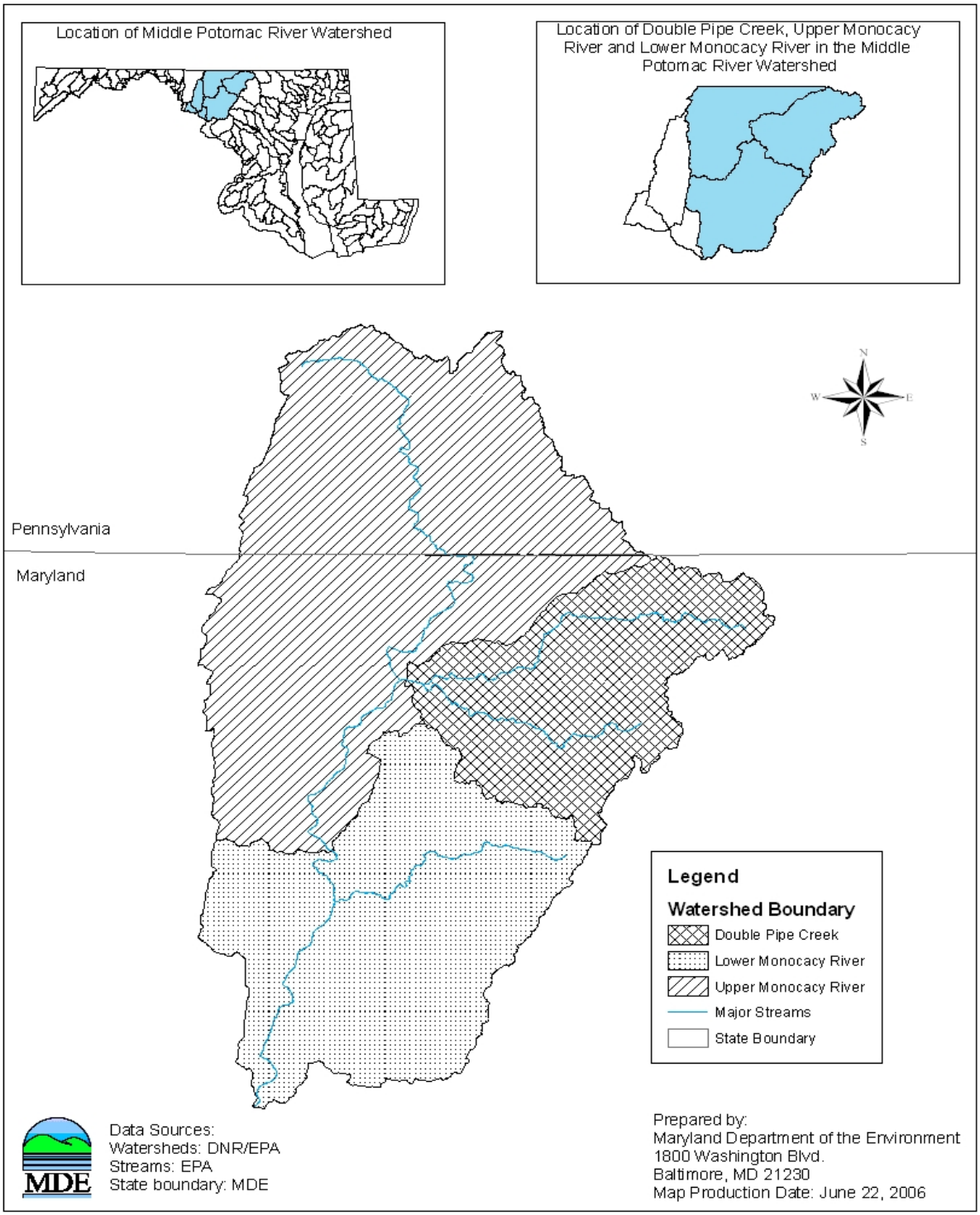
APPENDIX D – Sediment TMDLs for the Double Pipe Creek, MD 8-digit Upper Monocacy River, and Lower Monocacy River Watersheds

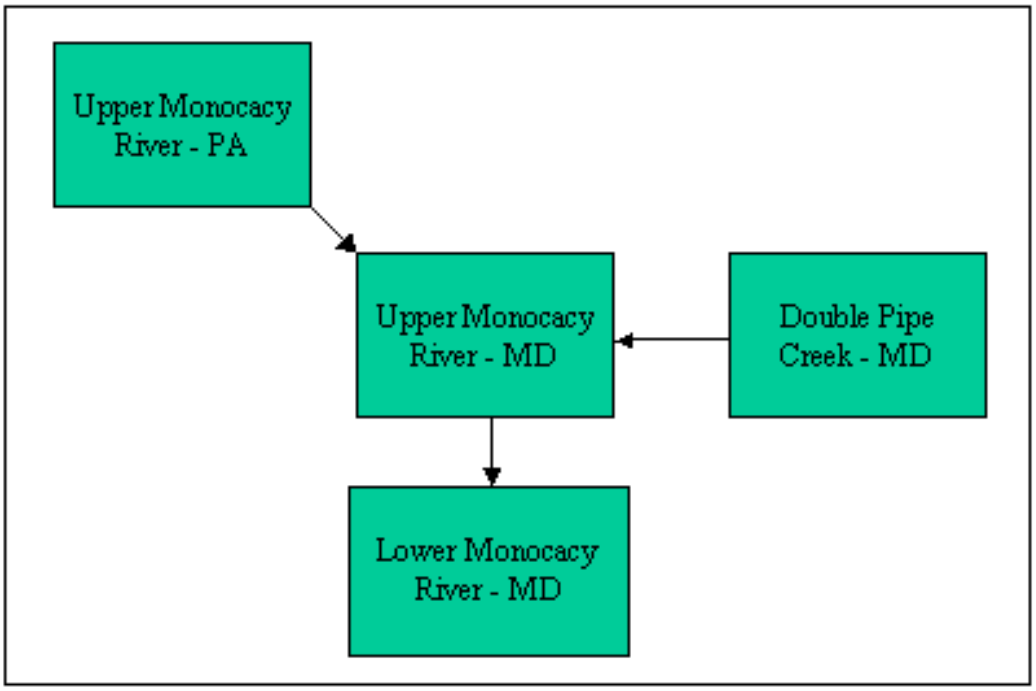
The purpose of this appendix is to explain the hydrologic relationship between the Double Pipe Creek, Upper Monocacy River, and Lower Monocacy River watersheds and how this affects the sediment TMDLs for each of the respective watersheds. As illustrated in Figure D-1, the three watersheds are hydrologically connected, beginning with the Double Pipe Creek watershed to the east. The Double Pipe Creek watershed flows into the Upper Monocacy River watershed, near the small town of Rocky Ridge. It is also shown in Figure D-1 that the Upper Monocacy River watershed includes land in Pennsylvania and Maryland. The combined flow from the Upper Monocacy River watershed and the Double Pipe Creek watershed flows into the Lower Monocacy River watershed. The hydrologic connectivity of the watersheds is illustrated in Figure D-2.

The baseline sediment loads for the watersheds are shown in Table D-1 through D-3. The TMDL calculations are shown in Tables D-4 through D-6. Further information can be found in the individual TMDL documents for each watershed.



Note: A separate sediment TMDL has been developed for Lake Linganore, a subwatershed within Lower Monaocay River watershed (MDE 2003), and is presented as an upstream load within the Lower Monocacy River TMDL.

Figure D-1: Location of the Double Pipe Creek, Upper Monocacy River, and Lower Monocacy River Watersheds



Note: A separate sediment TMDL has been developed for Lake Linganore, a subwatershed within Lower Monaocay River watershed (MDE 2003), and is presented as an upstream load within the Lower Monocacy River TMDL.

Figure D-2: Flow Schematic of the Double Pipe Creek, Upper Monocacy River, and Lower Monocacy River Watersheds

Table D-1: Double Pipe Creek Baseline Sediment Loads (ton/yr)

Total Baseline Load (ton/yr)	=	Nonpoint Source BL_{DP}	+	NPDES Stormwater BL_{DP}	+	Process Water BL_{DP}
35,224.3	=	29,674.5	+	5,189.8	+	360.0

Table D-2: MD 8-digit Upper Monocacy River Baseline Sediment Loads (ton/yr)

		Upstream Baseline Load[1]				MD 8-digit Upper Monocacy River Watershed Baseline Contribution				
Total Baseline Load (ton/yr)	=	BL_{PA}	+	BL_{DP}[2]	+	Nonpoint Source BL_{UM}	+	NPDES Stormwater BL_{UM}	+	Process Water BL_{UM}
98,728.7	=	20,511.9	+	35,224.3	+	38,679.3	+	4,129.1	+	184.1

Notes: [1] Although the upstream values are reported as single values, they could include point and nonpoint sources.

[2] For Double Pipe Creek watershed point and nonpoint characterization, please refer to the "Total Maximum Daily Load of Sediment in the Double Pipe Creek Watershed, Frederick and Carroll Counties, Maryland" (MDE 2008).

Table D-3: Lower Monocacy River Baseline Sediment Loads (ton/yr)

		Upstream Baseline Load[1]			MD 8-digit Lower Monocacy River Watershed Baseline Load Contribution				
Total Baseline Load (ton/yr)	=	BL_{LL}[2]	BL_{UM}[3]	+	Nonpoint Source BL_{LM}	+	NPDES Stormwater BL_{LM}	+	Process Water BL_{LM}
146,423.0	=	11,585.0	98,728.7	+	27,073.4	+	8,312.5	+	723.4

Notes: [1] Although the upstream value is reported as a single value, it includes point and nonpoint sources.

[2] For Lake Linganore watershed point and nonpoint source characterization, please refer to the "Total Maximum Daily Load of Phosphorus and Sediments for Lake Linganore, Frederick County, Maryland" (MDE 2003).

[3] For Upper Monocacy River watershed point and nonpoint characterization, please refer to Section 2.2.4 of this document.

Table D-4: Double Pipe Creek Average Annual TMDL (ton/yr)

TMDL (ton/yr) =	LA_{DP} +	NPDES Stormwater WLA_{DP} +	Process Water WLA_{DP} +	MOS
24,199.1	20,461.1	3,377.9	360.0	Implicit

Table D-5: MD 8-digit Upper Monocacy River Average Annual TMDL (ton/yr)

TMDL (ton/yr)	=	LA					+	WLA			+	MOS
		LA_{PA}[1]	+	LA_{DP}[2]	+	LA_{UM}	+	NPDES Stormwater WLA_{UM}	+	Process Water WLA_{UM}	+	
66,707.3	=	19,362.0	+	24,199.1	+	20,820.6	+	2,141.5	+	184.1	+	Implicit

Upstream Load Allocation[3, 4] — MD 8-digit Upper Monocacy River Watershed TMDL Contribution

Notes:

[1] LA_{PA} was determined to be necessary in order to meet Maryland water quality standards within the Upper Monocacy River watershed.

[2] For Double Pipe Creek watershed WLA and LA characterization, please refer to the "Total Maximum Daily Load of Sediment in the Double Pipe Creek Watershed, Frederick and Carroll Counties, Maryland" (MDE 2008).

[3] A delivery factor of 1 was used.

[4] Although for the purpose of this analysis upstream loads are referred to as LAs, they could include point and nonpoint sources.

Table D-6: Lower Monocacy River Average Annual TMDL (ton/yr)

TMDL (ton/yr)	=	LA					+	WLA			+	MOS
		LA_{LL}[1]	+	LA_{UM}[2]	+	LA_{LM}	+	NPDES Stormwater WLA_{LM}	+	Process Water WLA_{LM}	+	
90,158.0	=	7,073.0	+	66,707.3	+	12,397.5	+	3,256.8	+	723.4	+	Implicit

Upstream Load Allocation[3,4] — Lower Monocacy River Watershed TMDL Contribution

Notes:

[1] For the Lake Linganore watershed WLA and LA characterization, please refer to the "Total Maximum Daily Loads of Phosphorus and Sediments for Lake Linganore, Frederick, County, MD" (MDE 2003).

[2] For Upper Monocacy River watershed WLA and LA characterization, please refer to Section 4 of this document.

[3] Although for the purpose of this analysis upstream loads are referred to as LAs, they could include point and nonpoint sources.

[4] A delivery factor of 1 was used for all upstream sources.