5. IMPACTS

As a requirement of the National Environmental Policy Act (NEPA) process, the potential impacts associated with the proposed project must be evaluated. Based on the results of the Alternatives Analysis discussed in Chapter 3 and the discussion in Chapter 4, the Recommended Plan includes the construction of a single 141-acre alignment built to the north and northeast of the existing Masonville Marine Terminal (MMT) facility and includes the use of borrow material from the Seagirt new work dredging for construction. In this Chapter, the impacts of the proposed Masonville Dredged Material Containment Facility (DMCF) Alternative with Seagirt Borrow Material (Recommended Plan – Alternative 2) and the Alternative with Borrow Scenario C (Alternative 1), which includes the use of onsite and offsite borrow, are analyzed. In addition to analyzing impacts associated with the proposed action, the NEPA also requires that the no action alternative is analyzed for each resource type. As a result of the impacts associated with the proposed action described in this chapter, a detailed compensatory mitigation package is included in Chapter 6. As part of this mitigation package for tidal open water impacts, the plan includes habitat restoration and community enhancements to Masonville Cove immediately west of the terminal facility (Chapter 6).

The recommended plan (Alternative 2), discussed in detail in Chapter 4, and the alternate DMCF construction option (Proposed Masonville DMCF with Borrow Scenario C, Alternative 1) both include the construction of a DMCF with a 141-acre footprint (130 acres of tidal open water) at Masonville in the Patapsco River with a containment structure composed of the following structural components, described in detail in Section 4.4 and shown in Figure 4-1:

- Fringe Marsh Dike
- Armored Dike
- Cofferdam
- Onshore Dike

The initial elevation of the containment structure would be +10 feet (ft) mean lower low water (MLLW). The final site elevation would be +36 ft MLLW, though dikes would temporarily be raised to +42 ft MLLW. This final site elevation is part of the construction plan for the proposed facility. The dike raisings described here would all occur so that the facility described in Chapter 4 would have the capacity described in that chapter (15.4 mcy). A berthing area would be constructed along the cofferdam section.

Both alternatives include 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 material for filling the Wet Basin would be excavated from within the Masonville DMCF footprint, and placed into the Wet Basin.

For the recommended plan (Alternative 2), onsite sand and stiff clay, sand and gravel from the Seagirt dredging area, and off-site material from an upland mining source would be used for the construction of the fringe marsh and armored dike sections of the containment structure. The use of on-site materials is important to the project because it decreases the cost of obtaining construction materials and increases placement capacity at the site. Overburden material (soft silts and clays) overlying the on-site borrow materials or underlying the footprint of the containment structure would be removed and transported to the Hart-Miller Island (HMI) DMCF for placement prior to mining the sand borrow. The use of material from the Seagirt dredging area would

decrease project costs by minimizing the need to purchase additional construction material from an upland mining source.

For Alternative 1 (Proposed Masonville DMCF with Borrow Scenario C), the Seagirt dredging area material would not be used. All of the other borrow sources described for the recommended plan would be used. Under this alternative additional construction material would need to be purchased from an upland mining source and/or additional Arundel clay would need to be excavated from within the onsite borrow source.

For the purposes of this impacts analysis, the existing project area or Study Area is defined as the tidal open water of the Baltimore Harbor encompassing the area from the western edge of the existing Fairfield terminal to the western point of Masonville Cove, out to the Ferry Bar Channel. This is larger than the actual proposed project footprint, but is necessary to accommodate modeling, engineering, and ecological sampling constraints. This area is approximately 670 acres. The region of influence includes resources located outside of the Study Area, but adjacent to the project, including the entire Patapsco River from the Hanover Street Bridge to Lazaretto Point (Figure 1-3). This area is approximately 1,375 acres for environmental resources and is approximately 254 acres for the cultural resources investigation. For the socioeconomic resources and aesthetics analyses, the region of influence varied by type of impact evaluated, and ranged from the area adjacent to the site (e.g., for the noise analysis) to Baltimore City and the entire State (e.g., for the economic impacts analysis).

For the preferred alternative (Alternative 2 - recommended plan), impacts are also assessed for the Seagirt dredging area, which covers 128 acres of river bottom adjacent to Seagirt Marine Terminal (Figure 1-3).

Definition of Impacts

A list of NEPA impact descriptors was created to evaluate the impacts and includes the following:

Significant Impact is a measure of the *intensity* and the *context* of effects of a major Federal action on, or the importance of that action to, the human environment [40 Code of Federal Regulations (CFR) 1508.27]. "Significant" is a function of the short-term, long-term, and cumulative impacts, both positive and negative, of the action on that environment. Because this project has anticipated significant impacts, the NEPA process is documented in the form of this environmental impact statement (EIS).

Short-term impacts are impacts with no lasting effects, or temporary impacts that occur during construction and then subside and return to normal after construction ends.

Long-term impacts are defined as impacts with lasting effects that occur during construction or dredged material placement activities that remain and do not diminish after placement ceases for terminal development.

Direct impacts are defined as impacts caused by the action and occur at the same time and place (40 CFR 1508.8).

Indirect impacts are caused by the action and occur later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air, water, and other natural systems, including ecosystems (40 CFR 1508.8).

Cumulative Impacts are those combined effects on quality of the human and natural environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of which Federal or non-Federal agency or person undertakes such other actions [40 CFR 1508.7, 1508.25(a), and 1508.25(c)]. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time or taking place within a defined area or region. It is the combination of these effects, and any resulting environmental degradation, that should be the focus of cumulative impact analysis.

Impacts Associated with Resources:
Beneficial impacts are defined as those impacts that result in a net gain of resources associated with the proposed project or a favorable change in existing conditions, such as improved air quality.

Adverse impacts are defined as those impacts that result in a net loss of resources associated with the proposed project or an unfavorable change in existing conditions, such as an increase in noise levels.

Impacts Associated with Economics:
Negative impacts are defined as those impacts that result in a numeric decrease in monetary values.

Positive impacts are defined as those impacts that result in a numeric increase in monetary values.

****These descriptors can be used in conjunction with significant, cumulative, short-term, long-term, direct, and indirect impacts. For example, positive, short-term impacts may occur if jobs become available through the project for the local population.***

5.1 ENVIRONMENTAL IMPACTS

Alternative 1 – Proposed Masonville DMCF with Borrow Scenario C

The primary impacts of this alternative would be related to: 1) pre-dredging of unsuitable material (overburden) in order to excavate 1.7 mcy of the borrow material below for dike construction, 2) management of derelict vessels, 3) construction of the exterior dike, and 4) the operation (filling) of the DMCF. It is expected that pre-dredging can be completed within 3 months and that construction of the initial dike to +10 feet (ft) MLLW would occur immediately afterward and be completed within one year. Following completion of the dike construction activities, disruptions would be limited to seasonal inflow activities and the trenching and grading necessary for dewatering and eventually raising of the dikes to the final dike elevation. The dikes would be raised to a temporary height of +42 ft MLLW and then graded to a final height of +36 ft MLLW. Therefore, disruptions during the construction period would be considered short-term and

temporary. Inflow, trenching, and grading would occur until approximately 2029; however, disruptions related to these activities are of substantially less magnitude than the construction-related impacts.

The total DMCF footprint is 141 acres. Of this, there are 130 acres of tidal open water and river bottom habitat that would be affected and would require mitigation, 10 acres of upland areas that would be buried, and 1 acre of vegetated wetlands that would be impacted and require mitigation. Within the 130 acres of tidal open water there are 0.38 acres of SAV that would be lost. This loss would likely require mitigation. The impacts to these areas are described throughout this chapter.

The environmental benefits associated with the project include the remediation of 25 derelict vessels within the proposed Masonville DMCF alignment and the removal of up to 2 mcy of contaminated sediments from 41 acres within the alignment and the capping of 88 acres of contaminated sediments within the proposed alignment. The remediation of the derelict vessels and capping of the contaminated sediments would remove some sources of contamination from the Patapsco River. The proposed compensatory mitigation plan (Chapter 6) is expected to have some long-term ecological benefits for this region of the Patapsco River. The proposed mitigation plan that is discussed in detail in Chapter 6 and considered in the cumulative impacts section of this Chapter (Section 5.8) includes the following items at Masonville Cove:

- Tidal wetland creation and enhancement
- Non-tidal wetland creation
- Reef and fish habitat creation
- Shallow water habitat (SWH) improvement
- Fringe marsh creation
- Terrestrial habitat enhancement and diversification
- Landside and in-water Phase I cleanup
- Conservation easement
- Masonville environmental education and nature center

Additional mitigation projects within the Patapsco River watershed include installing American eel passages on four dams, stocking and monitoring shad and herring in the main stem of the Patapsco River, and installing trash interceptors along one or more outfalls along the Middle branch of the Patapsco River. These mitigation projects are detailed in Chapter 6 and Appendix M. These projects are associated only with the proposed Masonville DMCF alternative and would not be realized under the no action alternative.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

These impacts would be similar to those described for Alternative 1. In addition to those impacts described for Alternative 1, material would be used from the Seagirt dredging area in the construction of the dikes at Masonville. The use of this material would alter some of the water quality and cost impacts, which are described in this chapter.

No Action Alternative

Under the no action alternative, the Masonville DMCF would not be developed. If the Masonville DMCF is not developed, the MPA would either defer currently scheduled dredging of the Port of Baltimore navigation channel system and associated public and private berthing facilities, or overload existing DMCFs, or some combination of these two actions.

Deferring scheduled dredging of navigation channels and berths would result in the gradual accumulation of sediments, which would normally be removed periodically from those channels and berths through maintenance dredging, and the failure to remove sediments from new work projects. Increasing amounts of accumulating sediments in existing channels causes reduced under-keel clearance for vessels that utilize the Port of Baltimore.

Reduced clearances can result in increased risk of groundings, impaired ability to maneuver to maintain safe headway and avoid collisions, and restrictions in the speed at which vessels can transit the shipping channels. Groundings can increase the risk of environmental damage associated with the accidental release of fuel, lubricating oil, or liquid cargo product into the surrounding waters, and can interfere with waterborne commerce that may share the blocked navigation channel. Impaired ability to maneuver due to reduced channel depth may increase the risk of collision between cargo vessels and other vessels, including recreational vessels. At the very least, restrictive speed limits due to reduced channel depths increase the costs for shipping lines that utilize the Port of Baltimore. This is because tightly-scheduled cargo vessels would take longer to enter the Port, load or unload their cargo, and leave the Port.

The Port of Baltimore enters into contracts with shipping companies under which the companies commit to bring their cargo through the Port for various periods of time. These contracts reflect shipping firms' long-term plans to utilize their fleet of vessels to transport cargo through the Port. Changes to available channel depths could prevent certain vessels from using the Port entirely, or could increase those risks discussed above. Shipping firms are gradually upgrading their vessel fleets; average vessel drafts for many classes of vessel have tended to increase. Faced with the possibility of decreasing channel depths, shipping firms may choose to take their business to other ports, with the associated loss of revenue and jobs to the Port of Baltimore and the State of Maryland.

If expected new work dredging is deferred, shipping firms with plans to expand facilities to accommodate new businesses or increased business volumes associated with deeper draft vessels may choose instead to defer the planned expansion, or may choose to relocate to other ports where the required facilities are available. In either case, increased or planned revenue and jobs may be lost from the Port of Baltimore and the State of Maryland.

Because of the potential economic losses to the Port of Baltimore and the State of Maryland associated with the potential deferment of scheduled dredging, the MPA considers the dredging deferment alternative to be much less preferable than continued dredging and the overloading of existing dredged material placement sites.

Because the MPA has determined that the currently scheduled dredging activities should not be deferred, the no action alternative would result in the need to place the materials scheduled to go

to the proposed Masonville DMCF at the HMI and Cox Creek DMCFs through 2009. Beginning in 2010, the HMI DMCF will be unavailable for placement of dredged material (Maryland Code Section 5-1103) and all dredged material would be placed at the Cox Creek DMCF. There are currently no other placement facilities for Harbor dredged sediments. The HMI DMCF will be capped with approximately 5 mcy of material suitable for habitat development, so it is possible that the HMI DMCF would be unable to receive material dredged from Baltimore Harbor channels in 2009. The next proposed placement facility would not be constructed until approximately 2014 (Table 1-2). From 2009 to 2014, there are 4.6 mcy of dredged material that would have been placed at the proposed Masonville DMCF that would need to be placed in an existing containment facility (Table 1-2). The 1.9 mcy of overburden material from the Masonville site to be placed at the HMI DMCF under the proposed Masonville DMCF alternative would not be placed there and this volume would be available for other placement needs.

The no action alternative involves annual overloading at both the HMI and Cox Creek DMCFs. Overloading at the Cox Creek DMCF would decrease the overall site life of Cox Creek by approximately 4 years, assuming that the material scheduled for placement at the proposed Masonville DMCF for 2010 through 2012 were to be placed at Cox Creek and the material to be placed at the proposed Masonville DMCF in 2009 was placed at the HMI DMCF. Refer to Table 1-2 for anticipated quantities of material that would have been placed at the proposed Masonville DMCF, if it were constructed. If the overall capacity of Cox Creek is decreased by the overloading (two to three times its efficient placement rate after 2010), the site may be filled to capacity prior to 2012. If Cox Creek is filled to capacity prior to 2014, there would be no DMCFs in the area to receive Baltimore Harbor sediments.

Overloading at the HMI and Cox Creek DMCFs would very likely result in the need to hold water at the facilities for longer periods and may result in increased discharges of nutrients into the Chesapeake Bay and Patapsco River, respectively. These increased discharges may require modifications to the existing discharge permits. Additional nutrient offsets, such as DMCF spillway treatment or retrofits to existing wastewater treatment plants may be required.

The existing 130 acres of open water and 10 acres of adjacent uplands at Masonville would not be filled if the DMCF is not developed. The existing conditions at the Masonville site, described in Chapter 2, would remain. This includes the preservation of approximately 1 acre of submerged aquatic vegetation (SAV), 126 acres of benthic habitat, 126 acres of essential fish habitat (EFH), and 10 acres of shallow water habitat (SWH). Note that the unauthorized dry dock adjacent to the former Kurt Iron and Metal (KIM) facility is not considered benthic or EFH habitat, but is considered as open water filled or lost as a result of the proposed Masonville DMCF, if it were constructed. The air emissions associated with the construction of the proposed Masonville DMCF would not be released. Many of the emissions that would be associated with the management of the proposed DMCF at Masonville would be associated with the HMI and Cox Creek DMCFs, since this material would still be managed at a facility. The full-time equivalent (FTE) jobs that would be associated with the construction and monitoring of proposed Masonville DMCF would not be created.

The Seagirt dredging area would be dredged to a depth of -50 ft MLLW with up to an additional 2 feet of over dredging under the current permit. All of the material dredged as part of this project would be placed at the HMI DMCF.

If the proposed Masonville DMCF is not constructed, there would be no regulatory reason to remediate the derelict vessels on the eastern side of the proposed DMCF site. The funding currently allocated for site development would be released to other Maryland Department of Transportation (MDOT) efforts and the remediation of the 25 derelict vessels would be deferred. Thus, removal of this source of contamination from the Patapsco River would not occur. Also, the other ecological benefits and community enhancements associated with the proposed Masonville DMCF (Chapter 6) would not be realized. The enhancements associated with the proposed Masonville compensatory mitigation plan (Chapter 6) would not be realized.

5.1.1 Physiography, Geology, Soils, and Groundwater

5.1.1.1 Physiography

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

Significant changes to the existing physiography would occur as a result of project development. Long-term impacts to the physiography of the project area would occur when the footprint of the lateral expansion is converted from tidal open water habitat of -7 to -15 ft MLLW to a fastland of elevation +36 ft MLLW. The final elevations of the proposed terminal expansion would be built to the current grade and would be consistent with the surrounding topography. Some short-term impacts to physiography are expected. Removal of unsuitable material for perimeter dike construction and access to on-site sand borrow sources would involve excavation down from approximately -10 to -25 ft below the current bottom contour. In addition, mining of dike construction materials from the on-site borrow sources would result in further excavations up to -40 ft below the current contour. These would be short-term changes because the site would be filled and raised to a final elevation of +36 ft MLLW. Dikes would be temporarily raised to +42 ft MLLW and graded to the final elevation.

Alternative 2 - Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

Impacts for this Alternative would include all of those impacts described for Alternative 1 and would include additional impacts to the Seagirt dredging area. In the Seagirt dredging area, approximately 128 acres of Patapsco River Bottom would be dredged from a current depth of -42 ft MLLW to a depth of -52 ft MLLW (under the current dredging plan). This dredging would occur without the construction of the Proposed Masonville DMCF and would result in average depths of approximately -51 ft. MLLW. In a 41 acre area sand borrow source was identified. The potential for doing one to two feet of advance maintenance dredging is still under consideration. Use of borrow material from the Seagirt dredging area would potentially increase dredging depths in this area from -50 ft MLLW (plus 2 feet of over dredging) to -51 ft MLLW (for one foot of advanced maintenance) or -52 ft MLLW (for two feet of advanced maintenance). In either of these latter cases, there is a potential for up to 2 feet of over dredging (due to the inaccuracy of the mechanical dredging process) which would result in final maximum depths of either -53 or -54 ft MLLW, respectively.

No Action Alternative

There would be no new impacts to physiography as a result of the no action alternative. The Seagirt dredging area would be dredged to a depth of -50 ft MLLW (plus up to an additional 2 feet of over dredging) as part of the Seagirt Marine Terminal access channel deepening and widening project, which is already permitted.

5.1.1.2 Geology

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

If this alternative is implemented, there would be no new impacts to geology.

Alternative 2 - Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

If this alternative is implemented, there would be no new impacts to geology.

No Action Alternative

There would be no new impacts to geology if the no action alternative is implemented.

5.1.1.3. Soils

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

Pre-dredging and Perimeter Dike Construction

Pre-dredging and perimeter dike construction would have negligible impacts on existing soils. Construction equipment would be present and activities would occur at the existing Masonville site and may leave tire tracks or other indentations in the soil. Impacted areas would be filled and paved after the construction process is completed, so these impacts would be inconsequential.

Site Operations

There would be a permanent loss of 124 acres of river bottom and a conversion of 6 acres to shallower bottom if the recommended plan were to be adopted. These 6 acres would have the dike containment structure as the substrate. The placement of dredged material within the recommended alignment would expand the existing Masonville site by turning tidal open water to fastland. The fill area would have a composition similar to the existing site and would be unsuitable for most development or agricultural use. The soils would be inaccessible from the surface because the fill area would likely be covered with an impervious surface to support a maritime facility after the dredged material placement period has ended.

Masonville Cove

In the adjacent Masonville Cove, there would be debris removal and backfill with clean fill to support terrestrial vegetation. Ten acres of terrestrial habitat, including the surface soil, would be

enhanced, which is expected to have a long-term, beneficial impact to the soils in the area. The MPA would be responsible for all costs associated with the remediation of soils.

Alternative 2 - Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

Impacts to soils for this alternative are the same as those described for Alternative 1. There would be no impacts to soils from the use of material from the Seagirt dredging area since this area is entirely submerged and, therefore, it does not include soils.

No Action Alternative

The no action alternative would have no new impacts to soil at the existing Masonville site, Masonville Cove, or the Seagirt dredging area.

5.1.1.4 Groundwater

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

The materials underlying the Masonville site are a mixture of unconsolidated sands, silts and clays overlying the Arundel formation. The Arundel Formation begins at a depth of approximately 35 feet and is approximately 50 ft thick in the Masonville DMCF area (Figure 2-3). At the deepest point, the DMCF would reach a depth of 60 feet. There would still be approximately 35 ft of the Arundel formation below the DMCF at this point. The Patuxent Aquifer begins at an elevation of approximately -85 ft (Figure 2-4). The eastern portion of the proposed Masonville DMCF has depths below 35 ft (Figure 2-5).

In order to minimize intrusion into the Patapsco River and the Patapsco formation, a geomembrane would be placed along the sides of the dikes and the bottom would be sealed by the existing Arundel formation. The geomembrane barrier covering the dikes would have a transmissivity of $5x10^{-6}$ centimeter (cm) per second and the Arundel formation consists of extremely dense, tight clay with very low vertical hydraulic conductivities on the order of 10^{-9} and 10^{-11} ft per second (Chapelle 1985). Construction of the proposed Masonville DMCF is not expected to have an impact on the Patuxent aquifer in the area. The Patuxent formation runs approximately 85 ft below the site and is protected by the approximately 50 ft thick Arundel formation (Figures 2-3 and 2-4). The Patuxent formation would not be disturbed by proposed project excavations. Monitoring at the HMI DMCF has indicated that the placement of a DMCF at HMI has had little impact on the Patuxent aquifer (URS 2004). This is likely because the Patuxent aquifer is confined by the Arundel formation. The Arundel formation is continuous throughout the Masonville region (Section 2.1.2.4) and the proposed DMCF is, therefore, not expected to have an adverse impact on the Patuxent Aquifer.

There would likely be a gap between the geomembrane barrier and the Arundel formation around most of the dike. The cofferdam may be constructed with part of the Arundel formation as a base and may allow the geomembrane on this portion of the site to connect with the Arundel formation. In other areas, water from within the DMCF may migrate through the area above the Arundel formation not covered by a geomembrane. Localized groundwater within the DMCF may potentially transport contaminants to the surface waters of the Patapsco River and into the

Patapsco formation through the dikes between the interface of the geomembrane along the sides and the Arundel formation along the bottom. Since an absolute seal is not anticipated, a comparison with the HMI DMCF experience is appropriate.

Dredged materials from the Bay are known to be rich in sulfur compounds that acidify when exposed to air. This process tends to mobilize metals within the material, which can be leached from the DMCF. Management practices developed at the HMI DMCF and other containment facilities in the Chesapeake Bay have indicated that keeping dredged materials hydrated tends to reduce acidification. In addition, it was found that the fine grained materials tended to develop a seal by filling in pores in the sand dikes, thus retarding movement through the dikes. The monitoring of wells at the HMI DMCF has indicated that the pH in the groundwater remains relatively neutral, thus preventing migration of metals into the groundwater (URS 2004). Spillway monitoring has found few exceedances of the pH or metals standards during discharge operations (URS 2004). The Masonville DMCF would be managed similarly so acidification of placed materials and mobilization of metals would be minimized. Further, the dredged material to be placed at the proposed Masonville site is similar to that placed at the HMI DMCF. In fact, these materials would be comprised of more recently deposited sediments in the federal channels which are dredged every 4 to 5 years, and some new work materials all of which are less contaminated than much of the Harbor materials placed at the HMI DMCF.

Former Kurt Iron and Metal (KIM) Site

While the surficial sediments in the former KIM Channel east of the Masonville area are already contaminated from past activities at the former KIM facility, the remediation of the derelict vessels within the proposed alignment should eliminate one existing source of contaminants to the groundwater. The former KIM site has been approved by Maryland Department of the Environment (MDE) for remediation through the Voluntary Cleanup Program (VCP). This program was designed to "encourage the investigation of eligible properties with known or perceived controlled hazardous substance contamination, protect public health and the environment, accelerate cleanup of properties, and provide liability releases and finality to site cleanup" (MDE 2005a). The Response Action Plan (RAP) (EBA 2005), which is the plan to address on-site contamination, includes capping (covering) the site, which has been cleared of all surface sources of contaminants. Subsurface contamination, which failed to meet Maryland commercial/industrial soil criteria, has also been removed to the satisfaction of MDE. Once capped, further infiltration would cease on that site and stormwater would no longer come in contact with the remaining low level soil contaminants. This would minimize contamination from the existing sediments from entering the Patapsco River or the Patapsco Aquifer.

Groundwater Effects on Wells

A search for wells supplying potable water within the City of Baltimore indicated that all drinking water within the City of Baltimore comes from surface water sources (Appendix A). Consultation with the City of Baltimore Environmental Health Division indicated that there are no wells supplying potable water permitted within the City of Baltimore. A permit would be required for a potable water well to be installed. The groundwater in the Masonville project area, the Seagirt dredging area, and the City of Baltimore as a whole is not used as a source of potable water. Residents residing within close proximity of the Masonville site receive potable water from the Baltimore Department of Public Works supply system reservoirs in Baltimore County. Although

the groundwater flowing below the site is not used as a drinking water source, the groundwater may also be transporting contaminants to the surface waters of the Patapsco River.

Approximately 90 percent of the potable water supply in Anne Arundel County is provided by groundwater wells. Based upon studies conducted by the U.S. Army Corps of Engineers (USACE) - Baltimore District at the Cox Creek DMCF in 1997 the nearest municipal wells in the area are located at Glen Burnie (USACE 1997). This well field is 5 miles south-southwest of the Masonville DMCF. These wells are currently screened in both the Lower Patapsco and the Patuxent formations. Anne Arundel county has a withdrawal allocation from the Patapsco Aquifer of 11.8 mgd, but was actually withdrawing on the order of 9 to 11 mgd 1997 (USACE 1997). No new groundwater supply wells are planned for the Patapsco in this region of the county as of the issuance of the USACE groundwater report in 1997 (USACE 1997). New supplies would be obtained from the Patuxent formation (USACE 1997).

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

Impacts to groundwater would include all of those impacts described for Alternative 1. Additional impacts resulting from the use of borrow material from the Seagirt dredging area are not anticipated. The Seagirt dredging area lies within the Patapsco aquifer. There is no upper confining layer for the Patapsco Aquifer in this area and the channels have been dredged into the Patapsco formation in the vicinity of the Seagirt dredging area since the creation of the Dundalk Marine Terminal in the 1950s. This formation has already been affected by dredging activities. Additional dredging into the Patapsco formation in the Seagirt dredging area is not expected to have an adverse impact on groundwater within the Patapsco formation. The Patuxent aquifer is confined by the Arundel formation, which is approximately 100 feet thick in this area. No impacts to the Patuxent aquifer are expected.

No Action Alternative

There would be no new impacts to groundwater from the no action alternative. This alternative would create no new potential for groundwater contamination from dredged material placement, but would also not cap contaminated sediments, which may continue to contaminate groundwater. If the Masonville DMCF is not constructed, there would be no regulatory reason to remediate the derelict vessels on the western side of the proposed DMCF site. The funding currently allocated for site development would be released to other MDOT efforts and the remediation of the 25 derelict vessels would be deferred. Thus, removal of this source of contamination from the Patapsco River would not occur.

5.1.2 Hydrology and Hydrodynamics

Proposed Masonville DMCF Alternative

The impact of the proposed Masonville DMCF on hydrodynamics and sedimentation within the Middle Branch of the Patapsco River was assessed using the three-dimensional numerical model described in Section 2.1.3. The impacts were measured by comparing model simulations with identical boundary forcing and comparing selected parameters. The proposed Masonville DMCF was represented by creating “dry” computational points within the dike outline (Figure 5-1). A

full description of the model development, calibration, and impact assessment scenario development can be found in Appendix B.

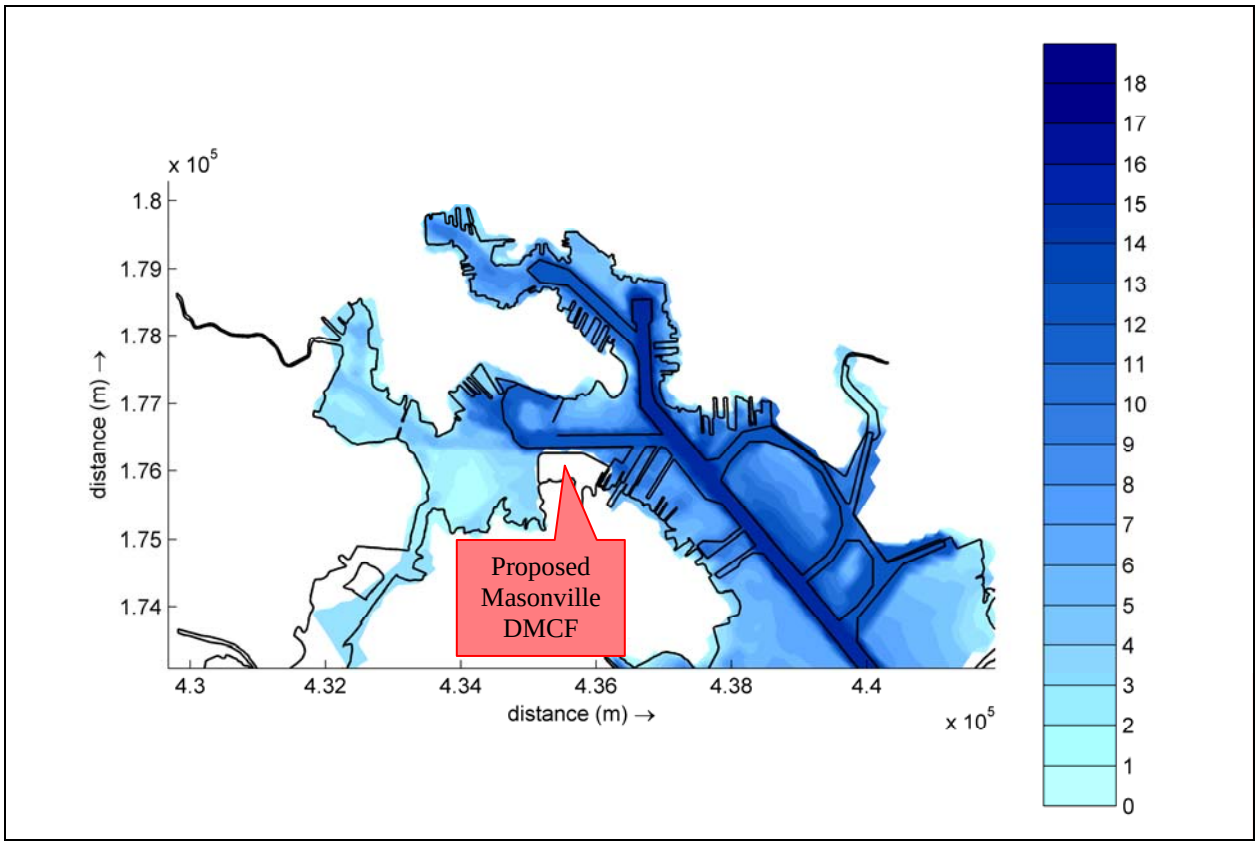


Figure 5-1. With-Project Model Bathymetry

5.1.2.1 Hydrodynamics

Hydrodynamics were assessed over a 30-day simulation corresponding to the data collection program used for model calibration (April-May 2005). The tides within Baltimore Harbor have small amplitude, less than a 2 ft average range, and therefore wind and density currents have an equal or greater influence on circulation and water levels.

Water Levels

Figure 5-2 displays observation points within the model domain where the model outputs water level and current magnitude and direction during the simulation. Water surface elevations at the observation points with and without project are compared in Figures 5-3a and 5-3b for a two-week cycle. The difference in water level between the simulations is indistinguishable to the human eye. Table 5-1 lists the correlation and Root Mean Square (RMS) error between with-project and without-project simulations.

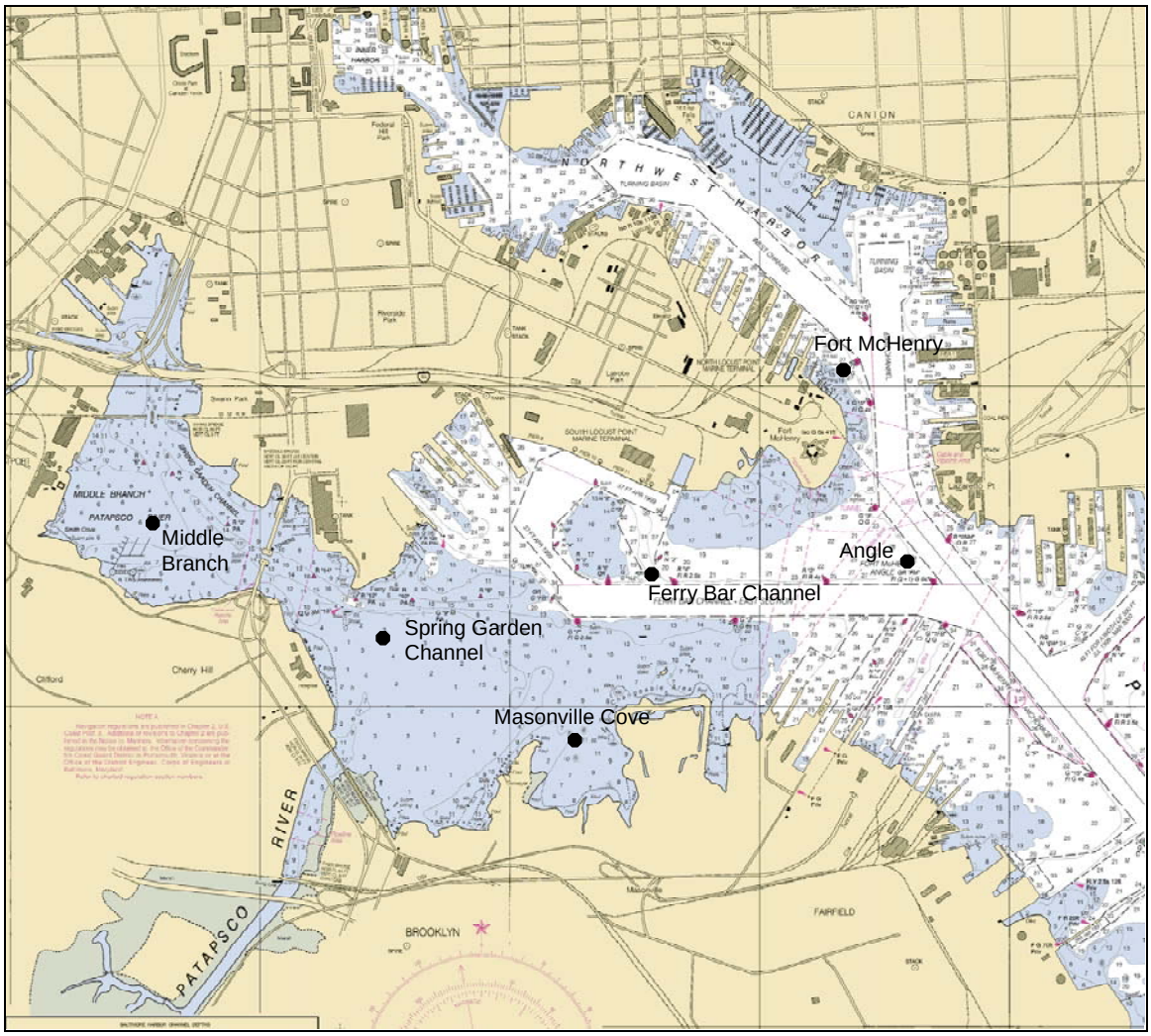


Figure 5-2. Observation Points Within Model

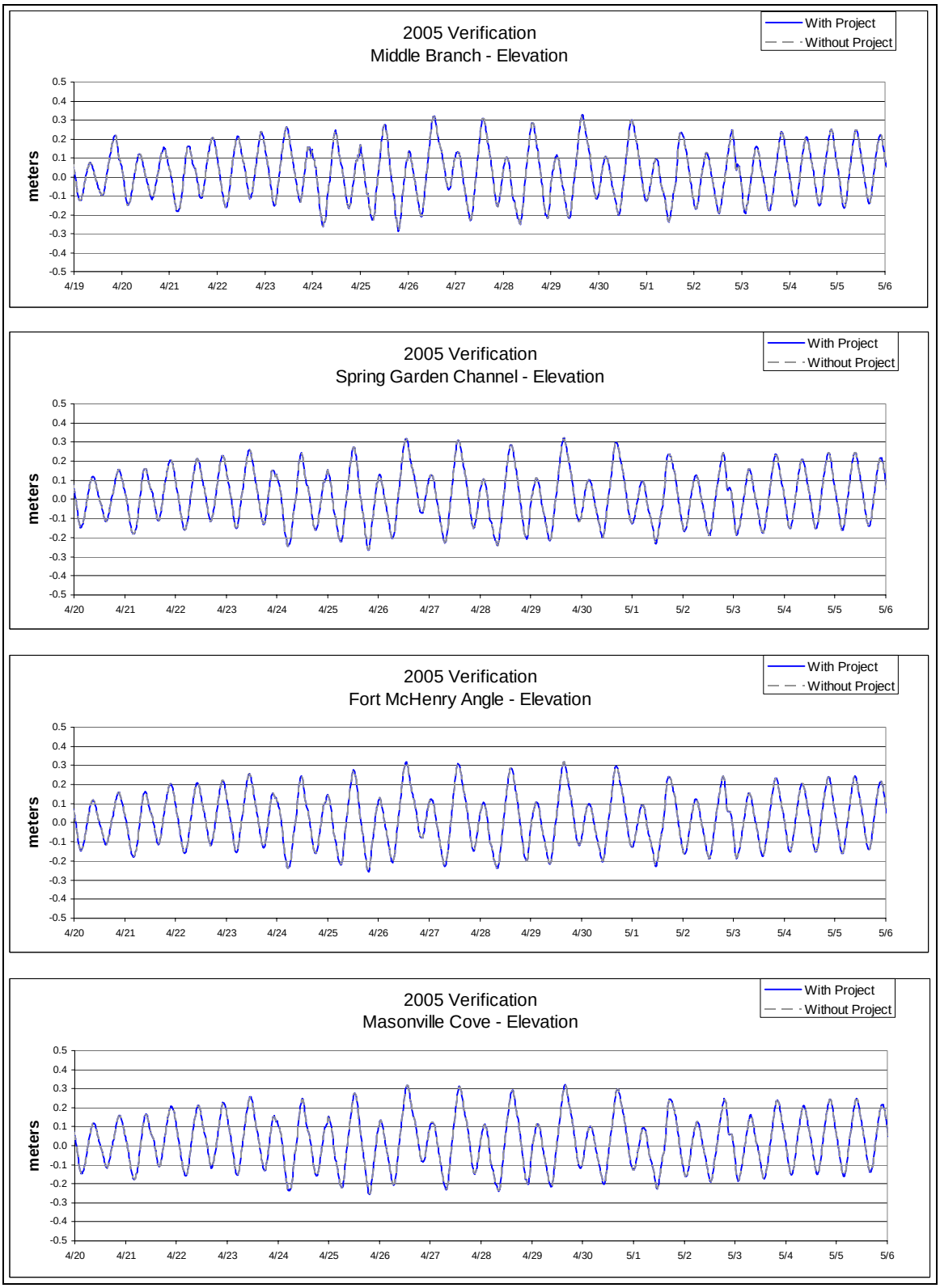


Figure 5-3a. Water Surface Elevation Comparison, With and Without Project (1 of 2)

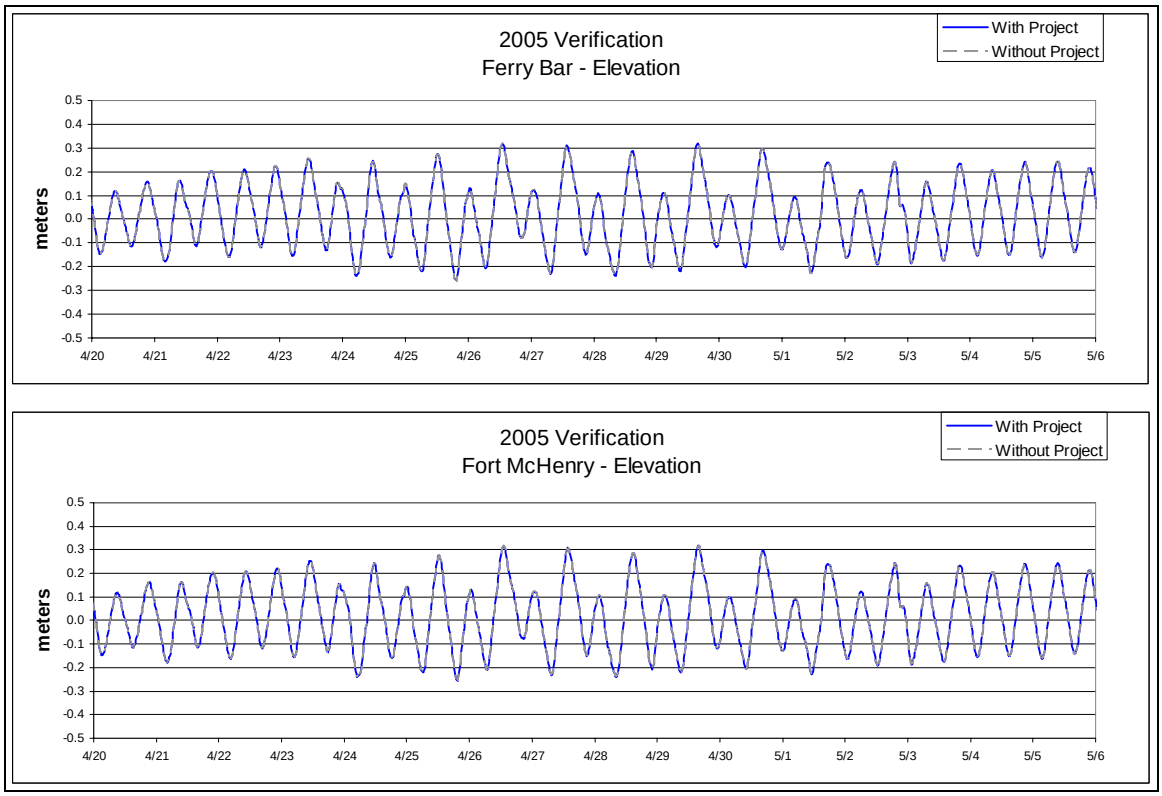


Figure 5-3b. Water Surface Elevation Comparison, With and Without Project (2 of 2)

Table 5-1. Water Surface Elevation Statistical Comparison, With and Without Project

Observation Point	Correlation	Root Mean Square (RMS) Error, cm
Fort McHenry	1.00	0.02
Fort McHenry Angle	1.00	0.04
Ferry Bar	1.00	0.07
Masonville Cove	1.00	0.09
Spring Garden Channel	1.00	0.06
Middle Branch	1.00	0.09

The RMS errors between the two datasets are less than 1 cm. Water surface elevations under typical tide and wind conditions, with and without project, are by all measures essentially identical. Delft modeling is ongoing and is expected to confirm that there would be no increase in flooding along the Patapsco River as a result of the proposed project. Section 5.1.2.3 addresses impacts to flooding during storm surge conditions.

Currents

Currents show more variation than the water surface elevations. Based on modeling output, the proposed Masonville DMCF does appear to alter the prevailing currents, especially in the immediate vicinity of the project. Figures 5-4 to 5-6 depict surface, mid-depth, and bottom current fields, respectively, during ebb tide at one time step during the simulation, with and without project. Under the modeled without project conditions, the flow out of the Middle Branch of the Patapsco travels mainly at the surface along the south shore with a maximum velocity of 0.25 meters per second (m/s) [(approximately 1 ft per second (ft/s)]. The flows on the channel bottom are weaker and do not necessarily follow the surface currents, depending on wind conditions and density stratification. However, under with-project conditions, the proposed Masonville DMCF blocks the outflow and diverts the surface flows out over the main Ferry Bar Channel. Inflows along the channel bottom increase slightly in strength.

Figures 5-7 to 5-9 display surface, mid-depth, and bottom current fields during flood tide, for with- and without-project conditions. Like the ebb tide, surface and bottom currents flow in opposite directions in the channels. The surface currents continue to flow outward, though at reduced velocity. The mid-depth and bottom currents flow inward. Under with-project conditions the strength of the inflowing bottom currents is increased.

Model results show that current patterns may be altered by the construction of the proposed Masonville DMCF. However, current strengths are on the same order as without-project conditions and not a substantial impact on the current patterns in the Patapsco.

Residence Time

Residence time is a typical measure used to assess the flushing characteristics of an enclosed water body. To assess the impact of the proposed Masonville DMCF on water exchange within the Middle Branch, the three-dimensional model was run using a tracer concentration to measure residence time, with and without project. The model initiated with a unit concentration of a tracer constituent within the Middle Branch of the Patapsco upstream of Fort McHenry. The boundary of the basin was defined as a line drawn between Fort McHenry and Fairfield. As the simulation progresses, the water from the basin would mix with water in the outer harbor and the tracer concentration would become diluted. The residence time is reached when the average concentration within the embayment reaches $1/e$, where e is the natural exponent (USACE 2001b).

Figure 5-10 displays the concentration at the observation points within the Middle Branch over the course of a two-week simulation for both with- and without-project conditions. Due to the change in current patterns described above, the dispersion of the tracer concentration has been slowed slightly resulting in marginally longer residence times. Table 5-2 lists the computed residence times for the Middle Branch embayment, with and without project. The residence times vary from approximately five days in the Ferry Bar Channel to over 10 days in the Middle Branch. With the proposed Masonville DMCF in place, residence times are increased by two to four hours (0.1-0.2 days) or one to two percent. These increases in residence times are statistically insignificant relative to the existing residence times in the area. Therefore, the effects to flushing would be minimal and impacts to water quality are not expected.

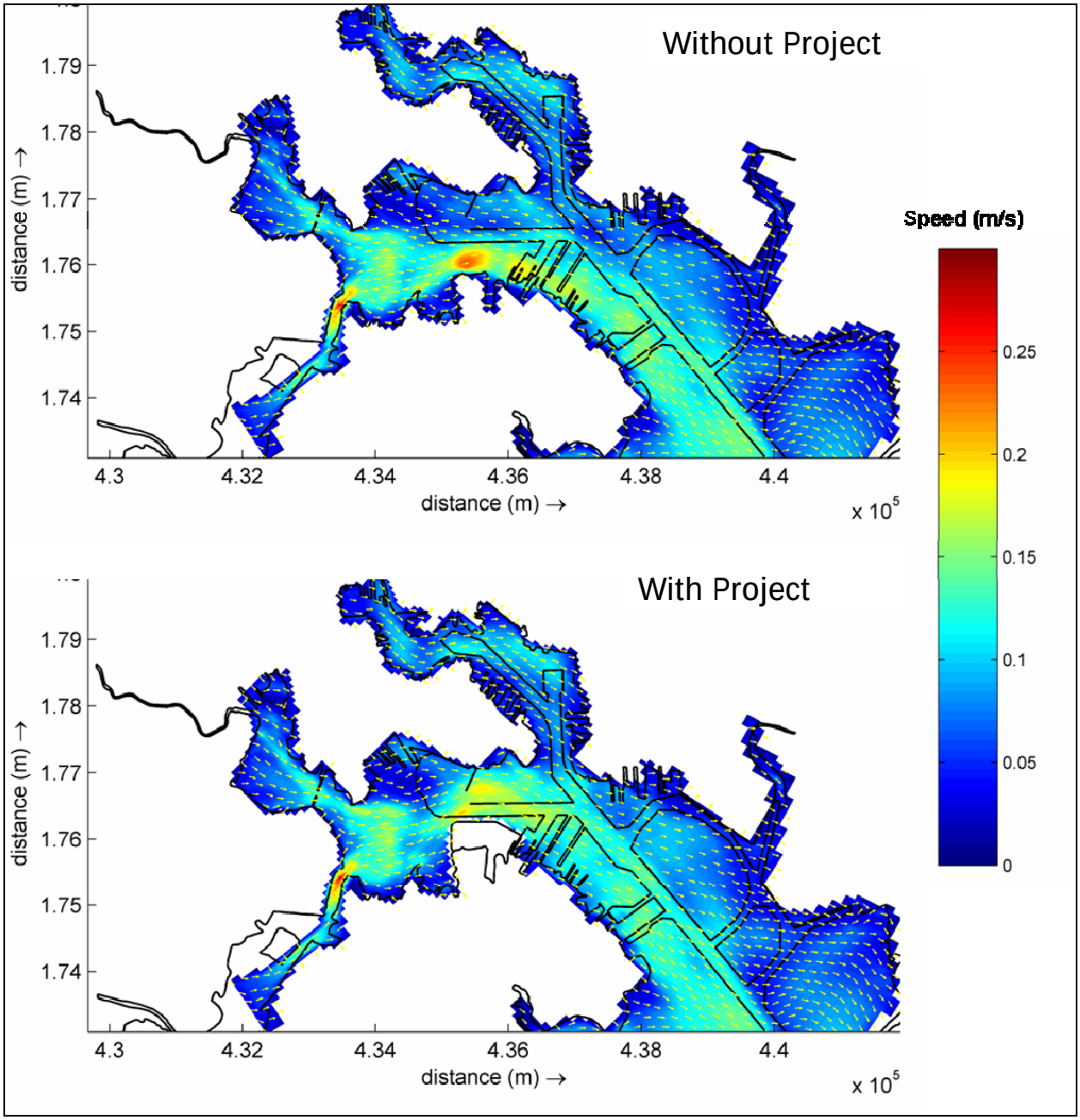


Figure 5-4. Ebb Tide Current Pattern (Surface) With and Without Project

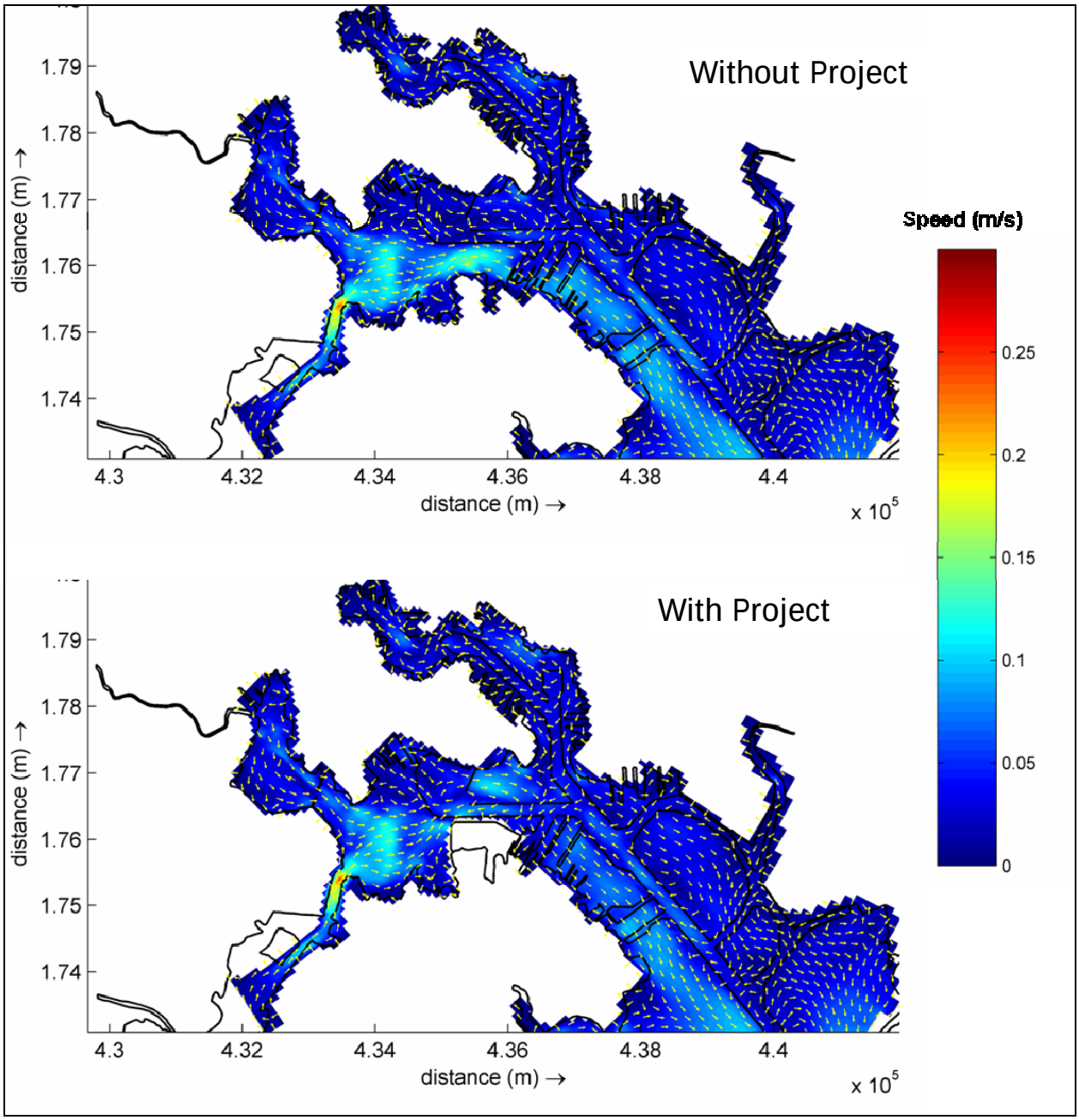


Figure 5-5. Ebb Tide Current Pattern (Mid Depth) With and Without Project

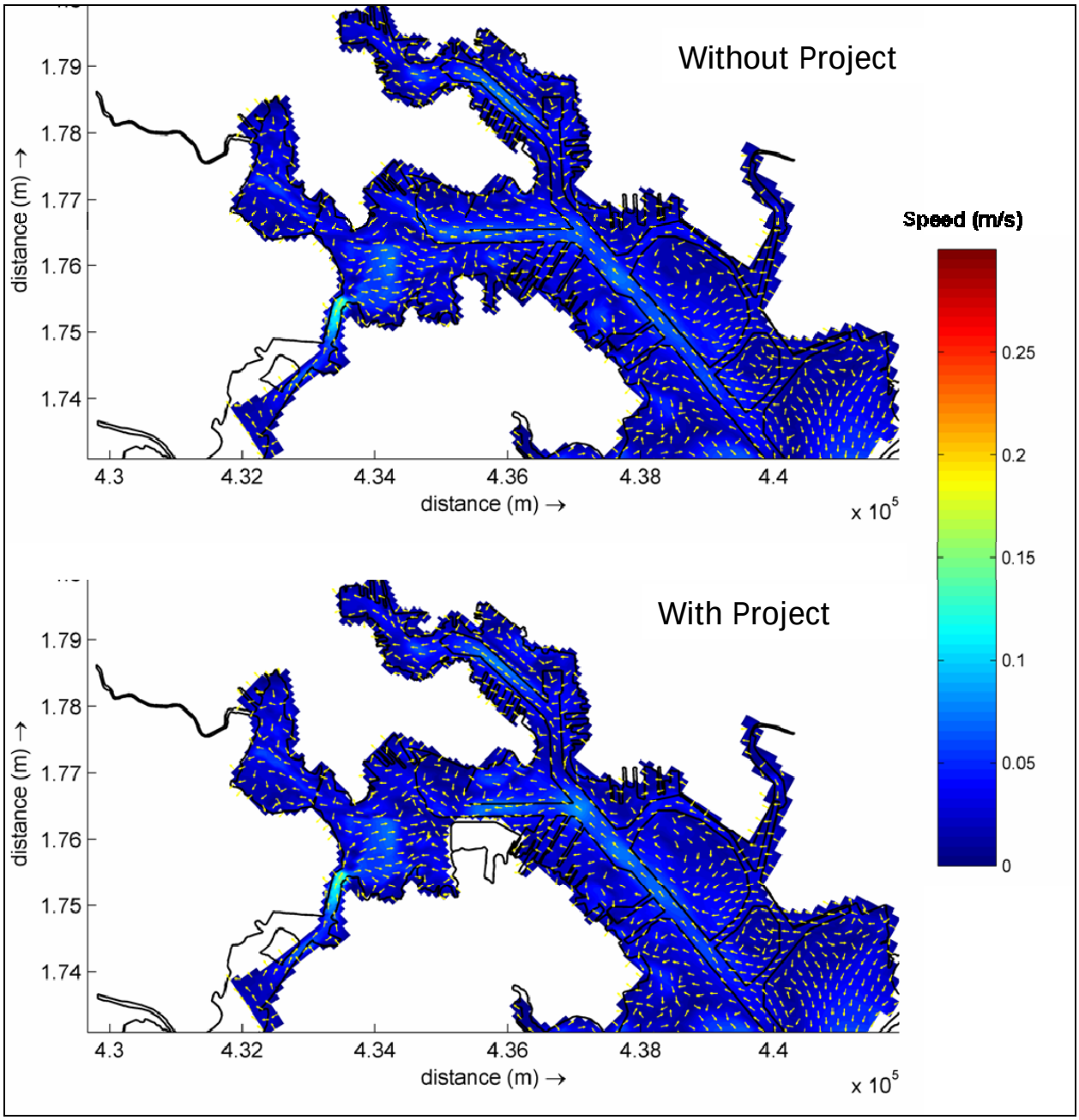


Figure 5-6. Ebb Tide Current Pattern (Bottom) With and Without Project

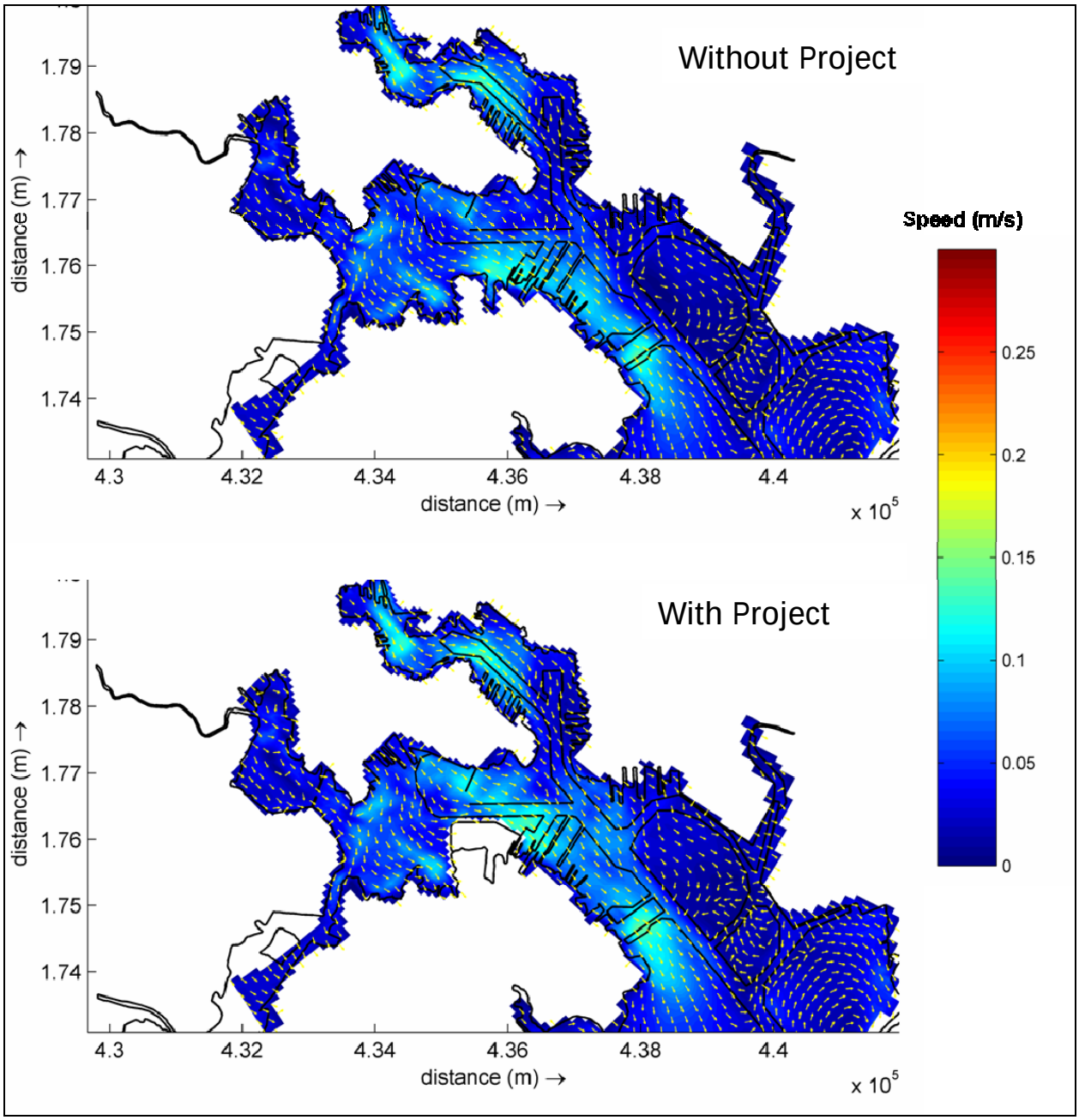


Figure 5-7. Flood Tide Current Pattern (Surface) With and Without Project

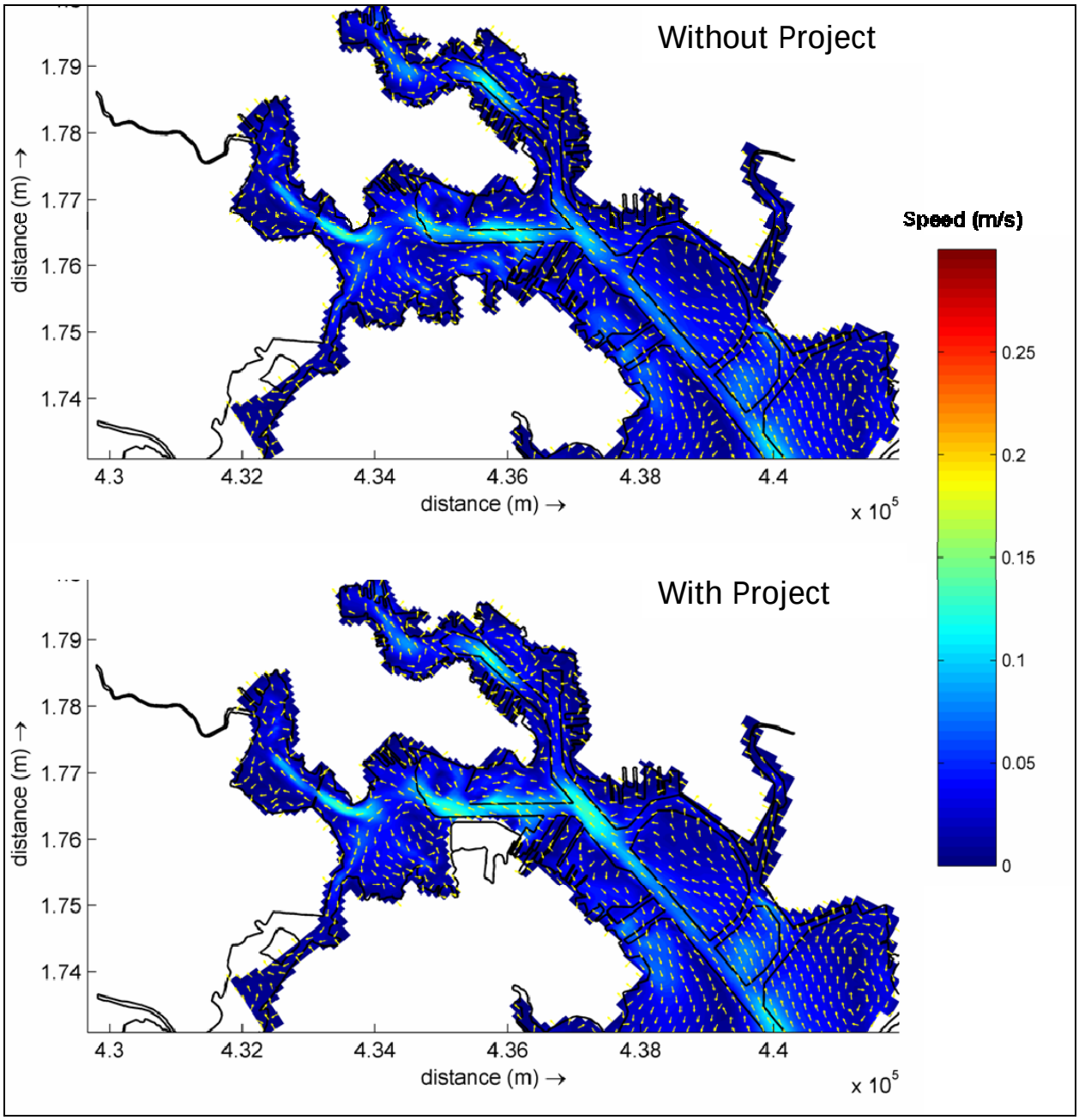


Figure 5-8. Flood Tide Current Pattern (Mid Depth) With and Without Project

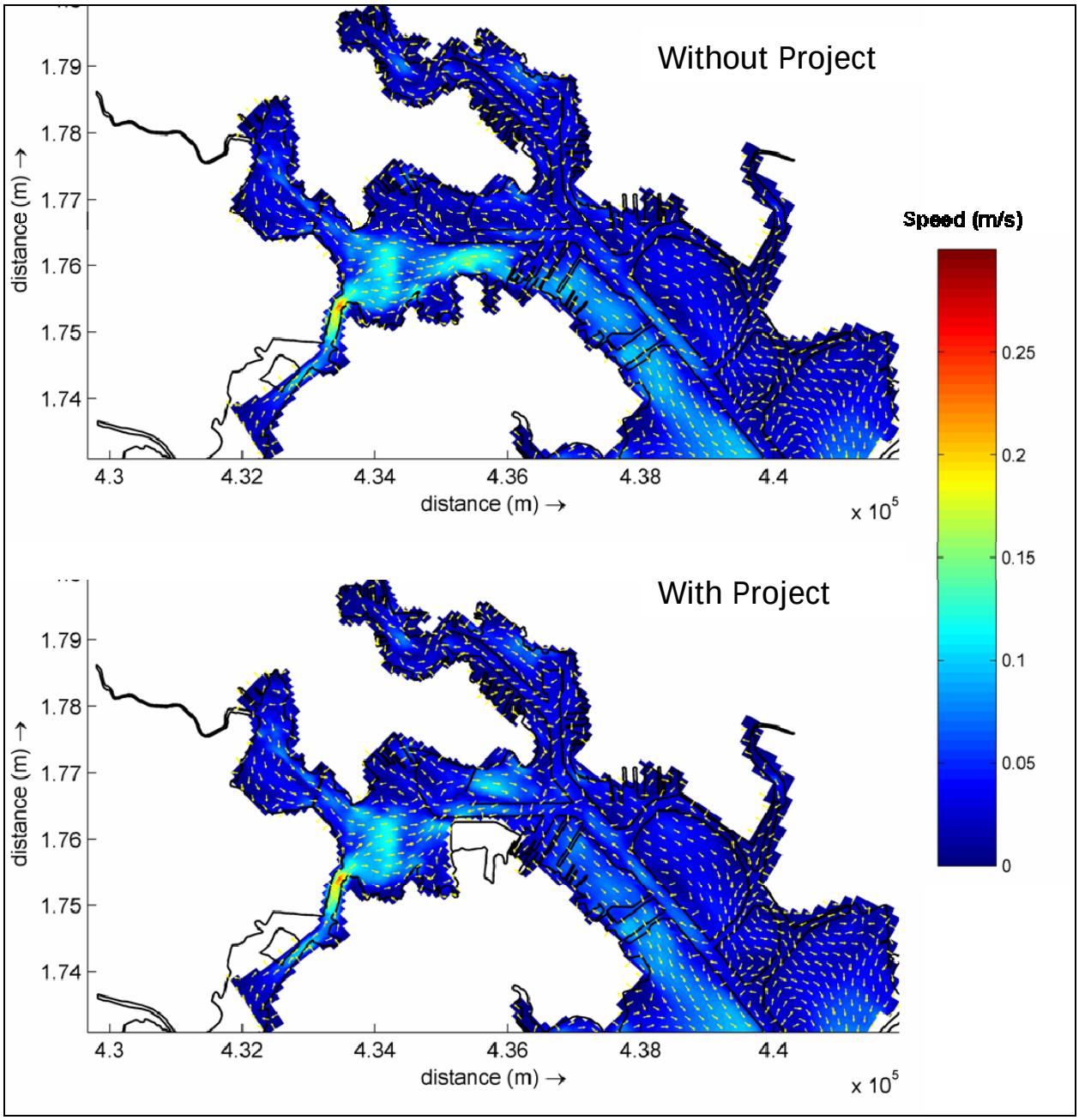


Figure 5-9. Flood Tide Current Pattern (Bottom) With and Without Project

Table 5-2. Residence Time of Patapsco River, Upstream of Fort McHenry

Location	Residence Time (days)	
	Without Project	With Project
Ferry Bar	5.0	5.1
Masonville Cove	6.0	6.2
Spring Garden Channel	6.9	7.0
Middle Branch	10.4	10.5

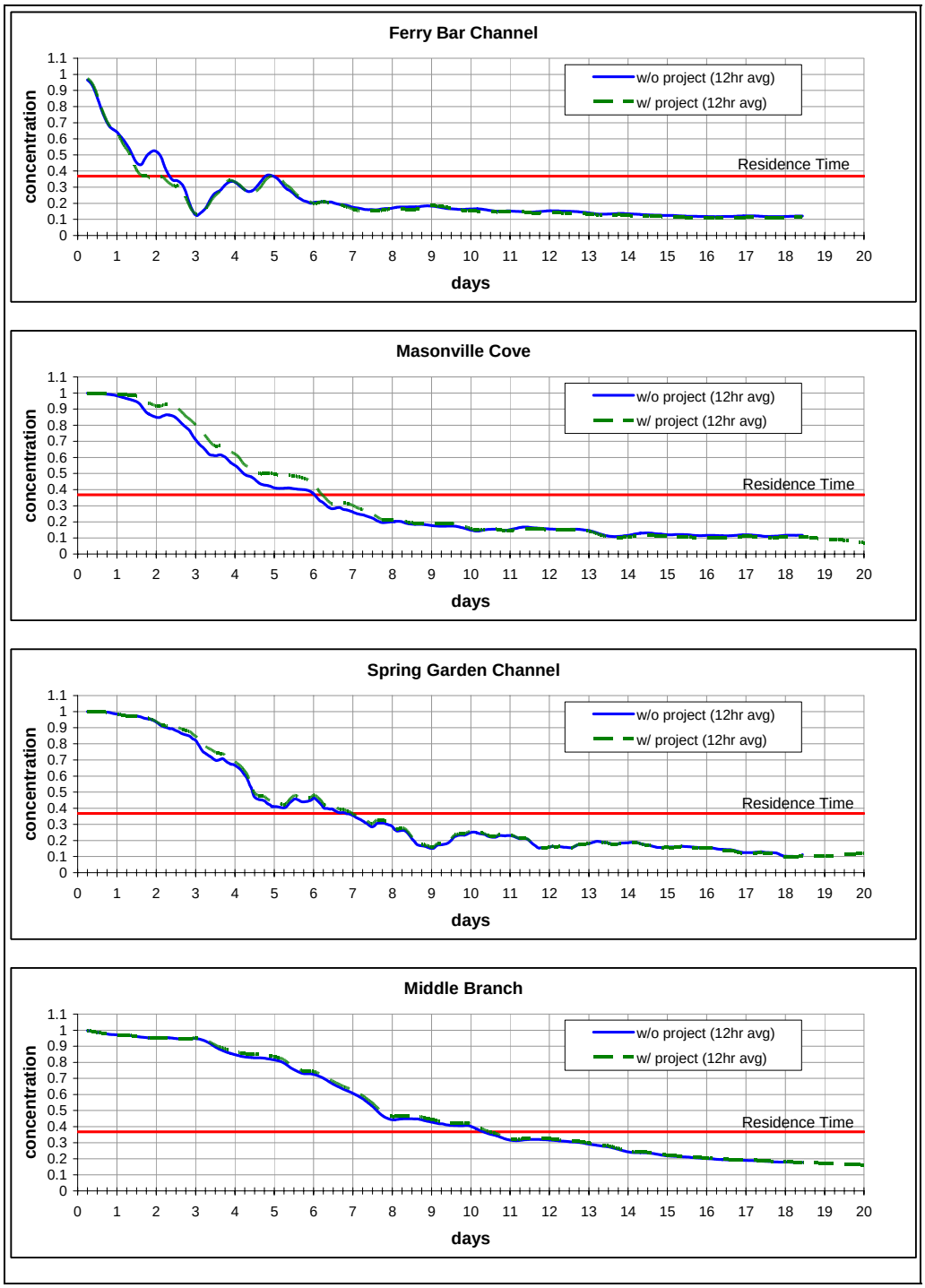


Figure 5-10. Modeled Residence Time at Observation Points, With and Without Project

5.1.2.2 Sedimentation Impacts

The influence of the proposed Masonville DMCF on erosion and deposition in the project area was assessed using the calibrated long-term morphological model. The model simulates the deposition of harbor sediments over a 20-year cycle by simulating sequential storm events which carry sediment load through high freshwater inflows and resuspend harbor sediments due to high winds. The model was calibrated to reproduce the 20-year deposition rate in the Ferry Bar Channel. Details of model calibration and sediment parameters are given in Appendix B.

Figure 5-11 displays the sedimentation and erosion patterns in the Patapsco River for with and without project conditions. Rates are presented as annual depth. Sedimentation rates are generally slow with maximum rates of one to two inches per year. The highest rates under without project conditions are in the upstream end of the Ferry Bar Channel and in Masonville Cove. Under with-project conditions, the model predicts increased sedimentation in both these areas. Sedimentation is limited by water depths. As water depths decrease, wind generated waves are able to impact the sediments on the bottom and resuspend fine sediment deposited in shallow areas. Thus, it is unlikely that there would be enough sedimentation to change open water areas to mudflats or wetlands. The model predicts that no erosion occurs in the bottom sediments or along the shorelines of the Patapsco; upstream of Fort McHenry (e.g., the system is depositional).

Figure 5-12 presents the relative sedimentation rate between with-project and without-project conditions. Sedimentation at the upstream end of the Ferry Bar Channel and at the north end of Masonville Cove increases by 0.4 to 0.8 inches per year. The net increase in sediment depth over 20 years in the Ferry Bar Channel is projected to be 8 to 16 inches. The sedimentation rate near the northwest corner of the DMCF decreases due to increased flow velocities near the structure.

Impacts associated with the potential alterations in sedimentation patterns are expected to be minor and predominantly associated with aquatic habitats and associated resources in the affected areas. These are detailed in individual impact sections throughout the rest of this chapter.

<u>No Action Alternative</u>

There would be no new impacts to hydrology and hydrodynamics from the no action alternative, or without project conditions. The without project conditions are described in more detail in the paragraphs above as a comparison to the with project conditions.

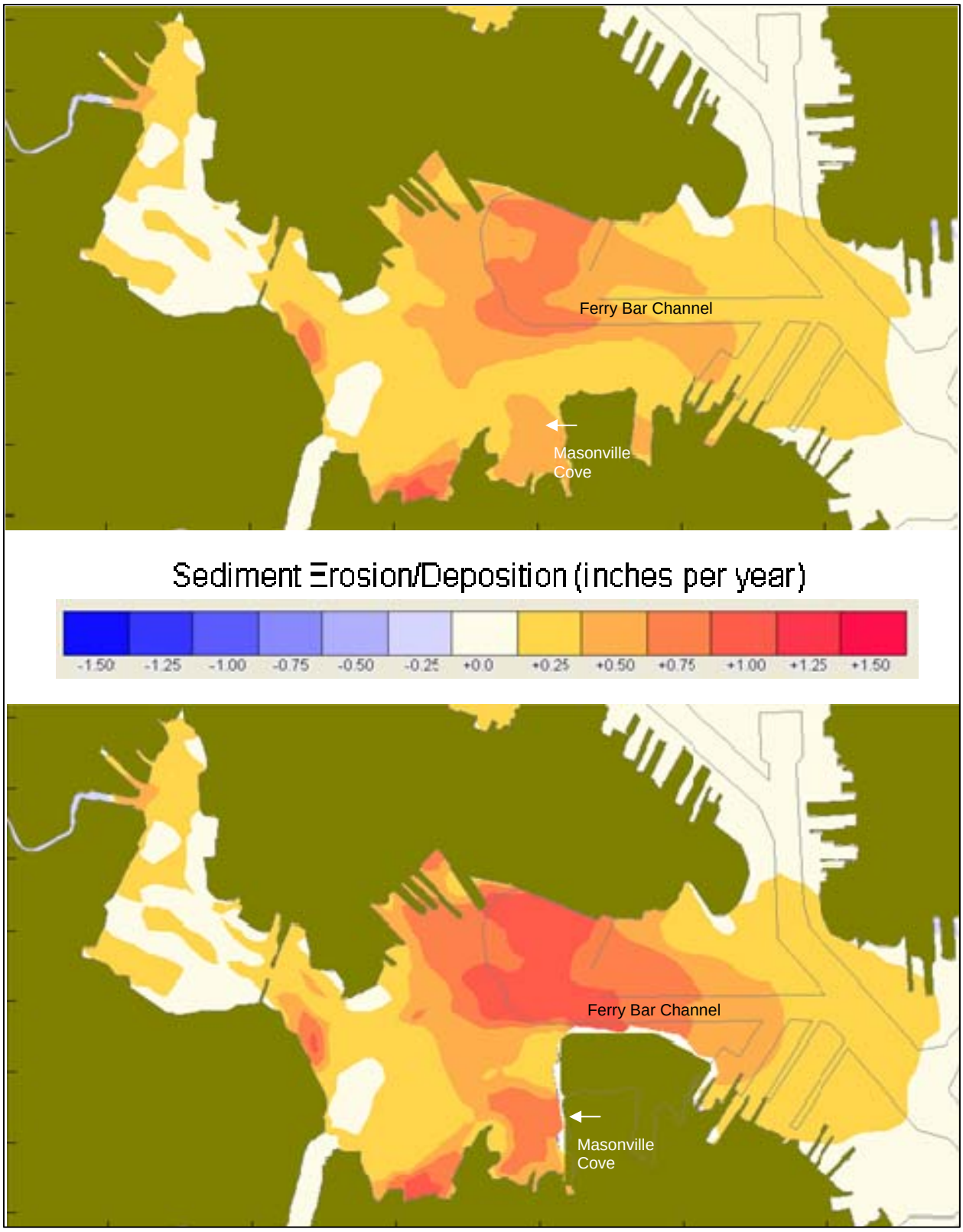


Figure 5-11. Sedimentation/Erosion Patterns, With Project (bottom) and Without Project (top)

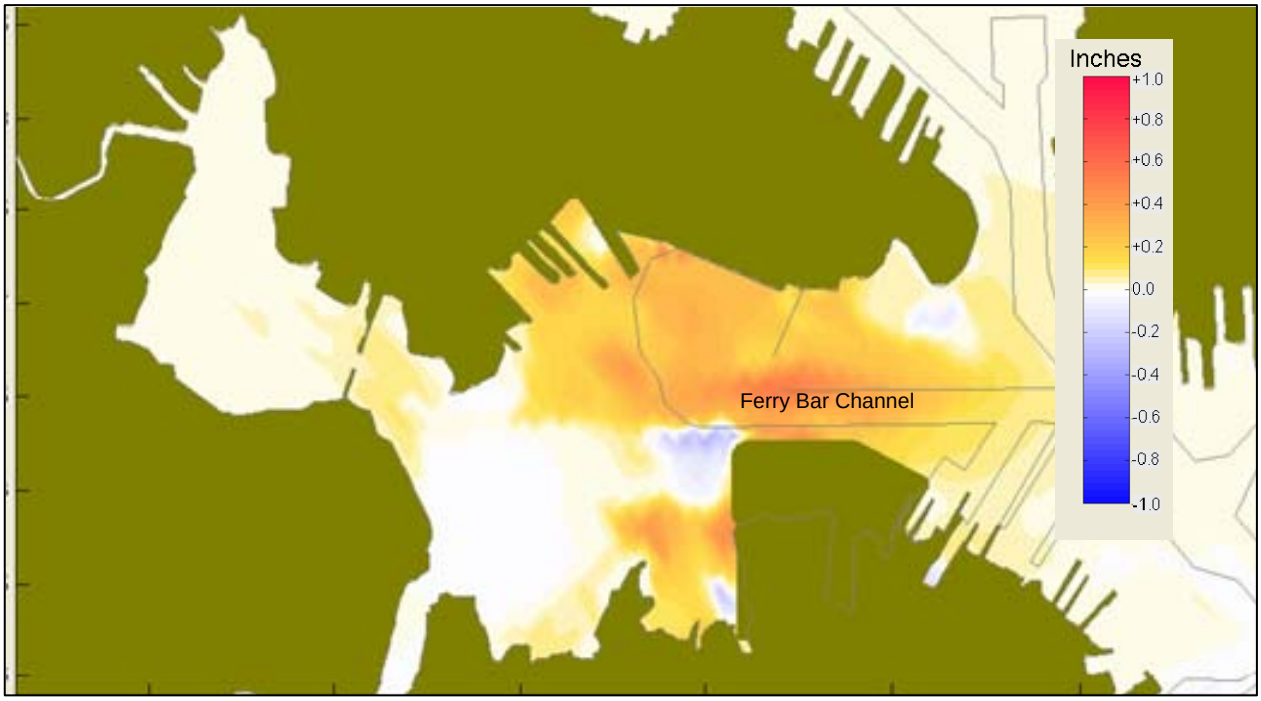


Figure 5-12. Change in the Annual Sedimentation Rate Because of Proposed Masonville DMCF Project

5.1.2.3 Storm Surge Impacts

The impact of the proposed Masonville DMCF on the water surface elevations within the Baltimore Harbor was assessed using the two-dimensional numerical model described in Appendix B. The impacts were measured by comparing model simulations with identical boundary forcing and comparing selected hurricane parameters. A full description of the model parameters, calibration, and impact assessment scenario development can be found in Appendix B.

Table 5-3 shows the water levels measured during the peak storm surge for the 1933 hurricane, Hurricane Fran, and Hurricane Isabel. The comparison of the with- and without-project water elevation in Table 5-3 reveals that the with-project water elevation is within millimeters of the without-project water levels and is considered acceptable.

Table 5-3 Peak Storm Surge Water Levels for Baltimore Harbor

Water Surface Elevation Point	Storm Surge Water Level (m)					
	1933		Fran		Isabel	
	Without	With	Without	With	Without	With
P(255, 1023)	1.418	1.418	0.980	0.980	2.031	2.033
P(252, 1024)	1.427	1.430	0.984	0.985	2.056	2.059
P(243, 1023)	1.449	1.454	1.010	1.009	2.167	2.166
P(248, 1024)	1.435	1.440	0.991	0.990	2.089	2.093
P(246, 1021)	1.415	1.421	0.991	0.990	2.073	2.070
P(256, 1026)	1.435	1.435	0.983	0.983	2.056	2.057
P(254, 1030)	1.460	1.460	0.990	0.990	2.107	2.108
P(251, 1032)	1.476	1.477	0.997	0.997	2.146	2.147

In order to fully observe the changes in water surface elevation, a difference plot was created for each storm surge. Figures 5-13, 5-14 and 5-15 show the difference plots for the 1933 Hurricane, Hurricane Ran and Hurricane Isabel, respectively. All three plots show that the proposed Masonville Site would decrease water levels in the Middle Branch area and would increase water levels in the Fort McHenry and Inner Harbor area.

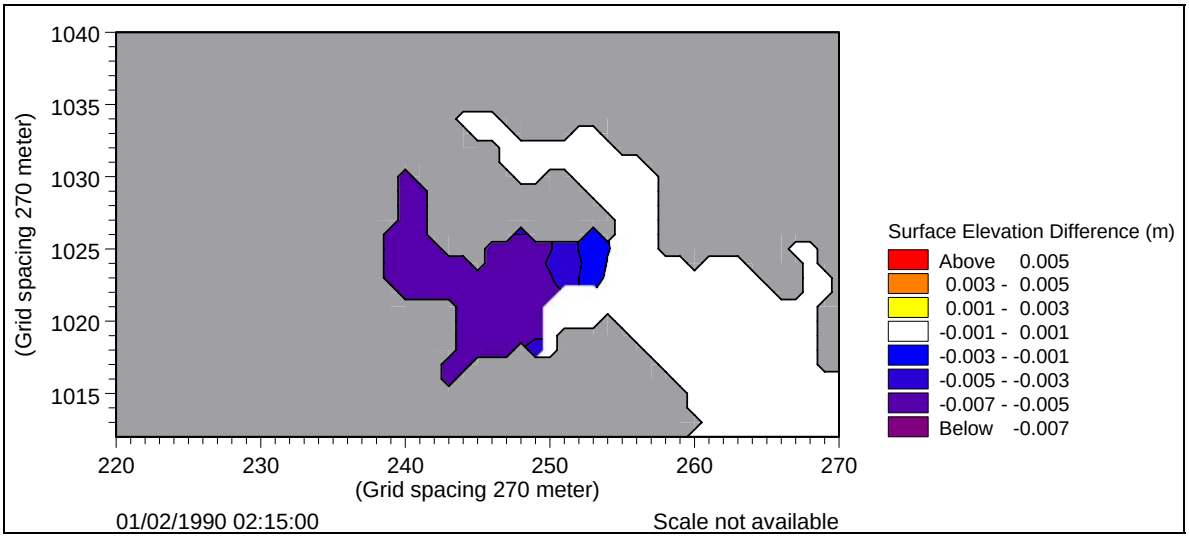


Figure 5-13 Surface Elevation Difference Plot for 1933 Hurricane Peak Storm Surge

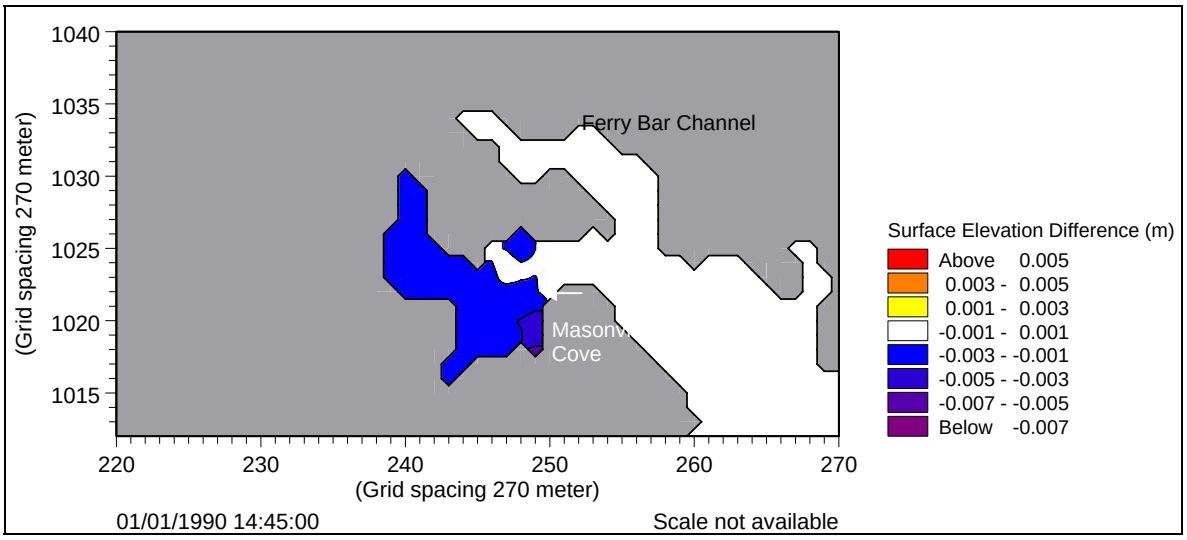


Figure 5-14 Surface Elevation Difference Plot for Hurricane Fran Peak Storm Surge

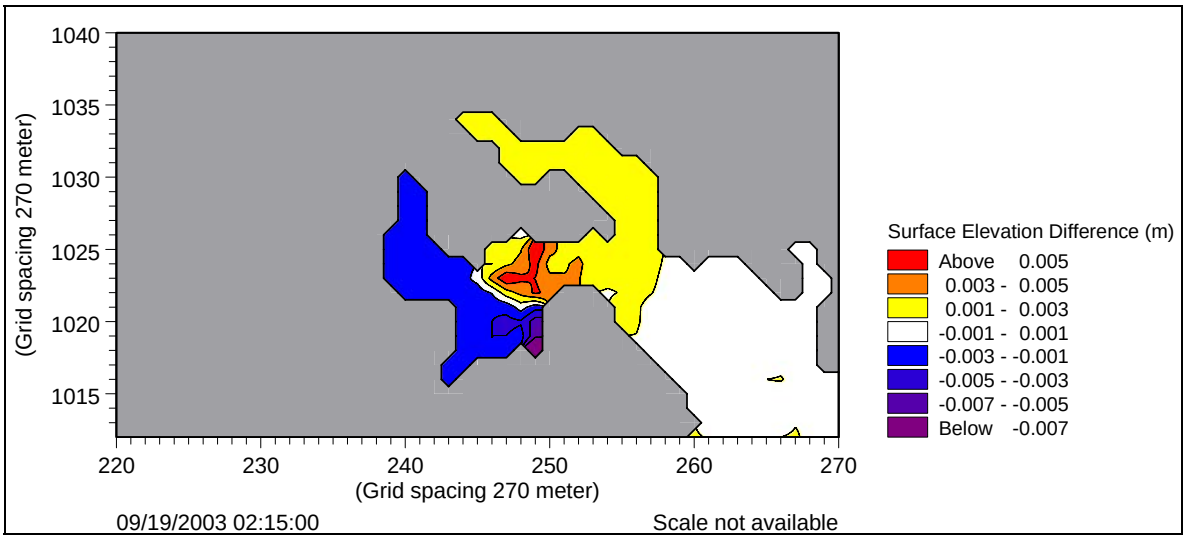


Figure 5-15 Surface Elevation Difference Plot for Hurricane Isabel Peak Storm Surge

<u>No Action Alternative</u>

There would be no new impacts to hydrology and hydrodynamics from the no action alternative, or without project conditions. The without project conditions are described in more detail in the paragraphs above as a comparison to the with project conditions.

5.1.3 Sediment Quality

<u>Alternative 1- Proposed Masonville DMCF with Borrow Scenario C</u>

No adverse impacts to sediment quality are expected from the containment dike construction or the construction of the proposed facility for the proposed Masonville DMCF. Prior studies

indicated that the existing surface sediment quality within the proposed alignment and within Masonville Cove is generally poor (Section 2.1.4 and Appendix A). Pre-dredging of the unsuitable overburden needs to be conducted in order to excavate the sand and clay in the borrow area for dike construction. In order to minimize re-suspension of the fine-grained overburden, the pre-dredging would be conducted manually with a bucket dredge. Some short-term water quality impacts (increased turbidity and the potential for nutrient releases) are anticipated as a result of pre-dredging and are discussed above in Section 5.1.5. Sand and clay from the proposed borrow area was tested (Section 2.1.4 and Appendix A). The materials below the overburden are generally physically and chemically suitable for use in the construction of the containment dikes. Surficial sediment quality in the Patapsco estuary should not be negatively impacted by using the relatively cleaner sand and clay from the proposed borrow area to construct the containment dikes.

Construction of the proposed Masonville DMCF would cap the remaining sediment contaminants detected throughout the area of the proposed alignment, including the vicinity of the former KIM facility, making these contaminants unavailable to the ecosystem, which has the potential to improve water quality within the Patapsco River in a localized area. Sediments within some areas of the footprint contained elevated levels of contaminants that were far above sediment quality criteria that are protective of aquatic organisms (Section 2.1.4). Many of the constituents (particularly PCBs, copper, lead, nickel and zinc) that exceeded the sediment quality criteria are being used to screen Harbor sediments for cleanup to help meet watershed Total Maximum Daily Loads (TMDLs) (Beaman 2002). PCB concentrations, for example, are two to nine times higher than the effective range median quotient (ERM-Q) that MDE has been using to screen sediment quality for capping/cleanup. Other metal concentrations range from one to eight times the ERM-Q.

Currently, the area in the vicinity of the former KIM facility has abandoned piers, derelict vessels, and deteriorating bulkheads, which would be covered and isolated from the Patapsco estuary by the proposed Masonville DMCF. Several of these vessels are known to contain petroleum products, creosoted timber and metals. Removal of these materials to licensed landfills or burial within the DMCF would have both an ecological benefit, sealing off contaminants from the Patapsco River, as well as an economic benefit, lowered costs for removal and remediation. Contaminants would be unlikely to enter the groundwater in the Patuxent Formation because they would be confined by the Arundel Formation, which is approximately 50 ft thick (Chapelle 1985). There would also be a liner around the site with a permeability of $5x10^{-6}$ cm per second.

No adverse impacts on the sediment quality are expected from the placement of dredged material in the proposed Masonville DMCF. Sediment quality of the dredged material that would be placed at the proposed Masonville DMCF is expected to be variable and may be unsuitable for habitat development. However, the sediments that would be contained within the proposed site would come from various locations within Baltimore Harbor and could contain elevated levels of metals, nutrients, and other organic contaminants. Sediments from non-Federal channels/projects that are targeted for placement at the proposed Masonville DMCF would be tested according to an MDE-approved sediment testing program prior to placement. The Federal navigation channels that are maintenance dredged within the Harbor are tested every three years for the full-suite of parameters in the Inland Testing Manual (ITM) (USEPA/USACE 1998).

Dewatering of dredged material placed in the proposed Masonville DMCF would expose the anoxic, sulfur-rich sediments to the atmosphere, oxidizing the sediment, lowering the pH, and, under extreme conditions, potentially mobilizing metals that were bound to the sediment. Dissolved metals released through the spillways as a result of this process could potentially be harmful to aquatic organisms and those who consume them. Discharges would be monitored and tested to ensure compliance with State of Maryland water quality standards and with requirements of the NPDES permit that would be required for the spillways.

In addition, effluent discharged from the proposed Masonville DMCF may have higher levels of suspended solids and nutrients compared to the background water under some river flow conditions. Any effluents discharges would be required to meet MDE and NPDES permit requirements. No substantial releases of contaminants to the surrounding estuarine environment or substantial increases in the concentrations of metals or organic constituents in the sediments in the vicinity of the proposed Masonville DMCF are expected. In general, the proposed placement of contaminated dredged material within the proposed Masonville DMCF, and capping the facility upon completion, would provide for the safe and permanent removal of contaminants within the sediment. The derelict vessels located within the proposed alignment would be remediated and either buried within the proposed facility or disposed of offsite. This would eliminate a source of contaminants and prevent additional contaminants to the water from entering the water. The encapsulation of contaminated sediments and the remediation of derelict vessels would reduce the contaminants that are bioavailable and accumulating in fish tissue in that area. The proposed project is expected to potentially improve sediment quality in the long-term.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

Impacts as a result of this alternative would be the same as those described for Alternative 1. Dredging and using borrow material from the Seagirt borrow source would not affect sediment quality in the Seagirt dredging area or the Masonville project area. The Seagirt dredging area is regularly dredged and would still be dredged to -50 feet MLLW without implementation of this alternative.

No Action Alternative

The no action alternative would have no long-term effect (either positive or negative) on the sediment quality at the existing Masonville site. The existing abandoned piers and deteriorating bulkheads, which are known to contain petroleum products, creosoted timber and asbestos would continue to leach contaminants to the sediment, further decreasing the sediment quality at the site and increasing the potential for effects to benthic organisms. If the Masonville DMCF is not constructed, there would be no regulatory reason to remediate the derelict vessels on the western side of the proposed DMCF site. The funding currently allocated for site development would be released to other MDOT efforts and the remediation of the 25 derelict vessels would be postponed indefinitely. Thus, removal of this source of contamination from the Patapsco River would not occur. The no action alternative includes the need to overload the existing placement facilities which could affect spillway discharge quality and near-field sediment quality in the vicinity of those sites. However, the HMI DMCF has been in operation for over 20 years with intermittent overloading and there has been no measurable deterioration in the sediment quality relative to Chesapeake Bay background levels.

5.1.4 Water Quality

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

Pre-dredging and Perimeter Dike Construction

The primary short-term impact would be an increase in water column turbidity and nutrient releases in the construction and pre-dredging areas. For pre-dredging, the silty overburden [approximately 1.7 million cubic yards (mcy)] that is unsuitable for dike construction and covering the borrow material would be removed and barged to the HMI DMCF for placement. It is anticipated that pre-dredging of the unsuitable material would begin in 2006 and would take approximately three to four months to complete. Pre-dredging would be conducted mechanically using a clam-shell dredge.

Perimeter dike building would be sequenced to best manage placement, loss of materials and turbidity (Chapter 6). Placement of the cofferdam (Section 4.5.2.2) would occur during the first phase of dike construction. Sand dike construction would begin with the western dike (fringe marsh) alignment and involve one or two hydraulic (cutter head) dredges moving material from the borrow area to the dike line. Sand would be mounded initially, then mechanically shaped into training dikes which would be used to guide hydraulic placement (Chapter 6). Some additional mechanical shaping of the sand would be required, in addition to the training dikes, before armor stone could be placed on the exterior slopes. Armor stone would then be placed on the exterior dike slopes. To minimize turbidity, the dike would be raised to +4 feet MLLW over the entire dike line, thus closing it off from the Patapsco River. If the harder Arundel Clay is needed as part of the construction materials, utilization of this material would not likely occur until the borrow area is enclosed. Construction of the sand perimeter dikes is expected to take approximately 12 months to complete and would cause a visible turbidity plume within the water column. The orientation and size of the expected turbidity plume would vary on a daily basis, depending on the volume of disturbed material as well as winds, tides and currents in the Study Area during construction and pre-dredging operations.

To assess the potential extent and impact of the dredging and dike building plumes, the USACE DREDGE model [developed by the Engineer Research and Development Center (ERDC) in Vicksburg, Mississippi] was run for site-specific operations. The DREDGE model uses site grain-size information in conjunction with the dredge size and pumping rates to predict the extent of the turbidity plume and concentrations of contaminants based on sediment composition. Turbidity plumes from both clam-shell and cutter head dredge operations and placement of materials along the dike line were modeled over a range of grain-size distributions. Field sampling of the fine overburden had indicated that the material, on average, was 87.3 percent fine silts and clays. The grain-size of the borrow material was somewhat more variable but the average particle distribution in the borrow area was approximately 29.3 percent fines. Details of the model inputs and results are included in Appendix J.

Turbidity is regulated by the rules for conventional pollutants: the allowed mixing zone in Maryland estuarine waters is defined as 10 percent of the cross-sectional area of the receiving water body at mean water level. The DREDGE model output for turbidity is based upon concentrations of total suspended solids (TSS). Turbidity limits in the surface water resulting

from any discharge may not exceed 150 nephelometric turbidity units (NTUs) at any time, and 50 NTUs as a monthly average. NTUs are the unit associated with indirect measurements of turbidity based upon the amount of light reflected (refracted); this method is not always a reliable predictor of the suspended solids in the water. The relationship between TSS and NTU is variable and is influenced by such things as salinity, phytoplankton, and composition of soils/sediments. Two large datasets were found for Baltimore Harbor materials that relate measurements of TSS to NTU. One was from the I-95 Tunnel turbidity monitoring for dredging operations and the other was for the spillway monitoring at the HMI DMCF. Both indicated that for the local dredged materials, 1 NTU was generally greater than 1 milligram per liter (mg/L) TSS. The DREDGE model output was interpreted in two ways: (1) based upon the conservative assumption that the TSS output would equate equally (1:1) to NTUs, and (2) the region-specific relationships that 50 NTU could be as much as 70 mg/L TSS, and 150 NTU could be as much as 240 mg/L TSS. The resulting affected cross-sections are included in Table 5-4.

Table 5-4. Cross-Sectional Area of Tidal Average and Material Weighted Sediment Plumes at the Masonville Site for Dredging in the Borrow and Dredged Material Placement during Dike Construction

Clamshell Dredging of the Overburden
(6-cm/sec Tidal Average Velocity, 1 Particle Distribution)

Downstream Distance (m)	**Cross-Sectional Area (%)**			
	Monthly Average		**Maximum**	
	50 mg/L	**70 mg/L**	**150 mg/L**	**240 mg/L**
Cutter head Dredging in the Borrow				
20	5.20	1.70	0.00	0.00
60	0.00	0.00	0.00	0.00
100	0.00	0.00	0.00	0.00
Dredging of the Borrow and Placement (6-cm/sec Tidal Average Velocity, Composite of Four Particle Distributions)				
Downstream Distance (m)	**Cross-Sectional Area (%)**			
	Monthly Average		**Maximum**	
	50 mg/L	**70 mg/L**	**150 mg/L**	**240 mg/L**
Cutter head Dredging in the Borrow				
20	2.54	1.76	0.26	0.04
100	0.24	0.04	0.00	0.00
200	0.00	0.00	0.00	0.00
Placement of Material during Construction				
100	17.55	14.16	6.69	2.12
200	21.16	14.80	0.99	0.00
400	15.70	4.50	0.00	0.00

The DREDGE modeling results indicate that at the dredge point for both the overburden dredging (clamshell) and the borrow dredging (cutter head), the turbidity plume would be considerably less than the 10 percent cross-sectional area under average tidal conditions. The DREDGE model applied in this context assumes the worst-case discharge of an unregulated outflow pipe. Even under those extreme conditions for the average tidal conditions, the turbidity associated with dike building should be able to meet the cross-sectional requirements of the MDE's surface water regulations for the instantaneous maximum for turbidity (150 NTU). However, the model predicts that the turbidity plume would exceed 50-70 mg/L TSS over 4.5 to 21.2 percent of the cross-

section on a monthly average basis if dike building was conducted without any turbidity control techniques. This is a worst-case assessment and overestimates the turbidity plume because dike construction involves baffling at the discharge point and training dike construction to minimize losses of materials (Chapter 6). Although fines would still be released, the project implementation plan includes the use of turbidity curtains around the discharge point (Section 7.4) in order to control turbidity, and the effect of the turbidity curtains is *not* included in the TSS modeling. Because the Masonville area has relatively weak currents and is protected, turbidity curtains would likely be an effective turbidity management tool. The effectiveness of turbidity curtains is highly variable but can remove as much as 80 to 90 percent of the turbidity in a water body (Francingues *et. al.* 2005). Even assuming a more conservative 50 to 60 percent effectiveness, turbidity curtains in conjunction with construction techniques designed to minimize material losses should put dike construction into compliance with MDE's turbidity limits. Field observations of dike construction elsewhere in the Bay tend to support this conclusion.

Turbidity monitoring conducted during both Phase I and Phase II construction of the Poplar Island Environmental Restoration Project (PIERP) exterior dikes indicated that the turbidity levels from hydraulic placement of material quickly diminished to background levels at a short distance from the placement area, except during periods of sustained high winds. Even during periods of sustained high winds, turbidity levels at PIERP were consistent with levels at nearby, off-site "reference" locations indicating that the increased turbidity was representative of ambient conditions and not solely a result of dike construction activities. Although the grain-size distribution is somewhat different at the PIERP, some borrow areas had fines consistent with the average conditions at Masonville. Based on this information, increases in turbidity associated with the construction of the perimeter containment dike at Masonville and the pre-dredging of the unsuitable materials are expected to be temporary, short-term, and localized. Masonville is (on average) a deeper area with weaker currents and finer-grained materials (compared to the PIERP), so some differences in turbidity dispersion are expected. It is assumed that construction activities would need to be monitored to insure compliance per requirements of the Water Quality Certificate (WQC) for the project. A conceptual monitoring framework is included in Section 7.5.

Suspended solids are only one part of the potential releases associated with dredging and in-water construction. Release of contaminants and nutrients is also a concern. To address this, the DREDGE model was also used for the Masonville site to predict potential contaminant concentrations in the plume during mechanical dredging and dike building operations. The model uses site-specific concentrations of contaminants measured in the on-site materials and partitions them from the particulates to the water column to predict dissolved concentrations of various constituents (Appendix J). The DREDGE model was run for several nutrients and the metals that were elevated in the sediments and borrow materials at Masonville. Results are detailed in Appendix J and the most pertinent results are included in Tables 5-5a, b, and c.

The overburden at Masonville is known to contain elevated levels of metals and polychlorinated biphenyls (PCBs) over much of the site. However, there is also a relatively high organic carbon component that binds the contaminants to particles. Table 5-5a shows the predicted concentrations of various contaminants that would be released during clamshell dredging of the overburden. For the metals and total PCBs, the model predicted that concentrations would be well below the chronic water quality criteria within 20 meters of the dredging point. Similar results were found for the dredging and dike building operations (Tables 5-5b and c, respectively)

Table 5-5a. Calculated Dissolved Concentrations for Clamshell Dredging of the Overburden (at a 6-cm/sec Average Tidal Velocity)

Parameter	Units	Chronic Saltwater WQ Criteria	Concentration at Downstream Distance (m) Along Plume Centerline							
			20	60	100	200	300	400	500	600
Chromium (+6)	ug/L	50	1.67	1.54	1.46	1.32	1.23	1.15	1.09	1.03
Copper	ug/L	6.1	3.14	2.86	2.69	2.41	2.22	2.07	1.94	1.83
Lead	ug/L	8.1	3.12	2.88	2.72	2.47	2.30	2.16	2.04	1.93
Mercury	ug/L	0.94	0.0031	0.0031	0.0030	0.0030	0.0029	0.0029	0.0028	0.0028
Nickel	ug/L	8.2	0.82	0.66	0.58	0.47	0.40	0.36	0.32	0.30
Zinc	ug/L	81	11.99	9.93	8.84	7.29	6.37	5.70	5.19	4.76
PCBs	ng/L	30	7.47	4.97	4.12	3.20	2.73	2.43	2.20	2.01
NO2+NO3	ug/L	--	0.33	0.19	0.15	0.10	0.08	0.07	0.06	0.05
TKN	ug/L	--	253.6	144.9	110.7	76.1	60.4	50.8	44.1	39.0
Phosphorus	ug/L	--	75.26	42.99	32.84	22.59	17.94	15.09	13.10	11.58

Table 5-5b. Calculated Dissolved Concentrations for Placement of Material Dredged from the Borrow during Dike Construction (at a 6-cm/sec Average Tidal Velocity)

Parameter	Units	Chronic Saltwater WQ Criteria	Concentration at Downstream Distance (m) Along Plume Centerline							
			100	200	300	400	500	600	700	800
Chromium (+6)	ug/L	50	1.01	0.98	0.95	0.93	0.90	0.87	0.85	0.83
Copper	ug/L	6.1	2.00	1.93	1.86	1.80	1.74	1.69	1.63	1.59
Lead	ug/L	8.1	5.23	5.08	4.93	4.79	4.65	4.52	4.40	4.29
Mercury	ug/L	0.94	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Nickel	ug/L	8.2	0.58	0.53	0.48	0.44	0.41	0.38	0.36	0.33
Zinc	ug/L	81	6.67	6.13	5.67	5.27	4.93	4.62	4.35	4.11
PCBs	ng/L	30	10.34	6.78	5.19	4.25	3.62	3.15	2.79	2.50
NO2+NO3	ug/L	--	0.43	0.23	0.16	0.12	0.10	0.08	0.07	0.06
TKN	ug/L	--	2471.1	1328.9	906.3	687.1	553.0	461.5	396.7	346.8
Phosphorus	ug/L	--	135.20	72.71	49.59	37.60	30.26	25.25	21.71	18.98

Note: NO2+NO3 are nitrate plus nitrite; TKN is total Kjeldahl nitrogen. Both are measurements of the available nitrogen in the water.

Table 5-5c. Calculated Dissolved Concentrations for Placement of Material Dredged from the Borrow during Dike Construction (at a 6-cm/sec Average Tidal Velocity) Placement of Soft Clay during Dike Construction

Parameter	Units	Chronic Saltwater WQ Criteria	Concentration at Downstream Distance (m) Along Plume Centerline							
			100	200	300	400	500	600	700	800
Chromium (+6)	ug/L	50	1.03	1.01	0.99	0.97	0.95	0.94	0.92	0.90
Copper	ug/L	6.1	2.03	1.98	1.94	1.90	1.86	1.82	1.78	1.75
Lead	ug/L	8.1	5.31	5.21	5.11	5.01	4.92	4.84	4.75	4.67
Mercury	ug/L	0.94	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Nickel	ug/L	8.2	0.61	0.57	0.54	0.51	0.48	0.46	0.43	0.41
Zinc	ug/L	81	6.94	6.57	6.23	5.93	5.66	5.41	5.18	4.97
PCB's	ng/L	30	14.43	9.38	7.24	6.00	5.15	4.54	4.06	3.69
NO2+NO3	ug/L	--	0.69	0.37	0.25	0.19	0.16	0.13	0.11	0.10
TKN	ug/L	--	3975.7	142.8	1464.9	1112.5	896.1	750.9	645.5	566.9
Phosphorus	ug/L	--	217.53	117.24	80.15	60.87	49.03	41.09	35.32	31.02

even considering the much higher pumping and discharge rates of the dike building activities. MDE's chronic criteria are the more conservative surface water limits (in terms of all the limits established for surface water quality) and were established to be protective of aquatic life. The results indicate that the plumes resulting from dredging and dike-building operations would not be releasing these metals and PCBs at levels that are harmful to aquatic life. The model assumes that background levels are zero which is a limitation of the model and does not reflect the natural condition. However, the results were confirmed using standard bench (elutriate) tests of the on-site materials, which did include measurements of background conditions.

In order to measure the actual dissolution (release) of constituents during dredging and placement operations, the U.S. Environmental Protection Agency (USEPA) prescribes conducting elutriate testing. Dredged material is mixed vigorously with site water and then the elutriate is tested for dissolved contaminants. Standard elutriate testing was completed on samples from five locations in the overburden area and seven in the borrow material. The resulting samples were analyzed for the full suite of priority pollutants recommended by the USEPA for dredged materials in inland waters. The results of the elutriate analyses indicated that all of the parameters evaluated met USEPA's saltwater acute and chronic criteria and State of Maryland saltwater surface water criteria, where criteria exist. Most State of Maryland criteria are the same as the USEPA's regulations (Appendix A). Many contaminants, specifically the semi volatile organic compounds and organ chlorine pesticides, were below the detection limits in the elutriates. A site water sample also indicated that concentrations of copper exceeded the USEPA's chronic water quality limits but were below Maryland's copper criterion and the USEPA acute salt water quality criterion. However, none of the elutriate samples indicated similar results. More specifically, all of the copper values met the chronic and acute surface water quality criteria for all five elutriate sample locations. The results for all of the elutriate and surface water testing are available in Appendix A.

DREDGE modeling was also used to predict the availability of some nitrogen compounds and the potential for nutrient releases. Concentrations of Total Kjeldahl Nitrogen (TKN), nitrate + nitrite, and total phosphorous were calculated for the overburden dredging and dike building activities (Tables 5-5a, b, and c). The highest nutrient releases would be caused by placement (dike building) operations due to the high volumes of water and dredged material and agitation within the hydraulic dredge. The maximum TKN concentrations were within 20 meters of the placement point and are predicted to be 3,976 ug/L. The model predicted nitrate + nitrite and total phosphorous to also be highest near the placement point at concentrations of 0.51 ug/L and 161.11 ug/L, respectively (Table 5-5c). In all modeled cases, the nutrient concentrations dropped quickly at greater distances from the placement site. These constituents and other nutrients were also measured in elutriates, which are described above. Detailed results are included in Appendix A and key nutrients are summarized in Table 5-6.

Table 5-6. Nutrient Parameters Measured in Site Water and Elutriates Prepared from Masonville Overburden and Borrow Materials

Analyte	Units	Site Water (background)	Overburden Elutriate concentrations		Borrow Elutriate concentrations	
		(range)	Minimum	Maximum	Minimum	Maximum
Ammonia	ug/L	9.4-250	2,500	4,100	170	500
Nitrate + Nitrite	ug/L	300-710	180	510	670	840
TKN	ug/L	830-2,700	4,300	14,100	200	830
Phosphorus	ug/L	85-300	44	950	100	390

For many nutrients, the site (preparation) water contained elevated levels of nitrogen and phosphorus compounds (relative to the elutriates, Table 5-6), which makes direct comparisons of measured results against modeled predictions difficult. In general, the model appears to predict lower TKN and nitrate + nitrite relative to the elutriate testing, but the phosphorous levels were comparable between the two methods. Both the modeling and elutriate testing indicate that nutrient releases can be expected from construction and dike building. Ammonia was well below both the acute and chronic criteria, based upon site specific conditions of 6.5 parts per thousand (ppt) salinity, temperature of 18.8 °C and pH of 6.9. Site-specific summer nutrient sampling (Section 2.1.5) found that most compounds were in the range of concentrations found at the Chesapeake Bay Program (CBP) monitoring location but that some of the nitrogen compounds were elevated near Masonville. This is consistent with the site water measurements in Table 5-6. The Patapsco River is already classified as impaired for nutrients and increased releases, even though they would be temporary, could further impair the system on a short-term basis. Currently, chlorophyll *a* and phaeophytin levels are not very high (Table 2-13) relative to the rest of the Patapsco estuary. However, elevated levels of nitrogen and phosphorous compounds can enrich the water and stimulate algal growth. Some short-term stimulation of the phytoplankton communities may occur as a result of dike building activities, particularly in summer.

Dissolved oxygen (DO) measurements taken during site investigations did not find depressed DO levels, even in summer, although the deeper areas of the site were not monitored. However, summer bottom DO levels are regularly poor in some areas of the Harbor (Maryland DNR 2006). Monitoring of the bottom waters near the Key Bridge indicate that DO levels near the bottom begin to get hypoxic (fall below 2 mg/L) as early as May and can remain depressed through

October. In some years the minimum DO levels reach anoxia (DO of zero). Excessive nutrients and the resulting phytoplankton growth are integral to and exacerbate these conditions. Increases in nutrient inputs from dredging and dike construction activities could further exacerbate the DO problems in the deeper areas of the Harbor on a short-term basis.

The release of nutrients or chemical constituents from the sediments during pre-dredging and dike construction activities is expected to be short term, temporary, and localized during dike construction and pre-dredging. Monitoring of actual dredging operations supports this conclusion. The USACE conducted several studies of the relationship between dredging and particulate re-suspension relative to dredging operations in the Bay and within Baltimore Harbor (EA 2006). The studies monitored TSS, toxics, and nutrients in the sediments and water column near maintenance and new-work dredging operations. The USACE studies found few chemical constituents in the water column present at detectable concentrations, even as close as 40 m from the point of active dredging operations. In addition, the study indicated that surface water TSS concentrations in the Harbor were higher after a typical rain event than during dredging operations.

Placement Site Effects for Masonville Overburden Materials

The overburden (pre-dredged) material would be removed and placed at the HMI DMCF, which is permitted to take contaminated dredged materials. The site has successfully managed dredged materials for the past 20 years. Results of the most recent monitoring at the HMI DMCF are summarized below (URS 2004).

There are two surface-water monitoring stations at the HMI DMCF located outside the perimeter dike. One is located at the northeast end of the HMI DMCF downstream of spillway 001B and the other is located at the southwest end of the HMI DMCF at boat dock 265. These sites are referred to as the "001B-Bay site" and "Dock 265 site," respectively. Both sites were compared to MDE's estuarine/saltwater criteria for surface water [Code of Maryland Regulations (COMAR) 26.08.02.03] and regulations for Use I (recreation, fishing, protection of aquatic life, etc.) and Use II (shellfish harvesting) (COMAR 26.08.02.07 and .08). The 001B-Bay site exceeded the water quality criteria for copper (from one sample that was collected). There were no other water quality criteria exceedances at the 001B-Bay site. The Dock 265 site exceeded the water quality criteria for cadmium (one sample), copper (both samples), and zinc (one sample). Surface water quality was also measured at several sites within the perimeter dike. These sites included one site within spillway 001B. Water measured in spillway 001B also exceeded the water quality criteria for ammonia and copper (URS 2004).

The exceedances of surface water quality outside the perimeter dike are attributed to background levels of copper and other contaminants occurring in the Bay (URS 2004). Data indicate that Chesapeake Bay occasionally exceeds water quality criteria for copper as does, the area surrounding the HMI DMCF (Harlan 2006).

Due to the elevated levels of some contaminants in the Masonville overburden material and the limited space at the HMI DMCF as it nears closure, the ability for the HMI DMCF to manage the Masonville overburden materials was assessed. Three fundamental questions were addressed: (1) is there more potential for air exposure, decreased pH, and associated contaminant mobility as the

HMI DMCF gets closer to closure (and there is less room to keep sediments inundated); (2) are there potential issues with meeting interim permit limits for ammonia; and (3) are the materials from Masonville markedly worse than what has been placed at the HMI DMCF previously?

The potential for material drying and leading to low pH conditions and contaminant mobility depends on how the site is managed. Acid rain combined with acid sulfurization affects pH conditions in the cell and thus, metals mobility. The Maryland Environmental Service (MES) has estimated that the processes resulting in a lowering of pH in the pond's water generally take 12 to 18 months to develop in the drying sediments. The potential for the placement of Masonville pre-dredge material to be associated with low pH of the pond's water would depend on existing site conditions at the time of placement. Current conditions in the pond's cell water are acceptable from a water quality perspective, but there have been extended periods of time when the pond's water did not meet discharge criteria and could not be discharged, due to lengthy drying periods. The MES and MPA are aware of the need to manage material and pond quality during the final stages of filling the HMI DMCF, and several management options are under consideration at the HMI DMCF to allow inflow of the Masonville material, while maintaining adequate water quality for discharge. The options include: 1) treatment of pond water and/or soils to raise pH levels and precipitate any dissolved metals, 2) managing the timeframe between inflow events so that acidification of the sediments and pond's water does not occur (inflowing over the entire cell more frequently than every 12 to 18 months), and 3) periodically wetting the cell so that acidification does not take place. An increased frequency of monitoring is also being planned to track conditions leading to acidification to enable effective site management.

During inflow of dredged material to the HMI DMCF, ammonia levels in the pond water typically increase in concentration and then decrease as inflow ceases. Under interim permit levels for ammonia that became effective in the HMI DMCF discharge permit as of July 2004, there might be the potential for ammonia concentrations in the pond water to exceed these levels should inflow occur during the summer months of the year (May through October). Should ammonia concentrations exceed permit limits, no discharge from the facility would occur until the concentrations returned within limits. The interim limits for ammonia are viable until December 31, 2006. MDE may establish these interim limits as final limits or they may decrease the daily maximum and monthly average concentrations.

To determine whether inflow of Masonville material during summer months would raise ammonia concentrations above interim permit limits, MES applied the new interim limits to ammonia levels during summer months when peak inflow occurs at the HMI DMCF. In the past 8 years, there were 3 months when inflow amounts were equal to or greater than the expected Masonville inflow amounts. For 2 of the 3 months, if the current permit had been in effect, the discharge concentrations of ammonia would have exceeded the interim monthly average limit. During the third month, the concentrations were close to the monthly average. Should dredged material be inflowed into the HMI DMCF during the summer months, the water quality would need to be closely monitored for ammonia and contingency plans would be developed so that the permit was not violated.

With respect to the question regarding the quality of Masonville overburden materials relative to those managed previously, a comparison of the inflow sediment quality to the surficial sediment quality was made (Table 5-7). The range of sediment quality conditions found at Masonville was

compared to the range of sediment quality conditions of the materials that have been accepted and managed at the HMI DMCF. For nutrients and all metals in the HMI DMCF sediment inflow database, the Masonville sediment concentrations, in the material proposed for placement at the HMI DMCF, fall within the range of concentrations that have already gone into the HMI DMCF and been managed successfully.

Testing of PCB's is not required in the HMI DMCF bulk sediment data analysis, but on occasion data are reported for non-required parameters. Because PCBs are elevated in the Masonville overburden materials, an evaluation of PCBs in the USACE's Baltimore Harbor Channels assessments was conducted to compare to Masonville sediment levels. The highest value for PCBs measured in the Harbor Channels based upon the 1998 and 2002 USACE surveys was 519 ug/kg. The highest level found in the Masonville overburden materials proposed for placement at the HMI DMCF is 324 ug/kg. The materials tested in the Harbor channels have not necessarily been placed in the HMI DMCF as the testing is done every three years and some of the areas are not dredged that frequently. However, in the case of total PCBs, the Masonville overburden concentrations were below the maximum concentrations in the Harbor channels.

Recent bulk sediment reports for the HMI DMCF from 2002 to present were also reviewed. Of the 8 reports reviewed, only 4 samples were tested for PCBs. Of the 4 tested samples, only 1 sample had PCB detections in the sediment and there was no detection of PCBs during elutriate testing of the samples. If the materials are not found during elutriate testing, it means that the PCBs are unlikely to be reintroduced into the water column and would likely remain bound to the sediments. Historically, MES has only kept a record of instances when reported PCB concentrations in the bulk sediment analysis were above the detection limit. Since 1986, infrequent detections of PCBs have been reported in the bulk sediment analysis. Of those few instances, the concentration of total PCBs detected was less than 1,000 ug/kg. MES has not experienced impacts to water quality from PCBs associated with past projects. The HMI DMCF was built to contain contaminated material and as long as elutriate testing does not indicate mobilization of PCBs, water quality impacts are not anticipated. Standard elutriate analysis of the overburden material within the Masonville DMCF alignment was described previously and indicated no exceedances of water quality criteria for PCBs or any contaminants (Appendix A). Therefore, the placement of the overburden material at the HMI DMCF should not cause discharges to exceed the surface water criteria. Additionally, inflow planning suggests that the proposed Masonville DMCF may be capped during site closure, further decreasing the risk of contaminant mobility from the Masonville material.

Table 5-7. Summary of HMI DMCF Inflow Dredged Material Quality (1985 – 2005) Versus Quality of Sediments in Overburden of Masonville Borrow Area

Project Name and Sampling Dates	METALS								
	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Copper	Iron
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Inner Harbor Average (1985-2005)	--	--	24.85	84.64	--	3.01	332.09	154.64	32,952
Inner Harbor Maximum (1985-2005)	--	--	540	739	--	69	6,300	1,500	93,100
Inner Harbor Minimum (1985-2005)	--	--	0.30	0.40	--	0.01	0.01	0.02	2
Outer Channel Average (1985-1999)	12,397	5.18	7.15	56.41	1.39	1.36	50.06	32.86	29,365
Outer Channel Maximum (1985-1999)	29,400	23.81	33.00	250	2.40	5.00	640	240.00	94,000
Outer Channel Minimum (1985-1999)	1,100	0.11	0.50	4.85	0.13	0.07	1.89	0.51	1,600
Masonville Sampling Maximum	**19,300**	**0.66**	**54.30**	**57.80**	**1.50**	**1.60**	**152**	**257**	**30,700**
Masonville Sampling Minimum	**13,600**	**0.37**	**11.70**	**57.80**	**1.10**	**0.47**	**90.20**	**102**	**24,500**

Project Name and Sampling Dates	METALS (continued)							
	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Inner Harbor Average (1985-2005)	189.78	--	0.66	--	7.75	1.53	--	360.10
Inner Harbor Maximum (1985-2005)	1,700	--	6.90	--	130	21	--	4,300
Inner Harbor Minimum (1985-2005)	0.05	--	0.01	--	0.02	0.01	--	0.04
Outer Channel Average (1985-1999)	49.83	1,967	0.19	35.66	3.21	1.30	1.36	197.18
Outer Channel Maximum (1985-1999)	464	7,000	2.10	79	11.90	7.70	4.76	580
Outer Channel Minimum (1985-1999)	1.50	33.80	0.01	2.20	0.10	0.10	0.23	7.63
Masonville Sampling Maximum	**142.00**	**303**	**0.80**	**25.60**	**6.40**	**0.74**	**0.49**	**357**
Masonville Sampling Minimum	**60.80**	**272**	**0.29**	**34.80**	**1.40**	**0.24**	**0.42**	**174**

Table 5-7. CONTINUED

Project Name and Sampling Dates	NUTRIENTS AND PHYSICAL PARAMETERS						
	TKN*	**TOTAL P***	**pH**	**O&G***	**TOC***	**COD***	**TS***
Units	**mg/kg**	**mg/kg**	**No Units**	**mg/kg**	**mg/kg**	**mg/kg**	**%**
Inner Harbor Average (1985-2005)	1,970	1,440	7.6	2,632	38,766	102,124	45
Inner Harbor Maximum (1985-2005)	15,000	29,000	8.8	70,200	260,000	579,000	98
Inner Harbor Minimum (1985-2005)	41	0	4.1	0	0	18	17
Outer Channel Average (1985-1999)	1,456	1,230	7.6	867	24,635	66,236	39
Outer Channel Maximum (1985-1999)	5,000	14,917	8.5	5,842	90,500	390,909	85
Outer Channel Minimum (1985-1999)	40	14	6.1	1	176	117	18
Max for Private / Federal Dredging jobs (1984-2005)	15,000	29,000	8.8	70,200	260,000	579,000	98
Min for Private / Federal Dredging jobs (1984-2005)	40	0	4.1	0	0	18	17
Masonville Sampling Maximum	**2,500**	**949**	**8.1**	**665**	**3.1**	**921**	**55**
Masonville Sampling Minimum	**927**	**49**	**7.9**	**163**	**1.9**	**21**	**42**

* Note the following abbreviations:

TKN = Total Kjeldahl Nitrogen

Total P = Total Phosphorus

O&G = Oil and Grease

TOC = Total Organic Carbon

COD = Chemical Oxygen Demand

TS = Total Solids

Note: not all Masonville stations were analyzed for all parameters

Other On-Site Effects

To construct the Masonville DMCF, the derelict vessels that currently exist adjacent to the former KIM facility would need to be cleaned and some material removed. Through negotiations with MDE, the MPA has formulated a plan to remove the bulk of the hazardous materials associated with the vessels, but also to leave the larger materials, like ship hulls, in place in order to minimize resuspension of the contaminated materials in that area (Section 7.3). Hazardous materials are discussed further in Sections 2.1.11 and 5.1.9. It is expected that the dikes, once constructed, would isolate these contaminants from the Patapsco River ecosystem.

Site Operations

Localized impacts on water quality during and shortly after the intermittent (70 days/year) discharges expected during facility operations. The primary pathway for water discharge from the containment areas would be through spillways during site dewatering operations and the water would discharge to surface waters along the northern side of the perimeter dike. Discharges would need to occur for the life of the site, which would be approximately 19 years.

Discharge from the spillways would likely contain elevated nutrient and TSS levels. Discharges would be controlled by internal dike structures during dredged material placement and management. Spillways or outlet structures would be permitted through MDE and would require the placement area to be closed off if the discharge during facility operations exceeds State of Maryland water quality standards. Sediments from the Federal navigation channels within the Harbor, which would be placed at Masonville in addition to other Harbor projects, are tested with respect to physical and chemical characteristics every three years (EA 1996, EA 2000a, EA 2005a). Analytical testing of effluent elutriates, which simulate effluent that would be discharged through spillways, is included as part of the testing program. Results of these analyses for the Federal navigation channels within the Harbor indicate that full-strength effluents do exceed acute and chronic water quality criteria for some metals and organic parameters (EA 2006).

Discharges from facility operations at Masonville, would be required to comply with a National Pollution Discharge Elimination System (NPDES) permit, which would stipulate the discharge water quality requirements for the project. The proposed project is expected to have similar discharge limits and monitoring/reporting requirements as the Cox Creek facility. Discharge of various constituents has been estimated for the proposed Masonville facility based upon data from the NPDES permit application (dated February 2004) for the Cox Creek DMCF. (Table 5-8).

Using these flow and concentration data, annual total nitrogen loads and loads of other constituents can be estimated. Assuming 60 days of discharge during the inflow period, and 10 days of discharge during the non-inflow period, the estimated annual loads for these constituent are included in Table 5-9.

It is anticipated that discharges from Masonville would be managed to meet an equivalent standard with respect to the current operations at the HMI DMCF, which has not had a

Table 5-8. Estimated Daily and Annual Loadings for the Masonville DMCF

	Constituent	Average Daily Flow (mgd)	Average Daily Concentration (mg/L)	Average Daily Load (lbs/day)
Inflow Period	TSS	7	75	4,381
	Ammonia	7	11	642
	Nitrate/Nitrite	7	0.19	11
	Phosphorus (total)	7	0.17	10
	Arsenic (total)	7	0.018	1.1
	Cadmium (total)	7	0.004	0.2
	Chromium (total)	7	0.008	0.5
	Copper (total)	7	0.013	0.89
	Lead (total)	7	0.004	0.2
	Nickel (total)	7	0.012	0.7
	Zinc (total)	7	0.025	1.5
Non-Inflow Period	TSS	0.36	75	225
	Ammonia	0.36	4.5	14
	Nitrate/Nitrite	0.36	0.64	1.9
	Phosphorus (total)	0.36	0.28	0.8
	Arsenic (total)	0.36	0.021	0.1
	Cadmium (total)	0.36	0.004	<0.1
	Chromium (total)	0.36	0.009	<0.1
	Copper (total)	0.36	0.019	0.1
	Lead (total)	0.36	0.005	<0.1
	Nickel (total)	0.36	0.093	0.3
	Zinc (total)	0.36	0.131	0.4

Note: Based upon the Cox Creek DMCF Discharge permit requirements which includes 70 days of annual operations.

Table 5-9. Estimated Annual Loadings for the Masonville DMCF
(based on 70 days of annual operations)

Constituent	Estimated Annual Load (lbs/yr)	Estimated Annual Load (million lbs/yr)
TSS	265,110	0.265
Total Nitrogen*	38,600	0.039
Phosphorus (total)	608	0.00061
Arsenic (total)	67	0.00007
Cadmium (total)	13	0.00001
Chromium (total)	31	0.00003
Copper (total)	54	0.00005
Lead (total)	13	0.00001
Nickel (total)	45	0.00005
Zinc (total)	94	0.00009

*Total (inorganic) nitrogen was calculated using the sum of ammonia and nitrate/nitrite concentrations from Table 5-7 in order to have an estimate comparable to regional loadings estimate.

measurable impact to the resources within the adjacent waters since it began operations over 20 years ago (URS 2004). Discharge via the Masonville spillways would be intermittent and used to manage the water levels in the site. Based upon the average daily discharges from the spillways, these constituents are not expected to have an impact on the Patapsco River. The site would release nutrients, which, in addition to the average conditions of the Patapsco estuary, could stimulate phytoplankton growth. For water quality, the Patapsco and Back River systems

(watersheds) are assessed and managed together. The predicted Masonville DMCF inputs were assessed in the context of other major loadings within the Patapsco-Back River tributary complex [based upon the State Section 303 (d)] reports. The report only calculates total loadings for limited constituents. The 2002 total loadings to the Patapsco and Back Rivers for TSS, total nitrogen, and total phosphorus were 96, 10.73, and 0.58 million pounds. The estimated annual loadings of TSS, total nitrogen, and total phosphorus from Masonville (Table 5-8) would be 0.265, 0.039, and 0.00061 million pounds per year. Compared to the total 2002 loadings this would constitute 0.28, 0.36, and 0.1 percent of the total loadings, respectively.

Discharge standards are set to minimize the potential for nutrient impacts, and, as stated above, if discharge during operations exceeds water quality standards, the spillway structure would be closed and discharges would be stopped. Once in place, the dikes would act to contain the contaminated sediments that currently exist near the eastern side of the site adjacent to the former KIM site.

Dikes are permeable structures and the potential for migration of contaminants from within a site to the surrounding waterway is potentially a concern. To address this issue, data from the in-dike monitoring wells at the HMI DMCF were examined. The HMI DMCF is held to monitoring criteria using USEPA's drinking water standards [Maximum Contaminant Levels (MCLs)], which are more conservative (lower) than surface water standards and set to protect human health. Concentrations of contaminants within the monitoring wells on either side of the dike are compared to MCLs. Though there are some constituents (such as chloride, iron, sulfate, and aluminum) passing through the dike at the HMI DMCF, concentrations are below the MCLs and are not of a level that would cause ecological effects. Since the overburden material at Masonville is similar to material already placed at the HMI DMCF, placement of additional material at the HMI DMCF is not expected to have an impact on material leaching through the dike.

Based on the evidence collected from studies at the HMI DMCF, there are unlikely to be any contaminants migrating through the dike at Masonville at levels that would cause an ecological effect or be a risk to human health. The proposed Masonville DMCF would receive Harbor dredged material similar to those being managed and contained at the HMI DMCF. In addition, a leachate barrier with a permeability of $5x10^{-6}$ cm per second would be placed along the fringe marsh and armored containment dikes. This would further reduce the potential of any material passing through the dike. There are expected to be no adverse impacts to water quality caused by the passage of materials through the containment dike of the proposed Masonville DMCF.

The dredged material placed in the proposed Masonville DMCF would be anoxic (low to no oxygen) silt and clays dredged from the channel bottoms. As these dredged materials dry and are dewatered, they are exposed to the atmosphere and oxidation would take place. As a result of geochemical processes, metals may become soluble and the pH may decrease, altering the water quality of effluent discharged through the spillways. In addition, dredged material that would be placed in the DMCF would include materials with known elevated levels of chemical analytes (EA 2006). However, (as described previously) dredged material with similar chemical characteristics has been placed at the HMI DMCF since 1984 without measurably impacting the surrounding environment (URS 2004). Therefore, no adverse impacts related to discharges are

expected based on experiences of placement at the HMI DMCF. Exterior water quality monitoring in the vicinity of the HMI DMCF has not identified any adverse effects to the water quality as a result of dredged material placement (URS 2004).

Fluctuations in ammonia, DO, and pH could impact effluent quality from the proposed Masonville DMCF. Ammonia is a nutrient that can affect water quality because it creates an oxygen demand through its conversion, by bacteria, to nitrite and it can be toxic at high concentrations. As previously discussed, nutrients, such as nitrate/nitrite and phosphorus, can stimulate algal growth. Discharge monitoring at the HMI DMCF also indicates that pH concentrations at locations ¼-mile from the spillways were within the normal range for estuarine waters (URS 2004). Water discharged from the proposed Masonville DMCF would be monitored closely, and would be required to meet facility-specific discharge limits which ensure compliance with MDE's surface water criteria. A Clean Water Act (CWA) Section 404(b)1 evaluation was completed for this project and is included in Appendix I.

In the long-term, the remediation of the derelict vessels and containment of contaminated sediments near the former KIM, are expected to have positive impacts on area water quality. These sediments and the associated contaminants would be isolated from currents and less likely to be suspended during high flow or storm events.

Alternative 2 - Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

Impacts from the implementation of this alternative would be similar to those described above. The impact differences from the implementation of Alternative 1 are described in the following paragraphs.

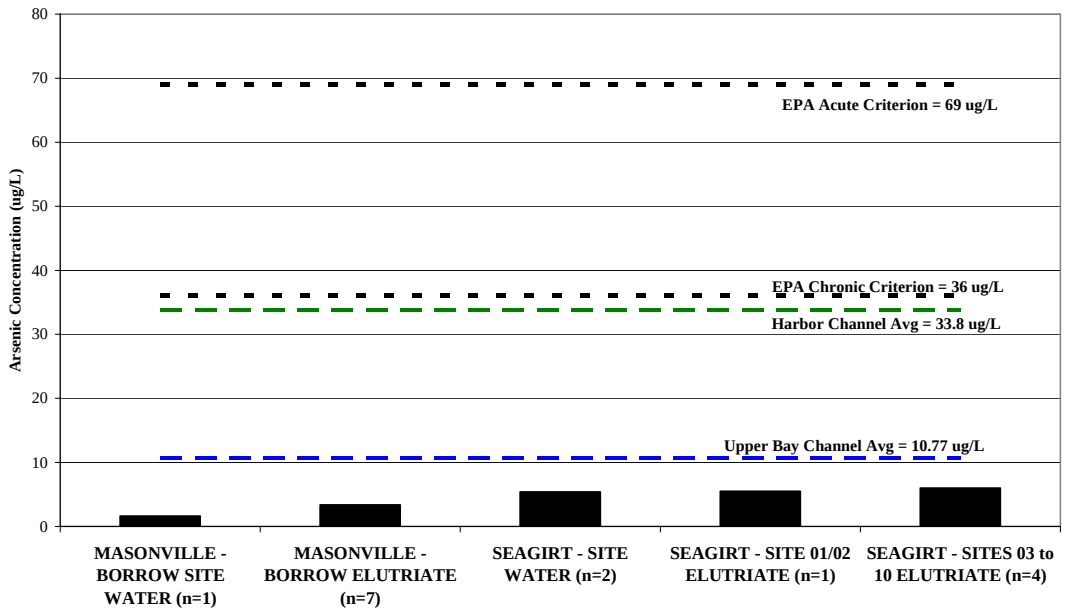
The changes in water quality impacts as a result of utilizing Seagirt sand and gravel in the Masonville dikes are expected to be positive. At the Masonville site, the Seagirt sand material would equal approximately ¼ of the material needed to construct the dikes, and would be of a larger grain size with only approximately 12 percent fines, on average (Appendix J). The sand in the borrow area of Masonville contains approximately 30 percent fines on average. In addition, the Seagirt materials, if used at Masonville, would be placed within the trench by split hull barge as opposed to being pumped onto the dike line hydraulically from the onsite borrow area. Placement of heavier materials that are placed directly rather than pumped would constitute a substantial reduction in the turbidity plume relative to hydraulic placement.

To quantify the reduction in the turbidity plume, STFATE modeling was conducted to simulate the use of a split hull barge to place Seagirt sand and gravel material at Masonville (Appendix J). Turbidity is regulated by the rules for conventional pollutants: the allowed mixing zone in Maryland estuarine waters is defined as 10 percent of the cross-sectional area of the receiving water body (at mean water level). The STFATE model output for turbidity is based upon concentrations of total suspended solids (TSS). Turbidity limits in the surface water resulting from any discharge may not exceed 150 nephelometric turbidity units (NTUs) at any time, and 50 NTUs as a monthly average. NTUs are the unit associated with indirect measurements of turbidity based upon the amount of light reflected (refracted) within the measuring device. The results of the STFATE model of split hull barge placement indicated that, under all tidal

conditions, the sediment plumes would be in compliance with the 10 percent cross-sectional area within 4 to 8 percent of the cross-sectional area. This is a substantial improvement relative to the hydraulic placement of materials. Modeling of the hydraulic placement of the sand from the Masonville borrow area predicted a turbidity plume would exceed 150 mg/L TSS in approximately 6.75 percent of the cross section on a monthly average basis if dike building was conducted without any turbidity control techniques (Table 5-4).

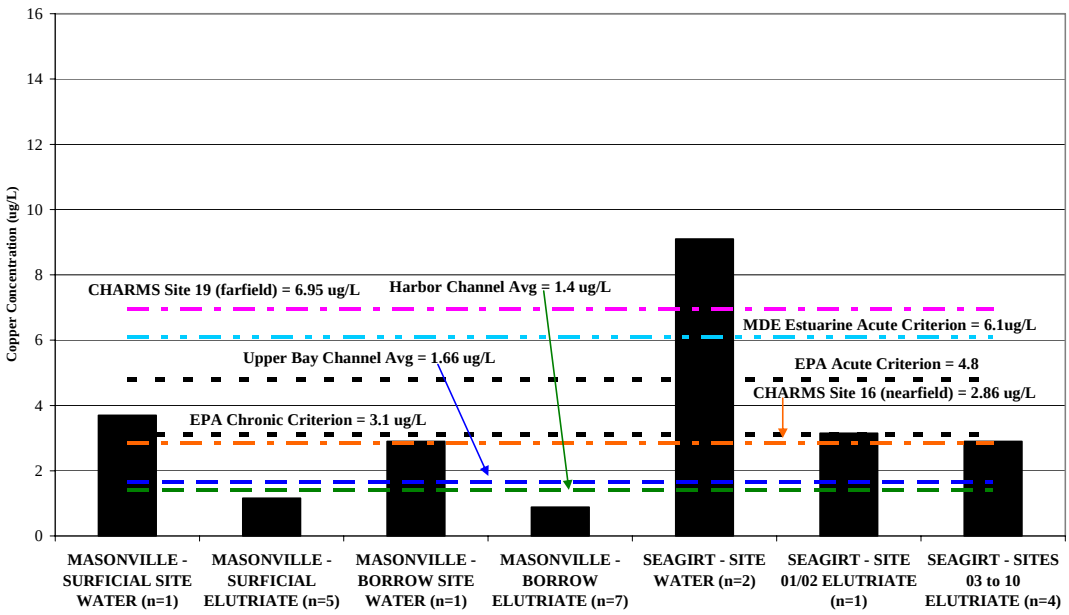
Based upon the elutriate testing of the borrow material (sand) at Masonville, the toxics that would dissolve into the water when the sand is placed on the dike never exceeded surface water criteria. Some nutrients were released in the testing and can be expected to be released during hydraulic placement of the Masonville sand on the dike line. Elutriate testing of the Seagirt materials yielded variable results. Elutriate concentrations were initially determined for five sediment samples from the Seagirt dredging area (corresponding to the five sediment samples described in Section 2.1.4). The resulting water chemistry concentrations were screened against the acute and chronic EPA water quality standards. Concentrations of the majority of analytes were below detection limits. Of the detected compounds, nearly all met surface water quality criteria (acute/chronic) required for in-water placement. The site water (control) sample had elevated concentrations of some contaminants, which seemed to dictate the concentrations in the elutriates. Based upon other results from the CHARMS studies, this seems to be an anomaly (Figures 5-16 to 5-25). For the initial analysis, the only surface water criteria excursions were nickel (EA-01/02-SED elutriate), lead (site water only), and copper (site water, EA-01/02-SED elutriate and EA-03/04-SED elutriate). The results were presented to regulators at the BEWG meeting on August 7, 2006 and it was suggested that a new/second site water sample be collected, tested, and used to create a second set of elutriates with the existing sediment samples. In the second round of testing, the analysis of the site water sample yielded fewer exceedances of water quality criteria and the elutriate results indicated that copper was elevated in only one of the five elutriate samples (EA-05/06-SED). However, nickel was elevated above the chronic criterion in 3 locations (EA-01/02-SED, EA-03/04-SED, EA-05/06-SED) and above the acute criterion at EA-01/02-SED. Zinc was also elevated above the acute criterion in the elutriate for EA-01/02-SED. The variability in the two sets of results could be due to the lack of homogeneity within sediment samples, matrix interferences, and higher concentrations of fines (silts and clays) in the 01/02 area. As discussed in Chapter 4, material from the area surrounding sample location EA-01/02-SED would not be used during the construction of the proposed Masonville DMCF (Section 4.4.2.3).

To assess the potential water quality impacts at the Masonville site, STFATE modeling was performed for dissolved constituents relative to the release point. This was calculated based on the maximum elutriate concentration and the corresponding water quality criteria which are summarized in the Table 5-10.



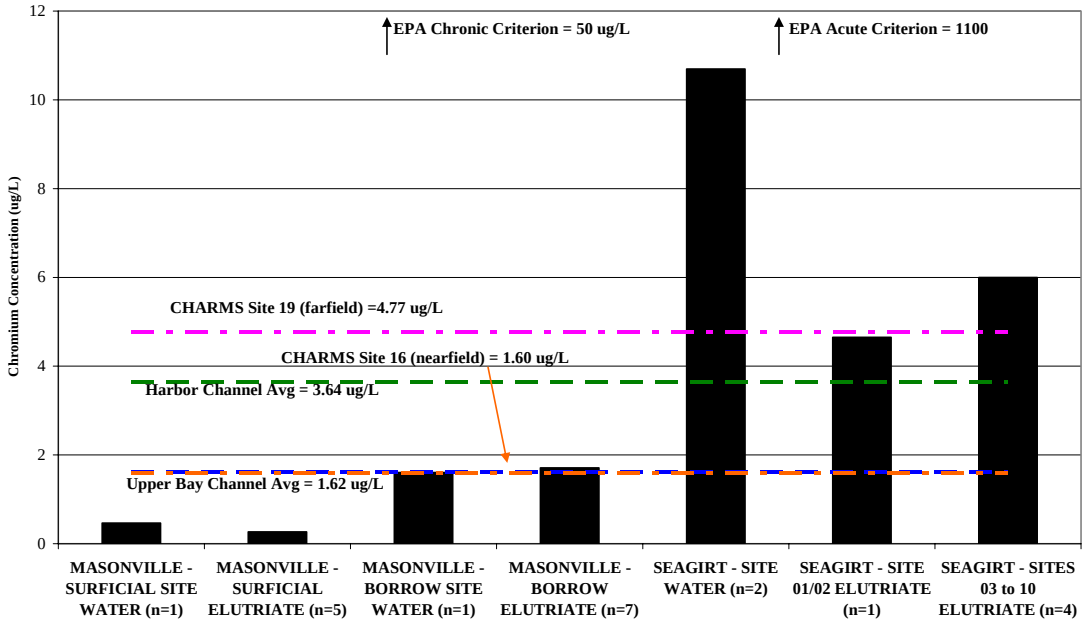
Mean arsenic concentrations from elutriate samples collected from within the proposed Masonville DMCF alignment and the Seagirt dredging area compared to the EPA acute and chronic criteria (USEPA 2004). Average elutriate arsenic concentrations from Baltimore Harbor (n=6) and the Upper Chesapeake Bay Approach Channels (n=21) (EA 1999 and preliminary unpublished data) are also presented

Figure 5-16. Mean Arsenic Concentrations in Elutriate Samples.



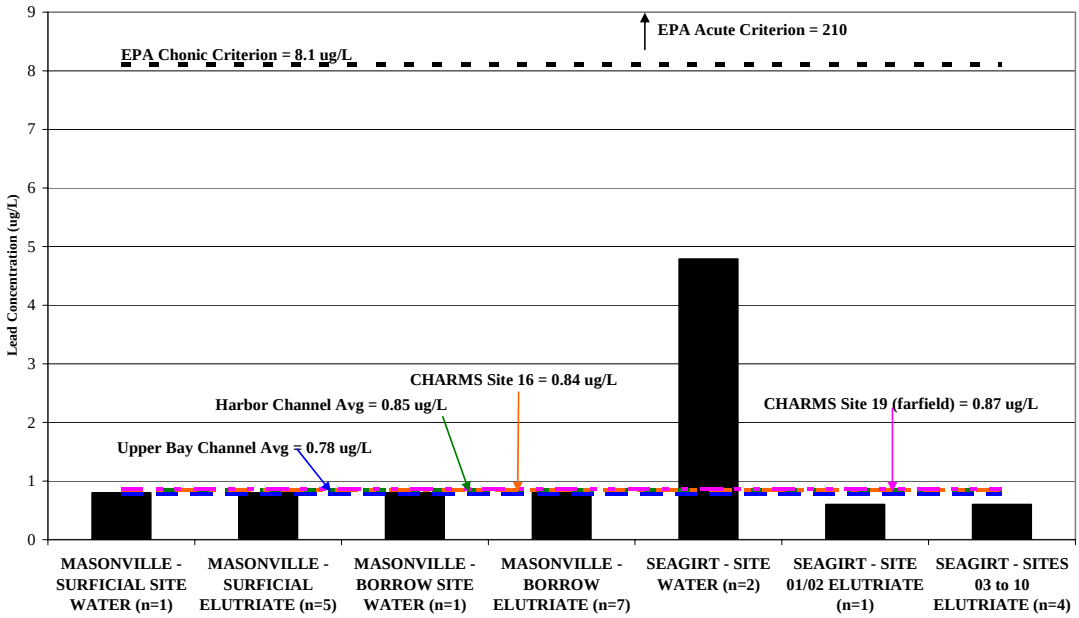
Mean copper concentrations from elutriate samples collected from within the proposed Masonville DMCF alignment and the Seagirt dredging area compared to the EPA acute and chronic criteria. Average elutriate copper concentrations from the CHARMS study (n=4 for each site), the Baltimore Harbor (n=6) and the Upper Chesapeake Bay Approach Channels (n=21) (EA 1999 and preliminary unpublished data) are also presented for comparison.

Figure 5-17. Mean Copper Concentrations in Elutriate Samples



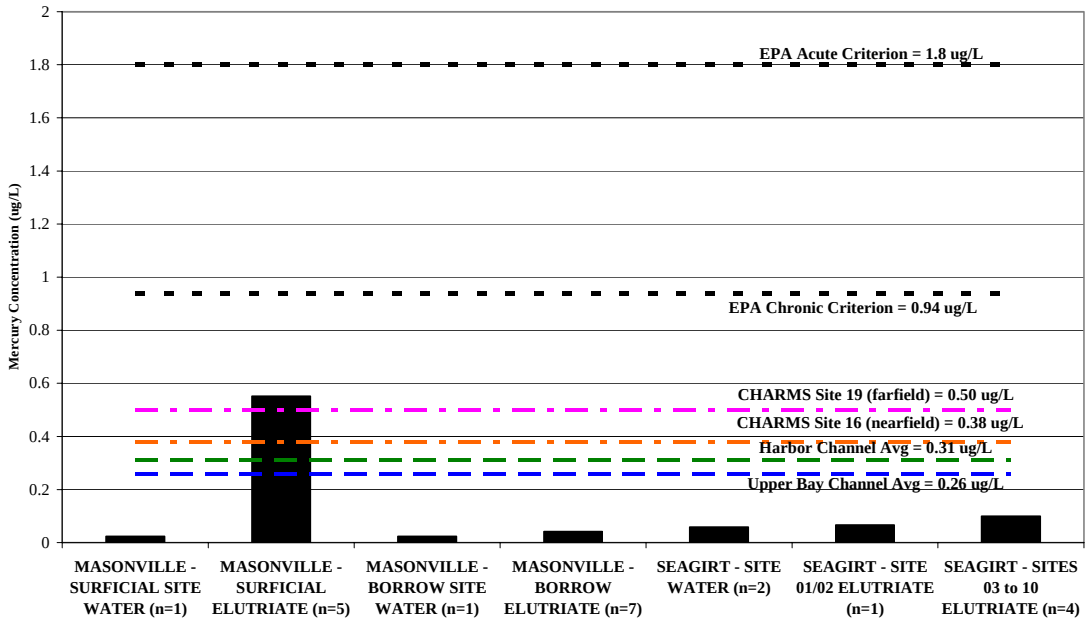
Mean chromium concentrations from elutriate samples collected from within the proposed Masonville DMCF alignment and the Seagirt dredging area compared to the EPA acute and chronic criteria (USEPA 2004). Average elutriate chromium concentrations from the CHARMS study (n=4 for each site), the Baltimore Harbor (n=6) and the Upper Chesapeake Bay Approach Channels (n=21) (EA 1999 and preliminary unpublished data) are also presented for comparison.

Figure 5-18. Mean Chromium Concentrations in Elutriate Samples



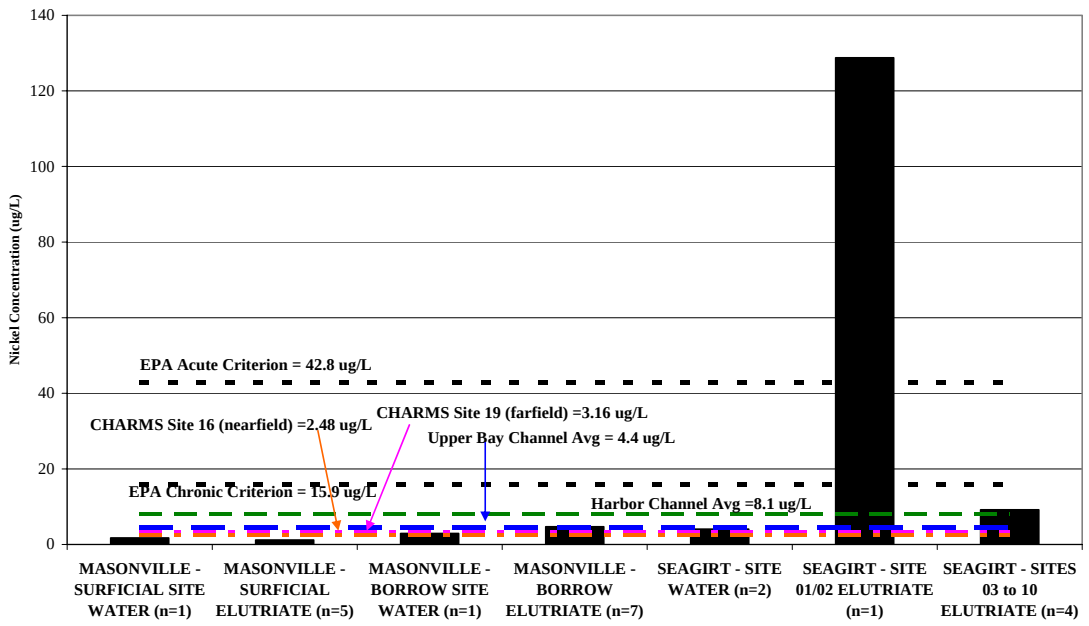
Mean lead concentrations from elutriate samples collected from within the proposed Masonville DMCF alignment and the Seagirt dredging area compared to the EPA acute and chronic criteria (USEPA 2004). Average elutriate lead concentrations from the CHARMS study (n=4 for each site), the Baltimore Harbor (n=6) and the Upper Chesapeake Bay Approach Channels (n=21) (EA 1999 and preliminary unpublished data) are also presented for comparison.

Figure 5-19. Mean Lead Concentrations in Elutriate Samples



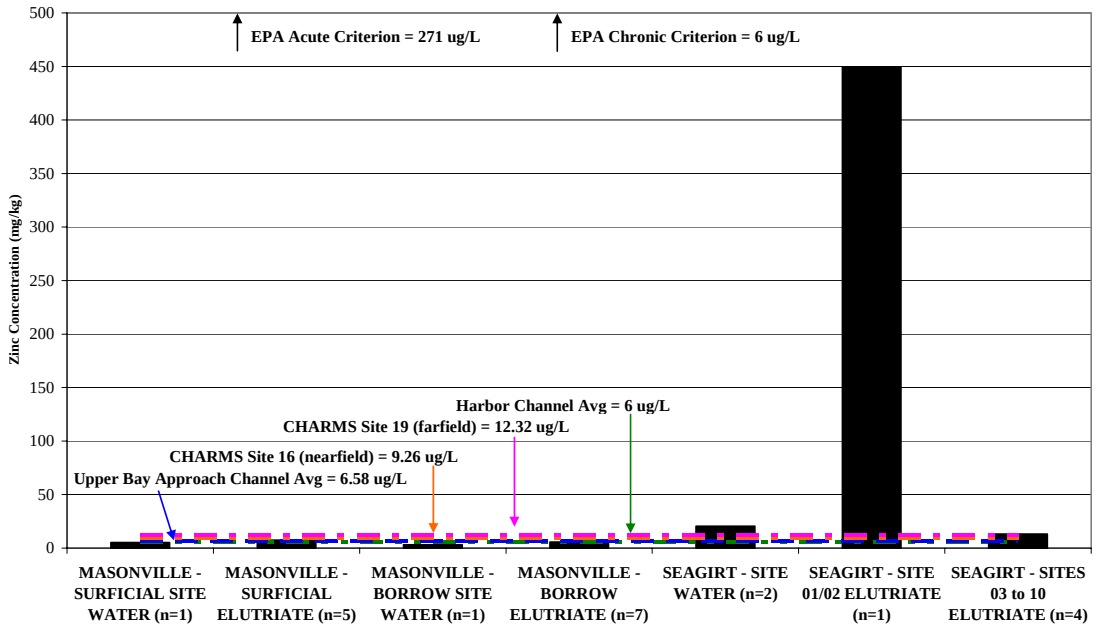
Mean mercury concentrations from elutriate samples collected from within the proposed Masonville DMCF alignment and the Seagirt dredging area compared to the EPA acute and chronic criteria (USEPA 2004). Average elutriate mercury concentrations from the CHARMS study (n=1 for each site), the Baltimore Harbor (n=6) and the Upper Chesapeake Bay Approach Channels (n=21) (EA 1999 and preliminary unpublished data) are also presented for comparison.

Figure 5-20. Mean Mercury Concentrations in Elutriate Samples



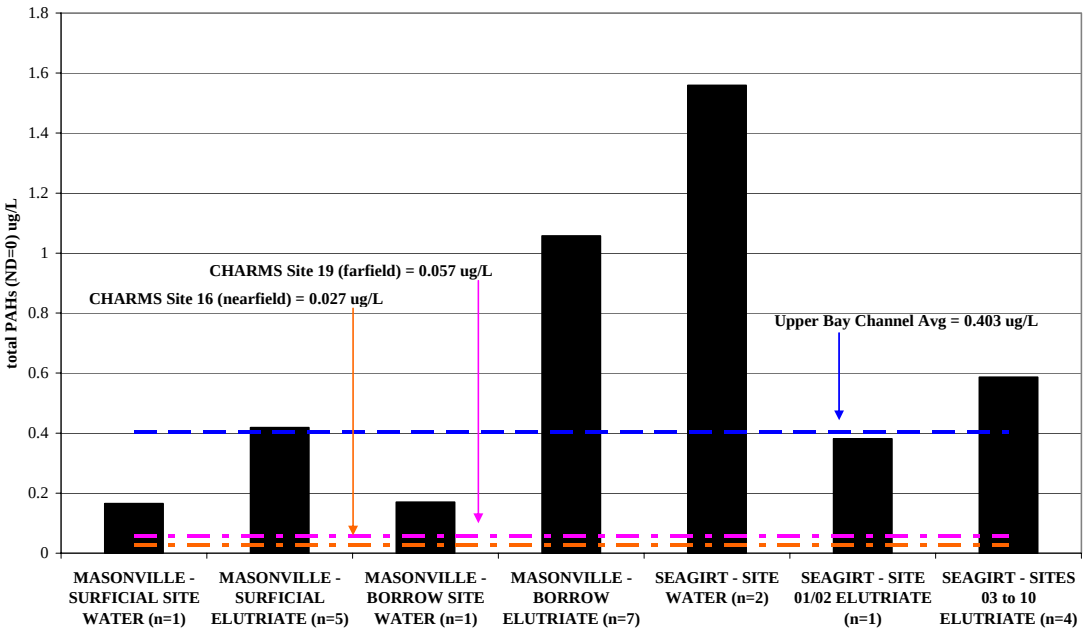
Mean nickel concentrations from elutriate samples collected from within the proposed Masonville DMCF alignmentand the Seagirt dredging area compared to the EPA acute and chronic criteria (USEPA 2004). Average elutriate nickel concentrations from the CHARMS study (n=4 for each site), theBaltimore Harbor (n=6) and the Upper Chesapeake Bay Approach Channels (n=21) (EA 1999 and preliminary

Figure 21. Mean Nickel Concentrations in Elutriate Samples



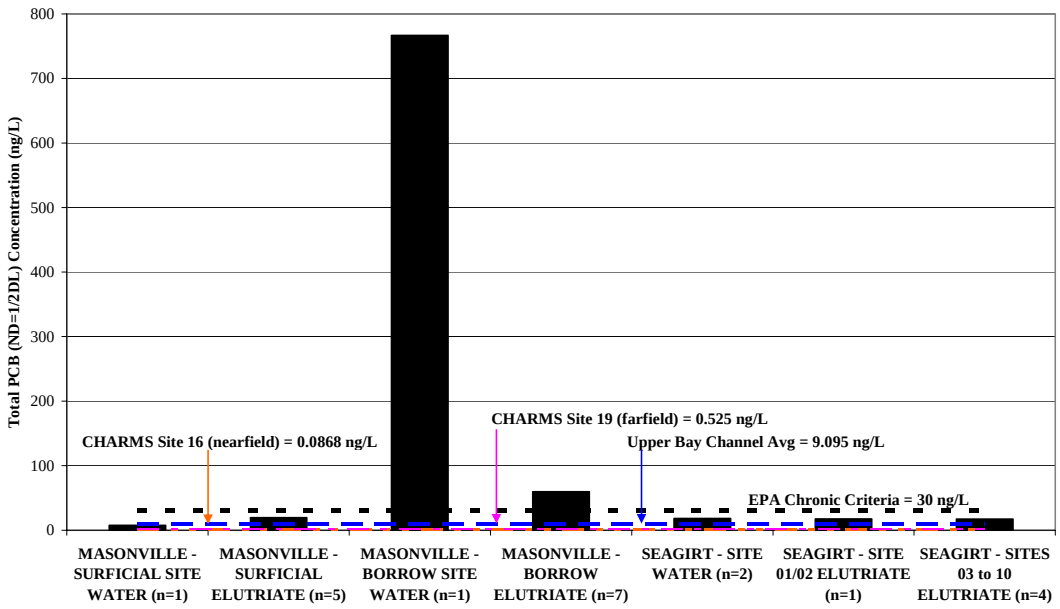
Mean zinc concentrations from elutriate samples collected from within the proposed Masonville DMCF alignment, Masonville Cove, and the Seagirt dredging area compared to the criteria (UEPA 2004). Average surface sediment zinc concentrations from the CHARMS study (n=4 for each site), the Baltimore Harbor (n=6) and the Upper Chesapeake Bay Approach Channels (n=21) (EA 1999 and preliminary unpublished data) are also presented for comparison.

Figure 22. Mean Zinc Concentrations in Elutriate Samples



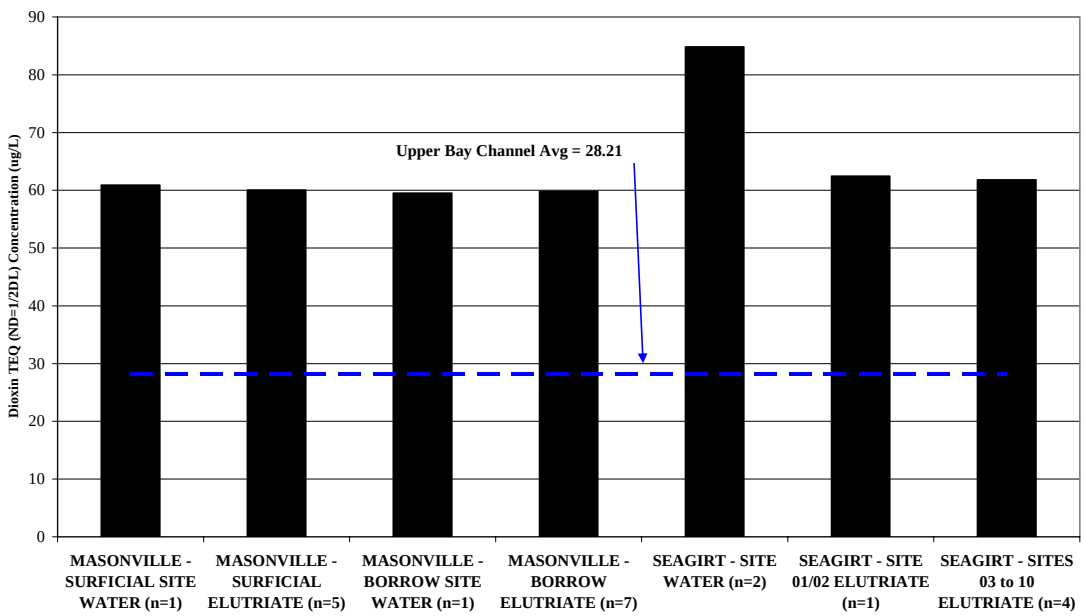
Mean total PAH (ND=0) concentrations from elutriate samples collected from within the proposed Masonville DMCF alignment and the Seagirt dredging area (USEPA 2004). Average surface sediment total PAH (ND=0) concentrations from the Upper Chesapeake Bay Approach Channels (n=11) (preliminary unpublished data) are also presented for comparison. These values are also compared to the CHARMS study (n=4 for each site).

Figure 23. Mean PAH (ND = 0) Concentrations in Elutriate Samples



Mean total PCB (ND=1/2DL) concentrations from elutriate samples collected from within the proposed Masonville DMCF alignment and the Seagirt dredging area compared to the EPA chronic criteria (USEPA 2004). Average elutriate total PCB (ND=1/2DL) concentrations from the CHARMS study (n=4 for each site) and the Upper Chesapeake Bay Approach Channels (n=11) (preliminary unpublished data) are also presented for comparison.

Figure 5-24. Mean PCB (ND =1/2 DL) Concentrations in Elutriate Samples



Mean Dioxin TEQ (ND=1/2DL) concentrations from elutriate samples collected from within the proposed Masonville DMCF alignment, Masonville Cove, and the Seagirt dredging area (USEPA 2004). Average surface sediment dioxin TEQ (ND=1/2DL) from the Upper Chesapeake Bay Approach Channels (n=11) (preliminary unpublished data) are also presented for comparison.

Figure 5-25. Mean Dioxin TEQ (ND = ½ DL) Concentrations in Elutriate Samples

Table 5-10. Maximum Elutriate Concentrations and Water Quality Criteria Used in STFATE Modeling

Parameter	Station	Concentration (ug/L)	EPA Criteria (ug/L)	
			Acute	Chronic
Copper	EA-03/04-SED	4.5	4.8	3.1
Nickel	EA-01/02-SED RE	206	74	8.2
Zinc	EA-01/02-SED RE	838	90	81

Background concentrations at Masonville were based on previous site water sampling in the project footprint were factored in and the water column concentrations were calculated for these three metals following placement at the Masonville site. The necessary dilution factors and distances from the placement point were calculated. The dilution factor necessary to achieve a criteria concentration (CC) in the presence of background (Cbkd) is given by:

$$\text{Dilution Factor} = (C_0 - C_{bkd}) \ / \ (C_C - C_{bkd})$$

Table 5-11 provides the water quality criteria used to assess the cross-sectional area distances. Table 5-12 provides the cross-sectional area to meet acute and chronic criteria for copper, nickel, and zinc. The table includes results for seven scenarios including a 28-ft undercut during initial placement, a 21-ft (half filled) undercut, and a 14-ft depth when the trench was filled to original grade. Each modeled scenario used a 6-cm/sec average tidal velocity. For nickel and zinc, the background concentrations used in the analysis were average concentrations for the Masonville site water collected in November 2005 and January 2006 (Appendix A). For copper, the January 2006 value (2.9 ug/L) was used for the modeling, because the November 2005 concentration and the average concentration exceeded the water quality criterion.

Table 5-11. Water Quality Criteria for Copper, Nickel, and Zinc

	Copper Chronic	Nickel Acute	Nickel Chronic	Zinc Acute	Zinc Chronic
Maximum Concentration (ug/L)	4.5	206	206	838	838
Criteria (ug/L)	3.1	74	8.2	90	81
Background (ug/L)	2.9	2.3	2.3	4.25	4.25

Table 5-12. Cross Sectional Area for Compliance with Acute and Chronic Water Quality Criteria for Copper, Nickel, and Zinc in Seagirt Elutriates

Water Depth (ft)	Barge Capacity (yd3)	Cross-Sectional Area (Percent)				
		Copper (chronic)	Nickel (acute)	Nickel (chronic)	Zinc (acute)	Zinc (chronic)
14	2,000 (12 ft)	2.6	< 0.2	8.4	3.2	4.0
21	2,000 (12 ft)	1.6	< 0.2	7.4	2.2	2.9
21	2,500 (14 ft)	2.0	< 0.2	8.0	3.2	3.6
21	3,000 (16 ft)	2.8	< 0.2	9.2	3.8	4.2
28	2,000 (12 ft)	< 0.2	< 0.2	5.8	0.5	0.8
28	2,500 (14 ft)	0.3	< 0.2	6.7	0.9	1.6
28	3,000 (16 ft)	0.7	< 0.2	7.4	1.7	2.1

The results indicated that (under worse-case conditions), the metals concentrations would generally be diluted to background within 887 feet of the discharge point. Tables 5-11 and 5-12 indicates that each of the modeled elutriate plumes are in compliance with the allowed 10-percent cross-sectional area for the chronic mixing zone. The largest difference in plume size was for nickel between the acute and chronic criterion. Taking into account background concentrations, the required dilution factor for nickel acute was 2.84 and for nickel chronic was 34.5. Concentrations associated with a 2.84 dilution factor were not present in the 14-ft water column above the undercut. Concentrations associated with a 34.5 dilution factor for nickel resulted in cross-sectional areas of 5.8 percent to 9.2 percent. For a 21-ft undercut, the nickel chronic cross-sectional area increased from 7.4 percent to 9.2 percent as the barge capacity increased from 2,000 yd^3 to 3,000 yd^3. All of this is within the allowable cross-sectional area for turbidity plumes.

Overall, the elutriate and modeling results indicate that the Seagirt sand is suitable for in-water placement. The possible exception would be the finer-grained materials in the vicinity of EA-01/02-SED. Based upon this analysis, the implementation plan was adjusted to avoid using the finer-grained materials in area EA-01/02-SED for dike construction. Therefore, the use of Seagirt sand is expected to be comparable to the Alternative 1 water quality impacts.

The Seagirt sand and gravel would only replace approximately 25 percent of the materials needed to build the Masonville dikes so the improvements would only be realized for approximately ¼ of the dike construction timeframe (January 2007 to January 2009). The remaining dike materials would still be hydraulically placed on the dike line and excavated from onsite sources at Masonville during 75 percent of the construction timeframe. The water quality impacts described in the EIS would prevail during these times.

A second water quality impact improvement that is more difficult to ascertain would potentially occur at the HMI DMCF. The heavy nature of the Seagirt sand and gravel would require higher volumes of water to slurry for placement in the site, requiring two or more times the volume typically used to offload dredged material. Although the water quality of the slurry would be expected to be relatively good due to the low percentage of fines and the presumed good quality of the sand and gravel, the HMI DMCF would still have to manage and discharge the additional

water. Placing the sand and gravel at Masonville would not require any slurrying and would preclude the need to pump additional water into the HMI DMCF.

One final water quality concern was raised by the BEWG relative to the Seagirt portion of the project. As mentioned in Section 3.9, the construction and cost advantages of retrieving more sand by potentially using several feet of borrow for advanced maintenance dredging were discussed with the resource agencies of the BEWG. Concerns about the potential for creating an area considerably deeper than the deepest adjacent channels were raised by the group. The primary concern is that deeper areas could become anoxic or hypoxic and remain so longer than shallower areas, essentially prolonging or exacerbating hypoxia in that area of the Harbor. The Seagirt dredging area ranges from 15 to 47 feet deep, and once dredged to a depth of 52 ft, would lie completely below the pycnocline. Most of the project area is currently susceptible to low oxygen conditions during the summer and would continue to be after dredging.

The adjacent channel (Fort McHenry Channel) is currently authorized to –50 feet but dredging is required to 51 feet (one foot advanced maintenance) and paid to –53 feet (two feet available over depth). The proposed dredging at Seagirt (described in Section 5.1.1.1) would be no more than 1 to 2 feet deeper than the adjacent channel and be physically connected. Therefore it is expected that dredging some parts of the Seagirt channel to –53 or -54 feet (maximum depth) would not impact water quality relative to the current permitted –52 feet permitted depth.

No Action Alternative

If the no action alternative is implemented, the proposed Masonville DMCF would not be constructed. Therefore, there would be no short-term (pre-dredging or construction) impacts on the water quality in the vicinity of Masonville. No pre-dredging would occur at Masonville so the 2 mcy that is scheduled to go to the HMI DMCF from this site would not be dredged. The associated turbidity and nutrient releases would not occur at Masonville. If no action is taken, no dredged material would be placed at Masonville and the projected spillway discharges and associated loadings and aquatic impacts (taking of open water) would not occur at the site.

If the no action alternative is selected, there would be no dikes or other containment of the contaminated sediments that currently exist near the western side of the site adjacent to the former KIM facility. These contaminated sediments would continue to adversely impact water quality through resuspension by natural processes and the ecosystem in this part of the Harbor. If the Masonville DMCF is not constructed, there would be no regulatory reason to remediate the derelict vessels on the western side of the proposed DMCF site. The funding currently allocated for site development would be released to other MDOT efforts and the remediation of the 25 derelict vessels would be deferred. Thus, removal of this source of contamination from the Patapsco River would not occur.

The no action alternative would, however, likely involve overloading of the HMI DMCF and Cox Creek sites, as described in Section 5.1. Overloading of the existing sites could have significant impacts to water quality and nutrient loadings in the adjacent water bodies. This is very difficult to quantify because it is unknown how materials would be placed under these conditions. However, the loadings estimated in Tables 5-8 and 5-9 would be distributed among

the Cox Creek and the HMI DMCFs until 2008, when the HMI DMCF stops receiving dredged material for capping and closure activities, and then at Cox Creek exclusively until another placement option could be developed.

5.1.5 Aquatic Resources

The proposed Masonville DMCF is located in an area with known anadromous fisheries and other aquatic resources. However, utilization of the area is currently limited by poor habitat and water quality, particularly the area within the proposed Masonville DMCF. Rehabilitation of the Masonville Cove shoreline and wetland habitat areas would provide and enhance habitat for fish, crustaceans, and benthos within the Cove. SAV may more readily colonize near the enhanced shoreline since water depth in near shore areas would be decreased, by augmentation with sand, and water clarity increased. Wetland rehabilitation would improve water quality and habitat for aquatic and upland species. The Baltimore Harbor is not known to be an important over wintering area for blue crabs or finfish since the depths are less than 40 ft. Therefore, the proposed project is not expected to impact these resources. No aquatic mammals are found in the Patapsco River and, therefore, the project would have no impact on aquatic mammals. Construction of fastland from dredged material would permanently cover 130 acres of existing river bottom, 127 acres of which is available aquatic habitat (3 acres are an existing unauthorized dry dock). Impacts to specific aquatic resources from the proposed action and the no action alternative are discussed in the sections below.

5.1.5.1 Shallow Water Habitat (SWH)

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

Adverse impacts to SWH would result from the construction of the proposed Masonville DMCF. Water depths along the existing shoreline are less than 6.5 meters and the placement of dredged material could permanently fill 10 acres of SWH. This SWH is composed of Tier I, Tier II, and Tier III habitat. This amount is broken down in Section 2.1.6.1. However, the majority of this SWH is in poor condition due to large amounts of debris and poor substrate quality. The acres of SWH lost would be converted to land area for use as a parking facility. Those organisms that would be displaced by the proposed construction would recolonize in a less degraded area adjacent to the proposed Masonville DMCF site. An additional 3.5 acres of SWH would be created along the dike as a result of the proposed Masonville DMCF.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

Impacts to SWH under this alternative are the same as those described for Alternative 1. There is no SWH in the Seagirt dredging area, so there would be no additional impacts to SWH by using the Seagirt borrow material.

No Action Alternative

The no action alternative would maintain current SWH. The existing degraded SWH would be preserved as is and would remain poor habitat for aquatic organisms.

5.1.5.2 Submerged Aquatic Vegetation (SAV)

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

The SAV observed within the KIM channel in October 2005, 0.38 acres of moderate density Eurasian water milfoil (*Myriophyllum spicatum*), would be buried as a result of site construction. Within the proposed footprint, approximately 10 acres of SWH (Tier I, Tier II, and Tier III SAV habitat) would be buried as a result of dike construction. This loss is among the losses that would require mitigation as part of the tidal wetlands permit requirements.

Existing condition studies in summer 2003 identified a very small patch of SAV in the southern portion of Masonville Cove. The SAV patch had expanded by summer 2004, comprising approximately half an acre of moderately dense growth. The species identified was the non-native Eurasian water milfoil. Horned pondweed (*Zannichellia palustris*) and Eurasian water milfoil were observed in Masonville Cove during the June 2006 survey but not during the August 2006 survey. Operation of the proposed Masonville DMCF would increase suspended sediments and turbidity of the water within Masonville Cove. This may have a adverse impact on SAV. The previously mentioned increase in the rate of sedimentation by 0.4 to 0.8 cm per year may have a adverse impact on SAV.

Based upon construction plume modeling (Section 5.1.5) elevated turbidity can be expected relative to the dike construction area. Several engineering options would be implemented to minimize turbidity and protect the SAV in Masonville Cove (Section 7.4). This would involve turbidity curtains around the discharge area during dike construction. This is expected to reduce the in-water turbidity by 50 to 60 percent.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

Relative to the impacts described for Alternative 1, there would be a reduced adverse impact to aquatic resources if material from the Seagirt dredging area is used for dike construction at Masonville. Modeling indicates that use of the Seagirt material would reduce turbidity during placement of approximately ¼ of the material needed to build the dikes. This is expected to lessen the water quality impacts and associated impacts to aquatic habitat and resources relative to Alternative 1. This also includes a lessening of the potential to impact SAV in Masonville Cove.

The Seagirt dredging area is too deep to support SAV growth and, therefore, there are no additional impacts to SAV as a result of using the Seagirt borrow material.

No Action Alternative

The no action alternative would have no new impacts to SAV. The 0.38 acres of SAV within the proposed alignment would not be affected and 10 acres of Tier I, II, and III SWH would not be buried.

5.1.5.3 Plankton

Plankton studies indicated that the plankton community in the vicinity of the site had a low diversity, particularly of ichthyoplankton, was typical of low mesohaline areas, and did not include the early life stages of commercially important or anadromous fish species. This is consistent with a 2-year plankton study of the Middle Branch (EA 1994) indicating that the early life stages of the anadromous fish spawned upstream of the site are very likely developing beyond their planktonic forms before reaching the Masonville area.

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

Short-term, indirect impacts to phytoplankton and zooplankton communities are expected as a result of pre-dredging and perimeter dike construction, because plankton cannot avoid construction activities. However, no significant, adverse impacts are anticipated with respect to the phytoplankton and zooplankton communities. Short-term increases in turbidity associated with construction and dredging activities, such as dike placement, could potentially suppress light penetration into the water column and could temporarily and locally depress phytoplankton communities.

During dredging activities, some increases in nutrient and chemical constituent concentrations can be expected, although construction would be managed to minimize these effects to the extent possible. Based upon the construction turbidity plume modeling (Section 5.1.3), minor, localized increases in nutrient concentrations can be expected, relative to background levels, which could potentially stimulate phytoplankton growth. Stimulation of phytoplankton growth can cause high densities of phytoplankton, called algal blooms, which have been tied to anoxic conditions in other areas of the Chesapeake Bay. Tidal currents, freshwater discharge, and wave action are expected to reduce these localized nutrient effects on phytoplankton through exchange with nearby waters. In addition, phytoplankton densities may already be limited by the turbidity effect, described above, and entrainment, described below, further reducing the risk of algal blooms during construction. Because water quality modeling predicts concentrations of nutrients from dredging operations no impact is predicted in adjacent areas. Overall, short-term, adverse impacts to phytoplankton are expected to be negligible.

Phytoplankton and zooplankton would become physically entrained or caught in sediment slurry during pre-dredging and construction activities and would be lost as a result. However, the potential impact would be localized and short-term. Reductions in phytoplankton densities would limit food availability for zooplankton. These effects are expected to be short-term and localized (as described above). Phytoplankton and zooplankton communities are widely distributed in the Harbor and are not a unique resource to the upper Bay ecosystem.

No additional adverse impacts to the phytoplankton and zooplankton communities are expected as a result of construction or operation of the proposed Masonville DMCF. Development of the DMCF would result in the loss of 130 acres of open water within the Patapsco estuary, which would take this area out of production for plankton. Because the tidal volume of the river wouldn’t change, the plankton communities would be displaced to adjacent waters. Therefore the physical removal of open water is expected to have a negligible effect on plankton.

Long-term impacts from discharge of ponded site water, such as turbidity, suspended solids, or elevated nitrogen concentrations, may also be indicated, although no such impacts have been detected relative to operations of the HMI DMCF. Discharge from the spillways would be controlled and monitored, and would be required to meet MDE water quality standards and/or MDE permit limits prior to discharge. Therefore, nutrient increases that could potentially stimulate phytoplankton blooms are not anticipated. Phytoplankton and nutrient levels are not monitored outside of the HMI DMCF but have been monitored near the Poplar Island Environmental Restoration Project (PIERP) since site development. Comparisons of exterior monitoring stations within ¼ mile of the PIERP were compared to background levels, which are control sites greater than 1 mile from the facility and the four Chesapeake Bay Program monitoring stations within 4 to 6 miles of the PIERP. Nutrient, chlorophyll *a* and phaeophytin levels near the site were generally within range of background levels for most sampling events indicating no measurable effect in the phytoplankton (EA 2004b). These results should be interpreted with caution because the salinity regime, current conditions, and plankton communities are somewhat different at the PIERP relative to the Masonville area. Also, the background levels of nitrogen and phosphorus are elevated within the Harbor relative to the relative open area where the PIERP is located.

In the long term, capping of contaminated sediments has the potential to improve water quality conditions in some areas adjacent to the site. Capping contaminated sediments in these areas near the former KIM facility and the remediation of the derelict vessels would prevent some pollutants at these sources from entering the water, lowering the potential for toxicity to phytoplankton, planktonic invertebrates, and larval fish.

Alternative 2 - Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

Relative to the impacts described for Alternative 1, there would be a reduced adverse impact to aquatic resources if material from the Seagirt dredging area is used for dike construction at Masonville. Modeling indicates that use of the Seagirt material would reduce turbidity during placement of approximately ¼ of the material needed to build the dikes. This is expected to reduce the water quality impacts and associated impacts to aquatic habitat and resources relative to Alternative 1.

Potential adverse impacts to plankton described for Alternative 1 would be reduced because of the lesser turbidity impacts associated with using the Seagirt sand and gravel for approximately ¼ of the construction material for the proposed Masonville DMCF dikes. The decrease in turbidity impacts associated with the change in borrow scenario would have a decreased impact on water quality than the scenario (in Alternative 1) that exclusively uses Masonville dredged material. Poor water quality would adversely affect phytoplankton, by decreasing the amount of light penetration and, therefore, the area of the water column available to phytoplankton for use.

By using the Seagirt sand and gravel and lessening the use of the hydraulically placed onsite borrow material, there would be fewer fines, toxics and nutrients released into the water. The release of toxicants and nutrients degrades water quality. Toxicants can be harmful to aquatic life and nutrients can stimulate algal growth, which has been linked to eutrophication and low concentrations of dissolved oxygen. These adverse impacts would be decreased by the use of the

Seagirt dredged material for the reasons described in the section on impacts to water quality for Alternative 2.

No Action Alternative

The 130 acres of proposed fill would remain open water and productive. If no action is taken, no dredged material would be placed at the site and the projected spillway discharges and associated potential for stimulation of algal growth would not occur at the site. The no action alternative would result in no short-term (pre-dredging or construction) impacts on the water quality in the vicinity of Masonville. No pre-dredging or site construction would be conducted and the associated water quality and plankton impacts would not occur on site.

The no action alternative would not include any means to contain the contaminated sediments that currently exist near the western side of the site, adjacent to the former KIM facility. Without capping, these materials would continue to impact the ecosystem in this part of the Harbor. The no action alternative includes the need to overload the existing placement facilities, which could affect spillway discharge quality and significantly increase nutrient levels in the vicinity of those sites. Other dredging projects may be deferred since placement sites would be limited, which may decrease overall spillway discharge (though operational discharges would be required to meet discharge permit regulations and therefore would be limited). This increases the potential for algal blooms and the associated oxygen demands, which have the potential for significant plankton and ecosystem impacts in the vicinity of the existing sites. This is particularly true of nearby deeper areas in warmer months where algal blooms can exacerbate hypoxia/anoxia. Although the HMI DMCF has been in operation for over 20 years with intermittent overloading, there is no exterior monitoring data to quantify the potential effects to plankton.

5.1.5.4 Benthic Community

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

If the proposed Masonville DMCF were to be constructed, short-term and permanent long-term impacts to the benthic community are anticipated. As a result of the construction, the Harbor bottom would be converted to fastland areas or wetland habitat thus eliminating the tidal open water habitat within the perimeter of the project area. Pre-dredging would remove not only sediment and substrate, but also any benthic organisms living in or on the sediments and substrate. This would be an adverse impact to the benthic community. There would also be increased turbidity and suspended sediments in the water, which would have an adverse impact on any organisms living within the proposed alignment during dredging. These turbidity-related impacts are negligible, however, because all benthic organisms would be buried during the placement of dredged material at the proposed facility. There would be short-term adverse impacts on the benthic community living outside but adjacent to the proposed Masonville DMCF alignment. There would be a temporary increase in turbidity and suspended sediments during construction. There may also be increased disturbances in the water from equipment operations.

The long-term impact on the benthic community living within the proposed alignment would be adverse and major; the benthic community would be eliminated since 130 acres of river bottom

are being affected. Only 127 acres of the 130 acres are currently considered benthic habitat because an unauthorized dry dock currently covers approximately 3 acres of the Patapsco River bottom. The affected areas would also be lost as a potential food source to finfish if the containment facility is constructed. There may be minor, localized increases in nutrient concentrations, which may stimulate high densities of phytoplankton growth, known as algal blooms. Algal blooms have been linked to anoxic conditions in other portions of the Chesapeake Bay. Anoxic conditions occur primarily in the summer months and in deep waters. If anoxia occurred, it would have an adverse impact on the benthic community.

Epibenthic colonization of the exterior perimeter dike constructed for the proposed Masonville DMCF would offset some loss of benthic habitat. The benthic communities adjacent to the proposed Masonville DMCF are expected to recover and repopulate once construction is complete. There would be an increase in turbidity and sedimentation in Masonville Cove as a result of the proposed Masonville DMCF, which would have an adverse impact on water quality and the benthic community within the Cove. The rate of sedimentation should be gradual and is unlikely to occur at a rate that would smother benthic organisms. Modeling suggests that the rate of sedimentation in the Cove would increase by 0.4 to 0.8 cm per year. This is a 50 percent increase over the current rate of sedimentation within the Cove. Both turbidity and sedimentation are expected to have only a minor adverse impact on the benthic community.

As a direct, beneficial result of the construction of the proposed Masonville DMCF, contaminated sediments within the project footprint would be capped, which would prevent those contaminants from becoming bioavailable.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

Relative to the impacts described for Alternative 1, there would be a reduced adverse impact to aquatic resources if material from the Seagirt dredging area is used for dike construction at Masonville. Modeling indicates that use of the Seagirt material would reduce turbidity during placement of approximately ¼ of the material needed to build the dikes. This is expected to reduce the water quality impacts and associated impacts to aquatic habitat and resources relative to Alternative 1.

Potential adverse impacts described for Alternative 1 to benthos would be reduced because of the lesser turbidity impacts associated with using the Seagirt borrow material for approximately ¼ of the Masonville dikes. The decrease in turbidity impacts associated with the change in borrow scenario would have a decreased impact on water quality than the exclusive use of Masonville dredged material.

By using the Seagirt sand and gravel and lessening the use of the hydraulically placed onsite Masonville materials, there would be less fines, toxics, and nutrients released into the water. Fines can settle to the bottom, potentially smothering, degrading, or otherwise adversely affecting benthic habitat. The release of toxicants and nutrients degrades water quality. Toxicants can be harmful to aquatic life and nutrients and can stimulate algal growth which has been linked to eutrophication and low dissolved oxygen. These adverse impacts would be

lessened by the use of the Seagirt dredged material for the reasons described in the water quality section.

No Action Alternative

There would be no impact to the benthic community with the no action alternative; the 127 acres of benthic habitat that would be buried under the proposed Masonville DMCF Alternative would remain available, but the contaminant encapsulation associated with the Masonville DMCF alternative would not be realized.

5.1.5.5 Fisheries

The proposed Masonville DMCF is located in a part of the Patapsco River that is known to support both freshwater and marine species during various seasons. Anadromous fish utilization in the area has been documented during site-specific studies. However, commercial harvesting near the site is not common.

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

Direct, indirect, short-term, and long-term impacts to finfish are expected as a result of perimeter pre-dredging and dike construction for the proposed Masonville DMCF. Construction activities that directly disturb bottom substrates would have adverse impacts on finfish, permanently displacing them from the proposed Masonville DMCF area.

The waters within the footprint of the proposed Masonville DMCF are currently providing habitat and feeding grounds for several species of finfish common throughout the Chesapeake Bay. Existing conditions surveys confirmed that most species currently using the area are common in the Chesapeake Bay and typical of the upper bay region (EA 2003a). However, utilization of the area is low relative to reference sites within the Harbor and areas east of the Key Bridge.

The permanent loss of approximately 127 acres of tidal open water habitat and 123 acres of river bottom utilized by finfish species within the footprint of the proposed Masonville DMCF is considered a significant, adverse impact. The 3 acres difference, between 130 and 127 acres, is the footprint of the unauthorized dry dock, which is not considered to be fish or benthic habitat. Similar tidal open water habitat is available and located adjacent to the proposed Masonville DMCF for finfish utilization. Much of the tidal open water in the vicinity of Masonville has poor substrate and impaired water quality and is void of natural cover items for finfish species, particularly SAV and oyster bars. The proposed Masonville DMCF was dominated by mobile, pelagic species such as white perch, menhaden and striped bass, which are expected to easily move out of or generally avoid the areas of construction during dredging activities. Less mobile species or life stages, such as young flounder, were not found within the proposed Masonville DMCF area. The finfish species that would be directly and adversely affected by pre-dredging and dike construction include the smaller, resident species with limited mobility such as gobies and blennies, and young fish using the area within the footprint for nursery grounds. With the exception of young of the year (YOY) white perch, most of the species were taken in very low

numbers during the existing conditions surveys conducted within the proposed Masonville DMCF area.

Sedimentation from associated pre-dredging and construction activities could have a short-term, adverse impact on less mobile and demersal finfish species. However, the depths and lack of habitat features in most of the proposed project area would limit utilization by many of these less mobile species, so the impact is expected to be minimal. Short-term and direct adverse impacts on the early life stages of some fish species, specifically during egg and larval stages are expected as a result of pre-dredging and construction activities. Adverse impacts to finfish populations could result from the entrainment of fish eggs and larvae during hydraulic dredging. However, the adverse impacts associated with entrainment are expected to affect only a small portion of the local fish community, and would be a short-term, localized impact. Suspended particles readily adhere to many of the fish eggs, making them less buoyant (in the case of pelagic eggs) or smothering them (in the case of demersal eggs). Fish species that have demersal eggs, such as silversides, gobies, and blennies, may be directly affected by the increased turbidity and siltation, and would be considered most sensitive to the construction and operation activities. Although impacts to fish eggs and larvae are expected to occur, ichthyoplankton density and diversity was limited near Masonville during existing conditions surveys and showed no evidence of very early life stages of anadromous species, such as white perch, striped bass, or river herring. In addition, fish eggs and larvae are widely dispersed in the Harbor and are not considered a resource unique to the waters surrounding the Masonville site.

Suspended sediments could also indirectly affect finfish by impairing the ability to feed, by limiting sight and ability to detect prey, of some larval and juvenile fish, including striped bass that are dependent on vision to detect prey. Short-term increases in turbidity are expected to have a negligible effect on larger, more mobile members of the fish community that would likely avoid the areas of highest turbidity. However, these potentially impacted species are common regionally, and any adverse impacts to finfish populations would be short-term and local. Pre-dredging would be conducted mechanically with a bucket dredge, which would generate less turbidity than hydraulic dredging (Section 5.1.5) and minimize impacts to the phytoplankton and zooplankton communities. In addition, time of year (TOY) restrictions would be required to protect anadromous fish inmigration and juvenile life stages that utilize the lower estuary for nursery habitat during out migration. These TOY restrictions would prohibit dredging during the timeframe of 15 February to 15 June.

Releases of nutrients could stimulate algal growth, which has been tied to anoxic conditions in other areas of the Chesapeake Bay. Hypoxic or anoxic conditions may occur in the deepest areas of the Harbor near Masonville.

Finfish species composition in the waters surrounding the proposed Masonville DMCF is not expected to change significantly in the long-term. Monitoring studies conducted around the HMI DMCF during pre- and post-construction have indicated no fundamental shift in finfish species compositions post-construction.

There is a potential for benefits to finfish in the longer-term from the capping of contaminated sediments near the former KIM facility and the ecosystem improvements proposed for

Masonville Cove. Capping the contaminated sediments near the former KIM facility would not only limit the source of contaminant inputs to the ecosystem, but would also isolate a source of fish tissue contamination within the Harbor.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

Relative to the impacts described for Alternative 1, there would be a localized beneficial impact to aquatic resources if material from the Seagirt dredging area is used for dike construction at Masonville. Modeling indicates that use of the Seagirt material would reduce turbidity during placement of approximately ¼ of the material needed to build the dikes. This is expected to lessen the water quality impacts and associated impacts to aquatic habitat and resources relative to the Alternative 1.

Potential adverse impacts described for Alternative 1 to fish, including EFH species, would be lessened because of the lesser turbidity impacts associated with using the Seagirt sand and gravel for approximately ¼ of the Masonville dikes. The decrease in turbidity associated with the change in borrow scenario would have a lesser impact on water quality than the exclusive use of Masonville dredged material. Poor water clarity also adversely affects fish species that rely on their vision to locate prey.

By using the Seagirt sand and gravel and lessening the use of the hydraulically placed onsite Masonville materials, there would be less fines, toxics and nutrients released into the water. Fines can settle to the bottom, potentially smothering, degrading, or otherwise adversely affecting benthic habitat. Release of toxicants and nutrients degrade water quality. Toxicants can be harmful to aquatic life and nutrients can stimulate algal growth which has been linked to eutrophication and low dissolved oxygen. These adverse impacts would be lessened by the use of the Seagirt dredged material for the reasons described in the water quality impacts section for Alternative 2.

No Action Alternative

The no action alternative would result in no short-term (pre-dredging or construction) impacts on the fisheries or fish habitat in the vicinity of Masonville. No pre-dredging or site construction would be conducted and the associated fisheries impacts would not occur on site. The 130 acres of proposed fill would remain open water and productive and no displacement of fisheries would occur. If no action is taken, no dredged material would be placed at the site and the projected spillway discharges and associated fisheries habitat impacts would not occur at the site.

The no action alternative would result in no dikes or other containment of the contaminated sediments that currently exist near the western side of the site, adjacent to the former KIM facility. Without capping, these materials would continue to impact the ecosystem in this part of the Harbor. However, there would be no dikes or other containment of the contaminated sediments that currently exist near the western side of the site, adjacent to the former KIM facility. Without capping, these materials would continue to impact fish, specifically concentrating in fish tissue, in this part of the Harbor (Section 5.1).

5.1.5.6 Essential Fish Habitat (EFH)

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

Pursuant to Section 305 (b) (2) of the Magnuson-Stevens Fishery Conservation & Management Act (MSFCMA), the USACE prepared an EFH Assessment for the proposed actions that occur within coastal waters of the United States (Appendix D). The detailed EFH Assessment includes the following components: a description of the proposed action, a listing of the life stages of all species with EFH designated in the project area, an analysis of the effects of the proposed action, and the Federal agency's opinions regarding the effects of the proposed action.

Based on informal agency coordination with the National Marine Fisheries Service (NMFS), it was determined that the area for the proposed expansion lies within waters designated as EFH for the following species and their life stages: summer flounder (juvenile and adult) and bluefish (adult and juvenile) (Appendix D). The Patapsco estuary, although falling within the general range of EFH for bluefish and summer flounder, is not considered important habitat for these species (Nichols 2005). In addition to being on the low end of the salinity preference for both bluefish and summer flounder, the substrates at Masonville are predominantly silty. Summer flounder prefer sandy substrates. Water quality within the Patapsco estuary is also poor, particularly near the bottom in warmer months. This would limit benthic (food) resources, and areas that summer flounder can safely inhabit. Both summer flounder and juvenile bluefish were collected in the vicinity of Masonville during seasonal finfish surveys. However, the numbers of individuals collected were very low, and in the case of summer flounder, found only in a single season. Habitat Areas of Particular Concern (HAPC) for juvenile and adult summer flounder were identified in Masonville Cove (e.g., small beds of SAV have been observed in Masonville Cove and KIM Channel).

Construction, dredging, and site operations activities associated with the lateral expansion are expected to cause the permanent loss of approximately 127 acres of technically defined EFH (the 130 in water acres less the 3 acres of the existing unauthorized dry dock). In addition, approximately 10 acres of SWH and SAV habitat are located within the proposed alignment and would be permanently lost as well.

Impacts to Individual Fish of each EFH Species

Bluefish and summer flounder were uncommon in site-specific fisheries studies (Appendix C) and are generally uncommon north of the Bay (William Preston Memorial) Bridge in most years (Nichols 2005). Summer flounder, in particular, are rarely recorded in the Baltimore Harbor. Collections near Masonville are unusual based upon the salinity preference for this species. Summer flounder generally prefer salinities greater than 10 ppt (Nichols 2005). In addition, bluefish and summer flounder are considered good swimmers and can easily avoid construction activities. Therefore direct impacts to bluefish (juvenile and adult) and summer flounder (juvenile and adult) are unlikely, even if construction occurs during warmer months. During colder weather months, individuals of these species are unlikely to be present, thus no impacts would be expected at those times of the year.

Impacts to EFH Habitat

Construction of the proposed Masonville DMCF would result in the loss of 127 acres of EFH and directly impact a small amount of SAV (0.38 acres) in KIM Channel and 10 acres of Tier I, Tier II, and Tier III SAV habitat along the shoreline of the existing Masonville terminal. However, utilization of the habitat is probably restricted due to the other habitat limitations listed above.

Impacts to Prey Consumed by EFH Species

The permanent reduction of tidal open water and the loss of benthic communities caused by the proposed Masonville DMCF would reduce biomass available for consumption by finfish species. Bluefish prey occur throughout the water column over a broad area of the Chesapeake Bay and its tributaries, so impacts to individual prey species or bluefish populations are expected to be negligible. Impacts to prey would be of greatest concern for summer flounder since they are bottom feeders and a loss of potential forage habitat would occur as a result of the proposed project. However, both bluefish and summer flounder are uncommon in the vicinity of Masonville, so any impacts to potential prey species are not expected to have an effect on EFH species.

Water quality improvements are expected to occur as a result of sediment capping and derelict vessel remediation, which has the potential to improve the benthic conditions in adjacent areas. Changes to water currents resulting from the project may have a minor, adverse impact on the benthic community by increasing the rate of sedimentation by 0.4 to 0.8 inches per year. This sedimentation would be gradual over the course of a year, not episodic, and the benthic community would not be smothered by this sedimentation. Therefore, forage resources would not be affected.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

Relative to the impacts described for Alternative 1, there would be reduced adverse impacts to aquatic resources if material from the Seagirt dredging area is used for dike construction at Masonville. Modeling indicates that use of the Seagirt material would reduce turbidity during placement of approximately ¼ of the material needed to build the dikes. This is expected to lessen the water quality impacts and associated impacts to aquatic habitat and resources relative to Alternative 1.

Potential adverse impacts described for Alternative 1 to fish, including EFH species, and EFH would be lessened because of the lesser turbidity impacts associated with using the Seagirt sand/gravel for approximately ¼ of the Masonville dikes. The decrease in turbidity impacts associated with the change in borrow scenario would have a less of an impact on water quality than the exclusive use of Masonville dredged material. Poor water clarity adversely affects fish species that rely on their vision to locate prey.

By using the Seagirt sand and gravel and lessening the use of the hydraulically placed onsite Masonville materials, there would be less fines, toxics and nutrients released into the water. Fines can settle to the bottom, potentially smothering, degrading, or otherwise adversely

affecting benthic habitat. The release of toxicants and nutrients degrades water quality. Toxicants can be harmful to aquatic life and nutrients can stimulate algal growth, which has been linked to eutrophication and low dissolved oxygen. These adverse impacts would be lessened by the use of the Seagirt dredged material for the reasons described in the water quality impacts section for Alternative 2.

No Action Alternative

With the no action alternative there would be no new impacts to EFH or EFH species.

5.1.5.7 Commercial Fisheries

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

As described in Section 2.1.6.7, commercial fishing is primarily conducted in the lower Patapsco River well outside of the proposed Masonville DMCF alignment, so the project is not expected to impact this resource. In addition, the short-term fisheries impacts described in Section 5.1.5.5 are not expected to have population-level effects on harvestable finfish resources or commercial harvests.

The only oyster bar within the Harbor was created as part of the Oyster Reef Planting Project near Fort Carroll. This bar lies 4.5 miles from the proposed Masonville DMCF and far outside any area that could be impacted from pre-dredging or construction activities. Additionally, it is an educational site and would not be commercially harvested in the near future, if at all. The proposed Masonville DMCF construction and site development is not expected to impact the oyster bar.

Some blue crabs were collected near Masonville during existing conditions surveys. Compared to collections in more saline areas of the Chesapeake Bay (USACE/MPA 2005), the numbers were relatively low and most were juveniles not of harvestable size. This is consistent with the size distributions of crabs collected during a 4-year seining study in the area (EA 1994). Although some crab harvesting is known to occur, consumption advisories and gear restrictions in some parts of the Harbor limit crab harvesting. The Masonville area and the Baltimore Harbor in general are not considered important or heavily-utilized blue crab over wintering areas and are expected to have even lower densities than other areas of the Bay of similar depth. For these reasons, the project is not expected to impact blue crabs.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

Impacts to commercial fisheries are expected to be the same as those described for Alternative 1. The Seagirt dredging area is not considered to be an important commercial fishing area. No additional impacts to commercial fisheries would result from use of the Seagirt borrow material.

No Action Alternative

As stated previously, the no action alternative would result in no short-term (pre-dredging or construction) impacts on the fisheries (finfish resources) or fish habitat in the vicinity of Masonville. No pre-dredging or site construction would be conducted and the associated fisheries impacts would not occur on the site. Under the no action alternative, the 130 acres of proposed fill would remain open water and productive and no displacement of fisheries would occur. If no action is taken, no dredged material would be placed at the site and the projected spillway discharges and associated fisheries habitat impacts would not occur at the site.

If no action alternative is implemented, there would be no containment of the contaminated sediments that currently exist near the western side of the site, adjacent to the former KIM facility. Without capping, these materials would continue to impact water quality and harvestable resources (e.g., fish tissue contaminant levels) within the lower Patapsco River.

5.1.6 Wetlands

Alternative 1 – Proposed Masonville DMCF with Borrow Scenario C

There would be long-term adverse impacts to wetlands associated with the proposed Masonville DMCF. Wetlands include tidal open waters of the U.S. The proposed alignment includes filling 130 acres of tidal open water. There is a wetland covering approximately 0.5 acres, located at the end of KIM Channel that has both tidal and non-tidal components (Appendix C). The tidal source of the tidal portion of this wetland would be lost by the filling of KIM Channel. A Maryland tidal wetlands license, a Maryland non-tidal wetlands permit, and a Federal Section 404 permit would be required for the proposed alternative.

As part of the compensatory mitigation for this alternative over 15 acres of tidal and non-tidal wetlands would be created or enhanced, 2 acres of fringe marsh would be created, and over 90 acres of reef and SWH substrate would be enhanced.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

Impacts to wetlands, including mitigation, under this alternative would include all of the impacts described for Alternative 1. Additionally, 2 feet of dredging for borrow would occur in 41 acres of tidal open water at Seagirt. Most of this area is currently over 40 ft deep. This additional dredging depth would occur within the 128 acres of the Seagirt dredging area, which is already permitted. In 41 acres of the Seagirt project, the depth of the water would be increased to either -51 or -52 feet MLLW (plus up to an additional 2 feet of over dredging). This is only a maximum 2-foot increase in depths from the dredging that would occur with out use of the Seagirt material for dike construction at Masonville. This area would remain tidal open water.

No Action Alternative

There would be no new impacts to wetlands if this alternative is implemented.

5.1.7 Terrestrial Resources

5.1.7.1 Upland Habitats

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

There would only be minor impacts to terrestrial resources by construction of the placement site because most construction would be in the water and terrestrial wildlife utilization is sparse. There would be an onshore dike constructed around KIM Channel and a berm constructed along the northern edge of MMT Phase II. This would bury a portion of the existing site. The northern and eastern edges of the existing Masonville DMCF would be lost, but the northern edge of the new DMCF would be replanted with native vegetation including grasses, shrubs, and trees.

An onshore dike and berm would be constructed along portions of the site. Some shoreline areas would be covered with dredged material and equipment and work crews would be using the area. Terrestrial vegetation may be removed or trampled. Ten acres of upland vegetation would be cleared from the existing northern and eastern borders of the site during the construction of the proposed Masonville DMCF. Twenty acres of native vegetation would be replanted along the northern edge of the proposed Masonville DMCF. Since existing vegetation is sparse and primarily opportunistic species, the impacts of clearing this vegetation would be minimal. There would be long-term beneficial impacts associated with the planting of native vegetation and removal of non-native and invasive species.

An off-site upland borrow source would be used for the construction of the cofferdam. This site would be permitted and the material approved for in-water placement. Material from this off-site source would be used to construct the cofferdam and would supplement borrow material obtained from on site for the remainder of the construction. There are no anticipated adverse impacts to uplands from the use of off-site borrow since the material would be obtained from an existing, licensed facility.

All of the upland habitat affected by the proposed Masonville DMCF falls within the Chesapeake Bay Critical Area. Impacts to the Critical Area are discussed in Section 5.1.12.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

The upland impacts for this alternative are the same as those described for Alternative 1.

No Action Alternative

The no action alternative would result in no new impacts to tidal open water, wetland, and upland habitats. Therefore 130 acres of tidal open water would remain available in the Patapsco River and the 1 acre of tidal and non-tidal vegetated wetlands would remain intact.

5.1.7.2 Bird and Mammal Usage

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

Birds and other wildlife in the area are acclimated to life within a busy port area and should acclimate to the proposed construction activity and operation of the proposed Masonville DMCF. No raptors are known to be nesting at the site, although a pair of bald eagles (*Haliaeetus leucocephalus*) was nesting (nest BC-04-01) adjacent to the western portion of Masonville Cove. The nest tree fell in winter 2005. As of this writing, no new nest has been constructed (E-mail from Glenn Therres at Maryland DNR dated April 7, 2006 in Appendix O). Potential impacts to bald eagles are further discussed in Section 5.1.8.

Ten total acres of terrestrial habitat exist along the northern and eastern edge of the existing MMT. This area would be lost as a result of the proposed DMCF alternative. Any wildlife using the existing Masonville shoreline to the north and east would lose habitat during dredged material placement and after paving to facilitate the end use of the site. There is minimal usage of the site by wildlife species and those that do use the site are tolerant of urbanized habitats and human activities. These species would be temporarily displaced by construction and would return to any available habitat after construction was complete. There would be approximately 20 acres of habitat created along the northern edge of the proposed facility, after the facility is no longer receiving dredged material.

During the operation of the proposed Masonville DMCF, birds and other wildlife may use the ponded water and mudflats that would be temporarily created within the DMCF. This additional habitat may have short-term beneficial effects on birds and wildlife in the area. Coordination with MD DNR has indicated that no TOY restrictions for waterfowl would be needed for the proposed project (E-mail from Larry Hindman at Maryland DNR dated March 15, 2006, Appendix O).

Both birds and wildlife may be adversely affected during the construction and operation of the proposed DMCF, however, the long-term benefits associated with the restoration of Masonville Cove are likely to have a greater (positive) impact on those species (Chapter 6).

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

The impacts to birds and mammals for this alternative are the same as those described for Alternative 1.

No Action Alternative

The no action alternative would have no new impact on avian and mammal species. The current habitat conditions would remain.

5.1.7.3 Reptiles and Amphibians

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

Reptiles and amphibians in the area are acclimated to life within a busy port area and should acclimate to the future proposed construction activity. Impacts to any reptile and amphibian species living at the current Masonville site would be negligible.

Any reptiles and amphibians using the existing Masonville shoreline would lose habitat during dredged material placement. The existing habitat is approximately 10 acres along the northern and eastern edge of the existing site. There have been no reptiles and amphibians observed on site, therefore, it is assumed that there is minimal usage of the site by reptiles and amphibians. If reptiles and amphibians inhabit the site, those that do would be tolerant of urbanized habitats and human activities. These species would be temporarily displaced by construction and may return to any available habitat after construction was complete. Twenty acres of habitat would be created along the northern edge of the proposed DMCF.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

The impacts to reptiles under this alternative are the same as those described for Alternative 1.

No Action Alternative

The no action alternative would have no new impacts to reptile and amphibian species. The current habitat conditions would remain.

5.1.8 Rare, Threatened, and Endangered (RTE) Species

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

The existing Masonville site is essentially an industrial area and utilized by few rare, threatened, and endangered (RTE) species, even passively. Although Masonville Cove has some habitat features that might accommodate some RTE species utilization, no RTE plants have been identified during existing conditions surveys and avian RTE species utilization has been limited. No raptors are known to be nesting immediately adjacent to the proposed Masonville DMCF, although a pair of bald eagles was nesting adjacent to the western part of Masonville Cove. However, the nest tree fell during late winter 2005 and, based on an early April 2006 Maryland DNR survey, it is doubtful that the remaining tree is sufficient to support an eagle's nest. One eagle was seen at the Cove during the survey, but no nest was found (Appendix O, E-mail from Glenn Therres from Maryland DNR dated April 7, 2006). Although the predominant site activities proposed for Masonville Cove include only shoreline restoration and rehabilitation, some placement site activities could occur within 0.5 miles of the nest. It is anticipated that if the eagles return, Masonville Cove improvement and placement site activities may need to be managed through TOY restrictions, to minimize potential disturbances to nesting. Table 5-13 below shows the distances between proposed and existing activities in the vicinity of the site of a bald eagle nest. These restrictions would only be applicable if there was a nest in the area.

Table 5-13. Distance from Bald Eagle Nest Site BC-04-01 to Proposed Project Activities and Sites

Activity	Distance from Nest Site (BC-04-01)	Protection Zone
SWH Enhancement	45 ft	Zone 1
Reef Creation – Outer Cove	350 ft	Zone 2
Tidal Wetland Creation	415 ft	Zone 2
Reef Creation – Inner Cove	570 ft	Zone 2
Non-Tidal Wetland Creation	620 ft	Zone 2
Education Trail	1020 ft	Zone 3
Pier Facility	1195 ft	Zone 3
Observation Area – Inner Cove	1330 ft	Zone 3
Proposed DMCF Facility	1820 ft	NA
Observation Area – Outer Cove	1850 ft	NA
Access Road – Existing Masonville Marine Terminal	1920 ft	NA
Road	1925 ft	NA
Environmental Education and Nature Center	2120 ft	NA
Existing Masonville Terminal Parking Lot	2509 ft	NA

None of the species of state concern identified in the Maryland DNR Natural Heritage letter (hooded merganser and moorhen) have been found at the site and the proposed DMCF project area does not currently provide critical habitats for these species.

Informal consultations with NMFS in fall 2005 indicated that a Section 7 consultation for shortnose sturgeon and sea turtles was required for this project (Appendix D). A Section 7 consultation was prepared but before it could be sent to NMFS, a subsequent letter was received, in March 2006, which expanded the species of concern to include listed whales that could be struck by ships as a result of port expansion activities (supported by the proposed DMCF). A revised Section 7 consultation has been prepared (Appendix D) and sent to and reviewed by the NMFS. Their concurrence can be found in Appendix D. The NMFS would like to be consulted on the end use of the site after the DMCF is no longer operational. The consultation concluded that Federally listed aquatic species are rare transients to the project area. The closest capture of shortnose sturgeon (*Acipenser brevirostrum*) was eight miles away. No shortnose sturgeon have been captured upstream of the Key Bridge. During the Bay Enhancement Working Group (BEWG) site ranking process in 2002, NMFS indicated that the shortnose sturgeon is probably transient to the Harbor (Nichols 2002) and it is likely they are only using the channels. Because shortnose sturgeon are only expected to be transient to the area, no impacts to this species are

anticipated. NMFS concurred with the assessment of impacts to shortnose sturgeon and large, listed whales as a result of the proposed Masonville DMCF in a letter dated July 28, 2006 but requested that additional consultation on large, endangered whales be completed when the end use of the site is determined. This letter is available in Appendix Q.

Neither the Maryland DNR nor the National Aquarium's Marine Animal Rescue Program has any record of sea turtle sightings or stranding in the Inner Harbor or Patapsco River (Kimmel 2005, Perry 2005) (Section 2.1.9). Sea turtles and whales are generally not found in the Patapsco River and it is unlikely that either are within or adjacent to the proposed Masonville DMCF alignment. Five listed whales (all dead) have been reported in Baltimore Harbor (three fin and two sei whales) since 1979, but all appear to have come in on the bows of ships. Listed whale ship strikes are relatively rare in the mid-Atlantic region and very few have been recorded in the Chesapeake Bay (Section 2.1.9). Even with port traffic increasing up to 1.8 times the current levels within the next 20 years of the DMCF operation, the overall risk of increased whale strikes is low. Therefore, no impacts to listed sea turtles or whales are anticipated. No other listed aquatic species are found within or are transient to the proposed project area.

The capping of contaminated sediments near the former KIM site has the potential to improve some habitat functions in the vicinity of Masonville, which would have secondary benefits to any transient RTE species utilizing the areas. Other improvements associated with mitigation options are detailed in Chapter 6.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

Relative to the impacts described for Alternative 1, the use of Seagirt sand and gravel and lessened use of hydraulically pumped onsite borrow material at Masonville would lessen the adverse water quality impacts, which in turn would lessen adverse impacts to aquatic RTE species. This includes transient shortnose sturgeon (*Acipenser brevirostrum*).

Reduced potential effects to shortnose sturgeon would be similar to those described for aquatic species in Section 5.1.6. As described in Section 2.1.9, it is unlikely that sea turtles or large whale species are using the Baltimore Harbor. However, these lessened impacts to water quality would decrease adverse impacts to those species relative to Alternative 1, if they were to occur in the Masonville area of the Patapsco River. Alternative 2 would have the same amount of ship traffic coming into and out of the Port (relative to Alternative 1). Barge traffic between Masonville and Seagirt would increase for several months, but this would constitute an overall shorter distance for some of the material to be transported, relative to being placed at the HMI DMCF. In addition, no large listed whales are known to occur within the project area so the change in barge shipping patterns would not affect whales.

No Action Alternative

The no action alternative would result in no new impacts to RTE species in the vicinity of Masonville.

5.1.9 Air Quality

The air emissions presented in this section differ from those presented in the DEIS and the Supplement to the DEIS as a result of changing project schedules and revised equipment and crew lists. These calculations also included a comparison of the emissions to the July 2006 standards for $PM_{2.5}$ and SO_2. These emissions are calculated based on the schedule used for the General Conformity Analysis (Appendix K), which is dated September 2006. These calculations, the crew lists, and the schedules used are presented in Appendix K.

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

Construction of the DMCF

Construction of the proposed Masonville DMCF would generate air emissions from the operation of dump trucks, hydraulic dredges, marine vessels, cranes, excavators, bulldozers, and other heavy-duty equipment. The pollutants of interest include carbon monoxide (CO), particulate matter up to 10 micrograms (PM10), nitrogen oxides ($NO_{X,}$) and volatile organic carbon (VOC) emissions. The pollutants of greatest concern would be NO_x and VOCs because they are the precursors to the formation of ozone. The Baltimore region is presently in non-attainment with the federal air quality standard for ozone.

Air emissions were initially estimated based on engine sizes and estimated hours of operation. The calculations made were of a "screening" nature using factors provided for diesel engines in the USEPA AP-42 document. This document is the primary reference used to calculate emissions from sources of air pollution. Emissions would result from two primary construction activities: hydraulic dredging during excavation of the sand borrow areas and construction of the proposed Masonville DMCF. Because of the estimated magnitude of emissions resulting from the proposed Masonville DMCF project, a Federal Conformity Analysis was completed and is included in Appendix K. If the total of direct and indirect emissions from a proposed Federal Action in a non-attainment area are below the *de minimis* thresholds specified in 40 CFR 93.153(b)(1) and the total emissions are not “regionally significant,” comprising 10 percent or more of the region’s total emissions of that pollutant, as specified in 40 CFR 93.153(i), the Federal Action is exempt from the requirements of General Conformity. As: “…moderate non-attainment areas inside an ozone transport region…” the thresholds in Baltimore City are 100 tons per year (tpy) for NOx and 50 tpy for VOC.

Emissions for the proposed Masonville DMCF during construction are summarized in Table 5-14. These emissions would occur over a two-year period from 2007 to 2008. The emissions calculations are part of the Federal Conformity Analysis included in Appendix K. Emissions would be regulated under the provisions of General Conformity since emissions of NO_x are over the General Conformity *de minimis* thresholds specified in 40 CFR 93.153(b)(1) and described above. A comparison of total annual emissions compared with the *de minimis* threshold are shown in Table 5-15.

Table 5-14. Estimated Total Air Emissions from the Proposed Masonville DMCF Project

Construction Crews	Emissions for the Masonville DMCF Project (tons)					
	CO	NO_X	$PM_{2.5}$	PM_{10}	SO_2	VOC
CREW A	2.164	10.955	0.323	0.332	1.803	0.327
CREW B	26.585	113.007	3.773	3.897	16.820	3.477
CREW C	21.844	130.591	3.441	3.463	21.612	2.577
CREW C1	2.841	6.057	0.312	0.340	0.132	0.529
CREW D	12.582	37.202	1.854	1.929	7.654	2.025
CREW E	0.843	1.595	0.083	0.092	0.251	0.154
CREW F	7.200	16.593	0.846	0.920	0.973	1.600
TOTAL	**74.06**	**316.00**	**10.63**	**10.97**	**49.25**	**10.69**

Source: Estimates were calculated using the methodology and information provided in the *USEPA AP-42 Document*
[1] - Crew A Duration: six months; Crew B Duration: 2 months; Crew C Duration: 9 months; Crew C1 Duration: 9 months; Crew D Duration: 10 Months; Crew E Duration: 4 months; Crew F Duration: 2 years.

Table 5-15. Total Estimated Annual Emissions Compared to the General Conformity Threshold

Pollutant	GC Threshold (tons)	2006 (tons)	2007 (tons)	2008 (tons)	2009 (tons)	Total (tons)
CO	--	2.72	41.18	28.72	1.44	74.06
NOx	100	12.00	**153.90**	**146.84**	3.26	316.00
PM2.5	100	0.38	5.82	4.27	0.17	10.63
PM10	--	0.39	6.04	4.35	0.18	10.97
SOx	100	1.97	24.20	22.92	0.16	49.25
VOC	50	0.43	6.01	3.94	0.31	10.69

Notes: Values in italics exceed the GC Threshold for that pollutant in a specific year. This values must be mitigated for to meet the general conformity requirements.

Mitigation would be necessary to offset emissions in both 2007 and 2008. The proposed mitigation is described in Chapter 6 and Appendix K.

In addition to temporary increases in air emissions from the planned construction activities, emissions associated with dredged material placement would occur after completion of construction. This would result from periodic dredged material placement of 16 mcy over a 20-year period, with an attendant increase in air emissions from these activities.

Volatilization From Overburden Material Placed at the HMI DMCF

No volatile organic compounds were identified in the materials to be dredged from within the footprint of the proposed Masonville DMCF with the exception of 2-Butanone (MEK) which was found at a maximum estimated concentration of 6.9 ug/kg (Appendix A). Methylene chloride was found at an estimated concentration of 4.7 ug/kg, but was also found in the blanks. This constituent is most likely a laboratory contaminant. Neither of these compounds would be expected to contribute to airborne VOCs at these concentrations.

Operation of the Masonville DMCF

The time horizon for the operational use of the Masonville DMCF would be 20 years. Over that period of time air emissions would be generated from equipment to be used on site. Although the exact nature of the equipment to be used as the site is unknown at this time, probable equipment would include:

- Bulldozers
- Dump trucks
- Trenchers
- Compactors
- IC Engine Pumps
- Generators
- Utility vehicles
- Marine support vessels
- Miscellaneous construction equipment

Based on air emission studies performed at similar dredge material sites (e.g., Poplar Island) the operational emissions should not be significant. NOx and CO would be the pollutants emitted in the largest quantities and emissions should not exceed 20 tpy and 10 tpy, respectively. Relative to these operational emissions, it is believed that the emissions associated with on-site equipment would eventually be offset by the cessation of similar activities at the HMI DMCF.

The Federal Conformity Analysis has been completed and is available in Appendix K. The draft federal conformity decision can be found in Appendix K. The final conformity decision will be released with the ROD.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

The emissions would be coming from similar types of equipment and crews to what was described for Alternative 1. The emissions for the Alternative 2 are described in Table 5-16 and 5-17 and the annual emissions are compared to the general conformity threshold in Table 5-18 and 5-19. The Federal Conformity analysis is available in Appendix K.

Total emissions under this alternative remain the same if dredging for borrow is completed to -53 ft MLLW (20 percent Seagirt) or -54 ft MLLW (25 percent Seagirt). There is a shift in the year of emissions, which is shown in tables 5-18 and 5-19.

Based on the emissions described in Table 5-18 and 5-19, mitigation would be required in 2007 and 2008 with either the 20 or 25 percent borrow scenario is used. Potential mitigation to offset these emissions if this alternative is implemented are described in Chapter 6 and Appendix K.

Table 5-16. Emissions (tons) Summary for the proposed Masonville DMCF Project for the 25 percent Seagirt Borrow Scenario

	CO	NOx	PM2.5	PM10	SO2	VOC
CREW A	2.164	10.955	0.323	0.332	1.803	0.327
CREW B1	26.585	113.007	3.773	3.897	16.820	3.477
CREW B3	8.371	53.574	1.348	1.348	9.085	0.940
CREW C	18.242	114.344	2.916	2.923	19.239	2.094
CREW C1	2.841	6.057	0.312	0.340	0.132	0.529
CREW D	12.582	37.202	1.854	1.929	7.654	2.025
CREW E	0.843	1.595	0.083	0.092	0.251	0.154
CREW F	7.200	16.593	0.846	0.920	0.973	1.600
TOTAL	**78.83**	**353.33**	**11.46**	**11.78**	**55.96**	**11.15**

Table 5-17. Emissions (tons) Summary for the proposed Masonville DMCF Project for the 20 percent Seagirt Borrow Scenario

	CO	NOx	PM2.5	PM10	SO2	VOC
CREW A	2.164	10.955	0.323	0.332	1.803	0.327
CREW B1	26.585	113.007	3.773	3.897	16.820	3.477
CREW B3	7.184	45.922	1.155	1.155	7.787	0.806
CREW C	19.444	122.020	3.111	3.117	20.537	2.230
CREW C1	2.841	6.057	0.312	0.340	0.132	0.529
CREW D	12.582	37.202	1.854	1.929	7.654	2.025
CREW E	0.843	1.595	0.083	0.092	0.251	0.154
CREW F	7.200	16.593	0.846	0.920	0.973	1.600
TOTAL	**78.84**	**353.35**	**11.46**	**11.78**	**55.96**	**11.15**

Table 5-18. Total Annual Emissions (tons) Compared to the General Conformity (GC) Threshold for the 25 percent Seagirt Borrow Scenario

Pollutant	GC Threshold	2006	2007	2008	2009	TOTAL
CO	NA	2.72	49.55	25.12	1.44	78.83
NOx	100	12.00	**207.47**	**130.60**	3.26	353.33
PM2.5	100	0.38	7.17	3.74	0.17	11.46
PM10	NA	0.39	7.39	3.81	0.18	11.78
SOx	100	1.97	33.28	20.55	0.16	55.96
VOC	50	0.43	6.95	3.46	0.31	11.15

Notes: Values in bold exceed the GC Threshold for that pollutant in a specific year. This values must be mitigated for to meet the general conformity requirements.

Table 5-19 Total Annual Emissions (tons) Compared to the General Conformity (GC) Threshold for the 20 percent Seagirt Borrow Scenario

Pollutant	GC Threshold	2006	2007	2008	2009	TOTAL
CO	NA	2.72	48.36	26.32	1.44	78.84
NOx	100	12.00	**199.82**	**138.27**	3.26	353.35
PM2.5	100	0.38	6.97	3.94	0.17	11.46
PM10	NA	0.39	7.20	4.01	0.18	11.78
SOx	NA	1.97	31.99	21.85	0.16	55.96
VOC	50	0.43	6.82	3.59	0.31	11.15

Notes: Values in bold exceed the GC Threshold for that pollutant in a specific year. This values must be mitigated for to meet the general conformity requirements.

Of the NO_x emissions calculated under the 20 and 25 percent Seagirt borrow scenarios (Alternative 2), 42.09 tons of NO_x would be emitted without the Masonville project. These emissions are associated with dredging activities to a depth of -52ft MLLW, which would be completed as part of the access channel deepening and widening project with or without the use of the material at Masonville. The Seagirt borrow material to be used for dike construction under this alternative would be placed at the HMI DMCF if it was not used during the construction of the dikes at Masonville. If this material is not considered as an increase in emissions associated with the proposed Masonville DMCF project, then the emissions of NO_x under either Seagirt borrow scenario (Alternative 2) are 311.26 tons. This is a decrease in emissions of 5 tons of NO_x relative to the Alternative 1. There is also a regional reduction in air emissions associated with this scenario that is described in further detail in the cumulative impacts section (Section 5.8.4.8).

Emissions from the volatilization from overburden material and the operation of the DMCF would be the same as those described for Alternative 1. Under this alternative 15.4 mcy of material would be placed, not the 16 mcy placed under Alternative 1.

No Action Alternative

The no action alternative would have no impact on air quality.

5.1.10 Hazardous, Toxic, and Radioactive Wastes (HTRW)

5.1.10.1 Kurt Iron and Metal Site

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

The major area of concern is the former KIM site, which has a number of sunken and derelict vessels, a steel dry dock and numerous barges with various materials on board. The primary hazardous materials are lead paint, various petroleum products and wastes, PCB-contaminated transformers, paint, and asbestos. This area has been investigated and negotiations are underway with regulatory agencies to resolve these issues. 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 MDE. The former KIM site would be remediated by removing all known hazardous and regulated materials from the 25 derelict vessels currently in the water. Materials

would be segregated between solid and hazardous wastes, placed on barges and shipped to appropriate locations for transfer to licensed and regulated landfills. Following removal of these materials, the remaining hulls would be left in place and the site filled and capped.

Shallow and perched water table flow may flow towards the Patapsco River. Currently, some entrained contaminants are likely discharging to the Patapsco via these shallow groundwater sources. The former KIM site has been approved by MDE for remediation through the VCP. The response action plan (RAP) includes capping the site, which has been cleared of all surface sources of contaminants. Once capped, further infiltration would cease on that site and stormwater would no longer come in contact with soil contaminants. Further, the derelict vessels would be remediated and the clean hulls would be buried with dredged material when the KIM Channel is filled in. Therefore existing sources, to the extent feasible, would be removed from the in-water area. While some leaching to the Patapsco may occur, it is expected that this would be considerably reduced when compared to existing conditions.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

The impacts to and resulting from HTRW at the former KIM site for this alternative are the same as those described for Alternative 1.

No Action Alternative

If the proposed Masonville DMCF is not constructed, there would likely be further delay in the remediation of the derelict vessels, which would potentially increase the cost of doing so.

5.1.10.2 Masonville Cove

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

Items such as slag, concrete pipe and rubble, metal materials, and ceramic insulators may be left on site and buried or removed, as required, depending upon location. Any materials that are found to fail Resource Conservation and Recovery Act (RCRA) characterization would be removed and disposed of appropriately. The timber waste would be buried or removed to either an approved landfill or other appropriate location.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

The impacts to and resulting from HTRW in Masonville Cove for this alternative are the same as those described for Alternative 1.

No Action Alternative

The no action alternative would cause no new impacts to Masonville Cove. Some contaminated materials would remain onsite.

5.1.10.3 Munitions of Explosive Concern (MEC)

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

No surveys for munitions of explosive concern (MEC) would be required by the USACE prior to pre-dredging and construction. However a brochure, that is included in Appendix N, on how to respond to MEC would be required to be attached as an appendix to all contract documents and contractors would be required to post the brochure in all offices, trailers, and dump shacks and on all dredges, derricks, unloaders, and tug boats (McKee 2006). If MEC are found, they would have to be extracted and disposed of before dredging and construction could take place. After recognizing a MEC, all personnel would be removed from the area around the MEC and the U.S. Coast Guard would be notified by calling 911 from land areas or using Channel 16 (156.800 MHz) to contact the Coast Guard by radio from in-water areas.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

Impacts within the proposed Masonville DMCF footprint as a result of MEC would be the same for this alternative as were described for Alternative 1.

There is a very small potential that Munitions of Explosive Concern (MEC) might be present in the new work areas at Seagirt, entrained in the dredged material. They are less likely to be present in the deeper sand/gravel deposits that would be used for dike construction than in the shallower overburden materials that would be removed to the HMI DMCF. If separation can occur at the dredge point by using a debris barge, the potential for MEC to be transported to Masonville can be reduced.

No Action Alternative

There would be no new impacts or actions as a result of the no action alternative.

5.1.11 Navigation

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

Some temporary impacts to navigation could occur during site construction. Although all construction would occur outside of the federal channels, increased barge and tug traffic could temporarily interact with the current shipping traffic, particularly when construction materials are moved into the area. The total impact of moving construction materials to the proposed project site cannot be calculated until a bid is received and it is known where the construction material would be coming from. There would be an increase in boat traffic as a result of this project and the construction is proposed to occur 24 hours a day. There are a total of 10 tug boats and 12 barges that would be associated with the project. There would be a total of 370 34-mile roundtrips by eight barges, pushed by tugs, to the HMI DMCF from the proposed Masonville DMCF to place the overburden material. As the dike is constructed, lighting and navigational aids would be placed on and along it. All appropriate safety precautions would be taken throughout the construction and operation process.

The site would permanently force recreational and commercial boaters using the area within the proposed Masonville DMCF footprint to use areas closer to the commercial shipping channels. The distance between the shoreline and Ferry Bar Channel would decrease from 1,500 ft to 400 ft. The impact to recreational boaters is discussed further in Section 5.4.

This project is expected to supply placement capacity for Harbor sediments in support of channel and other dredging projects. It would have a beneficial impact on local commercial navigation in the long-term. The dredging of Harbor channels maintains safe shipping lanes throughout the Harbor so that large ships with deep drafts are able to navigate to the terminals and anchorages in the Patapsco River. A mooring buoy used to moor barged cargo was identified at the northwest corner of the proposed terminal expansion area. This buoy would need to be relocated to accommodate site development. The final location for the mooring buoy has not yet been determined. Movement of the mooring buoy would require a Section 10 permit from the USACE and is included on the joint permit application for the proposed project. If the permit is issued, the USACE would send a copy of the permit to the Coast Guard. The MPA must also follow appropriate procedures with the Coast Guard for the relocation of the buoy.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

Impacts to navigation as a result of this alternative would include all of those impacts described for Alternative 1. There would be additional impacts to navigation during the dredging activities within the Seagirt dredging area. Use of the Seagirt dredged material would increase the amount of ship traffic between Seagirt Marine Terminal and the Masonville project area for a few months while the sand and gravel is recovered and shipped. Although all construction would occur outside of the federal channels, increased barge and tug traffic could temporarily interact with the current shipping traffic, particularly when construction materials are being moved. There would be an estimated 250 roundtrips covering 4.6 miles (round trip) made by barges pushed by tugs to deliver Seagirt borrow material to the Masonville project site. A total of 2 barges and 1 tug would be used to transport the material to the Masonville site.

No Action Alternative

No new impacts to navigation would occur as a result of the no action alternative.

5.1.12 Floodplains

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

The proposed Masonville DMCF would cause permanent, direct impacts to the floodplain. The proposed alignment would bury 10 acres of land within the floodplain. This land would be raised to a height of +36 ft MLLW. The construction of the DMCF would result in the creation of 123 acres of fastland, which would likely become part of the 100-yr floodplain.

Executive Order 11988 (Floodplains) was taken into consideration for this project. Other sites were considered, but there were no practicable alternatives at this time that could meet the Harbor dredging need.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

The impacts to the 100-yr flood plain under this alternative would be the same as those described for Alternative 1.

No Action Alternative

The no action alternative would result in no change to the floodplain.

5.1.13 Critical Areas

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

The MMT is owned by the MDOT and managed by the MPA. State agency properties within the critical area zone are under the jurisdiction of the Critical Areas Commission for the Chesapeake and Atlantic Coastal Bays. As required by Maryland law, new development and redevelopment of an Intensely Developed Area (IDA) site must be accompanied by techniques to decrease (phosphorus discharge) by greater than 10 percent. Construction of a containment site or beneficial use project would involve construction within the critical area and would require review and approval by the Commission. This is also true if any existing stormwater discharges are added or relocated as a result of the proposed project. Changes in impervious surface would be considered and may require mitigation or monetary offset. However, as a rule, if City of Baltimore stormwater regulations are followed, the water quality requirements for the critical area would be satisfied. For Baltimore City, additional requirements may be requested by the State Commission. This would involve complying with the 10 percent phosphorous reduction rule.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

The impacts to Critical Areas would be the same for this alternative as those for Alternative 1.

No Action Alternative

No development would occur in the existing critical area.

5.1.14 Coastal Zone Management

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

The State of Maryland has authority to require consistency with the Coastal Zone Management Act (CZMA) since the Masonville site is located in the Patapsco River within Maryland's coastal zone. The proposed DMCF would lie wholly within the Coastal Zone and would fill 130 acres

of tidal open water along the shoreline of the Patapsco River. A Federal consistency determination would be required as part of the permitting process. When a permit from the State of Maryland is required, the permit decision also constitutes the Federal consistency decision (Ghigiarelli 2004). The consistency process for a State activity requiring a state permit is as follows (Ghigiarelli 2004):

1) Notification of MDE about the proposed activity,
2) Submission of the permit application,
3) Permit process, including public participation, and
4) Permit decision/Federal Consistency Determination.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

This alternative is subject to the same consistency process described under Alternative 1. In addition to the DMCF footprint (see description for Alternative 1), the area subject to the consistency determination would include the 128 acre Seagirt dredging area. MDE has been made aware of the modification to the proposed activity and modified applications for a State tidal wetlands license and State non-tidal wetlands permit were submitted by the MPA to the USACE and MDE on June 22, 2006.

No Action Alternative

The no action alternative would have no impact on land use in the coastal zone and a Federal consistency determination would not be required.

5.1.15 Coastal Barriers

The proposed Masonville DMCF alignment and Seagirt dredging areas are not and do not contain a coastal barrier. Therefore, the project is in full compliance with the Coastal Barriers Resource Act (CBRA).

5.1.16 Wild and Scenic Rivers

The Patapsco River is not a wild and scenic river; therefore, the Wild and Scenic Rivers Act is not applicable to the proposed Masonville DMCF project. Thus, the project is in full compliance with the Act.

5.1.17 Prime and Unique Farmland

No prime and unique farmland exists at the proposed Masonville DMCF project site or Seagirt dredging area; therefore, project is in full compliance with the Farmland Protection Policy Act.

5.2 CULTURAL RESOURCES

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

A cultural resource investigation was undertaken in accordance with Section 106 of the National Historic and Preservation Act (NHPA) of 1966, as amended, and it's implementing regulations, which include 36 CFR, Part 800. The efforts for the Masonville cultural resource investigation were conducted with coordination with the State Historic Preservation Office (SHPO) in accordance with the regulations. A copy of this correspondence is found in Appendix O. The regulations require the agency to identify, evaluate and mitigate impacts to cultural resources listed on, or eligible for inclusion on the National Register of Historical Places prior to initiation of project activities or issuance of permits.

The cultural resource investigation conducted for the Masonville project met the requirements through written and verbal correspondence with the Maryland Historical Trust (MHT) and archival research. A review of available archeological surveys in the area and a Phase I underwater archeological survey were also conducted by RCG&A of Frederick, Maryland during March 2005. This survey covered the proposed Masonville DMCF area and Masonville Cove.

Submerged, historic, cultural resources, dating from post-colonization to present day, are discussed in detail in Section 2.2.

Historic vessel wrecks identified in archival research for the Masonville survey and addressed in the subsequent remote sensing survey are estimated to have occurred no earlier than circa 1930. Two to five vessel wrecks that occurred in the timeframe of 1940 to 1950 were identified in the general vicinity of the Masonville survey. The wrecks were attributed to shoaling and erratic sandbar build-up concurrent with developing shoreline configuration (RCG&A 2005).

According to recent archival research, a low to moderate perceived possibility of encountering significant submerged cultural resources exists in the Masonville survey area due to "shoreline modifications, frequent channel dredging, an aggressive salvage industry and a limited number of reported shipwrecks" (RCG&A 2005). In addition, the development of the adjacent shoreline occurred shortly before the dredging activities, leaving a small window for the loss and deposition of historic cultural resources (RCG&A 2005).

SHPO correspondence was initialized in spring 2005. The SHPO initially suspected marine vessels of significance to be located within the original footprint of the Masonville survey area, which included the proposed project footprint and Masonville Cove. Based on correspondence with MHT, resources identified as potentially endangered by the project alignment were largely limited to offshore shipwrecks and barges.

An underwater archeological survey was conducted in February 2005 to assure that cultural resources would not be encountered during project activities (RCG&A 2005, MES 2005). Five target clusters were identified from individual anomalies found in the Masonville survey area (RCG&A 2005). After further examination, the targets were dismissed as iron debris associated with a moored barge(s) and did not meet criteria identified as significant cultural resources

eligible for inclusion on the National Register of Historic Places. In correspondence dated July 7, 2005, MHT responded that they agree with the findings of the draft "Underwater Archeological Survey" report (MHT 2005). No additional cultural investigation was recommended for any of the targets. Details of the Phase I underwater archeological survey, including decision-making criteria for the individual targets, is included in Section 2.2 (RCG&A 2005).

The cultural investigation for the Masonville portion of the project included archival research, correspondence with pertinent agencies, review of previous archeological reports and a Phase I survey. No evidence has been documented or information recovered that suggests adverse impacts to cultural or historical resources from the proposed project. Coordination with the SHPO and the MHT has been completed. A letter date May 30, 2006 indicates that the MHT "determined that there are no historic properties affected," including Fort McHenry, by the proposed Masonville DMCF.

Viewshed impacts related to Fort McHenry are discussed in Section 5.4.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

Impacts to cultural and historic resources under this alternative would be the same as those described for Alternative 1. Dredging work within the Seagirt dredging area was previously permitted. There are no indications that the additional two feet of depth (from -50 ft plus 2 ft of overdepth to -52 ft plus 2 ft of overdepth) contain any historical or cultural resources.

No Action Alternative

The no action alternative would have no new impacts to cultural resources.

5.3 SOCIOECONOMIC IMPACTS

The methods used to assess or calculate the socioeconomic impacts are detailed in Appendix L.

5.3.1 Land and Water Use

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

The proposed DMCF would fill 130 acres of tidal open water. Of these 130 acres, 123 would be converted to fastland. The existing onshore areas would not have a change in land use; the area would remain industrial. The in-water areas that would be affected by the proposed Masonville DMCF footprint would be shallower, but the area affected does not include the nearby shipping channel (Ferry Bar Channel), so water use is unlikely to be affected. Recreational use of the area is minor and there would still be 400 ft between the shoreline and the shipping channel available for recreational use, although reduced from 1,400 ft. The upland and vegetated wetland areas (11 acres) are currently part of an industrial area and would remain so if this alternative is implemented.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow

The impacts to land and water use as a result of this alternative would include all of those impacts described for Alternative 1. There would also be activity within the Seagirt dredging area. Dredging within this area would be a temporary activity and is only expected to have short-term impacts to the use of the channel. Dredging activities would occur from April through November. It is anticipated that the shipping channel would still be used during the dredging activities.

No Action Alternative

The no action alternative would have no impact on land and water use.

5.3.2 Fishery-related Economic Impacts

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

The existing level of commercial fishing effort in the waters around the proposed Masonville DMCF is low (Section 2.3.1). In addition, the proposed project is not expected to have an adverse impact on commercial stocks of fish or crab. Therefore, economic impacts to commercial fishing associated with the project are not expected. Impacts to commercial fisheries are included in Section 5.1.5.7.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

The impacts to commercial fishing for this alternative are the same as those described for Alternative 1. No commercial fishing occurs within the navigation channels; therefore, no commercial fishing occurs within the Seagirt dredging area.

No Action Alternative

No economic impacts to commercial fisheries are expected with the no action alternative.

5.3.3 Employment and Industry

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

Maryland Statewide Economic Impacts

The Statewide economic impacts from constructing a DMCF at Masonville are summarized in Table 5-20. The total level of spending on the project over 20 years is approximately $179 million. This spending is estimated to create approximately 42 long-term direct jobs, measured as full time equivalents (FTEs), in Maryland, and the project is expected to generate about $8.9 million annually in direct business sales. After “multiplier effects”, or indirect and induced impacts are considered, average annual spending on the project is expected to generate approximately 126 FTE jobs in Maryland and total (direct, indirect, and induced) Statewide

business sales of approximately $16.2 million annually ($324 million total) over the course of the 20-yr life of the project.

Analytical results show that development of a DMCF at Masonville would generate economic impacts that would last up to 20 years from the period of initial site development and construction, through material placement and site finishing. Economic impacts would persist beyond 20 years as a result of long-term commitments to site monitoring and maintenance and subsequent commercial uses of the site.

Baltimore City Economic Impacts

Most of the direct economic impacts of developing and using a DMCF at Masonville would occur in Baltimore City. This is a heavily populated, industrially developed and diversified area, which means that direct spending here would generate more substantial indirect and induced economic impacts than similar levels of spending in less developed parts of the state where more inputs would need to be imported from outside the region and outside the state. The overall regional impacts from developing and using a DMCF at Masonville are summarized in Table 5-21.

The analysis shows that the roughly $179 million in overall direct project spending over 20 years, or approximately $8.9 million in annual spending, is expected to generate approximately 42 direct annual jobs (FTEs) in Baltimore City. Factoring in indirect and induced impacts, approximately 112 total FTE jobs would be generated in the City over the 20-yr life of the project and annual City business sales would increase by approximately $14.9 million (Table 5-21).

Port of Baltimore Economic Impacts

The proposed Masonville DMCF may facilitate Port of Baltimore expansion by providing additional land area along the Patapsco River, which may be used for the development of Port of Baltimore facilities. Additional terminal or port facilities would provide an opportunity for the Port of Baltimore to increase their share of the cargo market.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

The impacts to employment and industry as a result of this alternative would be the same as those described for Alternative 1.

No Action Alternative

If no action is taken, no employment and industry impacts (positive or negative) related to the construction of the proposed action are expected.

Table 5-20. Summary of State Economic Impacts Associated with the Proposed Masonville DMCF

	Initial Study/Permitting/ Design Costs	Site Development	Dredging	Transport	Placement	Long-Term Site Maintenance & Monitoring	Total
I. Direct Impacts							
Total Spending[1]	$2,800,000	$59,307,126	$51,000,000	$14,400,000	$36,000,000	$15,150,000	$178,657,126
Average Annual Spending[2]	$140,000	$2,965,356	$2,550,000	$720,000	$1,800,000	$757,500	$8,932,856
Average Annual Employment[3]	2	18	4	4	2	12	42
II. Economic Impacts[4]							
Impact Category							
Total Jobs (FTEs)[5]	3.4	47.4	26.5	11.2	18.1	19.1	126
Labor Income	$134,120	$2,063,481	$1,578,319	$415,827	$1,112,615	$589,996	$5,894,358
Employee Compensation	$122,822	$1,796,590	$1,322,718	$370,279	$933,800	$522,611	$5,068,820
Proprietors Income	$11,298	$266,891	$255,601	$45,548	$178,815	$67,385	$825,538
Indirect Business Taxes	$8,134	$150,177	$138,598	$45,006	$97,829	$43,322	$483,066
Other Property Type Income	$23,649	$521,463	$367,220	$159,636	$259,217	$163,388	$1,494,573
Value Added	$165,903	$2,735,122	$2,084,137	$620,468	$1,469,661	$796,706	$7,871,997
Business Sales	$264,660	$5,369,669	$4,612,387	$1,387,844	$3,256,274	$1,354,430	$16,245,264

[1] Direct spending by task over the 20 year project life was drawn from current estimates by GBA. These are feasibility level estimates and are subject to change.

[2] Average annual cost per task over 20 year project life (not adjusted for annual fluctuations in spending per task)

[3] Direct employment per task was estimated by UMCES using phone interviews and IMPLAN regional economic modeling results

[4] Average annual economic impacts over 20 year project life
Includes direct, indirect and induced economic impacts of both state and federal spending in Maryland
Direct, indirect and induced impacts of spending were estimated using the IMPLAN regional economic modeling system

[5] These numbers represent the average number of full-time equivalent (FTE) jobs in each task over the 20 year project. The number of man-years associated with each task, therefore, is the value shown multiplied by 20. The jobs associated with some tasks will be primarily in early years and the jobs associated with some tasks will be in later years. (See text)

Table 5-21. Summary of Local Economic Impacts Associated with the Proposed Masonville DMCF

	Initial Study/Permitting/ Design Costs	Site Development	Dredging	Transport	Placement	Long-Term Site Maintenance & Monitoring	Total
I. Direct Impacts[1]							
Total Spending[1]	$2,800,000	$59,307,126	$51,000,000	$14,400,000	$36,000,000	$15,150,000	$178,657,126
Average Annual Spending[2]	$140,000	$2,965,356	$2,550,000	$720,000	$1,800,000	$757,500	$8,932,856
Average Annual Employment[3]	2	18	4	3	3	12	42
II. Economic Impacts[4]							
Impact Category							
Total Jobs (FTEs)[5]	3.4	43.2	22.7	9.7	16	17.4	112
Labor Income	$ 121,173	$ 1,990,621	$ 1,464,321	$ 375,450	$ 1,033,639	$ 552,070	$5,537,274
Employee Compensation	$ 110,794	$ 1,731,253	$ 1,212,198	$ 335,206	$ 855,669	$ 490,544	$4,735,664
Proprietors Income	$ 10,379	$ 259,368	$ 252,124	$ 40,244	$ 177,970	$ 61,526	$801,611
Indirect Business Taxes	$ 7,018	$ 132,235	$ 100,589	$ 41,847	$ 71,004	$ 38,448	$391,141
Other Property Type Income	$ 20,573	$ 479,752	$ 260,632	$ 149,988	$ 183,975	$ 149,531	$1,244,451
Value Added	$ 148,764	$ 2,602,608	$ 1,825,542	$ 567,285	$ 1,288,618	$ 740,049	$7,172,866
Business Sales	$ 245,479	$ 5,072,918	$ 4,135,962	$ 1,273,181	$ 2,919,503	$ 1,262,348	$14,909,391

[1] Direct spending by task over the 20 year project life was drawn from current estimates by GBA. These are feasibility level estimates and are subject to change.

[2] Average annual cost per task over 20 year project life (not adjusted for annual fluctuations in spending per task)

[3] Direct employment per task was estimated by UMCES using phone interviews and IMPLAN regional economic modelling results

[4] Average annual economic impacts over 20 year project life
Includes direct, indirect and induced economic impacts of both state and federal spending in Maryland
Direct, indirect and induced impacts of spending were estimated using the IMPLAN regional economic modelling system

[5] These numbers represent the average number of full-time equivalent (FTE) jobs in each task over the 20 year project. The number of man-years associated with each task, therefore, is the value shown multiplied by 20. The jobs associated with some tasks will be primarily in early years and the jobs associated with some tasks will be in later years. (See text)

5.3.4 Environmental Justice

The USEPA Office of Environmental Justice defines environmental justice as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies." Fair treatment means that no group of people including a racial, ethnic, or socio-economic group should bear a disproportionate share of the adverse environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies (USEPA 1998). Additionally, Maryland's definition, which builds on USEPA's definition, specifically notes that all citizens of the State should expect: 1) to be protected from public health hazards and 2) to have access to the socio-economic resources necessary to address concerns about their livelihood and health (Commission on Environmental Justice & Sustainable Communities 2002).

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

Environmental justice issues arise if a project is expected to generate adverse environmental or economic consequences. The overall results of the air quality and water quality analyses suggest that the action is not likely to generate health risks to people within the area, and the project has the potential to improve water quality in some of the adjacent waters. The economic effects of the project are expected to be largely positive, so adverse economic impacts are not a concern. However, temporary air quality, noise and light effects, visual impacts and recreational boater disruptions during the construction period could potentially be seen as undesirable impacts. For this reason, the presence of any vulnerable racial, ethnic, or socio-economic group in the vicinity of the project was reviewed.

The demographics of the area around the project were evaluated using data from the neighboring census tracts from the 2000 U.S. Census. These are discussed in Section 2.3.2. Variables on race and household income were assessed to determine whether areas near the project contained a disproportionate share of any vulnerable group. Vulnerable groups were defined as:

- African-Americans
- Hispanics (non-white)
- All minorities (all non-white)
- Households below the federal poverty level

In addition, whether the median household and per capita income levels were below the county or state level was evaluated to further inform the evaluation of socio-economic groups.

The Census data suggest that the census tracts near the proposed Masonville DMCF do not contain a disproportionate minority population, but do have higher poverty levels than the City as a whole (Table 5-22). Median household income is 27 percent lower and per capita income is 33 percent lower in the neighboring census tracts than in Baltimore City. Additionally, a greater proportion of households in the neighboring census tracts report Supplemental Security Income and/or Public Assistance Income, and the census tracts have a greater proportion of persons below the poverty level.

Table 5-22. Demographic Statistics for the Area Near the Proposed Masonville DMCF

	Neighboring Census Tracts	Baltimore City	Maryland
Total Population	210,006	651,154	5,296,486
Percent White, not of Hispanic/Latino origin	45.1	31.6	62.1
Percent Black or African American, not of Hispanic/Latino origin	50.9	64	27.9
Percent of Persons of Hispanic or Latino origin	1.8	1.7	4.3
Median household income	$24,729	$34,077	$52,868
Per capita income	$12,715	$18,929	$25,614
Percent of Households With Supplemental Security Income (SSI)	11.7	8.7	3.4
Percent of Households with Public Assistance Income	12.0	7.3	2.4
Percent of Persons with income below poverty level	34.8	22.9	8.5

Source: U.S. Census 2000

Although a disproportionate number of low income persons and households exist in the area surrounding the proposed Masonville DMCF, there is scant evidence for unfair treatment or lack of opportunity for community involvement during the Harbor site selection and evaluation process. For example, from March to October 2003, an ad hoc committee, known as the Harbor Team, was convened by the MPA. The committee was made up of representatives from local governments, business interests, community groups, and environmental organizations, and considered many options for placement of Harbor dredged material. One of the recommendations that came out of that process was constructing a DMCF at Masonville along with a "community enhancement project" in the adjacent Masonville Cove (Harbor Team 2003). A number of potential environmental restoration and enhancement projects are being considered as compensatory mitigation as the plans for the proposed Masonville DMCF develop (Chapter 6). Therefore, through citizen participation and community enhancement, disproportionate impacts to low-income persons and households associated with the proposed Masonville DMCF were avoided or mitigated.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow

The environmental justice impacts described for Alternative 1 are the same as environmental justice impacts for this alternative.

No Action Alternative

The no action alternative would not result in environmental justice impacts.

5.3.5 Safety to Children

"A growing body of scientific knowledge demonstrates that children may suffer disproportionately from environmental health risks and safety risks… Therefore, …each Federal

agency: (a) shall make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children; and (b) shall ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks" (Executive Order 13045, April 21, 1997).

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

No health or safety risks to children associated with the project have been identified. The types of activities associated with construction of the proposed Masonville DMCF would not generate chemical constituents that may pose health risks to children. Additionally, as this project is adjacent to an existing industrial facility, safety to children should not be an issue because it is presumed that children would not have access. All existing, working Port terminals are completely surrounded by chain link fencing with barbed wire as described in Section 2.3.5.

As part of the project, a variety of community and environmental enhancements have been proposed for Masonville Cove. Currently, conditions in Masonville Cove are unsafe for children. Large amounts of debris alongshore and in the water make this area treacherous. Additionally, environmental contaminants may be present, but their levels are currently unknown and testing is ongoing. The intent of the enhancement projects is to improve these conditions for the health and safety of the community. Precautions would be taken at Masonville Cove to minimize the risk of potential hazardous conditions presented by the water to users. At a minimum, the same safety measures would be implemented at Masonville Cove that are taken at State supervised parks and reservoirs where swimming is prohibited.

At the State Parks, the Department of Natural Resources follows the guidelines of the U.S. Lifesaving Association (USLA 2005). Specifically, Maryland DNR prepares a "beach management plan" for designated locations, including water bodies where swimming might appear attractive but is prohibited for health or safety reasons (attractive nuisances), for example, the fringe marsh area in Masonville Cove. The standard management practices to safeguard the public are signage, education, and surveillance conducted either by personnel or by remote cameras. At Masonville Cove, it would be important to convey the reasons why swimming is prohibited through signage and other means.

Currently, environmental education programs by the National Aquarium in Baltimore and the Living Classrooms Foundation are planned for the Cove (Chapter 6). Each of these organizations has standard operating procedures to ensure the safety of participants. It is intended that these operating procedures would be implemented for the activities and programs at Masonville Cove.

In the event that standards are not met Cove-wide, access would be allowed only in those areas deemed safe. Therefore, no additional health and safety risks to children are anticipated.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

Child health and safety impacts for this alternative are the same as those described for Alternative 1. No children have access to the Seagirt borrow area since it is out in the open water in a shipping channel that is surrounded by industrial facilities.

No Action Alternative

The no action alternative would not impact safety to children.

5.4 AESTHETICS AND RECREATION

The methods used to assess the impacts to aesthetics and recreation are described in Appendix L.

5.4.1 Aesthetics, Noise, and Light

Aesthetics, noise, and light impacts are discussed in the following sections. Odor impacts should not affect nearby residences, Fort McHenry, or the Harbor Hospital. An odor study done prior to the construction of a dredged material containment site at Canton/Seagirt found that the worst-case odor emissions were confined within approximately 760 yards of the site emitting the odor (Ecological Analysts 1981). The closest residences would be approximately 1,400 yards from the proposed Masonville DMCF, which is almost double this distance. No adverse impacts as a result of odor emitted by the proposed DMCF are expected to affect residences. Fort McHenry is 1,050 yards from the proposed DMCF and odor would not be expected to affect recreators at Fort McHenry.

5.4.1.1 Aesthetics

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

Geographic Information System (GIS) Analysis - *Views were assessed from several points in the landscape that were chosen to represent concentrations of viewers most affected by the proposed project (Figure 5-26). Fort McHenry was selected as a viewpoint because of its close* proximity to the proposed project and because it draws tourists who would be considered highly sensitive to views. The Harbor Hospital was also chosen as a viewpoint because in addition to being in view of the proposed site, it is surrounded by City-owned parks that provide public access to the water, such as Middle Branch, Cherry Hill, Ferry Bar, and Reed Bird. To assess potential aesthetic impacts to water users, a viewpoint from the shipping channel at the Fort McHenry Angle was also chosen. For each viewpoint, the changes in foreground, middleground, and long water views associated with the proposed project were evaluated to weight the impact of visual changes.

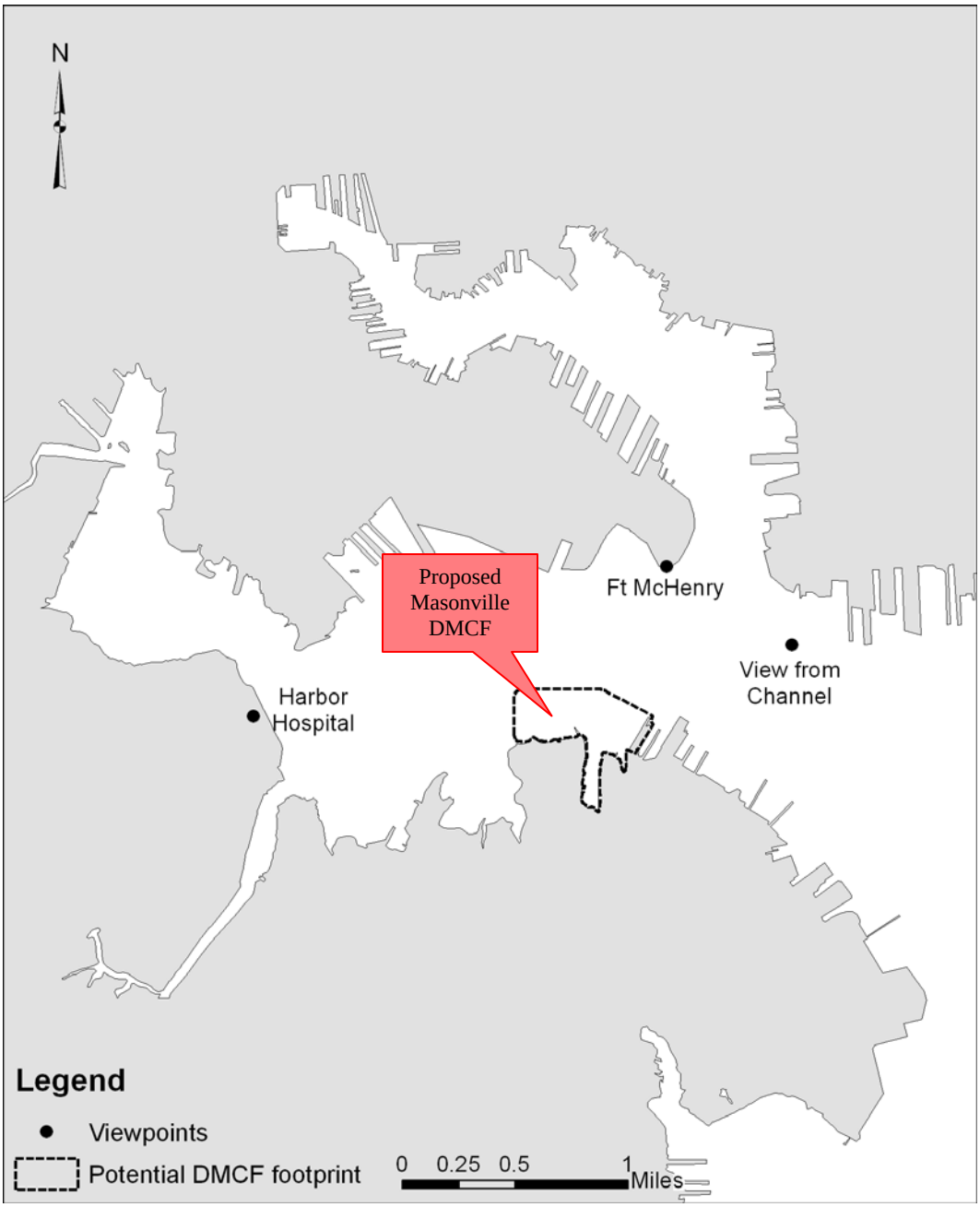


Figure 5-26. Viewpoints Used in Aesthetic Analysis

A variety of landscape features was compared for the proposed project and the adjacent shoreline. In this section, analyses of the variables that were quantified to judge spatial dominance of the project are presented. Other variables examined in the GIS are discussed in the summary of impacts below. The variables that best captured the changes in views in this waterfront environment were measures of the proportion of middleground view that was occupied by the project.

Initially, the total field of view from a particular point was characterized for each distance zone (foreground, middleground, or long water view) by measuring the angular portion of the field of view at a specified distance from the viewer. For example, the total view for the middleground represents the angle of the view over which an observer can see at least ½ mile and up to 4 miles. Next, the proportion of the field of view that the proposed project would occupy was measured for each distance zone. Using three different distances allows the effect of changes in length of view and changes in view character to be analyzed and weighted.

The proposed Masonville DMCF does not fall into the foreground view of the Harbor Hospital or channel viewpoints, but instead falls 0.6 miles, or just outside the foreground view, from Fort McHenry. The existing Masonville shoreline lies about 0.8 miles from Fort McHenry; thus, the proposed project would technically fall outside the foreground view, but it would appear markedly closer than the existing shoreline and would occupy a considerable portion of the view from this vantage point (see middleground analysis below). Because the foreground view from this viewpoint comes very close to being affected by the construction of the proposed project, a 3-D simulation of the view from Fort McHenry to the site before and after project construction was created (Figure 5-27). Additionally, given concerns about the sensitivity of the view from Harbor Hospital, a simulation of the view from that site before and after construction was also created (Figure 5-28).

For the middleground (1/2 – 4 miles), the view was assessed in terms of the total width of view (measured as an angle), and the width of view occupied by the proposed project (Figures 5-27 and 5-28) to assess potential visual effects during or after construction. The analysis shows that the middleground view at Fort McHenry is more exposed to the proposed project than the view from the channel or Harbor Hospital (Table 5-23). The project would occupy approximately 19 percent of the middleground view at Fort McHenry, compared to approximately 13 percent at the viewpoint in the Channel and 10 percent at Harbor Hospital.

The analysis indicates that during construction, a relatively small proportion of most views by boaters and shoreline users would consist of construction activities. At Fort McHenry, one-fifth of the middle-ground view would be dominated by activities on-site once the full perimeter of the project is constructed.

Whether or not viewers at Fort McHenry would find the view degraded during construction is not entirely known. Some viewers may consider construction activities visually unappealing, but others would be interested to view the construction. The activities would not represent a strong visual contrast with existing land use, although exposed dirt would contrast with the current vegetated and weathered shoreline. Once completed, the project would include land cover similar to existing uses and thus is not expected to represent a major impact on middleground views (Figures 5-29 and 5-30).

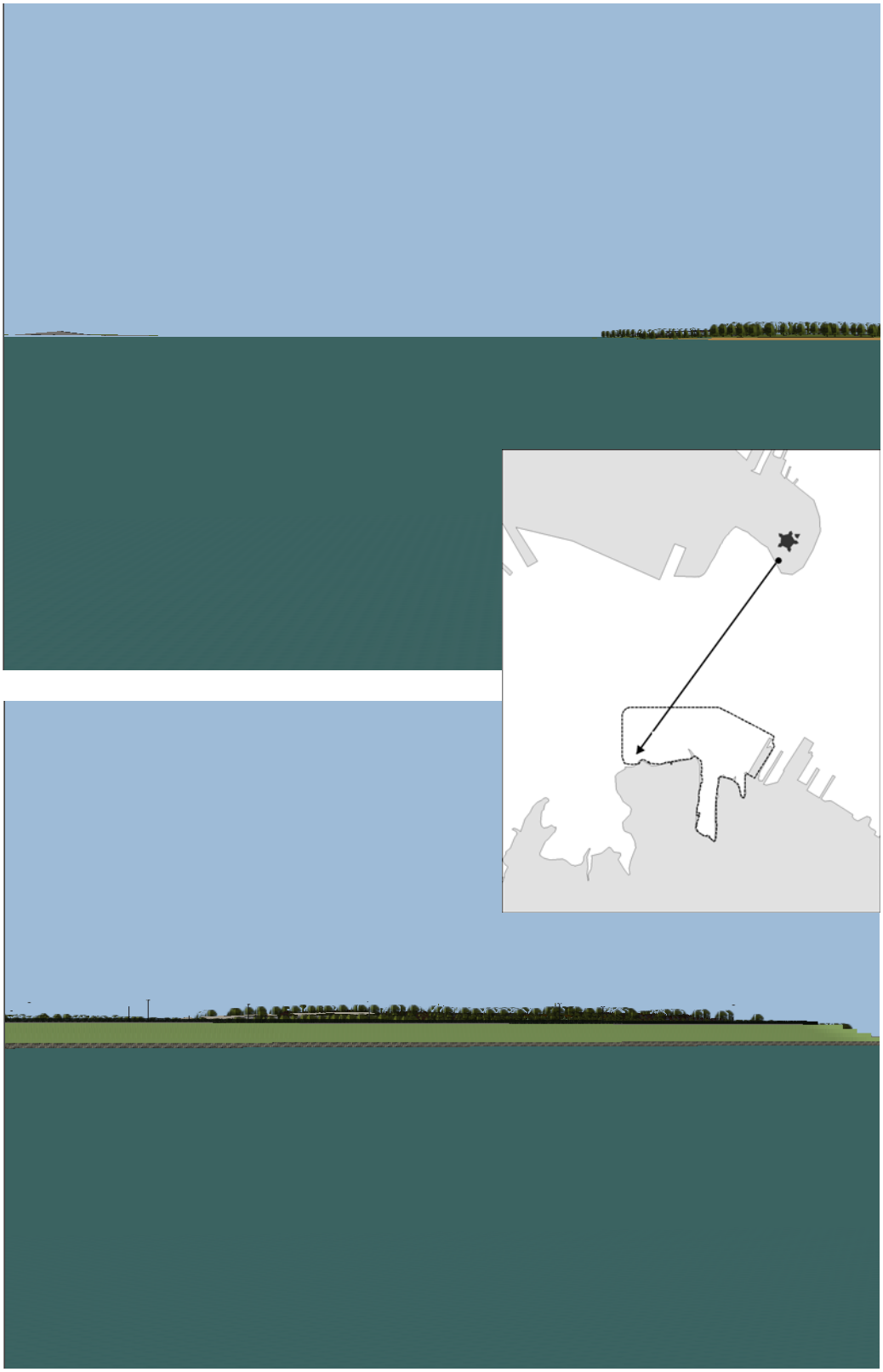


Figure 5-27. Simulated View From Fort McHenry Before (top) and After (bottom) Project Construction.

Inset map shows location of observer at Fort McHenry and direction of view.

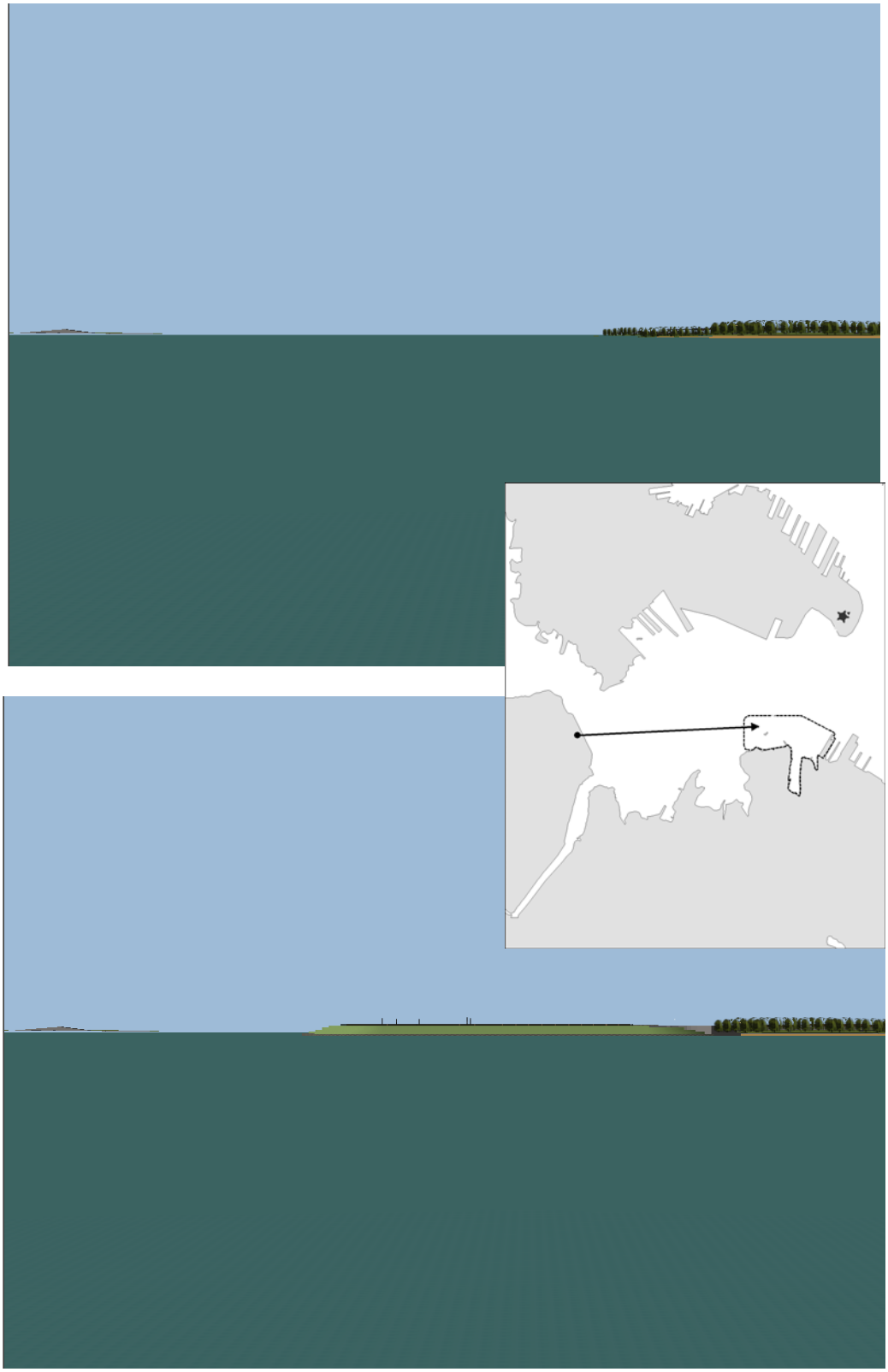


Figure 5-28. Simulated View From Harbor Hospital Before (top) and After (bottom) Project Construction.
Inset map shows location of observer at Harbor Hospital and direction of view.

Table 5-23. Changes to Middleground Views Associated with Proposed Masonville DMCF

Description of View	Fort McHenry	Harbor Hospital	View from channel
Distance to proposed project	0.6 miles	1.1 miles	0.7 miles
Total middleground view	236º	125º	251º
DMCF view	45º (19%)	12º (10%)	32º (13%)

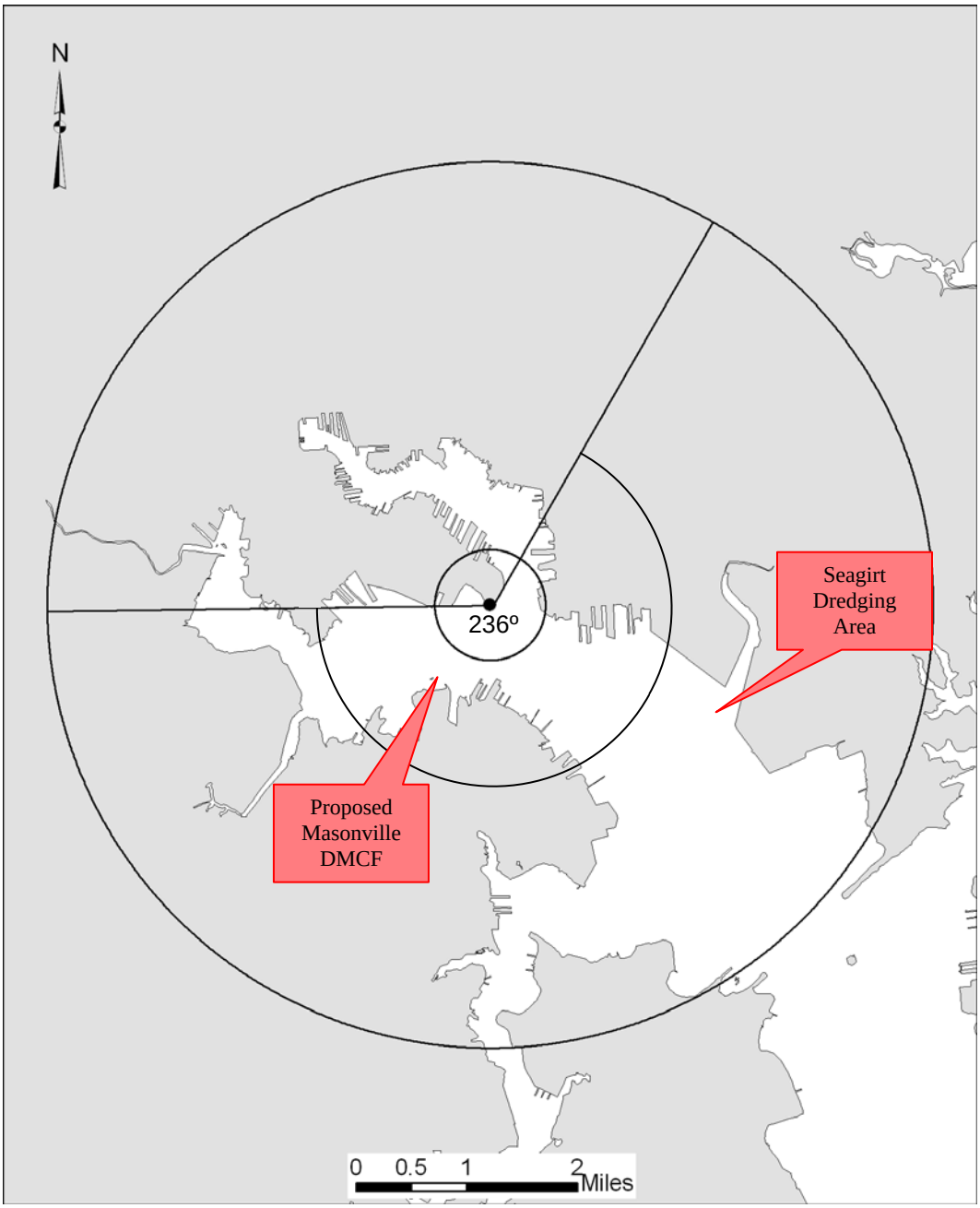


Figure 5-29. Total Middleground View from Fort McHenry Viewpoint

Figure 5-30. Portion of Middleground View Occupied by Proposed Masonville DMCF

The proposed Masonville DMCF does not affect the long water view (greater than 6 miles) from any viewpoint. Tourists at Fort McHenry and boaters in the main stem of the Patapsco River enjoy a long water view to the southeast, but the proposed site does not fall within this view. Looking due east from Harbor Hospital, the water view is less than 4 miles long. The Patapsco River is less than one mile wide in this area, and therefore, long, unobstructed views are not available here.

Spatial Dominance - From the results of the GIS analysis, it is evident that the proposed project has the potential to be a substantial element in the landscape for some viewpoints. From most

viewpoints, the project is not likely to adversely affect views because it is anticipated that the project, once completed, would blend into the existing landscape.

The proposed project would be similar in appearance to the existing port terminal from the most common viewpoints. From nearby, the project would be a large feature in the landscape that would be noticeable during construction, but would not be inconsistent with the existing appearance of the area. From the north shore of the Middle Branch, represented by the Fort McHenry viewpoint, views would be considerably changed by the project because it would fall close to the foreground and would occupy nearly 20 percent of the middleground view.

As currently envisioned, the proposed DMCF would extend approximately 1,200 ft into the Patapsco River from the existing shoreline. The river is approximately 4,000 ft wide in this area. While the height of the DMCF would be consistent with existing land, for viewers west of the project, represented by the Harbor Hospital viewpoint, the proposed DMCF would occupy a substantial portion of the middleground water view.

For recreational boaters venturing west from the Fort McHenry Angle into the Middle Branch, the proposed project would be a dominant feature of the foreground and middleground view. However, the finished appearance of the project would be in keeping with existing conditions in terms of view and would not affect long water-views that are generally the most highly-valued views.

Scale Contrast - The scale of the proposed project is consistent with existing port facilities in the Middle Branch of the Patapsco River. The height of the proposed Masonville DMCF would be consistent with the existing site. However, the project's elevation is expected to be considerably higher than the natural shoreline in the adjacent Masonville Cove and have steeper slopes. Existing slopes at Masonville are around 15 percent, but the constructed project may have slopes closer to 30 percent in some areas during construction. The dikes on the north and northeast side of the proposed project would be about two-tenths of a mile closer to Fort McHenry than what currently exists at Masonville, and given the expected slope differences, would represent a moderate scale contrast from Fort McHenry. Overall, the scale contrast of the proposed Masonville DMCF would be minimal for most viewers given the existing land use and port facilities in the area, but visual changes would be apparent at Fort McHenry and from the Cove.

Compatibility - Over the long-term, the project would be generally harmonious with the setting since it is an extension of an existing terminal. The projected use is consistent with the majority of the existing industrial uses in the area, and consistent with existing shoreline use at the site. The existing hardened shoreline of the project area is vegetated with grass, shrubs, and trees, creating a relatively smooth transition between the Cove and the existing shoreline. Initially, the new dikes would be barren and therefore less consistent with the natural shore of the Cove until similar vegetation becomes established. During the material inflow phase, the dikes would likely be planted with grasses or shrubs, and once the proposed Masonville DMCF is closed, there is no current plan to plant the dikes, but vegetation would likely become established on its own. Debris removed as part of the project is likely to enhance the eventual compatibility of the new site with the natural areas and enhance the quality of visual aesthetics within the Cove.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

The impacts to aesthetics for this alternative would be the same as those described for Alternative 1.

No Action Alternative

Impacts to aesthetics associated with the no action alternative are not expected.

5.4.1.2 Noise

Regulatory Setting

The Baltimore City Revised Code bases its noise standards on zoning. The table below describes noise limits for various types of zoning (Table 5-24). In addition to maximum noise levels, the Baltimore City Revised Code stipulates that between the hours of 9 PM and 7 AM, the maximum permissible sound from any use that borders on a residential zone must be reduced by 5 A-Weighted Decibel (dBA). The Code defines a noise as "any steady-state or impulse sound that occurs on either a continuous or intermittent basis."

Table 5-24. Maximum Permissible Noise Levels for Different Types of Zoning

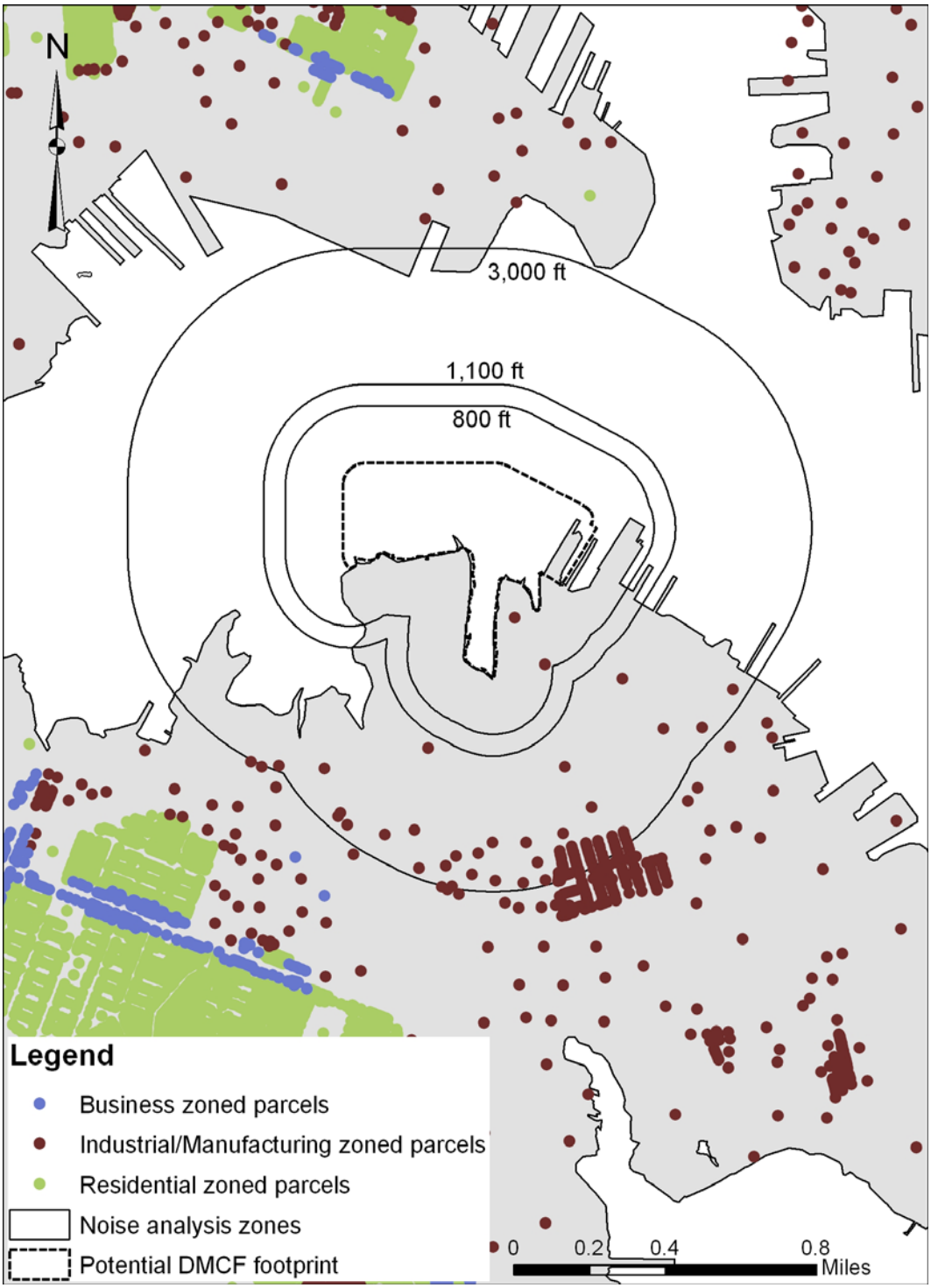
	Maximum permissible noise at property line when boundary shared with:		
Zone	**Manufacturing Zone**	**Commercial Zone**	**Residential Zone**
Manufacturing[1]	75 dBA	70 dBA	70 dBA
Commercial	64 dBA	61 dBA	58 dBA
Residential	61 dBA	58 dBA	55 dBA

Source: Baltimore City Revised Code 2005
[1]Maximum noise limits are defined in the Health section of the Baltimore City Revised Code which refers to limits set for "Manufacturing zones". The Zoning section of the Code refers to these zones as "Industrial districts". These terms are used interchangeably below.

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

Sustained Daytime Noise - Sustained noise levels generated by typical daily operations associated with the proposed Masonville DMCF are expected to peak at around 94 dBA at 50 ft. This sound level represents several pieces of heavy equipment, such as bulldozers and compactors, working simultaneously in close proximity to one another. For any given observer, the sustained, elevated sound level experienced would depend on distance from the noise-generating machinery, atmospheric conditions, and proximity of multiple pieces of machinery to each other. Factoring attenuation with distance, molecular absorption, and analogous excess attenuation, a 94 dBA sound is estimated to decrease to 70 dBA within about 800 ft of the noise source when traveling over land. The entire area within this 800 ft zone is currently zoned Industrial/Manufacturing (Figure 5-31 and Table 5-25).

Therefore, under modeled conditions, sustained noise levels would be within acceptable limits for sensitive receptors. A 94 dBA sustained sound generated by the project would be expected to



Note: parcel location dots represent the centric of the land parcel, not necessarily the location of the house or building within the parcel. Zoning maps were not readily available, so parcel zoning data were used as a proxy to create this figure. Source data: Maryland Department of Planning.

Figure 5-31. Zones Used For Noise Analysis

Table 5-25. Summary of Noise Analysis

Noise type	Estimated peak noise level	Distance to industrial/ residential boundary attenuation level	Estimated level at sensitive receptor:		
			Nearest residence	Harbor Hospital	Ft McHenry
Sustained/daytime	94 dBA	800 ft	49 dBA	50 dBA	59 dBA
Periodic	110 dBA	3,000 ft	65 dBA	66 dBA	**75 dBA**
Nighttime	93 dBA	1,100 ft	47 dBA	48 dBA	57 dBA

Note: boldface noise levels exceed suggested maximum levels

attenuate to about 49 dBA before it reaches the nearest residence. A 94 dBA sustained sound from the proposed site is estimated to decrease to about 50 dBA at Harbor Hospital and 59 dBA at Fort McHenry.

Periodic Noise **-** Various construction activities associated with the proposed Masonville DMCF would produce loud, periodic sounds. Periodic sounds may be more noticeable to residents and visitors than sustained sounds because they are not consistent with steady, uniform background noise. Back-up beepers create loud, relatively high-pitched periodic sounds, and the associated sound level can vary from 85 to 110 dBA at 50 ft. The placement of rock during dike construction would also generate sound levels in this range, although these sounds would be lower pitched. A sound at the 110 dBA level would be expected to attenuate over land to daytime manufacturing/residential zone boundary levels within about 3,000 ft of the source. The entire area within this 3,000 foot zone is zoned Industrial/Manufacturing (Figure 5-31 and Table 5-25).

The analysis indicates that periodic sounds may exceed acceptable noise levels at some sensitive receptors. Periodic sounds would be expected to attenuate to less than 65 dBA at the nearest residences, 4,400 ft away. At Harbor Hospital, the loudest project-related periodic sounds would be about 66 dBA. Visitors along the southern shore of Fort McHenry may be subjected to periodic sounds of up to 75 dBA. While sounds reaching Fort McHenry are expected to be slightly above the 70 dBA suggested maximum ambient noise level for parks, as set by the state of California, noises of this level are not inconsistent with an urban, industrial setting. California standards were used because no standards for the State of Maryland were available. Appendix L contains additional detail on the methodology used and the rationale for this.

Nighttime Noise **-** Some sound-generating phases of project construction would occur day and night including pre-dredging, dike construction, and material inflow. Activities associated with inflow would persist on a seasonal basis for the duration of the project development. The area is accessible from land without using residential roads, so it not expected that trucks would pass through residential areas at night. Also, much of the equipment traffic to and from the site during construction and inflow would be from the water.

The duration of noticeable nighttime noise increase would depend on the actual distance between equipment and receptors, duration of activities in areas proximate to the proposed site, and proximity of multiple pieces of noise-generating equipment to each other. Assuming equipment used for inflow would include a hydraulic unloader, trackhoe, bulldozer, and a few dump trucks, the maximum sound levels associated with these activities would be expected to be in the range

of 93 dBA at 50 ft. That sound level would typically attenuate over land to an acceptable nighttime manufacturing/residential zone boundary level of 65 dBA within about 1,100 ft. The area within this 1,100 ft zone is zoned Industrial/Manufacturing (Figure 5-31 and Table 5-25).

Nighttime noise is not expected to be disruptive at sensitive receptors. A 93 dBA sound originating from the proposed site would attenuate to about 47 dBA at the nearest residences. At the Harbor Hospital, nighttime noise is expected to be about 48 dBA, consistent with other nighttime noises in the area. Because Fort McHenry is closed to visitors at night, nighttime noise is not of great concern. However, a 93 dBA sound from the proposed site would attenuate to about 57 dBA at Fort McHenry, and therefore would typically be within acceptable limits.

Conclusions - Generally, noise impacts associated with the proposed Masonville DMCF are not expected to interfere with residential or recreational activities. Construction activities may begin during summer of 2007, and operations may persist for 20 years or more; however, the noise generated by the project is not expected to be inconsistent with the site's industrial setting. As activities shift location during project construction, sound levels associated with sustained activities, such as the operation of vehicles and pumping of dredged material, would affect different areas and therefore would not affect the same group over the entire construction period. In addition to potential noise impacts on shore, recreational boaters traveling close to the site would be exposed to elevated sound levels.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

The noise impacts for this alternative would include all of the impacts described for Alternative 1. The Seagirt dredging area is located in an industrial area surrounded by marine terminals and shipping channels. The closest noise receptor to the Seagirt dredging area is a residential community, St. Helena, located along the Baltimore City-Baltimore County line approximately 0.75 miles from the Seagirt dredging area. The largest zone for noise considerations for the construction of the proposed Masonville DMCF covers an area 3,000 ft (approximately 0.56 miles) from the project site (Figure 5-32). This area was used to assess periodic noise. This neighborhood does not fall within this range and is also outside of the nighttime noise zone which is within 1,100 ft (approximately 0.21 miles) from the site (Figure 5-32). Therefore, due to the distance of noise receptors to the Seagirt dredging area and dredging activities, no noise is anticipated to affect any residential areas or sites accessible to the public, such as Fort McHenry.

No Action Alternative

Noise impacts associated with the no action alternative are not expected.

5.4.1.3 Light

Regulatory Setting

The Baltimore City Code does not set any specific limits on lighting. The Off-Street Parking Regulations stipulate that lighting near residences must not reflect or direct rays of light into any adjacent lot or residence (Baltimore City Code Zoning Regulations Section 10-309).

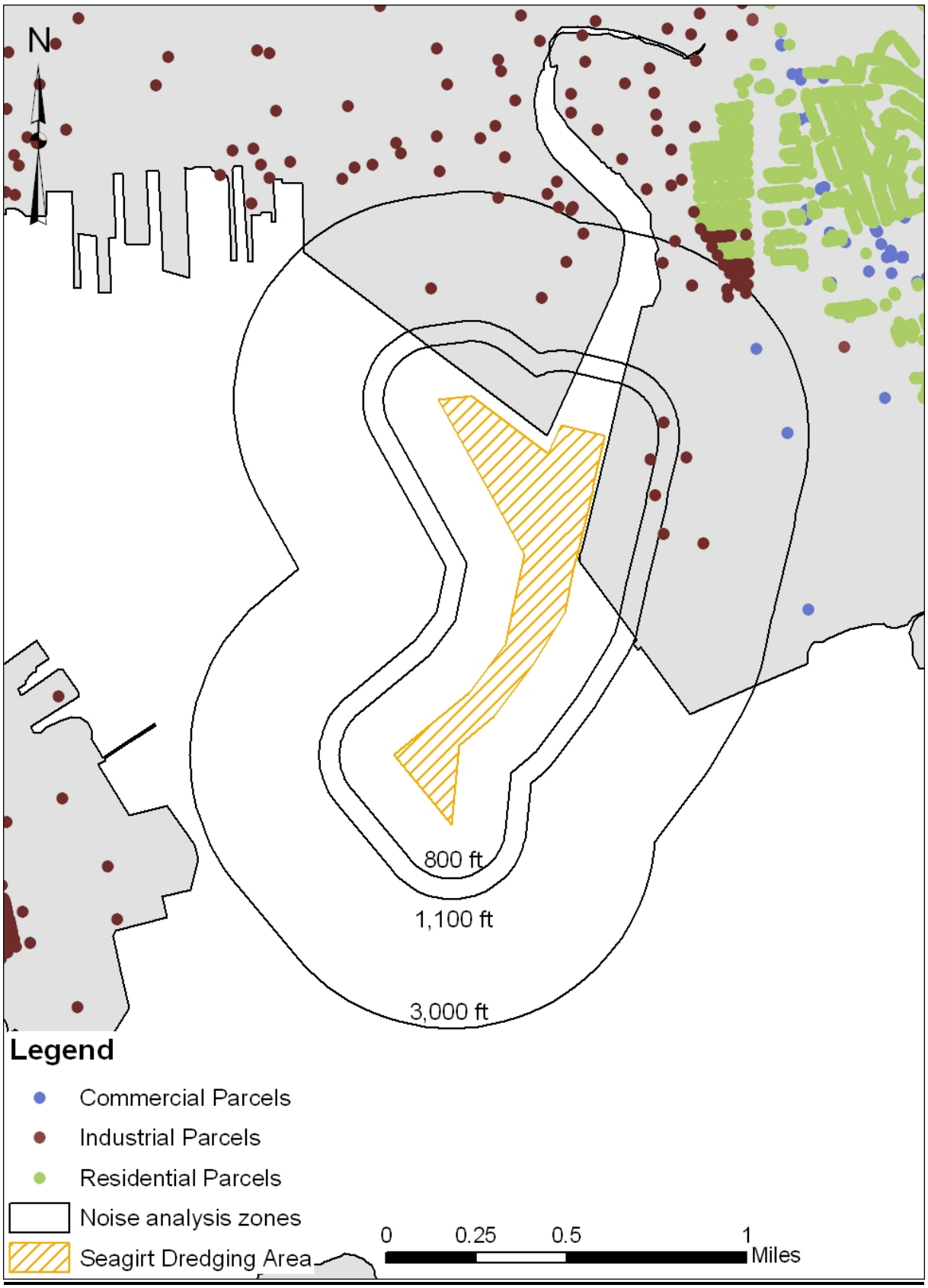


Figure 5-32. Zones Used for Seagirt Noise Analysis.

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

With project conditions – The duration of nighttime activities varies by project phase. Pre-dredging and dike construction are nearly continuous over the first year and a half of the project, while inflow activities occur seasonally for the duration of the project after dike construction is complete. Therefore, potential light impacts associated with these phases of activity would be temporary and seasonal, respectively. The inflow activities use the highest power bulbs of any project activity and these lights may be raised as high as roughly 50 ft above sea level and have the potential to be seen over 10 miles away by an observer at 15 ft above sea level, under very clear atmospheric conditions. However, these operations use lights that are mobile and shielded, so glare may reach areas along the Patapsco River, such as the Harbor Hospital, depending on the direction that the source is facing, but this would be a short-term effect.

Potential impacts during construction and inflow - During project construction and inflow, sensitive receptors along the Patapsco waterfront, such as Harbor Hospital, could experience increased light depending on the orientation and shielding of lights. Structures, such as docks, piers, breakwaters, and channels, are required to be lit temporarily during construction either by floodlight and/or by federally maintained aids to navigation. These lights would be noticeable at the Hospital but would be generally in keeping with existing lights in the Patapsco.

Conclusions - In summary, existing light levels at this urban site are sufficiently high that the increase in light from the proposed project should not be noticeable from most locations. However, the intensity and direction of light plants during construction and inflow would determine whether light impacts may be experienced for periods at individual locations. The main area potentially affected by this increased lighting would be the Harbor Hospital, but impacts are expected to be of limited duration. Therefore, overall long-term lighting impacts are expected to be minimal.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow

The impacts to light for this alternative would include all of the impacts described for Alternative 1. Dredging activities within the Seagirt dredging area are not expected to have an adverse impact to light since the Seagirt dredging area is within a navigation channel and is surrounded by port facilities. No additional impacts to light are anticipated from use of the Seagirt borrow material.

No Action Alternative

The no action alternative would not result in new light impacts.

5.4.2 Recreation

5.4.2.1 Recreational Boating

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

Based upon input from the local community, the current recreational boat use of the area around the proposed Masonville DMCF is presumed to be relatively low. The waters that would be filled by the project have depths from 0 to 15 ft indicating their potential use for small craft, but submerged debris may make navigation difficult. Any recreational boaters who currently use the water within the proposed footprint would be forced to travel closer to the shipping channel after construction of the proposed Masonville DMCF. The distance from shoreline to the Ferry Bar shipping channel would be reduced from about 1,500 ft to about 400 ft. There are currently low numbers of recreational boaters in this area so the reduced distance between the shoreline and the shipping channels is not anticipated to have an adverse affect on recreational boating. Those few recreational boats using the area should be able to safely navigate in the 400 ft between the shoreline and the shipping channel.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow Material

The impacts to recreational boating for this alternative include all of the impacts described for Alternative 1. Because the Seagirt dredging area lies within a navigation channel, the level of recreational boating is likely low, and therefore impacts are likely to be minimal. No additional impacts to recreational boating would result from use of the Seagirt borrow material.

No Action Alternative

The no action alternative would not affect recreational boating.

5.4.2.2 Recreational Fishing

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

Adverse impacts to recreational fishing associated with the proposed Masonville DMCF are not expected and some minor improvements are possible. The data suggest that the level of recreational fishing from boats in this area is relatively low. Fishing from shore, such as that at Middle Branch Park, would not be affected by construction of the proposed project. Please refer back to section 2.4.2 for more information on current recreation at the site. However, any recreational fishermen fishing from boats in the Middle Branch have the potential to be displaced by the construction of the proposed Masonville DMCF. These impacts would be minor because alternative nearby fishing locations are available.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

The impacts to recreational fishing for this alternative include all of the impacts described for Alternative 1. No recreational fishing occurs within the Seagirt dredging area since it lies within

a navigation channel. No additional impacts to recreational fishing would result from use of the Seagirt borrow material.

No Action Alternative

The no action alternative would have no new impacts to recreation fishing.

5.4.2.3 Wildlife Viewing

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

Construction of the proposed Masonville DMCF is not expected to impact wildlife viewing. Current use of Masonville Cove by wintering waterfowl and recreational birders was discussed in the Other Recreational Activities section of the Existing Conditions chapter. Wintering waterfowl are found inside the Cove until it ices over (Ringler 2005); therefore construction of the proposed DMCF is not expected to spatially overlap with the area used by the over wintering birds.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

The impacts to wildlife viewing for this alternative include all of the impacts described for Alternative 1. No wildlife viewing occurs within the Seagirt dredging area since it lies within a navigation channel surrounded by marine terminals and industrial areas. No additional impacts to wildlife viewing would result from the use of the Seagirt borrow material.

No Action Alternative

The no action alternative would not result in impacts to wildlife viewing.

5.4.2.4 Other Uses

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

The proposed Masonville DMCF is not expected to affect other recreational uses in the area.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow

This alternative is not expected to affect other recreational uses within the proposed Masonville DMCF project area or Seagirt dredging area.

No Action Alternative

The no action alternative would not have impacts on other recreational uses of the Masonville area.

5.5 ENVIRONMENTAL BENEFITS

Alternative 1 - Proposed Masonville DMCF with Borrow Scenario C

The beneficial impacts of the proposed Masonville DMCF have been detailed in individual resource sections and are both direct and indirect. Direct impacts to the project area would be realized by the remediation of the derelict vessels and burial and removal of contaminated sediments.

The remediation of vessels and subsequent burial of sediments would significantly reduce the non-point source toxics burden in this part of the Patapsco River, making legacy sediment contaminants such as metals, including mercury, and PCBs less available to the aquatic environment. This would have a beneficial effect on the benthic community and availability of food resources for fish by eliminating a source of contaminants from the food chain. Indirectly, remediation and clean up within the water also makes 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 currently has MDE consumption advisories for several species primarily due to PCB and pesticide tissue accumulations. Removing a source of PCB contamination from the Patapsco River has the potential to improve the tissue contamination levels of harvestable resources near the site and secondarily benefit anything consuming them.

The Masonville Cove cleanup and improvements may improve both the ecological system as well as the adjacent community. Details of the mitigation impacts are included in Chapter 6.

Short-term and long-term beneficial impacts associated with the construction and operation of the proposed Masonville DMCF include increased spending that would create jobs both locally and at the State level. The jobs created would benefit employment rates, income, and revenues. The additional beneficial impact of the project would be increased placement capacity to meet the Baltimore Harbor dredged material placement needs. There would be direct benefits to navigation safety through channel dredging and to employment through increased jobs with the MPA. Secondary benefits are realized in induced jobs and continued Port expansion and cargo market share.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

The environmental benefits of this alternative would include all of the environmental benefits from Alternative 1. There would be the additional benefit of minimizing the amount of material from the Seagirt dredging area that is placed at the HMI DMCF. This leaves additional capacity available for other projects. Regional emissions would also be minimized by decreasing the distance that some of the material dredged from the Seagirt dredging area would be transported for placement. These decreases in regional emissions would include approximately 100 tons of NO_x.

No Action Alternative

The primary benefit of the no action alternative would be no loss of tidal open water habitat, Patapsco River bottom habitat, or shallow water habitat within the footprint of the alignment. The remaining habitat conditions of the tidal open water adjacent to Masonville would also remain. The 1.7 mcy of overburden removed from the Masonville site under the proposed Masonville DMCF alternative would remain in place and would not be placed at the HMI DMCF. This capacity at the HMI DCMF would be available for other dredging placement projects through December 31, 2009.

5.6 IRRETRIEVABLE USES OF RESOURCES

Alternative 1 – Proposed Masonville DMCF with Borrow Scenario C

Large construction projects invariably consume resources that become unavailable for other uses. Table 5-26 depicts the total acres affected and total acres lost from the proposed Masonville DMCF for each type of habitat. The greatest irretrievable resource used would be the conversion of 123 acres of tidal open water within the Baltimore Harbor to fastland and loss of 123 acres of Patapsco River bottom and conversion of 6 acres to manmade bottom at shallower depths.

Table 5-26. Summary of Habitat Types Affected By the Proposed Masonville DMCF

Type of Habitat	Total Acres Affected	Total Acres Lost
River Bottom Habitat	127 acres	123 acres*
Open Water Habitat	127 acres	127 acres*
Shallow Water Habitat	10 acres	10 acres
Essential Fish Habitat	127 acres	127 acres
Unauthorized Dry Dock (included as affected open water habitat)	3 acres	NA
Terrestrial Upland Habitat	10 acres	10 acres
Vegetated Wetland Habitat	1 acre	1 acre

**Note: difference between affected and lost acres is due to conversion of 6 acres of existing river bottom to shallower water with a manmade substrate (the containment structure).*

Dike construction would also require excavated resources, which would irretrievably used in the construction of this project. The dikes would predominantly be sand with rock armor. The sand dike would require 1.9 mcy of sand/clay; the majority of the material would be excavated from the bed of the Patapsco River with augmenting from some off site sources, as necessary. In order to reach this resource, 1.1 mcy of overburden (silt) would be stripped off the borrow source and placed in the HMI DMCF. An additional 0.6 mcy of overburden would be removed from the proposed dike construction area. This stripping (e.g., pre-dredging) would consume approximately 12 percent of the remaining capacity within the HMI DMCF. The dike armoring would require 48,000 tons of 250 lb stone that would need to be excavated and shipped from inland quarries. An additional 152,000 cy of construction material (sand) would need to be excavated from an off-site, licensed upland source for cofferdam construction. There would be

24,000 tons of stone dike fill for the Wet Basin would also be excavated from an off-site licensed upland source (M&N 2005b).

$288 million dollars would be spent on this project. Though this is not a natural resource, this constitutes an irretrievable use of monetary resources.

The only other irretrievable resource would be the fuel consumed by vessels and construction equipment during construction and operation.

Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)

The irretrievable uses of resources under this alternative would include all of those irretrievable uses described for Alternative 1. Additionally, the use of Seagirt dredged material would result in a lessening of the need for common borrow for cofferdam filling. Therefore approximately 63,000 cy of material that would have been irretrievably lost from upland mining sources would no longer be received for the Masonville project.

An additional 139,000 cy of material would be dredged from the Seagirt dredging area under this alternative than would be under Alternative 1 and the No Action Alternative. This additional 139,000 cy of material would be used during the dike construction of the proposed Masonville DMCF and would not be available for any other uses. Another 399,000 cy of material from the Seagirt dredging area would be irretrievably used during dike construction at the proposed Masonville DMCF. This material would be dredged and removed from the dredging area without the proposed Masonville DMCF project.

Approximately 2.5 mcy of unsuitable construction material would be removed from the Seagirt dredging area in order to access the suitable construction material described in the preceding paragraph. This material would be placed at the HMI DMCF, which would be capped before 2010, making this material unavailable for any other potential future uses. This material would also be placed at the HMI DMCF without the proposed Masonville DMCF project.

No Action Alternative

There would be no irretrievable uses of resources under the no action alternative.

5.7 SUMMARY OF IMPACTS

Table 5-27 summarizes the impacts that would result from each alternative. This table does not include cumulative impacts, which are discussed in Section 5.8.

Table 5-27. Summary of Impacts to Environmental Resources

Environmental Resources	No Action Alternative	Alternative 1 – Proposed Masonville DMCF with Borrow Scenario C	Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)
Hydrology/Hydrodynamics	• No change to local hydrodynamics • No change in residence time in the Middle Branch	• No significant impacts to water levels or current velocities. • No adverse impacts to flooding are expected. • Long-term impact - residence time in Masonville Cove would increase, potentially increasing sedimentation rate slightly.	• Would be the same as those described for Alternative 1.
Physical Characteristics	• No change or impacts	• Long-term significant impact – 130 total acres of open water affected – change from 127 acres of tidal open water habitat to fastland with a final elevation of +36 feet MLLW and conversion of 6 acres of existing river bottom to shallower water with a manmade substrate (the containment structure). • Conversion of 10 acres of existing upland to fastland. • Conversion of 1 acre of vegetated wetland to fastland.	• Includes all impacts from Alternative 1 • Depth of Seagirt Dredging Area increases from -42 feet MLLW to a maximum of -52 (+2 feet of over dredging) feet MLLW
Water Quality	• Long-term adverse impact – continued release of toxics to the water column due to contaminated sediments.	• Short-term adverse impact – increase in water column turbidity and nutrients during pre-dredging of unsuitable overburden. • Short-term adverse impact – increase in water column turbidity and dissolved nutrients during dike construction. Nutrient stimulation can cause algal blooms and increased potential for anoxia. • Short-term adverse impact – fluctuations in ammonia, DO, and pH could impact the water quality of discharges from the placement area	• Adverse impacts lessened by about ¼ relative to Alternative 1 because of decreased turbidity with the change in borrow scenario.
Sediment Quality	• Long-term adverse impact – continued burden to the ecosystem from contaminated sediments.	• Long-term beneficial impact – capping of contaminated sediments and removal from Patapsco River ecosystem.	• Same as Alternative 1

Environmental Resources	No Action Alternative	Alternative 1 – Proposed Masonville DMCF with Borrow Scenario C	Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)
Phytoplankton/Zooplankton	• No impacts to plankton	• Short-term adverse impact – increases in turbidity (pre-dredging and dike construction) could temporarily and locally depress phytoplankton, and zooplankton communities. • Short-term adverse impact – potential for entrainment in sediment slurry during dredging and construction activities. • Long-term adverse impact – potential for additional release of nutrients from construction operations and spillways and subsequent algal blooms due to longer period of operations.	• Adverse impacts lessened by about ¼ relative to Alternative 1 because of decreased turbidity with the change in borrow scenario.
Fisheries	• No impacts to fisheries	• Significant long-term adverse impact – loss of 127 acres of tidal open water habitat and displacement of fish utilization. • Short-term adverse impact – potential to entrain fish larvae during dredging. • Short-term adverse impact – less mobile fish species within footprint would be lost during construction. • Short-term adverse impact – increase in water column turbidity during construction and dredging activities. •Long-term beneficial impact – remediation of contaminated sediments (and associated water quality improvements).	• Adverse impacts lessened by about ¼ relative to Alternative 1 because of decreased turbidity with the change in borrow scenario.
Essential Fish Habitat (EFH)	• No impacts to EFH	• Long-term minor adverse impact – loss of approximately 127 acres of EFH within footprint although presence of MSFCMA species is low. •Long-term beneficial impact – burial of contaminated sediments and associated water quality improvements.	• Adverse impacts lessened by about ¼ relative to Alternative 1 because of decreased turbidity with the change in borrow scenario.

Environmental Resources	No Action Alternative	Alternative 1 – Proposed Masonville DMCF with Borrow Scenario C	Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)
Benthic community	• No adverse impacts to benthos	• Significant long-term adverse impact – 130 total acres of river bottom habitat affected – loss of 124 acres of river bottom and associated benthic organisms and conversion of 6 acres of existing river bottom to shallower water with a manmade substrate (the containment structure). • Long-term beneficial impact – capping of contaminated sediments and removal from ecosystem.	• Adverse impacts lessened by about ¼ relative to Alternative 1 because of decreased turbidity with the change in borrow scenario and decreased amount of fines smothering benthic habitat.
Commercial Fisheries	• No impacts to commercial fisheries	• No adverse impacts because commercial harvesting not common near site	• Same as Alternative 1.
Submerged Aquatic Vegetation (SAV)	• No impacts to SAV	• Long-term adverse impact – loss of approximately 0.38 acres of SAV and 10 acres of Tier I/Tier II/Tier III SAV Habitat within the DMCF footprint.	• Adverse impacts lessened by about ¼ relative to Alternative 1 because of decreased turbidity with the change in borrow scenario. • Loss of 10 acres of Tier I/Tier II/Tier III SAV Habitat and 0.38 acres of SAV.
Shallow Water Habitat (SWH)	• No impacts to SWH	• Long-term adverse impact – loss of approximately 10 acres of SWH within footprint.	• Adverse impacts lessened by about ¼ relative to Alternative 1 because of decreased turbidity with the change in borrow scenario.
Wildlife (waterfowl, mammals, reptiles, amphibians)	• No impacts to wildlife	• No significant adverse impacts expected. DMCF area not utilized extensively by birds and other wildlife. • Short-term beneficial impact – interim benefits associated with ponded water and mud flats during operations. • Long-term beneficial impact – Masonville Cove would be put into a conservation easement which would be a permanent conservation area.	• Same as Alternative 1.
Wetlands	• No impacts to wetlands	• Long-term adverse impact – loss of approximately 126 acres of tidal open water, 3 acres of unauthorized dry dock (which count as tidal open water) and 1 acre of onshore wetlands.	• Includes all impacts from Alternative 1. • Dredging for borrow would occur in 41 acres of tidal open water in the Seagirt dredging area.

Environmental Resources	No Action Alternative	Alternative 1 – Proposed Masonville DMCF with Borrow Scenario C	Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)
Upland vegetation	• No adverse impact to upland vegetation	• Long-term adverse impact – 10 acres of the site would be covered by dredged material, an onshore dike, and a berm. • Long-term beneficial impact – habitat improvements in Masonville Cove designed specifically to clean up and enhance terrestrial habitat (approximately 35 total acres) • Long-term beneficial impact – approximately 20 acres of new plantings	• Same as Alternative 1.
RTE species	• No impacts to RTE species	• Long-term minor adverse impact – loss of approximately 130 acres of tidal open water within footprint, although presence of aquatic RTE species is low. • Long-term beneficial impact – Masonville Cove would be put into a conservation easement which would create a bird sanctuary in the area around the former bald eagle nest site.	• Includes all impacts to Alternative 1. • Long-term minor adverse impact -- 128 acres of tidal open water in the Seagirt dredging area, although presence of aquatic RTE species is low.
Air quality	• No impacts to air quality	• Short-term adverse impact – increased emissions from dredging and other equipment during construction. • Long-term adverse impact – increased emissions from operations of the DMCF • A Federal conformity decision would be required. Estimated output is above the criteria and steps are being taken to find offsets emissions associated with the site.	• Same as Alternative 1, though a regional decrease in emissions would result with this alternative relative to Alternative 1.
Noise	• No impacts to noise	• No adverse impacts – noise associated with construction and operations are not expected to interfere with residential or recreational activities.	• Same as Alternative 1. • No additional adverse impacts to noise are expected as a result of using the Seagirt borrow material.
Light	• No impacts to light	• No adverse impacts – light associated with construction and operations are expected to be negligible in the urban setting.	• Same as Alternative 1. • No additional adverse impacts to noise are expected as a result of using the Seagirt borrow material.

Environmental Resources	No Action Alternative	Alternative 1 – Proposed Masonville DMCF with Borrow Scenario C	Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)
Hazardous, Toxic, and Radioactive Wastes (HTRW)	• No impacts to HTRW	• No adverse impacts. • Long-term beneficial impact – capping of contaminated sediments and removal from Patapsco River ecosystem. • Long-term beneficial impact – remediation of derelict vessels and capping of residual contaminants.	• Same as Alternative 1
Navigation	• No impacts to navigation	• Short-term adverse impacts – temporary increase in barge traffic during dredging and offloading activities has the potential to impact local commercial navigation.	• Includes impacts described for Alternative 2. • Short-term increase in traffic between Masonville and Seagirt • Short-term increase in traffic within the Seagirt dredging area
Coastal Zone Management	• No impacts to Coastal Zone Management	• Masonville DMCF and Cove are within a critical area; Coastal Zone Consistency Determination required.	• Coastal Consistency Determination is required- the Masonville and Seagirt sites are both within Maryland's Coastal Area.
Coastal Barrier Resources	• No impacts to Coastal Barrier Resources	• No impacts to coastal barrier resources	• No impacts to coastal barrier resources
Chesapeake Bay Critical Areas	• No impacts to Chesapeake Bay critical areas.	• The proposed project and improvements to the Cove would require agency coordination. • Long-term beneficial impact – phosphorous loadings reduced by at least 10 percent to comply with critical area regulations • Averse impact – construction within the critical area buffer	• Same as Alternative 1.
Floodplains	• No impacts to floodplains	• Long-term minor adverse impact – raising of 10 acres of land in the floodplain to an elevation of +36 ft MLLW • Modeling is ongoing.	• Same as Alternative 1.
Wild and Scenic Rivers	• No impacts to Wild and Scenic Rivers	• No impacts to wild and scenic rivers	• No impacts to wild and scenic rivers
Prime and Unique Farmland	• No impacts to prime and unique farmland	• No impacts to prime and unique farmland.	• No impacts to prime and unique farmland.

Environmental Resources	No Action Alternative	Alternative 1 – Proposed Masonville DMCF with Borrow Scenario C	Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)
Cultural Resources	• No impacts to cultural resources	• Coordination with the NPS has indicated that there would be no significant impacts to Fort McHenry. • There are no submerged cultural resources within the proposed Masonville DMCF footprint or Masonville Cove	• Includes all impacts from Alternative 1. • Coordination with the MHT indicated no additional impacts as a result of the additional dredging depth in the Seagirt dredging area relative to the previously permitted depth.
Aquatic Resources – Economics	• No impacts to Aquatic Resources – Economics	• No impacts – the area is generally not commercially harvested.	• Same as Alternative 1.
Employment, income and revenues	• No adverse impacts • No beneficial impacts because of increased spending from project	• Long-term beneficial impacts – project spending would increase jobs and revenues at both the state and local levels. • Long-term beneficial impact – unused industrial land converted to a public use park.	• Same as Alternative 1.
Future land and water use	• No adverse impacts • No beneficial impacts because of cleanup and recreational/educational elements at Masonville Cove.	• Long-term beneficial impacts – project would cleanup and improve recreational/educational opportunities at Masonville Cove.	• Same as Alternative 1.
Environmental justice	• No beneficial or adverse impacts	• No adverse impacts to minority or low-income populations.	• Same as Alternative 1.
Safety to children	• No beneficial or adverse impacts	• Long -term beneficial impacts – project would cleanup Masonville Cove, effectively reducing the current safety risks to area children.	•Same as Alternative 1.
Recreation	• No adverse impacts • No beneficial impacts because of Cove cleanup and recreational improvements.	• Long-term minor adverse impact – loss of tidal open water for recreational fishing although present utilization low. • Long-term beneficial impact – cleanup of Masonville Cove and creation of hiking trails, kayak launch, and eco-recreation (e.g. bird watching).	• Same as Alternative 1.

Environmental Resources	No Action Alternative	Alternative 1 – Proposed Masonville DMCF with Borrow Scenario C	Alternative 2 – Proposed Masonville DMCF with Seagirt Borrow (Preferred Alternative)
Aesthetics, impacts to Patapsco River shoreline	• No beneficial or adverse impacts	• No long-term adverse impact predicted. Construction and operations consistent with urban and port areas. Views from Fort McHenry would be consistent with the current viewshed and would be characteristic of the surrounding port and industrial areas. • Long-term beneficial impact. Cleanup of Masonville Cove would be a considerable aesthetic improvement to area.	• Same as Alternative 1.

5.8 CUMULATIVE IMPACTS

5.8.1 Definition

Cumulative impacts are those combined effects on quality of the human environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what Federal or non-Federal agency or person undertakes such other actions [40 CFR 1508.7, 1508.25(a), and 1508.25(c)]. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time or taking place within a defined area or region, or from these minor impacts combined with major impacts. It is the combination of these effects, and any resulting environmental degradation, that should be the focus of cumulative impact analysis. Thus, the cumulative impacts of an action can be viewed as the total effects on a resource, ecosystem, or human community of that action and all other activities affecting that resource.

The concept of cumulative impacts takes into account reasonably identifiable disturbances within the general region of the proposed project because cumulative impacts result in the compounding of the effects of all actions over time. Thus, the cumulative impacts of an action can be viewed as the total effects on a resource, ecosystem, or human community of that action and all other activities affecting that resource no matter what entity (federal, non-federal, or private) is taking the actions. Consistent with the Council of Environmental Quality (CEQ) regulations, effects and impacts are used synonymously (USEPA 1999). Cumulative impacts include both direct and indirect impacts. Effects include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions that may have both beneficial and detrimental effects; even if on balance the agency believes that the effect would be beneficial (40 CFR 1508.8).

5.8.2 Sources of Cumulative Impacts

Activities warranting the greatest attention in the cumulative impacts are those activities that in combination with the proposed Masonville DMCF, would potentially magnify what are perceived by resource agency personnel and the public as the significant impacts of other dredged material management facilities within the Harbor area as well as other major sources of anthropogenic water quality impacts to the lower Patapsco watershed. Those activities meriting particular scrutiny include: 1) conversion of substantial areas of tidal open water and Patapsco River bottom habitat, including SWH converted to upland habitat, 2) other major nutrient or turbidity inputs, 3) other major in-water construction projects or dredging operations, and 4) use of the HMI DMCF for disposal of material.

Most of the large in-water construction projects that would have affected Patapsco River bottom were not constructed recently. For this analysis, only projects constructed since approximately 1980 were considered recent. Recent and reasonably foreseeable human actions that have converted or would convert tidal open water habitat to uplands include the HMI DMCF, Seagirt Marine Terminal, the rehabilitation of Cox Creek DMCF, the Masonville DMCF, and the proposed second and third harbor placement options described in Chapter 1. Currently, the

second and third Harbor options include placement facilities at Sparrows Point and British Petroleum (BP)-Fairfield. The Cox Creek DMCF was constructed in the 1960s by Kennecott Refining Co. and was rehabilitated to accept Harbor materials beginning in 2002. At that time, five acres of in-water construction were necessary to rehabilitate the existing dikes. The Seagirt Marine Terminal was constructed on fill material from the I-95 tunnel project and the filling of this area and the construction of the terminal are considered in the cumulative impacts. There are other pending projects involving the redevelopment of industrial areas along the Middle Branch of the Patapsco River. The acreages of the current and proposed facilities are shown in Table 5-28.

Table 5-28. Acreages of Current and Proposed In-Water Projects

Facility	Status	Acres
Hart-Miller Island DMCF	Existing	1,140
Seagirt Marine Terminal	Existing	149
Cox Creek DMCF	Existing	5*
Masonville DMCF	Proposed	130
Sparrows Point DMCF	Proposed	Up to 460
BP-Fairfield DMCF	Proposed	146-199
Other Pending Projects in the Middle Branch of the Patapsco River	Proposed	2

**Acres added as part of site rehabilitation*
‡Acres are approximate, preliminary and subject to change during plan development. Only in-water acres are included in this number.

If all of the proposed projects are implemented and terminal improvements are required, over 3,000 acres of tidal open water habitat and bottom habitat would have been lost or disturbed in or near the Patapsco River between 1960 and the reasonably foreseeable future. At the HMI DMCF, the existing 1,140-acres are going to be developed into wildlife habitat after closure. The Seagirt Marine Terminal has already been converted from a DMCF to a port facility. The final disposition of the Cox Creek DMCF has not been determined, but is intended to be used in conjunction with a dredged material recycling/reuse facility. The new sites considered in the cumulative impacts (Masonville, BP-Fairfield, and Sparrows Point) would be redeveloped as Port facilities and would constitute a loss of ecological function. However, it is anticipated that any loss of river bottom and tidal open water habitat required for any of the proposed in-water projects would be mitigated, per State and Federal law. These losses are discussed in more detail in Section 5.8.3. The proposed AES Sparrows Point LNG project would not result in the loss of open water. However, dredging would be completed over approximately 120 acres of the Patapsco River to deepen berthing areas, create turning circles, and deepen and widen access channels. The total volume of material to be dredged as part of the LNG project is between 2.5 and 4 mcy. Due to the volume of the material generated, the dredged material from the LNG project would not be disposed of in any existing or proposed placement facilities within the Baltimore Harbor. Various options are currently being considered for placement of this material including reuse of the material onsite, innovative reuse and recycling techniques, upland disposal, and offshore disposal (AES Sparrows Point LNG 2006).

As described in Chapter 2, the water quality of the lower Patapsco River is degraded and many of the stressors are associated with nutrient releases from point and non-point sources along the Harbor. Wastewater treatment facilities are among the major sources of nutrient inputs. The Patapsco Wastewater Treatment Plant (WWTP) is approximately 2 miles east of the proposed Masonville DMCF and constitutes a major source of nutrient inputs to the Harbor. Other major sources of nutrient inputs include the Back River WWTP and the Cox Creek WWTP. There are also numerous industrial WWTP that discharge nutrients and other constituents into the Patapsco River. It is expected that all discharges from any of the proposed Harbor DMCFs would be managed through MDE's TMDL program to limit nutrient inputs to the water body.

A second large contributor to nutrient loadings is stormwater discharges which are both point and non-point sources including freshwater inputs from the Patapsco River, Gwynns Falls, Jones Falls and Herring Run. Real estate development in the City of Baltimore will continue to occur over the foreseeable future. While this cannot be specifically quantified, impacts to the Patapsco River from construction and stormwater discharges are controlled by the City of Baltimore and surrounding counties through stringent management requirements. Since most of the anticipated development in the City of Baltimore will replace older or dilapidated structures, the result will be improved stormwater quality when compared to existing conditions. The City of Baltimore has recently adopted very strict criteria for stormwater management in response to USEPA requirements and state TMDL criteria. Cumulative impacts as a function of development are not expected to be significant.

There are both commercial and residential developments being constructed or planned throughout the City of Baltimore. In the vicinity of Masonville some of the larger developments, which are either in the planning stages or under construction, are as follows:

- Inner Harbor East – former Carr-Lowery Glass Plant and former Westport BGE power plant sites located along the western shore of the Middle Branch on Kloman Street.
- A residential/light commercial development at Port Covington directly across the Patapsco from Masonville (Maryland Voluntary Cleanup Program).
- The renovation and redevelopment of the City garage just west of the Hanover Street bridge at Dickman Street (Maryland Voluntary Cleanup Program).
- New commercial development at Potee and Garrett Streets (Maryland Voluntary Cleanup Program) south west of Masonville.
- General redevelopment in the communities of Westport and Cherry Hill
- New future (not specified) commercial/industrial development in the Fairfield section, east of the Masonville site.

All of these development projects would result in considerable improvements in the existing conditions on the sites. Several are in the Maryland Voluntary Cleanup Program, as noted above, which requires cleanup of the site to stringent soil and groundwater criteria. All new development in both the City of Baltimore and Anne Arundel county are subject to strict air quality and stormwater management regulations and criteria. In all cases, the completed developments would result in cleaner stormwater discharges to the Patapsco. The cumulative impacts of these developments are not expected to be negative within the region.

Another source of disturbance within the Patapsco River includes the maintenance dredging of the navigation channels and new work dredging for specific berthing projects (Chapter 1). Dredging activities disturb the bottom and resuspend sediments that increase turbidity and nutrients in the water column. These are generally short-term effects and not expected to contribute significantly to long-term cumulative water quality in the Patapsco River.

The end use of the proposed Masonville DMCF has not yet been determined. It is likely that a terminal facility would be constructed on the site. Future development of the proposed Masonville DMCF as a terminal facility would likely include paving or surfacing. If it is surfaced, this would add approximately 123 acres of impervious surface, which would require stormwater management, to the floodplain. Although this is a small area relative to the amount of impervious surface around the Baltimore Harbor, it would constitute an incremental increase. Impacts associated with a potential terminal facility, consistent with nearby terminal facilities, are acknowledged here (channel widening, relieving platform for the berthing area, and surfacing of the filled DMCF) but would not be implemented immediately and a supplemental NEPA document may be required at that time.

The impacts of a port facility, such as a terminal, consistent with the surrounding area are considered in the following sections. To accommodate that use, the existing Piers 1, 2, and 3 would be demolished. Pier 3 would be replaced with a relieving platform over and adjacent to the cofferdam to accommodate cargo ships. The demolition of these three piers would need to occur as part of the construction of the proposed Masonville DMCF. Material from the existing piers would be placed in a licensed landfill. An existing access channel may be widened to ensure the safe passage of cargo ships to the new Pier 3. If this occurs, material dredged from the channel would be placed at Cox Creek DMCF, the proposed Masonville DMCF, or a future Harbor placement site, such as BP-Fairfield or Sparrows Point, if they are developed. This would involve approximately two additional acres of impact, but not fill, to tidal open water areas of the Harbor and may result in up to 1 mcy of placement material. Additional impacts to Patapsco River and surrounding areas may result from the construction of ethanol plants. There are two ethanol plants proposed for development in the vicinity of the proposed Masonville DMCF site: one at Sparrows Point and one along Curtis Bay. Since these plants are in the planning stages, the impacts of these facilities are not assessed in the following sections. Any actions to build or operate such facilities would require compliance with state and federal regulations for emissions and discharges.

5.8.3 Duration of Impacts

If the proposed Masonville DMCF project moves forward, pre-dredging would begin in 2007. Site construction would begin in mid-2007 with the majority of the initial construction completed by 2009. Masonville is anticipated to have a 20-year site life and would be one of two or three placement options needed within the Harbor as soon as 2014. Short-term (construction) impacts would be realized by 2009. Long-term impacts include permanent changes to resources that occur during the construction, site operations, and filling of the site. Longer-term (operational) impacts would occur through 2029. As stated previously, the future use of the facility is expected to be as a terminal facility but the exact details of the type of facility are undetermined at this time.

5.8.4 Cumulative Environmental Impacts

5.8.4.1 Physiography, Soils, and Groundwater

Physiography

The proposed creation of a DMCF at Masonville, BP-Fairfield, and Sparrows Point; the creation of the HMI DMCF; the expansion of the Cox Creek DMCF; and the placement of dredged material at Seagirt Marine Terminal would cumulatively convert over 2,000 acres of open water to fastland. The proposed projects at Masonville, BP-Fairfield, and Sparrows Point, and the Cox Creek DMCF would expand the existing shoreline and would have a final elevation consistent with the surrounding land area. The HMI DMCF has expanded and combined two existing islands resulting in the addition of approximately 1,140 acres of fastland to the Chesapeake Bay. The dredging of Seagirt Marine Terminal is scheduled to deepen 149 acres of the Patapsco River. Cumulatively, a total of 2,082 acres would be converted from open water to fastland as a result of these proposed and existing projects. These would constitute significant, irreversible impacts to physiography.

Work at the AES Sparrows Point LNG Terminal would permanently deepen existing channels to -44 feet, dredge berthing areas to -44 feet, and dredge a turning circle. This area, approximately 120 acres, would be maintenance dredged to ensure the safe passage of ships to the LNG terminal. An additional 1.5 acres would be converted from upland to tidal open water.

Soil

Cumulative impacts to soil are minor. The existing soils are not going to be removed or degraded. The soils existing adjacent to the Masonville, BP-Fairfield, Sparrows Point, Cox Creek, and Seagirt sites are primarily urban or manmade (USDA NRCS 1973, USDA NRCS 1976, USDA 1998). The creation of additional fastland by depositing dredged material would be consistent with the soils in the area. Cox Creek, Masonville, BP-Fairfield, and Sparrows Point already have manmade soils located adjacent to the proposed DMCFs or dredging area (USDA NRCS 1973, USDA NRCS 1976, USDA NRCS 1998). The land adjacent to Seagirt Marine Terminal consists entirely of urban land, which is at least 80 percent impervious surface (USDA NRCS 1998). These projects would convert existing sediments from shipping channels to soil.

The HMI DMCF incorporated two existing islands (Hart Island and Miller Island) into a placement facility. The original Hart Island consisted of coastal beaches, tidal marshes and three types of soil: Fallsington sandy loam, Woodstown sandy loam, and Sassafras sandy loam. Both the Woodstown and Sassafras sandy loam are soils that are suitable for cultivation and farming. The Fallsington sandy loam is a poorly drained soil type. The original Miller Island consisted of coastal beaches and tidal marshes. Most of the soils at both the original Hart and Miller Islands were buried as a result of the HMI DMCF construction. The HMI DMCF will create 1,140 acres of soil from sediments. This land will not be converted to impervious surface, but will support vegetation.

The proposed Masonville DMCF, as well as the proposed future DMCFs at Sparrows Point and BP-Fairfield would not have an adverse impact on soils, all of which consist of made land at both locations. The proposed AES Sparrows Point LNG Terminal may affect 80 acres of upland at Sparrows Point. This area consists of made land and development of Sparrows Point is unlikely to have adverse impacts to soils.

Cumulatively, therefore, the impacts to soil at all of the facilities are expected to be minor.

Groundwater

The entire Patapsco River and Baltimore Harbor region is underlain by two aquifers, the surficial aquifer, the Patapsco formation, and a deeper aquifer, the Patuxent formation. These two formations are separated by the Arundel formation, which is a clay confining layer ranging from 30 to 200 ft thick. The Patapsco formation has elevated salt concentrations in the Baltimore Harbor region. Low concentrations of industrial contaminants have also caused localized degradation of this formation over the last 100 years. The Arundel Formation, however, is continuous in the Harbor area and prevents contamination in the surficial aquifer from contaminating the Patuxent formation. The Patuxent aquifer is locally degraded due to past pumping activities as evidenced by salt intrusion in the near field around the Harbor. Further contamination is not expected to occur from the proposed project and future DMCF construction. The DMCFs proposed at BP-Fairfield, Masonville, Sparrows Point, the Cox Creek DMCF, and the Seagirt Marine Terminal would not be expected to have a cumulative impact on the Patuxent formation, because the Patuxent formation in this region is protected by the Arundel formation which has transmissivities of 10^{-9} to 10^{-11} ft per second. Therefore, there are no anticipated cumulative impacts to groundwater in the Patuxent Formation.

Groundwater in the Patapsco aquifer flows southeast away from the Harbor locally at the site but towards Curtis Creek to the southeast. The Masonville site is underlain with mixed sands and gravels with interbedded small clay lenses. This sand and gravel layer forms the edge of the south-eastward dipping Patapsco formation, which formally begins southeast of the site. The site abuts the northwestern edge of the upper Patapsco and waters of the Patapsco River likely communicate with this leading northwest edge of the outcrop zone.

There are perched water tables at the Cox Creek site, but not at Masonville. At BP-Fairfield, it is flowing toward the Patapsco River and Curtis Bay. Shallow perched water tables at these sites generally flow in the direction of local topography, which is to the Baltimore Harbor waters in all cases. These sites are not expected to have an adverse impact on groundwater quality since groundwater would be entering the DMCFs and then retained for settling and/or treatment before being discharged into the Patapsco River. In the case of the proposed DMCF at Masonville, there would be a leachate barrier with a permeability of $5x10^{-6}$ cm per second lining the dikes, which would help to minimize contaminants that may enter the Patapsco River.

Studies of groundwater at the Sparrows Point site are ongoing. Although some results are still preliminary, investigations in the vicinity of the landfill on Coke Point (southwest peninsula of Bethlehem Steel) were made available. Much of the peninsula has been built up or stabilized with slag over the last 90 years. Groundwater flow studies indicated that the shallow aquifer

generally moves westward and southwestward toward Bear Creek and the Patapsco River. Analysis of the shallow aquifer found volatile and semi volatile contaminants above detectable levels. The most notable compounds found at elevated levels included benzene, toluene, xylene and several metals (including lead and mercury). PCBs were also detected in a couple of the samples. No groundwater wells for potable water use are located near the proposed Sparrows Point site.

Water in the surficial aquifer at the HMI DMCF eventually flows into the Bay. Studies at the HMI DMCF have indicated that there has been no adverse impact on water quality as a result of the DMCF (URS 2004).

Approximately 90 percent of the potable water supply in Anne Arundel County is provided by groundwater wells. Based upon studies conducted by USACE - Baltimore District at the Cox Creek DMCF in 1997, the Arundel formation, the nearest municipal wells in the area are located at Glen Burnie (USACE 1997). This well field is 6 miles southwest of the Cox Creek DMCF and 5 miles south southwest of the proposed Masonville DMCF. These wells are currently screened in both the Lower Patapsco and the Patuxent formations. Anne Arundel County has a withdrawal allocation from the Patapsco Aquifer of 11.8 mgd, but was actually withdrawing on the order of 9 to 11 mgd in 1997 (USACE 1997). No new groundwater supply wells are planned for the Patapsco in this region of the county as of the issuance of the USACE groundwater report in 1997 (USACE 1997). New supplies would be obtained from the Patuxent formation (USACE 1997). The USACE – Baltimore District concluded in its 1997 Cox Creek DMCF groundwater report that the Cox Creek DMCF would not affect flow direction or quality of groundwater. The proposed DMCF site at BP-Fairfield is approximately the same distance from the Anne Arundel County well field as the Cox Creek DMCF. Therefore, the proposed DMCF at BP-Fairfield would likely have the same groundwater protection requirements as the Cox Creek DMCF, and would be expected to have no affect upon the Anne Arundel county well fields. The Sparrows Point site is approximately 3.5 miles further northeast of Cox Creek and down-gradient influence to the Patapsco Aquifer would not be expected to affect potable water supply wells in Anne Arundel County.

The cumulative effects of these additional proposed sites on the Patapsco River would be expected to be on the same level as effects from the proposed DMCF at Masonville. While all would likely be required to have the same groundwater protection requirements as the Cox Creek DMCF, some migration of water within each proposed DMCF is likely to occur.

The KIM Channel lies immediately east of the Masonville area. The remediation of the derelict vessels is expected to eliminate one existing source of contaminants to the groundwater. The former KIM site has also been approved by the MDE for remediation through the VCP. The site has been cleared of all surface sources of contaminants and subsurface contamination which failed to meet Maryland commercial/industrial soil criteria has also been removed to the satisfaction of MDE. The site will be capped and further infiltration will cease on that site. Stormwater will no longer come in contact with the remaining low level soil contaminants. This will minimize contamination from the existing sediments from entering the Patapsco River or the Patapsco Aquifer. The cumulative effect will be to reduce existing contributions of contaminants to the Patapsco River and local groundwater.

5.8.4.2 Hydrology and Hydrodynamics

The impacts associated with the proposed Masonville DMCF are localized and do not extend to the project areas for the existing facilities or proposed projects. Impacts from projects that are more closely situated to each other such as the proposed DMCFs at both BP-Fairfield and Sparrows Point would be further evaluated in an EIS and feasibility study documents if a decision is made to pursue these projects. The Cox Creek DMCF had no substantial impacts on water levels, flows, or wave conditions (USACE 2000).

The impacts assessment for Seagirt Marine Terminal found impacts to flushing characteristics in the area to be "inconsequential" and there were no adverse impacts to flooding (Ecological Analysts 1984). The initial construction of the Seagirt disposal site resulted in a loss of 9.6 percent of the cross-sectional area of the Baltimore Harbor.

The HMI DMCF is not located within the area of influence of any of the proposed or existing projects. The HMI DMCF EIS states that there would be no significant effect of the DMCF upon tidal currents, non-tidal circulation in the upper Chesapeake Bay or on the non-tidal circulation patterns and flushing rates of the Back and Middle Rivers (USACE NRCS 1973).

The AES Sparrows Point LNG Terminal is still in the planning and pre-permit application phase. Impacts to hydrology have not been assessed at this time, but would be evaluated at the time of permit application.

5.8.4.3 Water Quality

The cumulative effects of developing the proposed Masonville DMCF in the context of the existing Baltimore Harbor water quality are difficult to assess due to the degraded water quality that currently exists there. Fluctuating freshwater inputs, non-point source pollutant inputs, and municipal and industrial discharges are the primary sources of contaminants affecting water quality and clarity of water in the Harbor. The primary cumulative water quality impacts from the existing and proposed DMCFs (Masonville, BP-Fairfield, and Sparrows Point) would be related to spillway discharges and concentrations of TSS, nutrients, and other constituents within the discharges. Construction of the Masonville facility or any of the proposed DMCFs as described above, would add point source discharge(s) to the system, which may result in increased nitrogen loads to the Patapsco River. Discharges would occur for at least 25 years. These discharges would be subject to site-specific NPDES discharge permits and associated limitations. These limitations would be based upon the TMDL developed for the Patapsco River and would limit or eliminate further degradation. Nutrient loadings were presented in Tables 5-8 and 5-9.

As stated in Section 5.1.5, water quality in the Patapsco and Back River systems (watersheds) are assessed and managed together. The predicted inputs from the proposed Masonville DMCF were assessed in the context of other major loadings within the Patapsco-Back River tributary complex [based upon the State Section 303 (d)] reports. The report only calculates total loadings for limited constituents. The 2002 total loadings to the Patapsco and Back Rivers for TSS, total nitrogen, and total phosphorus were 96, 10.73, and 0.58 million pounds. The estimated annual

loadings of TSS, total nitrogen, and total phosphorus from Masonville would be 0.265, 0.039, and 0.00061 million pounds per year. Compared to the total 2002 loadings this would constitute 0.28, 0.36, and 0.1 percent of the total loadings, respectively. Table 5-29 details the daily loadings of several of the major discharges in the Patapsco-Back River complex which are expected to continue into the foreseeable future.

Table 5-29. Approximate Daily Loadings for Major Point Sources in the Patapsco-Back River Tributary System for 2003

Point Source	lbs/day	
	Total Nitrogen	**Total Phosphorus**
Back River WWTP	10,000	200
Bethlehem Steel (ISG)	800	40
Patapsco WWTP	7,400	250
WR Grace	1,800	4

Source: Maryland Section 303 (d) report for 2003.

The HMI DMCF is within this tributary system but because it has an intermittent discharge is not among the major point source inputs reported on an annual basis in the Section 303 (d) report. The estimated daily loadings from the proposed Masonville DMCF for the 60 to 70 days that discharge would be required annually is 557 to 650 lbs/day of total nitrogen and 10 pounds per day of total phosphorus. Discharges at the HMI DMCF occur throughout the year when site water quality meets criteria. In some years, discharges are less in summer, which is the period of highest phytoplankton abundance. Loadings from the Cox Creek DMCF would be of similar magnitude to loadings from the proposed Masonville DMCF and would occur concurrently with Masonville in most years due to dredging windows and schedules and major storm events.

The Harbor placement sites in addition to the proposed Masonville DMCF are proposed for BP-Fairfield and Sparrows Point. If implemented, these would constitute additional point sources and loadings to the Patapsco-Back River complex. Based upon the proposed sizes of the BP-Fairfield and Sparrows Point sites, the loadings are expected to be between one and two times those predicted for the proposed Masonville DMCF (respectively).

The projected daily loadings from the proposed Masonville DMCF or any of these DMCFs are substantially lower than those of most of the major point source contributors in the Patapsco River, but would add to the overall loadings within the lower Patapsco River, which is already designated as impaired for nutrients. Excessive nutrients can stimulate phytoplankton growth and contribute to anoxic conditions. Because the discharges are intermittent, these would be short-term impacts. It is anticipated that the proposed Masonville DMCF and any or all future DMCF loadings would need to be offset or mitigated in order for the Patapsco-Back River tributary complex to meet future TMDL requirements for the tributary. Therefore the cumulative water quality impacts to the Patapsco River should be minimal because there would be offsets and mitigation.

Dredged material that would be placed in the proposed Masonville DMCF or any of the proposed DMCFs would include materials with known elevated concentrations of contaminants. As explained in Section 5.1.1, dredged material with similar chemical characteristics, including

elevated nutrients, has been placed at the HMI DMCF since 1984, with no measurable impacts to the water body either from spillway releases or migration through the dikes. In addition to the intermittent discharges typical of DMCFs and the best management practices (BMPs) employed at the HMI DMCF to manage discharge quality, the proposed Masonville DMCF would have a leachate barrier and would be required to use mitigative measures to moderate or offset loadings. The proposed AES Sparrows Point LNG Terminal would involve dredging approximately 120 acres of open water, which would increase turbidity in the dredging and surrounding areas. Dredging also has the potential to resuspend contaminants or other materials into the water column. Turbidity curtains and other infrastructure or construction methods can be used to minimize the in water impacts.

A water quality certification and associated NPDES permit with associated discharge limitations would be required for all the proposed DMCF projects in the Patapsco River. Therefore, it is expected that operation of the proposed Masonville DMCF and the construction of future DMCFs would not have cumulative negative impacts to water quality, because discharges would be offset or mitigated. The proposed capping of 901 acres of contaminated sediments at Masonville, Sparrows Point, and BP-Fairfield and clean up of Masonville Cove has the potential to have positive impacts to the non point-source releases of contaminants to the Patapsco River. The burial of contaminated sediments will prevent contaminants from being resuspended and entering the water.

5.8.4.4 Sediment Quality

The proposed projects associated with Masonville, BP-Fairfield, and Sparrows Point, and the existing projects at the Cox Creek DMCF, the HMI DMCF, and at the Seagirt Marine Terminal (not the dredging area) would cumulatively result in the capping of over up to 901 acres of contaminated sediments. This would prevent contaminants from mobilizing and entering the Patapsco River and the Chesapeake Bay.

At the proposed AES Sparrows Point LNG Terminal approximately 120 acres of material would be dredged, which would remove surficial sediments. These surficial sediments are generally the most contaminated sediments and their removal would eliminate the possibility of contaminants from those sediments from mobilizing and entering the Patapsco River and Chesapeake Bay.

5.8.4.5 Aquatic Resources

The cumulative impact of the proposed Masonville DMCF was evaluated in terms of the regional loss of tidal open water habitat. Within the region of the lower Patapsco and adjacent areas of the Bay, approximately 1,142 acres of tidal open water habitat have been lost due to previous actions and an additional 943 are proposed for development for dredged material management. There are approximately 19,300 acres of tidal open water in the Patapsco River. The proposed future projects would constitute impacts to approximately 5 percent of the total area of the tidal portion of the Patapsco River. Previous development at the HMI DMCF is not included in the 943 acres because it lies outside the tidal portion of the Patapsco. Because most of the total impacted acreages (except up to 100 acres at Sparrows Point) are not proposed for wetlands or other aquatic habitat restoration, these are permanent losses of tidal open water habitat.

Approximately 1.5 acres of tidal open water would be created by the AES Sparrows Point LNG Terminal project. An additional 120 acres of tidal open water would be deepened as a result of the proposed project. No filling of tidal open water would occur as part of this project.

In addition to the tidal open water acreages, new work dredging operations would impact river bottom. The current new work dredging projects are detailed in Section 1.2 and would constitute up to 13 additional acres of impact for deepening or reconfiguration of berthing areas. Generally, deepening to 50 ft results in localized "holes," which are not swept by normal currents and therefore become more anoxic relative to adjacent areas, resulting in degradation of benthic and fish habitat.

There is a 2-acre marsh creation project, not required as mitigation, pending for the Middle Branch of the Patapsco River. This would convert 2 acres of open water to a vegetated wetland.

Plankton

The proposed projects associated with Masonville, BP-Fairfield, and Sparrows Point, and the existing projects at the Cox Creek DMCF, the HMI DMCF, and the Seagirt Marine Terminal would result in the total loss of 2,085 acres of open water. Approximately 1.5 acres of tidal open water would be created by the proposed AES Sparrows Point LNG Terminal. Construction and dredging associated with all of the projects considered would have short-term adverse impacts to plankton species. The plankton resources in all of these areas could be locally depressed during construction activities but that would be a short-term impact and is not expected to have cumulative impacts. These projects would not be occurring simultaneously or in the same place, so the short-term impacts would not overlap.

In the longer-term, the plankton productivity over the 2,085 acres would be lost and displaced to the adjacent waters. The longer-term potential cumulative impacts to plankton are largely associated with cumulative loadings and water quality. Excessive nutrients can stimulate phytoplankton growth and contribute to anoxic conditions. Because the discharges would be intermittent, these would be short-term impacts. As stated elsewhere, the burial of contaminated sediments has the potential to improve (e.g., decrease) non-point releases of contaminants to the Patapsco River. Water quality improvements, particularly those associated with net reductions in nutrient or toxics releases could have a positive impact on plankton.

Fisheries

The conversion of 2,085 acres of tidal open water habitat within the Patapsco River and adjacent areas of the Bay would permanently displace fisheries resources from these areas. Because the lower Patapsco River supports both anadromous and marine species, both migratory and resident fish are likely to be displaced. The 1,140 acres of open water at the HMI DMCF was not considered a spawning or breeding ground for fish or shellfish (USACE 1973). The Cox Creek DMCF expansion is not expected to have an adverse impact on fisheries. Activities associated with the construction of the Seagirt Marine Terminal had a negligible impact on aquatic life (Ecological Analysts 1984).

Dredging approximately 120 acres of tidal open water and creating an additional 1.5 acres of tidal open water would displace fish in the short-term but is not expected to have an adverse, long-term impact to fish populations.

Commercial Fisheries

Any harvesting that is currently occurring within the areas proposed for development would be displaced. Commercial fisheries harvesting is minimal near the Masonville, Cox Creek, BP-Fairfield, and Seagirt Marine Terminal sites, but does occur in the outer Harbor near Sparrows Point and in the vicinity of the HMI DMCF. Because Sparrows Point, both the DMCF site and the AES LNG Terminal site, and the HMI DMCF are the only current or future sites that potentially support commercial harvesting, direct, significant cumulative impacts to commercial harvesting areas are not expected. As stated previously, a cumulative loss of tidal open water habitat is projected. It is expected that mitigation (including habitat enhancements) would be required for the losses in all cases; the cumulative impact of all these habitat enhancements has the potential to improve fisheries habitat in many areas of the Patapsco River. Commercial fishing in the vicinity of the HMI DMCF has remained active since the development of the DMCF. Some short-term displacement of fishing activities likely occurred during construction due to dredging and boat traffic associated with the project. The cumulative effect of capping 901 acres of sediment as a result of the proposed DMCFs or associated mitigation projects has the potential to reduce legacy contaminants from the existing sediments in some areas, making less available for accumulation in fish tissue. This has the potential to have a long-term positive impact on harvestable resources.

Essential Fish Habitat

Cumulatively, up to 2,085 acres of EFH could be lost through existing and proposed projects. Although the Patapsco River and Baltimore Harbor lie in an area that provides EFH for several species managed under the Magnuson Stevens Fisheries Conservation Act, the species are transient to and relatively rare to the area, compared to higher salinity areas of the Chesapeake Bay. Further, the physical habitat features within the affected areas are not unique within the Chesapeake Bay watershed and the forage species currently supported by these areas are ubiquitous to the Chesapeake Bay. Therefore, no adverse impact to EFH species is expected.

Benthic Community

Over 2,000 acres of benthic habitat have been or would be lost as a result of the proposed projects associated with Masonville, BP-Fairfield, and Sparrows Point, and the existing projects at the Cox Creek DMCF, the Seagirt Marine Terminal, and the HMI DMCF. Though this habitat has been or would be lost, the habitat at Masonville, BP-Fairfield, Sparrows Point, Cox Creek, and Seagirt is degraded. This constitutes a net loss of benthic habitat within the Patapsco River and adjacent areas of the Bay. Unlike nekton (fish and plankton), these resources cannot move. In addition, cumulative water quality impacts (nutrient loadings) associated with site operations (discharges) have the potential to exacerbate hypoxia/anoxia in some areas. Although the discharges are intermittent and constitute short-term effects (as described in Section 5.8.4.3),

there is a potential to impact deeper areas of the River (below the pycnocline, greater than 15 feet) and the associated benthic habitat.

As stated previously, the cumulative effect of capping 901 acres of contaminated sediment as a result of the proposed DMCFs or associated mitigation projects has the potential to reduce legacy contaminants (from the existing) sediments in some areas. This has the potential to improve the benthic habitat in adjacent areas by making contaminants less available to the benthic communities.

SAV and SWH

The proposed Masonville DMCF would affect approximately 0.38 acres of the non-native SAV species Eurasian water milfoil and 10 acres of shallow water habitat (Tier I, Tier II, and Tier III SAV habitat). This impact was evaluated in terms of the regional loss of SWH (habitat with water depths that are less than -6.5 ft MLLW). The construction of the Cox Creek DMCF expansion resulted in the loss of approximately 5 acres of SWH. There was no SAV growing within those 5 acres (USACE 2000). There are no records on the amount of SWH that were lost as a result of the construction of the HMI DMCF. A maximum of 44 acres of SWH lies within the proposed site footprints for the BP-Fairfield and Sparrows Point DMCF projects combined. The amount of SWH associated with the AES Sparrows Point LNG Terminal project is not known at this time. There may also be 2 acres of SWH habitat converted to a marsh within the Inner Harbor West portion of the Patapsco River. It is expected that if all the sites are developed, this would be a permanent impact to SWH. However, many of the mitigation options being considered are being designed to enhance SWH in the Harbor. This would include substrate improvements to encourage SAV colonization and wetland creation and enhancements.

5.8.4.6 Terrestrial Resources

Bird and Mammal Usage

All of the existing and proposed sites considered as part of the cumulative impacts considered for the proposed Masonville DMCF, are in highly industrialized areas. Any wildlife living in these areas are acclimated to living in an urban environment and no adverse cumulative impacts to reptiles and amphibians are expected as a result of the proposed and current projects. There is no wildlife habitat associated with Sparrows Point or BP Fairfield. When the degraded upland habitat surrounding the Masonville Cove is remediated as part of the overall site cleanup, wildlife habitat is expected to improve in that area. Similar improvements are expected in association with any future DMCF development as part of the compensatory mitigation packages.

Reptiles and Amphibians

All of the existing and proposed sites considered as part of the cumulative impacts for the proposed Masonville DMCF, are in highly industrial areas. Any reptiles or amphibians living in these areas are acclimated to living in an urban environment and no adverse cumulative impacts to reptiles and amphibians are expected as a result of the proposed and current projects. There is

no reptile or amphibian habitat associated with the Sparrows Point or BP-Fairfield site. When the degraded upland habitat surrounding the Masonville Cove is remediated as part of the overall site cleanup, reptile and amphibian habitat would be improved. Similar improvements are expected in association with any future DMCF development as part of the compensatory mitigation

Wetland and Upland Habitats

Nearly all of the cumulative effects to wetlands would be to tidal open water. At the Masonville site there would be 0.42 acres of vegetated wetland affected. No other impacts to vegetated wetlands are anticipated. This is also true for the other proposed DMCF projects in the Baltimore Harbor. Therefore, cumulative wetland impacts have been analyzed in the aquatic resources Section 5.8.4.5. Because the current and proposed Harbor DMCFs are all tidal open water sites, no cumulative adverse upland impacts are expected. The HMI DMCF encroaches 100 ft into a wetland on the former Hart Island (USACE 1973). All of the sites combined include the loss of over 2,000 acres of tidal open water. Each of these projects would be or was required to mitigate for the loss of wetlands, including tidal open water. There are significant cumulative impacts to tidal open water. A new 2-acre marsh, however, is proposed for mitigation for open water losses associated with an industrial redevelopment area along the western shore of the Middle Branch of the Patapsco River.

The proposed BP-Fairfield, Sparrows Point, and Masonville DMCF projects would result in a loss of 48 acres of upland habitat in the critical area. An additional 20 acres of upland habitat would be established on the edge of the proposed Masonville DMCF to replace 10 acres of upland lost. The Cox Creek expansion had no impact on upland habitats. The HMI DMCF dike was placed so that the existing woodland on Hart Island would not be affected. Cumulative impacts to upland habitats are minor.

Approximately 80 acres of upland habitat would be affected and approximately 120 acres of tidal open water would be affected as a result of the AES Sparrows Point LNG Terminal. Appropriate mitigation would be required if this project is completed.

One additional project would result in improvements to the Middle Branch. The National Aquarium in Baltimore is developing an environmental Demonstration Area along the north shore of the Middle Branch, just west of the Veterans Bridge (Hanover Street Bridge). This National Aquarium project would result in added shoreline wetlands and shoreline restoration. This, along future wetland mitigation projects to be developed by Baltimore City, would further add cumulative benefit to the Patapsco River estuary region.

5.8.4.7 Rare, Threatened, and Endangered Species

The Baltimore Harbor and the Patapsco River are essentially an industrial area and utilized by few RTE species, even passively. No RTE species were known to occur at the HMI DMCF, the Seagirt Marine Terminal, or Cox Creek DMCF sites at the time of construction (USACE 1973, USACE 2000, Ecological Analysts 1984). These sites are currently port facilities and do not contain habitat for RTE species. Although shortnose sturgeon have been collected by commercial fishermen in the mouth of the Patapsco River, they are transients to the area (Section

2.1.9). Other listed aquatic species (sea turtles and whales) are not known to occur near any of the current or future Harbor project sites. Port shipping is expected to increase 1.8 times over the next 20 years. However, increases in ship strikes of listed whale species as a result of increased ship traffic is expected to be very low due to the currently low incidence of ship strikes along the migratory routes in the region (Maryland and Virginia waters).

5.8.4.8 Air Quality

The proposed Masonville DMCF would produce air quality impacts in addition to the construction related emissions associated with developing the project. The secondary emissions would be produced by the following activities.

- Emissions produced during the maintenance dredging of shipping channels
- Emissions associated with the development of the adjacent commercial properties would include the Masonville Marine Terminal Phase I, Masonville Marine Terminal Phase II, Fairfield Marine Terminal, and the former KIM property.

These emissions would also be generated by or associated with the proposed BP-Fairfield and Sparrows Point DMCFs, if they are constructed as anticipated. These emissions were produced by or associated with the Seagirt Marine Terminal, the Cox Creek DMCF renovation, and the HMI DMCF when they were constructed.

Maintenance Dredging Activities

The dredging of the Baltimore shipping channels would result in air emissions associated with the use of hydraulic and mechanical equipment. Maintenance dredging has been an ongoing activity in the Baltimore Harbor area for decades. Presently the bulk of the material is being sent for disposal at the HMI DMCF. Placement of material at the HMI DMCF would be terminated around the timeframe of the activation of the proposed Masonville DMCF. It is not envisioned that there would be a net change in the historical emissions associated with the maintenance dredging projects. It is probable that emissions may be reduced since cleaner internal combustion engines are starting to be utilized by the industry.

It is also important to note that the prime federal statute regulating emissions from new construction projects, the General Conformity Rule, specifically exempts maintenance dredging from the requirements of the regulation.

Emissions from Adjacent Developed Properties

There are a variety of current proposals for the utilization of the MMT Phase I, MMT Phase II, Fairfield Marine Terminal, and the former KIM property. Final plans for development may be several years away from completion. The only known activity would be the expansion of the vehicle receiving and holding areas.

It is believed that the emissions associated with the property use should be minimal. Emissions would largely be related to the movement of the vehicle fleet and should not be significant. The type of vehicles being imported would represent a new fleet with the most up-to-date emission

control systems required by USEPA standards. Vehicles would only be used intermittently with no continuous source of emissions to be associated with the properties. Additionally, activities involving the "routine operation of facilities, mobile assets, and equipment" are exempt from the General Conformity Rule. The General Conformity Rule identifies actions which are deemed to have significant air quality impacts.

All projects completed within the State of Maryland must comply with the State Implementation Plan. Any actions whose emissions do not fall below the EPA threshold values for the region would require mitigation or offsets. Therefore, there should be no increase in regional emissions.

End Use of the Proposed DMCF

It is proposed that the Masonville site may be developed as a port facility after the DMCF closes. If this were developed as a port facility it is anticipated that it would be consistent with MMT Phase I and MMT Phase II and may serve as an automobile storage and loading area. The emissions associated with this would be similar to those discussed for MMT Phase I and MMT Phase II discussed above.

Regional Emissions Reduction Associated with Alternative 2

Implementation of Alternative 2 (either the 20 or 25 percent Seagirt borrow scenarios) would result in a regional reduction of emissions, particularly of NO_x, relative to Alternative 1. There would also be a reduction of emissions associated with the Seagirt dredging project relative to the No Action Alternative. This reduction in emissions is associated with the shortened transport distance for the material by placing the material at Masonville during dike construction instead of at the HMI DMCF. The proposed Masonville DMCF site is approximately 2.3 miles from the Seagirt dredging area, while the HMI DMCF is approximately 14 miles away. The placement of the materials using a split hull barge at Masonville rather than pumping the material hydraulically would also decrease regional emissions. The total decrease in regional NO_x emissions associated with the implementation of Alternative 2 rather than Alternative 1 or the No Action Alternative would be 56.6 tons.

5.8.4.9 Hazardous, Toxic, and Radioactive Wastes

The proposed Masonville DMCF would result in a substantial reduction in HTRW. There would be no additions of these materials as a result of this project or any of the other projects considered as part of the cumulative impacts. If the proposed Masonville DMCF is constructed, the derelict vessels in KIM Channel would be remediated. The land portion of the former KIM site has had all surface and significant subsurface contamination removed. The former KIM site would be capped and has been cleared by the MDE VCP. The BP-Fairfield site has had the petroleum contamination removed and the site has been cleared by the MDE VCP program. The existing projects at the Seagirt Marine Terminal, the HMI DMCF, the Cox Creek DMCF, and the proposed DMCFs at Sparrows Point, Masonville, and BP-Fairfield would all cap contaminated sediments, which has the potential to positively impact water quality by removing a non-point source contribution to the waterway. When contaminated sediments in the Harbor are dredged

they would be placed in confined disposal sites, thus further reducing the availability of the contaminants to the environment. Material dredged as part of the AES Sparrows Point LNG Terminal project would remove contaminated surficial sediments from the Patapsco River, reducing the availability of those contaminants to the environment.

In addition to the reductions related to the proposed Masonville DMCF, the mitigation package includes the removal and appropriate disposal of approximately 16,000 tons of creosote treated timbers and numerous piles of discarded materials and wastes that are found throughout the land area surrounding Masonville Cove. Throughout the Baltimore Harbor region, contaminated sites are being remediated as they are purchased or redeveloped. The overall cumulative impacts of remediation and cleanup of contaminated sites is beneficial to the region and ecosystem.

5.8.4.10 Navigation

Masonville, BP-Fairfield, Sparrows Point, Cox Creek, and HMI are proposed and existing DMCFs for material dredged from Baltimore Harbor Channels. If these DMCFs did not exist, or are not constructed, maintenance of the Baltimore Harbor Channels would be adversely affected, which would have an adverse impact on navigation. The construction of additional DMCFs is expected to promote safe passage through the Harbor channels. Therefore, the cumulative impact of the existing and proposed DMCFs is beneficial. There are minor increases in boat traffic during the construction of a DMCF, but these a short-term impacts that only have a negligible effect on cumulative impacts. The AES Sparrows Point LNG Terminal would not be expected to have adverse impacts to navigation.

5.8.4.11 Floodplains

The footprint of these proposed and existing projects are primarily within the waterway and not along the land adjacent to the water. Therefore, no significant, cumulative impacts to the floodplains are expected as a result of the proposed and existing DMCF projects in the Patapsco River. All of the proposed DMCF projects (Masonville, BP-Fairfield, and Sparrows Point) would comply with Executive Order 11988. The AES Sparrows Point LNG Terminal includes approximately 80 acres of land within the floodplain and would turn 1.5 acres of upland habitat into tidal open water, removing it from the waterway.

5.8.4.12 Critical Areas

There would be 38 acres of the critical area affected by the construction of the proposed BP-Fairfield DMCF and 10 acres of critical area affected by the construction of the proposed Masonville DMCF. There are no impacts anticipated to the critical area if the Sparrows Point DMCF is constructed. The Cox Creek and the HMI DMCFs and the Seagirt Marine Terminal were already in existence prior to the creation of the Critical Areas Program, thus were not subject to the regulations of the Program, through a grandfather clause (USACE 2000). Up to 80 acres within the Critical Area would be developed as part of the AES Sparrows Point LNG Terminal. The critical area buffer lost during construction of the proposed Masonville DMCF would be replaced along the outer edge of the new dike. Similar losses projected for future sites would be mitigated through negotiation with the Critical Area Commission.

5.8.4.13 Coastal Zone Management

Considering all existing and proposed projects, there would be a cumulative loss of over 2,000 acres of tidal open water and aquatic habitat. There would be significant impacts to the benthic community and fisheries as a result of these proposed projects. All of these projects are required to comply with the Coastal Zone Management Act and would require a Coastal Zone Consistency Determination. The associated mitigation plans for any future sites would include features that could improve the coastal zone in some areas of the Patapsco River.

5.8.4.14 Coastal Barriers

There are no coastal barriers in Baltimore County or Baltimore City. Therefore, there are no cumulative impacts to coastal barriers.

5.8.4.15 Wild and Scenic Rivers

The Patapsco River is not a designated Wild and Scenic River. There are no cumulative impacts to Wild and Scenic Rivers.

5.8.4.16 Prime and Unique Farmland

No prime and unique farmland has been or would be affected by any of the proposed projects. There are no cumulative impacts to prime and unique farmlands.

5.8.5 Cumulative Impacts to Cultural Resources

There are no cultural resources located within the proposed project footprints of Masonville and BP-Fairfield, or within the project footprints of the Seagirt Marine Terminal, the Cox Creek DMCF, and the HMI DMCF. There are unlikely to be any cultural resources affected by the proposed development of Sparrows Point. Two potential resources have been identified in the vicinity of Sparrows Point, but the project alignments for the DMCF have not been finalized, and would likely avoid these resources. The AES Sparrows Point LNG Terminal project would also need to consider these potential cultural resources before developing the facility.

5.8.6 Cumulative Impacts to Socioeconomic Resources

5.8.6.1 Future Land and Water Use

The adjacent land use around the proposed Masonville DMCF is largely industrial, thus construction of the DMCF and its subsequent development as a port terminal would be in keeping with existing uses. The same relationship between proposed land use and existing land use holds true for the proposed Sparrows Point and BP-Fairfield DMCFs, Cox Creek DMCF expansion, and the AES Sparrows Point LNG Terminal. In each of these cases, any new land created by the project and existing land would ultimately be used for industrial purposes within a pre-existing industrial landscape. The HMI DMCF is located offshore but within view of a

number of homes in Baltimore County, and this site's ultimate use as a park would provide recreational opportunities to nearby residents, as is currently the case with a portion of the island.

The cumulative impact of additional industrial lands created through these projects is expected to increase land supply for industrial activities. Development of industrial activities where a concentration already exists would allow compatible activities to be co-located and prevent spillovers into less compatible areas (e.g., residential areas).

Current water use in the Patapsco River is primarily associated with: domestic and international shipping, recreational boating to or from the Inner Harbor area, recreational angling, and commercial fishing. In the future, the development of the proposed DMCFs and the maintenance of Seagirt Marine Terminal would facilitate the use of these waters by shippers. Future water use by recreational boaters is not expected to be impacted by the implementation of these projects. The mitigation projects associated with the proposed DMCFs and the Cox Creek renovation may improve aquatic habitats locally and improve conditions for recreational fishing.

5.8.6.2 Fishery-Related Economic Impacts

The cumulative economic impacts on commercial fishing are thought to be low because, overall, the level of commercial fishing effort in the Patapsco is low. The proposed Masonville DMCF is not expected to displace commercial watermen, nor is it expected to have an adverse impact on commercial fish stocks. Similarly, the proposed DMCFs at Sparrows Point and BP-Fairfield and the AES Sparrows Point LNG Terminal are not expected to have an adverse impact on commercial fishing. Some commercial crabbing may occur within the proposed wetland cell at the southeast corner of Sparrows Point, but commercial and recreational fishing concerns would be taken into account as that alternative is examined. Development of the AES Sparrows Point LNG Terminal would also involve consideration of recreational and commercial fisheries. The rehabilitation of the Cox Creek DMCF is located south of the Key Bridge, where commercial fishing effort in the Patapsco may be somewhat more concentrated. However, the project is only 5 acres in size, and therefore is not expected to adversely affect commercial fisheries. Similarly, the placement of fill material at the location of the Seagirt Marine Terminal beginning in 1980 is not thought to have had an adverse impact on commercial fishing in the Patapsco.

Unlike the other projects, the HMI DCMF is not in the Patapsco River, but in the Chesapeake Bay. The commercial watermen who fish this area of the Bay are likely different from those who fish inside the Patapsco due to the larger vessels required restrictions on some gears inside the River, and run times to landing and docking facilities. Therefore, any negative economic impacts associated with the construction of the HMI DMCF likely would have been borne by commercial watermen who have not been and would not be affected by the other projects.

5.8.6.3 Employment and Industry

The cumulative economic impacts generated by spending on the proposed Masonville DMCF and other proposed projects would be significant. As described in Section 5.3.3.4, the proposed Masonville DMCF constructed alone would generate nearly $324 million in direct, indirect, and

induced spending over the 20 year life of the project[1]. Two additional DMCFs have been proposed, one at Sparrows Point and one at BP-Fairfield. Preliminary cost estimates for these projects are $432 million and $152 million, respectively[2]. Assuming spending patterns for these projects are similar to those for Masonville, and accounting for statewide multiplier effects, the total (direct, indirect, and induced) statewide impacts are estimated to be $786 million for the Sparrows Point DMCF and $276 million for the BP-Fairfield DMCF. Therefore, the cumulative economic impacts of direct, indirect, and induced spending on these projects could reach over $1.3 billion dollars.

The Port of Baltimore is a major contributor to the economy of the City, State, and Region in terms of jobs, business revenues to the private sector, and tax revenues and customs fees to the public sector (MPA 2002a). The Port is made up of a mix of public and private terminals. The MPA, while not a for-profit entity, holds and manages commercial real-estate. Publicly-owned port terminals that are leased to private companies, such as the one that may be developed at Masonville, generate revenue from leases, wharfage, and dockage fees that offsets operating expenses at public terminals (MPA 2002a).

Preliminary estimates for the AES Sparrows Point LNG Terminal anticipate approximately 500 individuals to be employed during the construction of the facility and 40 to 50 additional full time jobs once the facility is operational. It is anticipated that induced and indirect jobs would be created during the construction and operation of the facility (AES Sparrows Point LNG 2006).

5.8.6.4 Environmental Justice

Cumulatively, no adverse environmental justice issues have been identified as a consequence of the existing or proposed projects described in this section. For some individual projects, lower income households would be affected. However community participation in the decision-making process and project-related mitigation would minimize any environmental justice concerns.

The communities around the proposed Masonville DMCF contain a higher proportion of households in poverty than the City or the State. The community, however, has been directly engaged in project planning and mitigation development. The opportunity for resident participation in the decision-making process has been facilitated through the Harbor Team process, and this effort has tempered environmental justice concerns. The communities around the proposed Sparrows Point DMCF and AES Sparrows Point LNG Terminal have slightly lower incomes, on average, than Baltimore County or the State, and the communities around the proposed BP-Fairfield DMCF have similar incomes to those in the City, but incomes are lower than the state average. Similar to Masonville, the residents in these areas were provided the opportunity to participate in the Harbor Team process. In each case, residents were part of a process which recommended proceeding with further study of a DMCF at each of these two

[1] Direct impacts are associated with spending on the project itself. Direct spending generates multiplier effects which result in indirect impacts associated with purchases and sales by businesses that supply inputs to the project, and induced impacts associated with increased spending due to increased household income from direct and indirect impacts.
[2] These cost estimates are preliminary and are expected to change as additional studies are completed.

sites, thereby assuaging environmental justice concerns. The Cox Creek DMCF Renovation Environmental Assessment (USACE 2000) notes that there are no minority or low-income groups near the project, therefore, environmental justice issues are not a concern. The Seagirt Marine Terminal and the HMI DMCF were constructed prior to the 1994 Executive Order that mandated consideration of minority and low-income populations; therefore, environmental justice issues were not considered in any NEPA documents relating to those projects. Nevertheless, no environmental justice issues have been identified in association with these projects.

5.8.6.5 Safety to Children

No cumulative impacts to the health and safety of children are anticipated. Due to the industrial nature of the proposed DMCFs at Masonville, Sparrows Point, and BP-Fairfield, the existing Seagirt Marine Terminal, as well as the Cox Creek rehabilitation and proposed AES Sparrows Point LNG Terminal, it is presumed that children would not have access to these sites, and therefore their safety would not be compromised. The development of the HMI DMCF as a park is not expected to pose any risks to the health and safety of children. The restoration of the Masonville Cove site would provide recreational activities which would not impact safety to children. There would be fences to separate the industrial portion of the DMCF from the restored habitat and nature center. The existing timbers and waste piles would be removed.

5.8.7 Cumulative Impacts to Aesthetics and Recreation

5.8.7.1 Aesthetics, Noise, and Light

Aesthetics

Cumulative effects of aesthetic impacts were evaluated by considering both short-term and long-term effects. The shoreline of the existing site is vegetated, therefore, during construction; the bare dikes of the project would be an apparent element in the viewshed from a variety of locations. In the long-term, the project is expected to be generally harmonious with the setting since it is an extension of an existing terminal. After project construction, the proposed Masonville DMCF is expected to be developed as a port terminal for the offloading and handling of automobile or RO-RO cargo. If the terminal is developed in this way, its end use would be consistent with the majority of the existing industrial uses in the area. After construction is complete and while the site is being developed for its end use, the dikes would be planted with trees which would make it consistent with the existing shoreline use at the site. The other proposed DMCF facilities at BP-Fairfield and Sparrows Point are expected to have similar aesthetic strengths and weaknesses, but generally be consistent with the urban Port setting. As part of the Cove cleanup activities, debris would be removed from the Masonville Cove shoreline. This would be a beneficial impact to the area. Therefore the cumulative impacts of the aesthetics of the project are not expected to be significant, but would likely improve the area.

Noise and Light

The majority of noise and light impacts are short-term construction impacts affecting those using or living in areas adjacent to the projects. The long-term increase in noise and light is modest at Masonville in the context of the ambient Baltimore light levels. Therefore, no cumulative impact is expected.

The end use of the proposed Masonville DMCF has not been finalized, but it is expected to be a port terminal used for automobile storage or RO-RO. An additional alternatives analysis would need to be completed prior to construction of the end use of the site. If the terminal is used for automobile or RO-RO offloading and storage, this use is consistent with other land use in the area. Noise levels from water-related activities associated with the port facility are expected to be consistent with existing noise levels. On the land-side, the terminal is expected to be accessible using existing infrastructure. Currently, the site is separated from nearby residences by infrastructure that contributes to the existing noise environment (e.g., railroad tracks and Interstate 895), as well as local, industrial roads that access the site (Figure 5-33). While the end use of the project may result in more truck traffic on the roads that currently access the site, these roads are isolated from residential areas, as described above. Therefore, this potential increase in traffic is not expected to result in noise impacts at nearby residences.

After the project is completed and the site is developed as a port terminal, the long-term lighting of the site is expected to be consistent with the current light environment of this urban, industrialized area. Any structures remaining after construction are likely to be permanently lit by aids to navigation, low-intensity lighting (e.g., for piers), or tall light poles (e.g., for parking facilities). These types of lighting are similar to what already exists in the area.

5.8.7.2 Recreation

Recreational opportunities (including educational opportunities) are limited in the industrial parts of Baltimore Harbor. Most of the area recreation is focused on Inner Harbor attractions and area parks. Because of this, short-term impacts to recreation are not expected due to the proposed Masonville DMCF construction. However, over the long-term, any recreational boaters using the waters around the proposed Masonville DMCF would have to travel closer to the shipping channel due to construction of the facility, and eventually, close to the facility itself. Although the current Masonville terminal and proposed Masonville DMCF would not add any recreational value to the area, project developments would not adversely impact recreation.

In a cumulative sense, recreational fishing and boating near the other proposed DMCFs (BP-Fairfield and Sparrows Point) and the proposed AES Sparrows Point LNG Terminal site is higher than the Masonville area and those projects could have a greater impact on recreation. The HMI DMCF has become a recreational destination, and the mitigation package for Masonville Cove associated with the proposed Masonville DMCF has recreational and educational potential as well. Secondary impacts of the Masonville Cove cleanup have the potential to improve wildlife observation, recreational boating, fishing, hiking, and environmental education. Therefore, the long-term cumulative effects on recreation and education are expected to be positive.

Figure 5-33. Existing Infrastructure Near Proposed Masonville DMCF.