money available for the cleanup would dictate the portion of the highlighted area that would undergo cleanup.

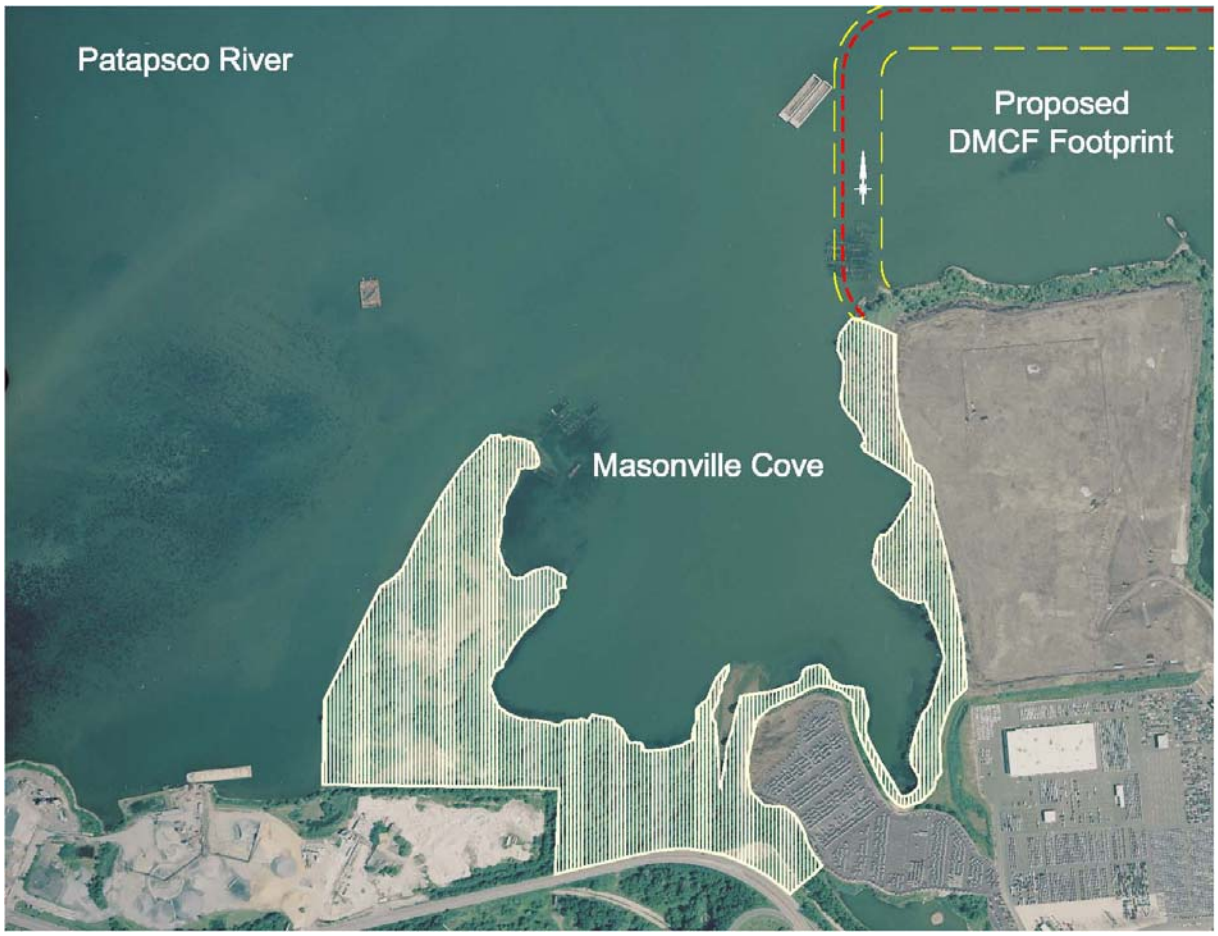

Figure 13-1 - Landside and In-water Cleanup at Masonville

13.2 LANDSIDE AND WATER DESCRIPTION

Existing Conditions – (Ownership: State of Maryland) – The landside area is debris ridden. Examples of debris include concrete pipe, wood based debris (railroad ties, telephone poles, timbers), scrap metal, tires, ceramic insulators, trash and other materials. Sampling of onsite soil and debris is being performed to characterize existing concentrations of contaminants of potential concern. The in-water areas have insulators, tires, trash and other debris.

Proposed Enhancement – A site specific human health risk assessment is proposed to evaluate the risk to park visitors, which will prioritize areas for debris and/or soil removal or remediation. Both the

landside and in-water cleanups will be cleaned as necessary to facilitate the other landside and in-water mitigation projects.

They will also include removal of contaminated materials and the use of institutional engineering/environmental controls to protect human health and the environment. The water would be cleaned up as necessary for the in-water mitigation projects to occur.

Benefits – The landside enhancements would prepare the area for use as a recreational park, providing the community with access to a safe and aesthetically pleasing natural area. The in-water enhancements would promote success of the in-water projects proposed in this mitigation plan.

Cost Estimate – The costs for landside and in-water cleanup cannot yet be estimated, as site investigations are underway. MPA currently has $2,500,000 allocated for this cleanup.

Maintenance and Monitoring – This item refers to the one-time cost for removal of debris and/or soil and capping of contaminated soils to complete other proposed Mitigation projects within the Cove and to allow public access to the area. Maintenance of these areas is included in the costs by specific area or mitigation project.

14.0 MITIGATION PROJECT 15 - TERRESTRIAL HABITAT ENHANCEMENT & DIVERSIFICATION – MASONVILLE COVE

14.1 TERRESTRIAL HABITAT LOCATION

The proposed terrestrial habitat enhancements would occur along the shoreline and adjacent areas of the land side of Masonville Cove (Figure 14-1). There are approximately 54 acres of land area around Masonville Cove. Ten acres of the existing land area that is not included in other enhancements would be targeted for habitat improvement/diversification.

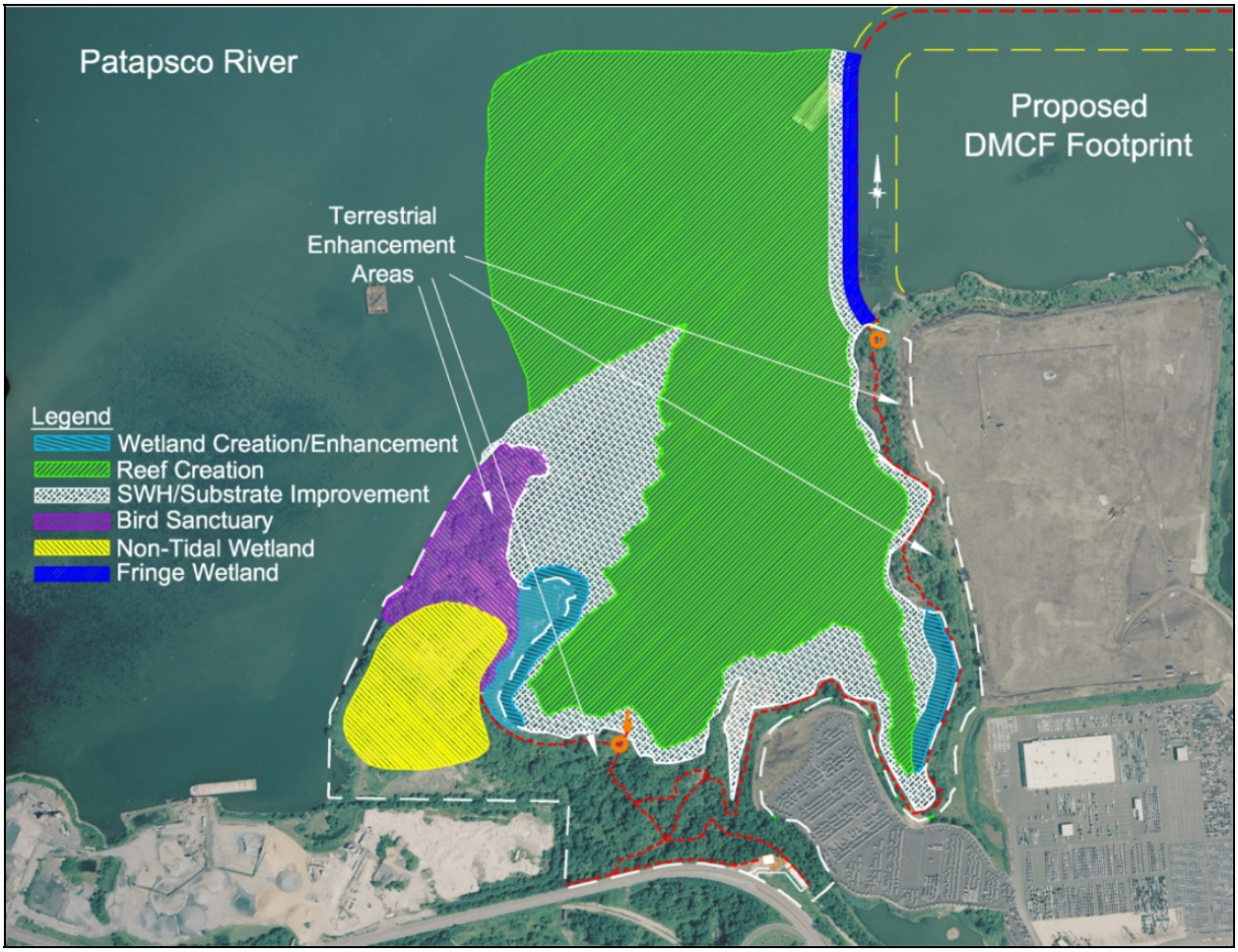

Figure 14-1 - Masonville Terrestrial Habitat Enhancement Area

14.2 TERRESTRIAL HABITAT DESCRIPTION

Existing Conditions – (Ownership: State of Maryland) – Existing condition studies found that most of the vegetation is comprised of opportunistic species that are invasive, non-native, or both. The area is disturbed throughout. There are debris piles and discarded timbers, concrete, rubble, and other materials. Vegetation is sparse along the bulkhead and concrete-rubble shorelines. The narrow forested buffer has areas of dense vegetation along the perimeter. Most of the plants observed in this buffer and within the study area are native to moist, coastal, or wetland soils, which is consistent with

the site. Several of the species found are non-native species, such as royal paulownia (*Paulownia tomentosa*), tree-of-heaven (*Ailanthus altissima*), mulberry (*Morus rubra*), and curly dock (*Rumex crispus*). The dominant deciduous trees identified in the area, included black locust (*Robinia pseudoacacia*), sumac species (*Rhus* sp.), redbud (*Cercis canadensis*), and tree-of-heaven. Dominant herbaceous plants included common reed (*Phragmites australis*) and pokeweed (*Phytolacca americana*). Poison ivy (*Toxicodendron radicans*) was also present.

Proposed Enhancement – (Scope: 10 Acres adjacent to Cove) **–** Prior to the implementation of Mitigation Project 15, debris removal would occur as part of Mitigation Project 14. Soil augmentation would be required in some areas to support new plantings. The proposed enhancement includes retaining native plants with good habitat value, reducing the number of non-native species, and augmenting the plantings with a variety of trees, shrubs, and herbaceous plants recommended by the USFWS for coastal plain areas within Chesapeake Bay. The species proposed are plants that are known to do well in moist floodplain areas. The larger tree species would include species such as willow oak (*Quercus phellos*) and white ash (*Fraxinus americana*). Medium trees and shrubs would include persimmons (*Diospyros virginiana*), pignut hickory (*Carya ovalis*), Paw paw (*Asimina triloba*), eastern red cedar (*Juniperus virginiana*), American holly (*Ilex opaca*), sassafras (*Sassafras albidum*), groudsel tree (*Baccharis halimifolia*), dogwood (*Cornus* sp.), and arrowwood (*Viburnum acerifolium*). Herbacious plants and grasses would include species such as rose mallow (*Hibiscus moscheutos*), black-eyed Susan (*Rudbeckia hirta*), switch grass (*Panicum virgatum)* and gamagrass (*Tripsacum dactyloides*).

Benefits **–** This project would improve density and diversity of plants in the Chesapeake Bay Critical Area buffer. This would provide direct cover and for opportunities for avian species. Larger trees, when mature, would provide nesting sites for eagles, which previously used the area, and other large tree nesters. This enhancement would also have indirect benefits to in-stream habitat by providing shading and improved bank conditions. Vegetation along shorelines also minimizes erosion, reducing sediment load to the cove.

Cost Estimate –

Assumptions:

400 trees and shrubs per acre: 70 percent trees, 30 percent shrubs

- 1 inch caliper trees cost $150 each, planting costs $100 each
- 5 gallon shrubs cost $30 each, planting costs $30 each

Seed mix for grasses and perennials (switch grass, black-eyed Susan, etc.)

- $100 per pound
- 20 lbs per acre

The total cost per acre is approximately $79,000 for plants and installation. Site preparation and soil augmentation would involve another $5,000 per acre. Total per acre is approximately $84,000. Assuming 10 acres would be affected, the estimated total cost is $840,000.

Maintenance and Monitoring – The 5-yr maintenance and monitoring costs are estimated at $30,000 per year, for a 5-yr total of $150,000. This cost includes cleanup events and invasive species control. Long-term maintenance costs taken as 50% of 5-year/start-up costs or $15,000 per year. This cost includes clean-up events.

15.0 MITIGATION PROJECT 16 - MASONVILLE ENVIRONMENTAL EDUCATION AND NATURE CENTER & TRAILS ALLOCATION

15.1 EDUCATION CENTER LOCATION

The proposed Masonville Environmental Education and Nature Center and trails **(**Figure 15-1). Figure 15-1 depicts the proposed location of the Environmental Education and Nature Center building and the route of the proposed trails.

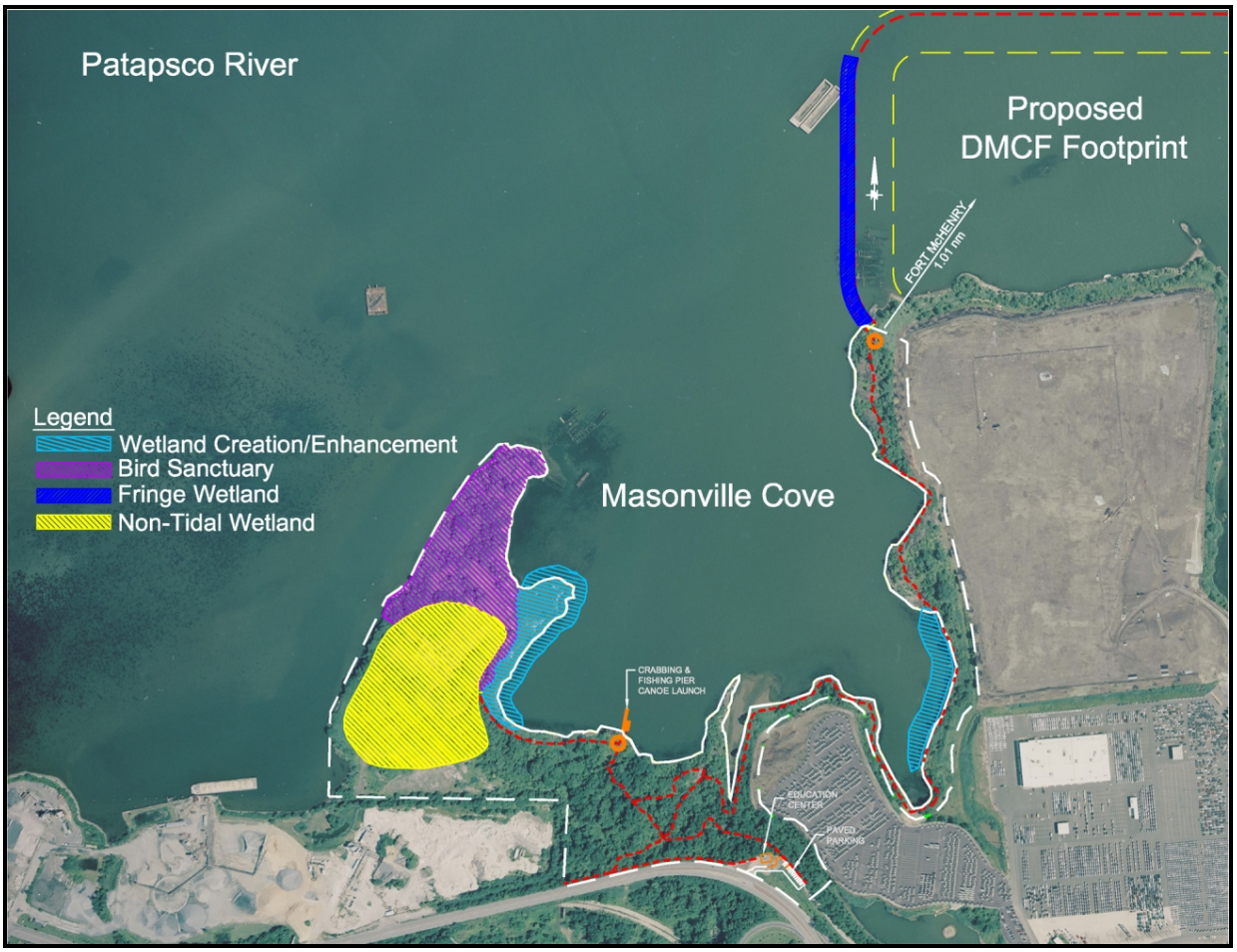

Figure 15-1 - Environmental Education and Nature Center and Hike and Bike Trails

15.2 EDUCATION CENTER DESCRIPTION

Existing Conditions – (Ownership: State of Maryland) **–** Currently, public access onto the land surrounding Masonville Cove is restricted to only authorized individuals. The land and shoreline are undeveloped and littered with railroad ties, rusted metal and other debris. The Cove serves as a unique waterfowl staging area during the winter months when up to 10,000 waterfowl have been observed at one time. The land area surrounding the Cove provides habitat for a limited amount and diversity of wildlife including deer and fox.

Proposed Enhancement **–** The Masonville Environmental Education and Nature Center would be a two story building approximately 30 ft by 40 ft, including 700 sq ft of deck, approximately 1,500 feet (ft)

of handicapped access trail to the water's edge, and possibly an additional 8,300 ft of trails (Figure 15-1).

Benefits – The construction of an environmental education and nature center on the land adjacent to Masonville Cove property would provide the Brooklyn and Curtis Bay communities with their local only access to the Patapsco River. The building would house environmental educational programs for their school children and their adult residents. As these children and adults learn about this unique natural area and participate in the cleanups, wetland plantings, and other activities, it is likely that their behavior toward the environment would improve.

The kayak and canoe pier would connect Masonville Cove to the Chesapeake Waterways program and all of the behavior changing activities offered by that program.

Cost Estimate – The estimated cost to construct the environmental education and nature center with the deck and peripheral facilities is $750,000.

Maintenance and Monitoring – This item is a one-time allocation of money spread over a five-year period.

16.0 MITIGATION PROJECT 17 - MASONVILLE COVE EDUCATION/RESEARCH ALLOCATION

16.1 EDUCATION/RESEARCH LOCATION

The proposed education and research would be conducted from the Masonville Environmental Education and Nature Center (Figure 15-1).

16.2 EDUCATION/RESEARCH DESCRIPTION

The education center at Masonville Cove provides an opportunity to combine citizen involvement, public awareness, education and research while filling data gaps in the scientific and mitigation design community. The project would use trained volunteers to collect scientifically valid data whereby increasing monitoring effort at many more wetland sites and for a longer period of time to improve assessment of mitigation success. Extensive public involvement in tidal wetland restoration also fulfills several additional objectives, including hands-on education opportunities and regular site maintenance. The goal of this program is to improve design and understanding of how created tidal wetlands function so that future mitigation sites, particularly those in urban areas, achieve a higher degree of success.

It is anticipated that this detailed hydrologic assessment, construction, and public involvement in the restoration, maintenance, and monitoring would provide useful information to improve tidal wetland mitigation design in urban tributaries such as the Patapsco River.

Cost Estimate – This line item shows the funding slated for educational and research projects. This funding is included in maintenance and monitoring cost for individual projects in this plan.

17.0 MITIGATION PROJECT 18 - CONSERVATION EASEMENT – MASONVILLE COVE

17.1 CONSERVATION EASEMENT LOCATION

The proposed Conservation Easement would cover approximately 50 acres of land surrounding Masonville Cove. (Figure 17-1).

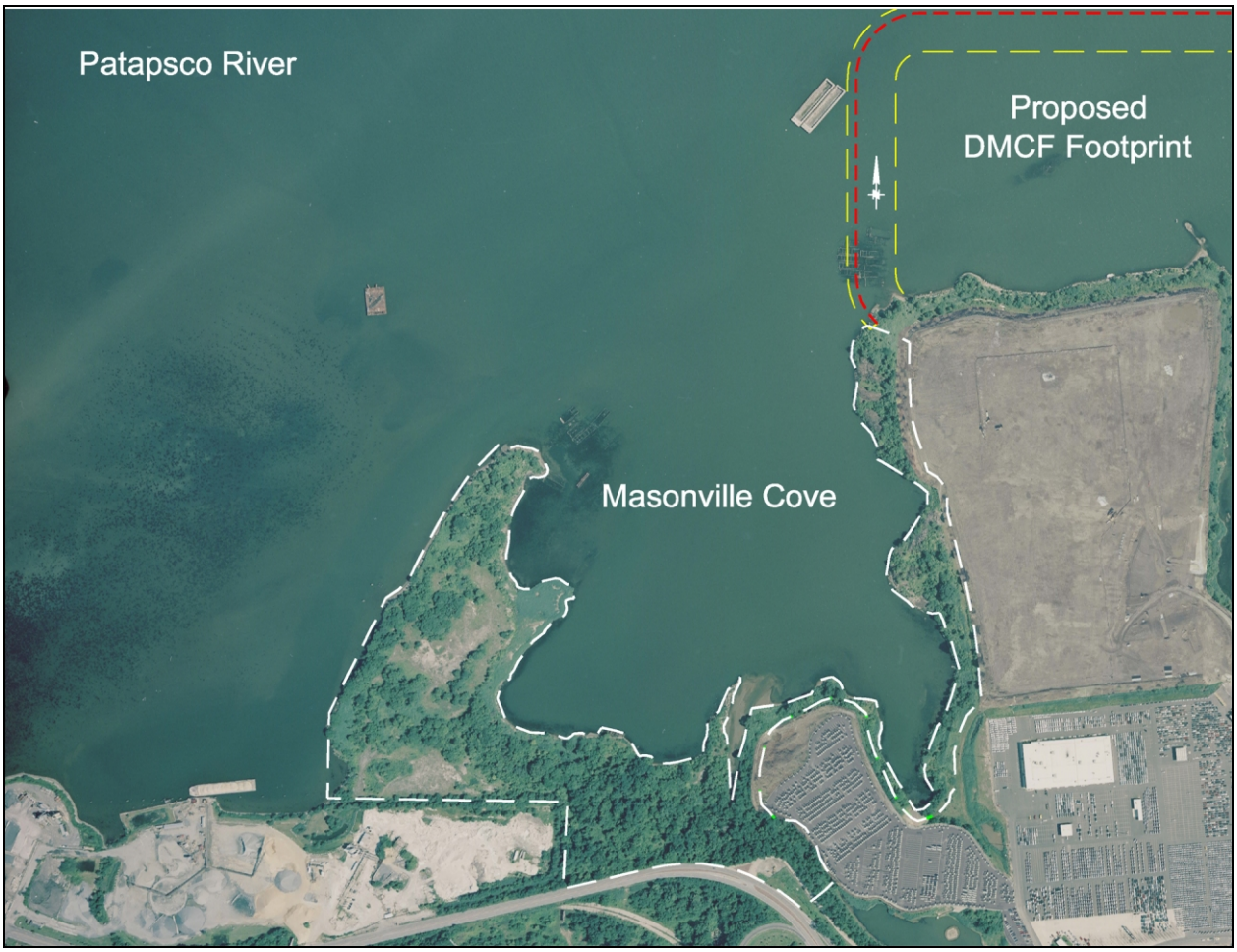

Figure 17-1 - Conservation Easement Boundary

17.2 CONSERVATION EASEMENT DESCRIPTION

Existing Conditions – (Ownership: State of Maryland) – Currently, the land surrounding Masonville Cove is owned by the Maryland Port Administration (MPA) and is zoned industrial. It is undeveloped at the present time but may soon be the focus of a significant cleanup effort. Additionally, environmental education programs would be conducted from a building to be constructed on site. The adjacent land uses include a port terminal for automobile storage and a sand and gravel operation. Existing condition studies found Masonville Cove to be a unique natural area within Baltimore City. The Cove provides foraging and resting opportunities for many bird species. Waterfowl are common in winter months and herons and egrets are common in warmer months. Song birds and raptors are also utilizing the site, particularly in warmer months. Existing condition studies found that the waters

within Masonville Cove provide refuge and forage opportunities for a variety of fish species including juvenile anadromous species, such as white perch (*Morone Americana*), striped bass (*Morone saxatilus*), yellow perch (*Perca flavescens*), and river herring *(Alosa pseudoharengus* and *Alosa aestivalis*), as well as forage species such as minnows, shiners, and silversides. The south shore of the Patapsco River has been identified by the NMFS as an important anadromous fish nursery area.

Proposed Enhancement –Conservation Easement on over 50 acres.

Benefits – The conservation easement would prevent the land from being used for any purposes except for environmental education and related activities. The only structures constructed on site would be to support these activities. Preservation of this area would be consistent with the habitat conservations goals of Baltimore City and provide a unique natural area within the urban setting. Preservation of the shoreline and terrestrial habitat areas would continue to support the fish and wildlife species known to occur there as well as protect any future habitat improvements and fish and wildlife utilization.

18.0 ENVIRONMENTAL BENEFIT 1 - SEDIMENT/CONTAMINANT ENCAPSULATION

18.1 ENCAPSULATION LOCATION

The location for sediment encapsulation would be the area within the proposed DMCF footprint. This is indicated by the blue, yellow, and aqua lines in Figure 18-1. See existing conditions for a description of this figure.

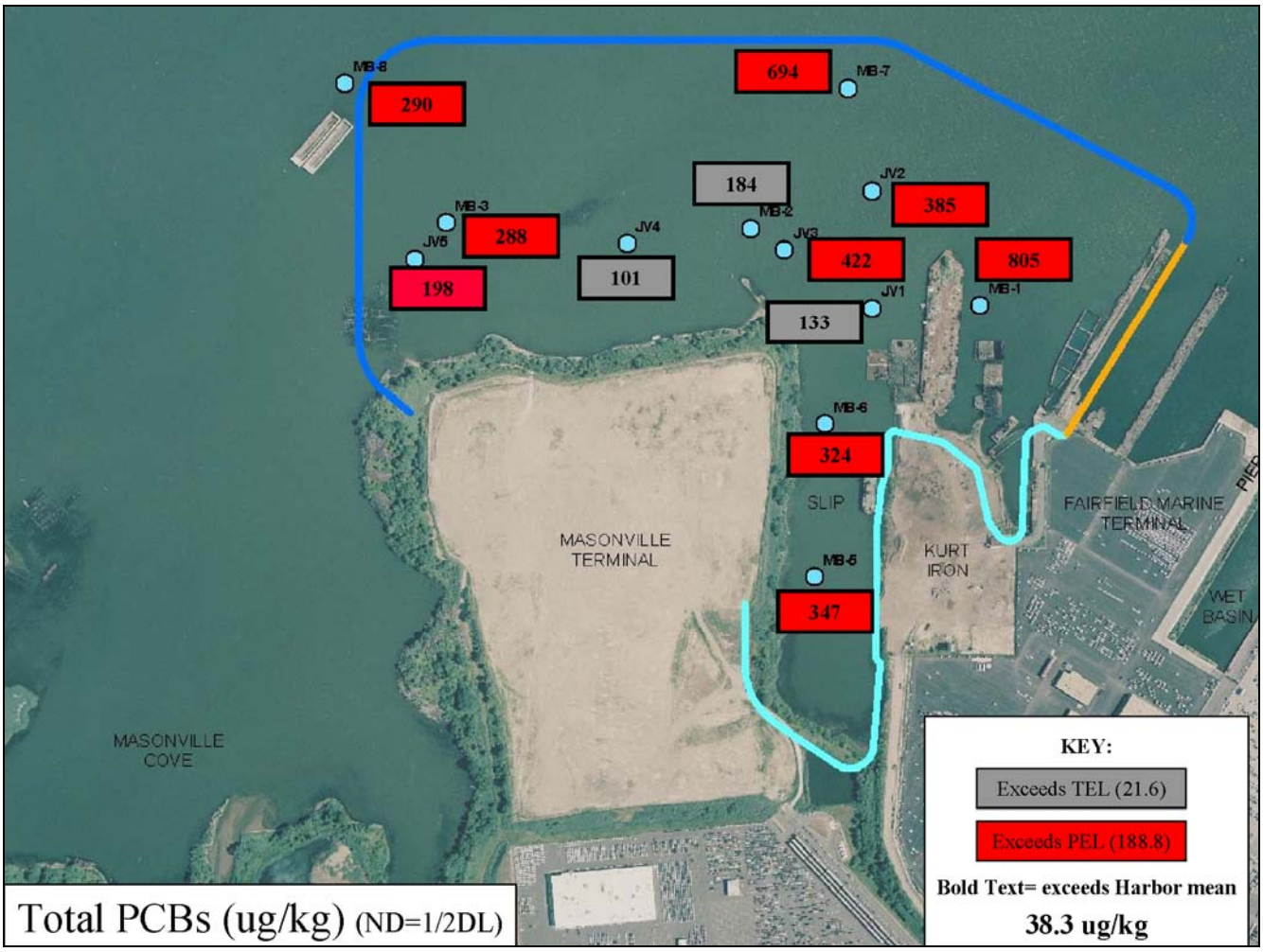

Figure 18-1 - Masonville Surficial Sediment Contamination

18.2 ENCAPSULATION DESCRIPTION

Existing Conditions – (Ownership: State of Maryland) – The surficial sediment quality within the proposed Masonville DMCF footprint is highly degraded due to elevated levels of some contaminants. The extent of surficial PCB contamination is shown in Figure 18-1. The areas that include red boxes are places where PCB concentrations exceed the level where a biological or ecological effect is likely. Several metals (including mercury, copper, and lead) were also found to be elevated within this area. The contaminant levels are having an effect on the biological community. Benthic communities within the DMCF footprint are degraded or very degraded in most areas. The presence of these contaminants in the surficial sediments makes them available for ingestion by benthic invertebrates and fish which

mobilizes them within the ecosystem making them available for higher level predators, including humans. There are consumption advisories within the Patapsco estuary for various fish species and crabs due to PCBs and certain pesticides.

Proposed Enhancement – (Scope: 127 acres of river bottom within the Patapsco estuary) – This proposed enhancement does not involve any additional work but is an added benefit of site development. The proposed alignment would enclose 127 acres of contaminated Patapsco river bottom, effectively encapsulating the contaminants and sequestering them from the estuary.

Benefits – Encapsulation of sediments would significantly reduce the toxics burden in this part of the Patapsco River, making contaminants such as metals (including mercury) and PCBs less available to the aquatic environment. This would have a direct benefit on the benthic community and availability of food resources for fish. Indirectly, the action would also make the contaminants less bioavailable for accumulation in fish tissue, lowering the potential human health and ecological risks associated with consumption of contaminated fish. The Patapsco River is currently under consumption advisories for several species because of PCBs, pesticide, and other toxin accumulations in fish tissue. Removing a source of these contaminants from the River would be beneficial to harvestable resources and to anything consuming them.

Cost Estimate – No incremental costs beyond site development.

19.0 ENVIRONMENTAL BENEFIT 2 – DERELICT VESSEL REMOVAL AND REMEDIATION

19.1 FORMER KURT IRON & METAL FACILITY LOCATION

The former Kurt Iron and Metal (KIM) facility lies to the east of the proposed Masonville DMCF site. Currently 25 vessels in various states of disrepair are associated with the site (Figure 19-1).

Figure 19-1 - Derelict Vessels in the Vicinity of the Former Kurt Iron and Metal Facility

19.2 ENVIRONMENTAL BENEFIT 2 DESCRIPTION

Existing Conditions – (Ownership: most unknown, two belong to State of Maryland) – The former KIM site was purchased by the MPA in September 2000 to expand port facilities and has known legacy contaminants from the previous owners. The major area of environmental concern is KIM channel, which has sunken and derelict vessels, a steel dry dock, and numerous barges with various materials on board. The ownership of most of the derelict vessels is not clear. Only three of the vessels were legally transferred with the property and are currently owned by the MPA. The MPA conducted an in-depth investigation of the materials including sampling each of the vessels structures,

drydock, and sediments beneath the drydock and debris piles. The primary regulated materials of concern associated with the structural materials of the vessels and dry dock include lead paint, PCB contaminated transformers and paint, asbestos, and various petroleum products and wastes.

The waste products are undoubtedly being released into the adjacent waters. Surficial sediment contaminants studies in the vicinity of the former KIM facility have demonstrated elevated levels of PCBs and some metals. The contaminant levels are having an effect on the biological community (e.g. degraded benthic communities). In addition, contaminants in the surficial sediments are available for ingestion by aquatic organisms and mobilization within the ecosystem (e.g. in tissues of fish and crabs). There are consumption advisories within the Patapsco estuary for various fish species and crabs due to PCBs and certain pesticides.

Proposed Enhancement – (Scope: Removal of bulk regulated wastes; burial of ship hulks) – At this time, the MPA proposes to remove regulated and hazardous wastes from the ships and drydocks and dispose of them properly in licensed landfills. The solid wastes that remain, primarily steel and timber ship hulls, are to be minimally processed and relocated as necessary inside the footprint of the proposed Masonville DMCF. Depending on costs (demolition and refloating costs and unit credit for scrap steel) at the time of the vessel remediation project and schedule durations, some derelict vessels may be processed offsite. A plan is under development for remediating, removing, or burying the remaining vessels after the hazardous materials have been removed to the satisfaction of the Maryland Department of the Environment (MDE).

Benefits – Remediation of the vessels would remove a significant source of toxics within the area and reduce the toxics burden in this part of the Patapsco River. This would effectively make contaminants such as metals and PCBs less available to the aquatic environment. Reductions of these contaminants would directly benefit the benthic community and fish forage availability. Indirectly, the action would also make contaminants less bioavailable for accumulation in fish tissue, lowering the potential human health and ecological risks associated with consumption of contaminated fish. The Patapsco River is currently under consumption advisories for several species due (primarily) to PCB and pesticide tissue accumulations. Removing a source of these contaminants from the River would be beneficial to harvestable resources and (indirectly) to anything consuming them.

Cost Estimate – Cost estimates vary widely due to some uncertainties about the volumes of some of the wastes. Currently, estimates are $3 to $5 million dollars.

TIER II MITIGATION PACKAGE

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FIGURE 20.1 – HARBOR HOSPITAL LOCATION MAP M-94
FIGURE 20.2 – HARBOR HOSPITAL TIDAL MARSH CREATION M-96
FIGURE 21.1 – CARR-LOWERY WETLAND LOCATION MAP M-97

1.0 INTRODUCTION

The Maryland Port Administration (MPA) is proposing the construction of a dredged material containment facility (DMCF) in the vicinity of the Masonville Marine Terminal (Figure 1). Construction of the facility would require mitigation to offset the facility's impacts. The proposed DMCF would fill 130 acres of tidal open water. In addition, the project would bury 10 acres of upland habitat within the Chesapeake Bay Critical Area buffer, and disturb approximately 1 acre of vegetated wetlands (delineated as 0.4 acres) and 0.38 acres of submerged aquatic vegetation (SAV).

Figure 1.1 - Extent of Area Impacted by Proposed Facility

Notes: The design for the proposed facility uses dikes to contain material dredged from the navigation channels within Baltimore Harbor. The green line delineates the footprint of the proposed facility.

A Tier I mitigation package was developed of the projects designed to compensate for the proposed action and all of the Tier I options would be implemented (unless determined not to be feasible as designs are further refined). A Tier II mitigation package was developed in case Tier I projects are unsuccessful or not feasible, in which case Tier II projects would be implemented. It is expected that the need and decision to implement a Tier II option would be made through the adaptive management process which will be implemented concurrently with the initiation of the mitigation options. Further, it is expected that decisions regarding adaptive management and implementation of Tier II options would initially be made by the MPA with approval(s) from the regulatory and advisory agencies of the Joint Evaluation Committee. The Tier I mitigation package is described in detail in this chapter and the Tier II mitigation package is available in Appendix M.

Table 1.1 - Summary of Proposed Mitigation Plan (Tier I Options)

Item #		Description	Quantity	Units	Initial Costs		Maintenance/Monitoring Costs		Total Item Cost (Thru 5 yrs)	Long-Term Maintenance/Monitoring*	
					Unit Cost	Total	Annual	5-yr Total		Annual (Forever)	Incremental 15-yr Total
Aquatic Projects											
1		Wetland Enhancement	2.0	acres	$153,000	$306,000	$9,000	$45,000	$351,000	$4,500	$67,500
2		Wetland Creation	3.1	acres	$153,000	$474,300	$13,500	$67,500	$541,800	$6,750	$101,250
3		Non-Tidal Wetland	10.0	acres	$100,000	$1,000,000	$15,000	$75,000	$1,075,000	$7,500	$112,500
4		Reef and Fish Habitat (subtotal)	95.8	acres							
	a	*Reef and Fish Habitat*[1]	73.0	acres	$31,000	$2,263,000	$44,640	$223,200	$2,486,200	$22,320	$334,800
	b	*SWH Substrate Improvement*[2]	22.8	acres	$20,000	$552,000	$14,800	$74,000	$626,000	$7,400	$111,000
5		Fringe Wetland Creation (along dike)[3]	2.0	acres	$94,500	$189,000	$22,500	$112,500	$301,500	$11,250	$168,750
6		Eel Passages (3 Dams)	3.0	project	$140,000	$420,000	$32,000	$160,000	$580,000	$16,000	$240,000
7		Shad and Herring Restoration	1.0	project	$450,000	$450,000	$100,000	$500,000	$950,000	$0[4]	$0[4]
8		3 Trash Interceptors[5]	3.0	project	$500,000	$1,500,000	$50,000	$250,000	$1,750,000	$30,000	$450,000
9		Biddison Run (Reach O)[6]	1.0	project	$461,061	$461,061	$0[7]	$0[7]	$461,061	$0[7]	$0[7]
10		Biddison Run (Reach P)	1.0	project	$1,046,295	$1,046,295	$0[7]	$0[7]	$1,046,295	$0[7]	$0[7]
11		2 Trash Interceptors[5]	2.0	project	$500,000	$1,000,000	$33,000	$165,000	$1,165,000	$20,000	$300,000
12		Western Run (6 Reaches)[8]	1.0	project	$1,140,855	$1,140,855	$0[7]	$0[7]	$1,140,855	$0[7]	$0[7]
Aquatic Related Projects							**Aquatic Totals**		**$12,474,711**		**$1,885,800**
13		WQ Monitoring in Cove	1.0	project	$96,000	$96,000	$49,000	$245,000	$341,000	$49,000	$735,000
14		Landside and Water- Phase I Cleanup	25.0	acres	$100,000	$2,500,000	$0[9]	$0[9]	$2,500,000	$0[9]	$0[9]
Non-Aquatic Projects							**Aquatic Related Totals**		**$2,841,000**		**$735,000**
15		Terrestrial Habitat Enhancement	10.0	acres	$84,000	$840,000	$30,000	$150,000	$990,000	$15,000	$225,000
16		Education Center/Trails (Allocation)[10]	1.0	project	$750,000	$750,000	$50,000	$250,000	$1,000,000	$0[10]	$0[10]
17		Education / Research $500,000 Allocation [11]	1.0	project	$0	$0	$0	$0	$0	$0	$0
18		Conservation Easement	25.0	acres	$0	$0	$0	$0	$0	$0	$0
Environmental Benefits from the Masonville DMCF							**Non-Aquatic Totals**		**$1,990,000**		**$225,000**
19		Sediment/Containment Encapsulation	123.0	acres	$0	$0	$0	$0	$0	$0	$0
20		Derelict Vessels (Remediation and Removal)	3.0	acres	$0	$3-5 Million[12]	$0	$0	$0	$0	$0
Relevant Totals						**$14,988,511**	**$463,440**	**$2,317,200**	**$17,305,711**	**$189,720**	**$2,845,800**

20-yr Mitigation Package Total	**$20,151,511**

Projects in Blue are added in response to the August 30th 2006 Joint Evaluation Committee meeting.

***The 20-yr package total estimates costs through the first 20 years of the project. MPA commits to continuing maintenance support in perpetuity, utilizing a pay-as-you-go third party fund.**

1 - Includes cost of deep water substrate improvement along west portion of DMCF.
2 - Includes cost of shallow water habitat creation along west portion of DMCF, and $112,000 for 0.8 acres of creation on the east portion of the Cove.
3 - Includes cost ($60,000) for planting upper and low marsh plants.
4 - The fish stocking is a 3-yr program that will be monitored for a total of 5 years. As such, long-term maintenance cost is not included.
5 - Long-term maintenance cost for trash interceptors reflects the cost of maintaining the structures and not the periodic trash removal.
6 - Biddison Run (Reach O) total project cost is $809,061, of which $348,000 is funded by other sources.
7 - The City's initial cost estimates are used to determine the adequate funding levels for each of the stream restoration projects. Mitigation package includes initial construction only. Maintenance and monitoring costs are not included in the package for the City's stream restoration projects. MPA proposes that Baltimore City retain responsibility for project maintenance and monitoring.
8 - Six reaches of Western Run were selected based on the analysis presented in the City's report "Western Run Stream Assessment".
9 - This item refers to the one-time cost for removal of debris (concrete drain pipe, scrap metal, insulators, etc.) initially necessary for opening areas of the Cove up to the public and for other improvements to occur. This cleanup is an initial task, and as such, maintenance does not apply.
10 - This item is a one-time allocation of money spread over a five-year period.
11 - This line item shows the funding slated for educational and research projects. This funding is included in maintenance and monitoring costs for individual projects above.
12 - Cost of Derelict Vessel (Remediation and Removal) is not included in the total Initial Cost.

2.0 TIER II MITIGATION OPTIONS

The Tier I mitigation options summarized in Table 1 are being included in the Environmental Impact Statement for the Masonville DMCF and are considered adequate mitigation for the project. The Tier I projects are expected to be successful in providing the anticipated benefits to the surrounding environment and local communities. The MPA is working with state and federal regulatory and resource agencies to develop the measures of success to which the Tier I mitigation projects will be held.

Should the Tier I mitigation projects not meet the measures of success currently under development, a list of projects that may be added to the mitigation package would be necessary. The Tier II mitigation options presented in this package are potential options to fulfill the aforementioned list.

Currently twenty (20) Tier II options exist. These options will need to be ranked according to environmental benefit. Table 2 presents the current list Tier II options, and is followed by facts sheets describing each of the options presented in the Table. The purpose of this package is to provide adequate information on each option to allow a ranking of the options to occur. The information presented in the facts sheets is obtained from reports provided by the City. The information on all of the options should be considered preliminary, and further investigation would be necessary prior to implementation.

The information provided on the projects that are recommended by the USACE 2006 Middle Branch Patapsco Restoration Plan is extremely preliminary. These projects may not currently be technically feasible, and are included so that they may be considered should future study determine they are technically feasible.

Table 2.1 – List of Tier II Mitigation Options (DRAFT)

Option Number	Description	Environmental Ranking Order	Comments
1	Rebuild 3-5 Outfalls		Info from City 2005 Letter.
2	Watershed 263 projects		Info provide in City 2006 Email.
3	Seton Keogh High School Wetland Project		Info from EA 2001(1).
4	Environmental Dredging/Capping		Info from MPA 2006.
5	Herring Run Stream Restoration Project - Reaches T & U		Info from AMT 2004.
6	Increase Middle Branch Reef Structure		Could be implemented if monitoring indicates initial density does not meet productivity goals.
7	Powder Mill Stream Restoration - Phases 1,2,3,4,5,6		Info from Parsons 2004(2).
8	Dead Run Stream Restoration Project Phase 1		Information not yet obtained.
9	Lower Stony Run - Phases 1, 2, & 3		Info from EA 2001(2).
10	Maidens Choice Run Phase 2 (below MC-10 project)		Info from Parsons 2004(1).
11	Dead Run Stream Restoration Project - Phase 2		Information not yet obtained.
12	Ft. Holabird Park Impervious Surface Removal		Info from discussions with City.
13	Trash Interceptors in the Patapsco River		Info from MPA 2006.
Conceptual Options Requiring Further Study to Determine Technically Feasible			
14	Tidal Marsh at Swann Park		Info from City 2006 Email, USACE 2006 Email.
15	Tidal Marsh at Warner Street		Info from City 2006 Email, USACE 2006 Email.
16	Tidal Marsh at Aquarium Site		Info from City 2006 Email, USACE 2006 Email.
17	Tidal Marsh at Middle Branch Park		Info from City 2006 Email, USACE 2006 Email.
18	Tidal Marsh at Harbor Hospital		Info from City 2006 Email, USACE 2006 Email.
19	Carr-Lowery Wetland		Info from City, 11-14-06 BEWG meeting.

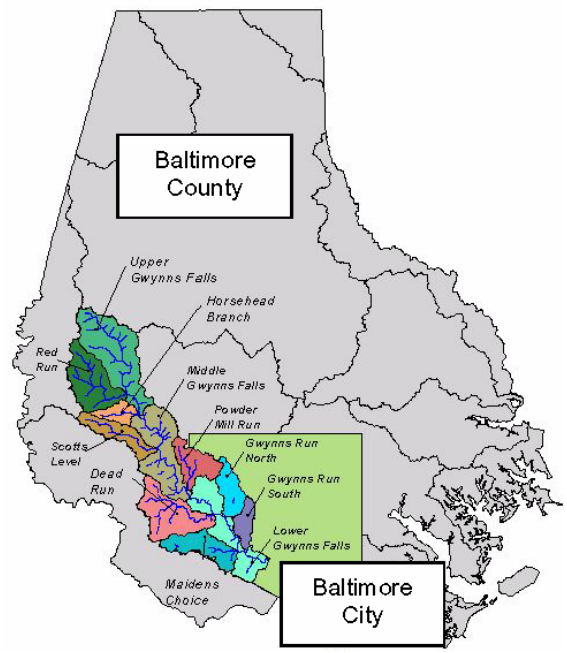
Items in blue were recommended by Baltimore City and included in the City's December 22, 2005 list of projects and reiterated in their August 16th, 2006 letter.
Items in red were recommended as part of the USACE 2006 Middle Branch Patapsco Restoration Plan.

Notes: 1) Options 1-3, 14, and 15 are the highest on the City's list of priority.
2) The information provided on the projects that are recommended by the USACE 2006 Middle Branch Patapsco Restoration Plan is extremely preliminary. These projects may not currently be technically feasible, and are included so that they may be considered should future study determine they are technically feasible.

3.0 TIER II OPTION 1 – REBUILD 3-5 OUTFALLS

3.1 Location

There have been multiple stream restoration plans done for Baltimore City that span several watersheds within the City limits. Due to its direct impact on the Middle Branch of the Patapsco River and the waters surrounding the Masonville site, the rebuilding of outfalls within the Gwynns Falls watershed may be most appropriate. Figure 3.1 Shows Baltimore City and outlines the Gwynns Falls watershed.



Source: (Parsons 2004(1))

Figure 3.1 – Location Map, Gwynns Falls Watershed

3.2 Existing Conditions

Parsons 2004(1) identifies fifty-two 52 outfalls within City limits in the Gwynns Falls watershed. Thirty-four (34) of these are recommended for retrofit. In general, problems with the outfalls include structural integrity, downstream bank and vegetation stability, and degraded channel conditions due to high-energy discharge. This physical and ecological instability contributes to sedimentation downstream in the Gwynns Falls River and the Middle Branch of the Patapsco River.

In particular, the City identified a specific (unnamed) tributary system that KCI Technologies evaluated. KCI's findings, which were presented to the MPA in a letter from Otis Rolley III (City 2005 Letter), showed that; several stormwater systems, originating from high-density residential and commercial areas, discharge into Gwynns Falls/Leakin Park to form a tributary system to the Gwynns Falls River. This system suffers from destabilized slopes, excessively steep channel profiles, and aggradations attributable to sediment mobilization.

3.3 Proposed Enhancement

This potential mitigation option would be to retrofit between three and five of the 34 outfalls recommended in Parsons 2004(1), with particular attention to the work outlined in KCI's memorandum to the City. This would include not only rebuilding outfalls, but also installing structures to reduce energy to protect channel conditions downstream, and bank stabilization efforts.

3.4 Benefits

The primary benefit associated with this option would be the reduction of erosion, and thus sediment load to the watershed and the Middle Branch of the Patapsco River.

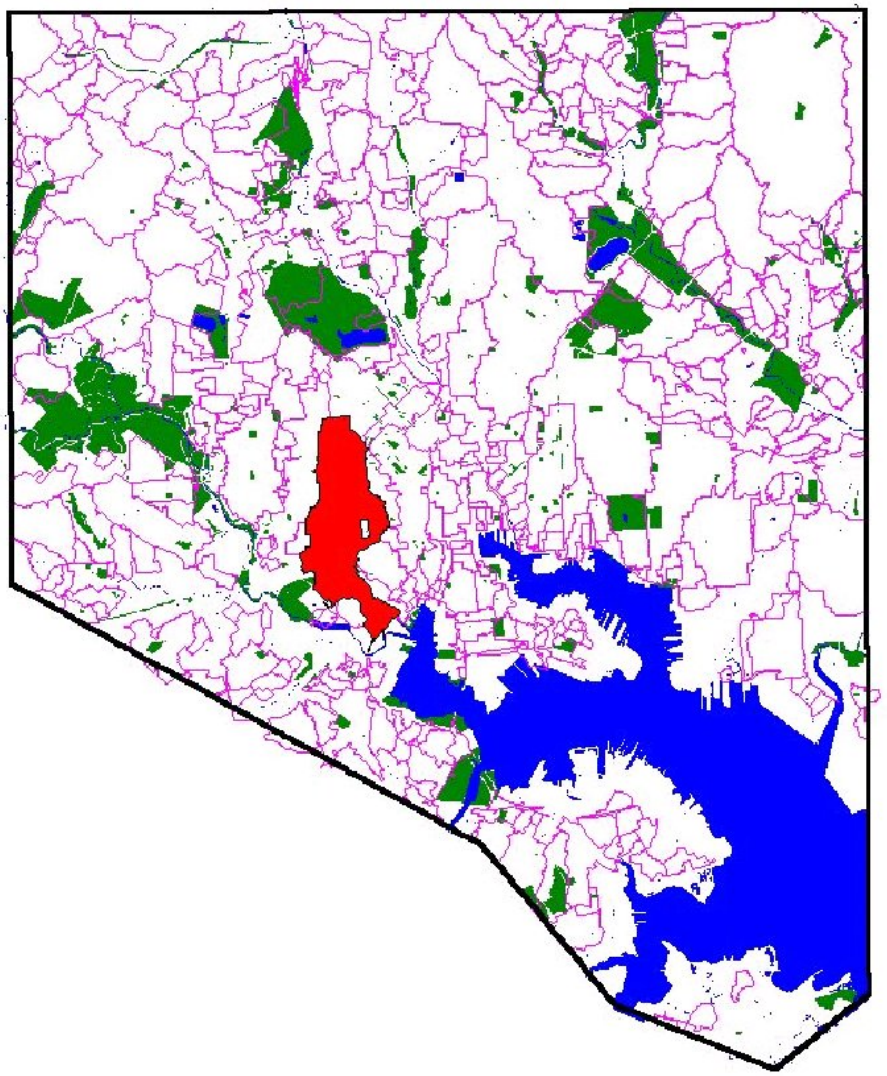
3.5 Cost

The efforts identified in KCI's memorandum range from $333,000 to $381,000 depending on the options selected. These costs are presented as preliminary estimates.

4.0 TIER II OPTION 2 – WATERSHED 263 PROJECTS[1]

4.1 Location

Watershed 263 is located within Baltimore City and is within the Gwynns Falls Watershed. Figure 4.1 depicts the boundaries of Baltimore City and Watershed 263 is highlighted in red.



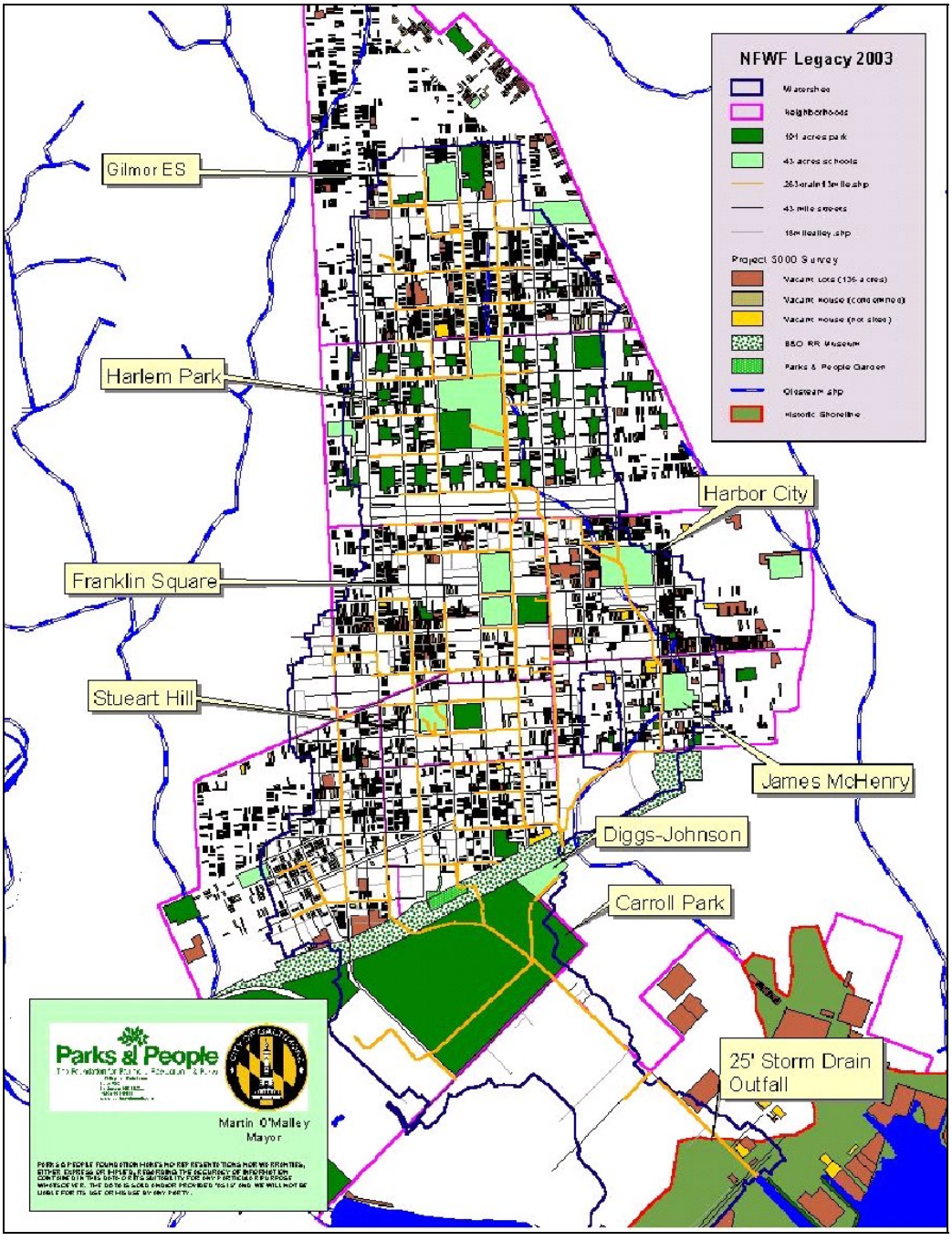
Source: Figure obtained from Baltimore City Department of Planning

Figure 4.1 – Watershed 263 Location Map

[1] All information for this option was provided by the City of Baltimore Planning Division (City 2006 Email).

4.2 Existing Conditions

The City's information on the Watershed 263 Restoration project states that "Baltimore's urban forest currently falls below important national thresholds for ecological values, including water quality, terrestrial and aquatic habitat, and open space for recreation and renewal." Typical problems throughout the watershed are impervious surfaces and sparsely vegetated areas.



Source: Photograph obtained from Baltimore City Department of Planning

Figure 4.2 – Watershed 263 Land Usage Map

4.3 Proposed Enhancement

The City has gone through some initial steps to determine appropriate projects to reduce the impact of runoff from impervious surfaces within Watershed 263. The City's list of approximately 100 projects includes projects such as bio-retention areas, rain gardens, and the installation of grass pavement. The City's estimate of cost for their approximately 100 projects is about $13 Million. The proposed mitigation would be to provide funding for an unspecified number of the projects on the City's list.

4.4 Benefits

The projects proposed by the City would allow for biofiltering of runoff from within the watershed. The projects would also provide retention time for significant amounts of the runoff, thus decreasing the peak runoff and discharge rates to the watershed's streams.

4.5 Cost

The number of projects selected from the City's list would determine the cost of this proposed mitigation option.

5.0 TIER II OPTION 3 – SETON KEOUGH HIGH SCHOOL WETLAND PROJECT[2]

5.1 Location

Seton Keough High School is located within the City limits of Baltimore. It is located at the intersection of Interstate 95 and Rt. 1. The property is located on the north side of I-95 and east of Rt. 1. The physical address of the school is 1201 S. Caton Ave., Halethorpe, MD 21227. The school is located within the Maidens Choice watershed. Figure 5.1 identifies the general area of the school.

Source: Photograph obtained from Baltimore City Department of Planning

Figure 5.1 – General Seton Keough High School Area

[2] Information for this option is obtained from *Maidens Choice Watershed Restoration Plan* (EA 2001(1)).

5.2 Existing Conditions

The Seton Keough High School property is composed of open field space for athletic activities, covered buildings for school activities, paved parking lots, and limited forested areas surrounding the property.

5.3 Proposed Enhancement

The proposed enhancement for this property would be the installation of a stormwater management pond and marsh. This project is recommended by the USACE according to Table 6-16 of the EA 2001(1) report.

5.4 Benefits

The project would reduce the solids transported into the stream, Gwynns Falls and ultimately into the Chesapeake Bay. Other benefits would be:

- Reduction of flow into the city waste water treatment system,
- Improve water quality,
- Improve health of species in/ near the stream,

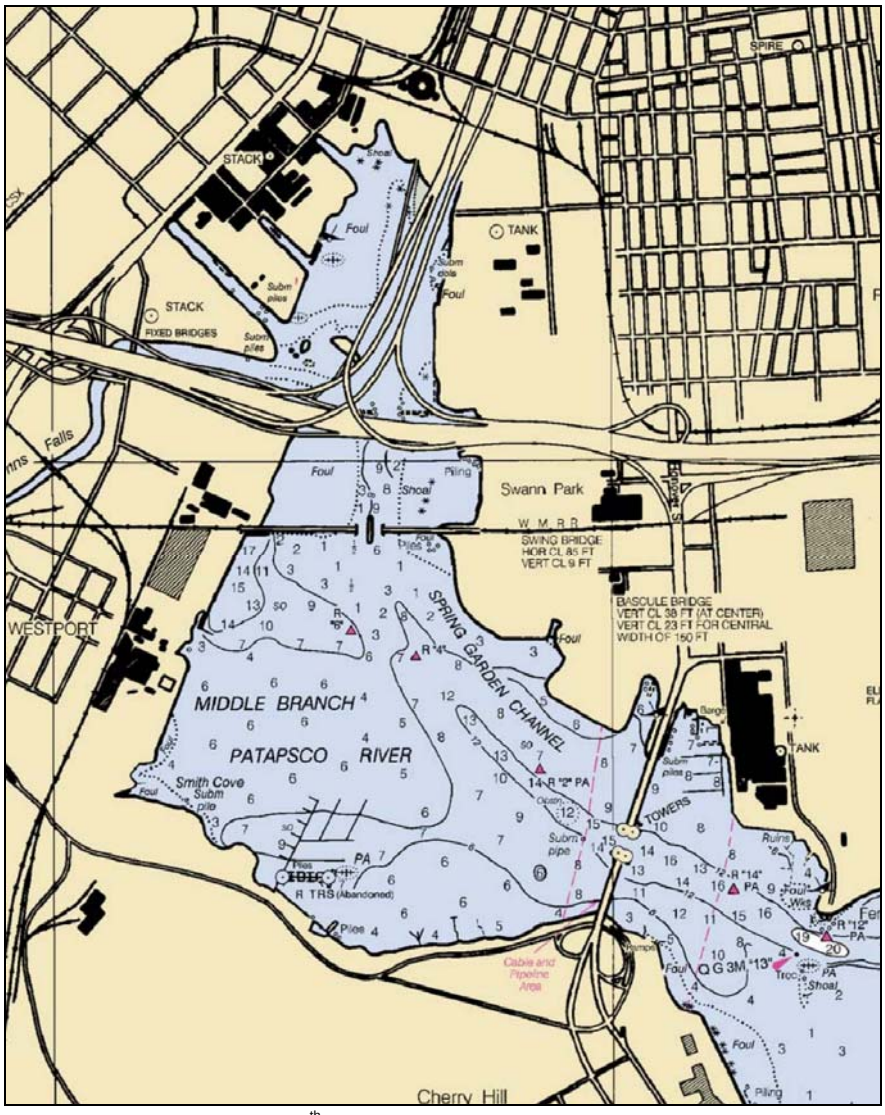
5.5 Cost

The EA 2001(1) report identifies the cost of the USACE selected wet pond and marsh at Seton Keough High School (it is identified as Arch Bishop High School in the EA report) to be $820,000 (2001 dollars). Of this cost, $120,000 is for design and $600,000 is for construction.

6.0 TIER II OPTION 4 – ENVIRONMENTAL DREDGING AND CAPPING[3]

6.1 Location

Environmental dredging and capping would be performed in the Middle Branch of the Patapsco River (see Figure 6.1) or other applicable areas.



Source: NOAA Chart 12281, 46th Ed., May 17/97

Figure 6.1 – Middle Branch of the Patapsco River

[3] Information for this option obtained from MPA's January 2006 proposed mitigation package submitted to the Maryland Department of the Environment (MPA 2006).

6.2 Existing Conditions

In some areas of the Middle Branch of the Patapsco River, sediments contain elevated concentrations of toxic organics and heavy metals. The depth of sediment requiring dredging would need to be determined through investigation on a case-by-case basis. However, for estimation purposes, five feet is assumed in this facts sheet.

6.3 Proposed Enhancement

The project would include either dredging the sediment or capping it with clean sand. The depth of dredging would need to be determined. Capping would be with approximately a three-foot layer of sand.

6.4 Benefits

Removing or capping the sediment would eliminate a source of contaminants to the Patapsco River and Chesapeake Bay system.

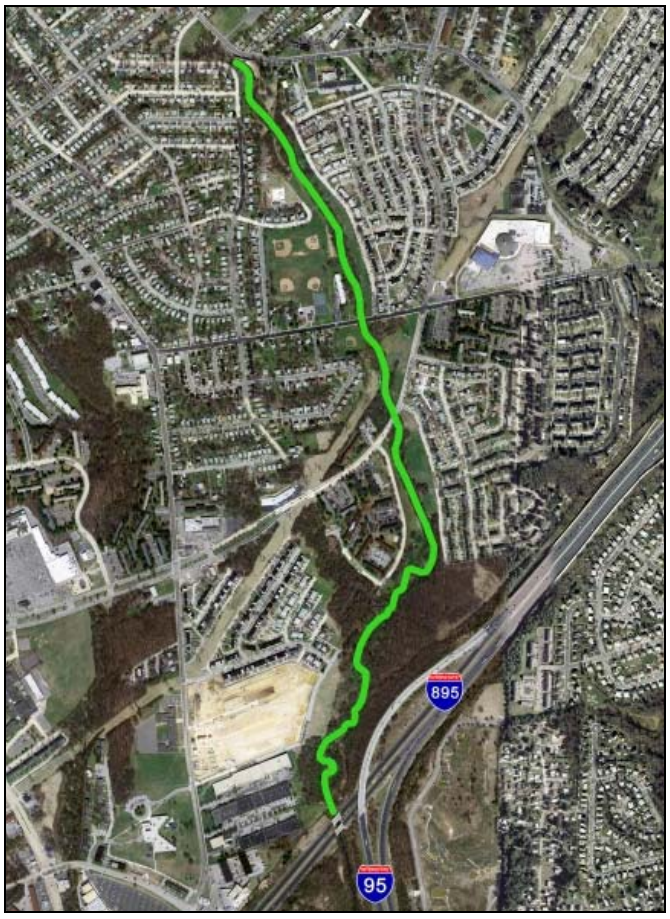
6.5 Cost

The estimated cost for environmental dredging is about $75 per cubic yard; thus for one acre of 5 ft of excavation the cost would be about $605,000. The cost for capping would be about $25 per cubic yard of sand; thus for one acre (a three foot sand cap and 30% losses) the cost would be about $160,000.

7.0 TIER II OPTION 5 – HERRING RUN STREAM RESTORATION PROJECT, REACHES T & U[4]

7.1 Location

The proposed stream restoration is for Moores Run (Reaches T & U as described in the report referenced below), which is identified as needing significant restoration in AMT 2004. Figure 7.1 shows the location of Moores Run.



Source: Google Earth Pro™ mapping service

Figure 7.1 – Moores Run Location Map

7.2 Existing Conditions

Moores Run has a multitude of issues. These include eroding banks, deteriorating stormwater outfalls, invasive riparian species, fish barriers, and trash, and are described in detail in the City's report. Reach T ranks in the poorest half of the twenty-four (24) reaches evaluated in the Herring Run Watershed Study in terms of both channel stability and habitat. Reach U ranks in

[4] Information in for this option is obtained from *Herring Run Watershed Stream Assessment and Restoration Concept Plan Final Report* (AMT 2004).

the poorest quarter of the twenty-four (24) reaches evaluated in terms of channel stability, but ranked in the best third for habitat.

7.3 Proposed Enhancement

The proposed enhancements include bank stabilization, channel realignment, repair of stormwater outfalls, riparian forest buffer replanting, trash removal, etc. and are described in detail in AMT 2004.

7.4 Benefits

The benefits of the projects include reduction in erosion of stream banks and thus sediment load to the watershed, improvement in water quality, and removal of invasive species and are described in detail in AMT 2004.

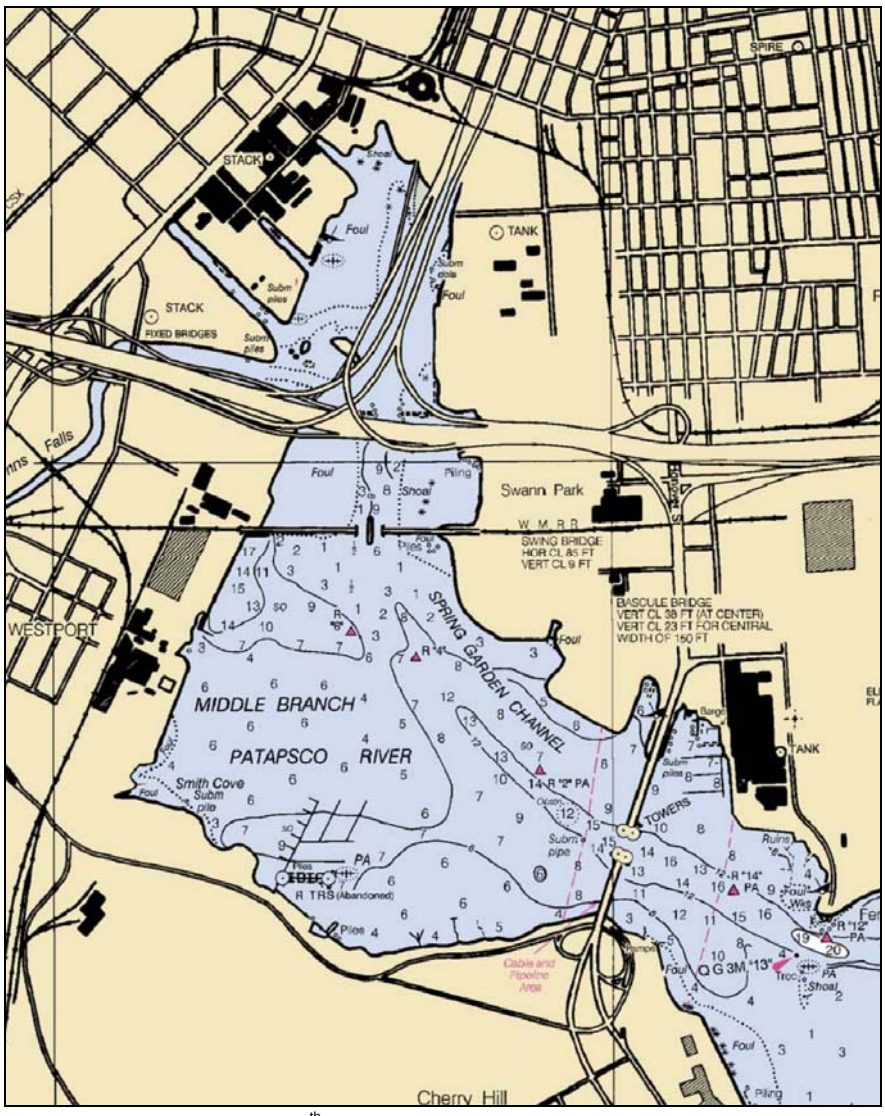
7.5 Cost

Appendix I of AMT 2004 contains the table labeled "Preliminary Construction Cost Estimate." This table lists the cost for Moores Run Reach T as $705,000 (2006 dollars) and the cost for Moores Run Reach U as $1,200,000 (2006 dollars).

8.0 TIER II OPTION 6 – INCREASE MIDDLE BRANCH REEF STRUCTURE

8.1 Location

The proposed reef structure would be located in the waters of the Middle Branch of the Patapsco River (Figure 8.1).



Source: NOAA Chart 12281, 46th Ed., May 17/97

Figure 8.1 – Middle Branch of the Patapsco River

8.2 Existing Conditions

Existing condition studies found that the waters within Middle Branch of the Patapsco provide refuge and forage opportunities for a variety of fish species including juvenile anadromous species, such as white perch (Morone Americana), striped bass (Morone saxatilus), yellow perch (Perca flavescens), and river herring (*Alosa pseudoharengus and Alosa aestivalis)*, as well as forage species such as minnows, shiners, and silversides. This is expected of natural shoreline areas along the southern shore of the Patapsco River. However, habitat degradation due to water

quality and excessive debris (e.g. tires, ceramic insulators, railroad ties, and trash) is apparent. The substrate in many areas consists primarily of fine grained material (silts and clays) with isolated sand pockets.

8.3 Proposed Enhancement

Improvement of substrate would occur through spreading and creating underwater mounds of sand and gravel and placement of reef balls and rock piles. Also possible is the use of concrete rubble structures.

8.4 Benefits

This project would improve substrate conditions, in-stream habitat, and vertical structure[*]. Substrate improvements would improve the benthic conditions, which would improve the forage opportunities for fish. Increase of in-stream three-dimensional structure would provide additional habitat for epibenthic colonization, cover for crabs, juvenile and small fish, and foraging sites for larger fish species. Many of the fish species known to utilize the cover are species that would benefit from the improved in-stream refugia. The hard vertical structure would provide substrate for encrusting bivalves such as platform mussels, which are known to occur within the cove, or oysters, which are found elsewhere in the Harbor. Once bivalve colonies establish themselves in the area, their filter feeding is expected to improve water clarity.

8.5 Cost

The cost to place the initial reef ball structures is about $10,000 per acre (USACE 2006).

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[*] A survey of available literature was conducted using the Web of Science. Searches included such keywords as "artificial reefs", "Reef Balls", "Chesapeake artificial reefs", and "estuary artificial reefs." The research included data on all types of artificial reefs, including oil rigs, sunken vessels, geotextile reefs, scrap tires, steel slag, and concrete reefs, from around the world. To select studies that may be relevant to assessing Reef Ball productivity in the Masonville Cove, issues inherent to estimating productivity changes in areas that contain Reef Balls versus those that do not were considered. The most significant issue stems from vast differences in latitude between the Chesapeake Bay region and the majority of the studies conducted. Outside of the Bay region, Reef Balls have generally been used to repair actual reef systems, and the bulk of monitoring data reflects vastly different communities. Monitoring often includes nearby areas of damaged or healthy reefs in areas of greatly different salinities and tropical/sub-tropical conditions. Temperate fouling communities are much different in terms of community structure and "productivity". However, a few monitoring studies that focus on an artificial reef in Delaware Bay that was created as mitigation for a dredged material disposal area were identified, and deemed the most appropriate in terms of general location (latitude).

The Delaware Bay studies examined productivity of artificial reefs relative to lost productivity in areas that had been inundated with dredged material (Burton et al. 2002, Steimle et al. 2002). The results of this study indicate that that the artificial reef provides enhanced benthic secondary production per unit area (2,000–12,000 kcal/yr) over the lost habitat (177 kcal/yr). However, the overall reef installation was too small to completely mitigate for lost productivity. Steimle et al. (2002) compared the per area secondary productivity of the artificial reef to the per area productivity of nearby sand habitat. In this study, enhancement of productivity associated with the artificial reef varied annually, but the per area productivity of the reef epifaunal community was generally at least 20 times greater than the per area productivity of the nearby infaunal community.

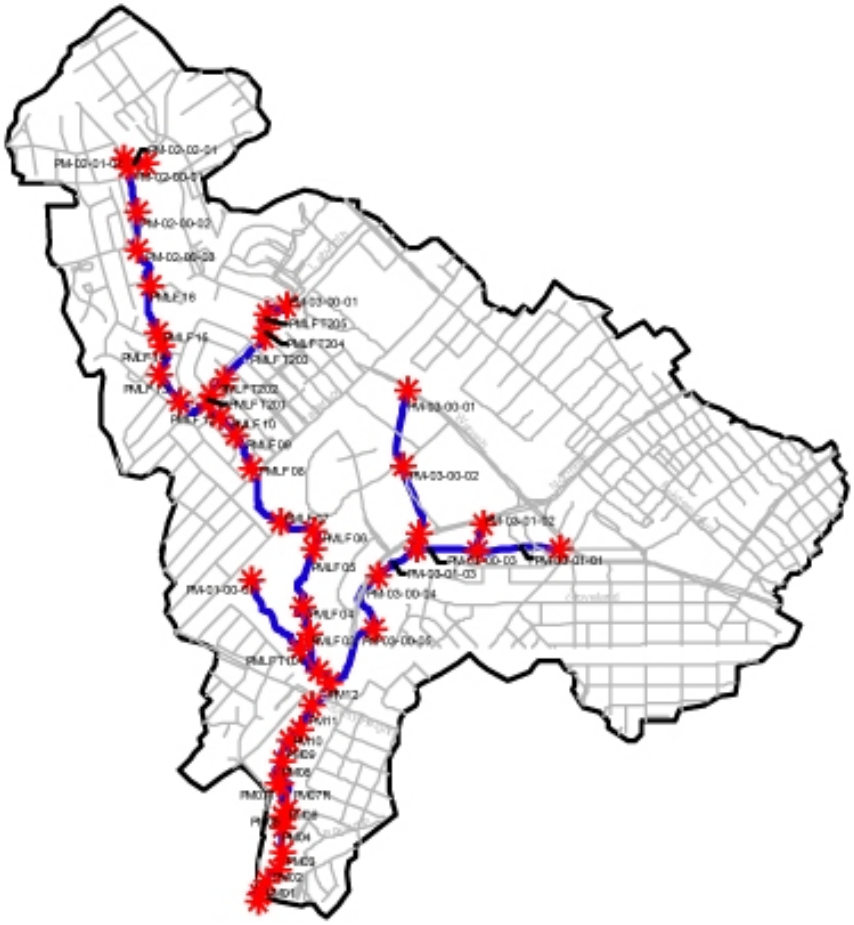
Maryland Environmental Service and the MD Department of Natural Resources have installed Reef Balls to enhance/restore oyster productivity in various areas of the Chesapeake Bay. However, in terms of epibenthic habitat, many of the Reef Balls have been tremendously successful.

Studies directly applicable to the proposed installation of Reef Balls in Masonville Cove were not available. However, qualitative information on Reef Ball usage in the upper Chesapeake suggests that Reef Balls placed at Masonville Cove may be utilized by a variety of epibenthic species, including platform mussels. Additionally, studies of benthic secondary production from artificial reefs in the Delaware Bay suggest that installation of an adequate number of Reef Balls may result in secondary production from the reefs that is higher than that of the existing soft-bottom habitat.

9.0 TIER II OPTION 7 – POWDER MILL STREAM RESTORATION- PHASES 1 - 6[5]

9.1 Location

The Powder Mill watershed is a sub-watershed of the Gwynns Falls Watershed, as pictured in Figure 3.1 of this document. Figure 9.1 shows the outline of the Powder Mill sub-watershed and the Powder Mill stream reaches.



Source: Powder Mill Report (Parsons 2004(2))

Figure 9.1 – Powder Mill Sub-watershed and Stream Reaches

9.2 Existing Conditions

The Powder Mill sub-watershed is located partially within Baltimore County and Baltimore City. The portion within the City is mostly comprised of commercial/industrial areas, with some residential areas. A significant portion (as high as 34%) of the sub-watershed is comprised of impervious area. Many of the reaches within the watershed are classified as degrading, showing bank instability. The water quality in the Powder Mill sub-watershed typically ranks within the middle third of the Gwynns Falls sub-watersheds.

[5] Information in for this option is obtained from *Powder Mill Targeted Watershed Assessment* (Parsons 2004(2)).

9.3 Proposed Enhancement

The Powder Mill report identifies eleven (11) projects as part of the Powder Mill subwatershed plan. These projects are in both Baltimore County and Baltimore City. The report does not specify which projects are in the City. This potential mitigation option would be to fund selected projects from the plan within the City. The main project components include:

- Stream restoration,
- Buffer enhancement,
- BMP creation,
- Channel daylightling,
- Stormdrain outfall retrofit, and
- SWM pond conversion to extended detention.

9.4 Benefits

The proposed projects would significantly increase water quality by reducing pollutant loadings into the watershed. Pollutant load reduced would include TSS, TP, TN, Pb, and Zn.

9.5 Cost

The eleven (11) projects identified in the report total $5.5 million (2004 dollars). The mitigation option would only include projects within the City and the number of projects would need to be determined through further investigation into the benefits.

10.0 TIER II OPTION 8 – DEAD RUN STREAM RESTORATION PROJECT – PHASE I

Information on the project was not available at the time of this EIS. The MPA is working with the City to obtain information on the Dead Run Stream Restoration Project.

10.1 Location

Figure 10.1 – Placeholder for Dead Run Stream Restoration Project Phase I Location

10.2 Existing Conditions

10.3 Proposed Enhancement

10.4 Benefits

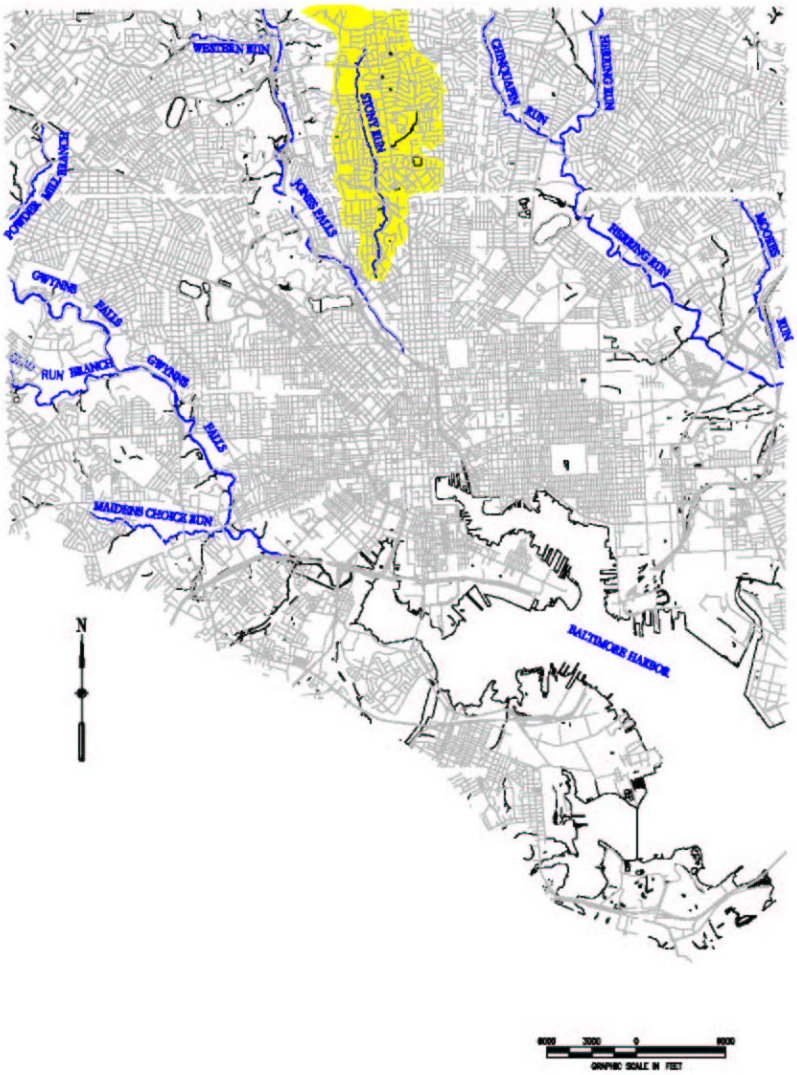
10.5 Cost

The City has identified the cost of the proposed project to be $1,500,000. The MPA is working with the City to obtain information on the Dead Run Stream Restoration Project.

11.0 TIER II OPTION 9 – LOWER STONY RUN PHASES I, II, III[6]

11.1 Location

Stony run is a tributary of the Jones Falls. Stony Run has a drainage area of 2,272 acres with approximately 3.3 miles of free flowing stream and approximately 0.7 miles of unnamed tributaries. Stony Run flows through the Loyola College campus, and the watershed is highlighted in Figure 11.1.



Source: Stony Run Watershed Restoration Plan (EA 2001(2)).

Figure 11.1 – Stony Run Watershed

[6] Information on Stony Run is obtained from *Stony Run Watershed Restoration Plan* (EA 2001(2)).

11.2 Existing Conditions

In general the Stony Run watershed contains highly developed areas that area impervious to the infiltration of precipitation. Stony Run is highly urbanized with the dominant land use characteristics being institutional and high and medium density residential areas. The majority of Stony Run flows through pipes as part of a storm water management system.

An assessment of existing conditions was conducted on December 18 to 20, 2001 to asses the condition of the stream. The approach for assessment uses a rigorous evaluation of over 30 physical, chemical, and biological parameters. Other sources for data were collected from: 1.) The City of Baltimore Department of Public Works, Bureau of Water and Wastewater, 2.) The City of Baltimore Department of Public Works, Bureau of Solid Waste, 3.) The City of Baltimore Bureau of Information/Technology Services, 4.) The Baltimore County Department of Environmental Protection and Resource Management, and 5.) The Baltimore County Department of Parks and Recreation.

Field observations revealed visual evidence of water quality impacts including sanitary sewer discharges to Stony Run and erosion of stream banks. Plastic bags and bottles were present throughout the stream corridor and became lodged in the vegetation and throughout the stream channel. Other forms of debris, including glass and metal, were also present and detracted from the attractiveness of Stony Run. An additional impact to the aesthetics of Stony Run was the erosion of the stream banks, the failed gabion baskets along portions of Stony Run, and the graffiti present on the concrete walls and bridge abutments within the watershed. Other filed observation included the lack of stormwater controls. Much of the surrounding watershed was developed prior to laws that required controls.

11.3 Proposed Enhancement

The following best management practices can be implemented as in-channel improvements:

- Controlling floatables and other refuse with screens and nettings is an in-channel improvement that directly affects the stream and surrounding area.
- Improvements to channel and bank stabilization is an in-channel improvement that will directly affect the stream and surrounding area by reducing streambank erosion.
- Floodplain plantings are improvements made to the stream environment directly adjacent to the watercourse.
- Invasive species management is a practice used in the floodplain that results in the improvement of both water quality and the health of the ecosystem.
- Stormwater wetlands can be created in the floodplain if the area is typically inundated with surface or ground water and supports plants adapted to saturated soil conditions.

The following best management practices can be implemented upland improvements:

- Forested riparian buffers are vegetated areas that act as natural filters for nonpoint source pollution, provide bank stabilization against erosion, create wildlife habitat for terrestrial species, and add to the aesthetic value of the landscape.

- Wet detention ponds are stormwater control structures that provide both detention and treatment of stormwater runoff.
- Vegetated swales are broad, shallow channels covered with dense grass or shrub vegetation that are used to trap and filter pollutants such as suspended solids, nutrients, and metals.
- Meadow buffers are grassland plantings created in the upland that are allowed to mature but not become forested.
- Erosion and sediment control is an upland improvement most utilized in areas of construction where soil is exposed.

11.4 Benefits

The benefits would reduce the solids transported into the stream, Jones Falls and ultimately into the Chesapeake Bay. Other benefits would be:

- Reduction of flow into the city waste water treatment system,
- Improve water quality,
- Improve health of species in/ near the stream,
- Decrease risks to public (i.e. health risks), and
- Aesthetics.

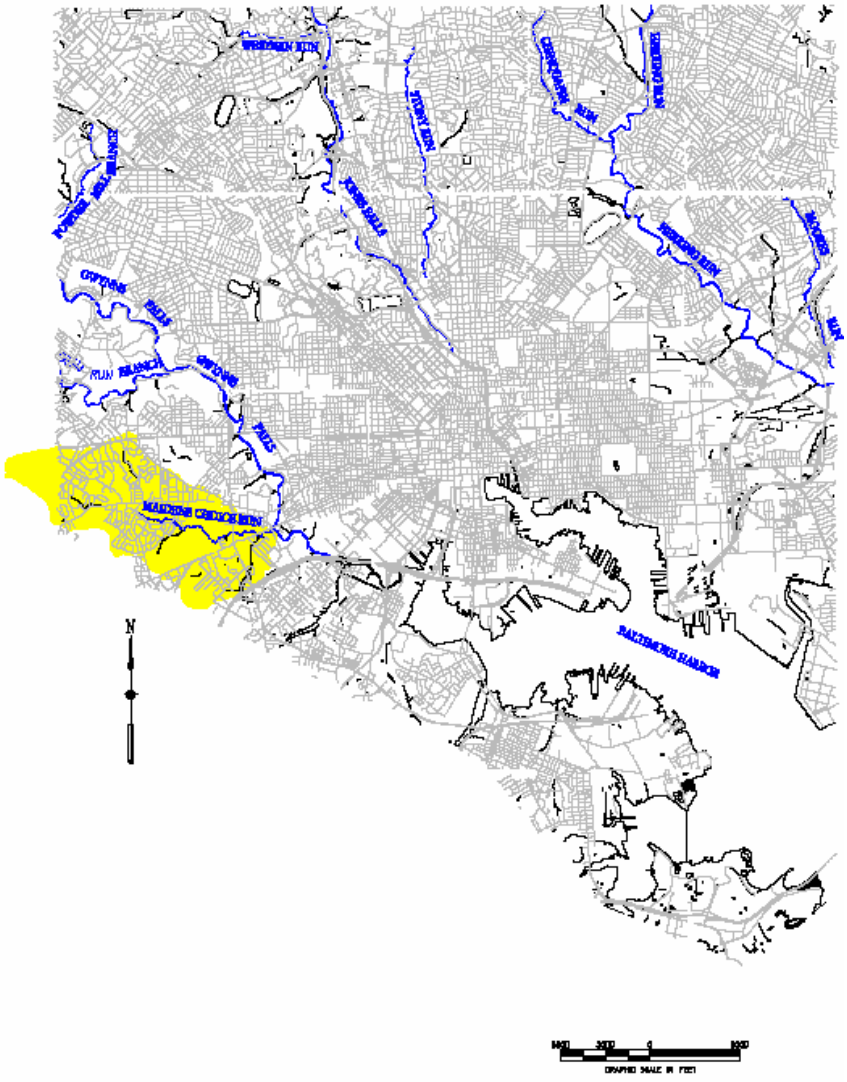
11.5 Cost

EA 2001(2) lists a multitude of proposed projects ranging in initial cost from several thousand dollars to $7 Million.

12.0 TIER II OPTION 10 – MAIDENS CHOICE RUN PHASE II[7]

12.1 Location

The Maidens Choice watershed is located in the southwest corner of the City of Baltimore. The watershed is a sub-watershed of the Gwynns Falls. The watershed for Maidens Choice is approximately 2,143 acres in size with a total stream length of 6.1 miles. The watershed comprises approximately 5% of the Gwynns Falls watershed.



Source: Maidens Choice Watershed Restoration Plan (EA 2001(1)).

Figure 12.1 – Maidens Choice Run Watershed Location Map

[7] Information for this option is obtained from *Maidens Choice Watershed Restoration Plan* (EA 2001(1)).

12.2 Existing Conditions

In general the Maidens Choice watershed contains highly developed areas that area impervious to the infiltration of precipitation. Residential and commercial areas dominate the watershed. Because a large portion of the watershed is highly impervious and the watershed lacks storm water control devices, Maidens Choice and adjacent areas experience reduced water quality, aesthetic quality, and increased threat to human health and safety.

An assessment of existing conditions was conducted by the USACE, Baltimore County, the City of Baltimore, and U.S. Fish and Wildlife Service staff in 1996 for the entire Gwynns falls watershed. Also, the Maryland Department of natural resources conducted fish sampling in 1987 to determine types of species within the stream. Approximately 3.5 miles of the Maidens Choice stream was assessed during this time frame by the groups named above. The investigative activities that were carried out were:

- Stream stability,
- Stream geomorphologic conditions,
- Hydrologic conditions,
- Riparian habitat, and
- In stream habitat.

For the Maidens Choice watershed, the findings were:

- Bank Stability – 29% in bad or very bad condition (1.0 miles assessed)
- Bed Stability – 40% in bad or very bad condition (1.4 miles assessed)
- Erodibility – 7% in bad or very bad condition (0.8 miles assessed)
- In Stream Habitat – 53% in bad or very bad condition (1.6 miles assessed)
- Riparian Habitat – 91% in bad or very bad condition (2.8 miles assessed)
- Forest Cover – 7.6% forest cover (162.9 acres assessed)
- Pollutant Loadings (TSS) – 152.2 lbs/acre

The Gwynns Falls watershed is composed of 9 sub-watersheds. Based on the findings for Maidens Choice field survey, the watershed was ranked as the second most degraded watershed that feeds the Gwynns Falls system next to the Upper Gwynns Falls Mainstream.

12.3 Proposed Enhancement

The USACE selected reach MC-10 as the preferred stream restoration project for the Maidens Choice watershed. This selection is currently the extent of this mitigation option.

Both the USACE and the City of Baltimore agree that the Maiden Choice sewer infrastructure needs to be upgraded/repaired. These improvements would increase the water quality in the stream. A second remedy for increasing the quality of the stream would be stabilizing the banks and sediment bed to reduce the total load into the water (i.e. reduction in TSS loading). Work may include regrading slopes, removal of retaining walls, stabilization with stone, plantings, bioengineering, restore natural geometry, etc. The third approach to mitigation would involve constructing new stormwater management ponds. Two potential sites were identified as Arch

Bishop Keough High School (now Seton Keough High School) and Loudon Park Cemetery. Other items identified that would improve water quality were:

- Increase forested riparian buffers,
- Promote "green roofs",
- Regular roadway sweeping, and
- Controlling the amount of litter and dumping.

12.4 Benefits

The proposed option would reduce the solids transported into the stream, Gwynns Falls River and ultimately into the Middle Branch of the Patapsco River. Other benefits would be:

- Reduction of flow into the city waste water treatment system,
- Improve water quality,
- Improve health of species in/near the stream,
- Decrease risks to public (i.e. health risks), and
- Aesthetics.

12.5 Cost

The USACE selected Maidens Choice stream reach MC-10 for restoration according to Table 6-15 of the EA 2001(1) report. The USACE estimated cost for restoration of this stream reach is $163,000 (2001 dollars) for bank protection and $25,000 per acre of riparian buffer. The report is not clear on the area of riparian buffer that should be restored/enhanced, but Table 5-3 of the EA 2001(1) report shows a stream length of 2,300 linear feet and a buffer width of 45 ft for the MC-10 reach. The entire buffer is thus 2.4 acres and the maximum cost implied by the report is $60,000 (2001 dollars). Thus the total cost for the USACE selected reach MC-10 is $220,000 (2001 dollars).

13.0 TIER II OPTION 11 – DEAD RUN STREAM RESTORATION PHASE II

Information on the project was not available at the time of this EIS. The MPA is working with the City to obtain information on the Dead Run Stream Restoration Project.

13.1 Location

Figure 13.1 – Placeholder for Dead Run Stream Restoration Project Phase I Location

13.2 Existing Conditions

13.3 Proposed Enhancement

13.4 Benefits

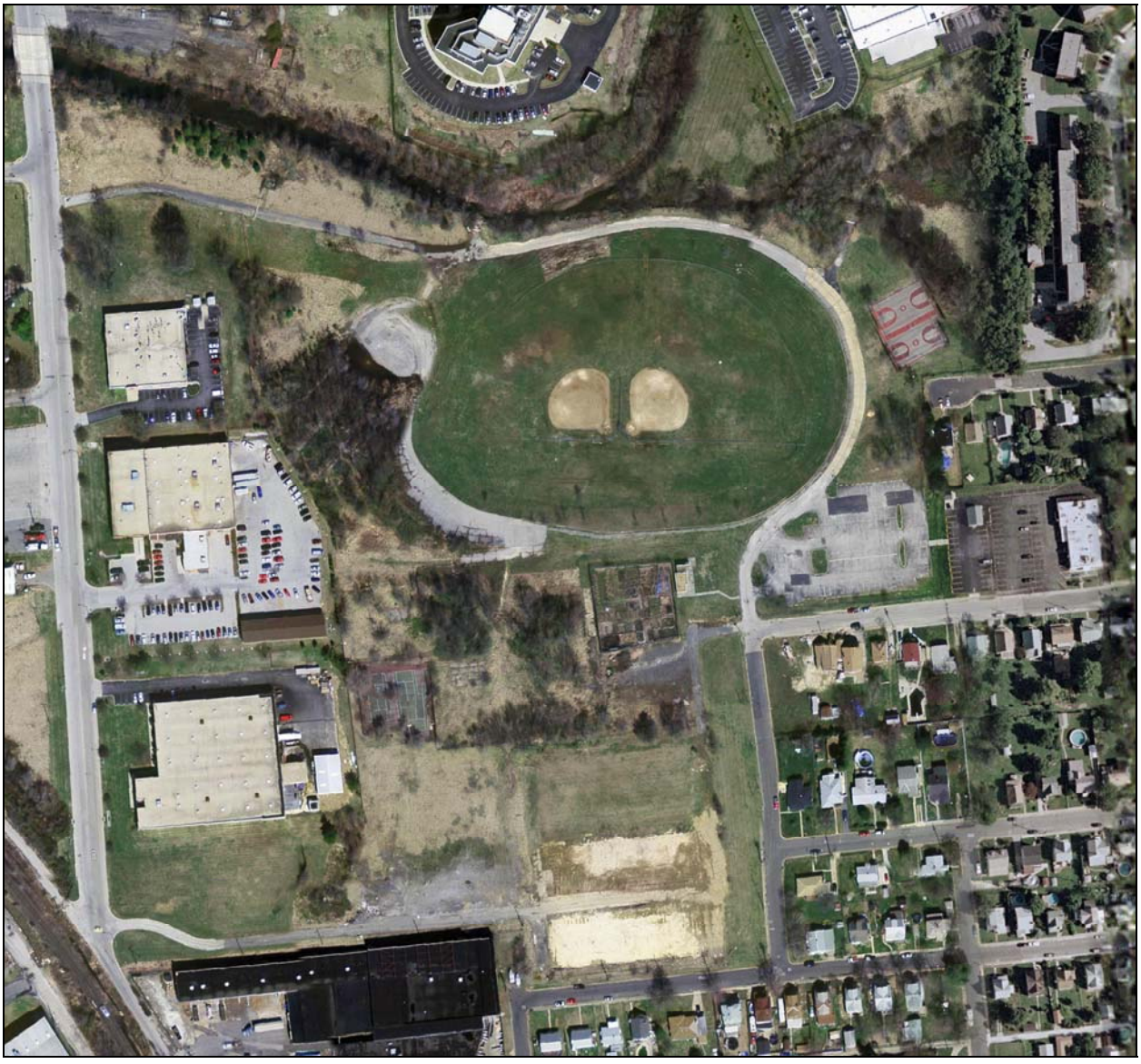
13.5 Cost

The City has identified the cost of the proposed project to be $2,250,000. The MPA is working with the City to obtain information on the Dead Run Stream Restoration Project.

14.0 TIER II OPTION 12 – FORT HOLABIRD PARK IMPERVIOUS SURFACE REMOVAL[8]

14.1 Location

The Fort Holabird Park is located near the intersection of Dundalk Avenue and Liberty Parkway. Figure 14.1 shows the general area of the park. Note the impervious surfaces, including the tennis courts, the circular road, and the paved area just below the tennis courts.



Source: Google Earth Pro™ mapping service

Figure 14.1 - General area of Fort Holabird Park

[8] Information obtained through conversations with the Baltimore City Planning Department.

14.2 Existing Conditions

The park has impervious surfaces including the tennis courts, paved area below the tennis courts, an the circular roadway. These surfaces result in higher peak runoffs and erosion.

14.3 Proposed Enhancement

The City would like to remove the impervious surfaces and replace them with vegetated areas.

14.4 Benefits

This mitigation option would enhance infiltration of rainwater, lessen peak runoff rates, and reduce erosion.

14.5 Cost

The cost of this option has not yet been determined.

15.0 TIER II OPTION 13 – TRASH INTERCEPTORS IN THE PATAPSCO RIVER[9]

15.1 Location

The proposed trash interceptors are located in the northern portion of the Middle Branch of the Patapsco River (Figure 15.1).

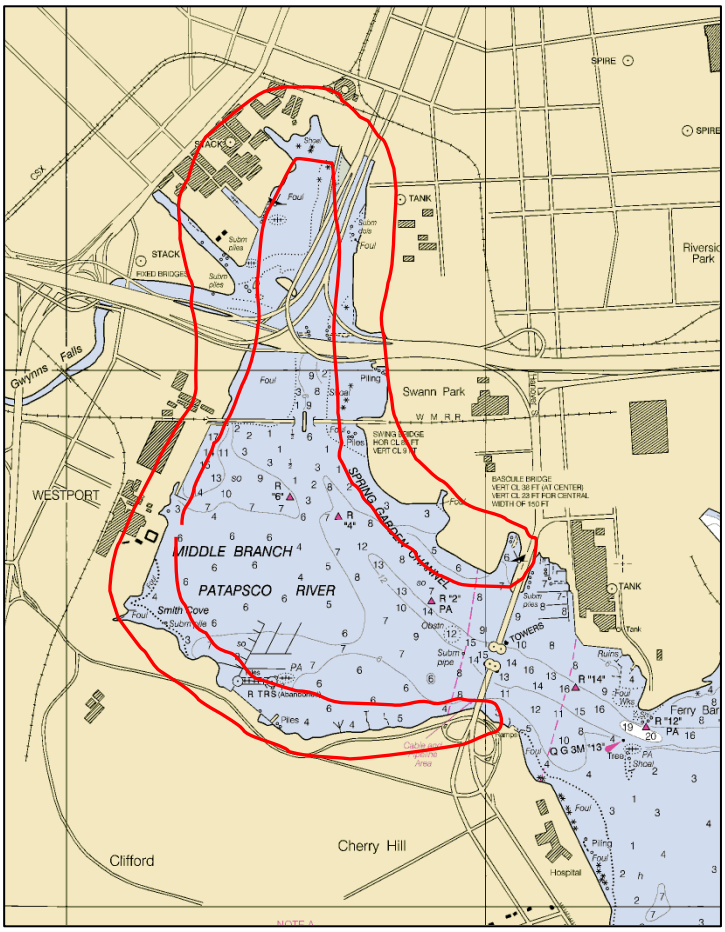


Figure 15.1 - Potential Trash Interceptor Location

15.2 Existing Conditions

Storm drain outfalls in Baltimore City carry large quantities of trash and debris into the Patapsco River and its tributaries. There are 15 outfalls located in the Middle Branch of the Patapsco. Of the 15 outfalls, five are north of the I-95 and I-395 intersection. Currently, there are few trash collection devices on outfalls in the Patapsco and none within the Middle Branch.

15.3 Proposed Enhancement

The option would include construction of a trash interceptor at one or more outfalls in the Middle Branch. The trash interceptors would consist of a netting system to catch trash and debris prior

[9] Source of information is MPA 2006.

to it entering the Middle Branch. The interceptors would be emptied every two weeks and after major events. The trash would be disposed of as municipal waste.

15.4 Benefits

The interceptors would remove the trash from the outfalls in the Middle Branch of the Patapsco. Removal of debris and trash increases survivability of wetlands in the watershed, reduces future buildup of debris along shorelines, and provides aesthetic benefits to the community.

15.5 Cost

The estimated costs for trash interceptors in the Middle Branch range from $300,000 to $1,000,000. Costs vary based on the size of the outfall and the structure required for to be constructed.

16.0 TIER II OPTION 14 – TIDAL MARSH AT SWANN PARK[10]

This option has not yet been determined to be technically feasible. Further study would be required to determine option feasibility.

16.1 Location

Swann Park is located along the Middle Branch of the Patapsco River as seen in Figure 16.1. Figure 16.2 summarizes the current information available on the proposed project.

Figure 16.1 – Swann Park Location Map

16.2 Existing Conditions

A detailed investigation of existing conditions has not been performed, but visual inspection shows that portions of the shoreline are unstable. The shallow water along the shoreline is underline by soft sediments, which have the potential to contain contamination.

16.3 Proposed Enhancement

The proposed enhancement is to construct a tidal wetland out of clean fill material (likely sand). The wetland would be planted with native vegetation.

16.4 Benefits

Benefits associated with this option would be the reduction of shoreline erosion, and thus sediment load to the watershed and the Middle Branch of the Patapsco River. The proposed

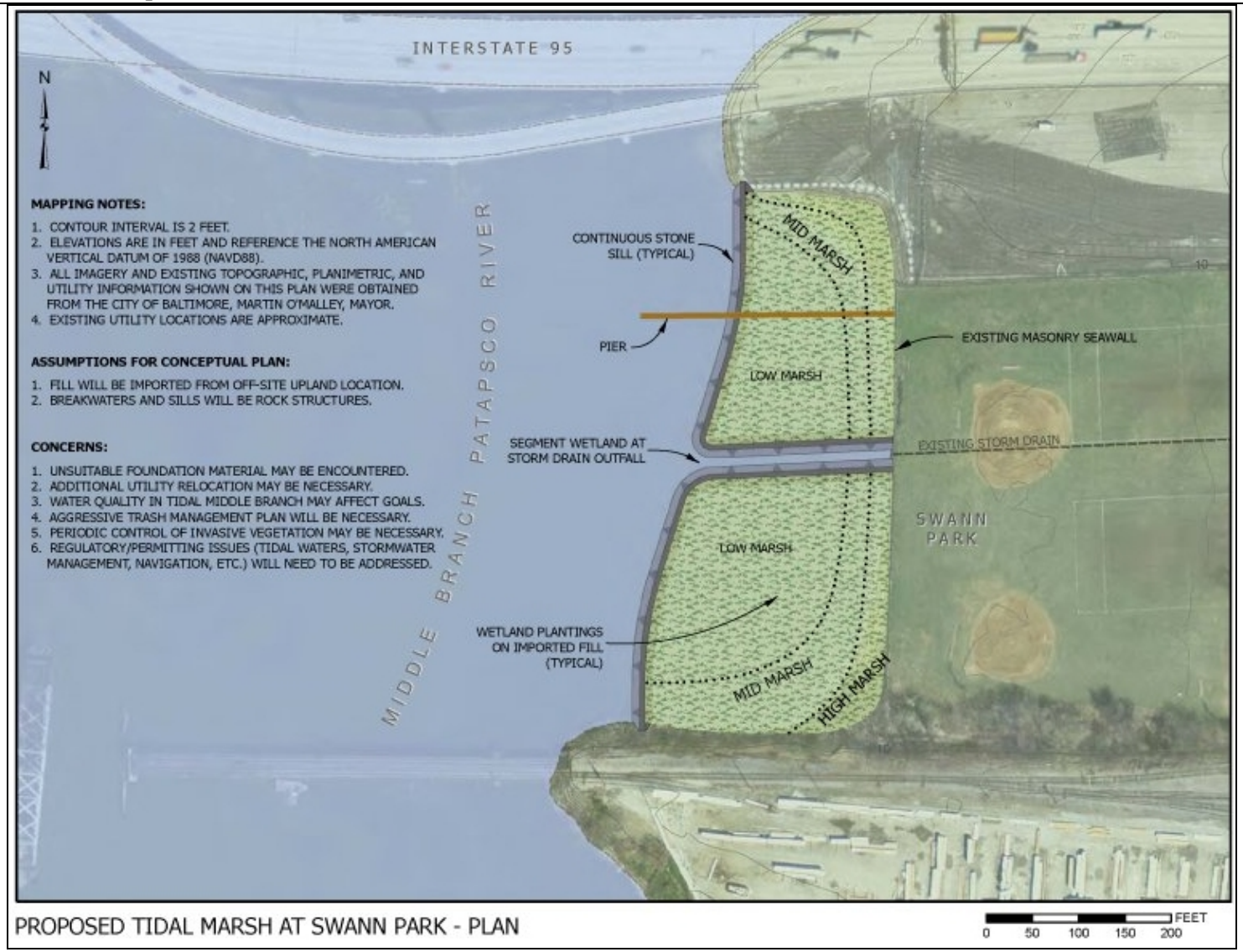
[10] Source of information is City 2006 Email.

enhancement would improve substrate conditions and create wetland habitat. There would potentially be an increase in fish forage and refuge opportunities. The project would also enhance wading bird and waterfowl foraging opportunities.

16.5 Cost

The USACE has provided[11] a conceptual cost range of $583,000 to $1,580,000.

[11] Source of costs is USACE 2006 Email.



Source: Baltimore City Planning Department - USACE 2006

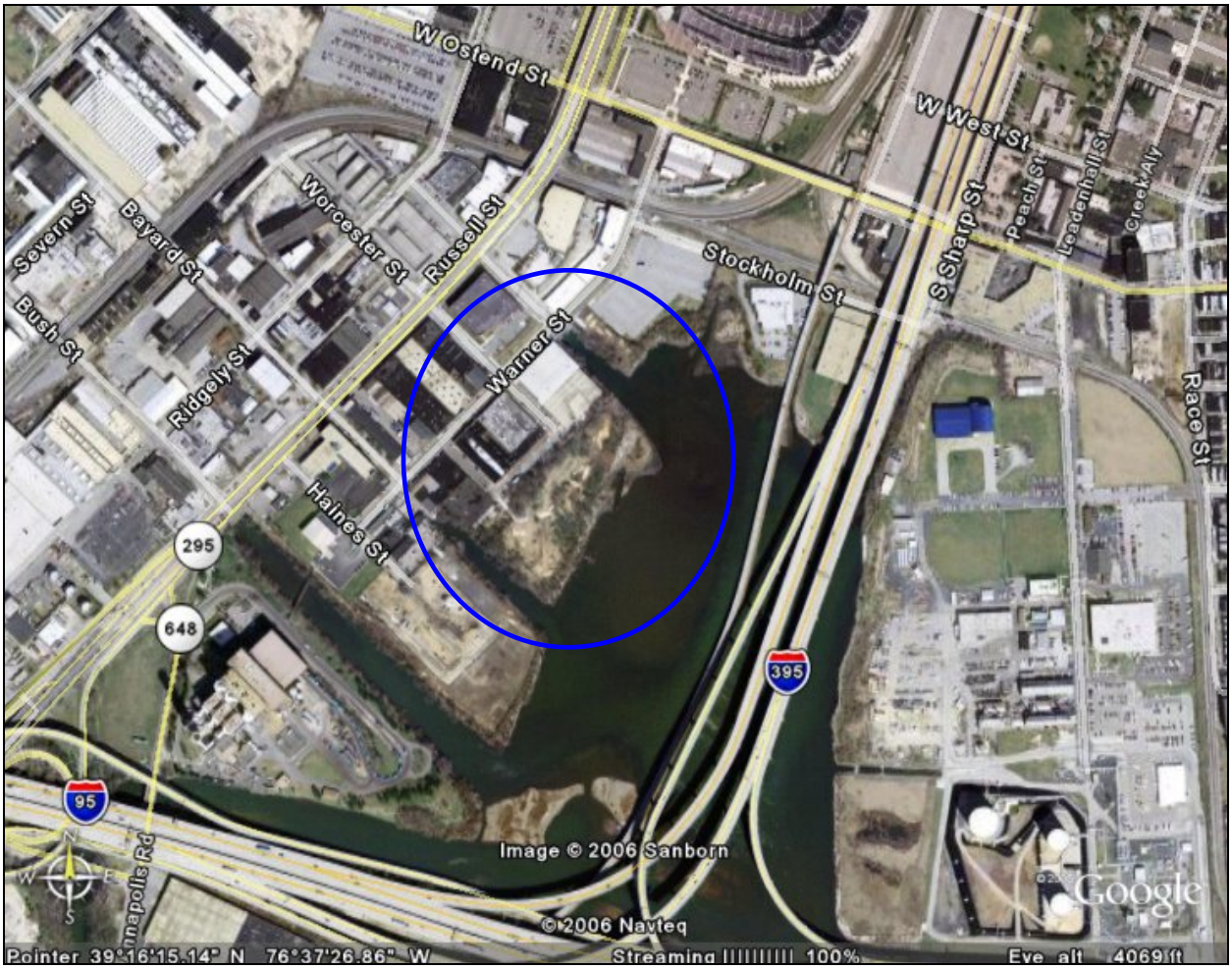
Figure 16.2 – Swan Park Tidal Marsh Creation

17.0 TIER II OPTION 15 – TIDAL MARSH AT WARNER STREET[12]

This option has not yet been determined to be technically feasible. Further study would be required to determine option feasibility.

17.1 Location

Warner Street is located near Interstate 395 along the Middle Branch of the Patapsco River as seen in Figure 17.1. Figure 17.2 summarizes the current information available on the proposed project.



Source: Google Earth Pro™ mapping service

Figure 17.1 – Location of Warner Street Tidal Marsh

17.2 Existing Conditions

A detailed investigation of existing conditions has not been performed, but visual inspection shows that portions of the shoreline are unstable. The shallow water along the shoreline is underline by soft sediments, which have the potential to contain contamination.

[12] Source of information is City 2006 Email.

17.3 Proposed Enhancement

The proposed enhancement is to construct a tidal wetland out of clean fill material (likely sand). The wetland would be planted with native vegetation.

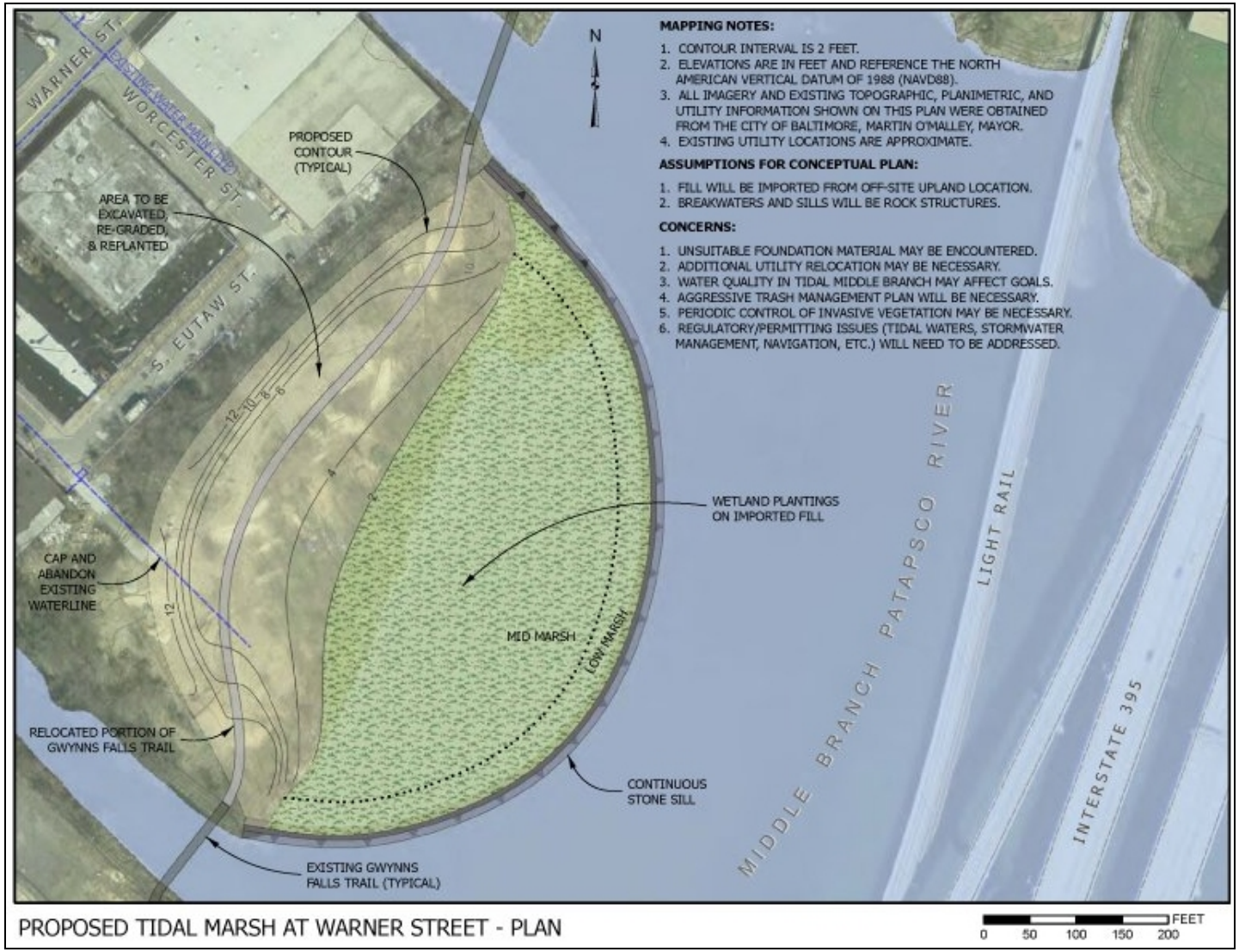
17.4 Benefits

Benefits associated with this option would be the reduction of shoreline erosion, and thus sediment load to the watershed and the Middle Branch of the Patapsco River. The proposed enhancement would improve substrate conditions and create wetland habitat. There would potentially be an increase in fish forage and refuge opportunities. The project would also enhance wading bird and waterfowl foraging opportunities.

17.5 Cost

The USACE has provided[13] a conceptual cost range of $1,014,000 to $2,184,000.

[13] Source of information is USACE 2006 Email.



Source: Baltimore City Planning Department - USACE 2006

Figure 17.2 – Warner Street Tidal Marsh Creation

18.0 TIER II OPTION 16 – TIDAL MARSH AT AQUARIUM SITE[14]

This option has not yet been determined to be technically feasible. Further study would be required to determine option feasibility.

18.1 Location

The Aquarium Site is located along the Middle Branch of the Patapsco River as seen in Figure 18.1. Figure 18.2 summarizes the current information available on the proposed project.

Source: Google Earth Pro™ mapping service

Figure 18.1 – Aquarium Site Location Map

[14] Source of information is City 2006 Email.

18.2 Existing Conditions

A detailed investigation of existing conditions has not been performed, but visual inspection shows that portions of the shoreline are unstable. The shallow water along the shoreline is underline by soft sediments, which have the potential to contain contamination.

18.3 Proposed Enhancement

The proposed enhancement is to construct a tidal wetland out of clean fill material (likely sand). The wetland would be planted with native vegetation.

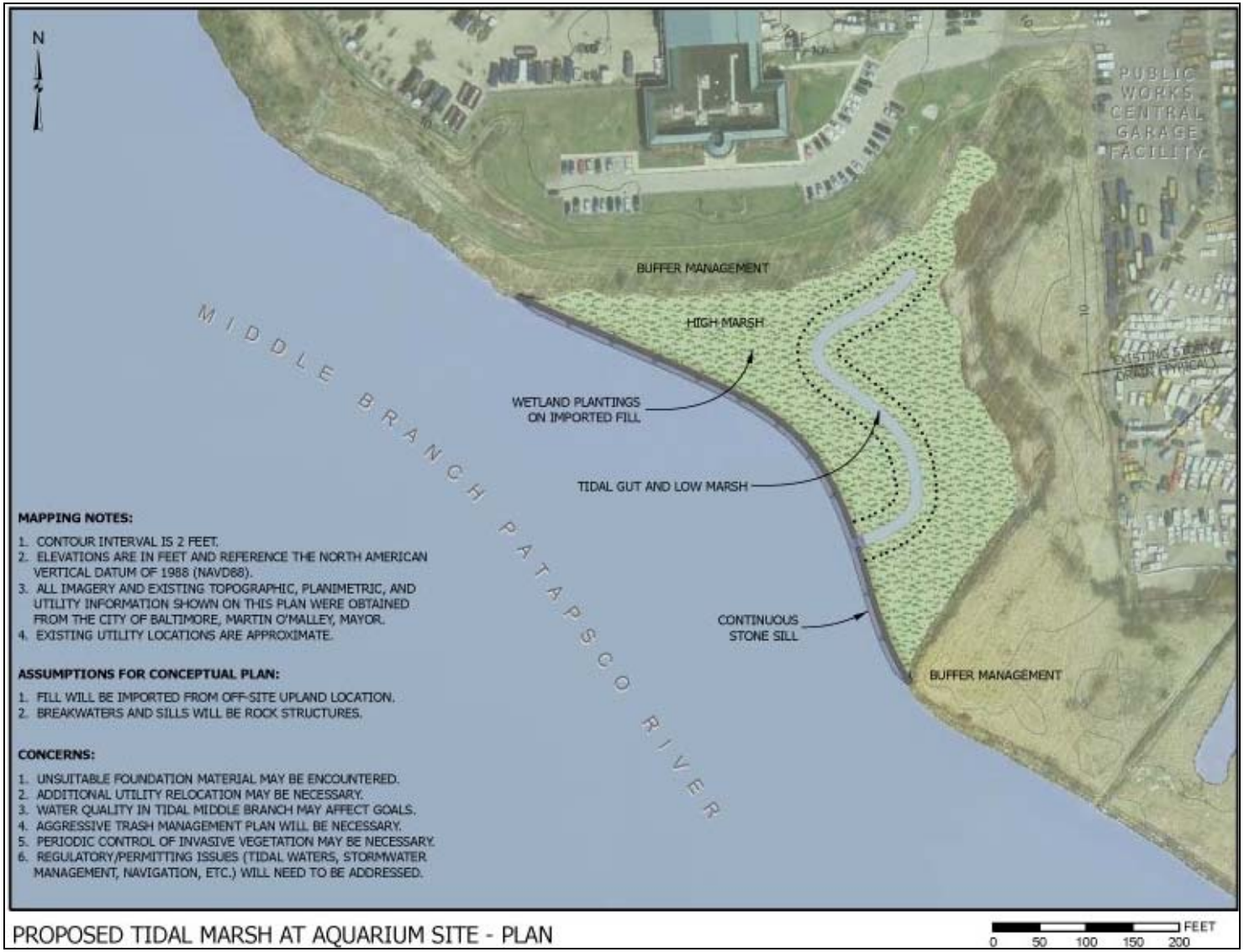
18.4 Benefits

Benefits associated with this option would be the reduction of shoreline erosion, and thus sediment load to the watershed and the Middle Branch of the Patapsco River. The proposed enhancement would improve substrate conditions and create wetland habitat. There would potentially be an increase in fish forage and refuge opportunities. The project would also enhance wading bird and waterfowl foraging opportunities.

18.5 Cost

The USACE has provided[15] a conceptual cost range of $509,000 to $1,078,000.

[15] Source of information is USACE 2006 Email.



Source: Baltimore City Planning Department - USACE 2006

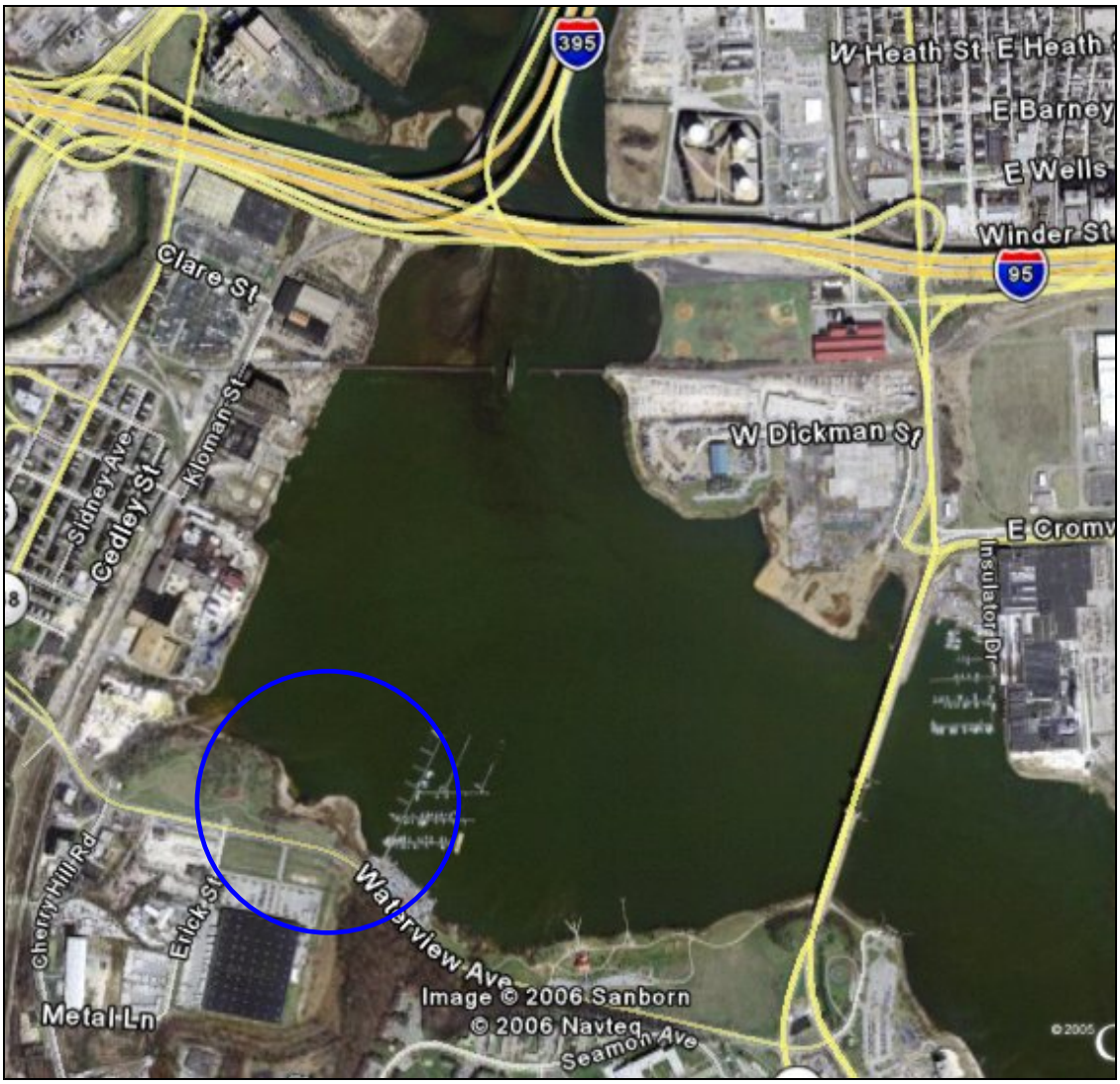
Figure 18.2 – Aquarium Site Tidal Marsh Creation

19.0 TIER II OPTION 17 – TIDAL MARSH AT MIDDLE BRANCH PARK[16]

This option has not yet been determined to be technically feasible. Further study would be required to determine option feasibility.

19.1 Location

Middle Branch Park is located along the Middle Branch of the Patapsco River as seen in Figure 19.1. Figure 19.2 summarizes the current information available on the proposed project.



Source: Google Earth Pro™ mapping service

Figure 19.1 – Middle Branch Park Tidal Marsh

[16] Source of information is City 2006 Email.

19.2 Existing Conditions

A detailed investigation of existing conditions has not been performed, but visual inspection shows that portions of the shoreline are unstable. The shallow water along the shoreline is underline by soft sediments, which have the potential to contain contamination.

19.3 Proposed Enhancement

The proposed enhancement is to construct a tidal wetland out of clean fill material (likely sand). The wetland would be planted with native vegetation.

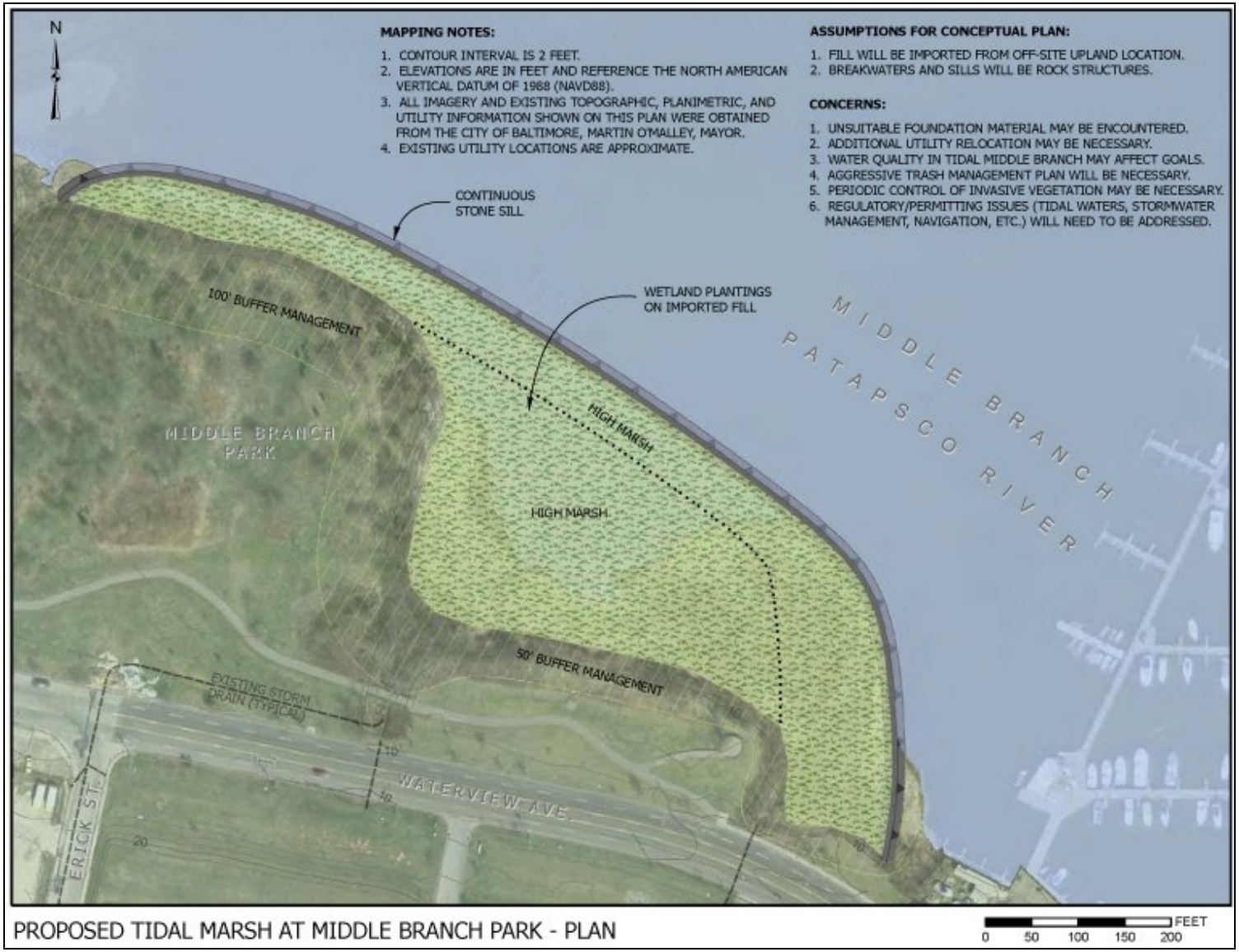
19.4 Benefits

Benefits associated with this option would be the reduction of shoreline erosion, and thus sediment load to the watershed and the Middle Branch of the Patapsco River. The proposed enhancement would improve substrate conditions and create wetland habitat. There would potentially be an increase in fish forage and refuge opportunities. The project would also enhance wading bird and waterfowl foraging opportunities.

19.5 Cost

The USACE has provided[17] a conceptual cost range of $781,000 to $1,675,000.

[17] Source of information is USACE 2006 Email.



Source: Baltimore City Planning Department - USACE 2006

Figure 19.2 – Middle Branch Park Tidal Marsh Creation

20.0 TIER II OPTION 18 – TIDAL MARSH AT HARBOR HOSPITAL[18]

This option has not yet been determined to be technically feasible. Further study would be required to determine option feasibility.

20.1 Location

Harbor Hospital is located along the Middle Branch of the Patapsco River as seen in Figure 20.1. Figure 20.2 summarizes the current information available on the proposed project.

Source: Google Earth Pro™ mapping service

Figure 20.1 – Harbor Hospital Location Map

[18] Source of information is City 2006 Email.

20.2 Existing Conditions

A detailed investigation of existing conditions has not been performed, but visual inspection shows that portions of the shoreline are unstable. The shallow water along the shoreline is underline by soft sediments, which have the potential to contain contamination.

20.3 Proposed Enhancement

The proposed enhancement is to construct a tidal wetland out of clean fill material (likely sand). The wetland would be planted with native vegetation.

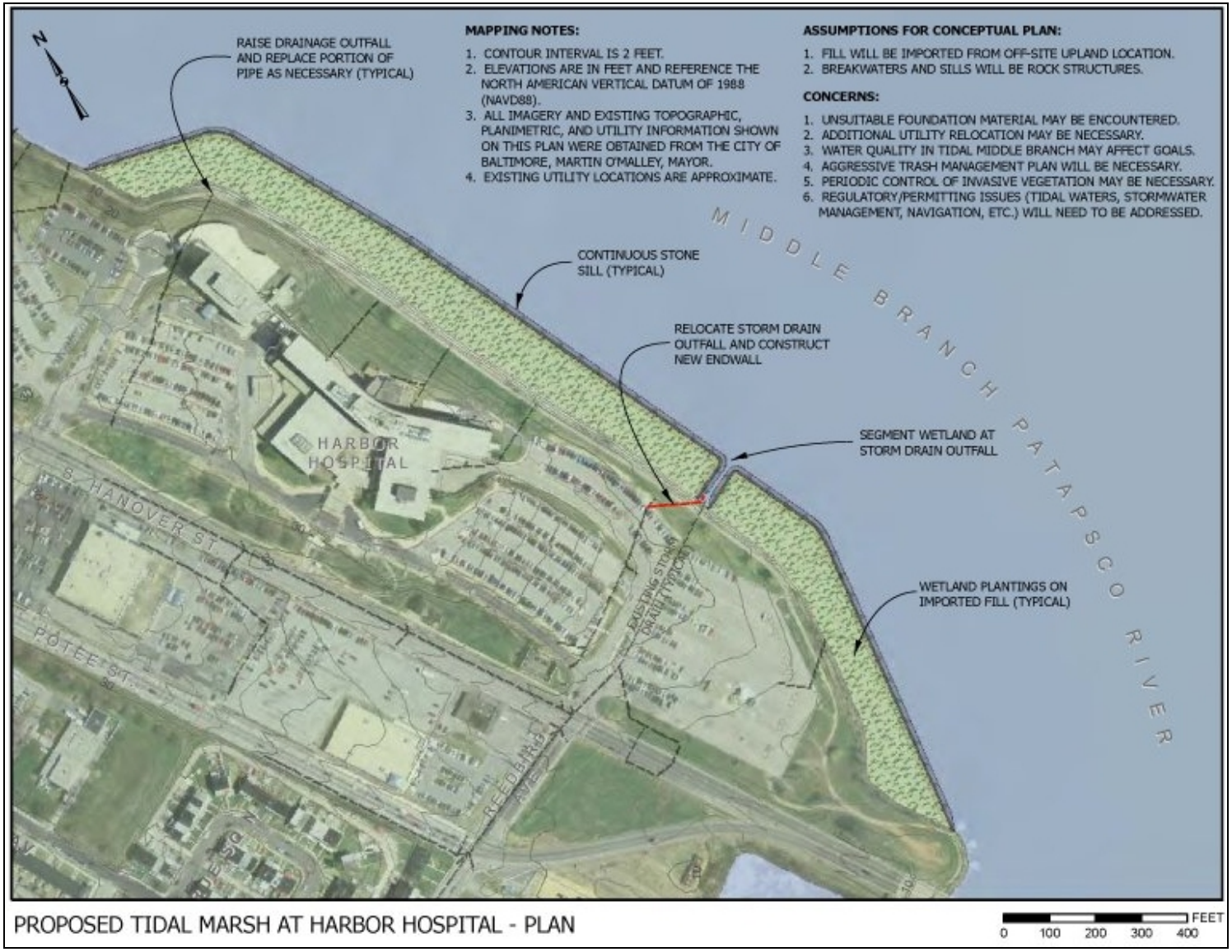
20.4 Benefits

Benefits associated with this option would be the reduction of shoreline erosion, and thus sediment load to the watershed and the Middle Branch of the Patapsco River. The proposed enhancement would improve substrate conditions and create wetland habitat. There would potentially be an increase in fish forage and refuge opportunities. The project would also enhance wading bird and waterfowl foraging opportunities.

20.5 Cost

The USACE has provided[19] a conceptual cost range of $1,067,000 to $2,075,000.

[19] Source of information is USACE 2006 Email.



Source: Baltimore City Planning Department - USACE 2006

Figure 20.2 – Harbor Hospital Tidal Marsh Creation

21.0 TIER II OPTION 19 – CARR-LOWERY WETLAND[20]

This option has not yet been determined to be technically feasible. Further study would be required to determine option feasibility.

21.1 Location

The proposed site of the Carr-Lowery Wetland is located along the Middle Branch of the Patapsco River as seen in Figure 21.1.

Source: Google Earth Pro™ mapping service

Figure 21.1 – Carr-Lowery Wetland Location Map

[20] Information provided by City at 11/14/06 Bay Enhancement Working Group meeting.

21.2 Existing Conditions

A detailed investigation of existing conditions has not been performed, but visual inspection shows that portions of the shoreline are unstable. The shallow water along the shoreline is underline by soft sediments, which have the potential to contain contamination.

21.3 Proposed Enhancement

The proposed enhancement is to construct a tidal wetland out of clean fill material (likely sand). The wetland would be planted with native vegetation.

21.4 Benefits

Benefits associated with this option would be the reduction of shoreline erosion, and thus sediment load to the watershed and the Middle Branch of the Patapsco River. The proposed enhancement would improve substrate conditions and create wetland habitat. There would potentially be an increase in fish forage and refuge opportunities. The project would also enhance wading bird and waterfowl foraging opportunities.

21.5 Cost

No cost for this option was provided.

REFERENCES

AMT 2004 - *Herring Run Watershed Stream Assessment and Restoration Concept Plan Final Report.* City of Baltimore. A. Morton Thomas & Associates, Inc. Biohabitats, Inc. July 2004.

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Parsons 2004(2) - *Powder Mill Targeted Watershed Assessment*. Baltimore City Department of Public Works Water Quality Management Section, Baltimore County Department o f Environmental Protection and Resources Management. Parsons Brinckerhoff. October 2004.

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CRITICAL AREA MITIGATION PLAN

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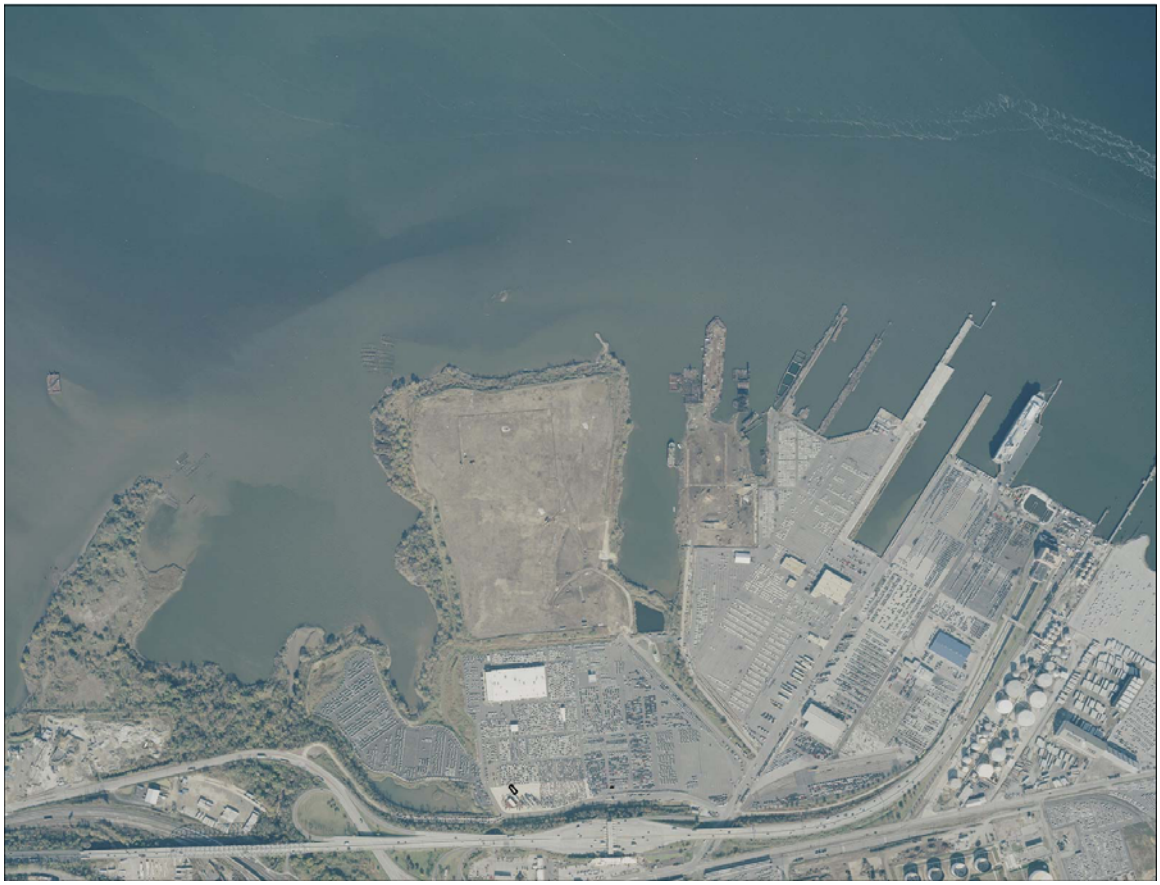
MASONVILLE
DREDGED MATERIAL
CONTAINMENT FACILITY



Chesapeake Bay Critical Area Commission
Conceptual Approval Request

Maryland Port Administration
February 2007

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(Appendices not resubmitted as they are unchanged from previous submittal)

Justification and Need

Maintenance and new dredging projects within the Baltimore Harbor generate approximately 1.5 million cubic yards (mcy) of dredged material on an annual basis. This demand for placement of dredged material is expected to continue for the next twenty years and beyond. Sediment dredged from the Patapsco River west of the North Point-Rock Point line is statutorily prohibited, by the State of Maryland, from being redeposited in an unconfined manner dredged material into or onto any portion of the water or bottomland of the Chesapeake Bay or of the tidewater portion of any of the Chesapeake Bay's tributaries except when used for a beneficial use project undertaken in accordance with State and federal laws. Extensive studies have shown that a dredged material containment facility (DMCF) is the most feasible option for the management of dredged material. Existing placement sites for dredged material from the Baltimore Harbor (Patapsco River west of the North Point-Rock Point line) include the Hart-Miller Island (HMI) DMCF and the Cox Creek DMCF. Currently, the majority of the Harbor dredged material is placed at the HMI DMCF, which is legislated to close by December 31, 2009. The Cox Creek DMCF also receives Harbor dredged material; however, its annual placement volume is limited to approximately 0.5 mcy per year. To avoid a dredged material placement capacity shortfall, implementation of new options capable of accepting the annual volume of 1.5 mcy of dredged material from the Baltimore Harbor is required.

Project Description

The proposed Masonville DMCF project requires filling of a portion of the Patapsco River (see Figures 1). The DMCF will consist of rock-armored sand/clay dikes, unarmored sand/clay dikes and steel cellular cofferdams. Ancillary construction associated with the DMCF includes relocating a Baltimore City 48” waterline, relocating Baltimore City storm drains, demolition of pier seawalls structures, relocating sunken barges and derelict vessels, and relocating a commercial mooring buoy. Figure 1 shows the general site alignment and the locations of the various containment structures.

The initial elevation of the containment structure would be +10 ft mean lower low water (MLLW). Borrow for initial construction of the dikes would use both onsite borrow and material borrowed from the shipping channels in front of Seagirt Marine Terminal. Ultimately, the dikes would be raised to an elevation of +42 ft MLLW.

The project also includes filling of the Wet Basin, which is located on the eastern portion of the site. A rock dike would close this area off from the Patapsco River, and the Wet Basin would be used to increase the capacity of the proposed Masonville DMCF. The initial elevation of the rock dike would be +8 ft MLLW. The material for filling the Wet Basin would be excavated from within the Masonville DMCF footprint and placed into the Wet Basin.

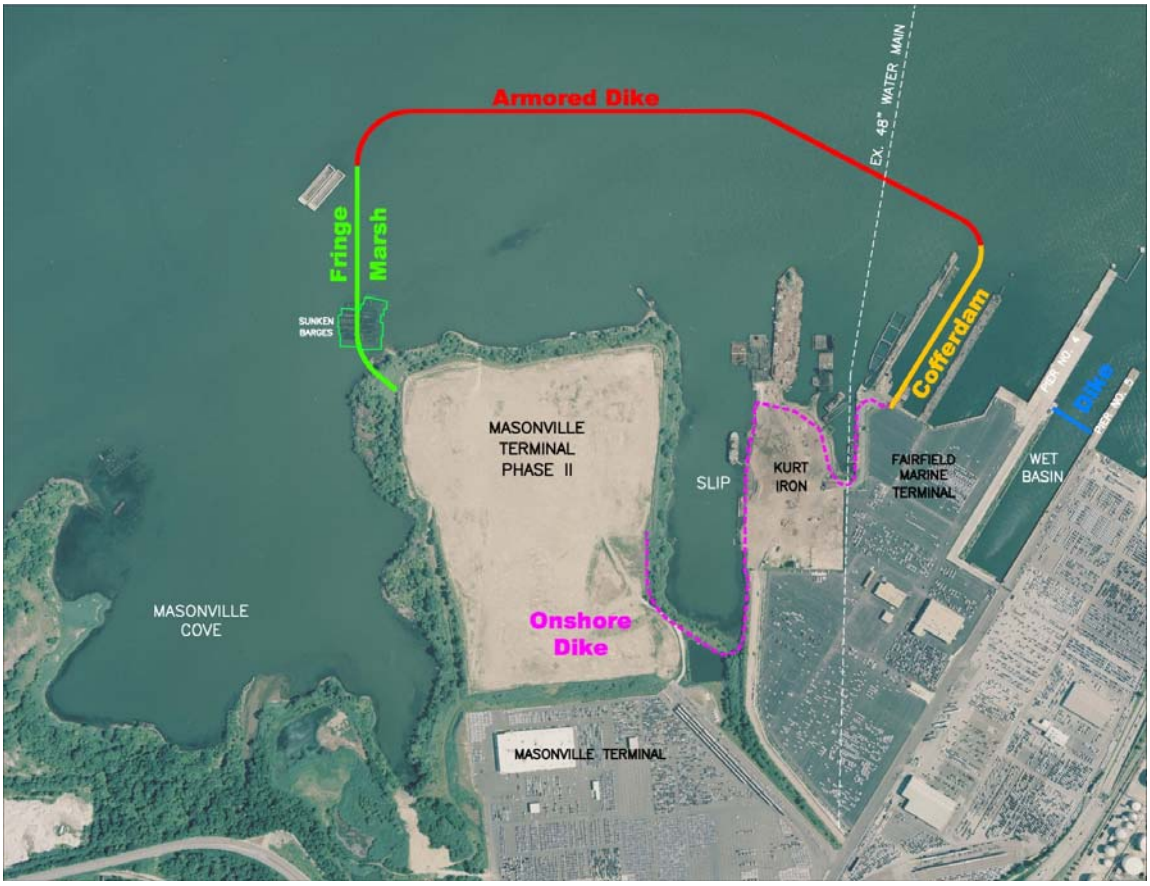

Figure 1. Masonville DMCF Project

Project Schedule and Phasing

The Masonville DMCF project construction, operations and associated mitigation projects are planned to begin in year 2007 and be complete in approximately year 2033. Table 1 shows the project broken into three phases; initial construction, intermediate construction and final construction. Initial construction (2007-2009) includes construction of the cofferdam, dikes (to elevation +10 ft MLLW) and spillways; relocation of storm drains and waterline and construction of all mitigation and plantings on existing land. Placement of dredged material will begin in approximately 2009 and in year 2019 will be up to an elevation of +0 ft MLLW. Intermediate construction (2010 – 2032) includes raising of the dikes to an elevation of +42 ft MLLW, planting of additional area created through dike raising and placing of dredged material to approximately elevation +40 ft MLLW. Final construction (2033) includes final development and planting of the site. Construction of the cofferdam and dike will create 14.1 acres of new critical area buffer in what is currently open water. Ultimately, the only portion of the new buffer that will not be vegetated is the 2.7 acres of cofferdam.

Initial Construction Phase

Construction of the DMCF facility will begin following the issuance of all required permits and approvals (estimated to be June 2007). The initial construction phase (shown in Figures C-1 through C-6) will include 7.15 acres of impacts (21.5 acres of mitigation required at ratio of 3:1) to the existing critical area buffer and 27.5 acres of mitigation plantings. At the end of the initial construction phase the completed plantings will exceed required plantings by approximately 7 acres. In addition to the mitigation plantings, the new 100 ft critical area buffer will be planted where feasible. The areas that can not be established in vegetation are included in the impact acreage for the initial construction.

The mitigation plantings during initial construction will be located in the Masonville Cove and Marine Terminal. Table 1 lists the planting projects and their acreages. Approximately 0.7 acres will be planted in the vicinity of the Environmental Education Center in Masonville Cove. The areas in this vicinity that have been selected for planning are primarily paved. The pavement in the area will be removed and planted with deciduous canopy and understory trees. Approximately 8.7 acres will be planted during the Phase 1 Masonville Cove cleanup. The Phase 1 area is characterized by extensive debris, invasive species and bare areas. Work in the area will include removal of debris and invasive species and planting with deciduous canopy and understory trees. Approximately 5.2 acres will be planted during shoreline enhancement and stabilization. The shoreline throughout Masonville Cove and along the western side of the Masonville Marine Terminal has portions that appear to be unstable and are not vegetated. In some areas the shoreline appears to be comprised of fill and debris. Shoreline stabilization will include excavation and/or filling to create a gently sloped shoreline to support vegetation. Shoreline plantings will include tidal wetland vegetation, salt bush and transition into deciduous canopy and understory trees and shrubs. Approximately 5.8 acres will be planted in the areas surrounding the existing Masonville Marine Terminal. Work in this area will include removal of invasive species and planting with deciduous canopy and understory trees. Approximately 6.8 acres will be planted during the Phase 2 and 3 Masonville Cove cleanup. The Phase 2 and 3 area is characterized by extensive debris, invasive species and bare areas. Work in the area will include removed of debris and invasive species and planting with deciduous canopy and understory trees.

Intermediate Construction Phase

The impacts that will occur to the existing critical area buffer during the intermediate phase will be due to placement of dredged material within the DMCF (Figure C-7). At the beginning of the intermediate phase (approximately year 2019) the dredged material will be at +0 ft MLLW. As additional material is placed within the DMCF, the elevation will increase and the material will cover the existing vegetation on the slopes. The impacts to the vegetation will continue until the dredged material reaches the top of the slope, at which point all impacts to the existing buffer will be complete. The area impacted during the intermediate phase of construction is 7.1 acres. Following

TABLE 1
IMPACT AND MITIGATION SCHEDULE FOR MASONVILLE DMCF 100 FT CRITICAL AREA BUFFER

Project	Figure Number	Project Type (Impact/Mitigation)	Estimated Beginning	Estimated Completion	Buffer Area (acres)	Impact/Mitigation (acres)*	Cumulative (acres)
Initial Construction							
Environmental Education Center	C-1	Mitigation	2007	2008	0.68	0.68	0.68
Cove Cleanup and Planting - Phase 1	C-2	Mitigation	2007	2008	8.68	8.68	9.36
Tidal Wetland Creation/Enhancement & Shoreline Stabilization	C-3	Mitigation	2007	2008	5.21	5.21	14.57
Masonville Marine Terminal Plantings	C-4	Mitigation	2007	2008	5.82	5.82	20.39
Demolition of Sea Wall	C-5	Impact	2007	2007	0.92	-2.76	17.63
Cofferdam/Waterline Phase 2	C-5	Impact	2007	2009	2.73	-8.19	9.44
Initial Dike and Spillways	C-5	Impact	2008	2009	3.30	-9.90	-0.46
Storm Drain Phase 2	C-5	Impact	2008	2009	0.20	-0.60	-1.06
Cove Cleanup and Planting - Phases 2 & 3	C-6	Mitigation	2009	2009	6.76	6.76	5.70
Intermediate Construction							
Dredged Material Placement to +0	C-7	Impact	2010	2019	0.00	0.00	5.70
Dike Raising	C-7	Impact	2019	2021	0.57	-1.71	3.99
Planting of Dike (beyond 100 ft buffer)	C-7	Mitigation	2022	2022	13.90	13.90	17.89
Dredged Material Placement - to +22	C-7	Impact	2019	2028	3.25	-9.75	8.14
Dredged Material Placement - to +40	C-7	Impact	2029	2032	3.25	-9.75	-1.61
Final Construction							
Site final planting	C-8	Mitigation	2033	2033	4.03	4.03	2.42

*Impacts are shown as negative acreage and are calculated based on a 3:1 mitigation ratio.

completion of the dikes approximately 13.9 acres of sloped area will be constructed in addition to the new 100 ft critical area buffer. These 13.9 acres will be planted with woody shrubs.

Final Construction Phase

During the final phase of construction development of the facility will be completed (Figure C-8). As part of the final development of the site, an additional area of 4.0 acres will be available for planting. These 4.0 acres will be planted with woody shrubs.

Mitigation and Community Enhancement

Mitigation is required for the filling of 130 acres of tidal open water and affecting 1 acre of vegetated wetlands. Approximately 0.4 acres of SAV within the DMCF alignment would also be affected by the recommended plan. The mitigation projects associated with the project are beneficial to the environment and the community surrounding Masonville and are an integral part of the overall project. The mitigation projects focus on improving the area adjacent to the DMCF known as Masonville Cove, along with supplemental projects in other areas. The overall mitigation package includes projects in Masonville Cove and in other areas of the Patapsco watershed. Masonville Cove is located along the southern shoreline of the Middle Branch of the Patapsco River, and the proposed mitigation and community enhancement projects in the Cove encompasses approximately 113 acres of water and 54 acres of upland (see Figure 2). The shoreline of the Cove is littered with heavy industrial debris including large timber piles and metal structures. Extensive trash and debris also litter the upland and shallow water portion of the site. Masonville Cove is a Designated Habitat Protection Area (DHPA) as determined by the City of Baltimore (City of Baltimore 2002). The DHPA has been designated based on historical use of the open water area of the Cove by wintering and migrating waterfowl. Details on the project mitigation plan are included as Appendix C.

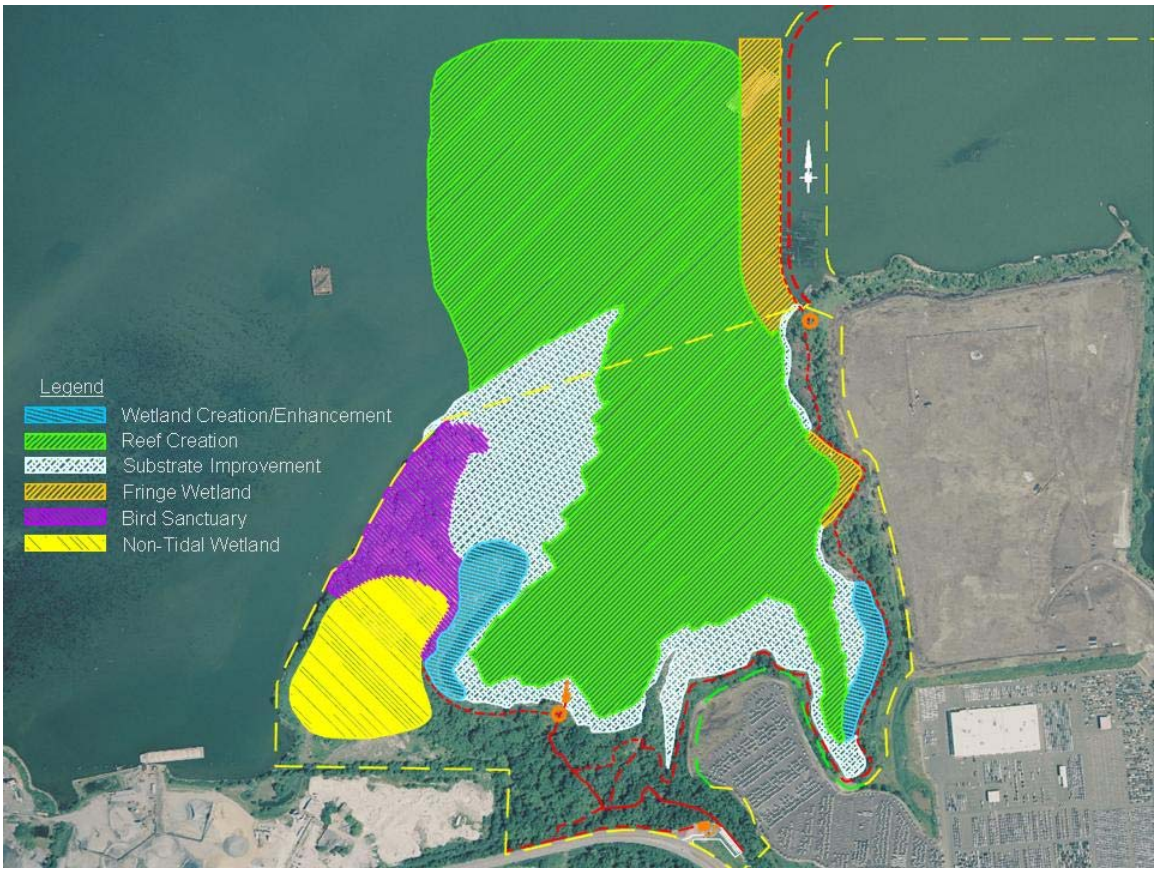

Figure 2. Masonville Cove Mitigation Projects

To document that the losses associated with the fill at Masonville are offset by the proposed mitigation projects an evaluation technique was employed that generally follows the NOAA Habitat Equivalency Analysis Approach. Habitat Equivalency generally makes assessments of the values and functions lost due to various environmental perturbations and gained through mitigative measures. For the Masonville mitigation, a Habitat Condition Analysis (HCA) was developed to evaluate the open water impacts and the benefits of the mitigation options based on standard measures of ecological value. Appendix D includes the HCA analysis that was presented to the JE committee during mitigation plan development.

Project Review and Approval

The National Environmental Policy Act (NEPA) process is underway for the project, in accordance with the US Army Corps of Engineers regulations for implementing NEPA as part of a regulatory action. Due to the size and potential impacts of the proposed DMCF, an environmental impact statement (EIS) is required to support the joint permit application submitted for the project. The draft document, "Tiered Draft Environmental Impact Statement for the Proposed Masonville Dredged Material Containment Facility" was distributed for public review and comment in May 2006. The Final EIS is expected to be published and available for public review and comment in February 2007. The EIS addresses justification and need for the proposed project as well as potential impacts and

site development issues. Through the NEPA process Federal, State, Local, and community agencies and representatives have reviewed and commented on the project. Appendix A contains agency correspondence included in the Draft EIS regarding wildlife and habitat assessments.

Critical Area Impacts

1,000 ft Buffer Impacts

The entire 298-acre project area is located within the 1,000 foot Critical Area Buffer (Figure 1). The 298 acres consists of 131 acres of open water filling, 113 acres of aquatic environmental restoration, and 54 acres of terrestrial habitat improvements and conservation. Following initial construction, 5.0 acres will be impervious, which includes the cofferdam (2.7 acres) and a 20 foot wide temporary stone road (2.3 acres) around the DMCF perimeter. Upon completion of the project in the year 2029, an estimated 90 acres will be impervious. The portions of the project that are impervious will be mitigated through offsite mitigation in accordance with the MPA's approved Institutional Storm Water Management Plan. Storm water that falls within the containment portion of the DMCF will be treated and discharged with water from dredging inflow. All water will be discharged from the site at the spillways and will be regulated through the Water Quality Certification for the facility. Regular monitoring will be conducted in accordance with the Water Quality Certification. The facility is anticipated to receive dredged material for a period of approximately 23 years. After the facility is closed, the final end use of the site is anticipated to be port related. During development activities pollutant reduction requirements will be met via onsite stormwater management facilities as much as possible. Appendix B contains the standard application Worksheet A with calculations for approximated pollutant reduction requirements. The pollutant removal requirements would be approximately 12 pounds of phosphorus for the portion of the project that would be impervious and not vegetated prior to final site development.

100 ft Buffer Impacts

Approximately 41.5 acres of the project area is located within the 100 ft buffer (see Figure C-1 and Table 1), with approximately 33.5 acres of the buffer being vegetated. Initial construction of the DMCF project will impact 7.2 acres of existing buffer around the former Kurt Iron and Metal site; filling of the site with dredged material will impact an additional 7.1 acres. The ultimate existing buffer impact (in year 2029) will be 10.5 acres (see figure C-2). The total area of the new buffer created by the DMCF project will be 14.1 acres, of which 11.4 acres will be vegetated (see Figures C-2 and C-3). Compensation for the inability to create vegetation on 2.7 acres of the created buffer (as it will become a berth for ships) will be achieved through plantings within the project area (see Figure C-4). Figure C-4 shows areas within the Masonville project are where critical areas mitigation would occur, and includes 1) areas of open space that would be vegetated; 2) areas where debris piles exist that would be removed and the soil would be vegetated; 3) areas where pavement would be removed and vegetated; 4) areas where the

shoreline would be stabilized by adding soil, flattening slopes, and planting with appropriate vegetation; and 5) areas to be vegetated on the newly created land. The total area available for critical area mitigation is 56.5 acres; 54.1 acres is required, of which 19.6 acres is needed for the future buffer creation and 34.5 acres is needed for the ultimate buffer impacts.

Project Schedule

The following Table 2 shows the anticipated dates of construction for the various phases of the project. The schedule was developed to avoid a dredged material placement capacity shortfall that would occur in 2009 if the Masonville project is not available for placement.

Table 2

Project Schedule

Activity	**Schedule**
Storm Drain Phase I	March 07 – Jan 08
Pre-dredging	Jun 07 – Jul 07
Cofferdam & Waterline	Jun 07 – May 08
Storm Drain Phase II	May 08 – Nov 08
Dike Construction	Jun 08 – Dec 08
Mitigation and Enhancement	July 07 – Completion

Costs

The MPA has designated $3.4 million in funding for projects located on the land within the Masonville Cove area. These costs are presented in Table 3, and include $2.5 million for cleanup of debris piles, trash and large items such as concrete pipe and timber piles, and $840 thousand for terrestrial habitat enhancement, which includes vegetative plantings. The MPA has also proposed to place the entire 54 acre land area into a conservation easement that will remain undeveloped and allow for improvement of the habitat, beginning with the cleanup and plantings. The Cove area will also be a key component of the environmental education to be performed through the National Aquarium in Baltimore (NAIB), the Living Classrooms Foundation, and Baltimore City schools in concert with community groups.

Table 3	
Land Area Mitigation Costs	
Description	**Cost**
Landside and Shoreline Cleanup	$2,500,000
Terrestrial Habitat Enhancement	$840,000
Conservation Easement	$0
Total	**$3,390,000**

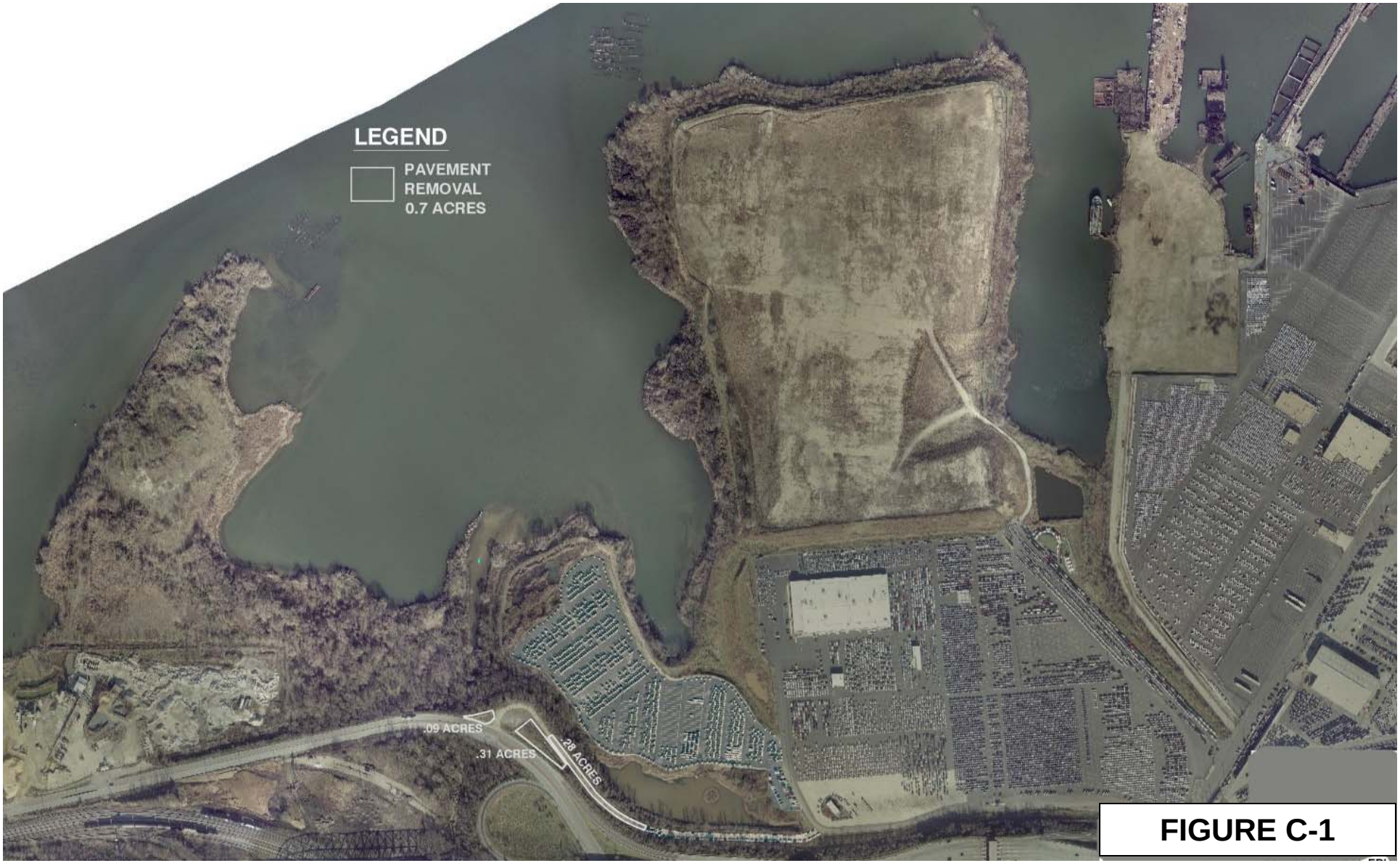

FIGURE C-1

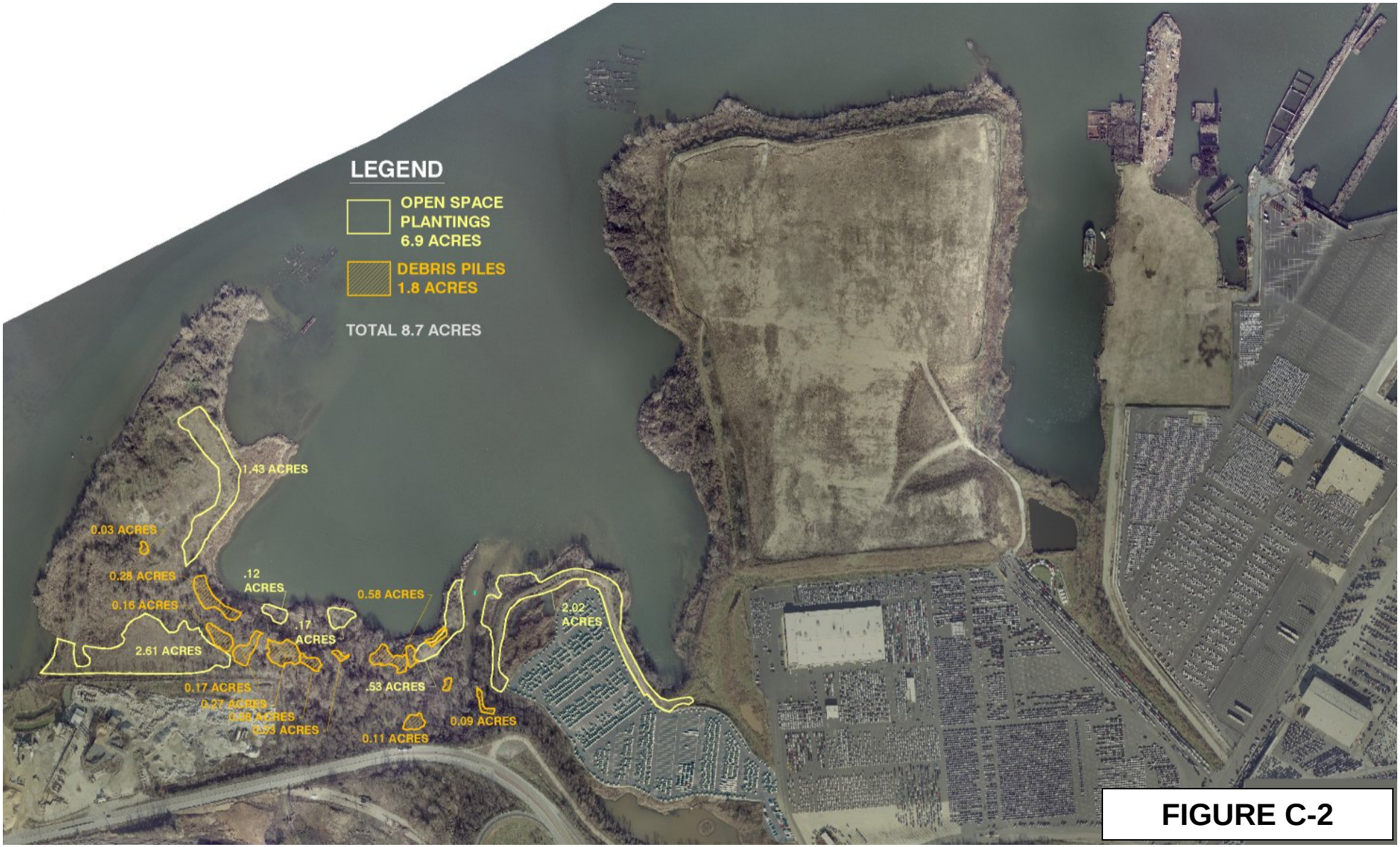
LEGEND
OPEN SPACE PLANTINGS 6.9 ACRES
DEBRIS PILES 1.8 ACRES
TOTAL 8.7 ACRES
1.43 ACRES
0.03 ACRES
0.28 ACRES
0.16 ACRES
.12 ACRES
.17 ACRES
0.58 ACRES
2.02 ACRES
2.61 ACRES
0.17 ACRES
.53 ACRES
0.09 ACRES
0.11 ACRES

FIGURE C-2


LEGEND
SHORELINE STABILIZATION 5.2 ACRES
1.08 ACRES
0.50 ACRES
1.16 ACRES
2.47 ACRES

FIGURE C-3


LEGEND
OPEN SPACE PLANTINGS
.99 ACRES
2.01 ACRES
1.69 ACRES
1.06 ACRES
.07 ACRES

FIGURE C-4

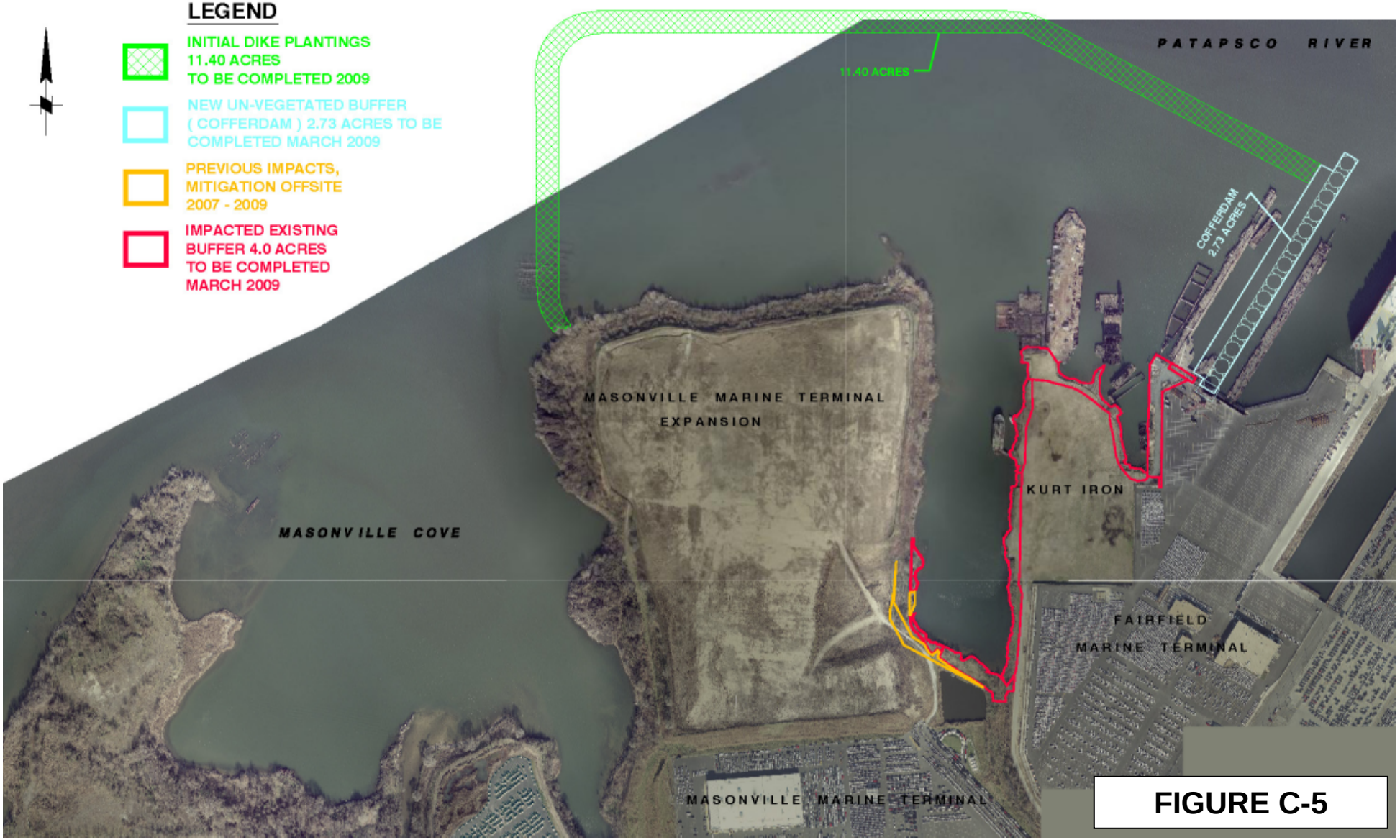
LEGEND
INITIAL DIKE PLANTINGS
11.40 ACRES
TO BE COMPLETED 2009
NEW UN-VEGETATED BUFFER
(COFFERDAM) 2.73 ACRES TO BE
COMPLETED MARCH 2009
PREVIOUS IMPACTS,
MITIGATION OFFSITE
2007 - 2009
IMPACTED EXISTING
BUFFER 4.0 ACRES
TO BE COMPLETED
MARCH 2009
PATAPSCO RIVER
11.40 ACRES
COFFERDAM
2.73 ACRES
MASONVILLE MARINE TERMINAL
EXPANSION
KURT IRON
MASONVILLE COVE
FAIRFIELD
MARINE TERMINAL
MASONVILLE MARINE TERMINAL

FIGURE C-5


LEGEND
PAVEMENT REMOVAL 0.7 ACRES
OPEN SPACE PLANTINGS 16.8 ACRES
SHORELINE STABILIZATION 5.2 ACRES
DEBRIS PILES 4.5 ACRES
TOTAL 27.2 ACRES
.65 ACRES
0.50 ACRES
1.54 ACRES
0.10 ACRES
1.16 ACRES
1.43 ACRES
0.03 ACRES
0.28 ACRES
0.16 ACRES
2.61 ACRES
.12 ACRES
2.47 ACRES
0.58 ACRES
.17 ACRES
0.17 ACRES
.53 ACRES
0.09 ACRES
0.11 ACRES
.09 ACRES
.31 ACRES
.28 ACRES
1.06 ACRES
.07 ACRES
.91 ACRES
1.30 ACRES
1.08 ACRES
.42 ACRES
1.36 ACRES
.99 ACRES
.48 ACRES
2.01 ACRES
2.02 ACRES
1.69 ACRES

FIGURE C-6


LEGEND
INITIAL PLANTED AREAS
INTERIM DIKE PLANTINGS
13.90 ACRES
TO BE COMPLETED 2021
PREVIOUS IMPACT,
MITIGATION OFFSITE
2007 - 2009
IMPACTED BUFFER
6.5 ACRES
2019 - 2033
PATAPSCO RIVER
5.35 ACRES
2.05 ACRES
.41 ACRES
.17 ACRES
.20 ACRES
2.77 ACRES
.57 ACRES
2.75 ACRES
MASONVILLE MARINE TERMINAL
EXPANSION
6.50 ACRES
KURT IRON
MASONVILLE COVE
FAIRFIELD
MARINE TERMINAL
MASONVILLE MARINE TERMINAL

FIGURE C-7

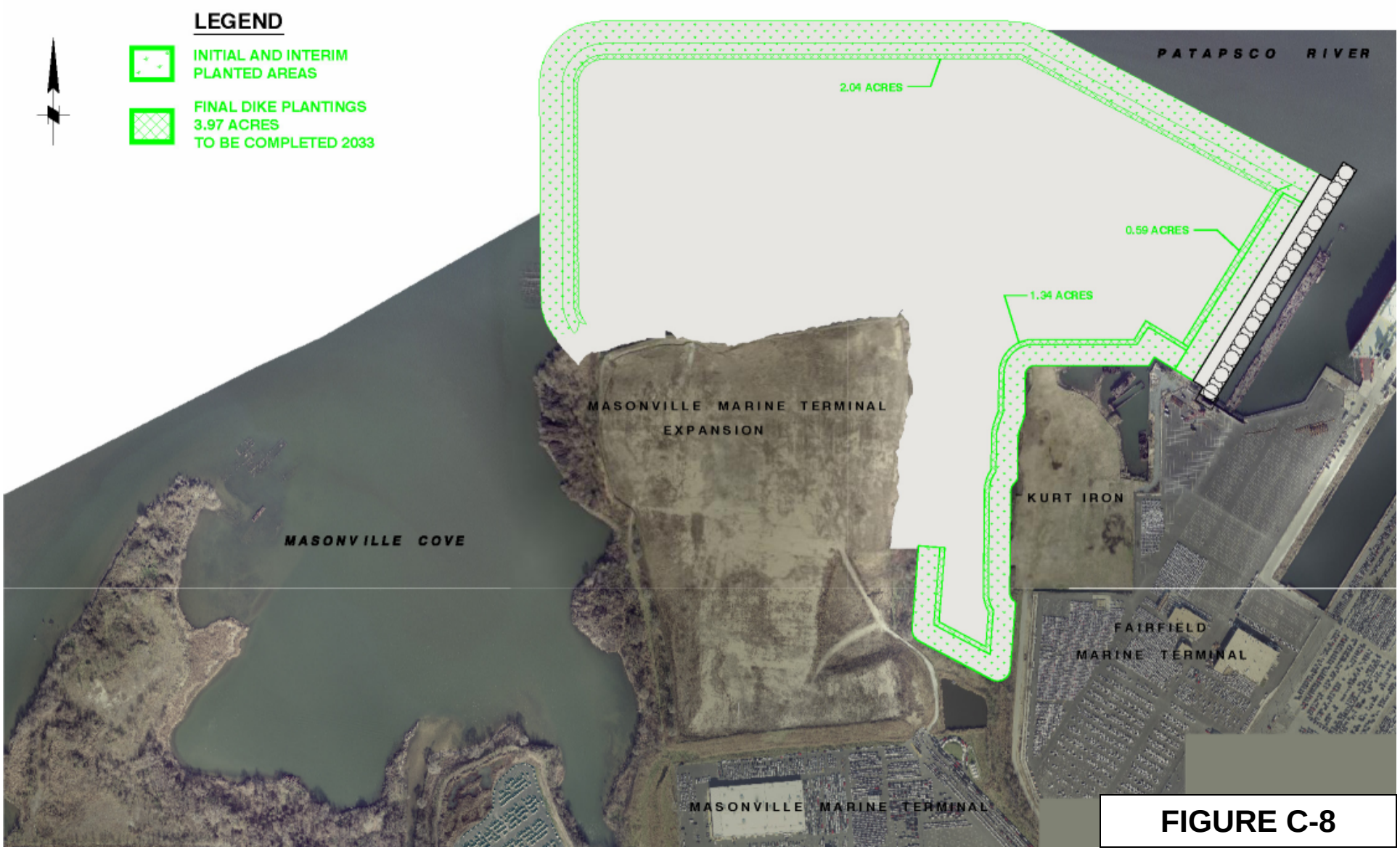
LEGEND
INITIAL AND INTERIM PLANTED AREAS
FINAL DIKE PLANTINGS 3.97 ACRES TO BE COMPLETED 2033
PATAPSCO RIVER
2.04 ACRES
0.59 ACRES
1.34 ACRES
MASONVILLE MARINE TERMINAL EXPANSION
KURT IRON
MASONVILLE COVE
FAIRFIELD MARINE TERMINAL
MASONVILLE MARINE TERMINAL

FIGURE C-8

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CRITICAL AREA COMMISSION STAFF REPORT

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Critical Area Commission

STAFF REPORT
March 7, 2007

APPLICANT:	Maryland Port Administration
JURISDICTION:	Baltimore City
PROPOSAL:	Masonville Dredged Material Containment Facility Mitigation Package
COMMISSION ACTION:	Vote
STAFF RECOMMENDATION:	Approve with Conditions
STAFF:	LeeAnne Chandler
APPLICABLE LAW/ REGULATIONS:	COMAR 27.02.05 State Agency Actions Resulting in Development on State-Owned Lands

DISCUSSION:

At the December 2006 meeting of the Critical Area Commission, the Commission voted to concur with the concept plan for the Masonville Dredged Material Containment Facility (DMCF) subject to four conditions. One condition required the Port to submit an overall mitigation package to the Commission for review and approval prior to any part of the project moving forward.

Project impacts include the following:

- Filling of 130 acres of tidal open water (including 0.4 acres of submerged aquatic vegetation).
- Loss of one (1) acre of vegetated wetlands.
- Disturbance of approximately 11.5 acres to the existing Buffer, phased over the life of the DMCF.
- Placement of approximately 2.7 acres of impervious surface in the newly created Buffer.

<u>Aquatic Mitigation</u>
Throughout the last year, the Port has worked with the Army Corps of Engineers, the Maryland Department of the Environment, Baltimore City and numerous other agencies in compiling a long list of mitigation options for the aquatic impacts associated with the DMCF. Many of the projects will be located at Masonville Cove, a Port-owned property directly west of the existing Masonville Marine Terminal. The Cove encompasses approximately 113 acres of water and 54 acres of upland that, although designated a Habitat Protection Area in the Baltimore City Critical

Area Program, are in poor condition due to past uses and activities in the area.

Table 1
Aquatic Mitigation Projects at Masonville Cove and within the Patapsco River watershed

Project	Description	Amount
Wetland Creation & Enhancement (MC)	Phragmites eradication followed by using sand to create appropriate elevations for regular tidal exchange and the planting of native wetland vegetation.	5.1 acres
Nontidal Wetland Creation (MC)	Excavation of existing material to achieve appropriate grades, construction of water level maintenance structures and planting native wetland vegetation.	10 acres
Reef and Fish Habitat (MC)	Debris removal followed by placement of sand, mounds of gravel, reefballs and rock piles to diversify habitat and provide foraging opportunities for fish.	95.8 acres
Fringe Wetland (MC)	Fringe marsh to be created along the western edge of the containment dike to improve benthic conditions and provide foraging opportunities for wading birds.	2 acres
Eel passages	Construction of specialized eel passages on dams within the Patapsco River that currently block the American eel from accessing the nearly 300 square miles above the dam.	4 blockages removed
Shad and Herring Restoration	Four species of anadromous fish would be produced, marked and stocked in the Patapsco River. Recovery of stocks will be monitored to determine if adult spawners can produce self-sustaining populations.	3 years of stocking
Trash interceptors	Large trash interceptors will be constructed at outfalls within the Middle Branch of the Patapsco River. Removal of debris and trash improves water quality and provides aesthetic benefits to the community.	5 interceptors
Stream Restoration	Bank stabilization, channel realignment, removal of fish barriers and riparian buffer restoration on two streams within the watershed.	13,500 linear feet

In addition to the list of projects above, the Port has identified a “Tier II’ list of projects should any of the above projects fail to proceed. Long term maintenance and monitoring of the entire aquatic package will be part of the requirement for Federal and State permits.

Critical Area Buffer Mitigation

Disturbance to the Critical Area Buffer will occur in the first two phases of the life of the facility. The initial phase includes construction of the cofferdam, dikes (to +10 ft) and spillways, and relocation of stormdrains and waterline. The intermediate phase will involve raising the dikes to +42 ft above mean low water and placement of dredged material within the facility. The

final phase will be development of the site for future Port business. All of the required mitigation will occur at Masonville Cove or at Masonville Terminal. The tables below provide an impact and mitigation schedule, summarizing Buffer impacts and mitigation over the life of the project.

Table 2: Proposed Buffer Impacts

Project	Buffer impact (acres)	Mitigation Due
Initial phase (2007 – 2009)		
Demolition of concrete bulkhead	0.92	2.76
Cofferdam/Waterline Phase 2	2.73	8.19
Initial Dike and Spillways	3.30	9.90
Stormdrain Phase 2	0.20	0.60
		Mitigation Subtotal for Initial Phase 21.45 acres
Intermediate Phase (2010 – 2029)		
Dike Raising	0.57	1.71
Dredge material placement to +22	3.25	9.75
Dredged material placement to +40	3.25	9.75
		Mitigation Subtotal for Intermediate Phase 21.21 acres
		Total Mitigation Due for Identified Buffer Impacts 42.66 acres

Table 3: Proposed Buffer Mitigation

Project	Description	Mitigation Credit (acres)
Initial phase (2007 – 2009)		
Environmental Education Center	Removal of existing pavement and planting around proposed Center	0.68
Cove Cleanup and Planting – Phase 1	Replanting will occur in the Cove area after removal of piles of debris and invasive species. Currently open areas will be planted as well.	8.68
Shoreline Stabilization	Fill and debris will be removed from the shoreline of the cove. After some grading, it will be planted with wetland vegetation with a transition to shrubs and trees	5.21
Masonville Marine Terminal Plantings	Removal of invasive species and planting with native shrubs and trees in currently degraded/open areas.	5.82
Cove Cleanup and Planting – Phase 2	Removal of debris and invasive species followed by planting native shrubs and trees	6.76
		Mitigation Provided in Initial Phase 27.15 acres
Intermediate Phase (2010 – 2029)		
Planting of Dike	Planting woody shrubs on dike (beyond 100 feet)	13.90
		Mitigation Provided in Intermediate Phase 13.90 acres
Final Phase (2030 and beyond)		
Site Development	Planting of additional area as needed.	4.03
		Total Mitigation Provided 45.08 acres

Staff recommends approval of the aquatic and Buffer mitigation package subject to the following conditions:

1. Specific details for the Buffer mitigation projects, including exact acreages, planting plans and schedules will be finalized and submitted to the Critical Area Commission for review and approval on a contract by contract basis.

2. Any aquatic mitigation project that involves development activity on uplands within the Critical Area will be submitted to the Critical Area Commission for review and approval.

3. The MPA will provide an updated mitigation "balance sheet" for Masonville DMCF if acreages of impact or mitigation provided change when designs of each stage of construction and mitigation are finalized.