TMDL Compliance Planning at the Maryland Port Administration

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INTRODUCTION

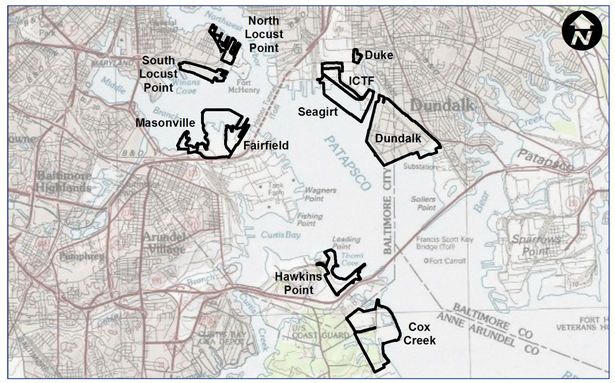
The MPA is committed to the stewardship of the Chesapeake Bay, including the wildlife that depends on aquatic and shoreline habitat. As part of that effort, MPA is working to reduce the impact of stormwater runoff from its facilities, which was the genesis for this project and the Water Quality Management Plan (WQMP). The goal of the plan is to help the MPA meet National Pollutant Discharge Elimination System (NPDES) Municipal Separate Stormwater System (MS4) permit requirements and the need for pollutant load reductions from the Chesapeake Bay nutrient and sediment Total Maximum Daily Load (TMDL).

The plan was developed to provide a description of existing conditions, potential pollutant sources, existing stormwater controls, recommendations for improvements, and an implementation plan.

To support MPA's reporting requirements, the plan provides:

- Inventory of existing stormwater controls, delineation of drainage areas, and calculations of both impervious and pervious treated and untreated area.
- Modeling of existing nutrient and sediment loads and an estimate of pollutant reductions from existing controls using methods compatible with the Chesapeake Bay TMDL.
- Analysis of potential of stormwater retrofits and non-structural measures and recommendations for those that are appropriate for MPA facilities.
- Concepts and cost estimates for specific stormwater retrofits and estimates of pollutant load reductions from recommended treatment measures.

Plans were included for ten marine terminals owned by the MPA: Cox Creek, Duke, Dundalk, Fairfield, Hawkins Point, the Intermodal Container Transfer Facility, Masonville, North and South Locust Point, and Seagirt.



LAND COVER

Land cover was mapped using planimetric data, updated with orthophotography, then field verified. The land use analysis found that pavement is the primary land cover. Because of the nature of port operations, particularly for containers and automobile and construction equipment, a great deal of open, paved space is required. Scrub/shrub was the second most prevalent land cover, made up of open areas near the shoreline at Masonville, Cox Creek, and Hawkins Point terminals. Buildings were also a significant part of the land cover, primarily from cargo sheds at Dundalk and South Locust Point.

Land Cover by Terminal

	Abandoned Pier	Building	Construction	Gravel	Landfill	Pavement	Railroad	Riprap	Scrub/Shrub	Tank	Turf	Water	Total
Cox Creek		15.1	25.5	4.5		21.4	0.9	0.8	128.7		7.3	47.8	252.0
Duke						13.6			0.2		0.4		14.2
Dundalk		42.0				528.7	2.3		2.2		1.9		577.1
Fairfield	2.2	1.4				57.5		1.2	0.6	0.0	3.7		66.6
Hawkins Point		0.6		3.1	7.6	7.9	3.3	1.1	41.7	1.4	37.2	7.4	111.3
ICTF		0.1		1.6		54.4	5.6		0.6		1.5		63.8
Masonville		2.4		0.8		93.2		0.2	62.7		21.9	3.2	184.4
North Locust Point	0.4	11.5		3.6		46.6	2.2	0.2	0.6	2.0	0.4	0.3	67.8
Seagirt		2.0		6.7		199.2	1.3	1.5			3.8	0.7	215.2
South Locust Point		23.8				59.4	0.1	0.8	0.1		0.8		85.0
Total	2.6	98.9	25.5	20.3	7.6	1,081.9	15.7	5.8	237.4	3.4	78.9	59.4	1,637.4
Percent of Total	0.2%	6.0%	1.6%	1.2%	0.5%	66.1%	1.0%	0.4%	14.5%	0.2%	4.8%	3.6%	100.0%

Land Cover, Dundalk, Seagirt, and ICTF

STORMWATER MANAGEMENT

Given the age and development of the terminals; there is a fairly large amount of stormwater treatment already in place.

All of the terminals had at least some level of water quality treatment. Fairfield and Masonville, which were constructed or renovated after stormwater management regulations were in place, had the largest amount of existing treatment, at 81 and 84 percent respectively. The two largest, most active sites, Dundalk and Seagirt, have fewer areas with stormwater treatment; by small conventional systems, hydrodynamic separators and inlet filters in the case of Dundalk, and inlet filters and wet storage at Seagirt.

Masonville Surface Sand Filter

Overall, the MPA is currently treating 16 percent of its impervious area with structural controls. The controls range in pollutant removal effectiveness from sand filters, wet ponds, and a shallow marsh in Masonville, to hydrodynamic structures and inlet filters at several of the terminals, to underground dry detention storage at Fairfield, which only provides sedimentation.

Summary of Impervious Area and Existing Stormwater Treatment

Terminal	Drainage Area (ac)	Impervious Area (IA) (ac)	Percent Impervious	Treated Area (ac)	Existing Treated IA (ac)	Existing % IA Treated
Cox Creek	251.9	41.0	16%	27.2	15.3	37%
Duke	14.2	13.6	96%	0.0		0%
Dundalk	577.0	570.6	99%	25.5	23.7	4%
Fairfield	66.7	58.9	88%	49.6	46.0	81%
Hawkins Point	111.2	13.0	12%	33.1	4.0	31%
ICTF	63.9	56.1	88%	0.3	0.3	1%
Masonville	184.4	96.4	52%	106.8	81.4	84%
North Locust Point	67.8	63.6	94%	1.1	1.1	2%
South Locust Point	85.1	83.2	98%	1.5	1.4	2%
Seagirt	215.1	207.8	97%	27.8	25.7	12%
TOTAL	1,637.3	1,204.2	74%	272.9	198.9	16%

Impervious Area Treated by Stormwater Management (Acres)

	Bioretention	Dry ED Pond	Dry Pond	Hydrodynamic Structure	Inlet Filter	Oil-grit Separator	Shallow Marsh	Surface Sand Filter	UG Detention	UG Sand Filter	Wet Pond	Wet Vault	Total
Cox Creek											15.3		15.3
Duke													
Dundalk	1.8	0.7	5.2	2.3	13.7								23.7
Fairfield			13.6			11.3		0.8	19.6	0.7			46.0
Hawkins Point											4		4.0
ICTF						0.3							0.3
Masonville		5				0.2	5.8	36.3			34.1		81.4
North Locust Point										1.1			1.1
South Locust Point		1.4											1.4
Seagirt					4.2						14.6	6.9	25.7
TOTAL	1.8	7.1	18.8	2.3	17.9	11.8	5.8	37.1	19.6	1.8	68	6.9	198.9

Existing Treatment, Dundalk, Seagirt and ICTF

STORMWATER RETROFITS

On-site Conventional BMPs

The assessment of potential retrofit sites conducted for each terminal resulted in seven recommended projects. They provide treatment for an additional 28 impervious acres. All of the proposed BMPs provide relatively high removal rates for all of the pollutants of concern.

Area-Wide Alternative BMPs

Following the assessment for conventional stormwater management practices, a set of alternative techniques were analyzed that were anticipated to be more feasible to implement given the constraints from the nature of Port facilities and operations. These area-wide alternatives were assessed and sized based on treating a unit impervious area, without siting them at specific locations. Two were conventional BMPs: underground wet vaults, and permeable pavers. Three were alternative BMPs: hydrodynamic separators, catch basin filters, and a proprietary underground filter. Two were pollution prevention methods: street sweeping and catch basin cleaning, and one was a mitigation approach: floating treatment wetlands.

PRIORITIZATION

There are any number of methods to define priorities for stormwater retrofits. However, for a project such as this one, where the goal was to reduce runoff pollution, and the cost and modeling data were available to demonstrate the cost-effectiveness of meeting the goal, then the simplest approach of determining the cost per pound of pollutant removed, was sufficient. Two tables are shown below, for the on-site retrofits, and for the area-wide approaches.

Priorities for On-Site Conventional BMPs

Site	Proposed Retrofit	Cost per lb, TP	Rank
FMT-R02	Bioswale	$15,874	1
NLPMT-R02	Wet Pond	$33,922	2
MMT-R01	Bioswale	$42,729	3
MMT-R02	Bioswale	$44,543	4
NLPMT-R03	UG Sand Filter	$50,970	5
SLPMT-R03	Bioretention	$53,108	6
NLPMT-R01	Wet Vault	$140,698	7

Priorities for Area-wide Retrofits

Proposed Retrofit	Cost per lb, TP	Rank
Floating treatment wetlands	$1,682	1
Permeable pavement	$10,075	2
Catch basin filters	$16,388	3
Street sweeping	$46,311	4
Hydrodynamic separators	$62,606	5
Wet vaults	$106,076	6
Catch basin cleaning	$171,316	7
Proprietary filter	$245,624	8

Of the area-wide projects, the highest ranked by an order of magnitude was the floating treatment wetlands. This approach had the lowest cost per pound of all the proposed alternatives, a function in part of its high removal rate. Permeable pavers ranked high, although the treated area for these BMPs (24.8 ac) was the lowest of all the alternatives.

Even with the low three percent TP removal rate for street sweeping, it was among the more cost-effective approaches. There is considerable uncertainty in both the cost and pollutant removal for this pollution prevention technique, however.

The lowest ranked project, the proprietary filter, has a high removal rate. It may be feasible to implement these BMPs at selected locations in order to improve the total pollutant removal from all of MPA's sites.

TMDL ISSUES

In the Phase II Watershed Improvement Plan (WIP), the Bay Program and MDE have allocated pollutant removal targets for Phase I NPDES counties and Maryland SHA. They have not yet been allocated to individual Phase II NPDES permittees; as a result, the reductions MPA will have to meet were not established as of the publication date of the plan. However, it is possible to use the loads and reductions from the Phase II WIP for all State Phase II permittees to estimate the percent reduction that might be required.

Of the on-site conventional BMPs, the bioswales at Masonville and Fairfield, the underground sand filter at North Locust Point, and the bioretention retrofit at South Locust Point all meet or exceed the 2025 target removal rates. However, while these conventional BMPs have rates that could achieve the targeted goals, the area that can feasibly be treated with them is so limited that the overall load reduction targets cannot be met with this approach.

	TN % Reduction	TP % Reduction
2017 Target	22%	33%
2025 Target	32%	46%

Of the area-wide alternatives, all but four, the hydrodynamic separators, catch basin filters, street sweeping, and catch basin cleaning, meet the targeted removal rates. This again depends on Bay Program acceptance of proposed rates for wet vaults, proprietary filters and floating treatment wetlands. With the exception of the floating treatment wetlands, however, the area-wide approaches with the highest removal rates and a large area of coverage are the least cost-effective.

The challenge in meeting the WIP targets is two-fold: First, MPA can only address improvements in one source sector for pollutant loads to the Bay: urban stormwater. Most other NPDES permittees addressing the issue, such as county governments, have the option of meeting the targets through reductions of loads in agriculture, stormwater, septic systems and wastewater. For these permittees, loads that can't be removed with stormwater retrofits may be achievable through other sectors.

North Locust Point Marine Terminal

Second, the MPA's options for retrofitting stormwater loads are limited because of site constraints. For example, some of the other options open to counties are to expand urban tree canopies; reduce lawn fertilizer; restore wetlands and plant streamside buffers. None of these improvements to natural features are applicable to the MPA's facilities.

In short, options for meeting the 2025 reductions onsite are limited. There are three possible approaches moving forward:

- Work with MDE and the Bay Program to set target expectations more applicable to the urban stormwater sector for 100% impervious sites.
- Work with MDE and the Bay Program to update removal efficiencies for area-wide alternatives such as street sweeping, where monitoring studies show better results than are currently credited.
- Work offsite to offset MPA stormwater loads in other areas within the Baltimore Harbor watersheds, which has the potential for allowing the MPA to meet its permit and TMDL goals. Floating treatment wetlands could provide full treatment of pollutant loads in a cost-effective manner. Nutrient trading may have the same benefits; however the program is still so recent that no cost data are yet available.

In summary, the WQMP successfully identified the current state of stormwater treatment at MPA's facilities. It provided an estimate of the amount of nutrient and sediment reduction needed, along with an inventory of potential treatment, giving MPA a much better understanding of its permit compliance requirements in the future.

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