

APPENDIX K
OEPA TRIBUTARY ANALYSIS



State of Ohio Environmental Protection Agency

Northeast District Office

110 E. Aurora Road
Twinsburg, Ohio 44087-1969
(330) 425-9171 FAX (330) 487-0769

George V. Voinovich
Governor

August 5, 1998

Mr. A. Lee Nageotte
AWK Consulting Engineers
1611 Monroeville Avenue
Turtle Creek, PA. 15145

RECEIVED

AUG 07 1998

AWK CONSULTING ENR. 185

Dear Mr. Nageotte:

Tim Delgado of your firm asked me to send you information concerning the aquatic life status of the tributaries that flow into the lower Mahoning River within the Army Corps project zone.

I am aware of two documents where information on the health of the Mahoning River tributaries would be found. The first source would be the May 1996 "Biological and Water Quality Study of the Mahoning River Basin" report. This report contains information on the chemical and biological health of four of the main tributaries in the lower Mahoning River area, Mosquito Creek, Meander Creek, Mill Creek, and Yellow Creek, plus a number of small tributaries to Mill Creek. Table 1 of the report indicates that the aquatic life attainment status for all of these tributaries is NON attainment of Clean Water Act Warmwater Habitat goals.

A second source of information is the State of Ohio 1996 Water Resources Inventory Report, what is also called the "305(b) report", since the information is required under Section 305(b) of the Clean Water Act. The Appendices to Volume I of the 1996 report titled "Summary, Status, and Trends" contains information on the aquatic life status of all of the named tributaries of the Mahoning River, including an identification of the causes and sources of impairment. I have attached a copy of the pages for the Mahoning River from this report.

Concerning possible sources of sediment to the mainstem, our agency 1994 survey did find elevated levels of chromium, lead, and zinc near the mouth (river mile 1.8) of Meander Creek. All of these parameters were at higher concentrations in the Mahoning River mainstem downstream from Meander Creek compared to an upstream sample station (see Table 10 in the 1996 report).

No other tributaries have been identified as being a significant source of contaminated sediment, but more intensive sampling at the mouths of these tributaries would be needed to reach a final conclusion.

If you have any questions, please contact me at (330) 963-1132.

Sincerely,

Robert D. Davic
Environmental Specialist
Division of Surface Water

RDD:bo

APPENDIX K
PAGE 1 OF 10

*Ohio Water Resource Inventory
Appendices to Volume I*



Summary, Status, and Trends

1996

OhioEPA

State of Ohio Environmental Protection Agency

P.O. Box 1049
1800 WaterMark Drive
Columbus, Ohio 43266-0149

APPENDIX 6
PAGE 2 OF 10

**DIOXIN TABULATIONS
ARE FOUND IN APPENDIX I**

APPENDIX <u> J </u>
PAGE <u> 3 </u> OF <u> 5 </u>

**TOXICITY EQUIVALENTS CALCULATIONS FOR BANK SAMPLES
TOTAL DIOXINS**

Sample Number 4MA0- PARAMETER	345SF (pg/g)	TEF	TEQ (ppt)	327SF (pg/g)	TEF	TEQ (ppt)
2,3,7,8-TCDD	0.40	1.0	0.40	13	1.0	13.00
Total TCDD	9.0			160		
1,2,3,7,8-PeCDD	3.1	0.5	1.55	25	0.5	12.50
Total PeCDD	25			210		
1,2,3,4,7,8-HxCDD	2.4	0.1	0.24	14	0.1	1.40
1,2,3,6,7,8-HxCDD	7.6	0.1	0.76	140	0.1	14.00
1,2,3,7,8,9-HxCDD	9.9	0.1	0.99	68	0.1	6.80
Total HxCDD	76			1200		
1,2,3,4,6,7,8-HpCDD	80	0.01	0.80	1200	0.01	12.00
Total HpCDD	150			2400		
OCDD	450	0.001	0.45	11000	0.001	11.00
2,3,7,8-TCDF	1.3	0.1	0.13	26	0.1	2.60
Total TCDF	15			240		
1,2,3,7,8-PeCDF	0.52	0.05	0.03	9.0	0.05	0.45
2,3,4,7,8-PeCDF	0.68	0.5	0.34	15	0.5	7.50
Total PeCDF	18			320		
1,2,3,4,7,8-HxCDF	0.96	0.1	0.10	39	0.1	3.90
1,2,3,6,7,8-HxCDF	1.1	0.1	0.11	22	0.1	2.20
2,3,4,6,7,8-HxCDF	0.51	0.1	0.05	15	0.1	1.50
1,2,3,7,8,9-HxCDF	0.5	0.1	0.05	2.9	0.1	0.29
Total HxCDF	13			850		
1,2,3,4,6,7,8-HpCDF	5.0	0.01	0.05	510	0.01	5.10
1,2,3,4,7,8,9-HpCDF	0.56	0.01	0.01	24	0.01	0.24
Total HpCDF	13			1600		
OCDF	10	0.001	0.01	720	0.001	0.72
TOTAL TEQ =			6.06	TOTAL TEQ =		
				95.20		

APPENDIX 2
PAGE 4 OF 5

**TOXICITY EQUIVALENTS CALCULATIONS FOR VERTICAL PROFILING SAMPLES
TOTAL DIOXINS**

Sample Number EN98MR- PARAMETER	SW-3-VU (pg/g)	TEF	TEQ (ppt)	NI-10-VU (pg/g)	TEF	TEQ (ppt)	LO-3-VU (pg/g)	TEF	TEQ (ppt)
2,3,7,8-TCDD	1.45	1.0	1.45	1.4	1.0	1.40	2.3	1.0	2.30
Total TCDD	16			26			22		
1,2,3,7,8-PeCDD	8.5	0.5	4.25	3.9	0.5	1.95	5.4	0.5	2.70
Total PeCDD	62			38			35		
1,2,3,4,7,8-HxCDD	14	0.1	1.40	5.3	0.1	0.53	2.8	0.1	0.28
1,2,3,6,7,8-HxCDD	190	0.1	19.00	30	0.1	3.00	65	0.1	6.50
1,2,3,7,8,9-HxCDD	53	0.1	5.30	18	0.1	1.80	28	0.1	2.80
Total HxCDD	1100			260			550		
1,2,3,4,6,7,8-HpCDD	1500	0.01	15.00	480	0.01	4.80	840	0.01	8.40
Total HpCDD	2700			980			1700		
OCDD	8700	0.001	8.70	7400	0.001	7.40	7900	0.001	7.90
2,3,7,8-TCDF	18	0.1	1.80	4.3	0.1	0.43	10	0.1	1.00
Total TCDF	340			90			67		
1,2,3,7,8-PeCDF	8.7	0.05	0.44	3.5	0.05	0.18	3.0	0.05	0.15
2,3,4,7,8-PeCDF	18	0.5	9.00	5.0	0.5	2.50	3.4	0.5	1.70
Total PeCDF	620			110			94		
1,2,3,4,7,8-HxCDF	75	0.1	7.50	10	0.1	1.00	12	0.1	1.20
1,2,3,6,7,8-HxCDF	39	0.1	3.90	5.9	0.1	0.59	5.9	0.1	0.59
2,3,4,6,7,8-HxCDF	27	0.1	2.70	4.0	0.1	0.40	4.1	0.1	0.41
1,2,3,7,8,9-HxCDF	1.7	0.1	0.17	0.21	0.1	0.02	1.5	0.1	0.15
Total HxCDF	2000			170			260		
1,2,3,4,6,7,8-HpCDF	1300	0.01	13.00	93	0.01	0.93	170	0.01	1.70
1,2,3,4,7,8,9-HpCDF	40	0.01	0.40	4.4	0.01	0.04	6.3	0.01	0.06
Total HpCDF	3800			270			530		
OCDF	1300	0.01	13.00	180	0.01	1.80	330	0.01	3.30
			TOTAL TEQ = 107.10			TOTAL TEQ = 28.77			TOTAL TEQ = 41.14

APPENDIX 2
PAGE 5 OF 5

APPENDIX K
OEPA TRIBUTARY ANALYSIS



State of Ohio Environmental Protection Agency

Northeast District Office

110 E. Aurora Road
Twinsburg, Ohio 44087-1969
(330) 425-9171 FAX (330) 487-0769

George V. Voinovich
Governor

August 5, 1998

Mr. A. Lee Nageotte
AWK Consulting Engineers
1611 Monroeville Avenue
Turtle Creek, PA. 15145

RECEIVED
AUG 07 1998
AWK CONSULTING ENGRS

Dear Mr. Nageotte:

Tim Delgado of your firm asked me to send you information concerning the aquatic life status of the tributaries that flow into the lower Mahoning River within the Army Corps project zone.

I am aware of two documents where information on the health of the Mahoning River tributaries would be found. The first source would be the May 1996 "Biological and Water Quality Study of the Mahoning River Basin" report. This report contains information on the chemical and biological health of four of the main tributaries in the lower Mahoning River area, Mosquito Creek, Meander Creek, Mill Creek, and Yellow Creek, plus a number of small tributaries to Mill Creek. Table 1 of the report indicates that the aquatic life attainment status for all of these tributaries is NON attainment of Clean Water Act Warmwater Habitat goals.

A second source of information is the State of Ohio 1996 Water Resources Inventory Report, what is also called the "305(b) report", since the information is required under Section 305(b) of the Clean Water Act. The Appendices to Volume I of the 1996 report titled "Summary, Status, and Trends" contains information on the aquatic life status of all of the named tributaries of the Mahoning River, including an identification of the causes and sources of impairment. I have attached a copy of the pages for the Mahoning River from this report.

Concerning possible sources of sediment to the mainstem, our agency 1994 survey did find elevated levels of chromium, lead, and zinc near the mouth (river mile 1.8) of Meander Creek. All of these parameters were at higher concentrations in the Mahoning River mainstem downstream from Meander Creek compared to an upstream sample station (see Table 10 in the 1996 report).

No other tributaries have been identified as being a significant source of contaminated sediment, but more intensive sampling at the mouths of these tributaries would be needed to reach a final conclusion.

If you have any questions, please contact me at (330) 963-1132.

Sincerely,

Robert D. Davic
Environmental Specialist
Division of Surface Water

RDD:bo

Ohio Water Resource Inventory Appendices to Volume I



Summary, Status, and Trends

1996

OhioEPA

State of Ohio Environmental Protection Agency

P.O. Box 1049
1800 WaterMark Drive
Columbus, Ohio 43266-0149

REVISION K
PAGE 2 OF 10



Ohio Water Resource Inventories

Section 305(b) of the Clean Water Act requires states to produce "Water Quality Inventories" that assess progress in achieving the objectives of the Act. In 1990, Ohio changed the title of the report from "Water Quality Inventory" to "Water Resource Inventory". The change reflects an ecosystems emphasis rather than reliance on water chemistry alone. The effects of human activity on aquatic ecosystems are broad, and extend beyond water chemistry to include physical and biological impacts. While chemical water quality remains an important component, it is necessary to consider additional impacts if we are truly interested in achieving the goals of the Clean Water Act by protecting and rehabilitating aquatic resources.

The intent is for the 305(b) report to be a routine check on the progress that states are making toward achieving the goals of the Clean Water Act. These reports focus on examining water resource quality over time and examining the effectiveness of water quality management programs.

The reports are in Adobe PDF format. Download a free copy of the Adobe Acrobat™ reader from [Adobe](#).

1996 Ohio Water Resources Inventory

[Executive Summary \(PDF-3890K\)](#)

[Volume 1 - Summary, Status and Trends \(PDF-4838K\)](#)

[Volume 2 - Ohio Fish Tissue Contaminant Monitoring \(PDF-847K\)](#)

[Volume 3 - Ohio's Public Lakes, Ponds and Reservoirs \(PDF-1779K\)](#)

[Appendices, Vol I \(PDF-2065K\)](#)

1994 Ohio Water Resources Inventory

[Executive Summary \(PDF-7600K\)](#)

[Volume 1 - Summary, Status and Trends \(PDF-2720K\)](#)

[\[DSW Home Page\]](#) [\[For More Info\]](#) [\[OEPA Home Page\]](#)

Information believed accurate but not guaranteed.
The State of Ohio disclaims liability for any errors or omissions.

Last Updated: Monday, 27-Jul-98 10:36:45 EDT
URL: http://chagrin.epa.state.oh.us/document_index/305b.html

Appendix A-1. Aquatic life attainment status of Ohio stream and river waterbodies. Impaired miles are shaded.

WB ID#	Waterbody Name	Assess. Cycle	Assess. Category	Use Attainment			
				Fully	Threatened	Partial	Not Support.
UPPER MAHONING RIVER							
OH 1 1	[18-001 - URM: 55.47 - LRM: 45.57] - MAHONING RIVER (WEST BRANCH TO DUCK CREEK)	96	MB				5.6
OH 1 3	[18-040 - URM: 10.90 - LRM: 0.00] - EAGLE CREEK (SOUTH FORK EAGLE CR. TO MAHONING R.)	96	MB	7.3			5.6
OH 1 6	[18-043 - URM: 9.00 - LRM: 0.00] - SOUTH FORK EAGLE CREEK	88	MB	3.1			4.9
OH 1 8	[18-040 - URM: 25.00 - LRM: 10.90] - EAGLE CREEK (HEADWATERS TO SOUTH FORK EAGLE CREEK)	88	EB	9.7			
OH 1 10	[18-046 - URM: 7.20 - LRM: 0.00] - SILVER CREEK	96	MB	7.2			
OH 1 11	[18-065 - URM: 1.70 - LRM: 0.00] - HIRAM TRIB.	88	EB				0.4
OH 1 14	[18-050 - URM: 13.20 - LRM: 0.00] - WEST BRANCH MAHONING RIVER	96	MB				12.7
OH 1 20	[18-001 - URM: 63.57 - LRM: 55.47] - MAHONING RIVER (MILTON DAM TO WEST BRANCH)	96	MB				
OH 1 21	[18-048 - URM: 13.00 - LRM: 0.00] - KALE CREEK	88	EC	0.5			12.5
OH 1 30	[18-001 - URM: 110.03 - LRM: 82.03] - MAHONING RIVER (HEADWATERS TO BEECH CREEK)	96	MB	17.3			1.7
OH 1 30.1	[18-066 - URM: 6.60 - LRM: 0.00] - NAYLOR DITCH (SEBRING)	88	EC				5.6
OH 1 33	[18-063 - URM: 4.20 - LRM: 0.00] - FISH CREEK	88	EB				
			Subbasin Totals:	45.1			
LOWER MAHONING RIVER							
OH 2 1	[18-001 - URM: 15.39 - LRM: 11.43] - MAHONING RIVER (YELLOW CREEK TO PA.)	96	MB				-0.0
OH 2 3	[18-005 - URM: 2.70 - LRM: 0.00] - HINES RUN	88	EC	0.5			2.2
OH 2 5	[18-007 - URM: 11.10 - LRM: 0.00] - YELLOW CREEK	96	MB				10.1
OH 2 7	[18-001 - URM: 21.67 - LRM: 15.39] - MAHONING RIVER (MILL CREEK TO YELLOW CREEK)	96	MB				0.0
OH 2 9	[18-010 - URM: 7.10 - LRM: 0.00] - DRY RUN	96	MB				6.1
OH 2 10	[18-011 - URM: 7.80 - LRM: 0.00] - CRAB CREEK	88	EC	0.5			7.3
OH 2 12	[18-020 - URM: 20.90 - LRM: 0.00] - MILL CREEK	96	MB				9.6
OH 2 13	[18-021 - URM: 4.10 - LRM: 0.00] - BEARS DEN RUN	96	MB				3.6
OH 2 14	[18-022 - URM: 4.00 - LRM: 0.00] - AX FACTORY RUN	96	MB				3.5
OH 2 15	[18-023 - URM: 4.50 - LRM: 0.00] - ANDERSONS RUN	96	MB				4.0
OH 2 16	[18-024 - URM: 1.60 - LRM: 0.00] - CRANBERRY RUN	88	EC				1.1
OH 2 17	[18-025 - URM: 4.80 - LRM: 0.00] - INDIAN RUN	96	MB				4.3
OH 2 18	[18-026 - URM: 2.40 - LRM: 0.00] - SAW MILL RUN	88	EC				1.4

WB ID#	Waterbody Name	Assess. Cycle	Assess. Category	Use Attainment			Not Assess.
				Fully	Threatened	Partial	
OH 2 20	[18-001 - URM: 30.27 - LRM: 21.67] - MAHONING RIVER (MEANDER CREEK TO MILL CREEK)	96	MB				0.1
OH 2 22	[18-014 - URM: 6.70 - LRM: 0.00] - SQUAW CREEK	88	EC	0.5			6.2
OH 2 23	[18-015 - URM: 20.40 - LRM: 0.00] - MEANDER CREEK	96	MB				17.4
OH 2 27	[18-030 - URM: 12.49 - LRM: 0.00] - MOSQUITO CREEK (MOSQUITO CR. RES. TO MAHONING R.)	96	MB				0.0
OH 2 31	[18-030 - URM: 35.00 - LRM: 11.80] - MOSQUITO CREEK (HEADWATERS TO MOSQUITO CR. RES.)	88	MB				22.2
OH 2 35	[18-001 - URM: 45.57 - LRM: 30.27] - MAHONING RIVER (DUCK CREEK TO MEANDER CREEK)	96	MB	0.3			
OH 2 37	[18-028 - URM: 4.70 - LRM: 0.00] - RED RUN	88	EC				
OH 2 37.1	[18-067 - URM: 2.17 - LRM: 0.00] - TRIB. TO RED RUN (WARREN)	88	EC				1.6
OH 2 38	[18-029 - URM: 12.80 - LRM: 0.00] - DUCK CREEK	88	EC	0.5			12.3
Subbasin Totals:				2.3			
PYMATUNING CREEK							
OH 3 1	[18-504 - URM: 13.20 - LRM: 0.00] - LITTLE YANKEE RUN	96	MB	4.0			
OH 3 2	[18-505 - URM: 6.90 - LRM: 0.00] - LITTLE DEER CREEK	96	MB				6.4
OH 3 3	[18-506 - URM: 14.80 - LRM: 0.00] - YANKEE RUN	96	MB	3.8			
OH 3 3.1	[- - URM: 0.00 - LRM: 0.00] -	88	EB				-2.0
OH 3 6	[18-550 - URM: 19.79 - LRM: 0.00] - PYMATUNING CREEK (SHENANGO RESERVOIR TO PA.)	96	MB				19.7
OH 3 10	[18-550 - URM: 34.33 - LRM: 19.80] - PYMATUNING CREEK (HEADWATERS TO SHENANGO RES.)	96	MB				7.8
OH 3 11	[18-556 - URM: 8.10 - LRM: 0.00] - SUGAR CREEK	96	MB	1.0			7.1
Subbasin Totals:				8.8			
LITTLE BEAVER CREEK							
OH 4 1	[08-001 - URM: 7.80 - LRM: 0.00] - LITTLE BEAVER CREEK (NORTH FORK TO PA.)	88	MB	7.8			
OH 4 3	[08-100 - URM: 6.07 - LRM: 0.00] - NORTH FORK (BULL CREEK TO LITTLE BEAVER CREEK)	88	EB				0.4
OH 4 6	[08-103 - URM: 16.60 - LRM: 0.00] - BULL CREEK	88	MB	16.6			
OH 4 7	[08-104 - URM: 7.20 - LRM: 0.00] - LESLIE RUN	88	EB				3.8
OH 4 7.1	[08-119 - URM: 2.25 - LRM: 0.00] - TRIB. TO LESLIE RUN	88	EB				0.2
OH 4 8.1	[08-120 - URM: 3.78 - LRM: 0.00] - TRIB. TO LITTLE BULL CREEK	88	MB	2.0			1.7
OH 4 10	[08-100 - URM: 7.75 - LRM: 6.07] - NORTH FORK (PA. TO BULL CREEK)	88	EB				
OH 4 11.2	[08-118 - URM: 2.06 - LRM: 0.00] - EAST FORK STATELINE CREEK	88	MB	3.0			-0.9
OH 4 11.3	[08-117 - URM: 2.00 - LRM: 0.00] - WEST FORK STATELINE CREEK	88	MB	0.1			-1.0

Appendix A-2. Causes and sources of aquatic life impairment or threats to aquatic life use attainment.

WB ID#	Cause of Impairment/Magnitude)	Source of Impairment/Magnitude)
--------	--------------------------------	---------------------------------

UPPER MAHONING RIVER

[18-001] - MAHONING RIVER (WEST BRANCH TO DUCK CREEK) - Segment Length: 9.90 miles
 OH 1 1 96 Other habitat alterations - [H] Flow regulation/modification - [H]
 Pathogens - [M] Agriculture - [S]
 Organic enrichment/DO - [H] Channelization - [M]
 Dam construction - [H]

[18-040] - EAGLE CREEK (SOUTH FORK EAGLE CR. TO MAHONING R.) - Segment Length: 10.90 miles
 OH 1 3 96 Other habitat alterations - [M] Flow regulation/modification - [M]

[18-043] - SOUTH FORK EAGLE CREEK - Segment Length: 9.00 miles
 OH 1 6 88 Other habitat alterations - [H] Dam construction - [H]
 Siltation - [M]

[18-040] - EAGLE CREEK (HEADWATERS TO SOUTH FORK EAGLE CREEK) - Segment Length: 14.10 miles
 OH 1 8 88 Organic enrichment/DO - [H] Municipal Point Sources - [H]
 Chlorine - [H]
 Unionized Ammonia - [H]

[18-065] - HIRAM TRIB. - Segment Length: 1.70 miles
 OH 1 11 88 Organic enrichment/DO - [H] Municipal Point Sources - [H]
 Unionized Ammonia - [H]

[18-050] - WEST BRANCH MAHONING RIVER - Segment Length: 13.20 miles
 OH 1 14 96 Other habitat alterations - [H] Channelization - [H]
 Flow regulation/modification - [H]

[18-001] - MAHONING RIVER (MILTON DAM TO WEST BRANCH) - Segment Length: 8.10 miles
 OH 1 20 96 Other habitat alterations - [H] Minor Municipal Point Source - [M]
 Suspended solids - [H] Flow regulation/modification - [H]
 Flow alteration - [H] Dam construction - [H]
 Organic enrichment/DO - [H] - [H]
 Turbidity - [H]

[18-001] - MAHONING RIVER (HEADWATERS TO BEECH CREEK) - Segment Length: 28.00 miles
 OH 1 30 96 Priority organics - [M] Minor Industrial Point Source - [H]
 Metals - [H] Minor Municipal Point Source - [H]
 Nutrients - [S] Spills - [H]
 Pathogens - [S] Contaminated sediments - [H]
 Cause Unknown - [H] Pasture land - [M]
 Siltation - [M] Source Unknown - [H]
 Agriculture - [M]

[18-066] - NAYLOR DITCH (SEBRING) - Segment Length: 6.60 miles
 OH 1 30.1 88 Metals - [H] Industrial Point Sources - [H]
 Urban Runoff/Storm Sewers (NPS) - [H]

[18-063] - FISH CREEK - Segment Length: 4.20 miles
 OH 1 33 88 Organic enrichment/DO - [H] Municipal Point Sources - [H]
 Unionized Ammonia - [H]

LOWER MAHONING RIVER

[18-001] - MAHONING RIVER (YELLOW CREEK TO PA.) - Segment Length: 3.96 miles
 OH 2 1 96 Priority organics - [M] Major Municipal Point Source - [M]
 Pesticides - [M] Minor Municipal Point Source - [S]
 Metals - [H] Flow regulation/modification - [M]

APPENDIX K
 PAGE 6 OF 10

Appendix A-2. Causes and sources of aquatic life impairment or threats to aquatic life use attainment.

WB ID#	Cause of Impairment/Magnitude	Source of Impairment/Magnitude
	Chlorine - [S] Pathogens - [H] Suspended solids - [S] Nutrients - [H] Organic enrichment/DO - [H]	Contaminated sediments - [M] Landfills - [S]
[18-007] - YELLOW CREEK - Segment Length: 11.10 miles OH 2 5 96	Cause Unknown - [M]	Source Unknown - [M]
[18-001] - MAHONING RIVER (MILL CREEK TO YELLOW CREEK) - Segment Length: 6.28 miles OH 2 7 96	Other habitat alterations - [M] Priority organics - [H] Metals - [H] Oil and grease - [M] Nutrients - [M] Organic enrichment/DO - [H] Pathogens - [H]	Major Municipal Point Source - [M] Combined Sewer Overflow - [H] Urban Runoff/Storm Sewers (NPS) - [H] Flow regulation/modification - [M] Spills - [H] Contaminated sediments - [M] Dam construction - [H]
[18-010] - DRY RUN - Segment Length: 7.10 miles OH 2 9 96	Cause Unknown - [H]	Source Unknown - [H]
[18-020] - MILL CREEK - Segment Length: 20.90 miles OH 2 12 96	Nutrients - [H] Metals - [S] Unionized Ammonia - [H] Nutrients - [S] Flow alteration - [M] Organic enrichment/DO - [H] Siltation - [H] Other habitat alterations - [M]	Major Municipal Point Source - [H] Urban Runoff/Storm Sewers (NPS) - [H] Agriculture - [H] Flow regulation/modification - [S] Channelization - [H] Dam construction - [H] Combined Sewer Overflow - [H]
[18-021] - BEARS DEN RUN - Segment Length: 4.10 miles OH 2 13 96	Nutrients - [M] Metals - [H]	Other - [H] Source Unknown - [H]
[18-022] - AX FACTORY RUN - Segment Length: 4.00 miles OH 2 14 96	Metals - [H] Nutrients - [M]	Urban Runoff/Storm Sewers (NPS) - [H] Source Unknown - [H]
[18-023] - ANDERSONS RUN - Segment Length: 4.50 miles OH 2 15 96	Organic enrichment/DO - [H] Metals - [H]	Urban Runoff/Storm Sewers (NPS) - [H] Source Unknown - [H]
[18-024] - CRANBERRY RUN - Segment Length: 1.60 miles OH 2 16 88	Organic enrichment/DO - [H]	Urban Runoff/Storm Sewers (NPS) - [H]
[18-025] - INDIAN RUN - Segment Length: 4.80 miles OH 2 17 96	Organic enrichment/DO - [H] Metals - [H]	Urban Runoff/Storm Sewers (NPS) - [H] Source Unknown - [H]
[18-026] - SAW MILL RUN - Segment Length: 2.40 miles OH 2 18 88	Organic enrichment/DO - [H]	Municipal Point Sources - [H]
[18-027] - MAHONING RIVER (MEANDER CREEK TO MILL CREEK) - Segment Length: 8.60 miles OH 2 20 96	Priority organics - [H] Metals - [H] Nutrients - [S] Thermal modifications - [H]	Major Industrial Point Source - [H] Major Municipal Point Source - [S] Spills - [M] Combined Sewer Overflow - [H]

Appendix A-2. Causes and sources of aquatic life impairment or threats to aquatic life use attainment.

WB ID#		Cause of Impairment/Magnitude)	Source of Impairment/Magnitude)
		Pesticides - [S] Organic enrichment/DO - [H]	
[18-015] - MEANDER CREEK - Segment Length: 20.40 miles OH 2 23 96		Metals - [H] Unionized Ammonia - [H] Nutrients - [H] Organic enrichment/DO - [H] Flow alteration - [M] Other habitat alterations - [H] Suspended solids - [H]	Major Municipal Point Source - [H] - [M] Dam construction - [H]
[18-030] - MOSQUITO CREEK (MOSQUITO CR. RES. TO MAHONING R.) - Segment Length: 12.49 miles OH 2 27 96		Suspended solids - [H]	Minor Industrial Point Source - [H] Major Municipal Point Source - [H] - [H]
[18-030] - MOSQUITO CREEK (HEADWATERS TO MOSQUITO CR. RES.) - Segment Length: 23.20 miles OH 2 31 88		Flow alteration - [H]	Flow regulation/modification - [H]
[18-001] - MAHONING RIVER (DUCK CREEK TO MEANDER CREEK) - Segment Length: 15.30 miles OH 2 35 96		Priority organics - [H] Metals - [H] Unionized Ammonia - [S] Chlorine - [H] Nutrients - [M] Pathogens - [M] Oil and grease - [H] Cause Unknown - [H]	Major Industrial Point Source - [H] Minor Industrial Point Source - [H] Major Municipal Point Source - [S] Urban Runoff/Storm Sewers (NPS) - [M] Spills - [M] Contaminated sediments - [M] Hazardous waste - [H] Source Unknown - [H]
[18-028] - RED RUN - Segment Length: 4.70 miles OH 2 37 88		Metals - [H] Unionized Ammonia - [H]	Industrial Point Sources - [H] Urban Runoff/Storm Sewers (NPS) - [H]
[18-067] - TRIB. TO RED RUN (WARREN) - Segment Length: 2.17 miles OH 2 37.1 88		Metals - [H]	Urban Runoff/Storm Sewers (NPS) - [H]
PYMATUNING CREEK			
[18-504] - LITTLE YANKEE RUN - Segment Length: 13.20 miles OH 3 1 96		Metals - [S] Chlorine - [S] Nutrients - [H] Flow alteration - [M]	Major Municipal Point Source - [H] Urban Runoff/Storm Sewers (NPS) - [M] Hydromodification - [M] Natural - [M] Urban Runoff/Storm Sewers (NPS) - [H]
[18-505] - LITTLE DEER CREEK - Segment Length: 6.90 miles OH 3 2 96		Organic enrichment/DO - [S] Flow alteration - [S] Other habitat alterations - [H]	Natural - [S] Source Unknown - [H]
[18-506] - YANKEE RUN - Segment Length: 14.80 miles OH 3 3 96		Nutrients - [H] Cause Unknown - [M] Organic enrichment/DO - [S] Chlorine - [S] Metals - [S]	Major Municipal Point Source - [H] - [H] Hydromodification - [M] Natural - [M]

APPENDIX 16

PAGE 8 OF 10

OHIO EPA Ecological Priority List: Ultimate Aq. Life Restorability Factors

Segment QHEI			River-Wide	Gradient			Drainage Area			N	Aquatic Life Use(s)	Restorability Rating ¹	Confidence
Mean	Min	Max	Mean QHEI	Mean	Min	Max	Mean	Min	Max				
UPPER MAHONING RIVER - [Watershed QHEI: 58.6, N = 26]													
[OH 1 1] - MAHONING RIVER (WEST BRANCH TO DUCK CREEK) Upper RM: 53.70 / Lower RM: 43.80													
61.64	40.50	69.00	62.9	0.7(4.0)	0.1(4.0)	0.0(4.0)	525.57	1426.00	678.00	7	WWH	Moderate-High	High
[OH 1 3] - EAGLE CREEK (SOUTH FORK EAGLE CR. TO MAHONING R.) Upper RM: 10.90 / Lower RM: 0.00													
86.00	31.50	66.50	65.0	0.6(3.0)	0.1(4.0)	0.0(5.0)	109.00	109.00	109.00	2	WWH	Low-Moderate	Mod
[OH 1 8] - SOUTH FORK EAGLE CREEK Upper RM: 9.00 / Lower RM: 0.00													
61.50	61.50	61.50	61.5	14.3(10)	14.3(10)	14.3(10)	9.30	9.30	9.30	1	WWH	High	Low
[OH 1 8] - EAGLE CREEK (HEADWATERS TO SOUTH FORK EAGLE CREEK) Upper RM: 25.00 / Lower RM: 10.90													
53.00	58.00	56.00	55.0	10.2(8.0)	10.2(8.0)	10.2(8.0)	5.50	6.50	5.50	1	WWH	Moderate-High	Low-Mod
[OH 1 10] - SILVER CREEK Upper RM: 7.20 / Lower RM: 0.00													
76.00	74.00	79.00	76.0	22.9(8.7)	18.1(8.0)	26.3(10)	10.00	8.40	10.80	3	QWH	Very High Quality	Mod-High
[OH 1 14] - WEST BRANCH MAHONING RIVER Upper RM: 13.20 / Lower RM: 0.00													
67.00	67.00	67.00	67.0	2.4(3.0)	2.4(8.0)	2.4(8.0)	104.00	104.00	104.00	1	WWH	High	Low
[OH 1 20] - MAHONING RIVER (MILTON DAM TO WEST BRANCH) Upper RM: 61.84 / Lower RM: 53.74													
49.33	40.50	60.50	62.9	1.0(5.3)	0.1(4.0)	2.9(8.0)	342.67	305.00	477.00	3	WWH	Moderate-High	High
[OH 1 24] - MAHONING RIVER (BEECH CREEK TO BERLIN DAM) Upper RM: 80.30 / Lower RM: 69.17													
61.25	58.00	67.30	62.8	0.1(4.0)	0.1(4.0)	0.1(4.0)	257.50	462.00	263.00	2	WWH	Moderate-High	Mod
[OH 1 30] - MAHONING RIVER (HEADWATERS TO BEECH CREEK) Upper RM: 108.30 / Lower RM: 80.30													
61.42	42.50	74.50	62.9	5.1(5.7)	0.1(3.0)	14.7(8.0)	57.83	3.00	90.00	6	WWH	High	High
LOWER MAHONING RIVER - [Watershed QHEI: 61.3, N = 71]													
[OH 2 1] - MAHONING RIVER (YELLOW CREEK TO PA.) Upper RM: 13.79 / Lower RM: 9.80													
72.80	48.00	86.00	62.9	2.1(9.2)	0.1(6.0)	2.7(10)	1073.20	999.00	1076.00	5	WWH	High	High
[OH 2 5] - YELLOW CREEK Upper RM: 11.10 / Lower RM: 0.00													
64.50	64.50	64.50	64.5	41.7(4.0)	41.7(4.0)	41.7(4.0)	31.90	31.90	31.90	1	WWH	High	Low
[OH 2 7] - MAHONING RIVER (MILL CREEK TO YELLOW CREEK) Upper RM: 20.00 / Lower RM: 13.80													
88.33	47.50	79.00	62.9	2.2(8.6)	0.1(6.0)	2.7(8.0)	1016.00	999.00	1024.00	6	WWH	High	High
[OH 2 9] - DRY RUN Upper RM: 7.10 / Lower RM: 0.00													
61.50	61.50	61.50	61.5	58.8(4.0)	58.8(4.0)	58.8(4.0)	9.80	9.80	9.80	1	WWH	High	Low
[OH 2 12] - MILL CREEK Upper RM: 20.90 / Lower RM: 0.00													
55.00	67.00	70.00	66.0	19.7(3.3)	0.1(2.0)	50.0(4.0)	56.00	28.00	79.00	10	WWH	Moderate-High	High
[OH 2 13] - BEARS DEN RUN Upper RM: 4.10 / Lower RM: 0.00													
67.00	67.00	67.00	67.0	47.6(4.0)	47.6(4.0)	47.6(4.0)	3.70	3.70	3.70	1	WWH	High	Low

APPENDIX 5
PAGE 9 OF 10

OHIO EPA Ecological Priority List: Ultimate Aq. Life Restorability Factors

Segment QHEI			River-Wide			Gradient			Drainage Area			N	Aquatic Life Use(s)	Restorability Rating ¹	Confidence
Mean	Min	Max	Mean	QHEI	Mean	Min	Max	Mean	Min	Max					
[OH 2 14] - AX FACTORY RUN Upper RM: 4.00 / Lower RM: 0.00															
64.26	59.00	69.50	64.3	60.0(4.0)	90.0(4.0)	90.0(4.0)	90.0(4.0)	2.90	2.90	2.90	2	WWH	High	Med	
[OH 2 15] - ANDERSONS RUN Upper RM: 4.50 / Lower RM: 0.00															
63.60	63.60	63.60	63.6	8.5(6.0)	18.6(6.0)	18.6(6.0)	8.20	8.20	8.20	1	WWH	High	Low		
[OH 2 17] - INDIAN RUN Upper RM: 4.80 / Lower RM: 0.00															
66.00	65.00	65.00	65.0	14.5(1.0)	14.8(1.0)	14.8(1.0)	14.70	14.70	14.70	1	WWH	High	Low		
[OH 2 20] - MAHONING RIVER (MEANDER CREEK TO MILL CREEK) Upper RM: 28.50 / Lower RM: 20.00															
61.18	42.60	78.60	62.9	1.2(7.8)	0.1(6.0)	2.6(7.0)	10.18(0.0)	858.00	22.6(0.0)	1.1	WWH	Moderate-High	High		
[OH 2 23] - MEANDER CREEK Upper RM: 20.40 / Lower RM: 0.00															
54.80	41.60	64.60	54.8	1.9(3.6)	0.1(2.0)	8.9(1.0)	84.60	84.00	86.00	6	WWH	Moderate-High	High		
[OH 2 27] - MOSQUITO CREEK (MOSQUITO CR. RES. TO MAHONING R.) Upper RM: 12.49 / Lower RM: 0.00															
55.19	45.60	67.00	55.2	1.8(6.8)	0.1(4.0)	8.9(1.0)	113.25	98.00	36.00	8	WWH	Low-Moderate	High		
[OH 2 35] - MAHONING RIVER (DUCK CREEK TO MEANDER CREEK) Upper RM: 43.80 / Lower RM: 28.50															
62.55	46.60	80.60	62.9	1.6(6.8)	0.1(4.0)	4.6(1.0)	618.47	678.00	858.00	19	WWH	Moderate-High	High		
[OH 2 37] - RED RUN Upper RM: 4.70 / Lower RM: 0.00															
												LRW	Essentially None	High	
PYMATUNING CREEK - [Watershed QHEI: 66.3, N = 29]															
[OH 3 1] - LITTLE YANKEE RUN Upper RM: 13.20 / Lower RM: 0.00															
72.60	64.00	88.00	72.6	20.2(8.4)	1.9(6.0)	37.0(1.0)	29.60	9.00	42.00	10	WWH	High	High		
[OH 3 2] - LITTLE DEER CREEK Upper RM: 6.90 / Lower RM: 0.00															
72.76	72.00	73.60	72.8	15.4(1.0)	15.4(1.0)	15.4(1.0)	7.00	7.00	7.00	2	WWH	High	Med		
[OH 3 3] - YANKEE RUN Upper RM: 14.80 / Lower RM: 0.00															
61.60	48.00	78.60	61.3	7.9(9.2)	8.9(6.0)	9.8(1.0)	41.72	28.60	45.00	5	WWH	High	High		
[OH 3 3.1] - MUD RUN Upper RM: 2.00 / Lower RM: 0.00															
62.00	82.00	62.00	62.0	8.7(6.0)	8.7(6.0)	8.7(6.0)	7.00	7.00	7.00	1	WWH	High	Low		
[OH 3 6] - PYMATUNING CREEK (SHENANGO RESERVOIR TO PA.) Upper RM: 19.79 / Lower RM: 0.00															
64.71	64.60	62.00	61.4	1.4(4.6)	1.3(1.0)	1.8(6.0)	108.67	258.00	68.00	7	WWH	Moderate-High	High		
[OH 3 10] - PYMATUNING CREEK (HEADWATERS TO SHENANGO RES.) Upper RM: 34.33 / Lower RM: 19.80															
49.75	45.60	64.00	61.4	3.4(6.0)	6.1(6.0)	8.7(6.0)	22.65	9.60	66.00	2	WWH	Moderate-High	Med		
[OH 3 11] - SUGAR CREEK Upper RM: 8.10 / Lower RM: 0.00															
64.60	63.60	65.60	64.5	3.9(6.0)	0.0(2.0)	7.8(1.0)	9.90		19.80	2	WWH	Moderate-High	Med		

LITTLE BEAVER CREEK - [Watershed QHEI: 71.2, N = 36]

APPENDIX 15
PAGE 10 OF 10