

## Development of Shenandoah River PCB TMDL

### Appendix A.1. USGS Gauge Flow Data

A search of the USGS webpage for historical daily flows found 34 stations with flows. Long term daily flows for the Shenandoah River are available from October 1930 through September 1998. An additional 23 stations with peak flow data were found. The following table shows the sites with peak flow data.

**Table A-1-1: USGS Stream Gauges Providing Peak Flow Data**

<b>Gauge</b>	<b>Location</b>
01620800	Briery Branch
01621200	War Branch
01621400	Blacks Run
01621450	Blacks Run Trib
01622100	North River Trib
01622300	Buffalo Branch Trib
01622400	Buffalo Branch Trib
01625500	North River @ Port Republic
01627300	South River Trib
01628000	South River @ Port Republic
01628600	Cub Run
01629400	South Fork Trib
01629945	Chub Run
01632300	Long Meadow
01632900	Smith Creek
01632950	Crooked Run
01632970	Crooked Run
01633650	Pughs Run
01633700	Pughs Run
01635200	North Fork Trib
01636000	North Fork @ Riverton
01636200	Shenandoah @ Riverton
01636330	Horsepen Spring

The next table is the gauges with daily flow records and their periods of record. It is significant that the South Fork gauge is in Front Royal near the confluence with the North Fork, while the nearest station on the North Fork is in Strasburg. The increase in drainage area for the North Fork between Strasburg and Front Royal is approximately 33 percent of the total North Fork drainage area at Front Royal. The gauge for the Shenandoah River at Millville is approximately 5 miles from the mouth where it flows into the Potomac River.

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**Table A-1-2: USGS Stream Gauges Providing Daily Flow Data**

<b>Gauge</b>	<b>Name</b>	<b>Drainage (square miles)</b>	<b>Start</b>	<b>Stop</b>
01620500	North River near Stokesville	17.2	10/01/1946	09/30/1999
01621000	Dry River	72.6	08/30/1946	09/30/1948
01621050	Muddy Creek	14.2	04/13/1973	09/30/1999
01621470	Blacks Run	19.4	02/18/1999	09/30/1999
01622000	North River @ Burketown	379	06/01/1926	10/31/1972
			05/23/1975	09/30/1999
01623000	Bell Creek near Staunton	0.61	10/01/1948	09/30/1955
01623500	Bell Creek @ Staunton	3.80	10/01/1948	09/30/1955
01624000	Bell Creek near Franks Mill	9.60	10/01/1948	09/30/1956
01624300	Middle River near Verona	178	10/01/1967	01/09/1987
01624800	Christians Creek	70.1	10/01/1967	10/06/1997
01625000	Middle River @ Grottoes	375	10/01/1927	09/30/1995
01625900	Back Creek	41.2	05/01/1974	09/30/1977
01626000	South River near Waynesboro	127	10/01/1952	09/30/1999
01626500	South River @ Waynesboro	133	10/01/2028	09/30/1952
01626850	South River near Dooms	149	04/23/1974	12/10/1996
01627500	South River @ Harriston	212	02/15/1925	09/30/1951
			10/01/1968	09/30/1999
01628060	White Oak Run	1.94	10/01/1979	09/30/1996
01628150	Deep Run	1.17	10/01/1979	09/30/1982
01628500	South Fork @ Lynnwood	1084	10/01/1930	09/30/1999
01629500	South Fork @ Luray	1377	04/01/1925	09/30/1930
			10/01/1938	09/30/1951
			06/01/1979	09/30/1999
01631000	South Fork @ Front Royal	1642	10/01/1930	09/30/1999
01632000	North Fork @ Cootes Store	210	04/01/1925	09/30/1999
01632082	Linville Creek	45.5	08/09/1985	09/30/1999
01633000	North Fork @ Mount Jackson	506	10/01/1943	09/30/1999
01633500	Stony Creek	79.4	04/01/1947	09/30/1956
01634000	North Fork @ Strasburg	768	04/01/1925	09/30/1999
01634500	Cedar Creek	103	10/01/1937	09/30/1999
01635360	Mill Run	1.17	11/18/1982	08/17/1988
			10/01/1988	05/30/1990
01635365	Shelter Run	0.14	09/02/1982	11/15/1984
			10/01/1985	05/12/1986
			07/15/1986	04/15/1990
01635500	Passage Creek	87.8	04/01/1932	09/30/1999
01636210	Happy Creek	14.0	10/01/1948	10/19/1977
01636451	Long Marsh	16.1	04/21/1988	03/28/1989
			05/03/1989	06/21/1989
01636462	Bullskin Run	22.2	04/21/1988	07/14/1989
01636500	Shenandoah @ Millville	3040	04/01/1895	03/31/1909
			08/01/1928	09/30/1998

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### Appendix A.2. Water Quality Data

Water quality data has been obtained from STORET, Virginia DEQ, and the EPA Superfund program. The Virginia DEQ data is included in the STORET data, and is summarized with that data. Current data is for four sample media; clams, sediments, fish, and the water column. The following table provides a broad summary of the data, including the number and percent of data with qualifier flags. The majority of the data with qualifiers are below detection limits or were Not Detected (ND). The clam results show 43% of all samples as remarked while 86% of all fish samples have qualifier flags. The sediment results shows 97% of data is below detection and 93% of water column samples are below detection levels. The available data that is above detection levels is very sparse, both spatially and temporally. A more detailed summary which shows the spatial and temporal availability of data is presented below by source and media.

**Table A-2-1: Sources of Water Quality Data**

Source	Media	# of Samples	# Remarkd	Comments
STORET	Fish	504	423	
STORET	Ambient	188	185	
STORET	Sediment	212	196	Some mud, some dry sediment
Superfund	Clams	53	23	Report both mg/kg and µg/kg
Superfund	Sunfish	295	265	
Superfund	Sediment	281	281	All not detected
Superfund	Ambient	180	156	All entries not detected

### Water Quality Analysis by Source and Media

The following data summaries are divided by source/agency and sample media (clams, fish, sediment, water). If several media were collected at a station, the station will appear in the table of results for each media. The detected compounds are predominantly PCB-1260 and Total PCBs, with the 2 values very similar or equal. PCB-1254 is also detected in some samples, primarily fish tissue. Unless otherwise stated, the sample counts are for all PCB parameters.

Much of the data has a data qualifier flag associated with each reading. The qualifier definitions for STORET and the Superfund program are generally similar. The following table summarizes the qualifiers in the Shenandoah data and how various qualifiers were used in this report. The U qualifier was used for all data with a value of 0.

**Table A-2-2: Water Quality Data Qualifiers**

Superfund	STORET	Report	Definition
J	J	J	Estimated values
K	K	K	Below detection level
	M	U	Present, but not quantified

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Superfund	STORET	Report	Definition
R		R	Rejected for gross QC problems
U	U	U	Not detected (ND)
UJ		U	Estimated value for ND
UL		U	ND, greater than value shown
W		W	Weathered for PCB analysis
WJ		W	Estimated value, weathered for PCB analysis

### Superfund Data

Sample Type: Clams

Date: 05/13/97

**Table A-2-3: Superfund Data for Clams**

Units	Count	Minimum	Maximum	Comments
mg/kg	30	0.320	16	
µg/kg	23	100	16000	All flagged W. Detection limits between 68 and 83.

Converting the µg/kg detection limits to mg/kg gives a range of 0.068 to 0.083 mg/kg respectively. The range of results for the µg/kg data is 0.1 mg/kg to 16 mg/kg. If the W flag does not require special data interpretation, the two sets of results could be combined.

Sample Type: Fish

Date: 05/13/97

**Table A-2-4: Superfund Data for Fish**

Units	Count	Minimum	Maximum	Comments
mg/kg	25	2	9.3	
mg/kg	164	ND	ND	Detection limit of 1
µg/kg	5	97	500	
µg/kg	6	21	48	Estimated values
µg/kg	28	ND	ND	Detection of 110 to 1000
µg/kg	67	37	9600	Detection of 67 to 130

Sample Type: Sediment

Dates: 09/23/93, 05/13/97

**Table A-2-5: Superfund Data for Sediment**

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Units	Count	Minimum	Maximum	Comments
mg/kg	3	ND	ND	All U, detection of 2 or 2.9
µg/kg	278	ND	ND	All U, detection between 30 and 760

Sample Type: Water

Dates: 09/23/93, 05/13/97

**Table A-2-6: Superfund Data for Water**

Units	Count	Minimum	Maximum	Comments
mg/L	25	ND	ND	All U, detection of 0.0001
µg/L	155	ND	ND	All U, detection of 0.3 or 0.5

The 0.3 µg/L detection level is 680 times greater than the Virginia standard and 6800 times greater than the West Virginia standard.

### STORET Data

#### USEPA Region 3

Sample Type: Water

**Table A-2-7: STORET Data for Water**

Station	Date	Count	Minimum	Maximum	Comments
Front Royal	01/10/79	7	ND	ND	One sample, 7 parameters, all ND
Waynesboro	05/01/79	7	ND	ND	One sample, 7 parameters, all ND

The 0.1 µg/L detection limit used is 230 times greater than the Virginia standard and 2300 times greater than the West Virginia standard.

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### USGS Data

**Table A-2-8: USGS Water Quality Gauge Stations**

AGENCY	STATION	LOCATION
I12WRD	01621050	MUDDY CREEK AT MOUNT CLINTON, VA
I12WRD	01628250	SOUTH FORK SHENANDOAH RIVER AT LYNNWOOD, VA
I12WRD	01629050	S F SHENANDOAH RIVER AT ELKTON, VA
I12WRD	01629500	S F SHENANDOAH RIVER NEAR LURAY, VA
I12WRD	01631000	S F SHENANDOAH RIVER AT FRONT ROYAL, VA
I12WRD	01633000	N F SHENANDOAH RIVER AT MOUNT JACKSON, VA
I12WRD	01634000	N F SHENANDOAH RIVER NEAR STRASBURG, VA
I12WRD	01636290	SHENANDOAH RIVER NEAR MILLWOOD, VA
I12WRD	01636451	NORTH FORK LONG MARSH RUN NEAR MEYERSTOWN, WV
I12WRD	01636462	BULLSKIN RUN AT KABLETOWN, WV
I12WRD	01636500	SHENANDOAH R AT MILLVILLE, WV
I12WRD	391200077520301	03722 D N HOOVER
I12WRD	391413077572301	37252 HEAD SPRING
I12WRD	391655077493801	CATTAIL SPRING 88A
I12WRD	391805077550701	ALDRIDGE SPRING @ ALDRIDGE, WV
I12WRD	391840077504001	037109 FLOWING SPRING (KANE)

Sample Type: Fish

**Table A-2-9: USGS Data for Fish**

Station	Date	Count	Value	Detection Limits
01621050	07/26/95	1	ND	50 µg/kg

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Sample Type: Sediment

**Table A-2-10: USGS Data for Sediment**

Station	Location	Date	Value (µg/kg)	Flag
01629050	S F SHENANDOAH RIVER AT ELKTON, VA	05/16/72	80	
01629050	S F SHENANDOAH RIVER AT ELKTON, VA	08/31/76	0	
01629500	S F SHENANDOAH RIVER NEAR LURAY, VA	05/16/72	5	
01631000	S F SHENANDOAH RIVER AT FRONT ROYAL, VA	05/16/72	30	
01634000	N F SHENANDOAH RIVER NEAR STRASBURG, VA	05/16/72	0	
01634000	N F SHENANDOAH RIVER NEAR STRASBURG, VA	08/31/76	0	
01636290	SHENANDOAH RIVER NEAR MILLWOOD, VA	05/16/72	0	
01636290	SHENANDOAH RIVER NEAR MILLWOOD, VA	08/31/76	0	
01636500	SHENANDOAH R AT MILLVILLE, WV	05/17/72	5	BD
01636500	SHENANDOAH R AT MILLVILLE, WV	08/31/76	0	

All 10 samples were “wet mud”. Three samples were above detection levels on 05/16/72. One detection limit of 5 µg/kg was listed for 1972. The three detected samples were on the south fork at Elkton (80 µg/kg), Front Royal (30 µg/kg), and Luray (5 µg/kg). The Millville sample for that date was below detection.

Sample Type: Water

**Table A-2-11: USGS Data for Water**

Station	Location	Date	Value (µg/L)	Flag
01628250	SOUTH FORK SHENANDOAH RIVER AT LYNNWOOD, VA	06/19/73	0.0	
01628250	SOUTH FORK SHENANDOAH RIVER AT LYNNWOOD, VA	10/25/72	0.0	
01628250	SOUTH FORK SHENANDOAH RIVER AT LYNNWOOD, VA	12/13/72	0.0	
01629050	S F SHENANDOAH RIVER AT ELKTON, VA	08/31/76	0.0	
01633000	N F SHENANDOAH RIVER AT MOUNT JACKSON, VA	02/21/80	0.0	U
01634000	N F SHENANDOAH RIVER NEAR STRASBURG, VA	08/31/76	0.0	
01636290	SHENANDOAH RIVER NEAR MILLWOOD, VA	06/19/73	0.0	
01636290	SHENANDOAH RIVER NEAR MILLWOOD, VA	08/31/76	0.0	
01636290	SHENANDOAH RIVER NEAR MILLWOOD, VA	10/25/72	0.0	U
01636290	SHENANDOAH RIVER NEAR MILLWOOD, VA	12/14/72	0.0	
01636451	NORTH FORK LONG MARSH RUN NEAR MEYERSTOWN, WV	03/28/89	0.1	BD
01636451	NORTH FORK LONG MARSH RUN NEAR MEYERSTOWN, WV	06/21/89	0.1	K
01636462	BULLSKIN RUN AT KABLETOWN, WV	06/21/89	0.1	K
01636500	SHENANDOAH R AT MILLVILLE, WV	08/31/76	0.0	
391200077520301	03722 D N HOOVER	07/26/88	0.1	K
391413077572301	37252 HEAD SPRING	03/29/89	0.1	K

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Station	Location	Date	Value (µg/L)	Flag
391413077572301	37252 HEAD SPRING	06/20/89	0.1	K
391655077493801	CATTAIL SPRING 88A	07/27/88	0.1	K
391805077550701	ALDRIDGE SPRING @ ALDRIDGE, WV	06/20/89	0.1	K
391805077550701	ALDRIDGE SPRING @ ALDRIDGE, WV	09/27/88	0.1	K
391840077504001	037109 FLOWING SPRING (KANE)	07/25/88	0.1	K

All 21 samples were reported as 0 or below a detection limit of 0.1 µg/L. The detection limit is roughly 230 times greater than the Virginia standard and 2300 times greater than the West Virginia standard.

### Army Corps of Engineers, Huntington Division

The Army Corp of Engineers data was collected on Evitts Run, a small trib that joins the Shenandoah near Mechanicstown, WV.

#### Sediments

Samples were tested for 7 Aroclors on each day. All data were below detection levels of 1.6 to 8.3 µg/kg. The detection limits were not uniform for any date, station, or Aroclor parameter.

**Table A-2-12: USACE Aroclor Data for Sediments**

Site	Date	Count	Minimum	Maximum	Comment
1AMEW0002	10/07/93	7	1.8	5.0	ND
1AMEW0002	07/07/94	7	2.1	6.0	ND
1AMEW0003	10/07/93	7	1.9	5.4	ND
1AMEW0003	07/07/94	7	2.8	8.0	ND
1AMEW0004	10/08/93	7	1.6	4.5	ND
1AMEW0004	07/07/94	7	2.4	6.8	ND
1AMEW0005	10/08/93	7	1.7	4.9	ND
1AMEW0005	07/07/94	7	3.0	8.3	ND

Note: ND = not detectable

#### Water

Samples at 6 stations were tested for 6 Aroclors in October. One extra Aroclor was tested for at station 1AMEW0007 in December. All samples are below detection levels of 0.023 to 0.065 µg/L. These detection limits are 50 to 150 times greater than the Virginia standard and 500 to 1500 times greater than the water quality standard for West Virginia.

**Table A-2-13: USACE Aroclor Data for Water Column**

Site	Date	Count	Minimum	Maximum	Comments
1AMEW0001	10/07/93	6	0.023	0.065	BD
1AMEW0002	10/07/93	6	0.023	0.065	BD
1AMEW0003	10/07/93	6	0.023	0.065	BD



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Site	Date	Count	Minimum	Maximum	Comments
1AMEW0004	10/07/93	6	0.023	0.065	BD
1AMEW0005	10/07/93	6	0.023	0.065	BD
1AMEW0007	12/17/93	7	0.023	0.065	BD

### West Virginia DNR Sediment and Tissue

Sample Type: Fish Tissue

**Table A-2-14: WVDNR Data for Fish Tissue**

Site	Date	Count	Minimum	Maximum	Comments
Meyerstown	10/15/81	4	0.05	0.05	BD
Meyerstown	10/17/83	4	0.00	0.25	2 entries as (0)
Meyerstown	09/27/84	5	0.00	0.13	3 entries as (0)
Meyerstown	10/11/89	48	0.00	11.80	6 samples, 6 of 8 tests (0)
Meyerstown	10/28/93	8	0.24	11.74	4 samples for total and 1260
Millville	09/01/78	16	0.00	0.50	2 samples, 5 of 8 tests (0)
Millville	10/11/89	48	0.00	4.30	6 samples, 6 of 8 tests (0)
Millville	10/28/93	12	0.11	4.89	6 samples for total and 1260

Data Summary:

For Meyerstown

- 41 of 69 samples reported as 0
- 2 samples for PCB-1254 on 10/15/81 reported as  $\mu\text{g}/\text{kg}$  were below 0.05 detection limit
- 2 samples for PCB-1260 on 10/15/81 reported as  $\text{mg}/\text{kg}$  were below 0.05 detection limit
- 24 samples reported as fish tissue wet weight in  $\text{mg}/\text{kg}$ 
  - ▶ Values for the 24 samples were between 0.13 and 11.8 $\text{mg}/\text{kg}$ .
  - ▶ The 9/27/84, 10/11/89, and 10/28/93 samples showed a wide variation in concentration.
  - ▶ The samples above detection were tested for total PCBs and aroclor 1260.
  - ▶ The PCB-1260 and total PCB values were very similar for a given date and time.

For Millville

- 46 of 76 samples reported as 0
- 1 sample for PCB-1254 on 09/01/78 reported as  $\mu\text{g}/\text{kg}$  was below 0.50 detection limit
- 1 sample for PCB-1260 on 09/01/78 reported as  $\text{mg}/\text{kg}$  was below 0.05 detection limit
- 28 samples reported as fish tissue wet weight in  $\text{mg}/\text{kg}$

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- ▶ Values for the 28 samples were between 0.11 to 4.89 mg/kg.
- ▶ The 9/27/84, 10/11/89, and 10/28/93 samples showed a wide variation in concentration.
- ▶ The samples above detection were tested for total PCBs and aroclor 1260.
- ▶ The PCB-1260 and total PCB values were very similar for a given date and time.

### Virginia State Water Control Board (SWCB)

Sample Type: Water

Water samples were collected on 28 dates. The values shown are the actual values or range of values for that site and day. If one value is listed for multiple samples, all samples were reported with that value, usually because of detection limits.

- 58 of 102 samples were reported as 0
- 6 samples taken on 07/13/90 at one station were not detected at 0.02 µg/L
- 36 samples were not detected at 0.10 µg/L detection level
- The 2 samples with reported values were collected 05/02/71 and 06/06/71.

**Table A-2-15: SWCB PCB Data for Water**

Station	Location	Date	Count	Value (µg/L)	Flag
1BCDR013.29	ROUTE 628 BRIDGE	08/21/79	1	0.00	
1BCDR013.29	ROUTE 628 BRIDGE	07/21/80	1	0.00	
1BCDR013.29	ROUTE 628 BRIDGE	05/29/85	6	0.10	K
1BCNG003.33	LAKE SHENANDOAH - LAKE CENTER - ALBERMARLE CO.	08/01/89	12	0.10	K
1BCRO000.43	RIVERTON CORP. BRIDGE	07/21/80	1	0.00	
1BCST012.32	ROUTE 794 BRIDGE (AUGUSTA COUNTY)	08/15/79	1	0.00	
1BCST012.32	ROUTE 794 BRIDGE (AUGUSTA COUNTY)	07/10/80	1	0.00	
1BCST012.55	ROUTE 794 BRIDGE	08/15/79	1	0.00	
1BCST012.55	ROUTE 794 BRIDGE	07/10/80	1	0.00	
1BDRI005.55	LAKE ARROWHEAD - STATION 100' FROM DAME PAGE CO.	07/31/90	6	0.02	K
1BHKS000.96	ROUTE 648 BRIDGE BELOW LURAY	08/20/79	1	0.00	
1BHKS000.96	ROUTE 648 BRIDGE BELOW LURAY	07/08/80	1	0.00	
1BHKS006.23	ROUTE 675 BRIDGE IN LURAY	06/06/71	1	0.16	
1BLEW002.91	APPROX. 0.3 MILES BELOW RT. 275 BRIDGE	07/10/80	1	0.00	
1BLNV000.21	DOWNSTREAM OF RT. 257 BRIDGE	04/23/78	1	0.00	
1BLNV000.21	DOWNSTREAM OF RT. 257 BRIDGE	08/06/79	1	0.00	
1BLNV000.21	DOWNSTREAM OF RT. 257 BRIDGE	07/01/80	1	0.00	
1BMDL001.83	ROUTE 769 BRIDGE	08/15/79	1	0.00	
1BMDL001.83	ROUTE 769 BRIDGE	07/10/80	1	0.00	
1BMDL036.08	ROUTE 742 BRIDGE	08/15/79	1	0.00	

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1BMDL036.08	ROUTE 742 BRIDGE	07/10/80	1	0.00	
1BNFS000.57	APPROX. 0.1 MILE BELOW RT. 340/522 BRIDGE	08/21/79	1	0.00	
1BNFS000.57	APPROX. 0.1 MILE BELOW RT. 340/522 BRIDGE	07/21/80	1	0.00	
1BNFS000.57	APPROX. 0.1 MILE BELOW RT. 340/522 BRIDGE	05/29/85	6	0.10	K
1BNFS010.34	RT. 55 BRIDGE WARREN/SHENANDOAH COUNTY	08/21/79	1	0.00	
1BNFS010.34	RT. 55 BRIDGE WARREN/SHENANDOAH COUNTY	07/21/80	1	0.00	
1BNFS070.67	ROUTE 698 BRIDGE	04/23/79	1	0.00	
1BNFS070.67	ROUTE 698 BRIDGE	08/06/79	1	0.00	
1BNFS070.67	ROUTE 698 BRIDGE	07/01/80	1	0.00	
1BNFS081.42	RT. 617/953 BRIDGE, W OF NEW MARKET	04/23/79	1	0.00	
1BNFS081.42	RT. 617/953 BRIDGE, W OF NEW MARKET	08/06/79	1	0.00	
1BNFS081.42	RT. 617/953 BRIDGE, W OF NEW MARKET	07/01/80	1	0.00	
1BNFS093.53	ROUTE 259 BRIDGE	04/23/79	1	0.00	
1BNFS093.53	ROUTE 259 BRIDGE	08/06/79	1	0.00	
1BNFS093.53	ROUTE 259 BRIDGE	07/01/80	1	0.00	
1BNTH014.08	RT. 693 AT QUARRY DOWNSTREAM FROM GAGING STATION	09/27/79	1	0.00	
1BNTH014.08	RT. 693 AT QUARRY DOWNSTREAM FROM GAGING STATION	07/10/80	1	0.00	
1BNTH045.36	STATION A1 - NEAR THE DAM - AUGUSTA COUNTY	06/21/88	6	0.10	K
1BPSG001.36	RT. 55 BRIDGE	08/21/79	1	0.00	
1BPSG001.36	RT. 55 BRIDGE	07/21/80	1	0.00	
1BSHN022.63	RT. 7 BRIDGE, CASTLEMANS FERRY BRIDGE	08/30/79	1	0.00	
1BSHN022.63	RT. 7 BRIDGE, CASTLEMANS FERRY BRIDGE	07/14/80	1	0.00	
1BSHN038.27	RT. 50 BRIDGE	05/02/71	1	0.10	
1BSKD003.18	STATION A1 - NEAR THE DAM - ROCKINGHAM COUNTY	06/28/88	6	0.10	K
1BSMT004.60	RT. 620 BRIDGE	04/23/79	1	0.00	
1BSMT004.60	RT. 620 BRIDGE	08/06/79	1	0.00	
1BSMT004.60	RT. 620 BRIDGE	07/01/80	1	0.00	
1BSSF000.58	APPROX. 0.4 MILE BELOW RT340/522 BRIDGE	08/20/79	1	0.00	
1BSSF000.58	APPROX. 0.4 MILE BELOW RT340/522 BRIDGE	07/08/80	1	0.00	
1BSSF003.56	RT. 619 BRIDGE AT GAGING STATION	08/20/79	1	0.00	
1BSSF003.56	RT. 619 BRIDGE AT GAGING STATION	07/08/80	1	0.00	
1BSSF054.20	RT. 211 BRIDGE, E OF NEW MARKET	08/20/79	1	0.00	
1BSSF054.20	RT. 211 BRIDGE, E OF NEW MARKET	07/08/80	1	0.00	
1BSSF100.10	RT. 708 BRIDGE	08/20/79	1	0.00	
1BSSF100.10	RT. 708 BRIDGE	07/08/80	1	0.00	
1BSTH007.80	RT. 778 AT HARRISONBURG	08/15/79	1	0.00	
1BSTH007.80	RT. 778 AT HARRISONBURG	07/10/80	1	0.00	

## Development of Shenandoah River PCB TMDL

Station	Location	Date	Count	Value (µg/L)	Flag
1BSTH027.85	ROUTE 664 BRIDGE - CITY OF WAYNESBORO	08/15/79	1	0.00	
1BSTH027.85	ROUTE 664 BRIDGE - CITY OF WAYNESBORO	07/10/80	1	0.00	
1BSTY001.22	RT. 11 BRIDGE	04/23/78	1	0.00	
1BSTY001.22	RT. 11 BRIDGE	08/06/79	1	0.00	
1BSTY001.22	RT. 11 BRIDGE	07/01/80	1	0.00	
2-HRD011.57	RT. 637 BRIDGE	04/17/79	1	0.00	
2-HRD011.57	RT. 637 BRIDGE	08/16/79	1	0.00	
2-HRD011.57	RT. 637 BRIDGE	07/16/80	1	0.00	
2-HRD011.57	RT. 637 BRIDGE	07/23/80	1	0.00	

Sample Type: Fish Tissue

The Virginia State Water Control Board fish tissue results (mg/kg) show

- 284 of 358 results reported as not detected (U)
- 45 samples below detection levels
- 29 samples above detection levels
- Most samples were tested for multiple parameters, with a few results for PCB-1254 and most results for Total PCB and PCB-1260.

**Table A-2-16: SWCB PCB Data for Fish Tissue**

Site	Date	Count	Minimum	Maximum	Comments
1BCDR013.29	07/24/79	2	1.00	1.00	All U
1BCDR013.29	08/04/81	2	0.50	0.50	All U
1BCDR013.29	07/27/83	3	0.01	2.30	One of 3 samples U
1BCDR013.29	08/13/85	3	0.01	0.01	All U
1BCDR013.29	07/16/86	9	1.00	1.00	All K
1BNFS000.57	08/18/88	3	1.00	1.00	All K
1BNFS000.69	07/26/79	2	1.00	1.00	All U
1BNFS000.69	07/28/83	3	1.00	1.00	All U
1BNFS000.69	08/14/85	3	1.00	1.00	All U
1BNFS000.69	08/18/88	9	0.10	4.20	7 of 9 K, one of 3 samples PCB-1260 same as total
1BNFS000.69	09/12/90	9	1.00	1.00	All U
1BNFS005.33	09/12/90	25	1.00	1.00	All U
1BNFS037.89	09/13/90	27	1.00	1.00	All U
1BSHN022.63	07/16/87	9	1.00	5.20	3 samples, 3 tests, PCB-1260 same as total, PCB-1254 was ND
1BSHN022.63	06/05/90	27	0.50	4.40	All U
1BSHN022.63	07/16/92	26	1.00	1.00	All U
1BSHN038.48	06/05/90	27	0.50	7.50	All U
1BSHN048.00	06/06/90	27	0.50	9.70	All U

## Development of Shenandoah River PCB TMDL

Site	Date	Count	Minimum	Maximum	Comments
IBSHN052.03	07/14/92	18	1.00	1.00	All U
IBSHN053.02	06/06/90	27	0.50	18.00	All U
IBSSF000.19	08/17/88	3	2.40	12.00	1 sample 3 tests
IBSSF000.58	07/26/79	4	1.00	1.00	All U
IBSSF000.58	07/28/83	3	0.01	0.01	All U
IBSSF000.58	08/14/85	3	0.01	0.01	All U
IBSSF000.58	08/16/88	3	3.00	21.00	1 sample 3 tests
IBSSF000.58	08/17/88	9	1.00	110.00	3 samples, 3 tests, PCB-1254 ND 2 of 3
IBSSF000.58	06/06/90	27	0.50	50.00	3 samples, 9 tests, 7 tests all ND
IBSSF000.58	07/14/92	18	1.00	1.00	All U
IBSSF003.50	07/16/92	27	1.00	1.00	All U

The 13 stations for the fish tissue data are as follows:

**Table A-2-17: SWCB Stations Recording Fish Tissue Data**

Agency	Station	Location
21VASWCB	IBCDR013.29	ROUTE 628 BRIDGE
21VASWCB	IBNFS000.57	APPROX. 0.1 MILE BELOW RT. 340/522 BRIDGE
21VASWCB	IBNFS000.69	UPSTREAM FROM DAM
21VASWCB	IBNFS005.33	AT CONFLUENCE OF PASSAGE CREEK
21VASWCB	IBNFS037.89	ROUTE 663 BRIDGE
21VASWCB	IBSHN022.63	RT. 7 BRIDGE, CASTLEMANS FERRY BRIDGE
21VASWCB	IBSHN038.48	AT RT. 17.50 BRIDGE
21VASWCB	IBSHN048.00	RT. 624 BRIDGE
21VASWCB	IBSHN052.03	POWER POOL (WARREN CO)
21VASWCB	IBSHN053.02	DOWNSTREAM OF FRONT ROYAL COUNTRY CLUB
21VASWCB	IBSSF000.19	APPROX. 0.4 MILE BELOW RT340/522 BRIDGE
21VASWCB	IBSSF000.58	APPROX. 0.4 MILE BELOW RT340/522 BRIDGE
21VASWCB	IBSSF003.50	DGIF BOAT LAUNCH LURAY AVE - WARREN COUNTY

Sample Type: Sediment

- Sediments were collected on 45 dates and at 90 stations
- The combination results in 143 station/date combinations
- 133 of 146 samples were below detection or reported as 0
- 6 of the 13 samples above the detection limits were reported at 500 µg/kg
- 7 of the 13 samples above the detection limits were reported at 1000 µg/kg
- Detection limits for all samples ranged between 20 µg/kg in 1996 to 1000 µg/kg in 1988
- The majority of the samples above detection limits were collected in July 1991

## Development of Shenandoah River PCB TMDL

The table below shows the data for the stations where samples above the detection limit were found.

**Table A-2-18: SWCB Stations With Samples Above Detection Limit**

Station	Location	Date	Value (µg/kg)	Flag
IBCNG003.33	LAKE SHENANDOAH - LAKE CENTER - ALBERMARLE CO.	08/01/89	1000.0	K
IBCNG003.33	LAKE SHENANDOAH - LAKE CENTER - ALBERMARLE CO.	08/01/89	1000.00	
IBCRO000.43	RIVERTON CORP. BRIDGE	07/23/91	500.00	
IBCRO000.43	RIVERTON CORP. BRIDGE	07/25/96	30.00	U
IBBST012.32	ROUTE 794 BRIDGE (AUGUSTA COUNTY)	07/01/91	1000.00	
IBDRI005.55	LAKE ARROWHEAD - STATION 100' FROM DAME PAGE CO.	07/31/90	1000.00	
IBDUR003.36	ROUTE 752 BRIDGE	07/02/91	1000.00	
IBMDD000.40	ROUTE 737 BRIDGE	07/02/91	1000.00	
IBMDD000.40	ROUTE 737 BRIDGE	06/18/96	30.00	U
IBMDD005.15	ROUTE 875 BRIDGE	07/02/91	1000.00	
IBNFS000.57	APPROX. 0.1 MILE BELOW RT. 340/522 BRIDGE	07/23/91	500.00	
IBNFS000.57	APPROX. 0.1 MILE BELOW RT. 340/522 BRIDGE	07/24/96	30.00	U
IBSHN022.63	RT. 7 BRIDGE, CASTLEMANS FERRY BRIDGE	06/05/90	180.00	U
IBSHN022.63	RT. 7 BRIDGE, CASTLEMANS FERRY BRIDGE	07/23/91	500.00	
IBSHN022.63	RT. 7 BRIDGE, CASTLEMANS FERRY BRIDGE	07/16/92	500.00	U
IBSHN022.63	RT. 7 BRIDGE, CASTLEMANS FERRY BRIDGE	07/24/96	30.00	U
IBSHN048.00	RT. 624 BRIDGE	06/06/90	250.00	U
IBSHN048.00	RT. 624 BRIDGE	07/23/91	500.00	
IBSHN048.00	RT. 624 BRIDGE	07/24/96	30.00	U
IBSSF000.19	APPROX. 0.4 MILE BELOW RT340/522 BRIDGE	07/23/91	500.00	
IBSSF000.19	APPROX. 0.4 MILE BELOW RT340/522 BRIDGE	07/24/96	30.00	U
IBSTH027.85	ROUTE 664 BRIDGE - CITY OF WAYNESBORO	07/01/91	1000.00	
IBSTH027.85	ROUTE 664 BRIDGE - CITY OF WAYNESBORO	07/22/96	20.00	U
2-HRD011.57	RT. 637 BRIDGE	07/24/91	500.00	
2-HRD011.57	RT. 637 BRIDGE	08/19/96	30.00	U