pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Southcentral Regional Office
CLEAN WATER PROGRAM

Application Type	**Renewal**	Application No.	**PA0021806**
Facility Type	**Municipal**	APS ID	**35069**
Major / Minor	**Minor**	Authorization ID	**1344334**

NPDES PERMIT FACT SHEET
INDIVIDUAL SEWAGE

Applicant and Facility Information

Applicant Name	**Annville Township Authority**	Facility Name	**Annville Township STP**
Applicant Address	PO Box 178	Facility Address	675 W Main Street
	Annville, PA 17003-0178		Annville, PA 17003-1235
Applicant Contact	Nicholas Yingst	Facility Contact	Les Powell
Applicant Phone	(717) 867-4476	Facility Phone	(717) 867-1992
Client ID	83361	Site ID	253421
Ch 94 Load Status	Not Overloaded	Municipality	Annville Township
Connection Status	No Limitations	County	Lebanon
Date Application Received	March 2, 2021	EPA Waived?	No
Date Application Accepted	March 15, 2021	If No, Reason	Significant CB Discharge

Purpose of Application: NPDES permit renewal for discharge of treated sewage

Summary of Review

1.0 General Discussion

This fact sheet supports the renewal of an existing NPDES permit for discharge of treated wastewater from Annville Township wastewater treatment plant. Annville Township owns the wastewater treatment plant, but Annville Township Authority operates, and maintains the wastewater treatment plant. The facility is located in North Annville Township, Lebanon County. The facility serves Township of Annville and North Annville Township. The facility also receives septage and hauled -in waste for processing. The facility utilizes activated sludge treatment process with clarifiers and denitrification filters for wastewater treatment to provide enhanced nutrient removal. The collection system has no combined sewers. The treatment plant has annual average design flow of 0.80 MGD, hydraulic capacity of 1.09 MGD and organic capacity of 3,520 lbs/dayBOD5. The discharge goes to Quittapahilla Creek which is classified for trout stocking (TSF) in 25 PA Code, Chapter 93. The existing NPDES permit was issued on August 30, 2016 with an effective date of September 1, 2016 and expiration date of August 31, 2021. The applicant submitted a timely NPDES renewal application to the Department and is currently operating under the terms and conditions in the existing permit under administrative extension provisions pending Department action on the renewal application. A topographic map showing the discharge location is presented in attachment A.

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

The facility produces Class B Biosolids which is land applied under a biosolids permit number PAG-08-3504.

Approve	Deny	Signatures	Date
X		*J. Pascal Kwedza* J. Pascal Kwedza, P.E. / Environmental Engineer	February 24, 2022
X		*Maria D. Bebenek for* Daniel W. Martin, P.E. / Environmental Engineer Manager	March 1, 2022
X		*Maria D. Bebenek* Maria D. Bebenek, P.E./ Program Manager	March 1, 2022

Summary of Review

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.

1.3.0 Changes to the existing permit

- E. Coli monitoring has been added
- Monitoring of Total Copper and Total Lead has been added.

1.3.1 Existing Limitations and Monitoring Requirements

DISCHARGE LIMITATIONS								MONITORING REQUIREMENTS	
	Mass Units lbs/day			Concentrations mg/l					
Discharge Parameter	Average Monthly	Average Weekly	Maximum Daily	Average Monthly	Average Weekly	Maximum Daily	Inst. Maximum	Monitoring Frequency	Sample Type
Flow (mgd)	Monitor & Report	XXX	Monitor & Report	XXX	XXX	XXX	XXX	1/week	measured
pH (S.U.)	XXX	XXX	XXX	From 6.0 to 9.0 inclusive				1/day	Grab
D.O.	XXX	XXX	XXX	Minimum of 5.0 mg/l at all times				1/day	Grab
TSS	200	300	XXX	30	45	XXX	60	1/week	24-hour comp
$CBOD_5$	167	267	XXX	25	40	XXX	50	1/week	24-hour comp
TRC	XXX	XXX	XXX	0.5	XXX	XXX	1.63	1/week	24-hour comp
NH_3-N (5/1 to 10/31)	57	XXX	XXX	8.5	XXX	XXX	17	1/week	24-hour comp
NH_3-N (11/1 to 4/30)	Report	XXX	XXX	Report	XXX	XXX	Report	1/week	24-hour comp
Fecal Col. (5/1 to 9/30)	XXX	XXX	XXX	200	XXX	XXX	XXX	1/week	Grab
Fecal Col. (10/1 to 4/30)	XXX	XXX	XXX	2,000	XXX	XXX	XXX	1/week	Grab
Total Phos.	13	XXX	XXX	2.0	XXX	XXX	4.0	1/week	24-hour comp

Summary of Review

1.3.2 Chesapeake Bay Limitations

Discharge Parameter	Effluent Limitations					Monitoring Requirements	
	Mass Load(lbs)		Concentrations (mg/l)			Minimum Measurement Frequency	Required Sample Type
	Monthly	Annual	Minimum	Monthly Average	Maximum		
Ammonia---N	Report	Report	XXX	Report	XXX	1/week	24-hr Comp
Kjeldahl---N	Report	XXX	XXX	Report	XXX	2/Week	24-hr Comp
Nitrate-Nitrite as N	Report	XXX	XXX	Report	XXX	2/Week	24-hr Comp
Total Nitrogen	Report	Report	XXX	Report	XXX	1/Month	Calculate
Total Phosphorus	Report	Report	XXX	Report	XXX	2/week	24-hr Comp
Net Total Nitrogen	Report	13,698	XXX	XXX	XXX	1/Month	Calculate
Net Total Phos.	Report	1,826	XXX	XXX	XXX	1/Month	Calculate

1.4.0 Discharge, Receiving Waters and Water Supply Information

Outfall No.	001	Design Flow (MGD)	.75
Latitude	40º 19' 43.54"	Longitude	-76º 31' 43.54"
Quad Name	Palmyra	Quad Code	1633
Wastewater Description:	Sewage Effluent		
Receiving Waters	Quittapahilla Creek	Stream Code	09691
NHD Com ID	133783863	RMI	7.10
Drainage Area	52.8	Yield (cfs/mi^2)	0.14
Q_{7-10} Flow (cfs)	7.39	Q_{7-10} Basis	USGS Gage Station
Elevation (ft)	377	Slope (ft/ft)	
Watershed No.	7-D	Chapter 93 Class.	TSF
Existing Use		Existing Use Qualifier	
Exceptions to Use		Exceptions to Criteria	
Assessment Status	Impaired		
Cause(s) of Impairment	Flow Alterations, Pathogens, Siltation		
Source(s) of Impairment	Agriculture, Source Unknown, Urban Runoff/Storm Sewers		
TMDL Status	Final	Name	Quittapahilla Creek Watershed

Background/Ambient Data		Data Source
pH (SU)		
Temperature (°F)		
Hardness (mg/L)		
Other:		

Nearest Downstream Public Water Supply Intake	PA American Water Company		
PWS Waters	Swatara Creek	Flow at Intake (cfs)	
PWS RMI		Distance from Outfall (mi)	<17

Changes Since Last Permit Issuance: None

1.4.1 Water Supply Intake

The closest water supply intake located downstream from the discharge is by PA American Water Co. on Swatara Creek in South Hanover Township, Dauphin County. The distance downstream from the discharge to the intake is approximately 17 miles. No impact is expected from this discharge.

2.0 Treatment Facility Summary

Treatment Facility Name: Annville Township STP

WQM Permit No.	Issuance Date
3800403 -3	07/26/2019
3800403 A-2	04/26/2018
3800403 10-1	5/23/2011

Waste Type	Degree of Treatment	Process Type	Disinfection	Avg Annual Flow (MGD)
Sewage	Tertiary	Activated Sludge With Solids Removal	Gas Chlorine	0.8

Hydraulic Capacity (MGD)	Organic Capacity (lbs/day)	Load Status	Biosolids Treatment	Biosolids Use/Disposal
1.09	3520	Not Overloaded	Aerobic Digestion	Land Application

Changes Since Last Permit Issuance: Permit amendment was issued on 04/26/2018 for installtion of a bar screen to replace the existing influent grinder. A second permit amendment was issued on 07/26/2019 to construct centrifuge for sludge dewatering.

2.1 Treatment Facility Description

The treatment plant consists of bar screen, influent pump station, headworks with two rotamat screening units and a degriter,(one for septage screening and the other for influent screening). Screened influent wastewater flow by gravity from the headworks to 2 contact stabilization units (first stage) where the bulk of BOD is removed. Screened wastewater from the septage is stored in a holding tank and pumped to the South gravity thickener where settleable solids are separated from the liquid portion of the hauled waste. The supernatant from the thickener then flows by gravity to the first stage for treatment. From the first stage, the effluent flow by gravity to the 2 secondary aeration tanks (second stage) for further treatment of BOD and for nitrification. Effluent from the second stage flow to the 2 final clarifiers and then pumped to the 3 denitrification filters. Denitrified effluent is chlorinated and flow by gravity through the 2 aerated chlorine contact tanks prior to discharge to Quittapahilla Creek via outfall 001. Waste activated sludge from the first and second stages are pumped to the North gravity thickener for thickening prior to pumping to one of the five aerobic digesters and there is a centrifuge to dewater sludge. Supernatant from the thickener is returned to the first stage. Backwash water from the three denitrification filters is discharged to one of the two lined storage basins for settling and returned to the head of the plant.

2.2 Treatment Chemical

- Aluminum Sulfate for phosphorus precipitation
- Polymer for coagulation
- Chlorine for disinfection

3.0 Compliance History

3.1 DMR Data for Outfall 001 (from January 1, 2021 to December 31, 2021)

Parameter	DEC-21	NOV-21	OCT-21	SEP-21	AUG-21	JUL-21	JUN-21	MAY-21	APR-21	MAR-21	FEB-21	JAN-21
Flow (MGD) Average Monthly	0.5326	0.6107	0.6258	1.0511	0.5356	0.5494	0.5085	0.5652	0.6455	0.7772	0.6266	0.6319
Flow (MGD) Daily Maximum	0.7429	0.7427	0.7814	1.8358	0.7724	0.7876	0.5696	0.7380	0.8378	1.2373	1.08	0.8768
pH (S.U.) Minimum	7.2	7.2	7.3	7.2	7.3	7.2	7.2	7.0	7.1	7.2	7.2	7.2
pH (S.U.) Maximum	7.8	7.7	7.8	7.7	7.9	7.9	7.8	7.8	7.7	7.7	7.7	7.7
DO (mg/L) Minimum	9.2	7.7	8.3	5.9	7.9	8.1	8.1	8.0	8.3	7.2	8.6	8.1
TRC (mg/L) Average Monthly	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.3
TRC (mg/L) Maximum	0.67	0.62	0.93	0.62	0.66	0.59	0.71	0.87	0.63	0.62	0.64	0.72
CBOD5 (lbs/day) Average Monthly	17	17	18	37	15	14	14	13	17	37	18	18
CBOD5 (lbs/day) Weekly Average	23	22	18	85	19	17	20	15	22	52	22	25
CBOD5 (mg/L) Average Monthly	3.6	3.2	3.3	4.5	3.2	3.0	2.9	2.6	3.0	5.7	3.3	3.4
CBOD5 (mg/L) Weekly Average	4.1	4.4	3.6	8.7	4.3	3.4	4.2	2.8	3.7	9.2	4.3	4.8
BOD5 (lbs/day) Raw Sewage Influent Ave. Monthly	968	1093	1079	1191	942	743	795	959	954	920	795	583
BOD5 (lbs/day) Raw Sewage Influent Daily Maximum	1054	1215	1258	1731	1139	840	913	1087	1138	1152	930	737
BOD5 (mg/L) Raw Sewage Influent Ave. Monthly	203	206	198	157	197	157	171	190	164	142	151	108
TSS (lbs/day) Average Monthly	13	23	15	43	13	22	30	19	17	42	20	12
TSS (lbs/day) Raw Sewage Influent Ave. Monthly	1222	1469	1345	1450	1442	1002	1145	1283	1370	984	1148	824

TSS (lbs/day) Raw Sewage Influent Daily Maximum	1553	1559	1525	2059	1701	1103	1453	1566	1958	1506	1457	1252
TSS (lbs/day) Weekly Average	21	28	19	76	20	38	46	24	23	136	29	16
TSS (mg/L) Average Monthly	2.7	4.4	2.7	5.8	2.7	4.5	6.4	3.6	3.0	5.3	3.6	2.3
TSS (mg/L) Raw Sewage Influent Aver. Monthly	257	278	248	191	299	212	246	255	238	147	217	150
TSS (mg/L) Weekly Average	4.0	5.6	3.2	10.0	4.4	8.2	9.8	4.2	4.0	14.4	4.4	2.6
Fecal Coliform (CFU/100 ml) Geometric Mean	4	45	18	158	80	24	17	9	13	28	9	4
Fecal Coliform (CFU/100 ml) Instant. Maximum	5	709	85	793	247	510	100	44	270	195	27	14
Nitrate-Nitrite (mg/L) Average Monthly	2.3	1.0	1.3	2.6	3.0	2.4	1.0	0.7	0.4	0.6	1.1	2.0
Nitrate-Nitrite (lbs) Total Monthly	356	154	229	613	419	384	125	102	73	131	146	394
Total Nitrogen (mg/L) Average Monthly	3.1	3.5	2.2	5.1	4.0	3.5	1.7	2.4	1.1	1.5	2.1	3.1
Total Nitrogen (lbs) Effluent Net Total Monthly	463	520	378	1192	552	547	211	350	187	320	295	577
Total Nitrogen (lbs) Total Monthly	463	520	378	1192	552	547	211	350	187	320	295	577
Total Nitrogen (lbs) Effluent Net Total Annual				10838								
Total Nitrogen (lbs) Total Annual				5199								
Ammonia (lbs/day) Average Monthly	0.37	12.92	3.05	7.7	0.74	6.36	0.87	0.84	0.56	1.25	0.29	0.79
Ammonia (mg/L) Average Monthly	0.08	2.57	0.56	1.02	0.15	1.27	0.19	0.17	0.10	0.16	0.06	0.12
Ammonia (lbs) Total Monthly	11.6	387.7	94.4	231	22.9	197	26.1	26.1	16.9	38.6	8.2	24.4
Ammonia (lbs) Total Annual				622								
TKN (mg/L) Average Monthly	0.77	2.46	0.86	2.56	0.93	1.05	0.67	1.71	0.69	0.88	1.04	1.06

TKN (lbs) Total Monthly	108	366	149	578	133	163	86	248	114	189	149	183
Total Phosphorus (lbs/day) Ave. Monthly	4.0	3.9	5.2	5.1	3.8	3.7	3.3	4.7	4.4	4.4	3.5	3.3
Total Phosphorus (mg/L) Ave. Monthly	0.8	0.7	0.9	0.7	0.8	0.7	0.7	0.9	0.8	0.7	0.6	0.6
Total Phosphorus (lbs) Effluent Net Total Monthly	123	116	160	153	117	113	98	145	132	138	99	102
Total Phosphorus (lbs) Total Monthly	123	116	160	153	117	113	98	145	132	138	99	102
Total Phosphorus (lbs) Effluent Net Total Annual				1389								
Total Phosphorus (lbs) Total Annual				1389								

3.2 Summary of Discharge Monitoring Reports (DMRs)**:**

DMRs review for the facility for the last 12 months of operation, presented on the table above in section 3.1 indicate permit limits have been met consistently. No effluent violations were noted on DMRs during the period reviewed.

3.3 Summary of Inspections:

The facility has been inspected a couple times during last permit cycle. No effluent violations were found during plant inspections. The facility is operated and well maintained.

4.0 Development of Effluent Limitations

Outfall No. 001 **Design Flow (MGD)** .8
Latitude 40º 19' 43.54" **Longitude** -76º 31' 43.54"
Wastewater Description: Sewage Effluent

4.1 Basis for Effluent Limitations

In general, the CWA requires that the effluent limits for a particular pollutant be the more stringent of either technology-based limits or water quality-based limits. Technology-based limits are set according to the level of treatment that is achievable using available technology. A water quality-based effluent limit is designed to ensure that the water quality standards applicable to a waterbody are being met and may be more stringent than technology-based effluent limits.

4.2 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)

4.3 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

4.4 Water Quality-Based Limitations

4.4.1 Receiving Stream

The receiving stream is the Quittapahilla Creek. According to 25 PA § 93.9o, this stream is protected for Warm Water Fishes (WWF) and Migratory Fishes (MF). It is located in Drainage List o and State Watershed 7-D. It has been assigned stream code 09691. According to the Department's 2014 Pennsylvania Integrated Water Quality Monitoring and Assessment Report, Quittapahilla Creek watershed is impaired for flow alterations, pathogens, siltation and urban runoff/. Source is agriculture, unknown and storm sewers respectively. TMDL is completed and approved by EPA in 2001. See 303d listed streams section of the report for further discussion.

4.4.2 Streamflow:

The Technical Support Document for Water Quality-Based Toxics Control (TSD) (EPA, 1991) and the Pennsylvania Water Quality Standards PA WQS) recommend the flow conditions to use in calculating water quality-based effluent limits

(WQBELs) using steady-state modeling. The TSD and the PA WQS state that WQBELs intended to protect aquatic life uses should be based on the lowest seven-day average flow rate expected to occur once every ten years (Q_{7-10}) for chronic criteria and the lowest one-day average flow rate expected to occur once every ten years (Q_{1-10}) for acute criteria. However, because the chronic criterion for ammonia is a 30-day average concentration not to be exceeded more than once every three years, EPA has used the Q_{30-10} for the chronic ammonia criterion instead of the Q_{7-10}. The Q_{30-10} is a biologically based design flow intended to ensure an excursion frequency of once every three years for a 30-day average flow rate. These flows were determined by correlating with the yield of USGS gage No. 01573560 on Swatara Creek near Hershey.
The Q_{7-10} and drainage area at the gage is 67.7ft3/s and 483mi^2 respectively. The resulting yields are as follows:

- Q_{7-10} = (67.7ft^3/s)/483 mi^2 = 0.14ft^3/s/ mi^2
- Q_{30-10} / Q_{7-10} = 0.89
- Q_{1-10} / Q_{7-10} = 1.23

The drainage area at the point of discharge taken from the previous protection report is 52.8 mi^2.

The Q_{7-10} at discharge = 52.8 mi^2 x 0.14 ft^3/s/mi^2 = 7.39 ft^3/s.

4.4.3 NH_3N Calculations

NH_3N calculations will be based on the Department's Implementation Guidance of Section 93.7 Ammonia Criteria, dated 11/4/97 (ID No. 391-2000-013). The following data is necessary to determine the instream NH_3N criteria used in the attached computer model of the stream:

- Discharge pH = 7.2 (DMR median)
- Discharge Temperature = 25 ^{o} C (Default)
- Stream pH = 7.8 (WQN Station on Quittapahilla Creek)
- Stream Temperature = 19 ^{o}C (WQN Station on Quittapahilla Creek)
- Background NH_3-N = 0.0 (default)

4.4.4 $CBOD_5$

The attached results of WQM 7.0 stream model presented in attachment B indicates that a monthly average limit of 25 mg/l CBOD5 is required to protect the water quality of the stream. This is consistent with the existing permit, therefore, the existing average monthly limit (AML) of 25mg/l, average weekly limit (AWL) of 40mg/l and IMAX of 50mg/l will remain in the permit. Past DMRs and inspection reports show the STP has been consistently achieving below 10 mg/l CBOD5. Mass limits are calculated using the equation presented in section 4.3.

4.4.5 NH_3-N

The attached results of WQM 7.0 stream model (attachment B) also indicates a summer limit of 10.1 mg/l NH_3 as a monthly average is necessary to protect the aquatic life from toxicity effects. This is slightly less stringent than the existing permit limitation and will not be written in the permit due to anti-backsliding restrictions. The existing summer limit of 8.5mg/l will remain in the permit. Winter results will be reported. Mass limits are calculated using the equation presented in section 4.3.

4.4.6 Dissolved Oxygen

The existing permit contains a limit of 5 mg/l for Dissolved Oxygen (DO). DEP's Technical Guidance for the Development and Specification of Effluent Limitations (362-0400-001, 10/97) suggests that either the adopted minimum stream D.O. criteria for the receiving stream or the effluent level determined through water quality modeling be used for the limit. Since the WQM 7.0 model was run using a minimum D.O. of 5.0 mg/l, this limit will be continued in the renewed permit with a daily monitoring requirement per DEP guidance.

4.4.7 Total Suspended Solids (TSS):

There is no water quality criteria for TSS. A limit of 30 mg/l AML in the existing permit which was 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 associated mass limits will remain in the permit. Mass limits are calculated using the equation presented in section 4.3.

4.4.8 Toxics

A reasonable potential (RP) analysis was done for pollutants sampled in support of the permit renewal application. All pollutants that were presented in the application sampling data were entered into DEP's Toxics Management Spreadsheet (TMS) to calculate WQBELs. The results of the TMS are presented in attachment C. Monitoring was recommended for Total Copper and Total Lead. The permittee had an opportunity to re-sample Total Copper and Total lead using a more sensitive method. The permit will be drafted requiring monitoring for Total Copper and Total Lead. If the results of the re-samples pollutants are non-detect using DEP's target QL for analysis, the monitoring requirement will be dropped from the final permit.

The recommended limitations 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.

4.4.9 TDS, Chloride, Sulfate, Bromide, and 1,4-dioxane

The maximum daily TDS data submitted with the application is 324 mg/l which is equivalent to 1216 lbs/day based on the permitted flow of 0.45 MGD. The discharge level for TDS is well below 1000 mg/l and the 20,000lbs/day cut-off to require monitoring in the permit. There is no data on 1,4-dioxane.

4.4.10 Influent BOD and TSS Monitoring

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

4.4.11 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 – 0.05 MGD. Your discharge of 0.8MGD requires 1/quarter monitoring as included in the permit.

4.4.12 Chesapeake Bay Strategy

The Department formulated a strategy in April 2007, to comply with the EPA and Chesapeake Bay requirements to reduce point source loadings of Total Nitrogen (TN) and Total Phosphorus (TP) to the Bay. In the Strategy, sewage dischargers have been prioritized by DEP based on their delivered TN loadings to the Bay. The highest priority (Phases 1, 2, and 3) dischargers received annual loading caps based on their design flow on August 29, 2005 and concentrations of 6 mg/l TN and 0.8 mg/l TP. Phase 4 (0.2 -0.4mgd) and Phase 5(below 0.2mdg) are required to monitor and report TN and TP during permit renewal and any facility in Phases 4 and 5 that undergoes expansion is subjected to cap load right away. EPA published Chesapeake Bay TMDL in December of 2010. In order to address the TMDL, Pennsylvania developed Chesapeake Watershed Implementation Plan (WIP) Phase 1, Phase 2 and currently Phase 3 WIP and a supplement to the WIPs to be implemented with the original Chesapeake Bay Strategy.

As outlined in the current Phase 3 WIP and the current supplement to the WIP, re-issuing permits for significant dischargers would follow the same phased approach formulated in the original Bay strategy whilst Phase 4 and Phase 5 will be required to monitor and report TN and TP during permit renewals.

This facility falls in phase 2 of the strategy and is required to meet a total maximum annual Total Nitrogen Cap load of 13,698lbs/year based on a design annual wasteflow of 0.75 MGD and 6 mg/l total nitrogen and a TP cap load of 1,826lbs/year based on annual wasteflow of 0.75 MGD and 0.8 mg/l total phosphorus. The facility is in compliance with the bay cap load requirements.

The Department approved a total nitrogen offset of 625lbs of nitrogen based on 25EDUs at 25lbs/EDU for Annville Township. The offsets are for 25 EDUs on-lot disposal systems that have been connected to the sewer conveyance system. These on-lot systems were put into use prior to January 1, 2003 and retired after January 1, 2003. The approved offsets are only for compliance purposes and are not available for trading or selling and will not be added to the base TN cap load. The permit will show the base cap load on the effluent page and show the offsets as a foot note with a language indicating the offsets may be applied throughout the compliance year or during the truing period. A complete list of addresses of the dwellings that were served by the retired on-lot systems that are now connected to the sewage conveyance system is on file. The offsets will not be added to the base cap load on the effluent page. It will be added as a foot note as follows:

"The permittee is authorized to use 625lbs/year as Total Nitrogen (TN) offsets toward compliance with the Annual Net TN mass load limitations (Cap Loads), in accordance with Part C of this permit. These Offsets may be applied throughout the Compliance Year or during the Truing Period. The application of offsets must be reported to DEP as described in Part C. The Offsets are authorized for the following pollutant load reduction activities: Connection of equivalent of 25 on-lot sewage disposal systems to the public sewer system after January 1, 2003, in which 25 lbs/year of TN offsets are granted per connection".

Additional Offsets are approved for the acceptance of hauled-in septage at the permittee's facility from residential sources within the municipal Act 537 planning area. Three pounds (3 lbs) of TN Offsets per year is approved per 1,000 gallons of septage accepted and processed at the facility. The Offsets approved are applicable to the acceptance of residential septage only. For the purpose of these Offsets, septage is defined as material removed from a septic tank by pumping. No other hauled-in wastes, including but not limited to holding tank wastes, solids and sludge generated at other facilities, may be approved. Such approved Offsets may only be applied in the Compliance Year in which the septage was accepted and are not cumulative.

4.4.13 Phosphorus:

The average monthly limit of 2mg/l phosphorus in the existing permit was based on the requirement to control phosphorus loading to Lower Susquehanna River Basin. That requirement has been superseded by the development of Chesapeake Bay TMDL in 2010, however due to anti-backsliding restrictions the limit will remain in the permit.

4.4.14 Total Residual Chlorine:

The attached TRC calculation results presented in attachment D 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 Guidance references Chapter 92a, Section 92a.48 (b) which establishes a standard BAT limit of 0.5 mg/l unless a facility-specific BAT has been developed. The attached TRC results indicate that an average monthly technology limit of 0.5 mg/l and 1.63 mg/l IMAX would be needed to prevent toxicity concerns. This is consistent with the existing permit limits and the facility is meeting the limit.

4.4.15 Stormwater:

The application identifies the four existing outfalls 002(Lat:40°19'44**"**, Long:76°31'48"), 003(Lat: 40°19'44**"**, Long: 76°31'45"), 004 (Lat: 40° 19' 39**"**, Long: 76° 31' 37") and 005(Lat: 40° 19' 38.6**"**, Long: 76° 31' 36") as receiving stormwater runoff from the treatment plant site. These outfalls will be included in Part C of the permit with BMP conditions.

4.4.16 Industrial Users

Annville Township WWTP receives wastewater from the following institutional users: Annville-Cleona High School, Lebanon Valley College, Kindred Place, UCC Home and Hill Farm Estates Retirement and Assisted Living. There are no categorical or significant industrial users tributary to the wastewater treatment plant.

4.4.17 Pretreatment Requirements

The design annual average flow of the treatment plant is 0.80 MGD and the facility receives no flow from significant Industrial users. EPA does not require development of pretreatment program for facilities with design flow less than 5MGD. However, the permit contains standard conditions requiring the permittee to monitor and control industrial users if applicable.

4.4.18 Biosolids Management

Sludge is thickened in the North and South gravity thickeners and digested in any of the 5 aerobic digesters prior to land application. The two existing aerobic digesters attached to the contact stabilization tanks are used primarily for digestion prior to transfer to the 3 new aerobic digesters installed during plant upgrade. Reed beds are used as during as needed. The Department has a separate biosolids permit for facilities that land apply. This facility has a biosolids permit and is required to sample pollutants and pathogens once a year for the purpose of regulating biosolids.

5.0 Other Requirements

5.1 Anti-backsliding

Not applicable to this permit

5.2 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. No High-Quality Waters are impacted by this discharge. No Exceptional Value Waters are impacted by this discharge.

5.3 Class A Wild Trout Fisheries

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

5.4 303d Listed Streams

The discharge is located on a stream segment that is designated on the 303(d) list as impaired, and the impairment is due to suspended solids and siltation from urban runoff and agricultural activities in the watershed. Sediment TMDL for Quittapahilla Creek was approved in 2001. Point sources were not included in the evaluation. Reduction in point source loadings below current permit levels is not appropriate at this time since the impairment is related to nonpoint sources.

5.5 Special Permit Conditions

The permit contains the following special conditions:

- Stormwater Prohibition, Approval Contingencies, Solids Management, Restriction on receipt of hauled in waste under certain conditions, Chlorine minimization and Storm water requirement

5.6 Basis for Effluent and Surface Water Monitoring

Section 308 of the CWA and federal regulation 40 CFR 122.44(i) require monitoring in permits to determine compliance with effluent limitations. Monitoring may also be required to gather effluent and surface water data to determine if additional effluent limitations are required and/or to monitor effluent impacts on receiving water quality. The permittee is responsible for conducting the monitoring and for reporting results on Discharge Monitoring Reports (DMRs).

5.7 Effluent Monitoring Frequency

Monitoring frequencies are based on the nature and effect of the pollutant, as well as a determination of the minimum sampling necessary to adequately monitor the facility's performance. Permittees have the option of taking more frequent samples than are required under the permit. These samples can be used for averaging if they are conducted using EPA-approved test methods (generally found in 40 CFR 136) and if the Method Detection Limits are less than the effluent limits. The sampling location must be after the last treatment unit and prior to discharge to the receiving water. If no discharge occurs during the reporting period, "no discharge" shall be reported on the DMR.

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" (362-0400-001), 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 Daily Max	XXX	XXX	XXX	XXX	Continuous	Measured
pH (S.U.)	XXX	XXX	6.0 Inst Min	XXX	XXX	9.0	1/day	Grab
DO	XXX	XXX	5.0 Daily Min	XXX	XXX	XXX	1/day	Grab
TRC	XXX	XXX	XXX	0.5	XXX	1.63	1/day	Grab
CBOD5	167	267	XXX	25.0	40.0	50	1/week	24-Hr Composite
BOD5 Raw Sewage Influent	Report	Report Daily Max	XXX	Report	XXX	XXX	1/week	24-Hr Composite
TSS	200	300	XXX	30.0	45.0	60	1/week	24-Hr Composite
TSS Raw Sewage Influent	Report	Report Daily Max	XXX	Report	XXX	XXX	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
Nitrate-Nitrite	XXX	XXX	XXX	Report	XXX	XXX	2/week	24-Hr Composite
Nitrate-Nitrite (lbs)	Report Total Mo	XXX	XXX	XXX	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		
Total Nitrogen	XXX	XXX	XXX	Report	XXX	XXX	1/month	Calculation
Total Nitrogen (lbs)	Report Total Mo	XXX	XXX	XXX	XXX	XXX	1/month	Calculation
Ammonia Nov 1 - Apr 30	Report	XXX	XXX	Report	XXX	XXX	2/week	24-Hr Composite
Ammonia May 1 - Oct 31	57	XXX	XXX	8.5	XXX	17	2/week	24-Hr Composite
Ammonia (lbs)	Report Total Mo	XXX	XXX	XXX	XXX	XXX	1/month	Calculation
TKN	XXX	XXX	XXX	Report	XXX	XXX	2/week	24-Hr Composite
TKN (lbs)	Report Total Mo	XXX	XXX	XXX	XXX	XXX	1/month	Calculation
Total Phosphorus	13	XXX	XXX	2.0	XXX	4	2/week	24-Hr Composite
Total Phosphorus (lbs)	Report Total Mo	XXX	XXX	XXX	XXX	XXX	1/month	Calculation
Total Copper	Report	XXX	XXX	Report	Report	XXX	1/week	24-Hr Composite
Total Lead	Report	XXX	XXX	Report	Report	XXX	1/week	24-Hr Composite

Compliance Sampling Location: At Outfall 001

7.1 Proposed Effluent Limitations and Monitoring Requirements

The limitations and monitoring requirements specified below are proposed for the draft permit, to comply with Pennsylvania's Chesapeake Bay Tributary Strategy.

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

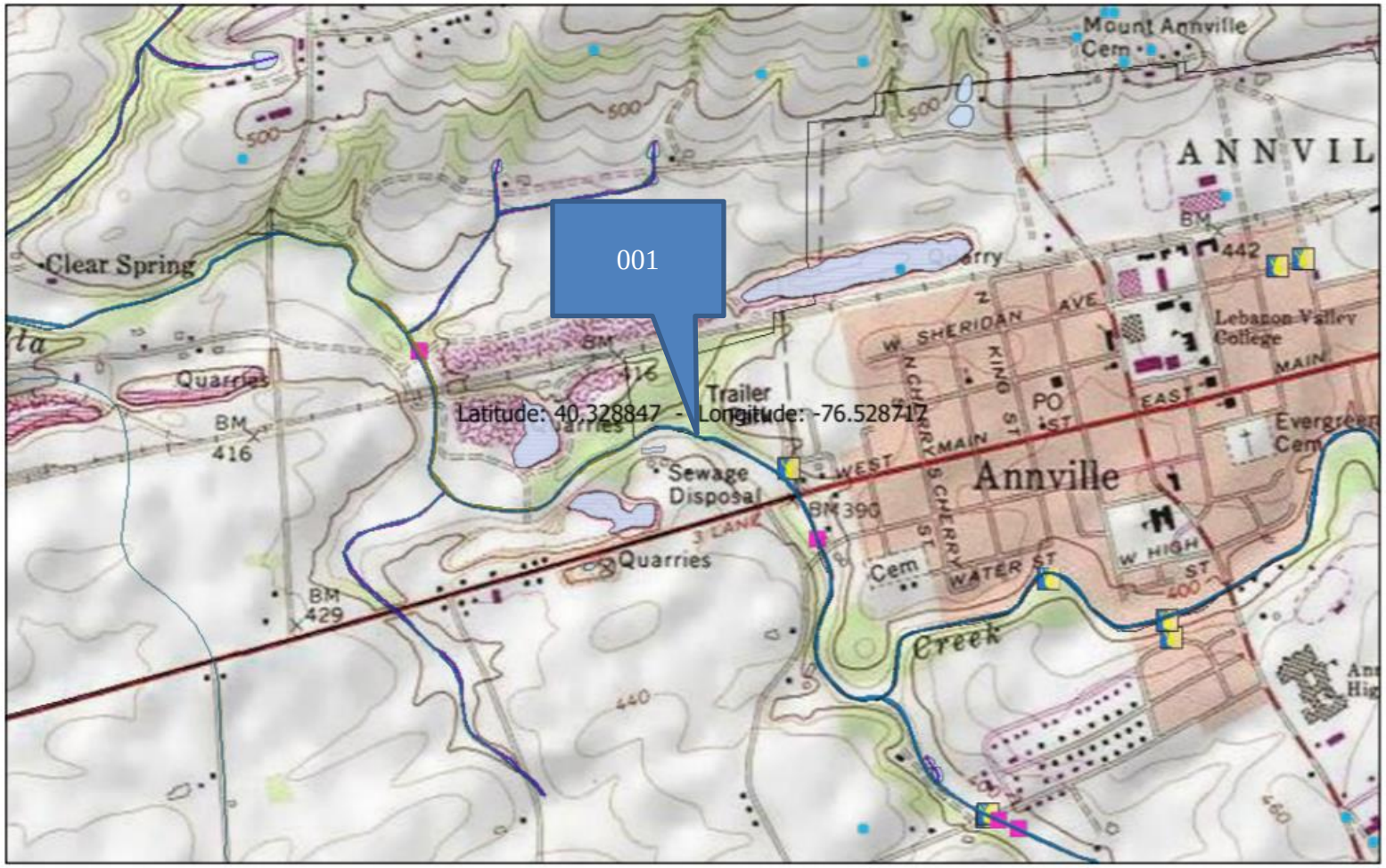
Parameter	Effluent Limitations						Monitoring Requirements	
	Mass Units (lbs/day) (1)		Concentrations (mg/L)				Minimum (2) Measurement Frequency	Required Sample Type
	Monthly	Annual	Monthly	Monthly Average	Maximum	Instant. Maximum		
Total Nitrogen (lbs) Effluent Net	XXX	13698 Total Annual	XXX	XXX	XXX	XXX	1/year	Calculation
Total Nitrogen (lbs)	XXX	Report Total Annual	XXX	XXX	XXX	XXX	1/year	Calculation
Ammonia (lbs)	XXX	Report Total Annual	XXX	XXX	XXX	XXX	1/year	Calculation
Total Phosphorus (lbs)	XXX	Report Total Annual	XXX	XXX	XXX	XXX	1/year	Calculation
Total Phosphorus (lbs) Effluent Net	XXX	1826 Total Annual	XXX	XXX	XXX	XXX	1/year	Calculation

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)
☒	Toxics Screening Analysis Spreadsheet (see Attachment **D**)
☐	Water Quality Toxics Management Strategy, 361-0100-003, 4/06.
☒	Technical Guidance for the Development and Specification of Effluent Limitations, 362-0400-001, 10/97.
☐	Policy for Permitting Surface Water Diversions, 362-2000-003, 3/98.
☐	Policy for Conducting Technical Reviews of Minor NPDES Renewal Applications, 362-2000-008, 11/96.
☐	Technology-Based Control Requirements for Water Treatment Plant Wastes, 362-2183-003, 10/97.
☐	Technical Guidance for Development of NPDES Permit Requirements Steam Electric Industry, 362-2183-004, 12/97.
☐	Pennsylvania CSO Policy, 385-2000-011, 9/08.
☐	Water Quality Antidegradation Implementation Guidance, 391-0300-002, 11/03.
☐	Implementation Guidance Evaluation & Process Thermal Discharge (316(a)) Federal Water Pollution Act, 391-2000-002, 4/97.
☒	Determining Water Quality-Based Effluent Limits, 391-2000-003, 12/97.
☐	Implementation Guidance Design Conditions, 391-2000-006, 9/97.
☒	Technical Reference Guide (TRG) WQM 7.0 for Windows, Wasteload Allocation Program for Dissolved Oxygen and Ammonia Nitrogen, Version 1.0, 391-2000-007, 6/2004.
☐	Interim Method for the Sampling and Analysis of Osmotic Pressure on Streams, Brines, and Industrial Discharges, 391-2000-008, 10/1997.
☐	Implementation Guidance for Section 95.6 Management of Point Source Phosphorus Discharges to Lakes, Ponds, and Impoundments, 391-2000-010, 3/99.
☒	Technical Reference Guide (TRG) PENTOXSD for Windows, PA Single Discharge Wasteload Allocation Program for Toxics, Version 2.0, 391-2000-011, 5/2004.
☐	Implementation Guidance for Section 93.7 Ammonia Criteria, 391-2000-013, 11/97.
☐	Policy and Procedure for Evaluating Wastewater Discharges to Intermittent and Ephemeral Streams, Drainage Channels and Swales, and Storm Sewers, 391-2000-014, 4/2008.
☒	Implementation Guidance Total Residual Chlorine (TRC) Regulation, 391-2000-015, 11/1994.
☐	Implementation Guidance for Temperature Criteria, 391-2000-017, 4/09.
☐	Implementation Guidance for Section 95.9 Phosphorus Discharges to Free Flowing Streams, 391-2000-018, 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, 391-2000-019, 10/97.
☐	Field Data Collection and Evaluation Protocol for Determining Stream and Point Source Discharge Design Hardness, 391-2000-021, 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, 391-2000-022, 3/1999.
☒	Design Stream Flows, 391-2000-023, 9/98.
☐	Field Data Collection and Evaluation Protocol for Deriving Daily and Hourly Discharge Coefficients of Variation (CV) and Other Discharge Characteristics, 391-2000-024, 10/98.
☐	Evaluations of Phosphorus Discharges to Lakes, Ponds and Impoundments, 391-3200-013, 6/97.
☒	Pennsylvania's Chesapeake Bay Tributary Strategy Implementation Plan for NPDES Permitting, 4/07.
☒	SOP: Establishing effluent limitation for individual sewage permit
☒	Other: Phase 3 WIP and Supplement

8. Attachments

A. Topographical Map



February 23, 2022

1:18,056

0 0.1 0.2 0.4 mi

0 0.17 0.35 0.7 km

B. WQM Model Results

WQM 7.0 Effluent Limits

SWP Basin	Stream Code	Stream Name
07D	9691	QUITTAPAHILLA 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)
7.100	Annville TWP	PA0021806	0.800	CBOD5	25		
				NH3-N	9.39	18.78	
				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
07D	9691	QUITTAPAHILLA CREEK	**7.100**	377.00	52.80	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	0.140	0.00	0.00	0.000	0.000	0.0	0.00	0.00	19.00	7.90	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
Annville TWP	PA0021806	0.8000	0.8000	0.8000	0.000	25.00	7.20

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
07D	9691	QUITTAPAHILLA CREEK	**5.200**	366.00	54.80	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	0.140	0.00	0.00	0.000	0.000	0.0	0.00	0.00	19.00	7.90	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	0.00	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	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
07D	9691	QUITTAPAHILLA CREEK	**1.000**	350.00	68.50	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	0.140	0.00	0.00	0.000	0.000	0.0	0.00	0.00	19.00	7.90	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	0.00	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 Wasteload Allocations

SWP Basin	Stream Code	Stream Name
07D	9691	QUITTAPAHILLA 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
7.100	Annville TWP	6.89	43.52	6.89	43.52	0	0
5.200		NA	NA	6.85	NA	NA	NA

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
7.100	Annville TWP	1.13	9.39	1.13	9.39	0	0
5.200		NA	NA	1.12	NA	NA	NA

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)		
7.10	Annville TWP	25	25	9.39	9.39	5	5	0	0
5.20		NA	NA	NA	NA	NA	NA	NA	NA

WQM 7.0 D.O.Simulation

SWP Basin	Stream Code	Stream Name
07D	9691	QUITTAPAHILLA CREEK

RMI	Total Discharge Flow (mgd)	Analysis Temperature (°C)	Analysis pH
7.100	0.800	19.860	7.703
Reach Width (ft)	**Reach Depth (ft)**	**Reach WDRatio**	**Reach Velocity (fps)**
44.511	0.749	59.407	0.259
Reach CBOD5 (mg/L)	**Reach Kc (1/days)**	**Reach NH3-N (mg/L)**	**Reach Kn (1/days)**
5.30	0.898	1.35	0.693
Reach DO (mg/L)	**Reach Kr (1/days)**	**Kr Equation**	**Reach DO Goal (mg/L)**
7.778	2.687	Tsivoglou	5
Reach Travel Time (days)			
0.449			

Subreach Results

TravTime (days)	CBOD5 (mg/L)	NH3-N (mg/L)	D.O. (mg/L)
0.045	5.09	1.31	7.47
0.090	4.89	1.27	7.21
0.135	4.70	1.23	6.99
0.179	4.51	1.19	6.82
0.224	4.34	1.15	6.68
0.269	4.17	1.12	6.57
0.314	4.00	1.08	6.49
0.359	3.85	1.05	6.43
0.404	3.70	1.02	6.39
0.449	3.55	0.99	6.37

RMI	Total Discharge Flow (mgd)	Analysis Temperature (°C)	Analysis pH
5.200	0.800	19.833	7.708
Reach Width (ft)	**Reach Depth (ft)**	**Reach WDRatio**	**Reach Velocity (fps)**
46.201	0.764	60.460	0.252
Reach CBOD5 (mg/L)	**Reach Kc (1/days)**	**Reach NH3-N (mg/L)**	**Reach Kn (1/days)**
3.50	0.500	0.96	0.691
Reach DO (mg/L)	**Reach Kr (1/days)**	**Kr Equation**	**Reach DO Goal (mg/L)**
6.430	1.723	Tsivoglou	5
Reach Travel Time (days)			
1.017			

Subreach Results

TravTime (days)	CBOD5 (mg/L)	NH3-N (mg/L)	D.O. (mg/L)
0.102	3.33	0.89	6.36
0.203	3.17	0.83	6.34
0.305	3.01	0.77	6.35
0.407	2.86	0.72	6.38
0.509	2.72	0.67	6.43
0.610	2.59	0.63	6.50
0.712	2.46	0.58	6.58
0.814	2.34	0.54	6.67
0.915	2.22	0.51	6.76
1.017	2.11	0.47	6.85

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	0.89	Use Inputted Reach Travel Times	☐
Q30-10/Q7-10 Ratio	1.23	Temperature Adjust Kr	☑
D.O. Saturation	90.00%	Use Balanced Technology	☑
D.O. Goal	5		

WQM 7.0 Hydrodynamic Outputs

SWP Basin	Stream Code	Stream Name
07D	9691	QUITTAPAHILLA 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												
7.100	7.39	0.00	7.39	1.2376	0.00110	.749	44.51	59.41	0.26	0.449	19.86	7.70
5.200	7.67	0.00	7.67	1.2376	0.00072	.764	46.2	60.46	0.25	1.017	19.83	7.71
Q1-10 Flow												
7.100	6.58	0.00	6.58	1.2376	0.00110	NA	NA	NA	0.24	0.474	19.95	7.69
5.200	6.83	0.00	6.83	1.2376	0.00072	NA	NA	NA	0.24	1.075	19.92	7.69
Q30-10 Flow												
7.100	9.09	0.00	9.09	1.2376	0.00110	NA	NA	NA	0.29	0.406	19.72	7.73
5.200	9.44	0.00	9.44	1.2376	0.00072	NA	NA	NA	0.28	0.919	19.70	7.73

C. Toxic Management Spreadsheet

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Toxics Management Spreadsheet
Version 1.3, March 2021

Discharge Information

Instructions | Discharge | Stream

Facility: **Annville Twp** NPDES Permit No.: **PA0021806** 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
0.8	100	7.2						

					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		400									
	Chloride (PWS)	mg/L		78.7									
	Bromide	mg/L	<	0.6									
	Sulfate (PWS)	mg/L		53.3									
	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	<	5									
	Free Cyanide	µg/L											
	Total Cyanide	µg/L											
	Dissolved Iron	µg/L											
	Total Iron	µg/L											
	Total Lead	µg/L	<	3									
	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		10									
	Total Molybdenum	µg/L											
	Acrolein	µg/L	<										
	Acrylamide	µg/L	<										
	Acrylonitrile	µg/L	<										
	Benzene	µg/L	<										
	Bromoform	µg/L	<										

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Toxics Management Spreadsheet
Version 1.3, March 2021

Model Results

Annville Twp, NPDES Permit No. PA0021806, Outfall 001

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

☐ ***Hydrodynamics***

☑ ***Wasteload Allocations***

☑ ***AFC*** CCT (min): 15 PMF: 0.402 Analysis Hardness (mg/l): 100 Analysis pH: 7.05

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 Dissolved Solids (PWS)	0	0		0	N/A	N/A	N/A	
Chloride (PWS)	0	0		0	N/A	N/A	N/A	
Sulfate (PWS)	0	0		0	N/A	N/A	N/A	
Total Copper	0	0		0	13.439	14.0	47.6	Chem Translator of 0.96 applied
Total Lead	0	0		0	64.581	81.6	278	Chem Translator of 0.791 applied
Total Zinc	0	0		0	117.180	120	408	Chem Translator of 0.978 applied

☑ ***CFC*** CCT (min): 92.781 PMF: 1 Analysis Hardness (mg/l): 100 Analysis pH: 7.02

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 Dissolved Solids (PWS)	0	0		0	N/A	N/A	N/A	
Chloride (PWS)	0	0		0	N/A	N/A	N/A	
Sulfate (PWS)	0	0		0	N/A	N/A	N/A	
Total Copper	0	0		0	8.956	9.33	65.0	Chem Translator of 0.96 applied
Total Lead	0	0		0	2.517	3.18	22.2	Chem Translator of 0.791 applied
Total Zinc	0	0		0	118.139	120	835	Chem Translator of 0.986 applied

☑ ***THH*** CCT (min): 92.781 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 Dissolved Solids (PWS)	0	0		0	500,000	500,000	N/A	
Chloride (PWS)	0	0		0	250,000	250,000	N/A	
Sulfate (PWS)	0	0		0	250,000	250,000	N/A	
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): 40.800 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 Dissolved Solids (PWS)	0	0		0	N/A	N/A	N/A	
Chloride (PWS)	0	0		0	N/A	N/A	N/A	
Sulfate (PWS)	0	0		0	N/A	N/A	N/A	
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	30.5	AFC	Discharge Conc > 10% WQBEL (no RP)
Total Lead	Report	Report	Report	Report	Report	µg/L	22.2	CFC	Discharge Conc > 10% WQBEL (no RP)

☐ ***Other Pollutants without Limits or Monitoring***

D. Total Residual Chlorine Calculations

TRC EVALUATION

Input appropriate values in A3:A9 and D3:D9

7.39	= Q stream (cfs)	0.5	= CV Daily
0.8	= 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 = 1.924	1.3.2.iii	WLA cfc = 1.868
PENTOXSD TRG	5.1a	LTAMULT afc = 0.373	5.1c	LTAMULT cfc = 0.581
PENTOXSD TRG	5.1b	LTA_afc= 0.717	5.1d	LTA_cfc = 1.086

Source		Effluent Limit Calculations	
PENTOXSD TRG	5.1f	AML MULT = 1.231	
PENTOXSD TRG	5.1g	AVG MON LIMIT (mg/l) = 0.500	BAT/BPJ
		INST MAX LIMIT (mg/l) = 1.635	

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)**