Pennsylvania Department of Environmental Protection

Northwest Regional Office
CLEAN WATER PROGRAM

Application Type	**Renewal**	Application No.	**PA0025283**
Facility Type	**Municipal**	APS ID	**1113923**
Major / Minor	**Minor**	Authorization ID	**1485443**

NPDES PERMIT FACT SHEET INDIVIDUAL SEWAGE

Applicant and Facility Information

Applicant Name	**Knox Borough**	Facility Name	**Knox Borough STP**
Applicant Address	PO Box 366 620 S Main Street	Facility Address	194 Mcelhattan Road
	Knox, PA 16232-0366		Knox, PA 16232-0298
Applicant Contact	Sharon Heeter	Facility Contact	
Applicant Phone	(814) 797-1376	Facility Phone	
Client ID	65957	Site ID	457559
Ch 94 Load Status	Not Overloaded	Municipality	Knox Borough
Connection Status	No Limitations	County	Clarion
Date Application Received	April 30, 2024	EPA Waived?	Yes
Date Application Accepted	May 29, 2024	If No, Reason	

Purpose of Application: Permit renewal for discharge of treated sewage.

Summary of Review

1.0 General Discussion

This factsheet supports the renewal of an existing NPDES permit for discharge of treated domestic wastewater from Knox Borough (Borough) STP. The Borough owns, operates, and maintains the wastewater treatment plant. The facility services Knox Borough (96.5% flow) and Beaver Township (3.5% flow). The treatment plant has a hydraulic and annual average design capacity of 0.502MGD and the organic design capacity is 1,047lbs/day- BOD_5. The facility discharges treated sewage to Canoe Creek which is classified for High-Quality-Cold Water Fishes (HQ-CWF). The existing NPDES permit was issued on October 08, 2019, with an effective date of November 1, 2019, and expiration date of October 31, 2024. The applicant submitted a timely NPDES permit renewal application to the Department and is currently operating under the terms and conditions in the existing permit. A topographic map showing discharge locations is presented in attachment A.

1.1 Sludge use and disposal description and location(s):

Digested sludge is hauled out periodically to ADS Greentree Landfill for disposal.

1.2 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		*J. Pascal Kwedza* J. Pascal Kwedza, P.E. / Environmental Engineer	October 8, 2025
X		Adam Olesnanik Adam Olesnanik, P.E. / Environmental Engineer Manager	October 10, 2025

1.3 Discharge, Receiving Waters and Water Supply Information

Outfall No.	001	Design Flow (MGD)	0.502
Latitude	41º 13' 24.00"	Longitude	-79º 31' 12.00"
Quad Name	-	Quad Code	-
Wastewater Description:	Sewage Effluent		

Receiving Waters	Canoe Creek (HQ-CWF)	Stream Code	49377
NHD Com ID	102670459	RMI	5.3
Drainage Area	9.1	Yield (cfs/mi^2)	0.0795
Q_{7-10} Flow (cfs)	0.72	Q_{7-10} Basis	USGS Gage Station
Elevation (ft)	1268.86	Slope (ft/ft)	
Watershed No.	17-B	Chapter 93 Class.	HQ-CWF
Existing Use	-	Existing Use Qualifier	-
Exceptions to Use	-	Exceptions to Criteria	-
Assessment Status	Impaired		
Cause(s) of Impairment	Metals, pH		
Source(s) of Impairment	Acid Mine Drainage, Petroleum/Natural Gas Activities		
TMDL Status	-	Name	-

Background/Ambient Data		Data Source
pH (SU)	7.0	Default
Temperature (°F)	20	Default
Hardness (mg/L)	100	Default
Other:	-	-

Nearest Downstream Public Water Supply Intake	Parker Area Water Authority		
PWS Waters	Allegheny River	Flow at Intake (cfs)	
PWS RMI	85.0	Distance from Outfall (mi)	18.0

1.3.1 Water Supply Intake

The nearest downstream potable water supply is the Parker Area Water Authority on the Allegheny River, located approximately 18 miles below the point of discharge. Due to the distance and dilution, no impact is expected from this discharge on the intake.

2.0 Treatment Facility Summary				
Treatment Facility Name: Knox Borough STP				
WQM Permit No.	**Issuance Date**			
1614402	September 23, 2014			
Waste Type	**Degree of Treatment**	**Process Type**	**Disinfection**	**Avg Annual Flow (MGD)**
Sewage	Secondary	Activated Sludge	Gas Chlorine	0.502
Hydraulic Capacity (MGD)	**Organic Capacity (lbs/day)**	**Load Status**	**Biosolids Treatment**	**Biosolids Use/Disposal**
0.502	1047	Not Overloaded	Anaerobic Digestion	Land Application

Changes Since Last Permit Issuance: N/A

2.1 Treatment System

Flow enters the fine screen building and travels through the fine screen then through a Parshall flume located on the outside of the building. The flow is split in half and each half is piped into two treatment trains comprised of an aeration tank and a clarifier. The discharge out of the two clarifiers is combined and piped to a chlorine contact tank. The chlorine contact discharge flows through a de-chlorination tank and then through the outfall pipe towards the outfall. Sludge from the clarifier is pumped to two digesters for further digestion. Sludge dewatering is completed by eight sand drying beds

3.0 Existing Effluent Limitations and Monitoring Requirements

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	XXX	9.0 Max	XXX	1/day	Grab
DO	XXX	XXX	6.0 Inst Min	XXX	XXX	XXX	1/day	Grab
Total Residual Chlorine (TRC)	XXX	XXX	XXX	0.43	XXX	1.4	1/day	Grab
CBOD5 Nov 1 - Apr 30	105.0	167.0	XXX	25.0	40.0	50	1/week	24-Hr Composite
CBOD5 May 1 - Oct 31	63.0	96.0	XXX	15.0	23.0	30	1/week	24-Hr Composite
TSS	126.0	188.0	XXX	30.0	45.0	60	1/week	24-Hr Composite
Fecal Coliform (CFU/100 ml) Oct 1 - Apr 30	XXX	XXX	XXX	2000 Geo Mean	XXX	10000	1/week	Grab
Fecal Coliform (CFU/100 ml) May 1 - Sep 30	XXX	XXX	XXX	200 Geo Mean	XXX	1000	1/week	Grab
Total Nitrogen	Report	XXX	XXX	Report	XXX	XXX	1/month	Calculation
Ammonia Nov 1 - Apr 30	56.5	XXX	XXX	13.5	XXX	27	1/week	24-Hr Composite
Ammonia May 1 - Oct 31	19.0	XXX	XXX	4.5	XXX	9	1/week	24-Hr Composite
Total Phosphorus	Report	XXX	XXX	Report	XXX	XXX	1/month	24-Hr Composite

3.1 Compliance History

3.1.1 DMR Data for Outfall 001 (from September 1, 2024 to August 31, 2025)

Parameter	AUG-25	JUL-25	JUN-25	MAY-25	APR-25	MAR-25	FEB-25	JAN-25	DEC-24	NOV-24	OCT-24	SEP-24
Flow (MGD) Average Monthly	0.127	0.153	0.269	0.215	0.302	0.223	0.271	0.206	0.226	0.185	0.167	0.182
Flow (MGD) Weekly Average	0.167	0.166	0.403	0.266	0.382	0.270	0.328	0.262	0.281	0.241	0.188	0.201
pH (S.U.) Instantaneous Minimum	6.5	6.8	6.7	6.7	6.6	6.5	6.4	6.5	6.5	6.5	6.5	6.4
pH (S.U.) Instantaneous Maximum	7.2	7.2	7.2	7.2	7.2	6.9	7.1	7.0	6.9	7.0	7.1	7.2
DO (mg/L) Instantaneous Minimum	6.1	6.0	6.8	7.0	6.7	7.2	7.3	7.6	7.5	6.8	6.4	6.1
TRC (mg/L) Average Monthly	0.06	0.08	0.09	0.03	0.07	0.09	0.10	0.11	0.18	0.17	0.10	0.15
TRC (mg/L) Instantaneous Maximum	0.22	0.23	0.21	0.09	0.22	0.23	0.24	0.22	0.35	0.32	0.22	0.36
CBOD5 (lbs/day) Average Monthly	24.0	< 20.0	< 34.0	40.0	30.0	16.0	4.0	< 6.0	< 12.0	17.0	19.0	25.0
CBOD5 (lbs/day) Weekly Average	29.0	36.0	55.0	63.0	49.0	31.0	5.0	8.0	14.0	26.0	31.0	66.0
CBOD5 (mg/L) Average Monthly	21.0	< 16.0	21.0	21.0	15.0	9.0	9.0	< 4.0	< 6.0	11.0	13.0	21.0
CBOD5 (mg/L) Weekly Average	24.0	24.0	23.0	23.0	21.0	17.0	12.0	6.0	6.0	13.0	16.0	61.0
BOD5 (lbs/day) Raw Sewage Influent Average Monthly	257	234	293.0	319	357	321.0	241.0	264.0	206	234.0	435	295
BOD5 (mg/L) Raw Sewage Influent Average Monthly	225	191	133.0	171	185	174.0	120.0	172.0	106	157.0	340	212
TSS (lbs/day) Average Monthly	11.0	16.0	< 34.0	21.0	14.0	15.0	12.0	6.0	< 7.0	< 3.0	< 5.0	< 12.0

TSS (lbs/day) Raw Sewage Influent Average Monthly	133	212	335.0	358	290.0	309.0	189.0	264.0	1813	111.0	868	278
TSS (lbs/day) Weekly Average	20.0	42.0	< 55.0	40.0	28.0	28.0	18.0	9.0	< 8.0	4.0	6.0	26.0
TSS (mg/L) Average Monthly	10.0	14.0	< 14.0	11.0	7.0	9.0	6.0	4.0	< 3.0	6.0	< 3.0	< 9.0
TSS (mg/L) Raw Sewage Influent Average Monthly	129	173	151.0	198	145.0	169.0	97.0	174.0	962	76.0	716	202
TSS (mg/L) Weekly Average	20.0	40.0	32.0	13.0	12.0	16.0	8.0	5.0	4.0	11.0	4.0	24.0
Fecal Coliform (No./100 ml) Geometric Mean	99	< 60.0	127.0	< 345	67.0	31.0	33.0	< 10.0	< 2.0	< 1.0	< 3.0	< 3
Fecal Coliform (No./100 ml) Instantaneous Maximum	2420	2420.0	817.0	> 2420	2420	649.0	614.0	1987	4.0	4.0	7.0	10
Total Nitrogen (mg/L) Average Monthly	7.43	5.0	11.32	2.75	12.7	19.9	12.1	7.91	7.44	4.04	18.2	17.7
Ammonia (lbs/day) Average Monthly	< 0.4	3.0	5.0	8.0	13.6	3.9	< 6.5	2.7	< 11.5	2.9	17.0	12.0
Ammonia (mg/L) Average Monthly	< 0.4	2.75	3.29	3.07	7.69	2.12	< 3.38	1.86	< 5.69	1.84	12.05	6.61
Total Phosphorus (mg/L) Average Monthly	5.34	2.97	2.65	1.53	3.71	1.62	2.22	2.18	3.18	3.7	2.66	4.69

3.1,2 Effluent Violations for Outfall 001, from: October 1, 2024 To: August 31, 2025

Parameter	Date	SBC	DMR Value	Units	Limit Value	Units
CBOD5	06/30/25	Avg Mo	21.0	mg/L	15.0	mg/L
CBOD5	08/31/25	Avg Mo	21.0	mg/L	15.0	mg/L
CBOD5	05/31/25	Avg Mo	21.0	mg/L	15.0	mg/L
CBOD5	07/31/25	Avg Mo	< 16.0	mg/L	15.0	mg/L

CBOD5	07/31/25	Wkly Avg	24.0	mg/L	23.0	mg/L
CBOD5	08/31/25	Wkly Avg	24.0	mg/L	23.0	mg/L
Fecal Coliform	05/31/25	Geo Mean	< 345	No./100 ml	200	No./100 ml
Fecal Coliform	07/31/25	IMAX	2420.0	No./100 ml	1000	No./100 ml
Fecal Coliform	08/31/25	IMAX	2420	No./100 ml	1000	No./100 ml
Fecal Coliform	05/31/25	IMAX	> 2420	No./100 ml	1000	No./100 ml
Ammonia	10/31/24	Avg Mo	12.05	mg/L	4.5	mg/L

3.2.2 Summary of DMRs:

DMRs review for the facility for the last 12 months of operation, presented on the table above in section 3.1.1 indicates permit limits have not been met consistently. CBOD5, Fecal Coliform and Ammonia effluent violations were noted during the period reviewed and presented in section 3.1.2. The violations appear as operations related which could be addressed with operational changes.

3.2.3 Summary of Inspections:

The facility has been inspected a couple of times during the previous permit cycle. No effluent violations were noted during plant inspects. Several operations, maintenance and sampling requirement violations were noted. Recommendations were made to address them. There is one Clean Water open violation that will need to be closed out before this permit can be finalized.

4.0 Development of Effluent Limitations

Outfall No. 001 **Design Flow (MGD)** .502
Latitude 41º 13' 24.41" **Longitude** -79º 31' 12"
Wastewater Description: Sewage Effluent

4.1 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)

4.2 Mass-Based Limits

The federal regulation at 40 CFR 122.45(f) requires that effluent limits be expressed in terms of mass, if possible. The regulation at 40 CFR 122.45(b) requires that effluent limitations for POTWs be calculated based on the design flow of the facility. The mass-based limits are expressed in pounds per day and are calculated as follows: Mass based limit (lb/day) = concentration limit (mg/L) × design flow (mgd) × 8.34

4.3 Water Quality-Based Limitations

4.3.1 WQM 7.0 Stream Model

WQM 7.0 is a water quality model DEP utilizes to establish appropriate effluent limits for $CBOD_5$, NH_3-N and DO in permits. The model simulates mixing and degradation of NH_3-N in the stream and compares calculated instream NH_3-N concentrations to NH_3-N water quality criteria and also simulates mixing and consumption of D.O. in the stream due to the degradation of $CBOD_5$ and NH_3N and compares calculated instream D.O. concentrations to D.O. water quality criteria and recommends effluent limits

4.3.2 Stream flows

The stream flows are based on USGS Gage Station #03030500 on Clarion River near Piney, PA. The modelled yield is 0.0795-cfs per square mile based on gage station $Q_{7\text{-}10}$ of 76.8cfs and drainage area of 966 square miles. The drainage area at the discharge point taken from the previous factsheet = 9.1mi^2. The resulting streamflows at the point of discharge are as follows:

$Q_{7\text{-}10}$ = 9.1 mi^2 x 0.0795 cfs/mi^2 = 0.72 cfs
$Q_{30\text{-}10}/ Q_{7\text{-}10}$ = 1.36
$Q_{1\text{-}10}/ Q_{7\text{-}10}$ = 0.64

4.3.3 Input for WQM and TMS Models

The following data were used in the WQM and TMS models for water quality analysis of the stream:

- Discharge pH = 6.8 (DMR median)
- Discharge Temperature = 25 ^{o} C (Default)
- Discharge Hardness = 100 mg/l (Default)

4.3.4 $CBOD_5$

The attached results of WQM 7.0 stream model (attachment B) indicates a monthly average limit (AML) of 15mg/L(rounded) CBOD5 for summer months is required to protect the water quality of the stream. The existing technology AML of 25mg/L for winter months will remain in the permit. The recommended limits are consistent with the existing permit limits and the facility is meeting the limits. Therefore, the existing AML of 15 mg/L, weekly average limit (AWL) of 23mg/L and instantaneous maximum (IMAX) of 30mg/L will remain for summer months and for winter months AML of 25mg/L AWL of 40mg/L and IMAX of 50mg/L will remain with 1/week sampling frequency. Mass limits are calculated for AMLs and AWLs following the formula listed in section 4.2 above.

4.3.5 NH_3-N

The attached results of the WQM 7.0 stream model (attachment B) also indicate that a summer AML of mg/l 3.5 NH_3-N and IMAX of 7 mg/L and a winter AML of 10.5 mg/L NH_3-N and IMAX of 21mg/L are necessary to protect the aquatic life from toxicity effects. These limits are slightly more stringent than the existing limits, but DMR reports indicate the facility can meet the new limits. Associated mass limits are calculated following the formula listed in section 4.2 above.

4.3.6 Total Suspended Solids (TSS):

There is no water quality criteria for TSS. The existing limit of 30 mg/l AML based on the minimum level of effluent quality attainable by secondary treatment as defined in 40 CFR 133.102b(1) and 25 PA § 92a.47(a)(1) and an AWL of 45mg/L per 40CFR 133.102(b)(2) and 25 PA § 92a.47(a)(2) with their associated mass limit will remain in the permit with the existing sampling frequency of 1/week.

4.3.7 Toxics

A reasonable potential (RP) analysis was done for Total Copper, Total Lead and Total Zinc using the sampling results provided in the application using DEP's Toxics Management Spreadsheet (TMS)(Version 1.4). to calculate water quality-based effluent limits (WQBELs). WQBELs recommended by the TMS are presented in attachment C. Monitoring was recommended for Total Copper and Total Zinc. No limitation or monitoring is recommended for Total Lead. Monitoring Total Copper and Total Zinc 2/month is imposed in the permit to collect addition data for analysis during the next permit renewal. The recommended limits follow the logic presented in DEPs SOP, to establish limits in the permit where the maximum reported concentration exceeds 50% of the WQBEL, or for non-conservative pollutants to establish monitoring requirements where the maximum reported concentration is between 25% - 50% of the WQBEL, or to establish monitoring requirements for conservative pollutants where the maximum reported concentration is between 10% - 50% of the WQBEL.

4.3.8 Total Residual Chlorine

The attached TRC calculation results utilizes the equations and calculations as presented in the Department's May 1, 2003 Implementation Guidance for Total Residual Chlorine (TRC) (ID No. 391-2000-015) for developing chlorine limitations. The results presented in attachment D indicates a water quality limit of 0.14 mg/l monthly average and IMAX of 0.47 mg/l would be needed to prevent toxicity concerns. The recommended limitation is more stringent than the existing permit limit, but the facility has de-chlorination system and should be able to meet the new limitation.

4.3.9 Fecal Coliform and E. Coli

The existing Fecal Coliform limit is consistent with the technology limits recommended in 92a.47(a)(4) and (a)(5) and will remain in the permit. In March of 2021, EPA approved DEP's Triennial Review of Water Quality Standards, which included a new swimming season criterion for E. coli. As a result, DEP is including monitoring requirements for E. Coli in new and

renewed sewage permits above 2000gpd. Monitoring frequency is based on annual average flow as follows: 1/month for design flows >= 1 MGD, 1/quarter for design flows >= 0.05 and < 1 MGD and 1/year for design flows of 0.002 and < 0.05 MGD. Your discharge of 0.502 MGD requires 1/quarter monitoring as included in the permit.

4.3.10 Best Professional Judgment (BPJ) Limitations

DEP's SOP no. BPNPSM-PMT-033 (Establishing Effluent Limitations for Individual Sewage Permits) recommends monitoring requirements for Total Phosphorus and Total Nitrogen for all sewage facilities. Therefore, the existing annual monitoring for Total Phosphorus and Total Nitrogen will be continued in the permit.

4.3.11 Influent BOD and TSS Monitoring

The existing influent BOD5 and TSS monitoring at the same frequency as is done for effluent will remain in order to implement Chapter 94.12 and assess percent removal requirements.

4.3.12 Pretreatment Requirements

The design annual average flow of the treatment plant is 0.502 MGD and the facility receives flow from no significant Industrial users. There is no approved pretreatment program for the facility, however, the permit contains standard conditions requiring the permittee to monitor and control industrial users if applicable.

5.0 Other Considerations and Requirements

5.1 Flow Monitoring

The requirement to monitor the volume of effluent will remain in the permit per 40 CFR § 122.44(i)(1)(ii).

5.2 The permit contains the following special conditions:

1. Stormwater Prohibition. 2. Approval Contingencies, 3. Proper Waste/solids Management, 4. Restriction on receipt of hauled in waste under certain conditions. 5. Chlorine minimization.

5.3 Anti-Degradation (93.4)

The effluent limits for this discharge have been developed to ensure that existing instream water uses and the level of water quality necessary to protect the existing uses are maintained and protected. The facility discharge to a stream segment designated as High-Quality Waters. The discharge is not expected to impact the stream negatively. No Exceptional Value Waters are impacted by this discharge.

5.4 Class A Wild Trout Fisheries

No Class A Wild Trout Fisheries are impacted by this discharge.

5.5 303d Listed Streams

The discharge is located on a 303d listed stream segment as impaired for aquatic life by pH and metals caused by acid mine drainage and petroleum/natural gas activities. The impairments are listed as Category 5 which requires TMDL development. No TMDL has been developed yet, therefore no further action is warranted at this time.

6.0 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	XXX	9.0 Max	XXX	1/day	Grab
DO	XXX	XXX	6.0 Inst Min	XXX	XXX	XXX	1/day	Grab
TRC	XXX	XXX	XXX	0.14	XXX	0.47	1/day	Grab
CBOD5 Nov 1 - Apr 30	105.0	167.0	XXX	25.0	40.0	50	1/week	24-Hr Composite
CBOD5 May 1 – Oct 31	63.0	96.0	XXX	15.0	23.0	30	1/week	24-Hr Composite
BOD5 Raw Sewage Influent	Report	Report Daily Max	XXX	Report	Report	XXX	1/week	24-Hr Composite
TSS	126.0	188.0	XXX	30.0	45.0	60	1/week	24-Hr Composite
TSS Raw Sewage Influent	Report	Report Daily Max	XXX	Report	Report	XXX	1/week	24-Hr Composite
Fecal Coliform (CFU/100 ml) Oct 1 - Apr 30	XXX	XXX	XXX	2000 Geo Mean	XXX	10000	1/week	Grab
Fecal Coliform (CFU/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
Total Nitrogen	Report	XXX	XXX	Report	XXX	XXX	1/month	Calculation

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

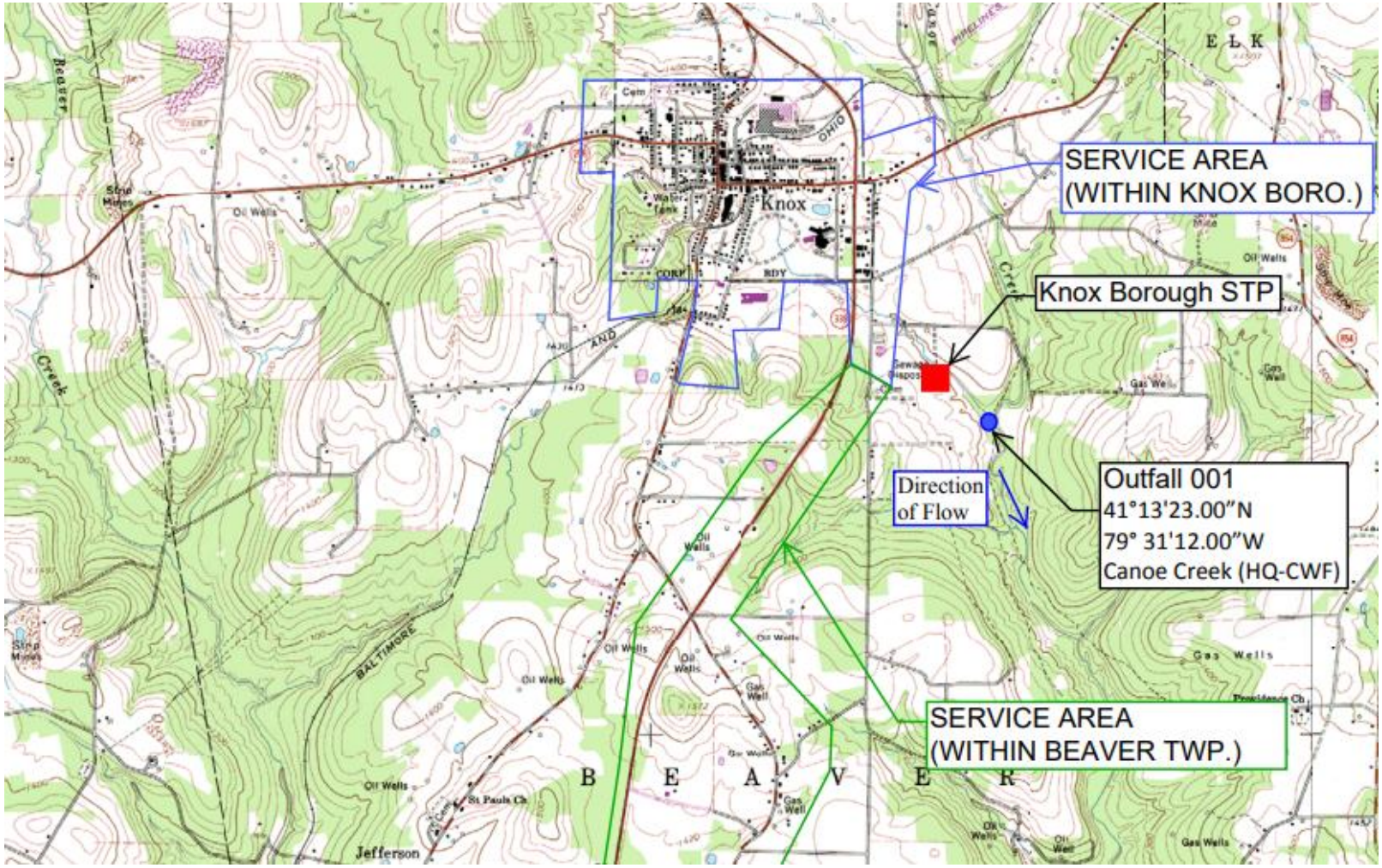
Parameter	Effluent Limitations						Monitoring Requirements	
	Mass Units (lbs/day) (1)		Concentrations (mg/L)				Minimum (2) Measurement Frequency	Required Sample Type
	Average Monthly	Weekly Average	Minimum	Average Monthly	Weekly Average	Instant. Maximum		
Ammonia Nov 1 - Apr 30	44	XXX	XXX	10.5	XXX	21	1/week	24-Hr Composite
Ammonia May 1 - Oct 31	14.70	XXX	XXX	3.5	XXX	7.0	1/week	24-Hr Composite
Total Phosphorus	Report	XXX	XXX	Report	XXX	XXX	1/month	24-Hr Composite
Total Copper	Report	Report Daily Max	XXX	Report	Report Daily Max	XXX	2/month	24-Hr Composite
Total Zinc	Report	Report Daily Max	XXX	Report	Report Daily Max	XXX	2/month	24-Hr Composite

Compliance Sampling Location: At Outfall 001

7.0 Tools and References Used to Develop Permit	
☒	WQM for Windows Model (see Attachment **B**)
☒	Toxics Management Spreadsheet (see Attachment **C**)
☒	TRC Model Spreadsheet (see Attachment **D)**
☐	Temperature Model Spreadsheet (see Attachment)
☒	Water Quality Toxics Management Strategy, 361-0100-003, 4/06.
☐	Technical Guidance for the Development and Specification of Effluent Limitations, 386-0400-001, 10/97.
☐	Policy for Permitting Surface Water Diversions, 386-2000-019, 3/98.
☐	Policy for Conducting Technical Reviews of Minor NPDES Renewal Applications, 386-2000-018, 11/96.
☐	Technology-Based Control Requirements for Water Treatment Plant Wastes, 386-2183-001, 10/97.
☐	Technical Guidance for Development of NPDES Permit Requirements Steam Electric Industry, 386-2183-002, 12/97.
☐	Pennsylvania CSO Policy, 386-2000-002, 9/08.
☐	Water Quality Antidegradation Implementation Guidance, 391-0300-002, 11/03.
☐	Implementation Guidance Evaluation & Process Thermal Discharge (316(a)) Federal Water Pollution Act, 386-2000-008, 4/97.
☒	Determining Water Quality-Based Effluent Limits, 386-2000-004, 12/97.
☐	Implementation Guidance Design Conditions, 386-2000-007, 9/97.
☒	Technical Reference Guide (TRG) WQM 7.0 for Windows, Wasteload Allocation Program for Dissolved Oxygen and Ammonia Nitrogen, Version 1.0, 386-2000-016, 6/2004.
☐	Interim Method for the Sampling and Analysis of Osmotic Pressure on Streams, Brines, and Industrial Discharges, 386-2000-012, 10/1997.
☐	Implementation Guidance for Section 95.6 Management of Point Source Phosphorus Discharges to Lakes, Ponds, and Impoundments, 386-2000-009, 3/99.
☐	Technical Reference Guide (TRG) PENTOXSD for Windows, PA Single Discharge Wasteload Allocation Program for Toxics, Version 2.0, 386-2000-015, 5/2004.
☒	Implementation Guidance for Section 93.7 Ammonia Criteria, 386-2000-022, 11/97.
☐	Policy and Procedure for Evaluating Wastewater Discharges to Intermittent and Ephemeral Streams, Drainage Channels and Swales, and Storm Sewers, 386-2000-013, 4/2008.
☒	Implementation Guidance Total Residual Chlorine (TRC) Regulation, 386-2000-011, 11/1994.
☐	Implementation Guidance for Temperature Criteria, 386-2000-001, 4/09.
☒	Implementation Guidance for Section 95.9 Phosphorus Discharges to Free Flowing Streams, 386-2000-021, 10/97.
☐	Implementation Guidance for Application of Section 93.5(e) for Potable Water Supply Protection Total Dissolved Solids, Nitrite-Nitrate, Non-Priority Pollutant Phenolics and Fluorides, 386-2000-020, 10/97.
☐	Field Data Collection and Evaluation Protocol for Determining Stream and Point Source Discharge Design Hardness, 386-2000-005, 3/99.
☐	Implementation Guidance for the Determination and Use of Background/Ambient Water Quality in the Determination of Wasteload Allocations and NPDES Effluent Limitations for Toxic Substances, 386-2000-010, 3/1999.
☐	Design Stream Flows, 386-2000-003, 9/98.
☐	Field Data Collection and Evaluation Protocol for Deriving Daily and Hourly Discharge Coefficients of Variation (CV) and Other Discharge Characteristics, 386-2000-006, 10/98.
☐	Evaluations of Phosphorus Discharges to Lakes, Ponds and Impoundments, 386-3200-001, 6/97.
☒	Pennsylvania's Chesapeake Bay Tributary Strategy Implementation Plan for NPDES Permitting, 4/07.
☒	SOP: Establishing effluent limitation for individual sewage permits.
☐	Other:

Attachments

A. Topographical Map



B. WQM Model Results

WQM 7.0 Effluent Limits

SWP Basin	Stream Code	Stream Name
17B	49377	CANOE CREEK

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)
5.300	Knox Borough	PA0025283	0.502	CBOD5	19.77		
				NH3-N	3.84	7.68	
				Dissolved Oxygen			5

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
17B	49377	CANOE CREEK	**5.300**	1268.29	9.10	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	0.079	0.00	0.00	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
Knox Borough	PA0025283	0.5020	0.5020	0.5020	0.000	25.00	6.80

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	5.00	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
17B	49377	CANOE CREEK	**4.870**	1255.95	9.30	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	0.079	0.00	0.00	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
17B	49377	CANOE CREEK

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												
5.300	0.72	0.00	0.72	.7766	0.00544	.542	16.96	31.31	0.16	0.161	22.59	6.89
Q1-10 Flow												
5.300	0.46	0.00	0.46	.7766	0.00544	NA	NA	NA	0.15	0.179	23.13	6.86
Q30-10 Flow												
5.300	0.98	0.00	0.98	.7766	0.00544	NA	NA	NA	0.18	0.147	22.21	6.90

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	6		

WQM 7.0 Wasteload Allocations

SWP Basin	Stream Code	Stream Name
17B	49377	CANOE CREEK

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
5.300	Knox Borough	14.4	22.98	14.4	22.98	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
5.300	Knox Borough	1.69	3.84	1.69	3.84	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)		
5.30	Knox Borough	19.77	19.77	3.84	3.84	5	5	0	0

WQM 7.0 D.O.Simulation

SWP Basin	Stream Code	Stream Name
17B	49377	CANOE CREEK

RMI	Total Discharge Flow (mgd)	Analysis Temperature (°C)	Analysis pH
5.300	0.502	22.589	6.885
Reach Width (ft)	**Reach Depth (ft)**	**Reach WDRatio**	**Reach Velocity (fps)**
16.957	0.542	31.309	0.163
Reach CBOD5 (mg/L)	**Reach Kc (1/days)**	**Reach NH3-N (mg/L)**	**Reach Kn (1/days)**
11.20	1.073	1.99	0.854
Reach DO (mg/L)	**Reach Kr (1/days)**	**Kr Equation**	**Reach DO Goal (mg/L)**
6.564	8.969	Tsivoglou	6
Reach Travel Time (days)			
0.161			

Subreach Results

TravTime (days)	CBOD5 (mg/L)	NH3-N (mg/L)	D.O. (mg/L)
0.016	10.98	1.96	6.44
0.032	10.77	1.93	6.34
0.048	10.56	1.91	6.26
0.064	10.36	1.88	6.20
0.080	10.16	1.86	6.15
0.097	9.96	1.83	6.12
0.113	9.77	1.81	6.09
0.129	9.58	1.78	6.08
0.145	9.40	1.76	6.08
0.161	9.22	1.73	6.08

C. TMS Results

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Toxics Management Spreadsheet
Version 1.4, May 2023

Discharge Information

Instructions | Discharge | Stream

Facility: **Knox Borough STP** NPDES Permit No.: **PA0025283** Outfall No.: **001**

Evaluation Type: **Major Sewage / Industrial Waste** Wastewater Description: **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
0.502	100	6.8						

					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	µg/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	µg/L		8									
	Free Cyanide	µg/L											
	Total Cyanide	µg/L											
	Dissolved Iron	µg/L	<										
	Total Iron	µg/L											
	Total Lead	µg/L	<	1									
	Total Manganese	µg/L											
	Total Mercury	µg/L	<										
	Total Nickel	µg/L	<										
	Total Phenols (Phenolics) (PWS)	µg/L	<										
	Total Selenium	µg/L	<										
	Total Silver	µg/L	<										
	Total Thallium	µg/L	<										
	Total Zinc	µg/L		74									
	Total Molybdenum	µg/L											

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Toxics Management Spreadsheet
Version 1.4, May 2023

Stream / Surface Water Information

Knox Borough STP, NPDES Permit No. PA0025283, Outfall 001

Instructions | Discharge | *Stream*

Receiving Surface Water Name: **Canoe Creek**

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	049377	5.3	1268.29	9.1			Yes
End of Reach 1	049377	4.87	1255.96	9.8			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	5.3	0.0795										100	7		
End of Reach 1	4.87	0.0795													

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	5.3														
End of Reach 1	4.87														

Model Results

Knox Borough STP, NPDES Permit No. PA0025283, Outfall 001

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

☐ *Hydrodynamics*

☑ *Wasteload Allocations*

☑ ***AFC*** CCT (min): 3.121 PMF: 1 Analysis Hardness (mg/l): 100 Analysis pH: 6.89

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	27.0	Chem Translator of 0.96 applied
Total Lead	0	0		0	64.581	81.6	158	Chem Translator of 0.791 applied
Total Zinc	0	0		0	117.180	120	231	Chem Translator of 0.978 applied

☑ ***CFC*** CCT (min): 3.121 PMF: 1 Analysis Hardness (mg/l): 100 Analysis pH: 6.89

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	18.0	Chem Translator of 0.96 applied
Total Lead	0	0		0	2.517	3.18	6.15	Chem Translator of 0.791 applied
Total Zinc	0	0		0	118.139	120	231	Chem Translator of 0.986 applied

☑ ***THH*** CCT (min): 3.121 PMF: 1 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 Zinc	0	0		0	N/A	N/A	N/A	

☑ ***CRL*** CCT (min): 3.982 PMF: 1 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 Zinc	0	0		0	N/A	N/A	N/A	

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

No. Samples/Month: 4

	Mass Limits		*Concentration Limits*						
Pollutants	AML (lbs/day)	MDL (lbs/day)	AML	MDL	IMAX	Units	Governing WQBEL	WQBEL Basis	Comments
Total Copper	Report	Report	Report	Report	Report	µg/L	17.3	AFC	Discharge Conc > 10% WQBEL (no RP)
Total Zinc	Report	Report	Report	Report	Report	µg/L	148	AFC	Discharge Conc > 10% WQBEL (no RP)

☑ ***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 Lead	N/A	N/A	Discharge Conc < TQL

D. TRC Results

TRC EVALUATION

Input appropriate values in A3:A9 and D3:D9

0.72	= Q stream (cfs)	0.5	= CV Daily
0.502	= Q discharge (MGD)	0.5	= CV Hourly
30	= no. samples	1	= AFC_Partial Mix Factor
0.3	= Chlorine Demand of Stream	1	= CFC_Partial Mix Factor
0	= Chlorine Demand of Discharge	15	= AFC_Criteria Compliance Time (min)
0.5	= BAT/BPJ Value	720	= CFC_Criteria Compliance Time (min)
0	= % Factor of Safety (FOS)	0	=Decay Coefficient (K)

Source	Reference	AFC Calculations	Reference	CFC Calculations
TRC	1.3.2.iii	WLA afc = 0.315	1.3.2.iii	WLA cfc = 0.299
PENTOXSD TRG	5.1a	LTAMULT afc = 0.373	5.1c	LTAMULT cfc = 0.581
PENTOXSD TRG	5.1b	LTA_afc= 0.117	5.1d	LTA_cfc = 0.174

Source		Effluent Limit Calculations	
PENTOXSD TRG	5.1f	AML MULT = 1.231	
PENTOXSD TRG	5.1g	AVG MON LIMIT (mg/l) = 0.144	AFC
		INST MAX LIMIT (mg/l) = 0.472	

WLA afc	**(.019/e(-k*AFC_tc)) + [(AFC_Yc*Qs*.019/Qd*e(-k*AFC_tc))... ...+ Xd + (AFC_Yc*Qs*Xs/Qd)]*(1-FOS/100)**
LTAMULT afc	EXP((0.5*LN(cvh^2+1))-2.326*LN(cvh^2+1)^0.5)
LTA_afc	wla_afc*LTAMULT_afc
WLA_cfc	**(.011/e(-k*CFC_tc) + [(CFC_Yc*Qs*.011/Qd*e(-k*CFC_tc))... ...+ Xd + (CFC_Yc*Qs*Xs/Qd)]*(1-FOS/100)**
LTAMULT_cfc	EXP((0.5*LN(cvd^2/no_samples+1))-2.326*LN(cvd^2/no_samples+1)^0.5)
LTA_cfc	wla_cfc*LTAMULT_cfc
AML MULT	EXP(2.326*LN((cvd^2/no_samples+1)^0.5)-0.5*LN(cvd^2/no_samples+1))
AVG MON LIMIT	MIN(BAT_BPJ,MIN(LTA_afc,LTA_cfc)*AML_MULT)
INST MAX LIMIT	**1.5*((av_mon_limit/AML_MULT)/LTAMULT_afc)**