UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

Ms. Marie Halka, Acting Director
Science Services Administration
Maryland Department of the Environment
1800 Washington Blvd., Suite 540
Baltimore, Maryland 21230-1718

OCT 0 1 2012

Dear Ms. Halka:

The U.S. Environmental Protection Agency (EPA), Region III, is pleased to approve the report, *Total Maximum Daily Loads of Polychlorinated Biphenyls in Baltimore Harbor, Curtis Creek/Bay, and Bear Creek Portions of Patapsco River Mesohaline Tidal Chesapeake Bay Segment, Maryland.* The TMDL report was submitted by the Maryland Department of the Environment (MDE) to EPA for final review on September 30, 2011, and received on October 7, 2011. The TMDL was established and submitted in accordance with Section 303(d)(1)(c) and (2) of the Clean Water Act to address impairments of water quality as identified in Maryland's Section 303(d) List.

The Maryland Department of the Environment has identified the Patapsco River Tidal Chesapeake Bay Segment (Integrated Report Assessment Unit ID: PATMH) on the State's 2010 Integrated Report as impaired by nutrients--nitrogen and phosphorus (1996), sediments (1996), trash and debris (2008), and impacts to biological communities (2004). The Baltimore Harbor portion of the Patapsco River Mesohaline Tidal Chesapeake Bay Segment (Integrated Report Assessment Unit ID: PATMH-02130903) has been individually identified on the State's 2010 Integrated Report as impaired by: PCBs in fish tissue (1998), chlordane (1998), bacteria–Furnace Creek, Marley Creek, Rock Creek, and all tidal waters upstream of the harbor tunnel (1998), zinc--Middle and North Branches (1998), chromium--Northwest Branch (1998), and lead--Northwest Branch (1998). In addition, the Curtis Creek/Bay portion of the Patapsco River Mesohaline Tidal Chesapeake Bay Segment (Integrated Report Assessment Unit ID: MD-PATMH-CURTIS_BAY_CREEK) has been individually identified on the State's 2010 Integrated Report as impaired by PCBs in both fish tissue and sediment (1998) and zinc (1998), and the Bear Creek portion of the Bay Segment has been individually identified on the State's 2010 Integrated Report (Integrated Report Assessment Unit ID: MD-PATMH-BEAR_CREEK) as impaired by PCBs in both fish tissue and sediment (1998), zinc (1998), and chromium (1998). This TMDL addresses the total PCB (tPCB) listings for the Baltimore Harbor embayment, Curtis Creek/Bay, and Bear Creek.

In accordance with Federal regulations at 40 CFR §130.7, a TMDL must comply with the following requirements: (1) be designed to attain and maintain the applicable water quality standards; (2) include a total allowable loading and as appropriate, wasteload allocations for point sources and load allocations for nonpoint sources; (3) consider the impacts of background pollutant contributions; (4) take critical stream conditions into account (the conditions when water quality is most likely to be violated); (5) consider seasonal variations; (6) include a margin of safety (which accounts for uncertainties in the relationship between pollutant loads and instream water quality); and (7) be subject to public participation. In addition, these TMDLs considered reasonable assurance that the TMDL allocations assigned to the nonpoint sources can be reasonably met. The enclosure to this letter describes how the PCB TMDL for the Baltimore Harbor, Curtis Creek/Bay, and Bear Creek Portions of Patapsco River Mesohaline Tidal Chesapeake Bay Segment watershed satisfies each of these requirements.

As you know, any new or revised National Pollutant Discharge Elimination System permits must be consistent with the TMDL's wasteload allocation pursuant to 40 CFR §122.44(d)(1)(VII)(B). Please submit all such permits to EPA for review as per EPA's letter dated October 1, 1998.

If you have any questions or comments concerning this letter, please do not hesitate to contact Ms. Maria Garcia, at 215-814-3199.

Sincerely,

Jon M. Capacasa, Director
Water Protection Division

Enclosure

cc: Melissa Chatham, MDE-SSA
Jay Sakai, MDE-WMA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

# Decision Rationale
# Total Maximum Daily Loads of Polychlorinated Biphenyls in Baltimore Harbor, Curtis Creek/Bay and Bear Creek Portions of Patapsco River Mesohaline Tidal Chesapeake Bay Segment, Maryland

Jon M. Capacasa, Director
Water Protection Division

Date: 10.1.12

**Decision Rationale**

# Total Maximum Daily Loads of Polychlorinated Biphenyls in Baltimore Harbor, Curtis Creek/Bay, and Bear Creek Portions of Patapsco River Mesohaline Tidal Chesapeake Bay Segment, Maryland

## I. Introduction

The Clean Water Act (CWA) requires a Total Maximum Daily Load (TMDL) be developed for those waterbodies identified as impaired by the State where technology based and other controls will not provide for attainment of water quality standards. A TMDL is a determination of the amount of a pollutant from point, nonpoint, and natural background sources, including a Margin of Safety (MOS) that may be discharged to a waterbody without exceeding water quality standards.

This document sets forth the U.S. Environmental Protection Agency's (EPA) rationale for approving the TMDLs for total Polychlorinated Biphenyls (PCB) in the Baltimore Harbor, Curtis Creek/Bay, and Bear Creek portions of the Patapsco River Mesohaline Tidal Chesapeake Bay Segment. The TMDL was established to address impairments of water quality, caused by PCBs, as identified in Maryland's 1998 Section 303(d) List for water quality limited segments. The Maryland Department of the Environment (MDE) submitted the report, *Total Maximum Daily Loads of Polychlorinated Biphenyls in Baltimore Harbor, Curtis Creek/Bay, and Bear Creek Portions of Patapsco River Mesohaline Tidal Chesapeake Bay Segment, Maryland,* dated September 2011, to EPA for final review on September 30, 2010, and received on October 7, 2011. The entire Patapsco River Mesohaline Tidal Chesapeake Bay Segment, also referred to as an embayment, includes more than the individual segments identified within the TMDL report as impaired for PCBs, for which TMDLs have been developed. Also, the Baltimore Harbor portion of the Patapsco River Mesohaline Tidal Chesapeake Bay/Segment encompasses both Curtis Creek/Bay and Bear Creek. Since the Curtis Creek/Bay and Bear Creek segments were individually identified as impaired for PCBs due to sediment data, in addition to the impairment listing for the entire Baltimore Harbor portion of the Bay Segment (based on PCB fish tissue concentrations), there is a spatial overlap between the various PCB impairment listings for the Bay Segment. As a result, the baseline and TMDL loads for the Baltimore Harbor portion of the Bay Segment described in this document include the baseline and TMDL loads for the Curtis Creek/Bay and Bear Creek segments. The spatial unit defined as the Baltimore Harbor embayment will refer solely to the Baltimore Harbor portion of the Patapsco River Mesohaline Tidal Chesapeake Bay Segment (i.e., the portion of the Bay Segment impaired for PCBs in fish tissue), which encompasses the Curtis Creek/Bay and Bear Creek segments. The spatial units defined as Curtis Creek/Bay and Bear Creek will refer solely to these individual segments of the Baltimore Harbor embayment, which are specifically impaired for PCBs in sediment, in addition to fish tissue. The basins identification are as follows: Patapsco River Mesohaline Tidal Chesapeake Bay Segment (MD-PATMH), Baltimore Harbor portion of the Patapsco River Mesohaline Tidal Chesapeake Bay Segment (MD-PATMH-2130903), Curtis Creek/Bay portion

of the Patapsco River Mesohaline Tidal Chesapeake Bay Segment (MD-PATMH-CURTIS_BAY_CREEK), Bear Creek portion of the Patapsco River Mesohaline Tidal Chesapeake Bay Segment (MD-PATMH-BEAR_CREEK).

EPA's rationale is based on the TMDL report and information contained in the computer files provided to EPA by MDE. EPA's review determined that the TMDLs meet the following seven regulatory requirements pursuant to 40 CFR Part 130.

1. The TMDL is designed to implement applicable water quality standards.
2. The TMDL includes a total allowable load as well as individual wasteload allocations (WLAs) and load allocations (LAs).
3. The TMDL considers the impacts of background pollutant contributions.
4. The TMDL considers critical environmental conditions.
5. The TMDL considers seasonal environmental variations.
6. The TMDL includes a MOS.
7. The TMDL has been subject to public participation.

In addition, these TMDLs considered reasonable assurance that the TMDL allocations assigned to nonpoint sources can be reasonably met.

## II. Summary

The TMDL specifically allocates the allowable total PCB (tPCB) loading to the Baltimore Harbor, Curtis Creek/Bay, and Bear Creek Portions of Patapsco River Mesohaline Tidal Chesapeake Bay Segment. There are 165 permitted point sources of PCB, which are included in the WLA. The fact that the TMDL does not assign WLAs to any other sources in the watershed should not be construed as a determination by either EPA or MDE that there are no additional sources in the watershed that are subject to the National Pollutant Discharge Elimination System (NPDES) program. In addition, the fact that EPA is approving this TMDL does not mean that EPA has determined whether some of the sources discussed in the TMDL, under appropriate conditions, might be subject to the NPDES program. The annual average TMDLs and maximum daily load (MDL) for tPCBs for the Baltimore Harbor, Curtis Creek/Bay, and Bear Creek Portions of Patapsco River Mesohaline Tidal Chesapeake Bay Segment are presented in Table 1. Individual annual and daily WLAs for permitted point sources are provided in Table 2.

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**Table 1. Summary of tPCB Baseline Loads, TMDL Allocations, Load Reductions and Maximum Daily Loads (MDLs) in the Baltimore Harbor Embayment**

| PCB Source | Baseline Load (g/year) | Percent of Total Baseline Load (%) | TMDL (g/year) | Load Reduction (%) | MDL (g/day) |
|---|---|---|---|---|---|
| Direct Atmospheric Deposition (to the Surface of the Embayment) | 1,360.88 | 22% | 576.47 | 57.6 | 5.30 |
| Tributaries[1] | | | | | |
| Jones Fall | 299.34 | 4.8 | 25.59 | 91.5 | 0.24 |
| Gwynns Fall | 541.42 | 8.7 | 46.29 | 91.5 | 0.43 |
| Patapsco River Lower North Branch | 688.85 | 11.1 | 58.90 | 91.5 | 0.54 |
| Non-regulated Watershed Runoff[2] | 362.49 | 5.9 | 30.99 | 91.5 | 0.29 |
| Contaminated Sites | 14.51 | 0.2 | 14.51 | 0.0 | 0.13 |
| ***Nonpoint Sources/LAs*** | ***3,267.49*** | ***52.7*** | ***752.75*** | ***77.0*** | ***6.93*** |
| Industrial Process Water[4] | 859.38 | 13.9 | 498.60 | 42.0 | 4.24 |
| WWTPs | 366.81 | 5.9 | 32.83 | 91.1 | 0.28 |
| DMCFs | 77.60 | 1.3 | 77.60 | 0.0 | 0.66 |
| NPDES Regulated Stormwater[2,3] | | | | | |
| Anne Arundel County | 850.74 | 13.7 | 66.97 | 92.1 | 0.62 |
| Baltimore County | 338.50 | 5.5 | 28.94 | 91.5 | 0.27 |
| Baltimore City | 435.27 | 7.0 | 30.44 | 93.0 | 0.28 |
| ***Point Sources/WLAs*** | ***2,928.31*** | ***47.3*** | ***735.22*** | ***74.9*** | ***6.34*** |
| ***MOS (5%)*** | - | - | **78.31** | - | **0.70** |
| **Total** | **6,195.79** | **100.0** | **1,566.29** | **74.7** | **13.96** |

Notes: [1] Although the tributary loads are reported here as a single nonpoint source value, they could include both point and nonpoint source loads.

[2] Load applies to the direct drainage portion of the applicable watershed only.

[3] Load per jurisdiction applies to all NPDES stormwater dischargers within the direct drainage area of the jurisdiction to the Baltimore Harbor embayment. These dischargers are identified in Appendix H.

[4] 18.66 g/year of the 498.6 g/year allocated to industrial process water point sources is assigned to the Back River WWTP Outfall 002, since the effluent from the outfall is routed to RG Steel for use in their industrial processes. The allocation to the Back River WWTP Outfall 002 is calculated as the part of the WWTP design flow allocated to the outfall, which is 50 Million Gallons per Day (MGD), multiplied by the water column TMDL endpoint, which is 0.27 ng/L.

**Table 2. Summary of tPCB Baseline Loads, TMDL Allocations, Load Reductions and MDLs in the Curtis Creek/Bay**

| PCB Source[1] | Baseline Load (g/year) | Percent of Total Baseline Load (%) | TMDL (g/year) | Load Reduction (%) | MDL (g/day) |
|---|---|---|---|---|---|
| Direct Atmospheric Deposition (to the Surface of the Embayment) | 121.26 | 20.5 | 51.37 | 57.6 | 0.47 |
| Non-regulated Watershed Runoff[2] | 77.19 | 13.1 | 6.60 | 91.5 | 0.06 |
| Contaminated Sites | 7.84 | 1.3 | 7.84 | 0.0 | 0.07 |
| ***Nonpoint Sources/LAs*** | ***206.29*** | ***35.0*** | ***65.81*** | ***68.1*** | ***0.61*** |
| Industrial Process Water[3] | - | - | - | - | - |
| WWTPs[3] | - | - | - | - | - |

| PCB Source[1] | Baseline Load (g/year) | Percent of Total Baseline Load (%) | TMDL (g/year) | Load Reduction (%) | MDL (g/day) |
|---|---|---|---|---|---|
| DMCFs[3] | - | - | - | - | - |
| NPDES Regulated Stormwater[2,4] | | | | | |
| Anne Arundel County | 357.68 | 60.6 | 23.13 | 93.5 | 0.21 |
| Baltimore City | 26.22 | 4.4 | 2.91 | 88.9 | 0.03 |
| ***Point Sources/WLAs*** | ***383.89*** | ***65.0*** | ***26.05*** | ***93.2*** | ***0.24*** |
| ***MOS (5%)*** | - | - | **4.83** | - | **0.04** |
| **Total** | **590.18** | **100.0** | **96.68** | **83.6** | **0.89** |

Notes: [1] None of the upstream tributaries (i.e., Jones Falls, Gwynns Falls, and the Patapsco River Lower North Branch) drain directly into the Curtis Creek/Bay portion of the embayment.
[2] Load applies to the direct drainage portion of the applicable watershed only.
[3] No industrial process water facilities, WWTPs, or DMCFs have been identified in the applicable watershed.
[4] Load per jurisdiction applies to all NPDES stormwater dischargers within the direct drainage area of the jurisdiction to Curtis Creek/Bay.

**Table 3. Summary of tPCB Baseline Loads, TMDL Allocations, Load Reductions and MDLs in the Bear Creek**

| PCB Source[1] | Baseline Load (g/year) | Percent of Total Baseline Load (%) | TMDL (g/year) | Load Reduction (%) | MDL (g/day) |
|---|---|---|---|---|---|
| Direct Atmospheric Deposition (to the Surface of the Embayment) | 79.32 | 18.5 | 33.60 | 57.6 | 0.31 |
| Non-regulated Watershed Runoff[2] | 26.33 | 6.1 | 2.25 | 91.5 | 0.02 |
| Contaminated Sites[4] | - | - | - | - | - |
| ***Nonpoint Sources/LAs*** | ***105.65*** | ***24.7*** | ***35.85*** | ***66.1*** | ***0.33*** |
| Industrial Process Water[3] | - | - | - | - | - |
| WWTPs[4] | - | - | - | - | - |
| DMCFs[4] | - | - | - | - | - |
| NPDES Regulated Stormwater[2] | | | | | |
| Baltimore County[5] | 322.85 | 75.3 | 27.60 | 91.5 | 0.25 |
| ***Point Sources/WLAs*** | ***322.85*** | ***75.3*** | ***27.60*** | ***91.5*** | ***0.25*** |
| ***MOS (5%)*** | - | - | ***3.34*** | - | **0.03** |
| **Total** | **428.50** | **100.0** | ***66.80*** | ***84.4*** | **0.61** |

Notes: [1] None of the upstream tributaries (i.e., Jones Falls, Gwynns Falls, and the Patapsco River Lower North Branch) drain directly into the Bear Creek portion of the embayment.
[2] Load applies to the direct drainage portion of the applicable watershed only.
[3] One outfall from the RG Steel facility discharges to Bear Creek. However, this facility falls under an aggregate WLA for all industrial process water discharges, which is accounted for in the TMDL for the Baltimore Harbor embayment. An individual baseline load and WLA for this outfall will therefore not be presented in this table.
[4] No WWTPs, DMCFs, or contaminated sites have been identified in the applicable watershed.
[5] Load applies to all NPDES stormwater dischargers within the direct drainage area of the jurisdiction to Bear Creek.

**Table 4. Industrial Process Water Facilities and DMCFs TMDL Allocations and MDLs in the Direct Drainage Area of the Baltimore Harbor Embayment's Watershed**

| Facility Name | NPDES # | Facility Type | Average Flow (MGD) | Average tPCB Concentration (ng/L) | tPCB WLA (g/year) | tPCB MDL (g/day) |
|---|---|---|---|---|---|---|
| Constellation Power - Fort Smallwood Complex[1] | MD0001503 | Industrial | 1100.0 | 0.39 | 410.31 | 3.49 |
| RG Steel[1] | MD0001201 | Industrial | 88.264 | 1.01 | 32.92 | 0.29 |
| Constellation - Riverside Generating Plant[1,2] | MD0001481 | Industrial | 83.0 | 0.70 | 30.96 | 0.26 |
| Wheelabrator Baltimore, LP[1,2] | MD0060640 | Industrial | 62.4 | 0.70 | 23.28 | 0.2 |
| Constellation Energy Group - Gould Street Generating Plant[2] | MD0070041 | Industrial | 2.94 | 0.70 | 1.1 | 0.01 |
| Cox Creek DMCF[3] | MDDRG3424 | DMCF | 9.03 | 3.11[4] | 38.8 | 0.33 |
| Masonville DMCF[3] | MDDRG3650 | DMCF | 9.03[3] | 3.11[4] | 38.8 | 0.33 |

**Notes:** [1] Monitoring study is currently being conducted to characterize tPCB concentrations in theindustrial process water facility's discharge.

[2] Industrial process water facility discharges have not yet been monitored and analyzed for PCBs. Thus, an average of the observed concentrations at the two monitored industrial facilities was used in the baseline load and WLA calculation.

[3] Average Flow value from Cox Creek DMCF will be assigned to the Masonville DMCF as the facility does not currently discharge.

[4] No usable tPCB monitoring data was available for the two DMCFs. Therefore, the average bottom water column tPCB concentration from monitoring stations adjacent to the navigational channels within the embayment was used as a surrogate to calculate the DMCF baseline load. Since any PCBs discharged from these facilities is resultant from tPCB concentrations in the dredged sediments, and is therefore indicative of a pass through condition, the WLA for the DMCFs was set equivalent to their baseline load. Thus, the average bottom water column tPCB concentration is the TMDL endpoint for the DMCFs as well.

**Table 5. Municipal Wastewater Treatment Plants tPCB WLAs and MDLs**

| Facility Name | NPDES No. | Design Flow (MGD) | tPCB WLA (g/year) | tPCB MDL (g/day) |
|---|---|---|---|---|
| Cox Creek WWTP | MD0021661 | 15.0 | 5.6 | 0.048 |
| Patapsco WWTP | MD0021601 | 73.0 | 27.2 | 0.231 |

## Table 6. NPDES Regulated Stormwater Facilities[1]

| MDE Permit | NPDES | Facility | City | County |
|---|---|---|---|---|
| 04DP3313 | MD0068276 | State Highway Administration (MS4) | State-wide | All phase I (Baltimore City, Baltimore County, Anne Arundel) |
| | MDR100000 | MDE General Permit to Construct | All | All |
| 02SW0036 | | Advanced Thermal Hydronics,Inc. | Dundalk | Baltimore |
| 02SW0037 | | Montebello Brands, Inc. | Dundalk | Baltimore City |
| 02SW0038 | | Techalloy Company,Inc. - Baltimore Welding Div. | Baltimore | Baltimore City |
| 02SW0039 | | Tnemec Company, Incorporated | Baltimore | Baltimore City |
| 02SW0040 | | Vulcan Hart Company | Baltimore | Baltimore |
| 02SW0048 | | H.R. Simon and Company,Inc. | Baltimore | Baltimore City |
| 02SW0075 | | New NGC, Inc. D/B/A National Gypsum Company | Baltimore | Baltimore City |
| 02SW0083 | | AMG Resources Corporation | Baltimore | Baltimore |
| 02SW0094 | | Baltimore Scrap Corporation | Baltimore | Baltimore City |
| 02SW0227 | | Smurfit-Stone Container Corporation - Baltimore | Baltimore | Anne Arundel |
| 02SW0234 | | Bestway Transport, Inc. | Baltimore | Baltimore City |
| 02SW0251 | | Delta Chemical Corporation | Baltimore | Baltimore City |
| 02SW0252 | | Reedbird Avenue Landfill | Baltimore | Baltimore City |
| 02SW0253 | | Pennington Avenue Landfill | Baltimore | Baltimore City |
| 02SW0256 | | Monument Street Landfill | Baltimore | Baltimore City |
| 02SW0257 | | Quarantine Road Landfill | Baltimore | Baltimore City |
| 02SW0298 | | Glen Burnie Landfill and Convenience Center | Glen Burnie | Anne Arundel |
| 02SW0308 | | Baltimore Sun - Sun Park | Baltimore | Baltimore City |
| 02SW0415 | | Dundalk Marine Terminal | Dundalk | Baltimore City |
| 02SW0419 | | Maryland Port Administration - Wallace St. | Baltimore | Baltimore City |
| 02SW0420 | | South Locust Point Marine Terminal | Baltimore | Baltimore City |
| 02SW0421 | | Clinton Street Marine Terminal | Baltimore | Baltimore City |
| 02SW0422 | | Maryland Port Admin. - Hawkins Point Marine Terminal | Baltimore | Baltimore City |
| 02SW0432 | | PQ Corporation | Baltimore | Baltimore City |
| 02SW0449 | | Daily Express, Inc. | Baltimore | Baltimore |
| 02SW0456 | | E. Stewart Mitchell, Inc. | Baltimore | Baltimore City |
| 02SW0500 | | Curtis Bay Energy Limited Partnership | Baltimore | Baltimore City |
| 02SW0564 | | Eastern Plating Company - Baylis | Baltimore | Baltimore City |
| 02SW0589 | | IST Corporation DBA Arcade Marketing CP | Baltimore | Anne Arundel |
| 02SW0625 | | Solley Road Sanitary Landfill | Glen Burnie | Anne Arundel |
| 02SW0629 | | Patapsco WWTP | Baltimore | Baltimore City |
| 02SW0650 | | Southern Galvanizing | Baltimore | Baltimore City |
| 02SW0681 | | Clean Harbors of Baltimore | Baltimore | Baltimore City |
| 02SW0682 | | Cambridge Iron & Metal Company, Inc. | Baltimore | Baltimore City |
| 02SW0684 | | BFI Quarantine Road Landfill | Baltimore | Baltimore City |
| 02SW0692 | | DLA/DNSC Curtis Bay Depot | Baltimore | Anne Arundel |
| 02SW0709 | | Baltimore City DPW - Fire Maintenance | Baltimore | Baltimore City |
| 02SW0711 | | Ansam Metals Corporation | Baltimore | Baltimore City |
| 02SW0760 | | Anne Arundel County - Cox Creek Water Reclamation Facility | Baltimore | Baltimore |
| 02SW0787 | | Houff Transfer, Inc. | Baltimore | Baltimore City |
| 02SW0823 | | Hubers Bus Service, Inc. | Glen Burnie | Anne Arundel |
| 02SW0832 | | H & S Bakery | Baltimore | Baltimore City |
| 02SW0885 | | P. T. O'Malley Lumber Company, Inc. | Baltimore | Baltimore |
| 02SW0923 | | Yellow Transportation, Inc. (BLT) | Baltimore | Baltimore City |
| 02SW0925 | | J & R Bus Service, Inc. | Glen Burnie | Anne Arundel |
| 02SW0938 | | Westway Terminal Company | Baltimore | Baltimore City |
| 02SW0939 | | Belt's Business Center - Baltimore | Baltimore | Baltimore City |
| 02SW0949 | | Transflow Terminal Services, Inc. | Baltimore | Baltimore City |
| 02SW0961 | | The Nelson Company | Baltimore | Baltimore |
| 02SW0962 | | Maisel Brothers, Inc. | Glen Burnie | Anne Arundel |

| MDE Permit | NPDES | Facility | City | County |
|---|---|---|---|---|
| 02SW0964 | | Reliable Contracting Company, Inc. | Glen Burnie | Anne Arundel |
| 02SW0978 | | Johnson's Transfer, Inc. | Baltimore | Baltimore City |
| 02SW1002 | | Tom's Auto Parts | Baltimore | Baltimore |
| 02SW1007 | | Bob's Transport & Storage Co., Inc. | Baltimore | Baltimore City |
| 02SW1018 | | Baltimore City DPW - Central Garage | Baltimore | Baltimore City |
| 02SW1020 | | Cox Auto Parts, Inc. | Baltimore | Baltimore |
| 02SW1025 | | Dext Company D/BA Reconserve of Maryland | Baltimore | Baltimore City |
| 02SW1028 | | Balterm - Dundalk | Dundalk | Baltimore City |
| 02SW1029 | | CSX Intermodal, Inc. - Baltimore | Baltimore | Baltimore City |
| 02SW1031 | | Baltimore Quality Assurance | Baltimore | Baltimore City |
| 02SW1040 | | Fairfield Truck and Tank Center, Inc. | Baltimore | Baltimore City |
| 02SW1057 | | Drever Heat Treating | Baltimore | Anne Arundel |
| 02SW1071 | | Rukert Terminals Corporation | Baltimore | Baltimore city |
| 02SW1080 | | Interstate Brands Corp. - Glen Burnie | Glen Burnie | Anne Arundel |
| 02SW1085 | | BFI Waste Services, LLC - Baltimore | Baltimore | Baltimore City |
| 02SW1087 | | Atlantic Terminalling, LLC | Baltimore | Baltimore City |
| 02SW1109 | | Baltimore Recycling Center, LLC | Baltimore | Baltimore City |
| 02SW1110 | | Balterm LLP. - South Locust Point Marine Terminal | Baltimore | Baltimore City |
| 02SW1111 | | Ports America Baltimore, Inc. | Dundalk | Baltimore City |
| 02SW1143 | | G & H Auto Parts | Baltimore | Baltimore |
| 02SW1161 | | The Owl Corporation | Baltimore | Baltimore |
| 02SW1176 | | Anne Arundel County - Northern District Roads | Glen Burnie | Anne Arundel |
| 02SW1181 | | Anne Arundel County Roads - Northern | Pasadena | Anne Arundel |
| 02SW1187 | | Curtis Recyclers, Inc. | Baltimore | Baltimore City |
| 02SW1210 | | The Dirt Express Company | Glen Burnie | Anne Arundel |
| 02SW1213 | | Maryland Port Administration - Childs Street | Baltimore | Baltimore City |
| 02SW1240 | | Baltimore Processing & Transfer Center | Baltimore | Baltimore City |
| 02SW1260 | | D.M.T. Trucking, Inc. | Baltimore | Baltimore City |
| 02SW1262 | | Baltimore Pipe, Inc. | Baltimore | Baltimore City |
| 02SW1274 | | Kaufman Products, Inc | Baltimore | Baltimore City |
| 02SW1283 | | EJ Enterprises, Inc. | Glen Burnie | Anne Arundel |
| 02SW1285 | | Maryland Recycle Company, Inc. - Glen Burnie | Glen Burnie | Anne Arundel |
| 02SW1298 | | The Sun Products Corporation | Baltimore | Baltimore City |
| 02SW1308 | | Dietrich Industries, Inc. | Baltimore | Baltimore |
| 02SW1308 | | Dietrich Industries, Inc. | Baltimore | Baltimore |
| 02SW1332 | | SHA - Glen Burnie Shop | Glen Burnie | Anne Arundel |
| 02SW1356 | | Pemco Corporation | Baltimore | Baltimore City |
| 02SW1360 | | PSC Sales, Inc. | Baltimore | Baltimore City |
| 02SW1373 | | Vane Terminal, Inc. - Pier 12 | Baltimore | Baltimore City |
| 02SW1384 | | Canton Marine Terminal - Pier 13 | Baltimore | Baltimore City |
| 02SW1395 | | Complementary Coatings Corporation d/b/a Insl-x | Baltimore | Baltimore City |
| 02SW1402 | | The Berg Brothers Recycling Company | Baltimore | Baltimore City |
| 02SW1411 | | Valley Proteins - Baltimore Division | Baltimore | Anne Arundel |
| 02SW1414 | | Eastalco Aluminum Company - Baltimore Pier | Baltimore | Baltimore City |
| 02SW1418 | | Dolphin Associates, Inc. | Baltimore | Baltimore City |
| 02SW1427 | | Infra-Metals Company | Baltimore | Baltimore City |
| 02SW1428 | | Holcim (US) Inc. - Baltimore Terminal | Baltimore | Baltimore City |
| 02SW1487 | | Depsco Services, Inc. | Baltimore | Baltimore City |
| 02SW1494 | | Laura A. Luckert Trucking, Inc. | Baltimore | Baltimore |
| 02SW1499 | | A. H. Gardner & Son, Inc. | Baltimore | Baltimore City |
| 02SW1504 | | Gable Signs & Graphics, Inc. | Baltimore | Anne Arundel |
| 02SW1506 | | Model Machine Company, Inc. | Baltimore | Baltimore City |
| 02SW1545 | | Associated Cargo, Inc. | Baltimore | Baltimore City |
| 02SW1589 | | Dovco Industrial Fabricators, Inc. | Baltimore | Baltimore City |
| 02SW1593 | | The Furst Brothers Company | Baltimore | Baltimore City |
| 02SW1620 | | A & I Transport, Inc. | Baltimore | Baltimore |

| MDE Permit | NPDES | Facility | City | County |
|---|---|---|---|---|
| 02SW1622 | | Vac Pac Manufacturing Company, Inc. | Baltimore | Baltimore City |
| 02SW1633 | | Patterns Unlimited, Inc. | Baltimore | Baltimore City |
| 02SW1634 | | B & G Quality Machine & Tool Company, Inc. | Baltimore | Baltimore City |
| 02SW1635 | | Liquid Transfer Terminals, Inc. - Pennington | Baltimore | Baltimore City |
| 02SW1658 | | American Limousines, Inc. | Baltimore | Baltimore City |
| 02SW1669 | | Wagner Brothers Containers, Inc. | Baltimore | Baltimore City |
| 02SW1674 | | MTA - Eastern Bus Division | Baltimore | Baltimore City |
| 02SW1695 | | Bruce Machine & Tool Company, Inc. | Baltimore | Baltimore City |
| 02SW1753 | | Fort Avenue Realty, LLC | Baltimore | Baltimore City |
| 02SW1764 | | Balterm, LLP - North Locust Point | Baltimore | Baltimore City |
| 02SW1774 | | The Vane Brothers Company | Baltimore | Baltimore City |
| 02SW1784 | | University of Maryland Medical Center | Baltimore | Baltimore City |
| 02SW1785 | | MTA- Washington Blvd. Bus Division | Baltimore | Baltimore City |
| 02SW1792 | | Active Transportation Company | Baltimore | Baltimore City |
| 02SW1814 | | Hawkins Point Landfill | Hawkins Point | Baltimore City |
| 02SW1873 | | Air Products & Chemicals, Inc. - Baltimore | Sparrows Point | Baltimore |
| 02SW1880 | | Freestate Auto Recycling, Inc. | Baltimore | Baltimore City |
| 02SW1881 | | OPTA Minerals Baltimore | Baltimore | Baltimore City |
| 02SW1885 | | Mid Atlantic Baking Company | Baltimore | Baltimore City |
| 02SW1907 | | Constellation Energy Group - Gould Street Generating Station | Baltimore | Baltimore City |
| 02SW1917 | | Community College of Baltimore County - Dundalk | Baltimore | Baltimore |
| 02SW1919 | | The Abbey Drum Company | Baltimore | Baltimore City |
| 02SW1939 | | The Abbey Drum Company - Baltic Avenue | Baltimore | Baltimore City |
| 02SW1951 | | MTA - Cromwell light rail maintenance Facility | Glen Burnie | Anne Arundel |
| 02SW1958 | | Geo Specialty Chemicals | Baltimore | Baltimore city |
| 02SW1973 | | Baltimore County Bureau of Highways - Shop 9 | Baltimore | Baltimore |
| 02SW1977 | | Dillons Bus Service, Inc. - Baltimore | Baltimore | Baltimore City |
| 02SW1990 | | Berry Plastics Corporation | Baltimore | Baltimore City |
| 02SW1991 | | Chesapeake Agro-iron, Inc. | Baltimore | Baltimore City |
| 02SW1993 | | Dana Container, Inc. | Baltimore | Baltimore City |
| 02SW2011 | | Signode Eastern Operations | Baltimore | Baltimore |
| 02SW2034 | | Fritz Enterprises, Inc. | Sparrows point | Baltimore |
| 02SW2041 | | BGE- Spring Gardens | Baltimore | Baltimore City |
| 02SW2045 | | MDTA - Baltimore Harbor Tunnel | Baltimore | Baltimore City |
| 02SW2046 | | MDTA - Fort McHenry Tunnel | Baltimore | Baltimore City |
| 02SW2050 | | MDTA - Francis Scott Key Bridge | Dundalk | Baltimore |
| 02SW2058 | | Ceres Terminals | Dundalk | Baltimore City |
| 02SW2060 | | Marine terminals Corporation East | Dundalk | Baltimore City |
| 02SW2064 | | Baltimore Packaging, LLC | Dundalk | Baltimore City |
| 02SW2065 | | Multimarine Refrigeration | Dundalk | Baltimore City |
| 02SW2071 | | Beverage Capital Corporation Plant #2 | Baltimore | Baltimore City |
| 02SW2073 | | Millennium Specialty Chemicals - St. Helena | Baltimore | Baltimore City |
| 02SW3026 | | Edgemere Terminals, Inc. | Baltimore | Baltimore City |
| 02SW3034 | | Lafarge Building Materials, Inc. | Sparrows point | Baltimore |
| 04DP3315 | MD0068292 | Baltimore City MS4 | Baltimore | Baltimore City |
| 04DP3316 | MD0068306 | Anne Arundel County MS4 | County-wide | Anne Arundel |
| 05DP3317 | MD0068314 | Baltimore County MS4 | County-wide | Baltimore |

**Note:** [1] Although not listed in this table, some individual process water permits incorporate stormwater requirements and are accounted for within the NPDES Stormwater WLA, as well as additional Phase II permitted MS4s, such as military bases, hospitals, etc.

The TMDL is a written plan and analysis established to ensure that a waterbody will attain and maintain water quality standards. The TMDL is a scientifically based strategy that considers current and foreseeable conditions, the best available data, and accounts for uncertainty

with the inclusion of a MOS value. The option is always available to refine the TMDL for resubmittal to EPA for approval if environmental conditions, new data, or the understanding of the natural processes change more than what was anticipated by the MOS.

## III. Background

The Patapsco River Mesohaline Chesapeake Bay Segment is a tidal estuary, or embayment, located on the western shore of the Chesapeake Bay. The total watershed draining to the Bay Segment covers 1,514 square kilometers ($km^2$)(374,040 acres) and spans Baltimore City, Carroll, Howard, Anne Arundel, and Baltimore Counties. The Baltimore Harbor Maryland 8-Digit (MD 8-digit) watershed comprises the majority of the Patapsco River Mesohaline Chesapeake Bay Segment. Curtis Creek/Bay and Bear Creek are specific segments within the Baltimore Harbor portion of the Bay Segment, which have been specifically identified as impaired for PCBs in sediments, in addition to fish tissue. Curtis Creek/Bay is located on the southwest shore of the Harbor within both Baltimore City and Anne Arundel County, while Bear Creek is located on the northwest shore of the Harbor within solely Baltimore County. The total watershed area draining to the Baltimore Harbor portion of the Bay Segment covers 1,491 $km^2$ (368,388 acres) and spans Baltimore City, Carroll, Howard, Anne Arundel, and Baltimore counties; however, the direct drainage portion of this watershed area only covers 219 $km^2$ (53,994 acres) and spans Baltimore City, Anne Arundel County, and Baltimore County. For simplicity, the spatial unit defined as the Baltimore Harbor embayment will refer solely to the Baltimore Harbor portion of the Patapsco River Mesohaline Tidal Chesapeake Bay Segment (i.e., the portion of the Bay Segment impaired for PCBs in fish tissue), which encompasses the Curtis Creek/Bay and Bear Creek segments. The spatial units defined as Curtis Creek/Bay and Bear Creek will refer solely to these individual segments of the Baltimore Harbor embayment, which are specifically impaired for PCBs in sediment, in addition to fish tissue.

It is estimated that sixty percent of the total freshwater entering the Baltimore Harbor embayment comes from the nontidal Patapsco River. The two other major tributaries entering the embayment are the Gwynns Falls and Jones Falls. The tidal range of the embayment is 0.3 meters based on the United States National Oceanic and Atmospheric Administration (NOAA) tidal station at in the Middle Branch Patapsco River. There are several "high quality" or Tier II (Benthic Index of Biotic Integrity (BIBI) and Fish Index of Biotic Integrity (FIBI) aquatic life assessment score > 4 (scale 1-5)) located within the embayment's watershed (none within the direct drainage portion however) requiring the implementation of Maryland's anti-degradation policy including at least portions of: Beaver Run, Cooks Branch, Gillis Falls, Joe Branch, Keyser's Run, Morgan Run, Middle Run, Red Run, the North Branch Patapsco River, and unnamed tributary to the North Branch Patapsco River, and an unnamed tributary to the South Branch Patapsco River. Approximately 0.9% of the embayment's drainage area is covered by water. The total population in the embayment's watershed is approximately 1,351,190. According to the United States Geological Survey's (USGS) 2006 land cover data, which was specifically developed to be applied within the Chesapeake bay Program's (CBP) Phase 5.3.2 watershed model, land use in the Baltimore Harbor embayment's watershed is predominantly urban. Urban land occupies approximately 45.1% of the watershed, while 29.0% is forested and

21.8% is agricultural. The remaining 4.1% is classified as barren, natural grassland, water, or wetland.

Maryland Water Quality Standards specify that all surface waters of the State shall be protected for water contact recreation, fishing, and the protection of aquatic life (COMAR 2011a). Additionally, the specific designated use of the Baltimore Harbor, Curtis Creek/Bay, and Bear Creek portions of the Patapsco River Mesohaline Tidal Chesapeake Bay Segment is Use II- Support of Estuarine and Marine Aquatic Life and Shellfish Harvesting (COMAR 2011b).

The Maryland Department of the Environment has identified the Patapsco River Tidal Chesapeake Bay Segment (Integrated Report Assessment Unit ID: PATMH) on the State's 2010 Integrated Report as impaired by nutrients--nitrogen and phosphorus (1996), sediments (1996), trash and debris (2008), and impacts to biological communities (2004). The Baltimore Harbor portion of the Patapsco River Mesohaline Tidal Chesapeake Bay Segment (Integrated Report Assessment Unit ID: PATMH-02130903) has been individually identified on the State's 2010 Integrated Report as impaired by: PCBs in fish tissue (1998), chlordane (1998), bacteria– Furnace Creek, Marley Creek, Rock Creek, and all tidal waters upstream of the harbor tunnel (1998), zinc--Middle and North Branches (1998), chromium--Northwest Branch (1998), and lead--Northwest Branch (1998). In addition, the Curtis Creek/Bay portion of the Patapsco River Mesohaline Tidal Chesapeake Bay Segment (Integrated Report Assessment Unit ID: MD-PATMH-CURTIS_BAY_CREEK) has been individually identified on the State's 2010 Integrated Report as impaired by PCBs in both fish tissue and sediment (1998) and zinc (1998), and the Bear Creek portion of the Bay Segment has been individually identified on the State's 2010 Integrated Report (Integrated Report Assessment Unit ID: MD-PATMH-BEAR_CREEK) as impaired by PCBs in both fish tissue and sediment (1998), zinc (1998), and chromium (1998).

CWA Section 303(d) and its implementing regulations require that TMDLs be developed for waterbodies identified as impaired by the State where technology based and other required controls do not provide for attainment of water quality standards. The PCB TMDLs submitted by MDE are designed to allow for the attainment of the Baltimore Harbor, Curtis Creek/Bay, and Bear Creek Portions of Patapsco River Mesohaline Tidal Chesapeake Bay Segment watershed's designated uses, and to ensure that there will be no PCB impacts affecting the attainment of these uses. Refer to Table 1 above for a summary of allowable loads.

Since the Baltimore Harbor embayment was identified as impaired for PCBs in fish tissue, the overall objective of the tPCB TMDLs established in this document is to ensure that the fishing designated use, which is protective of human health related to the consumption of fish, in the embayment is supported. However, the TMDLs will also ensure the protection of all other applicable designated uses within the embayment. This objective is achieved via the use of extensive field observations and a three-dimensional numeric model that simulates hydrodynamics, organic carbon (OC) species, and PCB homologs. In the model, the transport and fate processes of PCBs are associated with OCs and include mechanisms of adsorption/desorption, surface volatilization, exchanges with bottom sediments from settling/resuspension, and exchanges between the Baltimore Harbor embayment and the open

waters of the Chesapeake mainstem. The conceptual basis of the model is that the transport and fate of toxic chemicals, especially hydrophobic organic chemicals, such as PCBs, is strongly influenced by their adsorption to OCs and exchanges between the water column and bottom embayment.

From 1996 to 2003, monitoring surveys were conducted under the Comprehensive Harbor Assessment and Regional Modeling Study (CHARM) (Baker et al. 2002) to measure tidal and non-tidal water column tPCB concentrations at stations throughout the Baltimore Harbor embayment and watershed. Sediment samples were collected in 1996 under the Baltimore Harbor Sediment Mapping Study to characterize tPCB sediment concentrations throughout the embayment. MDE collected fish tissue samples for PCB analysis in the Baltimore Harbor embayment, including Curtis Creek/Bay and Bear Creek, from 2001 to 2003. From 2008 to 2009, MDE collected additional fish tissue, water column (non-tidal and tidal), and stormwater samples for PCB analysis to further support TMDL development.

Both point and nonpoint sources of PCBs have been identified throughout the Baltimore Harbor embayment's watershed. Nonpoint sources include loads from:

*Resuspension and Diffusion from Bottom Sediments* – The water quality model, using observed tPCB concentrations in the water column and sediment, predicts a net tPCB transport of 9,107.3 g/year entering the Baltimore Harbor embayment from the bottom sediment. However, this load contribution is resultant from other point and nonpoint source inputs (both historic and current) within the embayment's watershed. Thus, this source is not considered to be directly controllable (reducible).

*Chesapeake Bay Mainstem Tidal Influence* – The water quality model, using observed estimated tPCB concentrations measured at the mouth of Baltimore Harbor embayment, predicts an estimated tPCB input and output associated with the flood and ebb tides of 183,548.0 and184,660.9 g/year, respectively. These loads result in a net tPCB transport of 1,112.9 g/year from the Baltimore Harbor embayment to the Chesapeake Bay mainstem due to the higher water column concentrations inside the embayment. However, upon reductions to watershed loads and loads from the resuspension and diffusion from bottom sediments, this net transport of PCBs out of the embayment and into the Bay mainstem could shift in the future. Even if this shift occurred though, the load contribution is resultant from historic and present point and nonpoint source inputs throughout the Upper Chesapeake Bay watershed, and it is therefore still not considered to be a directly controllable source (reducible).

*Atmospheric Deposition* – There is no recent study of the atmospheric deposition of PCBs to the surface of the Baltimore Harbor embayment. A depositional rate of 16.3 $\mu g/m^2$/ year for urban areas from a Chesapeake Bay Program (CBP) 1999 study was used for this TMDL since urban land use comprises the majority of the Baltimore Harbor embayment's watershed. In addition, this rate is within the range of measurements from a study conducted in the Baltimore Harbor by Bamford, et al. (2002a). Loads were calculated for both, the direct atmospheric deposition to the surface of the embayment and for the direct deposition to the watershed. The direct atmospheric deposition load to the surface of the Baltimore embayment (1,360.0 g/year)

was calculated by multiplying the surface area of the embayment (83.49 $km^2$) and the deposition rate of 16.3 $\mu g/m^2$/year. Similarly, the atmospheric deposition load to the embayment's watershed was calculated by multiplying 16.3 $\mu g/m^2$/year by the embayment's watershed area (total) of 1,491.7 $km^2$, which results in a load of 24,314 g/year. Applying the PCB pass-through efficiency estimated by Totten, et al. (2006) for the Delaware River watershed of approximately one percent, the atmospheric tPCB load to the Baltimore Harbor embayment from the watershed is approximately 243.1 g/year. This load, however, is inherently modeled as part of the tributary loads or non-regulated watershed runoff/NPDES Regulated Stormwater direct drainage loads described below.

Using the same calculation to determine the atmospheric deposition loads to the surface of the Baltimore Harbor embayment, the Curtis Creek/Bay and Bear Creek atmospheric deposition loads to the surface to the embayment were calculated as 121.26 g/year and 79.32, respectively.

*Non-Regulated Watershed Runoff* – tPCB loads were calculated for samples collected at four non-tidal monitoring stations using observed tPCB concentration and average daily flow from regional USGS gages closest to each non-tidal monitoring station. The relationship between loads and flows was developed via regression analysis for each monitoring station. With this relationship, the tPCB load corresponding to any flow can be estimated. The specific non-regulated watershed runoff tPCB load only corresponds to the direct drainage areas of the Baltimore Harbor embayment's watershed. Therefore, the load is based on average daily flow information from USGS gages within these direct drainage areas only. Additionally, the load specifically corresponds to the non-urbanized areas (i.e., primarily forest and agricultural areas) of the embayment's direct drainage.

*Tributaries* – There are three upstream tributaries draining into the Baltimore Harbor embayment (i.e., these freshwater inputs are not considered to be part of the direct drainage to the embayment): the Jones Falls, Gwynns Falls, and Patapsco River Lower North Branch. The baseline tPCB loads from these upstream tributaries are estimated based on the same methodology used to calculate the non-regulated watershed runoff tPCB load. These loads are presented as single values, representing the total tPCB load at the outlet of the individual basins. However, they could include both point and nonpoint sources, but for the purposes of this analysis, will be treated as a single nonpoint source load.

*Contaminated Sites* – Contaminated sites refers to areas with known PCB soil contamination, as documented by state or federal hazardous waste cleanup programs (i.e., state or federal Superfund programs). A total of four contaminated sites have been identified within the direct drainage area of the Baltimore Harbor embayment's watershed. The sites have been identified with PCB soil concentrations at or above method detection levels, as determined via soil sample results contained within MDE Land Management Administration's (LMA) contaminated site survey and investigation records. The median tPCB concentration of the site samples was multiplied by the soil loss rate, which is a function of soil type, pervious area, and land cover, to estimate the tPCB edge of field (EOF) load. Since all of the sites were immediately adjacent to the tidal embayment, a sediment delivery ratio of one was applied, and as a result the final edge-of-stream (EOS) load is equivalent to the final EOF load. The

contaminated site tPCB baseline load to the Baltimore Harbor embayment is estimated to be 14.5 g/year. This load is the summation of individual PCB loads from the four identified contaminated sites. Two of these sites have already undergone some degree of soil remediation, in which case the estimated tPCB load is reflective of post remediation PCB soil levels.

Point sources include loads from:

*Industrial Process Water Facilities* – Five industrial process water facilities have been identified as being located within the direct drainage area of the Baltimore Harbor embayment's watershed, and having the potential to discharge PCBs to the embayment. The sites were identified using guidance developed by Virginia for monitoring point sources in support of TMDL development. The State has identified specific types of permitted industrial and municipal facilities based on their Standard Industrial Classification (SIC) codes as having the potential to contain PCBs within their process water discharge (VADEQ 2009). Additional facilities were also identified with the potential to discharge PCBs; however, they were considered *de minimis*, as the total average flow for the facilities was below 1.0 Million Gallons per day (MGD). PCB monitoring data is available for two of the five industrial process water facilities. MDE collected multiple effluent samples for PCB analysis in April and May 2006. The baseline tPCB loads for these facilities were estimated by multiplying the average flows by the average observed tPCB concentrations per facility. To calculate the tPCB baseline loads for facilities without tPCB monitoring data, the individual facilities' average flows were used in conjunction with an average of the observed concentrations at the two monitored facilities. The aggregate tPCB baseline load for all industrial process water facilities is 859.4 g/year.

*Municipal Wastewater Plants* – Two municipal Wastewater Treatment Plants (WWTP), Patapsco WWTP and Cox Creek WWTP, have been identified within the direct drainage of the Baltimore Harbor embayment's watershed. These WWTPs discharge directly to the embayment. MDE collected multiple effluent samples for each facility in March and May 2006 for PCB analysis. The baseline tPCB loading was calculated based on the average discharge flow for the period of March 2010 through February 2011 and the average observed tPCB concentration. The estimated baseline loads are 32.1 g/year and 334.7 g/year, for the Cox Creek and Patapsco municipal WWTPs, respectively.

*Dredged Material Containment Facility (DMCF)* – Two DMCFs, Massonville and Cox Creek, have been identified within the direct drainage area of the Baltimore Harbor embayment's watershed. These facilities discharge directly to the embayment. The Masonville DMCF is not yet operational, and tPCB elutriate concentrations reported from Cox Creek DMCF monitoring data are below detection levels. The applied analytical method provides a detection limit that is insufficient for measuring PCBs at levels below the water column TMDL endpoint tPCB concentration. Thus, no measurable tPCB concentration data is available for either of the DMCFs. The average value of bottom water column tPCB concentrations from monitoring stations adjacent to the navigational channels in the embayment was applied as a surrogate for elutriate concentrations from these facilities. Bottom water column tPCB concentrations are the best available representation of conditions at the sediment-water interface, which is comparable to elutriate tPCB concentrations produced from the dewatering of dredged material (from the

navigational channels) at these containment facilities. The baseline tPCB loads for these facilities were estimated by multiplying the average observed flows (the Cox Creek average flow is also used for the Masonville DMCF, since the facility is not yet operational) by the average value of observed bottom water column tPCB concentrations at monitoring stations adjacent to the navigational channels within the embayment. The aggregate tPCB baseline load for the DMCFs is 77.6 g/year.

*NPDES Regulated Stormwater* – MDE estimates pollutant loads from NPDES regulated stormwater areas based on urban land use within a given watershed. The 2006 USGS spatial land cover, which was used to develop CBP's Phase 5.3.2 watershed model land use, was applied in this TMDL to estimate the NPDES Regulated Stormwater tPCB Baseline Load. The direct drainage area of the Baltimore Harbor embayment's watershed spans Anne Arundel County, Baltimore County, and Baltimore City. The NPDES stormwater permits within the direct drainage area of the watershed include: (i) the area covered under the Anne Arundel County, Baltimore County, and Baltimore City Phase I jurisdictional MS4 permits, (ii) the State Highway Administration's (SHA) Phase I MS4 permit, (iii) any state and federal general Phase II MS4s, (iv) industrial facilities permitted for stormwater discharges, and (v) construction sites. The NPDES Regulated Stormwater tPCB Baseline Load was estimated by multiplying the percentage of urban land use within the direct drainage area to each impaired segment by the total watershed baseline load for these direct drainage areas. The remainder of the direct drainage area watershed baseline load per segment is associated with the non-regulated watershed runoff tPCB baseline load (nonpoint source load described above). Since the identified contaminated sites are located within the urban land use area, their total loading (14.5 g/year) is subtracted from the NPDES Regulated Stormwater tPCB baseline loads, resulting in final NPDES Regulated Stormwater tPCB Baseline Loads of 1,624.5, 383.9, and 322.9 g/year, for the Baltimore Harbor embayment, Curtis Creek/Bay, and Bear Creek, respectively.

An integrated modeling approach was used for this TMDL study. The model framework includes hydrodynamics, eutrophication, sorbent dynamics between PCBs and organic carbon (OC), and PCB transport and fate. In order to assess the attainment of the TMDL endpoints for tPCBs in both the water column and sediment, the Baltimore Harbor embayment was divided into 11 segments. The average annual tPCB concentrations in both the water column and bottom sediments within each segment were required to meet the endpoints established in this TMDL. The hydrological sequence used the mean flow year of 1998 to run the model repeatedly for 60-80 years. Different scenarios were conducted. Loads from point and nonpoint sources were reduced until the endpoints were met in each segment. The results indicated that when the water column TMDL endpoint tPCB concentration (0.27 ng/L) was met, the sediment tPCB concentration was still higher than the site-specific sediment TMDL endpoint tPCB concentration (3.1 ng/g). Approximately 60 years were required for the bottom sediment to meet the endpoint, given the mean hydrological condition. A load reduction of 91.5 percent for all watershed sources (i.e. tributaries, non-regulated watershed runoff, and NPDES regulated stormwater), with slight variations in the regulated stormwater sector due to the locations of the contaminated sites, and 57.6 percent from atmospheric deposition are required to meet both the water column and sediment TMDL endpoints.

## IV. Discussion of Regulatory Conditions

EPA finds that MDE has provided sufficient information to meet all seven of the basic requirements for establishing a PCB TMDL for the Baltimore Harbor, Curtis Creek/Bay, and Bear Creek Portions of Patapsco River Mesohaline Tidal Chesapeake Bay Segment watershed. EPA, therefore, approves this PCB TMDL for the Baltimore Harbor, Curtis Creek/Bay, and Bear Creek Portions of Patapsco River Mesohaline Tidal Chesapeake Bay Segment watershed. This approval is outlined below according to the seven regulatory requirements.

### *1) The TMDLs are designed to implement applicable water quality standards.*

Water Quality Standards consist of three components: designated and existing uses; narrative and/or numerical water quality criteria necessary to support those uses; and an anti-degradation statement. Maryland Water Quality Standards specify that all surface waters of the State shall be protected for water contact recreation, fishing, and the protection of aquatic life. Additionally, the specific designated use of the Baltimore Harbor, Curtis Creek/Bay, and Bear Creek portions of the Patapsco River Mesohaline Tidal Chesapeake Bay Segment is Use II-Support of Estuarine and Marine Aquatic Life and Shellfish Harvesting. There are several "high quality," or Tier II, stream segments (Benthic Index of Biotic Integrity (BIBI) and Fish Index of Biotic Integrity (FIBI) aquatic life assessment scores > 4 (scale 1-5)) located within the embayment's watershed (none within the direct drainage portion however) requiring the implementation of Maryland's anti-degradation policy including at least portions of: Beaver Run, Cooks Branch, Gillis Falls, Joe Branch, Keyser's Run, Morgan Run, Little Morgan Run, an unnamed tributary to Morgan Run, Middle Run, Red Run, the North Branch Patapsco River, an unnamed tributary to the North Branch Patapsco River, and an unnamed tributary to the South Branch Patapsco River.

The State of Maryland has adopted three separate water column tPCB criteria: criterion for protection of human health associated with consumption of PCB contaminated fish, as well as fresh and salt water chronic tPCB criteria for the protection of aquatic life. The Maryland human health tPCB criterion is set at 0.64 ng/L, ppt. The Maryland fresh and salt water chronic aquatic life tPCB criteria are set at 14 ng/L and 30 ng/L, respectively. The water column mean tPCB concentration within the embayment exceeds the human health criteria of 0.64 ng/L; however, only a single water column sample exceeds the saltwater aquatic life tPCB criterion of 30 ng/L.

A sediment tPCB criterion has not yet been established in Maryland; however, in order to assess waters of the State for toxic impairments in sediment, an Integrated Report assessment methodology has been established. If toxicity and a degraded benthic community are present within the sediment, and the sediment concentration of a given toxic substance exceeds the effects-range median (ERM), the waterbody will be listed as impaired on the Integrated Report for that substance (MDE 2011a). The Curtis Creek/Bay and Bear Creek segments were listed as impaired for PCBs in sediment due to the presence of toxicity, a degraded benthic community, and exceedances of the sediment tPCB ERM concentration of 180 ng/g, or ppb.

In addition to the water column criteria, fish tissue monitoring data can serve as an indicator of PCB water quality conditions. The Maryland fish tissue monitoring data is used to issue fish consumption advisories/recommendations and determine whether Maryland waterbodies are meeting the "fishing" designated use. Currently, Maryland applies 39 ng/g as the tPCB fish tissue listing threshold. The tPCB concentrations for all of the fish samples (several species of fish including channel catfish, white perch, etc. were collected) exceed the listing threshold, demonstrating that a PCB impairment exists within the Baltimore Harbor embayment.

Since the overall objective of the tPCB TMDLs for the Baltimore Harbor embayment, Curtis Creek/Bay, and Bear Creek is to ensure the support of the "fishing" designated use, the tPCB fish tissue listing threshold (39 ng/g) was translated into an associated water column tPCB threshold concentration to apply within this analysis as the water column TMDL endpoint. This was done using the Adjusted Total Bioaccumulation Factor (Adj-tBAF) of 145,344 L/kg for the Baltimore Harbor embayment. A total Bioaccumulation Factor (tBAF) is calculated per fish species, and subsequently the tBAFs are normalized by the median species lipid content and median dissolved water column tPCB concentration in the species home range to produce the Adj-tBAF per species. The most environmentally conservative of the Adj-tBAFs is then selected to calculate the water column TMDL endpoint tPCB concentration. This final water column tPCB concentration was then subsequently compared to the water column tPCB criteria concentrations, to ensure that all applicable criteria within the embayment would be attained. Based on this analysis, the water column tPCB concentration and TMDL endpoint of 0.27 ng/L for the Baltimore Harbor embayment, derived from the tPCB fish tissue listing threshold, is less than both the human health water column tPCB criterion of 0.64 ng/L as well as the fresh and saltwater aquatic life chronic tPCB criteria of 14 ng/L and 30 ng/L, respectively.

Similarly, in order to establish a sediment tPCB concentration that is protective of the "fishing" designated use within the embayment, a tPCB sediment concentration was derived from the tPCB fish tissue listing threshold to apply within this analysis as the sediment TMDL endpoint concentration. Using an Adjusted Sediment Bioaccumulation Factor of 12.4, would result in a sediment tPCB concentration of 3.1 ng/g.

Although the ERM is sufficient for providing an official assessment (i.e., Integrated Report listing purposes) of PCB sediment impairments, since it provides reasonable certainty that concentrations above this threshold do in fact result in toxicity, concentrations below this threshold may still be representative of conditions that adversely impact benthic life, in some instances. Conversely, the SQG Threshold Effects Level (TEL) of 21.6 ng/g, or ppb, for PCBs in estuarine sediments indicates that concentrations below this threshold are highly unlikely to result in toxicity and will therefore be protective of benthic life. Thus, the final target sediment tPCB concentration was compared to the tPCB TEL of 21.6 ng/g, since the endpoint concentration must be protective of benthic life within Curtis Creek/Bay and Bear Creek, in order to address the specific sediment PCB impairment listings for these two segments. Based on this analysis, the sediment tPCB concentration and TMDL endpoint of 3.1 ng/g for the Baltimore Harbor embayment, derived from the tPCB fish tissue listing threshold, is less than the TEL of 21.6 ng/g. By establishing a tPCB TMDL endpoint for sediments protective of the "fishing" designated use in the embayment, the benthic life in Curtis Creek/Bay and Bear Creek will also

be protected when this endpoint is achieved (i.e., the impairment listings for PCBs in sediment for the Curtis Creek/Bay and Bear Creek portions of the embayment will be addressed).

EPA believes these are reasonable and appropriate water quality goals.

2) ***The TMDLs include a total allowable load as well as individual wasteload allocations and load allocations.***

**Total Allowable Load**

EPA regulations at 40 CFR §130.2(i) state *that the total allowable load shall be the sum of individual WLAs for point sources, LAs for nonpoint sources, and natural background concentrations*. The TMDL for PCBs for Baltimore Harbor, Curtis Creek/Bay, and Bear Creek Portions of Patapsco River Mesohaline Tidal Chesapeake Bay Segment watershed is consistent with 40 CFR §130.2(i) because the total loads provided by MDE equal the sum of the individual WLAs for point sources and the land based LAs for nonpoint sources.

The allowable load was determined by first estimating a baseline load calculated from model-estimated tPCB loads from point and nonpoint sources using monitoring data. The water quality model developed for simulating ambient sediment and water column tPCB concentrations within the Baltimore Harbor embayment was used to determine the specific load reductions for each reducible source category that would result in simulated tPCB concentrations in the sediment and water column that meet the TMDL endpoints. The resultant TMDL scenario requires a 91.5 percent reduction for all watershed sources (i.e., tributaries, non-regulated watershed runoff, and NPDES regulated stormwater), with slight variations in the regulated stormwater sector due to the locations of the contaminated sites, and a 57.6 percent reduction for atmospheric deposition, in order to achieve the sediment and water column TMDL endpoint tPCB concentrations. The allowable load was calculated as 1,566.29, 96.68, 66.80 g/year for the Baltimore Harbor, Curtis Creek/Bay, and Bear Creek Portions of Patapsco River Mesohaline Tidal Chesapeake Bay Segment, respectively. This load is considered the maximum allowable load the watershed can assimilate and still attain water quality standards. The allowable load was reported in units of grams/year for the average annual load and in grams/day for the long term daily load. Expressing TMDLs using these units is consistent with Federal regulations at 40 CFR §130.2(i), which states that *TMDLs can be expressed in terms of either mass per time, or other appropriate measure*. The average annual and long term daily tPCB TMDLs are presented in Tables 1 through 3.

**Load Allocations**

The TMDL summary in Tables 1 through 3 contains the LAs for the Baltimore Harbor, Curtis Creek/Bay, and Bear Creek Portions of Patapsco River Mesohaline Tidal Chesapeake Bay Segment Watershed. According to Federal regulations at 40 CFR §130.2(g), LAs are best estimates of the loading, which may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading. Wherever possible, natural and nonpoint source loadings should be distinguished.

Load allocations for nonpoint sources were assigned to direct atmospheric deposition (to the surface of the embayment), identified contaminated sites, non-regulated watershed runoff within the embayment's direct discharge, and upstream tributaries. The model results show that in order to meet the "fishing" designated use in the embayment, load reductions of 57.6 percent from atmospheric deposition as well as 91.5 percent from direct drainage non-regulated watershed runoff and upstream tributaries are required. A smaller reduction for atmospheric deposition is required since it has a much smaller impact on water quality than the watershed land sources. The atmospherically deposited load is evenly distributed over the surface water of the entire embayment. However, watershed sources will vary, relative to their impact on water quality, throughout the embayment, thus resulting in higher tPCB concentrations in specific portions of the embayment, thereby requiring a greater reduction to achieve the TMDL condition. Given that a number of contaminated sites have already undergone some degree of remediation and their baseline loads constitute a relatively small percentage of the total baseline load, these sites were not subjected to any reductions. Loads from resuspension and diffusion from bottom sediments and the tidal influence from the Chesapeake Bay mainstem needed to be included within the model to predict tPCB concentrations within the embayment; however, the load from resuspension and diffusion from the bottom sediments is not deemed to be directly controllable within the framework of the TMDL. Therefore, this source will not be assigned an allocation or a required reduction. Also, the tidal influence from the Chesapeake Bay mainstem is neither a current source of PCBs to the embayment under current conditions, nor is it deemed to be directly controllable within the framework of the TMDL. Therefore, this source will also not be assigned an allocation or a required reduction. These loads are expected to reduce over time via natural attenuation, as evidenced by the observed decrease in tPCB concentrations in both the Upper Chesapeake Bay and at the tidal boundary between the embayment and the Bay mainstem.

**Wasteload Allocations**

There are 165 permitted point sources of PCBs with NPDES permits regulating the discharge of PCBs in the Baltimore Harbor, Curtis Creek/Bay, and Bear Creek Portions of Patapsco River Mesohaline Tidal Chesapeake Bay Segment watershed which are included in the WLAs. Point sources include two municipal WWTPs, five industrial process water facilities, two Dredged Material Containment Facilities (DMCF), and 156 NPDES regulated stormwater facilities.

The Municipal WWTP WLAs were calculated based on the water column TMDL endpoint tPCB concentration of 0.27 ng/L and the current design flows for the facilities. The elevated tPCB concentrations in municipal wastewater are believed to be primarily due to external sources (e.g., source water, atmospheric deposition, and stormwater runoff) infiltrating the wastewater collection system through broken sewer lines and connections. Also, these facilities are currently installing advanced treatment technologies, which will improve the removal efficiency of organic compounds, including PCBs, in their treatment process. There are currently no effluent PCB limits established in the discharge permits for municipal WWTPs. Inclusion of a WLA in this document does not reflect any determination to impose an effluent limit in future permits.

The WLAs for the industrial process water facilities are calculated by multiplying the water column TMDL endpoint tPCB concentration of 0.27 ng/L by the average observed flows for the facilities. For the RG Steel facility, a portion of the intake water used in facility operations is routed from the Back River WWTP. The Back River WWTP is located in the watershed draining to Back River Oligohaline Tidal Chesapeake Bay Segment (also referred to as an embayment). The WWTP has two outfalls, 001 and 002. Outfall 001 discharges to the Back River embayment, and an allocation has been assigned to the outfall within the Back River embayment PCB TMDL (MDE 2011d). However, the entirety of the effluent from Outfall 002 is routed to RG Steel, for use in its industrial processes. Therefore, a portion of the WLA for RG Steel is accounted for by the Back River WWTP Outfall 002 effluent. The specific portion of the RG Steel WLA accounted for by the effluent from the Back River WWTP Outfall 002 is based on the water column TMDL endpoint tPCB concentration of 0.27 ng/L and the design flow of the WWTP allocated to the outfall of 50 MGD. The aggregate tPCB WLA for all industrial process water facilities is 498.6 g/year, which constitutes a 42.0 percent reduction from baseline conditions. There are currently no effluent PCB limits established in discharge permits for industrial process water facilities. The inclusion of a WLA in this document does not reflect any determination to impose an effluent limit in future permits.

Further characterization of industrial process water facility tPCB baseline loads will need to be conducted within the initial stages of the implementation process, since the current load estimation is based on limited tPCB monitoring data from only two facilities (RG Steel and Constellation Power – Fort Small Wood Complex). The baseline loads for the additional three industrial process water facilities are estimated by applying the average tPCB concentration from the two monitored facilities. Additionally, measurement of influent concentrations will allow for an estimation of the direct PCB contribution from the facility and a subsequent correction of the tPCB baseline load calculations. Facilities that withdraw water from the Baltimore Harbor embayment and do not contribute additional PCBs to the system would not be in violation of the WLA, since the source of PCBs in their effluent would be due to pass-through conditions. Facilities that withdraw water directly from WWTP effluent will be accounted for under the WLA assigned to the WWTP (either partially or fully, dependent on if their intake water is partially or fully withdrawn from the WWTP), and if they do not contribute additional PCBs to the system, they would not be in violation of the WLA, since the PCB levels in their discharge should be equivalent to levels in their intake water from the WWTP. MDE is currently collecting samples from four of the industrial process water facilities with the largest average flows (i.e., > 50 MGD). Both influent and effluent concentrations will be measured as a part of this study.

The WLA for the DMCFs was set equivalent to their estimated tPCB baseline load. These facilities are responsible for the disposal and containment of contaminated sediments dredged from navigation channels within the Baltimore Harbor embayment. These facilities do not have the capability to treat their discharges for PCBs, but any PCBs in their discharges are due to PCBs in the bottom sediments that were dredged, indicating a pass through condition (i.e., no additional PCBs are generated during the containment process, similar to the industrial process water facilities).

The NPDES Regulated Stormwater WLAs were established by reducing the NPDES regulated stormwater baseline loads proportionally to the non-regulated watershed runoff baseline loads, after the WLAs for the remaining source sectors were set, until the TMDL was achieved. The NPDES regulated stormwater baseline loads to the Baltimore Harbor embayment, Curtis Creek/Bay, and Bear Creek constitute a large portion of the total baseline load to the embayment, and they therefore require a 91.5 percent reduction, with slight variations due to the locations of the contaminated sites. The NPDES regulated stormwater WLAs are 126.4, 26.1, and 27.6 g/year, for the Baltimore Harbor embayment, Curtis Creek/Bay, and Bear Creek, respectively.

Federal regulations at 40 CFR §122.44(d)(1)(vii)(B) require that, for an NPDES permit for an individual point source, the effluent limitations must be consistent with the assumptions and requirements of any available WLA for the discharge prepared by the State and approved by EPA. There is no express or implied statutory requirement that effluent limitations in NPDES permits necessarily be expressed in daily terms. The CWA definition of "effluent limitation" is quite broad (effluent limitation is "any restriction on quantities, rates, and concentrations of chemical, physical, biological, and other constituents which are discharged from point sources ... )." See CWA 502(11). Unlike the CWA's definition of TMDL, the CWA definition of "effluent limitation" does not contain a "daily" temporal restriction. NPDES permit regulations do not require that effluent limits in permits be expressed as maximum daily limits or even as numeric limitations in all circumstances, and such discretion exists regardless of the time increment chosen to express the TMDL. For further guidance, refer to Benjamin H. Grumbles memo (November 15, 2006) titled *Establishing TMDL Daily Loads in Light of the Decision by the U.S. Court of Appeals for the D.C. Circuit in Friends of the Earth, Inc. v. EPA, et al., No. 05-5015 (April 25, 2006) and implications for NPDES Permits.*

EPA has authority to object to the issuance of an NPDES permit that is inconsistent with WLAs established for that point source. It is also expected that MDE will require periodic monitoring of the point source(s) through the NPDES permit process, in order to monitor and determine compliance with the TMDL's WLAs. Based on the foregoing, EPA has determined that the TMDLs are consistent with the regulations and requirements of 40 CFR Part 130.

### *3. The TMDLs consider the impacts of background pollutant contributions.*

The TMDLs consider the impact of background pollutants by considering land uses.

### *4. The TMDLs consider critical environmental conditions.*

EPA regulations at 40 CFR §130.7(c)(1) require TMDLs to account for critical conditions for stream flow, loading, and water quality parameters. The intent of the regulations is to ensure that: (1) the TMDLs are protective of human health, and (2) the water quality of the waterbodies is protected during the times when they are most vulnerable.

Critical conditions are important because they describe the factors that combine to cause a violation of water quality standards and will help in identifying the actions that may have to be

undertaken to meet water quality standards[1]. Critical conditions are a combination of environmental factors (e.g., flow, temperature, etc.), which have an acceptably low frequency of occurrence. In specifying critical conditions in the waterbody, an attempt is made to use a reasonable worst-case scenario condition. For this TMDL, seasonality was not based on monthly averages of tPCB concentrations for all stations because the month and year in which the data was collected for over 30 stations varies dramatically. However, a seasonality analysis was conducted for a monitoring station, located in the Middle Branch of the Baltimore Harbor, which contains PCB water column data for every month of the year. This analysis shows that the tPCB concentrations spike during the winter and spring months. Also, the TMDLs are protective of human health at all times; thus, they implicitly account for seasonal variations as well as critical conditions. Additionally, since PCB levels in fish tissue become elevated due to long-term exposure it has been determined that the selection of the average annual tPCB water column and sediment concentrations within each impaired segment for comparison to the endpoints applied within the TMDLs adequately considers the impact of seasonal variations and critical conditions on the "fishing" designated use in the Baltimore Harbor embayment, Curtis Creek/Bay, and Bear Creek.

***5) The TMDLs consider seasonal environmental variations.***

As mentioned above, the TMDLs are protective of human health at all times and thus they implicitly account for seasonal variations as well as critical conditions. Seasonality is accounted for within the model simulation, since it is run for one full year, representative of average annual flow, with multiple iterations, which account for seasonal changes in the hydrologic and hydrodynamic conditions. Again, as mentioned above, since PCB levels in fish tissue become elevated due to long-term exposure it has been determined that the selection of the average annual tPCB water column and sediment concentrations within each impaired segment for comparison to the endpoints applied within the TMDLs adequately considers the impact of seasonal variations and critical conditions on the "fishing" designated use in the Baltimore Harbor embayment, Curtis Creek/Bay, and Bear Creek.

***6) The TMDLs include a Margin of Safety.***

The requirement for a MOS is intended to add a level of conservatism to the modeling process in order to account for uncertainty. Based on EPA guidance, the MOS can be achieved through two approaches. One approach is to reserve a portion of the loading capacity as a separate term, and the other approach is to incorporate the MOS as part of the design conditions.

To assess model uncertainty, a sensitivity analysis was conducted to evaluate the effects of changes in model forcing, model parameters, and external loads on the model results. The sensitivity analysis can provide information on whether or not model predictions are reliable given the uncertainties in the model parameters, model forcing conditions and loads. A total of five sensitivity analysis simulations were conducted to identify individual model forcing conditions and model parameters on model predictions. The sensitivity analysis simulation

[1] EPA memorandum regarding EPA Actions to Support High Quality TMDLs from Robert H. Wayland III, Director, Office of Wetlands, Oceans, and Watersheds to the Regional Management Division Directors, August 9, 1999.

details and results are presented in Appendix G of the TMDL report. Based on this model sensitivity test, MDE applied an explicit five percent MOS to account for uncertainty, in order to provide adequate and environmentally protective TMDLs.

***7) The TMDLs have been subject to public participation.***

MDE provided an opportunity for public review and comment on the PCB TMDL for the Baltimore Harbor, Curtis Creek/Bay, and Bear Creek Portions of Patapsco River Mesohaline Tidal Chesapeake Bay Segment watershed. The public review and comment period was open from August 26, 2011 through September 26, 2011. MDE received three sets of written comments. All the comments were satisfactorily addressed by MDE.

A letter was sent to the U.S. Fish and Wildlife Service pursuant to Section 7(c) of the Endangered Species Act, requesting the Service's concurrence with EPA's findings that approval of this TMDL does not adversely affect any listed endangered and threatened species, and their critical habitats.

## V. Discussion of Reasonable Assurance

EPA requires that there be a reasonable assurance that the TMDLs can be implemented. WLAs will be implemented through the NPDES permit process. According to 40 CFR §122.44(d)(1)(vii)(B), the effluent limitations for an NPDES permit must be consistent with the assumptions and requirements of any available WLA for the discharge prepared by the State and approved by EPA. Furthermore, EPA has the authority to object to issuance of an NPDES permit that is inconsistent with WLAs established for that point source.

The TMDLs presented in this report call for substantial reduction in PCB loads from diffuse sources present throughout the Baltimore Harbor embayment's watershed. Since PCBs are no longer manufactured and their use has been substantially restricted, it is reasonable to expect that with time PCB concentration in the aquatic environment will decline. Observations show that the average tPCB concentration in the Upper Chesapeake Bay is decreasing at a rate of 6.5 percent per year and since water quality data for sediments and the water column in the embayment from 2000 and 2008 demonstrate that PCB concentrations are declining over time, within this TMDL analysis, as a conservative estimate, a five percent rate of decline in tPCB concentrations at the boundary between the embayment and the Bay mainstem has been assumed. Given this rate of decline, the tPCB levels in the Baltimore Harbor embayment are expected to decline over time due to natural attenuation, such as the burial of contaminated sediments with newer, less contaminated materials, flushing of sediments during periods of high stream flow, and biodegradation. Discovering and remediating any existing PCB land sources throughout the Upper Chesapeake Bay watershed via future TMDL development and implementation efforts will further help to meet water quality goals in the Baltimore Harbor embayment.

One alternative for reducing the tPCB concentrations in the water column that MDE may consider is removal of PCB-contaminated systems (i.e., dredging – specifically, additional dredging outside of that which is already currently conducted for the navigational channels).

However, dredging is the least desirable alternative because of its potential biological destruction.

PCBs are still being released to the environment via accidental fires, leaks, disposal of PCB containing products, etc. Therefore, an adaptive approach of implementation is anticipated, with subsequent monitoring to assess the effectiveness of the ongoing implementation efforts to manage potential risks to both recreational and subsistence fish consumers.

A collaborative approach involving MDE and the identified NPDES permit holders as well as those responsible for nonpoint PCB runoff throughout the watersheds will be used to work toward attaining the WLAs and LAs presented in this report. The reductions will be implemented in an adaptive and iterative process that will: (1) identify specific sources, or areas of PCB contamination, within the embayment's watershed, and (2) target remedial action to those sources with the largest impact on water quality, while giving consideration to the relative cost and ease of implementation. The implementation efforts will be periodically evaluated, and if necessary, improved, in order to further progress toward achieving the water quality goals.

Under certain conditions, EPA's NPDES regulations allow the use of non-numeric, Best Management Practices (BMP) water quality based effluent limits (WQBELs). BMP WQBELs can be used where "numeric effluent limitations are infeasible; or the practices are reasonably necessary to achieve effluent limitations and standards or to carry out the purposes and intent of the CWA (CFR 2011c)." For example, MDE's Phase I MS4 permits require restoration targets for impervious surfaces (i.e., restore 10 percent or 20 percent of a jurisdiction's total impervious cover with no stormwater management/BMPs), and these restoration efforts have known total suspended solids (TSS) reduction efficiencies. Since PCBs are known to adsorb to sediments and their concentrations correlate with TSS concentrations, the significant restoration requirements in the MS4 permits, which will lead to a reduction in sediment loads entering the Baltimore Harbor embayment, will also contribute toward PCB load reductions and meeting PCB water quality goals. Other BMPs that focus on PCB source tracking and elimination at the source rather than end-of-pipe controls are also warranted.

Where necessary, the source characterization efforts will be followed with pollution minimization and reduction measures that will include BMPs for reducing runoff from urban areas, identification and termination of ongoing sources (e.g., industrial uses of equipment that contain PCBs), etc. Numerous stormwater dischargers are located in the Baltimore Harbor embayment's watershed including three Municipal Phase I MS4s, the SHA Phase I MS4, industrial facilities, State and Federal Phase II MS4s, and any construction activities on areas greater than one acre. The current Montgomery County Phase I MS4 permit already requires that the jurisdiction develops an implementation plan to meet its assigned NPDES Regulated Stormwater WLAs. Thus, similar requirements are expected to be put in place in the future for the other Phase I MS4 permits.

Since a number of contaminated sites have already undergone some degree of remediation and their baseline loads constitute a relatively small percentage of the total baseline load, these sites are not intended to be targeted during the initial stages of implementation and

thus at this point were not subjected to any reductions. However, if in the future it becomes clear that the TMDL goals cannot be achieved without load reductions from these sites, additional reduction measures might need to be considered.

Given the persistent nature of PCBs, the difficulty in removing them from the environment, and the significant reductions necessary in order to achieve water quality goals in the Baltimore Harbor embayment, effectiveness of the implementation effort will need to be reevaluated throughout the process to ensure progress is being made toward reaching the TMDLs. As part of Maryland's Watershed Cycling Strategy, follow-up monitoring and assessment will be routinely conducted to evaluate the implementation status. MDE also periodically monitors and evaluates concentrations of contaminants in recreationally caught fish, shellfish, and crabs throughout Maryland. MDE will use these monitoring programs to evaluate progress towards meeting the "fishing" designated use.