Pennsylvania Department of Environmental Protection

Northwest Regional Office
CLEAN WATER PROGRAM

NPDES PERMIT FACT SHEET INDIVIDUAL SEWAGE

Application Type	**Renewal**	Application No.	**PA0222585**
Facility Type	**Municipal**	APS ID	**1101773**
Major / Minor	**Minor**	Authorization ID	**1463376**

Applicant and Facility Information

Applicant Name	**Brokenstraw Valley Area Authority**	Facility Name	**Brokenstraw Valley Area Authority Wastewater Treatment Plant**
Applicant Address	770 Rouse Avenue	Facility Address	620 Shannon Lane
	Youngsville, PA 16371		Warren, PA 16365
Applicant Contact	Bill Hendrickson	Facility Contact	Joel Turk
Applicant Phone	(814) 563-7681	Facility Phone	(814) 516-2023
Client ID	114573	Site ID	487330
Ch 94 Load Status	Not Overloaded	Municipality	Brokenstraw Township
Connection Status	No Limitations	County	Warren
Date Application Received	November 8, 2023	EPA Waived?	Yes
Date Application Accepted		If No, Reason	

Purpose of Application: NPDES Renewal.

Summary of Review

An application was submitted for an NPDES permit renewal for an existing minor sewage facility discharge. The Brokenstraw WWTP consists of a channel auger screen, two sequencing batch reactor (SBR) tanks, UV disinfection, and Outfall 001 to the Allegheny River. Sludge handling consists of an aerobic digester, sludge drying beds, and a sludge storage bed.

Changes to the permit: E. Coli monitoring has been added to the permit.

There are no open violations for the Applicant.

Sludge use and disposal description and locations: Sludge is dried on drying beds and then land applied.

Public Participation

DEP will publish notice of the receipt of the NPDES permit application and a tentative decision to issue the individual NPDES permit in the *Pennsylvania Bulletin* in accordance with 25 Pa. Code § 92a.82. Upon publication in the *Pennsylvania Bulletin*, DEP will accept written comments from interested persons for a 30-day period (which may be extended for one additional 15-day period at DEP's discretion), which will be considered in making a final decision on the application. Any person may request or petition for a public hearing with respect to the application. A public hearing may be held if DEP determines that there is significant public interest in holding a hearing. If a hearing is held, notice of the hearing will be published in the *Pennsylvania Bulletin* at least 30 days prior to the hearing and in at least one newspaper of general circulation within the geographical area of the discharge.

Approve	Deny	Signatures	Date
X		Benjamin R. Lockwood Benjamin R. Lockwood / Environmental Engineering Specialist	May 8, 2025
X		Adam Olesnanik Adam Olesnanik, P.E. / Environmental Engineer Manager	May 19, 2025

Discharge, Receiving Waters and Water Supply Information

Outfall No.	001	Design Flow (MGD)	.4
Latitude	41º 49' 55.6"	Longitude	79º 15' 28.6"
Quad Name		Quad Code	
Wastewater Description:	Sewage Effluent		
Receiving Waters	Allegheny River (WWF)	Stream Code	42122
NHD Com ID	112375987	RMI	182.3
Drainage Area	3490 mi^2	Yield (cfs/mi^2)	0.087
Q_{7-10} Flow (cfs)	302	Q_{7-10} Basis	USGS PA StreamStats
Elevation (ft)	1764	Slope (ft/ft)	
Watershed No.	16-B	Chapter 93 Class.	WWF
Existing Use	N/A	Existing Use Qualifier	N/A
Exceptions to Use	N/A	Exceptions to Criteria	N/A
Assessment Status	Impaired		
Cause(s) of Impairment	Mercury		
Source(s) of Impairment	Source Unknown		
TMDL Status	N/A	Name	N/A
Nearest Downstream Public Water Supply Intake	Aqua Pennsylvania Inc. - Emlenton		
PWS Waters	Allegheny River	Flow at Intake (cfs)	
PWS RMI		Distance from Outfall (mi)	88

Changes Since Last Permit Issuance: None

Treatment Facility Summary				
Waste Type	**Degree of Treatment**	**Process Type**	**Disinfection**	**Avg Annual Flow (MGD)**
Sewage	Secondary	Sequencing Batch Reactor	Ultraviolet	0.4
Hydraulic Capacity (MGD)	**Organic Capacity (lbs/day)**	**Load Status**	**Biosolids Treatment**	**Biosolids Use/Disposal**
0.4	834	Not Overloaded	Aerobic Digestion	Landfill

Changes Since Last Permit Issuance: None

Compliance History	
Summary of DMRs:	There were no violations in the past year DMR data.
Summary of Inspections:	7/21/2020: An inspection was conducted due to a major plant failure. The PLC failed which required the WWTP to be operated manually 24/7. There were fecal coliform violations as the UV lamps were not turned on at times. 9/15/2021: A routine inspection was conducted. No issues were noted. 5/5/2022: An inspection was conducted due to a complaint of backed up sewage into a basement. 10/8/2024: A routine inspection was conducted. There were no issues noted during the inspection.

Other Comments: There are currently no open violations for this Applicant

Compliance History

DMR Data for Outfall 001 (from April 1, 2024 to March 31, 2025)

Parameter	MAR-25	FEB-25	JAN-25	DEC-24	NOV-24	OCT-24	SEP-24	AUG-24	JUL-24	JUN-24	MAY-24	APR-24
Flow (MGD) Average Monthly	0.297	0.236	0.216	0.261	0.177	0.172	0.172	0.180	0.196	0.214	0.214	0.378
Flow (MGD) Weekly Average	0.390	0.297	0.341	0.325	0.217	0.216	0.183	0.204	0.254	0.242	0.218	0.447
pH (S.U.) Daily Minimum	6.71	6.64	6.6	6.6	6.66	6.65	6.7	7.16	7.11	7.04	7.05	6.96
pH (S.U.) Daily Maximum	7.02	6.81	6.66	6.7	6.79	6.84	7.2	7.29	7.23	7.25	7.22	7.17
DO (mg/L) Daily Minimum	5.93	6.04	5.98	5.91	5.46	5.28	4.94	4.80	4.84	5.02	5.22	5.49
CBOD5 (lbs/day) Average Monthly	< 7.9	10.0	< 6.1	< 4.6	< 3.4	< 3.7	< 7.5	< 5.0	7.0	< 6.6	< 4.6	< 4.9
CBOD5 (lbs/day) Weekly Average	11.8	25.5	8.5	< 4.7	< 4.1	6.8	11.1	9.9	9.5	12.9	5.4	< 7.9
CBOD5 (mg/L) Average Monthly	< 3.0	4.0	< 3.8	< 2.2	< 2.0	< 2.2	< 5.3	< 3.4	4.0	< 3.9	< 2.9	< 2.1
CBOD5 (mg/L) Weekly Average	4.0	7.0	6.0	< 2.0	< 2.0	3.0	8.0	6.0	6.0	8.0	4.0	< 2.0
BOD5 (lbs/day) Raw Sewage Influent Average Monthly	363	692	258.0	224.0	279.0	441	230.0	247	< 203	261	277	225
BOD5 (mg/L) Raw Sewage Influent Average Monthly	139	253	155.0	107	169.0	260	166	176	< 120.5	152	179	107
TSS (lbs/day) Average Monthly	8.1	7.0	6.7	24.7	5.8	< 3.2	< 6.8	< 7.0	< 11.9	< 8.6	< 10.1	< 12.1
TSS (lbs/day) Raw Sewage Influent Average Monthly	367	661	200.0	319	325.0	412	206	276	224.0	248	323	240
TSS (lbs/day) Weekly Average	13.7	9.9	12.3	31.2	10.3	7.5	< 11.1	< 8.4	23.1	< 8.8	12.2	< 19.7
TSS (mg/L) Average Monthly	3.0	3.8	4.3	11.8	3.3	< 1.8	< 5.0	< 5.0	< 6.8	< 5.0	< 6.5	< 5.0

TSS (mg/L) Raw Sewage Influent Average Monthly	143	244	124.0	152	195.0	216	156	194	140.0	145	209	111
TSS (mg/L) Weekly Average	4.0	7.0	8.0	19.0	5.0	3.0	< 5.0	< 5.0	14.0	5.0	8.0	5.0
Fecal Coliform (No./100 ml) Geometric Mean	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5	< 5.0	< 11	< 5.0	< 15	< 6	< 5.0
Fecal Coliform (No./100 ml) Instantaneous Maximum	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5	5.0	132	5.0	182	10	5.0
UV Intensity (µw/cm²) Average Monthly	48.3	45.7	40.9	39.5	38.1	39.1	43.4	49.7	52.1	55.3	59.0	61.3
UV Intensity (µw/cm²) Instantaneous Maximum	50.5	48.4	43.2	40.9	40.0	40.1	49.2	55.7	58.9	60.1	61.1	63.9
Total Nitrogen (mg/L) Average Quarterly	8.60			21.0			20.5			7.91		
Ammonia (lbs/day) Average Monthly	< 0.4	< 0.3	< 0.2	< 0.5	< 0.2	0.3	< 0.2	< 0.4	< 0.5	0.3	0.4	< 2.0
Ammonia (mg/L) Average Monthly	< 0.158	< 0.15	< 0.15	< 0.222	< 0.115	0.167	< 0.175	< 0.282	< 0.315	0.148	0.233	< 0.4
Total Phosphorus (mg/L) Average Quarterly	1.69			3.89			4.8			0.51		
Total Nickel (mg/L) Average Quarterly	< 0.005			< 0.005			< 0.005			< 0.005		
Chloride (mg/L) Average Monthly	89.8	116	137	87.9	106.0	121	111.0	118	97.6	109	85.9	57.3

Development of Effluent Limitations

Outfall No. 001 **Design Flow (MGD)** .4
Latitude 41º 49' 55.6" **Longitude** 79º 15' 28.6"
Wastewater Description: Sewage Effluent

Technology-Based Limitations

The following technology-based limitations apply, subject to water quality analysis and BPJ where applicable:

Pollutant	Limit (mg/l)	SBC	Federal Regulation	State Regulation
$CBOD_5$	25	Average Monthly	133.102(a)(4)(i)	92a.47(a)(1)
	40	Average Weekly	133.102(a)(4)(ii)	92a.47(a)(2)
Total Suspended Solids	30	Average Monthly	133.102(b)(1)	92a.47(a)(1)
	45	Average Weekly	133.102(b)(2)	92a.47(a)(2)
pH	6.0 – 9.0 S.U.	Min – Max	133.102(c)	95.2(1)
Fecal Coliform (5/1 – 9/30)	200 / 100 ml	Geo Mean	-	92a.47(a)(4)
Fecal Coliform (5/1 – 9/30)	1,000 / 100 ml	IMAX	-	92a.47(a)(4)
Fecal Coliform (10/1 – 4/30)	2,000 / 100 ml	Geo Mean	-	92a.47(a)(5)
Fecal Coliform (10/1 – 4/30)	10,000 / 100 ml	IMAX	-	92a.47(a)(5)
Total Residual Chlorine	0.5	Average Monthly	-	92a.48(b)(2)

Comments: E. Coli monitoring has been added per Chapter 92 requirements.

Water Quality-Based Limitations

The following limitations were determined through water quality modeling (output files attached):

Parameter	Limit (mg/l)	SBC	Model
NH3-N	25	Avg. Mo.	WQM 7.0
$CBOD_5$	25	Avg. Mo.	WQM 7.0

Comments: The existing $CBOD_5$ and NH_3-N limits of 25 mg/l are the same as the WQM Model output, and will remain in the permit. Toxics Management Spreadsheet was used to evaluate toxic parameters. The spreadsheet did not recommend any monitoring/limits for toxic parameters.

Additional Considerations

This facility is a POTW, therefore, the requirement to sample raw sewage BOD and TSS has been incorporated into the permit.

Ultraviolet disinfection is used; therefore, a monitoring requirement for UV Intensity is included in the permit.

Total Nitrogen and Total Phosphorus will be monitored 1/quarter per the Departments' SOP.

A Dissolved Oxygen minimum limitation of 4.0 mg/L will be implemented based on the standard in 25 PA Code Chapter 93 and best professional judgment.

Anti-Backsliding

Pursuant to 40 CFR § 122.44(l)(1), all proposed permit requirements addressed in this fact sheet are at least as stringent as the requirements implemented in the existing NPDES permit.

Threatened and Endangered Mussel Species Concerns and Considerations

The Allegheny River is known to contain state and federally listed threatened and endangered mussel species. Due to this being a direct discharge to the Allegheny River, potential impacts were evaluated.

The USFWS has indicated in comment letters on other NPDES permits that to protect threatened and endangered mussel species, wastewater discharges containing ammonia-nitrogen (NH_3-N), chloride (Cl^-), zinc, nickel, and copper, where mussels or their habitat exist, can be no more than 1.9 mg/l, 78 mg/l, 13.18 µg/l, 7.3 µg/l, and 10 µg/l respectively. The Department reviewed sampling data for these four parameters to determine potential impacts that the discharge may have to threatened and endangered mussel species.

A summary of the sampling from the NPDES Permit renewal application is as follows:

Sampling Data for USFWS Parameters of Concern	
Parameter	January 2018 Application Testing Information (all 24-hour composite samples)
Ammonia-Nitrogen (NH_3-N) (mg/L)	0.7
Chloride (mg/L)	102.1
Nickel (mg/L)	0.05
Zinc (mg/L	0.0354
Copper (mg/L	0.0067

Based on this sampling data, the existing discharge from the Brokenstraw Valley Area Authority STP is not believed to be having any adverse effects on threatened or endangered mussel species in the Allegheny River considering that the discharge appears to generally be meeting the criteria established by the USFWS at the end of pipe. Additionally, the Department did consider what impacts, if any, the reported slight exceedances of the USFWS criteria in the discharge effluent will have on threatened and endangered mussel species. The Department determined that discharge is not expected to have any adverse effects on threatened or endangered mussel species in the Allegheny River considering the size of the proposed discharge and the instantaneous assimilative capacity of the River. This discharge (0.4 MGD), and its associated pollutants of concern, are not expected to be measurable at levels that would impact mussels once it essentially instantly mixes upon reaching the river. The Department prepared impact area calculations (found at the end of this fact sheet) to determine the area of River that will be required to assimilate the maximum reported effluent concentrations of Ammonia-Nitrogen, Chloride, Zinc, Nickel, and Copper to achieve pollutant concentrations at or below the USFWS criteria in the River.

As shown on the “impact area” calculations, the subject discharge is expected to almost instantaneously dilute with the River (within 2 square meters of the discharge pipe). Based on this information, the Department has determined the discharge will be protective of threatened and endangered mussels in the Allegheny River. However, the Department will continue the monthly effluent monitoring for Chloride, and quarterly effluent monitoring for Nickel, and propose quarterly effluent monitoring for Zinc, and Copper, to develop a dataset as a means of further evaluating potential impacts in the upcoming permit term. The Department is already proposing to continue the weekly effluent limitations for Ammonia-Nitrogen from the previous permit, therefore, no additional or increased effluent limitations or monitoring is proposed for Ammonia-Nitrogen due to the concern of threatened and endangered mussel species.

Proposed Effluent Limitations and Monitoring Requirements

The limitations and monitoring requirements specified below are proposed for the draft permit, and reflect the most stringent limitations amongst technology, water quality and BPJ. Instantaneous Maximum (IMAX) limits are determined using multipliers of 2 (conventional pollutants) or 2.5 (toxic pollutants). Sample frequencies and types are derived from the "NPDES Permit Writer's Manual" (386-0400-001), SOPs and/or BPJ.

Outfall 001, Effective Period: Permit Effective Date through Permit Expiration Date.

Parameter	Effluent Limitations						Monitoring Requirements	
	Mass Units (lbs/day) (1)		Concentrations (mg/L)				Minimum (2) Measurement Frequency	Required Sample Type
	Average Monthly	Weekly Average	Minimum	Average Monthly	Weekly Average	Instant. Maximum		
Flow (MGD)	Report	Report	XXX	XXX	XXX	XXX	Continuous	Measured
pH (S.U.)	XXX	XXX	6.0 Daily Min	XXX	9.0 Daily Max	XXX	1/day	Grab
DO	XXX	XXX	4.0 Daily Min	XXX	XXX	XXX	1/day	Grab
CBOD5	83.0	133.0	XXX	25.0	40.0	50	1/week	24-Hr Composite
BOD5 Raw Sewage Influent	Report	XXX	XXX	Report	XXX	XXX	1/week	24-Hr Composite
TSS Raw Sewage Influent	Report	XXX	XXX	Report	XXX	XXX	1/week	24-Hr Composite
TSS	100.0	150.0	XXX	30.0	45.0	60	1/week	24-Hr Composite
Fecal Coliform (No./100 ml) Oct 1 - Apr 30	XXX	XXX	XXX	2000 Geo Mean	XXX	10000	1/week	Grab
Fecal Coliform (No./100 ml) May 1 - Sep 30	XXX	XXX	XXX	200 Geo Mean	XXX	1000	1/week	Grab
E. Coli (No./100 ml)	XXX	XXX	XXX	XXX	XXX	Report	1/quarter	Grab
UV Intensity (µw/cm²)	XXX	XXX	XXX	Report	XXX	Report	1/day	Measured
Total Nitrogen	XXX	XXX	XXX	Report Avg Qrtly	XXX	XXX	1/quarter	24-Hr Composite
Ammonia	83.0	XXX	XXX	25.0	XXX	50	1/week	24-Hr Composite
Total Phosphorus	XXX	XXX	XXX	Report Avg Qrtly	XXX	XXX	1/quarter	24-Hr Composite

Outfall 001, Continued (from Permit Effective Date through Permit Expiration Date)

Parameter	Effluent Limitations						Monitoring Requirements	
	Mass Units (lbs/day) (1)		Concentrations (mg/L)				Minimum (2) Measurement Frequency	Required Sample Type
	Average Monthly	Weekly Average	Minimum	Average Monthly	Weekly Average	Instant. Maximum		
Total Nickel	XXX	XXX	XXX	Report Avg Qrtly	XXX	XXX	1/quarter	24-Hr Composite
Total Copper	XXX	XXX	XXX	Report Avg Qrtly	XXX	XXX	1/quarter	24-Hr Composite
Total Zinc	XXX	XXX	XXX	Report Avg Qrtly	XXX	XXX	1/quarter	24-Hr Composite
Chloride	XXX	XXX	XXX	Report	XXX	XXX	1/month	24-Hr Composite

Compliance Sampling Location: Outfall 001, after UV disinfection

Other Comments: None

Brokenstraw Valley Area Authority WWTP PA0222585 Outfall 001

Region ID: PA
Workspace ID: PA20250508004400409000
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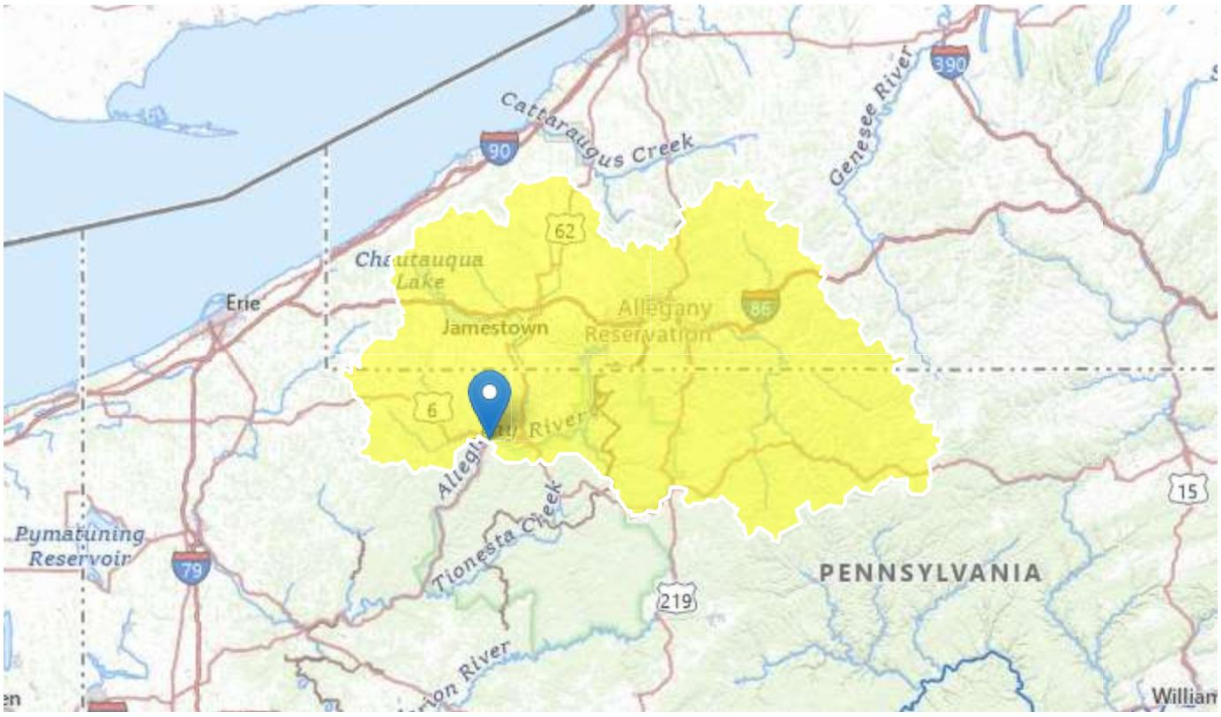

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Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	3490	square miles
ELEV	Mean Basin Elevation	1764	feet
PRECIP	Mean Annual Precipitation	44	inches

Low-Flow Statistics

Low-Flow Statistics Parameters [Low Flow Region 3]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	3490	square miles	2.33	1720
ELEV	Mean Basin Elevation	1764	feet	898	2700
PRECIP	Mean Annual Precipitation	44	inches	38.7	47.9

Low-Flow Statistics Disclaimers [Low Flow Region 3]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Low-Flow Statistics Flow Report [Low Flow Region 3]

Statistic	Value	Unit
7 Day 2 Year Low Flow	481	ft^3/s
30 Day 2 Year Low Flow	618	ft^3/s
7 Day 10 Year Low Flow	302	ft^3/s
30 Day 10 Year Low Flow	363	ft^3/s
90 Day 10 Year Low Flow	496	ft^3/s

Low-Flow Statistics Citations

Stuckey, M.H.,2006, Low-flow, base-flow, and mean-flow regression equations for Pennsylvania streams: U.S. Geological Survey Scientific Investigations Report 2006-5130, 84 p. (http://pubs.usgs.gov/sir/2006/5130/)

Brokenstraw Valley Area Authority WWTP PA0222585 RMI = 179.1

Region ID: PA
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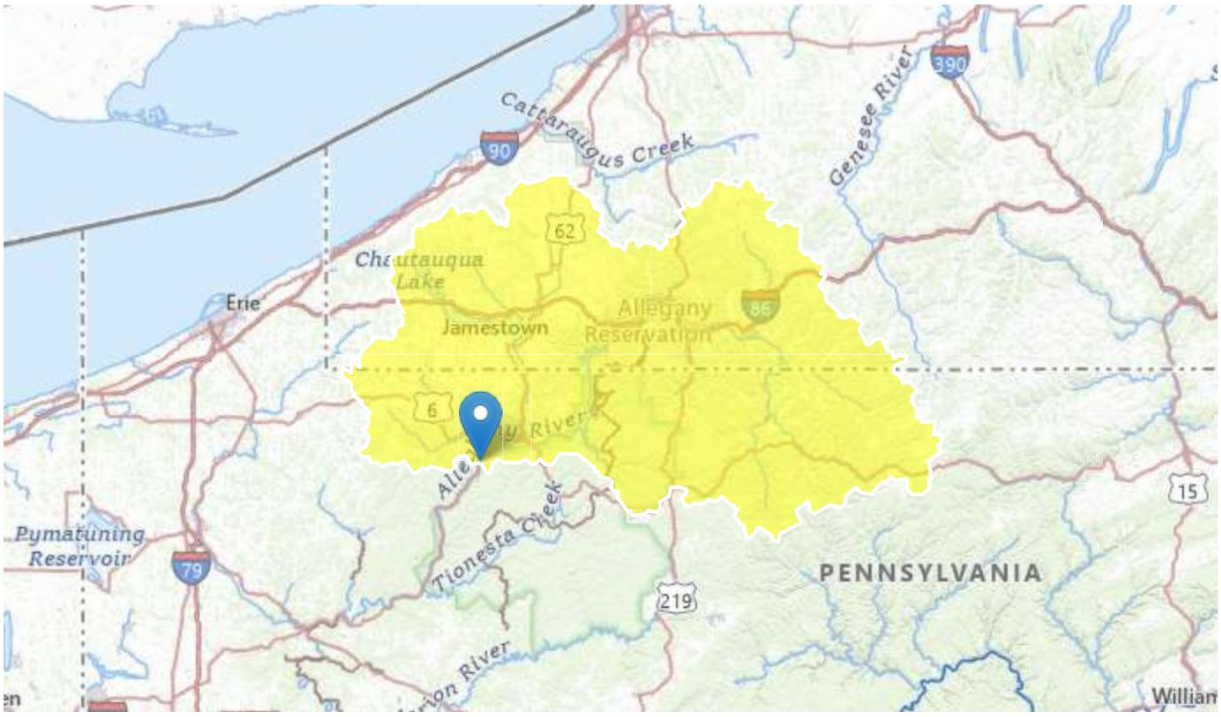

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Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	3510	square miles
ELEV	Mean Basin Elevation	1763	feet
PRECIP	Mean Annual Precipitation	44	inches

Low-Flow Statistics

Low-Flow Statistics Parameters [Low Flow Region 3]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	3510	square miles	2.33	1720
ELEV	Mean Basin Elevation	1763	feet	898	2700
PRECIP	Mean Annual Precipitation	44	inches	38.7	47.9

Low-Flow Statistics Disclaimers [Low Flow Region 3]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Low-Flow Statistics Flow Report [Low Flow Region 3]

Statistic	Value	Unit
7 Day 2 Year Low Flow	484	ft^3/s
30 Day 2 Year Low Flow	621	ft^3/s
7 Day 10 Year Low Flow	304	ft^3/s
30 Day 10 Year Low Flow	365	ft^3/s
90 Day 10 Year Low Flow	499	ft^3/s

Low-Flow Statistics Citations

Stuckey, M.H.,2006, Low-flow, base-flow, and mean-flow regression equations for Pennsylvania streams: U.S. Geological Survey Scientific Investigations Report 2006-5130, 84 p. (http://pubs.usgs.gov/sir/2006/5130/)

Input Data WQM 7.0

SWP Basin	Stream Code	Stream Name	RMI	Elevation (ft)	Drainage Area (sq mi)	Slope (ft/ft)	PWS Withdrawal (mgd)	Apply FC
18A	42122	ALLEGHENY RIVER	**182.300**	1764.00	3490.00	0.00000	0.00	☑

Stream Data

Design Cond.	LFY (cfsm)	Trib Flow (cfs)	Stream Flow (cfs)	Rch Trav Time (days)	Rch Velocity (fps)	WD Ratio	Rch Width (ft)	Rch Depth (ft)	Tributary Temp (°C)	Tributary pH	Stream Temp (°C)	Stream pH
Q7-10	0.100	0.00	302.00	0.000	0.000	0.0	0.00	0.00	20.00	7.00	0.00	0.00
Q1-10		0.00	0.00	0.000	0.000							
Q30-10		0.00	0.00	0.000	0.000							

Discharge Data

Name	Permit Number	Existing Disc Flow (mgd)	Permitted Disc Flow (mgd)	Design Disc Flow (mgd)	Reserve Factor	Disc Temp (°C)	Disc pH
Brokenstraw	PA0222585	0.4000	0.4000	0.4000	0.000	25.00	7.00

Parameter Data

Parameter Name	Disc Conc (mg/L)	Trib Conc (mg/L)	Stream Conc (mg/L)	Fate Coef (1/days)
CBOD5	25.00	2.00	0.00	1.50
Dissolved Oxygen	3.00	8.24	0.00	0.00
NH3-N	25.00	0.00	0.00	0.70

Input Data WQM 7.0

SWP Basin	Stream Code	Stream Name	RMI	Elevation (ft)	Drainage Area (sq mi)	Slope (ft/ft)	PWS Withdrawal (mgd)	Apply FC
18A	42122	ALLEGHENY RIVER	**179.100**	1763.00	3510.00	0.00000	0.00	☑

Stream Data

Design Cond.	LFY (cfsm)	Trib Flow (cfs)	Stream Flow (cfs)	Rch Trav Time (days)	Rch Velocity (fps)	WD Ratio	Rch Width (ft)	Rch Depth (ft)	Tributary Temp (°C)	Tributary pH	Stream Temp (°C)	Stream pH
Q7-10	0.100	0.00	304.00	0.000	0.000	0.0	0.00	0.00	20.00	7.00	0.00	0.00
Q1-10		0.00	0.00	0.000	0.000							
Q30-10		0.00	0.00	0.000	0.000							

Discharge Data

Name	Permit Number	Existing Disc Flow (mgd)	Permitted Disc Flow (mgd)	Design Disc Flow (mgd)	Reserve Factor	Disc Temp (°C)	Disc pH
		0.0000	0.0000	0.0000	0.000	25.00	7.00

Parameter Data

Parameter Name	Disc Conc (mg/L)	Trib Conc (mg/L)	Stream Conc (mg/L)	Fate Coef (1/days)
CBOD5	25.00	2.00	0.00	1.50
Dissolved Oxygen	3.00	8.24	0.00	0.00
NH3-N	25.00	0.00	0.00	0.70

WQM 7.0 Hydrodynamic Outputs

SWP Basin	Stream Code	Stream Name
18A	42122	ALLEGHENY RIVER

RMI	Stream Flow (cfs)	PWS With (cfs)	Net Stream Flow (cfs)	Disc Analysis Flow (cfs)	Reach Slope (ft/ft)	Depth (ft)	Width (ft)	W/D Ratio	Velocity (fps)	Reach Trav Time (days)	Analysis Temp (°C)	Analysis pH
Q7-10 Flow												
182.300	302.00	0.00	302.00	.6188	0.00006	1.265	352.88	278.88	0.68	0.289	20.01	7.00
Q1-10 Flow												
182.300	193.28	0.00	193.28	.6188	0.00006	NA	NA	NA	0.53	0.370	20.02	7.00
Q30-10 Flow												
182.300	410.72	0.00	410.72	.6188	0.00006	NA	NA	NA	0.80	0.243	20.01	7.00

WQM 7.0 Modeling Specifications

Parameters	Both	Use Inputted Q1-10 and Q30-10 Flows	☑
WLA Method	EMPR	Use Inputted W/D Ratio	☐
Q1-10/Q7-10 Ratio	0.64	Use Inputted Reach Travel Times	☐
Q30-10/Q7-10 Ratio	1.36	Temperature Adjust Kr	☑
D.O. Saturation	90.00%	Use Balanced Technology	☑
D.O. Goal	5		

WQM 7.0 Wasteload Allocations

SWP Basin	Stream Code	Stream Name
18A	42122	ALLEGHENY RIVER

NH3-N Acute Allocations

RMI	Discharge Name	Baseline Criterion (mg/L)	Baseline WLA (mg/L)	Multiple Criterion (mg/L)	Multiple WLA (mg/L)	Critical Reach	Percent Reduction
182.300	Brokenstraw	16.74	50	16.74	50	0	0

NH3-N Chronic Allocations

RMI	Discharge Name	Baseline Criterion (mg/L)	Baseline WLA (mg/L)	Multiple Criterion (mg/L)	Multiple WLA (mg/L)	Critical Reach	Percent Reduction
182.300	Brokenstraw	1.89	25	1.89	25	0	0

Dissolved Oxygen Allocations

RMI	Discharge Name	CBOD5		NH3-N		Dissolved Oxygen		Critical Reach	Percent Reduction
		Baseline (mg/L)	Multiple (mg/L)	Baseline (mg/L)	Multiple (mg/L)	Baseline (mg/L)	Multiple (mg/L)		
182.30	Brokenstraw	25	25	25	25	3	3	0	0

WQM 7.0 D.O.Simulation

SWP Basin	Stream Code	Stream Name
18A	42122	ALLEGHENY RIVER

RMI	Total Discharge Flow (mgd)	Analysis Temperature (°C)	Analysis pH
182.300	0.400	20.010	7.000
Reach Width (ft)	**Reach Depth (ft)**	**Reach WDRatio**	**Reach Velocity (fps)**
352.879	1.265	278.879	0.678
Reach CBOD5 (mg/L)	**Reach Kc (1/days)**	**Reach NH3-N (mg/L)**	**Reach Kn (1/days)**
2.05	0.031	0.05	0.701
Reach DO (mg/L)	**Reach Kr (1/days)**	**Kr Equation**	**Reach DO Goal (mg/L)**
8.232	0.187	Tsivoglou	5
Reach Travel Time (days)			
0.289			

Subreach Results

TravTime (days)	CBOD5 (mg/L)	NH3-N (mg/L)	D.O. (mg/L)
0.029	2.05	0.05	8.23
0.058	2.04	0.05	8.23
0.087	2.04	0.05	8.23
0.115	2.04	0.05	8.22
0.144	2.04	0.05	8.22
0.173	2.04	0.05	8.22
0.202	2.03	0.04	8.22
0.231	2.03	0.04	8.22
0.260	2.03	0.04	8.21
0.289	2.03	0.04	8.21

WQM 7.0 Effluent Limits

SWP Basin	Stream Code	Stream Name
18A	42122	ALLEGHENY RIVER

RMI	Name	Permit Number	Disc Flow (mgd)	Parameter	Effl. Limit 30-day Ave. (mg/L)	Effl. Limit Maximum (mg/L)	Effl. Limit Minimum (mg/L)
182.300	Brokenstraw	PA0222585	0.400	CBOD5	25		
				NH3-N	25	50	
				Dissolved Oxygen			3

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

Toxics Management Spreadsheet
Version 1.4, May 2023

Discharge Information

Instructions | Discharge | Stream

Facility: **Brokenstraw Area Valley Authority WWTP** NPDES Permit No.: **PA0222585** Outfall No.: **001**

Evaluation Type: **Major Sewage / Industrial Waste** Wastewater Description: **Treated sewage**

Discharge Characteristics								
Design Flow (MGD)*	Hardness (mg/l)*	pH (SU)*	Partial Mix Factors (PMFs)				Complete Mix Times (min)	
			AFC	CFC	THH	CRL	Q_{7-10}	Q_h
0.4	100	7						

					0 if left blank		*0.5 if left blank*		*0 if left blank*			*1 if left blank*	
	Discharge Pollutant	Units	Max Discharge Conc		Trib Conc	Stream Conc	Daily CV	Hourly CV	Stream CV	Fate Coeff	FOS	Criteria Mod	Chem Transl
Group 1	Total Dissolved Solids (PWS)	mg/L											
	Chloride (PWS)	mg/L											
	Bromide	mg/L	<										
	Sulfate (PWS)	mg/L											
	Fluoride (PWS)	mg/L	<										
Group 2	Total Aluminum	mg/L	<										
	Total Antimony	µg/L	<										
	Total Arsenic	µg/L											
	Total Barium	µg/L											
	Total Beryllium	µg/L	<										
	Total Boron	µg/L											
	Total Cadmium	µg/L	<										
	Total Chromium (III)	µg/L	<										
	Hexavalent Chromium	µg/L	<										
	Total Cobalt	µg/L	<										
	Total Copper	mg/L		0.0067									
	Free Cyanide	µg/L											
	Total Cyanide	µg/L	<										
	Dissolved Iron	µg/L											
	Total Iron	mg/L	<										
	Total Lead	mg/L		0.000217									
	Total Manganese	mg/L											
	Total Mercury	µg/L											
	Total Nickel	mg/L	<	0.05									
	Total Phenols (Phenolics) (PWS)	µg/L	<										
	Total Selenium	µg/L	<										
	Total Silver	µg/L	<										
	Total Thallium	µg/L	<										
	Total Zinc	mg/L		0.0354									
	Total Molybdenum	µg/L											
	Acrolein	µg/L	<										
	Acrylamide	µg/L	<										
	Acrylonitrile	µg/L	<										
	Benzene	µg/L	<										
	Bromoform	µg/L	<										

Group 3	Carbon Tetrachloride	µg/L	<										
	Chlorobenzene	µg/L											
	Chlorodibromomethane	µg/L	<										
	Chloroethane	µg/L	<										
	2-Chloroethyl Vinyl Ether	µg/L	<										
	Chloroform	µg/L	<										
	Dichlorobromomethane	µg/L	<										
	1,1-Dichloroethane	µg/L	<										
	1,2-Dichloroethane	µg/L	<										
	1,1-Dichloroethylene	µg/L	<										
	1,2-Dichloropropane	µg/L	<										
	1,3-Dichloropropylene	µg/L	<										
	1,4-Dioxane	µg/L	<										
	Ethylbenzene	µg/L	<										
	Methyl Bromide	µg/L	<										
	Methyl Chloride	µg/L	<										
	Methylene Chloride	µg/L	<										
	1,1,2,2-Tetrachloroethane	µg/L	<										
	Tetrachloroethylene	µg/L	<										
	Toluene	µg/L	<										
	1,2-trans-Dichloroethylene	µg/L	<										
	1,1,1-Trichloroethane	µg/L	<										
	1,1,2-Trichloroethane	µg/L	<										
	Trichloroethylene	µg/L	<										
	Vinyl Chloride	µg/L	<										
Group 4	2-Chlorophenol	µg/L	<										
	2,4-Dichlorophenol	µg/L	<										
	2,4-Dimethylphenol	µg/L	<										
	4,6-Dinitro-o-Cresol	µg/L	<										
	2,4-Dinitrophenol	µg/L	<										
	2-Nitrophenol	µg/L	<										
	4-Nitrophenol	µg/L	<										
	p-Chloro-m-Cresol	µg/L	<										
	Pentachlorophenol	µg/L	<										
	Phenol	µg/L	<										
	2,4,6-Trichlorophenol	µg/L	<										
Group 5	Acenaphthene	µg/L	<										
	Acenaphthylene	µg/L	<										
	Anthracene	µg/L	<										
	Benzidine	µg/L	<										
	Benzo(a)Anthracene	µg/L	<										
	Benzo(a)Pyrene	µg/L	<										
	3,4-Benzofluoranthene	µg/L	<										
	Benzo(ghi)Perylene	µg/L	<										
	Benzo(k)Fluoranthene	µg/L	<										
	Bis(2-Chloroethoxy)Methane	µg/L	<										
	Bis(2-Chloroethyl)Ether	µg/L	<										
	Bis(2-Chloroisopropyl)Ether	µg/L	<										
	Bis(2-Ethylhexyl)Phthalate	µg/L	<										
	4-Bromophenyl Phenyl Ether	µg/L	<										
	Butyl Benzyl Phthalate	µg/L	<										
	2-Chloronaphthalene	µg/L	<										
	4-Chlorophenyl Phenyl Ether	µg/L	<										
	Chrysene	µg/L	<										
	Dibenzo(a,h)Anthrancene	µg/L	<										
	1,2-Dichlorobenzene	µg/L	<										
	1,3-Dichlorobenzene	µg/L	<										
	1,4-Dichlorobenzene	µg/L	<										
	3,3-Dichlorobenzidine	µg/L	<										
	Diethyl Phthalate	µg/L	<										
	Dimethyl Phthalate	µg/L	<										
	Di-n-Butyl Phthalate	µg/L	<										
	2,4-Dinitrotoluene	µg/L	<										

	2,6-Dinitrotoluene	µg/L	<										
	Di-n-Octyl Phthalate	µg/L	<										
	1,2-Diphenylhydrazine	µg/L	<										
	Fluoranthene	µg/L	<										
	Fluorene	µg/L	<										
	Hexachlorobenzene	µg/L	<										
	Hexachlorobutadiene	µg/L	<										
	Hexachlorocyclopentadiene	µg/L	<										
	Hexachloroethane	µg/L	<										
	Indeno(1,2,3-cd)Pyrene	µg/L	<										
	Isophorone	µg/L	<										
	Naphthalene	µg/L	<										
	Nitrobenzene	µg/L	<										
	n-Nitrosodimethylamine	µg/L	<										
	n-Nitrosodi-n-Propylamine	µg/L	<										
	n-Nitrosodiphenylamine	µg/L	<										
	Phenanthrene	µg/L	<										
	Pyrene	µg/L	<										
	1,2,4-Trichlorobenzene	µg/L	<										
Group 6	Aldrin	µg/L	<										
	alpha-BHC	µg/L	<										
	beta-BHC	µg/L	<										
	gamma-BHC	µg/L	<										
	delta BHC	µg/L	<										
	Chlordane	µg/L	<										
	4,4-DDT	µg/L	<										
	4,4-DDE	µg/L	<										
	4,4-DDD	µg/L	<										
	Dieldrin	µg/L	<										
	alpha-Endosulfan	µg/L	<										
	beta-Endosulfan	µg/L	<										
	Endosulfan Sulfate	µg/L	<										
	Endrin	µg/L	<										
	Endrin Aldehyde	µg/L	<										
	Heptachlor	µg/L	<										
	Heptachlor Epoxide	µg/L	<										
	PCB-1016	µg/L	<										
	PCB-1221	µg/L	<										
	PCB-1232	µg/L	<										
	PCB-1242	µg/L	<										
	PCB-1248	µg/L	<										
	PCB-1254	µg/L	<										
	PCB-1260	µg/L	<										
	PCBs, Total	µg/L	<										
	Toxaphene	µg/L	<										
	2,3,7,8-TCDD	ng/L	<										
Group 7	Gross Alpha	pCi/L											
	Total Beta	pCi/L	<										
	Radium 226/228	pCi/L	<										
	Total Strontium	µg/L	<										
	Total Uranium	µg/L	<										
	Osmotic Pressure	mOs/kg											

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Toxics Management Spreadsheet
Version 1.4, May 2023

Stream / Surface Water Information

Brokenstraw Area Valley Authority WWTP, NPDES Permit No. PA0222585, Outfall 001

Instructions | Discharge | *Stream*

Receiving Surface Water Name: **Allegheny River**

No. Reaches to Model: **1**

- (●) Statewide Criteria
- ( ) Great Lakes Criteria
- ( ) ORSANCO Criteria

Location	Stream Code*	RMI*	Elevation (ft)*	DA (mi²)*	Slope (ft/ft)	PWS Withdrawal (MGD)	Apply Fish Criteria*
Point of Discharge	042122	182.3	1764	3490			Yes
End of Reach 1	042122	179.1	1763	3510			Yes

Q $_{7\text{-}10}$

Location	RMI	LFY (cfs/mi²)*	Flow (cfs)		W/D Ratio	Width (ft)	Depth (ft)	Velocity (fps)	Travel Time (days)	Tributary		Stream		Analysis	
			Stream	Tributary						Hardness	pH	Hardness*	pH*	Hardness	pH
Point of Discharge	182.3	0.1	302									100	7		
End of Reach 1	179.1	0.1	304									100	7		

Q $_{h}$

Location	RMI	LFY (cfs/mi²)	Flow (cfs)		W/D Ratio	Width (ft)	Depth (ft)	Velocity (fps)	Travel Time (days)	Tributary		Stream		Analysis	
			Stream	Tributary						Hardness	pH	Hardness	pH	Hardness	pH
Point of Discharge	182.3														
End of Reach 1	179.1														

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Toxics Management Spreadsheet
Version 1.4, May 2023

Model Results

Brokenstraw Area Valley Authority WWTP, NPDES Permit No. PA0222585, Outfall 001

Instructions | Results | RETURN TO INPUTS | SAVE AS PDF | PRINT | ◉ All ○ Inputs ○ Results ○ Limits

☐ ***Hydrodynamics***

☑ ***Wasteload Allocations***

☑ ***AFC*** CCT (min): 15 PMF: 0.031 Analysis Hardness (mg/l): 100 Analysis pH: 7.00

Pollutants	Stream Conc (µg/L)	Stream CV	Trib Conc (µg/L)	Fate Coef	WQC (µg/L)	WQ Obj (µg/L)	WLA (µg/L)	Comments
Total Copper	0	0		0	13.439	14.0	226	Chem Translator of 0.96 applied
Total Lead	0	0		0	64.581	81.6	1,320	Chem Translator of 0.791 applied
Total Nickel	0	0		0	468.236	469	7,587	Chem Translator of 0.998 applied
Total Zinc	0	0		0	117.180	120	1,938	Chem Translator of 0.978 applied

☑ ***CFC*** CCT (min): 720 PMF: 0.215 Analysis Hardness (mg/l): 100 Analysis pH: 7.00

Pollutants	Stream Conc (µg/L)	Stream CV	Trib Conc (µg/L)	Fate Coef	WQC (µg/L)	WQ Obj (µg/L)	WLA (µg/L)	Comments
Total Copper	0	0		0	8.956	9.33	990	Chem Translator of 0.96 applied
Total Lead	0	0		0	2.517	3.18	338	Chem Translator of 0.791 applied
Total Nickel	0	0		0	52.007	52.2	5,535	Chem Translator of 0.997 applied
Total Zinc	0	0		0	118.139	120	12,713	Chem Translator of 0.986 applied

☑ ***THH*** CCT (min): 720 PMF: 0.215 Analysis Hardness (mg/l): N/A Analysis pH: N/A

Pollutants	Stream Conc (µg/L)	Stream CV	Trib Conc (µg/L)	Fate Coef	WQC (µg/L)	WQ Obj (µg/L)	WLA (µg/L)	Comments
Total Copper	0	0		0	N/A	N/A	N/A	
Total Lead	0	0		0	N/A	N/A	N/A	
Total Nickel	0	0		0	610	610	64,726	
Total Zinc	0	0		0	N/A	N/A	N/A	

☑ ***CRL*** CCT (min): 720 PMF: 0.329 Analysis Hardness (mg/l): N/A Analysis pH: N/A

Pollutants	Stream Conc (µg/L)	Stream CV	Trib Conc (µg/L)	Fate Coef	WQC (µg/L)	WQ Obj (µg/L)	WLA (µg/L)	Comments
Total Copper	0	0		0	N/A	N/A	N/A	
Total Lead	0	0		0	N/A	N/A	N/A	
Total Nickel	0	0		0	N/A	N/A	N/A	
Total Zinc	0	0		0	N/A	N/A	N/A	

☑ ***Recommended WQBELs & Monitoring Requirements***

No. Samples/Month: 4

Pollutants	Mass Limits		Concentration Limits				Governing WQBEL	WQBEL Basis	Comments
	AML (lbs/day)	MDL (lbs/day)	AML	MDL	IMAX	Units			

☑ ***Other Pollutants without Limits or Monitoring***

The following pollutants do not require effluent limits or monitoring based on water quality because reasonable potential to exceed water quality criteria was not determined and the discharge concentration was less than thresholds for monitoring, or the pollutant was not detected and a sufficiently sensitive analytical method was used (e.g., <= Target QL).

Pollutants	Governing WQBEL	Units	Comments
Total Copper	0.15	mg/L	Discharge Conc ≤ 10% WQBEL
Total Lead	0.34	mg/L	Discharge Conc ≤ 10% WQBEL
Total Nickel	4.86	mg/L	Discharge Conc ≤ 10% WQBEL
Total Zinc	1.24	mg/L	Discharge Conc ≤ 10% WQBEL

5/19/2025

Outfall 001

Facility:	Brokenstraw Valley Area Authority STP		
Permit Number:	PA0222585	Effective: 5/19/2025	Expiration: 5/18/2030
Outfall No:	001		
Location:	Brokenstraw Township, Warren County		
Discharge to:	Allegheny River		
Site Specific Mussel Survey Completed:	N/A		

	Discharge and Stream Characteristics		Comments
Q_S	Stream Flow	195 MGD / 302 cfs	
Q_D	Discharge Flow	0.4 MGD / 0.61898 cfs	
$C_{S(Cl^-)}$	Instream chloride Concentration	0 mg/L	
$C_{E(Cl^-)}$	Discharge chloride (existing)	102.1 mg/L	
$C_{P(Cl^-)}$	Discharge chloride (proposed)	102.1 mg/L	
$C_{S(Ni)}$	Instream nickel Concentration	0 µg/L	
$C_{E(Ni)}$	Discharge nickel (existing)	50 µg/L	
$C_{P(Ni)}$	Discharge nickel (proposed)	50 µg/L	
$C_{S(Zn)}$	Instream zinc Concentration	0 µg/L	
$C_{E(Zn)}$	Discharge zinc (existing)	35.4 µg/L	
$Zn_{P(Zn)}$	Discharge zinc (proposed)	35.4 µg/L	
$C_{S(Cu)}$	Instream copper Concentration	0 µg/L	
$C_{E(Cu)}$	Discharge copper (existing)	6.7 µg/L	
$Zn_{P(Cu)}$	Discharge copper (proposed)	6.7 µg/L	
$C_{S(NH3-N)}$	Instream NH^3-N	0.1 mg/L	
$C_{E(NH3-N)}$	Discharge NH^3-N (existing)	0.7 mg/L	
$C_{P(NH3-N)}$	Discharge NH^3-N (proposed)	0.7 mg/L	
pH_S	Instream pH	7 S.U.	
T_S	Instream Temp.	25 °C	Default value for a WWF
$C_{C(NH3-N)}$	Ammonia criteria	1.367 mg/L	From ammonia criteria comparison spreadsheet -using instream pH and Temp
$C_{C(Cl^-)}$	Chloride criteria	78 mg/L	USFWS criteria
$C_{C(Ni)}$	Nickel criteria	7.3 µg/L	USFWS criteria
$C_{C(Zn)}$	Zinc criteria	13.18 µg/L	USFWS criteria
$C_{C(Cu)}$	Copper criteria	10 µg/L	USFWS criteria
W_S	Stream width	100 meters	Google Earth (Approximate)

Ammonia Criteria Calculations:

pH_S	7	S.U.	*(Default value is 7.0)*
T_S	25	°C	*(Default value is 20 ° for a CWF and 25° for a WWF)*

Acute Criteria

METHOD and UNITS	CRITERIA	Comments	
Old CMC (mg TAN/L) =	6.764		
EPA 2013 CMC (mg TAN/L) =	11.073	Oncorhynchus present	* formula on pg. 41 (plateaus at 15.7 C)
	11.073	Oncorhynchus absent	* formula on pg. 42 (plateaus at 10.2 C)

Chronic Criteria

	METHOD and UNITS	CRITERIA	COMMENTS
	Old CMC (mg TAN/L) =	1.341	
$C_{C(NH3-N)}$	EPA 2013 CMC (mg TAN/L) =	1.367	* formula on pg. 46 (plateaus at 7 C)

Endangered Mussel Species Impact Area Calculations:

Existing Area of Impact

☑ N/A - No Site Specific Mussel Survey Completed for this Discharger

Approximate Area of Impact Determined from Survey =	N/A m^2	(Enter N/A if no site specific survey has been completed)
Existing Mussel Density within Area of Impact =		
Rabbitsfoot *(Quadrula cylindrical)*	per m^2	
Northern Riffleshell *(Epioblasma torulosa rangiana)*	per m^2	
Rayed Bean *(Villosa fabalis)*	per m^2	
Clubshell *(Pleurobema clava)*	per m^2	
Sheepnose *(Plethobasus cyphyus)*	per m^2	
Snuffbox *(Epioblasma triquetra)*	per m^2	
TOTAL	0 per m^2	

Method 1 - Utilizing Site Specific Mussel Survey Information

☑ N/A - No Site Specific Mussel Survey Completed for this Discharger

This method utilizes a simple comparison of the size of the existing area of impact as determined from a site specific mussel survey and the chlorides in the existing discharge compared to the chlorides in the proposed discharge after the facility upgrades treatment technologies. This method is only applicable to where the stream impairment is caused by TDS and/or chlorides as the plume has been delineated through conductivity measurements.

A.	Area of Impact Determined from Survey:	N/A	m^2
B.	Chlorides in Existing Discharge:	102	mg/L
C.	Chlorides in Proposed Discharge after Treatment Facility Upgrades:	102.1	mg/L
D.	Approximate Area of Impact after Treatment Facility Upgrades:	N/A	m^2

A/B = D/C Therefore, D = (A*C)/B

5/19/2025

Outfall 001

Facility:	Brokenstraw Valley Area Authority STP				
Permit Number:	PA0222585	Effective:	5/19/2025	Expiration:	5/18/2030
Outfall No:	001				
Location:	Brokenstraw Township, Warren County				
Discharge to:	Allegheny River				
Site Specific Mussel Survey Completed:	N/A				

Endangered Mussel Species Impact Area Calculations: (continued...)

Method 2 - Mass Balance Relationship of Loading and Assimilative Capacity of Stream

Chloride (Cl^-)	$L_{S(Cl^-)}$ = Available Chloride Loading in Stream = $C_{C(Cl^-)} - C_{S(Cl^-)} \times Q_S(MGD) \times 8.34$ =	126,851 lbs/Day
	$L_{D\text{-}MAX(Cl^-)}$ = Current Maximium Discharge Chloride Loading exceeding criteria = $(C_{E(Cl^-)} - C_{E(Cl^-)}) \times Q_D(MGD) \times 8.34$ =	80 lbs/Day
	$\%_{E(Cl^-)}$ = Percent of Stream Capacity for Current Loading = $L_{D\text{-}MAX(Cl^-)} / L_{S(Cl^-)}$ =	0% of Stream Capacity
	$L_{D(Cl^-)}$ = Proposed Discharge Cl^- Loading exceeding criteria after Treatment Facility Upgrades = $(C_{P(Cl^-)} - C_{P(Cl^-)}) \times Q_D(MGD) \times 8.34$ =	80.3976 lbs/Day
	$\%_{P(Cl^-)}$ = Percent of Stream Capacity for Proposed Loading = $L_{D(Cl^-)} / L_{S(Cl^-)}$ =	0.06% of Stream Capacity
	Proposed Area of Impact due to Chloride * = $(\%_{P(Cl^-)} \times W_S)^2 \times 0.5$ =	0.00 m^2
	* assuming equal flow across transect and 90° spread at discharge	
Nickel(Ni)	$L_{S(Ni)}$ = Available Nickel Loading in Stream = $C_{C(Ni)} - C_{S(Ni)} \times Q_S(MGD) \times 8.34$ =	11,872 lbs/Day
	$L_{D\text{-}MAX(Ni)}$ = Current Maximium Discharge Nickel Loading exceeding criteria = $(C_{E(Ni)} - C_{E(Ni)}) \times Q_D(MGD) \times 8.34$ =	142 lbs/Day
	$\%_{E(Ni)}$ = Percent of Stream Capacity for Current Loading = $L_{D\text{-}MAX(Ni)} / L_{S(Ni)}$ =	1% of Stream Capacity
	$L_{D(Ni)}$ = Proposed Discharge Ni Loading exceeding criteria after Treatment Facility Upgrades = $(C_{P(Ni)} - C_{P(Ni)}) \times Q_D(MGD) \times 8.34$ =	142.4472 lbs/Day
	$\%_{P(Ni)}$ = Percent of Stream Capacity for Proposed Loading = $L_{D(Ni)} / L_{S(Ni)}$ =	1.20% of Stream Capacity
	Proposed Area of Impact due to Nickel * = $(\%_{P(Ni)} \times W_S)^2 \times 0.5$ =	0.72 m^2
	* assuming equal flow across transect and 90° spread at discharge	
Zinc (Zn)	$L_{S(Zn)}$ = Available Zinc Loading in Stream = $C_{C(Zn)} - C_{S(Zn)} \times Q_S(MGD) \times 8.34$ =	21,435 lbs/Day
	$L_{D\text{-}MAX(Zn)}$ = Current Maximium Discharge Zinc Loading exceeding criteria = $(C_{E(Zn)} - C_{E(Zn)}) \times Q_D(MGD) \times 8.34$ =	74 lbs/Day
	$\%_{E(Zn)}$ = Percent of Stream Capacity for Current Loading = $L_{D\text{-}MAX(Zn)} / L_{S(Zn)}$ =	0% of Stream Capacity
	$L_{D(Zn)}$ = Proposed Discharge Zn Loading exceeding criteria after Treatment Facility Upgrades = $(C_{P(Zn)} - C_{P(Zn)}) \times Q_D(MGD) \times 8.34$ =	74.12592 lbs/Day
	$\%_{P(Zn)}$ = Percent of Stream Capacity for Proposed Loading = $L_{D(Zn)} / L_{S(Zn)}$ =	0.35% of Stream Capacity
	Proposed Area of Impact due to Zinc * = $(\%_{P(Zn)} \times W_S)^2 \times 0.5$ =	0.06 m^2
	* assuming equal flow across transect and 90° spread at discharge	
Copper (Cu)	$L_{S(Cu)}$ = Available Copper Loading in Stream = $C_{C(Cu)} - C_{S(Cu)} \times Q_S(MGD) \times 8.34$ =	16,263 lbs/Day
	$L_{D\text{-}MAX(Cu)}$ = Current Maximium Discharge Copper Loading exceeding criteria = $(C_{E(Cu)} - C_{E(Cu)}) \times Q_D(MGD) \times 8.34$ =	-11 lbs/Day
	$\%_{E(Cu)}$ = Percent of Stream Capacity for Current Loading = $L_{D\text{-}MAX(Cu)} / L_{S(Cu)}$ =	0% of Stream Capacity
	$L_{D(Cu)}$ = Proposed Discharge Cu Loading exceeding criteria after Treatment Facility Upgrades = $(C_{P(Cu)} - C_{P(Cu)}) \times Q_D(MGD) \times 8.34$ =	-11.0088 lbs/Day
	$\%_{P(Cu)}$ = Percent of Stream Capacity for Proposed Loading = $L_{D(Cu)} / L_{S(Cu)}$ =	-0.07% of Stream Capacity
	Proposed Area of Impact due to Copper* = $(\%_{P(Cu)} \times W_S)^2 \times 0.5$ =	0.00 m^2
	* assuming equal flow across transect and 90° spread at discharge	
Ammonia-Nitrogen (NH3-N)	$L_{S(NH3\text{-}N)}$ = Available NH3-N Loading in Stream = $C_{C(NH3\text{-}N)} - C_{S(NH3\text{-}N)} \times Q_S(MGD) \times 8.34$ =	2,061 lbs/Day
	$L_{D\text{-}MAX(NH3\text{-}N)}$ = Current Maximium Discharge NH3-N Loading = $C_{E(NH3\text{-}N)} \times Q_D(MGD) \times 8.34$ =	2 lbs/Day
	$\%_{E(NH3\text{-}N)}$ = Percent of Stream Capacity for Current Loading = $L_{D\text{-}MAX(NH3\text{-}N)} / L_{S(NH3\text{-}N)}$ =	0% of Stream Capacity
	$L_{D(NH3\text{-}N)}$ = Proposed Discharge NH3-N Loading after Treatment Facility Upgrades = $C_{P(NH3\text{-}N)} - C_{C(NH3\text{-}N)} \times Q_D(MGD) \times 8.34$ =	-2 lbs/Day
	$\%_{P(NH3\text{-}N)}$ = Percent of Stream Capacity for Proposed Loading = $L_{D(NH3\text{-}N)} / L_{S(NH3\text{-}N)}$ =	-0.10% of Stream Capacity
	Proposed Area of Impact due to NH3-N * = $(\%_{P(NH3\text{-}N)} \times W_S)^2 \times 0.5$ =	0.00 m^2
	* assuming equal flow across transect and 90° spread at discharge	

Outfall 001

Facility:	Brokenstraw Valley Area Authority STP				
Permit Number:	PA0222585	Effective:	5/19/2025	Expiration:	5/18/2030
Outfall No:	001				
Location:	Brokenstraw Township, Warren County				
Discharge to:	Allegheny River				
Site Specific Mussel Survey Completed:	N/A				

Endangered Mussel Species Impact Area Calculations: (continued...)

Method 3 - Mass Balance Relationship of Stream Flow, Proposed Effluent Quality, and Mussel Protection Criteria

Chloride (Cl)	$Q_{A(Cl^-)}C_{S(Cl^-)} + Q_D C_{P(Cl^-)} = Q_T C_{C(Cl^-)}$	
	$Q_{A(Cl^-)}$ = Assimilative Stream Flow Required to Achieve Criteria (cfs)	
	$Q_T = Q_S + Q_D$ (cfs)	
	$Q_{A(Cl^-)}C_{S(Cl^-)} + Q_D C_{P(Cl^-)} = (Q_D+Q_S)C_{C(Cl^-)}$	
	SOLVING FOR $Q_{A(Cl^-)} = [(Q_D C_{P(Cl^-)} / C_{C(Cl^-)}) - Q_D)] / (1 - C_{S(Cl^-)}/C_{C(Cl^-)})$ =	0.19124895 cfs
	$\%_{P(Cl^-)}$ = Percent of Stream Width Required to Assimilate Chlorides to Criteria Concentration = $Q_{A(Cl^-)} / Q_S$ (cfs) =	0.0633%
	$W_{I(Cl^-)}$ = Proposed Width of Stream required to Assimilate Chlorides to Criteria Concentration = W_S X $\%_{P(Cl^-)}$	0.063327 meters
	Proposed Area of Impact due to Chloride * = $(W_{I(Cl^-)})^2$ X 0.5 = * assuming equal flow across transect and 90° spread at discharge	0.00 m^2
Nickel (Ni)	$Q_{A(Ni)}C_{S(Ni)} + Q_D C_{P(Ni)} = Q_T C_{C(Ni)}$	
	$Q_{A(Ni)}$ = Assimilative Stream Flow Required to Achieve Criteria (cfs)	
	$Q_T = Q_S + Q_D$ (cfs)	
	$Q_{A(Ni)}C_{S(Ni)} + Q_D C_{P(Ni)} = (Q_D+Q_S)C_{C(Ni)}$	
	SOLVING FOR $Q_{A(Ni)} = [(Q_D C_{P(Ni)} / C_{C(Ni)}) - Q_D)] / (1 - C_{S(Ni)}/C_{C(Ni)})$ =	3.62060904 cfs
	$\%_{P(Cl^-)}$ = Percent of Stream Width Required to Assimilate Nickel to Criteria Concentration = $Q_{A(Ni)} / Q_S$ (cfs) =	1.1989%
	$W_{I(Ni)}$ = Proposed Width of Stream required to Assimilate Nickel to Criteria Concentration = W_S X $\%_{P(Ni)}$	1.198877 meters
	Proposed Area of Impact due to Nickel * = $(W_{I(Ni)})^2$ X 0.5 = * assuming equal flow across transect and 90° spread at discharge	0.72 m^2
Zinc (Zn)	$Q_{A(Zn)}C_{S(Zn)} + Q_D C_{P(Zn)} = Q_T C_{C(Zn)}$	
	$Q_{A(Zn)}$ = Assimilative Stream Flow Required to Achieve Criteria (cfs)	
	$Q_T = Q_S + Q_D$ (cfs)	
	$Q_{A(Zn)}C_{S(Zn)} + Q_D C_{P(Zn)} = (Q_D+Q_S)C_{C(Zn)}$	
	SOLVING FOR $Q_{A(Zn)} = [(Q_D C_{P(Zn)} / C_{C(Zn)}) - Q_D)] / (1 - C_{S(Zn)}/C_{C(Zn)})$ =	1.04353077 cfs
	$\%_{P(Cl^-)}$ = Percent of Stream Width Required to Assimilate Zinc to Criteria Concentration = $Q_{A(Zn)} / Q_S$ (cfs) =	0.3455%
	$W_{I(Zn)}$ = Proposed Width of Stream required to Assimilate Zinc to Criteria Concentration = W_S X $\%_{PZn)}$	0.345540 meters
	Proposed Area of Impact due to Zinc * = $(W_{I(Zn)})^2$ X 0.5 = * assuming equal flow across transect and 90° spread at discharge	0.06 m^2
Copper (Cu)	$Q_{A(Cu)}C_{S(Cu)} + Q_D C_{P(Cu)} = Q_T C_{C(Cu)}$	
	$Q_{A(Cu)}$ = Assimilative Stream Flow Required to Achieve Criteria (cfs)	
	$Q_T = Q_S + Q_D$ (cfs)	
	$Q_{A(Cu)}C_{S(Cu)} + Q_D C_{P(Cu)} = (Q_D+Q_S)C_{C(Cu)}$	
	SOLVING FOR $Q_{A(Cu)} = [(Q_D C_{PCu)} / C_{C(Cu)}) - Q_D)] / (1 - C_{S(Cu)}/C_{C(Cu)})$ =	-0.2042634 cfs
	$\%_{P(Cu)}$ = Percent of Stream Width Required to Assimilate Copper to Criteria Concentration = $Q_{A(Cu)} / Q_S$ (cfs) =	-0.0676%
	$W_{I(Cu)}$ = Proposed Width of Stream required to Assimilate Copper to Criteria Concentration = W_S X $\%_{PCu)}$	-0.067637 meters
	Proposed Area of Impact due to Copper * = $(W_{I(Cu)})^2$ X 0.5 = * assuming equal flow across transect and 90° spread at discharge	0.00 m^2
Ammonia-Nitrogen (NH3-N)	$Q_{A(NH3\text{-}N)}C_{S(NH3\text{-}N)} + Q_D C_{P(NH3\text{-}N)} = Q_T C_{C(NH3\text{-}N)}$	
	$Q_{A(NH3\text{-}N)}$ = Assimilative Stream Flow Required to Achieve Criteria (cfs)	
	$Q_T = Q_S + Q_D$ (cfs)	
	$Q_{A(NH3\text{-}N)}C_{S(NH3\text{-}N)} + Q_D C_{P(NH3\text{-}N)} = (Q_D+Q_S)C_{C(NH3\text{-}N)}$	
	SOLVING FOR $Q_{A(NH3\text{-}N)} = [(Q_D C_{P(NH3\text{-}N)} / C_{C(NH3\text{-}N)}) - Q_D)] / (1 - C_{S(NH3\text{-}N)}/C_{C(NH3\text{-}N)})$ =	-0.325856 cfs
	$\%_{P(NH3\text{-}N)}$ = Percent of Stream Width Required to Assimilate NH3-N to Criteria Concentration = $Q_{A(NH3\text{-}N)} / Q_S$ (cfs) =	-0.1079%
	$W_{I(NH3\text{-}N)}$ = Proposed Width of Stream required to Assimilate NH3-N to Criteria Concentration = W_S X $\%_{P(NH3\text{-}N)}$	-0.107899 meters
	Proposed Area of Impact due to NH3-N * = $(W_{I(NH3\text{-}N)})^2$ X 0.5 = * assuming equal flow across transect and 90° spread at discharge	0.01 m^2